

# CoreTigo

## TigoMaster 2TH

### User Manual

Revision 1.1



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## Introduction

### About this document

This document describes the device TigoMaster 2TH IO-Link Wireless Master.

The device and the firmware are under development and changes of the functionality can appear.

The information provided in this document is preliminary, may not be complete and may not be error free.

The device must not be used in a productive environment.

## Device description

### Functional description

The device is intended for use within an EtherNet/IP network. It enables the operation of up to 16 IO-Link sensors/actuators via a wireless connection.

The device is parameterized via EtherNet/IP. The device stores the parameters.

Alternatively, the IO-Link ports of the device can be configured using the integrated Web Server. The Web Server enables you to parameterize the wireless IO-Link sensors/actuators connected to the device.

OPC UA Server is also integrated and offers identification, status, configuration.

## Regulatory Notices

### FCC

FCC ID: 2ATSM-COR2TH

#### **CAUTION:**

Any changes or modifications not expressly approved by (CoreTigo Ltd.) could void the user's authority to operate the equipment.

## Class B Warnings

### The FCC Wants You to Know

This equipment has been tested and found to comply with the limits for a Class B 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.

### FCC Warning

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

### ISED Warning

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.

### Interference statement

*This device contains licence-exempt transmitter(s)/receiver(s) that comply with Innovation, Science and Economic Development Canada's licence-exempt RSS(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.*

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

- 1) L'appareil ne doit pas produire de brouillage;*
- 2) L'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.*

This radio transmitter [IC:26463-COR2TH] 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 type: External antenna ; Antenna gain: 1.6dBi

## Wireless notice

This device complies with FCC/ISED radiation exposure limits set forth for an uncontrolled environment 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.

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 la fréquence radio (RF) ISED règles d'exposition. L'émetteur ne doit pas être colocalisé ni fonctionner conjointement avec à autre antenne ou autre émetteur.

## FCC warning Professional installation instruction

### Installation personal

This product is designed for specific application and needs to be installed by a qualified personal who has RF and related rule knowledge. The general user shall not attempt to install or change the setting.

### Installation location

The product shall be installed at a location where the radiating antenna can be kept 40cm from nearby person in normal operation condition to meet regulatory RF exposure requirement.

### External antenna

Use only the antennas which have been approved by the applicant. The non-approved antenna(s) may produce unwanted spurious or excessive RF transmitting power which may lead to the violation of FCC/IC limit and is prohibited.

Installation procedure

Please refer to user's manual for the detail.

**Warning:** Please carefully select the installation position and make sure that the final output power does not exceed the limit set force in relevant rules. The violation of the rule could lead to serious federal penalty.

The antennas must be professional installed, and can not be replaced by any unauthorized person.

## IC warning Professional installation instruction

### Installation

Ce produit est destiné à un usage spécifique et doit être installé par un personnel qualifié maîtrisant les radiofréquences et les règles s'y rapportant. L'installation et les réglages ne doivent pas être modifiés par l'utilisateur final.

### Emplacement d'installation

En usage normal, afin de respecter les exigences réglementaires concernant l'exposition aux radiofréquences, ce produit doit être installé de façon à respecter une distance de 40 cm entre l'antenne émettrice et les personnes.

### Antenn externe.

Utiliser uniquement les antennes approuvées par le fabricant. L'utilisation d'autres antennes peut conduire à un niveau de rayonnement essentiel ou non essentiel dépassant les niveaux limites définis par FCC/IC, ce qui est interdit.

### Procédure d'installation

Consulter le manuel d'utilisation.

### Avertissement

Choisir avec soin la position d'installation et s'assurer que la puissance de sortie ne dépasse pas les limites en vigueur. La violation de cette règle peut conduire à de sérieuses pénalités fédérales.



## Device overview

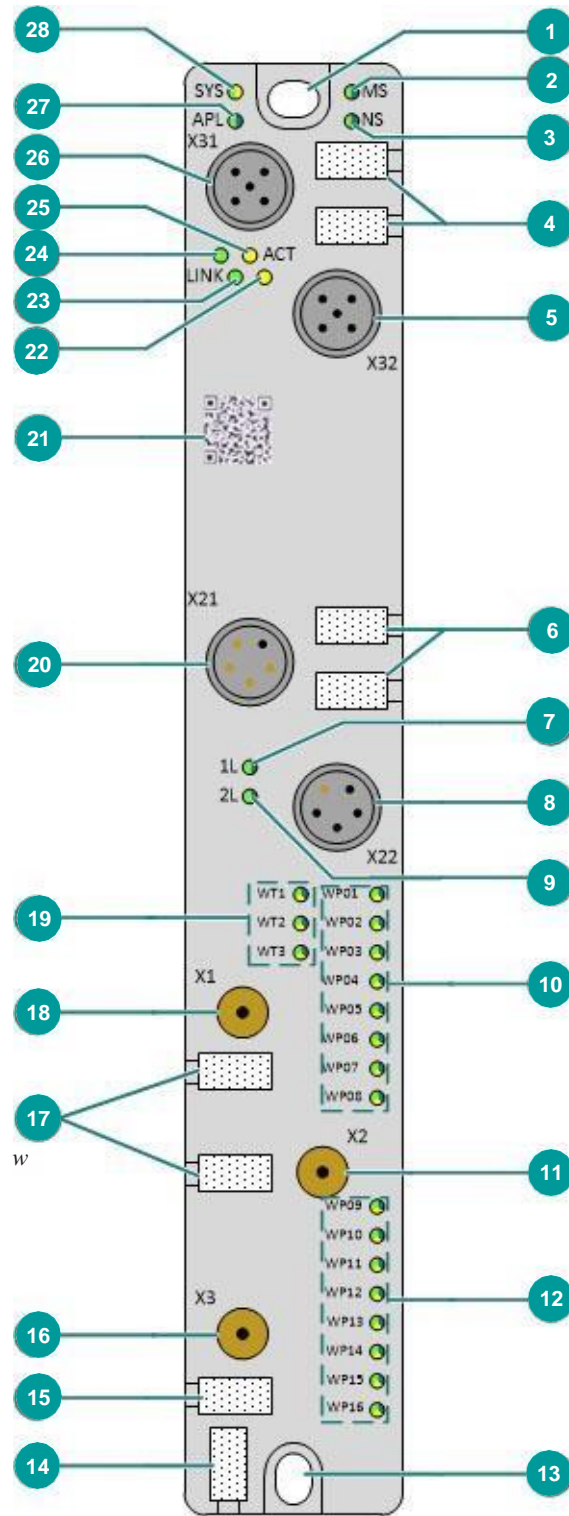


Figure 1 - Positions of interface connectors and LEDs, TIGOMASTER 2TH

Table 1 - Positions of interface connectors and LEDs, TIGOMASTER 2TH

Function	Pos.	Name	Description	For details see section
Ethernet	(26)	X31	Ethernet interface, M12, D-coded, EtherNet/IP port 1 (CH0)	Ethernet [
	(5)	X32	Ethernet interface, M12, D-coded, EtherNet/IP port 2 (CH1)	
	(24)	LINK (X31)	Link LED for connector X31	EtherNet/IP Adapter status
	(25)	ACT (X31)	Activity LED for connector X31	
	(22)	ACT (X32)	Activity LED for connector X32	
	(23)	LINK (X32)	Link LED for connector X32	
	(4)	-	Labeling fields Ethernet interfaces X31 and X32	-
LEDs	(28)	SYS	System status LED	System LED
	(27)	APL	Application status LED	APL LED
	(2)	MS	Module status LED	EtherNet/IP Adapter status
	(3)	NS	Network status LED	
Power supply	(20)	X21	Power supply input (Power In), M12, L-coded	Power supply
	(8)	X22	Power supply output (Power Out), M12, L-coded	
	(7)	1L (X22)	1L supply voltage status LED (DC 24 V)	Supply voltage status
	(9)	2L (X22)	2L supply voltage status LED (DC 24 V)	
	(6)	-	Labeling fields power supply input X21 and output X22	-
Antenna connectors and LEDs for IO-Link wireless radio module	(18)	X1	Connector for SMA antenna for IO-Link wireless connection to the devices 1 to 8	IO-Link, SMA antenna
	(11)	X2	Connector for SMA antenna for IO-Link wireless connection to the devices 9 to 16	
	(16)	X3	Connector for auxiliary antenna	
	(17), (15)	-	Labeling fields SMA antennas X1, X2 and X3	-
	(19)	WT1 ... WT3	IO-Link wireless track status LEDs	Wireless track status
	(10)	WP01 ... WP08	Port status LEDs for IO-Link wireless device ports P01 to P08	Wireless port status
	(12)	WP09 ... WP16	Port status LEDs for IO-Link wireless device ports P09 to P16	
Identification	(21)	-	Data matrix code	Identification
	(14)	-	Device labeling field for the TIGOMASTER 2TH device	-
Mounting	(1)	-	Mounting hole (up) and grounding	Mounting and demounting
	(13)	-	Mounting hole (down)	

## Laserings

Manufacturer address, product name, part number, serial number, MAC address of the device, certification signs (CE, UL, etc.), environmental signs (disposal, etc.) and technical data (power supply, SELV, PELV, etc.) are provided as laserings on the right or the left side of the housing.

## Revisions and versions

The hardware revision listed below, as well as the software and firmware versions belong together functionally. If a hardware installation is available, the firmware must be updated according to these specifications.

*Table 2 - Hardware*

Product name	Description	Part no.	Hardware revision
TIGOMASTER 2TH	EtherNet/IP IO-Link Wireless Master	1912.122	3

*Table 3 - Software*

Software	Name	Version
Engineering tool	TigoEngine	1.3

*Table 4 - Firmware*

Protocol	File name	Version
EtherNet/IP Adapter	U197H001.nxi	2.0

## Identification

On the front side of the TIGOMASTER 2TH device housing a 2D data matrix code (DM code, 10x10 mm) is provided, which includes the part number, hardware revision and serial number for device identification.

For identifying the data matrix code see position (21) in section Device overview TIGOMASTER 2TH [ ] page 6].



Figure 2: Data matrix code (example)

On housings right side area identification data is provided in plain text (example values):

- Product name: 1234.567,
- Part number: 1912.122,
- Serial number: 20000,
- MAC ID: 00-02-A2-2F-75-44.

## Connectors and interfaces

### Power supply

#### Connectors X21 and X22

The device is supplied via connector X21 (PWR IN). You can connect two supply lines to the connector:



- Supply line 1: 1L (U1L) and the reference potential 1M
- Supply line 2: 2L (U2L) and the reference potential 2M

Both supply lines are electrically isolated.

Each pin of connector X21 (PWR IN) is connected to the same pin of socket X22 (PWR OUT) and is used to forward the supply to the next device.

For identifying the connector X21 on the board, see position (20), and connector X22, see position (8) in section Device overview TigoMaster 2TH- [page 6].

Table 5 - Power supply

PWR IN	PWR OUT	Pin	Signal	Description
 <p>M12, L-coded, male 5-pin (4 + FE) X21</p>	 <p>M12, L-coded, female 5-pin (4 + FE) X22</p>	1	1L	+24 V DC power supply for system and sensor, U <sub>1L</sub>
		2	2M	Ground for 2L
		3	1M	Ground for 1L
		4	2L	+24 V DC power supply for auxiliary/switched power supply, U <sub>2L</sub>
		FE	FE	Functional earth

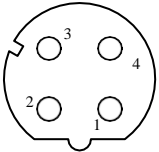
## Ethernet

- Connector X31 for Ethernet interface port 1 (CH0)
- Connector X32 for Ethernet interface port 2 (CH1)

For identifying the connector X31 on the board, see position (26), and connector X32, see position (6) in section Device overview TigoMaster 2TH- [page 6].

### Connectors X31 and X32

Table 6 - Ethernet

Ethernet	Pin	Signal	Description
 <p>M12, D-coding, female 4-pin X31, X32</p>	1	TX+	Transmit data, positive
	2	RX+	Receive data, positive
	3	TX-	Transmit data, negative
	4	RX-	Receive data, negative

## IO-Link, SMA antenna


With the TIGOMASTER 2TH device two tracks with each up to 8 and together up to 16 IO-Link wireless devices simultaneously can be supported.

### IO-Link

The type of data transferred (length and data type, etc.) depends on the connected IO-Link Slaves.

### SMA antenna

Table 7 - SMA antenna type

Antenna SMA	Type	Manufacturer
	2.4GHz Antenna - 2.4GHz, Bandwidth: 1000 MHz Impedance: 50 Ohms Power Rating: 1 W	Taoglas, GW.26.0112

#### Important:

The use of an SMA antenna other than the SMA antenna supplied with the product is not permitted. This could result in losing the approval for your device.

For proper device operation, all three SMA antennas X1, X2 and X3 must be mounted.

## 1. Safety

### 1.1 General note

The documentation in the form of a user manual, an operating instruction manual or other manual types, as well as the accompanying texts have been created for the use of the products by qualified personnel. When using the products, all Safety Messages, Integrated Safety Messages, Property Damage Messages and all valid legal regulations must be obeyed. Technical knowledge is presumed. The user has to assure that all legal regulations are obeyed.

### 1.2 Intended use

The device EtherNet/IP IO-Link Wireless Master TIGOMASTER 2TH is used to acquire and output field signals via IO-Link to sensors, actuators and hubs that are sent or received to a higher-level control system.

The device described in this document serves as a decentralized input/output device in an EtherNet/IP network.

The product is intended for indoor use in industrial environments without weathering (no direct sunlight, no salt water or salt spray).

The device has been developed for a working environment that requires protection class IP 67.

Applications other than those described here are not permitted.

### 1.3 Personnel qualification

The device may only be mounted, configured, operated, or demounted by qualified personnel. Job-specific technical skills for people professionally working with electricity must be present concerning the following topics:

- 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
- Installing and configuring IT systems

## 1.4 Information and data security

Take all usual measures for information and data security for devices with Ethernet technology.

CoreTigo explicitly points out that a device with access to a public network (Internet) must be installed behind a firewall or only be accessible via a secure connection such as an encrypted VPN connection.

Otherwise, the integrity of the device, its data, the application, or system section is not safeguarded.

CoreTigo cannot assume any warranty or liability for damage due to neglected security measures or incorrect installation.



## 2. Mounting and demounting

### 2.1 Mounting

#### Required tools for mounting the device

You will need the following tools for mounting:

- Allen key for the M4 fixing screws with hexagon socket

Only additionally required for installation without existing threaded hole:

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

You will also need two M4 hexagon socket head screws according to DIN 912 / ISO 4762 of suitable length.

#### Before mounting the device

Always observe the following instructions:

- The device may only be installed and commissioned by qualified electricians in accordance with EN 50110-1/-2 and IEC 60364.
- Refer to the safety instructions in the Safety [ ] page 11] chapter.
- Before mounting the device, check for damage, e.g. transport damage! Damaged devices must not be put into operation.

#### Mounting instructions

Observe the following points when selecting the mounting location:

- When mounting outside buildings: Mount the device in such a way that it is protected from weathering, especially from direct sunlight and the effects of UV light, salt water or salt spray, e.g. in a switch box.
- Only screw the device on flat contact surfaces to protect it from mechanical tension.
- Do not bridge any gaps with the unit to protect it from any tensile forces that may occur.
- To prevent damage to the unit, do not mount it in shearing areas of moving system parts. Also, lay the cables in such a way that they cannot be caught in the shear zones of moving system parts.
- Leave sufficient space for easy replacement of the unit and for connecting the plug connections.

- Ensure that the requirements of the device for vibration and shock resistance are met at the installation site.
- Mount the device so that the diagnostic LEDs of the device remain visible.
- Observe the following instructions for the installation procedure:
- Disconnect the system from the power supply before you start installation.
- Ensure sufficient equipotential bonding in your system.
- During installation, make sure that you do not soil the connections. Dirt will damage the contacts, resulting in

### Notes on protection against the heat generated by the device

The device can become hot during operation! Therefore, always observe the following instructions:

- The cooling of the unit must not be impaired.
- Ensure an unobstructed air supply!
- Do not install the unit near strong heat sources!
- Do not mount the unit on or near highly inflammable materials.

### Mounting of the device

You can attach the device directly to your system or in the control cabinet with screws. Fasten the device to a flat, solid base with two M4 screws, each of which is screwed into a threaded hole. Section *Technical data* [ ] page 76] contains the specification of the tightening torque.

#### Note:

Note that the device requires a connection to FE (functional earth) via the screws.

The procedure for this is as follows:

- Hold the unit in the desired position and mark the two points where the threads are to be cut. Make sure that there is enough space around the device so that you can connect all cables without any problems.
- Cut an M4 thread at each of the two marked points with the M4 thread cutter, if necessary, pre-drill with the drill first.
- Screw the unit into the threaded holes with the Allen key using two M4 cylinder head screws of suitable length at the upper and lower ends. Observe the tightening torque.

**After mounting**

Observe the notes on *Grounding* [ ] page 14].

**Mounting of the SMA antennas Important:**

For proper device operation, all three SMA antennas X1, X2 and X3 must be mounted.

## 2.2 Grounding

**Functional earth**

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

- Ground the device via the metal housing and/or,
- Ground via FE of the power supply connection and/or,
- Grounding can be done separately via a cable lug and the mounting hole if the device is mounted on a non-conductive base.

Ensure that the contacts are perfect and that the cable cross-section is sufficient.

## 2.3 Demounting

**Required tools for demounting**

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

**Before demounting**

Prepare for demounting:

- Disconnect the part of the plant to which you have mounted the device from the power supply.
- If the device is dirty, clean it first. It is particularly important to clean dirty screw connections.
- Before demounting, loosen all screw connections at the terminals and disconnect the cables.

**Demounting**

To disassemble the device, e.g. when replacing the device, proceed as follows:

- Make sure that the part of the plant on which you have mounted the device is de-energized.

- Use the Allen key to loosen the two M4 cylinder head screws.
- Remove the device.

**After demounting**

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

### 3. Configuration

#### 3.1 Configuration tools

The parameters of the device can be set in several ways. The following table gives an overview of the tools.

Table 8 - Overview configuration tools and configuration

Tool	Description	IO configuration	IO-Link Wireless Master	Port configuration
Ethernet/IP Scanner	<p>The Ethernet/IP Scanner must be configured to exchange process data with the CoreTigo device.</p> <p>The EDS file provided for the TigoMaster 2TH device is used to configure the TIGOMASTER 2TH device via the Ethernet/IP Scanner.</p>	The Ethernet/IP Scanner configures the CoreTigo device.	-	<p>If connection 1 is used, the Ethernet/IP Scanner sets the port configuration parameters. These parameters configure each port and determine whether the port is used (or disabled) as an IO-Link device, digital input or digital output.</p> <p>For each other connection, the Web Server has to be used for the port configuration.</p>
TigoEngine	Server and to perform configuration steps via the Web Server.	-	The IO-Link Wireless Master has to be configured via the Web Server.	yes

**Note:**

Each time Ethernet/IP communication is started, the Ethernet/IP Scanner transmits the configuration and parameters to the TIGOMASTER 2TH device. Port configuration parameters set by the TigoEngine or the OPC UA Client are overwritten. The parameters via Ethernet/IP have priority.

If you want to change port configuration parameters (permanently) via the TigoEngine, the or the OPC UA Client, set them with the configuration software of the Ethernet/IP Scanner.

A distinction is made between three areas for configuration and parameterization:

1. The EtherNet/IP configuration
2. IO-Link Wireless Master configuration
3. The port-configuration (IO-Link master, digital input and output)
4. The IO-Link device configuration

### 3.2 Configuring EtherNet/IP

In order that the EtherNet/IP Scanner and the EtherNet/IP Adapter exchanges process data, the EtherNet/IP Scanner must be configured. Therefore, you need the device description file (EDS file) of the TigoEngine:

CORETIGO\_TIGOENGINE\_V1.1\_IOL\_W.EDS

Perform the following steps:

- Import the EDS file into the configuration software of the EtherNet/IP Scanner.
- Select the TigoEngine device from the device catalog and add it to the configuration project.
- For configuration of the TigoEngine device, select a connection.
- Set the parameters.

### 3.3 Selecting a connection

The TigoEngine device offers several types of connections:

- Exclusive owner: The Scanner can read input process data and write output process data.
- Input only: The Scanner can read input process data only.
- Listen only: The Scanner can read input process data only. This connection requires that another Scanner has established an Exclusive Owner or an Input Only connection with the TigoEngine device.

The max. number of usable sensors/actors depends on the number of IO- Link bytes the used sensor/actor requires to transfer. In case, one or more sensors/actors require to transfer 17 or more IO-Link bytes, then max. 8 sensors/actors (and one track) can be used. In case all sensors/actors require 16 IO-Link bytes or less, then up to 16 sensors/actors (and two tracks) can be used.

*Table 9 - Connections*

Connection	Name	Description
Connection 1	Exclusive Owner - 32 bytes per IO-Link Port with Config	Up to 8 sensors/actors with up to 32 IO-Link bytes and one track can be used. The EtherNet/ IP Scanner sends the port parameters to the TigoEngine device.
Connection 2	Exclusive Owner - 32 bytes per IO-Link Port without Config	Up to 8 sensors/actors with up to 32 IO-Link bytes and one track can be used. The port parameters have to be set using the webserver.
Connection 3	Listen Only - 32 bytes per IO-Link	Up to 8 sensors/actors with up to 32 IO-Link bytes and one track can be used.
Connection 4	Input Only - 32 bytes per IO-Link	Up to 8 sensors/actors with up to 32 IO-Link bytes and one track can be used.
Connection 5	Exclusive Owner - 16 bytes per IO-Link Port without Config	Up to 16 sensors/actors with up to 16 IO-Link bytes and two tracks can be used. The port parameters have to be set using the webserver.
Connection 6	Listen Only - 16 bytes per IO-Link	Up to 16 sensors/actors with up to 16 IO-Link bytes and two tracks can be used.
Connection 7	Input Only - 16 bytes per IO-Link	Up to 16 sensors/actors with up to 16 IO-Link bytes and two tracks can be used.
Connection 8	Exclusive Owner - 4 bytes per IO-Link Port without Config	Up to 16 sensors/actors with up to 4 IO-Link bytes and two tracks can be used. The port parameters have to be set using the webserver.
Connection 9	Listen Only - 4 bytes per IO-Link	Up to 16 sensors/actors with up to 4 IO-Link bytes and two tracks can be used.
Connection 10	Input Only - 4 bytes per IO-Link	Up to 16 sensors/actors with up to 4 IO-Link bytes and two tracks can be used.

### 3.4 Setting parameters

If using connection 1 the following parameters must be set.

Table 10 - Parameters 10 to 85

No.	Parameter name	Value range	Default	Description
10, 20, ...	Port mode	Deactivated	Deactivated	The port is inactive. L+ is turned off, Input and Output Process Data is 0.
		Cyclic		Target mode based on user defined configuration including validation of Vendor ID, Device ID, and Revision.
		Roaming		Target mode without configuration, Validation: No Device Check
11, 21, ...	Validation and backup	No Device check	No Device check	There is no device check for validation or backup of connected IO-Link Slave devices (default).
		Type compare*, no Backup/Restore		A device check is performed for validation of connected IO-Link Slave devices to the specified device type, without backup/restore.
		Type compare*, Backup only"		A device check is performed for validation or backup of connected IO-Link Slave devices to the specified device type, without restore.
		Type compare*, Restore only		A device check is performed for validation or restore of connected IO-Link Slave 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 Slave devices to the specified device type.
		No type compare*, no Backup/Restore		A device check is performed for validation of connected IO-Link Slave devices, without type compare, without backup/restore.
		No type compare*, Backup only		A device check is performed for validation or backup of connected IO-Link Slave devices, without type compare, without restore.
		No type compare*, Restore only		A device check is performed for validation or restore of connected IO-Link Slave devices, without type compare, without backup.
		No type compare*, Backup and Restore		A device check is performed for validation or backup/restore of connected IO-Link Slave devices, without type compare.
13, 23, ...	Port cycle time	0 ... 255	0	See table <i>Calculation of the port cycle time</i> [ ] page 42].
14, 24, ...	Vendor ID	0 ... 65535	0	Vendor ID See the documentation of the manufacturer of the sensor/actuator used.
15, 25, ...	Device ID	0 ... 4294967295	0	Device ID See the documentation of the manufacturer of the sensor/actuator used.

Table 11 - Parameter 90

No.	Parameter name	Value range	Default	Description
90	DIO process data layout	Port based (IQ/CQ, IQ/CQ, IQ/CQ, ...)	Port based	Sequence of the process data of the digital inputs and the digital outputs: Port 1 (Bit 0 and 1), Port 2 (Bit 2 and 3), ..., Port 8 (Bit 14 and 15). For each port first pin 4 then pin 2 is transmitted.
		Pin Based (IQ, IQ, IQ, ... CQ, CQ, CQ, ...)		The sequence of the process data of the digital inputs and the digital outputs: Pin 4 (Port 1 to 8), pin 2 (Port 1 to 8).



Table 12 - Parameters 410 to 566

No.	Parameter name	Value range	Default	Description	
410, 430 ...	Slot number	0 ... 255	0	Wireless slot number to be used for the port	
	Track number	0 ... 255	0	Wireless track number to be used for the port	
	Device TX power	0 ... 255	0	This parameter contains the transmit power level of the W-Device	
	Max retry	0 ... 255	0	Maximum number of retries for a transmission in OPERATE mode	
	IMA time	0 ... 65535	0	Requested IMA time for the OPERATE mode	
	Slot type	Single slot	Single slot	Single slot	Slot type is "single slot"
		Double slot			Slot type is "double slot"
	Low power device	Not Low Power	Not Low Power	Not Low Power	Is the connected W-Device low power or not
		Low Power			
	Max PD segment length	0 ... 32	0	This parameter contains the maximum segment length of the PDOOut data to the Message handler to distribute PDOOut Data within multiple W-Cycles.	
	Unique ID – Byte 1	0 ... 255	0	UniqueID of the W-Device	
	Unique ID – Byte 2	0 ... 255	0	UniqueID of the W-Device	
	Unique ID – Byte 3	0 ... 255	0	UniqueID of the W-Device	
	Unique ID – Byte 4	0 ... 255	0	UniqueID of the W-Device	
	Unique ID – Byte 5	0 ... 255	0	UniqueID of the W-Device	
	Unique ID – Byte 6	0 ... 255	0	UniqueID of the W-Device	
	Unique ID – Byte 7	0 ... 255	0	UniqueID of the W-Device	
Unique ID – Byte 8	0 ... 255	0	UniqueID of the W-Device		
Unique ID – Byte 9	0 ... 255	0	UniqueID of the W-Device		
Unique ID – Byte 10	0 ... 255	0	UniqueID of the W-Device		

### 3.5 Configuration and parameterization via TigoEngine

To Learn how to configure the TigoMaster 2TH please refer to the TigoEngine user manual.

### 3.6 OPC UA

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

- device identification,
- identification of the actors and sensors

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

opc.tcp://IP address:4840

For IP address, use the IP address of the device.

The client can access device parameters anonymously (read only) or with username/password (read and write). The username and password are set with the Web Server TigoEngine.

The following figure shows a section of the information model of the device.

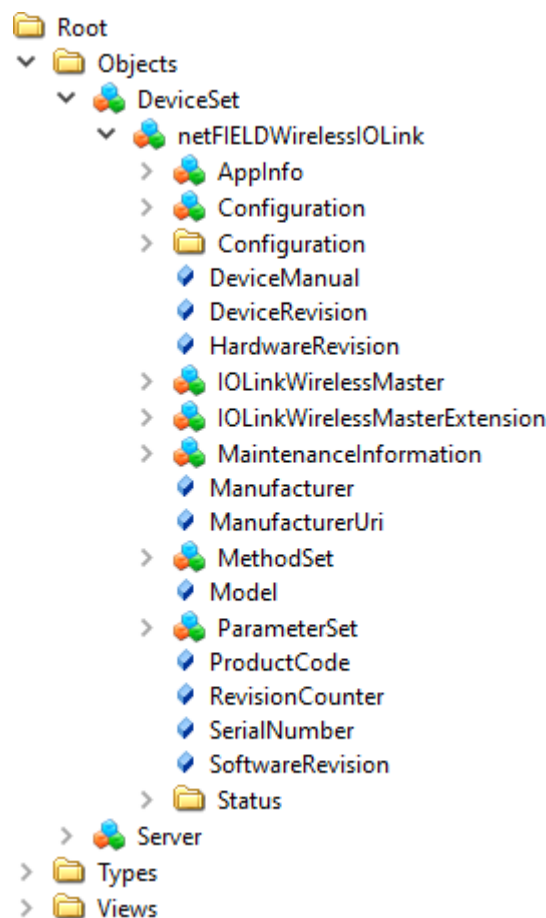


Figure 27: OPC UA: Information model of the device

### 3.7 Device identification

The device provides nodes for device identification. For example, the OPC UA client can read the version of the device firmware used in the SoftwareRevisionnode. The path to these nodes is

Root > Object > DeviceSet > [Devicename]

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

Table 34: Device identification

### 3.8 Identification of connected sensors/actors

The device provides nodes for the identification of connected sensors/ actors. For example, the OPC UA client can read the version of the device firmware used in the SoftwareRevisionnode. The path to these nodes is

Root > Object > DeviceSet > [Device name] >  
IOLinkWirelessMaster > PortXX > Device

Node name	Node class	Access	Description
Manufacturer	Variable	read	Device manufacturer
MinCycleTime	Variable	read	Minimal cycle time
Model	Variable	read	Model name
RevisionID	Variable	read	Hardware revision
SerialNumber	Variable	read	Serial number
SoftwareRevision	Variable	read	Revision/version of the firmware
VendorID	Variable	read	Vendor identification

Table 35: Identification of the connected sensor/actor

## 4. Communication

### 4.1 Process data

This section describes the process data for

- Connection 1 (Exclusive Owner - 32 bytes per IO-Link Port with Config)
- Connection 2 (Exclusive Owner - 32 bytes per IO-Link Port without Config)

The process data of the digital inputs and outputs have a fixed size of 276 Byte.

#### Output process data

The following table gives a description of the process data structure of the output process data.

Byte	Number of bytes	Output process data	Description
1	1 byte	DO status	0: DO data not valid. Substitute values are used. 1-255: DO data valid.
2	1 byte	Padding byte	Do not use
3 ... 4	2 byte	DO data	Depends on setting for process data layout: pin-based or port-based. See next table.
5	1 byte	IO-Link Port 1 Output enable	0: IO-Link Port 1 output data not valid. 1-255: IO-Link Port 1 output data valid.
6	1 byte	Padding byte	Do not use
7 ... 38	32 byte	IO-Link port 1 process output data	IO-Link output data of the sensor/actor connected to Port 1. For a description of the data, see manual of the manufacturer of the used sensor/actor.
39	1 byte	IO-Link Port 2 Output enable	0: IO-Link Port 2 output data not valid. 1-255: IO-Link Port 2 output data valid.
40	1 byte	Padding byte	Do not use
41 ... 72	32 byte	IO-Link port 2 process output data	IO-Link output data of the sensor/actor connected to Port 2. For a description of the data, see manual of the manufacturer of the used sensor/actor.
73	1 byte	IO-Link Port 3 Output enable	0: IO-Link Port 3 output data not valid. 1-255: IO-Link Port 3 output data valid.
74	1 byte	Padding byte	Do not use
75 ... 106	32 byte	IO-Link port 3 process output data	IO-Link output data of the sensor/actor connected to Port 3. For a description of the data, see manual of the manufacturer of the used sensor/actor.
107	1 byte	IO-Link Port 4 Output enable	0: IO-Link Port 4 output data not valid. 1-255: IO-Link Port 4 output data valid.
108	1 byte	Padding byte	Do not use
109 ... 140	32 byte	IO-Link port 4 process output data	IO-Link output data of the sensor/actor connected to Port 4. For a description of the data, see manual of the manufacturer of the used sensor/actor.
141	1 byte	IO-Link Port 5 Output enable	0: IO-Link Port 5 output data not valid. 1-255: IO-Link Port 5 output data valid.
142	1 byte	Padding byte	Do not use
143 ... 174	32 byte	IO-Link port 5 process output data	IO-Link output data of the sensor/actor connected to Port 5. For a description of the data, see manual of the manufacturer of the used sensor/actor.
175	1 byte	IO-Link Port 6 Output enable	0: IO-Link Port 6 output data not valid. 1-255: IO-Link Port 6 output data valid.

Byte	Number of bytes	Output process data	Description
176	1 byte	Padding byte	Do not use
177 ... 208	32 byte	IO-Link port 6 process output data	IO-Link output data of the sensor/actor connected to Port 6. For a description of the data, see manual of the manufacturer of the used sensor/actor.
209	1 byte	IO-Link Port 7 Output enable	0: IO-Link Port 7 output data not valid. 1-255: IO-Link Port 7 output data valid.
210	1 byte	Padding byte	Do not use
211 ... 242	32 byte	IO-Link port 7 process output data	IO-Link output data of the sensor/actor connected to Port 7. For a description of the data, see manual of the manufacturer of the used sensor/actor.
243	1 byte	IO-Link Port 8 Output enable	0: IO-Link Port 8 output data not valid. 1-255: IO-Link Port 8 output data valid.
244	1 byte	Padding byte	Do not use
245 ... 276	32 byte	IO-Link port 8 process output data	IO-Link output data of the sensor/actor connected to Port 8. For a description of the data, see manual of the manufacturer of the used sensor/actor.

Table 36: Output process data

The following table shows the mapping of the process output data (DO data) for port-based or pin-based layout.

Process data layout	Mapping / Sequence of the process data
Port-based	Bit 0 = Port 1 Pin 4, Bit 1 = Port 1 Pin 2, Bit 2 = Port 2 Pin 4, Bit 3 = Port 2 Pin 2, ...
Pin-based	Bit 0 = Port 1 Pin 4, Bit 1 = Port 2 Pin 4, Bit 2 = Port 3 Pin 4, Bit 3 = Port 4 Pin 4, ... Bit 8 = Port 1 Pin 2, Bit 9 = Port 1 Pin 2, ...

Table 37: Mapping of the digital output process data

### Input process data

The following table gives a description of the process data structure of the input process data.

Byte	Number of bytes	Input process data	Description
1	1 byte	DI status	0: DI data not valid. 1-255: DI data valid.
2	1 byte	Padding byte	Do not use
3 ... 4	2 byte	DI data	Depends on setting for process data layout: pin-based or port-based. See next table.
5	1 byte	IO-Link Port 1 data status	0: IO-Link Port 1 input data not valid. 1-255: IO-Link Port 1 input data valid.
6	1 byte	Padding byte	Do not use
7 ... 38	32 byte	IO-Link port 1 process input data	IO-Link input data of the sensor/actor connected to Port 1. For a description of the data, see manual of the manufacturer of the used sensor/actor.
39	1 byte	IO-Link Port 2 data status	0: IO-Link Port 2 input data not valid. 1-255: IO-Link Port 2 input data valid.
40	1 byte	Padding byte	Do not use
41 ... 72	32 byte	IO-Link port 2 process input data	IO-Link input data of the sensor/actor connected to Port 2. For a description of the data, see manual of the manufacturer of the used sensor/actor.
73	1 byte	IO-Link Port 3 data status	0: IO-Link Port 3 input data not valid. 1-255: IO-Link Port 3 input data valid.
74	1 byte	Padding byte	Do not use

Byte	Number of bytes	Input process data	Description
75 ... 106	32 byte	IO-Link port 3 process input data	IO-Link input data of the sensor/actor connected to Port 3. For a description of the data, see manual of the manufacturer of the used sensor/actor.
107	1 byte	IO-Link Port 4 data status	0: IO-Link Port 4 input data not valid. 1-255: IO-Link Port 4 input data valid.
108	1 byte	Padding byte	Do not use
109 ... 140	32 byte	IO-Link port 4 process input data	IO-Link input data of the sensor/actor connected to Port 4. For a description of the data, see manual of the manufacturer of the used sensor/actor.
141	1 byte	IO-Link Port 5 data status	0: IO-Link Port 5 input data not valid. 1-255: IO-Link Port 5 input data valid.
142	1 byte	Padding byte	Do not use
143 ... 174	32 byte	IO-Link port 5 process input data	IO-Link input data of the sensor/actor connected to Port 5. For a description of the data, see manual of the manufacturer of the used sensor/actor.
175	1 byte	IO-Link Port 6 data status	0: IO-Link Port 6 input data not valid. 1-255: IO-Link Port 6 input data valid.
176	1 byte	Padding byte	Do not use
177 ... 208	32 byte	IO-Link port 6 process input data	IO-Link input data of the sensor/actor connected to Port 6. For a description of the data, see manual of the manufacturer of the used sensor/actor.
209	1 byte	IO-Link Port 7 data status	0: IO-Link Port 7 input data not valid. 1-255: IO-Link Port 7 input data valid.
210	1 byte	Padding byte	Do not use
211 ... 242	32 byte	IO-Link port 7 process input data	IO-Link input data of the sensor/actor connected to Port 7. For a description of the data, see manual of the manufacturer of the used sensor/actor.
243	1 byte	IO-Link Port 8 data status	0: IO-Link Port 8 input data not valid. 1-255: IO-Link Port 8 input data valid.
244	1 byte	Padding byte	Do not use
245 ... 276	32 byte	IO-Link port 8 process input data	IO-Link input data of the sensor/actor connected to Port 8. For a description of the data, see manual of the manufacturer of the used sensor/actor.

Table 38: Input process data

The following table shows the mapping of the process input data (DI data) for port-based or pin-based layout.

Process data layout	Mapping / Sequence of the process data
Port-based	Bit 0 = Port 1 Pin 4, Bit 1 = Port 1 Pin 2, Bit 2 = Port 2 Pin 4, Bit 3 = Port 2 Pin 2, ...
Pin-based	Bit 0 = Port 1 Pin 4, Bit 1 = Port 2 Pin 4, Bit 2 = Port 3 Pin 4, Bit 3 = Port 4 Pin 4, ... Bit 8 = Port 1 Pin 2, Bit 9 = Port 1 Pin 2, ...

Table 39: Mapping of the digital input process data

## 5. Diagnosis

### 5.1 Diagnosis via LEDs

#### 5.1.1 System LED

The system status LED SYS can assume the states described below.









LED	Color	State	Description
SYS	Duo-LED: yellow RDY / green RUN		
	 green)	On	The firmware is running.
	 (green)	Blinking	During the formatting of the file system
	 (yellow)	On	A system error has occurred.
	 (yellow)/  (green)	Blinking, 3x yellow, 3x green	Firmware crash, unrecoverable (an internal exception occurred that cannot be handled)
	 (yellow)/  (green)	Blinking, 1 Hz, 4 Hz	<ul style="list-style-type: none"> <li>• 1 Hz: The Maintenance Firmware is idle (waiting for update).</li> <li>• 4 Hz: The Maintenance Firmware is in operation: Firmware update will be installed.</li> </ul>
 (gray)	Off	<ul style="list-style-type: none"> <li>• No supply voltage: No supply voltage for the device or hardware defect.</li> <li>• During a firmware reset</li> </ul>	

Table 40: States of the SYS-LED

LED state	
Blinking	The display turns on and off in phases.
Blinking, 3x yellow, 3x green	The indicator turns on and off with a frequency of approx. 1 Hz: <ul style="list-style-type: none"> <li>• 3x yellow "On" for 500 ms and "Off" for 500 ms and</li> <li>• 3x green "On" for 500 ms and "Off" for 500 ms</li> </ul>
Blinking, yellow/green, 1 Hz, 4 Hz	The indicator turns on in phases yellow or green, with a frequency of approx.: <ul style="list-style-type: none"> <li>• 1 Hz: 1 x yellow "On" for 500 ms and 1 x green "On" for 500 ms</li> <li>• 4 Hz: 1 x yellow "On" for 125 ms and 1 x green "On" for 125 ms</li> </ul>

Table 41: Definitions of the states of the system status LED SYS

### 5.1.2 APL LED

The application LED **APL** indicates the internal communication status as described below.






LED	Color	State	Description
<b>APL</b>	<b>Duo LED red/green/yellow</b> (yellow = red and green simultaneously)		
	 (green)	On	IO-Link Wireless Master configured
	 (green)	Blinking	IO-Link Wireless Master communication established
	 (yellow)	On	Initialization of IO-Link Wireless Master components done
	 (red)	Blinking	IO-Link Wireless Master communication error
	 (gray)	Off	IO-Link Wireless Master components not initialized

Table 42: APL LED states

### 5.1.3 Supply voltage status

The supply voltage status LEDs **1L** and **2L** indicate the states described below.





LED	Color	State	Description
<b>1L</b>	<b>Duo LED red/green</b>		
	 (green)	On	1L supply voltage ok
	 (gray)	Off	No 1L supply voltage
<b>2L</b>	<b>Duo LED red/green</b>		
	 (green)	On	2L supply voltage ok
	 (gray)	Off	No 2L supply voltage

Table 43: Supply voltage status 1L and 2L



### 5.1.4 EtherNet/IP Adapter status

The **MS** and **NS** LEDs indicate the status of the EtherNet/IP Adapter. The LNK and ACT LEDs indicate the status of the Ethernet.

#### EtherNet/IP Adapter status

The following table describes the LED states of the EtherNet/IP Adapter.

Table 13 - EtherNet/IP Adapter status













LED	Color	State	Description
<b>MS</b> (module status)	<b>Duo LED red/green</b>		
	 (green)	On	<b>Device operational:</b> The device is operating correctly.
	 (green)	Flashing (1 Hz)	<b>Standby:</b> The device has not been configured.
	 (green/red/green)	Flashing green/red/green	<b>Self-test:</b> The device is performing its power-up testing. The module status indicator test sequence occurs before the network status indicator test sequence, according to the following sequence: <ul style="list-style-type: none"> <li>• Network status LED off.</li> <li>• Module status LED turns green for approximately 250 ms, turns red for approximately 250 ms, and again turns green (and holds that state until the power-up test has completed).</li> <li>• Network status LED turns green for approximately 250 ms, turns red for approximately 250 ms, and then turns off (and holds that state until the power-up test has completed).</li> </ul>
	 (red)	Flashing (1 Hz)	<b>Major recoverable fault:</b> The device has detected a major recoverable fault. E.g., an incorrect or inconsistent configuration can be considered a major recoverable fault.
	 (red)	On	<b>Major unrecoverable fault:</b> The device has detected a major unrecoverable fault.
	 (off)	Off	<b>No power:</b> The device is powered off.
<b>NS</b> (Network status)	<b>Duo LED red/green</b>		
	 (green)	On	<b>Connected:</b> An IP address is configured, at least one CIP connection (any transport class) is established, and an Exclusive Owner connection has not timed out.
	 (green)	Flashing (1 Hz)	<b>No connections:</b> An IP address is configured, but no CIP connections are established, and an Exclusive Owner connection has not timed out.
	 (green/red/green)	Flashing green/red/off	<b>Self-test:</b> The device is performing its power-up testing. Refer to description for module status LED self-test.
	 (red)	Flashing (1 Hz)	<b>Connection timeout:</b> An IP address is configured, and an Exclusive Owner connection for which this device is the target has timed out. The network status indicator returns to steady green only when all timed out Exclusive Owner connections are reestablished.
	 (red)	On	<b>Duplicate IP:</b> The device has detected that its IP address is already in use.
 (off)	(Off)	<b>Not powered, no IP address:</b> The device does not have an IP address (or is powered off).	

Table 14 - LED states EtherNet/IP

LED state	Definition
Flashing (1 Hz)	The indicator turns on and off with a frequency of 1 Hz: “on” for 500 ms, followed by “off” for 500 ms.
Flashing green/red/ green	The MS LED indicator turns on green on for 250 ms, then red on for 250 ms, then green on (until the test is completed).
Flashing green/red/off	The NS LED indicator turns on green on for 250 ms, then red on for 250 ms, then off (until the test is completed).

## Ethernet status

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

Table 15 - Ethernet status





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





Table 16 - LED states Ethernet status

LED state	Definition
Flickering (load dependent)	The indicator turns on and off with a frequency of approximately 10 Hz to indicate high Ethernet activity: on for approximately 50 ms, followed by off for 50 ms. The indicator turns on and off in irregular intervals to indicate low Ethernet activity

## 5.2 Wireless track status

The wireless track status LEDs **WT1** ... **WT3** indicate the states for the wireless tracks 1, 2 and 3 as described below.







Table 17 - Wireless track status WT1 ... WT3

LED	Color	State	Description
WT1 ... WT3	Duo LED red/green/yellow (yellow = red and green simultaneously)		
	 (green)	On	<ul style="list-style-type: none"> <li>Track operational (cyclic, non-roaming)</li> <li>Track operational (roaming)</li> <li>Track service mode</li> </ul>
	 (yellow)	On	Track inactive
	 (red)	Blinking	Track error
	 (gray)	Off	Track off

## 5.3 Wireless port status

The wireless port status LEDs **WP01** ... **WP16** indicate the states for the wireless ports 1 ... 16 as described below.

Table 18 - Wireless track status WP1 ... WP16

LED	Color	State	Description
WP1 ... WP16	Duo LED red/green/yellow (yellow = red and green simultaneously)		
	 (green)	On	Port operational
	 (green)	Blinking	Pairing success, communication ready
	 (yellow)	Blinking	Port ready
	 (red)	Blinking	Port communication lost
	 (red)	On	Port errors (pairing timeout, pairing wrong slot-type, revision fault, compatibility fault, serial number fault, process data fault, cycle time fault)
	 (gray)	Off	Port inactive

## 6. Technical data

Table 19 - Technical data TIGOMASTER 2TH

Category	Parameter	Value			
Product	Part number	1912.122			
	Product name	TIGOMASTER 2TH			
	Description	TigoEngine EtherNet/IP IO-Link Wireless Master			
	Function	<ul style="list-style-type: none"> <li>IO-Link Master Wireless for EtherNet/IP</li> <li>2 tracks, 16 channels</li> <li>Connector/housing: 30 mm</li> </ul>			
Communication controller	Type	netX 90			
Integrated memory	RAM	16 MB SDRAM			
	FLASH	8 MB			
Ethernet communication	Real-Time Ethernet	EtherNet/IP Adapter			
Ethernet interface	Interface type	100BASE-TX, 10BASE-T, isolated			
	Auto-negotiation, Auto crossover	yes			
	Connectors	X31: Ethernet interface, M12, D-coded, EtherNet/IP port 1, X32: Ethernet interface, M12, D-coded, EtherNet/IP port 2			
IO-Link Wireless	Radio	2 track = 16 IO-Link wireless salves, 3 antennas, 16 LEDs			
	Output power	10dBm max.			
LEDs	System and application	SYS	System status	green/ yellow	
		APL	Application status	red/green	
	Power supply	1L (X22)	1L power supply (DC 24 V)		red/green
		2L (X22)	2L power supply (DC 24 V)		red/green
	EtherNet/IP communication	MS	Module status		red/green
		NS	Network status		red/green
	Ethernet	LINK (X31)	Link status, connector X31		green
		ACT (X31)	Activity status, connector X31		yellow
		LINK (X32)	Link status, connector X32		green
		ACT (X32)	Activity status, connector X32		yellow
	Wireless tracks	WT01 ... WT03	IO-Link wireless track status, antenna X1 ... X3		red/yellow/ green
	Wireless ports	WP01 ... WP08	Port status, IO-Link wireless device ports P01 to P08		red/yellow/ green
		WP09 ... WP16	Port status, IO-Link wireless device ports P09 to P16		red/yellow/ green
	Power supply 1L, 2L	Voltage supply	24V DC, -25%/+30% (18 V DC ... 31,2 V DC)		
Under voltage warning		17.0 V (17.5 V -3%): ON, 18 V (17.5 V +3%): OFF			
Over voltage warning		32.1 V (31.2 V +3%): ON, 30.3 V (31.2 V -3%): OFF			
Power consumption (w/o DI/DO)		1L: 0.2 A (at 24 V DC), 2L: 0.1 A (at 24 V DC)			
Connectors		X21: Power supply input (Power In), M12, L-coded, X22: Power supply output (Power Out), M12, L-coded			
Power consumption (power connectors)		Max. 16 A, Max. current of the device including pass through must not exceed 16 A for 1L and 2L			
Revers polarity protection		Yes			

Category	Parameter	Value
Ambient conditions	Operating temperature range	-25 °C ... +55 °C
	Storage temperature range	-40 °C ... +85 °C
	Max. temperature change	3 K / min
	Humidity	10 ... 95% relative humidity, no condensation permitted
	Operating height	0 ... 2000 m
	Over voltage category	II (EN 60664-1)
Device	Dimensions (L x W x H)	200 x 30 x 20 mm
	Housing	Plastics
	Mounting/installation	Screw mounting with 2x M4 screws to the 2 mounting holes (1 x up and 1 x down). These screws make contact to FE (functional earth).
	Tightening torque	1.2 Nm
CE sign	CE sign	Yes
	Standards used for development (preliminary)	EN 55032:2015, EN 300328 V2.2.2, EN 301489-1 V2.2.3, EN 301489-17 V3.1.1, EN 61000-6-2:2005/AC:2005, EN 62368-1:2014
	RoHS	In preparation
UL certification	According to UL requirements for EN 61010-2-201	In preparation
Firmware download	Software to download and update the firmware	Web Server TigoEngine
Configuration	Configuration software	EtherNet/IP Scanner, TigoEngine

