SIEMENS

SIMATIC

ET 200pro
IO-Link Master
(6ES7147-4JD00-0AB0)

Manual

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.

If more than one degree of danger is present, the warning notice representing the highest degree of danger will be used. A notice warning of injury to persons with a safety alert symbol may also include a warning relating to property damage.

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.

Proper use of Siemens products

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⚠ 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.

Trademarks

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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.

Preface

Purpose of the documentation

This product manual supplements the ET 200pro Distributed I/O System operating instructions. It contains the description of all functions of the ET 200pro IO-Link Master. The information in this manual and the ET 200pro Distributed I/O System operating instructions enables you to commission the ET 200pro IO-Link Master.

Information about functions that are generally associated with the ET 200pro Distributed I/O System can be found in the ET 200pro Distributed I/O System operating instructions on the Internet (http://support.automation.siemens.com/WW/view/en/21210852).

Information about functions that are generally associated with the IO-Link system can be found in the IO-Link System function manual on the Internet (http://support.automation.siemens.com/WW/view/en/65949252).

Basic knowledge required

General knowledge of automation engineering and the use of IO-Link systems is needed to understand this manual.

Scope of the manual

This manual is valid for the following modules of the ET 200pro Distributed I/O System:

- Electronic module IO-Link Master EM 4 IO-Link HF (6ES7147-4JD00-0AB0)

- In combination with connection module CM IO-Link 4×M12P (6ES7194-4CA20-0AA0)

This manual contains a description of the components which were valid at the time the manual was published. We reserve the right to issue a Product Information which contains up-to-date information about new components and new versions of components.

Changes compared to previous version

Compared to the previous version, this manual contains the following changes/additions:

- Functional expansion "Port configuration without S7-PCT" of the electronic module IO-Link master EM 4 IO-Link HF.

Recycling and disposal

The ET 200pro IO-LINK Master is low in contaminants and can therefore be recycled. For environmentally friendly recycling and disposal of your old equipment, contact a certified electronic waste disposal company and dispose of the equipment according to the applicable regulations in your country.

Additional support

If you have questions regarding use of the products described in this manual, and do not find the answers in this document, contact your local Siemens representative.

Your personal contact person can be found on the Internet (http://www.automation.siemens.com/partner/).

A guide to the technical documentation for the various SIMATIC products and systems can be found on the Internet (https://support.industry.siemens.com/cs/ww/en/view/109742705).

The online catalog and online ordering system can be found on the Internet (http://mall.industry.siemens.com).

Technical Support

Expert advice on technical questions with a wide range of demand-optimized services for all our products and systems.

Technical Support can be found on the Internet (http://www.siemens.com/automation/service).

Security information

Siemens provides products and solutions with industrial security 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 security 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 security measures that may be implemented, please visit (https://www.siemens.com/industrialsecurity).

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 customers' exposure to cyber threats.
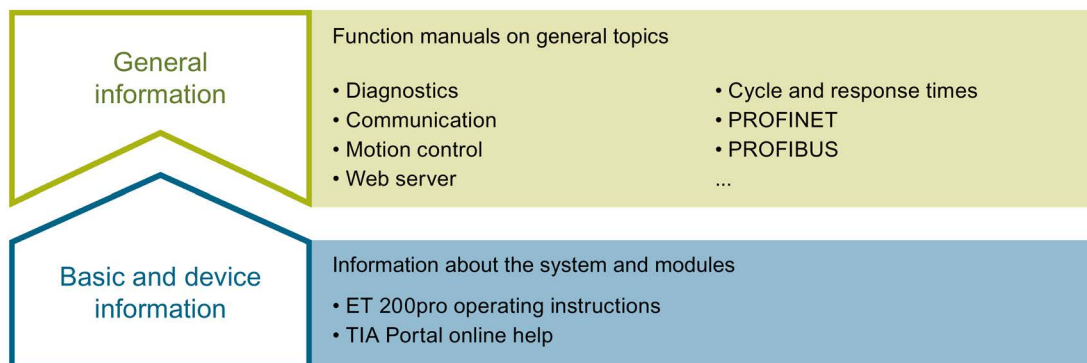
To stay informed about product updates, subscribe to the Siemens Industrial Security RSS Feed under (https://www.siemens.com/industrialsecurity).

Table of contents

Documentation guide

The documentation for the distributed I/O system ET 200pro and for the S7-1500 based CPU 1516pro-2 PN is arranged into various areas. This arrangement enables you to access the specific content you require.

General information	Function manuals on general topics
	• Diagnostics • Cycle and response times • Communication • PROFINET • Motion control • PROFIBUS • Web server ...

Basic and device information	Information about the system and modules
	• ET 200pro operating instructions • TIA Portal online help

Basic and device information

The operating instructions describe in detail the configuration, installation, wiring and commissioning of the ET 200pro distributed I/O system. In addition, the operating instructions also contain device information such as properties, wiring diagrams, characteristics, and technical specifications. The STEP 7 online help supports you in the configuration and programming.

General information

The function manuals contain detailed descriptions on general topics such as diagnostics, communication, Motion Control, Web server, OPC UA.

You can download the documentation free of charge from the Internet (http://w3.siemens.com/mcms/industrial-automation-systems-simatic/en/manual-overview/Pages/Default.aspx).

Changes and supplements to the manuals are documented in a Product Information.

"mySupport"

With "mySupport", your personal workspace, you make the best out of your Industry Online Support.

In "mySupport", you can save filters, favorites and tags, request CAx data and compile your personal library in the Documentation area. In addition, your data is already filled out in support requests and you can get an overview of your current requests at any time.

You must register once to use the full functionality of "mySupport".

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

"mySupport" - Documentation

In the Documentation area in "mySupport" you can combine entire manuals or only parts of these to your own manual.
You can export the manual as PDF file or in a format that can be edited later.

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

"mySupport" - CAx data

In the CAx data area in "mySupport", you can access the current product data for your CAx or CAe system.

You configure your own download package with a few clicks.

In doing so you can select:

- 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" - CAx data on the Internet (http://support.industry.siemens.com/my/ww/en/CAxOnline).

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 will find the application examples on the Internet (https://support.industry.siemens.com/sc/ww/en/sc/2054).

TIA Selection Tool

With the TIA Selection Tool, you can select, configure and order devices for Totally Integrated Automation (TIA).
This tool is the successor of the SIMATIC Selection Tool and combines the known configurators for automation technology into one 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 (http://w3.siemens.com/mcms/topics/en/simatic/tia-selection-tool).

SIMATIC Automation Tool

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

General function overview:

- Network browsing and creation of a table showing the accessible devices in the network.

- Flashing of device LEDs or HMI display to locate a device

- Downloading of addresses (IP, subnet, gateway) to a device

- Downloading the PROFINET name (station name) to a device

- Placing a CPU in RUN or STOP mode

- Setting the time in a CPU to the current time of your PG/PC

- Downloading a new program to a CPU or an HMI device

- Downloading from CPU, downloading to CPU or deleting recipe data from a CPU

- Downloading from CPU or deleting data log data from a CPU

- Backup/restore of data from/to a backup file for CPUs and HMI devices

- Downloading service data from a CPU

- Reading the diagnostics buffer of a CPU

- Performing a CPU memory reset

- Resetting devices to factory settings

- Downloading a firmware update to a device

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

PRONETA

With SIEMENS PRONETA (PROFINET network analysis), you analyze the PROFINET network during commissioning. PRONETA features two core functions:

- The topology overview independently scans PROFINET network and all connected components.

- The IO check is a fast test of the wiring and the module configuration of a system.

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

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 optimal exploitation of resources

You can find SINETPLAN on the Internet (https://www.siemens.com/sinetplan).

Product overview

<div style="text-align: right; font-size: 3em;">2</div>

2.1   Properties

Article numbers

6ES7147-4JD00-0AB0 (electronic module EM 4 IO-Link HF)

6ES7194-4CA20-0AA0 (connection module CM IO-Link 4×M12P)

View of the module

The figure below shows the electronic module EM 4 IO-Link HF together with the connection module CM IO-Link 4×M12P.
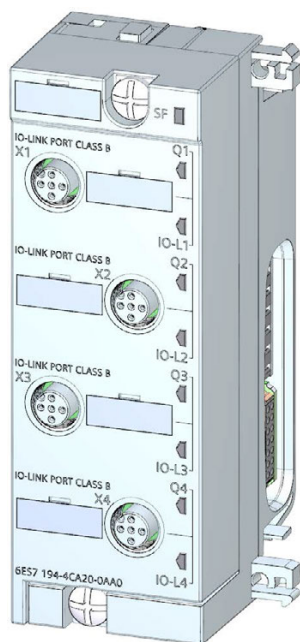

Figure 2-1   Electronic module EM 4 IO-Link HF with connection module CM IO-Link 4×M12P

Properties

The electronic module EM 4 IO-Link HF in combination with the connection module CM IO-Link 4×M12P has the following technical properties:

- IO-Link master according to IO-Link Specification V1.1

- Dimensions 45 x 130 mm

- 4 IO-Link ports (Port Class B)

- 4 M12 connections

- SIO mode (standard IO mode)

- Supported data transmission rates:

    - COM1 (4.8 kBd)

    - COM2 (38.4 kBd)

    - COM3 (230.4 kBd)

- Configuration limits:

    - Max. 32 bytes input data and 32 bytes output data per port

    - Max. 32 bytes input data and 32 bytes output data per module

- Automatic backup of device parameters during replacement of the IO-Link device (only for V1.1 devices)

- Suitable for connection of IO-Link devices with 3-wire and 5-wire connection

- Configurable diagnostics can be set for each port (in IO-Link mode)

The module supports the following functions:

Table 2- 1   Version dependencies of the module functions

Function	Firmware version of the module
Firmware update	V1.0 or higher
Master backup with function block "IO_LINK_MASTER"	V1.0 or higher
IO-Link port configuration with S7-PCT (as of V3.4 Hotfix 1)	V1.0 or higher
IO-Link port configuration without S7-PCT (as of V3.5 Update 1)	V1.1 or higher
PortQualifierInformation (PQI)	V1.1 or higher

Hardware and software requirements

You can use the IO-Link master with firmware version 1.1 in combination with the following interface modules or CPUs of the ET 200pro distributed I/O system:

- IM 154-1 DP (6ES7154-1AA01-0AB0)

- IM 154-2 DP HF (6ES7154-2AA01-0AB0)

- IM 154-3 PN HF (6ES7154-3AB00-0AB0)

- IM 154-4 PN HF (6ES7154-4AB10-0AB0) Firmware V7.1 and higher

- IM 154-8 PN/DP CPU (6ES7154-8AB01-0AB0), Firmware V3.2 and higher, not in combination with STEP 7 (TIA Portal)

- IM 154-8F PN/DP CPU (6ES7154-8FB01-0AB0), Firmware V3.2 and higher, not in combination with STEP 7 (TIA Portal)

- IM 154-8FX PN/DP CPU (6ES7154-8FX00-0AB0), Firmware V3.2 and higher, not in combination with STEP 7 (TIA Portal)

- CPU 1516pro-2 PN (6ES7516-2PN00-0AB0)

Note

Firmware update of the IO-Link master in connection with CPU 1516pro-2 PN

When you carry out a firmware update for the IO-Link master, please note that you need to exchange the IO-Link master in the HW configuration of your TIA Portal project for the newer version and download the project again to the CPU. This applies to use in connection with a CPU 1516pro-2 PN up to firmware version 2.5.

You need the following configuration software for operation of the IO-Link master:

- STEP 7 as of V5.5 SP4 with HSP287, **or**

- STEP 7 (TIA Portal) with HSP0251, **or**

- GSD file for PROFIBUS or PROFINET

- PCT as of V3.5 Update 1

The GSD files can be downloaded from the Internet:

- PROFINET (https://support.industry.siemens.com/cs/ww/en/view/21915937)

- PROFIBUS (https://support.industry.siemens.com/cs/ww/en/view/21221197)

The HSPs can be downloaded from the Internet:

- STEP 7 V5.5 SP4 or higher
(https://support.industry.siemens.com/cs/ww/en/view/23183356)

- STEP 7 (TIA Portal) (https://support.industry.siemens.com/cs/ww/en/view/72341852)

2.2 Functions

Introduction

Below is a brief overview of the operating modes of the ports and other functions of the IO-Link master EM 4 IO-Link HF.

Firmware update

You can perform firmware updates for the IO-Link master.
Additional information about firmware updates for ET 200pro can be found in the ET 200pro Distributed I/O System operating instructions, chapter "Maintenance and service", section "Firmware update" on the Internet (https://support.industry.siemens.com/cs/ww/en/view/21210852).

Master Backup

The "IO_LINK_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 "IO_LINK_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.

Note
Availability

Note that the Master Backup function is available only for IO-Link devices that are specified for the IO-Link Standard as of V1.1.

You will find information on the Master Backup and Master Restore functions in section "Master backup" of chapter "Integration into the automation system" of the IO-Link System (https://support.industry.siemens.com/cs/ww/en/view/65949252) function manual.

PortQualifierInformation

Each port has PortQualifierInformation (PQI). This PQI provides information on the device status of the port and IO-Link. The PQI is transmitted cyclically with the process data.

You will find the structure of the PQI byte in the section Address space (Page 21).

Port configuration

You can use an electronic module EM 4 IO-Link HF as of firmware version V1.1 to commission the IO-Link 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 in STEP 7.

Procedure

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

- Configure the I/O data lengths for each port
- Optional: Activate the PortQualifierInformation (PQI)
- Port mode:
  – Operation in "IO-Link autostart" mode (default)
  – Operation in "IO-Link manual" mode
  – Operation as DI
  – Operation as DQ
  – Disabled

Port configuration with S7-PCT

Requirements

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

Procedure

You configure the IO-Link master with the Port Configuration Tool S7-PCT, V3.2 or higher.
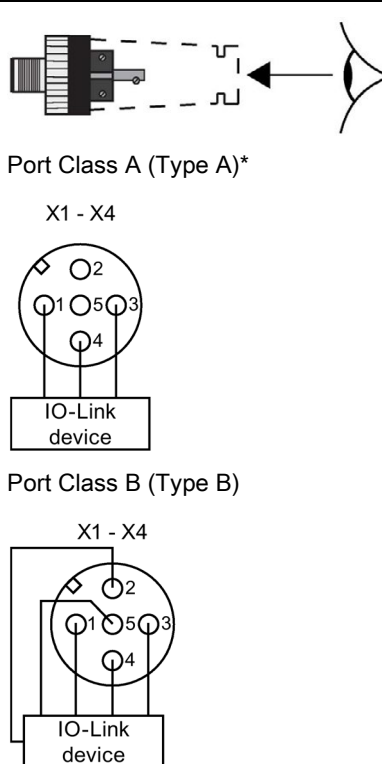
Wiring

<div style="text-align: right; font-size: 3em;">3</div>

3.1 Pin assignment

Pin assignment on the connection module CM IO-Link 4×M12P

The table below shows the pin assignments for the IO-Link master.

Table 3- 1   Pin assignment for IO-Link master

View of circular connector	Pin	Assignment of X1 to X4
Port Class A (Type A)* X1 - X4 IO-Link device Port Class B (Type B) X1 - X4 IO-Link device	1	24 V encoder supply $1U_S$ (provided by ET 200pro for the connected encoder)
	2	24 V actuator supply $2U_A$
	3	Sensor supply ground 1M
	4	IO-Link Master Port 1 (C/Q): Connector X1 Port 2 (C/Q): Connector X2 Port 3 (C/Q): Connector X3 Port 4 (C/Q): Connector X4
	5	Load voltage supply ground 2M

* If you use the sockets for IO-Link devices with Port Class A, you must not place any signals on pins 2 and 5.

The M12 connectors are implemented according to IO-Link Specification as Port Class B. Pins 2 and 5 contain an additional power supply.

Reaction-free connection of devices with different port types (Class A and Class B) is possible using a 3-wire connecting cable (assignment of pins 1, 3 and 4).

NOTICE

24 V encoder supply $1U_S$

Use only the 24 V encoder supply $1U_S$ provided by the module to supply power to the devices.

3.2 Circuit diagram

Circuit diagram

The following figure shows the circuit diagram of the ET 200pro IO-Link master, consisting of the electronic module EM 4 IO-Link HF and connection module CM IO-Link 4×M12P.
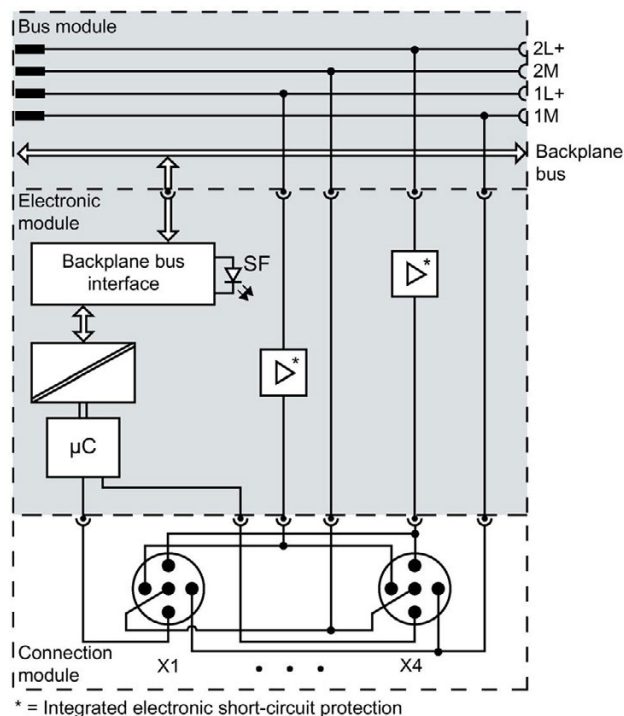

Figure 3-1   Circuit diagram of IO-Link master (EM 4 IO-Link HF and CM IO-Link 4×M12P)

Parameters/address space

4.1 Parameters

Parameters

The following table shows the general parameters for the EM 4 IO-Link HF electronic module.

Table 4- 1   General parameters

Parameters	Value range	Default	Scope
Diagnostics			
Group diagnostics	• Disable • Enable	Disable	Module
Diagnostics port 1*	• Disable • Enable	Disable	Port
Diagnostics port 2*	• Disable • Enable	Disable	Port
Diagnostics port 3*	• Disable • Enable	Disable	Port
Diagnostics port 4*	• Disable • Enable	Disable	Port
Configuration			
Port configuration without S7-PCT	• Disable • Enable	Disable	Module
PortQualifierInformation (PQI)	• Disable • Enable	Enable	Module

* Diagnostic information is signaled only in IO-Link mode.

The following table shows the port parameters for the electronic module EM 4 IO-Link HF with firmware version V1.1.

Table 4- 2   Port parameters

Parameters	Value range	Default
Port configuration		
Operating mode	• IO-Link autostart • IO-Link manual • DI • DQ • Disabled	IO-Link autostart
Length of input data (without PQI)	Depending on the total length of the module*	Depending on the total length of the module*
Length of output data	Depending on the total length of the module*	Depending on the total length of the module*
Vendor ID**	Manufacturer ID of the connected IO-Link devices	0
DeviceID**	Device ID of the connected IO-Link device	0
Test level/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	Type-compatible (V1.1) with Backup&Restore

* Make sure not to exceed the maximum possible length of the input or output data for all ports.
   Example:
   You have selected the 32I/32O configuration. You have assigned the first port 16 bytes of input data.
   You can still assign a total of 16 bytes of input data for the remaining three ports.

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

4.2 Explanation of parameters

Group diagnostics

Enable of group diagnostics for the module.

Diagnostics port

This parameter enables the diagnostics for the selected port.
The diagnostics possible depends on the IO-Link device in use. Additional information about the diagnostic interrupts can be found in the description of the utilized IO-Link device.

Port configuration without S7-PCT

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

PortQualifierInformation

This parameter releases the PortQualifierInformation (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
- DI
- DQ
- Disabled

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.
In addition, you can select the test 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

You can find the Vendor ID and Device ID on the Internet
(https://support.industry.siemens.com/cs/ww/en/view/109748852).

DI

The port is operating as a standard digital input.

DQ

The port is operating as a standard digital output.

Disabled

The port is disabled.

4.3 Address space

Address space of the electronic module EM 4 IO-Link HF

The electronic module EM 4 IO-Link HF supports a variable address space for I/O data. The maximum size of the input and output addresses of the electronic module is 32 bytes each. You specify the assignment of the IO-Link devices to the address space in S7-PCT or STEP 7. Within the high limit of 32 bytes input and 32 bytes output for the entire module, additional I/O data lengths are possible. The following table shows the supported address spaces for I/O data:

Module configuration/ supported address space for I/O data	IO-Link master with firmware V1.0	IO-Link master with firmware V1.1
1-byte input/1-byte output	X	
2-byte inputs/2-byte outputs	X	
4-byte inputs/4-byte outputs	X	X*
8-byte inputs/0-byte outputs	X	X
8-byte inputs/8-byte outputs	X	X
12-byte inputs/8-byte outputs		X
16-byte inputs/16-byte outputs	X	X
20-byte inputs/16-byte outputs		X
32-byte inputs/32-byte outputs	X	X

* No PortQualifierInformation is transferred with this configuration.

PortQualifierInformation (PQI)

You can enable the PortQualifierInformation (PQI) for your IO-Link master as of firmware version V1.1.
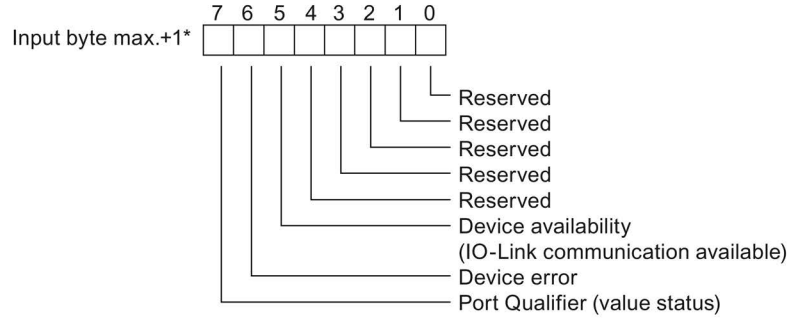

Note

PortQualifierInformation (PQI)

If you have activated the PortQualifierInformation (PQI), this is always transferred with the size 1 byte together with the input data of the IO-Link device.

The following figure shows the structure of the PQI byte.
You activate a parameter by setting the corresponding bit to "1".

Port Qualifier Information (PQI)

```
                        7  6  5  4  3  2  1  0
Input byte max.+1*     [  |  |  |  |  |  |  |  ]
                                            └── Reserved
                                         └───── Reserved
                                      └──────── Reserved
                                   └─────────── Reserved
                                └────────────── Reserved
                             └───────────────── Device availability
                                                (IO-Link communication available)
                          └──────────────────── Device error
                       └─────────────────────── Port Qualifier (value status)
```

* The PQI byte is always located after the last input byte of the port.
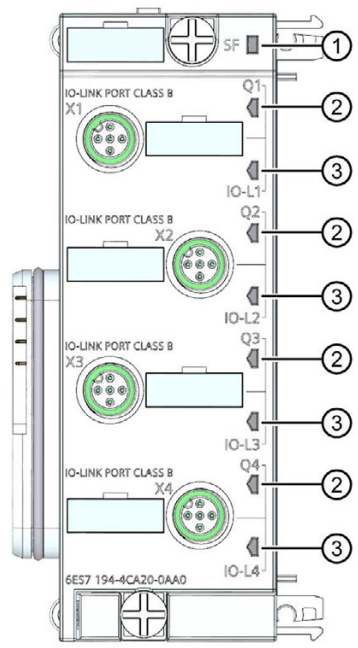
Figure 4-1   Structure of the PQI byte

Reference

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

Diagnostics alarms

<div style="text-align: right; font-size: 3em;">5</div>

5.1   Status and error displays

LED displays

The following figure shows the LED display of the IO-Link master EM 4 IO-Link HF with connection module CM IO-Link 4×M12P..

①	Group fault (SF)	(red)
②	Channel status in SIO mode (Q1 to Q4)	(green)
③	Channel fault/Status IO-Link communication (IO-L 1 to IO-L 4)	(green/red)

Figure 5-1   LED displays

Meaning of the LEDs

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

SF LED

Table 5- 1   Status displays of the SF LED

LEDs	Meaning	Remedy
SF		
On	Diagnostic alarm is present	Evaluate the diagnostics.
	No parameter assignment or incorrect parameter assignment	Check the parameter assignment.
	Short-circuit of encoder supply 1L+	Check the wiring.

* Not relevant

LEDs Q1 to Q4

Valid for an IO-Link port that is in SIO mode.

Table 5- 2   Status displays of LEDs Q1 to Q4

LEDs		Meaning	Remedy
SF	Q1 to Q4		
Off	On	Input or output value is 1.	---
Off	Off	Input or output value is 0 or port is disabled.	---

LEDs IO-L 1 to IO-L 4

Valid for an IO-Link port that is in IO-Link mode and for which the port diagnostics is enabled.

Table 5- 3   Status displays of LEDs Q1 to Q4

LEDs		Meaning	Remedy
SF	IO-L 1 to IO-L 4		
Off	Flashes (green)	Incorrect device	Check the utilized IO-Link device.
On	Flashes (green)	No IO-Link communication (e.g. when you have enabled the port but a functional IO-Link device cannot be found).	Check the wiring.
Off	On (green)	IO-Link communication established, **no** active device fault.	---
On	On (red)	IO-Link communication established, active device or channel fault.	Check the utilized IO-Link device.
		Incorrect device	
Off	Off	Port deactivated	---

5.2 Diagnostics alarms

For all diagnostic events, diagnostics alarms are output and the SF LED lights up red on the IO-Link master. You can read out the diagnostics alarms, for example, in the diagnostics buffer of the CPU. You can evaluate the error codes with the user program.
The following table lists the diagnostics alarms that are detected by the IO-Link master.

Table 5- 4   Error types - Module diagnostics (output at channel 0)

Diagnostics alarm	Error code	Meaning (IO-Link error code)
Parameter assignment error	0010_H	• Missing or incomplete parameter assignment of the IO-Link master (1882_H)
Safety shutdown	0019_H	• Serious error (replacement of master required) (1880_H)
Error	0009_H	• Data storage error (1881_H)
Overflow	0007_H	• Process tag range exceeded ($8C10_H$)
Supply voltage missing	0011_H	• 24 V encoder supply $1U_S$ (of 1L+) for device missing (1806_H) • 24 V encoder supply $1U_S$ (of 1L+) for device too low (<15.6 V) (1807_H) • Load voltage 2L+ (switched) missing (1888_H) • 24 V actuator supply 2 U_A (of 2L+) for device missing ($180E_H$) • 24 V actuator supply 2 U_A (of 2L+) for device too low (<15 V) ($180X_H$)

Table 5- 5   Error types - Port diagnostics (output at channel 1 to 4)

Diagnostics alarm	Error code	Meaning (IO-Link error code)
Parameter assignment error	0010_H	• Incorrect device (1802_H) • Vendor ID and Device ID not defined (1817_H) • Process data length of the IO-Link device exceeded (1818_H) • No cycle time configured (1819_H) • Could not configure IO-Link master (1882_H, 1883_H) • Memory error (1886_H) • Process data length exceeded (1887_H) • PQI not supported (1889_H)
Short-circuit	0001_H	• Load current > 670 mA (typ.) (C/Q) (1804_H) • Load current > 4 A (per device, typ.) (1L+) / load current > 8.8 A (per device, typ.) (2L+) (1806_H)
Overtemperature	0005_H	• Temperature exceeded on master (> 115 °C) (1805_H)
Wire break (only in IO-Link mode)	0006_H	• No IO-Link device connected • There is a break on the signal line to the IO-Link device • IO-Link device cannot communicate due to a different error (1800_H)
Undervoltage	0007_H	• Supply voltage too low (<19.9 V, typ.) (1807_H)
External fault	$001A_H$	• Data storage error (1809_H, $180A_H$, $180B_H$, $180C_H$, $180D_H$) • Load voltage 2L+ missing ($180E_H$)

Additional information about diagnostics alarms can be found in the ET 200pro Distributed I/O System operating instructions, chapter "Alarm, error and system messages" on the Internet (http://support.automation.siemens.com/WW/view/en/21210852).

Technical specifications 6

Technical specifications of the IO-Link Master

Technical specifications	
Dimensions and weight	
EM 4 IO-Link HF	
Dimensions W x H x D (mm)	45 x 130 x 35
Weight	Approx. 150 g
CM IO-Link 4×M12P	
Dimensions W x H x D (mm)	45 x 130 x 39
Weight	Approx. 115 g
Voltages and currents	
Rated supply voltage of electronics/encoder 1L+	24 V DC
Reverse polarity protection	Yes
Rated load voltage 2 L+	24 V DC
• Reverse polarity protection	Yes, per module, against destruction, loads are activated
• Short-circuit protection	Yes; per channel
Current consumption	
• From backplane bus	Max. 20 mA
• From supply voltage 1L+	Max. 40 mA
• From load voltage 2L+ (without load)	Max. 20 mA
Power loss of the module	Typ. 2.6 W
Electrical isolation	
• Between channels and backplane bus	Yes
• Between channels	No
• Between backplane bus and all other circuit elements	Yes
• Between load voltages	Yes
Insulation	
Insulation tested with	707 V DC (type test)
Status, interrupts, diagnostics	
Status display	Green LED, per channel; one green LED each for channel status Qn (SIO mode) and port status IO-Ln (IO-Link mode)
Interrupts	
• Diagnostic interrupt	Configurable

Technical specifications	
Diagnostic functions	
• Group error display	Red LED (group error)
• Channel error display	Red LED, per channel; combined with IO-Link port status
• Diagnostic information readable	Yes
Monitoring for	
• Short-circuit	Yes; per channel
• Wire break	Yes; per channel
Encoder supply	
Number of encoder supplies	4
Total current up to 55 °C	Max. 2 A
Short-circuit protection	Yes; per module, electronic
IO-Link	
Number of ports	4
• Number of ports that can be activated simultaneously	4
IO-Link Protocol 1.0	Yes
IO-Link Protocol 1.1	Yes
Transmission rate	4.8 kBd (COM1); 38.4 kBd (COM2), 230.4 kBd (COM3)
Size of process data, input per port	32 bytes
Size of process data, input per module	32 bytes
Size of process data, output per port	32 bytes
Size of process data, output per module	32 bytes
Memory size for device parameters	2 KB; for each port
Master Backup	Possible with function block IO_LINK_MASTER
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, using 3 wire cable
Port type B	Yes; additional device supply: max. 4 A total current, max. 2 A each for: • X1 and X2 • X3 and X4

Dimension drawing

<div style="text-align: right">**A**</div>

Dimension drawing

The following figure shows the dimension drawing of the ET 200pro IO-Link master, consisting of the electronic module EM 4 IO-Link HF and connection module CM IO-Link 4×M12P.
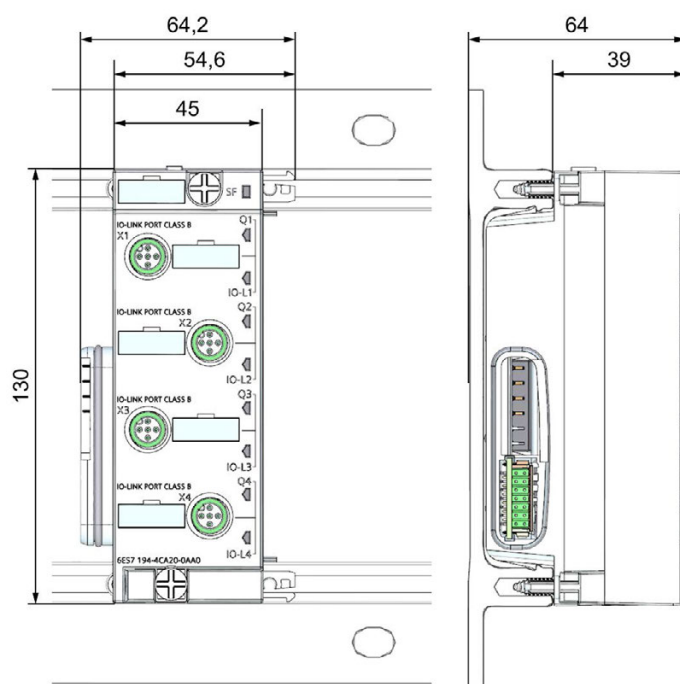

Figure A-1   Dimension drawing of electronic module EM 4 IO-Link HF and connection module CM IO-Link 4×M12P

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