

 CoreTigo

TigoGateway 2TC EtherCAT USER MANUAL



Revision 2.0

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Revision Control

Author Name	Description	Rev.	Date
CoreTigo	First version	1.0	Dec 24, 2024
CoreTigo	Updates in Web Server and PLC Configuration	2.0	Dec 29, 2024

Acronyms and Abbreviations

Term	Meaning
ACT	System Activity
AL	Application Layer
API	Application Programming Interface
CM	Configuration Manager
DCP	Discovery and Basic Configuration Protocol
DS	Data Storage
DSlot	Double Slot
DU	Diagnosis Unit
FAT	File Allocation Table
FE	Functional Earth
FOTA	Firmware Upgrade Over the Air
FW	Firmware
HCI	Human-Computer Interaction
HW	Hardware
IF	Interface
IOLW	IO Link Wireless
ISDU	Indexed Service Data Unit
LQI	Link Quality Indicators
ODE	On-request Data Exchange
OPC UA	Open Platform Communication Unified Architecture
OS	Operating System
PDE	Process Data Exchange
PDin	Process Data Input
PDout	Process Data Output
PER	Packet Error Rate
Q	Queue
RSSI	Received Signal Strength Indication
SM	System Management
SMI	Standardized Master Interface
SSlot	Single Slot
SW	Software
TBD	To be determined
VS	Vendor Specific
W-Device	Wireless Device (for example, TigoBridge)
W-Master	Wireless Master (for example, TigoGateway)

1. Introduction

1.1. About

This User Manual describes the TigoGateway 2TC device.

TigoGateway 2TC is an industrial-grade IP20 IO-Link Wireless Master. It supports up to 16 IO-Link Wireless Devices simultaneously and includes interfaces to a variety of Industrial Ethernet protocols. The IO-Link Wireless connectivity enables to control sensors and actuators wirelessly, with low latency and high reliability, deterministic and scalable performance.

1.2. Manual Structure

The sections of this User Manual build on one another from section numbers 1 to 10.

1.3. Typographical Conventions

Enumerations are shown in list form with bullet points:

- Entry 1
- Entry 2
- Entry 3

Instructional steps are shown in list form with numbering:

1. Step 1
2. Step 2
3. Step 3

Decimal numbers are shown without additional indicators and are not spelled out (for example, 123).

1.4. Symbols

The following symbols are used in this User Manual:



Note:

This symbol indicates a general note.



Warning:

This symbol indicates a security notice which must be observed.



Reference(s):

This symbol indicates a cross-reference to other documentation.

1.5. Deviating Views

The product views and illustrations in this User Manual may deviate from the actual product.

2. Safety and Requirements

2.1. General Note

Users of this manual must be qualified to use the device described. All safety messages, property damage messages, and valid legal regulations must be observed by users.


Note:

CoreTigo Ltd. assumes that users have the technical capabilities required.

2.2. Electrical Connection

The TigoGateway's products family shall be supplied by an isolated power source that meets the following requirements:

- Limited-Energy Circuit in accordance with UL/CSA 61010-1 or
- Limited Power Source (LPS) in accordance with (UL/CSA 60950-1 or EN 62368-1, Annex Q) or
- Class 2 supply source which complies with the National Electrical Code (NEC), NFPA 70, Clause 725.121 and Canadian Electrical Code (CEC), Part I, C22.1.

2.3. Intended Use

The TigoGateway can be used to either acquire, 'or output', IO-Link field signals to sensors, actuators, and hubs, with such signals being sent and received to a higher-level control system. It is intended for use in operating temperatures of 0°C to 55°C. Its housing will protect it from damage caused by any buildup of moisture on surfaces which are in contact with the air. It is developed for any working environment requiring protection class IP20.


Note:

The TigoGateway is intended for indoor use.


Warning:

Product applications other than those described in this User Manual are not permitted.

2.4. Personnel Qualification

The product may only be mounted, configured, operated, or demounted by qualified personnel with skills in the following area:

- Safety and health at work
- Mounting and connecting of electrical equipment
- Measurement and analysis of electrical functions and systems
- Evaluation of the safety of electrical systems and equipment.


Warning:

CoreTigo Ltd. does not assume any warranty or liability for damage caused to the product due to non-compliance with security measures or incorrect installation of the product.

2.5. Power Drop for Write/Delete Access in File System

The **File Allocation Table (FAT)** file system is subject to certain operational limitations. Specifically, write and delete access in the file system (for the purpose of firmware update, configuration, download, and so forth) may destroy the FAT if access cannot be completed during power drops.

Without such a proper FAT, firmware might not be found nor started. Hence, it is important to verify that the power supply of the device does not drop during write and delete access in the file system.

2.6. Information and Data Security

Users are expected to follow all safety measures regarding information and data security relevant to devices used.

If a TigoGateway is connected to a public network, safeguard its data integrity by doing one of the following:

- Install it behind a firewall (recommended).
- Make the TigoGateway accessible only through a secure connection (for example, an encrypted VPN connection).

2.7. Regulatory Notices

FCC ID: 2ATSM-COR2TGW

IC: 26463-COR2TGW

2.7.1. Class A Warnings – Industrial Use

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 instructions, 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.

2.7.2. FCC Warning

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

2.7.3. ISED Warning

CoreTigo Ltd. does not endorse any changes made to the device by the user of any kind. Any change or modification may void the user's right to use the device.

CoreTigo Ltd. n'approuve aucune modification apportée à l'appareil par l'utilisateur, quelle qu'en soit la nature. Tout changement ou modification peuvent annuler le droit d'utilisation de l'appareil par l'utilisateur.

2.7.4. Interference Statement

This device complies with Part 15 of the FCC Rules and Industry Canada license-exempt RSS standard(s). Operation is subject to the following two conditions:

1. This device may not cause interference.
2. This device must accept any interference, including interference that may cause undesired operation of the device.

Le présent appareil est conforme aux CNR d'Industrie 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'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.*

2.7.5. Wireless Notice

This device complies with FCC/ISED radiation exposure limits set forth and meets the FCC radio frequency (RF) Exposure Guidelines and RSS-102 of the ISED radio frequency (RF) Exposure rules. This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter. The distance between user and device should be no less than 20cm.

This radio transmitter [26463-COR2TGW] has been approved by Innovation, Science and Economic Development Canada to operate with the antenna types listed below, with the maximum permissible gain indicated. Antenna types not included in this list that have a gain greater than the maximum gain indicated for any type listed are strictly prohibited for use with this device.

- Antenna Part Number: TLW2.5A-SMA-Male
- Manufacturer: CoreTigo Ltd.
- Peak Gain: 1.5 dBi

Le présent appareil est conforme à l'exposition aux radiations FCC / ISED définies pour un environnement non contrôlé et répond aux directives d'exposition de la fréquence de la FCC radiofréquence (RF) et RSS- 102 de Peak Gain (1.5 dBi). La distance entre l'utilisation et l'appareil ne doit pas être inférieure à 20 cm.

2.8. Requirements

2.8.1. Hardware

Installation of the product requires the following hardware:

- TigoGateway IO-Link Wireless Master
- 24 V DC SELV (Safety Extra Low Voltage) or PELV (Protective Extra Low Voltage) Power Supply
- CAT5 - Ethernet Cable with RJ45 Connectors
- EtherCAT Supported PLC (not mandatory)



Note:

The abovementioned components are provided by CoreTigo Ltd. upon purchase.

- PC or Notebook with a minimum of 1 additional Ethernet Port and Internet Access/PLC

2.8.2. Software

The TigoEngine software application should be used for installation, setup, maintenance and control of the TigoGateway.

3. Getting Started

3.1. Product Description

TigoGateway 2TC is an industrial-grade IP20 IO-Link Wireless Master.

TigoGateway 2TC has two IO-Link Wireless tracks which support up to 8 IO-Link Wireless Devices per track, and includes interfaces to a variety of Industrial Ethernet protocols. The IO-Link Wireless connectivity enables the control of sensors and actuators wirelessly, with low latency and high reliability, deterministic and scalable performance.

Key functionalities include:

- Interfaces to a variety of Industrial Ethernet protocols and other communication protocols such as OPC UA, HTTP and REST API
- PLC control of sensors and actuators under deterministic constraints
- Uploading of high-resolution OT data to the Cloud with a secure connection via MQTT TLS can be done from the TigoGateway 2TC via the TigoEngine software (refer to TigoEngine User Manual for more information)

3.2. Product Overview

All technical data, such as the manufacturer's address, product name, part number, serial number, MAC address, certification signs (for example, CE and UL), environmental signs (for example, disposal), and other data is provided in the form of side label attached to the device's housing.

For further details see [Technical Data](#).

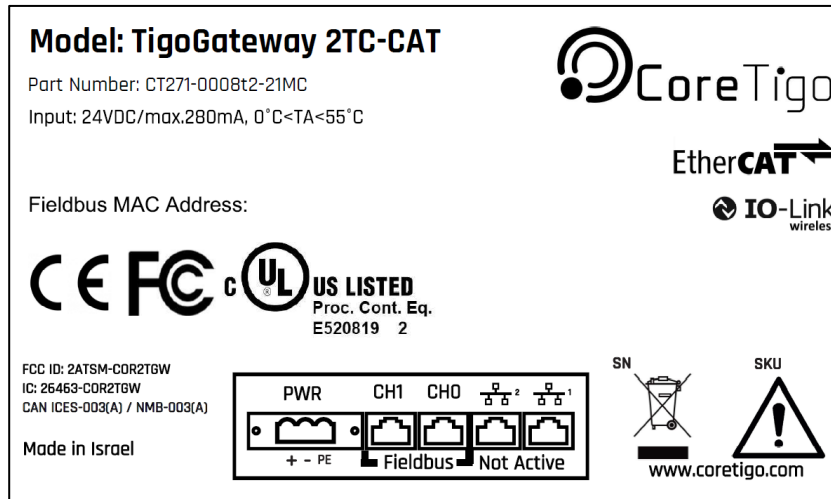


Figure 1: TigoGateway 2TC-CAT Side Label

3.2.1. Network Topology

The network topology in which the TigoGateway is used is described in the diagram below.

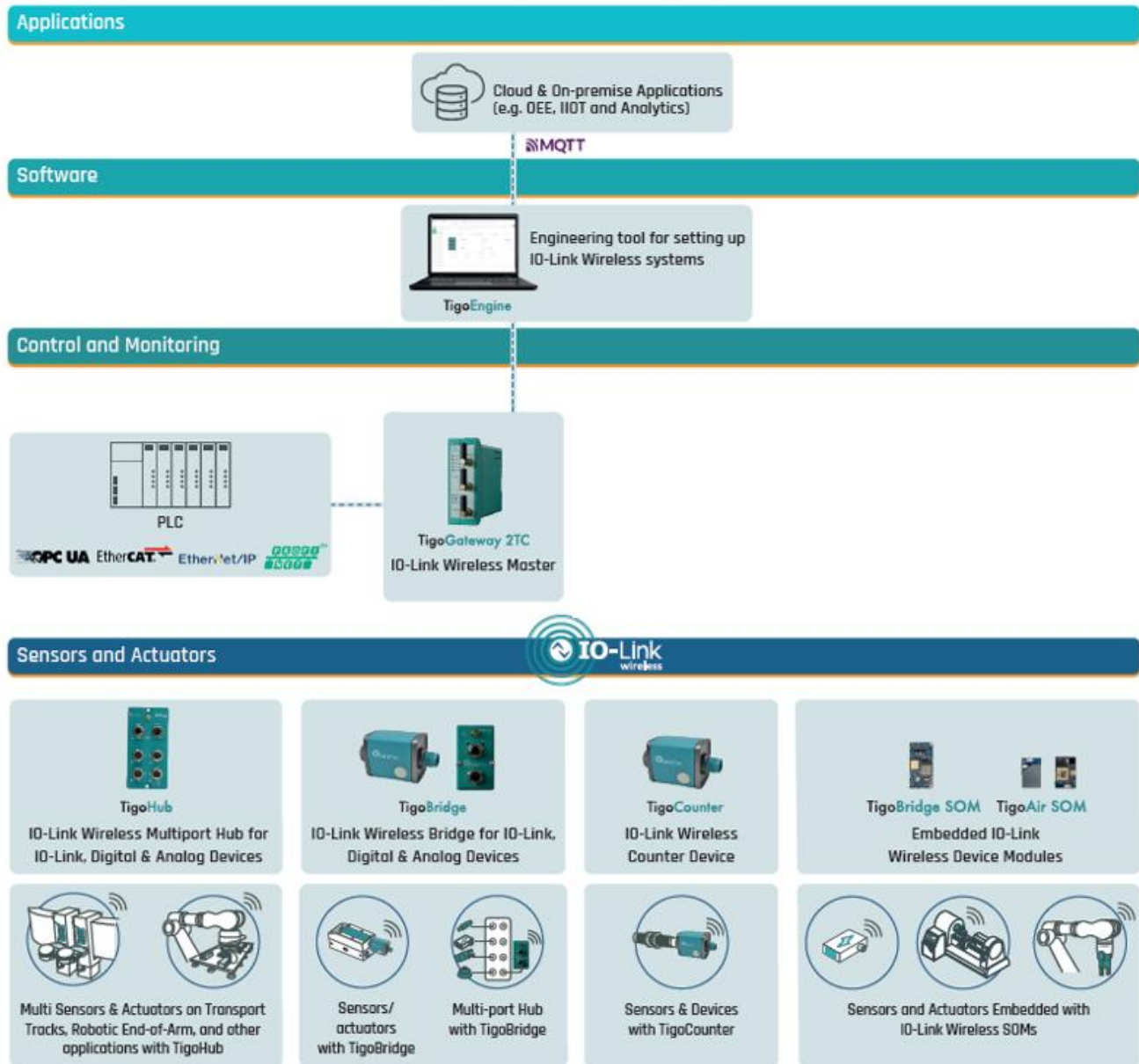
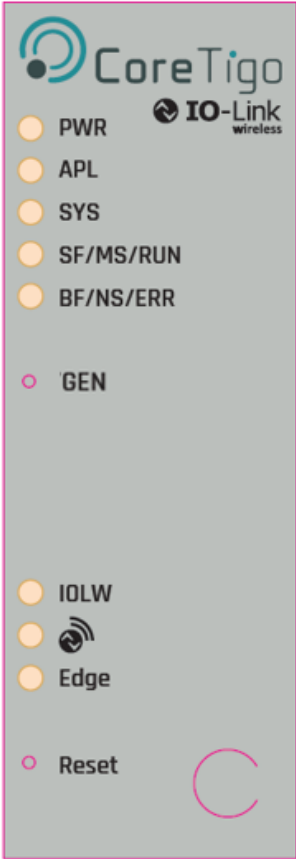
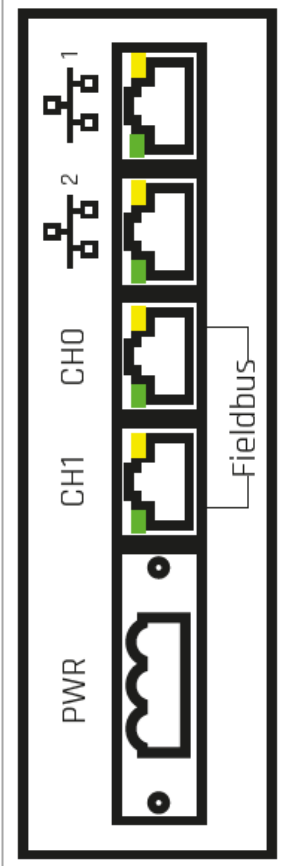



Figure 2: TigoGateway 2TC Network Topology

3.2.2. LEDs

The positions of the LEDs on TigoGateway are illustrated in the schematic diagrams below.

Table 1: Front and Bottom Panel LEDs



Front Panel	Bottom Panel
	
<p>Legend:</p> <ul style="list-style-type: none">1. PWR – On/Off2. APL – IOLW Master Configured3. SYS – Firmware Running4. SF/MS/RUN – System Failure5. BF/NS/ERR – Bus Failure6. GEN - General7. IOLW - IOLW Connected8. QSI  – Quality Signal Indicator9. EDGE – Not Active	<p>Legend:</p> <ul style="list-style-type: none">10. PWR – On/Off (Connector)11. CH0 – RJ45 Ethernet12. CH1 – RJ45 Ethernet13. LAN1 – Not Active14. LAN2 – Not Active

3.2.3. LED Indications

The tables below indicate the states of each LED on the TigoGateway.






3.2.3.1. PWR LED

Table 2: Power LED

LED Type	Color	State	Description
PWR		On	All processes are powered
		Off	One or more processes is not powered

3.2.3.2. APL LED

Table 3: APL LED

LED Type	Color	State	Description
APL		On	IO-Link Wireless Master configured.
		Blinking	Communication established.
		On	Initialization of components done.
		Blinking	Communication error.
		Off	Components not initialized.

3.2.3.3. System LED

Table 4: System LED







LED Type	Color	State	Description
SYS		On	The firmware is running.
		Blinking	File system formatting is in progress
		On	A system error has occurred.
		Blinking (3 x Yellow , 3 x Green)	Firmware crash, unrecoverable (an internal exception occurred that cannot be handled).
		Blinking (1 Hz, 4Hz)	1 Hz: The maintenance firmware is idle (waiting for update). 4 Hz: The maintenance firmware is in operation: a firmware update will be installed.
		Off	No supply voltage to the TigoGateway, or a hardware defect during a firmware reset.

Table 5: System LED States

LED State	Description
Blinking	The display turns on and off in phases.
Blinking (3 x Yellow , 3 x Green)	The indicator turns on and off with a frequency of approximately 1 Hz: <ul style="list-style-type: none"> 3 x Yellow "On" for 500 ms and "Off" for 500 ms 3 x Green "On" for 500 ms and "Off" for 500 ms

Blinking (1Hz, 4 Hz)	<p>The indicator turns on in phases Yellow or Green with a frequency of approximately:</p> <ul style="list-style-type: none"> 1 Hz: 1 x Yellow "On" for 500 ms and 1 x Green "On" for 500 ms 4 Hz: 1 x Yellow "On" for 125 ms and 1 x Green "On" for 125 ms
-------------------------	---

3.2.3.4. TigoGateway Device Status (EtherCAT)

The **MS** and **NS** LEDs indicate the status of the TigoGateway.

The LNK and ACT LEDs indicate the status of the Ethernet.

The following table describes the LED states of the TigoGateway.

Table 6: TigoGateway Device Status









LED	Color	State	Description
RUN (Module Status)		Off	INIT: the device is in INIT state.
		On	Device Operational: the device is operating correctly.
		Flashing (2.5 Hz)	Pre-Operational: the device is in the PreOperational state.
		Single Flash	Safe-Operational: the device is in the SafeOperational state.
ERR (Network Status)		Off	Off no error: the EtherCAT communication of the device is in working order.
		Flashing (2.5 Hz)	Invalid configuration: General Configuration Error Possible reason: State change commanded by master is impossible due to register or object settings.
		Single Flash	Local error: slave device application has changed the EtherCAT state autonomously. Possible reason 1: A host watchdog timeout has occurred. Possible reason 2: Synchronization error, device enters Safe-Operational state automatically.
		Double Flash	Application watchdog timeout: An application watchdog timeout has occurred. Possible reason: Sync Manager Watchdog timeout.

Table 7: LED States








LED state	Definition
Flashing (2.5 Hz)	The indicator turns on and off with a frequency of 2.5 Hz: on for 200 ms, followed by off for 200 ms.
Single Flash	The LED shows one short flash (200 ms) followed by a long off phase (1,000 ms).

Double flash	<p>The LED shows the following sequence:</p> <p>1st short flash (200 ms) – short off (200 ms) – 2nd short flash (200 ms) – long off (1,000 ms)</p>
--------------	--

3.2.3.5. IO-Link Wireless and Edge Computing LEDs





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

Table 8: Lower Front Panel LEDs Status

LED	Color	State	Description
IOLW		On	All paired ports are in operation mode or no port is paired
		On	When a paired device sends an event and all ports are operational, the LED initially turns yellow for a user-configured duration, after which it turns green . In the case of multiple events, the LED indication restarts from the time of the last event occurrence.
		On	One of the paired ports is not in operation mode
		On	One or more of the paired ports falls within the QSI threshold range, but none of them are below it.
		On	The paired ports are beyond the upper limit of the QSI threshold range.
		On	One or more of the paired ports falls below the lower limit of the QSI threshold range.
Edge			Not Active

3.2.3.6. Ethernet LEDs

Table 9: Ethernet Status (Bottom Panel)

LED	Color	State	Description
LINK		On	The device is linked to the Ethernet.
		Off	The device has no link to the Ethernet.
ACT		Flickering (load dependent)	The device sends/receives Ethernet frames.
		Off	The device does not send/receive Ethernet frames.

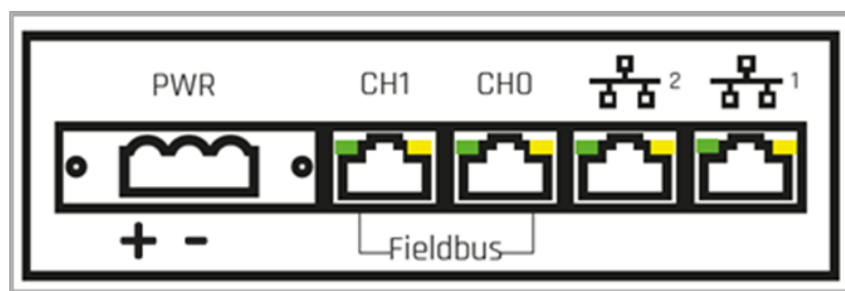


Figure 3: Ethernet Bottom Panel

Table 10: Ethernet LED States

LED Status	Definition
Flickering (Load Dependent)	<p>The LED turns on and off with a frequency of approximately 10 Hz to indicate high Ethernet activity: On for approximately 50 ms, followed by Off for 50 ms.</p> <p>The LED turns on and off in irregular intervals to indicate low Ethernet activity.</p> <p>NOTE: LAN1 port LED has additional states:</p> <ul style="list-style-type: none"> Steady orange indicates 100Mbps speed LED Off indicates 10Mbps speed

3.2.4. Connection Points

3.2.4.1. Power Supply

The device's power is supplied via a 3-pin terminal block about 15mm in length (PWR IN).

Table 11: Power Supply Connectors

[illegible]

3.2.4.2. Ethernet

Users must utilize the following connectors to establish a connection with the interface ports of the TigoGateway.

- Connector **CH0** for Ethernet interface port 1
- Connector **CH1** for Ethernet interface port 2

Table 12: EtherNet Connectors

Connector	Location	Description
CH0-OT	Bottom Panel	RJ45 Ethernet port with link and active LED
CH1-OT	Bottom Panel	RJ45 Ethernet port with link and active LED
LAN1-IT	Bottom Panel	Not active
LAN2-IT	Bottom Panel	Not active



3.2.4.3. SMA Antenna

The TigoGateway 2TC is equipped with three SMA antennas. The types of data transferred (e.g. length and data type) may vary depending on the connected devices.

Table 13: Top Panel Connectors

Connector	Location	Description
SMA T1	Top Panel	T1 Antenna (all variants of board)
SMA T2	Top Panel	T2 Antenna (all variants of board)
SMA T3	Top Panel	T3 Antenna (all variants of board)

Table 14: SMA Antenna

SMA Antenna	Type	Model
	2.4GHz Antenna <ul style="list-style-type: none"> • Bandwidth: 1000 MHz • Impedance: 50 Ohms • Power Rating: 1 W 	CT-ANT-1000
	When mounting the TigoGateway inside a cabinet, it is possible to extend the antenna outside of the cabinet. In such case, use the following cable and antenna: <ul style="list-style-type: none"> • Panel Mount Antenna Coax cable, SMA male to female, 1m, IP67 • 2.4GHz Whip Straight RF Antenna 3.5dBi SMA Male Connector Mount 	CT-CBL-ACRFSMSF01 CT-ANT-1100


Note:

It is not permitted to use an alternative SMA antenna from the one supplied by CoreTigo Ltd. Using an alternative SMA antenna may result in a loss of device approval. Additionally, SMA antennas must be mounted for proper device functioning.

4. Installation Overview

Warning:

Comply with all safety instructions relevant to the TigoGateway and to the mounting tools.



The TigoGateway may only be installed and commissioned by qualified electricians in accordance with EN 50110-1/-2 and IEC 60364.

Make sure that the TigoGateway is not damaged. A damaged TigoGateway must not be put into operation.

TigoGateway can only be used in an indoor location.

4.1. Hardware Installation

This section describes how to mount and ground the TigoGateway.

4.1.1. Select the Mounting Location

The TigoGateway can be mounted in the control cabinet or on any part of the system that meets the following requirements:

- The TigoGateway should be hung on a DIN rail which is a metal rail of a standard type widely used for mounting circuit breakers and industrial control equipment inside equipment racks. Standard DIN Rails are available in 35mm (7.5 and 15mm deep), 32mm and 15mm widths and are supplied in 1 m (3'3") and 2 m (6'6") lengths.
- The TigoGateway must not be mounted in the shearing areas of moving system parts (otherwise it might be damaged).
- The cables for the TigoGateway must be laid in such a way that they cannot be caught in the shearing areas of moving system parts (otherwise they might be damaged).
- The mounting location must have sufficient space for easy replacement of the TigoGateway and connecting all required cables to it.
- The mounting location must meet the TigoGateway's vibration and shock resistance requirements.
- The diagnostic LEDs of the TigoGateway must be visible when it is mounted.
- The TigoGateway must not be mounted on or near highly inflammable materials.
- To prevent the TigoGateway from overheating:
 - It must not be mounted near strong heat sources
 - It must have an unobstructed air supply
 - Its cooling must not be impeded
- Do not bridge any gaps with the unit to protect it from any tensile forces that may occur.

4.1.2. Equipment Required

Mounting the TigoGateway requires the assembly of a DIN rail on a convenient wall. TigoGateway is attached to the DIN rail from the rear side as shown below.

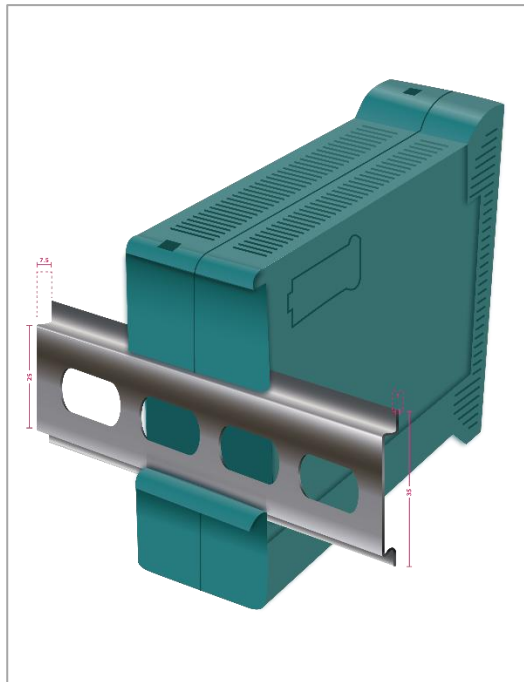


Figure 4: TigoGateway Bracket for DIN Rail

4.1.3. Mount the TigoGateway



Note:

Make sure not to soil the connectors on the TigoGateway during installation.
Dirt will damage the contacts.

1. Disconnect the system from the power supply.
2. Ensure sufficient equipotential bonding in the system.
3. Secure unit in the desired position on the DIN rail (inner width 25mm, outer width 35mm, depth 7.5mm).
4. Mount the TigoGateway's SMA antenna.

SMA antenna must be mounted for proper TigoGateway operation.

4.1.4. Ground the TigoGateway

Each of the TigoGateway's power supply connectors has an FE pin that is connected to the metal housing of the TigoGateway. The metal housing has a central grounding point for the FE.

Ground the TigoGateway as follows:

1. Connect TigoGateway to FE (functional earth) in one or more of the following ways:
 - Via the metal housing.
 - Via FE of the power supply connectors.
 - Via a cable lug and the mounting hole, if the TigoGateway is mounted on a non-conductive base.
2. Make sure that the contacts are attached solidly and that the cable cross-section is sufficient.

4.1.5. Demount the TigoGateway

1. Disconnect the part of the plant to which you have mounted the TigoGateway from the power supply.
2. Verify that the plant on which the TigoGateway is mounted is de-energized.
3. If the TigoGateway is dirty, clean it first.
4. Before demounting from the DIN rail, disconnect the cables.
5. Remove the TigoGateway for replacement or reuse.

Warning:


During operation, high surface temperatures can occur on the housing and at the metal connections, especially at the M12 connector sleeve.

When the TigoGateway is in operation, let it cool down before touching it or use gloves.

Warning:


If the demounted TigoGateway is defective, mark it as defective to prevent it from being used again.



Disposal of Waste Electronic Equipment

Important notes from the European Directive 2011/19/EU "Waste Electrical and Electronic Equipment (WEEE)".

Warning:


- This product must not be treated as household waste. As a consumer, you are legally obliged to dispose of all waste electronic equipment according to national and local regulations.
 - This product must be disposed of at a designated waste electronic equipment collection point.
-

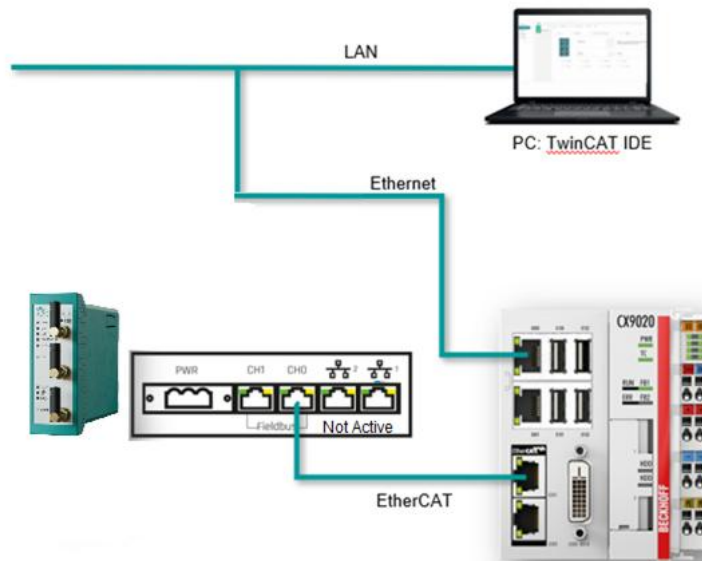
4.2. Connect TigoGateway



Warning:

- Danger of electrical shock.
- Operate the TigoGateway exclusively with 24 V DC SELV (Safety Extra Low Voltage) or PELV (Protective Extra Low Voltage) power supply.
- Pay attention to a central grounding (FE) if two separate power supplies are used.

Connection Example with EtherCAT PLC



Connection Example with TigoBridge

The connection example below describes a typical installation that uses a TigoBridge to connect a wired IO-Link Device via a wireless connection to the IO-Link Wireless Master.

Process:

1. Connect the Ethernet cable to the **CH0** connector of the TigoGateway and to the Controlling IPC and/or to PLC.
2. Connect the power cable to the **PWR** connector of the TigoGateway.
3. Connect the wired IO-Link device with the cable to the W-Bridge.
4. Connect the power cable (+24 V DC SELV or PELV) to the power connector of the W-Bridge.
5. Switch on the power supply units of the TigoGateway and TigoBridge.
6. Configure and setup TigoGateway 2TC and connected IO-Link Wireless Devices via the TigoEngine

4.2.1. TigoEngine

TigoEngine is a software-based management platform for the efficient setup of IO-Link Wireless masters and devices. It enables installation, configuration, and monitoring of an IO-Link Wireless system.



Reference:

For further information please refer to the *TigoEngine User Manual*.

Online and offline setup of IO-Link Wireless components is possible, with a variety of options to connect to IO-Link Wireless masters. With its intuitive user interface, TigoEngine simplifies the deployment and maintenance of an IO-Link Wireless system.

TigoEngine Key Functionalities

- IO-Link Wireless Master communication and configuration
- Scanning for available IO-Link Wireless devices within range of an IO-Link Wireless master
- Pairing and connecting IO-Link Wireless devices to the relevant IO-Link Wireless masters
- Configuration of IO-Link Wireless device parameters based on IODD
- Wireless channel blacklist configuration per master
- Loading parameters from an IO-Link sensor
- Bulk configuration of devices via uploaded files
- Firmware upgrade—updating wireless devices using FOTA
- Third party software integration via an MQTT publisher—exporting process data from TigoEngine to third party software (requires an MQTT broker on the third party software side)
- Performance Monitoring:
 - Packet Error Rate (PER) real-time display—enables analysis of latency and network interferences
 - Link Quality Indication (LQI)
 - Received Signal Strength Indication (RSSI)

5. Configuration

5.1. TigoGateway Network Configuration

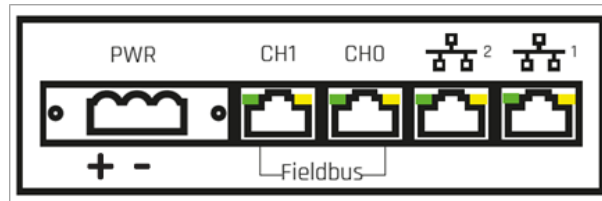


Figure 5: Ethernet Bottom Panel

Table 15: TigoGateway Settings

Port Name	Default Settings	Processor
CH0/CH1(Wireless Master)	IP: 192.168.1.100 Subnet Mask: 255.255.255.0	Netx W-Master

5.2. General

Before the TigoGateway can operate together with its connected devices, it must be configured.

Configuration has the following levels:

- EtherCAT configuration– performs the configuration and parameterization.
- IO-Link Wireless Master configuration – of TigoGateway parameters (e.g. track mode).
- Port configuration – of parameters for the wireless ports (subslots), for connected IO-Link Wireless devices and TigoBridge devices, and for Standard IO mode.

Configuration is performed using one or more tools together with an ESI file.

An ESI file is available, user should copy the file into the ECAT development tool (TwinCAT, Codesys...) ESI directory.

5.3. Introduction

The parameters can be grouped in the following categories and sub-categories:

- TigoGateway:
 - Input/output data of the EtherCAT I/O modules/submodules.
 - Parameters for the IO-Link Wireless Master (e.g. track mode).
 - Parameters for the wireless ports (e.g. wireless slot number).
- Connected IO-Link devices:
 - IO-Link device parameters.

To set parameters, use the following tools:

- **Configuration Software of EtherCAT**
 - The EtherCAT network must be configured to exchange process data with the TigoGateway device.
 - The configuration software of the EtherCAT network requires an ESI file to configure the device.
 - The configuration software of the EtherCAT network requires the ESI file to be located in the ESI

folder with all other catalog ESI devices, the user can make the configuration settings and parameterizations for the device.

- The user loads the configuration to the EtherCAT configuration software.
- The EtherCAT configuration software performs the configuration and parameterization of the TigoGateway device.

- **TigoEngine**

TigoEngine is software that enables the user to do the following:

- Set all parameters for the TigoGateway W-Master and its connected IO-Link and IO-Link Wireless devices.
- Monitor the TigoGateway and IO-Link devices in any system connected to TigoEngine.

In order for the EtherCAT Master and the TigoGateway 2TC to exchange process data, you need to configure the EtherCAT Master using the ESI file (EtherCAT Slave Information file) for the TigoGateway 2TC.

Configuring the EtherCAT Master has the following stages:

- Prerequisites
- Import the ESI file
- Define the module for each port
- Set parameters for the ports

5.3.1. Prerequisites

Make sure that:

- You have the latest ESI file:
The ESI file name is in the format **CoreTigo_TigoGateway_2TC.xml**. It is provided separately and can be download from the CoreTigo Customer Portal <https://support.CoreTigo.com/index.php>.
- All components are connected to the system and to the power supply (as described in previous sections).
- The TigoGateway is connected to your EtherCAT Master (for example, TwinCAT).

5.3.2. Import the ESI File

This procedure uses the example of importing the ESI file in a TwinCAT programming environment.

1. Import the ESI file as follows:
 - In the configuration software for the EtherCAT Master, click the menu for your programming environment: for example, **TwinCAT**.
 - In the menu, select **EtherCAT Devices > Reload Device Descriptions**.

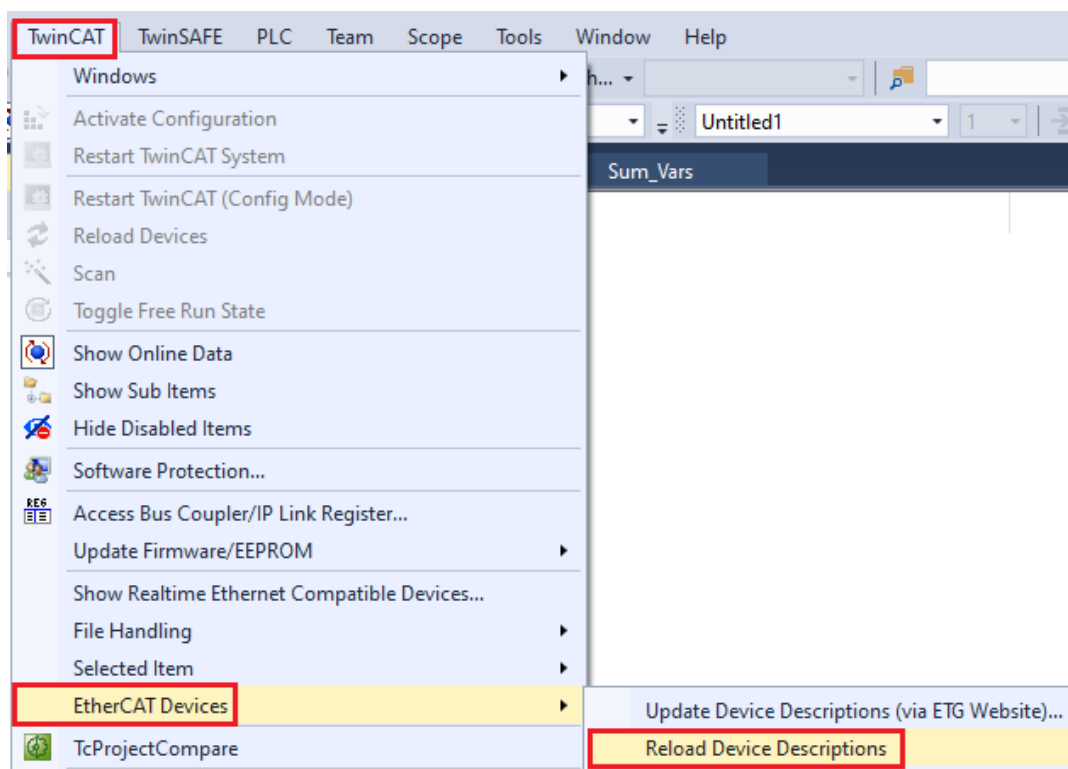


Figure 8: Import the ESI File

2. In the device catalog select the TigoGateway 2TC (EtherCAT), and add it to the configuration project.

Note: Use the scan feature of the configuration software to add the TigoGateway 2TC to the project.

5.3.3. Define the Module for Each Port

Each wireless IO-Link port of the TigoGateway 2TC corresponds to a **slot** in the configuration software. There are 16 slots (ports), named WP01–WP16. Each slot has a **module** property that needs to be defined according to the type of device connected to it: that is, according to the device's quantity of bytes PDIN and quantity of bytes PDOUT.

Define each slot's module as follows:

1. In the configuration software for the EtherCAT Master, double-click TigoGateway 2TC.
2. In the main window, select the **Slots** tab.

In the **Slots** tab you can see that the default setting for each slot's module is **Slot Empty** (that is, disabled).

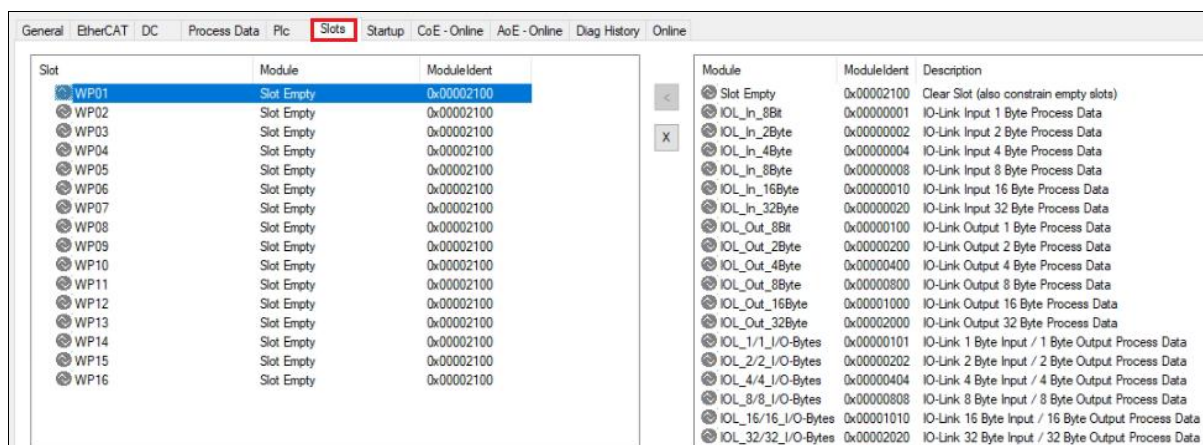


Figure 9: Slots Tab

3. Select the desired slot.

In the example in the figure below, WP01 is selected.

4. Click .

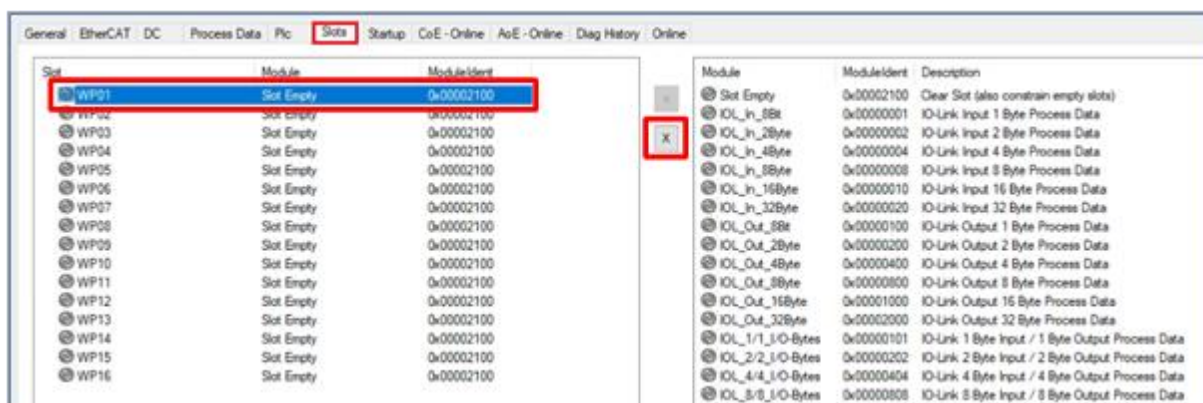


Figure 10: Clear a Slot's Current Module Setting

5. In the **Module** pane, select the relevant module (according to the size of the process data input and output by the device connected to the slot).

For example, if the selected slot is connected to a device with 2 bytes PDIN and 4 bytes PDOOUT, the relevant module would be IOL_4/4_I/O-Bytes, as shown in the figure below.

6. Click .

The selected module now appears in the following places:

- The selected slot's row in the **Slots** tab (in the **Module** column)
- The **Solution Explorer**
- The **Startup** tab

General EtherCAT DC Process Data Plc Slots Startup CoE - Online AoE - Online Diag History Online			
Slot	Module	ModuleId	
WP01	IOL_4/4_I/O-Bytes	0x0000404	
WP02	Slot Empty	0x00002100	
WP03	Slot Empty	0x00002100	
WP04	Slot Empty	0x00002100	
WP05	Slot Empty	0x00002100	
WP06	Slot Empty	0x00002100	
WP07	Slot Empty	0x00002100	
WP08	Slot Empty	0x00002100	
WP09	Slot Empty	0x00002100	
WP10	Slot Empty	0x00002100	
WP11	Slot Empty	0x00002100	
WP12	Slot Empty	0x00002100	
WP13	Slot Empty	0x00002100	
WP14	Slot Empty	0x00002100	
WP15	Slot Empty	0x00002100	
WP16	Slot Empty	0x00002100	

Module	ModuleId	Description
Slot Empty	0x00002100	Clear Slot (also constrain empty slots)
IOL_In_8Bit	0x00000001	IO-Link Input 1 Byte Process Data
IOL_In_2Byte	0x00000002	IO-Link Input 2 Byte Process Data
IOL_In_4Byte	0x00000004	IO-Link Input 4 Byte Process Data
IOL_In_8Byte	0x00000008	IO-Link Input 8 Byte Process Data
IOL_In_16Byte	0x00000010	IO-Link Input 16 Byte Process Data
IOL_In_32Byte	0x00000020	IO-Link Input 32 Byte Process Data
IOL_Out_8Bit	0x00000100	IO-Link Output 1 Byte Process Data
IOL_Out_2Byte	0x00000200	IO-Link Output 2 Byte Process Data
IOL_Out_4Byte	0x00000400	IO-Link Output 4 Byte Process Data
IOL_Out_8Byte	0x00000800	IO-Link Output 8 Byte Process Data
IOL_Out_16Byte	0x00001000	IO-Link Output 16 Byte Process Data
IOL_Out_32Byte	0x00002000	IO-Link Output 32 Byte Process Data
IOL_1/1_I/O-Bytes	0x00000101	IO-Link 1 Byte Input / 1 Byte Output Process Data
IOL_2/2_I/O-Bytes	0x00000202	IO-Link 2 Byte Input / 2 Byte Output Process Data
IOL_4/4_I/O-Bytes	0x0000404	IO-Link 4 Byte Input / 4 Byte Output Process Data

Figure 11: Set a Slot's Module

Box 1 (NFD-3090-ECS-IOLM\W)
TxPDO Mapping of New Messages Available
TxPDO Mapping of Status Data
Module 1 (IOL_4/4_I/O-Bytes)
TxPDO
Input byte 0
Input byte 1
Input byte 2
Input byte 3
RxPDO
Output byte 0
Output byte 1
Output byte 2
Output byte 3

Figure 9: Module in Solution Explorer

Table 16: Modules

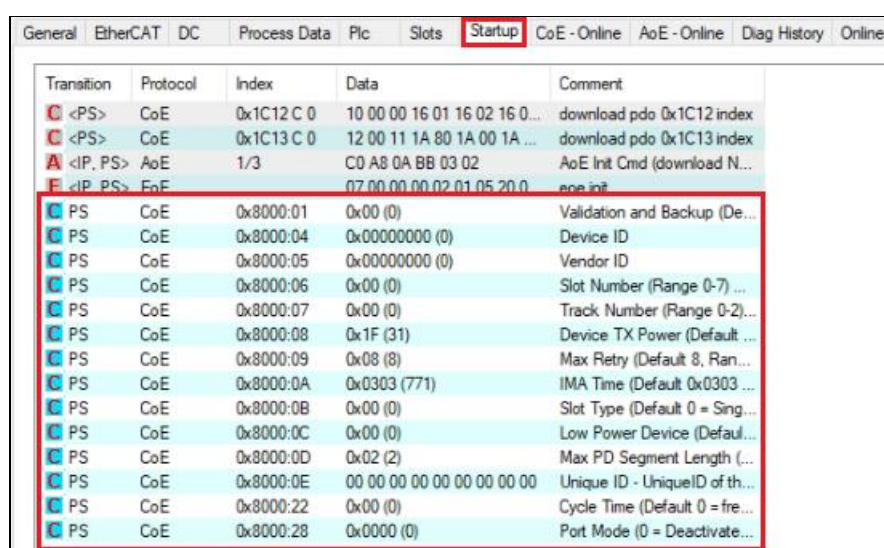
Module (Device Type)	Description
Slot empty	No device is connected to the wireless IO-Link port.
IOL_In_8Bit	IOL_In_8Bit IO-Link Input 1 Byte Process Data
IOL_In_2Byte	IOL_In_2Byte IO-Link Input 2 Byte Process Data
IOL_In_4Byte	IOL_In_4Byte IO-Link Input 4 Byte Process Data
IOL_In_8Byte	IOL_In_8Byte IO-Link Input 8 Byte Process Data
IOL_In_16Byte	IOL_In_16Byte IO-Link Input 16 Byte Process Data
IOL_In_32Byte	IOL_In_32Byte IO-Link Input 32 Byte Process Data
IOL_Out_8Bit	IOL_Out_8Bit IO-Link Output 1 Byte Process Data
IOL_Out_2Byte	IOL_Out_2Byte IO-Link Output 2 Byte Process Data
IOL_Out_4Byte	IOL_Out_4Byte IO-Link Output 4 Byte Process Data

Module (Device Type)	Description
IOL_Out_8Byte	IOL_Out_8Byte IO-Link Output 8 Byte Process Data
IOL_Out_16Byte	IOL_Out_16Byte IO-Link Output 16 Byte Process Data
IOL_Out_32Byte	IOL_Out_32Byte IO-Link Output 32 Byte Process Data
IOL_1/1_I/O-Bytes	IOL_1/1_I/O-Bytes IO-Link 1 Byte Input / 1 Byte Output Process Data
IOL_2/2_I/O-Bytes	IOL_2/2_I/O-Bytes IO-Link 2 Byte Input / 2 Byte Output Process Data
IOL_8/8_I/O-Bytes	IOL_8/8_I/O-Bytes IO-Link 8 Byte Input / 8 Byte Output Process Data
IOL_16/16_I/O-Bytes	IOL_16/16_I/O-Bytes IO-Link 16 Byte Input / 16 Byte Output Process Data
IOL_32/32_I/O-Bytes	IOL_32/32_I/O-Bytes IO-Link 32 Byte Input / 32 Byte Output Process Data

5.3.4. Set Parameters for the Ports

TigoGateway 2TC is supplied with default parameter settings, which you can change according to your system's needs (after you have defined the ports' modules as detailed in [Set Parameters for the Ports](#)). You change the settings of port parameters and IO-Link Wireless device parameters in the **Startup** tab of the configuration software of the EtherCAT Master. When communication starts, the EtherCAT Master then sends these parameters to the TigoGateway 2TC.

Each parameter for each port is identified by an index and sub-index, where the index (for example, 0x8000) identifies the port, and the sub-index (for example, 01) identifies the parameter. The index and sub-index are separated from each other by a period, i.e.: 0x8000.01.



Transition	Protocol	Index	Data	Comment
<PS>	CoE	0x1C12 C 0	10 00 00 16 01 16 02 16 0...	download pdo 0x1C12 index
<PS>	CoE	0x1C13 C 0	12 00 11 1A 80 1A 00 1A ...	download pdo 0x1C13 index
<IP, PS>	AoE	1/3	C0 A8 0A BB 03 02	AoE Init Cmd (download N...
<IP, PS>	CoE		07 00 00 00 02 01 05 20 0	aoe init
PS	CoE	0x8000:01	0x00 (0)	Validation and Backup (De...
PS	CoE	0x8000:04	0x00000000 (0)	Device ID
PS	CoE	0x8000:05	0x00000000 (0)	Vendor ID
PS	CoE	0x8000:06	0x00 (0)	Slot Number (Range 0-7) ...
PS	CoE	0x8000:07	0x00 (0)	Track Number (Range 0-2)...
PS	CoE	0x8000:08	0x1F (31)	Device TX Power (Default ...
PS	CoE	0x8000:09	0x08 (8)	Max Retry (Default 8, Ran...
PS	CoE	0x8000:0A	0x0303 (771)	IMA Time (Default 0x0303 ...
PS	CoE	0x8000:0B	0x00 (0)	Slot Type (Default 0 = Sing...
PS	CoE	0x8000:0C	0x00 (0)	Low Power Device (Defaul...
PS	CoE	0x8000:0D	0x02 (2)	Max PD Segment Length (...)
PS	CoE	0x8000:0E	00 00 00 00 00 00 00 00	Unique ID - UniqueID of th...
PS	CoE	0x8000:22	0x00 (0)	Cycle Time (Default 0 = fre...
PS	CoE	0x8000:28	0x0000 (0)	Port Mode (0 = Deactivate...

Figure 12: Startup Tab Showing the Parameters for Port WP01 (Index 0x08000)

To change the setting of a parameter:

1. In the **Startup** tab, double click the parameter.
2. Change the parameter setting as desired.
3. Click **Reload Devices** (🔄) to apply the change.

The indexes for each port are listed in the table below.

Table 17: Port Indexes

Port	Index
WP01	0x8000
WP02	0x8010
WP03	0x8020
WP04	0x8030
WP05	0x8040
WP06	0x8050
WP07	0x8060
WP08	0x8070
WP09	0x8080
WP010	0x8090
WP011	0x80A0
WP012	0x80B0
WP013	0x80C0
WP014	0x80D0
WP015	0x80E0
WP016	0x80F0

The parameters are detailed in the table below.

Table 18: Port Parameters

Sub-Index	Example Index with Sub-Index	Parameter Name	Range of Values	Default	Description
01	0x8000.01	Validation and Backup	(0) No Device check	(0) No Device check	There is no device check for validation or backup of connected IO-Link Slave devices (default).
			(1) Type compatible to V1.0		A device check is performed for validation of IO-Link Slave devices connected to the specified device type compatible to V1.0, without backup/restore.
			(2) Type compatible to V1.1		A device check is performed for validation of IO-Link Slave devices connected to the specified device type

Sub-Index	Example Index with Sub-Index	Parameter Name	Range of Values	Default	Description
					compatible to V1.1, without backup/restore.
			(3) Type compatible to V1.1 Backup/Restore		A device check is performed for validation or backup/restore of IO-Link Slave devices connected to the specified device type.
01			(4) Type compatible V1.1 Restore only		A device check is performed for validation or restore of IO-Link Slave devices connected to the specified device type, without backup.
04	0x8000.04	Device ID	0–16777215	0	<p>Device ID</p> <p>The expected device ID of the connected wireless IO-Link Device (if validation is in use).</p> <p>For details of device IDs, see ioddfinder.io-link.com, or documentation of the relevant IO-Link Device.</p> <p>Value = 0 if no validation is used.</p>
05	0x8000.05	Vendor ID	1–65535	0	<p>Manufacturer ID</p> <p>The expected manufacturer ID of the connected wireless IO-Link Device (if validation is in use).</p> <p>For details of Manufacturer IDs, see ioddfinder.io-link.com, or documentation of the relevant IO-Link Device.</p> <p>Value = 0 if no validation is used.</p>
06	0x8000.06	Slot number	0–7	0	Wireless slot number to be used for the port
07	0x8000.07	Track number	1–3	1	Wireless track number to be used for the port
08	0x8000.08	Device TX Power	1–31	31	Transmit power level of the W-Device

Sub-Index	Example Index with Sub-Index	Parameter Name	Range of Values	Default	Description
09	0x8000.09	Max Retry	2–31	8	Maximum number of retries for a transmission in OPERATE mode
0A	0x8000.0A	IMA Time	1.664 ms ... 10 min	3	Requested I-Am-Alive time for OPERATE mode. See section Error! Reference source not found. for details.
0B	0x8000.0B	IMA Time Multiplier	1-255	3	IMA Time Multiplier
0C	0x8000.0C	Slot Type	0: Single slot	0	Slot type is single slot
			1: Double slot		Slot type is double slot
0D	0x8000.0D	Low Power Device	0: Not Low Power	0	Is the connected W-Device low power or not
			1: Low Power		
0E	0x8000.0E	Max PD Segment Length	1–32	2	Maximum segment length of the PDOOut data to the Message handler to distribute PDOOut Data within multiple W-Cycles.
0F	0x8000.0F	Cycle time out	0,5,10,50,100,150, 200,250,300	0 (free run)	Port cycle time (ms) for PD out
10	0x8000.10	Cycle time in	0,5,10,50,100,150, 200,250,300	0 (free run)	Port cycle time (ms) for PD in
11	0x8000.11	Unique ID Byte 0	0–255	0	Unique ID of the W-Device
		Unique ID Byte 1	0–255	0	Unique ID of the W-Device
		Unique ID Byte 2	0–255	0	Unique ID of the W-Device
		Unique ID Byte 3	0–255	0	Unique ID of the W-Device
		Unique ID Byte 4	0 ... 255	0	Unique ID of the W-Device
		Unique ID Byte 5	0–255	0	Unique ID of the W-Device
		Unique ID Byte 6	0–255	0	Unique ID of the W-Device
		Unique ID Byte 7	0–255	0	Unique ID of the W-Device

Sub-Index	Example Index with Sub-Index	Parameter Name	Range of Values	Default	Description
		Unique ID Byte 8	0–255	0	Unique ID of the W-Device
28	0x8000.28	Port Mode	0: Deactivated	0	The W-port is inactive. Input and output process data is 0.
			52: Cyclic Auto Pairing		The W-port operates in cyclic Auto Pairing mode.
			53: Cyclic		The W-port operates in cyclic mode.
			54:Roaming Auto Pairing		The W-port operates in roaming Auto Pairing mode.
			55:Roaming		The W-port operates in roaming mode.

Port Cycle Time

The Port Cycle Time parameter sets up the cycle time of a W-Port of the Master. The cycle time is encoded using **Time Base** values (bits 6+7) and **Multiplier** values (bits 0-5), as shown in the following table.

Table 19: Port Cycle Time Calculation

Value Range	Time Base (Bits 6+7)	Multiplier (Bits 0-5)	Resulting Cycle Time/Notes
0	0	0	Free-running mode.
1 ... 64	00	1 ... 63	Note: If the free-running mode is chosen with a time base of 0, the W-Master stack automatically configures the Master Cycle Time to be the Minimum Master Cycle Time based on the PD Segmentation Length, Slot Type and Max Retry configurations.
65 ... 127	01: 5ms	1 ... 63 as multiplier	5 ... 315 ms (Time Base * Multiplier) For W-Devices and W-Bridges the minimum possible transmission time is 5 ms
128 ... 255	10 ...11: reserved	1 ... 63	Reserved. Do not use

5.3.4.1. I-Am-Alive Time

The **I-Am-Alive Time** parameter controls TigoGateway 2TC and W-Device communication if no other messages are transmitted. The W-Device must send **I-Am-Alive** messages to the TigoGateway 2TC before timeout, otherwise the TigoGateway 2TC reports a communication error (**ComLost**).

The **I-Am-Alive Time** parameter comprises a **Time Base** and **Multiplier**, and is calculated by multiplying them by each other.

The table below shows the coding of the time base.

Table 20: Time Base of I-Am-Alive Time

Value	Time Base	Description
0	Reserved	Do not use
1	1.664 ms	Time base is 1.664 ms.
2	5 ms	Time base is 10 ms.
3	1 sec	Time base is 1 sec
4	1 min	Time base is 1 min
5 ... 255	Reserved	Do not use

The multiplier has the value range of 1 ... 255.

The **I-Am-Alive Time** parameter (**Multiplier * Time Base**) is calculated as shown in the following table:

Table 21: Calculation of I-Am-Alive Time

Multiplier (Bits 8-15)	Time Base (Bits 0-7)	Calculated I-Am-Alive Time	Value
1	1: 1.664 ms	1.664 ms	257
	2: 5 ms	5 ms	258
	3: 1 sec	1 sec	259
	4: 1 min	1 min	260
2	1: 1.664 ms	3.328 ms	513
	2: 5 ms	10 ms	514
	3: 1 sec	2 sec	515
	4: 1 min	2 min	516
3	1: 1.664 ms	4.992 ms	769
	2: 5 ms	15 ms	770
	3: 1 sec	3 sec	771
	4: 1 min	3 min	772
4 ... 254	1 ... 4	Multiplier * time base	Value of multiplier * 256 + value of the time base.
255	1: 1.664 ms	424.32 ms	65281

2: 5 ms	1275 ms	65282
3: 1 sec	255 s	65283
4: 1 min	255 min (10 min is used)	65284

The TigoGateway 2TC verifies the calculated **I-Am-Alive Time** with the following limits:

- Minimum **I-Am-Alive Time** = **W-Sub-cycle duration** [ms] * (**MaxRetry** + 1)
- Maximum **I-Am-Alive Time** = 10 minutes

5.3.5. Prevent the Configuration Software of the EtherCAT Master from Configuring a Port

When EtherCAT communication is initiated, the EtherCAT Master transmits its configuration parameters to the Master. These override any port configuration parameters set by the CoreTigo Web Server or TigoEngine: parameters set using the EtherCAT Master have priority.

However, you can prevent the EtherCAT Master from transmitting a specific parameter as follows:

1. In the **Startup** tab, select the relevant parameter(s).
2. Press delete.

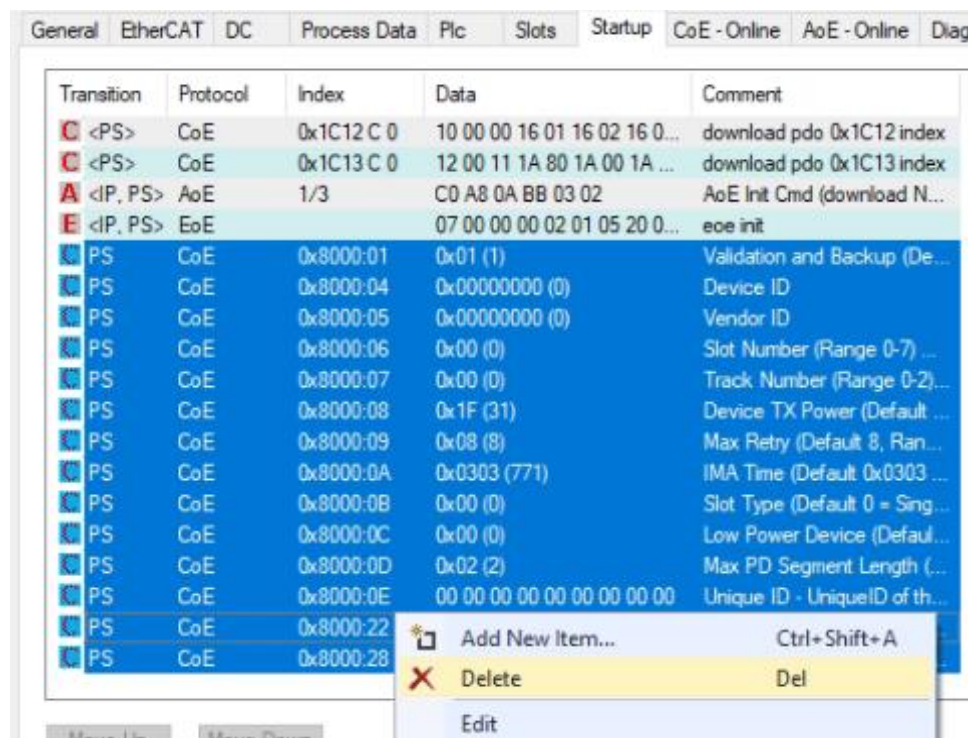


Figure 11: Delete Parameters from the Startup Tab: Example

5.4. Monitor and Write with the Configuration Software of the EtherCAT Master

5.4.1. Monitor Ports

The **CoE - Online** tab enables you to monitor various information, including:

- Online data for each port
- The state of each port

General	EtherCAT	DC	Process Data	Plc	Slots	Startup	CoE - Online	AoE - Online	Diag
<div> Update List <input type="checkbox"/> Auto Update <input checked="" type="checkbox"/> Single Update <input type="checkbox"/> Show Offline Data </div> <div> Advanced... </div> <div> Add to Startup... Online Data Module OD (AoE Port): 0 </div>									
Index	Name	Flags	Value						
70F0:0	IO-Link Out WP16		> 0 <						
8000:0	Configuration Data WP01		> 40 <						
8000:01	Validation and Backup	RW	0x00 (0)						
8000:04	Device ID	RW	0x00000003 (3)						
8000:05	Vendor ID	RW	0x000003F3 (1011)						
8000:06	Slot	RW	0x00 (0)						
8000:07	Track	RW	0x00 (0)						
8000:08	Device TX Power	RW	0x1F (31)						
8000:09	Max Retry	RW	0x05 (5)						
8000:0A	IMA Time	RW	0x0303 (771)						
8000:0B	Slot Type	RW	0x01 (1)						
8000:0C	Low Power Device	RW	0x00 (0)						
8000:0D	Max PD Segment Length	RW	0x02 (2)						
8000:0E	Unique ID	RW	CF 42 AF D2 01 00 00 F3 03						
8000:22	Cycle Time	RW	0x00 (0)						
8000:28	PORTMODE	RW	0x0001 (1)						

Figure 12: Monitor Port Configuration Data in the CoE-Online Tab

Name	Online	Type	Size	>Addr...	In/Out	User ID	Linked to
New Message Available Flag	0	BIT	0.1	39.0	Input	0	
State of WP01	6	USINT	1.0	40.0	Input	0	
State of WP02	3	USINT	1.0	41.0	Input	0	
State of WP03	3	USINT	1.0	42.0	Input	0	
State of WP04	3	USINT	1.0	43.0	Input	0	
State of WP05	3	USINT	1.0	44.0	Input	0	
State of WP06	3	USINT	1.0	45.0	Input	0	
State of WP07	3	USINT	1.0	46.0	Input	0	
State of WP08	3	USINT	1.0	47.0	Input	0	
State of WP09	3	USINT	1.0	48.0	Input	0	

Figure 13: Monitor the State of a Port in the CoE-Online Tab

5.4.2. Monitor a PDIN Value

1. In the **Solution Explorer**, select the Input byte that you want to monitor.
2. Select the **Online** tab.
3. View the **Value** box.

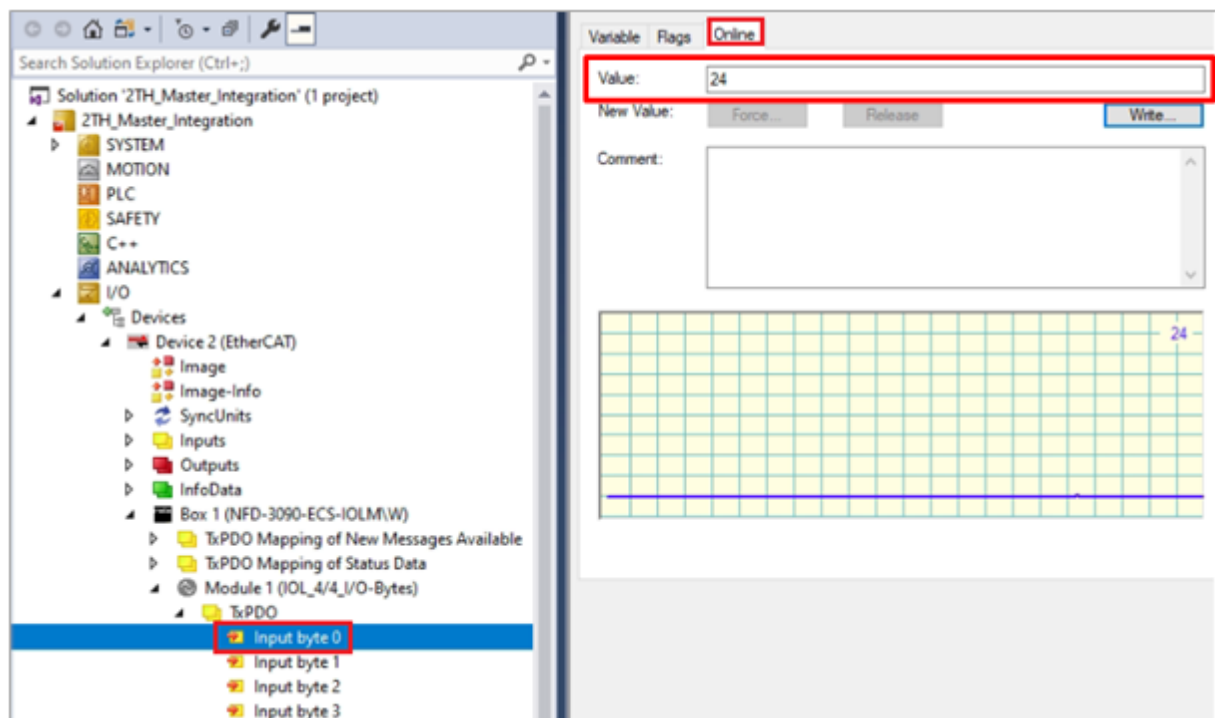


Figure 14: Monitor a PDIN Value

5.4.3. Write a PDOOUT Value

1. In the **Solution Explorer**, select the Output byte that you want to write.
2. Select the **Online** tab.
3. Click **Write**.
4. In the **Set Value** dialog box, type the desired value in the **Dec** box.
5. Click **OK**.

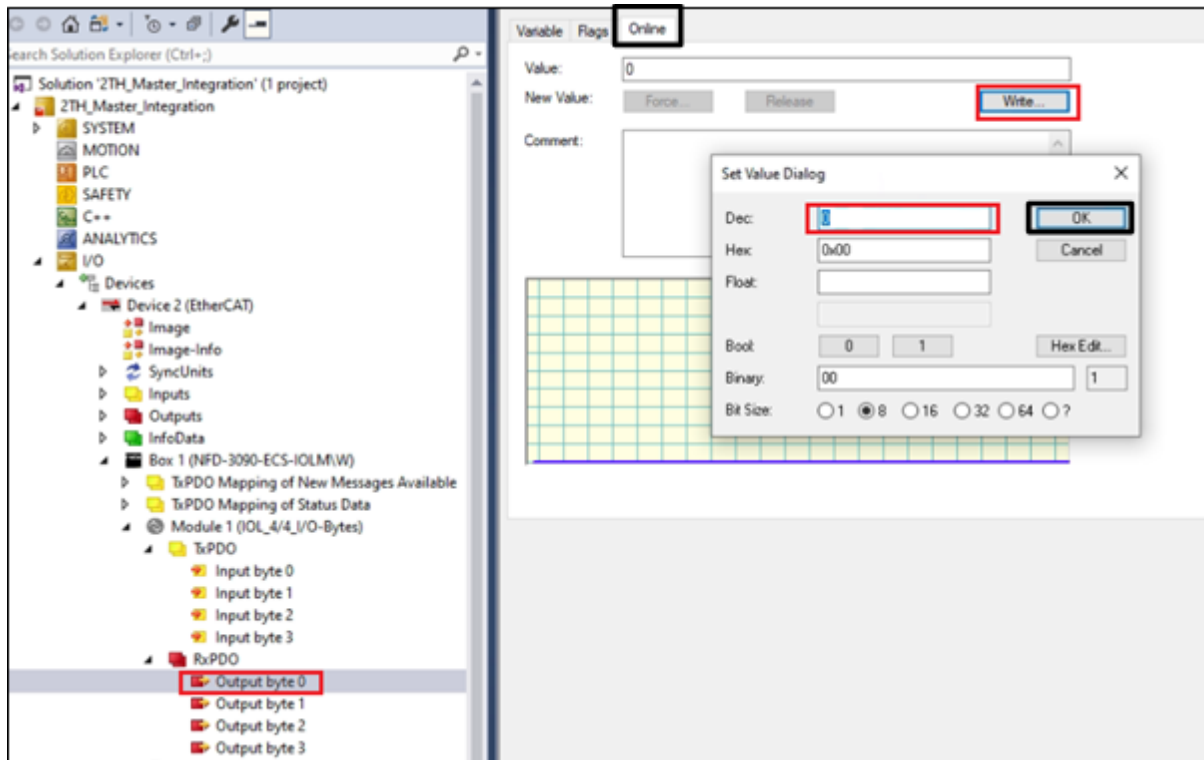
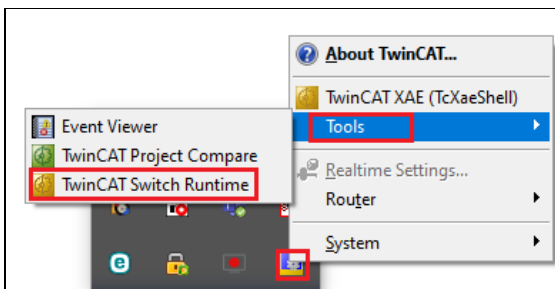


Figure 15: Write a PDOOUT Value

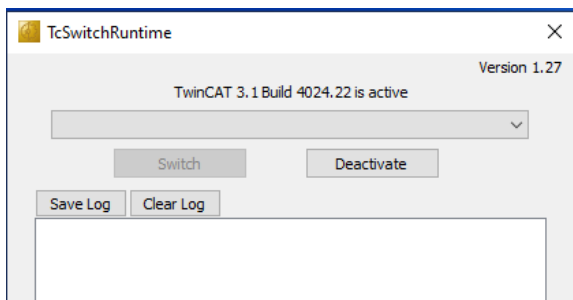
5.4.4. TwinCAT as EtherCAT Master

Setting up TwinCAT as EtherCAT master on PC:

1. Install TwinCAT from <https://www.beckhoff.com/he-il/support/download-finder/software-and-tools/#>
2. Right click on "TwinCAT Config Mode" icon and select **Tools --> TwinCAT Switch Runtime**:

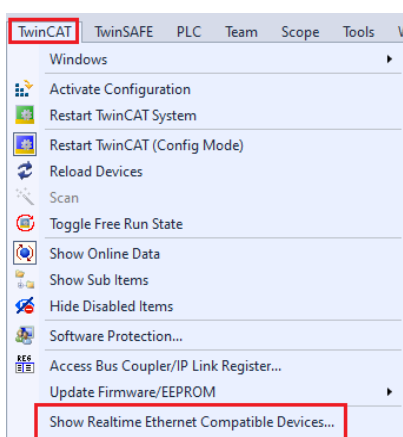


The following window opens:

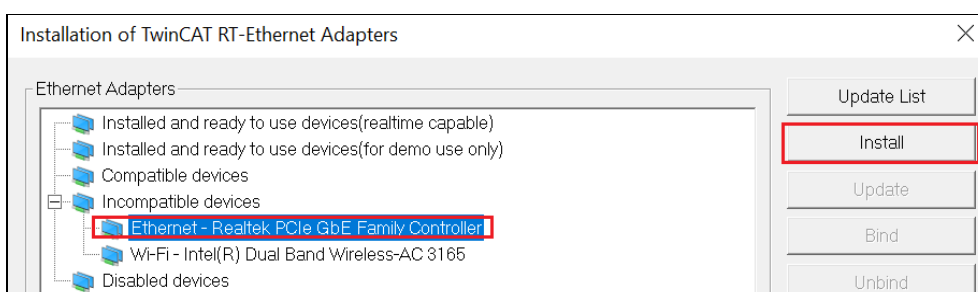


3. Run TwinCAT shell and open a new project.

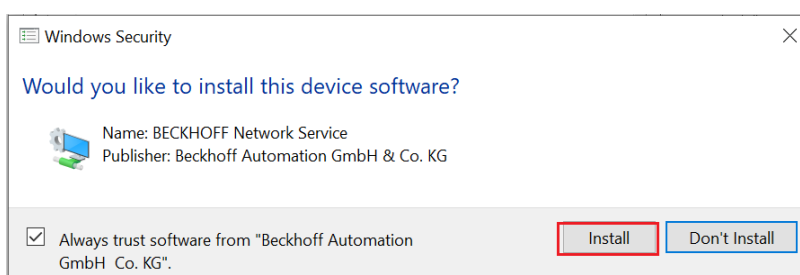
4. Open TwinCAT menu and select **Show Realtime Ethernet Compatible Devices**.



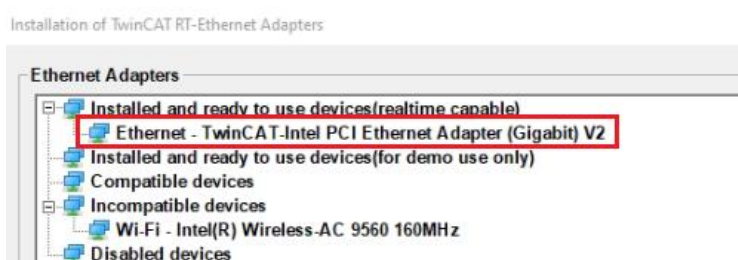
5. Select your PC Ethernet interface under Incompatible devices and click install: (It will work only listed Ethernet adapters that TwinCAT supports)



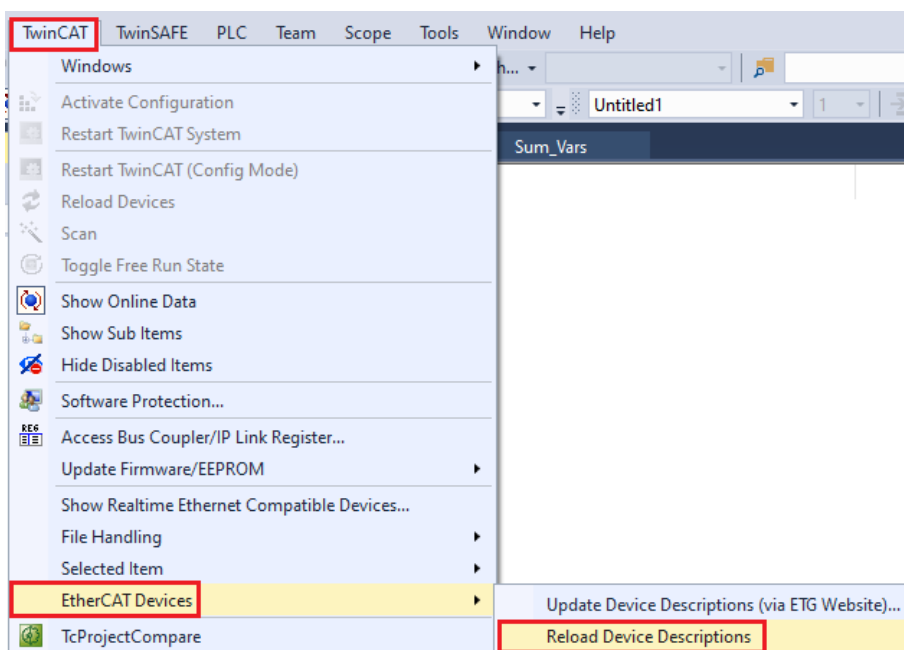
6. Click **Install**.



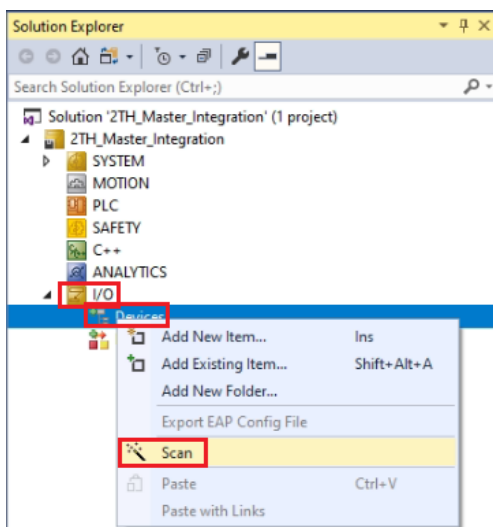
The PC Ethernet adapter will appear under "Installed and ready to use devices" and can be used as EtherCAT master:



7. Load the ESI file (EtherCAT Slave Information).
 - Download the ESI files from CoreTigo customer portal. (attached).
 - Copy both files to C:\TwinCAT\3.1\Config\Io\EtherCAT
 - Open the TwinCAT menu and select **EtherCAT Devices --> Reload Device Descriptions**

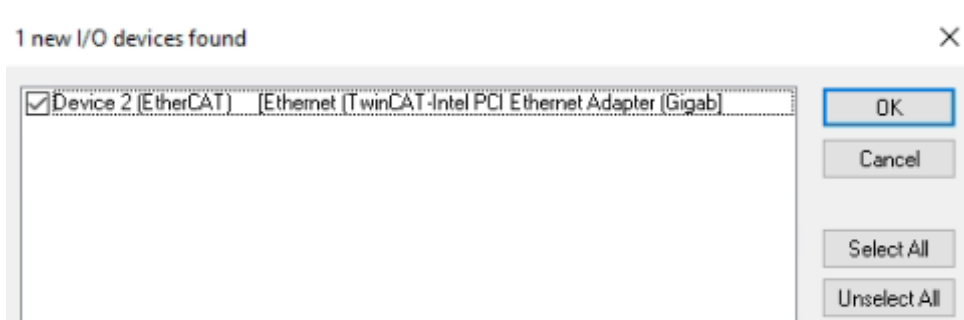


8. Connect the TigoGateway 2TC EtherCAT to the PC.
9. Open the I/O branch under the solution explorer and right click on devices then select scan.

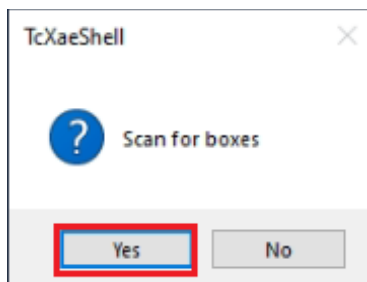


The scan will first find the PC Ethernet adapter as EtherCAT master to scan for EtherCAT slaves.

10. Click **OK**.

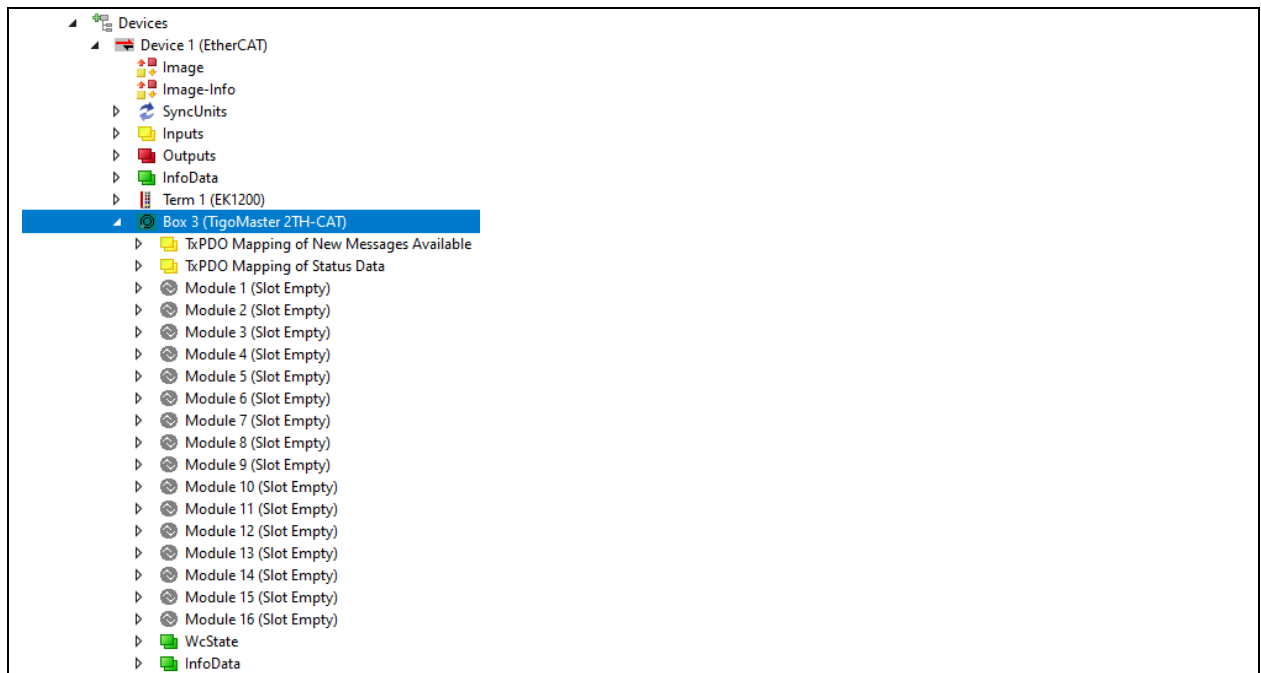


11. It will prompt to scan for boxes - click **yes**: (This step will scan for EtherCAT slaves).

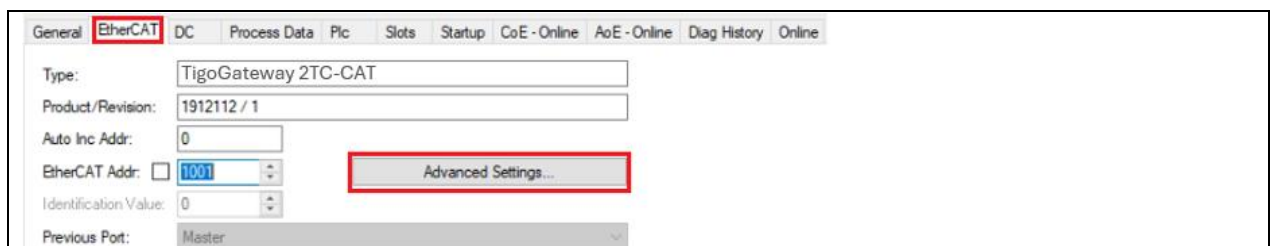


12. A prompt to Activate Free Run appears - click **yes**.

The Device will appear as EtherCAT master (PC network adapter) and under Device, Box is CoreTigo Master.

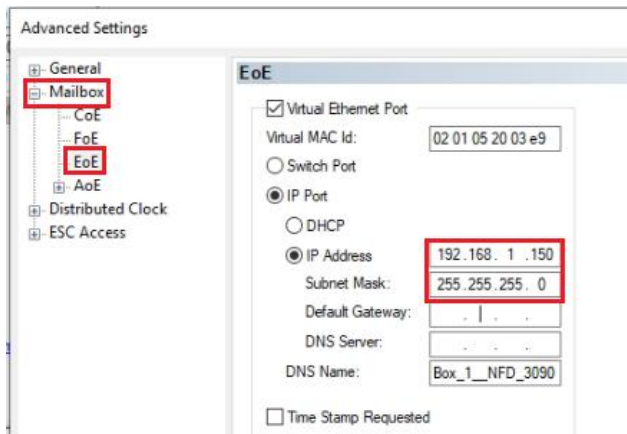


13. Set the IP address to TigoGateway 2TC. See [Set the Device Date and Time Using OPC UA](#),
 14. Double click on CoreTigo TigoGateway 2TC and on the main window select the tab EtherCAT.
 15. Click on **Advanced** settings.



16. Open the Mailbox menu and select EoE.


17. Enter the desired IP address, subnet mask and click **OK**.



18. Click on **Reload Devices** to apply the changes.



The TigoGateway can be configured using TigoEngine.

Masters				
Status	Name	IP Address	Type	Connection time
	EtherCAT_Master	192.168.1.150	TigoMaster 2TH	Connected on: 2/27/2022, 11:21:22 AM

19. Modules configuration: (each module is a wireless port).

20. Double click on CoreTigo TigoGateway 2TC and on the main window select the tab **Slots**.

General EtherCAT DC Process Data Plc Slots Startup CoE - Online AoE - Online Diag History Online					
Slot	Module	ModuleId	Module	ModuleId	Description
WP01	Slot Empty	0x00002100	Slot Empty	0x00002100	Clear Slot (also constrain empty slots)
WP02	Slot Empty	0x00002100	IOL_in_8Bit	0x00000001	IO-Link Input 1 Byte Process Data
WP03	Slot Empty	0x00002100	IOL_in_2Byte	0x00000002	IO-Link Input 2 Byte Process Data
WP04	Slot Empty	0x00002100	IOL_in_4Byte	0x00000004	IO-Link Input 4 Byte Process Data
WP05	Slot Empty	0x00002100	IOL_in_8Byte	0x00000008	IO-Link Input 8 Byte Process Data
WP06	Slot Empty	0x00002100	IOL_in_16Byte	0x00000010	IO-Link Input 16 Byte Process Data
WP07	Slot Empty	0x00002100	IOL_in_32Byte	0x00000020	IO-Link Input 32 Byte Process Data
WP08	Slot Empty	0x00002100	IOL_out_8Bit	0x00000100	IO-Link Output 1 Byte Process Data
WP09	Slot Empty	0x00002100	IOL_out_2Byte	0x00000200	IO-Link Output 2 Byte Process Data
WP10	Slot Empty	0x00002100	IOL_out_4Byte	0x00000400	IO-Link Output 4 Byte Process Data
WP11	Slot Empty	0x00002100	IOL_out_8Byte	0x00000800	IO-Link Output 8 Byte Process Data
WP12	Slot Empty	0x00002100	IOL_out_16Byte	0x00001000	IO-Link Output 16 Byte Process Data
WP13	Slot Empty	0x00002100	IOL_out_32Byte	0x00002000	IO-Link Output 32 Byte Process Data
WP14	Slot Empty	0x00002100	IOL_1/1_I/O-Bytes	0x00000101	IO-Link 1 Byte Input / 1 Byte Output Process Data
WP15	Slot Empty	0x00002100	IOL_2/2_I/O-Bytes	0x00000202	IO-Link 2 Byte Input / 2 Byte Output Process Data
WP16	Slot Empty	0x00002100	IOL_4/4_I/O-Bytes	0x00000404	IO-Link 4 Byte Input / 4 Byte Output Process Data
			IOL_8/8_I/O-Bytes	0x00000808	IO-Link 8 Byte Input / 8 Byte Output Process Data
			IOL_16/16_I/O-Bytes	0x00001010	IO-Link 16 Byte Input / 16 Byte Output Process Data
			IOL_32/32_I/O-Bytes	0x00002020	IO-Link 32 Byte Input / 32 Byte Output Process Data

All slots are disabled by default.

21. In order to enable a slot, select it, click on the X and select the size of the process data.

22. In this example, a device paired to WP01 has 2 bytes PDIN and 4 bytes PDOOUT so the "IOL_4/4_I/O-Bytes" will be used.

Slot	Module	ModuleId	Module	ModuleId	Description
WP01	IOL_4/4_I/O-Bytes	0x0000404	Slot Empty	0x00002100	Clear Slot (also constrain empty slots)
WP02	Slot Empty	0x00002100	IOL_In_8Bit	0x00000001	IO-Link Input 1 Byte Process Data
WP03	Slot Empty	0x00002100	IOL_In_2Byte	0x00000002	IO-Link Input 2 Byte Process Data
WP04	Slot Empty	0x00002100	IOL_In_4Byte	0x00000004	IO-Link Input 4 Byte Process Data
WP05	Slot Empty	0x00002100	IOL_In_8Byte	0x00000008	IO-Link Input 8 Byte Process Data
WP06	Slot Empty	0x00002100	IOL_In_16Byte	0x00000010	IO-Link Input 16 Byte Process Data
WP07	Slot Empty	0x00002100	IOL_In_32Byte	0x00000020	IO-Link Input 32 Byte Process Data
WP08	Slot Empty	0x00002100	IOL_Out_8Bit	0x00000100	IO-Link Output 1 Byte Process Data
WP09	Slot Empty	0x00002100	IOL_Out_2Byte	0x00000200	IO-Link Output 2 Byte Process Data
WP10	Slot Empty	0x00002100	IOL_Out_4Byte	0x00000400	IO-Link Output 4 Byte Process Data
WP11	Slot Empty	0x00002100	IOL_Out_8Byte	0x00000800	IO-Link Output 8 Byte Process Data
WP12	Slot Empty	0x00002100	IOL_Out_16Byte	0x00001000	IO-Link Output 16 Byte Process Data
WP13	Slot Empty	0x00002100	IOL_Out_32Byte	0x00002000	IO-Link Output 32 Byte Process Data
WP14	Slot Empty	0x00002100	IOL_1/1_I/O-Bytes	0x00000101	IO-Link 1 Byte Input / 1 Byte Output Process Data
WP15	Slot Empty	0x00002100	IOL_2/2_I/O-Bytes	0x00000202	IO-Link 2 Byte Input / 2 Byte Output Process Data
WP16	Slot Empty	0x00002100	IOL_4/4_I/O-Bytes	0x00000404	IO-Link 4 Byte Input / 4 Byte Output Process Data

23. Under Module 1, TxPDO has 4 bytes and RxPDO has 4 bytes:

Box 3 (TigoMaster 2TH-CAT)	
▶	TxPDO Mapping of New Messages Available
▶	TxPDO Mapping of Status Data
▶	Module 1 (IOL_4/4_I/O-Bytes)
▶	TxPDO
▶	Input byte 0
▶	Input byte 1
▶	Input byte 2
▶	Input byte 3
▶	RxPDO
▶	Output byte 0
▶	Output byte 1
▶	Output byte 2
▶	Output byte 3

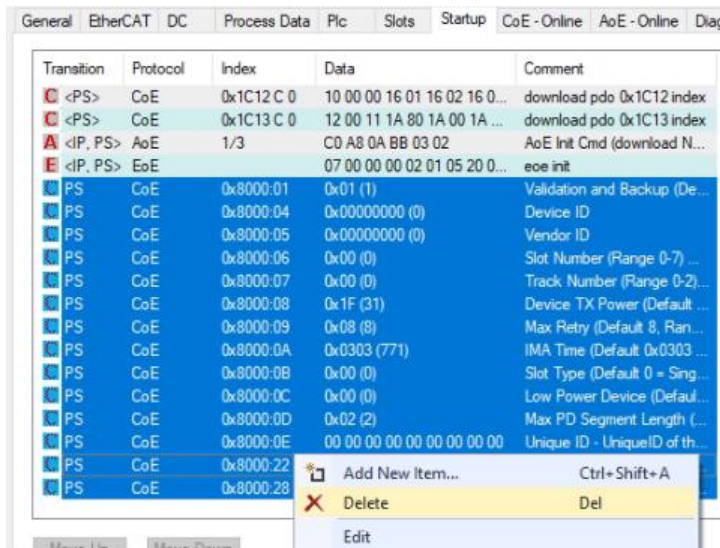
24. In the **Startup** tab you can decide whether the configuration of the W-ports (slots) will be configured by the EtherCAT master or not.

By default when defining a new module, the configuration parameters will be added to the Startup.
(The index will be 0x8000 for Wport1, 0x8010 for Wport2, 0x8020 for Wport3, etc.)

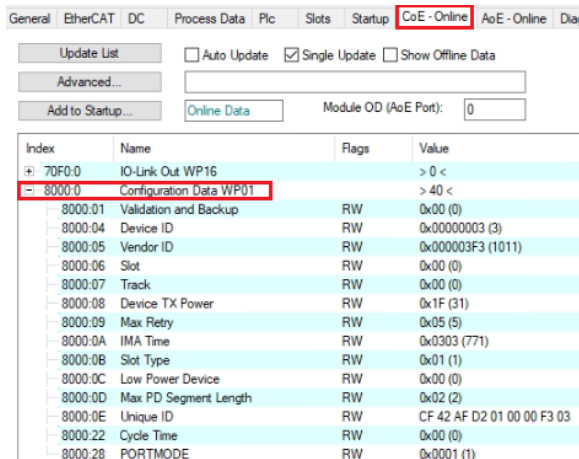
25. In order to edit the parameters, double click and change its value.

Transition	Protocol	Index	Data	Comment
<PS>	CoE	0x1C12 C 0	10 00 00 16 01 16 02 16 0...	download pdo 0x1C12 index
<PS>	CoE	0x1C13 C 0	12 00 11 1A 80 1A 00 1A ...	download pdo 0x1C13 index
<IP, PS>	AoE	1/3	C0 A8 0A BB 03 02	AoE Init Cmd (download N...
<IP, PS>	CoE		07 00 00 00 02 01 05 20 0	one init
PS	CoE	0x8000:01	0x00 (0)	Validation and Backup (De...
PS	CoE	0x8000:04	0x00000000 (0)	Device ID
PS	CoE	0x8000:05	0x00000000 (0)	Vendor ID
PS	CoE	0x8000:06	0x00 (0)	Slot Number (Range 0-7) ...
PS	CoE	0x8000:07	0x00 (0)	Track Number (Range 0-2)...
PS	CoE	0x8000:08	0x1F (31)	Device TX Power (Default ...
PS	CoE	0x8000:09	0x08 (8)	Max Retry (Default 8, Ran...
PS	CoE	0x8000:0A	0x0303 (771)	IMA Time (Default 0x0303 ...
PS	CoE	0x8000:0B	0x00 (0)	Slot Type (Default 0 = Sing...
PS	CoE	0x8000:0C	0x00 (0)	Low Power Device (Defaul...
PS	CoE	0x8000:0D	0x02 (2)	Max PD Segment Length (...
PS	CoE	0x8000:0E	00 00 00 00 00 00 00 00	Unique ID - UniqueID of th...
PS	CoE	0x8000:22	0x00 (0)	Cycle Time (Default 0 = fre...
PS	CoE	0x8000:28	0x0000 (0)	Port Mode (0 = Deactivate...

26. If you want the EtherCAT master to not change the W-ports (slots) configuration, select all the rows and delete.



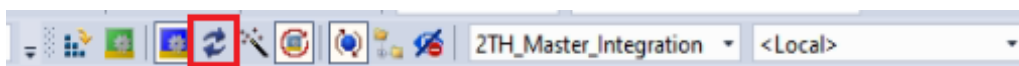
27. In **CoE - Online** tab we can see the online data of the W-port.



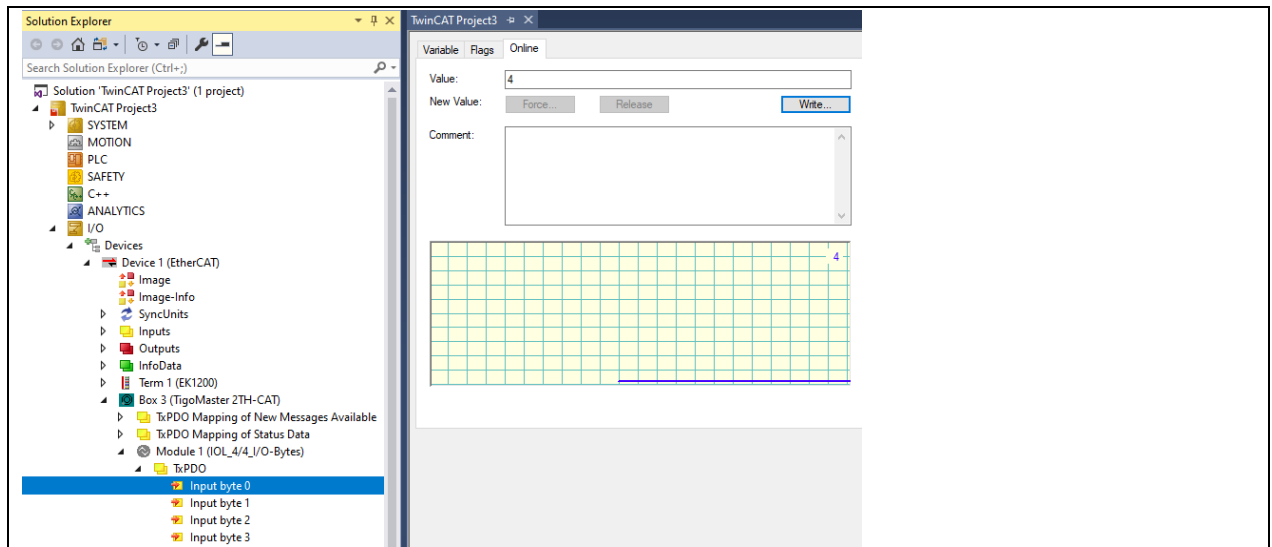
28. The state of the Wport can be monitored as well:

Name	Online	Type	Size	>Addr...	In/Out	User ID	Linked to
New Message Available Flag	0	BIT	0.1	39.0	Input	0	
State of WP01	6	USINT	1.0	40.0	Input	0	
State of WP02	3	USINT	1.0	41.0	Input	0	
State of WP03	3	USINT	1.0	42.0	Input	0	
State of WP04	3	USINT	1.0	43.0	Input	0	
State of WP05	3	USINT	1.0	44.0	Input	0	
State of WP06	3	USINT	1.0	45.0	Input	0	
State of WP07	3	USINT	1.0	46.0	Input	0	
State of WP08	3	USINT	1.0	47.0	Input	0	
State of WP09	3	USINT	1.0	48.0	Input	0	

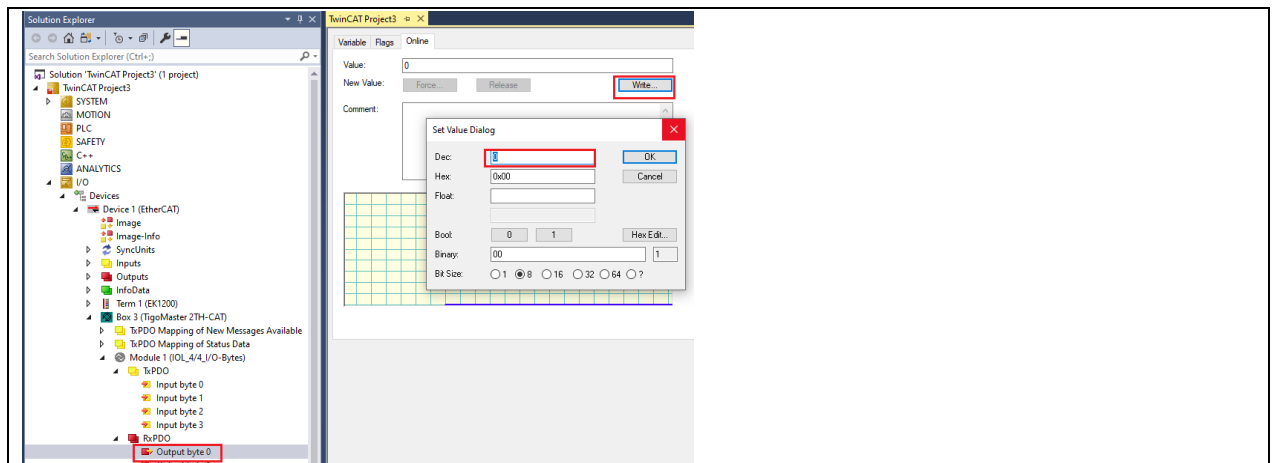
29. Click on **Reload Devices** to apply the changes.



30. Now the **PDIN** values can be monitored when selecting the required Input Byte and online.



31. The **PDOUT** can be written as well by selecting the required output Byte and monitor.



5.5. TigoEngine Configuration

In order to use the TigoEngine it is necessary to have a valid user license.

Licenses are granted by CoreTigo. Some are for a limited period with an expiry date, and some are perpetual. After expiration of the license the user will only be able to access the TigoEngine if the license has been renewed by CoreTigo.

After successful installation of the TigoEngine you will be prompted to activate your account.



References:

- For further details of how to use TigoEngine, see the *TigoEngine User Manual*.

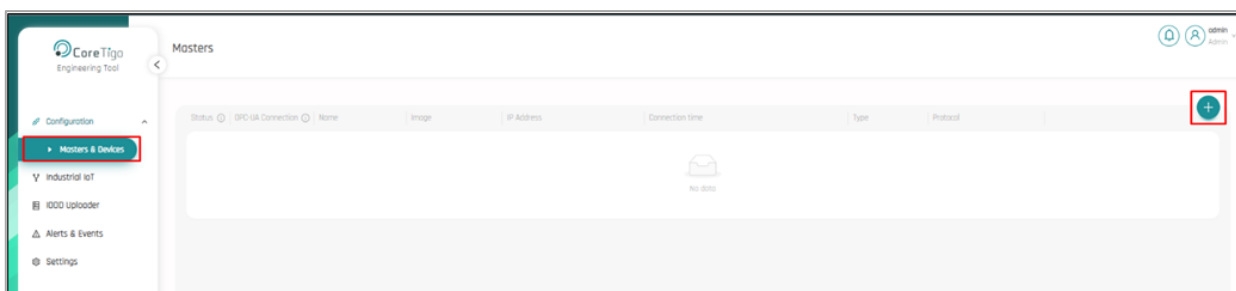
TigoEngine supports multiple TigoGateway connections.

After TigoEngine has been installed, the System Administrator logs in to TigoEngine using the default Administrator's authentication credentials, which are:

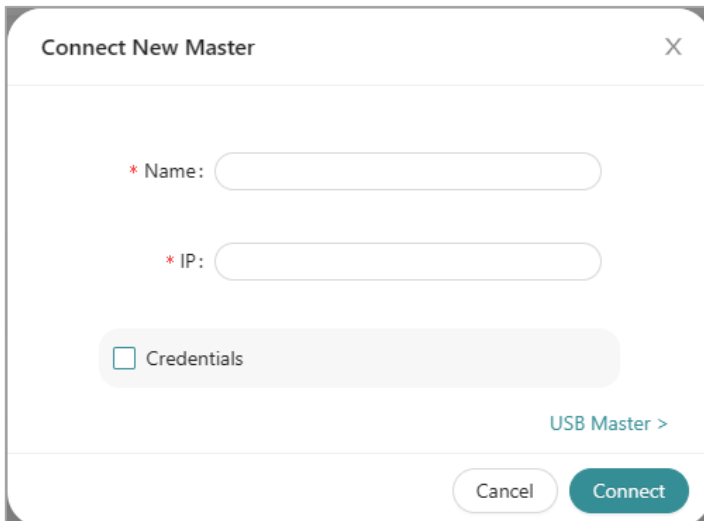
- User = admin**
- Password = admin**

Note: It is recommended to change the password after first login.

- In TigoEngine's **Masters** view, click the **Connect New Master** button.



- In the **Connect New Master** window, set the following:
 - Name** – type the desired name for this TigoGateway.
 - IP** – type the IP address of the TigoGateway that you want to connect to TigoEngine.
 - Master Type** – select TigoGateway from the drop-down list.



Connect New Master [X]

* Name:

* IP:

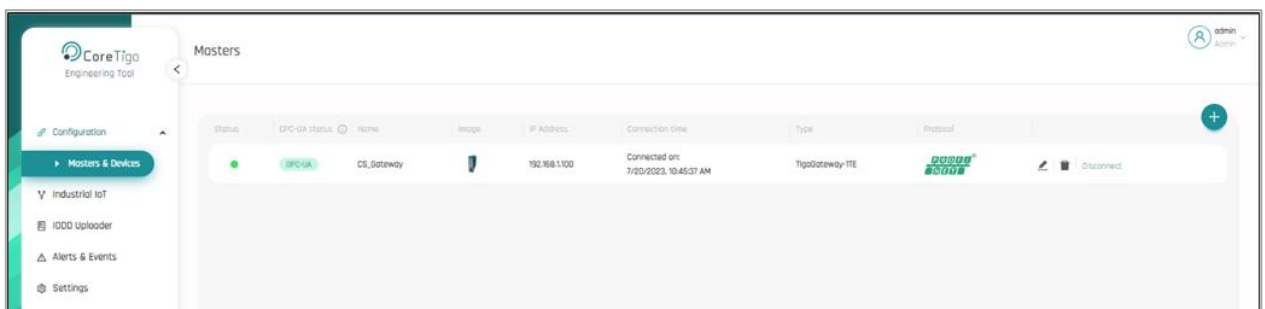
☐ Credentials

[USB Master >](#)

3. Click **Connect**.

When the TigoGateway is connected, its details appear in the table in the **Masters** window, together with a **Green** bubble in the **Status** column.

Disconnect the TigoGateway or **Edit/Delete** its details in TigoEngine by selecting it and then clicking the relevant button in the **Actions** column.









Status	OPC-UA status	Name	Image	IP Address	Connection time	Type	Protocol	Actions
●	OPC-UA	CS_Gateway		192.168.1.100	Connected on: 7/20/2023, 10:45:37 AM	TigoGateway-TTE		   

Figure 6: Masters View –TigoGateway Connected



Note: The status indication (●) shows the HTTP connection to the wireless master. When it is green, the user can scan ,pair and configure the wireless ports.

The OPC UA connection indication (OPC-UA) shows the OPC UA connection to the wireless master. When it is green, data exchange (process data & MQTT) between the wireless master and TigoEngine is active.

6. CoreTigo Web Server

6.1. Introduction

The CoreTigo Web Server enables you to see information about the TigoGateway 2TC to which the web server is connected (via its IP address), configure the connected TigoGateway 2TC, and scan for unconnected IO-Link wireless devices.

This chapter describes how you can use the integrated CoreTigo WirelessWeb Server to access detailed information about the current operating status of the IO-Link Wireless Master device and the connected IO-Link Devices. You also can make settings for device parameterization to influence the device behavior.

6.1.1. Prerequisites

To use the CoreTigo Web Server, you need the following:

- An Internet browser
- A login to the CoreTigo Web Server:
 - If you want to configure TigoGateway 2TC, you need a login with administrator's privileges
 - If you only want to view information about TigoGateway 2TC on the web server dashboard, you can use the default login:

Username = root
Password = password
- A note of the IP address of the TigoGateway 2TC.

NOTE: Only an EtherCAT Master can configure an IP address for the TigoGateway 2TC-CAT via EoE protocol.

6.1.2. Functional Overview

The following overview shows you which functions are provided by the CoreTigo Wireless Web Server integrated in the device and via which menu items or tabs of the UI these functions can be accessed.

Table 1: Functional Overview of the CoreTigo Wireless Web Server for IO-Link Devices

Menu	Tab	Description	Section
Dashboard	-	Display of device-specific information	Dashboard
Licenses	-	Display of the used software components	Licenses
IO-Link Wireless Master settings	Channel Selection	WLAN channel list	Channel Selection
	Configuration	Configure parameters of the IO-Link Wireless Master	Configuration
	Scan	Scan for unconnected IO-Link Devices	Scanning and Pairing
Wireless port WP01, WP02, WP03 ...	(all)	Port-specific information and settings for the wireless IO-Link ports WP01, WP02, WP03 ...	Device or port information

Menu	Tab	Description	Section
	Information	Displays device information on the connected IO-Link Device	Device information
	Status	Displays port status information	Port status
	Settings	Display (and setting) of port parameters.	Port settings
	ISDU	Display of device Index Service Data Units	Device ISDU
		Display of master Index Service Data Units	Master ISDU
Settings	(all)	Device settings	Process data
	Settings	Setting of port parameters (such as port mode, Unique ID, IMA Time, etc.)	Device settings
	Device configuration	Configure parameters for IP connection	Port settings
	Maintenance information	Store maintenance information	IP parameters
	Firmware update	Update the firmware of the device	Maintenance information
	Factory reset	Reset the device to factory settings	Firmware update
	MQTT	Client and connection configuration	Factory settings
User Administration	-	Set up and manage users	MQTT configuration
Sign In / Sign Out	-	User login and logout	

6.1.3. Opening the CoreTigo Web Server

1. Make sure that the PC on which you want to access the website of the CoreTigo Wireless Web Server and the device you want to connect to are both on the same Ethernet subnet.
2. Enter the following in the address line of your web browser: `http://<IP Address of TigoGateway 2TC>`. The TigoGateway 2TC is provided with a default IP Address 192.168.1.100, and the subnet mask address is 255.255.255.0.

The dashboard of the CoreTigo Web Server appears. It displays information about the TigoGateway 2TC.

3. Log in.

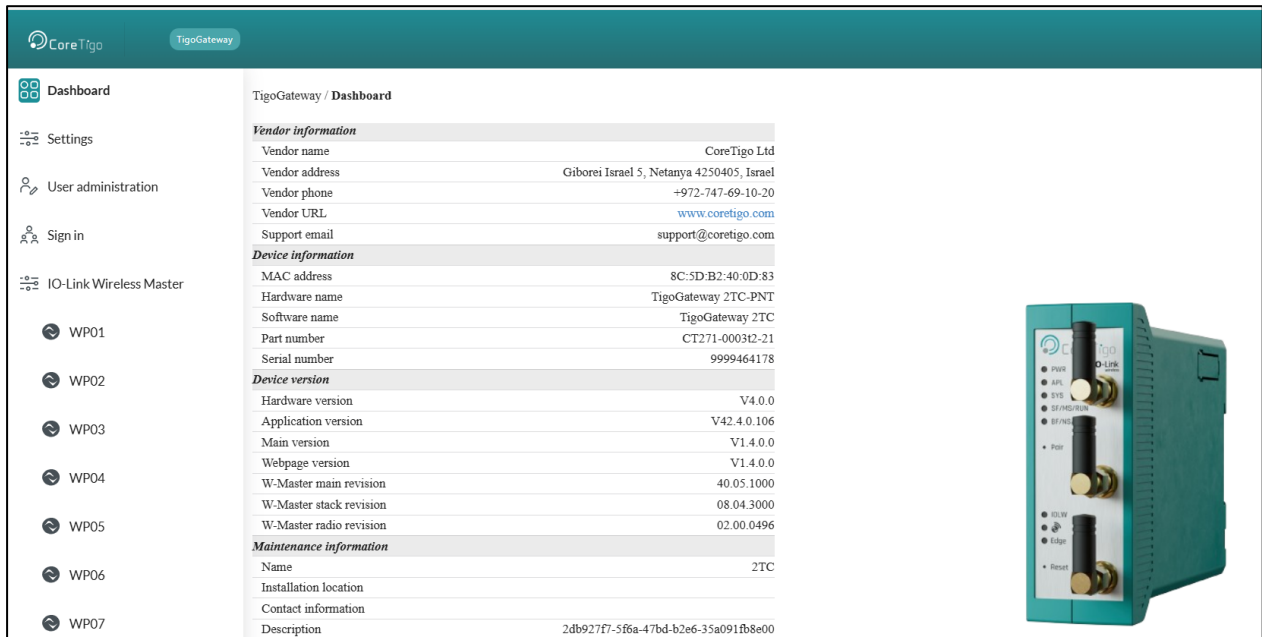


Figure 24: CoreTigo Web Server Dashboard

Table 19: Dashboard Information

Area	Information Displayed / Function
Top left corner	Current connection state and user role
Left column	Navigation area. Icons on errors or operating states may appear here.
Vendor information	Contact details of the device manufacturer
Device information	Identification details of the device
IO-Link Wireless technology	Radio connection specifications
Device version	Hardware and software version numbers
Maintenance information	Installation and service details - includes textual information that the user can specify, such as device name, installation location and date, contact information, description, date of last and next service of the device. These texts can be edited using the Maintenance information tab of the Settings menu.

6.1.4. Licenses

The Licenses menu item allows you to display the page of the same name.

This displays:

- a list of the licensed software components contained in the product.
- for each licensed software component, a link to the associated license conditions.

6.2. IO-Link Wireless Master Settings

The IO-Link Wireless Master Settings page is where you perform most procedures in the web server. It has the following tabs:

- **Channel selection** tab – here you can select the WLAN channels that you want to configure (for example, WLAN channels 01–04).
- **Configuration** tab – here you can do the following for the selected channels:
 - Configure TigoGateway 2TC parameters, including track transmission power
 - Activate/deactivate track0, track1, or track2

For further details, see section 6.2.3.

- **Scan** tab – here you can scan for unconnected IO-Link devices. A scan result then shows the found devices.
- **Diagnostics** – Here you can view the temperature of the cores

6.2.1. Channel Selection

1. Select **Master** in the left column of the CoreTigo Wireless Web Server.

The **Channel Selection** tab appears.

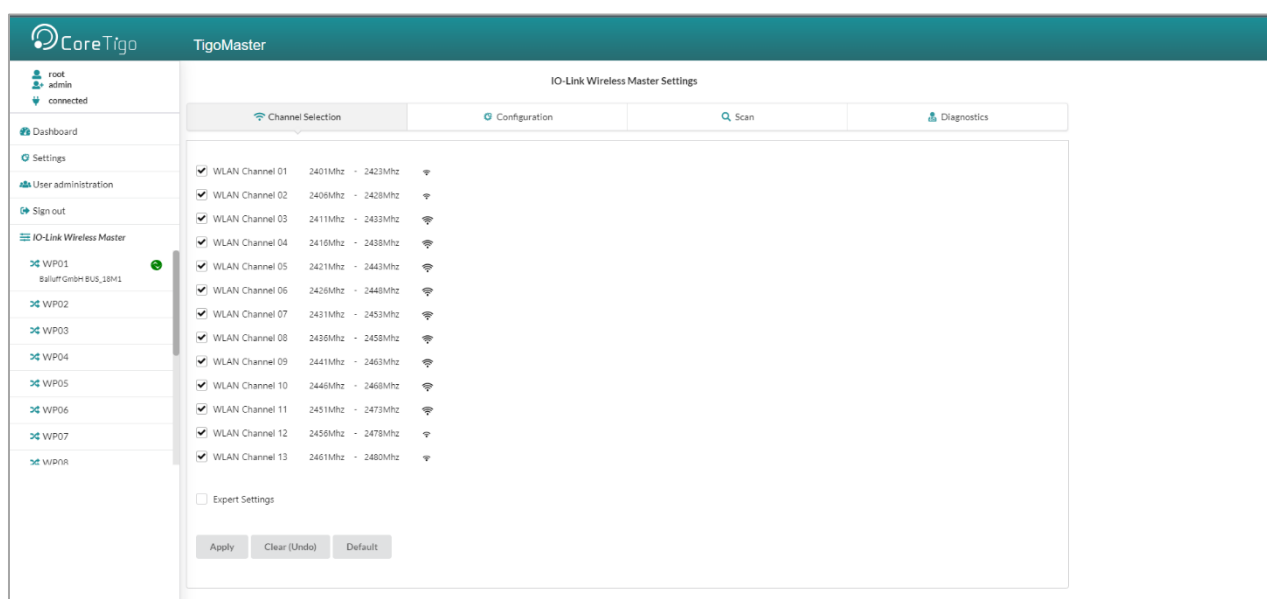
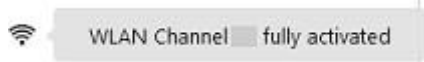



Figure 25: Channel Selection Tab

2. Use the **Channel Selection** tab to select the WLAN channels required for operation.
3. Click **Apply**.

The selected WLAN channels are configured.

Table 20: WLAN Channels

Parameter	Description	Value/Value Range
WLAN Channel 01 ... WLAN Channel 13	<p>List of WLAN channels 01 to 13 on the 2.4 GHz frequency band.</p> <p>The radio symbols indicate whether a channel is activated fully or partially.</p> <p>Hover to indicate the help text.</p>  	<ul style="list-style-type: none"> checked" unchecked (default)

6.2.2. Expert Settings

The Expert mode allows a refinement of the transmission frequencies to be used. Here, each individual operating channel can be activated or deactivated. Since the list of operating channels is based on the WLAN channels, there are overlaps. When activating/deactivating the operating channels, these overlaps are automatically taken into consideration.

The complete range of wireless operating channels comprises 80 bitwise coded 1 MHz frequency channels.

- The wireless channels 1 (2401 MHz), 2 (2402 MHz), 79 (2479 MHz), 80 (2480 MHz) are used for network configurations and cannot be configured.
- The wireless channels 3-78 (2403 ... 2478 MHz) can be configured to be used or not for IO-Link wireless communication within a Wireless Master. Frequency Hopping is used for transmission on different frequency channels on the 2.4 GHz Band frequency.



Note:

Ranges of wireless operating channels assigned to each of the WLAN channels 01 to 13 overlap each other. In consequence, if a 1 MHz frequency channel option is configured for one WLAN channel, this will have effect on the corresponding 1 MHz frequency channel that is also assigned to a WLAN channel in the neighborhood.

Check **Expert Settings** (at the bottom of the screen).

The following view appears with configuration options of each single MHz frequency.

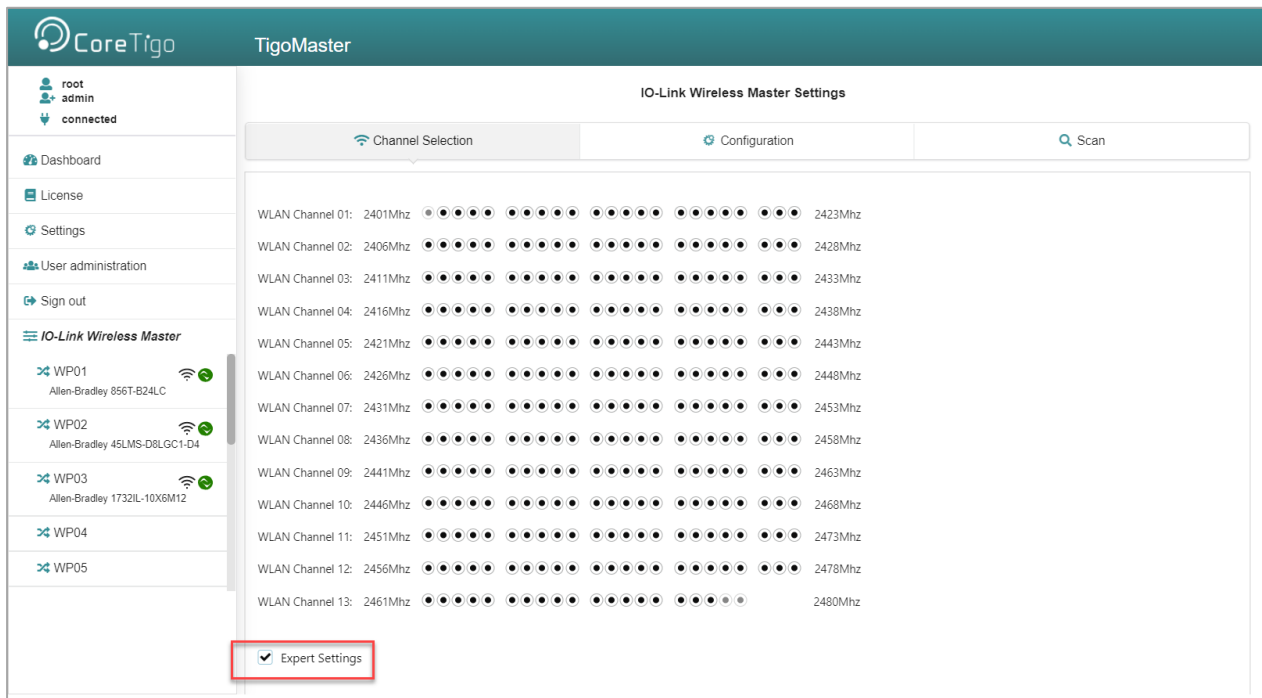


Figure 26: Expert Settings

6.2.3. W-Master Configuration

To open the **IO-Link Wireless Master Settings** page, click **W-Master** in the explorer bar on the left of the web server and select the **Configuration** tab.

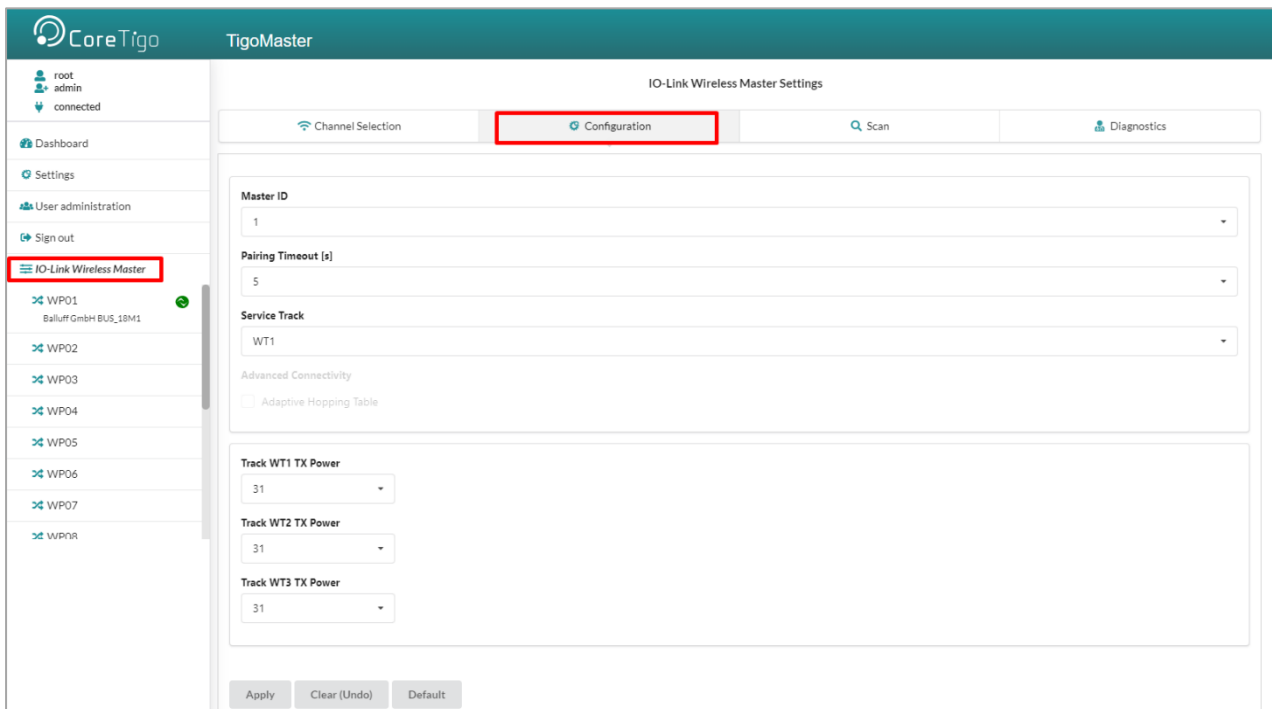


Figure 27: Configuration Tab


In the **Configuration** tab, you can set the parameters detailed in Table .

Table 21: W-Master Advanced Configuration View

Parameter	Description	Value/Value Range
Master ID	W-Master Identifier according to IOLW specification	<ul style="list-style-type: none"> 1 ... 29 0: when not yet configured
Pairing Timeout	Timeout for pairing by button/UID in seconds	<ul style="list-style-type: none"> 5 ... 60 0: when not yet configured
Service Track	Track# that will perform Scan & Pair	<ul style="list-style-type: none"> WT1/WT2/WT3
Track TX Power	Transmission strength. The maximum allowable value for the TX Power parameter is selected by the IO-Link Wireless Master.	1 ... 31 (default 31)

- Make settings for the parameters “Master ID”, “Pairing Timeout”, “Service Track”, and “WT1 TXPower ... WT3 TXPower”.
- Click **Apply**.
The request appears:
Applying configuration will restart the device. Are you sure?
- Click **Yes**.
- Wait until reset operation is finished and the result is shown:
The message **Master configured successfully** appears.

6.2.4. Error Handling

When the IO-Link Wireless Master assumes error status, an **Orange** triangle icon  appears for the Master in the left column of the CoreTigo Wireless Web Server indicating that the message Master configuration has failed.

For troubleshooting:

- Delete the Master configuration.
- Perform a device reset.

6.2.5. Scanning and Pairing

6.2.5.1. Scanning

1. Select **Master** in the left column of the CoreTigo Wireless Web Server.
2. Open the **Scan** tab.

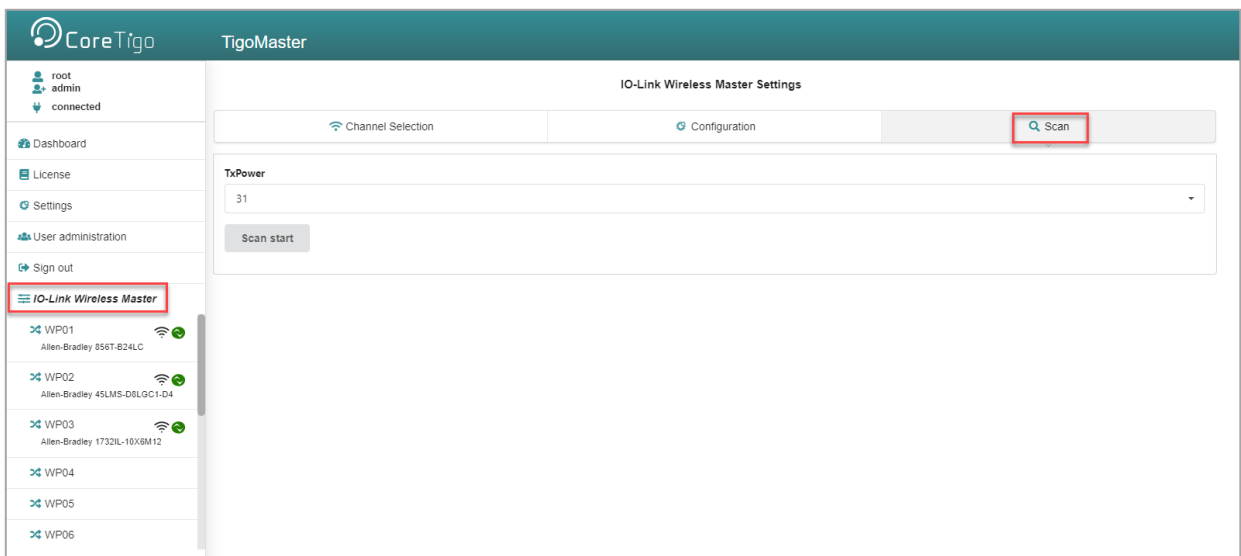


Figure 28: Scan Tab

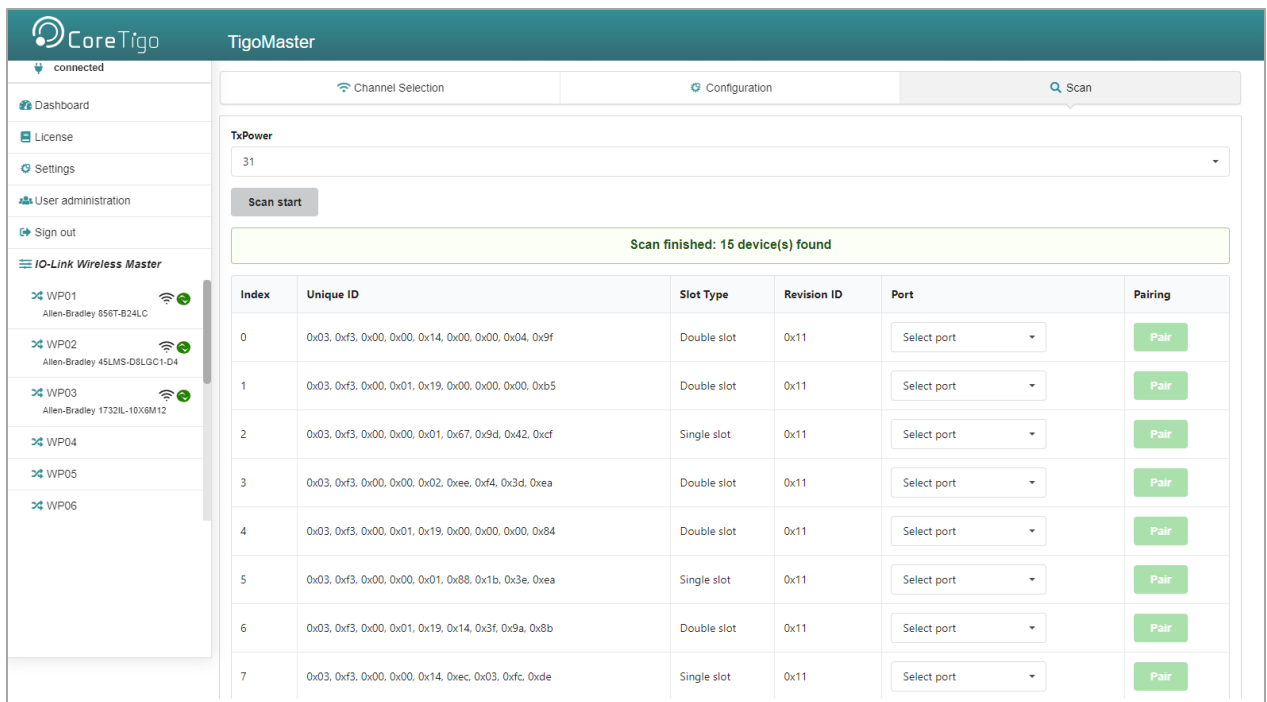
8. Use the **Scan** tab, to scan for unconnected devices.
9. Select **TxPower**.

The value range of “TxPower” (Transmission power) is “1 ... 31” and the default value is “31”.

10. Click **Scan start**.

The system searches for unconnected devices.

The scan result is displayed after a few moments.



Index	Unique ID	Slot Type	Revision ID	Port	Pairing
0	0x03, 0xf3, 0x00, 0x00, 0x14, 0x00, 0x00, 0x04, 0x9f	Double slot	0x11	Select port	Pair
1	0x03, 0xf3, 0x00, 0x01, 0x19, 0x00, 0x00, 0x00, 0xb5	Double slot	0x11	Select port	Pair
2	0x03, 0xf3, 0x00, 0x00, 0x01, 0x67, 0x9d, 0x42, 0xcf	Single slot	0x11	Select port	Pair
3	0x03, 0xf3, 0x00, 0x00, 0x02, 0xee, 0x44, 0x3d, 0xea	Double slot	0x11	Select port	Pair
4	0x03, 0xf3, 0x00, 0x01, 0x19, 0x00, 0x00, 0x00, 0x84	Double slot	0x11	Select port	Pair
5	0x03, 0xf3, 0x00, 0x00, 0x01, 0x88, 0x1b, 0x3e, 0xea	Single slot	0x11	Select port	Pair
6	0x03, 0xf3, 0x00, 0x01, 0x19, 0x14, 0x3f, 0x9a, 0x8b	Double slot	0x11	Select port	Pair
7	0x03, 0xf3, 0x00, 0x00, 0x14, 0xec, 0x03, 0xfc, 0xde	Single slot	0x11	Select port	Pair

Figure 29: Scan Result

The scan result includes a textual description: “**Scan finished:** [number of found devices] **device(s) found**”.

For scan errors the following appears: “**Scan failed HTTP Error** [error number]: [short description of error]” plus a further message in the upper part of the **Scan** tab.


Table 22: Scan Result/Pairing

Parameter	Description	Value/Value Range
Index	Device index	<ul style="list-style-type: none"> 0 ... 20
Unique ID	Identification of the found IO-Link Device as unique ID(UUID, 9 Bytes). Copy/note the unique ID. This value is required for portconfiguration.	<ul style="list-style-type: none"> 0 ... 0xFF
Slot Type	Slot type of the found device	<ul style="list-style-type: none"> Single slot (default) Double slot
Revision ID	Revision ID of the found device This parameter is specified by the found device. It indicates software revision running on the found device.	<ul style="list-style-type: none"> 0: No device connected Others: Software revision running on the found device
Port	ID of wireless IO-Link port to which the IO-Link Device isto be paired. Note: For a device featuring “Double slot” an even portmust be assigned.	<ul style="list-style-type: none"> WP01 ... WP16

Parameter	Description	Value/Value Range
	Otherwise the error message appears: “Pairing failedHTTP Error 500:NetProxy returned with an error: C0000124”	
Pairing	A pairing service is provided to pair a found IO-Link Device to a wireless IO-Link port of the IO-Link WirelessMaster.	<ul style="list-style-type: none"> Pair (Green) (default) Remove (Red)

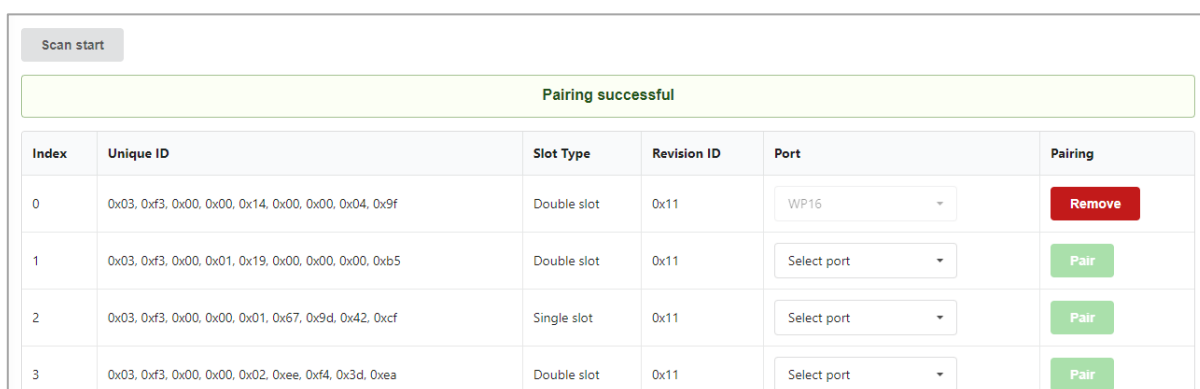
6.2.5.2. Pairing / Unpairing

For pairing an IO-Link Device to a wireless IO-Link port of the IO-Link Wireless Master device during device commissioning:

1. In the **Scan** tab in the scan result, select the **Port**.
2. Click .

Pairing is performed and **Pair (Green)** switches to **Remove (Red)**.

The message **Pairing successful** appears.



The screenshot shows a web interface with a 'Scan start' button at the top left. A green banner at the top reads 'Pairing successful'. Below this is a table with the following data:





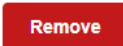
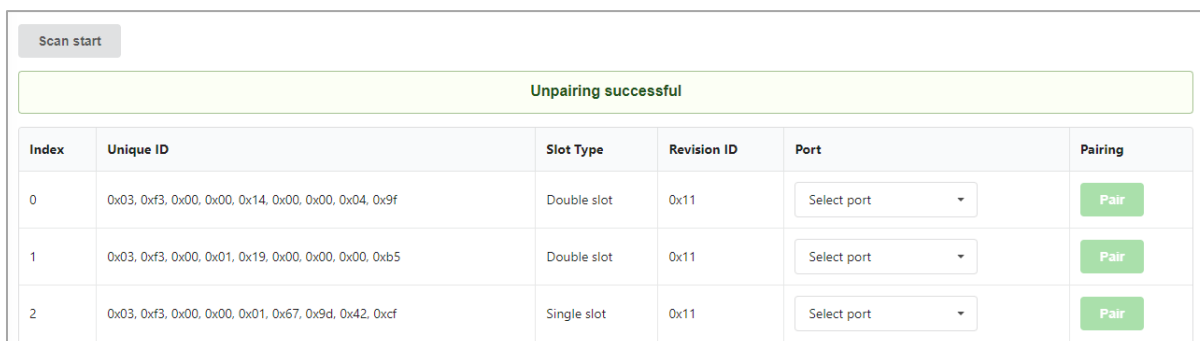
Index	Unique ID	Slot Type	Revision ID	Port	Pairing
0	0x03, 0xf3, 0x00, 0x00, 0x14, 0x00, 0x00, 0x04, 0x9f	Double slot	0x11	WP16	
1	0x03, 0xf3, 0x00, 0x01, 0x19, 0x00, 0x00, 0x00, 0xb5	Double slot	0x11	Select port	
2	0x03, 0xf3, 0x00, 0x00, 0x01, 0x67, 0x9d, 0x42, 0xcf	Single slot	0x11	Select port	
3	0x03, 0xf3, 0x00, 0x00, 0x02, 0xee, 0xf4, 0x3d, 0xea	Double slot	0x11	Select port	

Figure 30: Pairing Successful

3. Change the pairing setting as follows:

- To unpair an IO-Link Device and a paired wireless IO-Link port, click .
- The message **Unpairing successful** appears.



The screenshot shows a web interface with a 'Scan start' button at the top left. A green banner at the top reads 'Unpairing successful'. Below this is a table with the following data:




Index	Unique ID	Slot Type	Revision ID	Port	Pairing
0	0x03, 0xf3, 0x00, 0x00, 0x14, 0x00, 0x00, 0x04, 0x9f	Double slot	0x11	Select port	
1	0x03, 0xf3, 0x00, 0x01, 0x19, 0x00, 0x00, 0x00, 0xb5	Double slot	0x11	Select port	
2	0x03, 0xf3, 0x00, 0x00, 0x01, 0x67, 0x9d, 0x42, 0xcf	Single slot	0x11	Select port	

Figure 31: Unpairing Successful

6.3. Device or Port Information

In the port specific tabs **Information**, **Status**, **Settings**, **ISDU**, **Process Data**, device or port information is displayed individually for each of the wireless IO-Link ports of the IO-Link Wireless Master device.

In the **Settings** tab you can make port-specific settings.

Access the tabs as follows:

11. In the left-hand column, click on the wireless IO-Link port **WP01**, **WP02**, **WP03**.....

The **Information** tab of the corresponding wireless IO-Link port appears.

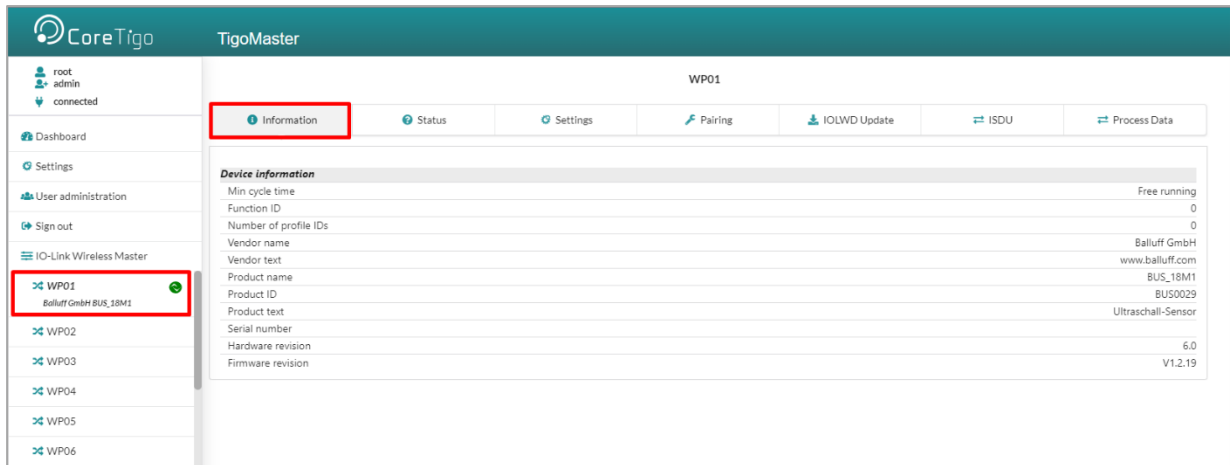


Figure 32: Information Tab

12. To open another tab, click **Status**, **Settings**, **ISDU**, or **Process Data**.

Table 23: Information, Status, Settings, ISDU, Process Data

Tab	Description
Information	Displays some "Device information" of the IO-Link Device (Mincycle time, Function ID, Number of profile IDs, Vendor name, Vendor text, Product name, Product ID, Product text, Serial number, Hardware revision, Firmware revision).
Status	Displays port status information (Port state, Port quality, RevisionID, Master cycle time, Input data length, Output data length, Vendor ID, Device ID, Signal quality). This tab shows current settings.
Settings	Display and setting of port parameters (Port mode, Port cycle time, Validation and backup, Vendor ID, Device ID, Low power device, Max PD segment length, Unique ID, Slot number, Tracknumber, Device TX power, Max retry, Slot type, IMA Time). This tab shows current settings.
ISDU	Display of the Index Service Data Units: <ul style="list-style-type: none"> Read/write access to parameters of the connected IO-LinkDevice. Read/write access to parameters of the IO-Link Wireless Master device.
Process Data	Display of the process data (input/output)

6.3.1. Device Information

The **Information** tab displays some “Device information” of the IO-Link Device connected to a wireless IO-Link port. The official IO-Link SMI layer does not provide this information.

13. In the left column of the CoreTigo Wireless Web Server, select the wireless IO-Link port with the connected IO-Link Device.

The **Information** tab appears with the device information of the connected device.

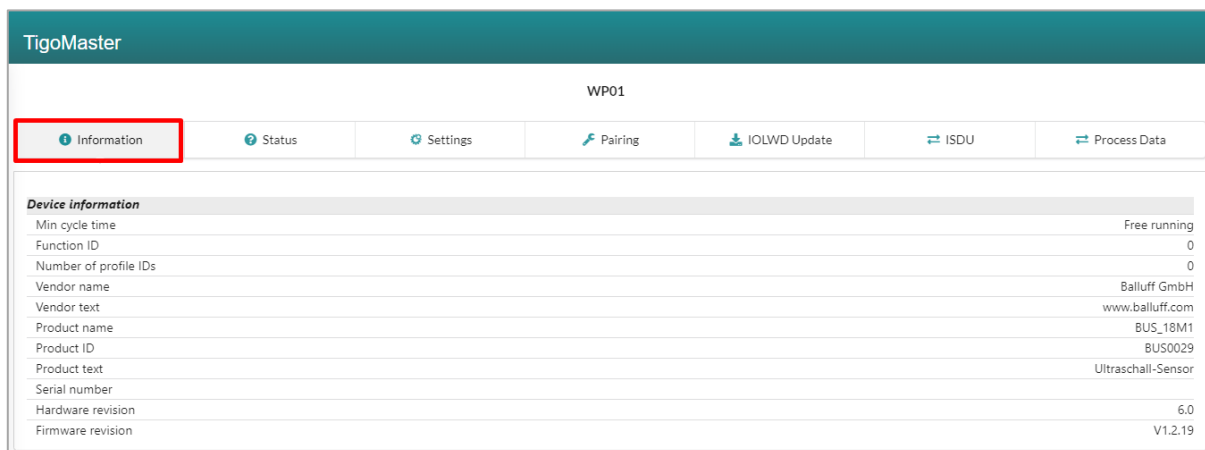


Figure 33: Information Tab – Device Information

Table 24: Information Tab Parameters

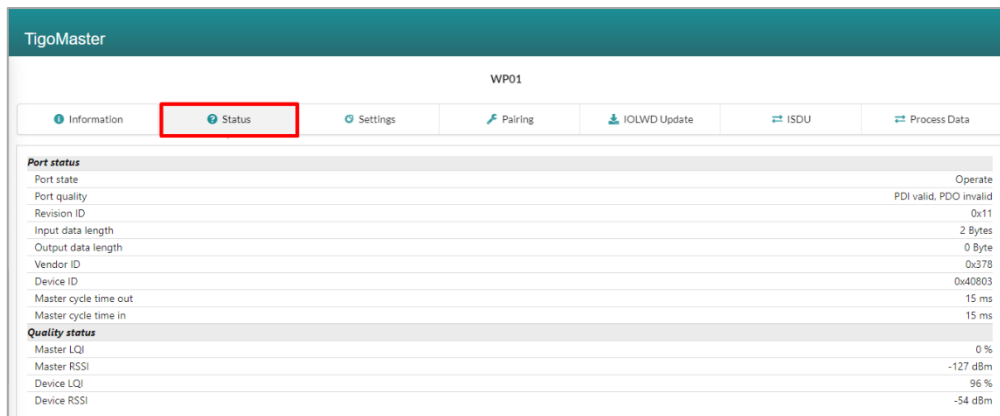
Parameter	Description	Value/Value Range
Min cycle time	Minimum cycle duration supported by a Device. This is a performance feature of the Device and depends on its technology and implementation.	0 ... ms
Function ID	Function ID of connected device.	
Number of profile IDs	Provides the number of ProfileIDs contained in the ProfileCharacteristic (index 0x000D) of the connected device. The complete list the ProfileIDs has to be read using common OnRequestData Read mechanism.	
Vendor name	Detailed name of vendor of connected device.	Character string (up to 64 characters)
Vendor text	Additional vendor information of the connected device.	Character string (up to 64 characters)
Product name	Detailed product or type name of the connected device.	Character string (up to 64 characters)
Product ID	Product or type identification of connected device.	Character string (up to 64 characters)
Product text	Description of function or characteristic of connected device.	Character string (up to 64 characters)

Parameter	Description	Value/Value Range
Serial number	Vendor specific serial number of connected device.	Character string (up to 16 characters)
Hardware revision	Revision of hardware of connected device in a vendor specificformat.	Character string (up to 64 characters)
Firmware revision	Revision of firmware in connected device in a vendor specificformat.	Character string (up to 64 characters)

6.3.2. Port Status

14. Select the wireless IO-Link port in the left column of the CoreTigo Wireless Web Server.
15. Open the **Status** tab.

The current values for the status data of the selected wireless IO-Linkport appear.



TigoMaster	
WP01	
Information	Status
Settings	Pairing
IOLWD Update	ISDU
Process Data	
Port status	
Port state	Operate
Port quality	PDI valid, PDO invalid
Revision ID	0x11
Input data length	2 Bytes
Output data length	0 Byte
Vendor ID	0x378
Device ID	0x40803
Master cycle time out	15 ms
Master cycle time in	15 ms
Quality status	
Master LQI	0 %
Master RSSI	-127 dBm
Device LQI	96 %
Device RSSI	-54 dBm

Figure 34: Port Status Tab

Table 25: Port Status Parameters

Parameter	Description	Value/Value Range
Port state	Current port state of wireless IO-Link port Descriptions of the possible values are listed in table.	Pairing success, Pairing timeout, Pairing wrong slot type, Inactive, Port ready, Communication ready, Operate, Communication lost, Revision fault, Compatibility fault, Serial number fault, Process data fault, Cycle time fault
Port quality	Status information of process data. Input process data is valid, Input process data is not valid. Output process data is valid, Output process data is not valid.	PDI valid, PDI invalid, PDO valid, PDO invalid.
Revision ID	Revision ID of the connected device.	0: No device connected Others: Revision ID of connected device

Parameter	Description	Value/Value Range
	This parameter is specified by the connected device. It indicates software revision running on the connected device.	
Master cycle time out	<p>Cycle time of PDOOUT communication in Operate mode.</p> <p>The Master cycle time is a Master parameter and sets up the actual cycle time of PDOOUT for particular wirelessIO-Link port.</p> <p>“Free running”: The Minimum Master cycle time is configured, based on the PDOOUT Segmentation length, Slot Type and Max Retry configurations.</p>	“Free running”, 5 ms ... 315 ms
Master cycle time in	<p>Cycle time of PDIN communication in Operate mode.</p> <p>The Master cycle time is a Master parameter and sets up the actual cycle time of PDIN for particular wirelessIO-Link port.</p> <p>“Free running”: The Minimum Master cycle time is configured, based on the PDIN Segmentation length, Slot Type and Max Retry configurations.</p>	“Free running”, 5 ms ... 315 ms
Input data length	Real input data length of connected device in bytes.	0 ... 32
Output data length	Real output data length of connected device in bytes.	0 ... 32
Vendor ID	Vendor ID of the connected IO-Link Device	0 ... 0xFFFF, Default: 0
Device ID	Device ID of the connected IO-Link Device	0 ... 0xFFFFFFFF, Default: 0
Master LQI	Master Link Quality Indication	0% ... 100%
Master RSSI	Master Received Signal Strength Indication	0 ... -100dbm
Device LQI	Device Link Quality Indication	0% ... 100%
Device RSSI	Device Received Signal Strength Indication	0 ... -100dbm

The **Status** tab with the port status data provides responses to the questions:

- What is the current port state of the wireless IO-Link port?
- Is the process data valid for input or output? Further port status values are displayed.

Table 26: Possible Values for the Port State

Value	Description
Pairing success	Device is connected to the port via radio and there is wireless communication with the connected device.
Pairing timeout	A timeout has occurred for the connection from this port to the device.
Pairing wrong slottype	A wrong slot type is used for the connection from this port to the device.
Inactive	The port is inactive.
Port ready	The port is ready.
Communication ready	The device is ready for communication.
Operate	The device is in communication.
Communication lost	The communication to the device is broken down.
Revision fault	An error was found during revision check.
Compatibility fault	An error was found during compatibility check.
Serial number fault	An error was found during serial number check.
Process data fault	An error was found during process data check.
Cycle time fault	The configured cycle time does not match the connected device.

6.3.3. Device ISDU

The **ISDU** tab allows read and write access to the IO-Link Device connected to a wireless IO-Link port by means of Index and Subindex. The ISDU message format is used for this.

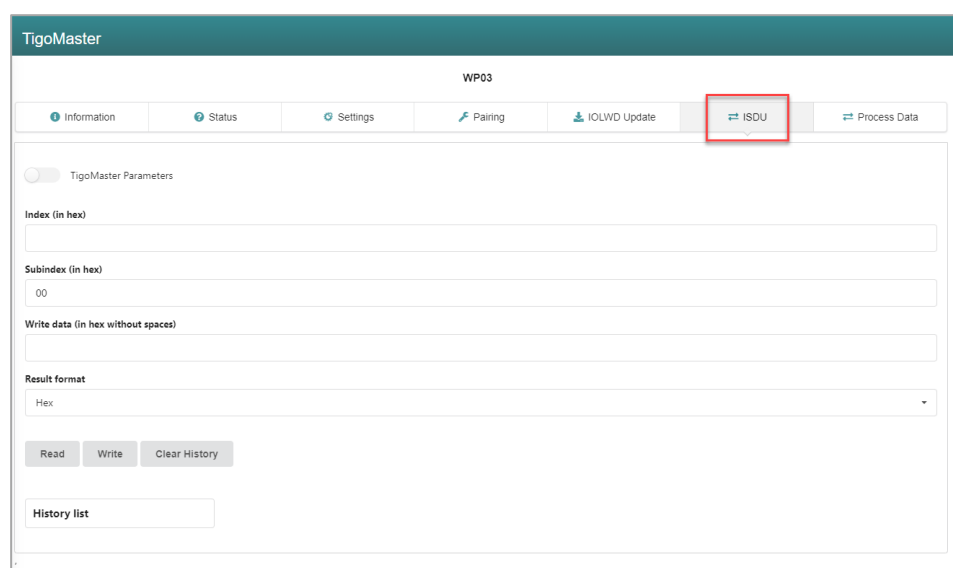


Figure 35: Display of On Request Data, Read/Write IO-Link Device Parameters

**Note:**

For the meaning of the Index and Subindex values, refer to the documentation of the connected IO-Link Device.

For a description of the ISDU message format, refer to the IO-Link specification.

6.3.3.1. Required Rights

Changes to settings require operator or admin rights. If these are not available, the **ISDU** tab is grayed out and the displayed values cannot be edited.

6.3.3.2. Access to IO-Link Device

To access the data of an IO-Link Device connected to the selected wireless IO-Link port via Index and Subindex (ISDU message format):

16. Select the wireless IO-Link port to which the IO-Link Device is connected in the menu on the left.
17. Open the **ISDU** tab.

The **ISDU** tab is displayed.

6.3.3.3. Read Access to IO-Link Device

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

18. Enter the **Index** for ISDU access as a hexadecimal value in the **Index** entry field.
19. Enter the **Subindex** for ISDU access as a hexadecimal value in the **Subindex** entry field.

The default value here is 00.

In case of input errors, an error message appears.

20. Click on **Read**.

The read access is executed.

An entry with a time stamp is written to the history at the bottom of the ISDU tab.

If the execution was successful, the text **Read ok:** is displayed and the result is displayed in the history. The entries in the history then have the following structure:

Time - Index:Subindex - Read ok: <Result>



The screenshot shows the ISDU tab interface. At the top, there is a 'Result format' section with a dropdown menu set to 'Hex'. Below this are three buttons: 'Read', 'Write', and 'Clear History'. At the bottom, there is a 'History list' section containing a single entry: '12:38:59 - 0:0 - Read OK: 0x00,0x44,0x41,0xff,0x11,0x83,0x83,0x00,0x02,0x00,0x01,0x2b,0x00,0x00,0x00,0x00'.

Figure 36: History List

If the execution was not successful, an error message with error codes of the IO-Link Wireless Master and IO-Link Device is displayed in the history.

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

Time - Index:Subindex - Read failed: IOLMErrorcode(<error code of the IO-Link master>): IOLDErrorCode(<error code of the IO-Link Device>)



Note:

Information on the meaning of the error codes of the IO-Link master (IOLMErrorcode) and device (IOLDErrorCode) can be found in the IO-Link specification.

The following applies in both cases:

- The **Time** is displayed in the format **HH:MM:SS**
- **Index** and **Subindex** are displayed in hexadecimal format.

6.3.3.4. Write Access to the IO-Link Device

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

21. Enter the **Index** of the connected IO-Link Device that you want to access as a hexadecimal value in the **Index** entry field.
22. Enter the **Subindex** of the connected IO-Link Device that you want to access as a hexadecimal value in the **Subindex** entry field. The default value here is 00.

In case of input errors, an error message appears.

23. Enter the data to be written (in hexadecimal, without spaces, e.g., 0102030405) in the **Write data** entry field.
24. Click on **Write**.

The write access is performed.

If the execution was successful, the text **Write ok:** is displayed and the result is displayed in the history. The entries in the history then have the following structure:

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

If the execution was not successful, an error message with error codes of the IO-Link Wireless Master and IO-Link Device is displayed in the history.

The entries in the history then have the following structure:

Time - Index:Subindex - Write failed: IOLMErrorcode(<error code of the IO-Link master>): IOLDErrorCode(<error code of the IO-Link Device>)

6.3.3.5. Delete the History of Read and Write Accesses

To clear the logged history of read and write accesses: Click **Clear history**.

The history of read and write accesses is deleted.

6.3.4. Master ISDU

The **ISDU** tab with the option **Tigo Master Parameters** allows read and write access to the IO-Link Wireless Master device, by means of PortId and ArgBlockId. The ISDU message format is used for this.

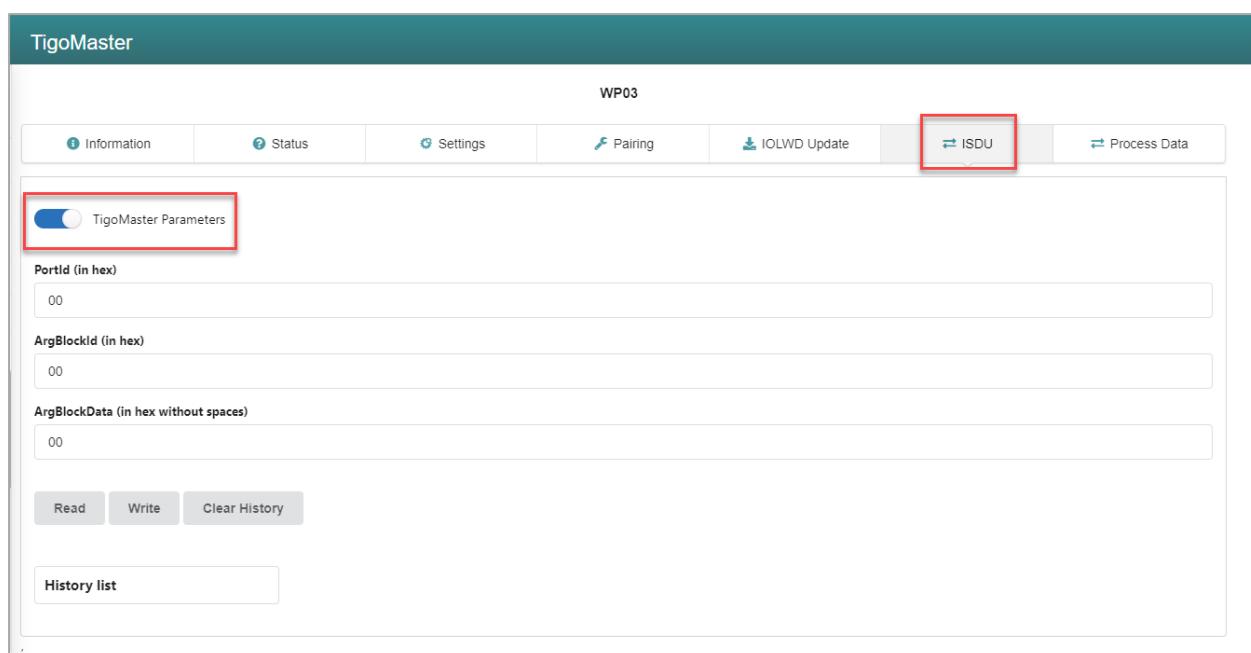


Figure 37: Display of the ISDU, Read/Write IO-Link Wireless Master Parameters

6.3.4.1. Required Rights

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

6.3.4.2. Access to IO-Link Wireless Master

To access the data of the IO-Link Wireless Master via PortId and ArgBlockId (ISDU message format):

25. In the menu on the left, select the wireless IO-Link port of the IO-LinkWireless Master to which an IO-Link Device is connected.
26. Open the **ISDU** tab.

The ISDU tab is displayed.

27. Enable **Tigo Master Parameters**.

The **Tigo Master Parameters** tab variant is displayed.

6.3.4.3. Read Access to IO-Link Wireless Master

To read data from the IO-Link Wireless Master, proceed as follows:

28. Enter the **PortId** of the IO-Link Wireless Master that you want to access as a hexadecimal value in the **PortId** entry field.
29. Enter the **ArgBlockId** of the IO-Link Wireless Master that you want to access as a hexadecimal value in the **ArgBlockId** entry field. The default value here is 00.
In case of input errors, an error message appears.
30. Click on **Read**.

The read access is executed. An entry with a time stamp is written to the history at the bottom of the **ISDU** tab.

If the execution was successful, the text **Read ok:** is displayed and the result is displayed in the history. The entries in the history then have the following structure:

Time - PortId:ArgBlockId - Read ok: <Result>

If the execution was not successful, an error message with error codes of the IO-Link Wireless Master and IO-Link Device is displayed in the history.

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

Time - PortId:ArgBlockId - Read failed: IOLMErrorCode(<error code of the IO-Link master>): IOLDErrorCode(<error code of the IO-Link Device>)



Note:

Information on the meaning of the error codes of the IO-Link master (IOLMErrorCode) and device (IOLDErrorCode) can be found in the IO-Link specification.

The following applies in both cases:

- The **Time** is displayed in the format **HH:MM:SS**
- **PortId** and **ArgBlockId** are displayed in hexadecimal format.

6.3.4.4. Write Access to IO-Link Wireless Master

To write data to the IO-Link Wireless Master, proceed as follows:

31. Enter the **PortId** of the IO-Link Wireless Master that you want to access as a hexadecimal value in the **PortId** entry field.
32. Enter the **ArgBlockId** of the connected IO-Link Device that you want to access as a hexadecimal value in the **ArgBlockId** entry field. The default value here is 00.

In case of input errors, an error message appears.

33. Enter the data to be written (in hexadecimal, without spaces, e.g., 0102030405) in the **ArgBlockData** entry field.

Write example: PortId = 01, ArgBlockId = B090, ArgBlockData = 01020304

34. Click on **Write**.

The write access is performed.

If the execution was successful, the text **Write ok:** is displayed and the result is displayed in the history. The entries in the history then have the following structure:

Time - PortId:ArgBlockId - Write ok: <Result>

If the execution was not successful, an error message with error codes of the IO-Link Wireless Master and IO-Link Device is displayed in the history.

The entries in the history then have the following structure:

Time - PortId:ArgBlockId:Data - Write failed: IOLMErrorCode(<error code of the IO-Link master>): IOLDErrorCode(<error code of the IO-Link Device>)

6.3.4.5. Delete the History of Read and Write Accesses

To clear the logged history of read and write accesses: Click **Clear history**.

The history of read and write accesses is deleted.

6.3.5. Process Data

You can display the process data belonging to a specific wireless IO-Link port using the **Process Data** tab.

To display the process data for a port:

35. Select the wireless IO-Link port in the left column of the CoreTigo Wireless Web Server.
36. Open the **Process Data** tab.

The current values of process data configured for input or output are displayed in hexadecimal format under input or output.

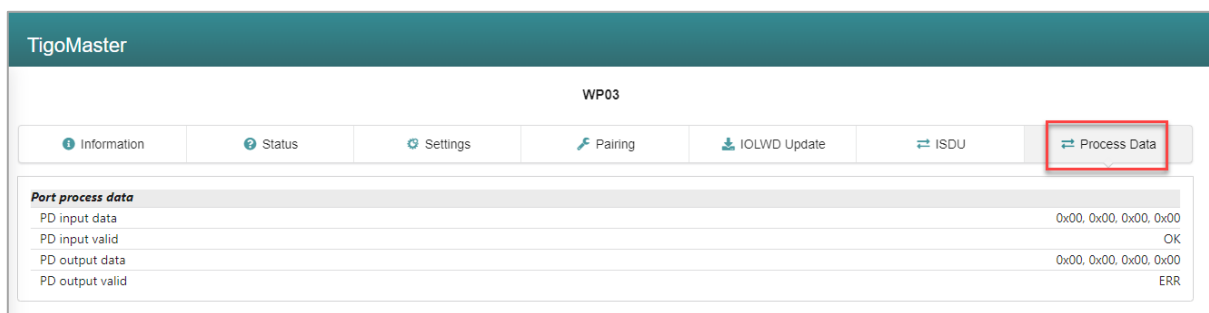


Figure 38: Display of the Process Data

The **Process Data** tab shows the process data input and output values from and to a connected IO-Link Device.

Table 27: Process Data Parameters

Parameter	Description
PD input data	“Process Data” input data to the connected IO-Link Devices.
PD input valid	Binary coded Port Qualifier for Input.
PD output data	“Process Data” output data from the connected IO-Link Devices.
PD output valid	Validation information for process data output. If Output Enable flag is set, data will be valid.

If no process data has been configured for a data direction (input or output), the corresponding field remains empty.

6.4. Device Settings

Using the CoreTigo Wireless Web Server, you can make the several settings on the device. Open the panes via the left column of the CoreTigo Wireless Web Server.

37. Select the wireless IO-Link port (**WP01**, **WP02**, **WP03** ...) and open the **Settings** tab to make the port settings.

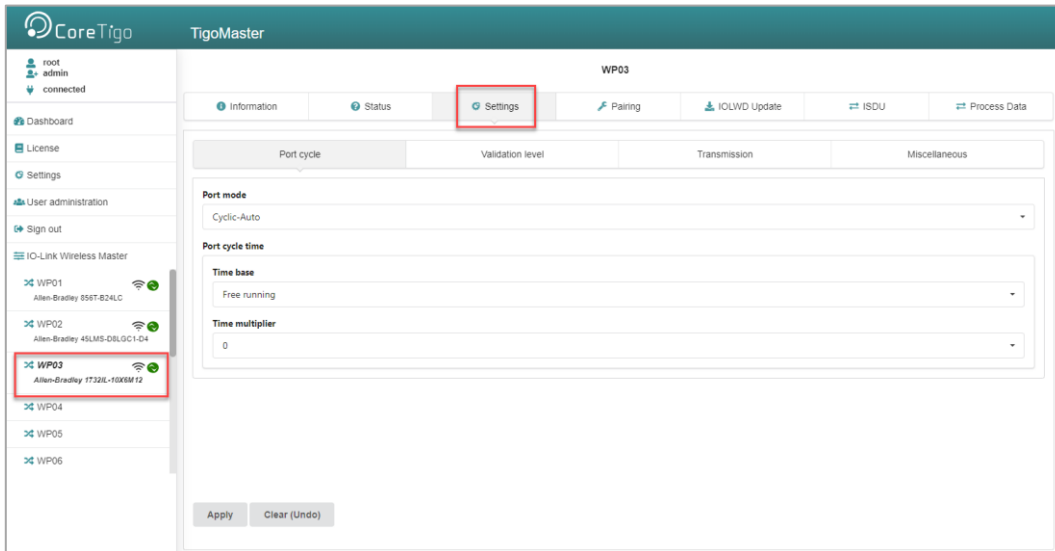


Figure 39: Settings Tab

38. Select **Settings** in the left column and open the corresponding tab:
 - Device information (with menu on the Configure IP parameters)
 - Maintenance information
 - Firmware update
 - Resetting the device to factory settings
 - MQTT

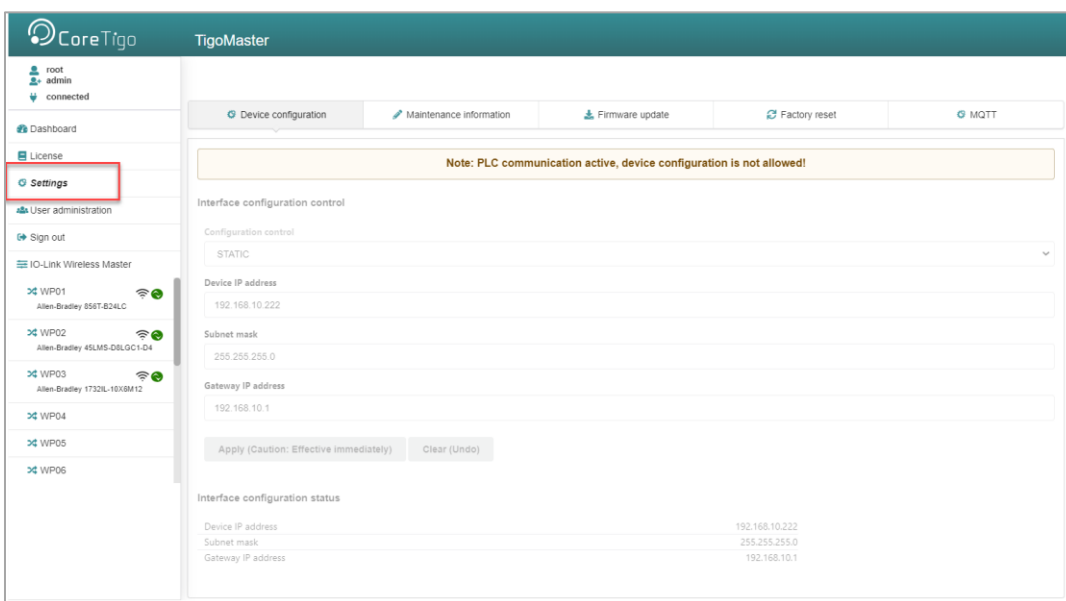


Figure 40: Device Configuration Subtab

39. Select **Sign In/Sign Out** or **User Administration** to access the Register, log off and manage users.

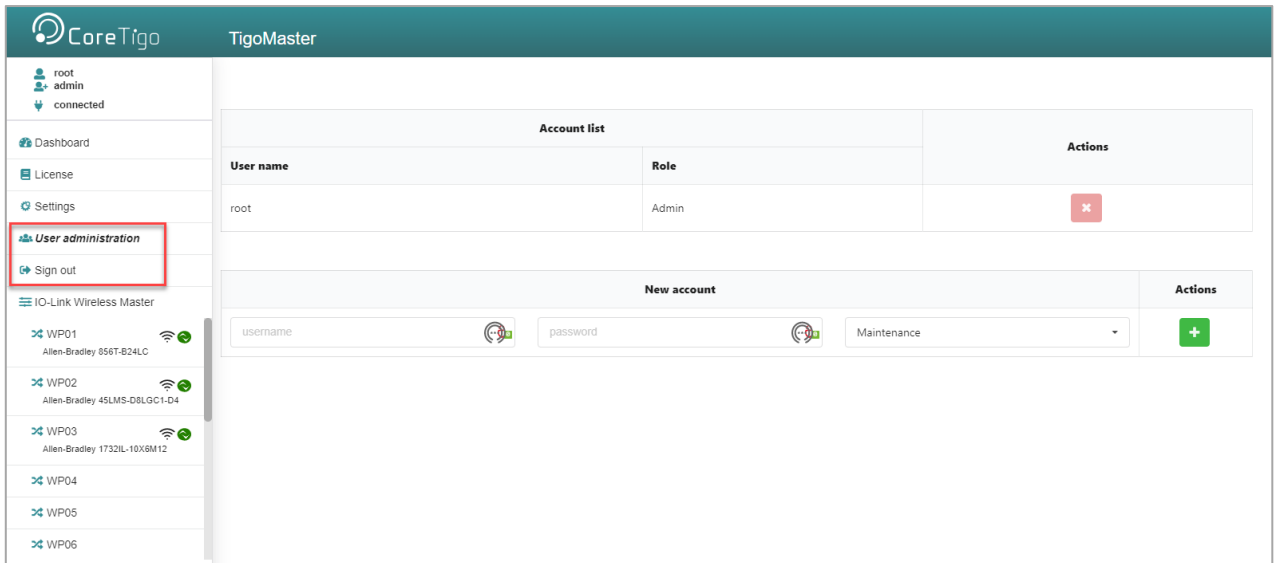


Figure 41: User Administration

6.4.1. Port Settings

Use the **Settings** tab to view and change the port settings individually.

1. Select the desired wireless port (WP01, WP02, WP03, ...) in the left column of the CoreTigo Wireless Web Server.
2. Open the **Settings** tab with its subtabs.

The **Port Cycle** subtab appears by default.

6.4.1.1. Settings > Port Mode

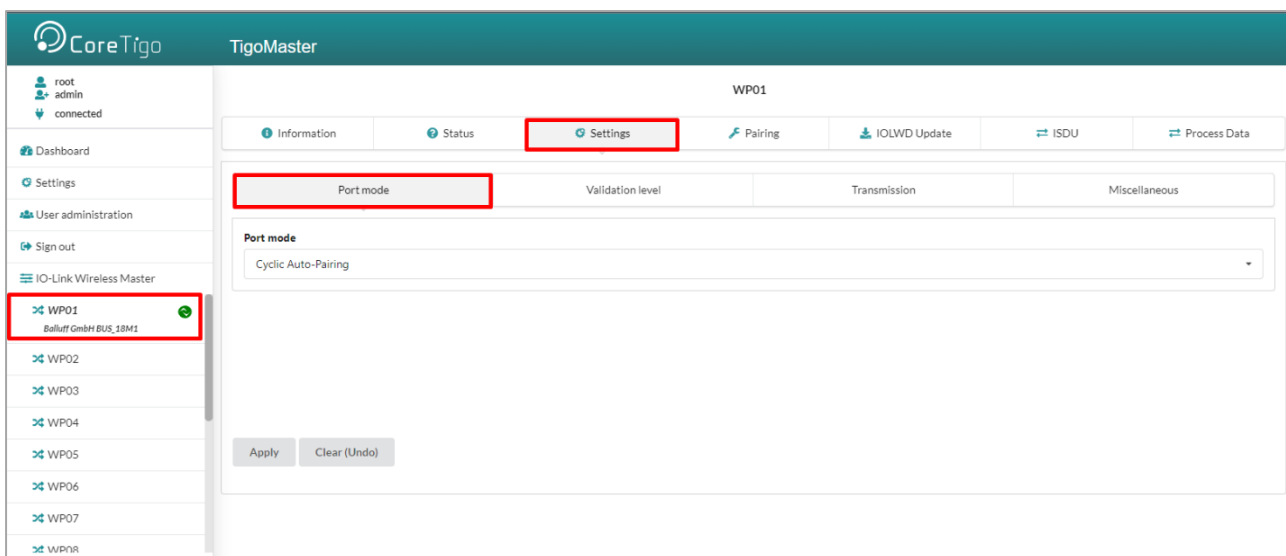


Figure 42: Settings Tab, Port mode Subtab

Table 28: Settings in Port Configuration for IO-Link Device, Port mode Subtab

Parameter	Description	Value/Value Range
Port mode	Operating mode of IO-Link port <ul style="list-style-type: none"> Deactivated: The port is inactive, Input and Output Process Data is 0. Cyclic Auto Pairing Cyclic Roaming Auto Pairing Roaming 	<ul style="list-style-type: none"> Deactivated: Cyclic Auto Pairing Cyclic Roaming Auto Pairing Roaming
Port cycle time	Time base: Used time base for the calculation of the port cycletime.	Free running, 5 ms
	Time multiplier: Used factor for the calculation of the port cycletime.	0 ... 63

3. Configure port operating mode **Port mode** by selecting the corresponding option.

4. Configure the "Port cycle time".

The parameter "Port cycle time" sets up the cycle time of a W-Port of the W-Master.

The cycle time is encoded using "Time base" (bits 6+7) and "Multiplier" (bits 0-5) values, as shown in the following table.

Table 29: Calculation of the Port Cycle Time of the IO-Link Wireless Master

Range of Values	Time Base (Bits 7+6)	Multiplier (Bits 5-0)	Resulting Cycle Time
0	00	0	Free-running mode
1 ... 64	00	1 ... 63	Note: If the free-running mode is chosen with a time base of 0, the W- Master stack will automatically configure the Master cycle time to be the Minimum Master cycle time based on the PD Segmentation length, SlotType, and Max Retry configurations.
65 ... 127	01: 5ms	1 ... 63 as multiplier	5 ... 315 ms (Time Base * Multiplier) Note: For W-Devices and W-Bridges the minimum possible transmission time is 5 ms.
128 ... 255	10 ... 11: reserved	1 ... 63	Reserved, do not use

5. Select the **Time base** and the **Time multiplier** for the "Port cycle time" calculation.

The result is indicated as value or text in brackets, e. g. **Port cycle time (Free running)**.

6.4.1.2. Settings > Validation level

1. Open the **Validation level** subtab.

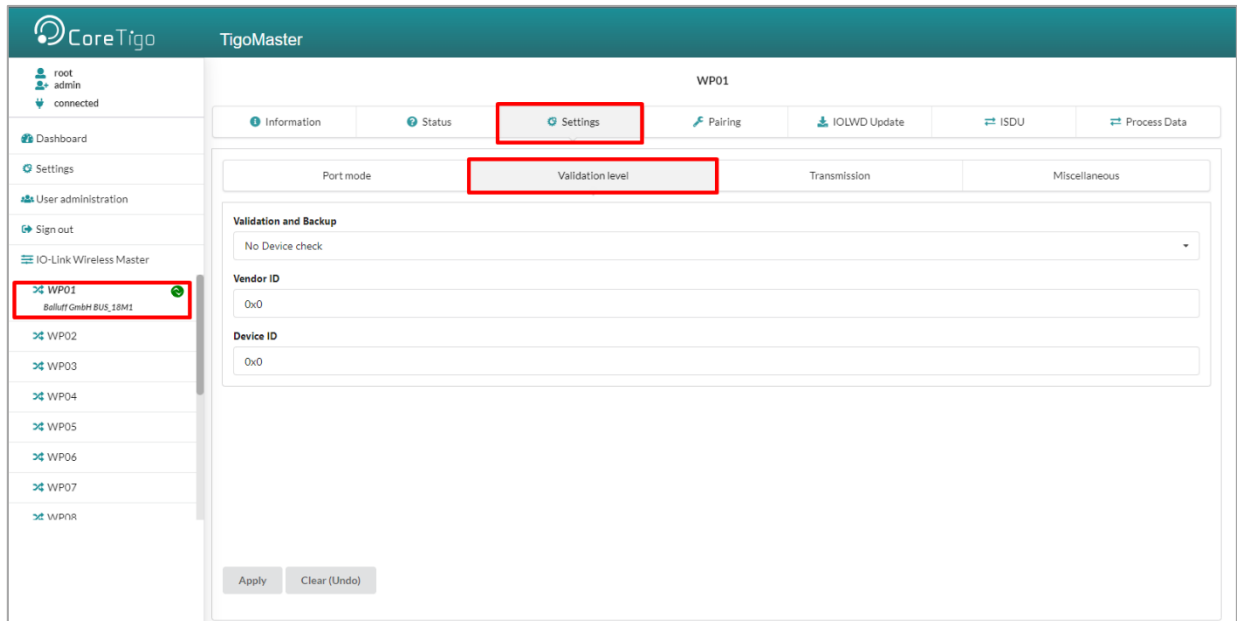


Figure 43: Settings Tab, Validation Level Subtab

2. Under **Validation and backup**, configure possible values for the inspection level to be performed by the device and the Backup/Restore behavior.
3. If necessary, set the expected port parameters VendorID and DeviceID.

Table 30: Settings in Port Configuration for IO-Link Device, Validation Level Subtab

Parameter	Description	Value/Value Range
Validation and backup	The table below contains descriptions for the possible values for the inspection level to be performed by the device and the Backup/Restore behavior:	Default: No device check
Vendor ID*	Expected Vendor ID of connected device. This information is required to check the device for type compatibility.	0 ... 0xFFFF, Default: 0
Device ID*	Expected Device ID of connected device. This information is required to check the device for type compatibility.	1 ... 0xFFFFFFFF, Default: 0xFFFFF

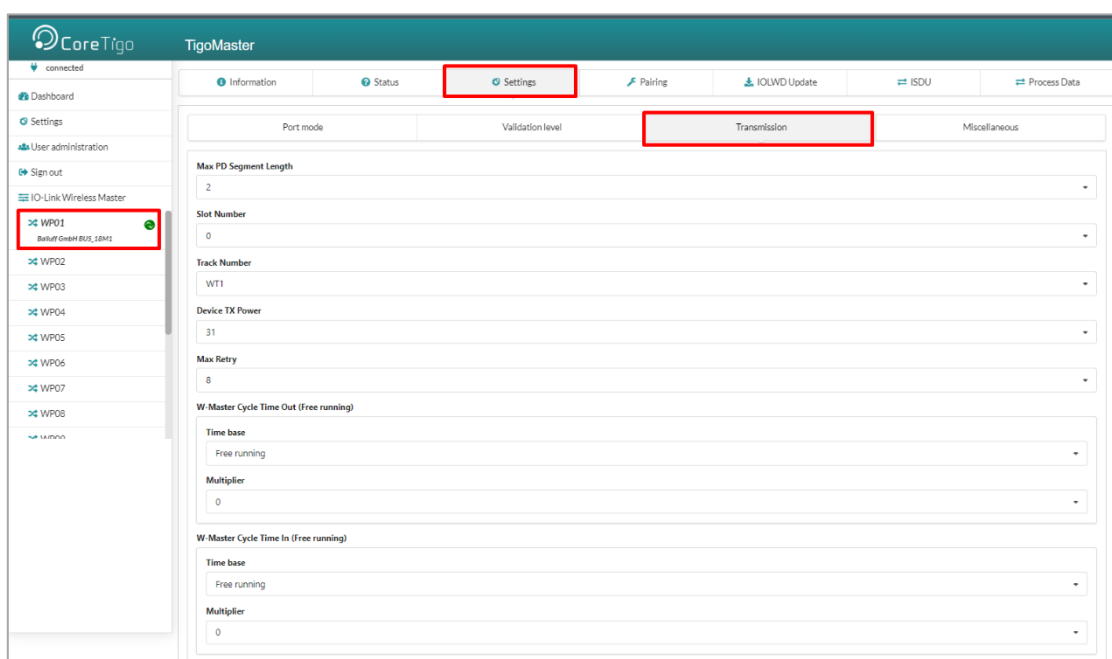
* Values are in hexadecimal

Table 31: Validation and Backup, Possible Values

Value	Description
No device check	There is no device check for validation or backup of connected IO-Link Devices
Type compare* No Backup/Restore	A device check is performed for validation of connected IO-Link Devices to the specified device type, without backup/restore.
Type compare* Restore only	A device check is performed for validation or restore of connected IO-Link Devices to the specified device type, without backup.
Type compare* Backup and Restore	A device check is performed for validation or backup/restore of connected IO-Link Devices to the specified device type.
*Type compare means compare DeviceID and VendorID from the configuration object with the real device values.	

6.4.1.3. Settings > Transmission

1. Open the **Transmission** subtab.

**Figure 44: Settings Tab, Transmission Subtab**

2. If necessary, set the expected port parameters Max PD Segment Length, Slot number, Track number, Device TX power or Max retry.

Table 32: Settings in Port Configuration for IO-Link Device, Transmission Subtab

Parameter	Description	Value/Value Range
Max PD Segment Length	This parameter contains the maximum segment length of the PDO data to the message handler to distribute PDO data within multiple wireless cycles. The maximum value depends by the actual transmission capacity of the used IO-Link Device.	1 ... 32 Byte, Default: 2
Slot number	Wireless slot number to be used for the port	0 ... 7, Default: 0
Track number	Wireless track number to be used for the port	WT1, WT2, WT3 Default: WT1
Device TX power	This parameter contains the transmit power level of the W-Device	1 ... 31, Default: 31
Max retry	Maximum number of retries for a transmission in OPERATE mode "Unknown" is indicated if there is no value available.	2 ... 31, Default: 8
Cycle time Out	Time base: Used time base for the calculation of the port cycle time.	Free running, 5 ms
	Time multiplier: Used factor for the calculation of the port cycle time.	0 ... 63
Cycle time In	Time base: Used time base for the calculation of the port cycle time.	Free running, 5 ms
	Time multiplier: Used factor for the calculation of the port cycle time.	0 ... 63

The parameter "cycle time out" or "cycle time in" sets up the cycle time of a W-Port of the W-Master for PDIN and PDOOUT (separate cycles). The cycle time is encoded using "Time base" (bits 6+7) and "Multiplier" (bits 0-5) values, as shown in the following table.

Table 33: Calculation of the Port Cycle Time of the IO-Link Wireless Master

Range of Values	Time Base (Bits 7+6)	Multiplier (Bits 5-0)	Resulting Cycle Time
0	00	0	Free-running mode
1 ... 64	00	1 ... 63	Note: If the free-running mode is chosen with a time base of 0, the W- Master stack will automatically configure the Master cycle time to be the Minimum Master cycle time based on the PD Segmentation length, Slot Type, and Max Retry configurations.
65 ... 127	01: 5ms	1 ... 63 as multiplier	5 ... 315 ms (Time Base * Multiplier) Note: For W-Devices and W-Bridges the minimum possible transmission time is 5 ms.
128 ... 255	10 ... 11: reserved	1 ... 63	Reserved, do not use

Select the **Time base** and the **Time multiplier** for the "Port cycle time" calculation.

The result is indicated as value or text in brackets, e. g. **Port cycle time (Free running)**.

6.4.1.4. Settings > Miscellaneous

1. Open the **Miscellaneous** subtab.

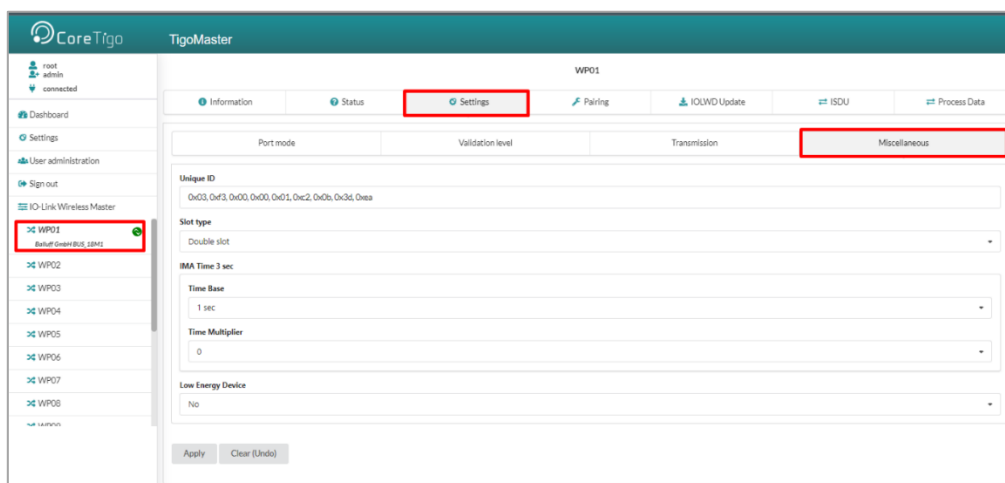


Figure 45: Settings Tab, Miscellaneous Subtab

1. To configure the Unique ID, use the Unique ID (UUID) from the scan result.
2. If necessary, set the expected port parameters Slot type or Low power device.
3. Configure the “IMA Time” (I-Am-Alive time).

Table 34: Settings in Port Configuration for IO-Link Device, Miscellaneous Subtab

Parameter	Description	Value/Value Range
Unique ID*	Unique ID of the IO-Link Device (9 Bytes. Use the Unique ID (UUID) from the scan result.	0 ... 0xFF, Default: 0
Slot type	Slot type of the found device. Use the slot type from the scan result. Note: For a device featuring “Double slot” an even number must be assigned as value for the slot.	Single slot, Double slot, Default: Single slot
IMA Time 3 sec (calculated time)	Requested I-Am-Alive time for the OPERATE mode The I-Am-Alive time is calculated by multiplying the “time base” with the “time multiplier”.	1.664 ... 10 min (for higher values an error message appears), Default: 3 sec
	Time base: Used time base for the calculation of the I-Am-Alivetime.	1.664 ms, 5 ms, 1 sec, 1 min
	Time multiplier: Used factor for the calculation of the I-Am-Alivetime.	1 ... 255
Low power device	Is the connected IO-Link Device a low power device or not.	No, Yes, Default: No

The parameter “I-Am-Alive time” serves for W-Master and W-Device communication control if no other messages are transmitted. The W-Device has to send an “I-Am-Alive” messages to the W-Master before timeout, otherwise an error is reported, e.g. to start failsafe functionalities in the application.

The "I-Am-Alive time" is calculated by multiplying the "Time base" with the "Multiplier".

The Wireless Master verifies the calculated "I-Am-Alive time" with the following limits:


- "Minimum I-Am-Alive time" = W-Sub-cycle duration [ms] * (MaxRetry + 1)
If the calculated "I-Am-Alive time" is less than the "Minimum I-Am-Alivetime", the Wireless Master uses the "Minimum I-Am-Alive time" as resulting "I-Am-Alive time".
- Maximum I-Am-Alive time = 10 minutes
If the calculated "I-Am-Alive time" is greater than the "Maximum I-Am- Alive time", the error message **Port configuration failed HTTP Error 500: NetProxy returned with an error: C0000124** appears.

4. Select the **Time base** and the **Time multiplier** for the "IMA Time" calculation in order to avoid exceeding the maximum allowed value.

The result is indicated as value in brackets.


5. Click **Apply**.


Your changes now take effect.

The message **Port configured successfully** appears and a **Green** tick  appears for the selected port in the left column of the CoreTigo Wireless Web Server, indicating that a connection from an IO-Link Device to this wireless IO-Link port has been established, and that the IO-Link Device is in "operate" state.



Note:

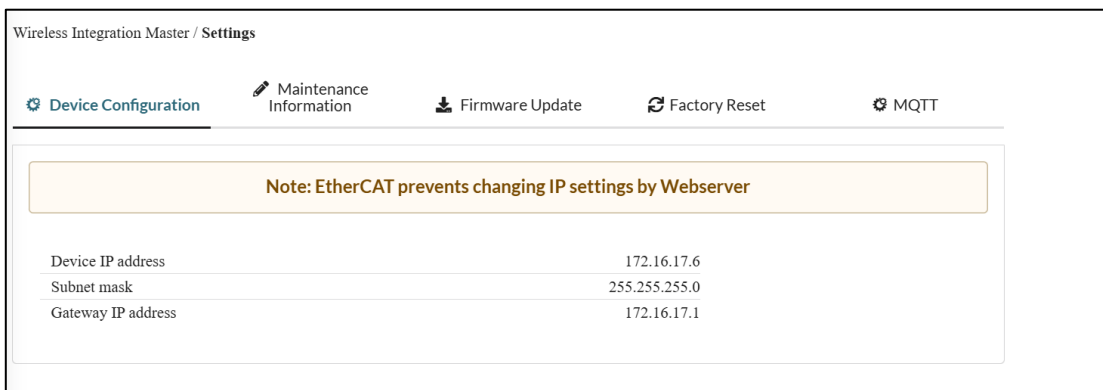
The **Green** tick icon  disappears if the IO-Link Wireless Master changes to an error state but the device connection is still established and in "connected" state (shown on top left corner of the CoreTigo Wireless Web Server).

If the device connection drops and "disconnected" state is shown, the **Green** tick icon  is still visible and reflects the latest status obtained from the device.

6.4.2. IP Parameters

1. Select **Settings** in the left column of the CoreTigo Wireless WebServer.

The **Device configuration** tab is displayed.



Wireless Integration Master / Settings

Device Configuration Maintenance Information Firmware Update Factory Reset MQTT

Note: EtherCAT prevents changing IP settings by Webserver

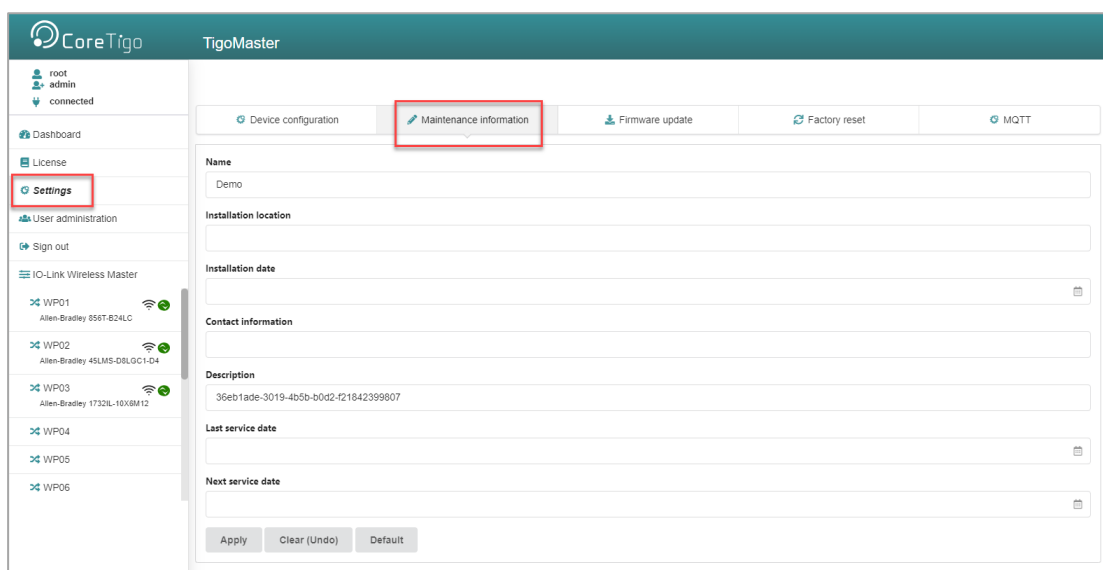
Device IP address	172.16.17.6
Subnet mask	255.255.255.0
Gateway IP address	172.16.17.1

Figure 46: Device Configuration Tab

The EtherCAT Master configures the IP address of the device. Therefore, no manual configuration of the IP address is required for EtherCAT devices.

6.4.3. Maintenance Information

The **Maintenance information** tab is used to store maintenance information such as device name, installation location and date, contact information, a description text, or the date of the last and next service on the device.



CoreTigo TigoMaster

root admin connected

Dashboard License Settings User administration Sign out IO-Link Wireless Master WP01 WP02 WP03 WP04 WP05 WP06

Device configuration Maintenance information Firmware update Factory reset MQTT

Name: Demo

Installation location:

Installation date:

Contact information:

Description: 36eb1ade-3019-4b5b-b0d2-f21842399807

Last service date:

Next service date:

Apply Clear (Undo) Default

Figure 47: Maintenance Information Tab

Changes to settings require operator or admin rights. If these are not available, the tab is grayed out and cannot be edited.

Table 35: Maintenance Information Tab Parameters

Parameter	Data Format and Length	Description
Name	Printable ASCII string, max.64 characters	Uniform label (string) in the installation for the function of this device
Installation location	Printable ASCII string, max.32 characters	Uniform label (string) in the system for the location where the device is mounted.
Installation date	ASCII time specification, max. 32 characters	Date of installation or commissioning of this device, the format may be defined by the fieldbus organization.
Contact information	Printable ASCII string, max.32 characters	Textual identification of a contact person for this managed node of the installation, together with information on how to contact this person.
Description	Printable ASCII string, max.64 characters	Readable comment field (in plain text) to store any individual status information and remarks.
Last service date	ASCII time specification, max. 32 characters	Date/time of the last service, e.g. firmware update
Next service date	ASCII time specification, max. 32 characters	Date/time of the next service, e.g. firmware

To make changes to the maintenance information:

1. Click on the **Settings** in the left column of the CoreTigo Wireless WebServer.
The **Device configuration** tab appears.
2. Select the **Maintenance information** tab.
3. Change the relevant fields there.
4. Click **Apply**.
Your changes take effect.

6.4.4. Firmware Update

The CoreTigo Wireless Web Server provides a way to update all firmware required for the IO-Link Wireless Master TigoMaster device via the **Firmware update** tab.

1. Select **Settings** in the left column of the CoreTigo Wireless WebServer.
2. Open the **Firmware update** tab.

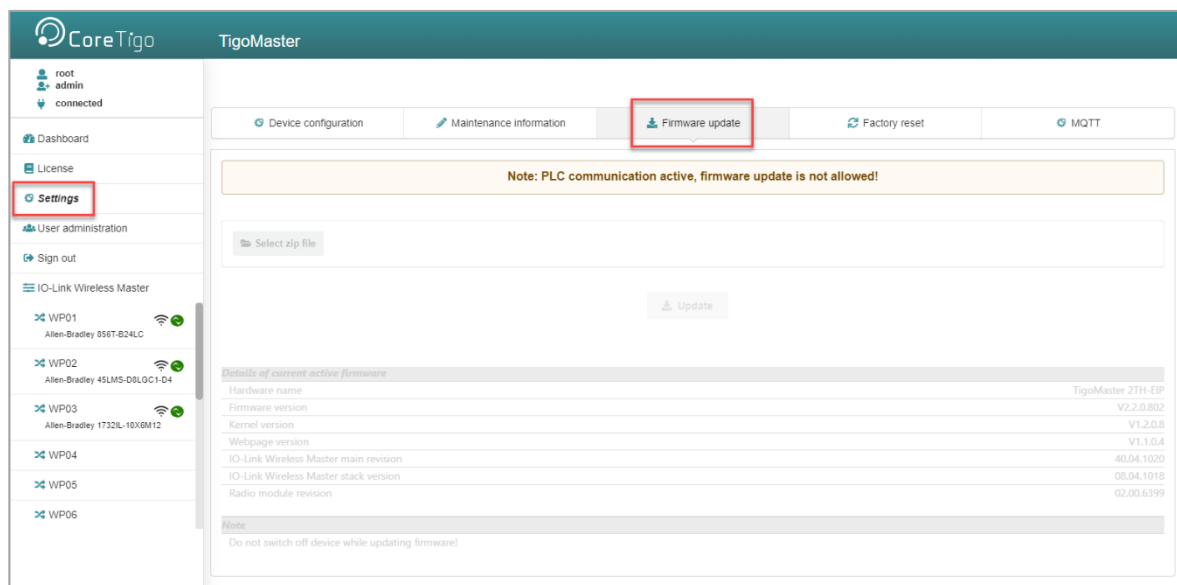


Figure 48: Firmware Update Tab

6.4.4.1. Bring the System into Safe Operating Condition

Never carry out a firmware update during operation of the system in which the TigoMaster device is installed. Before each firmware update, the system must first be shut down properly, or must be brought into a safe operating state.

6.4.4.2. Invalid Firmware

Loading invalid firmware files could render your device unusable. Only load firmware files to the device that are valid for this device. Otherwise, it may be necessary to send your device for repair.



Warning:

If you update the firmware of the TigoMaster device without making a backup of the firmware and configuration data, you cannot restore the state of your device prior to the update, including the previously used firmware.

Changes to settings require operator or admin rights. If these are not available, the **Firmware update** tab is grayed out and cannot be edited.

To update the firmware, you need the file *NFDW_Update_[protocol name]_V[version].zip* containing all firmware required for the TigoMaster device. You can download this from the website of the device manufacturer or provider.

1. In the **Firmware update** tab, click on **Choose File**.

A file selection dialog appears.

2. Select the file **2TH_[protocol name]_V[version].zip** in this dialog.
3. Click **Update**.

The firmware update is performed. This takes a short while.

A message appears indicating that the firmware update has finished, and the device will be restarted after pressing **OK**. It will have a new IP address.

4. Click **OK**.
5. Perform the port configuration again.

6.4.5. Master Reset



Warnings:

- Never carry out a firmware update during operation of the system on which the TigoMaster device is installed.
- Before each firmware update, the system must first be shut down properly, or must be brought into a safe operating state.
- Loading invalid firmware files could render your device unusable. Load only firmware files to the device that are valid for this device, lest the device may require repair.
- If you update the firmware of the TigoMaster device and you did not make a backup of the firmware and configuration data, you cannot restore the state of your device prior to the update, including the previously used firmware.

To perform a reset of the IO-Link Wireless Master device, proceed as follows.

1. Verify that the system is in a safe operating condition.
2. Select **Settings** in the left column of the CoreTigo Wireless Web Server.
3. Open the **Firmware Update** tab.
4. Click **Delete all settings**.
5. Click **Reset**.

The device reset is complete.

The message **Device reset successfully** appears.

6.4.6. Factory Settings

In some cases, it is helpful to reset the device to the factory settings. This is possible for various selectable classes of settings via the **Factory reset** tab in the **Settings** menu.

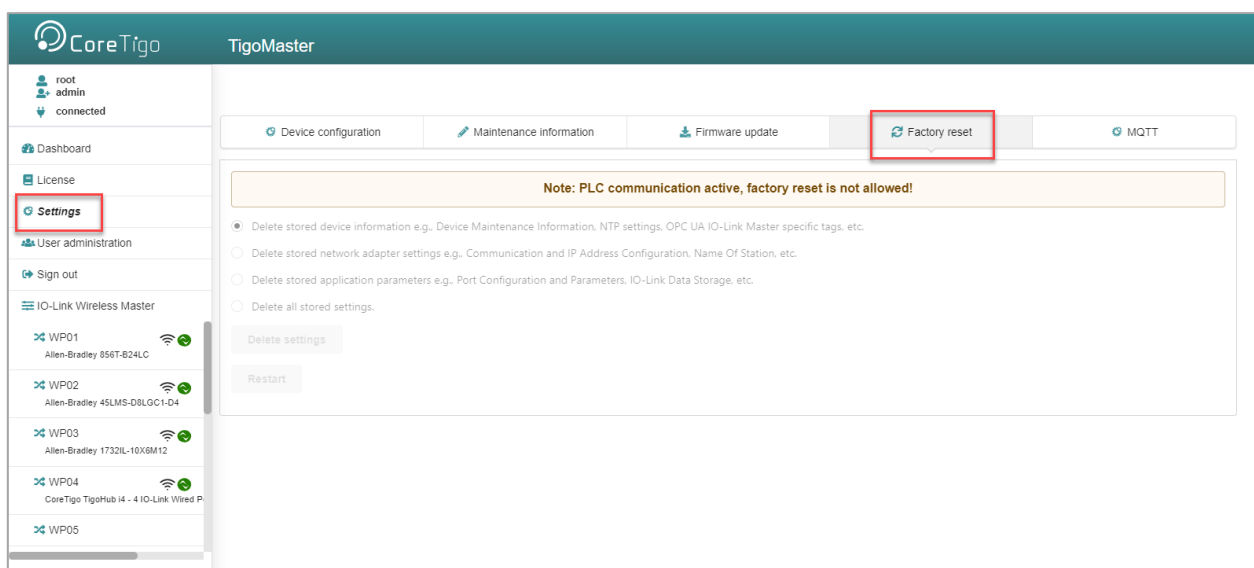


Figure 49: Factory Reset Tab

Changes to settings require operator or admin rights. If these are not available, the tab is grayed out and cannot be edited. Various settings made can be deleted depending on your selection.

Table 36: Options to Delete Settings

Option	Delete Stored Configuration
Delete stored device information	Device information (e.g. maintenance information, system time settings, and IO-Link master settings within OPC UA)
Delete stored network adapter settings	Network adapter settings (communication settings, IP address configuration, Name of Station)
Delete stored application parameters	Application-specific data (port configuration and parameters, permanent parameters)
Delete all stored settings	All settings

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

- Click on the **Settings** in the left column of the CoreTigo Wireless WebServer.
The **Device configuration** tab appears.
- Select the **Factory reset** tab.
- Select which settings should be reset to the factory defaults.
- Click on **Delete settings**.
The selected settings are deleted.
- Click on **Restart**.
The device is restarted with the factory settings.

6.4.7. MQTT Configuration

Use the **MQTT** tab to view and change the MQTT client and connection configuration.

1. Select **Settings** in the left column of the CoreTigo Wireless WebServer.
2. Open the **MQTT** tab with its subtabs.

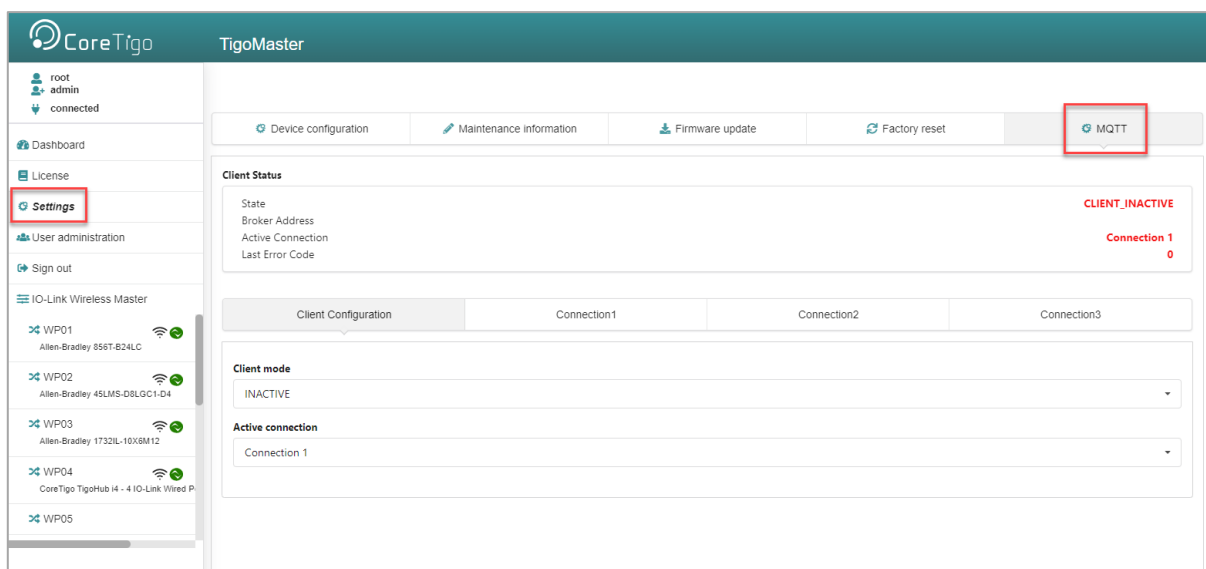


Figure 50: MQTT Tab

The **Client Status** appears, and by default the **Client Configuration** subtab.

6.4.7.1. MQTT > Client Status and Client Configuration

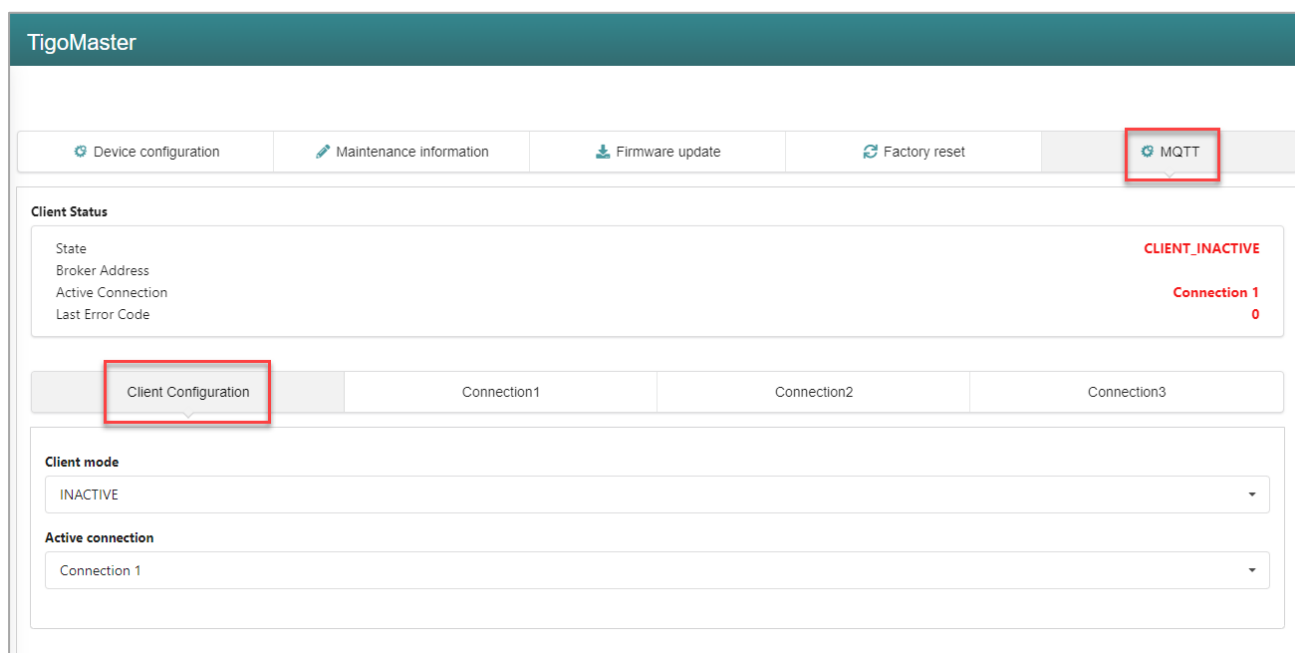


Figure 51: MQTT Tab, Client Status, Client Configuration Subtab

Table 37: MQTT in Port Configuration for IO-Link Device, Client Status

Parameter	Description	Value/Value Range
State	States 1, 2: "CONNECTING" State 3: "CONNECTION_ACCEPTED" States 0,4,5,6: "CLIENT_INACTIVE"	CONNECTING (Red), CONNECTION_ACCEPTED

Parameter	Description	Value/Value Range
	Connection state code 0: Ready: initialization value, connection not established. 1: Connecting: TCP connection establishment in progress. 2: TCP Connected: TCP connection established. MQTT connection in progress. 3: MQTT Connected: MQTT connection established. 4: Disconnecting: MQTT connection shutdown in progress. 5: Disconnected: TCP connection terminated. 6: Wait Reconnect: Waiting for reconnection to be allowed again. See "Connect Timeout" parameter.	(Green), CLIENT_INACTIVE (Red)
Broker Address	Current value for "Broker Address"	Example: 192.168.10.5
Active connection	Current value for "Active connection", respectively active connection configured.	Example: Connection 1
Last Error Code	Last error code, related to this connection.	Example: 0

Table 38: MQTT in Port Configuration for IO-Link Device, Client Configuration

Parameter	Description	Value/Value Range
Client mode	"ACTIVE" means MQTT client application is enabled and "INACTIVE" means disabled.	INACTIVE (default) ACTIVE
Active connection	Active connection configured.	Connection 1 (default) Connection 2 Connection 3

3. For **MQTT Client Configuration** make the following settings and configuration steps:

- Client mode
- Active connection

6.4.7.2. MQTT > Connection1 > IP Settings

1. Open the **Connection1** subtab.

The **IP settings** subtab appears by default.

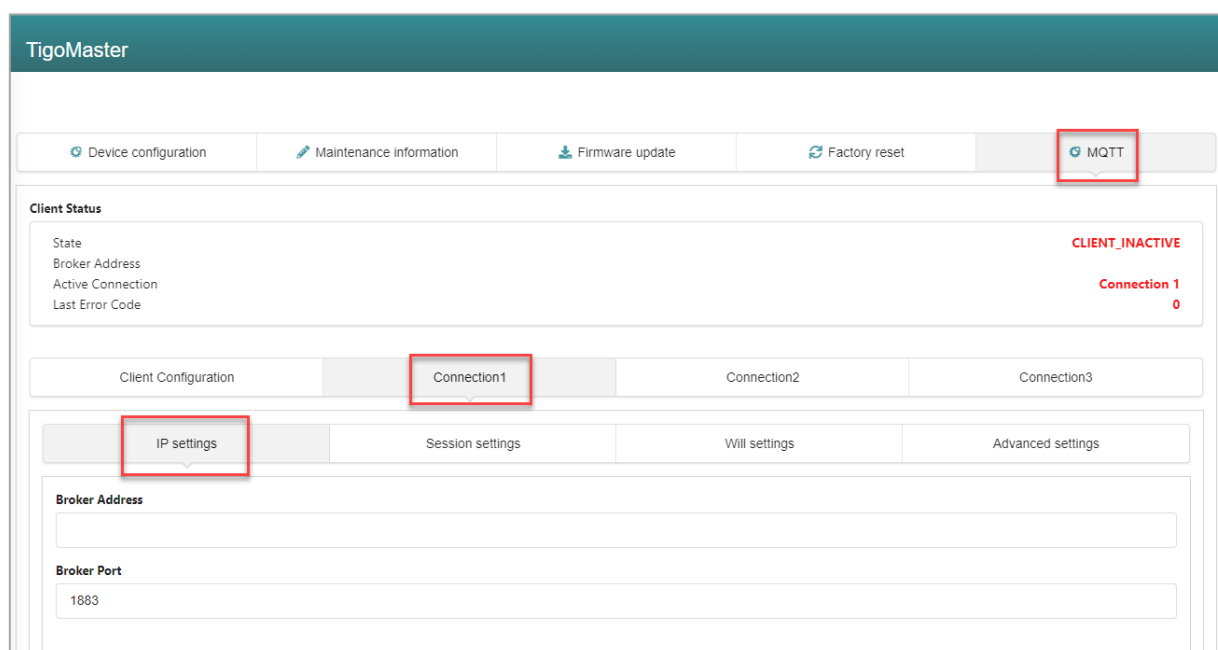


Figure 52: MQTT Tab, Connection 1 > IP Settings Subtab

Table 39: MQTT in Port Configuration for IO-Link Device, Connection1 > IP Settings

Parameter	Description	Value/Value Range
Broker Address	IP address of the broker.	Valid IP address Default: [BrokerAddress],
Broker Port	MQTT broker IP port number.	Typically: 1883

2. For **MQTT Connection Configuration** make the following settings and configuration steps:
 - Broker Address
 - Broker Port

6.4.7.3. MQTT > Connection1 > Session Settings

1. Open the **Session settings** subtab.

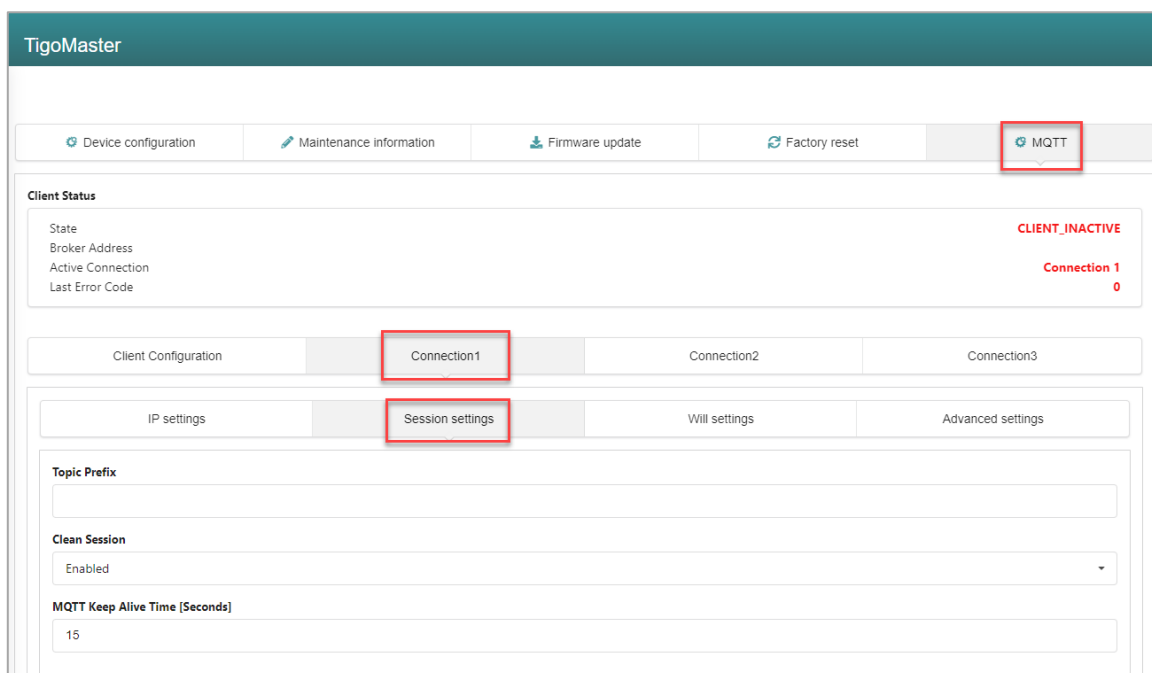


Figure 53: MQTT Tab, Connection1 > Session Settings Subtab

Table 40: MQTT in Port Configuration for IO-Link Device, Connection1 > Session Settings

Parameter	Description	Value/Value Range
Topic Prefix	Text that is prefixed to each topic, e. g. 'StationA'. For each single topic can be configured if this prefix is to be preceded or not. If left empty the firmware will try to use the MAC address.	Text of uppercase and lowercase letters and underscore, Default: [not specified]
Clean Session	Setting whether all topics are to be transferred to the broker after establishing a connection or not. Enabled (default): After a connection to the broker has been established, all topics of the type 'publish' are transmitted from the MQTT client to the broker. Disabled: Only those topics are transmitted to the broker, which have changed since the last connection. Note that if you use this setting, the broker must support the 'preserve context' function.	Enabled (default), Disabled
MQTT KeepAlive Time [Seconds]	Interval in which the MQTT client sends a sign of life to the broker. The set value for the MQTT client must be less than the monitoring time set in the broker. Enabling this timeout is suitable if the connection is used for at least one subscription so a permanent connection to the broker is required. Not allowed to be enabled together with the Connection Idle Timeout.	Specified in s. 0 = send no sign of life to the broker. Default: 0

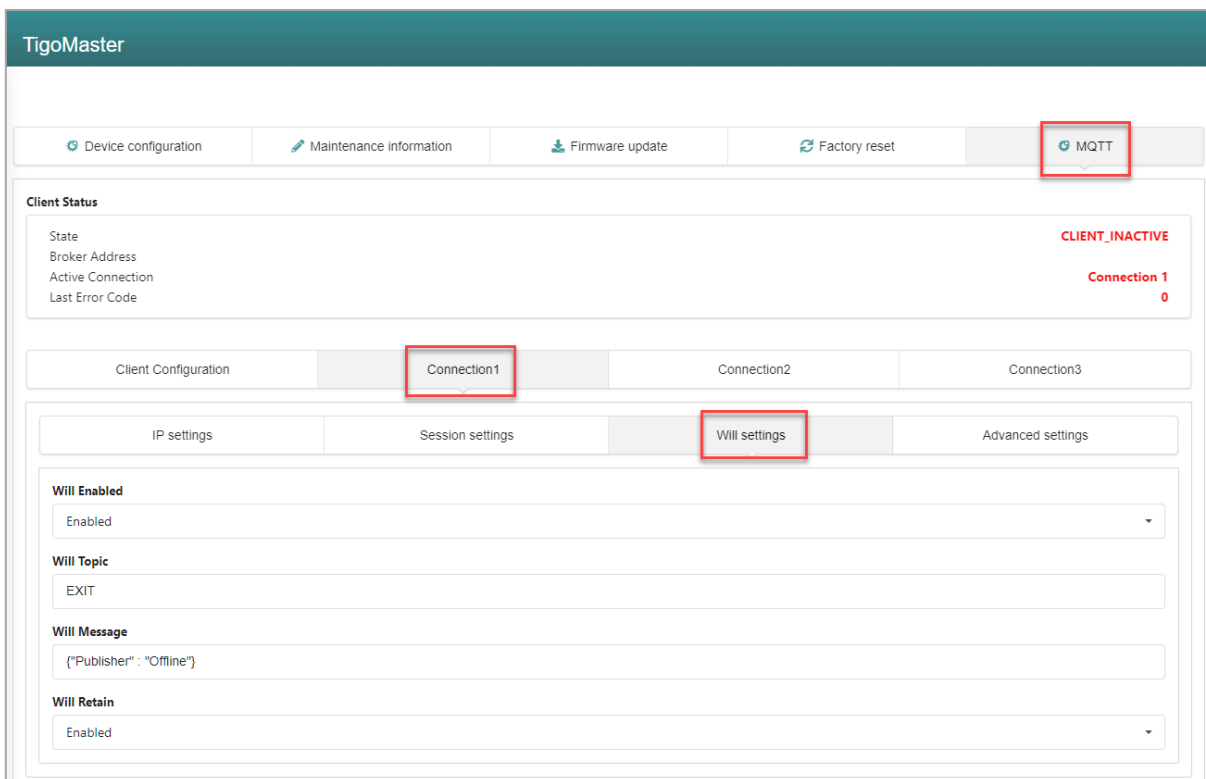
2. For **MQTT Connection Configuration** make the following settings and configuration steps:

- Topic Prefix
- Clean Session

- MQTT Keep Alive Time

6.4.7.4. MQTT > Connection1 > Will Settings

1. Open the **Will Settings** subtab.



TigoMaster

Device configuration Maintenance information Firmware update Factory reset **MQTT**

Client Status

State CLIENT_INACTIVE
 Broker Address
 Active Connection Connection 1
 Last Error Code 0

Client Configuration **Connection1** Connection2 Connection3

IP settings Session settings **Will settings** Advanced settings

Will Enabled
 Enabled

Will Topic
 EXIT

Will Message
 {\"Publisher\": \"Offline\"}

Will Retain
 Enabled

Figure 54: MQTT Tab, Connection1 > Will Settings Subtab

Table 41: MQTT in Port Configuration for IO-Link Device, Connection1 > Will Settings

Parameter	Description	Value/Value Range
Will Enabled	Enable this option if you want to use the “will” feature of MQTT.	Enabled (default), Disabled
Will topic	Unique name for the topic, editable. If left empty the firmware will use the string constant "will" prefixed by the Prefix Will if enabled.	Max. 128 characters of text from uppercase and lowercase letters and underscore. Default: [not specified]
Will Message	Payload forwarded by the broker to other clients subscribed to the will topic in case of abnormal disconnection (when an MQTT Disconnect packet was not sent to the broker). If left empty, the string "Disconnected" is sent.	Text of uppercase and lowercase letters and underscore Default: [not specified]
Will QoS	Quality of Service Level for the Will Message. 0: "Only once": fire and forget 1: "At least once": acknowledged delivery 2: "Exactly once": assured delivery	Only once (default) At least once Exactly once
Will Retain	Setting whether the broker shall store the history of a data value or not.	Enabled (default), Disabled

2. For **MQTT Connection Configuration** make the following settings and configuration steps:

- Will Enabled
- Will Topic
- Will Message
- Will Retain

6.4.7.5. MQTT > Connection1 > Advanced Settings

1. Open the **Advanced settings** subtab.

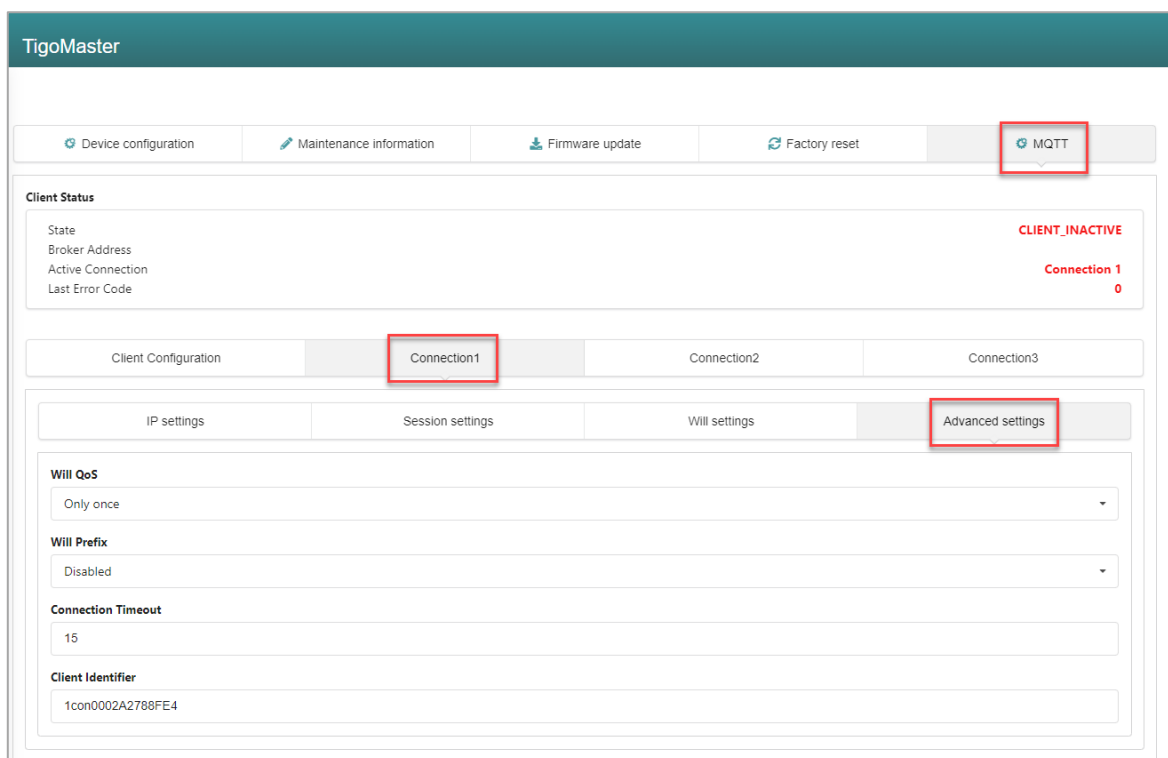


Figure 55: MQTT Tab, Connection1 > Advanced Settings Subtab

Table 42: MQTT in Port Configuration for IO-Link Device, Connection1 > Advanced Settings

Parameter	Description	Value/Value Range
Will QoS	Quality of Service Level for the Will Message. 0: "Only once": fire and forget 1: "At least once": acknowledged delivery 2: "Exactly once": assured delivery	Only once (default) At least once Exactly once
Will Prefix	Text that is prefixed to each Will topic. For each single topic can be configured if this prefix is to be preceded or not.	Text of uppercase and lowercase letters and underscore. Default: [not specified]
Connection Timeout	Time for trying to establish a connection (MQTT Connect) to the broker. If the connection could not be established, then the MQTT client waits for the duration of 'Connection Timeout' until a new connection is established to the broker.	Specified in s. = 0 MQTT client constantly tries to establish a connection to the broker. Default: 0
Client Identifier	Unique name of the MQTT client in UTF-8 format used at connection establishment time. All devices that are connected to a broker, must have a unique name. The name may only consist of lowercase letters, uppercase letters and numbers. If the field is empty, the broker assigns a name.	Max. 23 bytes for Max. 23 characters. Default: [Client ID] Example: "ClientId1"

2. For **MQTT Connection Configuration** make the following settings and configuration steps:
 - Will QoS

- Will Prefix
- Connection Timeout
- Client Identifier

6.4.8. Log In and User Administration

6.4.8.1. Log In User



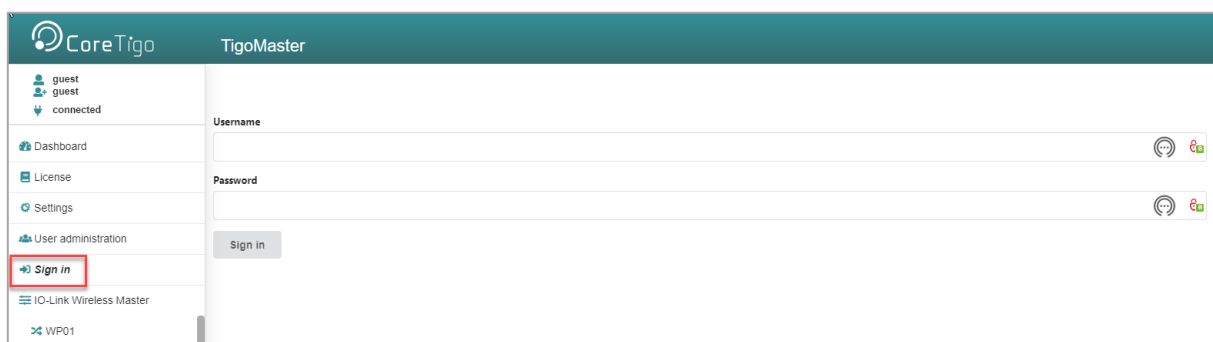
Note:

Log In is only possible when device connection state is “connected” (top left corner of the CoreTigo Wireless Web Server).

To log in as a user:

1. Select **Sign in** in the left column of the CoreTigo Wireless Web Server.

The input mask for username and password appears:



The screenshot shows the CoreTigo TigoMaster web interface. On the left sidebar, the 'Sign in' menu item is highlighted with a red box. The main content area displays the 'Sign in' input mask, which includes fields for 'Username' and 'Password', each with a 'Show/Hide' icon. A 'Sign in' button is located below the password field. The top left corner of the interface shows the connection status as 'connected'.

Figure 56: Menu Item Sign In - Input Mask for Username and Password

2. Enter your username and password correctly in the corresponding input fields of the screen mask.
3. Click **Sign in**.

If you have entered a known username correctly, you can work with the CoreTigo Wireless Web Server with the defined rights of this user.

The user role (**Operator, Maintenance, Admin**) used for sign in is displayed in the upper left corner.

The previous menu entry **Sign in** changes and is now called **Sign out**.

6.4.8.2. Log Out Users

To log out a user:

1. Click on the **Sign out** menu item in the main menu of the CoreTigo Wireless Web Server (left side panel).

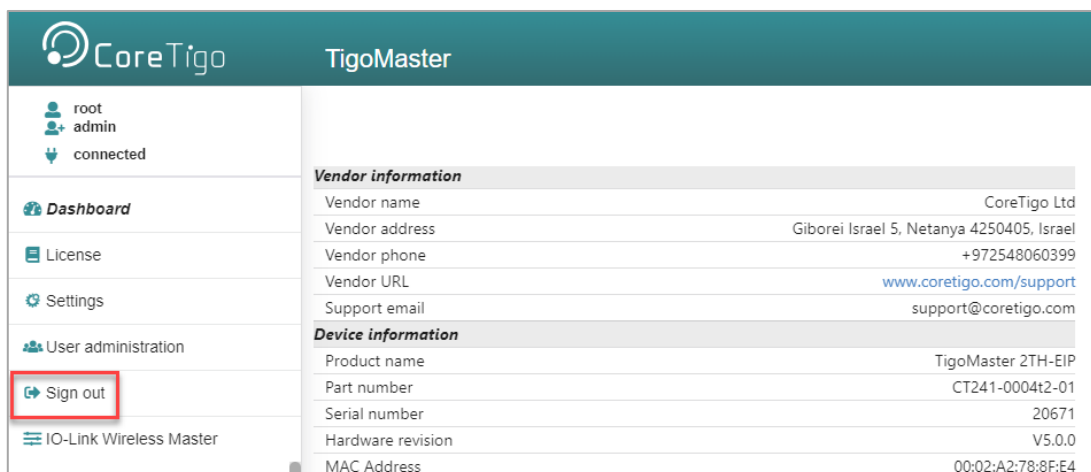


Figure 57: Menu Item Sign Out

From now on, you can no longer work with the CoreTigo Wireless WebServer with the previous rights.

The user role **guest** appears in the upper left corner.

The previous menu entry **Sign out** changes and is now called **Sign in** again.

6.4.8.3. Guest User Access

By default, the CoreTigo Wireless Web Server identifies a user guest without password, which has been set up to realize a first-time or guest access.

6.4.8.4. First-Time Login as Administrator

In the delivery state or after resetting to the factory settings, the CoreTigo Wireless Web Server can be accessed via the username "root" and the password "password".

This combination also has administrator rights.



Warning:

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

6.4.8.5. User Administration

1. Select **User Administration** in the left column of the CoreTigo Wireless Web Server.

The Administration pane provides a role-based user administration. You can use it to create and delete users and assign roles to them on which their rights depend.

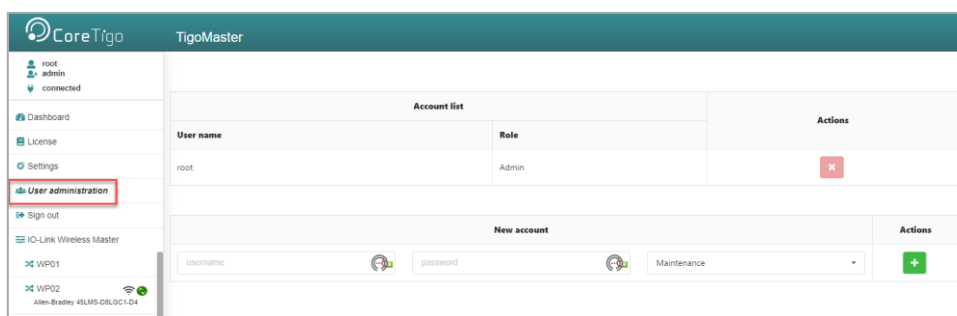


Figure 58: User Administration Screen

Users can be divided into three roles:

- Maintenance
- Operator
- Administrator

6.4.8.6. Creating a New User

Proceed as follows:

1. In the **Username input** field (left side), enter the username for the user. Usernames that have already been used are not permitted here.
2. In the **Password input** field (middle), enter the password for this username.
3. Use the combo box on the right to select the role for the new user to be created (the roles **Maintenance**, **Operator** or **Administrator** are available).
4. Click on the **Green** field.

The new user is created and assigned to the selected role, appearing in the **Account List**.

6.4.8.7. Remove User

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

Click the **Red** square with a white cross to the right of the user to be removed.

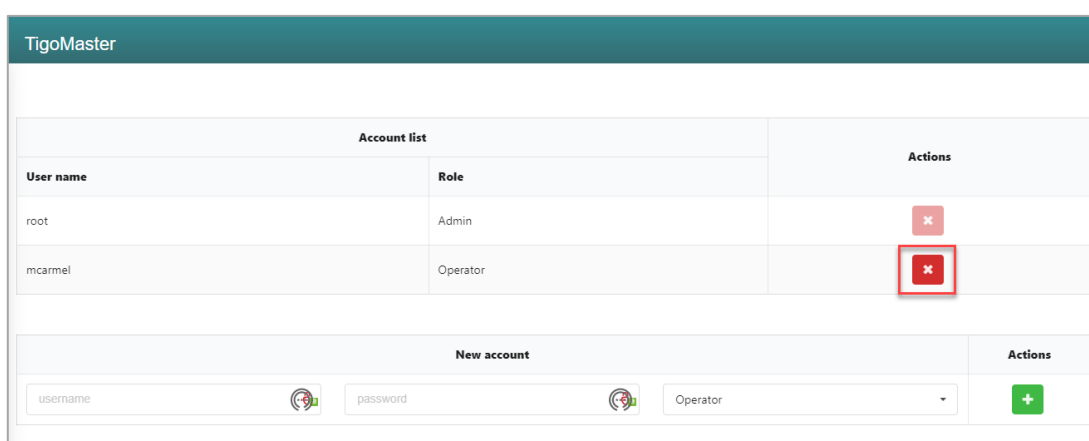


Figure 59: Remove a User

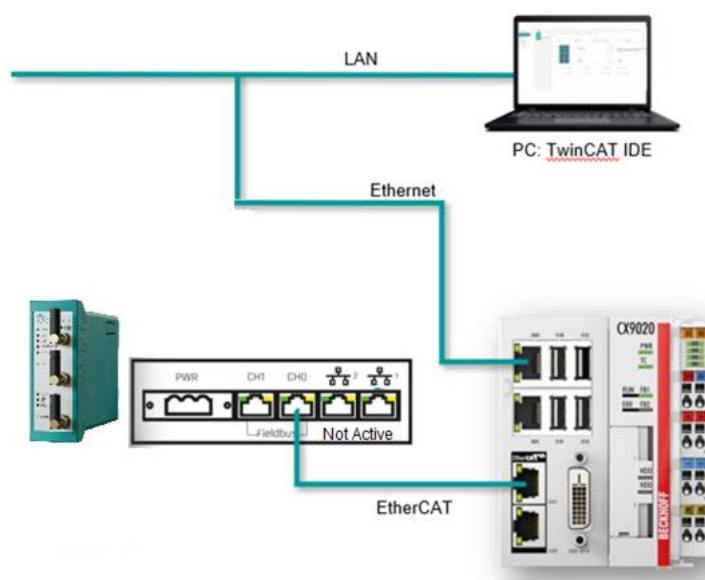
The user will be deleted.

The "root" user cannot be deleted, so the **Red** delete button is grayed out.

7. Commissioning

The IP Address for the industrial ethernet interface can be set for the TigoGateway 2TC-CAT (EtherCAT version) via the EOE (Ethernet over EtherCAT) protocol available by connecting an EtherCAT PLC to the TigoGateway.

Example Connection Diagram with EtherCAT PLC:



8. Use an OPC UA Client

TigoGateway has an integrated OPC UA server, enabling you to communicate with it using an OPC UA client. Communication has 2 levels:

- Read only - anonymous authentication permits read access only.
- Read and write - authentication with a username and password enables read and write access to users who have write permission.

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

The IP of the EtherCAT slave is the IP that was set in [Monitor and Write with the Configuration Software of the EtherCAT Master](#).

For test purposes, you can use such a client as the UaExpert from Unified Automation GmbH (<http://www.unifiedautomation.com>).

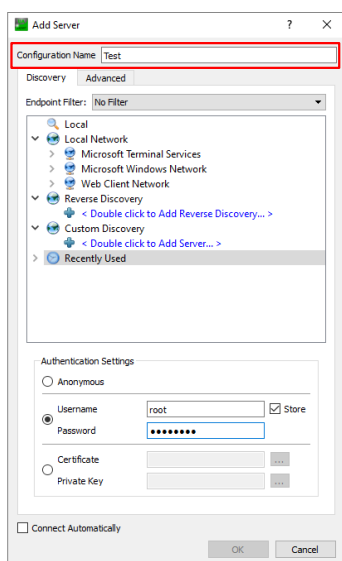
8.1.1. Requirements

- OPC UA client application installed on your local PC.
- A username and password that have Admin privileges.
- Device IP address

8.1.2. Instructions

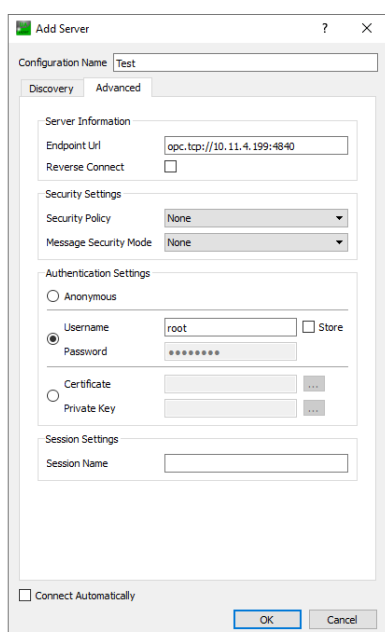
1. Start UaExpert (or your chosen OPC UA client).
2. Select **File > New**, and then select **Server > Add**.

3. In the **Add Server** dialog box, type the desired **Configuration Name**.



4. In the **Advanced** tab, set **Endpoint Url** = **opc.tcp://<IP address>:4840**.

The IP of the EtherCAT slave is the IP that was set in [Monitor and Write with the Configuration Software of the EtherCAT Master](#).



5. Under **Authentication Settings**, do the following:
 - If you need write access, select the **Username/Password** option, and enter the relevant **Username** and **Password**.
 - If read access only is sufficient, select the **Anonymous** option.
6. Click **OK**.

In the project window, under **Project > Servers**, the UaExpert enters the server, for example, Test.

7. Open the **Context** menu of the server (Test) and select **Connect**.

The connection starts.

8.1.3. Set the Device Date and Time Using OPC UA

Requirements

- OPC UA client.
- A username and password that have write permission.
- NTP Server IP address
- Converted IP address (from NTP server to a decimal number)
- Device is connected.

Examples of an NTP Server

The German Federal Institute of the Physikalisch-Technische Bundesanstalt in Braunschweig has the following NTP servers:

- ptbtime1.ptb.de - IP address 192.53.103.108
- ptbtime2.ptb.de - IP address 192.53.103.104

Converting an IP Address to a Decimal Number

This section uses one of the above IP Addresses as its example: namely, 192.53.103.108 (belonging to NTP server ptbtime1.ptb.de).

Like most IP addresses, our example is composed of 4 segments, which are separated from each other by a period. To convert an IP address to a decimal number, each segment is inserted into a specific place in the conversion formula below, where the letters A, B, C, D are the placeholders for the 4 segments (in our example, A is the placeholder for 192, B is the placeholder for 53, C is the placeholder for 103, and D is the placeholder for 108).

The conversion formula is:

$$((A * 256 + B) * 256 + C) * 256 + D = \text{IP address as a decimal number}$$

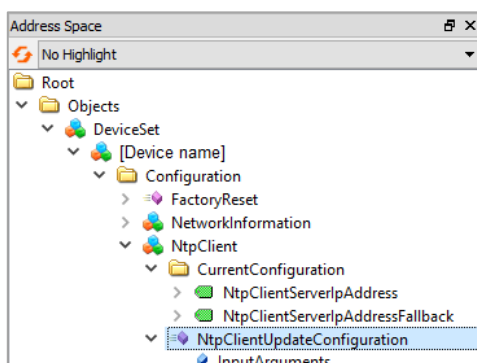
Inserting an example IP address into the formula gives the following:

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

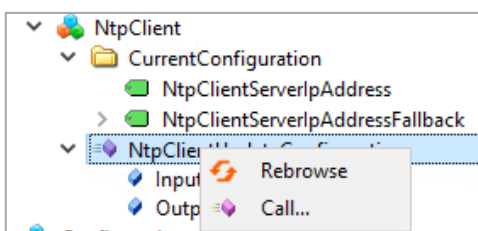
The decimal number in this example IP address is 3224725356.

Instructions

1. In the **Address Space** window, go to **Root > Objects > DeviceSet > [Device name] > Configuration > NtpClient > NtpClientUpdateConfiguration**.

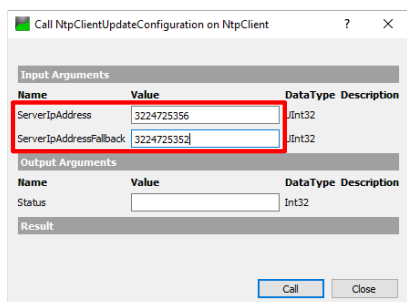


2. Right-click **NtpClientUpdateConfiguration**, and then click **Call**.



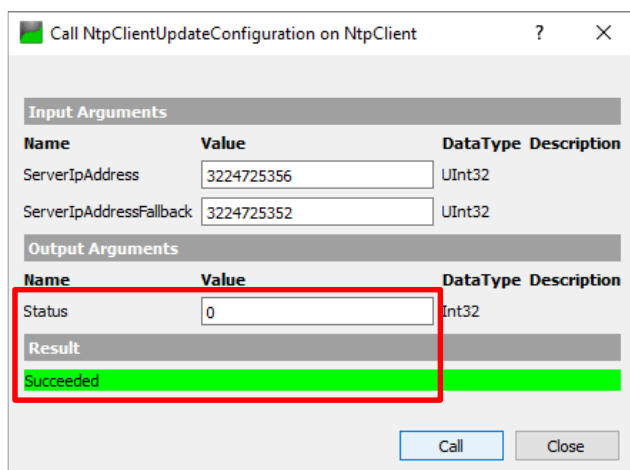
3. In the **Call NtpClientUpdateConfiguration** dialog box, set the following:

- **ServerIpAddress = 3224725356**
- **ServerIpAddressFallback = 3224725352**



4. Click **Call**.

5. Verify that the Status = **0** and the **Result = Succeeded**.

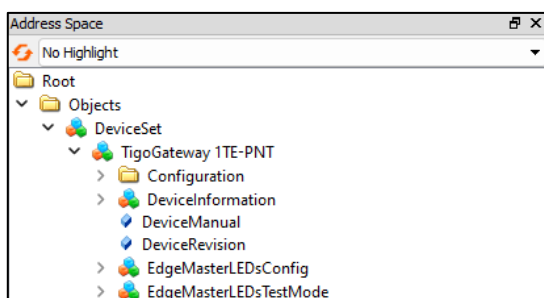


8.2. OPC UA Configuration for LEDs Indications

The following section provides detailed instructions on how to configure OPC UA settings specifically for LED indications, focusing on QSI threshold and IOLW event timeout parameters.

8.2.1. QSI Threshold

1. To update QSI threshold range In the **Address Space** window go to **Root > Objects > DeviceSet > [Device name] > TigoGatewayLEDsConfig**.



2. Modify the **value** column associated with the **QSI_TH_High/Low** to set the desired lower and upper limits.

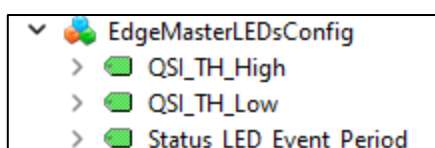
#	Server	Node Id	Display Name	Value	Datatype
1	OPC UA Server	NS7 Numeric 1...	QSI_M	162	Byte
2	OPC UA Server	NS7 Numeric 721	QSI_TH_High	254	Byte
3	OPC UA Server	NS7 Numeric 720	QSI_TH_Low	0	Byte

8.2.2. Event Timeout

The event timeout parameter determines the duration for which the **IOLW** LED indication remains yellow when a paired device sends an event and all ports are operational.

To configure the Event Timeout parameter:

1. Navigate to the TigoGatewayLEDsConfig.
2. Select **Status_LED_Event_Period**



3. Modify the **value** column associated with the **Status_LED_Event_Period** parameter to set the desired duration. (Units are in seconds)

#	Server	Node Id	Display Name	Value	Datatype
1	OPC UA Server	NS7 Numeric 722	Status_LED_Eve...	300	UInt32

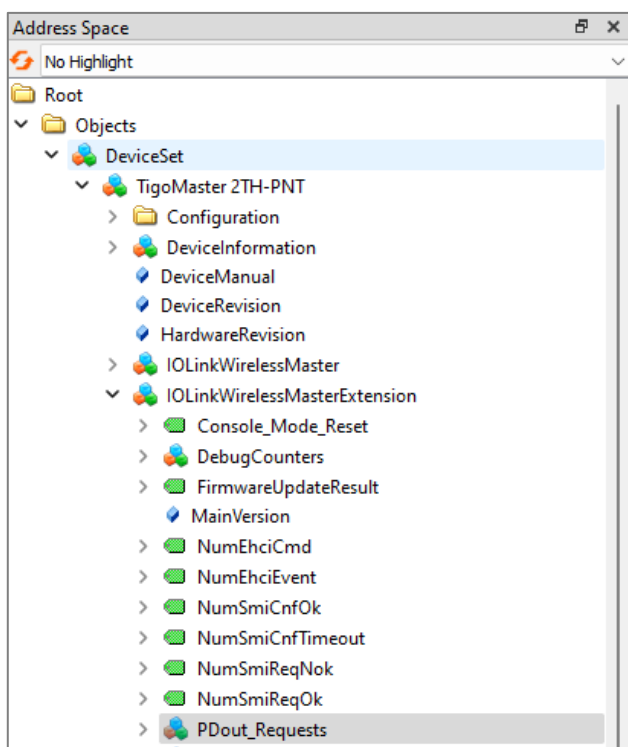
8.3. PDout Over OPC UA

8.3.1. Requirements

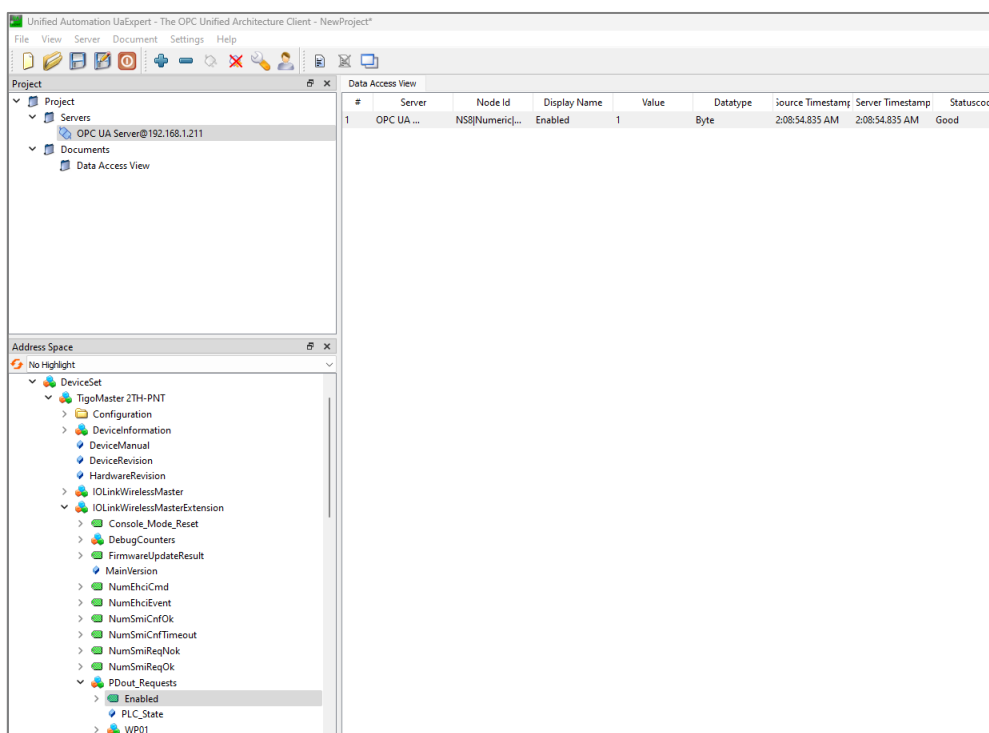
- OPC UA client.
- Username and password that have write permission.
- Device is connected with PDout is paired to the W-Master
- PLC is not communication with the W-Master. (PDout over OPC UA is not supported when PLC is communicating with the W-Master in order to avoid conflicts)

8.3.2. Instructions

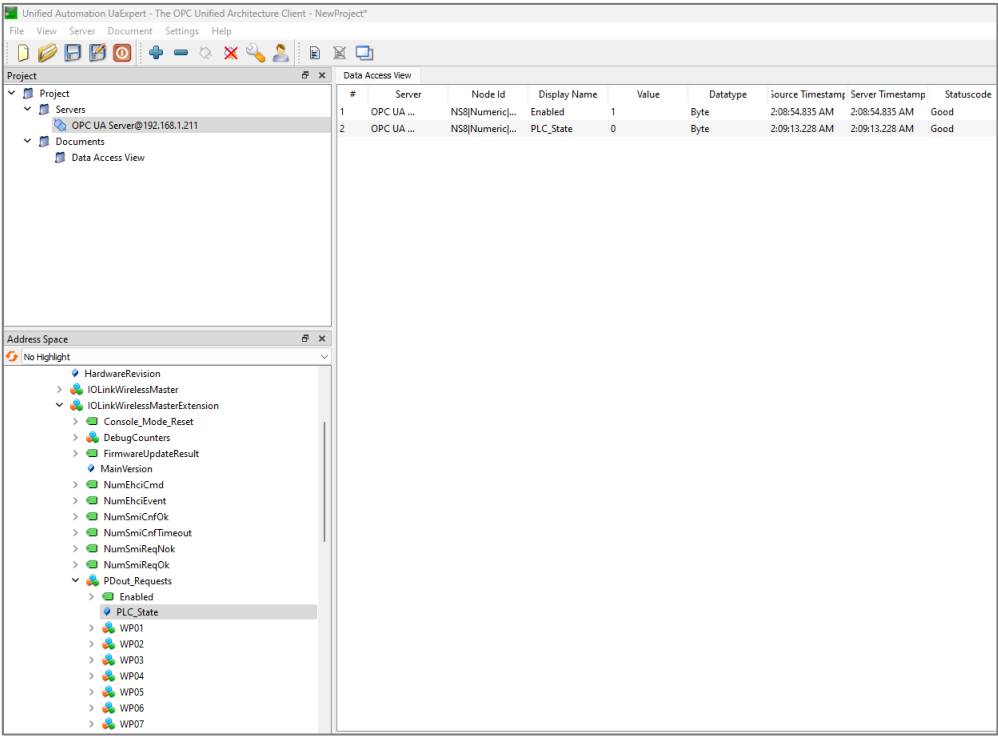
1. In the **Address Space** window, go to **Root > Objects > DeviceSet > [Device name] > IOLinkWirelessMasterExtension > PDout_requests**.



2. Enable **PDout over OPC UA** - Under the PDout_Requests object, go to the “Enabled” node and write the value ‘1’:



3. Check if a PLC is communicating with the W-Master - Under the PDout_Requests object, subscribe to the “PLC_State” node. If the node value is ‘0’, then the PLC is not connected. If the PLC is connected, the value of this node is ‘1’.



If the PLC is connected, the PD_{OUT} over OPCUA feature is disabled until the PLC is disconnected (there will be errors when trying to write to the PD_{OUT} over OPCUA nodes of every port).

Sending PDout to a W-Port

1. Select the required port and create a subscription to **PDData**, **PDValid**, **PDLength**, **RequestsCounter** and **SmiResult** of the port.
2. Enter the required data as array of bytes to the **PDData** and set 1 to **PDValid**.
3. The **RequestsCounter** should increase by one for every change in the **PDData** or **PDValid**.
4. The **PDLength** will be updated with number of bytes sent.
5. The **SmiResult** will show the status of the request.

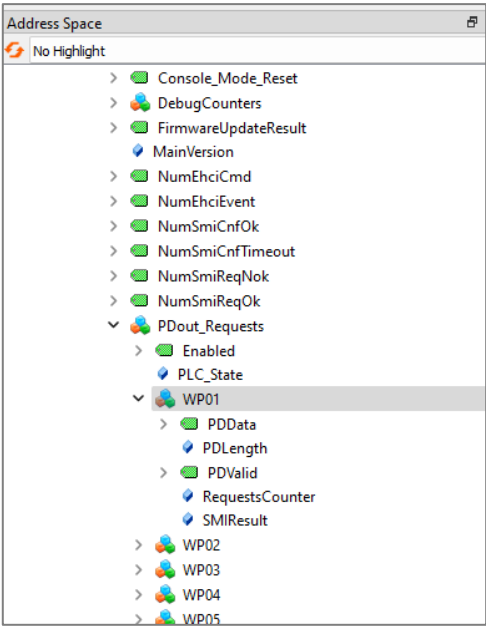
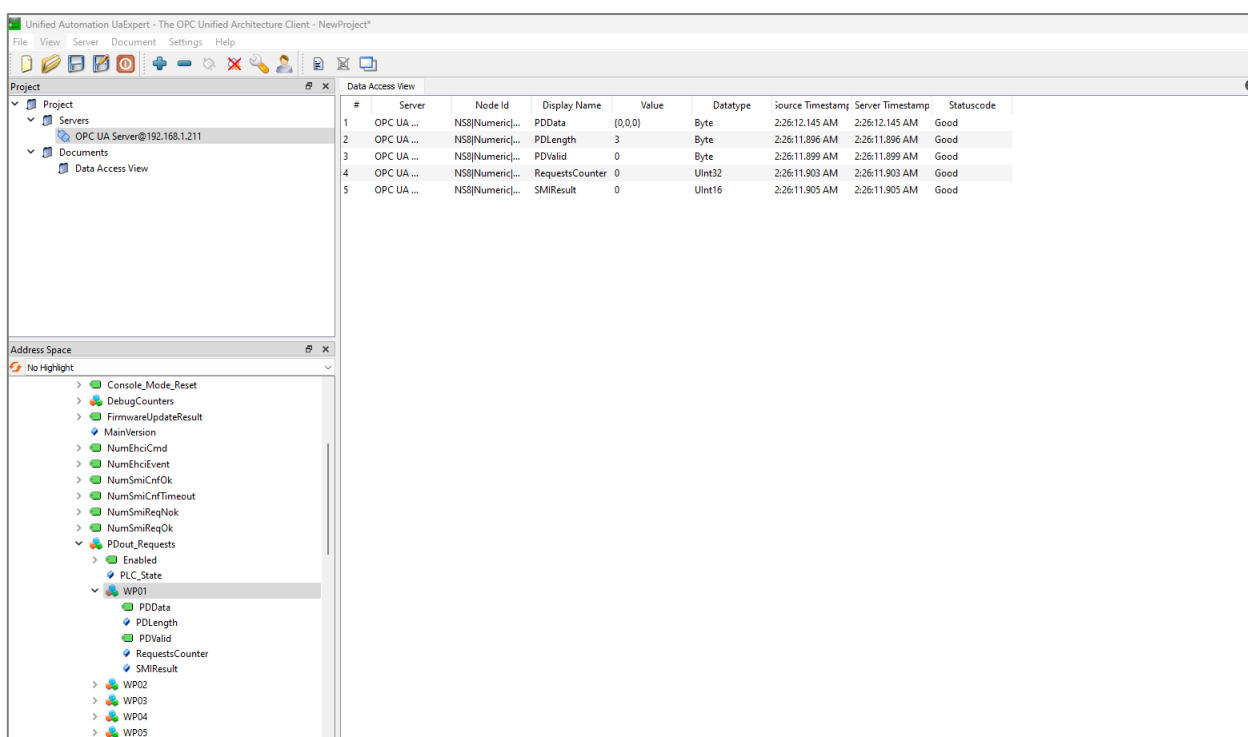


Table 22: Input and Output Nodes

Variable Name	Type	Description
Input Nodes		
PDValid	Byte (uint8_t)	'1' – PD _{OUT} is valid '0' – PD _{OUT} is invalid
PDData	Byte Array (up to 32 bytes)	The PD _{OUT} data
Output Nodes		
SmiResult	2Bytes – uint16_t	SMI confirmation result
RequestsCounter	4Bytes – uint32_t	A variable that counts the number of requests that were executed
PDLength	Byte (uint8_t)	PD length between 0 to 32 bytes (This node is read only, and the value of this node is loaded internally by netX)



#	Server	Node Id	Display Name	Value	Datatype	Source Timestamp	Server Timestamp	StatusCode
1	OPC UA ...	NS8[Numeric ...]	PDData	{0,0,0}	Byte	2:26:12.145 AM	2:26:12.145 AM	Good
2	OPC UA ...	NS8[Numeric ...]	PDLength	3	Byte	2:26:11.896 AM	2:26:11.896 AM	Good
3	OPC UA ...	NS8[Numeric ...]	PDValid	0	Byte	2:26:11.899 AM	2:26:11.899 AM	Good
4	OPC UA ...	NS8[Numeric ...]	RequestsCounter	0	UInt32	2:26:11.903 AM	2:26:11.903 AM	Good
5	OPC UA ...	NS8[Numeric ...]	SmiResult	0	UInt16	2:26:11.905 AM	2:26:11.905 AM	Good

For sending an **invalid** PD_{OUT}: write the value '0' to the PDValid node (the RequestsCounter should be increased by '1').

For sending a **valid** PD_{OUT}: write the value '1' to the PDValid node, and then write a byte-array of the PD_{OUT} data to the PDData node (the RequestsCounter should be increased by '1'):

Unified Automation UaExpert - The OPC Unified Architecture Client - NewProject*

FileViewServerDocumentSettingsHelp

Project

Project

Servers

OPC UA Server@192.168.1.211

Documents

Data Access View

Data Access View

#	Server	Node Id	Display Name	Value	Datatype	Source Timestamp	Server Timestamp	Statuscode
1	OPC UA ...	NS0(Numeric...	PDData	{17,34,51}	Byte	2:28:14.395 AM	2:28:14.395 AM	Good
2	OPC UA ...	NS0(Numeric...	PDLength	3	Byte	2:26:11.896 AM	2:26:11.896 AM	Good
3	OPC UA ...	NS0(Numeric...	PDValid	1	Byte	2:27:13.148 AM	2:27:13.148 AM	Good
4	OPC UA ...	NS0(Numeric...	RequestsCounter	2	UInt32	2:28:14.402 AM	2:28:14.402 AM	Good
5	OPC UA ...	NS0(Numeric...	SMIResult	0	UInt16	2:26:11.905 AM	2:26:11.905 AM	Good

Address Space

No Highlight

Console_Mode_Reset

DebugCounters

FirmwareUpdateResult

MainVersion

NumEhcCmd

NumEhcEvent

NumSmiCnfOk

NumSmiCnfTimeout

NumSmiReqNok

NumSmiReqOk

PDout_Requests

Enabled

PLC_State

WP01

PDData

PDLength

PDValid

RequestsCounter

SMIResult

WP02

WP03

WP04

WP05

9. Status and Diagnostics

9.1. TigoGateway

See also [LED indications](#).

9.2. IO-Link Diagnosis

9.2.1. Event Qualifier

The event qualifier is bit-coded information about the event.

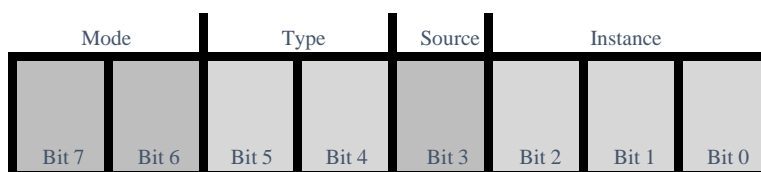


Figure 7: Event Qualifier

Table 23: Event Qualifier

Bit	Name	Description
Bit 6–7	Mode	0: Reserved 1: Event single shot 2: Event disappears 3: Event appears
Bit 4–5	Type	0: Reserved 1: Notification 2: Warning 3: Error
Bit 3	Source	0: Device (remote) 1: Master/Port
Bit 0–2	Instance	0: Unknown 1–3: Reserved 4: Application 5–7: Reserved

9.2.2. IO-Link Wireless Master Event Codes

Table 24: Master Event Codes

Event Code	Description	Type	Remedy
0x0000	No malfunction	Notification	No action required
0xFF21	Communication to Wireless Device (IO-Link Device is connected to Bridge)	Event	No action required
0xFF22	Communication loss to IO-Link Device (IO-Link Device is disconnected from TigoBridge)	Error	Check connection from IO-Link Device to the TigoBridge
0xFFB1	Max Retry error, indicating a packet loss The W-Master cannot create a message to the W-Device after MaxRetry attempts. This error indicates that one packet failed to be transmitted successfully. This can be, for example, the result of a noisy environment (RF-wise). It affects the PER of the system.	Error	If the PER is too high, check the system configuration (ranges, operating channels, etc.).
0xFFB2	IMA timeout The W-Master did not receive a message from the connected W-Device within the IMA timeout. This error indicates that the IOLW connection failed. Possibly this leads to Communication Loss 0xFF22.	Error	Check connection from IO-Link Device to TigoBridge

9.2.3. IO-Link Device Event Codes (Common)

The following table lists standard IO-Link Device Event Codes. For device-specific Event Codes or remedies, use the manual of the relevant IO-Link Device.

Table 25: IO-Link Device Event Codes

Event Code	Description	Type	Remedy (Common)
0x0000	No malfunction	Notification	No action required
0x1000	General malfunction (unknown error)	Error	See manual of the relevant IO-LinkDevice
0x1800 – 0x18FF	Vendor-specific	-	See manual of the relevant IO-LinkDevice
0x4000	Temperature fault – overload	Error	Check temperature, find source of overload
0x4210	Device temperature overrun	Warning	Clear source of heat
0x4220	Device temperature underrun	Warning	Insulate IO-Link Device
0x5000	Device hardware fault	Error	Exchange IO-Link Device
0x5010	Component malfunction	Error	Repair or exchange
0x5011	Non-volatile memory loss	Error	Check batteries

Event Code	Description	Type	Remedy (Common)
0x5012	Batteries low	Warning	Exchange batteries
0x5013	HMI button pressed	Notification	No action required
0x5100	General power supply fault	Error	Check availability of power supply
0x5101	Fuse blown/open	Error	Exchange fuse
0x5110	Primary supply voltage overrun	Warning	Check tolerance of 1L+ voltage
0x5111	Primary supply voltage underrun	Warning	Check tolerance of 1L+ voltage
0x5112	Secondary supply voltage fault (Port Class B)	Warning	Check tolerance of 1L+ voltage
0x6000	Device software fault	Error	Check firmware revision
0x6320	Parameter error	Error	Check data sheet and values
0x6321	Parameter missing	Error	Check data sheet
0x6350	Parameter changed	Error	Check configuration
0x7700	Wire break of a subordinate device	Error	Check installation
0x7701 – 0x770F	Wire break of subordinate device 1–device 15	Error	Check installation
0x7710	Short circuit	Error	Check installation
0x7711	Ground fault	Error	Check installation
0x8C00	Technology-specific application fault	Error	Reset Device
0x8C01	Simulation active	Warning	Check operational mode
0x8C10	Process variable range overrun – Process Data uncertain	Warning	Check configuration of device
0x8C20	Measurement range exceeded	Error	Check application
0x8C30	Process variable range underrun – Process Data uncertain	Warning	Check configuration of device
0x8C40	Maintenance required	Warning	Clean
0x8C41	Maintenance required	Warning	Refill
0x8C42	Maintenance required	Warning	Exchange wear and tear parts
0x8CA0 – 0x8DFF	Vendor-specific	-	See manual of the relevant IO-LinkDevice
0xB000 – 0xB0FF	Safety extensions	-	See manual of the relevant IO-LinkDevice
0xB100 – 0xBFFF	Profile-specific	-	See manual of the relevant IO-LinkDevice
0xFF91	Internal Data Storage upload request	Notification (single shot)	See manual of the relevant IO-LinkDevice

Event Code	Description	Type	Remedy (Common)
0xFFB9	Retry error	Error	See manual of the relevant IO-LinkDevice
Any other code	Reserved	-	See manual of the relevant IO-LinkDevice

10. Technical Data

10.1. TigoGateway 2TC Specifications

The table below describes the TigoGateway functionality.

Table 26: TigoGateway Functionality

Parameter	Specifications
Mechanical	
Dimensions	25mm X 105mm X 80mm
Mounting	DIN rail
Processors	
NXP IMX8 Arm A53	Application processor up to 1.5Ghz speed
NetX90	Industrial Ethernet Connectivity Processor
Interface	
Industrial Ethernet	EtherCAT 2 x RJ45 – OT Ports (PLC or similar)
LAN RJ45	2 x RJ45 IT Ports (Not Active)
Electrical Data	
Input Operating Voltage	24V DC [Peak Power: 250mA, Average Power: 160mA]
Radio	
TigoMaster SOM	2 Tracks (up to 16 IO-Link Wireless devices)
Frequency Range	Unlicensed 2401-2480 MHz ISM band
Communication	
IO-Link Wireless	
MQTT	
OPC UA	
Security	
TLS	
Antenna	
SMA Connector	
Certifications	
CE	<ul style="list-style-type: none"> ETSI EN 301489-1,17 ETSI EN 300328 EN 55032 EN 55035 EN 62479 EN IEC 61326-1 EN IEC 61000-3-2 EN IEC 61000-3-3
FCC	2ATSM-COR2TGW
UL	UL 61010-1-2

Parameter	Specifications
ISED	<ul style="list-style-type: none"> • IC: 26463-COR2TGW • ICES-003 Issue 7 • RSS-247 Issue • RSS-Gen Issue 5 • IC RF Exposure Report
Reach	Certified
RoHS	Certified
Ingress Protection	
IP 20	
Operating Environment	
Operating Temperature	0°C to +55°C
Maximum Temperature Gradient	3K per min
Storage Temperature	-40°C to 85°C
Operating Altitude	Up to 2000m
Humidity	5 to 95% RH
Pollution	Degree 2

[*] The TigoGateway's products family should be supplied from a limited, Class 2, power supply or via an overcurrent protective device (fuse, breaker, etc.) rated 4A max., or less.

10.2. EtherCAT Protocol Specifications

Table 27: Protocol Technical Data

Feature	Description
Maximum number of cyclic input data	1024 bytes
Maximum number of cyclic output data	1024 bytes
Acyclic communication (CoE)	SDO SDO Master-Slave SDO Slave-Slave (depending on master capability)
Type	Complex Slave
Supported protocols	SDO client and server side protocol CoE Emergency messages (CoE) Ethernet over EtherCAT (FoE) File Access over EtherCAT (FoE)
Supported state machine	ESM (EtherCAT State Machine)
Supported of synchronization modes	Freerun: the application of the slave is not synchronized to EtherCAT Synchronous with SYNCMAN Event: the application of the slave issynchronized to the SM2/3 Event Synchronous with SYNC Event: the application of the slave is synchronized to the SYNC0 or SYNC1 Event

Feature	Description
Supported features	PDI watchdog EtherCAT mailbox handling EtherCAT state machine handling Master-to-slave SDO communication Slave-to-slave SDO communication Integrated CoE object dictionary (ODV3) Ethernet over EtherCAT (EoE) handling File Access over EtherCAT (FoE) server
Number of FMMU channels	8
Number of Sync Manager channels	4
Distributed Clocks (DC)	Supported with 32-bit timestamps and isochronous PDI functionality(Sync0, Sync1)
Ethernet interface	Two Ethernet Interfaces 100BASE-TX Integrated Dual-PHY (supports Auto-Negotiation and Auto-Crossover)
Data transport layer	Ethernet II, IEEE 802.3
Restrictions	EtherCAT Slave stack AoE application interface not available FoE for firmware upload is supported, but application interface is not available ESC - EtherCAT Slave Controller No DC Latch functionality No support of bit-wise FMMU mapping (Exception: Fill Status of Transmit Mailbox) Restricted DC Sync signal generation No Single-Shot Mode support No Acknowledge Mode support Restricted DC Control Functionality No adjustment of Register Speed Counter Start (0x0930:0x931) No showing of Register Speed Counter Diff (0x0932:0x933) No MIO (PHY Management Interface) access from EtherCAT Master side No physical Read-Write commands supported (APRW, FPRW, BRW)
Reference to stack version	V5.1