MANUFACTURER DOCUMENT PACKAGE

Manufacturer's Manual

Selected official pages for procurement and maintenance review

PRODUCT BRAND

Siemens

PRODUCT MODEL

6ES7132-6BH00-0BA0

Sixteen Channel Standard Digital Output. Relevant section pages: 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30. Adjacent model text on shared pages is outside this product reference.

OFFICIAL SOURCE

Digital output module DQ 16x24VDC/0.5A ST (6ES7132-6BH00-0BA0); 12/2015, A5E03574420-AC

Original Siemens documentation (third-party-hosted copy)

Original Siemens 12/2015 manual, third-party-hosted. QI needs firmware V1.1.0 and compatible configuration. Any safety-related shutdown requires the specified F-PM-E arrangement; this Standard module has no independent safety rating.

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Amikon Limited prepared this independent reference package. Selected manufacturer pages follow with their original content and pagination visible.

SIEMENS

SIMATIC

ET 200SP
Digital output module
DQ 16x24VDC/0.5A ST
(6ES7132-6BH00-0BA0)

Manual

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Parameter data record A

12/2015

A5E03574420-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.

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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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Qualified Personnel

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

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Preface

Purpose of the documentation

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

Functions that generally relate to the system are described in this 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 this manual, it applies to the CPUs of the S7-1500 automation system as well as to the CPUs/interface modules of the ET 200SP distributed I/O system.

STEP 7: In this documentation, "STEP 7" is used as a synonym for all versions of the configuration and programming software "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.

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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).

Product overview

2

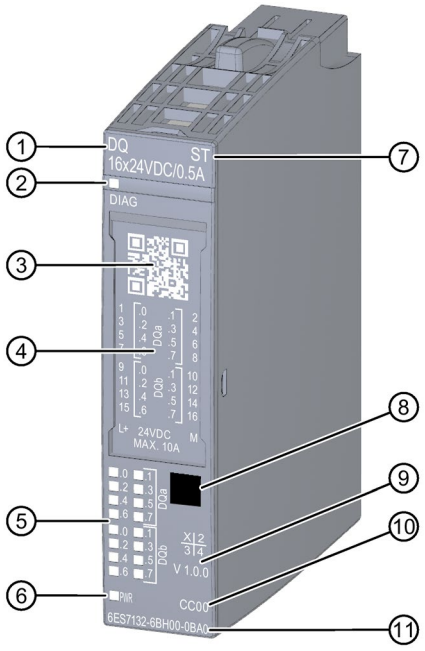
2.1 Properties

Article number

6ES7132-6BH00-0BA0 (packaging unit: 1 unit)

6ES7132-6BH00-2BA0 (packaging unit: 10 units)

View of the module



① Module type and name
② LED for diagnostics
③ 2D matrix code
④ Wiring diagram
⑤ LEDs for channel status
⑥ LED for supply voltage
⑦ Function class
⑧ Color coding module type
⑨ Function and firmware version
⑩ Color code for selecting the color identification labels
⑪ Article number

Image 2-1 View of the module DQ 16×24VDC/0.5A ST

Properties

The module has the following technical properties:

- Digital output module with 16 outputs
- Source output (PNP, P-switching)
- Supply voltage L+
- Output current 0.5 A (per channel), total current max. 8 A
  (see derating: Technical specifications (Page 22))
- Configurable diagnostics (per module)
- Configurable substitute values (per channel)
- Suitable for solenoid valves, DC contactors, and indicator lights
- Safety-related shutdown

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 can find additional information on the accessories in the system manualET 200SP distributed I/O system (https://support.industry.siemens.com/cs/ww/en/view/91696622).

Connecting

3

3.1 Wiring and block diagram

This section includes the block diagram of the DQ 16×24VDC/0.5A ST module with the terminal assignments for a 1-wire connection.

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

Note

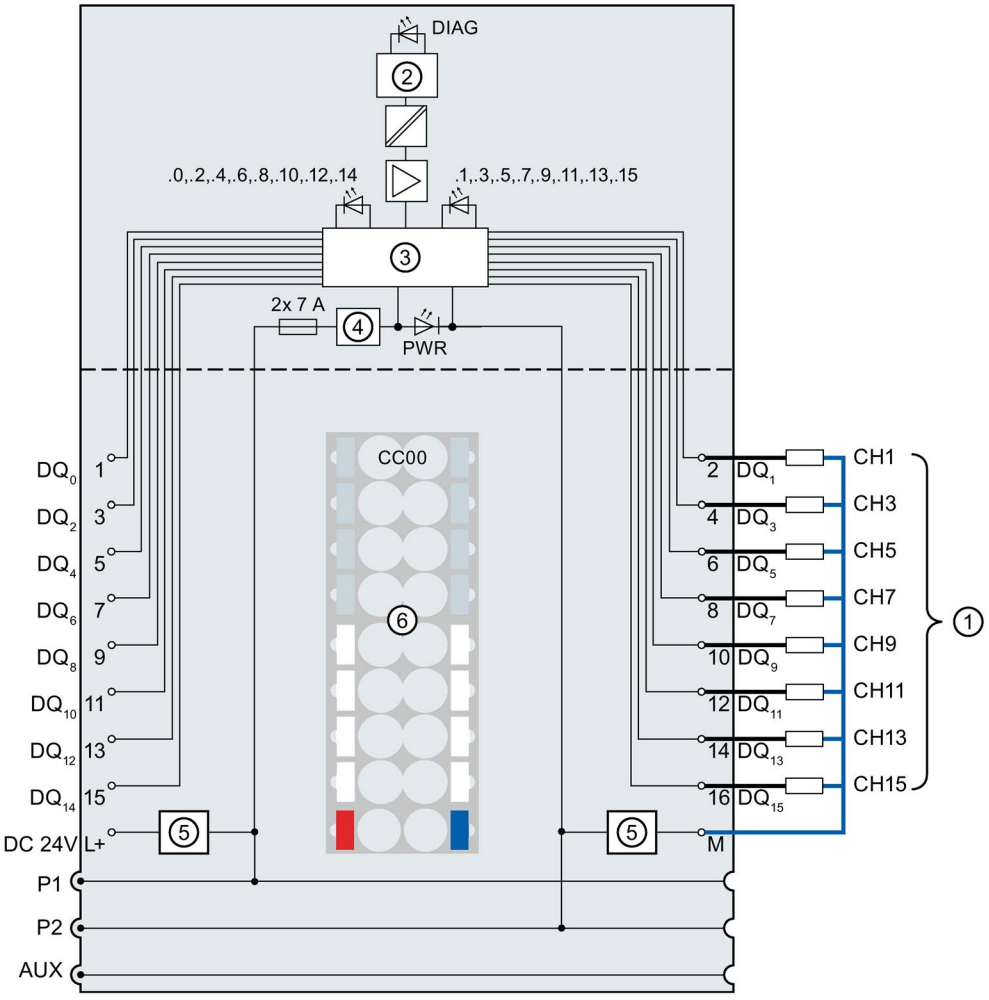
The load group of the module must begin with a light-colored BaseUnit. Keep this in mind also during the configuration.

Note

The fuse integrated in BaseUnit type A1 may be triggered in the digital output module, rendering the terminals unusable.
Make sure that you only use digital output modules with BaseUnit type A0 during commissioning.

Wiring: 1-wire connection of actuators

The following figure shows the block diagram and an example for the terminal assignment of the digital output module DQ 16×24VDC/0.5A ST on the BaseUnit BU type A0 (1-wire connection).



①	1-wire connection	DQ_n	Output signal, channel n
②	Backplane bus interface	24 V DC	Supply voltage L+ (infeed for light-colored BaseUnit only)
③	Output electronics	M	Ground
④	Polarity reversal protection	P1, P2, AUX	Internal self-assembling voltage buses Connection to left (dark-colored BaseUnit) Connection to left interrupted (light-colored BaseUnit)
⑤	Supply voltage filter circuit (only available with light BaseUnit)	DIAG	Diagnostics LED (green, red)
⑥	Color-coded label with color code CC00 (optional)	.0 to .15	Channel status LED (green)
		PWR	Power LED (green)

Image 3-1 Wiring and block diagram for 1-wire connection of actuators

Parameters/address space

4

4.1 Parameters

Parameters for DQ 16x24VDC/0.5A ST

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

- Central operation with an ET 200SP 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 section Parameter assignment and structure of parameter data record (Page 27).

The following parameter settings are possible:

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

Parameters	Range of values	Default	Parameter reassignment in RUN	Effective range with configuration software, e.g. STEP 7 (TIA Portal)	
				GSD file PROFINET IO	GSD file PROFIBUS DP [1]
Diagnostics: No supply voltage L+	• Enable • Disable	Disable	Yes	Module	Module
Diagnostics: Short-circuit to ground	• Enable • Disable	Disable	Yes	Module	Module
Diagnostics: Short-circuit to L+	• Enable • Disable	Disable	Yes	Module	Module
Diagnostics: Wire break	• Enable • Disable	Disable	Yes	Module	Module
Channel activated	• Enable • Disable	Enable	Yes	Channel	Channel

Parameters	Range of values	Default	Parameter reassignment in RUN	Effective range with configuration software, e.g. STEP 7 (TIA Portal)	
				GSD file PROFINET IO	GSD file PROFIBUS DP [1]
Reaction to CPU STOP	• Turn off • Keep last value • Output substitute value 1	Turn off	Yes	Channel	Module
Potential group	• Use potential group of the left module (module plugged into a dark-colored BaseUnit) • Enable new potential group (module plugged into light-colored BaseUnit)	Use potential group of the left module	No	Module	Module

[1] 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 6 bytes.

Note

If one of the two parameters "Diagnostics: Short-circuit to L+" or "Diagnostics: Wire break" is enabled and one of these diagnostics occurs, the affected channel is switched off to avoid triggering an undefined load. Note that a diagnostic interrupt can only be generated when diagnostics are enabled. [1]

[1] as of module revision 05

4.2 Declaration of 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 actuator supply to ground occurs.

Diagnostics: Short-circuit to L+

Enabling of the diagnostics if a short-circuit of the actuator supply to L+ occurs.

Diagnostics: Wire break

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

Channel activated

Determines whether a channel is activated or deactivated.

Reaction to CPU STOP / substitute value

Determines the behavior of the module in the event of a CPU STOP.

Potential group

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 the dark-colored BaseUnit, which follows a light-colored BaseUnit or server module in the station configuration.

See also

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

4.3 Address space

The module can be configured differently in STEP 7; see following table. Depending on the configuration, additional/different addresses are assigned in the process image output/input.

Configuration options of DQ 16x24VDC/0.5A ST

You can configure the module with STEP 7 (TIA Portal) or with a GSD file. If you configure the module by means of a GSD file, the configurations are available under various short designations/module names; see the table below. The following configurations are possible:

Table 4- 2 Configuration options with GSD file

Configuration	Short designation/module name in the GSD file	Configuration software, e.g. with STEP 7 (TIA Portal)		
		Integrated in the hardware catalog STEP 7, as of V13, SP1	GSD file PROFINET IO	GSD file PROFIBUS DP
1 x 16-channel without value status	DQ 16x24VDC/0.5A ST V1.0	X	X	X
1 x 16-channel without value status	DQ 16x24VDC/0.5A ST V1.1	---	X	X
1 x 16-channel with value status	DQ 16x24VDC/0.5A ST V1.1, QI	---	X	---

Evaluating the value status

An additional two bytes are allocated in the input address space if you enable the value status for the digital module. Bits 0 to 15 in these bytes 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 deactivated or there is a fault on the module.

If a fault 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 DQ 16×24VDC/0.5A ST with value status (Quality Information (QI)). The addresses for the value status are only available if the value status is enabled.

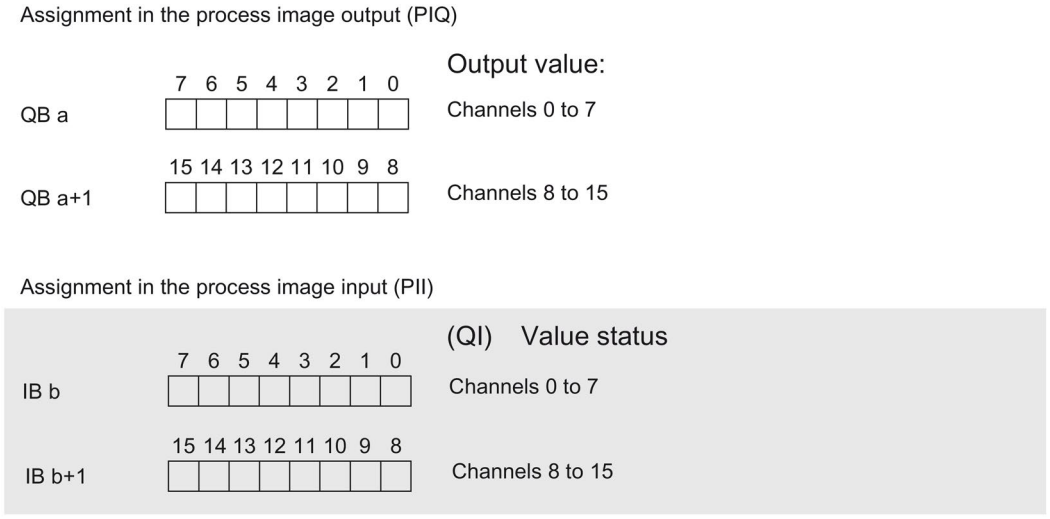


Image 4-1 Address space of DQ 16×24VDC/0.5A ST with value status

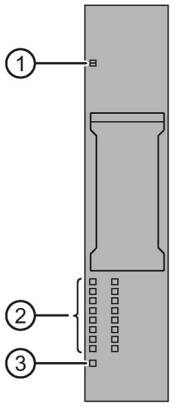
Interrupts/diagnostic alarms

5

5.1 Status and error display

LED display

The figure below shows the LED displays of the DQ 16x24VDC/0.5A ST.



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

Image 5-1 LED display

Meaning of the LEDs

The following tables contain the meaning of the status and error displays. Remedial measures for diagnostic alarms can be found in chapter Diagnostic messages (Page 21).

DIAG LED

Table 5- 1 DIAG LED fault display

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

LED channel status

Table 5- 2 LED channel status display

LED channel status	Meaning
Off	Channel deactivated or activated and process signal = 0
On	Channel activated and process signal = 1

PWR LED

Table 5- 3 Status display of the PWR LED

PWR LED	Meaning
Off	Supply voltage L+ missing
On	Supply voltage L+ present

5.2 Interrupts

The digital output module DQ 16×24VDC/0.5A ST supports diagnostic interrupts.

Diagnostics interrupts

The module generates a diagnostic interrupt at the following events:

- Short-circuit
- Wire break
- Parameter assignment error
- Supply voltage missing
- Channel temporarily unavailable

5.3 Diagnostic messages

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

Note

Parallel connection of two outputs

For parallel connection of two outputs for redundant control of a load, the channel diagnostics "Short-circuit to L+" and "Wire break" must be deactivated.

Table 5- 4 Diagnostics alarms, their meaning and corrective measures

Diagnostics alarm	Error code	Meaning	Solution
Short-circuit	1_H	• Short-circuit of actuator supply to ground • Short-circuit of actuator supply to L+	Correct the process wiring
Wire break	6_H	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)	• Disable diagnostics • Connect a resistor to the actuator contacts in the load resistance range
Parameter assignment error	10_H	• The module cannot evaluate parameters for the channel. • Incorrect parameter assignment.	• Correct the parameter assignment
Supply voltage missing	11_H	Missing or insufficient supply voltage L+	• Check supply voltage L+ on the BaseUnit • Check BaseUnit type
Channel temporarily unavailable	$1F_H$	Firmware update is currently in progress or has been canceled. The module does not output any process or substitute values in this state.	• Wait for firmware update. • Restart the firmware update.

Technical specifications

6

6.1 Technical specifications

Technical specifications of the DQ 16×24VDC/0.5A ST

	6ES7132-6BH00-0BA0
General information	
Product type designation	ET 200SP, DQ 16x24VDC/0.5A ST, PU 1
Firmware version	V1.1
• FW update possible	Yes
Usable BaseUnits	BU type A0
Color code for module-specific color identification label	CC00
Product function	
I&M data	Yes; I&M0 to I&M3
Engineering with	
STEP 7 TIA Portal can be configured/integrated as of version	V13 SP1
STEP 7 can be configured/integrated as of version	V5.5 / -
PCS 7 can be configured/integrated as of version	V8.1 SP1
PROFIBUS as of GSD version/GSD revision	GSD revision 5
PROFINET as of GSD version/GSD revision	GSDML V2.3
Operating mode	
DQ	Yes
DQ with energy-saving function	No
PWM	No
Oversampling	No
MSO	No
Supply voltage	
Rated value (DC)	24 V
Valid range, low limit (DC)	19.2 V
Valid range, high limit (DC)	28.8 V
Polarity reversal protection	Yes
Input current	
Current consumption, max.	60 mA; no load
Output voltage	
Rated value (DC)	24 V
Power loss	
Power loss, typ.	1 W

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Address area	
Address space per module	
Address space per module, max.	2 bytes; + 2 bytes for QI information
Digital outputs	
Number of outputs	16
Sinking output	No
Sourcing output	Yes
Short-circuit protection	Yes
• Response threshold, typ.	0.7 to 1.3 A
Limitation of inductive shutdown voltage to	Typ. L+ (-50 V)
Control of a digital input	Yes
Switching capacity of outputs	
With resistive load, max.	0.5 A
With lamp load, max.	5 W
Load resistance range	
Low limit	48 Ω
High limit	12 kΩ
Output current	
For signal "1" rated value	0.5 A
For signal "0" residual current, max.	0.1 mA
Output delay with resistive load	
"0" to "1", typ.	50 µs
"1" to "0", typ.	100 µs
Parallel connection of two outputs	
For increased performance	No
For redundant control of a load	Yes
Switching frequency	
With resistive load, max.	100 Hz
With inductive load, max.	2 Hz
With lamp load, max.	10 Hz
Total current of the outputs	
Current per channel, max.	0.5 A
Current per module, max.	8 A
Total current of the outputs (per module)	
Horizontal installation	
• Up to 40 °C, max.	8 A
• Up to 50 °C, max.	6 A
• Up to 60 °C, max.	4 A
Vertical installation	
• Up to 30 °C, max.	8 A
• Up to 40 °C, max.	6 A
• Up to 50 °C, max.	4 A

	6ES7132-6BH00-0BA0
Cable length	
Shielded, max.	1000 m
Unshielded, max.	600 m
Isochronous mode	
Isochronous mode (application synchronized up to terminal)	No
Interrupts/diagnostics/status information	
Substitute values can be applied	Yes
Interrupts	
Diagnostics interrupt	Yes
Diagnostics alarms	
Diagnostics	Yes
Monitoring of the supply voltage	Yes
Wire break	Yes; module by module
Short-circuit	Yes; module by module
Group error	Yes
Diagnostics indicator LED	
Monitoring of the supply voltage (PWR LED)	Yes; green PWR LED
Channel status display	Yes; green LED
For channel diagnostics	No
For module diagnostics	Yes; green/red DIAG LED
Electrical isolation	
Electrical isolation of channels	
Between the channels	No
Between the channels and backplane bus	Yes
Permitted potential difference	
Between different circuits	75 V DC / 60 V AC (basic insulation)
Insulation	
Insulation tested with	707 V DC (type test)
Dimensions	
Width	15 mm
Weights	
Weight, approx.	28 g

Safety-related shutdown

Note

The digital output module DQ 16x24VDC/0.5A ST supports safety-related shutdown in connection with a fail-safe power module F-PM-E 24VDC/8A PPM ST:

- SIL according to IEC 61508: 2
- Highest attainable safety class in safety mode, performance level according to EN ISO 13849-1: d

Residual current for signal state "0"

Note

Residual current for signal state "0"

Due to the Diagnostics: Wire break function, there is a low level of residual current in the "0" signal state at the output, which may cause the display diodes to flicker.

This residual current does not depend on the setting for the Diagnostics: Wire break parameter.

Derating trend

The following figure show the load current derating with horizontal and vertical mounting positions.

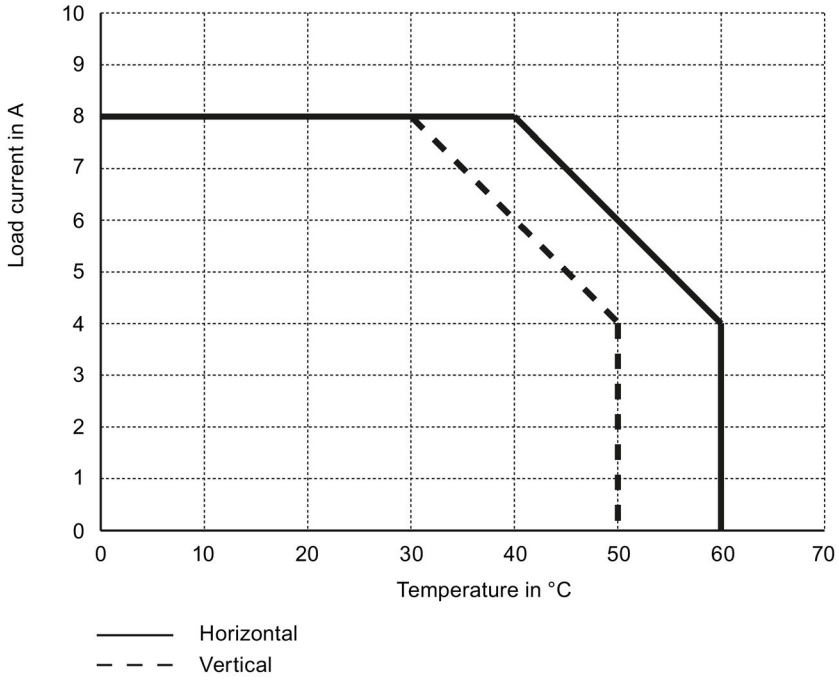


Image 6-1 Load current for mounting position

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 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 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 includes the diagnostics enable for the entire module.

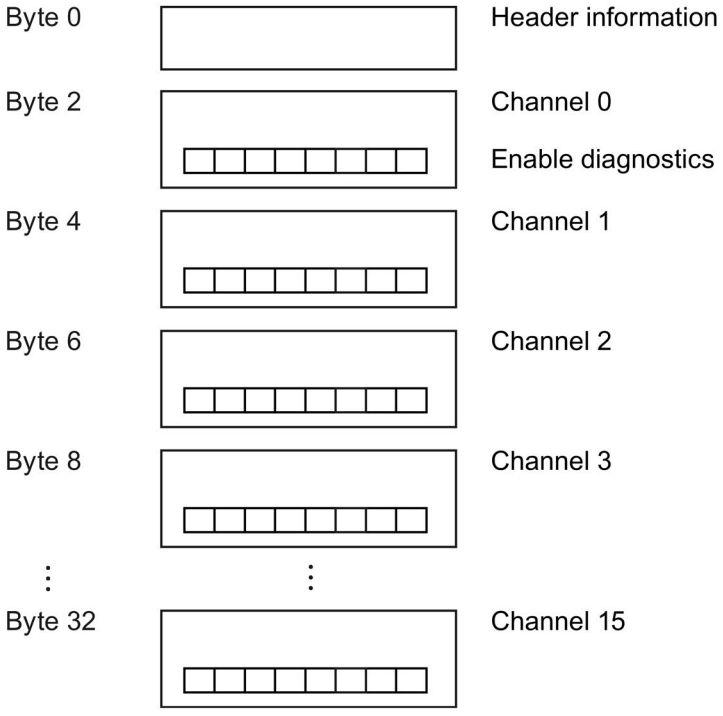


Image A-1 Structure of data record 128

Header information

The figure below shows the structure of the header information.

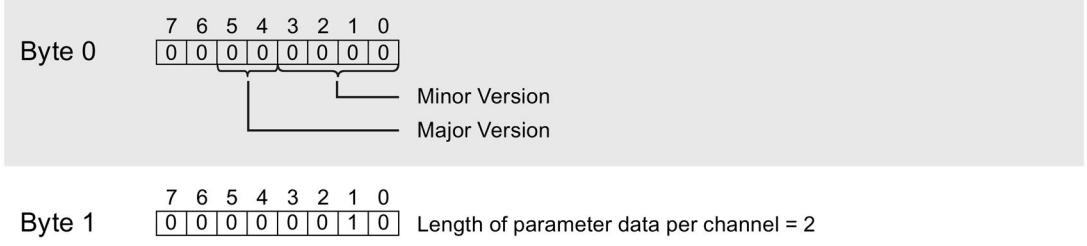
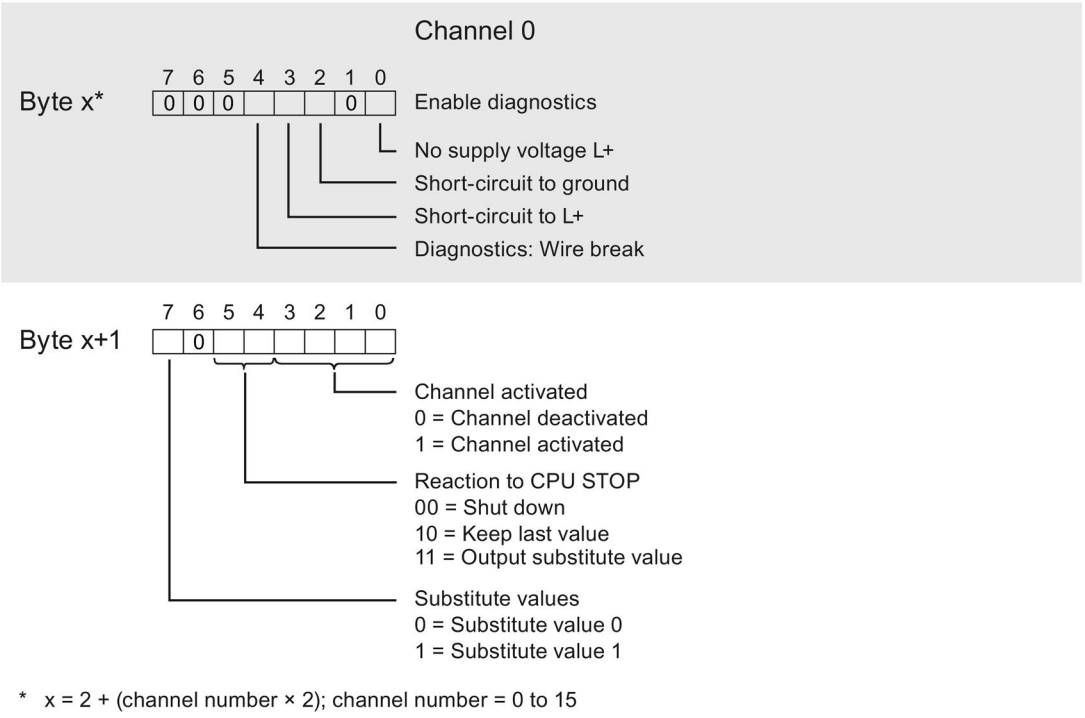


Image A-2 Header information

Parameters

The figure below shows the structure of the parameters for channels 0 to 15.

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



* x = 2 + (channel number × 2); channel number = 0 to 15

Image A-3 Structure byte x to x+1 for the channels 0 to 15

Error transmitting the data record

The module always checks all values of the data record to be sent. The module applies the values from the data record only when all values have been transmitted without errors.

The WRREC instruction for writing data records returns the appropriate error code if there are errors in the STATUS parameter.

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

Error code in the STATUS parameter (hexadecimal)				Meaning	Solution
Byte 0	Byte 1	Byte 2	Byte 3		
DF	80	B0	xx	Number of the data record unknown	Enter valid number for data record.
DF	80	B1	xx	Length of the data record incorrect	Enter valid value for data record length.
DF	80	B2	xx	Slot invalid or unavailable	• Check the station to determine whether the module is plugged in or pulled. • Check assigned values for the parameters of the WREC 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	xx	Parameter error	Check the parameters of the module