# **SIEMENS**





# EQUIPMENT MANUAL

# SIMATIC

# ET 200SP

Digital input/output module DI 8x/DQ 8x24VDC/0.5A ST 6ES7133-6BH00-0BA0

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# SIEMENS

# SIMATIC

# ET 200SP Digital input/output module DI 8x/DQ 8x24VDC/0.5A ST (6ES7133-6BH00-0BA0)

**Equipment Manual** 

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# 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.

# 

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

# 

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 <sup>®</sup> 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.

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# Introduction

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# Purpose of the documentation

This manual complements the system manual ET 200SP distributed I/O system (http://support.automation.siemens.com/WW/view/en/58649293). Functions that generally relate to the system are described in the system manual. The information provided in this manual and in the system/function manuals supports you in commissioning the system.

# Conventions

CPU: When the term "CPU" is used in the following, it applies to the central processing units of the S7-1500 automation system as well as to the CPUs/interface modules of the ET 200SP distributed I/O system.

STEP 7: To designate the configuring and programming software, we use "STEP 7" in this documentation as a synonym for all versions of "STEP 7 (TIA Portal)". 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.

#### **Recycling and disposal**

For ecologically sustainable recycling and disposal of your old device, contact a certified disposal service for electronic scrap and dispose of the device in accordance with the regulations in your country.

1.1 ET 200SP Documentation Guide

# 1.1 ET 200SP Documentation Guide

# 1.1.1 Information classes ET 200SP



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/cn/en/view/84133942)

# Manual Collection fail-safe modules

The Manual Collection contains the complete documentation on the fail-safe SIMATIC modules, gathered together in one file. You can find the Manual Collection on the Internet. (https://support.industry.siemens.com/cs/ww/en/view/109806400) 1.1 ET 200SP Documentation Guide

# 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 PROFlenergy diagnostics, you can quickly detect the current pause mode or the readiness for operation of devices that support PROFlenergy 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/industrialcommunication/profinet/sinetplan.html). 1.1 ET 200SP Documentation Guide

# 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. (<u>https://support.microsoft.com/en-us/topic/microsoft-net-framework-4-8-offline-installer-for-windows-9d23f658-3b97-68ab-d013-aa3c3e7495e0</u>))
- 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: (<u>https://support.industry.siemens.com</u>)
     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.

# 1.1 ET 200SP Documentation Guide

# 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 registra- tion, 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 fre- quently 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	<ul> <li>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:</li> <li>Product images, 2D dimension drawings, 3D models, internal circuit diagrams, EPLAN macro files</li> <li>Manuals, characteristics, operating manuals, certificates</li> <li>Product master data</li> </ul>

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)

# **Safety instructions**

# 2.1 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 more information on protective industrial cybersecurity measures for implementation, please visit (<u>https://www.siemens.com/global/en/products/automation/topic-areas/industrial-cybersecurity.html</u>).

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

To stay informed about product updates at all times, subscribe to the Siemens Industrial Cybersecurity RSS Feed under

(https://new.siemens.com/global/en/products/services/cert.html).

# **Product overview**

# 3.1 Properties

# Article number

6ES7133-6BH00-0BA0

# View of the module



- ① Module type and name
- 2 LED for diagnostics
- ③ QR code for identification link
- ④ Wiring diagram
- 5 LEDs for channel status
- ⑦ Article number
- (8) Function and firmware version
- 9 BU type
- 1 Color code for selecting the color identification labels
- ① Color coding module type
- 6 LED for supply voltage 12 Function class
- Figure 3-1 View of the module DI 8x/DQ 8x24VDC/0.5A ST

Digital input/output module DI 8x/DQ 8x24VDC/0.5A ST (6ES7133-6BH00-0BA0) Equipment Manual, 02/2024, A5E52173282-AA

3.1 Properties

# Properties

The module has the following technical properties:

- Digital inputs
  - 8 digital inputs
  - Sink input (PNP)
  - Configurable input delay 0.05 ms to 20 ms (per channel)
  - Configurable diagnostics (per module)
  - Suitable for connection of switches and 2-wire sensors in accordance with IEC 61131, type 1 and 3
- Digital outputs
  - 8 digital outputs
  - Supply voltage L+
  - Source output (PNP, P-switching)
  - Output current 0.5 A (per channel)
  - Configurable diagnostics (per module)
  - Configurable substitute values (per channel)
  - Suitable for solenoid valves, DC contactors, and indicator lights

The module supports the following functions:

## Table 3-1 Version dependencies of the functions

	HW ver-	FW version	STEP 7	GSD file	
Function	sion		TIA Portal	PROFINET IO	PROFIBUS DP
Firmware update	FS01	V1.0.0 or higher	V18 or higher with HSP 0401	Х	Х
Identification data I&M0 to I&M3	FS01	V1.0.0 or higher	V18 or higher with HSP 0401	Х	Х
Reconfiguration in RUN	FS01	V1.0.0 or higher	V18 or higher with HSP 0401	Х	Х
PROFlenergy	FS01	V1.0.0 or higher	V18 or higher with HSP 0401	Х	-
Value status	FS01	V1.0.0 or higher	V18 or higher with HSP 0401	Х	Х

The module can be configured with HSP or a GSD file with TIA V18 or later. The configurations for the operating modes can be found under various codes *I* module names:

Table 3-2 Codes / module names for the configuration options

Function	Configuration software				
	GSD file PROFINET IO	GSD file PROFIBUS DP			
Without QI	DI 8x/DQ 8x24VDC/0.5A ST V1.0	DI 8x/DQ 8x24VDC/0.5A ST V1.0			
With QI	DI 8x/DQ 8x24VDC/0.5A ST V1.0, QI	DI 8x/DQ 8x24VDC/0.5A ST V1.0, QI			

# Product overview

3.1 Properties

# Accessories

The following accessories must be ordered separately:

- Labeling strips
- Color identification labels
- Reference identification label
- Shield connector

# See also

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

# Connection

# 4.1 Wiring diagram

This section contains the pin assignment for the module. You can find information on wiring the BaseUnit in the ET 200SP distributed I/O system (http://support.automation.siemens.com/WW/view/en/58649293) system manual.

# **Terminal assignment**

Description	Signal	Terminal	BaseUnit BU type A0	Terminal	Signal	Description
Digital input, channel 0	DI <sub>0</sub>	1	1	2	$DI_1$	Digital input, channel 1
Digital input, channel 2	DI <sub>2</sub>	3	3 4	4	$DI_3$	Digital input, channel 3
Digital input, channel 4	DI <sub>4</sub>	5	5 6 8	6	$DI_5$	Digital input, channel 5
Digital input, channel 6	$DI_6$	7	9 0 10	8	$DI_7$	Digital input, channel 7
Digital output, channel 0	DQ <sub>0</sub>	9	11 10 01 12	10	$DQ_1$	Digital output, channel 1
Digital output, channel 2	DQ <sub>2</sub>	11	13 14	12	DQ <sub>3</sub>	Digital output, channel 3
Digital output, channel 4	DQ <sub>4</sub>	13	17	14	$DQ_5$	Digital output, channel 5
Digital output, channel 6	DQ <sub>6</sub>	15		16	DQ <sub>7</sub>	Digital output, channel 7
24 V DC supply voltage	L+	17		18	М	Ground

# Input connection types

1-wire connection for channel n	1-wire connection with common sup- ply for several channels	3-wire connection for channel n
L+ O	L+O	DI <sub>n</sub> O L+

You can also connect the power supply via a potential distribution module (PotDis module).

# NOTE

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

4.1 Wiring diagram

# **Output connection types**



You can also connect the ground via a potential distribution module (PotDis module).

## NOTE

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

# 4.2 Block diagram



This section contains the block diagram of the module-

Figure 4-1 Block diagram for I/O module and BaseUnit

# Wire-break detection

When wire-break detection is configured the module requires a low quiescent current at the digital input in case of "0" signal for the monitoring. The parallel connection of a resistor with 25 k $\Omega$  to 45 k $\Omega$  is required in order that this quiescent current can flow when mechanical transducer contacts are open.

If wire-break detection is disabled in the configuration, no parallel connection of the resistor is required.

If wire-break detection is configured, connect a resistor with 25 k $\Omega$  to 45 k $\Omega$  parallel to each mechanical transducer contact.



Figure 4-2 Connect mechanical transducer contact with resistor

# Parameters/address space

# 5.1 Parameters

Specify the module properties with the various parameters in the course of the parameter assignment of the module with STEP 7. The following table lists the configurable parameters. The effective range of the parameters depends on the type of configuration. The following configurations are possible:

- Central operation on an ET 200SP CPU or on an ET 200SP Open Controller
- Distributed operation on PROFINET IO in an ET 200SP system
- Distributed operation on PROFIBUS DP in an ET 200SP system

In addition to configuration via the configuration software, you can also configure parameters in RUN mode (dynamic) via the user program. When assigning parameters in the user program, use the "WRREC" instruction to transfer the parameters to the module using the data records; refer to the section Parameter assignment and structure of the parameter data record (Page 35).

The following parameter settings are possible:

Parameters	Value range	Default	Reconfig- uration in RUN	Effective range with config- uration software	
				GSD file PROFINET I- O	GSD file PROFIBUS DP <sup>1</sup>
Diagnostics No supply voltage L+	<ul><li>Disable</li><li>Enable</li></ul>	Disable	Yes	Module	Module
Diagnostics DI: Wire break	<ul><li>Disable</li><li>Enable</li></ul>	Disable	Yes	Module	Module
Diagnostics DQ: Short-circuit to ground	<ul><li>Disable</li><li>Enable</li></ul>	Disable	Yes	Module	Module
Diagnostics DQ: Short-circuit to L+	<ul><li>Disable</li><li>Enable</li></ul>	Disable	yes	Module	Module
Diagnostics DQ: Wire break	<ul><li>Disable</li><li>Enable</li></ul>	Disable	yes	Module	Module
Channel activated DI	<ul><li>Disable</li><li>Enable</li></ul>	Enable	yes	Channel	Channel

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

<sup>1</sup> Due to the limited number of parameters at a maximum of 244 bytes per ET 200SP station with a PROFIBUS GSD configuration, the parameter assignment options are restricted. If your PROFIBUS Master supports the "Read / write data record" function, you can set this parameter via data record 128, see Appendix "Parameter data set".

5.2 Explanation of parameters

Parameters	arameters Value range Default Reconfi uration		Reconfig- uration in	Effective range with config- uration software	
			RUN	GSD file PROFINET I- O	GSD file PROFIBUS DP <sup>1</sup>
Input delay	<ul> <li>None</li> <li>0.05 ms</li> <li>0.1 ms</li> <li>0.4 ms</li> <li>0.8 ms</li> <li>1.6 ms</li> <li>3.2 ms</li> <li>12.8 ms</li> <li>20 ms</li> </ul>	3.2 ms	yes	Channel	Module
Channel activated DQ	<ul><li>Disable</li><li>Enable</li></ul>	Enable	yes	Channel	Channel
Reaction to CPU STOP	<ul> <li>Shutdown</li> <li>Keep last value</li> <li>Output substitute value 1 (for PROFINET IO)</li> <li>Output substitute value (for PROFIBUS DP)</li> </ul>	Shutdown	yes	Channel	Module
Substitute value	• 0 • 1	0	yes	-	Channel
Potential group	<ul> <li>Use potential group of the left module (module plugged into a dark BaseUnit)</li> <li>Enable new potential group (module plugged into light- colored BaseUnit)</li> </ul>	Use potential group of the left module	No	Module	Module

Due to the limited number of parameters at a maximum of 244 bytes per ET 200SP station with a PROFIBUS GSD configuration, the parameter assignment options are restricted. If your PROFIBUS Master supports the "Read / write data record" function, you can set this parameter via data record 128, see Appendix "Parameter data set".

# 5.2 Explanation of parameters

# Diagnostics: No supply voltage L+

Enabling of the diagnostics for no or insufficient supply voltage L+.

# **Diagnostics DI: Wire break**

Enabling of the diagnostics if the module has no current flow or the current is too weak to be measured at the relevant input.

# **Diagnostics DQ: Short-circuit to ground**

Enable "Short-circuit" diagnostics when a short-circuit occurs between output and ground.

5.2 Explanation of parameters

## Diagnostics DQ: Short-circuit to L+

Enable "Short-circuit" diagnostics when a short-circuit occurs between output and L+.

## **Diagnostics DQ: Wire break**

Enabling of the diagnostics if the line to the actuator is broken.

#### NOTE

#### Wire break diagnostics in problematic electromagnetic conditions

To avoid faulty wire break diagnostics, deactivate the diagnostics or increase the current to at least 10 mA.

#### NOTE

#### Glowing of LEDs due to wire break test current

Permanently active wire break test current of approx. 20  $\mu A$  can cause connected LEDs to glow in the "0" signal state.

## **Channel activated DI**

Determines whether a channel is enabled or disabled. If a digital input is disabled, its input signals at the terminal are not processed by the module.

#### Input delay

This parameter can be used to avoid signal faults. Changes to the signal are only detected if they are constantly pending longer than the set input delay time. For input channels with longer input delays, the read time is moved accordingly. This means individual channels can be assigned input delays, if necessary, without having a negative impact on the possible cycle time.

#### NOTE

If you select the "None" or "0.05 ms" option for the input delay, you have to use shielded cables for connection of the digital inputs.

# **Channel activated DQ**

Specifies whether a channel is activated or deactivated.

#### **Reaction to CPU STOP**

Determines the behavior of the module at CPU STOP.

# Substitute value

Defines the substitute value that is output when a CPU STOP occurs and the setting "Output substitute value" is selected in the "Reaction to CPU STOP" parameter.

## **Potential group**

Specify whether a light-colored BaseUnit with incoming supply voltage or a dark-colored BaseUnit is located in this slot (see ET 200SP distributed I/O system (<u>http://support.automation.siemens.com/WW/view/en/58649293</u>) system manual). A potential group consists of a group of directly adjacent I/O modules within an ET 200SP

station, which are supplied via a common supply voltage. A potential group begins with a light-colored BaseUnit through which the required voltage is supplied for all modules of the potential group. The light-colored BaseUnit interrupts the

three self-assembling voltage buses P1, P2 and AUX to the left neighbor. All additional I/O modules of this potential group are plugged into dark-colored BaseUnits. You take the potential of the self-assembling voltage buses P1, P2 and AUX from the left neighbor.

A potential group ends with a dark-colored BaseUnit, which is followed by a light-colored BaseUnit or server module in the station configuration.

# 5.3 Address space

AB x

# Address space for configuration as DI 8x/DQ 8x24VDC/0.5A ST

The following figures show the assignment of the address space without value status. "EB x" stands for the start address input byte x. "AB x" stands for the address output byte x.

Assignment in the process image input (PII)

 7
 6
 5
 4
 3
 2
 1
 0
 Input value

 IB x
 Image: Second se

Assignment in the process image output (PIQ)

7 6 5 4 3 2 1 0

Output value Channels 0 to 7 5.3 Address space

# Address space for configuration as DI 8x/DQ 8x24VDC/0.5A ST, QI

The following figures show the assignment of the address space with value status (Quality Information (QI)). "IB x" represents the start address of input byte x. "AB x" stands for the address output byte x.

Assignment in the process image input (PII)



# Evaluating the value status

An additional bit is assigned to each channel for the value status. The bit for the value status indicates whether the output value specified by the user program is actually pending at the module terminal (0 = value is incorrect).

You can find more information on evaluating the value status in the ET 200SP Distributed I/O System (https://support.industry.siemens.com/cs/ww/en/view/58649293) System Manual.

# Interrupts/diagnostic messages

# 6.1 Status and error display

# LED display

The following figure shows you the LED display of the DI 8x/DQ 8x24VDC/0.5A ST.



# Meaning of the LED display

The following tables show the meaning of the status and error displays. Remedial measures for dealing with diagnostic interrupts can be found in the section Diagnostics alarms (Page 27).

6.1 Status and error display

# DIAG LED

Table 6-1 DIAG LED fault/error display

DIAG LED	Meaning
□ Off	Backplane bus supply of the system is interrupted or switched off.
- 片 Flashes	Module parameters not assigned
■ On	Module parameters assigned and no module diagnostics
<del>洪</del> Flashes	Module parameters assigned and module diagnostics

# LED channel status inputs

Table 6-2 LED channel status display inputs

Channel status LED	Meaning
□ Off	Process signal = 0
On	Process signal = 1

# LED channel status outputs

Table 6-3 LED channel status display outputs

LED channel status	Meaning
Off	<ul> <li>Channel deactivated</li> <li>Channel activated and process signal = 0</li> <li>Diagnostics pending</li> </ul>
• On	Channel activated and process signal = 1

# **PWR LED**

#### Table 6-4 Status display of the PWR LED

PWR LED	Meaning
□ Off	No supply voltage L+
■ On	Supply voltage L+ present

# 6.2 Interrupts

The DI 8x/DQ 8x24VDC/0.5A ST digital input/output module supports diagnostic interrupts.

# **Diagnostic interrupts**

The module generates a diagnostics interrupt at the following events:

- Short-circuit
- Wire break
- Parameter assignment error
- Supply voltage missing
- Channel / component temporarily not available

Detailed information on the event is available in the STEP 7 online help.

# 6.3 Diagnostics alarms

A diagnostic message is generated and the DIAG-LED flashes red on the module for each diagnostics event. You can read out the diagnostics alarms, for example, in the diagnostic buffer of the CPU. You can evaluate the error codes with the user program.

Table 6-5 Diagnostic interrupts, their meaning and how to deal with them

Diagnostic interrupt	Error code	Meaning		Remedy	
Short-circuit	1 <sub>H</sub>	• Sł gi • Sł	nort-circuit between output and round nort-circuit between output and L+	Correct the process wiring	
Wire break	6 <sub>H</sub>	DI	Impedance of transducer circuit too high.	<ul> <li>Use a different encoder type or modify the wiring, for example, using cables with larger cross-section</li> <li>Connect a resistor of 25 kiloohms to 45 kiloohms to the transducer contacts</li> </ul>	
			Wire break between the module and sensor	Connect the cable	
			Channel not connected (open)	Deactivate diagnostics	
		DQ	Actuator circuit impedance too high	Use a different actuator type or modify the wiring, e.g. use cables with larger cross-section	
			Wire break between the module and actuator	Connect the cable	
			Channel not connected (open)	<ul> <li>Deactivate diagnostics</li> <li>Connect a resistor of 48 kiloohms to 12 kiloohms to the actuator contacts See Connect mechanical transducer contact with resistor (Page 19)</li> </ul>	

# 6.3 Diagnostics alarms

Diagnostic interrupt	Error code	Meaning	Remedy
Parameter assignment error	10 <sub>H</sub>	<ul><li>The module cannot evaluate parameters for the channel/module.</li><li>Incorrect parameter assignment.</li></ul>	Correct the parameter assignment
Supply voltage miss- ing	11 <sub>H</sub>	No or insufficient supply voltage L+	<ul> <li>Check the supply voltage L+ at the BaseUnit</li> <li>Check BaseUnit type</li> </ul>
Channel / component temporarily not avail- able	1F <sub>H</sub>	Firmware update is currently in progress or was canceled. The module does not output any process values or substitute values in this state, or does not read in any process values.	<ul><li>Wait for firmware update.</li><li>Restart the firmware update.</li></ul>

# 7.1 Technical specifications

# Technical specifications of the DI 8x/DQ 8x24VDC/0.5A ST

The following table shows the technical specifications as of 02/2024. You can find a data sheet including daily updated technical specifications on the Internet (https://support.industry.siemens.com/cs/ww/en/pv/6ES7133-6BH00-0BA0/td?dl=en).

Article number	6ES7133-6BH00-0BA0	
General information		
Product type designation	DI 8x/DQ 8x24VDC/0,5A ST	
HW functional status	FS01	
Firmware version	V1.0	
FW update possible	Yes	
usable BaseUnits	BU type A0	
Color code for module-specific color identifica- tion plate	CC00	
Product function		
I&M data	Yes; I&M0 to I&M3	
Isochronous mode	No	
Engineering with		
<ul> <li>STEP 7 TIA Portal configurable/integrated from version</li> </ul>	STEP 7 V18 or higher with HSP 0401	
PROFIBUS from GSD version/GSD revision	One GSD file each, Revision 3 and 5 and higher	
PROFINET from GSD version/GSD revision	GSDML V2.42	
Operating mode		
• DI	Yes	
• DQ	Yes	
• DQ with energy-saving function	No	
• PWM	No	
Oversampling	No	
• MSO	No	
Redundancy		
Redundancy capability	No	

Article number	6ES7133-6BH00-0BA0	
Supply voltage		
Rated value (DC)	24 V	
permissible range, lower limit (DC)	19.2 V	
permissible range, upper limit (DC)	28.8 V	
Reverse polarity protection	Yes	
Input current		
Current consumption, max.	35 mA; without load	
output voltage / header		
Rated value (DC)	24 V	
Power loss		
Power loss, typ.	1 W	
Address area		
Address space per module		
Inputs	1 byte; + 1 byte for QI information	
Outputs	1 byte	
Hardware configuration		
Automatic encoding	Yes	
Mechanical coding element	Yes	
• Type of mechanical coding element	Туре А	
Selection of BaseUnit for connection variants		
1-wire connection	BU type A0	
2-wire connection	BU type A0 with AUX terminals or potential dis- tributor module	
3-wire connection	BU type A0 with AUX terminals or potential dis- tributor module	
Digital inputs		
Number of digital inputs	8	
Digital inputs, parameterizable	Yes	
Source/sink input	P-reading	
Input characteristic curve in accordance with IEC 61131, type 1	Yes	
Input characteristic curve in accordance with IEC 61131, type 3	Yes	
Input voltage		
Rated value (DC)	24 V	
• for signal "0"	-30 to +5 V	
• for signal "1"	+11 to +30V	
Input current		
• for signal "1", typ.	2.5 mA	

Article number	6ES7133-6BH00-0BA0		
Input delay (for rated value of input voltage)			
for standard inputs			
<ul> <li>parameterizable</li> </ul>	Yes; 0.05 / 0.1 / 0.4 / 0.8 / 1.6 / 3.2 / 12.8 / 20 ms		
<ul><li>at "0" to "1", min.</li></ul>	0.05 ms		
<ul><li>at "0" to "1", max.</li></ul>	20 ms		
<ul><li>at "1" to "0", min.</li></ul>	0.05 ms		
<ul><li>at "1" to "0", max.</li></ul>	20 ms		
Cable length			
• shielded, max.	1 000 m		
• unshielded, max.	600 m		
Digital outputs			
Type of digital output	Source output (PNP, current-sourcing)		
Number of digital outputs	8		
Current-sourcing	Yes		
Digital outputs, parameterizable	Yes		
output characteristic acc. to IEC 61131, type 0.5	Yes		
Short-circuit protection	Yes; Electronic		
Response threshold, typ.	1 A		
Limitation of inductive shutdown voltage to	Typ. L+ (-50 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; max. 1 H inductance		
• on lamp load, max.	5 W		
Load resistance range			
lower limit	48 Ω		
• upper limit	12 kΩ		
Output voltage			
• for signal "1", min.	L+ (-0.8 V)		
Output current			
<ul> <li>for signal "1" rated value</li> </ul>	0.5 A		
<ul> <li>for signal "1" permissible range, max.</li> </ul>	0.5 A		
• for signal "0" residual current, max.	0.1 mA		
Output delay with resistive load			
• "0" to "1", max.	50 µs		
• "1" to "0", max.	100 µs		

Parallel switching of two outputsNoi for upratingNoi for redundant control of a loadYesSwitching frequency100 Hzwith resistive load (acc. to IEC 60947-51) bC13), max.101 HzDC13), max.100 Hzto map load, max.100 HzTotal current of the outputs0.5 Acurrent per channel, max.4 ATotal current of the outputs (per module) horizontal installation4 A- up to 50 °C, max.4 ACable length1000 m- up to 50 °C, max.4 ACable length1000 m- shielded, max.600 mEncoderYesCannectable encodersYes- premissible quiescent current (2-wine) shielded, max.1000 mDiagnostics functionYesDiagnostics functionYesDiagnostics functionYesDiagnostics functionYesDiagnostic alarmYes: module-by-module, for DI: optional pretersi in the case of simple encoder currets: 25 kOhmVire breakYes: module-by-module for DQNonitoring the supply voltageYes: module-by-module for DQShort-circuit to L4Yes: module-by-module for DQShort-circuit to L4-Yes: module-by-module for DQShort-circuit to L4-Yes: module-by-module for DQ	Article number	6ES7133-6BH00-0BA0	
• for upratingNo• for redundant control of a loadYesSwitching frequency100 Hz• with resistive load, max.100 Hz• with inductive load (acc. to IEC 60947-5-1) DC13), max.0.1 Hz; higher frequencies are possible, see Equipment Manual "Maximum permitted switching frequency of inductive loads"• on lamp load, max.0.5 A• Current of the outputs0.5 A• Current per channel, max.4 ATotal current of the outputs (per module) horizontal installation4 A• up to 60 °C, max.4 ACable length • up to 50 °C, max.4 A• up to 50 °C, max.600 mEncoder1000 mConnectable encoders • 2-wire sensorYes• 2-wire sensor1.5 mA• 2-wire sensorYesDiagnostics function • subsibit quiescent current (2-wire sensor), max.YesDiagnostics function • Substitute values connectableYesDiagnostic alarmYesDiagnostic alarmYesDiagnostic alarmYesNonitoring the supply voltage • Wire-break wire-breakYes; module-by-module, for DI: optional protect- ive circuit for preventing wire-break diagnostics in the case of simple encoder contacts: 25 kOhm vericuit for preventing wire-break diagnostics in the case of simple encoder contacts: 25 kOhm vericuit for preventing wire-break diagnostics in the case of simple encoder contacts: 25 kOhm vericuit for preventing wire-break diagnostics in the case of simple encoder contacts: 25 kOhmDiagnostic uit to L+Yes; module-by-module for DQ• Sh	Parallel switching of two outputs		
<ul> <li>for redundant control of a load</li> <li>Yes</li> <li>with resistive load, max.</li> <li>100 Hz</li> <li>with inductive load (acc. to IEC 60947-5-1, DC13), max.</li> <li>on lamp load, max.</li> <li>10 Hz</li> <li>on lamp load, max.</li> <li>10 Hz</li> <li>on lamp load, max.</li> <li>10 Hz</li> <li>current per channel, max.</li> <li>Current per channel, max.</li> <li>Current per module, max.</li> <li>Current per channel, max.</li> <li>Current per module, max.</li> <li>4 A</li> <li>Total current of the outputs (per module)</li> <li>horizontal installation         <ul> <li>up to 60 °C, max.</li> <li>4 A</li> </ul> </li> <li>Cable length         <ul> <li>shielded, max.</li> <li>1000 m</li> <li>unshielded, max.</li> <li>000 m</li> </ul> </li> <li>Connectable encoders         <ul> <li>2-wire sensor</li> <li>2-wire sensor</li> <li>2-wire sensor</li> <li>2-wire sensor</li> <li>2-wire sensor</li> <li>3-shielded, max.</li> <li>1000 m</li> <li>1.5 mA</li> </ul> </li> <li>Substitute values connectable</li> <li>Yes</li> <li>Alarms         <ul> <li>Diagnostic sfunction</li> <li>Yes</li> <li>Monitoring the supply voltage</li> <li>Wire-break</li> <li>Yes; module-by-module, for D1: optional protective in the case of simple encoder contacts: 25 kOhm to 45 kOhm</li> <li>Short-circuit to M</li> <li>Yes; module-by-module for DQ</li> <li>Short-circuit to L+</li> <li>Yes; module-by-module for DQ</li> <li>Short-circuit to L+</li> <li>Yes; module-by-module for DQ</li> <li>Short-circuit to L+</li> <li>Yes; module-by-module for DQ</li> <li>Short-circuit to L+</li></ul></li></ul>	for uprating	No	
Switching frequency       100 Hz         • with resistive load, max.       100 Hz         • with inductive load (acc. to IEC 60947-5-1, DC13), max.       0.1 Hz; higher frequencies are possible, see Equipment Manual "Maximum permitted switching frequency of inductive loads"         • on lamp load, max.       10 Hz         Total current of the outputs       0.5 A         • Current per channel, max.       4 A         Total current of the outputs (per module)       -         horizontal installation       -         - up to 60 °C, max.       4 A         Cable length       -         • shielded, max.       1000 m         • unshielded, max.       1000 m         • unshielded, max.       600 m         Encoder       -         Connectable encoders       -         • 2-wire sensor       Yes         - permissible quiescent current (2-wire sensor), max.       1.5 mA         Diagnostic function       Yes         Substitute values connectable       Yes         Diagnostic alarm       Yes         Diagnostic alarm       Yes         Diagnostic alarm       Yes         Monitoring the supply voltage       Yes; module-by-module, for DI: optional protect-ive circuit for preventing wire-break diagnostics in the case of simple encoder contacts:	for redundant control of a load	Yes	
<ul> <li>with resistive load, max.</li> <li>100 Hz</li> <li>with inductive load (acc. to IEC 60947-5-1) DC13), max.</li> <li>DC13), max.</li> <li>DC13, max.</li> <li>DC13, max.</li> <li>DC13, max.</li> <li>DC13, max.</li> <li>DC14</li> <li>DC14</li> <li>DC15</li> <li>Current of the outputs</li> <li>Current per channel, max.</li> <li>Current per module, max.</li> <li>Current of the outputs (per module)</li> <li>horizontal installation         <ul> <li>up to 60 °C, max.</li> <li>Vertical installation</li></ul></li></ul>	Switching frequency		
<ul> <li>with inductive load (acc. to IEC 60947-5-1) DC13), max.</li> <li>DC13), max.</li> <li>10 Hz</li> <li>1</li></ul>	• with resistive load, max.	100 Hz	
• on lamp load, max.10 HzTotal current of the outputs.• Current per channel, max.0.5 A• Current per module, max.4 ATotal current of the outputs (per module).horizontal installation up to 60 °C, max.4 Avertical installation up to 50 °C, max.4 ACable length.• shielded, max.1000 m• unshielded, max.600 mConnectable encoders.• 2-wire sensorYes• 2-wire sensor1.5 mA• 2-wire sensorYes- permissible quiescent current (2-wire sensor), max.1.5 mABiagnostics functionYesSubstitute values connectableYesAlarms.• Diagnostic farmYes• Monitoring the supply voltageYes; module-by-module, for DI: optional protect-iver circuit for preventing wire-break diagnostics 25 kohm• Short-circuit to MYes; module-by-module for DQ• Short-circuit to L+Yes; module-by-module for DQ• Short-circuit to L+Yes; module-by-module for DQ• Short-circuit to L+Yes; module-by-module for DQ	• with inductive load (acc. to IEC 60947-5-1, DC13), max.	0.1 Hz; higher frequencies are possible, see Equipment Manual "Maximum permitted switching frequency of inductive loads"	
Total current of the outputs0.5 A• Current per channel, max.4 ATotal current of the outputs (per module)horizontal installation- up to 60 °C, max.4 Avertical installation- up to 50 °C, max.4 ACable length• shielded, max.600 mEncoderConnectable encoders• 2-wire sensor- permissible quiescent current (2-wire sensor), max.Diagnostic function Substitute values connectableNational Substitute values connectableVesDiagnostic function Substitute values connectableVire-breakVire-breakVire-breakVire-breakShort-circuit to M Short-circuit to L+• Short-circuit to L+ Senou per value• Group errorYesVesDiagnoster of the supply voltage Short-circuit to L+ Short-circuit to L+• Short-circuit to L+ Short-circuit to L+• Group error• Short-circuit to L+ Stort-circuit to L+• Conper value by-module for DQ Yes• Conper value by-module for DQ 	• on lamp load, max.	10 Hz	
<ul> <li>Current per channel, max.</li> <li>Current per module, max.</li> <li>A</li> <li>Current of the outputs (per module)</li> <li>horizontal installation         <ul> <li>up to 60 °C, max.</li> <li>4 A</li> </ul> </li> <li>retrical installation         <ul> <li>up to 50 °C, max.</li> <li>4 A</li> </ul> </li> <li>coble length         <ul> <li>shielded, max.</li> <li>000 m</li> </ul> </li> <li>connectable encoders             <ul> <li>2-wire sensor</li> <li>2-wire sensor</li> <li>permissible quiescent current (2-wire sensor), max.</li> </ul> </li> <li>Interrups/diagnostics/status information             <ul> <li>Total gamostics function</li> <li>Substitute values connectable</li> <li>Yes</li> </ul> </li> <li>Alarms         <ul> <li>Diagnostic alarm</li> <li>Yes; module-by-module, for DI: optional protect-ive circuit for preventing wire-break diagnostics; 25 kOhm</li> <li>Ves; module-by-module for DQ</li> <li>Short-circuit to M</li> <li>Yes; module-by-module for DQ</li> <li>Short-circuit to L+</li> <li>Yes; module-by-module for DQ</li> <li>Short-circuit to L+</li> <li>Yes; module-by-module for DQ</li> </ul> </li> </ul>	Total current of the outputs		
• Current per module, max.4 ATotal current of the outputs (per module) horizontal installation - up to 60 °C, max.4 Avertical installation - up to 50 °C, max.4 ACable length • shielded, max.1 000 mcurrent per module, max.600 mEncoder Connectable encoders • 2-wire sensor - permissible quiescent current (2-wire sensor), max.YesDiagnostics function Substitute values connectableYesAlarms • Diagnostic alarmYesDiagnostic function • Wire-breakYesDiagnostic alarmYesDiagnostic short-circuit to M • Short-circuit to L4 • Short-circuit to L4 • Group errorYes; module-by-module for DQ ves; module-by-module for DQDiagnoser • Short-circuit to L4 • Group errorYes; module-by-module for DQ Yes; module-by-module for DQ	• Current per channel, max.	0.5 A	
Total current of the outputs (per module) horizontal installation – up to 60 °C, max.4 Avertical installation – up to 50 °C, max.4 ACable length • shielded, max.1 000 me unshielded, max.600 mEncoderYesConnectable encoders • 2-wire sensor – permissible quiescent current (2-wire sensor), max.YesInterrupts/diagnostics/status information Substitute values connectableYesDiagnostic function substitute values connectableYesDiagnostic alarm • Diagnostic alarmYesDiagnostic alarm • Short-circuit to M • Short-circuit to L+ • Group errorYesDiagnoper content to L+ • Group errorYesDiagnoper content to L+ • Group errorYesDiagnoper content to L+ • Group errorYes	• Current per module, max.	4 A	
horizontal installation4 A- up to 60 °C, max.4 Avertical installation4 A- up to 50 °C, max.4 ACable length1000 m- shielded, max.600 m- unshielded, max.600 mEncoderYesConnectable encodersYes- permissible quiescent current (2-wire sensor), max.1.5 mADiagnostics function Substitute values connectableYesPiagnostic substitute values connectableYesPiagnostic alarmYesNonitoring the supply voltageYes· Monitoring the supply voltageYes; module-by-module, for DI: optional protect- in the case of simple encoder contacts: 25 kOhm· Short-circuit to MYes; module-by-module for DQ· Short-circuit to L+Yes; module-by-module for DQ· Group errorYes; module-by-module for DQ	Total current of the outputs (per module)		
- up to 60 °C, max.4 Avertical installation up to 50 °C, max.4 ACable length1000 m- shielded, max.600 mEncoder-Connectable encodersYes- 2-wire sensorYes- permissible quiescent current (2-wire sensor), max.YesDiagnostics functionYesDiagnostics functionYesDiagnostic alarmYesDiagnostic alarmYesNonitoring the supply voltageYesWire-breakYes; module-by-module, for DI: optional protect- ive circuit for preventing wire-break diagnostics is to 45 kOhm• Short-circuit to MYes; module-by-module for DQ• Short-circuit to L+Yes; module-by-module for DQ• Group errorYes	horizontal installation		
vertical installation4 ACable length1 000 m• shielded, max.600 m• unshielded, max.600 mEncoder-Connectable encodersYes• 2-wire sensor1.5 mA- permissible quiescent current (2-wire sensor), max.YesDiagnostics functionYesSubstitute values connectableYesAlarms-• Diagnostic alarmYes• Monitoring the supply voltageYes• Monitoring the supply voltageYes; module-by-module, for DI: optional protect- ive circuit for preventing wire-break diagnostics sin the case of simple encoder contacts: 25 kOhm to 45 kOhm• Short-circuit to MYes; module-by-module for DQ• Short-circuit to L+Yes; module-by-module for DQ• Group errorYes	– up to 60 °C, max.	4 A	
- up to 50 °C, max.4 ACable length.• shielded, max.1000 m• unshielded, max.600 mEncoder.Connectable encoders.• 2-wire sensorYes- permissible quiescent current (2-wire sensor), max.1.5 mADiagnostics function substitute values connectableYesAlarms • Diagnostic alarmYes• Diagnostic alarmYesDiagnoses • Monitoring the supply voltageYes; module-by-module, for DI: optional protect- ive circuit for preventing wire-break diagnostics; in the case of simple encoder contacts: 25 kOhm• Short-circuit to M • Short-circuit to L+Yes; module-by-module for DQ• Group errorYes; module-by-module for DQ	vertical installation		
Cable lengthI 000 m• shielded, max.600 mEncoder600 mConnectable encodersYes• 2-wire sensorYes- permissible quiescent current (2-wire sensor), max.1.5 mAInterrupts/diagnostics/status informationYesDiagnostics function Substitute values connectableYesAlarms • Diagnostic alarmYes• Monitoring the supply voltageYes• Monitoring the supply voltageYes; module-by-module, for DI: optional protect- ive circuit for preventing wire-break diagnostics in the case of simple encoder contacts: 25 kOhm to 45 kOhm• Short-circuit to M • Short-circuit to L+ • Group errorYes	– up to 50 °C, max.	4 A	
<ul> <li>shielded, max.</li> <li>unshielded, max.</li> <li>600 m</li> <li< td=""><td>Cable length</td><td></td></li<></ul>	Cable length		
• unshielded, max.600 mEncoder-Connectable encoders-• 2-wire sensorYes- permissible quiescent current (2-wire sensor), max.1.5 mAInterrupts/diagnostics/status information-Diagnostics function substitute values connectableYesAlarms • Diagnostic alarm-Diagnoses • Monitoring the supply voltageYesWire-breakYes; module-by-module, for DI: optional protect- in the case of simple encoder contacts: 25 kOhm• Short-circuit to M • Short-circuit to L+Yes; module-by-module for DQ• Group errorYes	• shielded, max.	1 000 m	
EncoderConnectable encoders• 2-wire sensor- permissible quiescent current (2-wire sensor), max.Interrupts/diagnostics/status informationDiagnostics functionSubstitute values connectableVesAlarms• Diagnostic alarmYesDiagnostic alarmVesSubstitute values connectableYesAlarms• Diagnostic alarmYesDiagnoses• Monitoring the supply voltageYes; module-by-module, for DI: optional protect- ive circuit for preventing wire-break diagnostics in the case of simple encoder contacts: 25 kOhm to 45 kOhm• Short-circuit to MYes; module-by-module for DQShort-circuit to L+Yes; module-by-module for DQYes; module-by-module for DQ	• unshielded, max.	600 m	
Connectable encodersYes2-wire sensorYes- permissible quiescent current (2-wire sensor), max.1.5 mAInterrupts/diagnostics/status informationYesDiagnostics functionYesSubstitute values connectableYesAlarmsYes• Diagnostic alarmYesDiagnostic alarmYesbiognostic alarmYesbiognosesYes• Monitoring the supply voltageYes• Wire-breakYes; module-by-module, for DI: optional protect- vic circuit for preventing wire-break diagnostics in the case of simple encoder contacts: 25 kOhm• Short-circuit to MYes; module-by-module for DQ• Short-circuit to L+Yes; module-by-module for DQ• Group errorYes	Encoder		
• 2-wire sensorYes- permissible quiescent current (2-wire sensor), max.1.5 mAInterrupts/diagnostics/status informationDiagnostics function Substitute values connectableYesAlarms • Diagnostic alarmYesDiagnostic alarmYesDiagnoses • Monitoring the supply voltageYesWire-breakYes; module-by-module, for DI: optional protect- ive circuit for preventing wire-break diagnostics o 45 kOhm• Short-circuit to M • Short-circuit to L+Yes; module-by-module for DQ• Group errorYes	Connectable encoders		
- permissible quiescent current (2-wire sensor), max.1.5 mAInterrupts/diagnostics/status information Diagnostics function Substitute values connectableYesAlarms • Diagnostic alarmYesDiagnostic alarmYesDiagnoses • Monitoring the supply voltageYes; module-by-module, for DI: optional protect- ive circuit for preventing wire-break diagnostics in the case of simple encoder contacts: 25 kOhm to 45 kOhm• Short-circuit to M • Short-circuit to L+ • Group errorYes; module-by-module for DQ• Monitor perventing vireYes; module-by-module for DQ	• 2-wire sensor	Yes	
Interrupts/diagnostics/status informationDiagnostics functionYesSubstitute values connectableYesAlarmsYes• Diagnostic alarmYesDiagnosesYes• Monitoring the supply voltageYes• Wire-breakYes; module-by-module, for DI: optional protect-ive circuit for preventing wire-break diagnostics in the case of simple encoder contacts: 25 kOhm• Short-circuit to MYes; module-by-module for DQ• Short-circuit to L+Yes; module-by-module for DQ• Group errorYes	<ul> <li>permissible quiescent current (2-wire sensor), max.</li> </ul>	1.5 mA	
Diagnostics functionYesSubstitute values connectableYesAlarmsYes• Diagnostic alarmYesDiagnosesYes• Monitoring the supply voltageYes; module-by-module, for DI: optional protect- ive circuit for preventing wire-break diagnostics in the case of simple encoder contacts: 25 kOhm• Short-circuit to MYes; module-by-module for DQ• Short-circuit to L+Yes; module-by-module for DQ• Group errorYes	Interrupts/diagnostics/status information		
Substitute values connectableYesAlarmsYes• Diagnostic alarmYesDiagnosesYes• Monitoring the supply voltageYes• Wire-breakYes; module-by-module, for DI: optional protect-ive circuit for preventing wire-break diagnostics in the case of simple encoder contacts: 25 kOhm to 45 kOhm• Short-circuit to MYes; module-by-module for DQ• Short-circuit to L+Yes; module-by-module for DQ• Group errorYes	Diagnostics function	Yes	
AlarmsYes• Diagnostic alarmYesDiagnosesYes• Monitoring the supply voltageYes• Wire-breakYes; module-by-module, for D1: optional protect- ive circuit for preventing wire-break diagnostics in the case of simple encoder contacts: 25 kOhm to 45 kOhm• Short-circuit to MYes; module-by-module for DQ• Short-circuit to L+Yes; module-by-module for DQ• Group errorYes	Substitute values connectable	Yes	
<ul> <li>Diagnostic alarm Yes</li> <li>Diagnoses         <ul> <li>Monitoring the supply voltage</li> <li>Wire-break</li> <li>Wire-break</li> <li>Yes; module-by-module, for DI: optional protect- ive circuit for preventing wire-break diagnostics in the case of simple encoder contacts: 25 kOhm to 45 kOhm</li> </ul> </li> <li>Short-circuit to M</li> <li>Short-circuit to L+</li> <li>Group error</li> <li>Yes</li> </ul>	Alarms		
DiagnosesYes• Monitoring the supply voltageYes; module-by-module, for DI: optional protect- ive circuit for preventing wire-break diagnostics in the case of simple encoder contacts: 25 kOhm• Short-circuit to MYes; module-by-module for DQ• Short-circuit to L+Yes; module-by-module for DQ• Group errorYes	Diagnostic alarm	Yes	
<ul> <li>Monitoring the supply voltage</li> <li>Wire-break</li> <li>Wire-break</li> <li>Yes; module-by-module, for DI: optional protect- ive circuit for preventing wire-break diagnostics in the case of simple encoder contacts: 25 kOhm to 45 kOhm</li> <li>Short-circuit to M</li> <li>Short-circuit to L+</li> <li>Yes; module-by-module for DQ</li> <li>Group error</li> <li>Yes</li> </ul>	Diagnoses		
<ul> <li>Wire-break</li> <li>Yes; module-by-module, for DI: optional protect- ive circuit for preventing wire-break diagnostics in the case of simple encoder contacts: 25 kOhm to 45 kOhm</li> <li>Short-circuit to M</li> <li>Yes; module-by-module for DQ</li> <li>Short-circuit to L+</li> <li>Yes; module-by-module for DQ</li> <li>Group error</li> <li>Yes</li> </ul>	<ul> <li>Monitoring the supply voltage</li> </ul>	Yes	
<ul> <li>Short-circuit to M Yes; module-by-module for DQ</li> <li>Short-circuit to L+ Yes; module-by-module for DQ</li> <li>Group error Yes</li> </ul>	• Wire-break	Yes; module-by-module, for DI: optional protect- ive circuit for preventing wire-break diagnostics in the case of simple encoder contacts: 25 kOhm to 45 kOhm	
<ul> <li>Short-circuit to L+</li> <li>Group error</li> <li>Yes; module-by-module for DQ</li> <li>Yes</li> </ul>	Short-circuit to M	Yes; module-by-module for DQ	
Group error Yes	Short-circuit to L+	Yes; module-by-module for DQ	
	Group error	Yes	

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Diagnostics indication LED		
<ul> <li>Monitoring of the supply voltage (PWR-LED)</li> </ul>	Yes; green PWR LED	
Channel status display	Yes; green LED	
for channel diagnostics	No	
for module diagnostics	Yes; green/red DIAG LED	
Potential separation		
Potential separation channels		
between the channels	No	
between the channels and backplane bus	Yes	
<ul> <li>between the channels and the power sup- ply of the electronics</li> </ul>	No	
Isolation		
Isolation tested with	707 V DC (type test)	
Standards, approvals, certificates		
Suitable for safety functions	No	
Ambient conditions		
Ambient temperature during operation		
<ul> <li>horizontal installation, min.</li> </ul>	-30 °C	
<ul> <li>horizontal installation, max.</li> </ul>	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.	5 000 m; restrictions for installation altitudes > 2 000 m, see ET 200SP system manual	
Dimensions		
Width	15 mm	
Height	73 mm	
Depth	58 mm	
Weights		
Weight, approx.	30 g	

# Maximum permitted switching frequency of inductive loads

The following trends show the maximum permissible switching frequency of inductive loads as a function of inductance and channel current. The maximum switching frequency applies to a pulse-pause ratio of 50%. The channel contributes 500 mA to the total current of the module, even if the actual channel current is smaller.

If you do not know the inductance of the actuator, assume a maximum inductance of 1.152 H for DC-13 loads (IEC 60947-5-1).



Figure 7-1 Maximum switching frequency

# **Dimension 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 the parameter data record

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. This means that you can use all the functions of the module even if you configured it via PROFIBUS-GSD.

## Parameter assignment in the user program

You can change the parameters of the module in RUN.

## **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 transferring parameters with the "WRREC" instruction, the module continues operation with the previous parameter assignment. The STATUS output parameter contains a corresponding error code.

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

A.1 Parameter assignment and structure of the parameter data record

# Structure of data record 128 for the complete module



Figure A-1 Structure of data record 128 for the complete module

# **Header information**

The figure below shows the structure of the header information.





A.1 Parameter assignment and structure of the parameter data record

# Module header information

The figure below shows the structure of the module header information.

Byte 2	7       6       5       4       3       2       1       0         0       0       0       0       0       1       Number of the following module parameter blocks = 1	
Byte 3	7 6 5 4 3 2 1 0 0 0 0 0 0 0 0 1 Length of the following module parameter block = 1	

Figure A-3 Module header information

# Module parameter block

The figure below shows the structure of the module parameter block. You enable a parameter by setting the corresponding bit to "1".



Figure A-4 Module parameter block

# Input channel header information

The figure below shows the structure of the input channel header information.

Byte 5	7       6       5       4       3       2       1       0         0       0       0       1       0       0       0       Number of following channel parameter blocks = 8
Byte 6	7       6       5       4       3       2       1       0         0       0       0       0       0       1       1       Length of the following channel parameter block = 1

Figure A-5 Input channel header information

A.1 Parameter assignment and structure of the parameter data record

# Channel parameter block input channel

The figure below shows the structure of the input channel parameter block. You enable a parameter by setting the corresponding bit to "1".



Figure A-6 Structure bytes 7 to 14 for input channels 0 to 7

# Output channel header information

The figure below shows the structure of the output channel header information.

Byte 15	7       6       5       4       3       2       1       0         0       0       0       0       1       0       0       0	Number of following channel parameter blocks = 8
Byte 16	7       6       5       4       3       2       1       0         0       0       0       0       0       0       0       1	Length of the following channel parameter block = 1

Figure A-7 Output channel header information

# Channel parameter block output channel

The figure below shows the structure of the output channel parameter block. Enable a parameter by setting the corresponding bit to "1".



Figure A-8 Structure bytes 17 to 24 for output channels 0 to 7

# A.2 Error codes

# Errors when transferring the data record

The module always checks all the values of the transferred data record. Only if all the values were transferred without errors does the module take over the values from the data record. In case of errors, the WRREC instruction for writing data records returns corresponding error codes in the STATUS parameter, see also the description of the "STATUS" parameter in the STEP 7 online help.

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

Error code in the STATUS parameter (hexadecim- al)		adecim-	Meaning	Solution	
Byte 0	Byte 1	Byte 2	Byte 3		
DF <sub>H</sub>	80 <sub>H</sub>	BO <sub>H</sub>	00 <sub>H</sub>	Number of the data record unknown	Enter a valid number for the data record.
DF <sub>H</sub>	80 <sub>H</sub>	B1 <sub>H</sub>	01 <sub>H</sub>	Length of the data record incorrect	Enter a valid value for the data record length.
DF <sub>H</sub>	80 <sub>H</sub>	B2 <sub>H</sub>	00 <sub>н</sub>	Module not accessible	<ul><li>Check station.</li><li>Plug the module in correctly.</li><li>Check parameters of the WRREC block.</li></ul>
DF <sub>H</sub>	80 <sub>H</sub>	EO <sub>H</sub>	01 <sub>H</sub>	Header error (version or specified bits incor- rect)	Correct version number or fixed bits, see Header information (Page 36)
DF <sub>H</sub>	80 <sub>H</sub>	EO <sub>H</sub>	02 <sub>H</sub>	Header error (number or length of paramet- er structures or parameter blocks incorrect)	Correct the number and length of the para- meter structures or parameter blocks, see Header information (Page 36).
DF <sub>H</sub>	80 <sub>H</sub>	E1 <sub>H</sub>	01 <sub>H</sub>	Reserved bit set	Describe all reserved bits with 0.
DF <sub>H</sub>	80 <sub>H</sub>	E1 <sub>H</sub>	06 <sub>H</sub>	Invalid coding for substitute value reaction	Use valid code for "Reaction to CPU STOP" parameter, see Structure bytes 17 to 24 for output channels 0 to 7 (Page 38).
DF <sub>H</sub>	80 <sub>H</sub>	E1 <sub>H</sub>	07 <sub>H</sub>	Invalid coding for input filter time	Use valid coding for parameter "Input delay", see Structure bytes 7 to 14 for input chan- nels 0 to 7 (Page 37-38).

Table A-1 Error messages, their meaning and corrective measures