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MANUAL

SIMATIC

ET 200SP

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

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ET 200SP Communication module IO-Link Master CM 4xIO-Link (6ES7137-6BD00-0BA0)

Equipment Manual

Preface

Documentation guide

1

Product overview

2

Connecting

3

Parameters/address space

4

Diagnostic alarms

5

Technical specifications

6




Parameter data record

A

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.

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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.

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.

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For additional information on industrial security measures that may be implemented, please visit (<https://www.siemens.com/industrialsecurity>).

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To stay informed about product updates, subscribe to the Siemens Industrial Security RSS Feed visit (<https://www.siemens.com/cert>).

Table of contents

	Preface	3
1	Documentation guide	5
1.1	ET 200SP Documentation Guide.....	5
2	Product overview	7
2.1	Properties.....	7
2.2	Functions.....	10
2.3	Replacement of the IO-Link Master CM 4xIO-Link communication module with an electronic coding element type H.....	10
2.4	Time-based IO.....	12
2.5	Reset communication module to factory settings.....	13
3	Connecting	14
3.1	Wiring and block diagram.....	14
4	Parameters/address space	18
4.1	Parameters.....	18
4.2	Declaration of parameters.....	20
4.3	Address space.....	22
5	Diagnostic alarms	25
5.1	Status and error displays.....	25
5.2	Diagnostic alarms.....	28
6	Technical specifications	30
A	Parameter data record	34
A.1	Parameter assignment and structure of parameter data set.....	34

Documentation guide

1.1 ET 200SP Documentation Guide



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.

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

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.

Examples:

- ET 200SP System Manual
- System Manual ET 200SP HA/ET 200SP modules for devices used in a hazardous area
- Online help 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:

- Equipment Manuals CPUs
- Equipment Manuals Interface Modules
- Equipment Manuals Digital Modules
- Equipment Manuals Analog Modules
- Equipment Manuals Motor Starter
- BaseUnits Equipment Manuals
- Equipment Manual Server Module
- Equipment Manuals Communications Modules
- Equipment Manuals Technology Modules

General information



The function manuals contain detailed descriptions on general topics relating to the SIMATIC ET 200SP distributed I/O system.

Examples:

- Function Manual ET 200AL/ET 200SP Mixed Configuration
- Function Manual Diagnostics
- Function Manual Communication
- PROFINET Function Manual
- PROFIBUS Function Manual
- Function Manual Designing Interference-free Controllers
- MultiFieldbus Function Manual

Product Information

Changes and supplements to the manuals are documented in a Product Information. The Product Information takes precedence over the device and system manuals.

You can find the latest Product Information on the ET 200SP distributed I/O system on the Internet. (<https://support.industry.siemens.com/cs/de/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. (<https://support.industry.siemens.com/cs/ww/en/view/84133942>)

Product overview

2.1 Properties

Article number

6ES7137-6BD00-0BA0

View of the module

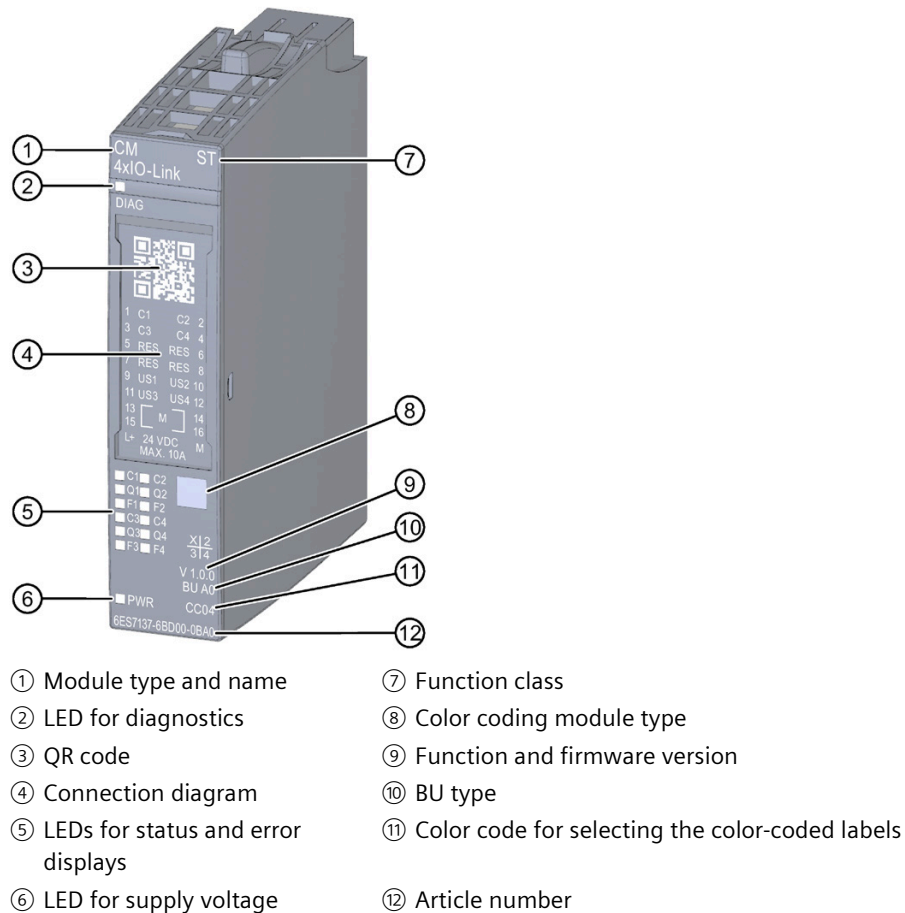


Figure 2-1 View of the IO-Link Master CM 4xIO-Link communication module

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
PROFenergy	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 "LIOLink_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 SupportedModule s.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.

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

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 "LIOLink_Master".

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 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

3.1 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.

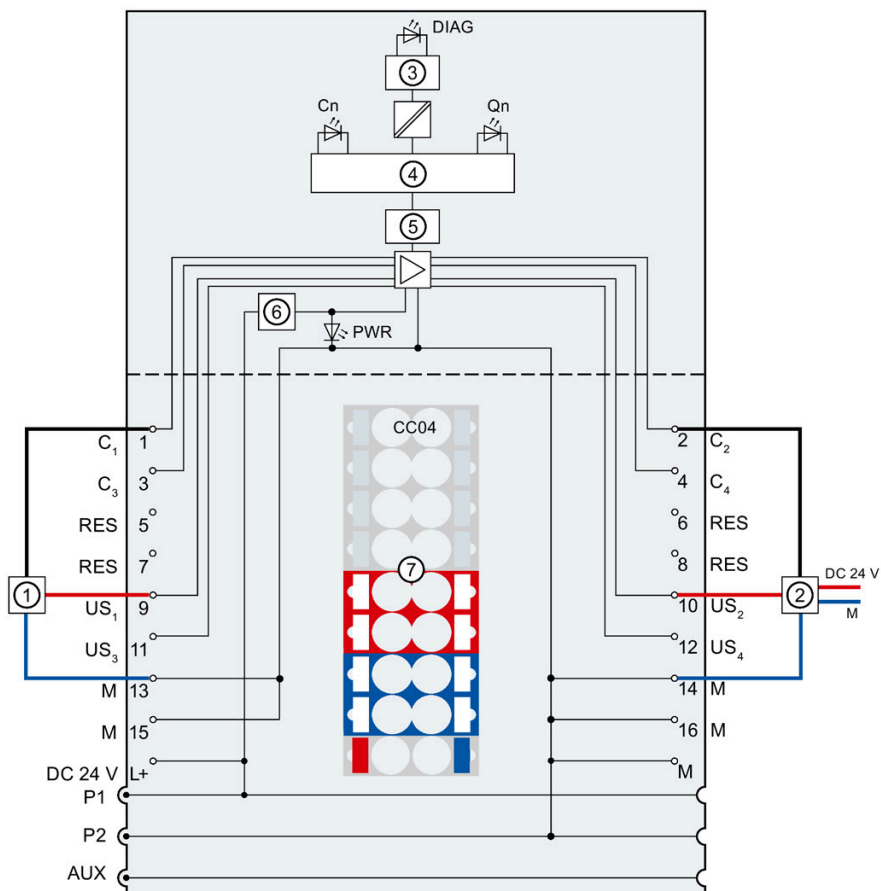
You can use and combine the different wiring options for all channels.

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 ($U_{S_n/M}$) 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).

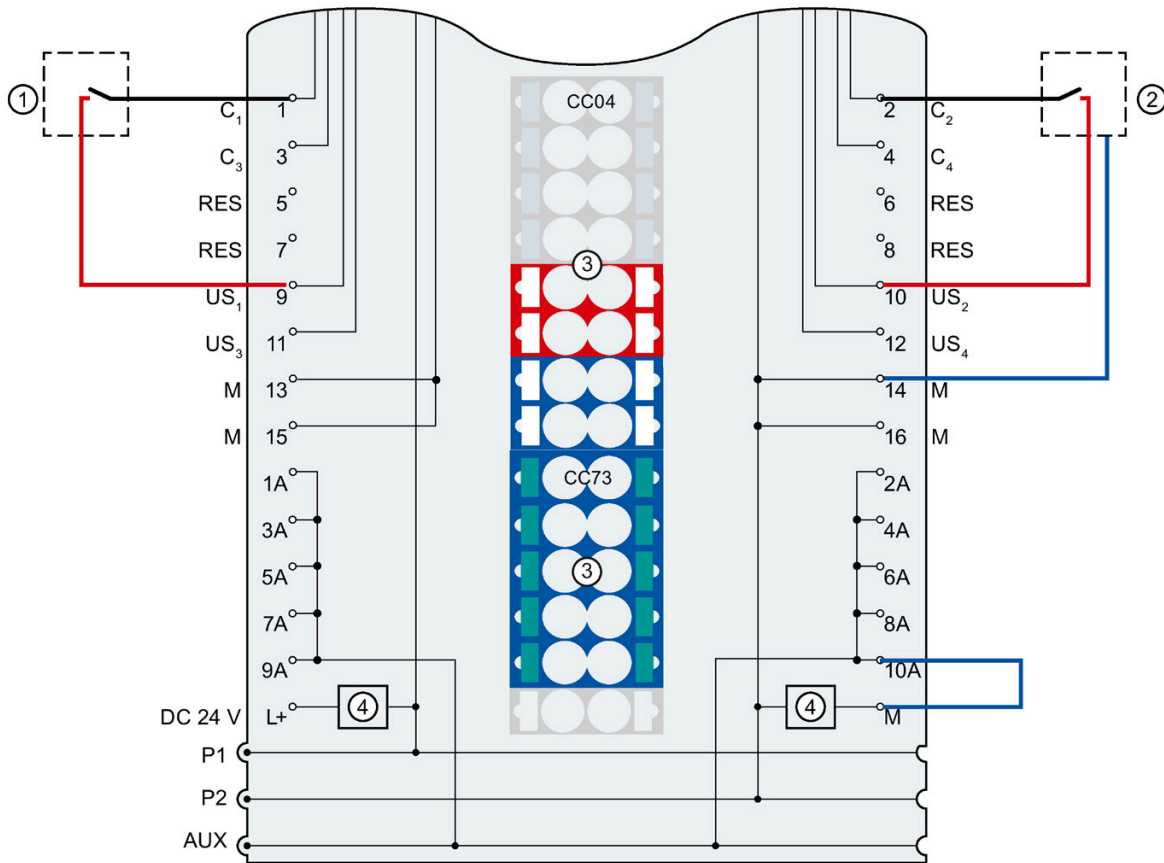


①	3-wire connection	P1, P2, AUX	Internal self-assembling voltage buses Connection to left (dark-colored BaseUnit) Connection to left interrupted (light-colored BaseUnit)
②	5-wire connection	C _n	Communication signal, DI, DQ
③	Backplane bus interface	RES	Reserved, must not be assigned
④	Microprocessor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

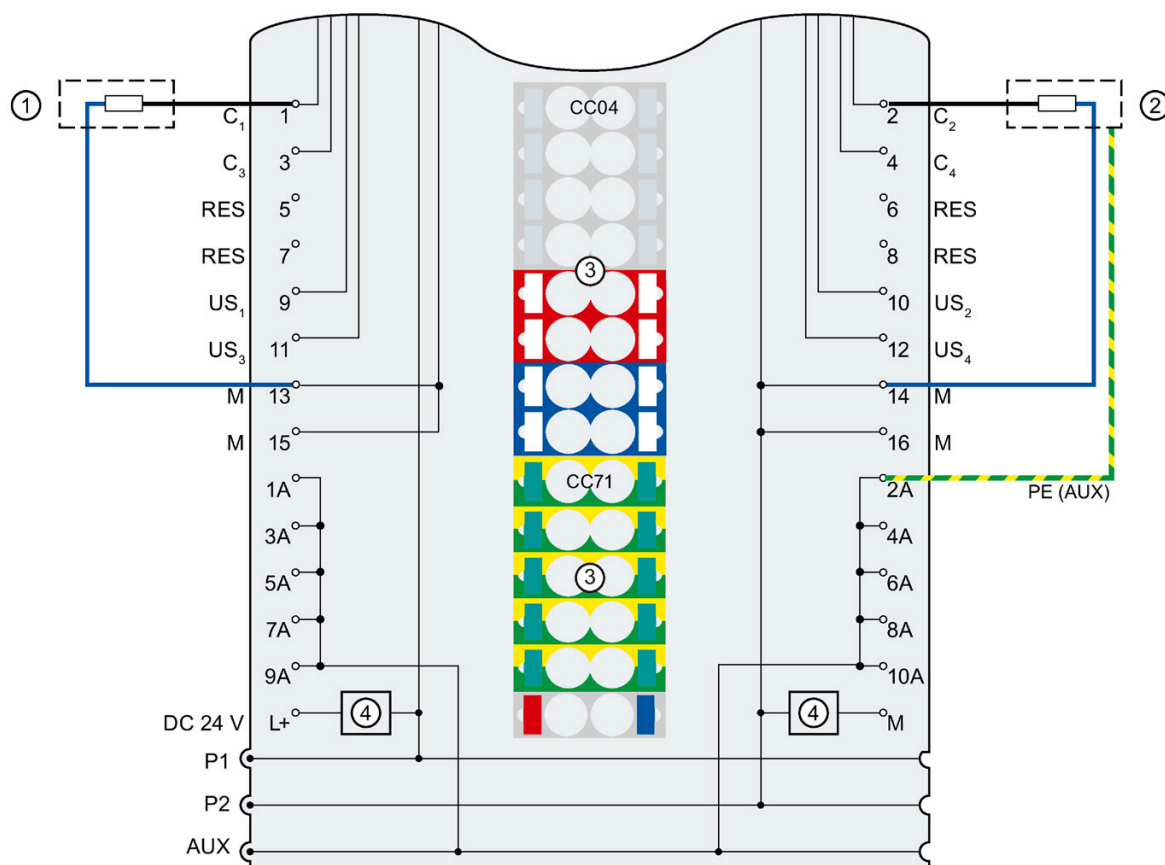


- | | | | |
|--------|--|-----------------|---|
| ① | 2-wire connection | 1 A to 10 A | AUX terminals |
| ② | 3-wire connection | PE (AUX) | Protective conductor connection |
| ③ | Color-coded labels with color code CC04 and CC73 (optional) | P1, P2, AUX | Internal self-assembling voltage buses
Connection 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 D | Supply voltage L+ (infeed for light-colored BaseUnit only) | RES | Reserved, must not be assigned |
| C | | US _n | Supply voltage (positive) |
| M | Ground | | |

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 D	Supply voltage L+ (infeed for light-colored BaseUnit only)	RES	Reserved, must not be assigned
C		US _n	Supply voltage (positive)
M	Ground		

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

Parameters/address space

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+	<ul style="list-style-type: none"> • disable • enable 	disable	Yes	Module
Diagnostics port 1	<ul style="list-style-type: none"> • disable • enable 	disable	Yes	Port (channel)
Diagnostics port 2	<ul style="list-style-type: none"> • disable • enable 	disable	Yes	Port (channel)
Diagnostics port 3	<ul style="list-style-type: none"> • disable • enable 	disable	Yes	Port (channel)
Diagnostics port 4	<ul style="list-style-type: none"> • disable • enable 	disable	Yes	Port (channel)
Potential group	<ul style="list-style-type: none"> • 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				
PortQualifierInformation (PQI)	<ul style="list-style-type: none"> • Disable • Enable 	Enable	No	Module
Port configuration without P7-PCT	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • 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**	<ul style="list-style-type: none"> • 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 **de**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 with the Port Configuration Tool S7-PCT, V3.2 or higher.

PortQualifierInformation (PQI)

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

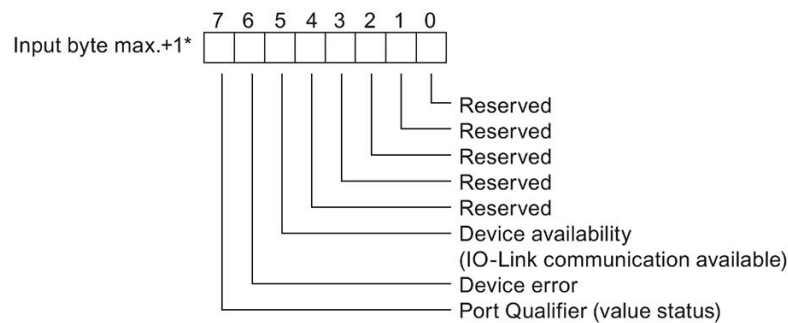
Note

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 figure below shows the structure of the PQI byte.

Port Qualifier Information (PQI)



* 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.

Diagnostic alarms

5.1 Status and error displays

LED display

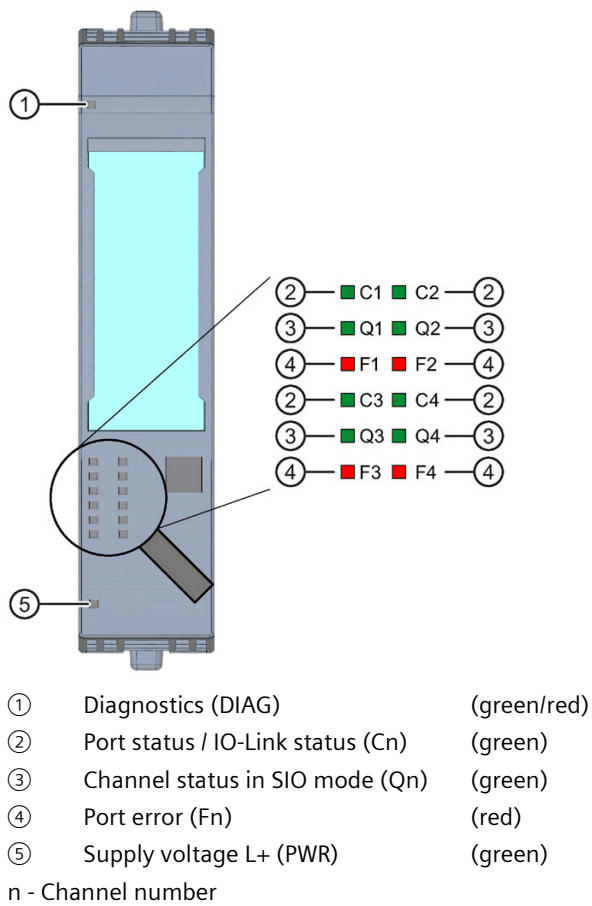






Figure 5-1 LED display

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 28) 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	1H	• Short-circuit in the process cables on the IO-Link device (1804H)	X	
		• Short-circuit on IO device (7710H)		X
Undervoltage	2H	• Supply voltage too low (5111H, 5112H)		X
Overvoltage	3H	• Supply voltage too high (5110H)		X
Overheating	5H	• Temperature exceeded on master (1805H)	X	
		• Temperature exceeded on device (4000H, 4210H)		X
Wire break	6H	• 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 (1800H)	X	
Overflow	7H	• Process tag range exceeded (8C10H)		X
		• Measuring range exceeded (8C20H)		X
Underflow	8H	• Process tag range too low (8C30H)		X
Error	9H	• All IO-Link error codes which are not listed here are mapped to this PROFIBUS DP error		X
Configuration error	10H	• Incorrect device (1802H) • Vendor ID and Device ID not defined (1817H) • Process data length of the IO-Link device exceeded (1818H) • No cycle time configured (1819H) • Cannot configure IO-Link master (1882H, 1883H) • Storage error (1886H) • Process data length exceeded (1887H) • PQI not supported (1889H)	X	
		• Device was not configured correctly (6320H, 6321H, 6350H)		X
Supply voltage missing	11H	• L+ supply voltage for device missing (1806H) • L+ supply voltage for device too low (<20 V) (1807H)	X	
Defective fuse	12H	• Fuse on device is defective (5101H)		X

Diagnostic alarm	Error code	Meaning (IO-Link error code)	IO-Link master	IO-Link device
Safety shutdown	19H	<ul style="list-style-type: none"> • Serious error (master has to be replaced) (1880H) 	X	
External fault	1AH	<ul style="list-style-type: none"> • Error in data storage (1809H, 180AH, 180BH, 180CH, 180DH) • More than 6 errors are pending simultaneously on the IO-Link device (1808H) • Consistency error in electronic coding element (1885H) • Process data length exceeded (1887H) 	X	

Technical specifications

Technical specifications of the IO-Link Master CM 4xIO-Link 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/6ES7137-6BD00-0BA0/td?dl=de>).

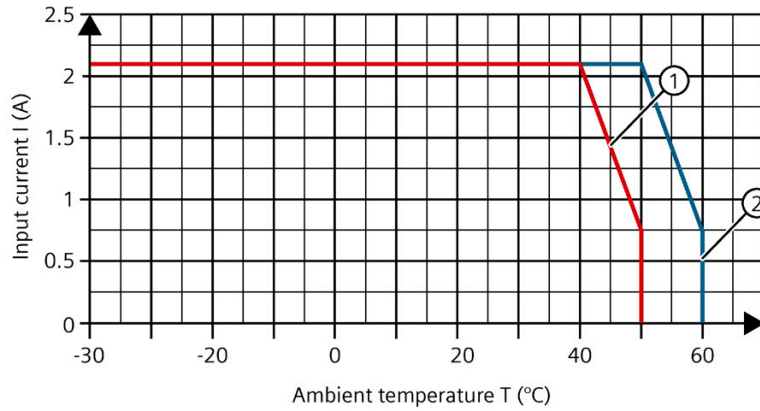
Article number	6ES7137-6BD00-0BA0
General information	
Product type designation	CM 4 x IO-Link ST
HW functional status	FS20
Firmware version	V2.2.2
<ul style="list-style-type: none"> FW update possible 	Yes
usable BaseUnits	BU type A0
Color code for module-specific color identification plate	CC04
Product function	
<ul style="list-style-type: none"> I&M data 	Yes; I&M0 to I&M3
<ul style="list-style-type: none"> Isochronous mode 	No; Only for PROFINET and configuration as version with FW V2.0 or V2.1
Engineering with	
<ul style="list-style-type: none"> STEP 7 TIA Portal configurable/integrated from version 	STEP 7 V15 or higher
<ul style="list-style-type: none"> STEP 7 configurable/integrated from version 	STEP 7 V5.5 or higher
<ul style="list-style-type: none"> PROFIBUS from GSD version/GSD revision 	One GSD file each, Revision 3 and 5 and higher
<ul style="list-style-type: none"> PROFINET from GSD version/GSD revision 	GSDML V2.3
Supply voltage	
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
power supply according to NEC Class 2 required	No
Input current	
Current consumption, max.	45 mA; without load
Encoder supply	
Number of outputs	4
Output current	
<ul style="list-style-type: none"> Rated value 	700 mA; Per channel
24 V encoder supply	
<ul style="list-style-type: none"> Short-circuit protection 	Yes

Article number	6ES7137-6BD00-0BA0
<ul style="list-style-type: none"> Output current, max. 	2.1 A
Power loss	
Power loss, typ.	1 W
Hardware configuration	
Automatic encoding	Yes
<ul style="list-style-type: none"> Electronic coding element type H 	Yes
Digital outputs	
Cable length	
<ul style="list-style-type: none"> unshielded, max. 	20 m; Also applies for shielded cables
IO-Link	
Number of ports	4
<ul style="list-style-type: none"> 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	
<ul style="list-style-type: none"> IO-Link 	Yes
<ul style="list-style-type: none"> DI 	Yes
<ul style="list-style-type: none"> DQ 	Yes; max. 100 mA per channel
Time Based IO	
<ul style="list-style-type: none"> TIO IO-Link IN 	No; Only for PROFINET and configuration as version with FW V2.0 or V2.1
<ul style="list-style-type: none"> TIO IO-Link OUT 	No; Only for PROFINET and configuration as version with FW V2.0 or V2.1
<ul style="list-style-type: none"> 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	
<ul style="list-style-type: none"> Port type A 	Yes
<ul style="list-style-type: none"> Port type B 	Yes; 24 V DC via external terminal
<ul style="list-style-type: none"> via three-wire connection 	Yes
Interrupts/diagnostics/status information	
Alarms	
<ul style="list-style-type: none"> Diagnostic alarm 	Yes; The port diagnosis is available in the IO-Link mode only.

Article number	6ES7137-6BD00-0BA0
Diagnoses	
• 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)
Ambient conditions	
Ambient temperature during operation	
• horizontal installation, min.	-30 °C
• horizontal installation, max.	60 °C
• vertical installation, min.	-30 °C
• vertical installation, max.	50 °C
Altitude during operation relating to sea level	
• Installation altitude above sea level, max.	2 000 m; On request: Installation altitudes greater than 2 000 m
Dimensions	
Width	13 mm
Height	73 mm
Depth	58 mm
Weights	
Weight, approx.	30 g

Power reduction (derating)

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



- ① Mounting position other than horizontal
- ② Horizontal mounting position

Figure 6-1 Derating curve, IO-Link master CM 4xIO-Link

Overview of the response time

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

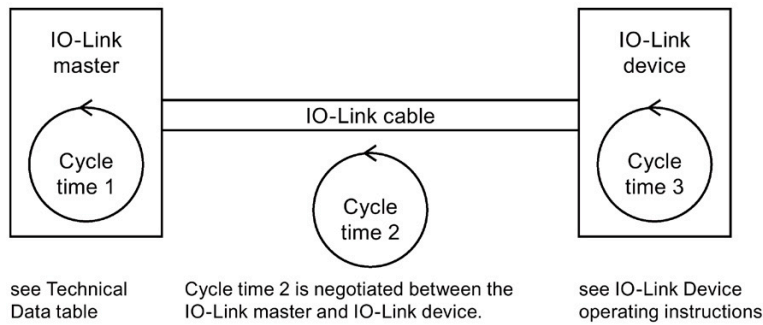


Figure 6-2 Cycle time for IO-Link without Time-based IO

Dimensional drawing

See manual ET 200SP BaseUnits

<http://support.automation.siemens.com/WW/view/en/58532597/133300>

Parameter data record

A.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
80B1H	Error in data length
80E0H	Error in header information
80E1H	Parameter error

Structure of data record 128

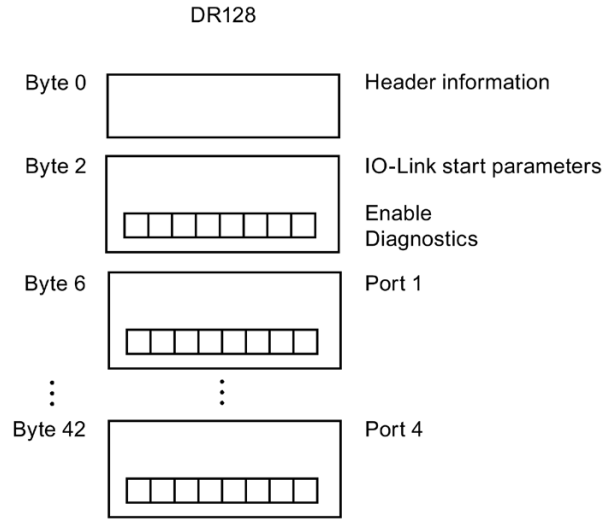


Figure A-1 Structure of data record 128

Header information

The figure below shows the structure of the header information.

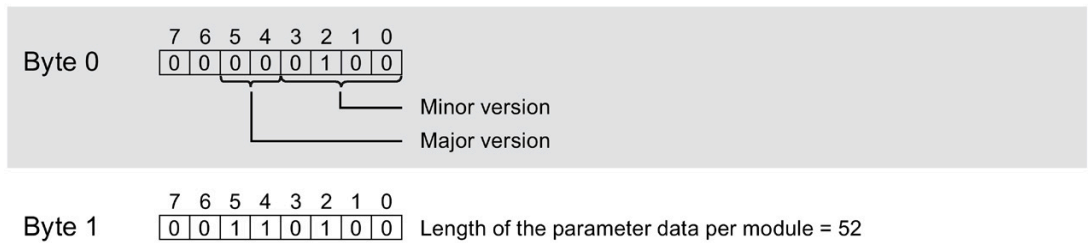


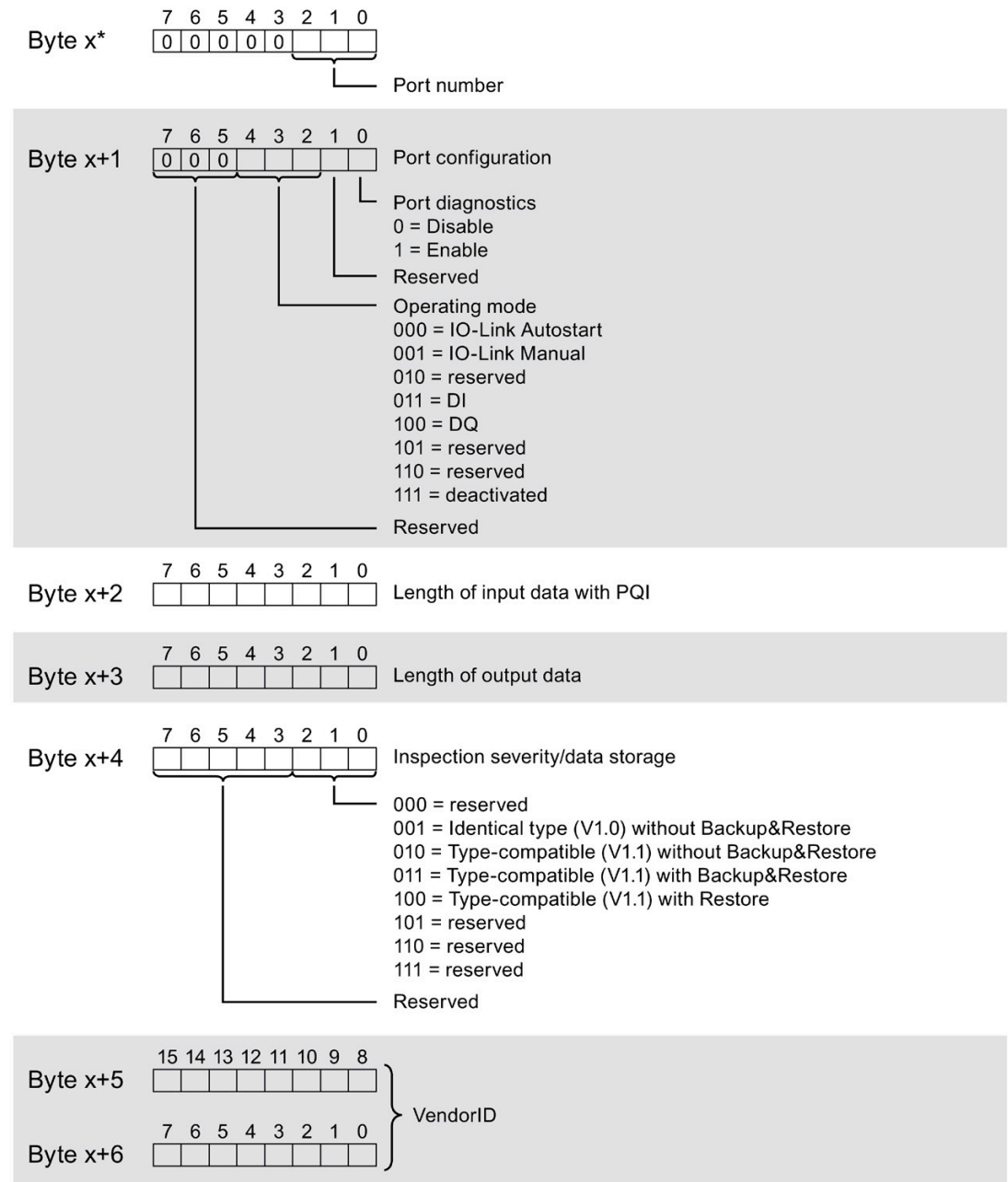
Figure A-2 Header information

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".

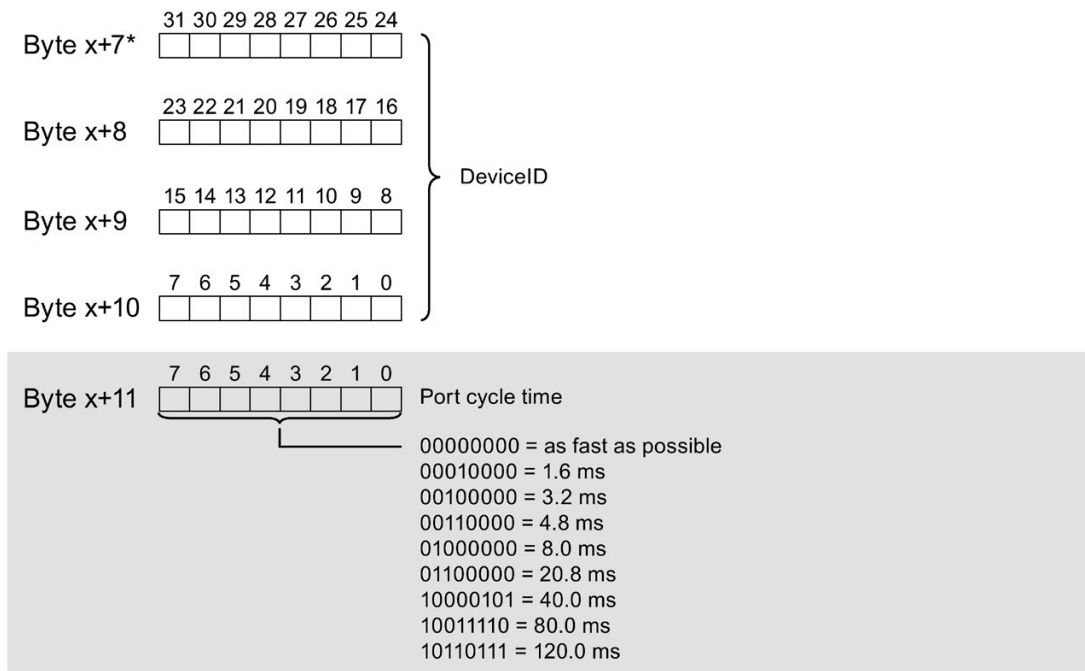
If you have selected IO-Link Manual operating mode, you must enter the Vendor ID (byte x+5 and x+6) and Device ID (byte x+7 to x+10) yourself.

You can find the Vendor ID and Device ID in the IO-DD of the IO-Link device being used.



* $x = 6 + ((\text{port number} - 1) \times 12)$; port numbers = 1 to 4.

A.1 Parameter assignment and structure of parameter data set



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