SIEMENS

Manual

SIMATIC

ET 200SP

Communication module IO-Link Master
CM 4xIO-Link (6ES7137-6BD00-0BA0)

Edition 10/2017

support.industry.siemens.com

SIEMENS

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ET 200SP
Communication module
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Manual

10/2017

A5E03856846-AD

Legal information

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⚠ 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.

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Preface

Purpose of the documentation

This manual supplements the ET 200SP distributed I/O system (http://support.automation.siemens.com/WW/view/en/58649293) system manual. It describes functions that generally affect the ET 200SP distributed I/O system.

The information provided in this manual and in the system manual and function manuals supports you in commissioning the ET 200SP distributed I/O system.

Conventions

Please also observe notes marked as follows:

Note

A note contains important information on the product described in the documentation, on the handling of the product or on the section of the documentation to which particular attention should be paid.

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

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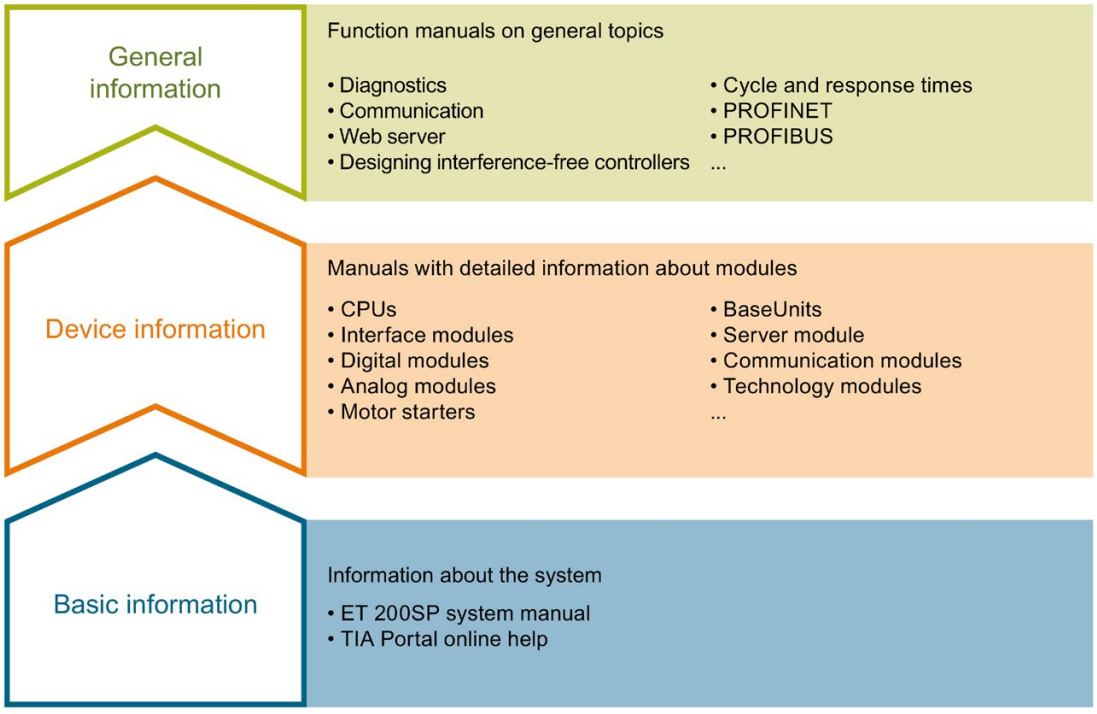
The documentation for the SIMATIC ET 200SP distributed I/O system is arranged into three areas.
This arrangement enables you to access the specific content you require.



Basic information

The system manual describes in detail the configuration, installation, wiring and commissioning of the SIMATIC ET 200SP. distributed I/O system. The STEP 7 online help supports you in the configuration and programming.

Device information

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

General information

The function manuals contain detailed descriptions on general topics regarding the SIMATIC ET 200SP distributed I/O system, e.g. diagnostics, communication, Web server, motion control and OPC UA.

You can download the documentation free of charge from the Internet (https://support.industry.siemens.com/cs/ww/en/view/109742709).

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

You can download the product information free of charge from the Internet (https://support.industry.siemens.com/cs/us/en/view/73021864).

Manual Collection ET 200SP

The Manual Collection contains the complete documentation on the SIMATIC ET 200SP distributed I/O system gathered together in one file.

You can find the Manual Collection on the Internet (http://support.automation.siemens.com/WW/view/en/84133942).

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

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You can export the manual in PDF format or in an editable format.

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

"mySupport" - CAx Data

In the CAx Data area of "mySupport", you can have access the latest 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 in 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 in individual products.

You can 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 run commissioning and maintenance activities simultaneously on various SIMATIC S7 stations as a bulk operation independently of the TIA Portal.

The SIMATIC Automation Tool provides a multitude of functions:

- Scanning of a PROFINET/Ethernet network and identification of all connected CPUs
- Address assignment (IP, subnet, gateway) and station name (PROFINET device) to a CPU
- Transfer of the data and the programming device/PC time converted to UTC time to the module
- Program download to CPU
- Operating mode switchover RUN/STOP
- Localization of the CPU by means of LED flashing
- Reading out CPU error information
- Reading the CPU diagnostic buffer
- Reset to factory settings
- Updating the firmware 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

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

- The topology overview independently scans PROFINET 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

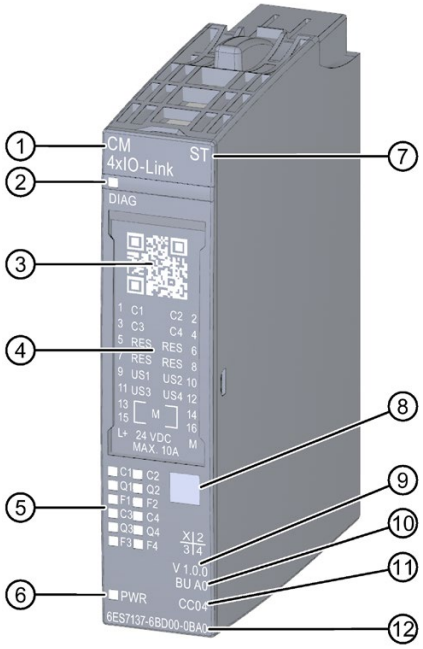
2

2.1 Properties

Article number

6ES7137-6BD00-0BA0

View of the module



① Module type and name
② LED for diagnostics
③ QR code
④ Connection diagram
⑤ LEDs for status and error displays
⑥ LED for supply voltage
⑦ Function class
⑧ Color coding module type
⑨ Function and firmware version
⑩ BU type
⑪ Color code for selecting the color-coded labels
⑫ Article number

Figure 2-1 View of the IO-Link Master CM 4xIO-Link communication module

Properties

The module has the following technical properties:

- IO-Link master according to IO-Link specification V1.1
- Serial communication module with 4 ports (channels)
- Data transmission rate COM1 (4.8 kbaud), COM2 (38.4 kbaud), COM3 (230.4 kbaud)
- SIO mode (standard IO mode)
- Suitable for connecting up to 4 IO-Link devices (3-wire connection) or 4 standard actuators or encoders
- Programmable diagnostics function by port
- Automatic backup of the master and device parameters via electronic coding element

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
Identification and maintenance data (I&M)	V1.0 or higher
PROFIenergy	V1.0 or higher
IO-Link port configuration with S7-PCT	V1.0 or higher
Module replacement with automatic data recovery without engineering for IO-Link master and IO-Link device	V1.0 or higher
Time-based IO (time stamping)	V2.0 or higher
Variable address range of I/O data with up to 32-byte inputs and 32-byte outputs	V2.0 or higher
Variable address range of I/O data with up to 144-byte inputs and 128-byte outputs	V2.1 or higher
IO-Link port configuration without S7-PCT	V2.2 or higher
Master Backup with function block IO_LINK_MASTER	V2.2 or higher
PortQualifierInformation (PQI)	V2.2 or higher

The module can be used with the following engineering tools:

Table 2- 2 Engineering tools depending on the firmware version of the module

Firmware version of the module	S7-PCT	STEP 7 (TIA Portal)	STEP 7 V5.5	GSD file
V1.0 (in PROFINET station)	V3.0 or higher	V12 SP1 or higher	As of V5.5 SP3 with HSP0231 as of V1.0	X
V1.0.3 (in PROFIBUS station)	V3.1 or higher	V13 or higher	As of V5.5 SP3 with HSP0231 as of V1.0	X
V2.0	V3.2 or higher	As of V13 (Time-based IO only with CPU S7-1500)	As of V5.5 SP3 with HSP0231 as of V1.0 (without Time-based IO)	X (without time-based IO)
V2.1	As of V3.3 and SupportedModules.xml V1.2	As of V13 SP1 with HSP0136 as of V1.0 (Time-based IO only with CPU S7-1500)	As of V5.5 SP4 with HSP0231 as of V4.0 (without Time-based IO)	X (without time-based IO)
V2.2	V3.5 or higher	V15 or higher (without time-based IO)	V5.5 SP4 or higher with HSP0231, V4.1 or higher (without time-based IO)	X (without time-based IO)

Accessories/spare parts

The following accessories / replacement parts are available for the module and are not included in the scope of delivery:

- Labeling strips
- Color-coded labels
- Reference identification label
- Electronic coding element type H

See also

You can find more information on accessories in the ET 200SP Distributed I/O System (http://support.automation.siemens.com/WW/view/en/58649293) system manual in the Accessories/Spare parts section.

2.2 Functions

IO-Link is a point-to-point connection between a master and a device. Both conventional and intelligent sensors/actuators can be used as devices at the IO-Link via unshielded standard cables using proven 3-wire technology. IO-Link is backward compatible with conventional digital sensors and actuators. The circuit state and data channel are designed in proven 24 V DC technology.

Reference

Additional information can be found in the IO-Link System (http://support.automation.siemens.com/WW/view/en/65949252) function manual.

2.3 Replacement of the IO-Link Master CM 4xIO-Link communication module with an electronic coding element type H

If you remove the communication module from the BaseUnit, part of the electronic coding element remains in the BaseUnit. The parameters of the IO-Link Master CM 4xIO-Link and of the IO-Link devices are stored in this part. A newly inserted (but not yet configured) IO-Link master takes over the parameters from the electronic coding element.

⚠ CAUTION

Removal and insertion

Plugging in the IO-Link Master CM 4xIO-Link communication module when the load is switched on can result in dangerous conditions in your plant.

The ET 200SP distributed I/O system may be damaged as a result.

The IO-Link Master CM 4xIO-Link communication module should only be plugged in or pulled out when the load is switched off.

Master Backup

In addition to saving the parameters in the electronic coding element, you can back up the parameters of your module, firmware version V2.2 or higher, with the function block "IO_LINK_MASTER".

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 restoring the 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 further information on the Master Backup 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.

Reference

For more information on the topic of "Coding element", refer to the Changing the type of an I/O module chapter of the ET 200SP distributed I/O system (http://support.automation.siemens.com/WW/view/en/58649293) system manual.

2.4 Time-based IO

Time-based IO ensures that signals are output with a precisely defined response time. A combination of inputs and outputs allows, for example, passing products to be measured precisely or liquids to be dosed optimally.

As of firmware version V2.0.0, the IO-Link master supports the Time-based IO function. You configure the connected IO-Link devices with time stamp functionality as normal with the SIMATIC S7 Port Configuration Tool (S7-PCT). In the "Ports" tab in S7-PCT, set the necessary parameters in the "Operating mode" section:

- IO-Link_Time_based_IO_IN
- IO-Link_Time_based_IO_OUT
- IO-Link_Time_based_IO_INOUT

The Time-based IO function can be used for IO-Link master with 32 bytes I/O data. Larger I/O data ranges are not supported by Time-based IO.

Note

Time stamp function

The time stamp function requires defined address assignment (mapping).

If the address area you require is already occupied, you must modify the user data arrangement of the IO-Link devices in the address space of the IO-Link master.

The "High-precision input/output with Time-based IO" function manual describes how to move user data in the address space.

Reference

You can find more information about Time-based IO in the High-precision input/output with Time-based IO (http://support.automation.siemens.com/WW/view/en/82527590) function manual.

2.5 Reset communication module to factory settings

Effects of resetting to the factory settings

Use the "Reset to factory settings" function to restore the parameter assignments of your IO-Link Master CM 4xIO-Link communication module made with S7-PCT to the factory state.

After a "Reset to factory settings", the parameters of the IO-Link Master CM 4xIO-Link communication module are assigned as follows:

- The ports are in DI mode
- The ports are mapped to the relative addresses 0.0 ... 0.3
- The PortQualifier is disabled
- I&M data 1 to 3 is deleted
- The electronic coding element (if it exists) is deleted

Note

The device parameters are deleted and the factory state is restored.

You should reset a removed IO-Link Master CM 4xIO-Link communication module to the factory settings before you place it in storage.

Procedure

To perform a "Reset to factory settings", proceed as described in the S7-PCT online help.

Connecting

3

3.1 Wiring and block diagram

This section includes the block diagram of the communication module IO-Link Master CM 4xIO-Link with the terminal assignments for 3-wire and 5-wire connection of IO-Link devices or 2-wire and 3-wire connection in DI or DQ operating mode.

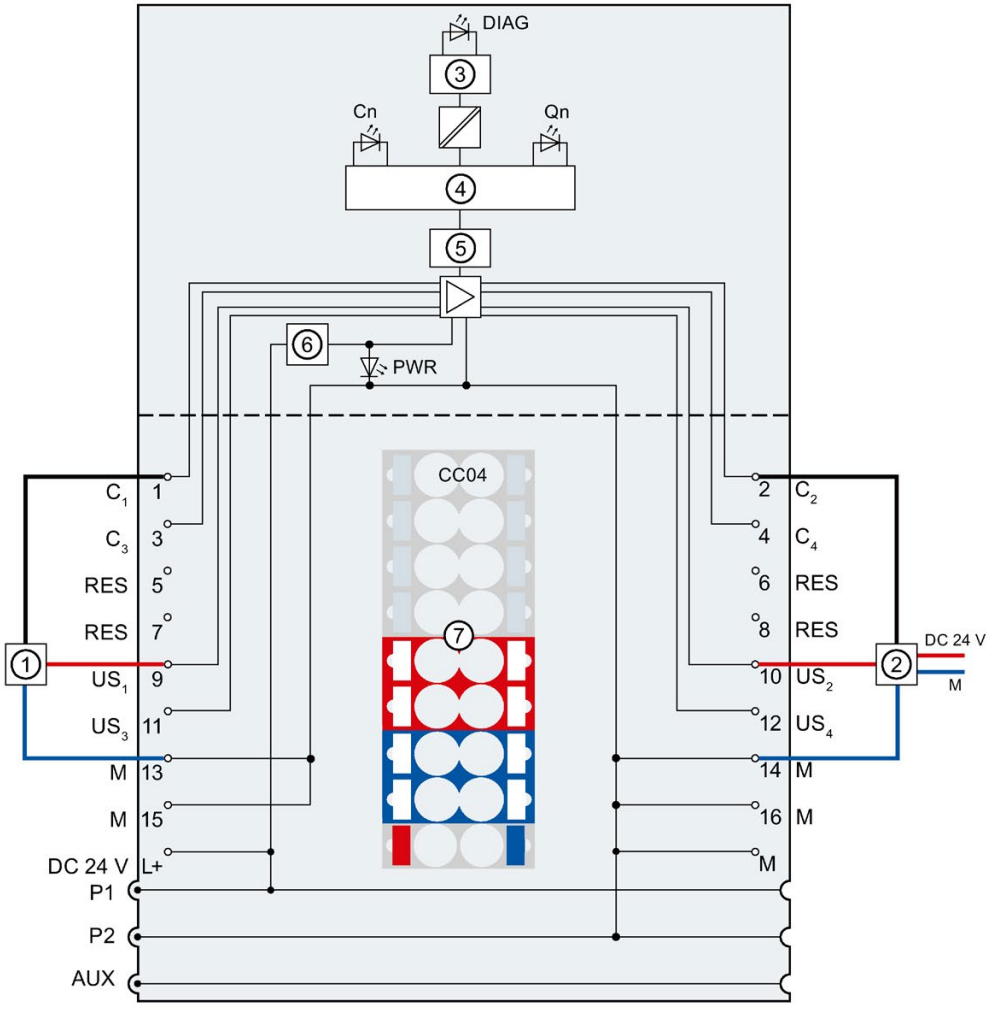
You can use and combine the different wiring options for all channels.

You can find information on wiring the BaseUnit in the system manual Distributed I/O System ET 200SP (https://support.industry.siemens.com/cs/ww/en/view/58649293).

NOTICE
Internal encoder supply Use only the supply voltage (US_n/M) made available by the IO-Link Master CM 4xIO-Link communication module to supply the IO-Link device (L+/L-).

Wiring: 3-wire and 5-wire connection of IO-Link devices

The following figure shows an example of the terminal assignment of the communication module IO-Link Master CM 4xIO-Link on the BaseUnit BU type A0 without AUX terminals (3-wire and 5-wire connection of IO-Link devices).

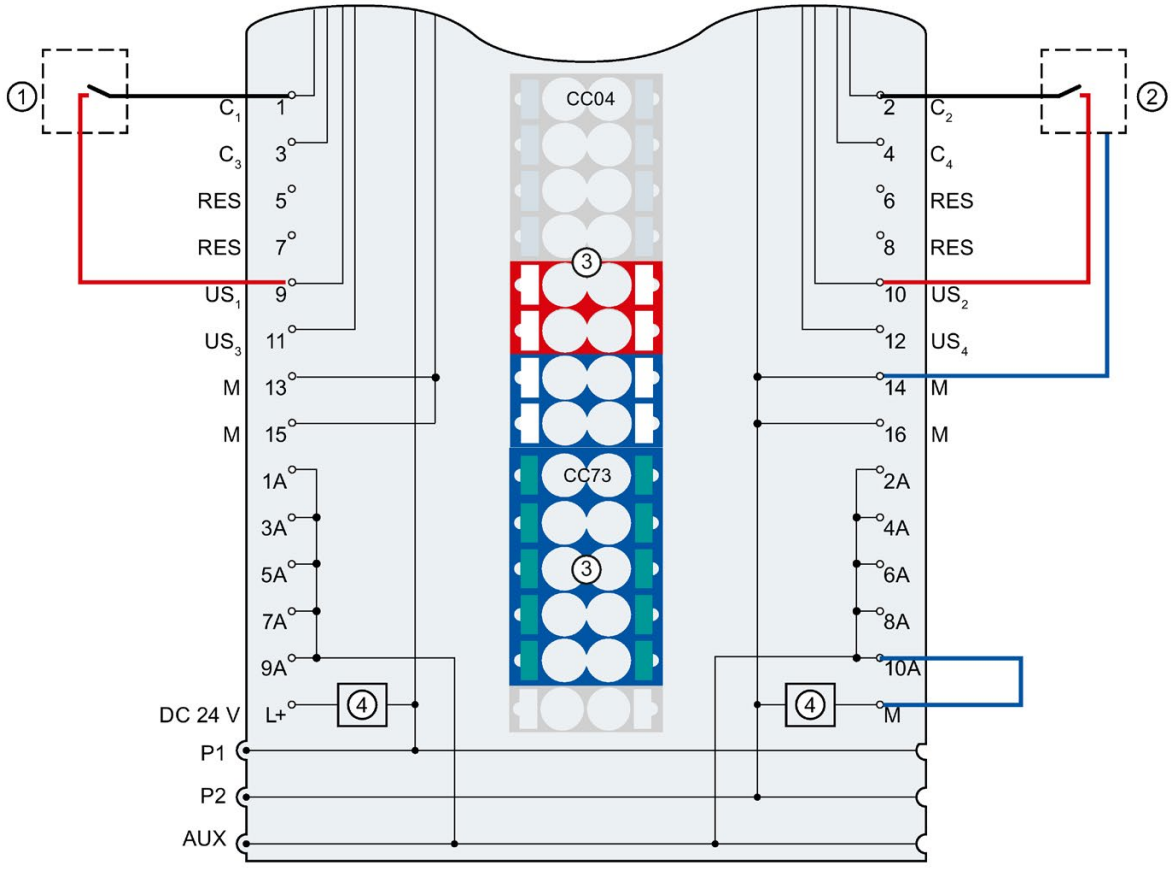


①	3-wire connection	P1, P2, AUX	Internal self-assembling voltage buses Connection to left (dark-colored BaseUnit) Connection to left interrupted (light-colored BaseUnit)
②	5-wire connection	C_n	Communication signal, DI, DQ
③	Backplane bus interface	RES	Reserved, must not be assigned
④	Microprocessor	US_n	Supply voltage (positive)
⑤	IO-Link circuitry	DIAG	Error or diagnostics LED (green, red)
⑥	Polarity reversal protection	Cn	LED port status IO-Link mode (green)
⑦	Color-coded label with color code CC04 (optional)	Qn	LED port status SIO mode
24 V DC	Supply voltage L+ (infeed for light-colored BaseUnit only)	Fn	LED port error
M	Ground	PWR	Power LED (green)

Figure 3-1 Block diagram and terminal assignment for 3-wire and 5-wire connection of IO-Link devices

Wiring: 2-wire and 3-wire connection in DI operating mode

The following figure shows an example of the terminal assignment of the communication module IO-Link Master CM 4xIO-Link on the BaseUnit BU type A0 with AUX terminals (2-wire and 3-wire connection) in DI operating mode.

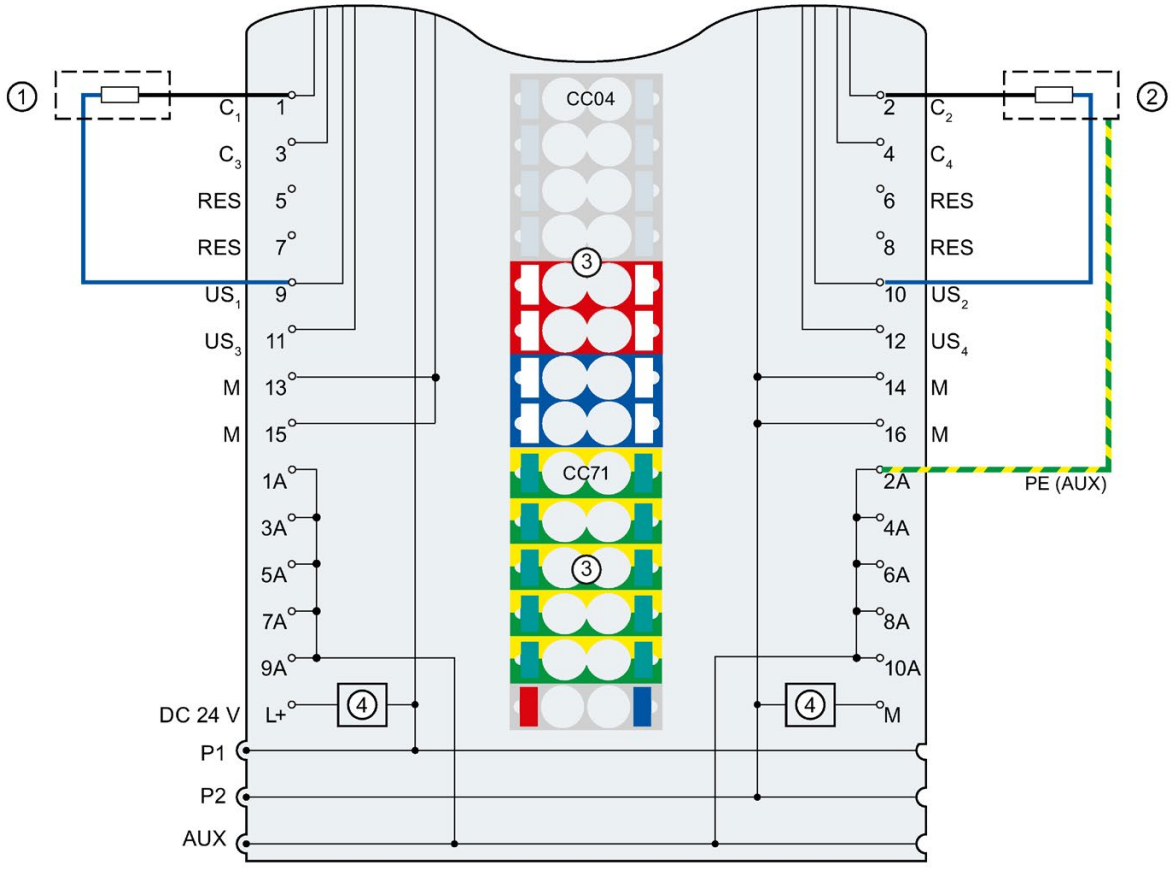


①	2-wire connection	1 A to 10 A	AUX terminals
②	3-wire connection	PE (AUX)	Protective conductor connection
③	Color-coded labels with color code CC04 and CC73 (optional)	P1, P2, AUX	Internal self-assembling voltage buses Connection to left (dark-colored BaseUnit) Connection to left interrupted (light-colored BaseUnit)
④	Filter connection supply voltage (only when light-colored BaseUnit is present)	C_n	Communication signal, DI, DQ
24 V DC	Supply voltage L+ (infeed for light-colored BaseUnit only)	RES	Reserved, must not be assigned
M	Ground	US_n	Supply voltage (positive)

Figure 3-2 Terminal assignment for 2-wire and 3-wire connection in DI operating mode

Wiring: 2-wire and 3-wire connection in DQ operating mode

The following figure shows an example of the terminal assignment of the communication module IO-Link Master CM 4xIO-Link on the BaseUnit BU type A0 with AUX terminals (2-wire and 3-wire connection) in DQ operating mode.



①	2-wire connection	1 A to 10 A	AUX terminals
②	3-wire connection	PE (AUX)	Protective conductor connection
③	Color-coded labels with color code CC04 and CC71 (optional)	P1, P2, AUX	Internal self-assembling voltage buses Connection to left (dark-colored BaseUnit) Connection to left interrupted (light-colored BaseUnit)
④	Filter connection supply voltage (only when light-colored BaseUnit is present)	C_n	Communication signal, DI, DQ
24 V DC	Supply voltage L+ (infeed for light-colored BaseUnit only)	RES	Reserved, must not be assigned
M	Ground	US_n	Supply voltage (positive)

Figure 3-3 Terminal assignment for 2-wire and 3-wire connection in DQ operating mode

Parameters/address space

4

4.1 Parameters

Parameters (GSD file)

The following table shows the general parameters for the IO-Link Master CM 4xIO-Link communication module.

Table 4- 1 General parameters (GSD file)

Parameters	Value range	Default	Configuration in RUN	Efficiency range
Diagnostics				
Diagnostics: No supply voltage L+	• disable • enable	disable	Yes	Module
Diagnostics port 1	• disable • enable	disable	Yes	Port (channel)
Diagnostics port 2	• disable • enable	disable	Yes	Port (channel)
Diagnostics port 3	• disable • enable	disable	Yes	Port (channel)
Diagnostics port 4	• disable • enable	disable	Yes	Port (channel)
Potential group	• Use potential group of the left module (dark-colored BaseUnit) • Enable new potential group (light-colored BaseUnit)	Use potential group of the left module (dark-colored BaseUnit)	No	Module
Master parameter				
PortQualifier Information (PQI)	• Disable • Enable	Enable	No	Module
Port configuration without P7-PCT	• Disable • Enable	Disable	No	Module

The following table shows the port parameters for the IO-Link Master CM 4xIO-Link communication module.

Table 4- 2 Port parameter (GSD file)

Parameters	Value range	Default
Port configuration		
Operating mode	• IO-Link Autostart • IO-Link manual • DI • DQ • Deactivated	IO-Link Autostart
Length of input data	depending on the selected I/O type*	depending on the selected I/O type*
Length of output data	depending on the selected I/O type*	depending on the selected I/O type*
VendorID**	Manufacturer ID of the connected IO-Link devices	0
DeviceID**	Device ID of the connected IO-Link devices	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

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

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

Reference

Additional information on the VendorID and DeviceID can be found on the Internet (https://support.industry.siemens.com/cs/ww/en/view/109748852).

4.2 Declaration of parameters

Diagnostics: No supply voltage L+

Enabling the diagnostic alarm for missing or insufficient supply voltage L+.

Diagnostics port

This parameter allows the enabling of the diagnostics for the selected port.
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.

Potential group

With the "Potential group" parameter, you specify whether the module is inserted on a light-colored or dark-colored BaseUnit.

A potential group always starts with an I/O module that is inserted on a light-colored BaseUnit. All modules inserted to the right of this on dark-colored BaseUnits belong to the same potential group, because the dark-colored BaseUnits are supplied via the light-colored BaseUnits.

The potential group ends with a new light-colored BaseUnit or the end of the station.

PortQualifierInformation

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

Port configuration without P7-PCT

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

Operating mode

This parameter specifies in which mode the selected port is to be operated.
You can select from the following options:

- IO-Link Autostart
- IO-Link manual
- DI
- DQ
- Deactivated

IO-Link Autostart

The connected IO-Link device starts automatically (Plug&Play functionality). The IO-Link device is immediately available to you and operational.

IO-Link manual

The connected IO-Link devices are **not** started automatically.
You must store the VendorID and DeviceID of the connected IO-Link devices in STEP 7.
In addition, you can select the test level for the 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

The VendorID and DeviceID can be found on the Internet (https://support.industry.siemens.com/cs/ww/en/view/109748852).

DI

The port operates as standard digital input.

DQ

The port operates as standard digital output.

Deactivated

The port is deactivated.

4.3 Address space

Configuration options of the communication module IO-Link Master CM 4xIO-Link

The size of the input and output addresses of the IO-Link Master CM 4xIO-Link communication module with firmware version V1.0 is 32 bytes in each case. As of firmware version V2.0, the modules support a variable address space for I/O data.

As of firmware version V2.2, you can configure the port directly in STEP 7.

The following table provides an overview of the configuration options of the supported address areas 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 V2.0	IO-Link master with firmware V2.1	IO-Link master with firmware V2.2
1 byte input/1 byte output		X	X	
2-byte inputs/2-byte outputs		X	X	
4-byte inputs/4-byte outputs				X*
8-byte inputs/0-byte outputs				X
8-byte inputs/8-byte outputs		X	X	X
12-byte inputs/8-byte outputs				X
12-byte inputs/12-byte outputs				
16-byte inputs/16-byte outputs		X	X	X
20-byte inputs/16-byte outputs				X
32-byte inputs/32-byte outputs	X	X	X	X
36-byte inputs/32-byte outputs				X
64-byte inputs/64-byte outputs			X	X
68-byte inputs/64-byte outputs				X
144-byte inputs**/128-byte outputs			X	X

* No PortQualifierInformation is transferred with this configuration.

** The 144-byte input address range covers additional quality information (PortQualifier) in addition to the 128-byte process data.

Note

Use of the IO-Link Master CM 4xIO-Link with I/O data > 32 bytes

IM 155-6 PN HF/ST interface modules with firmware versions up to V3.0 only support I/O data up to 32 bytes. If you are using IO-Link Master CM 4xIO-Link with I/O data > 32 bytes, you need the IM 155-6 PN HF/ST interface module with firmware version as of V3.1.

Port configuration

With a IO-Link Master CM 4xIO-Link as of firmware version V2.2, you can commission the IO-Link port of the IO-Link master and 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 activated 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:

- Activate the diagnostics
- Configuration of the I/O data lengths for each port
- Activate the PortQualifierInformation (PQI)
- Port mode:
  - Operation in "IO-Link Autostart" mode (default)
  - Operation in "IO-Link Manual" mode
  - Operated as DI
  - Operated as DQ
  - Deactivated

Port configuration with S7-PCT

Requirements

You have deactivated 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.

PortQualifierInformation (PQI)

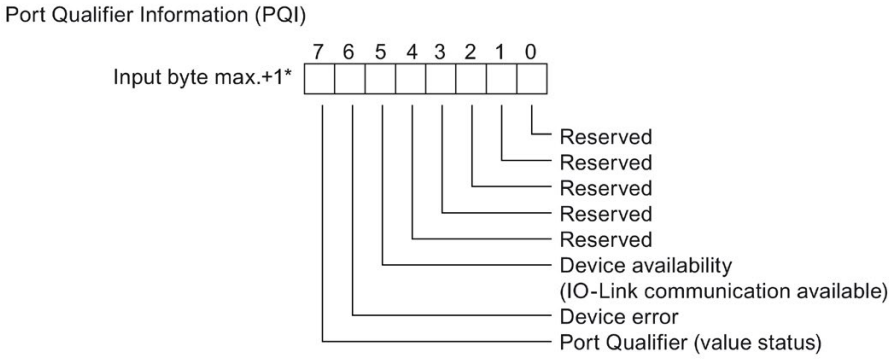
You can activate the PortQualifierInfortion (PQI) for your IO-Link master, firmware version V2.2 or higher.

Note

PortQualifierInformation (PQI)

If you have activated the PortQualifierInformation (PQI), these are 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.
Activate a parameter by setting the corresponding bit to "1".



* The PQI byte is always located after the last input byte of the port. Depending on the configuration, the PQI byte is therefore located in the process image of the inputs at byte 2, 3, 4, 5, 8, 9, 16, 17, 32 or 33.

Figure 4-1 Structure of the PQI byte

Reference

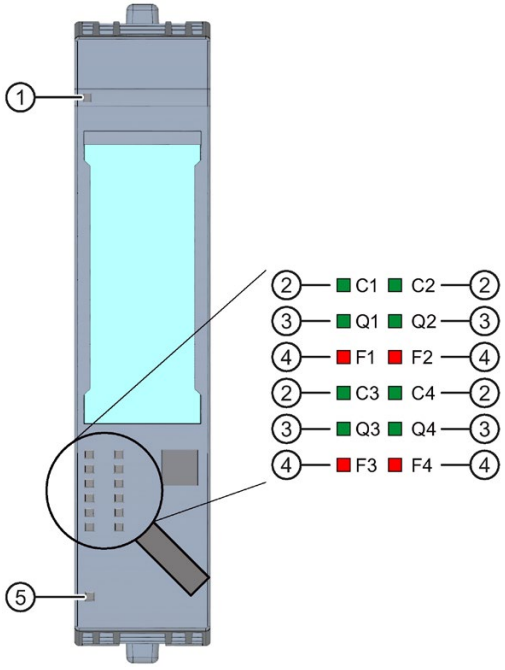
For more information, please refer to the IO-Link system (http://support.automation.siemens.com/WW/view/en/65949252) function manual.

Diagnostic alarms

5

5.1 Status and error displays

LED display



①	Diagnostics (DIAG)	(green/red)
②	Port status / IO-Link status (Cn)	(green)
③	Channel status in SIO mode (Qn)	(green)
④	Port error (Fn)	(red)
⑤	Supply voltage L+ (PWR)	(green)

n - Channel number

Figure 5-1 LED display

Meaning of the LED displays

The following tables show the meaning of the status and error displays. Remedial measures for diagnostic alarms can be found in the Diagnostic alarms (Page 31) chapter.

LED DIAG

Table 5- 1 DIAG LED fault display

DIAG	Meaning
Off	Backplane bus supply of the ET 200SP not OK
Flashes	Module is not configured
On	Module parameterized and no module diagnostics
Flashes	Module parameterized and module diagnostics

Cn LEDs

Table 5- 2 Status displays of C1, C2, C3 and C4 LEDs

C1, C2, C3 or C4	Meaning
Off	Port disabled or in SIO mode
Flashes	Port in IO-Link mode, device not connected or port not connected with the configured device
On	Port in IO-Link mode, device not connected

Qn LEDs

Table 5- 3 Status displays of Q1, Q2, Q3 and Q4 LEDs

Q1, Q2, Q3 or Q4	Meaning
Off	Process signal = 0 in SIO mode, deactivated or in IO-Link mode
On	Process signal = 1 in SIO mode

Fn LEDs

Table 5- 4 F1, F2, F3 and F4 LED error displays

F1, F2, F3 or F4	Meaning
▫ Off	No error
■ On	Error

LED PWR

Table 5- 5 Status display of the PWR LED

PWR	Meaning
▫ Off	Supply voltage L+ missing
■ On	Supply voltage L+ present

5.2 Diagnostic alarms

For each diagnostics event, a diagnostic alarm is issued and the DIAG LED flashes red on the communication module. 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.

Table 5- 6 Error types

Diagnostic alarm	Error code	Meaning (IO-Link error code)	IO-Link master	IO-Link device
Short-circuit	1_H	• Short-circuit in the process cables on the IO-Link device (1804_H)	X	
		• Short-circuit on IO device (7710_H)		X
Undervoltage	2_H	• Supply voltage too low (5111_H, 5112_H)		X
Overvoltage	3_H	• Supply voltage too high (5110_H)		X
Overheating	5_H	• Temperature exceeded on master (1805_H)	X	
		• Temperature exceeded on device (4000_H, 4210_H)		X
Wire break	6_H	• No IO-Link device connected • There is a break in the signal line to the IO-Link device • IO-Link device cannot communicate due to another error (1800_H)	X	
Overflow	7_H	• Process tag range exceeded ($8C10_H$) • Measuring range exceeded ($8C20_H$)		X
Underflow	8_H	• Process tag range too low ($8C30_H$)		X
Error	9_H	• All IO-Link error codes which are not listed here are mapped to this PROFIBUS DP error		X
Configuration error	10_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) • Cannot configure IO-Link master (1882_H, 1883_H) • Storage error (1886_H) • Process data length exceeded (1887_H) • PQI not supported (1889_H)	X	
		• Device was not configured correctly (6320_H, 6321_H, 6350_H)		X
Supply voltage missing	11_H	• L+ supply voltage for device missing (1806_H) • L+ supply voltage for device too low (<20 V) (1807_H)	X	
Defective fuse	12_H	• Fuse on device is defective (5101_H)		X
Safety shutdown	19_H	• Serious error (master has to be replaced) (1880_H)	X	
External fault	$1A_H$	• Error in data storage (1809_H, $180A_H$, $180B_H$, $180C_H$, $180D_H$) • More than 6 errors are pending simultaneously on the IO-Link device (1808_H) • Consistency error in electronic coding element (1885_H) • Process data length exceeded (1887_H)	X	

Technical specifications

6

Technical specifications of the IO-Link Master CM 4xIO-Link communication module

Article number	6ES7137-6BD00-0BA0
General information	
Product type designation	CM 4 x IO-Link ST, PU 1
Firmware version	V2.2
• FW update possible	Yes
usable BaseUnits	BU type A0
Color code for module-specific color identification plate	CC04
Product function	
• I&M data	Yes; I&M0 to I&M3
Engineering with	
• STEP 7 TIA Portal configurable/integrated as of version	STEP 7 V15 or higher
• STEP 7 configurable/integrated as of version	STEP 7 V5.5 or higher
• PROFIBUS as of GSD version/GSD revision	One GSD file each, Revision 3 and 5 and higher
• PROFINET as of GSD version/GSD revision	GSDML V2.3
Supply voltage	
Type of supply voltage	24 V DC
Rated value (DC)	24 V
permissible range, lower limit (DC)	19.2 V; 20.5 V if IO-Link is used, as the supply voltage for IO-Link devices has to be at least 20 V at the master.
permissible range, upper limit (DC)	28.8 V
Reverse polarity protection	Yes
Input current	
Current consumption, max.	45 mA; without load
Encoder supply	
Number of outputs	4
Output current	
• Rated value	200 mA; Per channel
24 V encoder supply	
• Short-circuit protection	Yes

Article number	6ES7137-6BD00-0BA0
Power loss	
Power loss, typ.	1 W
Digital outputs	
Cable length	
• unshielded, max.	20 m; Also applies for shielded cables
IO-Link	
Number of ports	4
• of which simultaneously controllable	4
IO-Link protocol 1.0	Yes
IO-Link protocol 1.1	Yes
Transmission rate	4.8 kBaud (COM1); 38.4 kBaud (COM2), 230.4 kBaud (COM3)
Cycle time, min.	2 ms; dynamic, depending on user data length
Size of process data, input per port	32 byte; max.
Size of process data, input per module	144 byte; max.
Size of process data, output per port	32 byte; max.
Size of process data, output per module	128 byte; max.
Memory size for device parameter	2 kbyte; for each port
Master backup	Yes
Configuration without S7-PCT	Yes
Cable length unshielded, max.	20 m
Operating modes	
• IO-Link	Yes
• DI	Yes
• DQ	Yes; max. 100 mA per channel
Time Based IO	
– TIO IO-Link IN	No; Only for PROFINET and configuration as version with FW V2.0 or V2.1
– TIO IO-Link OUT	No; Only for PROFINET and configuration as version with FW V2.0 or V2.1
– TIO IO-Link IN/OUT	No; Only for PROFINET and configuration as version with FW V2.0 or V2.1
Connection of IO-Link devices	
• Port type A	Yes
• Port type B	Yes; 24 V DC via external terminal
• via three-wire connection	Yes
Isochronous mode	
Isochronous operation (application synchronized up to terminal)	No; Only for PROFINET and configuration as version with FW V2.0 or V2.1

Article number	6ES7137-6BD00-0BA0
Interrupts/diagnostics/status information	
Alarms	
• Diagnostic alarm	Yes; The port diagnosis is available in the IO-Link mode only.
Diagnostic messages	
• Monitoring the supply voltage	Yes
• Wire-break	Yes
• Short-circuit	Yes
• Group error	Yes
Diagnostics indication LED	
• Monitoring of the supply voltage (PWR-LED)	Yes; green PWR LED
• Channel status display	Yes; one green LED for channel status Qn (SIO mode) and port status Cn (IO-Link mode) per channel
• for channel diagnostics	Yes; red Fn LED
• for module diagnostics	Yes; green/red DIAG LED
Potential separation	
Potential separation channels	
• between the channels	No
• between the channels and backplane bus	Yes
• between the channels and the power supply of the electronics	No
Isolation	
Isolation tested with	707 V DC (type test)
Dimensions	
Width	15 mm
Height	73 mm
Depth	58 mm
Weights	
Weight, approx.	30 g

Overview of the response time

The following figure shows the response time for IO-Link without Time-based IO.

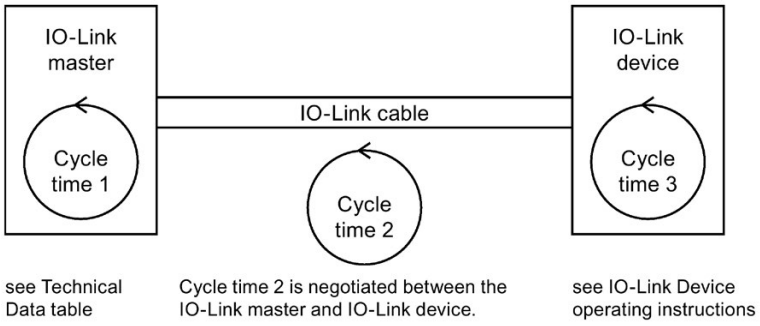


Figure 6-1 Cycle time for IO-Link without Time-based IO

Dimensional drawing

See manual ET 200SP BaseUnits
(http://support.automation.siemens.com/WW/view/en/58532597/133300)

Parameter data record

A

A.1 Parameter assignment and structure of parameter data set

The data record of the module has an identical structure, regardless of whether you configure the module with PROFIBUS DP or PROFINET IO. With data record 128, you can reconfigure the module in your user program regardless of your programming.

The following describes the structure of data record 128 as of firmware version V2.2.

Configuration in the user program

You can configure the modules in runtime.

Changing parameters in RUN

The "WRREC" instruction is used to transfer the parameters to the module using data record 128. The parameters set in STEP 7 are not changed in the CPU, which means that the parameters set in STEP 7 will be valid again after a restart.

Output parameter STATUS

If errors occur when transmitting parameters with the "WRREC" instruction, the module continues operation with the previous parameter assignment. The STATUS output parameter contains a corresponding error code.

You will find a description of the "WRREC" instruction and the error codes in the STEP 7 online help.

Error message

The module always checks all the values of the transferred data record. Only if all the values were transferred without errors does the module apply the values from the data record.

The instruction WRREC for writing data records returns corresponding error codes when errors occur in the parameter STATUS.

The following table shows the module-specific error codes and their meaning for the parameter data record 128:

Table A- 1 Error message

Error code	Meaning
$80B1_H$	Error in data length
$80E0_H$	Error in header information
$80E1_H$	Parameter error

Structure of data record 128

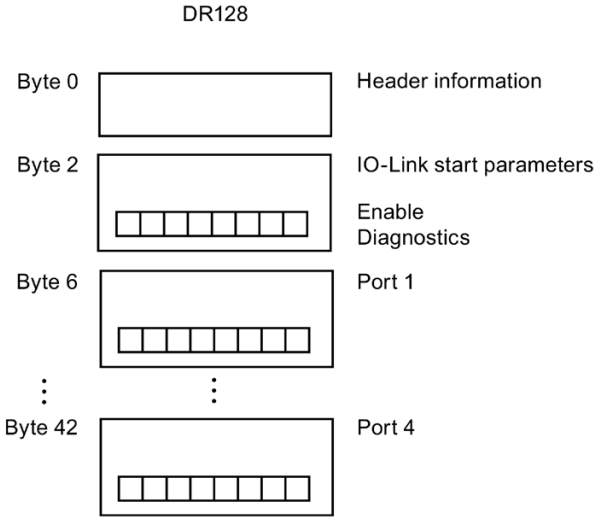


Figure A-1 Structure of data record 128

Header information

The figure below shows the structure of the header information.

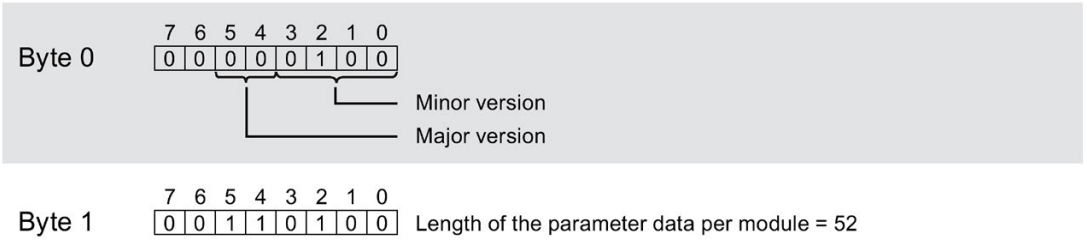


Figure A-2 Header information

IO-Link start parameters

The following figure shows the structure of the IO-Link start parameter.
Activate a parameter by setting the corresponding bit to "1".

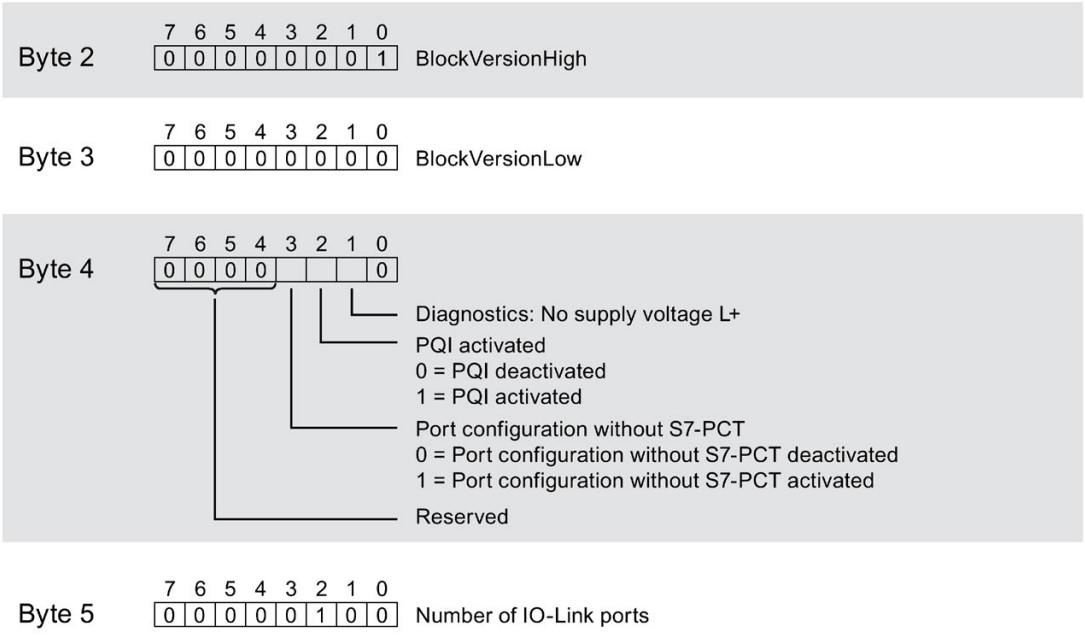
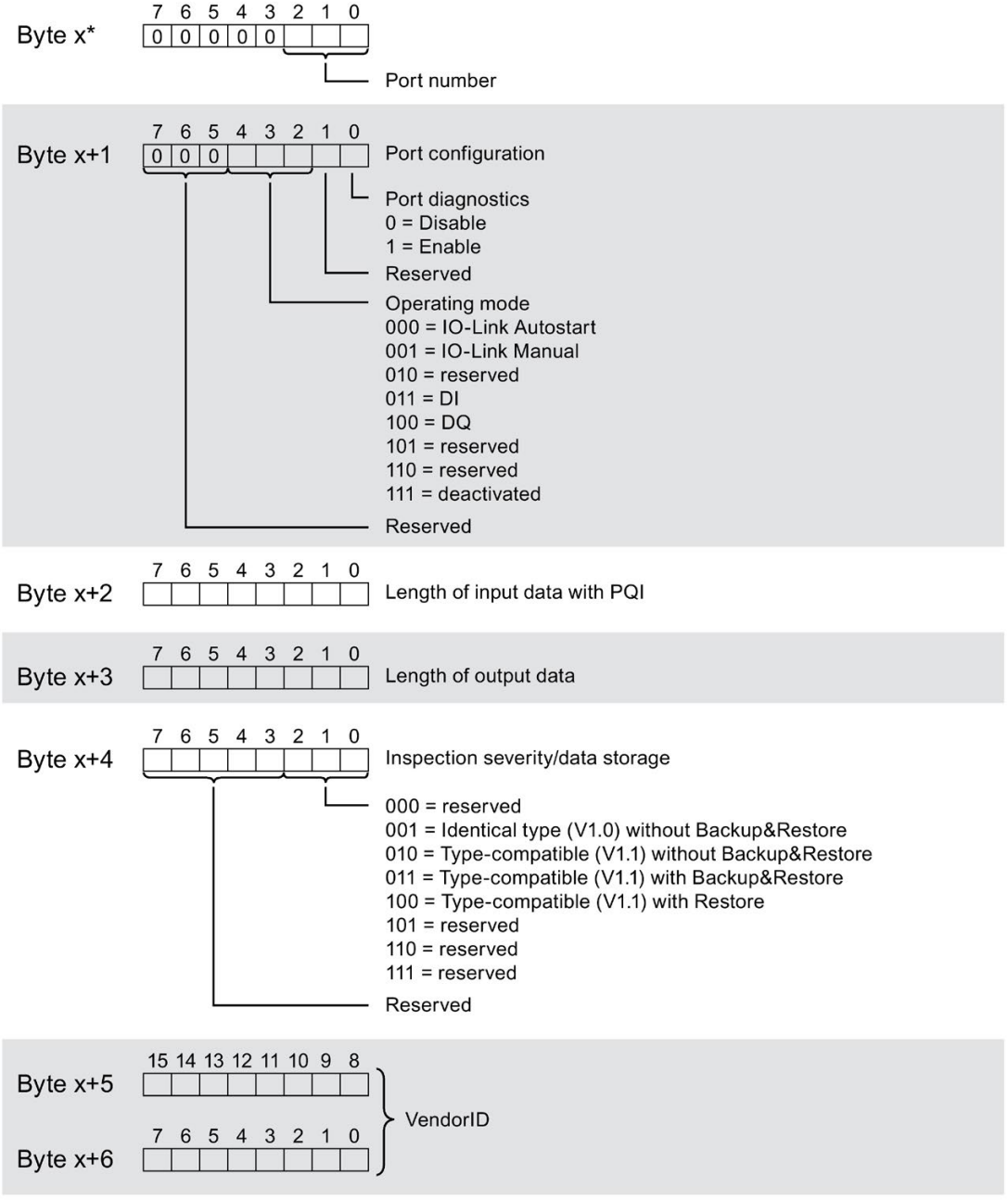


Figure A-3 IO-Link start parameters

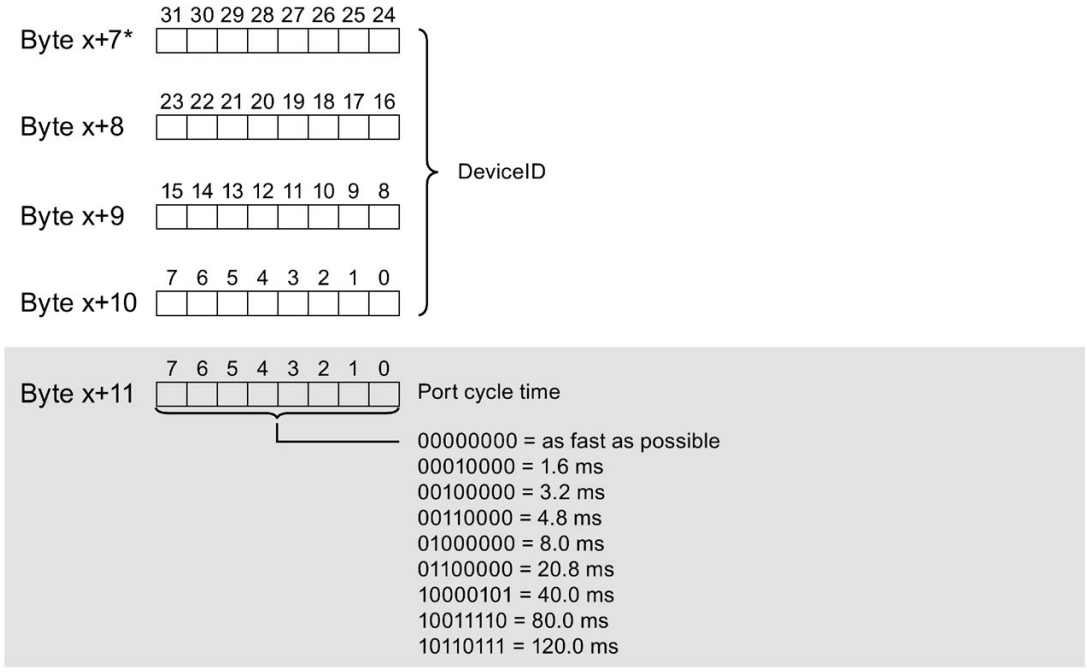
Port parameter

The following figure shows an extract from the structure of the port parameter.
Activate a parameter by setting the corresponding bit to "1".

If you have selected IO-Link Manual operating mode, you must enter the Vendor ID (byte x+5 and x+6) and Device ID (byte x+7 to x+10) yourself.
You can find the Vendor ID and Device ID in the IODD of the IO-Link device being used.



* x = 6 + ((port number-1) x 12); port numbers = 1 to 4.



* x = 6 + ((port number-1) x 12); port numbers = 1 to 4.

Figure A-4 Port parameter