SIEMENS

Manual

SIMATIC

S7-1500 / ET 200MP

Digital input module
DI 64x24VDC SNK/SRC BA (6ES7521-1BP00-0AA0)

Edition 07/2020

support.industry.siemens.com

SIEMENS

SIMATIC

S7-1500/ET 200MP Digital input module DI 64x24VDC SNK/SRC BA (6ES7521-1BP00-0AA0)

Equipment Manual

07/2020

A5E48025116-AA

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Preface

Purpose of the documentation

This manual supplements the S7-1500/ET 200MP (https://support.industry.siemens.com/cs/ww/en/view/59191792) system manual.

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

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

Conventions

The term "CPU" is used in this manual both for the CPUs of the S7-1500 automation system and 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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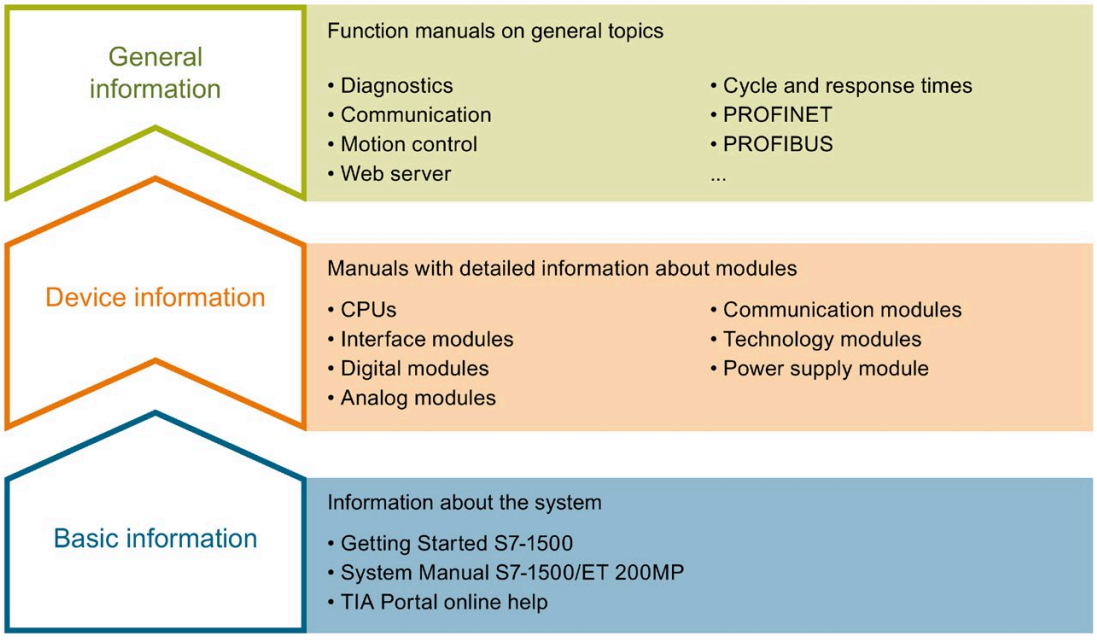
Table of contents

S7-1500 / ET 200MP Documentation Guide

1

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, OPC UA.

You can download the documentation free of charge from the Internet (https://support.industry.siemens.com/cs/ww/en/view/109742691).

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

You can download the product information free of charge from the Internet (https://support.industry.siemens.com/cs/us/en/view/68052815).

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 (https://support.industry.siemens.com/cs/ww/en/view/86140384).

SIMATIC S7-1500 comparison list for programming languages

The comparison list contains an overview of which instructions and functions you can use for which controller families.

You can find the comparison list on the Internet (https://support.industry.siemens.com/cs/ww/en/view/86630375).

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Application examples

The application examples support you with various tools and examples for solving your automation tasks. Solutions are shown in interplay with multiple components in the system - separated from the focus on individual products.

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

Product overview

2

2.1 Properties

Article number

6ES7521-1BP00-0AA0

View of the module

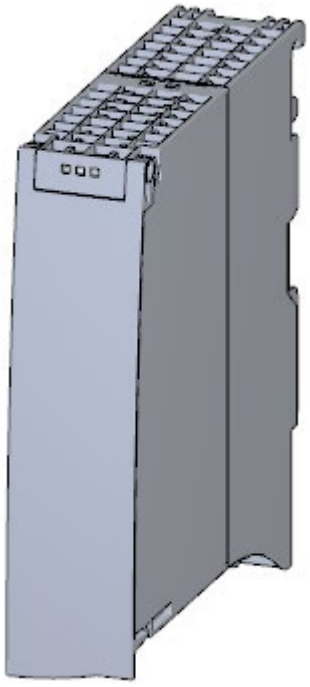


Figure 2-1 View of the DI 64x24VDC SNK/SRC BA module

Properties

The module has the following technical properties:

- 64 digital inputs; electrically isolated in 4 groups of 16
- Sourcing input or sinking input, depending on wiring
- Rated input voltage 24 V DC
- Suitable for switches and 2-/3-/4-wire proximity switches

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) as of V16 and HSP 0319	**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	X	--- / X
Identification data I&M0 to I&M3	V1.0.0 or higher	X	X
Module-internal Shared Input (MSI)	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 (TIA Portal) and with a GSD file.

Accessories

The following accessories are supplied with the module and can be ordered as spare parts:

- U connector
- Universal front door with the article number: 6ES7 591-8AA00-0AA0

You can find additional information in the system manual S7-1500/ET 200MP (http://support.automation.siemens.com/WW/view/en/59191792).

Other components

The following must be ordered separately:

- SIMATIC TOP connect connection module
- Pre-fabricated connecting cable with IDC connectors

For additional information, see section Connecting a module with a connection module (Page 14)

Wiring

3

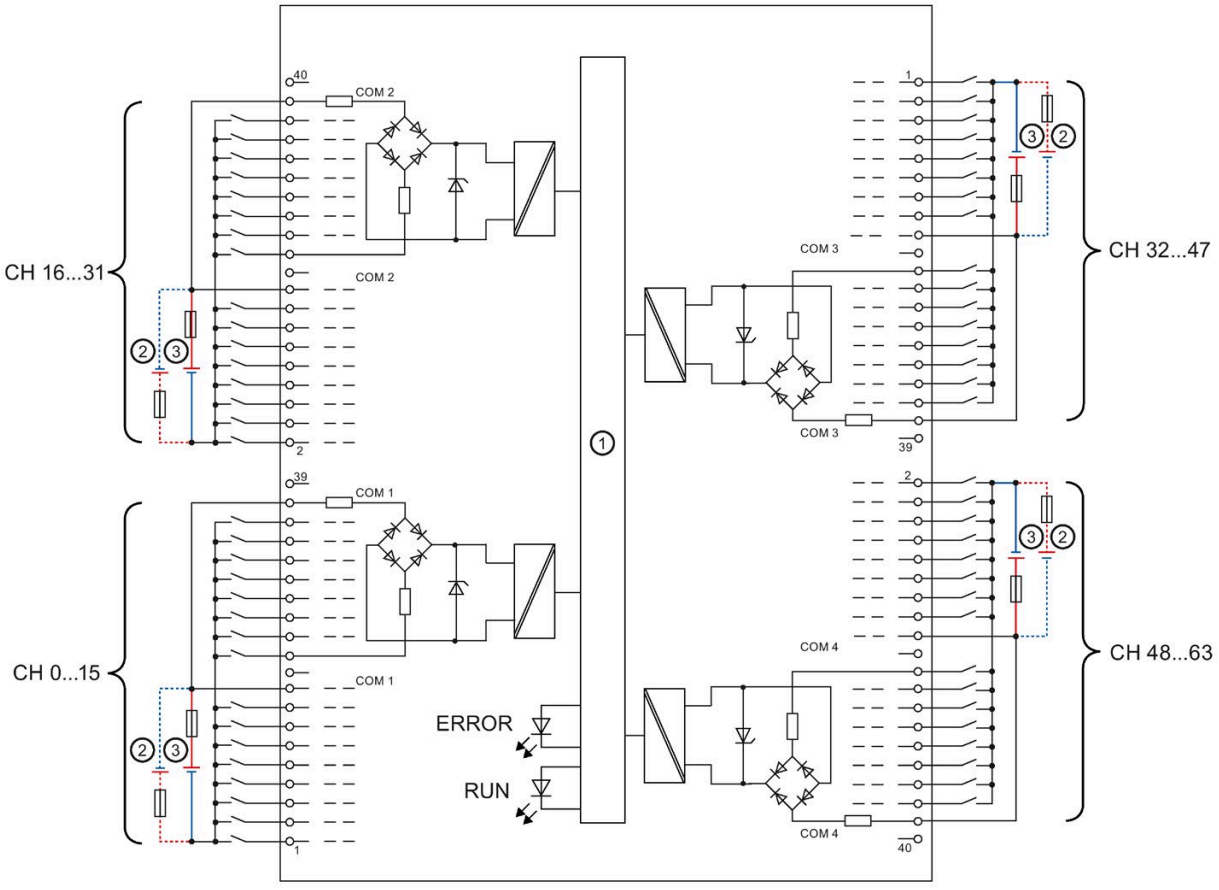
3.1 Wiring and block diagrams

This section contains the block diagram of the module and the terminal assignment.

Wiring and block diagram

The following figure shows the terminal assignment and the assignment of the channels.

- Inputs: Channel 0 to 31 to connector X10
- Inputs: Channel 32 to 63 to connector X11



①	Backplane bus interface	CHx	Channel
②	Terminal for "sinking" operating mode	RUN	Status display LED (green)
③	Terminal for "sourcing" operating mode	ERROR	Error display LED (red)

Figure 3-1 Block diagram and terminal assignment

3.2 Terminal assignment X10 and X11.

The following figure shows the assignment of the channels to the addresses.

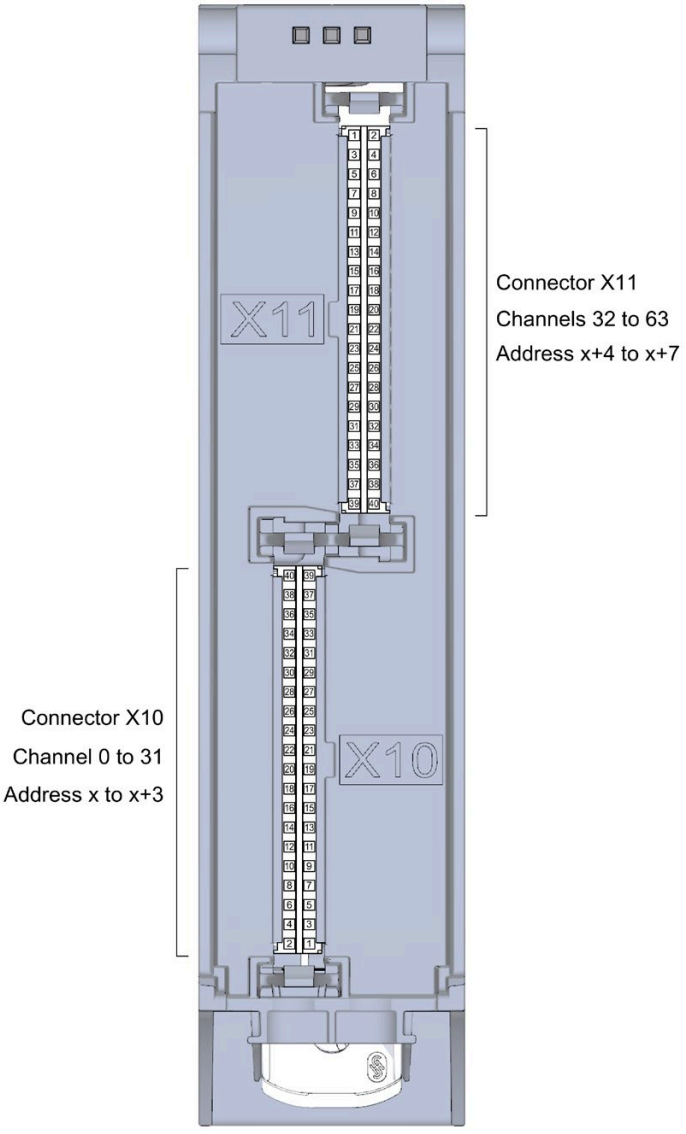


Figure 3-2 Front view of the module without front door

Terminal and address assignment

For connecting sensors or actuators, we recommend using the SIMATIC TOP connect pre-assembled connecting cables and the SIMATIC TOP connect connection modules. However, if you choose another wiring option, you will need the following tables.

Table 3- 1 Assignment for connector X10 of the module

Assignment for inputs to X10					
Terminal	**Channel**	**Address**	**Terminal**	**Channel**	**Address**
40	---	---	**39**	---	---
38	2COM *	---	**37**	1COM **	---
36	Channel 31	x+3.7	**35**	Channel 15	x+1.7
34	Channel 30	x+3.6	**33**	Channel 14	x+1.6
32	Channel 29	x+3.5	**31**	Channel 13	x+1.5
30	Channel 28	x+3.4	**29**	Channel 12	x+1.4
28	Channel 27	x+3.3	**27**	Channel 11	x+1.3
26	Channel 26	x+3.2	**25**	Channel 10	x+1.2
24	Channel 25	x+3.1	**23**	Channel 9	x+1.1
22	Channel 24	x+3.0	**21**	Channel 8	x+1.0
20	---	---	**19**	---	---
18	2COM *	---	**17**	1COM **	---
16	Channel 23	x+2.7	**15**	Channel 7	x.7
14	Channel 22	x+2.6	**13**	Channel 6	x.6
12	Channel 21	x+2.5	**11**	Channel 5	x.5
10	Channel 20	x+2.4	**9**	Channel 4	x.4
8	Channel 19	x+2.3	**7**	Channel 3	x.3
6	Channel 18	x+2.2	**5**	Channel 2	x.2
4	Channel 17	x+2.1	**3**	Channel 1	x.1
2	Channel 16	x+2.0	**1**	Channel 0	x.0

* 2M for Sinking (sinking input) connection type/ 2L+ for Sourcing (sourcing input) connection type

** 1M for Sinking (sinking input) connection type/ 1L+ for Sourcing (sourcing input) connection type

Table 3- 2 Assignment for the connector X11 of the module

Assignment for inputs to X11					
Terminal	**Channel**	**Address**	**Terminal**	**Channel**	**Address**
1	Channel 32	x+4.0	**2**	Channel 48	x+6.0
3	Channel 33	x+4.1	**4**	Channel 49	x+6.1
5	Channel 34	x+4.2	**6**	Channel 50	x+6.2
7	Channel 35	x+4.3	**8**	Channel 51	x+6.3
9	Channel 36	x+4.4	**10**	Channel 52	x+6.4
11	Channel 37	x+4.5	**12**	Channel 53	x+6.5
13	Channel 38	x+4.6	**14**	Channel 54	x+6.6
15	Channel 39	x+4.7	**16**	Channel 55	x+6.7
17	3COM *	---	**18**	4COM **	---
19	---	---	**20**	---	---
21	Channel 40	x+5.0	**22**	Channel 56	x+7.0
23	Channel 41	x+5.1	**24**	Channel 57	x+7.1
25	Channel 42	x+5.2	**26**	Channel 58	x+7.2
27	Channel 43	x+5.3	**28**	Channel 59	x+7.3
29	Channel 44	x+5.4	**30**	Channel 60	x+7.4
31	Channel 45	x+5.5	**32**	Channel 61	x+7.5
33	Channel 46	x+5.6	**34**	Channel 62	x+7.6
35	Channel 47	x+5.7	**36**	Channel 63	x+7.7
37	3COM *	---	**38**	4COM **	---
39	---	---	**40**	---	---

* 3M for Sinking (sinking input) connection type/ 3L+ for Sourcing (sourcing input) connection type

** 4M for Sinking (sinking input) connection type/ 4L+ for Sourcing (sourcing input) connection type

3.3 Connecting a module with a connection module

Component for connecting

To connect sensors, you need 2 connection modules per module. The connection modules are connected to the module with pre-assembled connecting cables.

You can find additional information on the components of the SIMATIC TOP connect system cabling, e.g. for connecting connection modules, in the equipment manual SIMATIC TOP connect for S7-1500 and ET 200MP (https://support.industry.siemens.com/cs/ww/en/view/95924607).

Note

Common supply

If you use the listed SIMATIC TOP connect connection modules, then all 32 channels of a connection module have a common supply. This means that 2 groups of 16 channels each are supplied by common potential.

You can find the required components in the tables below.

Table 3- 3 SIMATIC TOP connect connection module

Components	Type	Description	Connection technology	Article number	Delivery quantity
Connection modules for digital inputs	TP1	1-wire connection, without LED (sinking input)	- Screw terminals - Push-in system	6ES7924-2AA20-0AA0 6ES7924-2AA20-0AC0	Pack of 1 Pack of 1
		1-wire connection, with LED (sinking input)	- Screw terminals - Push-in system	6ES7924-2AA20-0BA0 6ES7924-2AA20-0BC0	Pack of 1 Pack of 1
		1-wire connection, with LED (sourcing input)	- Screw terminals - Push-in system	6ES7924-2AK20-0BA0 6ES7924-2AK20-0BC0	Pack of 1 Pack of 1
	TP3	3-wire connection, without LED (sinking input)	- Screw terminals - Push-in system	6ES7924-2CA20-0AA0 6ES7924-2CA20-0AC0	Pack of 1 Pack of 1
		3-wire connection, with LED (sinking input)	- Screw terminals - Push-in system	6ES7924-2CA20-0BA0 6ES7924-2CA20-0BC0	Pack of 1 Pack of 1

Table 3- 4 Connecting cables SIMATIC TOP connect

Components	Length	Article number	Delivery quantity
Pre-assembled connecting cable with IDC connector an both ends • IDC connector 40-pin for the I/O module • IDC connector 50-pin for the SIMATIC TOP connect connection module	1.0 m	6ES7923-5BB00-0GB0	Pack of 1
	2.0 m	6ES7923-5BC00-0GB0	Pack of 1
	2.5 m	6ES7923-5BC50-0GB0	Pack of 1
	3.0 m	6ES7923-5BD00-0GB0	Pack of 1

Support for selecting hardware components

We recommend you use the TIA Selection Tool for planning your project. The TIA Selection Tool is available free of charge as a desktop version for download or as a cloud version, refer to the Internet (https://new.siemens.com/global/en/products/automation/topic-areas/tia/tia-selection-tool.html).

3.4 Wiring of the module

Requirement

- The I/O modules are installed on the mounting rail.
- The supply voltage of the station is switched off.

Procedure

1. Plug the two SIMATIC TOP connect connecting cables with the **40-pin** IDC connector into X10 and X11.

   Note when plugging:

   – ① The nob on the left edge of connector X11

   – ② The nob on the right edge of connector X10

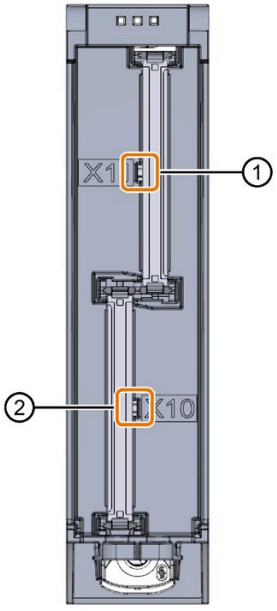


Figure 3-3 Connect the SIMATIC TOP connect 40-pin connecting cable to the module

2. Guide the SIMATIC TOP connect connecting cables down to the module.
3. Guide a cable tie around the module at the fixing points and connect the SIMATIC TOP connect cables.

4. Tighten the cable tie for the strain relief.

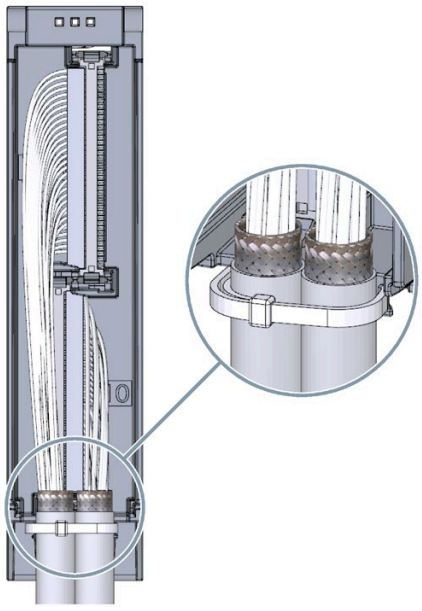


Figure 3-4 Fastening the cable tie for the strain relief

5. Plug the SIMATIC TOP connect connecting cables with the **50-pin** IDC connector into the SIMATIC TOP connect connection module.

Additional information

You can find out how to wire the SIMATIC TOP connect connection module in the equipment manual SIMATIC TOP connect for S7-1500 and ET 200MP (https://support.industry.siemens.com/cs/ww/en/view/95924607).

3.5 Fuse

Miniature circuit breaker

The supply lines of groups are to be protected with a 4 A miniature circuit breaker with tripping characteristic C or B.

Below, you see the connection for "Sourcing" mode and for "Sinking" mode.

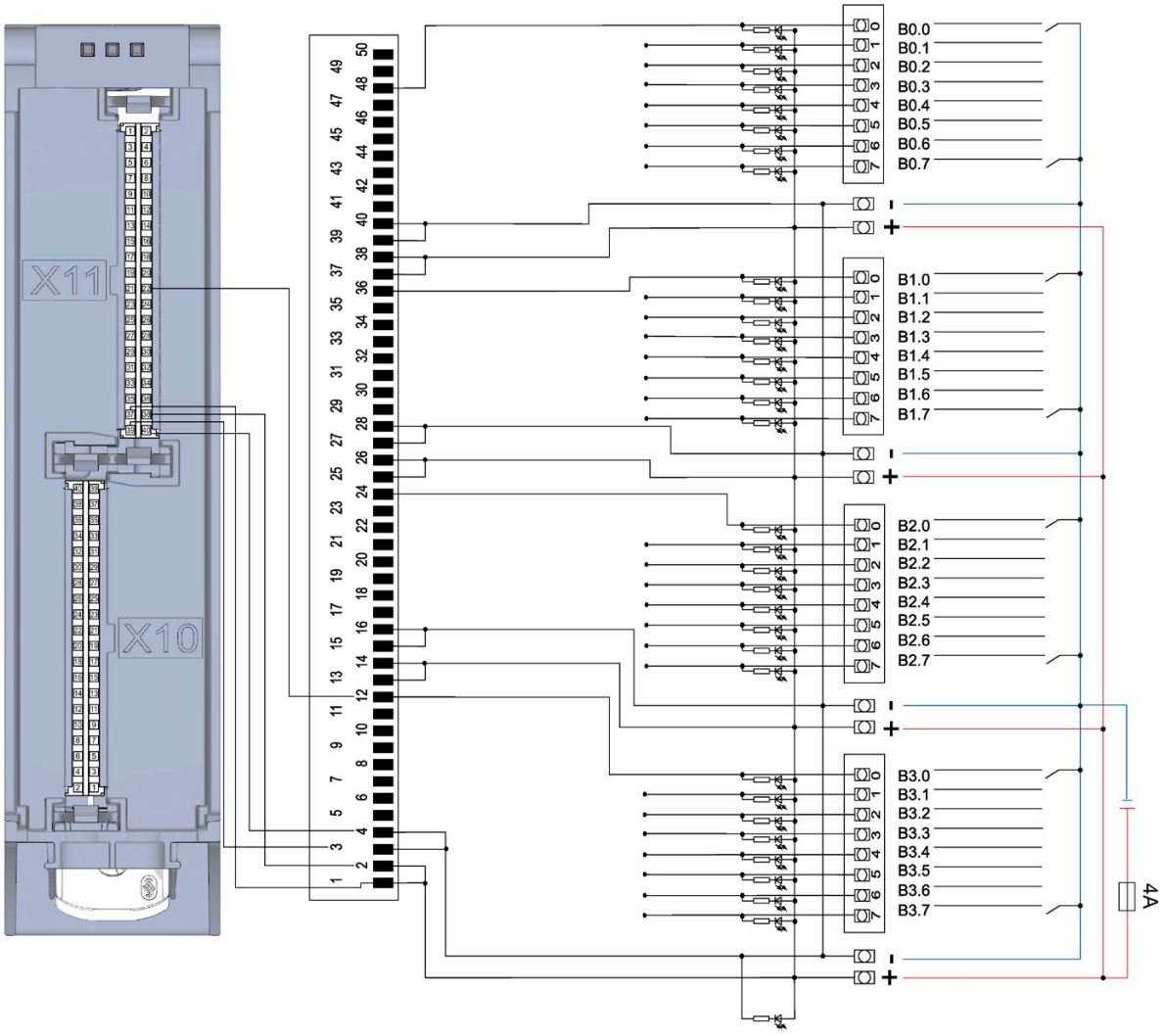


Figure 3-5 "Sourcing" mode

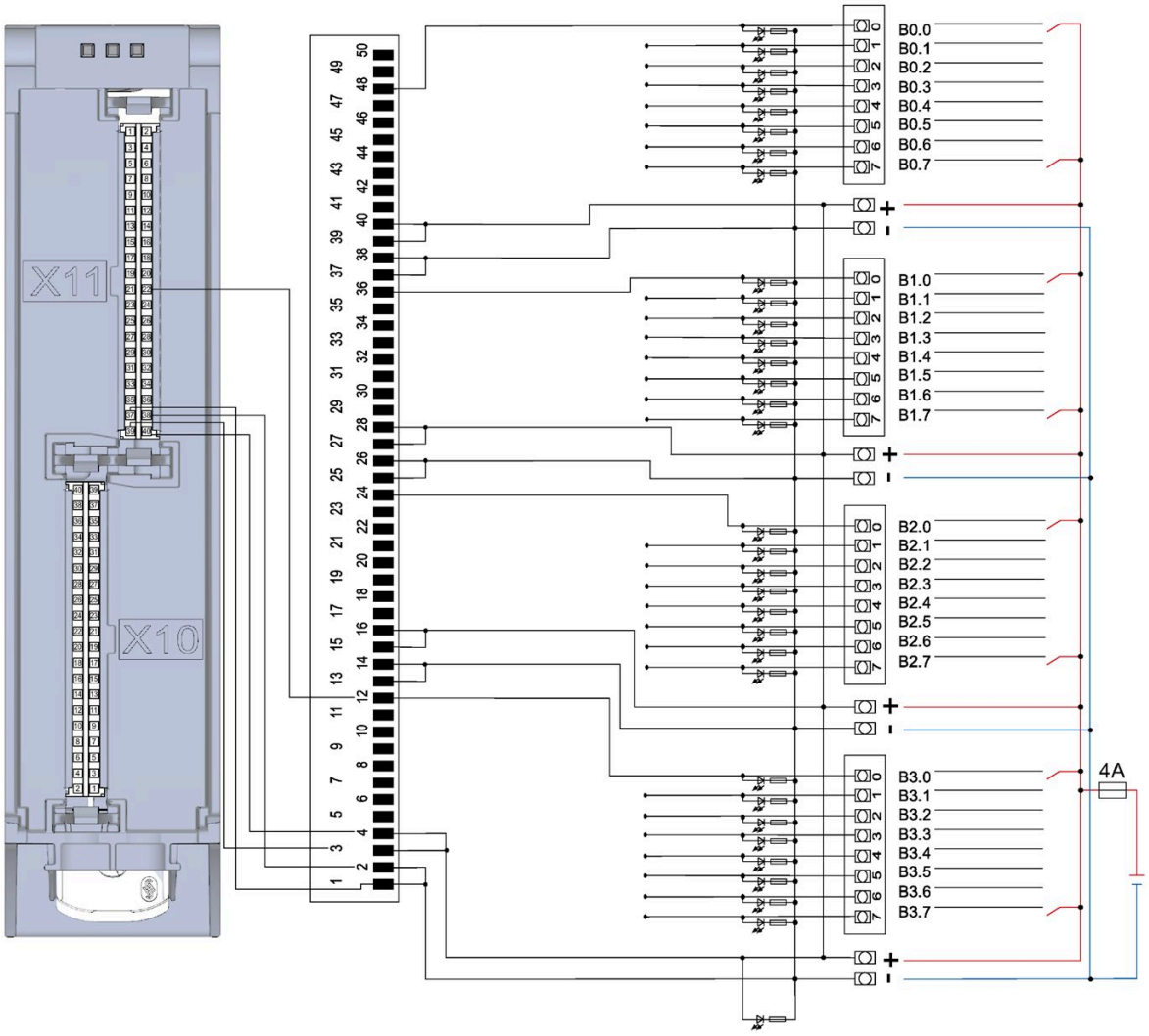


Figure 3-6 "Sinking" mode

Address space

4

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

Configuration options of DI 64x24VDC SNK/SRC 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 short designations/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 the hardware catalog of STEP 7 (TIA Portal) as of V16 and HSP 0319	GSD file in STEP 7 (TIA Portal) V12 or higher or STEP 7 V5.5 SP3 or higher
1 x 64-channel without value status	DI 64x24VDC SNK/SRC BA	X	X
8 x 8-channel without value status	DI 64x24VDC SNK/SRC BA S	X (PROFINET IO only)	X (PROFINET IO only)
1 x 64-channel with value status for module-internal Shared Input (MSI) with up to 4 sub-modules	DI 64x24VDC SNK/SRC BA MSI	X (PROFINET IO only)	X (PROFINET IO only)

Address space for configuration as 1 x 64-channel DI 64x24VDC SNK/SRC BA

The figure below shows the address space assignment for configuration as a 1 x 64-channel module. You can freely assign the start address for the module. The addresses of the channels are derived from the start address.

"IB a" for example, stands for module start address input byte a.

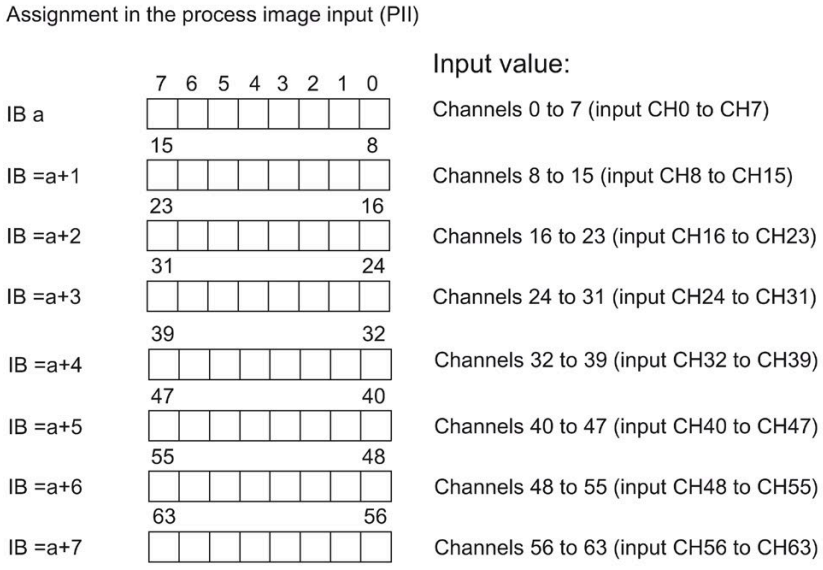


Figure 4-1 Address space for configuration as 1 x 64-channel DI 64x24VDC SNK/SRC BA

Address space for configuration as 8 x 8-channel DI 64x24VDC SNK/SRC BA S

For the configuration as an 8 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 IO controllers depends on the interface module used. Please observe the information in the manual for the particular interface module.

Unlike the 1 x 64-channel module configuration, each of the eight submodules has a freely assignable start address.

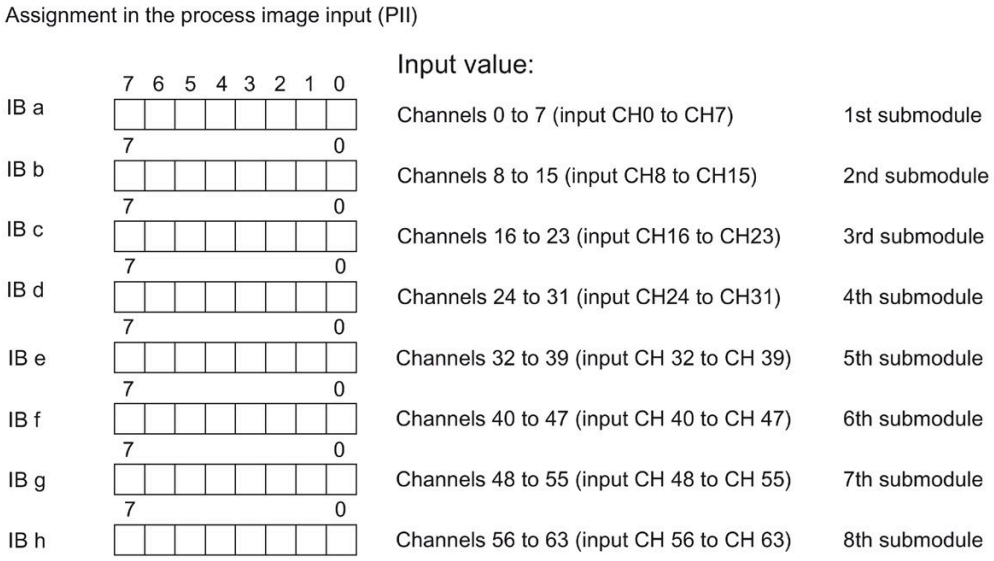


Figure 4-2 Address space for configuration as 8 x 8-channel DI 64x24VDC SNK/SRC BA S

Address space for configuration as 1 x 64-channel DI 64x24VDC SNK/SRC BA MSI

The channels 0 to 63 of the module are copied in up to 4 submodules for the configuration as 1 x 64-channel module (module-internal shared input, MSI). Channels 0 to 63 are then available with identical input values in various submodules. These submodules can be assigned to up to four IO controllers when the module is used in a shared device. Each IO controller has read access to the same channels.

The number of usable IO controllers depends on the interface module used. Please 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 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).

The figure below shows the assignment of the address space with submodules 1 and 2.

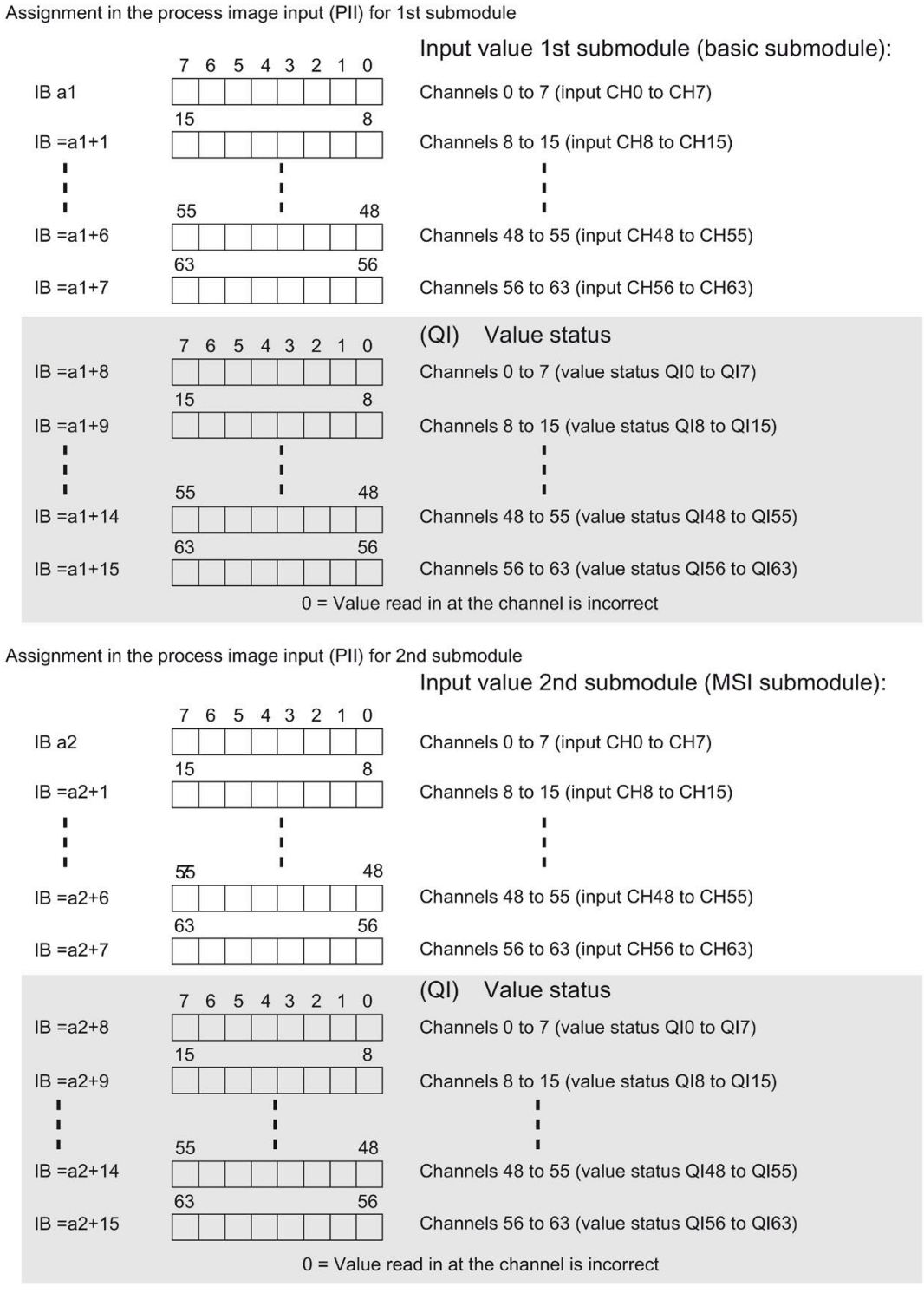


Figure 4-3 Address space for configuration as 1 x 64-channel DI 64x24VDC SNK/SRC BA MSI with value status

The figure below shows the assignment of the address space with submodules 3 and 4.

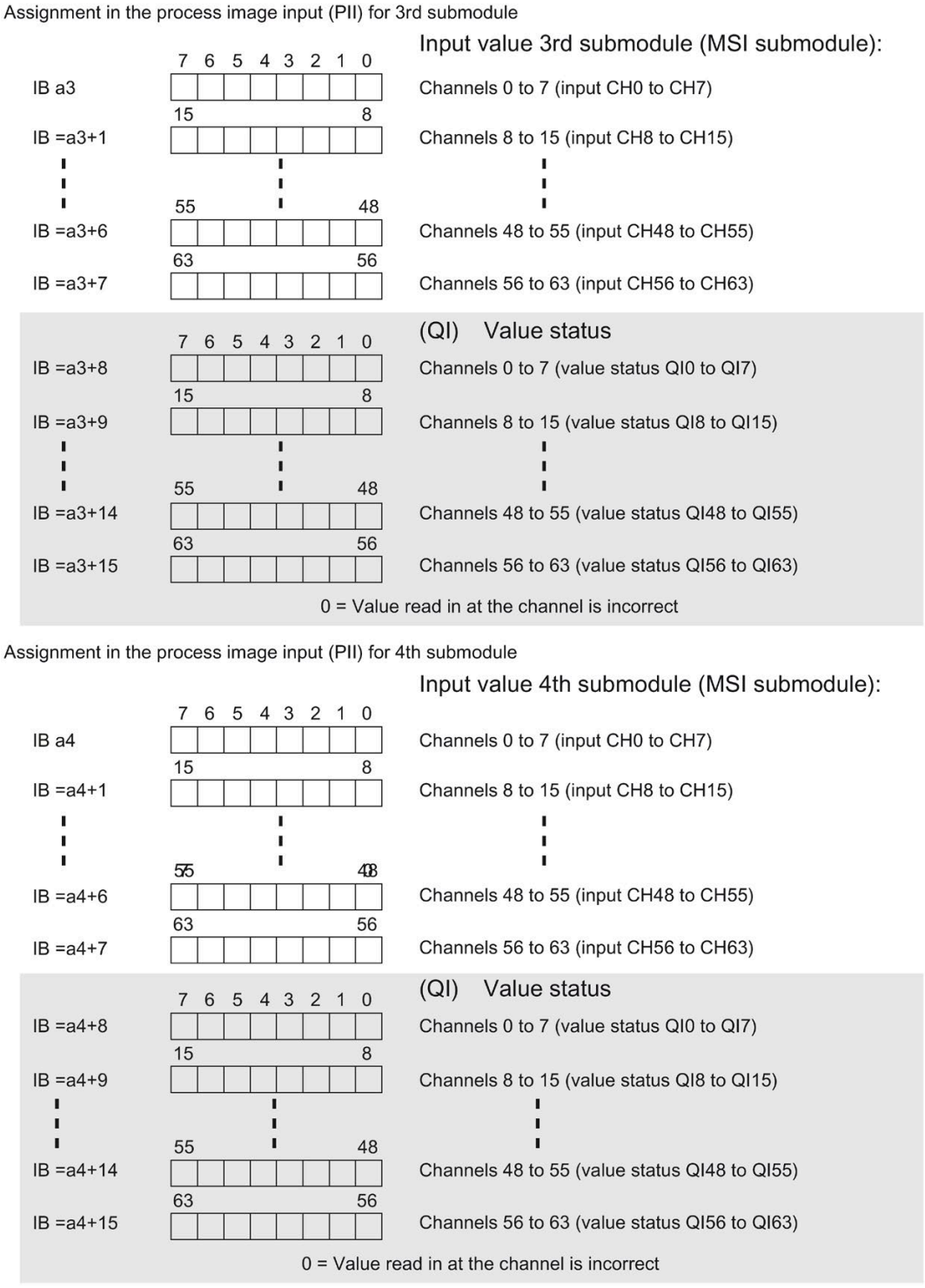


Figure 4-4 Address space for configuration as 1 x 64-channel DI 64x24VDC SNK/SRC BA MSI with value status

Reference

You can find information on the Shared Input/Output (MSI/MSO) function in the section Module-Internal Shared Input/Output (MSI/MSO) of the PROFINET with STEP 7 V16 (https://support.industry.siemens.com/cs/ww/en/view/49948856) function manual.

Diagnostic alarms

5

5.1 Status and error displays

LED displays

The figure below shows the LED displays (status and error displays) of the DI 64x24VDC SNK/SRC BA.

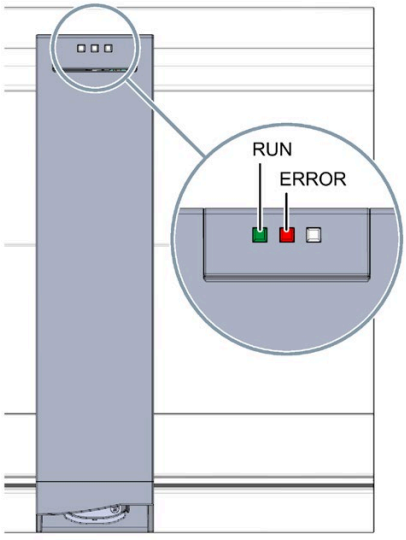


Figure 5-1 LED display of the module DI 64x24VDC SNK/SRC BA

Meaning of the LED displays

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

RUN and ERROR LED

Table 5- 1 Status and error displays RUN and ERROR

LED		Meaning	Remedy
RUN	ERROR		
Off	Off	Voltage missing or too low at backplane bus	• Switch on the CPU and/or the system power supply modules. • Verify that the U connectors are inserted. • Check whether too many modules are inserted.
Flashes	Off	Module starts up	---
On	Off	Module is ready	
Flashes	Flashes	Hardware defective	Replace the module.

Technical specifications

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Technical specifications of DI 64x24VDC SNK/SRC BA

The following table shows the technical specifications as of 07/2020. You can find a data sheet including daily updated technical specifications on the Internet (https://support.industry.siemens.com/cs/ww/en/ps/td).

Enter the article number or the short designation of the module on the website.

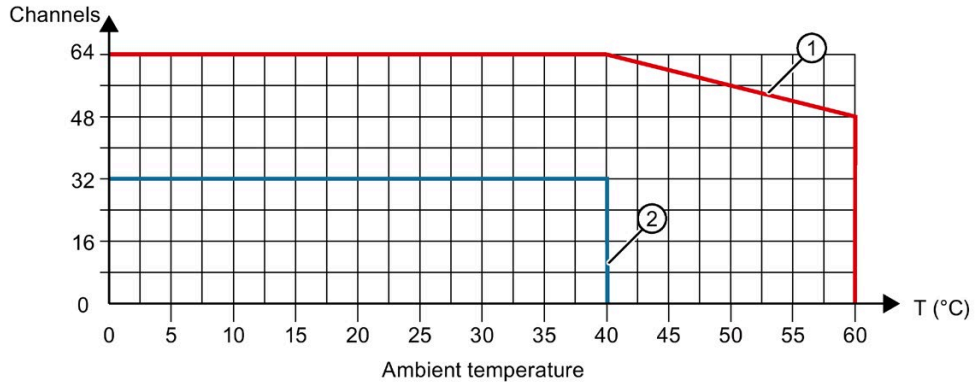
Article number	6ES7521-1BP00-0AA0
General information	
Product type designation	DI 64x24VDC BA
HW functional status	From FS01
Firmware version	V1.0.0
• FW update possible	Yes
Product function	
• I&M data	Yes; I&M0 to I&M3
• Isochronous mode	No
• Prioritized startup	No
Engineering with	
• STEP 7 TIA Portal configurable/integrated from version	V16 with HSP 0319 / V17
• STEP 7 configurable/integrated from version	V5.5 SP3 / -
• PROFIBUS from GSD version/GSD revision	V1.0 / V5.1
Operating mode	
• DI	Yes
• Counter	No
• Oversampling	No
• MSI	Yes
Power	
Power available from the backplane bus	0.6 W
Power loss	
Power loss, typ.	4.8 W
Digital inputs	
Number of digital inputs	64
Digital inputs, parameterizable	No
Source/sink input	Yes
Input characteristic curve in accordance with IEC 61131, type 3	Yes

Article number	6ES7521-1BP00-0AA0
Number of simultaneously controllable inputs	
• Number of simultaneously controllable inputs	64; see additional description in the manual
Input voltage	
• Rated value (DC)	24 V
– 24 V DC	Yes
• for signal "0"	-30 to +5 V
• for signal "1"	+11 to +30V
Input current	
• for signal "1", typ.	2.7 mA
Input delay (for rated value of input voltage) for standard inputs	
– parameterizable	No
– at "0" to "1", min.	3 ms
– at "0" to "1", max.	4 ms
– at "1" to "0", min.	3 ms
– at "1" to "0", max.	4 ms
for interrupt inputs	
– parameterizable	No
for technological functions	
– parameterizable	No
Cable length	
• shielded, max.	1 000 m
• unshielded, max.	600 m
Encoder	
Connectable encoders	
• 2-wire sensor	Yes
– permissible quiescent current (2-wire sensor), max.	1.5 mA
Interrupts/diagnostics/status information	
Diagnostics function	No
Alarms	
• Diagnostic alarm	No
• Hardware interrupt	No
Diagnostic messages	
• Monitoring the supply voltage	No
• Wire-break	No
• Short-circuit	No
• Group error	No

Article number	6ES7521-1BP00-0AA0
Diagnostics indication LED	
• RUN LED	Yes; green LED
• ERROR LED	Yes; red LED
• MAINT LED	No
• Monitoring of the supply voltage (PWR-LED)	Yes; via SIMATIC TOP connect connection module
• Channel status display	Yes; via SIMATIC TOP connect connection module
• for channel diagnostics	No
• for module diagnostics	No
Potential separation	
Potential separation channels	
• between the channels	No
• between the channels, in groups of	16; 32 when using SIMATIC TOP connect connection module
• between the channels and backplane bus	Yes
Isolation	
Isolation tested with	707 V DC (type test)
Standards, approvals, certificates	
Suitable for safety functions	No
Ambient conditions	
Ambient temperature during operation	
• horizontal installation, min.	-30 °C
• horizontal installation, max.	60 °C
• vertical installation, min.	-30 °C
• vertical installation, max.	40 °C
Altitude during operation relating to sea level	
• Installation altitude above sea level, max.	5 000 m
Dimensions	
Width	35 mm
Height	147 mm
Depth	129 mm
Weights	
Weight, approx.	250 g
Other	
Note:	Please order cable and connection modules separately

Power reduction (derating) depending on the mounting position and ambient temperature (per module)

The following graphs show the number of channels that can be used simultaneously depending on the mounting position of the S7-1500/ET 200MP automation system and the ambient temperature.



① Horizontal mounting of the system
② Vertical mounting of the system

Figure 6-1 Information on channels used simultaneously (per module)

Dimensional drawing

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

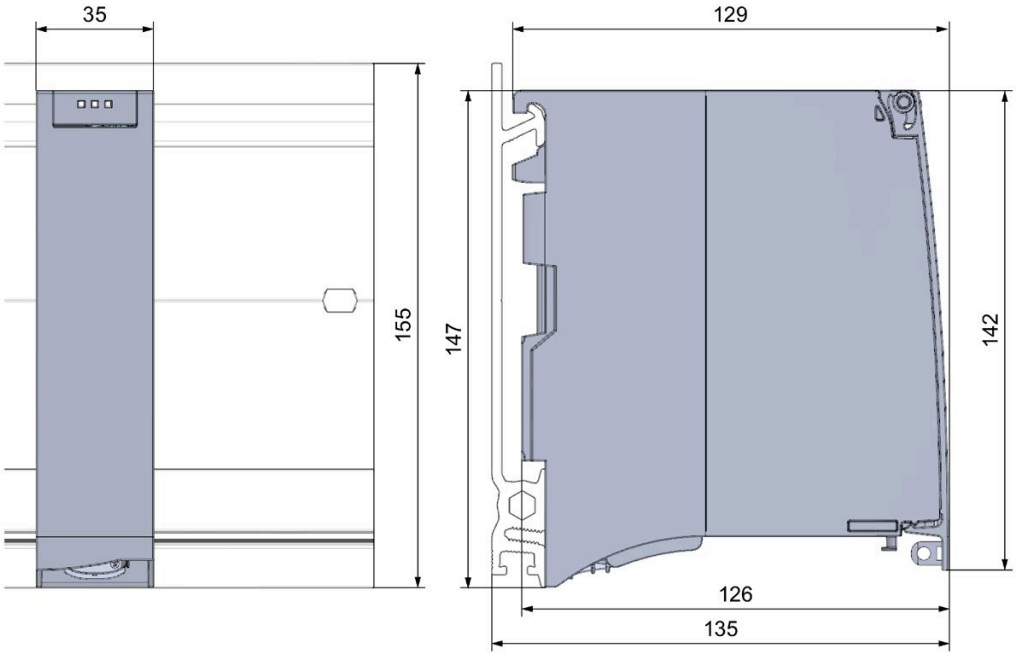

Figure A-1 Dimensional drawing of the DI 64x24VDC SNK/SRC BA module

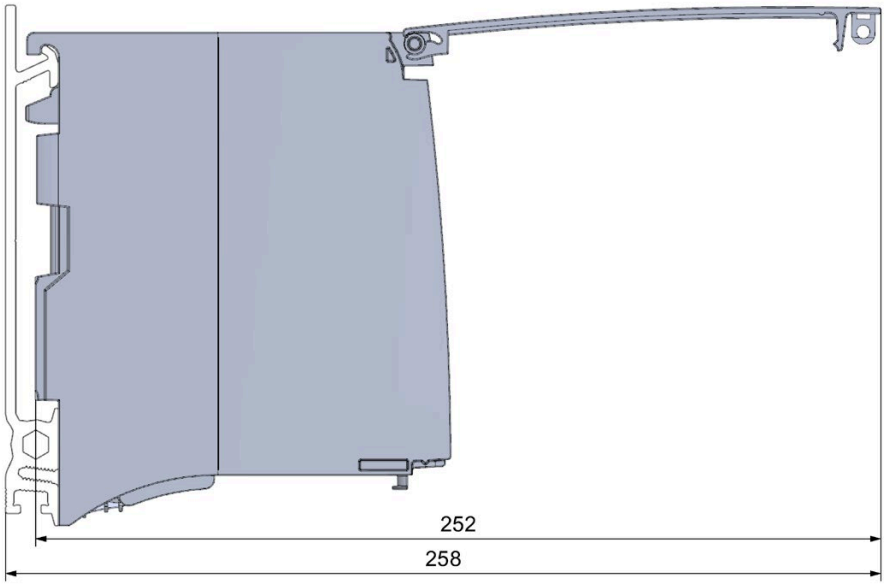

Figure A-2 Dimension drawing of the DI 64x24VDC SNK/SRC BA module, side view with open front cover