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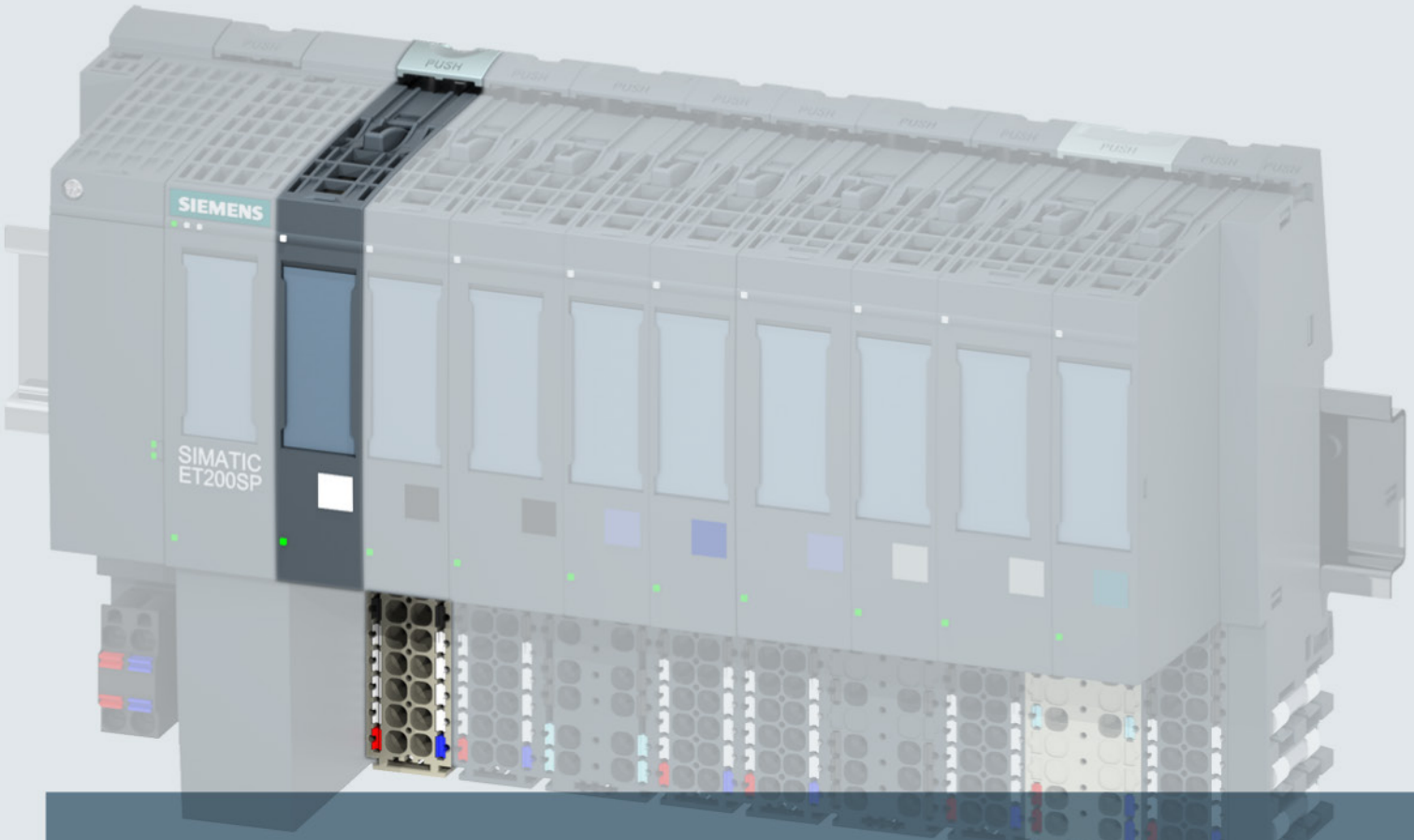

SIMATIC

ET 200SP

Digital input module DI 8x24VDC ST (6ES7131-6BF00-0BA0)

Manual

Edition 07/2014

Answers for industry.

SIEMENS

SIMATIC

ET 200SP
DI 8x24VDC ST digital input module (6ES7131-6BF00-0BA0)

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A5E03574157-AC

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.

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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.

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The product/system described in this documentation may be operated only by **personnel qualified** for the specific task in accordance with the relevant documentation, in particular its warning notices and safety instructions. Qualified personnel are those who, based on their training and experience, are capable of identifying risks and avoiding potential hazards when working with these products/systems.

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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 AG
Industry Sector
Postfach 48 48
90026 NÜRNBERG
GERMANY

A5E03574157-AC
℗ 07/2014 Subject to change

Preface

Purpose of the documentation

This device manual supplements the system manual ET 200SP distributed I/O system (http://support.automation.siemens.com/WW/view/en/58649293).

Functions that relate generally to the system are described in this manual.

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

Conventions

Please pay particular attention to notes highlighted as follows:

Note

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

Security information

Siemens provides products and solutions with industrial security functions that support the secure operation of plants, solutions, machines, equipment and/or networks. They are important components in a holistic industrial security concept. With this in mind, Siemens' products and solutions undergo continuous development. Siemens recommends strongly that you regularly check for product updates.

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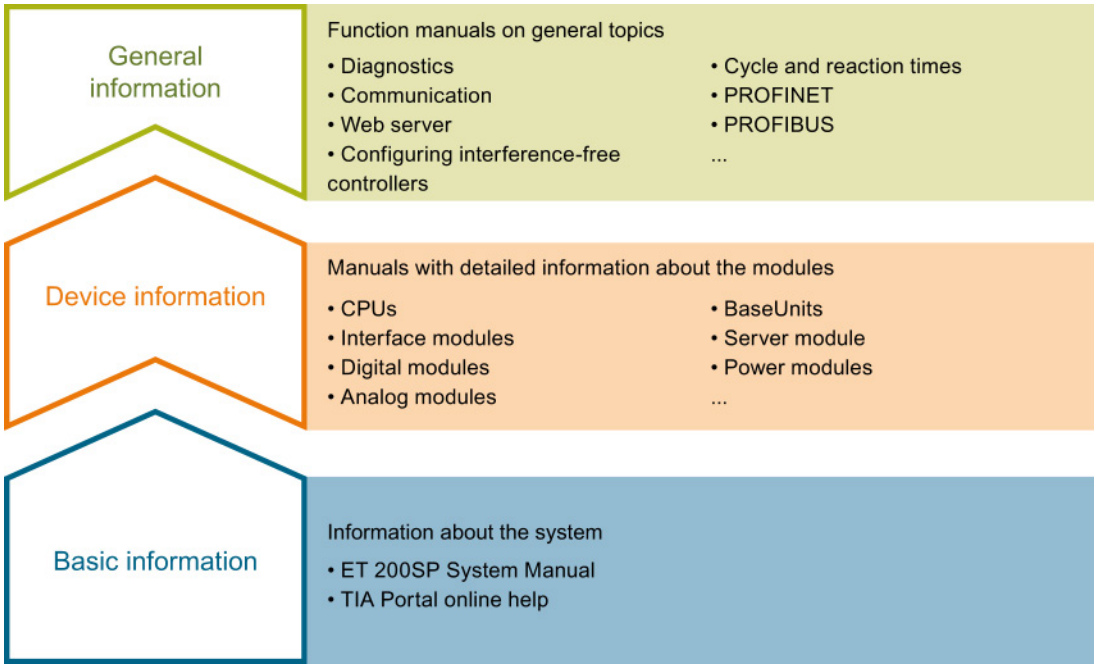
To stay informed about product updates as they occur, sign up for a product-specific newsletter. You can find more information on the Internet (http://support.automation.siemens.com).

Table of contents

Documentation guide

1

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



Basic information

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

Device information

Manuals contain a compact description of the module-specific information, such as properties, terminal diagrams, characteristics, technical specifications.

General information

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

You can download the documentation free of charge from the Internet (http://w3.siemens.com/mcms/industrial-automation-systems-simatic/en/manual-overview/tech-doc-et200/Pages/Default.aspx).

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

Manual Collection ET 200SP

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

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

My Documentation Manager

The My Documentation Manager is used to combine entire manuals or only parts of these to your own manual.
You can export the manual as PDF file or in a format that can be edited later.

You can find the My Documentation Manager on the Internet (http://support.automation.siemens.com/WW/view/en/38715968).

Applications & Tools

Applications & Tools supports you with various tools and examples for solving your automation tasks. Solutions are shown in interplay with multiple components in the system - separated from the focus in individual products.

You can find Applications & Tools on the Internet (http://support.automation.siemens.com/WW/view/en/20208582).

CAx Download Manager

The CAx Download Manager is used to access the current product data for your CAx or CAe systems.

You configure your own download package with a few clicks.

In doing so you can select:

- Product images, 2D dimension drawings, 3D models, internal circuit diagrams, EPLAN macro files
- Manuals, characteristics, operating manuals, certificates
- Product master data

You can find the CAx Download Manager on the Internet (http://support.automation.siemens.com/WW/view/en/42455541).

Product overview

2

2.1 Properties

Article number

6ES7131-6BF00-0BA0

View of the module

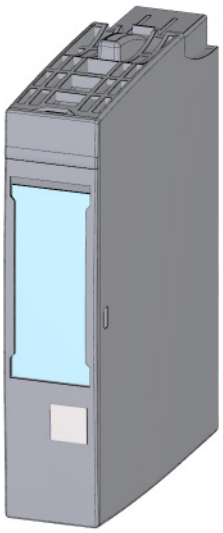


Figure 2-1 View of the module DI 8×24VDC ST

Properties

The module has the following technical properties:

- Digital input module with 8 inputs
- Supply voltage L+
- Sink input (PNP)
- Configurable input delay 0.05 ms to 20 ms

- Module-oriented selectable diagnostics
- Suitable for connection of switches and 2-wire sensors in accordance with IEC 61131, type 1 and 3

The module supports the following functions:

- Firmware update
- I&M identification data
- Configuration in RUN
- PROFIenergy

Table 2- 1 Version dependencies of other module functions

Function	Product version of the module as of	Firmware version of the module as of
Value status	1	V1.1.0

You can configure the module with STEP 7 (TIA Portal) and with a GSD file.

Accessories

The following accessories must be ordered separately:

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

See also

You will find additional information on the accessories in the ET 200SP distributed I/O system (http://support.automation.siemens.com/WW/view/en/58649293) system manual.

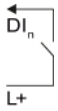
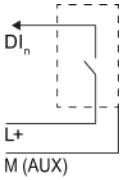
Wiring up

3

3.1 Terminal assignment

General terminal assignment

Table 3- 1 Terminal assignment

<table>
<tr><th colspan="7">Terminal assignment for DI 8×24VDC ST (6ES7131-6BF00-0BA0)</th></tr>
<tr><th>Terminal</th><th>Assignment</th><th>Terminal</th><th>Assignment</th><th>Explanation</th><th>BaseUnit[1]</th><th>Color identification label (terminals 1 to 16)</th></tr>
<tr><td>1</td><td>DI_0</td><td>2</td><td>DI_1</td><td rowspan="9">• DI_n: Input signal, channel n
• L+: Encoder supply</td><td rowspan="9">A0</td><td rowspan="9"> 
CC01
6ES7193-6CP01-2MA0</td></tr>
<tr><td>3</td><td>DI_2</td><td>4</td><td>DI_3</td></tr>
<tr><td>5</td><td>DI_4</td><td>6</td><td>DI_5</td></tr>
<tr><td>7</td><td>DI_6</td><td>8</td><td>DI_7</td></tr>
<tr><td>9</td><td>L+</td><td>10</td><td>L+</td></tr>
<tr><td>11</td><td>L+</td><td>12</td><td>L+</td></tr>
<tr><td>13</td><td>L+</td><td>14</td><td>L+</td></tr>
<tr><td>15</td><td>L+</td><td>16</td><td>L+</td></tr>
<tr><td>L+</td><td>24 VDC</td><td>M</td><td>M</td></tr>
<tr><td colspan="4">2-wire
  </td><td colspan="3">3-wire
 
Only with BaseUnits with AUX connections (6ES7193-BU15-P16-A10-2D)</td></tr>
</table>

[1] Usable BaseUnit types, can be identified by the last two digits of the article number.

Note

The first BaseUnit of an ET 200SP station must be a light-colored BaseUnit. Also keep this in mind during the configuration.

See also

You will find additional information on the BaseUnit types in the ET 200SP distributed I/O system (http://support.automation.siemens.com/WW/view/en/58649293) system manual.

3.2 Schematic circuit diagram

Schematic circuit diagram

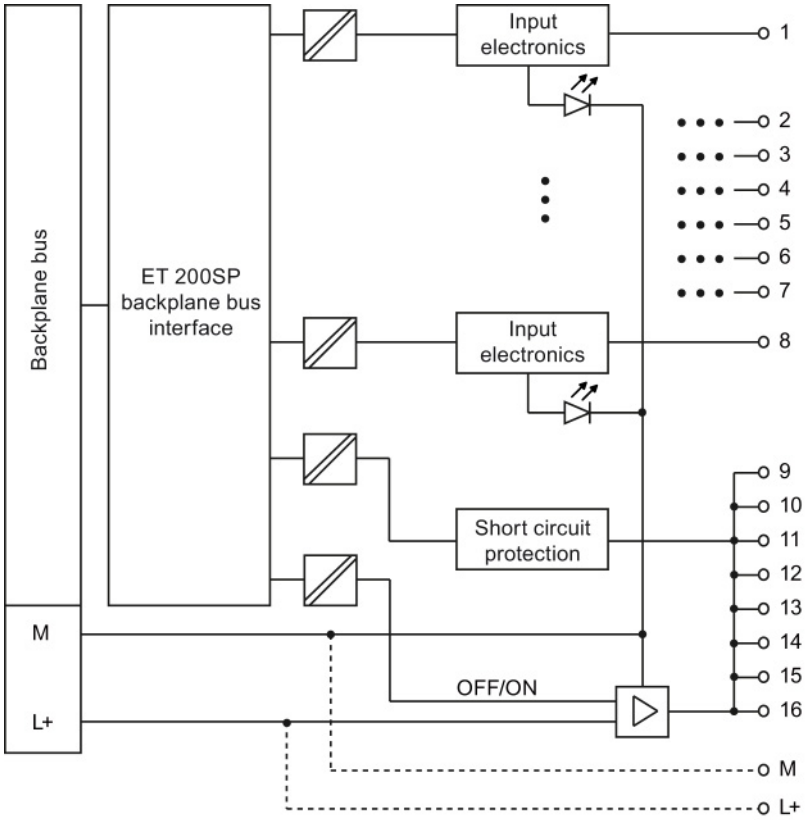


Figure 3-1 Schematic circuit diagram DI 8×24VDC ST

Parameters/address space

4

4.1 Parameters

Parameters for DI 8x24VDC ST

The effective range of the parameters depends on the type of configuration. The following configurations are possible:

- Central operation with an S7-1500 CPU
- Distributed operation on PROFINET IO in an ET 200SP system
- Distributed operation on PROFIBUS DP in an ET 200SP system

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 23).

The following parameter settings are possible:

Table 4- 1 Settable parameters and their defaults (GSD file)

Parameters	Value range	Default	Configuration in RUN	Effective range with configuration software, e.g. STEP 7 (TIA Portal)	
				GSD file PROFINET IO	GSD file PROFIBUS DP [2]
Diagnostics No supply voltage L+	• Disable • Enable	Disable	yes	Module	Module
Diagnostics Short-circuit to ground	• Disable • Enable	Disable	yes	Module	Module
Diagnostics wire break[1]	• Disable • Enable	Disable	yes	Module	Module
Operating mode	• Channel disabled • Channel enabled	Channel enabled	yes	Channel	Channel
Input delay	• none • 0.05 ms • 0.1 ms • 0.4 ms • 0.8 ms • 1.6 ms • 3.2 ms • 12.8 ms • 20 ms	3.2 ms	yes	Channel	Module
Potential group	• Use potential group of the left module • Allow new potential group	Use potential group of the left module	no	Module	Module

[1] If you use a simple switch, you need to connect a resistor in parallel so that the wire break diagnostics is enabled in the open state (sensor resistance for the wire break diagnostics: 25 kΩ to 45 kΩ).

[2] Due to the limited number of parameters at a maximum of 244 bytes per ET 200SP station with a PROFIBUS GSD configuration, the configuration options are restricted. If required, you can assign these parameters using data record 128 as described in the "GSD file PROFINET IO" column (see table above). The parameter length of the I/O module is 16 bytes.

4.2 Explanation of the parameters

Diagnostics no supply voltage L+

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

Diagnostics short-circuit to ground

Enabling of the diagnostics if a short-circuit of the encoder supply to ground occurs.

Diagnostics 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.

Operating mode

Determines whether a channel is enabled or disabled.

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.

Potential group

Specifies that a BaseUnit with voltage supply feed-in is located in this slot (see system manual ET 200SP distributed I/O system (http://support.automation.siemens.com/WW/view/en/58649293)).

4.3 Address space

Configuration options

The following configurations are possible:

- Configuration 1: Without value status
- Configuration 2: With value status

Evaluating the value status

An additional byte is allocated in the input address space if you enable the value status for the digital module. Bits 0 to 7 in this byte are assigned to a channel. They provide information about the validity of the digital value.

Bit = 1: No fault is present on the channel.

Bit = 0: Channel is disabled or there is a fault/error on the module.

If a fault/error occurs on a channel with this module, the value status for all channels is 0.

Address space

The following figure shows the assignment of the address space for the DI 8×24VDC ST with value status (Quality Information (QI)). The addresses for the value status are only available if the value status is enabled.

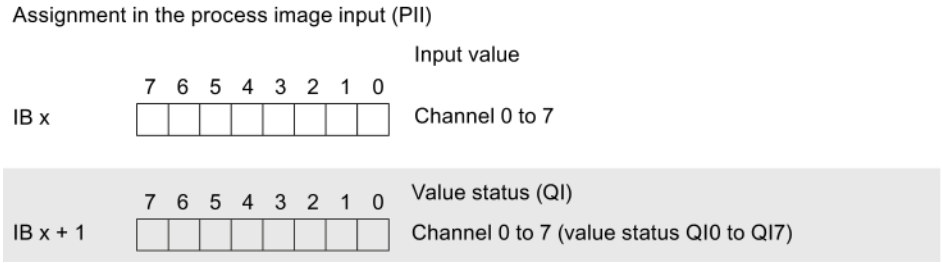


Figure 4-1 Address space of the DI 8×24VDC ST with value status

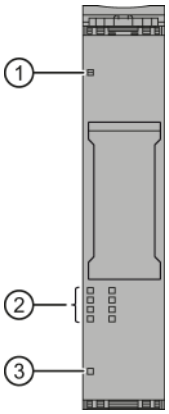
Interrupts/diagnostics alarms

5

5.1 Status and error display

LED display

The figure below shows the LED displays of the DI 8x24VDC ST.



① DIAG (green/red)
② Channel status (green)
③ PWR (green)

Figure 5-1 LED display

Meaning of the LED displays

The following tables show the meaning of the status and error displays. Measures for dealing with diagnostics alarms can be found in the section Diagnostics alarms (Page 19).

DIAG LED

Table 5- 1 DIAG LED fault/error display

DIAG LED	Meaning
off	Backplane bus supply of the ET 200SP not OK
Flashes	Module parameters not assigned
on	Module parameters assigned and no module diagnostics
Flashes	Module parameters assigned and module diagnostics

Channel status LED

Table 5- 2 Status display of the channel status LED

Channel status LED	Meaning
off	Process signal = 0
on	Process signal = 1

PWR LED

Table 5- 3 Status display of the PWR LED

PWR LED	Meaning
off	No supply voltage L+
on	Supply voltage L+ present

5.2 Interrupts

The DI 8×24VDC ST digital input module supports diagnostic interrupts.

Diagnostics interrupt

The module generates a diagnostics interrupt for the following events:

- Channel temporarily unavailable
- Short-circuit
- Wire break
- Parameter assignment error
- No load voltage

5.3 Diagnostics alarms

A diagnostics alarm is output for each diagnostics event and the DIAG LED on the module flashes. The diagnostics alarms can, for example, be read from the diagnostics buffer of the CPU. You can evaluate the error codes with the user program.

Table 5- 4 Diagnostics alarms, their meaning and how to deal with them

Diagnostics alarm	Error code	Meaning	Remedy
Channel temporarily unavailable	$1F_H$	Firmware update in progress or update has been cancelled. The module reads no process values in this state.	• Wait for firmware update • Restart the firmware update
Short-circuit	1_H	Short-circuit to ground at encoder supply	Correct the process wiring
Wire break	6_H	Impedance of encoder circuit too high.	Use a different encoder type or modify the wiring, for example, using cables with larger cross-section
		Wire break between the module and sensor	Connect the cable
		Channel not connected (open)	• Disable diagnostics • Connect a resistor of 25 kilohms to 45 kilohms to the encoder contacts
Parameter assignment error	10_H	• The module cannot evaluate parameters for the channel. • Incorrect parameter assignment.	Correct the parameter assignment
No load voltage	11_H	No or insufficient supply voltage L+	• Check supply voltage L+ on the BaseUnit • Check BaseUnit type

Technical specifications

6

6.1 Technical specifications

Technical specifications of the DI 8×24VDC ST

	6ES7131-6BF00-0BA0
Product type designation	DI 8x24VDC ST
General information	
Firmware version	V1.1
Usable BaseUnits	BU type A0
Color code for module-specific color identification label	CC01
Product function	
I&M data	Yes
Engineering with	
STEP 7 TIA Portal can be configured/integrated as of version	V11 SP2 / V13
STEP 7 can be configured/integrated as of version	V5.5 SP3 / -
PROFIBUS as of GSD version/GSD revision	GSD as of revision 5
PROFINET as of GSD version/GSD revision	V2.3 / -
Installation type/mounting	
Rack mounting possible	Yes
Front installation possible	Yes
Rail mounting possible	Yes
Wall/direct mounting possible	No
Supply voltage	
Type of supply voltage	DC
Rated value (DC)	24 V
Valid range low limit (DC)	19.2 V
Valid range high limit (DC)	28.8 V
Reverse polarity protection	Yes
Input current	
Current consumption, max.	50 mA
Encoder supply	
24 V encoder supply	
24 V	Yes
Short-circuit protection	Yes
Output current, max.	700 mA

	6ES7131-6BF00-0BA0
Power loss	
Power loss, typ.	1 W
Address area	
Address space per module	
Address space per module, max.	1 byte; + 1 byte for QI information
Hardware configuration	
Fieldbus connection via separate transceiver	Yes
Digital inputs	
Number of inputs	8
Input characteristic curve acc. to IEC 61131, type 1	Yes
Input characteristic curve acc. to IEC 61131, type 3	Yes
Input voltage	
Type of input voltage	DC
Rated value, DC	24 V
For signal "0"	-30 to 5 V
For signal "1"	11 to 30 V
Permitted voltage at input, min.	-30 V
Permitted voltage at input, max.	30 V
Input current	
For signal "1", typ.	2.5 mA
Input delay (for rated value of input voltage)	
For standard inputs	
• Configurable	Yes; 0.05 / 0.1 / 0.4 / 0.8 / 1.6 / 3.2 / 12.8 / 20 ms (in each case + delay of 30 to 500 µs, depending on cable length)
Cable length	
Cable length shielded, max.	1000 m
Cable length unshielded, max.	600 m
Encoders	
Supported encoders	
2-wire sensor	Yes
• Permissible quiescent current (2-wire sensor), max.	1.5 mA
Interfaces	
Number of RS 485 interfaces	0
Interrupts/diagnostics/status information	
Interrupts	
Diagnostics interrupt	Yes
Diagnostics alarms	
Diagnostics	Yes
Monitoring of supply voltage	Yes
Wire break	Yes
Short-circuit	Yes

	6ES7131-6BF00-0BA0
Diagnostics display LED	
Monitoring of the supply voltage (PWR LED)	Yes; green PWR LED
Channel status display	Yes; green LED
For module diagnostics	Yes; green/red DIAG LED
Electrical isolation	
Electrical isolation of channels	
Between the channels	No
Between the channels and the backplane bus	Yes
Permitted potential difference	
Between different circuits	75 VDC / 60 VAC (basic isolation)
Insulation	
Insulation tested with	707 VDC (type test)
Degree of protection and protection class	
IP (rear)	IP20
Standards, approvals, certificates	
Use in hazardous areas	
Explosion protection category for gas	ATEX II 3 G Ex nA IIC T4 Gc
Associated equipment (Ex ia)	No
Associated equipment (Ex ib)	No
Environmental conditions	
Operating temperature	
Horizontal installation, min.	0 °C
Horizontal installation, max.	60 °C
Vertical installation, min.	0 °C
Vertical installation, max.	50 °C
Dimensions	
Width	15 mm
Weights	
Weight, approx.	28 g
Information for market places	
Digital inputs/outputs, configurable	Yes

Dimension drawing

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

Parameter data record

A

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

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

Structure of data record 128

Note

Channel 0 contains the diagnostics for the entire module.

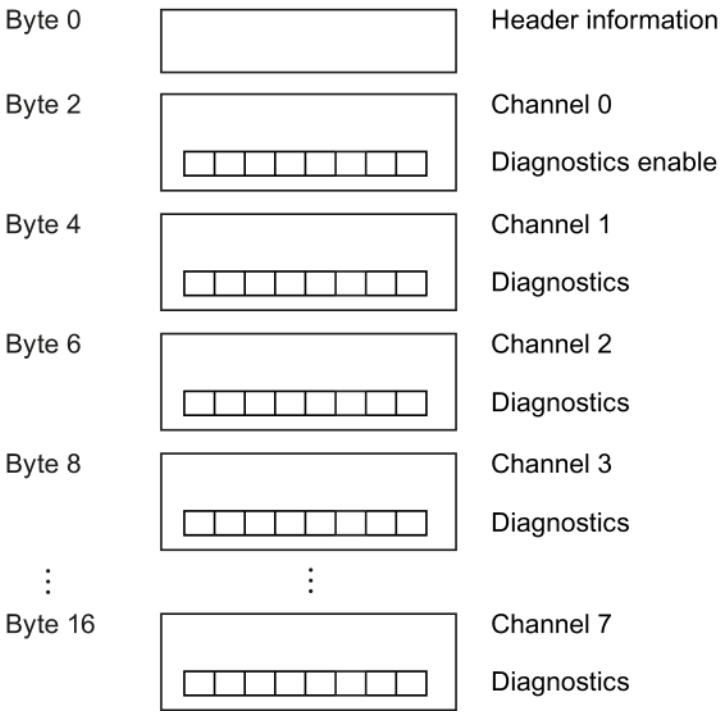


Figure A-1 Structure of data record 128

Header information

The figure below shows the structure of the header information.

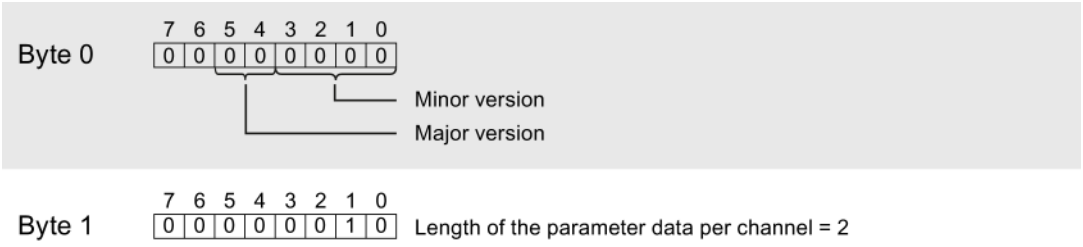


Figure A-2 Header information

Parameters

The figure below shows the structure of the parameters for channels 0 to 7.

You enable a parameter by setting the corresponding bit to "1".

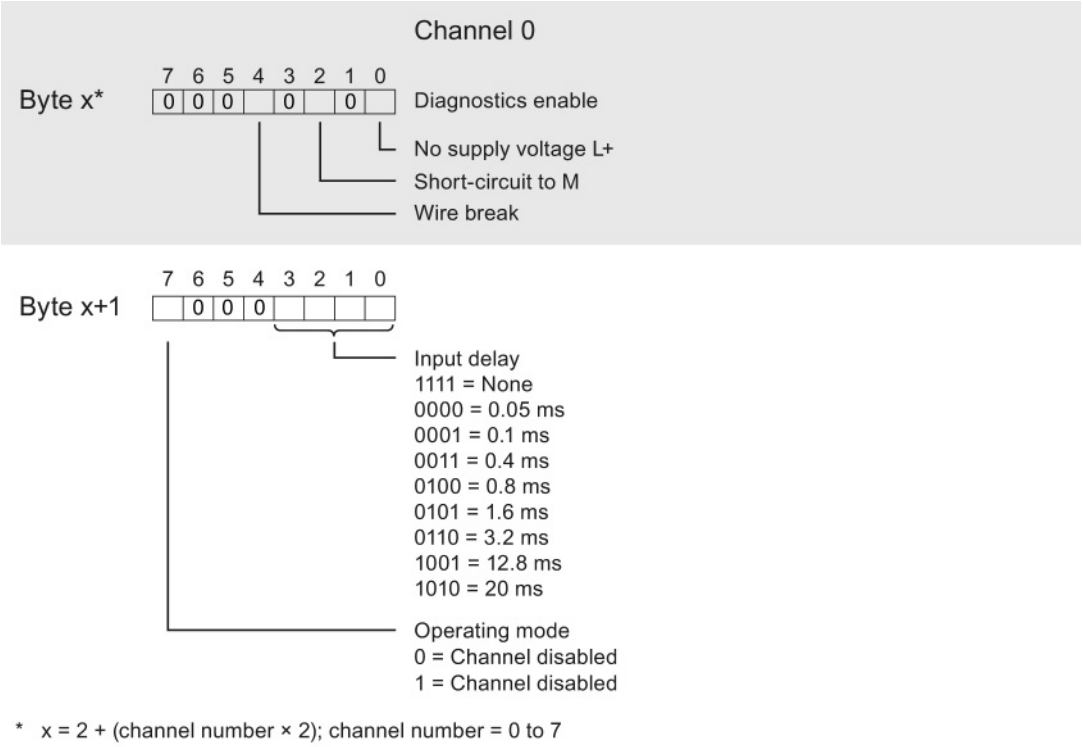


Figure A-3 Structure byte x to x+1 for the channels 0 to 7