

**SIEMENS**



# SIMATIC

**S7-1500 / ET 200MP**

Digital output module DQ 16x230VAC/1A ST Triac (6ES7522-5FH00-0AB0)

Manual

Edition

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Answers for industry.

# SIEMENS

## SIMATIC

S7-1500/ET 200MP  
Digital output module  
DQ 16x230VAC/1A ST Triac  
(6ES7522-5FH00-0AB0)

Manual

Preface

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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.

 <b>DANGER</b>
indicates that death or severe personal injury <b>will</b> result if proper precautions are not taken.
 <b>WARNING</b>
indicates that death or severe personal injury <b>may</b> result if proper precautions are not taken.
 <b>CAUTION</b>
indicates that minor personal injury can result if proper precautions are not taken.
<b>NOTICE</b>
indicates that property damage can result if proper precautions are not taken.


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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.

# Preface

## Purpose of the documentation

This manual supplements the system manuals:

- S7-1500 Automation System
- ET 200MP Distributed I/O System

Functions that relate in general to the systems are described in these system manuals.

The information provided in this manual and in the system/function manuals supports you in commissioning the systems.

## 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 interface modules of the ET 200MP 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:

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### 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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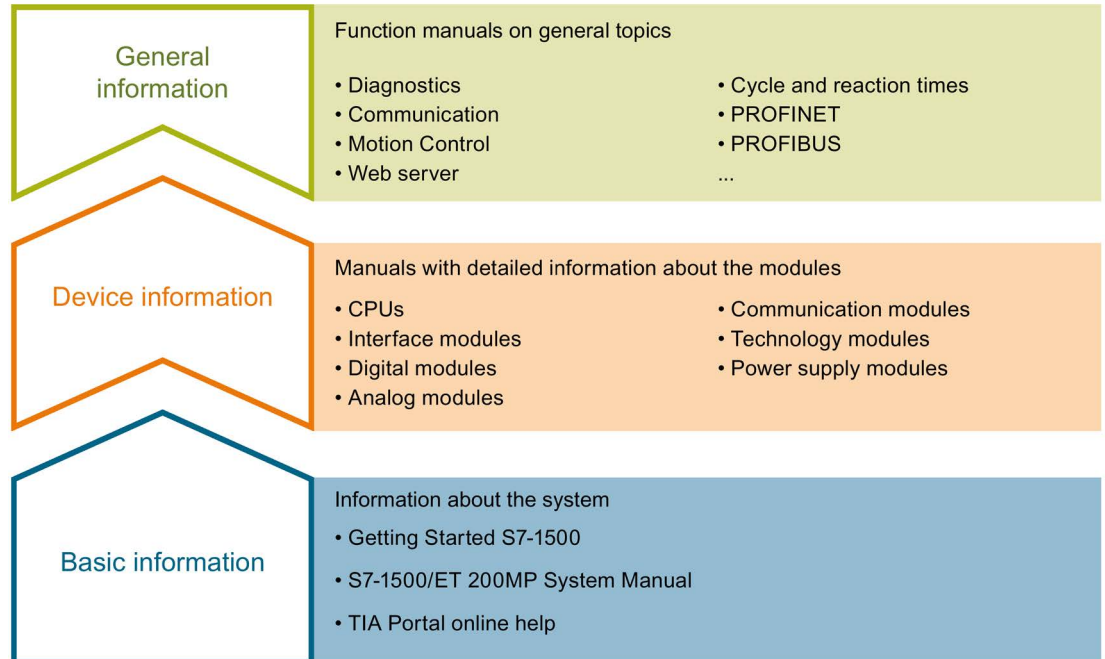
For legal reasons, we are obliged to publish the original text of the license conditions and copyright notices. Please read the information relating to this in the appendix.

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# Documentation guide

The documentation for the SIMATIC S7-1500 automation system and the SIMATIC ET 200MP 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 S7-1500 and ET 200MP systems. The STEP 7 online help supports you in the configuration and programming.

## Device information

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

## General information

The function manuals contain detailed descriptions on general topics regarding the SIMATIC S7-1500 and ET 200MP systems, e.g. diagnostics, communication, Motion Control, Web server.

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

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

## Manual Collection S7-1500/ET 200MP

The Manual Collection contains the complete documentation on the SIMATIC S7-1500 automation system and the ET 200MP 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/86140384>).

## 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.industry.siemens.com/My/ww/en/documentation>).

## Application examples

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 in individual products.

You can find application examples on the Internet (<https://support.industry.siemens.com/sc/ww/en/sc/2054>).

## 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.industry.siemens.com/my/ww/en/CAXOnline>).

## TIA Selection Tool

With the TIA Selection Tool, you can select, configure and order devices for Totally Integrated Automation (TIA).

This tool is the successor of the SIMATIC Selection Tool and combines the known configurators for automation technology into one 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 (<http://w3.siemens.com/mcms/topics/en/simatic/tia-selection-tool>).



# Product overview

## 2.1 Properties

### Article number

6ES7522-5FH00-0AB0

### View of the module

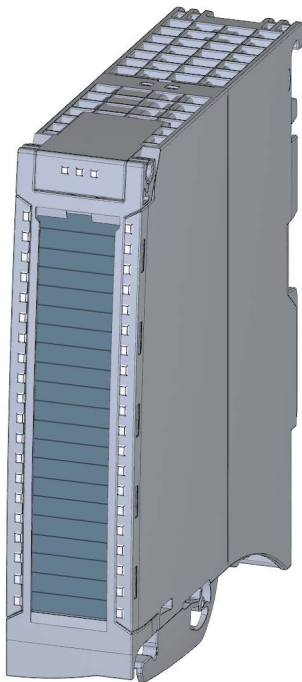


Figure 2-1 View of the DQ 16x230VAC/1A ST module

### Properties

The module has the following technical properties:

- 16 digital outputs (Triac)
- Rated output voltage 120 V/230 V AC
- Rated output current 1A (per channel)
- Configurable substitute values (per channel)
- Suitable for solenoid valves, DC contactors, indicator lights and smaller single phase drives

2.1 Properties

The module supports the following functions:

Table 2- 1 Version dependencies of the module functions

Function	Firmware version of the module	Configuration software	
		STEP 7 V13, SP1 or higher with HSP 0119	GSD file in STEP 7 , V12 or higher STEP 7 V5.5 SP3 or higher
Firmware update	V1.0.0 or higher	X	--- / X
Identification data I&M0 to I&M3	V1.0.0 or higher	X	--- / X
Reconfiguration in RUN	V1.0.0 or higher	X	X
Module-internal Shared Output (MSO)	V1.0.0 or higher	X (PROFINET IO only)	X (PROFINET IO only)
Configurable submodules/submodules for shared device	V1.0.0 or higher	X (PROFINET IO only)	X (PROFINET IO only)

You can configure the module with STEP 7 and with a GSD file.

**Accessories**

The following components are supplied with the module and can also be ordered separately as spare parts:

- Labeling strips
- U connector
- Universal front door

**Other components**

The following component must be ordered separately:

Front connectors, including potential jumpers and cable ties

For more information on accessories, refer to the S7-1500, ET 200MP system manual (<http://support.automation.siemens.com/WW/view/en/59191792>).

This section contains the block diagram of the module and outlines various wiring options. You will find information on wiring the front connector, establishing a cable shield, etc in the system manual S7-1500/ET 200MP (<http://support.automation.siemens.com/WW/view/en/59191792>) in section Wiring.

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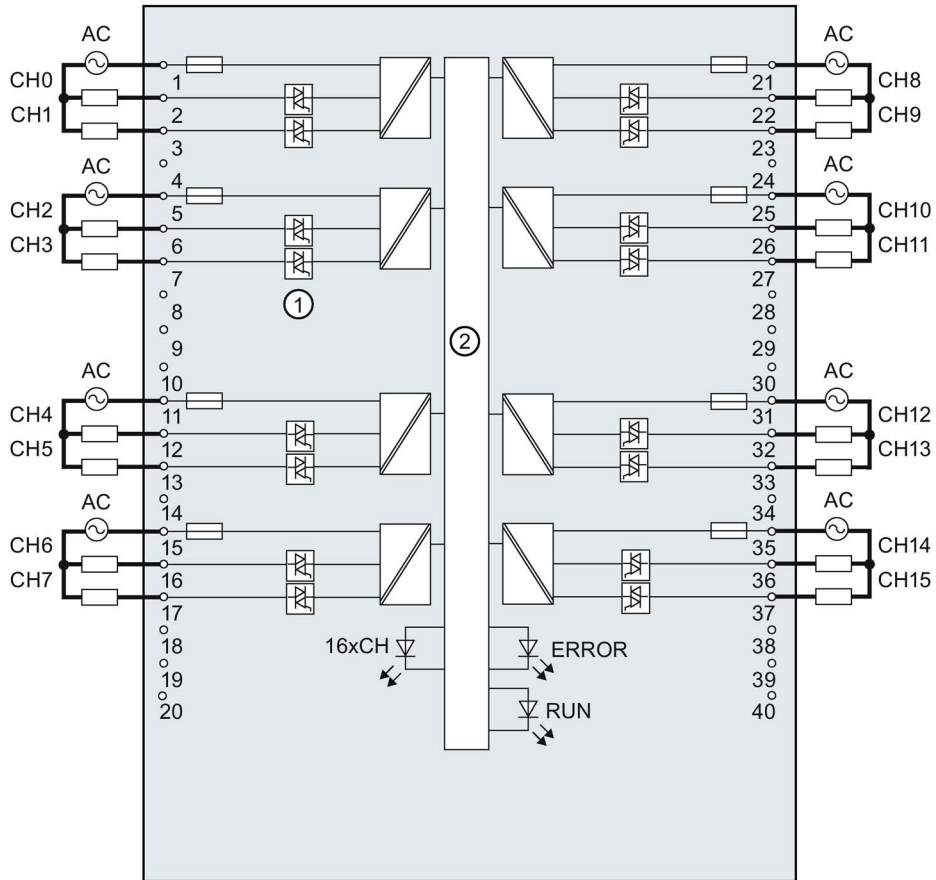
**Note**

Do not insert the potential jumpers included with the front connector!

---

### Block diagram and terminal assignment

The example in the following figure shows the terminal assignment and the assignment of the channels. The individual channels are connected with a TRIAC (Triode for Alternating Current).



- |                           |       |                                       |
|---------------------------|-------|---------------------------------------|
| ① TRIAC 16x               | CHx   | Channel or channel status LED (green) |
| ② Backplane bus interface | RUN   | Status display LED (green)            |
|                           | ERROR | Fault display LED (red)               |

Figure 3-1 Block diagram and terminal assignment

## Parameters/address space

### 4.1 Parameters

#### DQ 16x230VAC/1A ST parameters

When you assign the module parameters in STEP 7, you use various parameters to specify the module properties. The table below lists the parameters that can be set. The effective range of the configurable parameters depends on the type of configuration. The following configurations are possible:

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

For parameter assignment in the user program, the parameters are transferred to the module using the WRREC instruction (reconfiguration in RUN) and data records; see chapter Parameter assignment and structure of the parameter data records (Page 27).

Table 4- 1 Configurable parameters and their defaults

Parameter	Range of values	Default	Reconfiguration in RUN	Range of effectiveness with configuration software, e.g. STEP 7	
				Integrated in the hardware catalog STEP 7, SP1 with HSP 0119 or GSD file PROFINET IO	GSD file PROFIBUS DP
Reaction to CPU STOP	<ul style="list-style-type: none"> <li>• Turn off</li> <li>• Keep last value</li> <li>• Output substitute value 1</li> </ul>	Turn off	Yes	Channel	Channel

## 4.2 Declaration of parameters

### Reaction to CPU STOP

Determines the reaction of the output to the CPU going into STOP state or when the connection to the CPU is interrupted.

## 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 16x230VAC/1A ST

You can configure the module with STEP 7 or with a GSD file.

When you configure the module by means of the GSD file, the configurations are available under different short designations/module names.

The following configurations are possible:

Table 4-2 Configuration options

Configuration	Short designation/module name in the GSD file	Configuration software, e.g., STEP 7	
		Integrated in hardware catalog STEP 7 V13, SP1 or higher with HSP 0119	GSD file in STEP 7 V12 or higher or STEP 7 V5.5 SP3 or higher
1 x 16-channel without value status	DQ 16x230VAC/1A ST	X	X
2 x 8-channel without value status	DQ 16x230VAC/1A ST S	X (PROFINET IO only)	X (PROFINET IO only)
1 x 16-channel with value status for module-internal Shared Output with up to 4 submodules	DQ 16x230VAC/1A ST MSO	X (PROFINET IO only)	X (PROFINET IO only)

### Value status (Quality Information, QI)

The value status is always activated for the DQ 16x230VAC/1A ST MSO.

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

### Address space for configuration as 16-channel DQ 16x230VAC/1A ST

The figure below shows the address space allocation for the configuration as 16-channel module. You can freely assign the start address for the module. The addresses of the channels are derived from the start address.

The letters "a to b" are printed onto the module. "For example, AB a" stands for module start address output byte a.

Assignment in the process image output (PIQ)

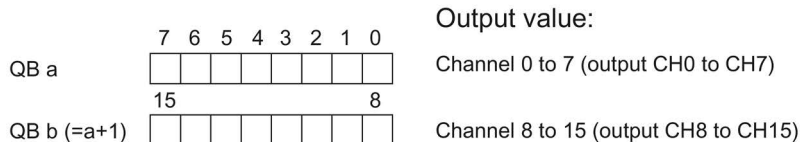


Figure 4-1 Address space for configuration as 16-channel DQ 16x230VAC/1A ST

### Address space for configuration as 2 x 8-channel DQ 16x230VAC/1A ST S

For the configuration as a 2 x 8-channel module, the channels of the module are divided into two submodules. The submodules can be assigned to different IO controllers when the module is used in a shared device.

The number of I/O controllers depends on the interface module being used. Please observe the information in the manual for the particular interface module.

Unlike the 1 x 16-channel module configuration, each of the two submodules has a freely assignable start address.

Assignment in the process image output (PIQ)

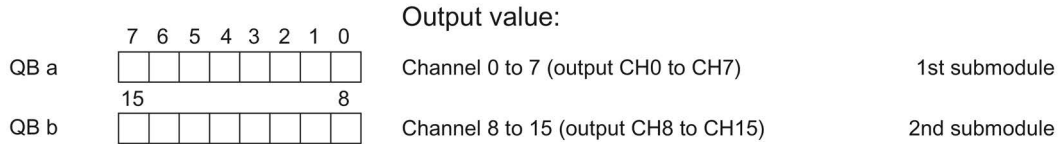


Figure 4-2 Address space for configuration as 2 x 8-channel DQ 16x230VAC/1A ST S

**Note**

**Substitute value behavior in shared device operation with 2 x 8-channel configuration**

If the system is in shared device mode and one of the associated IO controllers goes into STOP or fails due to, for example, a communication failure, all submodules of the output module follow the configured substitute value behavior (e.g. switch off).

This means that even when only one IO controller fails, the other IO controllers associated with the shared device no longer control the assigned submodule of the output module.

### Address space for configuration as 1 x 16-channel DQ 16x230VAC/1A ST MSO

For the configuration as a 1 x 16-channel module (module-internal Shared Output, MSO), channels 0 to 15 of the module are copied to multiple submodules. Channels 0 to 15 are then available with identical values in various submodules. These submodules can be assigned to up to four IO controllers when the module is used in a shared device:

- The IO controller to which submodule 1 is assigned has write access to outputs 0 to 15.
- The IO controllers to which submodule 2, 3, or 4 is assigned have read access to outputs 0 to 15.

The number of IO controllers depends on the interface module being used. Observe the information in the manual for the particular interface module.

#### Value status (Quality Information, QI)

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

For the first submodule (=basic submodule), the value status 0 indicates that the value is incorrect or that the IO controller of the basic submodule is in STOP state.

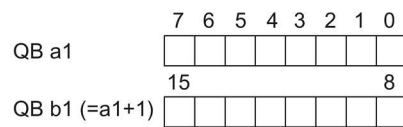
For the 2nd to 4th submodule (=MSO submodule), the value status 0 indicates that the value is incorrect or one of the following errors has occurred:

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



The figure below shows the assignment of the address space for submodules 1 and 2 and the value status.

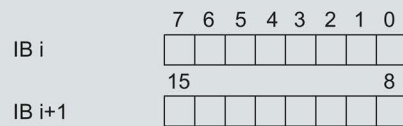
Assignment in the process image output (PIQ) for 1st submodule



1st submodule (basic submodule):

Channel 0 to 7 (output CH0 to CH7)

Channel 8 to 15 (output CH8 to CH15)

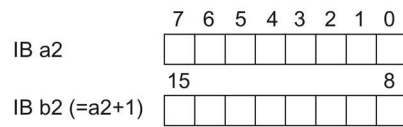


(QI) Value status

Channel 0 to 7 (value status QI0 to QI7)

Channel 8 to 15 (value status QI8 to QI15)

Assignment in the process image input (PII) for 2nd submodule

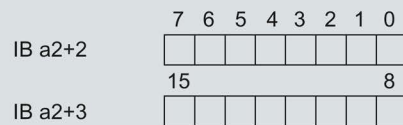


2nd submodule (MSO submodule):

Read back output values

Channel 0 to 7 (output CH0 to CH7)

Channel 8 to 15 (output CH8 to CH15)



(QI) Value status

Channel 0 to 7 (value status QI0 to QI7)

Channel 8 to 15 (value status QI8 to QI15)

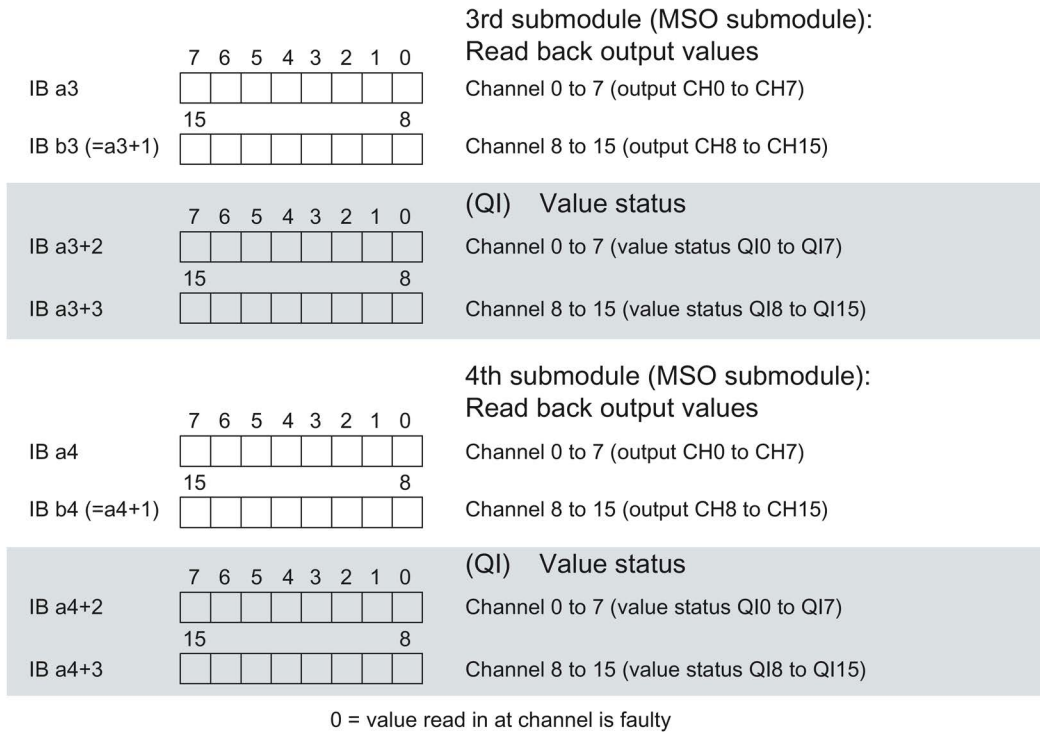
0 = value read in at channel is faulty

Figure 4-3 Address space for configuration as 1 x 16-channel DQ 16x230VAC/1A ST MSO with value status

4.3 Address space

The figure below shows the assignment of the address space for submodules 3 and 4 and the value status.

Assignment in the process image input (PII) for 3rd and 4th submodule



0 = value read in at channel is faulty

Figure 4-4 Address space for configuration as 1 x 16-channel DQ 16x230VAC/1A ST MSO with value status

Reference

You will find information on the module-internal shared input/shared output (MSI/MSO) function in the function manual PROFINET with STEP 7 V13 (<http://support.automation.siemens.com/WW/view/en/49948856>) in the section Module-internal shared input/shared output (MSI/MSO).

## Diagnostic alarms

### 5.1 Status and error displays

#### LED displays

The figure below shows the LED displays (status and error displays) of DQ 16x230VAC/1A ST.

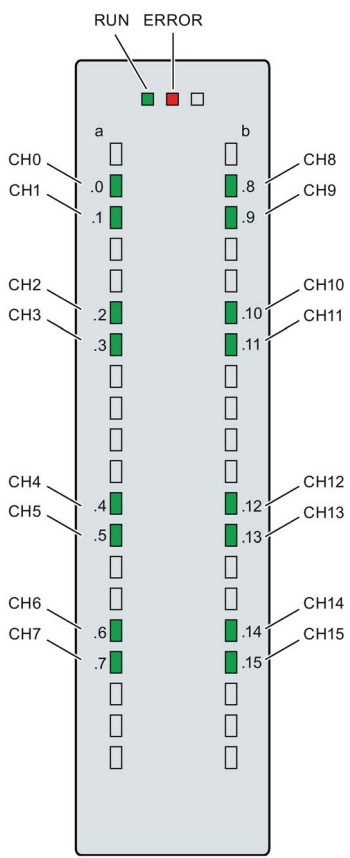










Figure 5-1 LED displays of the module DQ 16x230VAC/1A ST

### Meaning of the LED displays

The following table explains the meaning of the status and error displays.



### RUN and ERROR LED

Table 5- 1 RUN and ERROR status and error displays

LED		Meaning	Solution
RUN	ERROR		
 Off	 Off	Voltage missing or too low at backplane bus	<ul style="list-style-type: none"> <li>Switch on the CPU and/or the system power supply modules.</li> <li>Verify that the U connectors are inserted.</li> <li>Check whether too many modules are inserted.</li> </ul>
 Flashes	 Off	The module starts and flashes until the valid parameter assignment is set.	---
 On	 Off	Module parameters assigned	
 Flashes	 Flashes	Hardware defective	Replace the module.

### CHx LED

Table 5- 2 CHx status display

LED CHx	Meaning	Solution
 Off	0 = Status of the output signal	---
 On	1 = Status of the output signal	---

# Technical specifications

## Technical specifications of the DQ 16x230VAC/1A ST

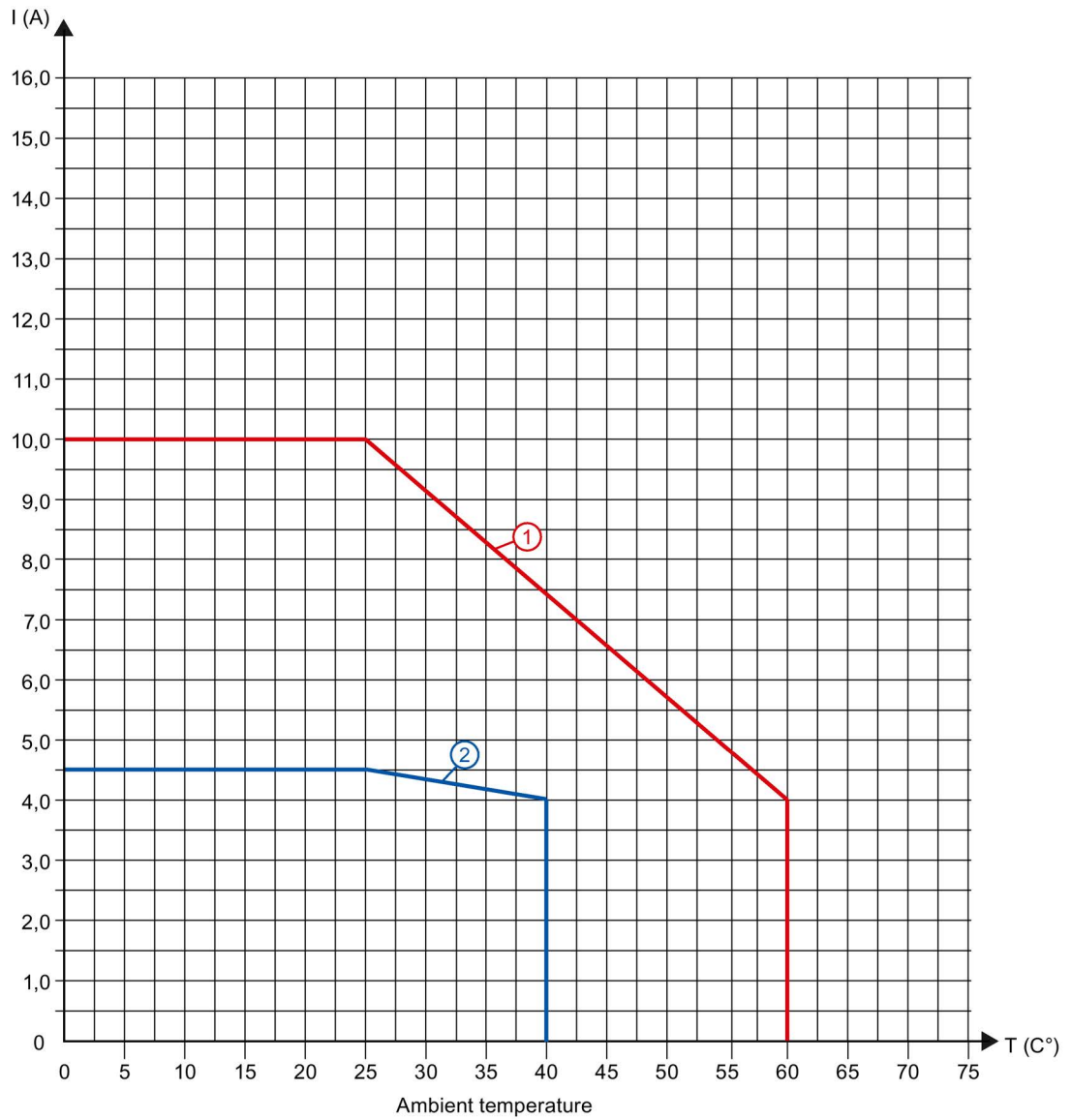
	6ES7522-5FH00-0AB0
Product type designation	DQ 16x230VAC/1A ST (Triac)
<b>General information</b>	
Hardware version	E01
Firmware version	V1.0.0
<b>Product function</b>	
I&M data	Yes; I&M0 to I&M3
<b>Engineering with</b>	
STEP 7 TIA Portal can be configured/integrated as of version	V13 SP1 / -
STEP 7 can be configured/integrated as of version	V5.5 SP3 / -
PROFIBUS as of GSD version/GSD revision	V1.0 / V5.1
PROFINET as of GSD version/GSD revision	V2.3 / -
<b>Operating mode</b>	
MSO	Yes
<b>Output voltage</b>	
Rated value (AC)	120/230 V AC, 50/60 Hz
<b>Power</b>	
Power consumption from the backplane bus	1.2 W
<b>Power loss</b>	
Power loss, typ.	11.1 W
<b>Digital outputs</b>	
Number of outputs	16
Sinking output	Yes
Sourcing output	Yes
Short-circuit protection	No
<b>Switching capacity of outputs</b>	
With resistive load, max.	1 A
With lamp load, max.	50 W
<b>Output voltage</b>	
For signal "1", min.	L1 (-1.5 V) at maximum output current; L1 (-8.5 V) at minimum output current

	6ES7522-5FH00-0AB0
<b>Output current</b>	
For signal "1" rated value	1 A
For signal "1" permitted range, min.	10 mA
For signal "1" permitted range, max.	15 A; max. 1 AC cycle
For signal "0" residual current, max.	2 mA
<b>Output delay with resistive load</b>	
"0" to "1", max.	1 AC cycle
"1" to "0", max.	1 AC cycle
<b>Parallel switching of 2 outputs</b>	
For logic operations	No
For increased performance	No
For redundant control of a load	Yes
<b>Switching frequency</b>	
With resistive load, max.	10 Hz
With inductive load, max.	0.5 Hz
With lamp load, max.	1 Hz
<b>Total current of outputs</b>	
Current per channel, max.	1 A; see additional description in the manual
Current per group, max.	2 A; see additional description in the manual
Current per module, max.	10 A; see additional description in the manual
<b>Triac outputs</b>	
Size of motor starter according to NEMA, max.	4
<b>Cable length</b>	
Shielded, max.	1000 m
Unshielded, max.	600 m
<b>Isochronous mode</b>	
Isochronous mode (application synchronized up to terminal)	No
<b>Interrupts/diagnostics/status information</b>	
Substitute values can be applied	Yes
<b>Interrupts</b>	
Diagnostics interrupt	No
<b>Diagnostics alarms</b>	
Diagnostics	No
Monitoring of supply voltage	No
Wire break	No
Short-circuit	No
Fuse blown	No
<b>Diagnostics indicator LED</b>	
RUN LED	Yes; green LED
ERROR LED	Yes; red LED
Monitoring of the supply voltage (PWR LED)	No
Channel status display	Yes; green LED
For channel diagnostics	No

<b>6ES7522-5FH00-0AB0</b>	
For module diagnostics	Yes; red LED
<b>Electrical isolation</b>	
<b>Electrical isolation of channels</b>	
Between the channels	No
Between the channels, in groups of	2
Between the channels and the backplane bus	Yes
<b>Permitted potential difference</b>	
Between different circuits	250 V AC between the channels and the backplane bus; 500 V AC between the channels
<b>Insulation</b>	
Insulation tested with	2500 V DC
<b>Distributed operation</b>	
Prioritized startup	Yes
<b>Dimensions</b>	
Width	35 mm
Height	147 mm
Depth	129 mm
<b>Weights</b>	
Weight, approx.	310 g

**Power reduction (derating) to aggregate current of outputs (per module)**

The following graphs show the loading capacity of the outputs in relation to the mounting position and the ambient temperature.



- ① Horizontal mounting position
- ② Vertical mounting position

Figure 6-1 Details on aggregate current of outputs (per module)



# Dimensional drawing

# A

The dimension drawing of the module on the mounting rail, as well as a dimension drawing with open front cover, are provided in the appendix. Always observe the specified dimensions for installation in cabinets, control rooms, etc.

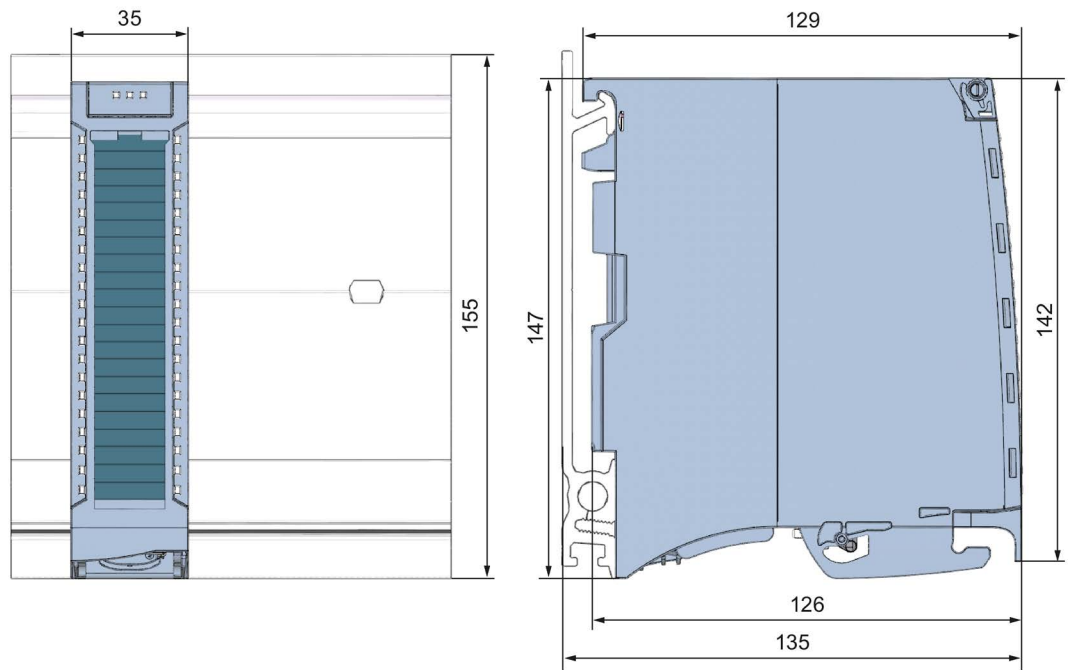


Figure A-1 Dimension drawing of the DQ 16x230VAC/1A ST module

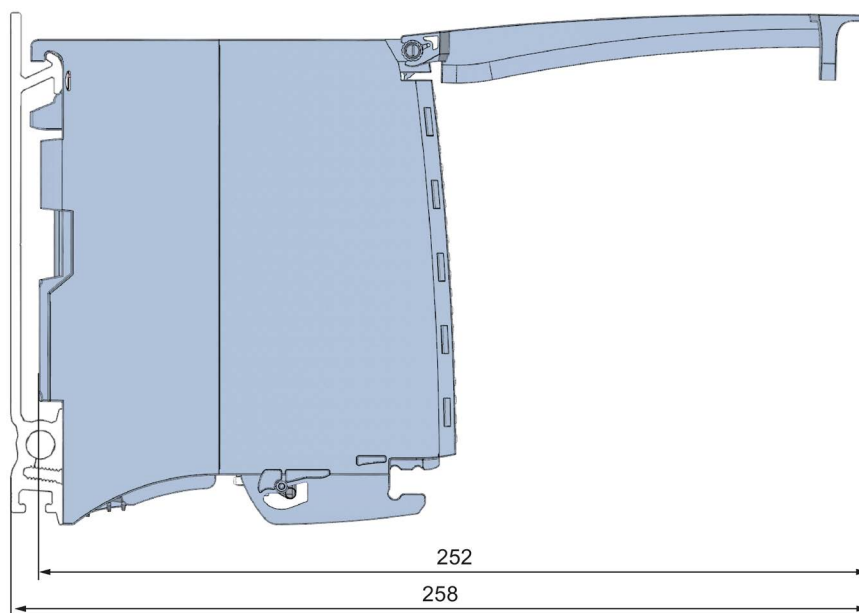


Figure A-2 Dimension drawing of the DQ 16x230VAC/1A ST module, side view with open front cover

## Parameter data records

### B.1 Parameter assignment and structure of the parameter data records

The data records of the module have an identical structure, regardless of whether you configure the module with PROFIBUS DP or PROFINET IO.

#### Dependencies for configuration with GSD file

When a GSD file is used to configure a module, dependencies can arise when "assigning the parameters".

There are no dependencies for this module. You can assign the individual parameters in any combination.

#### Parameter assignment in the user program

You have the option to reconfigure the module in RUN (e.g. the response of selected channels to the CPU STOP state can be changed in RUN without having an effect on the other channels).

#### Changing parameters in RUN

The WRREC instruction is used to transfer the parameters to the module using data records 64 to 79. The parameters set in STEP 7 are not changed in the CPU, which means the parameters set in STEP 7 are valid again after a restart.

The parameters are only checked for plausibility by the module after the transfer.

#### STATUS output parameter

The module ignores errors that occurred during the transfer of parameters with the WRREC instruction and continues operation with the previous parameter assignment. However, a corresponding error code is written to the STATUS output parameter.

The description of the WRREC instruction and the error codes is available in the STEP 7 online help.

#### Operation of the module behind a PROFIBUS DP interface module

If the module is operated behind a PROFIBUS DP interface module, the parameter data records 0 and 1 are not read back. You get the diagnostics data records 0 and 1 for the read back parameter data records 0 and 1. You can find more information in the Interrupts section of the PROFIBUS DP interface module device manual on the Internet (<http://support.automation.siemens.com/WW/view/en/78324181>).

### Assignment of data record and channel

For the configuration as a 1 x 16-channel module, the parameters are located in data records 64 to 79 and are assigned as follows:

- Data record 64 for channel 0
- Data record 65 for channel 1
- ...
- Data record 78 for channel 14
- Data record 79 for channel 15

For the configuration as a 2 x 8-channel module, the module has 2 submodules with eight channels each. The parameters for the channels are located in data records 64 to 71 and are assigned as follows:

- Data records 64 to 71 for channels 0 to 7 (submodule 1)
- Data records 64 to 71 for channels 8 to 15 (submodule 2)

Address the respective submodule for data record transfer.

### Data record structure

The example in the figure below shows the structure of data record 64 for channel 0. The structure of channels 1 to 16 is identical. The values in byte 0 and byte 1 are fixed and may not be changed.

Enable a parameter by setting the corresponding bit to "1".

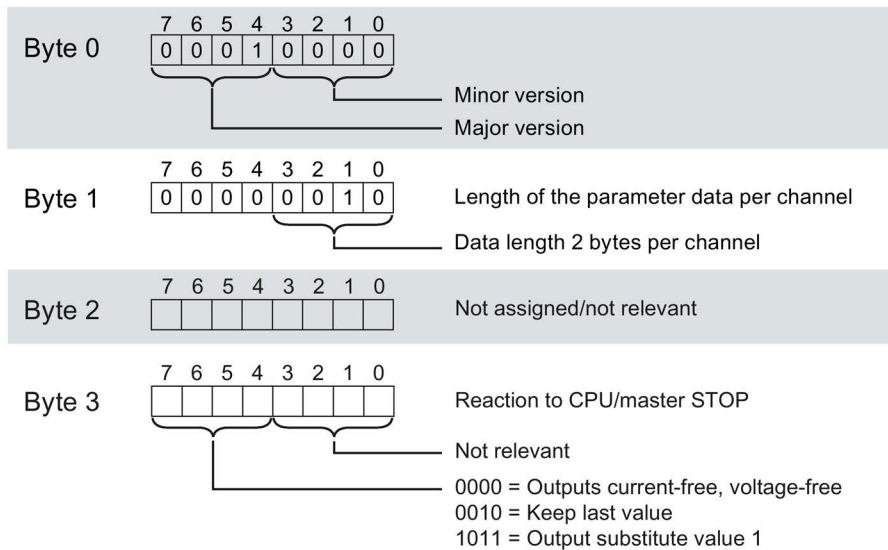


Figure B-1 Structure of data record 64: Bytes 0 to 3



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