MANUFACTURER DOCUMENT PACKAGE

Manufacturer's Manual

Selected official pages for procurement and maintenance review

PRODUCT BRAND

Siemens

PRODUCT MODEL

6ES7131-6BH00-0BA0

ET 200SP 16-Channel Digital Input. Relevant section pages: 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23. Adjacent model text on shared pages is outside this product reference.

OFFICIAL SOURCE

Digital input module DI 16x24VDC ST (6ES7131-6BH00-0BA0); 12/2015, A5E03573442-AD

Siemens original documentation and product reference

Original Siemens December 2015 manual, retrieved from a public document archive. The archive is not a Siemens-hosted website. The later -01 model manual is not substituted.

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SIEMENS

SIMATIC

ET 200SP
Digital input module
DI 16x24VDC ST
(6ES7131-6BH00-0BA0)

Manual

Preface

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Parameter data record A

12/2015

A5E03573442-AD

Legal information

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indicates that minor personal injury can result if proper precautions are not taken.

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Preface

Purpose of the documentation

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

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

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

Conventions

CPU: When the term "CPU" is used in this manual, it applies to the CPUs of the S7-1500 automation system as well as to the CPUs/interface modules of the ET 200SP distributed I/O system.

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

Please also observe notes marked as follows:

Note

A note contains important information on the product described in the documentation, on the handling of the product or on the section of the documentation to which particular attention should be paid.

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Product overview

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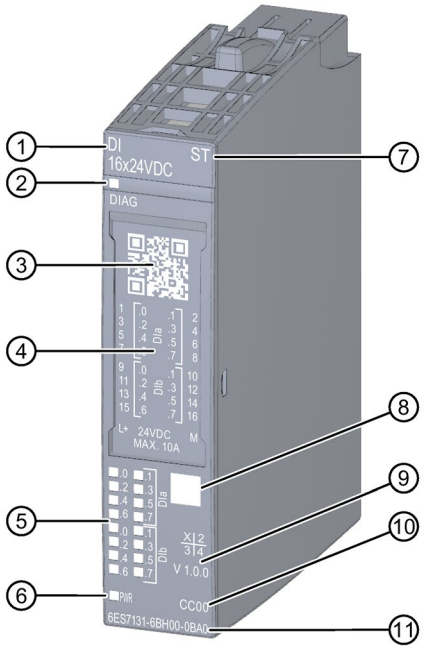
2.1 Properties

Article number

6ES7131-6BH00-0BA0 (packaging unit: 1 unit)

6ES7131-6BH00-2BA0 (packaging unit: 10 units)

View of the module



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

Image 2-1 View of the module DI 16×24VDC ST

Properties

The module has the following technical properties:

- Digital input module with 16 inputs
- Sink input, (PNP, P-reading)
- Supply voltage L+
- Configurable input delay 0.05 to 20 ms (per channel)
- Configurable diagnostics (per module)
- Suitable for connection of switches and 2-wire sensors in accordance with IEC 61131, type 3

The module supports the following functions:

- Firmware update
- I&M identification data
- Configuration in RUN

Table 2- 1 Version dependencies of other module functions

Function	Product version of the module as of	Firmware version of the module as of
Value status	1	V1.1.0

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

Accessories

The following accessories must be ordered separately:

- Labeling strips
- Color identification labels
- Reference identification label
- Shield connector

See also

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

Connecting

3

3.1 Wiring and block diagram

This section includes the block diagram of the DI 16x24VDC ST module with the terminal assignments for a 1-wire connection.

Information on wiring the BaseUnit can be found in the system manual ET 200SP distributed I/O system (http://support.automation.siemens.com/WW/view/en/58649293).

Note

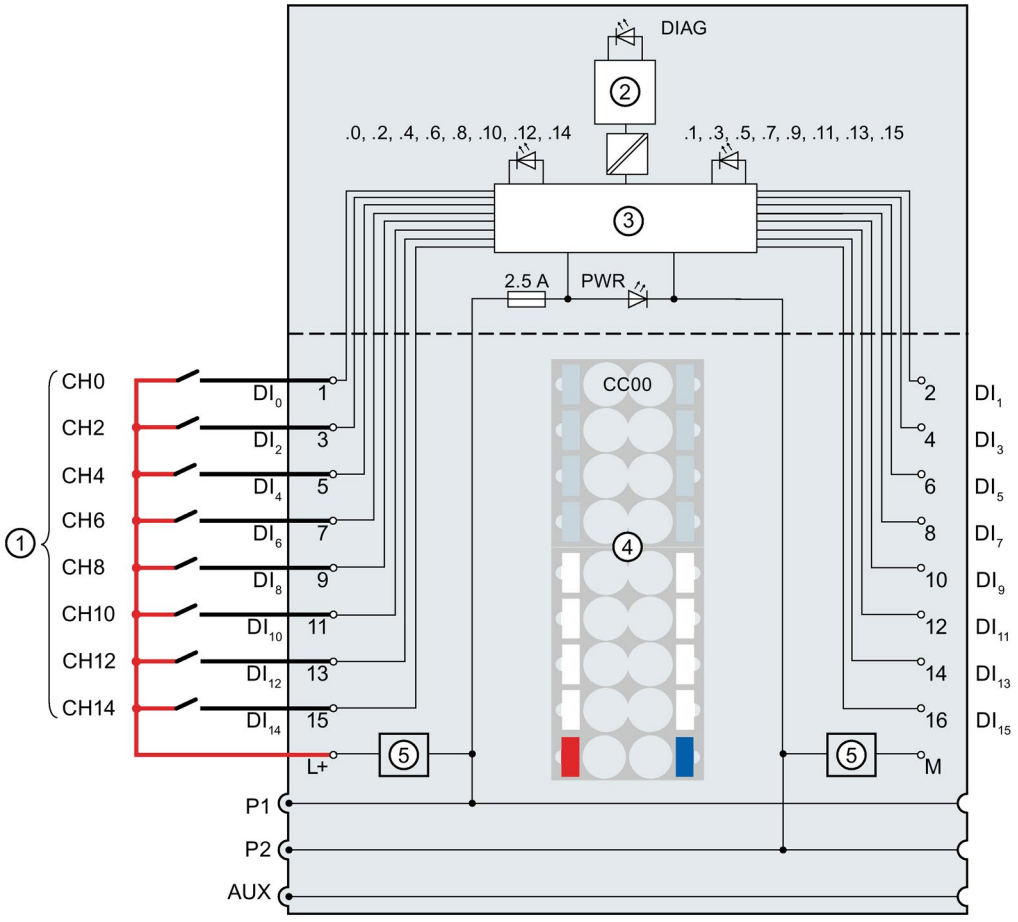
The load group of the module must begin with a light-colored BaseUnit. Keep this in mind also during the configuration.

Note

Make sure that you only use digital modules with BaseUnit type A0 during commissioning.

Wiring: 1-wire connection

The following figure shows the block diagram and an example of the terminal assignment of the digital input module DI 16x24VDC ST on the BaseUnit BU type A0 without AUX terminals (1-wire connection).



①	1-wire connection	DI_n	Input signal, channel n
②	Backplane bus interface	L+	24 V DC (infeed only with light-colored BaseUnit)
③	Input electronics	M	Ground
④	Color-coded label with color code CC00 (optional)	DIAG	Error or diagnostics LED (green, red)
⑤	Filter connection supply voltage (only when light-colored BaseUnit is present)	.0 to .15	Channel status LED (green)
P1, P2, AUX	Internal self-assembling voltage buses Connection to left (dark-colored BaseUnit) Connection to left interrupted (light-colored BaseUnit)	PWR	Power LED (green)

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

Parameters/address space

4

4.1 Parameters

Parameters for DI 16x24VDC ST

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

- Central operation with an ET 200SP CPU
- Distributed operation on PROFINET IO in an ET 200SP system
- Distributed operation on PROFIBUS DP in an ET 200SP system

When assigning parameters in the user program, use the "WRREC" instruction to transfer the parameters to the module using the data records; refer to section Parameter assignment and structure of parameter data record (Page 24).

The following parameter settings are possible:

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

Parameters	Range of values	Default	Parameter reassignment in RUN	Effective range with configuration software, e.g. STEP 7 (TIA Portal)	
				GSD file PROFINET IO	GSD file PROFIBUS DP [2]
Diagnostics: No supply voltage L+	• Disable • Enable	Disable	Yes	Module	Module
Diagnostics wire break[1]	• Disable • Enable	Disable	Yes	Module	Module
Channel activated	• Disable • Enable	Enable	Yes	Channel	Channel

Parameters	Range of values	Default	Parameter reassignment in RUN	Effective range with configuration software, e.g. STEP 7 (TIA Portal)	
				GSD file PROFINET IO	GSD file PROFIBUS DP [2]
Input delay	• None • 0.05 ms • 0.1 ms • 0.4 ms • 0.8 ms • 1.6 ms • 3.2 ms • 12.8 ms • 20 ms	3.2 ms	Yes	Channel	Module
Potential group	• Use potential group of the left module (module plugged into a dark-colored BaseUnit) • Enable new potential group (module plugged into light-colored BaseUnit)	Use potential group of the left module	No	Module	Module

[1] If you use a floating switch, you need to connect a resistor in parallel so that the wire break diagnostics is enabled in the open state (sensor resistance for the wire break diagnostics: 25 kΩ to 45 kΩ).

[2] Due to the limited number of parameters with a maximum of 244 bytes per ET 200SP station for a PROFIBUS GSD configuration, the configuration options are restricted. If required, you can assign these parameters using data record 128 as described in the "GSD file PROFINET IO" column (see table above). The parameter length of the I/O module is 4 bytes.

4.2 Declaration of parameters

Diagnostics: No supply voltage L+

Enabling of the diagnostics for no or insufficient supply voltage L+.

Diagnostics: Wire break

Enabling diagnostics if the line to the encoder is interrupted.

Channel activated

Determines whether a channel is activated or deactivated.

Input delay

This parameter can be used to suppress signal interference. Changes to the signal are only detected if they are constantly pending longer than the set input delay time.

Potential group

A potential group consists of a group of directly adjacent I/O modules within an ET 200SP station, which are supplied via a common supply voltage.

A potential group begins with a light-colored BaseUnit through which the required voltage is supplied for all modules of the potential group. The light-colored BaseUnit interrupts the three self-assembling voltage buses P1, P2 and AUX to the left neighbor.

All additional I/O modules of this potential group are plugged into dark-colored BaseUnits. You take the potential of the self-assembling voltage buses P1, P2 and AUX from the left neighbor.

A potential group ends with the dark-colored BaseUnit, which follows a light-colored BaseUnit or server module in the station configuration.

See also

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

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 input.

Configuration options of DI 16x24VDC ST

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

Table 4- 2 Configuration options with GSD file

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

Evaluating the value status

An additional two bytes are allocated in the input address space if you enable the value status for the digital module. Bits 0 to 15 in these bytes are assigned to a channel. They provide information about the validity of the digital value.

Bit = 1: No fault is present on the channel.

Bit = 0: Channel is deactivated or there is a fault on the module.

If a fault occurs on a channel with this module, the value status for all channels is 0.

Address space

The following figure shows the assignment of the address space for the DI 16×24VDC ST with value status (Quality Information (QI)). The addresses for the value status are only available if the value status is enabled.

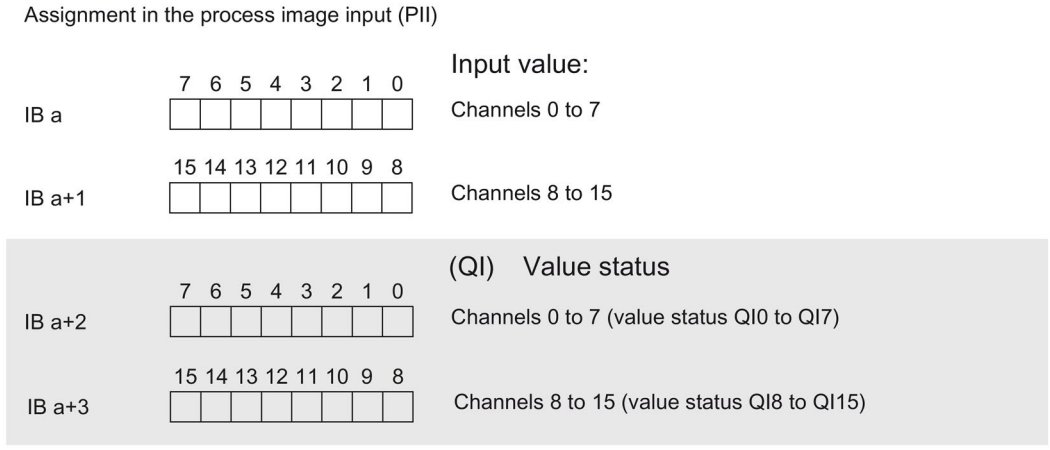


Image 4-1 Address space of the DI 16×24VDC ST with value status

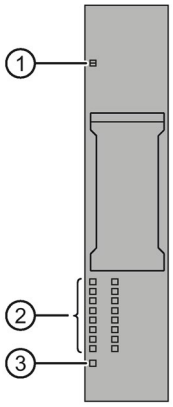
Interrupts/diagnostic alarms

5

5.1 Status and error display

LED display

The following figure shows you the LED display of the DI 16x24VDC ST.



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

Image 5-1 LED display

Meaning of the LEDs

The following tables show the meaning of the status and error displays. Corrective measures for diagnostics alarms can be found in section Diagnostic messages (Page 20).

DIAG LED

Table 5- 1 Error display of the DIAG LED

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

Channel status LED

Table 5- 2 Status display of the channel status LED

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

PWR LED

Table 5- 3 Status display of the PWR LED

PWR LED	Meaning
Off	Missing supply voltage L+
On	Supply voltage L+ present

5.2 Interrupts

The DI 16×24VDC ST digital input module supports diagnostic interrupts.

Diagnostics interrupts

The module generates a diagnostic interrupt at the following events:

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

5.3 Diagnostic messages

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

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

Diagnostics alarm	Error code	Meaning	Solution
Wire break	6_H	Impedance of encoder circuit too high.	Use a different encoder type or modify the wiring, for example, use cables with larger cross-section
		Wire break between the module and sensor	Connect the cable
		Channel not connected (open)	• Disable diagnostics • Connect a resistor of between 25 and 45 kOhms to the encoder contacts
Parameter assignment error	10_H	• The module cannot evaluate parameters for the channel. • Incorrect parameter assignment.	Correct the parameter assignment
Supply voltage missing	11_H	Missing or insufficient supply voltage L+	• Check supply voltage L+ on the BaseUnit • Check BaseUnit type
Channel temporarily unavailable	$1F_H$	Firmware update is currently in progress or has been canceled. The module does not read in process values in this state.	• Wait for firmware update. • Restart the firmware update.

Technical specifications

6

6.1 Technical specifications

Technical specifications of the DI 16×24VDC ST

	6ES7131-6BH00-0BA0
General information	
Product type designation	ET 200SP, DI 16x24VDC ST, PU 1
Firmware version	V1.1
• FW update possible	Yes
Usable BaseUnits	BU type A0
Color code for module-specific color identification label	CC00
Product function	
I&M data	Yes; I&M0 to I&M3
Engineering with	
STEP 7 TIA Portal can be configured/integrated as of version	V13 SP1
STEP 7 can be configured/integrated as of version	V5.5 / -
PCS 7 can be configured/integrated as of version	V8.1 SP1
PROFIBUS as of GSD version/GSD revision	GSD revision 5
PROFINET as of GSD version/GSD revision	GSDML V2.3
Operating mode	
DI	Yes
Counter	No
Oversampling	No
MSI	No
Supply voltage	
Rated value (DC)	24 V
Valid range, low limit (DC)	19.2 V
Valid range, high limit (DC)	28.8 V
Polarity reversal protection	Yes
Input current	
Current consumption, max.	90 mA

	6ES7131-6BH00-0BA0
Encoder supply	
Short-circuit protection	No
24 V encoder supply	
24 V	No
Short-circuit protection	No
Power loss	
Power loss, typ.	1.7 W
Address area	
Address space per module	
Address space per module, max.	2 bytes; + 2 bytes for QI information
Digital inputs	
Number of inputs	16
Sinking/sourcing input	Yes; reading p
Input characteristic curve acc. to IEC 61131, type 1	Yes
Input characteristic curve acc. to IEC 61131, type 2	No
Input characteristic curve acc. to IEC 61131, type 3	Yes
Pulse stretching	No
Input voltage	
Type of input voltage	DC
Rated value (DC)	24 V
For signal "0"	-30 ... +5 V
For signal "1"	+11 ... +30 V
Input current	
For signal "1", typ.	2.5 mA
Input delay (for rated value of input voltage)	
For standard inputs	
• Configurable	Yes; 0.05 / 0.1 / 0.4 / 0.8 / 1.6 / 3.2 / 12.8 / 20 ms (in each case + delay of 30 to 500 µs, depending on cable length)
• With "0" to "1", min.	0.05 ms
• With "0" to "1", max.	20 ms
• With "1" to "0", min.	0.05 ms
• With "1" to "0", max.	20 ms
For interrupt inputs	
• Configurable	No
for counters/technological functions	
• Configurable	No
Cable length	
Shielded, max.	1000 m
Unshielded, max.	600 m

	6ES7131-6BH00-0BA0
Encoders	
Supported encoders	
2-wire sensor	Yes
• Permissible quiescent current (2-wire sensor), max.	1.5 mA
Isochronous mode	
Isochronous mode (application synchronized up to terminal)	No
Interrupts/diagnostics/status information	
Interrupts	
Diagnostics interrupt	Yes
Diagnostics alarms	
Diagnostic information can be read	Yes
Diagnostics	Yes
Monitoring of the supply voltage	Yes
• Configurable	Yes
Monitoring of the encoder supply	No
Wire break	Yes; module by module
Short-circuit	No
Group error	Yes
Diagnostics indicator LED	
Monitoring of the supply voltage (PWR LED)	Yes; green PWR LED
Channel status display	Yes; green LED
For channel diagnostics	No
For module diagnostics	Yes; green/red DIAG LED
Electrical isolation	
Electrical isolation of channels	
Between the channels	No
Between the channels and backplane bus	Yes
Between the channels and voltage supply of the electronics	No
Permitted potential difference	
Between different circuits	75 V DC / 60 V AC (basic insulation)
Insulation	
Insulation tested with	707 V DC (type test)
Dimensions	
Width	15 mm
Weights	
Weight, approx.	28 g

Dimension drawing

See manual ET 200SP BaseUnits
(http://support.automation.siemens.com/WW/view/en/59753521)