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SIMATIC

S7-1500 / ET 200MP

Digital input/output module DI 16x24VDC/DQ 16x24VDC/0.5A BA (6ES7523-1BL00-0AA0)

Manual

Edition

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Answers for industry.

SIEMENS

SIMATIC

S7-1500/ET 200MP

Digital input/output module

DI 16x24VDC/DQ 16x24VDC/0.5A BA
(6ES7523-1BL00-0AA0)

Manual

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Preface

Purpose of the documentation

This product 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 product manual and in the system/function manuals supports you in commissioning the systems.

Changes compared to previous version

Compared to the previous version, this product manual includes detailed information on the module functions, for example, as of which STEP 7 version the function is supported.

Conventions

The term "CPU" is used in this manual both for the CPUs of the S7-1500 automation system, as well as for interface modules of the ET 200MP distributed I/O system.

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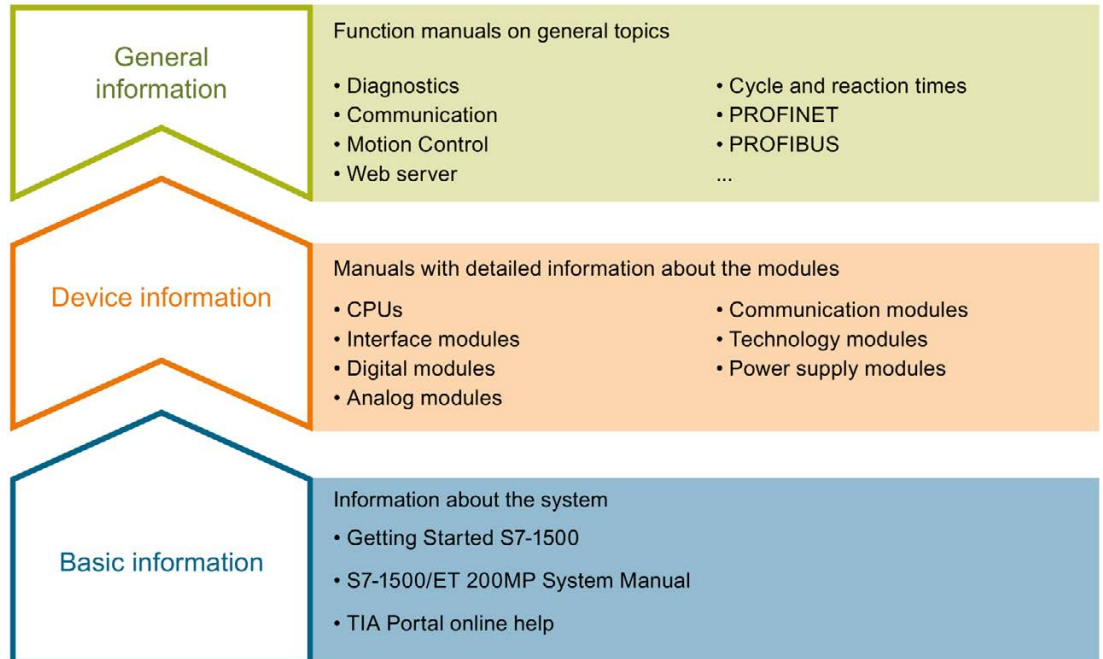
For legal reasons, we are obliged to publish the original text of the license conditions and copyright notices. Please read the information relating to this in the appendix.

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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

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

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 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.

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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

2.1 Properties

Part number:

6ES7523-1BL00-0AA0

View of the module

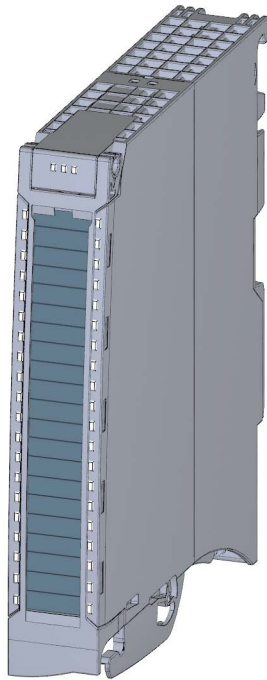


Figure 2-1 View of the DI 16x24VDC/DQ 16x24VDC/0.5A BA module

Properties

The module has the following technical properties:

- Digital inputs
 - 16 digital inputs; electrically isolated in groups of 16
 - Rated input voltage 24 VDC
 - Suitable for switches and 2-/3-/4-wire proximity switches
- Digital outputs
 - 16 digital outputs, electrically isolated in groups of 8
 - Rated output voltage 24 VDC
 - Rated output current 0.5 A per channel
 - Suitable for solenoid valves, DC contactors, and indicator lights

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 (TIA Portal)	GSD file in STEP 7 (TIA Portal) V12 or higher, or STEP 7 V5.5 SP3 or higher
Firmware update	V1.0.0 or higher	V13 or higher	X
Identification data I&M0 to I&M3	V1.0.0 or higher	V13 or higher	X
Module-internal Shared Input (MSI) / Shared Output (MSO)	V1.0.0 or higher	V13 Update 3 or higher (PROFINET IO only)	X (PROFINET IO only)
Configurable submodules / submodules for Shared Device	V1.0.0 or higher	V13 Update 3 or higher (PROFINET IO only)	X (PROFINET IO only)

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

Accessories

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

- Front connector (push-in terminals) including cable tie
- Labeling strips
- U connector
- Universal front door

You can find more information on accessories in the Wiring section of the S7-1500 Automation System (<http://support.automation.siemens.com/WW/view/en/59191792>) system manual and the ET 200MP Distributed I/O System (<http://support.automation.siemens.com/WW/view/en/59193214>) system manual.

Wiring

3.1 Wiring and block diagram

This section contains the block diagram of the module and outlines various connection options.

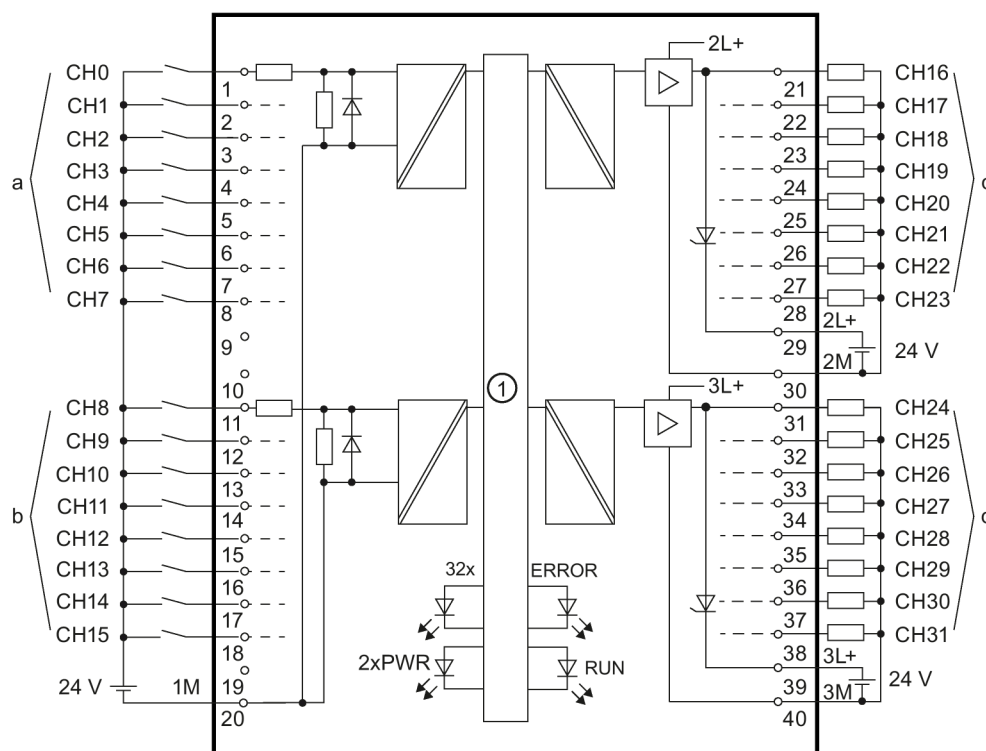
For more information on front connector wiring and creating cable shields, for example, refer to the "Wiring" section in the S7-1500 Automation System (<http://support.automation.siemens.com/WW/view/en/59191792>) and ET 200MP Distributed I/O System (<http://support.automation.siemens.com/WW/view/en/59193214>) system manuals.

Abbreviations used

Meaning of the abbreviations used in the following figure:

- xL+ Supply voltage connector
- xM Ground connector
- CHx Channel or display for the channel status
- PWRx Display for the supply voltage (POWER)

The figure below shows you how to connect the module and the assignment of the channels to the addresses (input byte a and b, output byte c and d).



① Backplane bus interface

Figure 3-1 Block diagram and terminal assignment

Address space

4.1 Address space

The module can be configured in various ways in STEP 7. Depending on the configuration, additional/different addresses are assigned in the process image input/output.

Configuration options of DI 16x24VDC/DQ 16x24VDC/0.5A BA

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

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

The following configurations are possible:

Table 4- 1 Configuration options

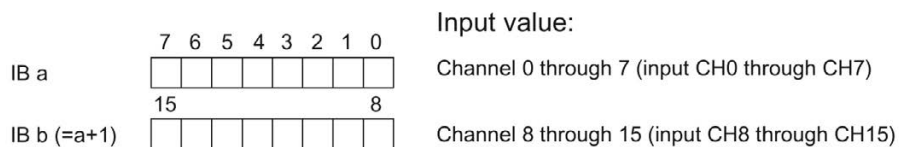
Configuration	Short designation/ module name in the GSD file	Configuration software, e.g., with STEP 7 (TIA Portal)	
		Integrated in hardware catalog STEP 7 (TIA Portal)	GSD file in STEP 7 (TIA Portal) V12 or higher or STEP 7 V5.5 SP3 or higher
1 x 32-channel without value status (1 x 16 digital inputs and 1 x 16 digital outputs)	DI 16x24VDC/ DQ 16x24VDC/0.5 BA	V13 or higher	X
4 x 8-channel without value status (2 x 8 digital inputs and 2 x 8 digital outputs)	DI 16x24VDC/ DQ 16x24VDC/0.5 BA S	V13 Update 3 or higher (PROFINET IO only)	X (PROFINET IO only)
1 x 32-channel with value status for up to 4 submodules (each 1 x 16 channels for module-internal Shared Input or Shared Output)	DI 16x24VDC/ DQ 16x24VDC/0.5 BA MSI or MSO	V13 Update 3 or higher (PROFINET IO only)	X (PROFINET IO only)

Address space for configuration as 1 x 32-channel DI 16x24VDC/DQ 16x24VDC/0.5A BA

The figure below shows the address space assignment for configuration as a 1 x 32-channel module (16 digital inputs / 16 digital outputs). You can freely assign the start address for the module. The addresses of the channels are based on the start address.

The letters "a" to "d" are printed on the module. "EB a", for example, stands for module start address input byte a.

Assignment in the process image input (PII)



Assignment in the process image output (PIQ)

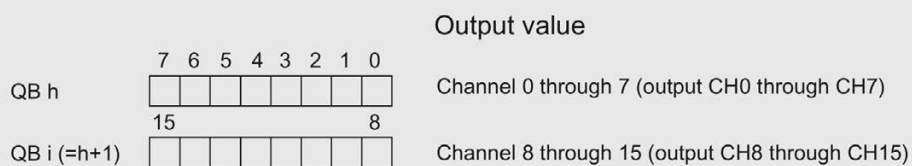


Figure 4-1 Address space for configuration as 32-channel DI 16x24VDC/DQ 16x24VDC/0.5A BA

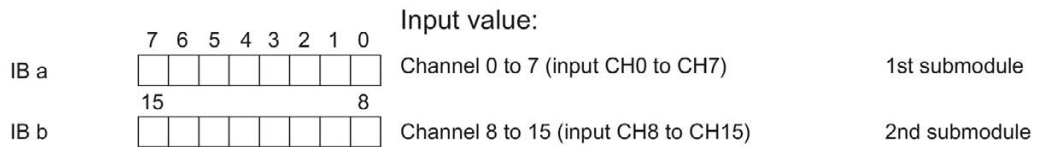
Address space for configuration as 4 x 8-channel DI 16x24VDC/DQ 16x24VDC/0.5A BA S

For the configuration as a 4 x 8-channel module, the channels of the module are divided into multiple submodules. The submodules can be assigned to different IO controllers when the module is used in a Shared Device.

The number of usable submodules depends on the interface module used. Please observe the information in the manual for the particular interface module.

Unlike the 1 x 32-channel module configuration, each of the four submodules has a freely assignable start address.

Assignment in the process image of the input (PII)



Assignment in the process image of the output (PIQ)

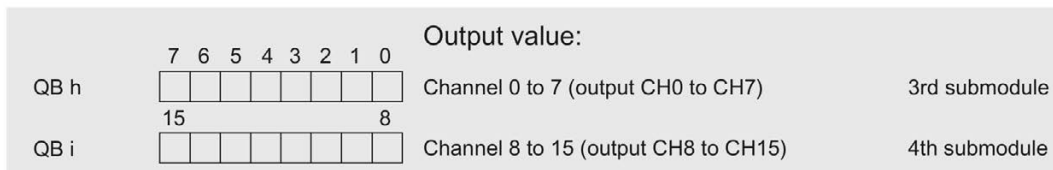


Figure 4-2 Address space for configuration as 4 x 8-channel DI 16x24VDC/DQ 16x24VDC/0.5A BA S

Address space for configuration as 1 x 32-channel DI 16x24VDC/DQ 16x24VDC/0.5A BA MSI/MSO

For configuration as a 1 x 32-channel module (module-internal Shared Input, MSI/Shared Output, MSO), the channels for inputs or outputs 0 to 15 of the module are copied to multiple submodules. Each of the 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 output channels 0 to 15 and read access to the input channels 0 to 15.
- The IO controllers to which submodule 2, 3 or 4 is assigned have read access to the input channels or output channels 0 to 15.

The number of usable submodules depends on the interface module used. Please observe the information in the manual for the particular interface module.

Value status (Quality Information, QI) for inputs

The meaning of the value status depends on the submodule involved.

For the 1st submodule (=basic submodule), the value status is not relevant.

For the 2nd to 4th submodule (=MSI submodule), the value status 0 indicates that the value is incorrect or the basic submodule has not yet been configured (not ready for operation).

Value status (Quality Information, QI) for outputs

The meaning of the value status depends on the submodule involved.

For the 1st submodule (=basic submodule), the value status 1 indicates that the output value specified by the user program is actually output at the module terminal.

Possible causes for value status = 0:

- Value is incorrect, for example, because the supply voltage is missing.
- IO controller of the basic submodule is in STOP mode.

For the 2nd to 4th submodule (=MSO submodule), the value status 1 indicates that the output value specified by the user program is actually output at the module terminal.

Possible causes for value status = 0:

- Value is incorrect, for example, because the supply voltage is missing.
- IO controller of the basic submodule is in STOP mode.
- The basic submodule is not yet configured.

4.1 Address space

The figure below shows the assignment of the address space with submodule 1 and the value status.

Assignment in the process image input (PII) for 1st submodule

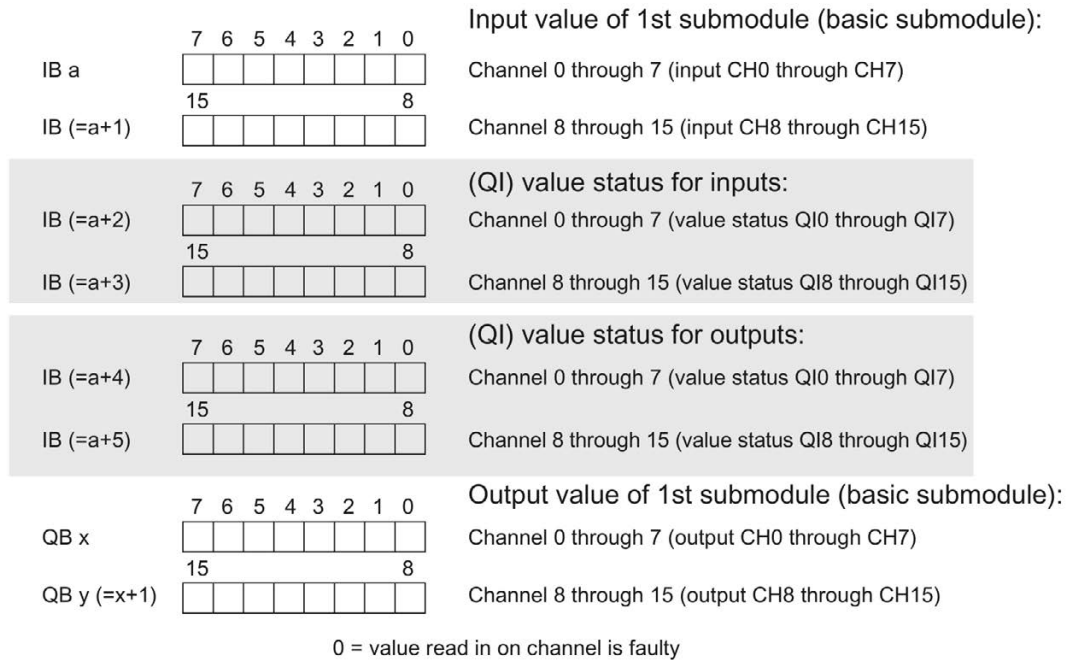


Figure 4-3 Address space for configuration as 1 x 32-channel DI 16x24VDC/DQ 16x24VDC/0.5A BA MSI/MSO

The figure below shows the assignment of the address space with submodule 2 and the value status.

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

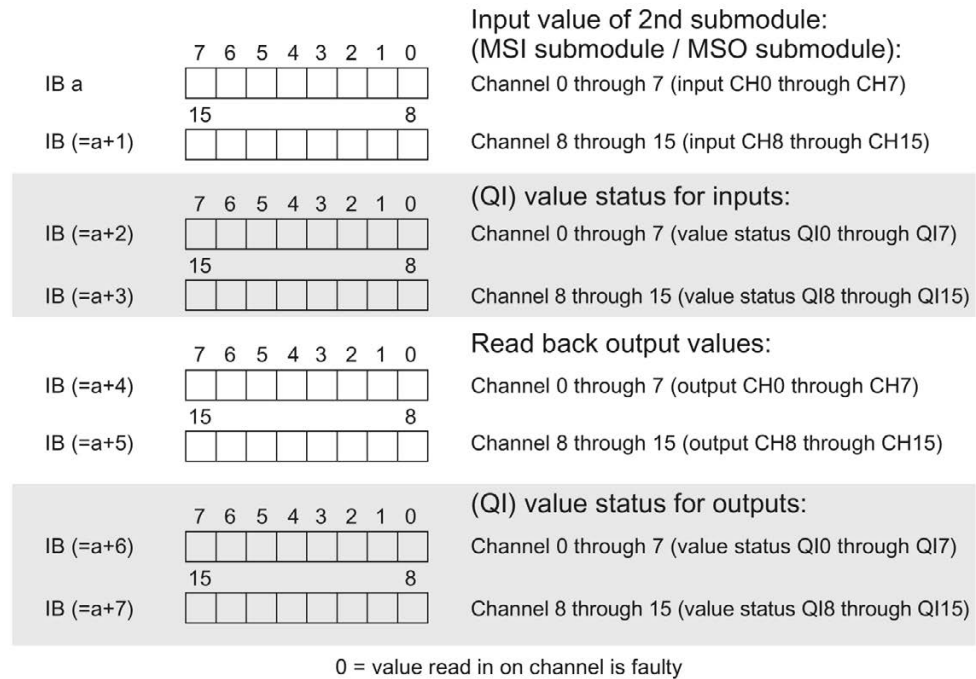


Figure 4-4 Address space for configuration as 1 x 32-channel DI 16x24VDC/DQ 16x24VDC/0.5A BA MSI/MSO

4.1 Address space

The figure below shows the assignment of the address space with submodule 3 and the value status.

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

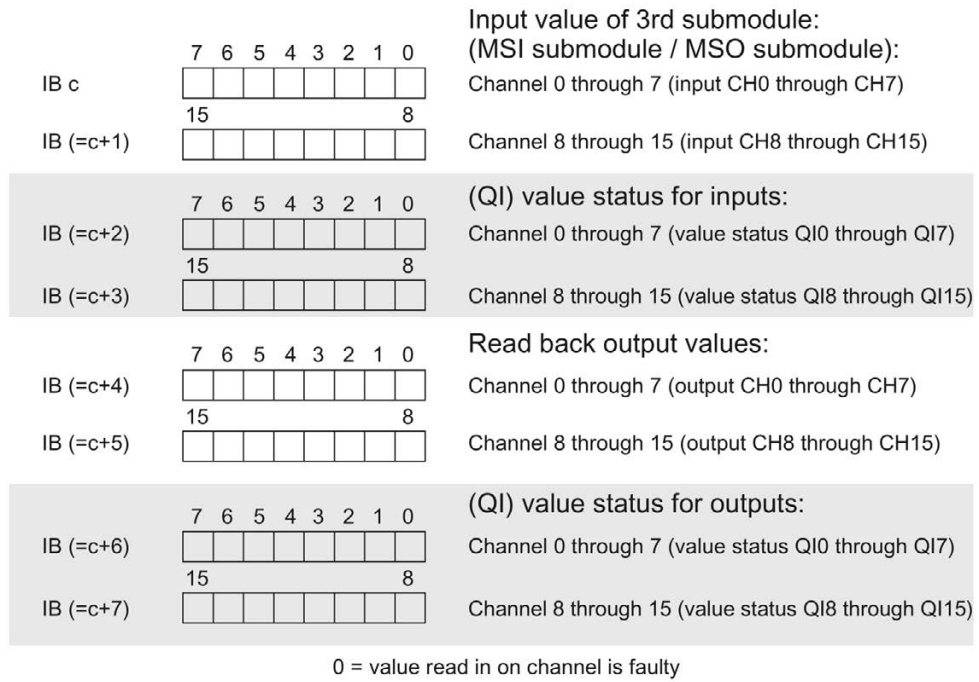


Figure 4-5 Address space for configuration as 1 x 32-channel DI 16x24VDC/DQ 16x24VDC/0.5A BA MSI/MSO

The figure below shows the assignment of the address space with submodule 4 and the value status.

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

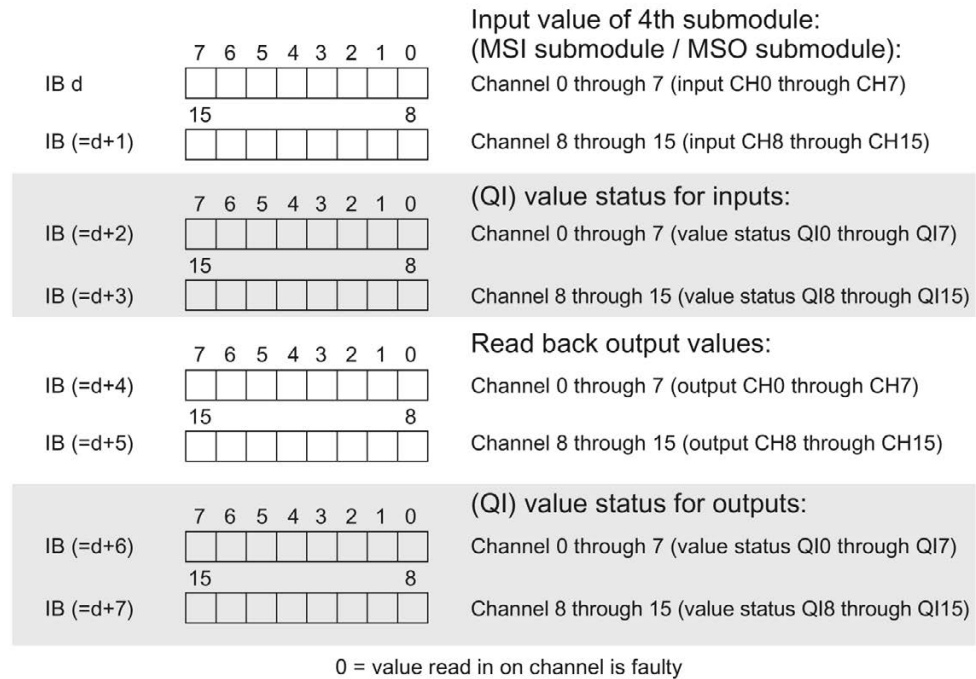


Figure 4-6 Address space for configuration as 1 x 32-channel DI 16x24VDC/DQ 16x24VDC/0.5A BA MSI/MSO

Diagnostics alarms

The module has no selectable diagnostics. Diagnostics alarms, for example, cannot be output with STEP 7 (TIA Portal).

5.1 Status and error displays

LED displays

The figure below shows the LED displays (status and error displays) of the DI 16x24VDC/DQ 16x24VDC/0.5A BA.

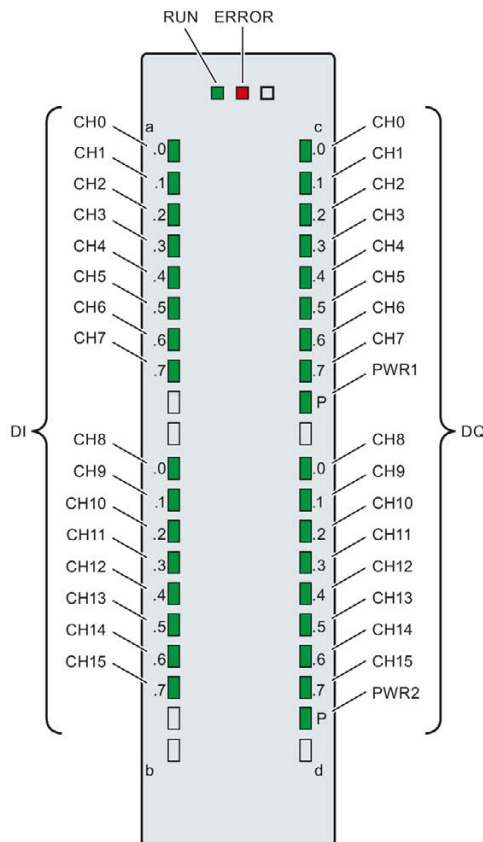


Figure 5-1 LED displays of the module DI 16x24VDC/DQ 16x24VDC/0.5A BA

Meaning of the LED displays

The tables below explain the meaning of the status and error displays.

LED RUN/ERROR

Table 5- 1 RUN/ERROR status and error displays

LED		Meaning	Remedy
RUN	ERROR		
□ Off	□ Off	Voltage missing or too low at backplane bus.	<ul style="list-style-type: none"> Switch on the CPU and/or the system power supply modules. Verify that the U connectors are inserted. Check to see if too many modules are inserted.
⚡ Flashes	□ Off	Module is starting up.	---
■ On	□ Off	Module is ready.	---
⚡ Flashes	⚡ Flashes	Hardware defective.	Replace the module.

LED PWRx

Table 5- 2 PWRx status display

LED PWRx	Meaning	Remedy
□ Off	Supply voltage L+ too low or missing	Check supply voltage L+.
■ On	Supply voltage L+ is present and OK.	---

LED CHx

Table 5- 3 CHx status display

LED CHx	Meaning	Remedy
□ Off	0 = Status of the input/output signal.	---
■ On	1 = Status of the input/output signal.	---

Technical specifications

Technical specifications of the DI 16x24VDC/DQ 16x24VDC/0.5A BA

	6ES7523-1BL00-0AA0
Product type designation	DI 16x24VDC / DQ16x24VDC/0.5A BA
General information	
Hardware version	E01
Firmware version	V1.0.0
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 / V13
STEP 7 can be configured/integrated as of version	V5.5 SP3 / -
Operating mode	
MSI	Yes
MSO	Yes
Supply voltage	
Type of supply voltage	DC
Rated value (DC)	24 V
Permitted range, low limit (DC)	20.4 V
Permitted range, high limit (DC)	28.8 V
Reverse polarity protection	Yes; with internal protection with 7 A per group
Input current	
Current consumption, max.	30 mA
Power	
Power taken from the backplane bus	1.1 W
Power loss	
Power loss, typ.	3.45 W
Digital inputs	
Number of inputs	16
Sinking/sourcing input	Sinking input
Input characteristic curve acc. to IEC 61131, type 3	Yes

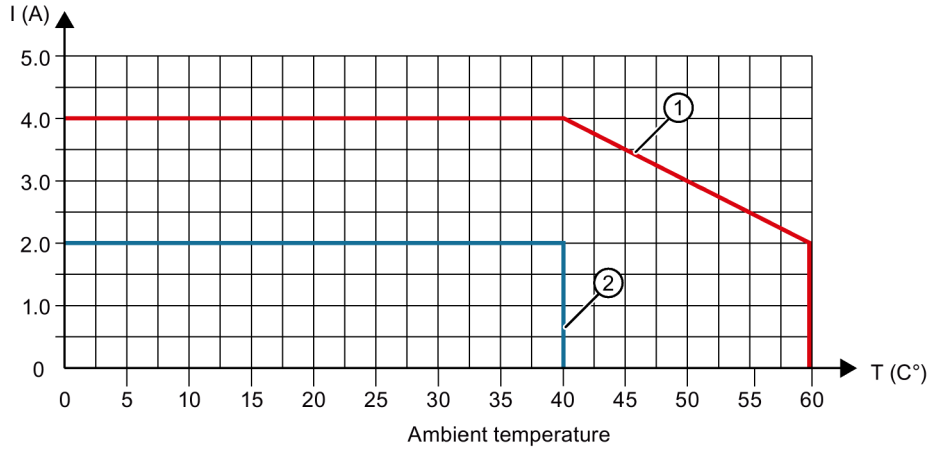
6ES7523-1BL00-0AA0	
Input voltage	
Rated value, DC	24 V
for signal "0"	-30 to +5 V
for signal "1"	11 to 30 V
Permitted voltage at input, min.	-30 V; -3 V permanently; -30 V brief reverse polarity protection
Permitted voltage at input, max.	30 V
Input current	
for signal "1", typ.	2.7 mA
Input delay (for rated value of input voltage)	
For standard inputs	
<ul style="list-style-type: none"> • Configurable 	No
<ul style="list-style-type: none"> • with "0" to "1", min. 	3 ms
<ul style="list-style-type: none"> • with "0" to "1", max. 	4 ms
<ul style="list-style-type: none"> • with "1" to "0", min. 	3 ms
<ul style="list-style-type: none"> • with "1" to "0", max. 	4 ms
For interrupt inputs	
<ul style="list-style-type: none"> • Configurable 	No
Cable length	
Cable length shielded, max.	1000 m
Cable length unshielded, max.	600 m
Digital outputs	
Type of digital output	Transistor
Number of outputs	16
Sourcing output	Yes
Short-circuit protection	Yes
<ul style="list-style-type: none"> • Response threshold, typ. 	1 A
Limitation of inductive shutdown voltage to	L+ (-53 V)
Activation of a digital input	Yes
Switching capacity of the 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 voltage	
Type of output voltage	DC
for signal "1", min.	L+ (-0.8 V)
Output current	
For signal "1" rated value	0.5 A
For signal "1" permitted range, max.	0.5 A
For signal "0" residual current, max.	0.5 mA

6ES7523-1BL00-0AA0	
Output delay with resistive load	
"0" to "1", max.	100 µs
"1" to "0", max.	500 µs
Parallel switching of 2 outputs	
For logical operations	Yes
For increased performance	No
For redundant activation of a load	Yes
Switching frequency	
With resistive load, max.	100 Hz
With inductive load, max.	0.5 Hz
With lamp load, max.	10 Hz
Total current of the outputs	
Max. current per channel	0.5 A; see additional description in the manual
Max. current per group	4 A; see additional description in the manual
Max. current per module	8 A; see additional description in the manual
Cable length	
Cable length shielded, max.	1000 m
Cable length unshielded, max.	600 m
Encoders	
Connectable encoders	
2-wire sensor	Yes
<ul style="list-style-type: none"> Permitted quiescent current (2-wire sensor), max. 	1.5 mA
Isochronous mode	
Isochronous mode (application synchronized up to terminal)	No
Interrupts/diagnostics/status information	
Substitute values can be applied	No
Interrupts	
Diagnostics interrupt	No
Hardware interrupt	No
Diagnostics alarms	
Diagnostics	No
Monitoring of the supply voltage	No
Wire break	No
Short-circuit	No

6ES7523-1BL00-0AA0	
Diagnostics indicator LED	
RUN LED	Yes; green LED
ERROR LED	Yes; red LED
MAINT LED	No
Monitoring of the supply voltage	Yes; green LED
Channel status display	Yes; green LED
For channel diagnostics	No
For module diagnostics	No
Electrical isolation	
Electrical isolation of channels	
Between the channels	No
Between the channels, in groups of	8
Between the channels and the backplane bus	Yes
Permitted potential difference	
Between different circuits	75 VDC / 60 VAC (basic isolation)
Isolation	
Isolation tested with	707 VDC (type test)
Distributed mode	
Prioritized startup	Yes
Dimensions	
Width	25 mm
Height	147 mm
Depth	129 mm
Weights	
Weight, approx.	280 g
Miscellaneous	
Note:	Supplied incl. 40-pin push-in front connector

Power reduction (derating) to total current of outputs (per group)

The following graphs show the load 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 total current of outputs (per group)

Dimensional drawing

A

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

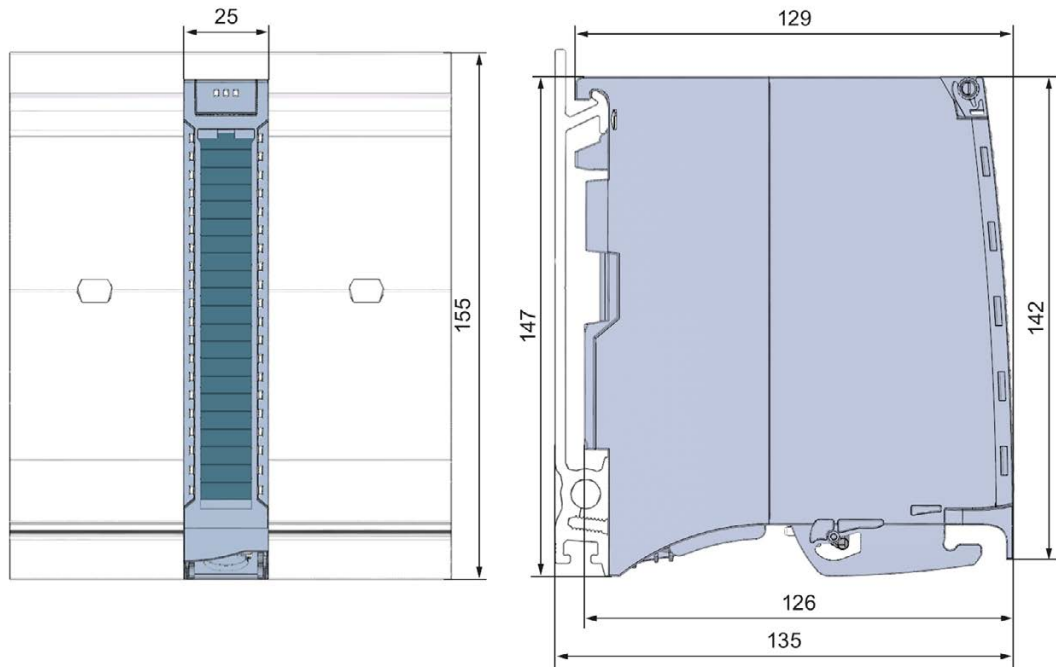


Figure A-1 Dimensional drawing of the DI 16x24VDC/DQ 16x24VDC/0.5A BA module

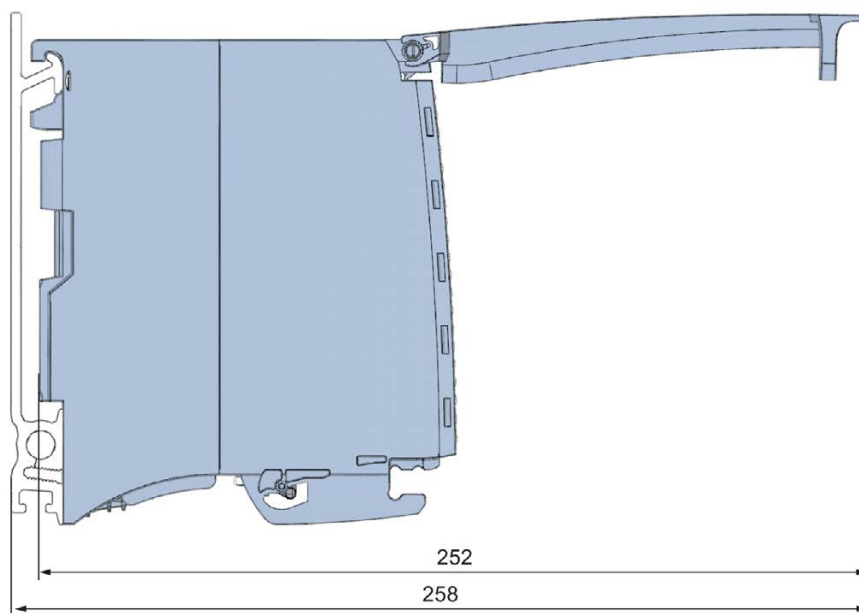


Figure A-2 Dimensional drawing of the DI 16x24VDC/DQ 16x24VDC/0.5A BA module, side view with open front cover

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