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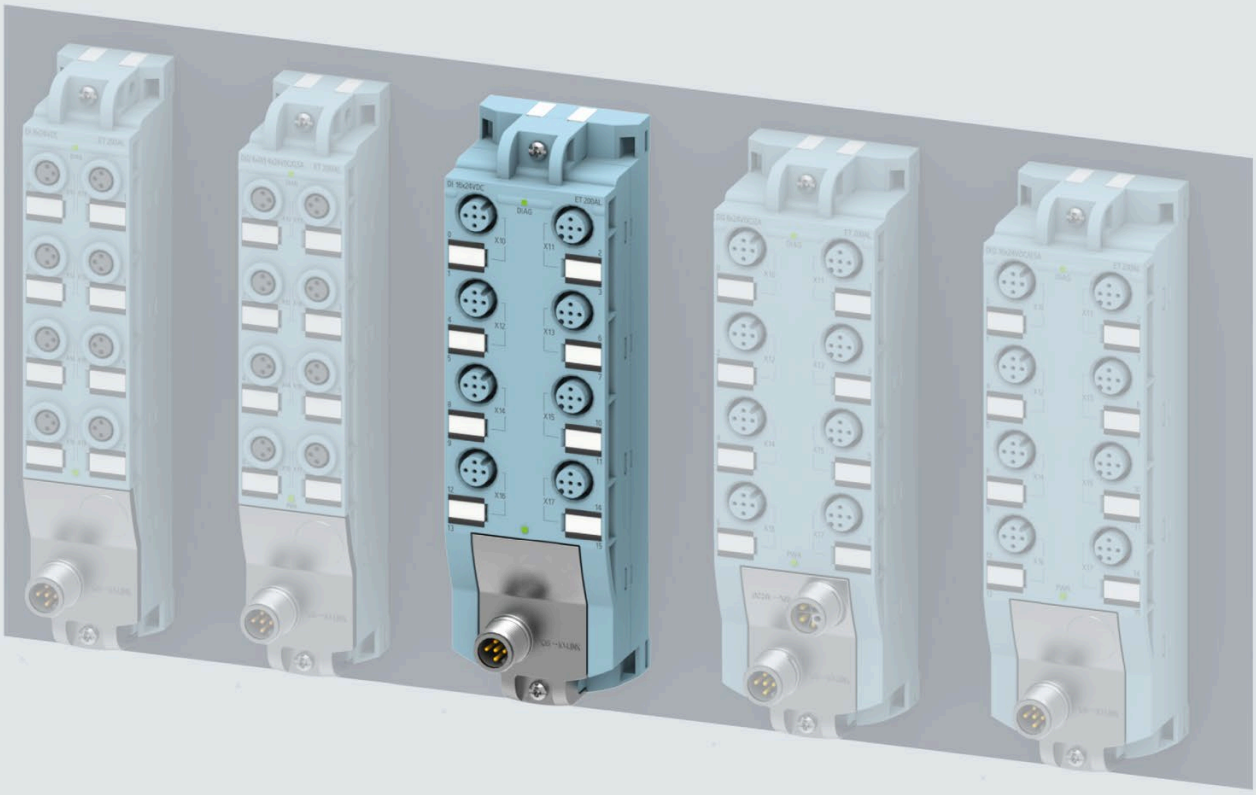

Manual

SIMATIC

ET 200AL

IO-Link Digital Input module DI 16x24VDC 8xM12
(6ES7141-5AH00-0BL0)

Edition 08/2021

support.industry.siemens.com

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SIMATIC

ET 200AL
IO-Link digital input module
DI 16x24VDC 8xM12
(6ES7141-5AH00-0BL0)

Equipment Manual

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Preface

Preface IO-Link module AL

Purpose of the documentation

This manual supplements the system manual ET 200AL IO-Link (https://support.automation.siemens.com/WW/view/en/109773203). Functions that generally relate to the distributed I/O system ET 200AL IO-Link I/O modules are described in this manual.

The information provided in this manual and in the system manual and function manuals supports you in commissioning the ET 200AL IO-Link I/O modules.

Changes compared to the previous version

This manual contains the following changes compared to the previous version:

- Supplements in the section Parameters (Page 15)

Conventions

Also observe notes labeled as follows:

Note

Indicates important product information to which particular attention should be paid.

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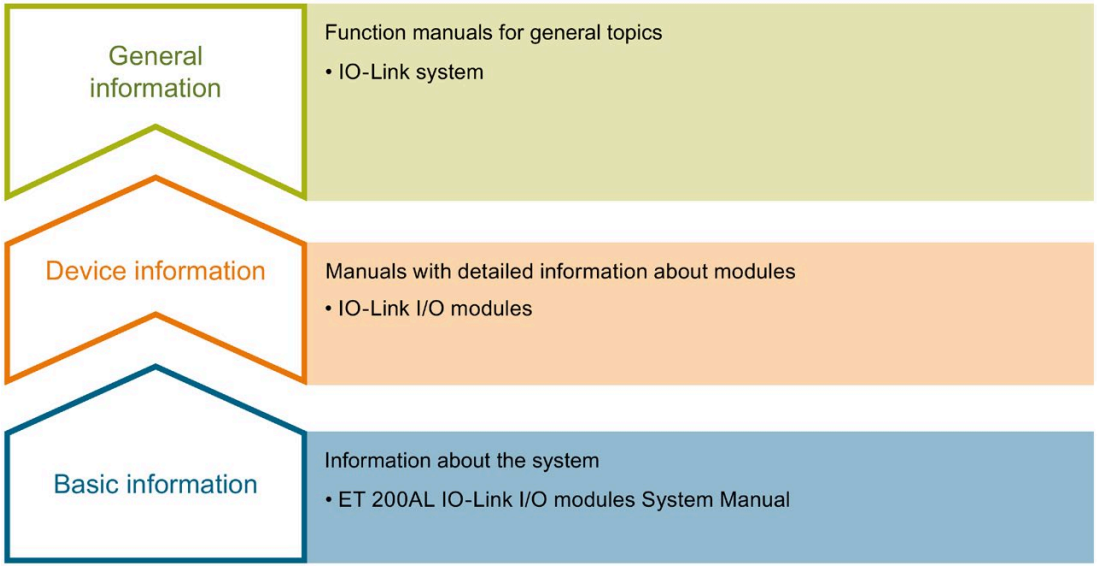
ET 200AL IO-Link I/O modules Documentation Guide

1

The documentation for the SIMATIC ET 200AL IO-Link I/O modules is arranged into three areas.
This arrangement enables you to access the specific content you require.



Basic information

The system manual describes in detail the configuration, installation, wiring and commissioning of the distributed I/O system SIMATIC ET 200AL IO-Link I/O modules.

Device information

Equipment 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 IO-Link system.

You can download the documentation free of charge from the Internet (https://support.industry.siemens.com/cs/ww/en/view/109742667).

ET 200AL Manual Collection

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

You can find the Manual Collection on the Internet (https://support.automation.siemens.com/WW/view/en/95242965).

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In the CAx data area of "mySupport", you can access the latest product data for your CAx or CAe system.

You configure your own download package with a few clicks.

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 "mySupport" CAx data on the Internet (https://support.industry.siemens.com/my/ww/en/CAxOnline).

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/cs/ww/en/ps/ae).

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 (https://support.industry.siemens.com/cs/ww/en/view/109767888).

PRONETA

SIEMENS PRONETA (PROFINET network analysis) allows you to analyze the plant network during commissioning. PRONETA has two core functions:

- The topology overview automatically scans the PROFINET and all connected components.
- The IO check is a fast test of the wiring and the module configuration of a plant.

You can find SIEMENS PRONETA on the Internet (https://support.industry.siemens.com/cs/ww/en/view/67460624).

SIMATIC S7-PCT

The Port Configuration Tool ("PCT") is PC-based software for the parameter assignment of Siemens IO-Link master-modules and IO-Link devices from any manufacturer.

The IO-Link devices are integrated using the standardized device description "IODD" that is available from the respective device manufacturer. S7-PCT supports the version 1.0 as well as V1.1 of the IODD.

S7-PCT is called via the hardware configuration of the IO-Link masters from STEP 7; however, it can also be started as "standalone" if the IO-Link master is not operated on a SIMATIC controller or when STEP 7 is not used.

You can find additional information on IO-Link on the Internet (https://new.siemens.com/global/en/products/automation/industrial-communication/io-link.html).

Product overview

2

2.1 Properties

Article number

6ES7141-5AH00-0BL0

View of the module

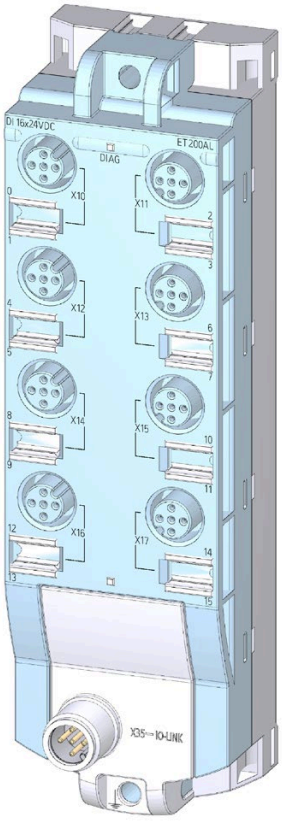


Figure 2-1 View of the DI 16x24VDC 8xM12 IO-Link digital input module

Properties

The module has the following technical properties:

- 16 digital inputs
- M12 sockets for connection of sensors
- 24 V DC supply voltage
- Configurable diagnostics can be set for each module
- Typical input delay of 3 ms
- Suitable for switches and proximity switches
- Dimensions 45 x 159 mm

Interface for IO-Link and power supply:

- M12 connector A-coded
- IO-Link Port Class A
- Supply of the module electronics
- Encoder supply

The module supports the following functions:

- Firmware update
- IO-Link profile: General profile

Accessories

The following components are included in the module package:

- Identification labels

Other components

The following component can be ordered as spare part:

- Identification labels

The following components can be ordered as accessories:

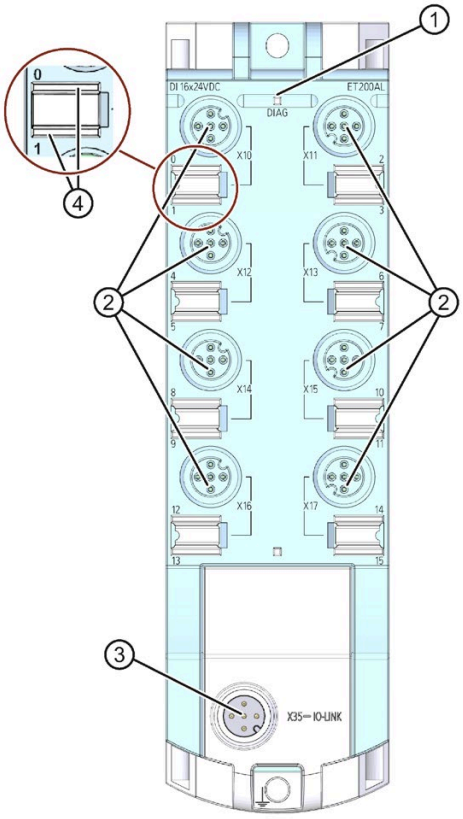
- Connectors
- Cables
- M12 sealing cap

See also

You can find more information on accessories in the Accessories/spare parts section of the ET 200AL distributed I/O system (https://support.automation.siemens.com/WW/view/en/109773203) IO-Link I/O modules system manual.

2.2 Operator controls and display elements

The figure below shows the operator controls and display elements of the DI 16x24VDC 8xM12 IO-Link digital input module.



① DIAG: LED display for the diagnostic status
② X10 to X17: Sockets for the input signal
③ X35: IO-Link interface
④ LED displays 0 to 15 for the channel status

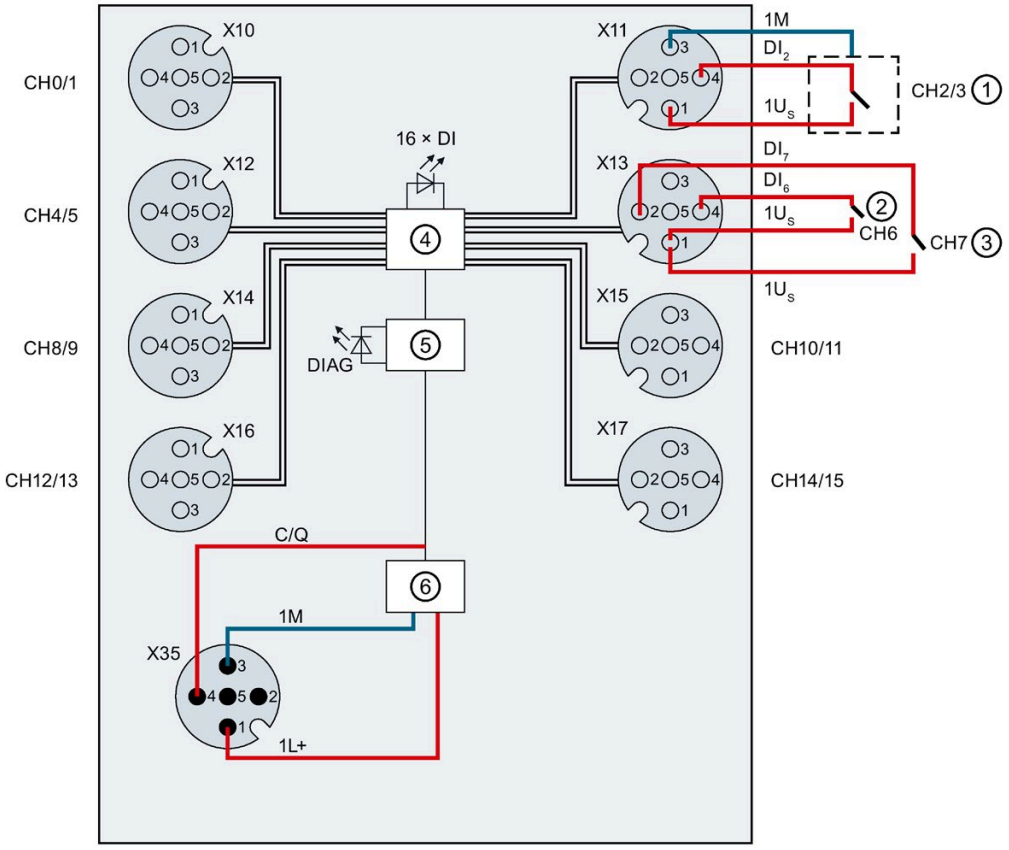
Figure 2-2 Operator controls and display elements

Wiring

3

3.1 Terminal and block diagram

The figure below shows an example of the pin assignment of signal inputs with 2-wire and 3-wire connection.



①	3-wire connection	1L+	Supply voltage 1L+ (non-switched)
②	2-wire connection	1M	Ground 1M (non-switched)
③	2-wire connection	1Us	24 V encoder supply
④	DI circuit	DIn	Input signal
⑤	Microcontroller	DI	Channel status LEDs (0 to 15) (green)
⑥	Internal supply voltage	DIAG	Diagnostic status LED (red/green)
X10 to X17	Channels 0 to 7		
X35	IO-Link interface		

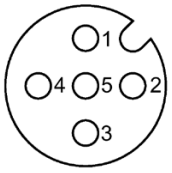
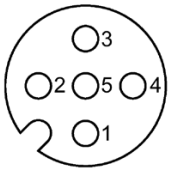
Figure 3-1 Terminal and block diagram

3.2 Pin assignment

Pin assignment of the sockets for digital inputs

The table below shows the pin assignment of the 8 sockets for the connection of digital inputs.

Table 3- 1 Pin assignment for digital inputs

Pin	Assignment	Front view of the sockets	
	X10 to X17 sockets for digital inputs	**X10, X12, X14, X16**	**X11, X13, X15, X17**
1	24 V encoder supply 1U_S (derived from 1L+ non-switched)		
2	Input signal DI_1: Connector X10 Input signal DI_3: Connector X11 Input signal DI_5: Connector X12 Input signal DI_7: Connector X13 Input signal DI_9: Connector X14 Input signal DI_{11}: Connector X15 Input signal DI_{13}: Connector X16 Input signal DI_{15}: Connector X17		
3	Encoder supply ground 1M		
4	Input signal DI_0: Connector X10 Input signal DI_2: Connector X11 Input signal DI_4: Connector X12 Input signal DI_6: Connector X13 Input signal DI_8: Connector X14 Input signal DI_{10}: Connector X15 Input signal DI_{12}: Connector X16 Input signal DI_{14}: Connector X17		
5	Functional earth FE		

NOTICE

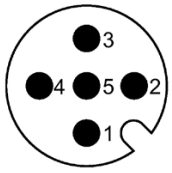
24 V encoder supply 1U_S

Use only the 24 V encoder supply 1U_S provided by the digital input module to supply power to the encoder.

Pin assignment of the IO-Link connector

The following table shows the pin assignment of the connector for the IO-Link connection. The IO-Link interface corresponds to the specification according to Port Class A.

Table 3- 2 Pin assignment of the IO-Link interface

Pin	Assignment X35	Front view of the connector (Port Class A)
1	1L+	
2	Unassigned	
3	Ground 1M	
4	Switching and communication cable (C/Q)	
5	Unassigned	

Note

Note that the module can only be supplied with a protective low voltage according to the standard SELV/PELV.

Parameters/address space

4

4.1 Parameters

The following table shows the parameters for the DI 16x24VDC 8xM12 IO-Link digital input module.

Table 4- 1 Parameters

Parameters	Value range			Default	Scope	ISDU index (hexadecimal)	ISDU subindex (hexadecimal)
	Value	Dec.	Hex.				
Diagnostics: Short-circuit to ground	Disable	0	0	Disable	Module	131	1
	Enable	255	FF				

4.2 Explanation of the parameters

Diagnostics: Short-circuit to ground

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

4.3 Address space

The figure below shows the assignment of the address space for the DI 16x24VDC 8xM12 IO-Link digital input module.

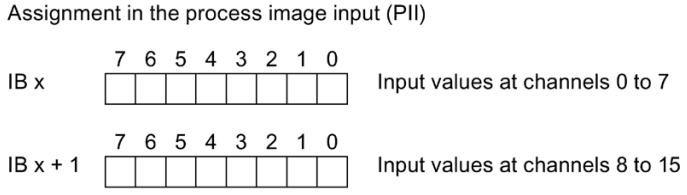


Figure 4-1 Address space IO-Link DI 16x24VDC 8xM12

4.4 IODD parameters

Device description IODD

An electronic device description is available for the DI 16x24VDC 8xM12 IO-Link digital input module, the IODD file (IO Device Description). The IODD provides a wealth of information for system integration:

- Communication properties
- Device parameters with value range and default value
- Identification, process and diagnostic data
- Device data
- Text description
- Image of the device
- Manufacturer logo

The structure of the IODD is identical for all devices from all manufacturers. The structure of the IODD is always represented in the same manner by the IO-Link Configuration Tool of the master manufacturer (for Siemens, S7-PCT). This ensures that the handling is the same for all IO-Link devices regardless of the manufacturer.

IODDfinder

The IODDfinder is a cross-vendor, central IO-Link database.
This database provides you with the latest IODDs of the device manufacturers and offers an information and download platform.
The IODDfinder is available on the Internet (https://ioddfinder.io-link.com).

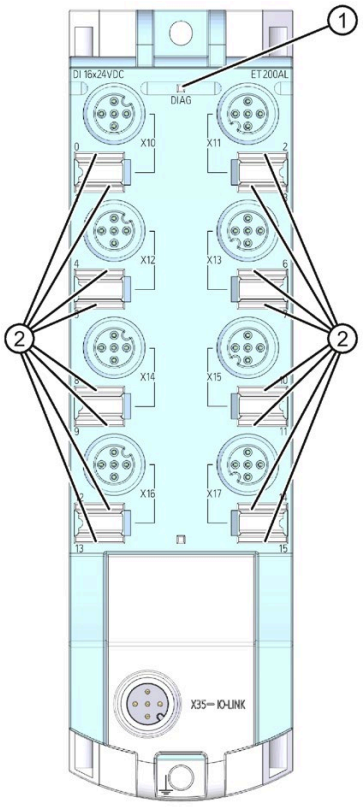
Interrupts/diagnostic alarms

5

5.1 Status and error displays

LED displays

The figure below shows the LED displays (status and error displays) of the DI 16x24VDC 8xM12 IO-Link digital input module.



① Diagnostic status (DIAG) (red/green)
② Channel status (0 to 15) (green)

Figure 5-1 LED displays

Meaning of the LEDs

The following tables set out the meaning of the status and error displays. Corrective measures for diagnostics alarms can be found in section Diagnostics alarms (Page 19).

DIAG LED

Table 5- 1 Error display of the DIAG LED

DIAG LED	Meaning
Off	No supply voltage 1L+
Flashes	• No data exchange with the IO-Link master (e.g. wire break) • Firmware is loading
On	Module is currently exchanging data with the IO-Link master and no module diagnostics
Flashes	Module is currently exchanging data with the IO-Link master and module diagnostics

LED channel status

Table 5- 2 LED channel status display

LED channel status	Meaning
Off	Process signal = 0
On	Process signal = 1

5.2 Interrupts

The DI 16x24VDC 8xM12 IO-Link digital input module supports diagnostic interrupts.

Diagnostic interrupt

The digital input module generates a diagnostic interrupt at the following events:

- Short-circuit of encoder supply to ground

5.3 Diagnostics alarms

For each diagnostic event, a diagnostics alarm is issued and the LED DIAG flashes red on the digital input module. You can read out the diagnostics alarms, for example, from the status of the IO-Link master. You can evaluate the error codes with the user program.

Table 5- 3 Diagnostics alarms, their meanings and corrective measures

Diagnostics alarm	Error code	Meaning	Remedy
Short-circuit	0x7710	Short-circuit of an encoder supply to ground	Eliminate the short-circuit

Note

Short-circuit at the sensor supply

A short-circuit at the sensor supply can cause wire break diagnostics of the IO-Link Master. The behavior depends on the technical specifications of the IO-Link Master used.

Technical specifications

6

Technical specifications of the DI 16x24VDC 8xM12 IO-Link digital input module

The following table shows the technical specifications as of the issue date. You can find a data sheet including daily updated technical specifications on the Internet (https://support.industry.siemens.com/cs/de/en/pv/6ES7141-5AH00-0BL0/td?dl=en).

Article number	6ES7141-5AH00-0BL0
General information	
Product type designation	DI 16x24VDC
HW functional status	FS01
Firmware version	V1.0.x
Vendor identification (VendorID)	42
Device identifier (DeviceID)	229380
Engineering with	
• IODD file	Yes
Supply voltage	
Load voltage 1L+	
• Rated value (DC)	24 V; Supply from 1Us+ of the IO-Link master
• permissible range, lower limit (DC)	18 V
• permissible range, upper limit (DC)	30 V
• Reverse polarity protection	Yes; Against destruction; encoder power supply outputs applied with reversed polarity
Input current	
Current consumption (rated value)	20 mA; without load
Encoder supply	
Number of outputs	8; Supply from 1Us+ of the IO-Link master
24 V encoder supply	
• Short-circuit protection	Yes; per module, electronic
• Output current, max.	0.7 A; Total current of all encoders (depending on IO-Link master supply via 1Us+)
Power loss	
Power loss, typ.	2.4 W
Digital inputs	
Number of digital inputs	16
Input characteristic curve in accordance with IEC 61131, type 3	Yes
Number of simultaneously controllable inputs all mounting positions	
– up to 55 °C, max.	16

Article number	**6ES7141-5AH00-0BL0**
Input voltage	
• Rated value (DC)	24 V
• for signal "0"	-30 to +5 V
• for signal "1"	+11 to +30V
Input current	
• for signal "1", typ.	3 mA
Input delay (for rated value of input voltage) for standard inputs	
– at "0" to "1", min.	1.2 ms
– at "0" to "1", max.	4.8 ms
– at "1" to "0", min.	1.2 ms
– at "1" to "0", max.	4.8 ms
Cable length	
• unshielded, max.	30 m
Encoder	
Connectable encoders	
• 2-wire sensor	Yes
– permissible quiescent current (2-wire sensor), max.	1.5 mA
IO-Link	
IO-Link protocol 1.1	Yes
Transmission rate	38.4 kBd (COM2)
Cycle time, min.	2.5 ms
Size of process data, input per module	2 byte
Size of process data, output per module	0 byte
Supported IO-Link profiles	common profile
Cable length unshielded, max.	20 m
Connection of IO-Link devices	
• Port type A	Yes
Interrupts/diagnostics/status information	
Alarms	
• Diagnostic alarm	Yes; Parameterizable
Diagnoses	
• Short-circuit	Yes; Sensor supply to M; module by module
Diagnostics indication LED	
• Channel status display	Yes; green LED
• for module diagnostics	Yes; green/red LED

Article number	6ES7141-5AH00-0BL0
Potential separation	
Potential separation channels	
• between the channels	No
• between the channels and the power supply of the electronics	No
Isolation	
Isolation tested with	707 V DC (type test)
Degree and class of protection	
IP degree of protection	IP65/67
Ambient conditions	
Ambient temperature during operation	
• min.	-30 °C
• max.	55 °C
Dimensions	
Width	45 mm
Height	159 mm
Depth	40 mm
Weights	
Weight, approx.	155 g

Dimension drawing

A

The figure below shows the dimension drawing of the DI 16x24VDC 8xM12 IO-Link digital input module in front and side view.

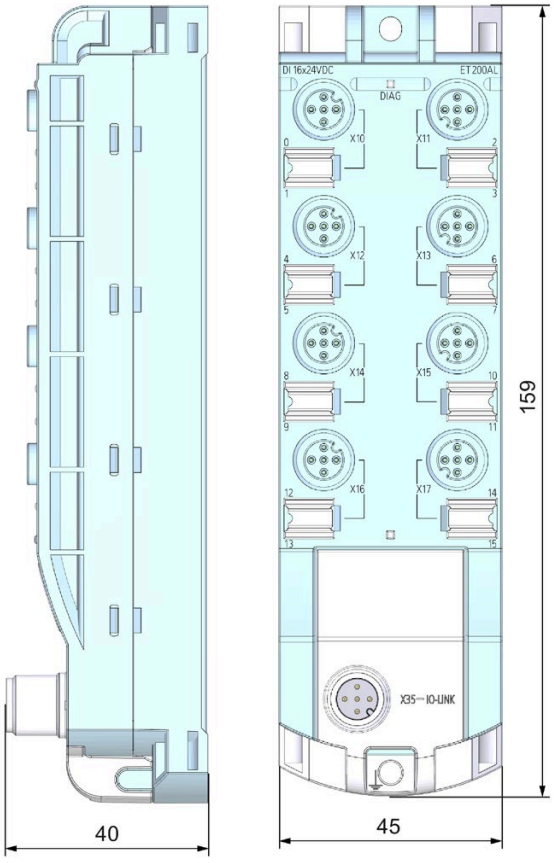


Figure A-1 Dimension drawing