SIEMENS

SIMATIC

ET 200eco PN Communication module CM 8x IO-Link + DI 4x24VDC M12-L (6ES7148-6JG00-0BB0

Equipment Manual

Introduction 1

Industrial cybersecurity 2

Product overview 3

Wiring 4

PROFINET IO 5

EtherNet/IP 6

Modbus TCP 7

Technical specifications 8

Dimension drawing A

Parameter data record B

10/2024
A5E49284833-AD

Legal information

Warning notice system

This manual contains notices you have to observe in order to ensure your personal safety, as well as to prevent damage to property. The notices referring to your personal safety are highlighted in the manual by a safety alert symbol, notices referring only to property damage have no safety alert symbol. These notices shown below are graded according to the degree of danger.

⚠ DANGER

indicates that death or severe personal injury **will** result if proper precautions are not taken.

⚠ WARNING

indicates that death or severe personal injury **may** result if proper precautions are not taken.

⚠ CAUTION

indicates that minor personal injury can result if proper precautions are not taken.

NOTICE

indicates that property damage can result if proper precautions are not taken.

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Qualified Personnel

The product/system described in this documentation may be operated only by **personnel qualified** for the specific task in accordance with the relevant documentation, in particular its warning notices and safety instructions. Qualified personnel are those who, based on their training and experience, are capable of identifying risks and avoiding potential hazards when working with these products/systems.

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Note the following:

⚠ WARNING

Siemens products may only be used for the applications described in the catalog and in the relevant technical documentation. If products and components from other manufacturers are used, these must be recommended or approved by Siemens. Proper transport, storage, installation, assembly, commissioning, operation and maintenance are required to ensure that the products operate safely and without any problems. The permissible ambient conditions must be complied with. The information in the relevant documentation must be observed.

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Disclaimer of Liability

We have reviewed the contents of this publication to ensure consistency with the hardware and software described. Since variance cannot be precluded entirely, we cannot guarantee full consistency. However, the information in this publication is reviewed regularly and any necessary corrections are included in subsequent editions.

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Table of contents

1 Introduction 5

1.1 Introduction ET 200eco PN Master 5

1.2 Industry Mall 5

1.3 Siemens Industry Online Support 6

1.4 Guide to ET 200eco PN M12-L 6

1.4.1 Information classes ET 200eco PN M12-L 6

1.4.2 Basic tools 7

1.4.3 S7 Port Configuration Tool (S7-PCT) 9

1.4.4 MultiFieldbus Configuration Tool (MFCT) 10

1.4.5 SIMATIC Technical Documentation 11

2 Industrial cybersecurity 13

2.1 Introduction to industrial cybersecurity 13

2.2 Cybersecurity information 13

2.3 Cybersecurity-relevant information 14

3 Product overview 15

3.1 Properties 15

3.2 Operator controls and display elements 18

3.3 Functions 19

3.4 Reset communication module to factory settings 20

4 Wiring 22

4.1 Terminal and block diagram 22

4.2 Pin assignment 23

5 PROFINET IO 27

5.1 Parameters/address space 27

5.1.1 Parameters 27

5.1.2 Explanation of the parameters 28

5.1.3 Address space 31

5.2 Interrupts/diagnostics alarms 34

5.2.1 Status and error displays 34

5.2.2 Interrupts 37

5.2.3 Alarms 38

5.2.3.1 Diagnostics alarms 38

5.2.3.2 Maintenance events 40

5.2.3.3 Process alarm events 41

6 EtherNet/IP 42

6.1 Functions/parameters/address space 42
6.1.1 Supported EtherNet/IP functions 42
6.1.2 Parameters 43
6.1.3 Explanation of the parameters 44
6.1.4 Update time of the I/O data 46
6.1.5 Example address space 47

6.2 Diagnostics 49
6.2.1 Status and error displays for EtherNet/IP 49

7 Modbus TCP 53

7.1 Functions/parameters/address space 53
7.1.1 Supported Modbus TCP functions 53
7.1.2 Parameters 54
7.1.3 Explanation of the parameters 55
7.1.4 Update time of the I/O data 56
7.1.5 Example address space 57

7.2 Diagnostics 59
7.2.1 Status and error displays for Modbus TCP 59

8 Technical specifications 63

A Dimension drawing 71

B Parameter data record 72

B.1 Dependencies for the configuration 72

B.2 Error transferring the data record 72

1 Introduction

1.1 Introduction ET 200eco PN Master

Purpose of the documentation

This equipment manual supplements the ET 200eco PN M12-L Distributed I/O System (https://support.industry.siemens.com/cs/ww/en/view/109778292) system manual. Functions that relate in general to the distributed I/O devices ET 200eco PN M12-L are described in this system manual.

The MultiFieldbus (https://support.industry.siemens.com/cs/ww/en/view/109773209) Function Manual describes general MultiFieldbus functions. This equipment manual describes the specific adaptations for this I/O device.

The information provided in this equipment manual and in the system manual and the function manuals supports you in commissioning the ET 200eco PN M12-L distributed I/O devices.

Conventions

Also observe notes labeled as follows:

NOTE

A note contains important information:

- The product described in the documentation
- On handling the product
- On the part of the documentation to which particular attention should be paid.

1.2 Industry Mall

The Industry Mall is the catalog and order system of Siemens AG for automation and drive solutions on the basis of Totally Integrated Automation (TIA) and Totally Integrated Power (TIP).

You can find catalogs for all automation and drive products on the Internet (https://mall.industry.siemens.com) and in the Information and Download Center (http://www.siemens.com/automation/service&support).

1.3 Siemens Industry Online Support

You can find current information on the following topics quickly and easily here:

- **Product support**

  All the information and extensive know-how on your product, technical specifications, FAQs, certificates, downloads, and manuals.

- **Application examples**

  Tools and examples to solve your automation tasks – as well as function blocks, performance information and videos.

- **Services**

  Information about Industry Services, Field Services, Technical Support, spare parts and training offers.

- **Forums**

  For answers and solutions concerning automation technology.

- **mySupport**

  Your personal working area in Industry Online Support for messages, support queries, and configurable documents.

This information is provided by the Siemens Industry Online Support in the Internet (http://www.siemens.com/automation/service&support).

1.4 Guide to ET 200eco PN M12-L

1.4.1 Information classes ET 200eco PN M12-L



The documentation for the SIMATIC ET 200eco PN M12-L distributed I/O system is arranged into three areas.

This arrangement enables you to access the specific content you require.

You can download the documentation free of charge from the Internet (https://support.industry.siemens.com/cs/de/en/view/109742718).

Basic information



The System Manual describes in detail the configuration, installation, wiring and commissioning of the SIMATIC ET 200eco PN M12-L distributed I/O system.

The STEP 7 online help supports you in the configuration and programming.

Examples:

- ET 200eco PN M12-L System Manual
- Online help in the TIA Portal

Device information



Equipment manuals contain a compact description of the module-specific information, such as properties, wiring diagrams, characteristics and technical specifications.

Examples:

- I/O Device Digital Inputs Equipment Manuals
- I/O Device Digital Inputs Equipment Manuals
- I/O Device Digital Inputs/Outputs Equipment Manuals
- IO-Link Master I/O Device Communication Module Equipment Manual
- I/O Device Analog Inputs Equipment Manual

General information



The function manuals contain detailed descriptions on general topics relating to the SIMATIC ET 200eco PN M12-L distributed I/O system.

Examples:

- Function Manual Diagnostics
- Function Manual Communication
- PROFINET Function Manual
- Function Manual Designing Interference-free Controllers
- IO-Link System Function Manual
- MultiFieldbus Function Manual

1.4.2 Basic tools

Tools

The tools described below support you in all steps: from planning, over commissioning, all the way to analysis of your system.

TIA Selection Tool

The TIA Selection Tool tool supports you in the selection, configuration, and ordering of devices for Totally Integrated Automation (TIA).

As successor of the SIMATIC Selection Tools , the TIA Selection Tool assembles the already known configurators for automation technology into a single tool.

With the TIA Selection Tool , you can generate a complete order list from your product selection or product configuration.

You can find the TIA Selection Tool on the Internet.
(https://support.industry.siemens.com/cs/ww/en/view/109767888)

SIMATIC Automation Tool

You can use the SIMATIC Automation Tool to perform commissioning and maintenance activities on various SIMATIC S7 stations as bulk operations independent of TIA Portal.

The SIMATIC Automation Tool offers a wide range of functions:

- Scanning of a PROFINET/Ethernet system network and identification of all connected CPUs
- Assignment of addresses (IP, subnet, Gateway) and device name (PROFINET device) to a CPU
- Transfer of the date and the programming device/PC time converted to UTC time to the module
- Program download to CPU
- RUN/STOP mode switchover
- CPU localization through LED flashing
- Reading out of CPU error information
- Reading the CPU diagnostic buffer
- Reset to factory settings
- Firmware update of the CPU and connected modules

You can find the SIMATIC Automation Tool on the Internet.
(https://support.industry.siemens.com/cs/ww/en/view/98161300)

PRONETA

SIEMENS PRONETA (PROFINET network analysis) is a commissioning and diagnostic tool for PROFINET networks. PRONETA Basic has two core functions:

- In the network analysis, you get an overview of the PROFINET topology. Compare a real configuration with a reference installation or make simple parameter changes, e.g. to the names and IP addresses of the devices.
- The "IO test" is a simple and rapid test of the wiring and the module configuration of a plant, including documentation of the test results.

You can find SIEMENS PRONETA Basic on the Internet:
(https://support.industry.siemens.com/cs/ww/en/view/67460624)

SIEMENS PRONETA Professional is a licensed product that offers you additional functions. It offers you simple asset management in PROFINET networks and supports operators of automation systems in automatic data collection/acquisition of the components used through various functions:

- The user interface (API) offers an access point to the automation cell to automate the scan functions using MQTT or a command line.
- With PROFIenergy diagnostics, you can quickly detect the current pause mode or the readiness for operation of devices that support PROFIenergy and change these as needed.
- The data record wizard supports PROFINET developers in reading and writing acyclic PROFINET data records quickly and easily without PLC and engineering.

You can find SIEMENS PRONETA Professional on the Internet.
(https://www.siemens.com/proneta-professional)

SINETPLAN

SINETPLAN, the Siemens Network Planner, supports you in planning automation systems and networks based on PROFINET. The tool facilitates professional and predictive dimensioning of your PROFINET installation as early as in the planning stage. In addition, SINETPLAN supports you during network optimization and helps you to exploit network resources optimally and to plan reserves. This helps to prevent problems in commissioning or failures during productive operation even in advance of a planned operation. This increases the availability of the production plant and helps improve operational safety.

The advantages at a glance

- Network optimization thanks to port-specific calculation of the network load
- Increased production availability thanks to online scan and verification of existing systems
- Transparency before commissioning through importing and simulation of existing STEP 7 projects
- Efficiency through securing existing investments in the long term and the optimal use of resources

You can find SINETPLAN on the Internet (https://new.siemens.com/global/en/products/automation/industrial-communication/profinet/sinetplan.html).

1.4.3 S7 Port Configuration Tool (S7-PCT)

SIMATIC S7-PCT

The Port Configuration Tool (PCT) is a PC-based software for the parameter assignment of Siemens IO-Link Master modules and IO-Link devices from any manufacturer.

You integrate IO-Link-devices using the standardized device description "IODD", which you get from the respective device manufacturer. S7-PCT supports version 1.0 and V1.1 of the IODD.

S7-PCT is called via the hardware configuration of the IO-Link Master from STEP 7. When STEP 7 is not used or the IO-Link Master is not operated on a SIMATIC controller, "standalone"-operation is also possible.

You can find additional information on IO-Link on the Internet (https://new.siemens.com/global/en/products/automation/industrial-communication/io-link.html).

1.4.4 MultiFieldbus Configuration Tool (MFCT)

MultiFieldbus Configuration Tool

MultiFieldbus Configuration Tool (MFCT) is a PC-based software and supports the configuration of MultiFieldbus- and DALI-devices. In addition, the MFCT offers convenient options for mass firmware updates of ET 200 devices with MultiFieldbus- support and reading service data for many other Siemens devices.

Functional scope of the MFCT

- MultiFieldbus configuration:
  Engineering, configuration and diagnostics of MultiFieldbus-devices, provision of the required project files (project, UDT-, CSV- and EDS-file), transfer/export of the files to device and/or data memory.
- DALI configuration:
  Device selection and online configuration of DALI devices.
- TM FAST:
  Generation and download of FPGA-UPD- and FPGA-DB-files.
- Maintenance:
  Topology scan of a Ethernet network, reading of service data, parameter assignment and firmware update.
- Settings:
  Language switching German / English, network scanner speed, setting of the network adapter, installation of GSDML-and EDS-files.

System/installation requirements for MFCT

The MFCT runs under Microsoft Windows and does not require installation or administrator rights.

For MFCT you must also install the following software:

- Microsoft .NET Framework 4.8 (You can find an Offline Installer on the Internet. (https://support.microsoft.com/en-us/topic/microsoft-net-framework-4-8-offline-installer-for-windows-9d23f658-3b97-68ab-d013-aa3c3e7495e0))
- NPcap from directory "Misc"
- PG/PC interface from directory "Misc"
- Microsoft C++ Redistributable for x86-systems (you can find the installation data for download on the Internet. (https://aka.ms/vs/15/release/vc_redist.x86.exe))

The download of the tool and further information as well as documentation on the individual functions of the MFCT can be found on the Internet.
(https://support.industry.siemens.com/cs/de/en/view/109773881)

1.4.5 SIMATIC Technical Documentation

Additional SIMATIC documents will complete your information. You can find these documents and their use at the following links and QR codes.

The Industry Online Support gives you the option to get information on all topics. Application examples support you in solving your automation tasks.

Overview of the SIMATIC Technical Documentation

Here you will find an overview of the SIMATIC documentation available in Siemens Industry Online Support:

Industry Online Support International (https://support.industry.siemens.com/cs/ww/en/view/109742705)

Watch this short video to find out where you can find the overview directly in Siemens Industry Online Support and how to use Siemens Industry Online Support on your mobile device:

Quick introduction to the technical documentation of automation products per video (https://support.industry.siemens.com/cs/us/en/view/109780491)

YouTube video: Siemens Automation Products - Technical Documentation at a Glance (https://youtu.be/TwLSxxRQQsA)

Retention of the documentation

Retain the documentation for later use.

For documentation provided in digital form:

1. Download the associated documentation after receiving your product and before initial installation/commissioning. Use the following download options:
   - Industry Online Support International: (https://support.industry.siemens.com)

     The article number is used to assign the documentation to the product. The article number is specified on the product and on the packaging label. Products with new, non-compatible functions are provided with a new article number and documentation.
   - ID link:

     Your product may have an ID link. The ID link is a QR code with a frame and a black frame corner at the bottom right. The ID link takes you to the digital nameplate of your product. Scan the QR code on the product or on the packaging label with a smartphone camera, barcode scanner, or reader app. Call up the ID link.
2. Retain this version of the documentation.

Updating the documentation

The documentation of the product is updated in digital form. In particular in the case of function extensions, the new performance features are provided in an updated version.

1. Download the current version as described above via the Industry Online Support or the ID link.
2. Also retain this version of the documentation.

mySupport

With "mySupport" you can get the most out of your Industry Online Support.

Registration	You must register once to use the full functionality of "mySupport". After registration, you can create filters, favorites and tabs in your personal workspace.
Support requests	Your data is already filled out in support requests, and you can get an overview of your current requests at any time.
Documentation	In the Documentation area you can build your personal library.
Favorites	You can use the "Add to mySupport favorites" to flag especially interesting or frequently needed content. Under "Favorites", you will find a list of your flagged entries.
Recently viewed articles	The most recently viewed pages in mySupport are available under "Recently viewed articles".
CAx data	The CAx data area gives you access to the latest product data for your CAx or CAe system. You configure your own download package with a few clicks: • Product images, 2D dimension drawings, 3D models, internal circuit diagrams, EPLAN macro files • Manuals, characteristics, operating manuals, certificates • Product master data

You can find "mySupport" on the Internet. (https://support.industry.siemens.com/My/ww/en)

Application examples

The application examples support you with various tools and examples for solving your automation tasks. Solutions are shown in interplay with multiple components in the system - separated from the focus on individual products.

You can find the application examples on the Internet.
(https://support.industry.siemens.com/cs/ww/en/ps/ae)

Industrial cybersecurity

2

2.1 Introduction to industrial cybersecurity

Due to the digitalization and increasing networking of machines and industrial plants, the risk of cyber attacks is also growing. Appropriate protective measures are therefore mandatory, particularly in the case of critical infrastructure facilities.

Refer to the System Manual (https://support.industry.siemens.com/cs/ww/en/view/109778292) for general information and measures regarding industrial cybersecurity.

This section provides an overview of security-related information pertaining to your SIMATIC device.

NOTE

Security-relevant changes to software or devices are documented in the New properties/functions chapter.

2.2 Cybersecurity information

Siemens provides products and solutions with industrial cybersecurity functions that support the secure operation of plants, systems, machines and networks.

In order to protect plants, systems, machines and networks against cyber threats, it is necessary to implement – and continuously maintain – a holistic, state-of-the-art industrial cybersecurity concept. Siemens' products and solutions constitute one element of such a concept.

Customers are responsible for preventing unauthorized access to their plants, systems, machines and networks. Such systems, machines and components should only be connected to an enterprise network or the internet if and to the extent such a connection is necessary and only when appropriate security measures (e.g. firewalls and/or network segmentation) are in place.

For additional information on industrial cybersecurity measures that may be implemented, please visit
https://www.siemens.com/cybersecurity-industry.

Siemens' products and solutions undergo continuous development to make them more secure. Siemens strongly recommends that product updates are applied as soon as they are available and that the latest product versions are used. Use of product versions that are no longer supported, and failure to apply the latest updates may increase customer's exposure to cyber threats.

To stay informed about product updates, subscribe to the Siemens Industrial Cybersecurity RSS Feed under
https://new.siemens.com/cert.

2.3 Cybersecurity-relevant information

Pay attention to all relevant cybersecurity information.

Topics with cybersecurity-relevant information	Reference
Operational application environment and security assumptions	
Requirements for the operational application environment of the system and security assumptions	You can find this section in the System Manual (https://support.industry.siemens.com/cs/ww/en/view/109778292).
Security properties of the product	
Signed firmware update	The topic of signed firmware updates is described in the Industrial cybersecurity chapter of the System Manual (https://support.industry.siemens.com/cs/ww/en/view/109778292).
Supported Ethernet services	Information about supported services can be found in the Technical specifications chapter. You can find detailed information on the supported Ethernet services in the Communication Function Manual (https://support.industry.siemens.com/cs/us/en/view/59192925).
Interfaces, ports, protocols and services	
Information on the following is security-relevant: • Communications layer and communication role • Default states • Enabling/disabling of ports and services	You can find detailed information on these topics in the Communication Function Manual (https://support.industry.siemens.com/cs/us/en/view/59192925).
Secure operation	
Recommendations for secure operation	You can find cross-system information on the secure operation of I/O devices in the System Manual (https://support.industry.siemens.com/cs/ww/en/view/109778292).
Corrective measures for known risks	Corrective measures for known risks are announced on the Siemens ProductCERT and Siemens CERT (https://siemens.com/productcert) web page. You can find more information on SIEMENS ProductCERT in the System Manual (https://support.industry.siemens.com/cs/ww/en/view/109778292).
Secure decommissioning Products that contain security-relevant data must be safely decommissioned before disposal or resale.	You can find information on secure decommissioning in the Secure operation of the system section in the System Manual (https://support.industry.siemens.com/cs/ww/en/view/109778292).

See also

PROFINET Function Manual (https://support.industry.siemens.com/cs/us/en/view/49948856)

Product overview

3

3.1 Properties

Article number

6ES7148-6JG00-0BB0

View of the module

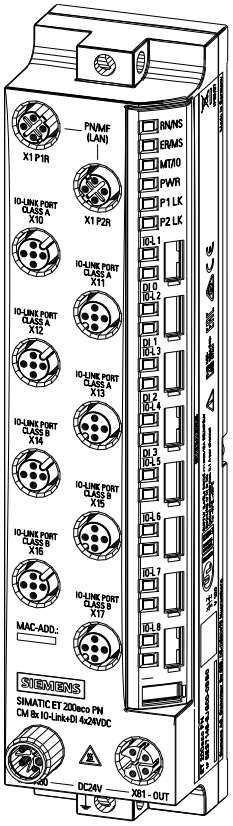


Figure 3-1 View of the CM 8xIO-Link + DI 4x24VDC M12-L communication module

Properties

The module has the following technical properties:

- IO-Link master according to IO-Link specification V1.1
- Using the MultiFieldbus function, it connects the ET 200eco PN M12-L distributed I/O system with one of the following bus protocols:
  - PROFINET IO
  - EtherNet/IP
  - Modbus TCP
- 8 IO-Link ports usable as:
  - 4 IO-Link Ports Type Class A and 4 IO-Link Ports Type Class B
- 4 digital inputs
- SIO mode (standard IO mode)
- Supported data transmission rates:
  - COM1 (4.8 kBd)
  - COM2 (38.4 kBd)
  - COM3 (230.4 kBd)
- Configuration limits:
  - Max. 33 bytes of input data and 32 bytes of output data per port
  - Max. 265 bytes of input data and 256 bytes of output data per module
- Automatic backup of device parameters during replacement of the IO-Link device (only for V1.1 devices)
- Configurable diagnostics can be set for each channel
- Hardware interrupts
- Dimensions 45 x 200 mm

The module supports the following functions:

- Firmware update
- Identification and maintenance data (I&M)
- IO-Link port configuration with S7-PCT as of V3.5, SP2
- IO-Link port configuration without S7-PCT
  - IO-Link autostart
  - IO-Link manual
- Master backup with function block "LIOLink_Master"
- Port Qualifier Information (PQI)

Accessories

The following components are included in the module package:

- Identification labels
- Product information

Other components

The following component can be ordered as spare part:

- Identification labels

The following components can be ordered as accessories:

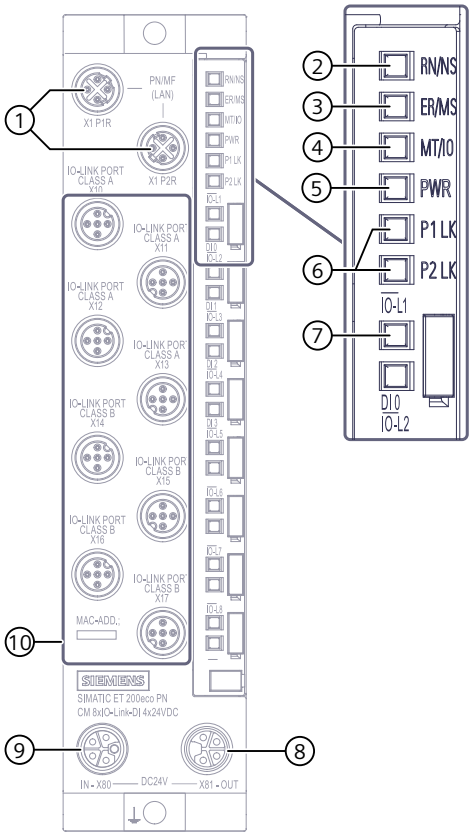
- Mounting rail
- Connectors and cables
- M12 sealing cap

See also

You can find additional information on the accessories in the ET 200eco PN M12-L distributed I/O system (http://support.automation.siemens.com/WW/view/en/109774008) system manual.

3.2 Operator controls and display elements

The following figure shows the operator controls and display elements of the CM 8xIO-Link + DI 4x24VDC M12-L communication module.



① PN/MF (LAN): Sockets for connecting MultiFieldbus
② RN/NS: RUN/network status LED
③ ER/MS: ERROR/module status LED
④ MT/IO: MAINT/IO status LED
⑤ PWR: LED display for load voltage 2L+
⑥ P1 LK: LINK port status LED
⑦ P2 LK: LINK port status LED
⑧ IO-L_1 to IO-L_8: LED indicators for channel status IO-Link
⑨ DI_0 to DI_3: LED indicators for channel status digital input
⑩ X10 to X13: Sockets for IO-Link port Class A and DI
X14 to X17: Sockets for IO-Link port Class B
⑪ X80: Connector for infeed of the supply voltages
⑫ X81: Socket for loop-through of the supply voltages

Figure 3-2 Operator controls and display elements

3.3 Functions

IO-Link is a point-to-point connection between an IO-Link master and an IO-Link device. On the IO-Link master, you can use IO-Link devices as well as conventional sensors/actuators with unshielded standard cables using proven 3-wire technology. IO-Link is downward-compatible to conventional digital sensors and actuators. The switching state and data channels are designed with trusted 24 V DC technology.

Master Backup

The "LIOLink_Master" function block is used to read all relevant IO-Link device and IO-Link master parameters. These can be stored retentively at a central location, such as in a data block in the IO controller.

The status of the IO-Link devices or IO-Link ports stored in the IO-Link master can be restored with the "LIOLink_Master" function block.
As a result, the IO-Link ports and the IO-Link master are configured with the values stored in the master backup.

A typical application is the restoration of parameters after replacement of the IO-Link master.

Port Qualifier Information (PQI)

Each port has Port Qualifier Information (PQI). This PQI provides information on the device status of the port and IO-Link. The PQI is transmitted cyclically with the process data. The PQI cannot be deactivated.

Port configuration

With an IO-Link master 8xIO-Link + DI 4x24VDC M12-L, you can commission the IO-Link submodules (ports) of the IO-Link master or the connected IO-Link devices in two different ways:

- Port configuration without S7-PCT
- Port configuration with S7-PCT

Port configuration without S7-PCT

Requirements

You have selected the "Port configuration without S7-PCT" check box in the configuration of the IO-Link master submodule in STEP 7.

Procedure

You configure the IO-Link master submodules directly in STEP 7:

- Activate the diagnostics
- Port mode:
  - Operation in "IO-Link autostart" mode (default)
  - Operation in "IO-Link manual" mode

Port configuration with S7-PCT

Requirements

You have **cleared** the "Port configuration without S7-PCT (PDCT)" check box in the configuration of all IO-Link master submodules in STEP 7 (default).

Procedure

You configure the IO-Link master with the Port Configuration Tool S7-PCT (PDCT) V3.5 SP2 or higher.

Reference

For more information on the IO-Link system, please see the IO-Link system (http://support.automation.siemens.com/WW/view/en/65949252) function manual.

3.4 Reset communication module to factory settings

There are three ways to reset to factory settings:

- PROFINET factory reset
- SIMATIC S7-PCT Factory Reset
- MFCT Factory Reset

PROFINET factory reset

You can find additional information on the PROFINET factory reset in the ET 200eco PN M12-L distributed I/O system (http://support.automation.siemens.com/WW/view/en/109774008) system manual.

SIMATIC S7-PCT Factory Reset

You trigger the reset to the factory settings in SIMATIC S7-PCT tool.

A reset is performed completely by IO-Link application and affects IO-Link related data.

- The port modes remain in the currently used mode
- Non-volatile memory is reset (content of the IO-Link data memory is lost)

MFCT Factory Reset

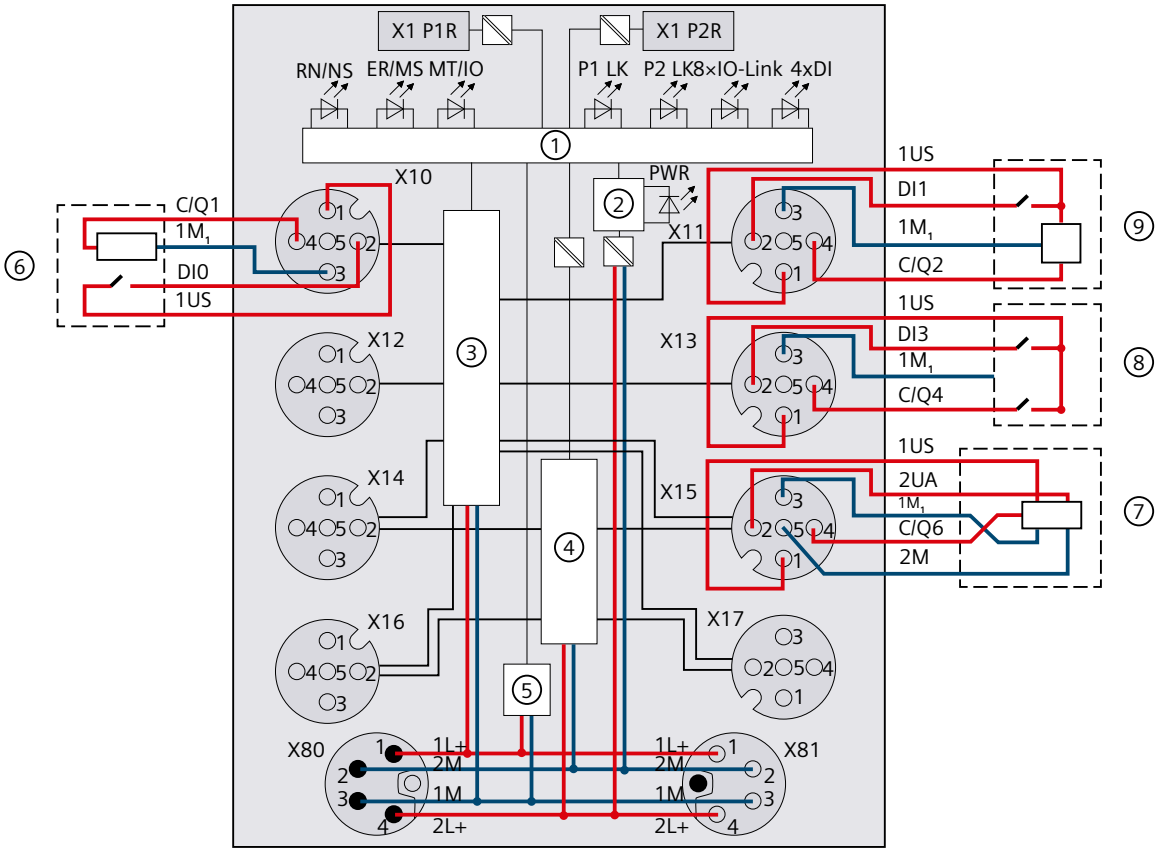
You can find additional information on the PROFINET factory reset in the ET 200eco PN M12-L distributed I/O system (http://support.automation.siemens.com/WW/view/en/109774008) system manual.

Wiring

4

4.1 Terminal and block diagram

The following figure shows an example of the pin assignment for Port Class A and Port Class B.



①	Bus interface with integrated 2-port switch	1L+	Supply voltage 1L+ (non-switched)
②	Monitoring	1M	Ground 1M (non-switched)
③	IO-Link/DI circuit (1L+, 1M)	2L+	Load voltage 2L+ (switched)
④	Load voltage supply circuit (2L+, 2M)	2M	Ground 2M (switched)
⑤	Internal supply voltage	$1U_S$	24 V encoder supply
⑥	Configured as output and input 2-wire connection	$2U_A$	24 V actuator supply
⑦	IO-Link Device Class B	C/Q_n	IO-Link Port n
⑧	Configured as inputs: 3-wire connection	P1 LK/P2 LK	Port 1/Port 2 LED LINK
⑨	IO-Link Device, Class A and input 2-wire connection	RN/NS	RUN/network status LED
X10 to X13	IO-Link Port Class A + DI	ER/MS	ERROR/module status LED

X14 to X17	IO-Link Port Class B	MT/IO	MAINT/IO status LED
X80	Infeed of supply voltages	X1 P1R	MultiFieldbus interface X1 Port 1
X81	Loop-through of supply voltages	X2 P2R	MultiFieldbus interface X1 Port 2
DI_n	Input signal	$1M_1$	Ground with reverse polarity protection, derived from 1M (non-switched)

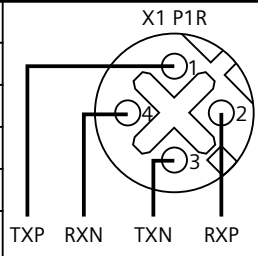
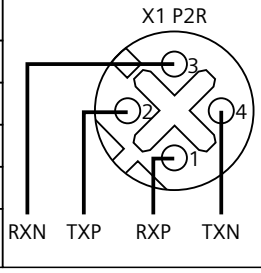
Figure 4-1 Terminal and block diagram

4.2 Pin assignment

Pin assignment MultiFieldbus connector

The following table shows the pin assignment of the MultiFieldbus connector.

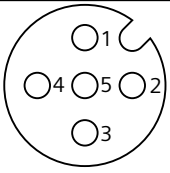
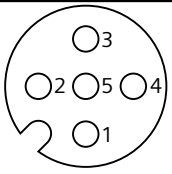
Table 4-1 Pin assignment of the MultiFieldbus connector, port 1 and 2

Pin	Assignment of the core color of the PROFINET cable	Assignment	Front view of the connectors
Assignment X1 P1R			
1	Yellow	TXP	
2	White	RXP	
3	Orange	TXN	
4	Blue	RXN	
Thread		Functional earth FE	
Assignment X1 P2R			
1	Yellow	RXP	
2	White	TXP	
3	Orange	RXN	
4	Blue	TXN	
Thread		Functional earth FE	

Pin assignment of the IO-Link sockets

The table below shows the pin assignments of the 8 sockets for the connection of IO-Link.

Table 4-2 Pin assignment of the IO-Link sockets

Pin	Assignment		Front view of the sockets	
	Port Class A	**Port Class B**		
1	24V encoder supply 1Us			
2	Input signal DI_0: Connector X10 Input signal DI_1: Connector X11 Input signal DI_2: Connector X12 Input signal DI_3: Connector X13	24 V actuator supply $2U_A$: Connector X14 24 V actuator supply $2U_A$: Connector X15 24 V actuator supply $2U_A$: Connector X16 24 V actuator supply $2U_A$: Connector X17		
3	Ground $1M_1$ (non-switched)			
4	IO-Link port 1: Connector X10 IO-Link port 2: Connector X11 IO-Link port 3: Connector X12 IO-Link port 4: Connector X13	IO-Link port 5: Connector X14 IO-Link port 6: Connector X15 IO-Link port 7: Connector X16 IO-Link port 8: Connector X17		
5	Not used	Ground 2M (switched)		

NOTICE

24 V encoder supply $1U_s$

Use only the 24 V encoder supply $1U_s$ provided by the IO-Link master to supply power to the devices/sensors.

NOTICE

Number of IO channels

Each of the 8x M12 sockets - except for Port Class B - can be assigned a maximum of two signals, namely IO-Link + standard DIQ. IO-Link can also be configured as DI or DQ (SIO mode). This means that the module can therefore be used for a maximum of 16 digital channels (sum of DI and DQ) - but NOT for 8x IO-Link + 16x digital; corresponding statements from competitors are incorrect!

NOTE

Port Class B

The pin assignment of the IO-Link interface of the sockets X14 to X 17 corresponds to the IO-Link specification as per Port Class B. Port Class B is specially suited for the connection of actuators with additional supply (e.g. valve terminals).

You can connect devices with Port Class A (e.g. sensors) to Port Class B sockets. Use a 3-wire connecting cable (Port Class A compatibility) to connect devices with Port Class A to the communications module CM 4xIO-Link 4xM12.

For more information on the IO-Link system, please see the IO-Link system (http://support.automation.siemens.com/WW/view/en/65949252) function manual.

NOTE

Reverse polarity protection

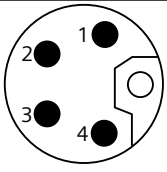
To ensure reverse polarity protection, use the ground $1M_1$ supplied by the I/O device on pin 3 of the corresponding socket. Reverse polarity protection is disabled when 1M is connected to X80/X81 and $1M_1$ to X10-X17.

With Class B ports, it must be ensured that the sensor and actuator supply are always galvanically isolated.

Pin assignment of the connector for infeed of the supply voltage (M12 L-coded)

The table below shows the pin assignment of the M12 L-coded connector for infeed of the supply voltage.

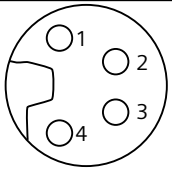
Table 4-3 Pin assignment of the supply voltage connector

Pin	Assignment of the core color of the power cable	Assignment X80 connector (POWER input)	Front view of the connector
1	Brown	Supply voltage 1L+ (Non-switched)	
2	White	Ground 2M (switched)	
3	Blue	Ground 1M (non-switched)	
4	Black	Load voltage 2L+ (switched)	

Pin assignment of the socket for loop-through of the supply voltage (M12 L-coded)

The table below shows the pin assignment of the M12 L-coded socket for loop-through of the supply voltage.

Table 4-4 Pin assignment of the supply voltage socket

Pin	Assignment of the core color of the power cable	Assignment	Front view of the socket
		X81 socket (POWER output)	
1	Brown	Supply voltage 1L+ (non-switched)	
2	White	Ground 2M (switched)	
3	Blue	Ground 1M (non-switched)	
4	Black	Load voltage 2L+ (switched)	

PROFINET IO

5

5.1 Parameters/address space

5.1.1 Parameters

Parameters

The following table shows the parameters that you can set for each port (each submodule) of the IO-Link master CM 8xIO-Link + DI 4x24VDC M12-L.

Table 5-1 Diagnostics and port parameters

Parameters	Value range	Default	Scope with configuration software, e.g. STEP 7 (TIA Portal)
Diagnostics			
Diagnostics: Missing 2L+	• Disable • Enable	Disable	Channel
Diagnostics undervoltage 1L+	• Disable • Enable	Disable	Channel
Diagnostics: Port	• Disable • Enable	Disable	Channel
Hardware interrupt (device notification)	• Disable • Enable	Disable	Channel
Port configuration			
Port configuration without S7-PCT	• Disable • Enable	Disable	Channel
Operating mode	• IO-Link autostart • IO-Link manual	0	Channel
Vendor ID**	Vendor ID of the connected IO-Link device	0	Channel
DeviceID*	Device ID of the connected IO-Link device		Channel
Inspection Level/Data Storage*	• Same type (V1.0) without Backup&Restore • Type compatible (V1.1) without Backup&Restore	Type-compatible (V1.1) with Backup&Restore	Channel

Parameters	Value range	Default	Scope with configuration software, e.g. STEP 7 (TIA Portal)
	• Type compatible (V1.1) with Backup&Restore • Type-compatible (V1.1) with Restore		
Port cycle time*	-	As short as possible	Channel

* Only effective if you use the "IO-Link manual" port mode.

5.1.2 Explanation of the parameters

Diagnostics: Undervoltage 1L+

Enabling of the diagnostics for insufficient supply voltage 1L+.

Diagnostics port

This parameter enables the diagnostics for the selected IO-Link port.
In the diagnostics A distinction is made between error and maintenance interrupts. The possible diagnostics are dependent on the IO-Link device used. More information about the diagnostic interrupts can be found in the description of the utilized IO-Link device.

Hardware interrupt (device notification)

Enable of the hardware interrupt for the selected IO-Link port.
The possible hardware interrupts are dependent on the IO-Link device used. More information on the hardware interrupts can be found in the description of the IO-Link device used.

NOTE

Configuration as digital input or digital output

Note that you cannot enable any port parameters or diagnostics alarms in SIO mode.

Diagnostics: Short-circuit

Enable diagnostics:

- On short-circuit of the encoder supply to ground.
- On short-circuit of the output to ground.
- On short-circuit of the output to 1L+.

Diagnostics: Wire break detection and alarm

Activates wire break detection and enabling of diagnostics for the digital input. In the event of an interruption of the cable between the encoder and I/O device, a diagnostics alarm is generated.

NOTE

- This diagnostics is only available for channels configured as inputs.
- Influence on the value status:
  If the parameter is deactivated, wire break detection is switched off. A wire break does not have an effect on the value status.

Input delay

This parameter can be used to suppress signal interference. Changes to the signal are only detected if they are present consistently for longer than the set input delay time.

For input channels with longer input delays, the read-in time is moved accordingly. This means individual channels can be assigned input delays, if necessary, without having a negative impact on the possible cycle time.

Hardware interrupt on rising edge (only for DIQ)

Specifies whether a hardware interrupt is generated for a rising edge on the channel.

Hardware interrupt on falling edge (only for DIQ)

Specifies whether a hardware interrupt is generated for a falling edge on the channel.

Configuration mode (only for DIQ)

Specifies whether the channel operates as digital input (DI) or digital output (DQ).

Reaction to CPU STOP (only for DIQ)

With this parameter, you set the reaction of the digital outputs of the I/O device after a CPU STOP:

- Shutdown: The digital output is de-energized.
- Keep last value: The last value of the digital output remains activated.
- Output substitute value 1: The I/O device outputs the substitute value "1".

Port configuration without S7-PCT

This parameter releases the port configuration without S7-PCT for the module.

NOTE

Changes to the port configuration

If you have assigned the IO-Link device parameters via port configuration without S7-PCT, or have configured the port as a digital input, digital output or deactivated, you can no longer change the port configuration via S7-PCT.

Operating mode

This parameter determines the mode in which the selected port should be operated.
You can select from the following options:

- IO-Link autostart
- IO-Link manual

IO-Link autostart

The connected IO-Link device starts automatically (Plug&Play functionality). The IO-Link device is immediately ready for operation.

IO-Link manual

The connected IO-Link device is **not** started automatically.
You must store the Vendor ID and Device ID of the connected IO-Link device in STEP 7.

Inspection Level/Data Storage

You can select the inspection level for data storage:

- Same type (V1.0) without Backup&Restore
- Type-compatible (V1.1) without Backup&Restore
- Type-compatible (V1.1) with Backup&Restore
- Type-compatible (V1.1) with Restore

Port cycle time

Set the IO-Link cycle time at the corresponding port.

ET 200AL IO-Link devices configured on the IO-Link submodules

You can find the parameters for the ET 200AL IO-Link modules that can be selected as IO-Link submodules in the manual for the respective module:

- ET 200AL DI 16x24VDC 8xM12 (6ES7141-5AH00-0BL0)
- ET 200AL DI 8x24VDC 8xM8 (6ES7141-5BF00-0BL0)
- ET 200AL DQ 8x24VDC/2A 8xM12 (6ES7142-5AF00-0BL0)
- ET 200AL DIQ 16x24 V DC/0.5 A, 8x M12 (6ES7143-5AH00-0BL0), only on the sockets X14 - X17
- ET 200AL DIQ 4+DQ 4x 24 V DC/0.5 A (6ES7143-5BF00-0BL0), only on the sockets X14 - X17

See also

You can find out more about the vendor ID and the device ID of an IO-Link device on the Internet (https://support.industry.siemens.com/cs/ww/en/view/109748852).

5.1.3 Address space

Introduction

The IO-Link master CM 8xIO-Link + DI 4x24VDC M12-L has eight ports. Each port is represented by a submodule.

Configuration of the IO-Link ports of the IO-Link master CM 8xIO-Link + DI 4x24VDC M12-L

The different operating modes of each IO-Link port are defined by configuring a corresponding submodule:

- as a digital input by configuring a digital input submodule,
- as a digital output by configuring a digital output submodule,
- as IO-Link device by configuring an IO-Link submodule,
- Port disabled:
  - in STEP 7 (TIA Portal): By deactivating the port enable.
  - with GSD: By plugging in a disabled IO-Link submodule (plugging in the submodule from the catalog, simply deleting an existing submodule is not sufficient)

The IO-Link ports are preconfigured as 2I + PQI.

When configuring IO-Link submodules, you can select the address spaces for I/O data in the following byte scales:

- ET 200AL DI 16x24VDC 8xM12
- ET 200AL DI 8x24VDC 8xM8
- ET 200AL DQ 8x24VDC/2A 8xM12
- ET 200AL DIQ 16x24 V DC/0.5 A, 8x M12

- ET 200AL DIQ 4+DQ 4x 24 V DC/0.5 A
- IO-Link 1 I/1 O + PQI
- IO-Link 2 I + PQI
- IO-Link 2 I/2 O + PQI
- IO-Link 4 I/4 O + PQI
- IO-Link 8 I/8 O + PQI
- IO-Link 16 I/16 O + PQI
- IO-Link 32 I/32 O + PQI

Port Qualifier Information (PQI)

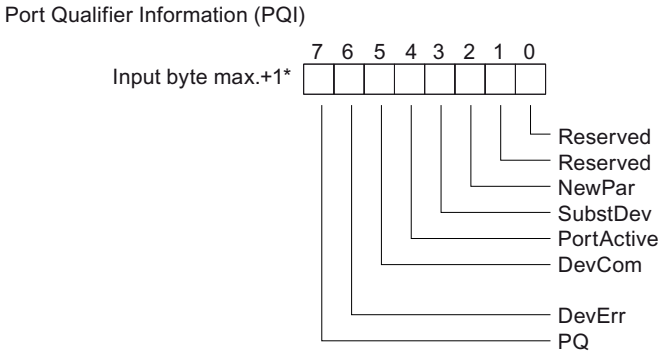
NOTE

Port Qualifier Information (PQI)

The Port Qualifier Information (PQI) with the size 1 byte is always transmitted together with the input data of the IO-Link device. The PQI cannot be deactivated.

	Description	Value	Meaning
Bit0	-	-	Reserved
Bit1	-	-	Reserved
Bit2	NewPar*	0	No update of the device parameters detected
		1	Device parameter update detected
Bit3	SubstDev*	0	No backup device detected (identical serial number)
		1	Backup device detected (different serial number)
Bit4	PortActive	0	Port disabled
		1	Port enabled
Bit5	DevCom	0	IO-Link device is not available
		1	IO-Link device is in the "Preoperate" or "Operate" state
Bit6	DevErr	0	No error
		1	An error or warning has occurred.
Bit7	PQ	0	The data of the IO-Link device is invalid
		1	The data of the IO-Link device is valid

* Bits are reset with function block "LIOLink_Master" .



* The PQI byte is always after the last input byte of the port.

Figure 5-1 Structure of the PQI byte

Address space for configuration as 1 x 4-channel DI 4x24VDC

The following figure shows the address space allocation for the configuration as 4-channel I/O device with digital inputs without value status. The addresses of the channels are derived from the start address.

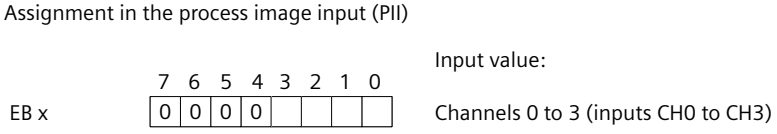


Figure 5-2 Address space DI 4x24VDC

Reference

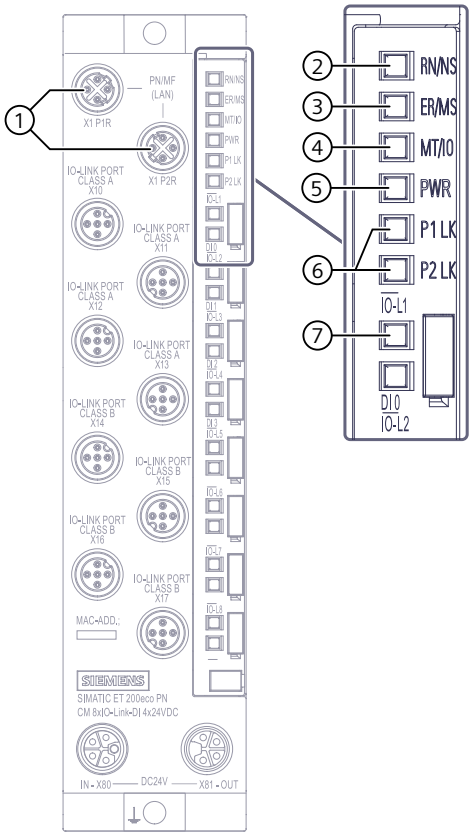
For more information, please refer to the IO-Link system (http://support.automation.siemens.com/WW/view/en/65949252) function manual.

5.2 Interrupts/diagnostics alarms

5.2.1 Status and error displays

LED displays

The following figure shows the LED display of the CM 8xIO-Link + DI 4x24VDC M12-L communication module.



① RN/NS: RUN/network status LED
② ER/MS: ERROR/module status LED
③ MT/IO: MAINT/IO status LED
④ PWR: Power LED for load voltage 2L+
⑤ P1 LK: LINK port status LED
⑥ P2 LK: LINK port status LED
⑦ LED displays IO-L_1 to IO-L_8 for channel status/channel fault
⑧ LED displays DI_0 to DI_3 for channel status

Figure 5-3 LED displays

Meaning of the LEDs

The following tables set out the meaning of the status and error displays.

Behavior of the LEDs RN/NS (RUN/network status), ER/MS (ERROR/module status) and MT/IO (MAINT/IO status)

Table 5-2 Error display of the LED

LED			Meaning	Remedy
RN/NS (green)	ERR/MS (red)	MT/IO (yellow)		
Off	Off	Off	No or insufficient supply voltage	Check the supply voltage.
On	On	On	Test of LEDs during startup: The three LEDs light up simultaneously for approximately 0.25 s.	-
			The three LEDs light up simultaneously for approximately 2 s while "Reset to factory settings" is running.	-
Flashes	Off	Off	Module is disabled	Activate the ET 200eco PN with the configuration software or via the user program.
			Module is not configured	Configure the ET 200eco PN via the configuration software.
			Module starts up	-
			Parameters are assigned to module	
			Loading firmware (when the firmware update is performed during startup, all LEDs retain their current status).	-
On	Not relevant	Not relevant	The ET 200eco PN is currently exchanging data with the IO controller.	-
Not relevant	Flashes	Not relevant	Module diagnostics is available	Evaluate the diagnostics and eliminate the error.
			The preset configuration does not match the actual configuration.	Check the configuration of the ET 200eco PN.
			Parameter error	Correct the errors in the parameter assignment.
Not relevant	Not relevant	On	Maintenance	Evaluate the maintenance events.
Flashes	Flashes	Flashes	The "Node flash test" is running (the P1 LK and P2 LK LEDs of the PROFINET interface are also flashing).	-
			Hardware or firmware faulty. (The P1 LK and P2 LK LEDs of the PROFINET interface are not flashing).	Replace the ET 200eco PN I/O device.

PWR LED

Table 5-3 Status display of the PWR LED

PWR LED	Meaning
Off	Load voltage 2L+ is missing or too low
On	Load voltage 2L+ present

LEDs P1 LK and P2 LK

The following table describes the behavior of LEDs that indicate the connection status with a PROFINET IO controller or a PROFINET switch.

Table 5-4 Status displays of the LEDs P1 LK and P2 LK

LEDs		Meaning	Remedy
P1 LK	P2 LK		
Off		There is **no** Ethernet connection between the communications interface of your IO device and a communication partner (e.g. IO controller).	Check whether the bus cable to the switch/communication partner is interrupted.
On		There is an Ethernet connection between the communications interface of your IO device and a communication partner (e.g. IO controller).	-
Flashes		The "Node flash test" is running (the RN/NS, ER/MS and MT/IO LEDs also flash).	-
		Communication error: A physical connection exists, but communication is not possible.	Check the PROFINET IO settings.

Channel status LEDs DI

Table 5-5 Status displays of the DI0, DI1, DI2, and DI3 LEDs

LEDs	Meaning
Channel status/channel error	
Off	Process value = 0
On	Process value = 1

Channel status/channel error LEDs IO-Link

The LEDs of IO-Link port class A and port class B have the same behavior.

LEDs Channel status/error	Meaning
Off	Input or output value is 0 or port is disabled.
On	IO-Link communication established, active device or channel fault.
Flashes	At startup or permanently, if no functional IO-Link device was found.
On	• DI/DQ operating mode: Input or output value is 1. • IO-Link operating mode: Communication is running.

5.2.2 Interrupts

Interrupts

The IO-Link Master **CM 8x IO-Link + DI 4x24VDC M12-L** supports the following interrupts:

- Diagnostics interrupts
- Hardware interrupts (at submodule port)
- Pull/plug interrupt (at submodule port)

In case of an alarm, the CPU of the IO controller automatically calls the interrupt OBs. Information on the cause and class of the error is available, based on the OB number and start information.

Detailed information on the error event can be obtained in the error OB using the instruction "RALRM" (read additional interrupt information).

Diagnostics interrupts

All IO-Link events of the type Error or Warning are mapped to the diagnostic interrupts of the assigned submodule. If you have parameterized the IO-Link master accordingly, it triggers a diagnostic interrupt for an incoming or outgoing event (alarm).
The coding of the events corresponds to the PROFINET standard of the extended channel diagnostics (USI=0x8002).

The CPU interrupts user program execution and processes the diagnostics interrupt OB (OB 82). You can determine the error events (channel diagnostics) with the "RALRM" instruction.

Hardware interrupts

All IO-Link events of the type Notification generated by the IO-Link device are mapped to the hardware interrupts of the assigned submodule.

The coding of the additional alarm information to the PROFINET standard "ProcessAlarmReason" (USI = 0x8320).

When a hardware interrupt occurs, the CPU interrupts execution of the user program and processes the hardware interrupt OB (for example OB 40). You can determine the events (ProcessAlarmReason) with the "RALRM" instruction.

Pull/plug interrupts

If you remove an IO-Link device or the IO-Link communication is interrupted, a pull alarm is generated by the assigned submodule.
As soon as you plug the IO-Link device back in or the IO-Link communication is re-established, a plug alarm is generated.

When an insert/remove module interrupt occurs, the CPU interrupts execution of the user program and processes the insert/remove module interrupt OB (OB 83). The event that triggered the interrupt is set in the start information of the insert/remove OB.

5.2.3 Alarms

The IO-Link master can generate diagnostic alarms of the type (severity) "Diagnostics" or "Maintenance" on behalf of the IO-Link device or the IO-Link port.

- Alarms of the "Diagnostics" type indicate a malfunction of the IO-Link device / port and should be corrected immediately.
- Alarms of the "Maintenance" type indicate a maintenance demand. The aim is to detect and eliminate potential faults at an early stage, even before functionality is impaired.
- Process alarm events signal the corresponding process states on the IO-Link device (e.g. limit exceeded)

5.2.3.1 Diagnostics alarms

IO-Link master error types

All IO-Link events of the type Error generated by the IO-Link device or port are mapped to the PROFINET diagnostics alarm of the "Diagnosis" type (severity) of the assigned submodule.

IO-Link device diagnostics

The IO-Link master generates PROFINET channel diagnostics (CET, ECET) from the IO-Link events of an IO-Link device according to the following mapping regulations:

In the "IO-Link Device Diagnostics - Page 1" (CET $0x9500_H$) the IO-Link event codes in the range 0x0000 - $0x7FFF_H$ are displayed directly:
$ECET_H$ = IO-Link Event $Code_H$

In the "IO-Link Device Diagnostics - Page 2" (CET $0x9501_H$) the IO-Link event codes in the range 0x8000 - $0xFFFF_H$ are displayed directly:
$ECET_H$ = (IO-Link Event $Code_H$ – $0x8000_H$)

Table 5-6 Overview of error types IO-Link device diagnostics

IO-Link event code	Error type (CET)	Extended error type (ECET)	Error text	Meaning
0x0000 - $0x7FFF_H$	$0x9500_H$ (38144_D)	0x0000 - $0x7FFF_H$ (0 - 32767_D)	Error / warning	See the manual of the IO-Link device or IODD file used.
0x8000 - $0xFFFF_H$	$0x9501_H$ (38134_D)	0x0000 - $0x7FFF_H$ (0 - 32767_D)	Error / warning	See the manual of the IO-Link device or IODD file used.

Example of displaying the IO-Link event codes:

An IO-Link device generates event code $0x4000_H$ (type "Error").
The channel diagnostics from the event code:

- PROFINET channel diagnostics type: Diagnosis, CET: $0x9500_H$, ECET: $0x4000_H$

  Diagnostics alarm "IO-Link Device Diagnostics - Page 1, Temperature fault - Overload", generated from the IO-Link event code $0x4000_H$.

IO-Link port diagnostics

The IO-Link master generates channel diagnostics for each port. The port-specific channel diagnostics are shown in the port diagnostics (CET $0x9502_H$).
The following table gives you an overview of the possible diagnostic events and their meaning.

Table 5-7 Overview of error types IO-Link port diagnostics

Error type (CET)	Extended error type (ECET)	Error text	Meaning
$0x9502_H$ (38136_D)	$0x17FF_H$ (6143_D)	Process data mismatch	Check submodule configuration
	0x1800H (32546D)	Device does not exist	Communication cancelled
	$0x1801_H$ (6145_D)	Parameter assignment error in startup	Check parameter assignment
	$0x1802_H$ (6146_D)	Wrong device VendorID	Check device
	$0x1803_H$ (6147_D)	Wrong device DeviceID	Check device
	$0x1804_H$ (6148_D)	Short-circuit to C/Q	Check port connection
	$0x1805_H$ (6149_D)	IO-Link PHY overtem-perature	
	$0x1806_H$ (6150_D)	Short-circuit to L+	Check port connection
	$0x1808_H$ (6152_D)	Event overflow on the device	
	$0x1809_H$ (6153_D)	Backup failed	Memory outside the range 2k

Error type (CET)	Extended error type (ECET)	Error text	Meaning
$0x9502_H$ (38136_D)	$0x180A_H$ (6154_D)	Backup invalid	Mismatch when identifying data storage
	$0x180B_H$ (6155_D)	Backup invalid	Data Storage unspecified error
	$0x180C_H$ (6156D)	Backup invalid	Upload error
	$0x180D_H$ (6157D)	Backup invalid	Download error
	$0x180E_H$ (6158_D)	P24 (Class B) missing or undervoltage	Check voltage supply (e.g. 2L+)
	$0x180F_H$ (6159_D)	Short circuit at P24 (Class B)	Check port connection
	$0x6000_H$ (24576_D)	Cycle time invalid	Check cycle time
	$0x6001_H$ (24577_D)	Revision error	Incompatible protocol version
	$0x6002_H$ (24578_D)	ISDU batch failed	Parameter inconsistency

See also

Diagnostics function manual
(https://support.industry.siemens.com/cs/ww/en/view/59192926)

5.2.3.2 Maintenance events

Maintenance events

All IO-Link events of the type Warning generated by the IO-Link device or port are mapped to the PROFINET diagnostics alarm of the "Maintenance" type of the assigned submodule. The aim is the early detection and elimination of potential faults.
For the IO-Link master, maintenance events signal to the user when a network component must be checked or replaced.

Example of displaying the IO-Link event codes:

An IO-Link device generates EventCode $0x8CA0_H$ (type "Warning").
The channel diagnostics results from the event code:

- PROFINET channel diagnostics type: Maintenance CET: $0x9501_H$, ECET: $0x0CA0_H$.

  Maintenance "IO-Link Device Diagnostics - Page 2, Ambient light interference", generated from the IO-Link event code $0x8CA0_H$.

5.2.3.3 Process alarm events

Hardware interrupt events

All IO-Link events (event codes) of the Notification type that are generated by the IO-Link device are mapped to the PROFINET process alarm of the assigned submodule.

The additional alarm information read out using RALRM contains the relevant IO-Link event code.

The coding of the additional alarm information corresponds to the coding USI = 0x8320 (ProcessAlarmReason).

EtherNet/IP

6

6.1 Functions/parameters/address space

6.1.1 Supported EtherNet/IP functions

Supported functions

The table below shows the functions that the I/O device supports with EtherNet/IP.

Supported functions	Remarks
I/O communication with scanner	FW 5.1.x or higher
Parameter assignment	FW 5.1.x or higher
Reading diagnostics	FW 5.1.x or higher
Normative CIP objects	FW 5.1.x or higher
Reset to factory settings	FW 5.1.x or higher
Diagnostics bit in data status of cyclic I/O data per submodule	FW 5.1.x or higher
Shared device functions	FW 5.1.x or higher
EtherNet/IP basic service	FW 5.1.x or higher
Reading events (hardware interrupts)	FW 5.1.x or higher
Data record interface	FW 5.1.x or higher

Supported diagnostics

The table below shows the diagnostics that the I/O device supports with EtherNet/IP.

Supported diagnostics	Remarks
Reading diagnostics via CIP EtherNet/IP	FW 5.1.x or higher
Reading diagnostics with MFCT	FW 5.1.x or higher
Reading hardware interrupt via CIP EtherNet/IP	FW 5.1.x or higher
PULL/PLUG event EtherNet/IP	FW 5.1.x or higher
Reading service data with MFCT	FW 5.1.x or higher

Supported CIP objects for EtherNet/IP

The table below shows the CIP objects that the I/O device supports with EtherNet/IP.

Supported CIP objects	Remarks
Identity object	FW 5.1.x or higher
Assembly object	FW 5.1.x or higher
Connection Manager object	FW 5.1.x or higher
TCP/IP Interface object	FW 5.1.x or higher
EtherNet Link object	FW 5.1.x or higher
LLDP Management object	FW 5.1.x or higher
LLDP Data Table object	Not supported
Param object	FW 5.1.x or higher

6.1.2 Parameters

Parameters

The following table shows the parameters that you can set for each port (each submodule) of the IO-Link master CM 8xIO-Link + DI 4x24VDC M12-L.

Table 6-1 Diagnostics and port parameters

Parameters	Value range	Default	Effective range with configuration software, for example, MFCT
Diagnostics			
Diagnostics: Missing 2L+	• Disable • Enable	Disable	Channel
Diagnostics undervoltage 1L+	• Disable • Enable	Disable	Channel
Diagnostics: Port	• Disable • Enable	Disable	Channel
Hardware interrupt (device notification)	• Disable • Enable	Disable	Channel
Port configuration			
Port configuration without S7-PCT	• Disable • Enable	Disable	Channel
Operating mode	• IO-Link autostart • IO-Link manual	0	Channel
Vendor ID**	Vendor ID of the connected IO-Link device	0	Channel

* Only effective if you use the "IO-Link manual" port mode.

Parameters	Value range	Default	Effective range with configuration software, for example, MFCT
DeviceID*	Device ID of the connected IO-Link device		Channel
Inspection Level/Data Storage*	• Same type (V1.0) without Backup&Restore • Type compatible (V1.1) without Backup&Restore • Type compatible (V1.1) with Backup&Restore • Type-compatible (V1.1) with Restore	Type-compatible (V1.1) with Backup&Restore	Channel
Port cycle time*	-	As short as possible	Channel

* Only effective if you use the "IO-Link manual" port mode.

6.1.3 Explanation of the parameters

Diagnostics: Missing 2L+

Enable of the diagnostics for no or insufficient load voltage.

Diagnostics: Undervoltage 1L+

Enabling of the diagnostics for insufficient supply voltage 1L+.

Diagnostics port

This parameter enables the diagnostics for the selected IO-Link port.
In the diagnostics A distinction is made between error and maintenance interrupts. The possible diagnostics are dependent on the IO-Link device used. Additional information about the diagnostic interrupts can be found in the description of the utilized IO-Link device.

Hardware interrupt (device notification)

Enable of the hardware interrupt for the selected IO-Link port.
The possible hardware interrupts are dependent on the IO-Link device used. Additional information on the hardware interrupts can be found in the description of the IO-Link device used.

NOTE

Configuration as digital input or digital output

Note that you cannot enable any port parameters or diagnostics alarms in SIO mode.

Port configuration without S7-PCT

This parameter releases the port configuration without S7-PCT for the module.

NOTE

Changes to the port configuration

If you have assigned the IO-Link device parameters via port configuration without S7-PCT, or have configured the port as a digital input, digital output or deactivated, you can no longer change the port configuration via S7-PCT.

Port Qualifier Information

This parameter enables the PortQualifier Information (PQI).
The PQI provides information on the device status of the port and IO-Link.

Operating mode

This parameter determines the mode in which the selected port should be operated.
You can select from the following options:

- IO-Link autostart
- IO-Link manual

IO-Link autostart

The connected IO-Link device starts automatically (Plug&Play functionality). The IO-Link device is immediately ready for operation.

IO-Link manual

The connected IO-Link device is **not** started automatically.
You must store the Vendor ID and Device ID of the connected IO-Link device in STEP 7.

Inspection Level/Data Storage

You can select the inspection level for data storage:

- Identical type (V1.0) without Backup&Restore
- Type-compatible (V1.1) without Backup&Restore
- Type-compatible (V1.1) with Backup&Restore
- Type-compatible (V1.1) with Restore

Port cycle time

Set the IO-Link cycle time at the corresponding port.

See also

You can find out more about the vendor ID and the device ID of an IO-Link device on the Internet (https://support.industry.siemens.com/cs/ww/en/view/109748852).

6.1.4 Update time of the I/O data

You can estimate the typical update time for an I/O cycle as follows:

RPI timer (settable from 2 to 20 ms ± 10 %) default 10 ms

+ I/O processing (typically 1.4 ms, ± 1 ms jitter due to free-running cycles)

+ EM conversion (dependent on cycle time and parameter assignment of the module)

If necessary, you must take into account other influences caused by the EIP scanner and network components by adding them.

6.1.5 Example address space

Configuration example

The following figure shows the configuration for this example in MFCT:

Slot	Name	Type
0	CM 8x IO-Link + DI 4x24VDC M12-L 8xM12 V5.1	IoLinkMaster
0.1	CM 8x IO-Link + DI 4x24VDC M12-L 8xM12 V5.1	
0.2		
0.3		
0.4		
1	CM 8x IO-Link + DI 4x24VDC M12-L 8xM12 V1.0	Digital
1.1	IO-Link Master + DI 4 (Pin 2)	
1.2	IO-Link 1 I/ 1 O + PQI	
1.3	IO-Link 1 I/ 1 O + PQI	

Figure 6-1 MFCT IO-Link master

Input range

The following table shows the input range for the example configuration:

Slot	Subslot	DataItem	Description
0	0	IDS	CM 8x IO-Link + DI 4x24VDC M12-L 8xM12 V5.1 / input data status
1	1	Inputs	IO-Link master + DI 4 (Pin 2)
1	1	IDS	IO-Link master + DI 4 (Pin 2) / input data status
1	2	Input_data_1_Byte	IO-Link 1 I/ 1 O + PQI
1	2	Port_status	IO-Link 1 I/ 1 O + PQI
1	2	IDS	IO-Link 1 I/ 1 O + PQI / input data status
1	3	Input_data_1_Byte	IO-Link 1 I/ 1 O + PQI
1	3	Port_status	IO-Link 1 I/ 1 O + PQI
1	3	IDS	IO-Link 1 I/ 1 O + PQI / input data status
1	2	ODS	IO-Link 1 I/ 1 O + PQI / output data status
1	3	ODS	IO-Link 1 I/ 1 O + PQI / output data status

Output range

The following table shows the output range for the example configuration:

Slot	Subslot	DataItem	Description
1	2	Output_data_1_Byte	IO-Link 1 I/ 1 O + PQI
1	3	Output_data_1_Byte	IO-Link 1 I/ 1 O + PQI

See also

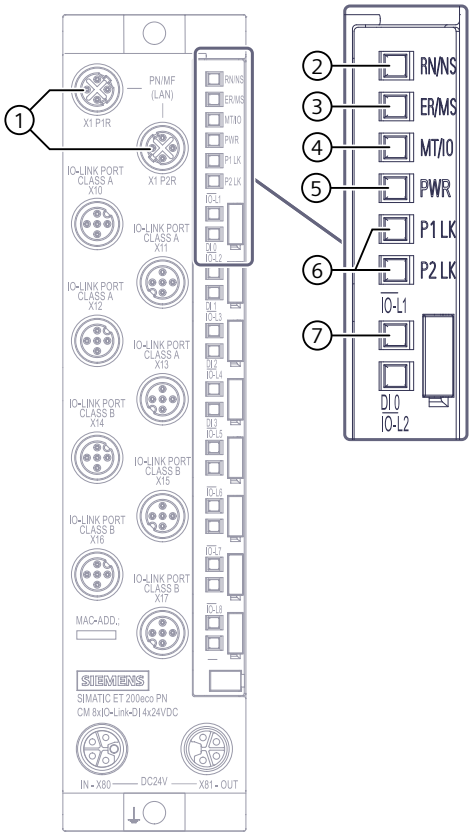
You can find more information in the MultiFieldbus (https://support.industry.siemens.com/cs/ww/en/view/109773209) function manual.

6.2 Diagnostics

6.2.1 Status and error displays for EtherNet/IP

LED displays

The following figure shows the LED display of the CM 8xIO-Link + DI 4x24VDC M12-L communication module.



① RN/NS: RUN/network status LED
② ER/MS: ERROR/module status LED
③ MT/IO: MAINT/IO status LED
④ PWR: Power LED for load voltage 2L+
⑤ P1 LK: LINK port status LED
⑥ P2 LK: LINK port status LED
⑦ LED displays IO-L_1 to IO-L_8 for channel status/channel fault
⑧ LED displays DI_0 to DI_3 for channel status

Figure 6-2 LED displays

Meaning of the LEDs

The following tables set out the meaning of the status and error displays.

Behavior of the LEDs RN/NS (RUN/network status), ER/MS (ERROR/module status) and MT/IO (MAINT/IO status) on EtherNet/IP

The LEDs display the status with the **highest priority** if there are different LED states due to overlaid events. (0 = off, 1 = green flashing, 2 = green, 3 = yellow, 4 = red flashing, 5 = red)

The following table shows the meaning of the RN/NS, ER/MS LEDs and MT/IO LEDs for EtherNet/IP:

Table 6-2 Error display of the LEDs

LEDs			Meaning	Remedy
RN/ NS	ER/ MS	MT/ IO		
□ Off	□ Off	□ Off	Missing or insufficient supply voltage at the I/O device.	• Check the supply voltage.
☼ Flashes	Not relevant	Not relevant	I/O device on, no data exchange	
■ On	Not relevant	Not relevant	The ET 200eco PN is currently exchanging data with the scanner.	
☼ Flashes	Not relevant	Not relevant	EtherNet/IP connection interrupted	
■ On	■ On	■ On	The ET 200eco PN is currently exchanging data with at least one EtherNet/IP connection.	---
			I/O devices used by EtherNet/IP are in RUN mode.	---
Not relevant	□ Off	Not relevant	No valid MultiFieldbus project is loaded in the ET 200eco PN.	
Not relevant	☼ Flashes	Not relevant	No data exchange. A valid MultiFieldbus project is loaded in the ET 200eco PN.	
Not relevant	■ On	Not relevant	Data exchange via EtherNet/IP	
Not relevant	☼ Flashes	Not relevant	Errors in the configuration or parameter assignment.	
Not relevant	Not relevant	□ Off	The EtherNet/IP I/O devices are in STOP mode. No error	
Not relevant	Not relevant	■ On	The EtherNet/IP I/O devices are in RUN mode.	
Not relevant	Not relevant	■ On	Maintenance	Evaluate the maintenance events.
Not relevant	Not relevant	☼ Flashes	IO diagnostics or missing I/O device of slots used by EtherNet/IP	

LEDs			Meaning	Remedy
RN/ NS	ER/ MS	MT/ IO		
Flashes	Flashes	Flashes	Test of LEDs during startup: The three LEDs light up simultaneously for approximately 0.25 s in red. Then for approximately 0.25 s in green.	---
Flashes	Flashes	Flashes	Hardware or firmware defective.	• You can read out the service data with MFCT.
Flashes	Flashes	Flashes	The "Node flash test" is running (the P1 LK and P2 LK LEDs are also flashing).	

PWR LED

Table 6-3 Status display of the PWR LED

PWR LED	Meaning
□ Off	Load voltage 2L+ is missing or too low
■ On	Load voltage 2L+ present

P1 LK and P2 LK LEDs

Table 6-4 Error display of the P1 LK and P2 LK LEDs

LEDs		Meaning	Remedy
P1 LK	P2 LK		
□ Off		There is **no** Ethernet connection between the communications interface of your IO device and a communication partner (e.g. scanner).	Check whether the bus cable to the switch/communication partner is interrupted.
■ On		There is an Ethernet connection between the communications interface of your IO device and a communication partner (e.g. scanner).	---
Flashes		The "Node flash test" is running (the RN/NS, ER/MS and MT/IO LEDs also flash).	---

Channel status LEDs DI

Table 6-5 Status displays of the DI0, DI1, DI2, and DI3 LEDs

LEDs Channel status/channel error	Meaning
□	Process value = 0
■ On	Process value = 1

Channel status/channel error LEDs IO-Link

The LEDs of IO-Link port class A and port class B have the same behavior.

LEDs Channel status/error	Meaning
□ Off	Input or output value is 0 or port is disabled.
■ On	IO-Link communication established, active device or channel fault.
■ Flashes	At startup or permanently, if no functional IO-Link device was found.
■ On	• DI/DQ operating mode: Input or output value is 1. • IO-Link operating mode: Communication is running.

Modbus TCP

7

7.1 Functions/parameters/address space

7.1.1 Supported Modbus TCP functions

Supported functions

The table below shows the functions that the I/O device supports with Modbus TCP.

Supported functions	RegLayoutVersion	Remarks
I/O communication with Modbus client	V1.0	FW 5.1.x or higher
Free user registers (e.g. for coordination of the redundancy)	V1.0	FW 5.1.x or higher
Device information	V1.0	FW 5.1.x or higher
Module configuration status register	≥ V1.1	FW 5.1.x or higher
Diagnostics bit in data status of cyclic I/O data per submodule	V1.0	FW 5.1.x or higher
Shared device functions	V1.0	FW 5.1.x or higher
Reading events (hardware interrupts)	V1.0	FW 5.1.x or higher
Data record interface	≥ V1.1	FW 5.1.x or higher

Supported diagnostics

The table below shows the diagnostics that the I/O device supports with Modbus TCP.

Supported diagnostics	Remarks
Reading diagnostics with MFCT	FW 5.1.x or higher
Reading hardware interrupts via event interface	FW 5.1.x or higher
PULL/PLUG event Modbus TCP	FW 5.1.x or higher
Reading service data with MFCT	FW 5.1.x or higher

7.1.2 Parameters

Parameters

The following table shows the parameters that you can set for each port (each submodule) of the IO-Link master CM 8xIO-Link + DI 4x24VDC M12-L.

Table 7-1 Diagnostics and port parameters

Parameters	Value range	Default	Effective range with configuration software, for example, MFCT
Diagnostics			
Diagnostics: Missing 2L+	• Disable • Enable	Disable	Channel
Diagnostics undervoltage 1L+	• Disable • Enable	Disable	Channel
Diagnostics: Port	• Disable • Enable	Disable	Channel
Hardware interrupt (device notification)	• Disable • Enable	Disable	Channel
Port configuration			
Port configuration without S7-PCT	• Disable • Enable	Disable	Channel
Operating mode	• IO-Link autostart • IO-Link manual	0	Channel
Vendor ID**	Vendor ID of the connected IO-Link device	0	Channel
DeviceID*	Device ID of the connected IO-Link device		Channel
Inspection Level/Data Storage*	• Same type (V1.0) without Backup&Restore • Type compatible (V1.1) without Backup&Restore • Type compatible (V1.1) with Backup&Restore • Type-compatible (V1.1) with Restore	Type-compatible (V1.1) with Backup&Restore	Channel
Port cycle time*	-	As short as possible	Channel

* Only effective if you use the "IO-Link manual" port mode.

7.1.3 Explanation of the parameters

Diagnostics: Missing 2L+

Enable of the diagnostics for no or insufficient load voltage.

Diagnostics: Undervoltage 1L+

Enabling of the diagnostics for insufficient supply voltage 1L+.

Diagnostics port

This parameter enables the diagnostics for the selected IO-Link port.
In the diagnostics A distinction is made between error and maintenance interrupts. The possible diagnostics are dependent on the IO-Link device used. Additional information about the diagnostic interrupts can be found in the description of the utilized IO-Link device.

Hardware interrupt (device notification)

Enable of the hardware interrupt for the selected IO-Link port.
The possible hardware interrupts are dependent on the IO-Link device used. Additional information on the hardware interrupts can be found in the description of the IO-Link device used.

NOTE
Configuration as digital input or digital output
Note that you cannot enable any port parameters or diagnostics alarms in SIO mode.

Port configuration without S7-PCT

This parameter releases the port configuration without S7-PCT for the module.

NOTE
Changes to the port configuration
If you have assigned the IO-Link device parameters via port configuration without S7-PCT, or have configured the port as a digital input, digital output or deactivated, you can no longer change the port configuration via S7-PCT.

Port Qualifier Information

This parameter enables the PortQualifier Information (PQI).
The PQI provides information on the device status of the port and IO-Link.

Operating mode

This parameter determines the mode in which the selected port should be operated.
You can select from the following options:

- IO-Link autostart
- IO-Link manual

IO-Link autostart

The connected IO-Link device starts automatically (Plug&Play functionality). The IO-Link device is immediately ready for operation.

IO-Link manual

The connected IO-Link device is **not** started automatically.
You must store the Vendor ID and Device ID of the connected IO-Link device in STEP 7.

Inspection Level/Data Storage

You can select the inspection level for data storage:

- Identical type (V1.0) without Backup&Restore
- Type-compatible (V1.1) without Backup&Restore
- Type-compatible (V1.1) with Backup&Restore
- Type-compatible (V1.1) with Restore

Port cycle time

Set the IO-Link cycle time at the corresponding port.

See also

You can find out more about the vendor ID and the device ID of an IO-Link device on the Internet (https://support.industry.siemens.com/cs/ww/en/view/109748852).

7.1.4 Update time of the I/O data

You can estimate the typical update time for an I/O cycle as follows:

Update time (can be set starting at 2 ms)

+ I/O processing (typically 1.4 ms, +/- 1 ms jitter due to free-running cycles)

+ EM conversion (dependent on cycle time and parameter assignment of the module)

If necessary, you must take into account other influences caused by the MTCP client and network components by adding them.

7.1.5 Example address space

Configuration example

The following figure shows the configuration for this example in MFCT:

Slot	Name	Type
0	CM 8x IO-Link + DI 4x24VDC M12-L 8xM12 V5.1	IoLinkMaster
0.1	CM 8x IO-Link + DI 4x24VDC M12-L 8xM12 V5.1	
0.2		
0.3		
0.4		
1	CM 8x IO-Link + DI 4x24VDC M12-L 8xM12 V1.0	Digital
1.1	IO-Link Master + DI 4 (Pin 2)	
1.2	IO-Link 1 I/ 1 O + PQI	
1.3	IO-Link 1 I/ 1 O + PQI	

Figure 7-1 MFCT IO-Link master

Input range

The following table shows the input range for the example configuration:

Slot	Subslot	DataItem	Description
0	0	IDS	CM 8x IO-Link + DI 4x24VDC M12-L 8xM12 V5.1 / input data status
1	1	Inputs	IO-Link master + DI 4 (Pin 2)
1	1	IDS	IO-Link master + DI 4 (Pin 2) / input data status
1	2	Input_data_1_Byte	IO-Link 1 I/ 1 O + PQI
1	2	Port_status	IO-Link 1 I/ 1 O + PQI
1	2	IDS	IO-Link 1 I/ 1 O + PQI / input data status
1	3	Input_data_1_Byte	IO-Link 1 I/ 1 O + PQI
1	3	Port_status	IO-Link 1 I/ 1 O + PQI
1	3	IDS	IO-Link 1 I/ 1 O + PQI / input data status
1	2	ODS	IO-Link 1 I/ 1 O + PQI / output data status
1	3	ODS	IO-Link 1 I/ 1 O + PQI / output data status

Output range

The following table shows the output range for the example configuration:

Slot	Subslot	DataItem	Description
1	2	Output_data_1_Byte	IO-Link 1 I/ 1 O + PQI
1	3	Output_data_1_Byte	IO-Link 1 I/ 1 O + PQI

See also

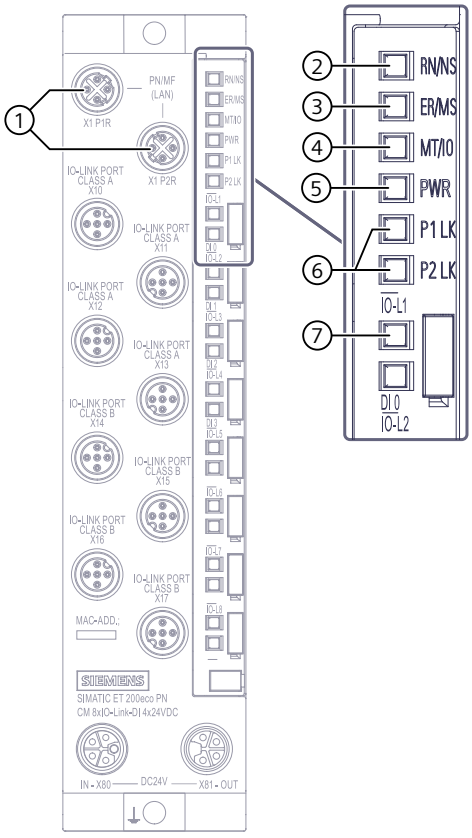
You can find more information in the MultiFieldbus (https://support.industry.siemens.com/cs/ww/en/view/109773209) function manual.

7.2 Diagnostics

7.2.1 Status and error displays for Modbus TCP

LED displays

The following figure shows the LED display of the CM 8xIO-Link + DI 4x24VDC M12-L communication module.



① RN/NS: RUN/network status LED
② ER/MS: ERROR/module status LED
③ MT/IO: MAINT/IO status LED
④ PWR: Power LED for load voltage 2L+
⑤ P1 LK: LINK port status LED
⑥ P2 LK: LINK port status LED
⑦ LED displays IO-L_1 to IO-L_8 for channel status/channel fault
⑧ LED displays DI_0 to DI_3 for channel status

Figure 7-2 LED displays

Meaning of the LEDs

The following tables set out the meaning of the status and error displays.

Behavior of the LEDs RN/NS (RUN/network status), ER/MS (ERROR/module status) and MT/IO (MAINT/IO status) on modbus TCP

The LEDs display the status with the **highest priority** if there are different LED states due to overlaid events. (0 = off, 1 = green flashing, 2 = green, 3 = yellow, 4 = red flashing, 5 = red)

The following table shows the meaning of the RN/NS, ER/MS LEDs and MT/IO LEDs for Modbus TCP:

Table 7-2 Error display of the LEDs

LEDs			Meaning	Remedy
RN/ NS	ER/ MS	MT/ IO		
□ Off	□ Off	□ Off	Missing or insufficient supply voltage at the I/O device.	• Check the supply voltage.
☼ Flashes	□ Off	□ Off	I/O device on, no data exchange	
■ On	□ Off	□ Off	The I/O device is exchanging data with any connection.	
☼ Flashes	☼ Flashes	□ Off	MultiFieldbus project is present in the I/O device, no data exchange	
■ On	■ On	□ Off	The I/O device exchanges data without errors via a modbus TCP connection	
■ On	☼ Flashes	□ Off	The I/O device exchanges data. An error has occurred in the I/O device.	Check the following: • Configuration • Parameter settings • PNIO diagnostics
☼ Flashes	☼ Flashes	□ Off	The I/O device does not exchange data. An error has occurred in the I/O device.	
☼ Flashes	☼ Flashes	□ Off	An existing connection to modbus TCP was terminated by a timeout	
☼ Flashes	☼ Flashes	□ Off	An existing connection to Modbus TCP was terminated by a timeout Errors in the configuration or parameter assignment.	Check the following: • Configuration • Parameter assignment
☼ Flashes	☼ Flashes	☼ Flashes	Test of LEDs during startup: The three LEDs light up simultaneously for approximately 0.25 s in red. Then for approximately 0.25 s in green.	---
☼ Flashes	☼ Flashes	☼ Flashes	Hardware or firmware defective.	• You can read out the service data with MFCT.
☼ Flashes	☼ Flashes	☼ Flashes	The "Node flash test" is running (the P1 LK and P2 LK LEDs are also flashing).	

PWR LED

Table 7-3 Status display of the PWR LED

PWR LED	Meaning
□ Off	Load voltage 2L+ is missing or too low
■ On	Load voltage 2L+ present

P1 LK and P2 LK LEDs

Table 7-4 Error display of the P1 LK and P2 LK LEDs

LEDs		Meaning	Remedy
P1 LK	P2 LK		
□ Off		There is **no** Ethernet connection between the communications interface of your IO device and a communication partner (e.g. scanner).	Check whether the bus cable to the switch/communication partner is interrupted.
■ On		There is an Ethernet connection between the communications interface of your IO device and a communication partner (e.g. scanner).	---
☼ Flashes		The "Node flash test" is running (the RN/NS, ER/MS and MT/IO LEDs also flash).	---

Channel status LEDs DI

Table 7-5 Status displays of the DI0, DI1, DI2, and DI3 LEDs

LEDs	Meaning
Channel status/channel error	
□ Off	Process value = 0
☼ On	Process value = 1

Channel status/channel error LEDs IO-Link

The LEDs of IO-Link port class A and port class B have the same behavior.

LEDs Channel status/error	Meaning
Off	Input or output value is 0 or port is disabled.
On	IO-Link communication established, active device or channel fault.
Flashes	At startup or permanently, if no functional IO-Link device was found.
On	• DI/DQ operating mode: Input or output value is 1. • IO-Link operating mode: Communication is running.

Technical specifications

8

Technical specifications of the CM 8xIO-Link + DI 4x24VDC M12-L communication module

The following table shows the technical specifications as of the issue date. You can find a data sheet including daily updated technical specifications on the Internet (https://support.industry.siemens.com/cs/de/en/pv/6ES7148-6JG00-0BB0/td?dl=de).

Article number	6ES7148-6JG00-0BB0
General information	
HW functional status	FS05
Firmware version	V5.2.x
• FW update possible	Yes
Vendor identification (VendorID)	002AH
Device identifier (DeviceID)	0306H
Manufacturer ID according to ODVA (VendorID)	04E3H
Device ID according to ODVA (Product code)	0FA9H
Product function	
• I&M data	Yes; I&M0 to I&M3, I&M5
• Isochronous mode	No
• Prioritized startup	Yes
Engineering with	
• STEP 7 TIA Portal configurable/integrated from version	STEP 7 V17 or higher with HSP 0363
• PROFINET from GSD version/GSD revision	GSDML V2.3.x
• Multi Fieldbus Configuration Tool (MFCT)	from V1.3 SP1
Operating mode	
• DI	Yes
• Counter	No
• DQ	No
• MSI	No
• MSO	No
Supply voltage	
power supply according to NEC Class 2 required	No

Article number	6ES7148-6JG00-0BB0
Load voltage 1L+	
• Rated value (DC)	24 V
• permissible range, lower limit (DC)	20.4 V
• permissible range, upper limit (DC)	28.8 V
• Reverse polarity protection	Yes; Against destruction; encoder power supply outputs applied with reversed polarity
Load voltage 2L+	
• Rated value (DC)	24 V
• permissible range, lower limit (DC)	20.4 V
• permissible range, upper limit (DC)	28.8 V
• Reverse polarity protection	Yes; against destruction
Input current	
Current consumption (rated value)	70 mA; without load
from load voltage 1L+ (unswitched voltage)	12 A; Maximum value
from load voltage 2L+, max.	12 A; Maximum value
Encoder supply	
Number of outputs	8
24 V encoder supply	
• Short-circuit protection	Yes; per channel, electronic
• Output current, max.	0.5 A; Per channel
Power loss	
Power loss, typ.	5.5 W
Address area	
Address space per module	
• Inputs	264 byte; + 8 bytes for QI information
• Outputs	256 byte
Hardware configuration	
Submodules	
• Number of configurable submodules, max.	9
Digital inputs	
Number of digital inputs	4
Source/sink input	P-reading
Input characteristic curve in accordance with IEC 61131, type 3	Yes
Number of simultaneously controllable inputs	
all mounting positions	
– up to 60 °C, max.	4

Article number	**6ES7148-6JG00-0BB0**
Input voltage	
• Rated value (DC)	24 V
• for signal "0"	-3 to +5V
• for signal "1"	+11 to +30V
Input current	
• for signal "1", typ.	2.5 mA
Input delay (for rated value of input voltage)	
for standard inputs	
– at "0" to "1", max.	typically 3 ms
– at "1" to "0", max.	typically 3 ms
Cable length	
• unshielded, max.	30 m
IO-Link	
Number of ports	8
• of which simultaneously controllable	8
IO-Link protocol 1.0	Yes
IO-Link protocol 1.1	Yes
Transmission rate	4.8 kBaud (COM1); 38.4 kBaud (COM2), 230 kBaud (COM3)
Cycle time, min.	2 ms
Size of process data, input per port	33 byte
Size of process data, input per module	264 byte
Size of process data, output per port	32 byte
Size of process data, output per module	256 byte
Memory size for device parameter	2 kbyte; for each port
Master backup	possible with LIOLink_Master function block
Configuration without S7-PCT	Possible; autostart/manual function
Cable length unshielded, max.	20 m
Operating modes	
• IO-Link	Yes
• DI	Yes
• DQ	Yes; max. 100 mA
Connection of IO-Link devices	
• Port type A	Yes; via 3-core cable
• Port type B	Yes; additional device supply: max. 2 A per port, max. 6 A per module
Interfaces	
Number of PROFINET interfaces	1
1. Interface	
Interface type	PROFINET with 100 Mbit/s full duplex (100BASE-TX)

Article number	6ES7148-6JG00-0BB0
Interface types	
• M12 port	Yes; 2x M12, 4-pin, D-coded
• Number of ports	2
• integrated switch	Yes
Protocols	
• PROFINET IO Device	Yes
• Open IE communication	Yes
Interface types	
M12 port	
• Autonegotiation	Yes
• Autocrossing	Yes
• Transmission rate, max.	100 Mbit/s
Protocols	
Supports protocol for PROFINET IO	Yes
PROFIsafe	No
EtherNet/IP	Yes
Modbus TCP	Yes
PROFINET IO Device	
Services	
– IRT	Yes; 250 µs to 4 ms in 125 µs frame
– Prioritized startup	Yes
– Shared device	Yes
– Number of IO Controllers with shared device, max.	2
Redundancy mode	
• PROFINET system redundancy (S2)	Yes
– on S7-1500R/H	Yes
– on S7-400H	Yes
• PROFINET system redundancy (R1)	No
• H-Sync forwarding	Yes
Media redundancy	
– MRP	Yes
EtherNet/IP	
Services	
– CIP Implicit Messaging	Yes
– CIP Explicit Messaging	Yes
– CIP Safety	No
– Shared device	Yes; 2x EtherNet/IP Scanner
– Number of scanners with shared device, max.	2

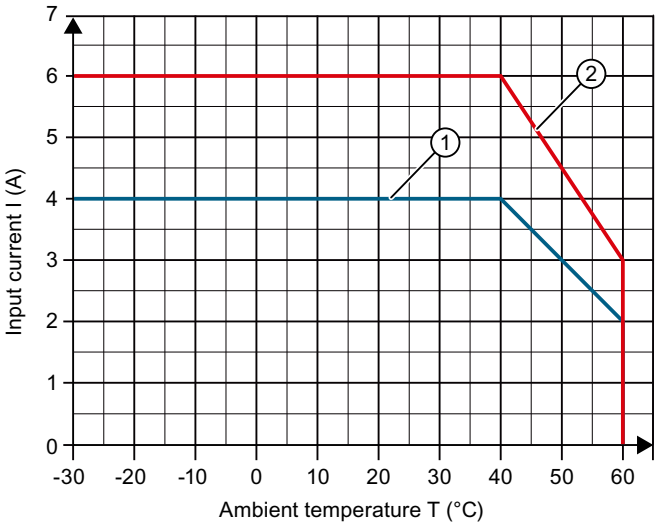
Article number	6ES7148-6JG00-0BB0
Updating times	
– Requested Packet Interval (RPI)	2 ms
Redundancy mode	
– DLR (Device Level Ring)	No
Address area	
– Address space per module, max.	300 byte
– LargeForwardOpen (Class3)	No
Modbus TCP	
Services	
– read coils (code=1)	Yes
– read discrete inputs (code=2)	Yes
– Read Holding Registers (Code=3)	Yes
– write single coil (code=5)	Yes
– write multiple coils (code=15)	Yes
– Write Multiple Registers (Code=16)	Yes
– Parameter change by master	No
– Modbus TCP Security Protocol	No
Address space per station	
– Address space per station, max.	300 byte
– Access-consistent address space	2 byte
Updating time	
– I/O request interval	2 ms
Connections	
– number of connections per device	12
Open IE communication	
• TCP/IP	Yes; (only EtherNet/IP or Modbus TCP)
• SNMP	Yes
• LLDP	Yes
• ARP	Yes
Interrupts/diagnostics/status information	
Alarms	
• Diagnostic alarm	Yes; Parameterizable
• Maintenance interrupt	Yes; Parameterizable
Diagnoses	
• Diagnostic information readable	Yes
• Monitoring the supply voltage	Yes
– parameterizable	Yes
• Wire-break	Yes
• Short-circuit encoder supply	Yes; Per channel

Article number	6ES7148-6JG00-0BB0
Diagnostics indication LED	
• RUN LED	Yes; green LED
• ERROR LED	Yes; red LED
• MAINT LED	Yes; Yellow LED
• Monitoring of the supply voltage (PWR-LED)	Yes; green LED
• NS LED	Yes; green/red LED
• MS LED	Yes; green/red LED
• IO LED	Yes; red/green/yellow LEDs
• Channel status display	Yes; green LED
• for channel diagnostics	Yes; red LED
• For load voltage monitoring	Yes; green LED
• Connection display LINK TX/RX	Yes; green LED, only link
Potential separation	
between the load voltages	Yes
between Ethernet and electronics	Yes
Potential separation channels	
• between the channels	No
• between the channels and the power supply of the electronics	No
Isolation	
tested with	
• 24 V DC circuits	707 V DC (type test)
• Test voltage for interface, rms value [Vrms]	1 500 V; According to IEEE 802.3
Degree and class of protection	
IP degree of protection	IP65/67/69K
Standards, approvals, certificates	
Suitable for safety-related tripping of standard modules	Yes; From FS01
Highest safety class achievable for safety-related tripping of standard modules	
• Performance level according to ISO 13849-1	PL d
• Category according to ISO 13849-1	Cat. 3
• SIL acc. to IEC 62061	SIL 2
• remark on safety-oriented shutdown	https://support.industry.siemens.com/cs/de/en/view/39198-632
Use in hazardous areas	
• Explosion protection category for gas	ATEX, UKEX, IECEx, CCCEx for Zone 2
• Explosion protection category for dust	ATEX, UKEX, IECEx, CCCEx for Zone 22

Article number	6ES7148-6JG00-0BB0
product functions / security / header	
signed firmware update	Yes
safely removing data	Yes
Ambient conditions	
Ambient temperature during operation	
• min.	-40 °C
• max.	60 °C
Altitude during operation relating to sea level	
• Ambient air temperature-barometric pressure-altitude	Up to max. 5 000 m, at installation height > 2 000 m additional restrictions, see manual for details
connection method	
Design of electrical connection	4/5-pin M12 circular connectors
Design of electrical connection for the inputs and outputs	M12, 5-pin, A-coded
Design of electrical connection for supply voltage	M12, 4-pin, L-coded
Dimensions	
Width	45 mm
Height	200 mm
Depth	48 mm
Weights	
Weight, approx.	780 g

Power reduction (derating) to total current of outputs, per module,

The following derating curves show the load capacity of the transducer supply outputs in relation to the mounting position and the ambient temperature.



① Total current of outputs 1L+

② Total current of outputs 2L+

Figure 8-1 Derating curve, IO-Link master

Dimension drawing

A

The following figure shows the dimension drawing of the CM 8xIO-Link + DI 4x24VDC M12-L communication module in front and side view.

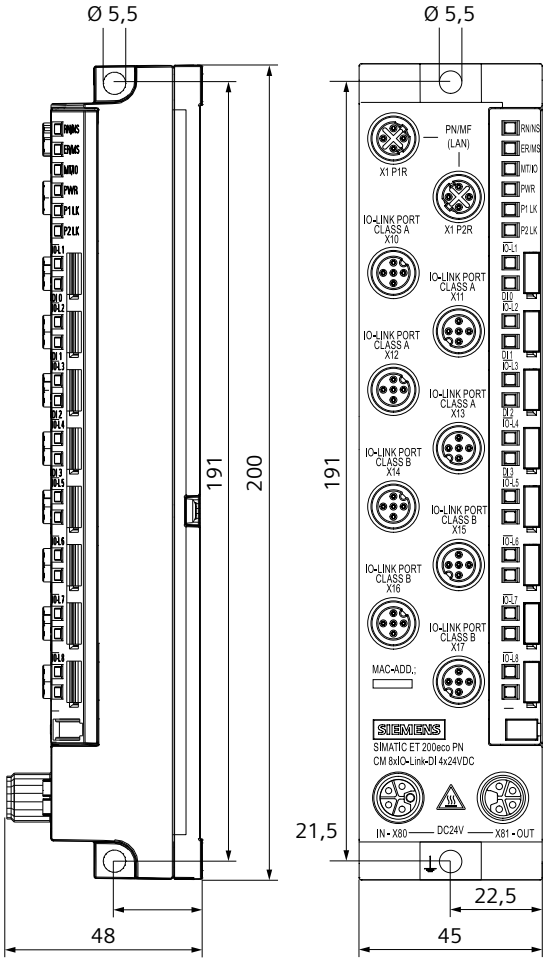


Figure A-1 Dimension drawing

Parameter data record

B

B.1 Dependencies for the configuration

When configuring the I/O device, the parameter settings are independent of each other.

B.2 Error transferring the data record

Error transferring the data record

The I/O device checks the values of the transferred data record. Only if the values were transferred without errors does the I/O device apply the values from the data record.

The "WRREC" instruction for writing data records returns corresponding error codes in the "STATUS" parameter when errors occur. For STEP 7 you will also find the parameter description in the STEP 7 online help.

The Error codes table shows the following:

- The specific error codes of the I/O device
- The meaning of the error code
- A suggestion for correcting the error
- The data record at which the error may occur

Table B-1 Error codes

Error code in STATUS parameter (hexadecimal)				Meaning	Remedy	DS 0xB900
Byte 0	Byte 1	Byte 2	Byte 3			
DF	80	B1	xx	Length of the data record incorrect.	Enter a valid value for the data record length.	✓
DF	80	B8	xx	Incorrect parameter.	Check the parameters of the I/O device.	✓