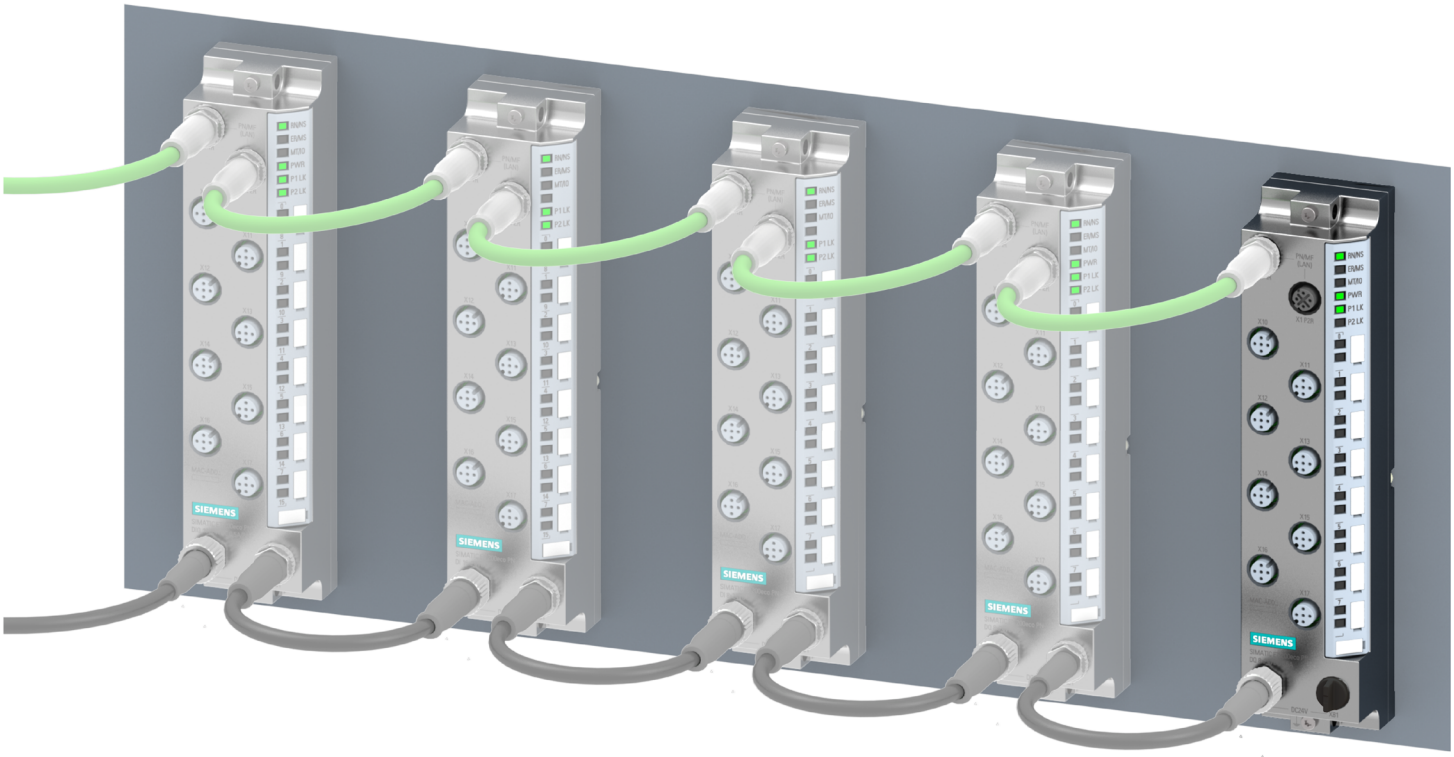


Edition 06/2024

EQUIPMENT MANUAL

SIMATIC

ET 200eco PN M12-L

I/O device digital outputs DQ 8x24VDC/0.5A M12-L 8xM12
6ES7142-6BG00-0BB0

support.industry.siemens.com

SIEMENS

SIEMENS

SIMATIC

ET 200eco PN
I/O device digital outputs
DQ 8x24VDC/0.5A M12-L 8xM12
(6ES7142-6BG00-0BB0)

Equipment Manual

Introduction 1

Industrial cybersecurity 2

Product overview 3

Wiring 4

PROFINET IO 5

EtherNet/IP 6

Modbus TCP 7

Technical specifications 8

Dimension drawing A

Parameter data record B

06/2024
A5E46570894-AE

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

Note the following:

⚠ WARNING

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

Trademarks

All names identified by ® are registered trademarks of Siemens Aktiengesellschaft. The remaining trademarks in this publication may be trademarks whose use by third parties for their own purposes could violate the rights of the owner.

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.

Siemens Aktiengesellschaft
Digital Industries
Postfach 48 48
90026 NÜRNBERG
GERMANY

A5E46570894-AE
Ⓟ 07/2024 Subject to change

Copyright © Siemens 2020 - 2024.
All rights reserved

Table of contents

1 Introduction 5

1.1 Guide to ET 200eco PN M12-L 6
1.1.1 Information classes ET 200eco PN M12-L 6
1.1.2 Basic tools 7
1.1.3 MultiFieldbus Configuration Tool (MFCT) 9
1.1.4 SIMATIC Technical Documentation 10

2 Industrial cybersecurity 13

2.1 Introduction to industrial cybersecurity 13
2.2 Cybersecurity information 13
2.3 Cybersecurity-relevant information 14

3 Product overview 15

3.1 Properties 15
3.2 Operator controls and display elements 18

4 Wiring 19

4.1 Terminal and block diagram 19
4.2 Pin assignment 21

5 PROFINET IO 25

5.1 Parameters/address space 25
5.1.1 Parameters 25
5.1.2 Explanation of the parameters 25
5.1.3 Address space 26
5.2 Interrupts/diagnostics alarms 30
5.2.1 Status and error displays 30
5.2.2 Interrupts 33
5.2.3 Alarms 33
5.2.3.1 Diagnostics alarms 33
5.2.3.2 Maintenance events 34

6 EtherNet/IP 36

6.1 Functions/parameters/address space 36
6.1.1 Supported EtherNet/IP functions 36
6.1.2 Parameters 37
6.1.3 Explanation of the parameters 38
6.1.4 Update time of the I/O data 38
6.1.5 Address space 38
6.2 Diagnostics 42
6.2.1 Status and error displays for EtherNet/IP 42

7 Modbus TCP 46

7.1 Functions/parameters/address space 46
7.1.1 Supported Modbus TCP functions 46
7.1.2 Parameters 47
7.1.3 Explanation of the parameters 47
7.1.4 Update time of the I/O data 48
7.1.5 Address space 48

7.2 Diagnostics 52
7.2.1 Status and error displays for Modbus TCP 52

8 Technical specifications 56

A Dimension drawing 63

A.1 Dimension drawing 63

B Parameter data record 64

B.1 Dependencies for the configuration 64

B.2 Structure of data record 128 for I/O device parameter assignment 64

B.3 Error transferring the data record 67

Introduction

1

Purpose of the documentation

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

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

The information provided in this Equipment Manual, the System Manual, and the Function Manuals supports you in commissioning the ET 200eco PN M12-L distributed I/O devices.

Changes compared to the previous version

This manual contains the following changes/additions compared to the previous version:

- Addition of the Industrial cybersecurity (Page 13) section
- Display of address spaces and the parameter record updated
- Technical specifications (Page 56) updated

Conventions

Also observe notes marked as follows:

Note

A note contains important information:

- On the product described in the documentation
- On handling the product
- On the part of the documentation to which particular attention is paid

1.1 Guide to ET 200eco PN M12-L

1.1.1 Information classes ET 200eco PN M12-L



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

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

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

Basic information



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

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

Examples:

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

Device information



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

Examples:

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

General information



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

Examples:

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

1.1.2 Basic tools

Tools

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

TIA Selection Tool

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

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

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

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

SIMATIC Automation Tool

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

The SIMATIC Automation Tool offers a wide range of functions:

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

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

PRONETA

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

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

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

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

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

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

SINETPLAN

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

The advantages at a glance

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

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

1.1.3 MultiFieldbus Configuration Tool (MFCT)

MultiFieldbus Configuration Tool

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

Functional scope of the MFCT

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

System/installation requirements for MFCT

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

For MFCT you must also install the following software:

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

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

1.1.4 SIMATIC Technical Documentation

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

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

Overview of the SIMATIC Technical Documentation

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

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

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

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

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

Retention of the documentation

Retain the documentation for later use.

For documentation provided in digital form:

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

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

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

Updating the documentation

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

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

mySupport

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

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

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

Application examples

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

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

Industrial cybersecurity 2

2.1 Introduction to industrial cybersecurity

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

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

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

Note

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

2.2 Cybersecurity information

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

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

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

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

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

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

2.3 Cybersecurity-relevant information

Pay attention to all relevant cybersecurity information.

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

See also

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

Product overview

3

3.1 Properties

Article number

6ES7142-6BG00-0BB0

View of the I/O device

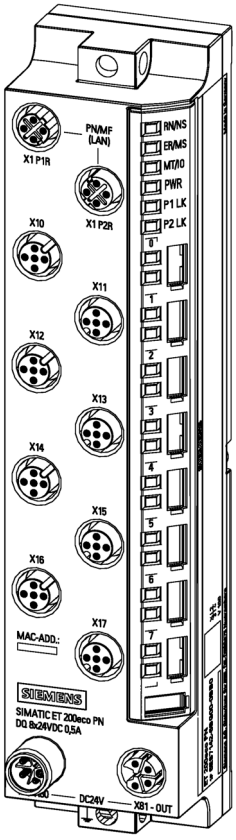


Figure 3-1 View of the I/O device DQ 8x24VDC/0.5A M12-L 8xM12

Properties

The I/O device has the following technical properties:

- Using the MultiFieldbus function, it connects the ET 200eco PN M12-L distributed I/O system with one of the following bus protocols:
  - PROFINET IO
  - EtherNet/IP
  - Modbus TCP
- 8 digital outputs
- M12 sockets for connection of actuators
- Rated supply voltage 24 V DC
- Rated load voltage 24 V DC
- Integrated switch with 2 ports
- Single and dual assignment of the sockets
- Configurable diagnostics can be set for each channel
- Output current per output 0.5 A
- Total current max. 4 A (per I/O device)
- Suitable for solenoid valves, DC contactors, and indicator lights
- Dimensions 45 x 200 mm

The I/O device supports the following functions:

- Firmware update
- Identification and maintenance data I&M0 to I&M3
- Isochronous mode
- Value status (Quality Information)
- Module-internal Shared Output (MSO)
- Shared Device

Accessories

The following components are included in the I/O device package:

- Identification labels

Other components

The following component can be ordered as spare part:

- Identification labels

The following components can be ordered as accessories:

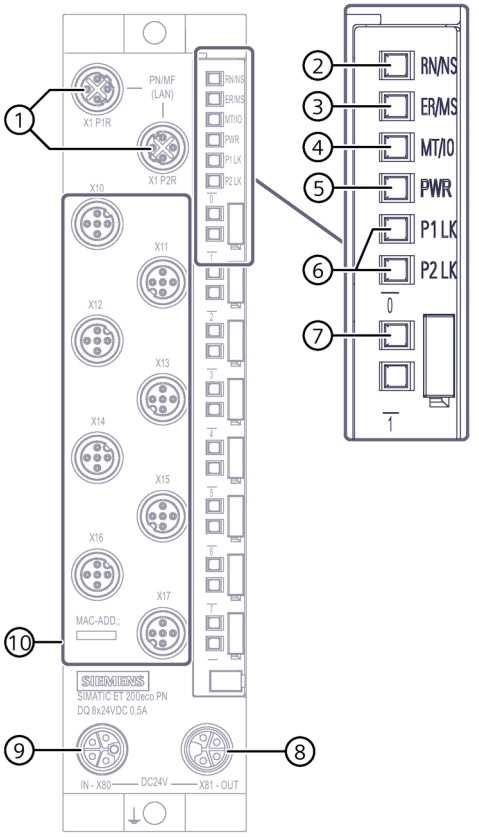
- Mounting rail
- Connectors and cables
- M12 sealing cap

See also

You can find additional information on the accessories in the ET 200eco PN M12-L distributed I/O system (https://support.industry.siemens.com/cs/ww/en/view/109778292) system manual.

3.2 Operator controls and display elements

The figure below shows the operator controls and display elements of the DQ 8x24VDC/0.5A M12-L 8xM12 I/O device.



① PN/MF (LAN): Sockets for connecting MultiFieldbus
② RN/NS: RUN/network status LED
③ ER/MS: ERROR/module status LED
④ MT/IO: MAINT/IO status LED
⑤ PWR: Power LED for load voltage 2L+
⑥ P1 LK/P2 LK: LINK port status LEDs
⑦ LED displays 0 to 7 for channel status/channel error
⑧ X81: Socket for loop-through of the supply and load voltage
⑨ X80: Connector for infeed of supply and load voltage
⑩ X10 to X17: Sockets for the output signal

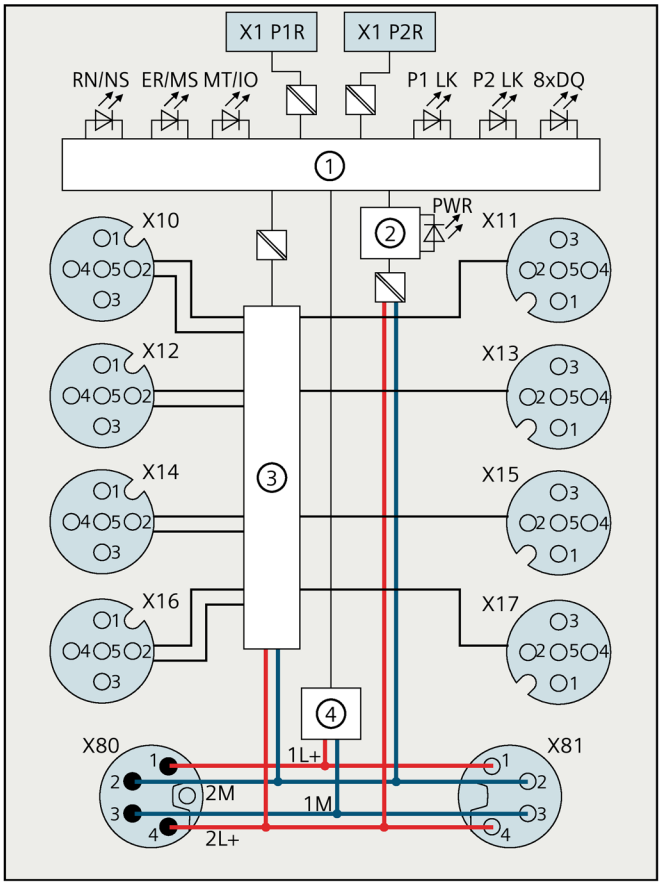
Figure 3-2 Operator controls and display elements

Wiring

4

4.1 Terminal and block diagram

The figure below shows an example of the connections and components of the I/O device.

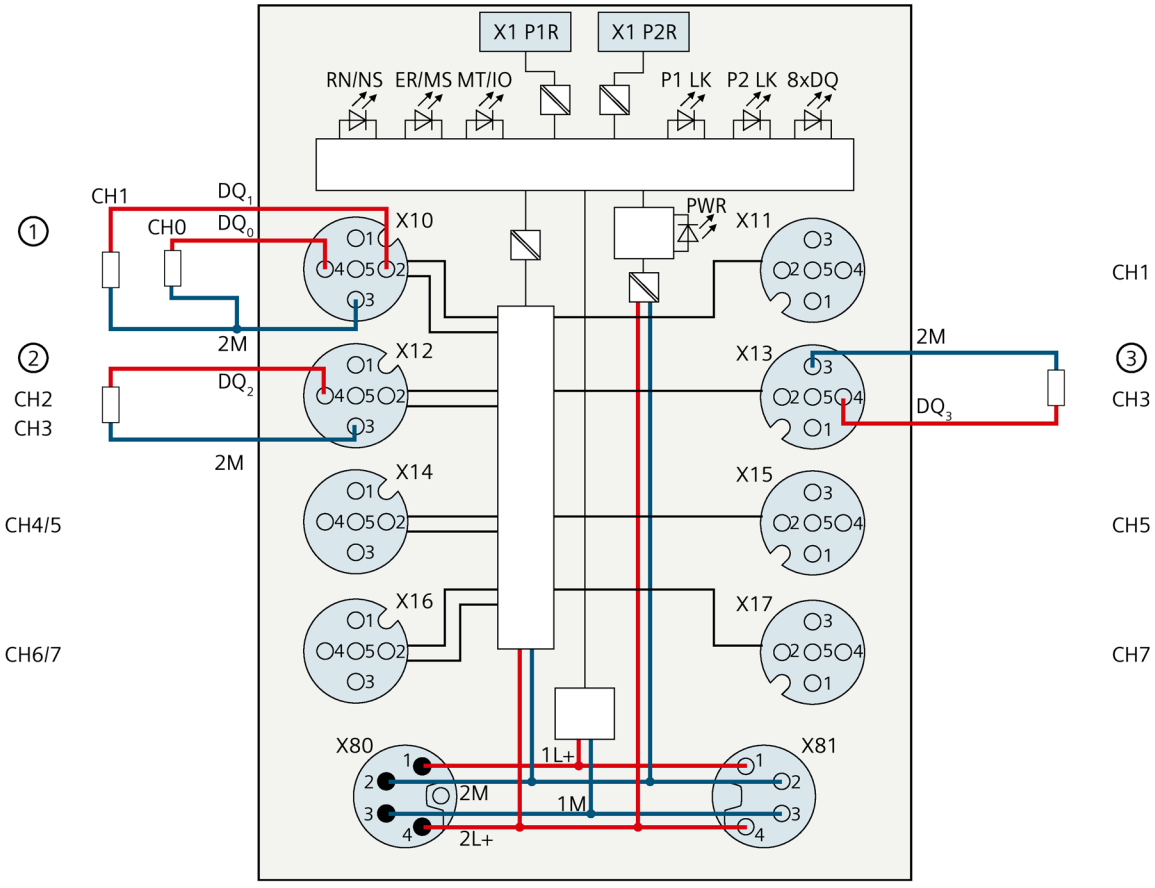


①	Bus interface with integrated 2-port switch	X1 P1R	MultiFieldbus interface X1 Port 1	RN/NS	RUN/network status LED
②	Monitoring	X1 P2R	MultiFieldbus interface X1 Port 2	ER/MS	ERROR/module status LED
③	DQ circuit	1L+	Supply voltage 1L+ (non-switched)	MT/IO	MAINT/IO status LED
④	Internal supply voltage	1M	Ground 1M (non-switched)	P1 LK	Link port 1 LED
X10 to X17	Channels 0 to 7	2L+	Load voltage 2L+ (switched)	P2 LK	LINK Port 2 LED
X80	Infeed of supply and load voltage	2M	Ground 2M (switched)	DQ	Channel status/channel error LEDs
X81	Loop-through of supply and load voltage			PWR	LED load voltage 2L+

Figure 4-1 Block diagram

Terminal circuit diagram

The figure below shows an example of the pin assignment of signal outputs with single and dual assignment of the sockets.



①	Output (dual assignment of the socket)	1L+	Supply voltage 1L+ (non-switched)	2L+	Load voltage 2L+ (switched)
②	Output (single assignment of socket)	1M	Ground 1M (non-switched)	2M	Ground 2M (switched)
③	Output (single assignment of socket)	DQ_n	Output signal		

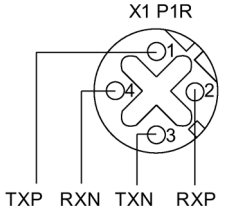
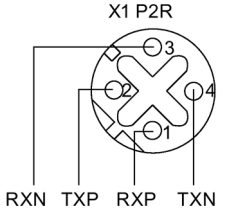
Figure 4-2 Terminal circuit diagram

4.2 Pin assignment

Pin assignment MultiFieldbus connector

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

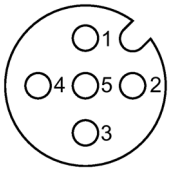
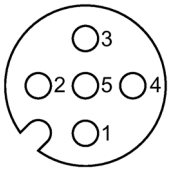
Table 4- 1 Pin assignment of the MultiFieldbus connector, port 1 and 2

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

Pin assignment of sockets for digital outputs

The table below shows the pin assignment of the 8 sockets for the connection of the digital outputs.

Table 4- 2 Pin assignment for digital outputs

Pin	Assignment	Front view of the sockets	
	X10 to X17 - sockets for digital outputs	**X10, X12, X14, X16**	**X11, X13, X15, X17**
1	-		
2	Connector X10: Output signal DQ_1* Connector X11: Not assigned Connector X12: Output signal DQ_3* Connector X13: Not assigned Connector X14: Output signal DQ_5* Connector X15: Not assigned Connector X16: Output signal DQ_7* Connector X17: Not assigned		
3	Ground 2M		
4	Connector X10: Output signal DQ_0 Connector X11: Output signal DQ_1* Connector X12: Output signal DQ_2 Connector X13: Output signal DQ_3* Connector X14: Output signal DQ_4 Connector X15: Output signal DQ_5* Connector X16: Output signal DQ_6 Connector X17: Output signal DQ_7*		
5	Functional earth FE		

* Note the assignment of the output signals to the respective sockets in the following section "Dual assignment of the sockets".

Dual assignment of the sockets

There are two output signals at the sockets X10, X12, X14 and X16 of the I/O device. Pin 2 of the respective socket is assigned an additional output signal.

Note

Dual or single assignment of sockets

You can select the dual and single assignment of sockets as desired.
Note that the output signals DQ_1, DQ_3, DQ_5 and DQ_7 are each parallel to the sockets X10/X11, X12/X13, X14/X15, X16/X17.

The following graphic shows the assignment of the output signals to the respective sockets with dual or single assignment.

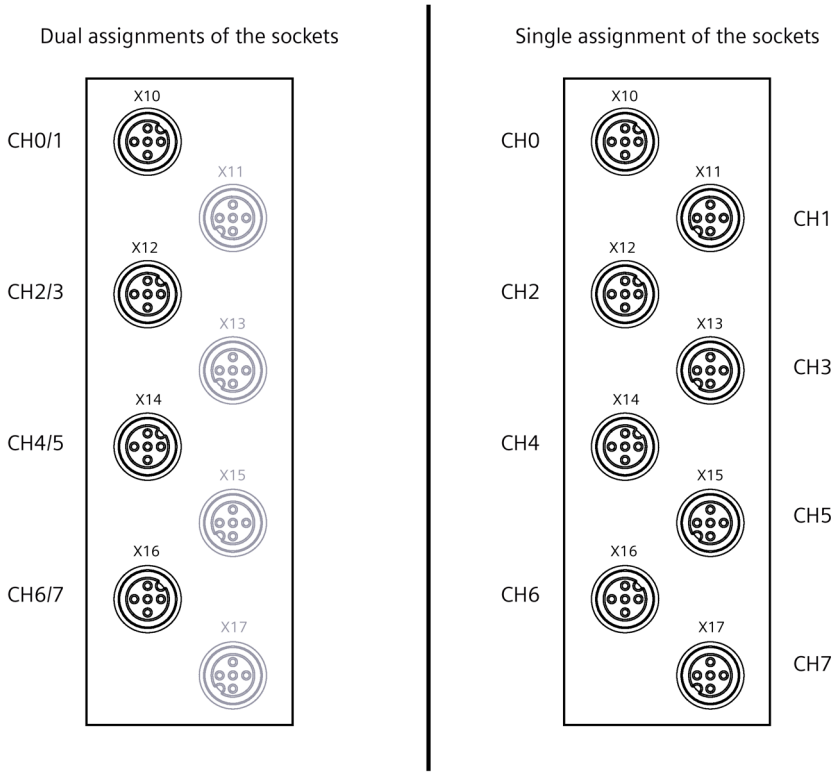
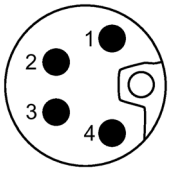


Figure 4-3 Assignment of output signals with dual or single assignment of sockets

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

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

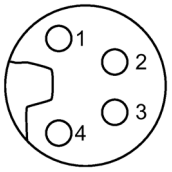
Table 4- 3 Pin assignment of the supply voltage connector

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

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

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

Table 4- 4 Pin assignment of the supply voltage socket

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

PROFINET IO

5

5.1 Parameters/address space

5.1.1 Parameters

The table below shows the parameters for the I/O device DQ 8x24VDC/0.5A M12-L 8xM12.

Table 5- 1 Configurable parameters and their defaults (GSD file)

Parameters	Value range	Default	Scope with configuration software, e.g. STEP 7 (TIA Portal)
Diagnostics: Low voltage 1L+	• Deactivated • Activated	Deactivated	Channel
Diagnostics: Missing 2L+	• Deactivated • Activated	Deactivated	Channel
Diagnostics: Short-circuit	• Deactivated • Activated	Deactivated	Channel
Diagnostics: Wire break	• Deactivated • Activated	Deactivated	Channel
Reaction to CPU STOP	• Shutdown • Keep last value • Output substitute value 1	Shutdown	Channel

5.1.2 Explanation of the parameters

Diagnostics: Low voltage 1L+

Enabling of the diagnostics for insufficient supply voltage 1L+.
Diagnostics: Low voltage 1L+ triggers the "Undervoltage" maintenance event. You can find more information in section Maintenance events (Page 34).

Diagnostics: Missing 2L+

Enabling of the diagnostics for missing or insufficient load voltage 2L+.

Diagnostics: Short-circuit

Enabling of the diagnostics for short-circuit of the output to ground.

Diagnostics: Wire break

Enabling of diagnostics when the line between the actuator and the I/O device is interrupted.

Reaction to CPU STOP

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

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

5.1.3 Address space

The DQ 8x24VDC/0.5A M12-L 8xM12 I/O device can be configured differently; see following table. Depending on the configuration, additional/different addresses are assigned in the process images.

Configuration options of the DQ 8x24VDC/0.5A M12-L 8xM12 I/O device

You can configure the I/O device Digital Outputs as follows:

- With STEP 7 (TIA Portal)
- With GSD file in any configuration software

When you configure the I/O device by means of the GSD file, the configurations are available under different short designations/device names in the device view of your configuration software.

The following configurations are possible:

Table 5- 2 Configuration options

Configuration	Short designation/ device name in the GSD file (device view in the configuration software)	Configuration software, e.g., with STEP 7 (TIA Portal)	
		Integrated in hardware catalog STEP 7 (TIA Portal)	GSD file in STEP 7 (TIA Portal) V11 or higher or STEP 7 V5.5 SP4 HF1 or higher
1 x 8-channel DQ 8x24VDC	DQ 8x24VDC	V16 or higher with HSP 0299	X
1 x 8-channel DQ 8x24VDC QI	DQ 8x24VDC QI	V16 or higher with HSP 0299	X
1 x 8-channel DQ 8x24VDC MSO	DQ 8x24VDC MSO	V16 or higher with HSP 0299	X
2 x 4-channel DQ 8x24VDC S	DQ 8x24VDC S	V16 or higher with HSP 0299	X

Address space for configuration as 1 x 8-channel DQ 8x24VDC

The table below shows the address space allocation with configuration as an 8-channel I/O device digital outputs without value status. The start address for the I/O device can be freely assigned. The addresses of the channels are derived from the start address.

Table 5- 3 Address space for configuration as 1 x 8-channel DQ 8x24VDC without value status

Bit → / Byte ↓	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0	Description
Assignments in the process image output (PIQ)									
QB x									Output values at channels 0 ... 7

Value status (Quality Information, QI)

The value status is always returned with the following configuration options:

- DQ 8x24VDC QI
- DQ 8x24VDC MSO

Evaluating the value status

An additional byte is occupied in the input address space if you enable the value status for the I/O device. Bits 0 to 7 in this byte are assigned to a channel and return information about the validity of the digital output value.

Bit = 1: No error on channel.

Bit = 0: Error on channel.

Address space for configuration as 1 x 8-channel DQ 8x24VDC QI

The table below shows the address space allocation with configuration as an 8-channel I/O device analog outputs with value status.

Table 5- 4 Address space for configuration as 1 x 8-channel DQ 8x24VDC QI with value status

Bit → / Byte ↓	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0	Description
Assignments in the process image output (PIQ)									
QB x									Output values at channels 0 ... 7
Assignments in the process image input (PII)									
IB x									Value status (QI) for outputs at channels 0 ... 7*

* 0 = Value read in at channel is incorrect

Address space for configuration as 1 x 8-channel DQ 8x24VDC MSO

With the configuration 1 x 8-channel I/O device (module-internal shared output, MSO), the channels 0 to 7 (incl. value status) of the I/O device are copied into two submodules. Channels 0 to 7 are then available with identical values in various submodules. These submodules can be assigned to two IO controllers when the I/O device is used in a shared device:

Outputs

- The IO controller to which submodule 1 is assigned has **write** access to outputs 0 to 7.
- The IO controller to which submodule 2 is assigned has **read** access to outputs 0 to 7.

Value status (Quality Information, QI)

The meaning of the value status depends on the submodule on which it occurs.

For the 1st Submodule (= basic submodule), the value status 0 indicates: The module detects that an error is pending at the channel and that the value is faulty.

For the 2nd Submodule (= MSO submodule), the value status 0 indicates:

- The value is faulty.
- The basic submodule is not yet assigned parameters (not ready).
- The connection between the IO controller and the basic submodule has been interrupted.
- The IO controller of the basic submodule is in STOP or POWER OFF state.

The table below shows the address space allocation with submodules 1 and 2 and the value status.

Table 5- 5 Address space for configuration as 1 x 8-channel DQ 8x24VDC MSO with value status

Bit → Byte ↓	**Bit 7**	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**	**Description**
Assignments in process image output (PIQ) submodule 1 (basic submodule)									
QB x									Output values at channels 0 ... 7
Assignments in process image input (PII) submodule 1 (basic submodule)									
IB x									Value status (QI) for outputs at channels 0 ... 7*
Assignments in process image input (PII) submodule 2 (MSO submodule)									
IB y									Read-back output values at channels 0 ... 7
IB y +1									Value status (QI) for outputs at channels 0 ... 7*

* 0 = Value read in at channel is incorrect

Reference

You can find information on the **Module-internal Shared Input/Shared Output (MSI/MSO)** functionality in the STEP 7 online help or in the SIMATIC PROFINET with STEP 7 (https://support.industry.siemens.com/cs/ww/en/view/49948856) Function Manual.

Address space for configuration as 2 x 4-channel DQ 8x24VDC S

The table below shows the address space allocation with configuration as a 2 x 4-channel I/O device digital outputs. The start addresses of the two submodules can be assigned freely.

Table 5- 6 Address space for configuration as 2 x 4-channel DQ 8x24VDC S

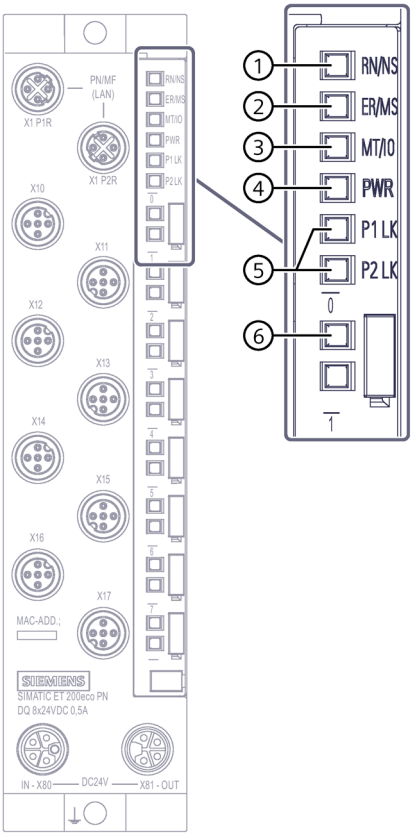
Bit → / Byte ↓	**Bit 7**	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**	**Description**
Assignments in process image output (PIQ) submodule 1									
QB x	0	0	0	0					Output values at channels 0 ... 3
Assignments in process image output (PIQ) submodule 2									
QB y	0	0	0	0					Output values at channels 4 ... 7

5.2 Interrupts/diagnostics alarms

5.2.1 Status and error displays

LED displays

The figure below shows the LED status and fault displays of the I/O device DQ 8x24VDC/0.5A M12-L 8xM12.



① RN/NS: RUN/network status LED
② ER/MS: ERROR/module status LED
③ MT/IO: MAINT/IO status LED
④ PWR: Power LED for load voltage 2L+
⑤ P1 LK/P2 LK: LINK port status LEDs
⑥ LED displays 0 to 7 for channel status/channel error

Figure 5-1 LED displays

Meaning of the LEDs

The following tables set out the meaning of the status and error displays. Measures for dealing with diagnostics alarms can be found in the section Diagnostics alarms (Page 33).

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

Table 5- 7 Error display of the LEDs

LEDs			Meaning	Remedy
RN/ NS	ER/ MS	MT/ IO		
Off	Off	Off	Missing or insufficient supply voltage at the I/O device.	Check the supply voltage.
On	On	On	Test of LEDs during startup: The three LEDs light up simultaneously for approximately 0.25 s.	---
			The three LEDs briefly light up simultaneously during the "Reset to factory settings" action.	---
Flashes	Off	Off	The ET 200eco PN is disabled.	Enable the ET 200eco PN with the configuration software or via the user program.
			The ET 200eco PN is either not configured or incorrectly configured.	Configure the ET 200eco PN via the configuration software.
			The ET 200eco PN is starting up.	---
			The ET 200eco PN is being assigned parameters.	
			Loading firmware (when the firmware update is performed during startup, all LEDs retain their current status)	
On	Not relevant	Not relevant	The ET 200eco PN is currently exchanging data with the IO controller.	
Not relevant	Flashes	Not relevant	Module diagnostics is available	Evaluate the diagnostics and eliminate the error.
			The preset configuration does not match the actual configuration.	Check the configuration of the ET 200eco PN.
			Parameter error	Correct the errors in the parameter assignment.
Not relevant	Not relevant	On	Maintenance	Evaluate the maintenance events.
Flashes	Flashes	Flashes	The "Node flash test" is running (the P1 LK and P2 LK LEDs of the PROFINET interface are also flashing).	---
			Hardware or firmware defective. (The P1 LK and P2 LK LEDs of the PROFINET interface are **not** flashing).	Replace the ET 200eco PN I/O device.

PWR LED

Table 5- 8 Status display of the PWR LED

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

P1 LK and P2 LK LEDs

Table 5- 9 Error display of the P1 LK and P2 LK LEDs

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

Channel status/channel error LEDs

Table 5- 10 Status and error display of the channel status/channel error LEDs

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

5.2.2 Interrupts

The I/O device digital outputs DQ 8x24VDC/0.5A M12-L 8xM12 supports diagnostic interrupts and maintenance alarms.

Diagnostic interrupt

The I/O device generates a diagnostic interrupt on the following events:

- Wire break
- Internal module fault
- Parameter error
- 2L+ missing or too low
- Short circuit to ground

Maintenance alarm

The I/O device generates a maintenance alarm on the following event:

- Low voltage 1L+
- Loss of synchronization

5.2.3 Alarms

5.2.3.1 Diagnostics alarms

A diagnostics alarm is output for each diagnostics event. On the I/O device DQ 8x24VDC/0.5A M12-L 8xM12 the LED ER/MS flashes red. You can read out the diagnostics alarms in the diagnostics buffer of the CPU, for example. You can evaluate the error codes with the user program.

Note

Wiring two outputs in parallel

For parallel connection of two outputs for redundant control of a load, disable the channel diagnostics "Wire break".

Uncouple the parallel switched outputs via external diodes.

Table 5- 11 Diagnostics alarms, their meanings and corrective measures

Diagnostics alarm	Error code	Meaning	Corrective measures
Wire break	6H	Fault in the external circuitry	Check the external circuitry and correct the fault.
		Actuator faulty	Replace the actuator.
		Actuator circuit impedance too high	Use a different actuator type or modify the wiring. For example, use cables with a larger cross-section.
		Interruption of cable between the I/O device and sensor.	Establish the connection.
		Channel not connected (open)	• Disable diagnostics • Connect a resistor to the actuator contacts in the load resistance range.
Error	9H	Internal module error has occurred	Replace the I/O device.
Parameter error	10H	• I/O device cannot evaluate parameters for the channel • Incorrect parameter assignment	Correct the parameter assignment.
Load voltage 2L+ missing	11H	Load voltage 2L missing or too low.	Check the supply voltage on the I/O device.
Short circuit to ground	106H	Short circuit to ground	• Correct the process wiring. • Replace the defective actuator.

5.2.3.2 Maintenance events

Triggering of a maintenance event

The MultiFieldbus interfaces of the ET 200eco PN M12-L support the diagnostics concept and maintenance concept in PROFINET according to the IEC 61158-6-10 standard. The goal is to detect and remove potential problems as soon as possible.

Maintenance events signal to the user when a plant component must be checked or replaced.

The CPU interrupts user program execution and executes the diagnostic interrupt OB. The event that triggered the maintenance event is entered in the start information of the diagnostic error interrupt OB.

The I/O device signals a maintenance event to the higher-level diagnostic system on the following event:

Table 5- 12 Triggering of a maintenance event

Maintenance alarm	Error code	Event	Meaning
Maintenance demanded MT/IO LED is lit	2H	Undervoltage	Supply voltage 1L+ is below the tolerance limit.
	8003H	Loss of synchronization	• No synchronization frame received. No synchronization telegram was received by the sync master within the timeout period after parameter assignment or during operation. • Successive synchronization telegrams are located outside permitted limits (jitter)

System alarms in STEP 7

The maintenance information is generated in STEP 7 with the following system alarms:

- Maintenance demanded - indicated for each port by a yellow wrench icon in the device view or in the hardware configuration.

You can find more information in the STEP 7 online help.

EtherNet/IP

6

6.1 Functions/parameters/address space

6.1.1 Supported EtherNet/IP functions

Supported functions

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

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

Supported diagnostics

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

Supported diagnostics	Remarks
Reading diagnostics via CIP EtherNet/IP	FW 5.1.x or higher
Reading diagnostics with MFCT	FW 5.1.x or higher
Reading hardware interrupt via CIP EtherNet/IP	FW 5.1.x or higher
PULL/PLUG event EtherNet/IP	Not supported
Reading service data with MFCT	FW 5.1.x or higher

Supported CIP objects for EtherNet/IP

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

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

6.1.2 Parameters

The table below shows the parameters for the I/O device DQ 8x24VDC/0.5A M12-L 8xM12.

Table 6- 1 Configurable parameters and their defaults (GSD file)

Parameters	Value range	Default	Effective range with configuration software, for example, MFCT
Diagnostics: Low voltage 1L+	• Deactivated • Activated	Deactivated	Channel
Diagnostics: Missing 2L+	• Deactivated • Activated	Deactivated	Channel
Diagnostics: Short-circuit	• Deactivated • Activated	Deactivated	Channel
Diagnostics: Wire break	• Deactivated • Activated	Deactivated	Channel
Reaction to CPU STOP	• Shutdown • Keep last value • Output substitute value 1	Shutdown	Channel

6.1.3 Explanation of the parameters

Diagnostics: Low voltage 1L+

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

Diagnostics: Missing 2L+

Enabling of the diagnostics for missing or insufficient load voltage 2L+.

Diagnostics: Short-circuit

Enabling of the diagnostics for short-circuit of the output to ground.

Diagnostics: Wire break

Enabling of diagnostics when the line between the actuator and the I/O device is interrupted.

Reaction to CPU STOP

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

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

6.1.4 Update time of the I/O data

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

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

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

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

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

6.1.5 Address space

The DQ 8x24VDC/0.5A M12-L 8xM12 I/O device can be configured differently; see following table. Depending on the configuration, additional/different addresses are assigned in the process images.

Configuration options of the DQ 8x24VDC/0.5A M12-L 8xM12 I/O device

When the I/O device is configured using a GSD file, the configurations are available under different short designations/device names in the device view of MFCT.

The following configurations are possible:

Table 6- 2 Configuration options

Configuration	Short designation/ device name in the GSD file (device view in the configuration software)	Configuration software, e.g. with MFCT
		GSD file in MFCT V1.3 SP1 or higher
1 x 8-channel DQ 8x24VDC	DQ 8x24VDC	X
1 x 8-channel DQ 8x24VDC QI	DQ 8x24VDC QI	X
1 x 8-channel DQ 8x24VDC MSO	DQ 8x24VDC MSO	X
2 x 4-channel DQ 8x24VDC S	DQ 8x24VDC S	X

Address space for configuration as 1 x 8-channel DQ 8x24VDC

The table below shows the address space allocation with configuration as an 8-channel I/O device digital outputs without value status. The addresses of the channels are derived from the start address.

Table 6- 3 Address space for configuration as 1 x 8-channel DQ 8x24VDC without value status

Bit → / Byte ↓	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0	Description
Assignments in the process image output (PIQ)									
QB x									Output values at channels 0 ... 7
Assignments in the process image input (PII)									
IB x									Input data status (IDS) of device
IB x +1									Output data status (ODS) of submodule

Value status (Quality Information, QI)

The value status is always returned with the following configuration options:

- DQ 8x24VDC QI
- DQ 8x24VDC MSO

Evaluating the value status

An additional byte is occupied in the input address space if you enable the value status for the I/O device. Bits 0 to 7 in this byte are assigned to a channel and return information about the validity of the digital output value.

Bit = 1: No error on channel.

Bit = 0: Error on channel.

Address space for configuration as 1 x 8-channel DQ 8x24VDC QI

The table below shows the address space allocation with configuration as an 8-channel I/O device analog outputs with value status. The addresses of the channels are derived from the start address.

Table 6- 4 Address space for configuration as 1 x 8-channel DQ 8x24VDC QI with value status

Bit → Byte ↓	**Bit 7**	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**	**Description**
Assignments in the process image output (PIQ)									
QB x									Output values at channels 0 ... 7
Assignments in the process image input (PII)									
IB x									Input data status (IDS) of device
IB x +1									Value status (QI) for outputs at channels 0 ... 7*
IB x +2									Input data status (IDS) of submodule
IB x +3									Output data status (ODS) of submodule

* 0 = Value read in at channel is incorrect

Address space for configuration as 1 x 8-channel DQ 8x24VDC MSO

With the configuration 1 x 8-channel I/O device (module-internal shared output, MSO), the channels 0 to 7 (incl. value status) of the I/O device are copied into two submodules. Channels 0 to 7 are then available with identical values in various submodules. These submodules can be assigned to two IO controllers when the I/O device is used in a shared device:

Outputs

- The IO controller to which submodule 1 is assigned has **write** access to outputs 0 to 7.
- The IO controller to which submodule 2 is assigned has **read** access to outputs 0 to 7.

Value status (Quality Information, QI)

The meaning of the value status depends on the submodule on which it occurs.

For the 1st Submodule (= basic submodule), the value status 0 indicates: The module detects that an error is pending at the channel and that the value is faulty.

For the 2nd Submodule (= MSO submodule), the value status 0 indicates:

- The value is faulty.
- The basic submodule is not yet assigned parameters (not ready).
- The connection between the IO controller and the basic submodule has been interrupted.
- The IO controller of the basic submodule is in STOP or POWER OFF state.

The table below shows the address space allocation with submodules 1 and 2 and the value status.

Table 6- 5 Address space for configuration as 1 x 8-channel DQ 8x24VDC MSO with value status

Bit → / Byte ↓	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0	Description
Assignments in process image output (PIQ) submodule 1 (basic submodule)									
QB x									Output values at channels 0 ... 7
Assignments in the process image input (PII) device status									
IB x									Input data status (IDS) of device
Assignments in process image input (PII) submodule 1 (basic submodule)									
IB x +1									Value status (QI) for outputs at channels 0 ... 7*
IB x +2									Input data status (IDS) of submodule 1 (basic submodule)
Assignments in process image input (PII) submodule 2 (MSO submodule)									
IB x +3									Read-back output values at channels 0 ... 7
IB x +4									Value status (QI) for outputs at channels 0 ... 7*
IB x +5									Input data status (IDS) of submodule 2 (MSO submodule)
IB x +6									Output data status (ODS) of submodule 1 (basic submodule)

* 0 = Value read in at channel is incorrect

Reference

You can find information on the **Module-internal Shared Input/Shared Output (MSI/MSO)** functionality in the MultiFieldbus (https://support.industry.siemens.com/cs/ww/en/view/109773209) Function Manual or in the SIMATIC PROFINET with STEP 7 (https://support.industry.siemens.com/cs/ww/en/view/49948856)Function ManualSIMATIC PROFINET with STEP 7 (https://support.industry.siemens.com/cs/ww/en/view/49948856).

Address space for configuration as 2 x 4-channel DQ 8x24VDC S

The table below shows the address space allocation with configuration as a 2 x 4-channel I/O device digital outputs.

Table 6- 6 Address space for configuration as 2 x 4-channel DQ 8x24VDC S

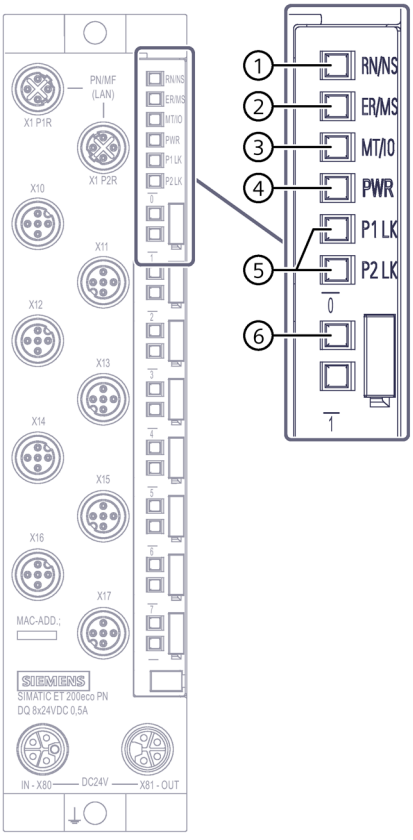
Bit → / Byte ↓	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0	Description
Assignments in the process image output (PIQ)									
QB x	0	0	0	0					Output values at channels 0 ... 3 submodule 1
QB x +1	0	0	0	0					Output values at channels 8 ... 11 submodule 2
Assignments in the process image input (PII)									
IB x									Input data status (IDS) of device
IB x +1									Output data status (ODS) of submodule 1
IB x +2									Output data status (ODS) of submodule 2

6.2 Diagnostics

6.2.1 Status and error displays for EtherNet/IP

LED displays

The figure below shows the LED displays (status and fault displays) of the I/O device DQ 8x24VDC/0.5A M12-L 8xM12.



① RN/NS: RUN/network status LED
② ER/MS: ERROR/module status LED
③ MT/IO: MAINT/IO status LED
④ PWR: Power LED for load voltage 2L+
⑤ P1 LK/P2 LK: LINK port status LEDs
⑥ LED displays 0 to 7 for channel status/channel error

Figure 6-1 LED displays

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

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

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

Table 6- 7 Error display of the LEDs

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

LEDs			Meaning	Remedy
RN/ NS	**ER/ MS**	**MT/ IO**		
Not relevant	Not relevant	Flashes	IO diagnostics or missing I/O device of slots used by EtherNet/IP	
Flashes	Flashes	Flashes	Test of LEDs during startup: The three LEDs light up simultaneously for approximately 0.25 s in red. Then for approximately 0.25 s in green.	---
Flashes	Flashes	Flashes	Hardware or firmware defective.	You can read out the service data with MFCT.
Flashes	Flashes	Flashes	The "Node flash test" is running (the P1 LK and P2 LK LEDs are also flashing).	

PWR LED

Table 6- 8 Status display of the PWR LED

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

P1 LK and P2 LK LEDs

Table 6- 9 Error display of the P1 LK and P2 LK LEDs

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

Channel status/channel fault LED

Table 6- 10 Status and fault display of the channel status/channel fault LED

LEDs Channel status/channel fault	Meaning
□ Off	Process value = 0
■ On	Process value = 1
■ On	Channel diagnostics

Modbus TCP

7

7.1 Functions/parameters/address space

7.1.1 Supported Modbus TCP functions

Supported functions

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

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

Supported diagnostics

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

Supported diagnostics	Remarks
Reading diagnostics with MFCT	FW 5.1.x or higher
Reading hardware interrupts via event interface	FW 5.1.x or higher
PULL/PLUG event Modbus TCP	Not supported
Reading service data with MFCT	FW 5.1.x or higher

7.1.2 Parameters

The table below shows the parameters for the I/O device DQ 8x24VDC/0.5A M12-L 8xM12.

Table 7- 1 Configurable parameters and their defaults (GSD file)

Parameters	Value range	Default	Effective range with configuration software, for example, MFCT
Diagnostics: Low voltage 1L+	• Deactivated • Activated	Deactivated	Channel
Diagnostics: Missing 2L+	• Deactivated • Activated	Deactivated	Channel
Diagnostics: Short-circuit	• Deactivated • Activated	Deactivated	Channel
Diagnostics: Wire break	• Deactivated • Activated	Deactivated	Channel
Reaction to CPU STOP	• Shutdown • Keep last value • Output substitute value 1	Shutdown	Channel

7.1.3 Explanation of the parameters

Diagnostics: Low voltage 1L+

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

Diagnostics: Missing 2L+

Enabling of the diagnostics for missing or insufficient load voltage 2L+.

Diagnostics: Short-circuit

Enabling of the diagnostics for short-circuit of the output to ground.

Diagnostics: Wire break

Enabling of diagnostics when the line between the actuator and the I/O device is interrupted.

Reaction to CPU STOP

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

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

7.1.4 Update time of the I/O data

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

Update time (can be set starting at 2 ms)

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

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

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

7.1.5 Address space

The DQ 8x24VDC/0.5A M12-L 8xM12 I/O device can be configured differently; see following table. Depending on the configuration, additional/different addresses are assigned in the process images.

Configuration options of the DQ 8x24VDC/0.5A M12-L 8xM12 I/O device

When the I/O device is configured using a GSD file, the configurations are available under different short designations/device names in the device view of MFCT.

The following configurations are possible:

Table 7- 2 Configuration options

Configuration	Short designation/ device name in the GSD file (device view in the configuration software)	Configuration software, e.g. with MFCT
		GSD file in MFCT V1.3 SP1 or higher
1 x 8-channel DQ 8x24VDC	DQ 8x24VDC	X
1 x 8-channel DQ 8x24VDC QI	DQ 8x24VDC QI	X
1 x 8-channel DQ 8x24VDC MSO	DQ 8x24VDC MSO	X
2 x 4-channel DQ 8x24VDC S	DQ 8x24VDC S	X

Address space for configuration as 1 x 8-channel DQ 8x24VDC

The table below shows the address space allocation with configuration as an 8-channel I/O device digital outputs without value status. The addresses of the channels are derived from the start address.

Table 7- 3 Address space for configuration as 1 x 8-channel DQ 8x24VDC without value status

Bit → / Byte ↓	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0	Description
Assignments in the process image output (PIQ)									
QB x									Output values at channels 0 ... 7
Assignments in the process image input (PII)									
IB x									Input data status (IDS) of device
IB x +1									Output data status (ODS) of submodule

Value status (Quality Information, QI)

The value status is always returned with the following configuration options:

- DQ 8x24VDC QI
- DQ 8x24VDC MSO

Evaluating the value status

An additional byte is occupied in the input address space if you enable the value status for the I/O device. Bits 0 to 7 in this byte are assigned to a channel and return information about the validity of the digital output value.

Bit = 1: No error on channel.

Bit = 0: Error on channel.

Address space for configuration as 1 x 8-channel DQ 8x24VDC QI

The table below shows the address space allocation with configuration as an 8-channel I/O device analog outputs with value status. The addresses of the channels are derived from the start address.

Table 7- 4 Address space for configuration as 1 x 8-channel DQ 8x24VDC QI with value status

Bit → / Byte ↓	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0	Description
Assignments in the process image output (PIQ)									
QB x									Output values at channels 0 ... 7
Assignments in the process image input (PII)									
IB x									Input data status (IDS) of device
IB x +1									Value status (QI) for outputs at channels 0 ... 7*
IB x +2									Input data status (IDS) of submodule
IB x +3									Output data status (ODS) of submodule

* 0 = Value read in at channel is incorrect

Address space for configuration as 1 x 8-channel DQ 8x24VDC MSO

With the configuration 1 x 8-channel I/O device (module-internal shared output, MSO), the channels 0 to 7 (incl. value status) of the I/O device are copied into two submodules. Channels 0 to 7 are then available with identical values in various submodules. These submodules can be assigned to two IO controllers when the I/O device is used in a shared device:

Outputs

- The IO controller to which submodule 1 is assigned has **write** access to outputs 0 to 7.
- The IO controller to which submodule 2 is assigned has **read** access to outputs 0 to 7.

Value status (Quality Information, QI)

The meaning of the value status depends on the submodule on which it occurs.

For the 1st Submodule (= basic submodule), the value status 0 indicates: The module detects that an error is pending at the channel and that the value is faulty.

For the 2nd Submodule (= MSO submodule), the value status 0 indicates:

- The value is faulty.
- The basic submodule is not yet assigned parameters (not ready).
- The connection between the IO controller and the basic submodule has been interrupted.
- The IO controller of the basic submodule is in STOP or POWER OFF state.

The table below shows the address space allocation with submodules 1 and 2 and the value status.

Table 7- 5 Address space for configuration as 1 x 8-channel DQ 8x24VDC MSO with value status

Bit → / Byte ↓	**Bit 7**	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**	**Description**
Assignments in process image output (PIQ) submodule 1 (basic submodule)									
QB x									Output values at channels 0 ... 7
Assignments in the process image input (PII) device status									
IB x									Input data status (IDS) of device
Assignments in process image input (PII) submodule 1 (basic submodule)									
IB x +1									Value status (QI) for outputs at channels 0 ... 7*
IB x +2									Input data status (IDS) of submodule 1 (basic submodule)
Assignments in process image input (PII) submodule 2 (MSO submodule)									
IB x +3									Read-back output values at channels 0 ... 7
IB x +4									Value status (QI) for outputs at channels 0 ... 7*
IB x +5									Input data status (IDS) of submodule 2 (MSO submodule)
IB x +6									Output data status (ODS) of submodule 1 (basic submodule)

* 0 = Value read in at channel is incorrect

Reference

You can find information on the **Module-internal Shared Input/Shared Output (MSI/MSO)** functionality in the MultiFieldbus (https://support.industry.siemens.com/cs/ww/en/view/109773209) Function Manual or in the SIMATIC PROFINET with STEP 7 (https://support.industry.siemens.com/cs/ww/en/view/49948856)Function ManualSIMATIC PROFINET with STEP 7 (https://support.industry.siemens.com/cs/ww/en/view/49948856).

Address space for configuration as 2 x 4-channel DQ 8x24VDC S

The table below shows the address space allocation with configuration as a 2 x 4-channel I/O device digital outputs.

Table 7- 6 Address space for configuration as 2 x 4-channel DQ 8x24VDC S

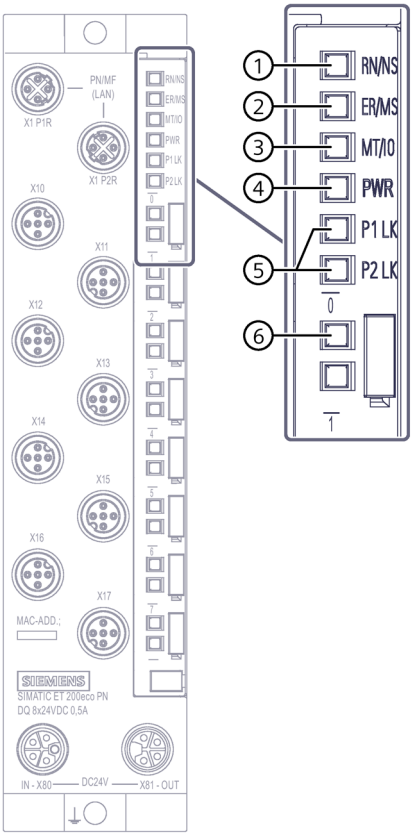
Bit → Byte ↓	**Bit 7**	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**	**Description**
Assignments in the process image output (PIQ)									
QB x	0	0	0	0					Output values at channels 0 ... 3 submodule 1
QB x +1	0	0	0	0					Output values at channels 8 ... 11 submodule 2
Assignments in the process image input (PII)									
IB x									Input data status (IDS) of device
IB x +1									Output data status (ODS) of submodule 1
IB x +2									Output data status (ODS) of submodule 2

7.2 Diagnostics

7.2.1 Status and error displays for Modbus TCP

LED displays

The figure below shows the LED status and fault displays of the I/O device DQ 8x24VDC/0.5A M12-L 8xM12.



① RN/NS: RUN/network status LED
② ER/MS: ERROR/module status LED
③ MT/IO: MAINT/IO status LED
④ PWR: Power LED for load voltage 2L+
⑤ P1 LK/P2 LK: LINK port status LEDs
⑥ LED displays 0 to 7 for channel status/channel error

Figure 7-1 LED displays

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

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

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

Table 7- 7 Error display of the LEDs

LEDs			Meaning	Remedy
RN/ NS	ER/ MS	MT/ IO		
Off	Off	Off	Missing or insufficient supply voltage at the I/O device.	• Check the supply voltage.
Flashes	Off	Off	I/O device on, no data exchange	
On	Off	Off	The I/O device is exchanging data with any connection.	
Flashes	Flashes	Off	MultiFieldbus project is present in the I/O device, no data exchange	
On	On	Off	The I/O device exchanges data without errors via a modbus TCP connection	
On	Flashes	Off	The I/O device exchanges data. An error has occurred in the I/O device.	Check the following: • Configuration • Parameter settings • PNIO diagnostics
Flashes	Flashes	Off	The I/O device does not exchange data. An error has occurred in the I/O device.	
Flashes	Flashes	Off	An existing connection to modbus TCP was terminated by a timeout	
Not relevant	Not relevant	On	Maintenance	Evaluate the maintenance events.
Flashes	Flashes	Off	An existing connection to Modbus TCP was terminated by a timeout. Errors in the configuration or parameter assignment.	Check the following: • Configuration • Parameter assignment
Flashes	Flashes	Flashes	Test of LEDs during startup: The three LEDs light up simultaneously for approximately 0.25 s in red. Then for approximately 0.25 s in green.	---

LEDs			Meaning	Remedy
RN/ NS	**ER/ MS**	**MT/ IO**		
Flashes	Flashes	Flashes	Hardware or firmware defective.	• You can read out the service data with MFCT.
Flashes	Flashes	Flashes	The "Node flash test" is running (the P1 LK and P2 LK LEDs are also flashing).	

PWR LED

Table 7- 8 Status display of the PWR LED

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

P1 LK and P2 LK LEDs

Table 7- 9 Error display of the P1 LK and P2 LK LEDs

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

Channel status/channel error LED

Table 7- 10 Status and error display of the channel status/channel error LED

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

Technical specifications

8

Technical specifications of the I/O device DQ 8x24VDC/0.5A M12-L 8xM12

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/6ES7142-6BG00-0BB0/td?dl=en).

Article number	6ES7142-6BG00-0BB0
General information	
HW functional status	FS06
Firmware version	V5.1.x
• FW update possible	Yes
Vendor identification (VendorID)	002AH
Device identifier (DeviceID)	0306H
Manufacturer ID according to ODVA (VendorID)	04E3H
Device ID according to ODVA (Product code)	0FA6H
Product function	
• I&M data	Yes; I&M0 to I&M3
• Isochronous mode	Yes
• Prioritized startup	Yes
Engineering with	
• STEP 7 TIA Portal configurable/integrated from version	STEP 7 V17 or higher with HSP 0363
• PROFINET from GSD version/GSD revision	GSDML V2.3.x
• Multi Fieldbus Configuration Tool (MFCT)	from V1.3 SP1
Operating mode	
• DQ	Yes
• MSO	Yes
Supply voltage	
power supply according to NEC Class 2 required	No
Load voltage 1L+	
• Rated value (DC)	24 V
• permissible range, lower limit (DC)	20.4 V
• permissible range, upper limit (DC)	28.8 V
• Reverse polarity protection	Yes

Article number	6ES7142-6BG00-0BB0
Load voltage 2L+	
• Rated value (DC)	24 V
• permissible range, lower limit (DC)	20.4 V
• permissible range, upper limit (DC)	28.8 V
• Reverse polarity protection	Yes; against destruction; load increasing
Input current	
Current consumption (rated value)	65 mA; without load
from load voltage 1L+ (unswitched voltage)	12 A; Maximum value
from load voltage 2L+, max.	12 A; Maximum value
Power loss	
Power loss, typ.	7 W
Address area	
Address space per module	
• Inputs	1 byte for QI information
• Outputs	1 byte
Hardware configuration	
Submodules	
• Number of configurable submodules, max.	2
Digital outputs	
Number of digital outputs	8
Current-sourcing	Yes
Short-circuit protection	Yes; per channel, electronic
• Response threshold, typ.	1 A
Limitation of inductive shutdown voltage to	Typ. 2L+ (-52 V)
Controlling a digital input	Yes
Switching capacity of the outputs	
• with resistive load, max.	0.5 A
• with inductive load, max.	0.5 A
• on lamp load, max.	5 W
Load resistance range	
• lower limit	48 Ω
• upper limit	4 kΩ
Output voltage	
• for signal "1", min.	2L+ (-0,8 V)
Output current	
• for signal "1" rated value	0.5 A
• for signal "1" permissible range, max.	0.5 A
• for signal "0" residual current, max.	0.1 mA

Article number	6ES7142-6BG00-0BB0
Output delay with resistive load	
• "0" to "1", max.	50 µs; at rated load
• "1" to "0", max.	100 µs; at rated load
Parallel switching of two outputs	
• for uprating	No
• for redundant control of a load	Yes
Switching frequency	
• with resistive load, max.	100 Hz
• with inductive load, max.	0.5 Hz
• on lamp load, max.	1 Hz
Total current of the outputs	
• Current per module, max.	4 A
Cable length	
• unshielded, max.	30 m
Interfaces	
Number of PROFINET interfaces	1
1. Interface	
Interface type	PROFINET with 100 Mbit/s full duplex (100BASE-TX)
Interface types	
• M12 port	Yes; 2x M12, 4-pin, D-coded
• Number of ports	2
• integrated switch	Yes
Protocols	
• PROFINET IO Device	Yes
• Open IE communication	Yes
Interface types	
M12 port	
• Autonegotiation	Yes
• Autocrossing	Yes
• Transmission rate, max.	100 Mbit/s
Protocols	
Supports protocol for PROFINET IO	Yes
PROFIsafe	No
EtherNet/IP	Yes
Modbus TCP	Yes

Article number	6ES7142-6BG00-0BB0
PROFINET IO Device	
Services	
– IRT	Yes; 250 µs to 4 ms in 125 µs frame
– Prioritized startup	Yes
– Shared device	Yes
– Number of IO Controllers with shared device, max.	2
Redundancy mode	
• PROFINET system redundancy (S2)	Yes
– on S7-1500R/H	Yes
– on S7-400H	Yes
• PROFINET system redundancy (R1)	No
• H-Sync forwarding	Yes
Media redundancy	
– MRP	Yes
EtherNet/IP	
Services	
– CIP Implicit Messaging	Yes
– CIP Explicit Messaging	Yes
– CIP Safety	No
– Shared device	Yes; 2x EtherNet/IP Scanner
– Number of scanners with shared device, max.	2
Updating times	
– Requested Packet Interval (RPI)	2 ms
Redundancy mode	
– DLR (Device Level Ring)	No
Address area	
– Address space per module, max.	20 byte
– LargeForwardOpen (Class3)	No
Modbus TCP	
Services	
– read coils (code=1)	Yes
– read discrete inputs (code=2)	Yes
– Read Holding Registers (Code=3)	Yes
– write single coil (code=5)	Yes
– write multiple coils (code=15)	Yes
– Write Multiple Registers (Code=16)	Yes
– Parameter change by master	No
– Modbus TCP Security Protocol	No

Article number	6ES7142-6BG00-0BB0
Address space per station	
– Address space per station, max.	20 byte
– Access-consistent address space	2 byte
Updating time	
– I/O request interval	2 ms
Connections	
– Number of connections per slave	12
Open IE communication	
• TCP/IP	Yes; (only EtherNet/IP or Modbus TCP)
• SNMP	Yes
• LLDP	Yes
• ARP	Yes
Isochronous mode	
Equidistance	Yes
shortest clock pulse	250 µs
max. cycle	4 ms
Jitter, max.	10 µs
Interrupts/diagnostics/status information	
Substitute values connectable	Yes
Alarms	
• Diagnostic alarm	Yes; Parameterizable
• Maintenance interrupt	Yes; Parameterizable
Diagnoses	
• Diagnostic information readable	Yes
• Monitoring the supply voltage	Yes
– parameterizable	Yes
• Wire-break	Yes
• Short-circuit	Yes; Outputs to M; channel by channel
Diagnostics indication LED	
• RUN LED	Yes; green LED
• ERROR LED	Yes; red LED
• MAINT LED	Yes; Yellow LED
• NS LED	Yes; green/red LED
• MS LED	Yes; green/red LED
• IO LED	Yes; red/green/yellow LEDs
• Channel status display	Yes; green LED
• for channel diagnostics	Yes; red LED
• For load voltage monitoring	Yes; green LED
• Connection display LINK TX/RX	Yes; green LED, only link

Article number	6ES7142-6BG00-0BB0
Potential separation	
between the load voltages	Yes
between Ethernet and electronics	Yes
Potential separation channels	
• between the channels	No
• between the channels and the power supply of the electronics	Yes
Isolation	
tested with	
• 24 V DC circuits	707 V DC (type test)
• Test voltage for interface, rms value [Vrms]	1 500 V; According to IEEE 802.3
Degree and class of protection	
IP degree of protection	IP65/67/69K
Standards, approvals, certificates	
Suitable for safety-related tripping of standard modules	Yes; From FS02
Highest safety class achievable for safety-related tripping of standard modules	
• Performance level according to ISO 13849-1	PL d
• Category according to ISO 13849-1	Cat. 3
• SIL acc. to IEC 62061	SIL 2
• remark on safety-oriented shutdown	https://support.industry.siemens.com/cs/de/en/view/39198632
Use in hazardous areas	
• Explosion protection category for gas	ATEX, UKEX, IECEx, CCCEx for Zone 2
• Explosion protection category for dust	ATEX, UKEX, IECEx, CCCEx for Zone 22
product functions / security / header	
signed firmware update	Yes
safely removing data	Yes
Ambient conditions	
Ambient temperature during operation	
• min.	-40 °C
• max.	60 °C
Altitude during operation relating to sea level	
• Ambient air temperature-barometric pressure-altitude	Up to max. 5 000 m, at installation height > 2 000 m additional restrictions
connection method	
Design of electrical connection	4/5-pin M12 circular connectors
Design of electrical connection for the inputs and outputs	M12, 5-pin, A-coded
Design of electrical connection for supply voltage	M12, 4-pin, L-coded

Article number	**6ES7142-6BG00-0BB0**
Dimensions	
Width	45 mm
Height	200 mm
Depth	48 mm
Weights	
Weight, approx.	780 g

Dimension drawing

A

A.1 Dimension drawing

The figure below shows the dimension drawing of the I/O device digital outputs DQ 8x24VDC/0.5A M12-L 8xM12 in front and side views.

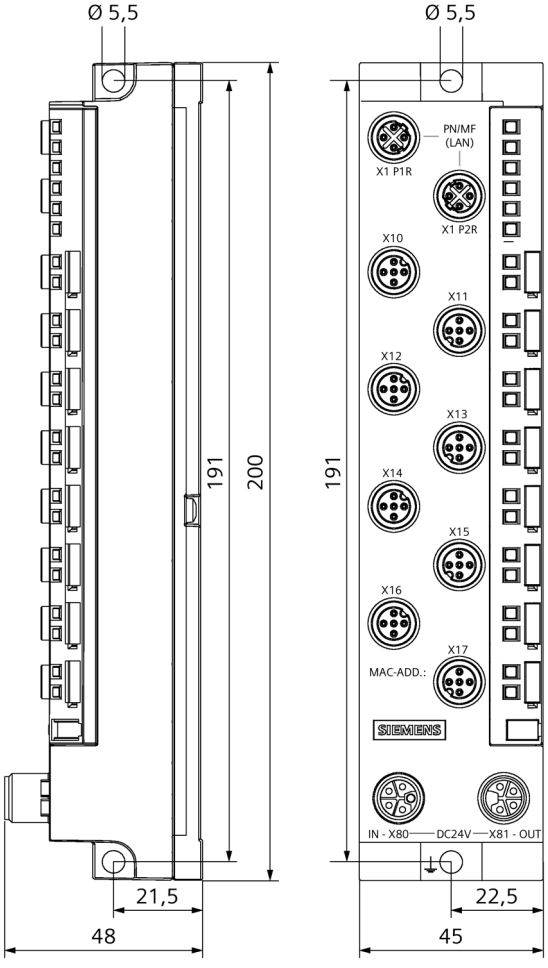


Figure A-1 Dimension drawing

Parameter data record

B

B.1 Dependencies for the configuration

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

B.2 Structure of data record 128 for I/O device parameter assignment

With data record 128, you can reconfigure the I/O device in your user program, regardless of your programming. This means that you can use all the functions of the I/O device even if you configured it with a GSD file.

Parameter assignment in the user program

You can reassign the parameters of the I/O device in RUN. For example, you can change the hardware interrupts of individual channels in RUN without this having an effect on the other channels.

Changing parameters in RUN

The "WRREC" instruction is used to transfer the parameters to the I/O device using data record 128. The parameters set with STEP 7 are not changed in the CPU by this action. After a restart, the parameters set in STEP 7 are still valid.

Output parameter STATUS

If errors occur during the transfer of parameters with the "WRREC" instruction, the I/O device continues operation with the previously valid parameter assignment. The STATUS output parameter contains a corresponding error code.

The instruction "WRREC" and the error codes are described in the online help of STEP 7.

Structure of data record 128 as a 1 x 8-channel I/O device

The following table shows the structure of data record 128 and the parameters with configuration as an 1 x 8-channel I/O device. The channel parameter blocks are identical and are shown based on the example of Channel 0.

Table B- 1 Configuration as a 1 x 8-channel I/O device. Data record 128 channel 0 ... 8 subslot 1

Bit → / Byte ↓	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0...1	**Header information**							
0	Reserved[1]	1_B	Major Version = 00_B		Minor Version = 0000_B			
1	Number of items of device header information = 2_D ($0000\ 0010_B$)							
2...3	**Device header information**							
2	Number of device parameter blocks = 1_D ($0000\ 0001_B$)							
3	Length of device parameter block = 1_D ($0000\ 0001_B$)							
4	**Device parameter block**							
	Reserved[1]							
5...6	**Channel header information**							
5	Number of channel parameter blocks							
	Configuration as a 1 x 8-channel I/O device = 8_D ($0000\ 1000_B$) Configuration as a 2 x 4-channel I/O device = 4_D ($0000\ 0100_B$)							
6	Length of a channel parameter block = 3_D ($0000\ 0011_B$)							
7...9	**Channel 0 channel parameter block**							
7	Reserved[1]			Diagnostics: Wire break	Reserved[1]	Diagnostics: Short circuit	Diagnostics: Low voltage 1L+	Diagnostics: Missing 2L+
				0_B: Disabled 1_B: Enabled		0_B: Disabled 1_B: Enabled	0_B: Disabled 1_B: Enabled	0_B: Disabled 1_B: Enabled
8	Channel mode 10_B: DQ		Reserved[1]					
9	Behavior in response to CPU STOP 0000_B: Shutdown 0010_B: Keep last value 1011_B: Output substitute value 1				Reserved[1]			
10...12	**Channel 1 channel parameter block**							
13...15	**Channel 2 channel parameter block**							
16...18	**Channel 3 channel parameter block**							
19...21	**Channel 4 channel parameter block**							
22...24	**Channel 5 channel parameter block**							
25...27	**Channel 6 channel parameter block**							
28...30	**Channel 7 channel parameter block**							

[1] Reserved bits must be set to 0

Structure of data record 128 as a 2 x 4-channel I/O device

The following table shows the structure of data record 128 with configuration as a 2 x 4-channel I/O device for channels 0 ... 3. The assignments of the header information and channel parameters are identical to the parameter assignments of a 1 x 8-channel I/O device.

Table B- 2 Data record 128 channel 0 ... 3 subslot 1

Bit → Byte ↓	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0...1	Header information							
2...3	Device header information							
4	Device parameter block							
5...6	Channel header information							
7...9	Channel 0 channel parameter block							
10...12	Channel 1 channel parameter block							
13...15	Channel 2 channel parameter block							
16...18	Channel 3 channel parameter block							

The following table shows the structure of data record 128 with configuration as a 2 x 4-channel I/O device for channels 4 ... 7. The assignments of the header information and channel parameters are identical to the parameter assignments of a 1 x 8-channel I/O device.

Table B- 3 Configuration as a 2 x 4-channel I/O device. Data record 128 channel 4 ... 7 subslot 2

Bit → Byte ↓	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0...1	Header information							
2...3	Device header information							
4	Device parameter block							
5...6	Channel header information							
7...9	Channel 4 channel parameter block							
10...12	Channel 5 channel parameter block							
13...15	Channel 6 channel parameter block							
16...18	Channel 7 channel parameter block							

B.3 Error transferring the data record

Error transferring the data record

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

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

The Error codes table shows the following:

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

Table B- 4 Error codes

Error code in STATUS parameter (hexadecimal)				Meaning	Solution	DS128
Byte 0	Byte 1	Byte 2	Byte 3			
DF	80	B0	xx	Number of the data record unknown.	Enter a valid number for the data record.	✓
DF	80	B1	xx	Length of the data record incorrect.	Enter a valid value for the data record length.	✓
DF	80	B2	xx	I/O device cannot be accessed:	Check the assigned values for the parameters of the "WRREC" instruction.	✓
DF	80	E0	xx	Wrong version or error in the header information.	Correct the version, length and number of parameter blocks.	✓
DF	80	E1	01	Reserved bit set	Check the parameters of the I/O device.	✓
DF	80	E1	02	Invalid diagnostics enable bit set for operating mode.	Check the parameters of the I/O device.	✓
DF	80	E1	06	Invalid coding for substitute value reaction.	Check the parameters of the I/O device.	✓
DF	80	E1	11	Invalid output range set.	Check the parameters of the I/O device.	✓