

MANUFACTURER DOCUMENT PACKAGE

Manufacturer's Manual

Selected official pages for procurement and maintenance review

PRODUCT BRAND

Siemens

PRODUCT MODEL

6ES7131-4RD02-0AB0

ET 200S NAMUR Input Module. Relevant section pages: 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 19, 21, 22, 23. Adjacent model text on shared pages is outside this product reference.

OFFICIAL SOURCE

Digital electronic module 4DI NAMUR (6ES7131-4RD02-0AB0); 03/2010, A5E02773488-01

Siemens original documentation and product reference

Original page 17 labels invalid value status as 2 in Figure 1-2, while page 16 explicitly states 0 = invalid and 1 = valid. Original pages are unchanged; Amikon summaries follow the explicit binary definition on page 16.

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Amikon Limited prepared this independent reference package. Selected manufacturer pages follow with their original content and pagination visible.

SIEMENS

SIMATIC

ET 200S distributed I/O
Digital electronic module 4DI
NAMUR (6ES7131-4RD02-0AB0)

Manual

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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.

DANGER

indicates that death or severe personal injury **will** result if proper precautions are not taken.

WARNING

indicates that death or severe personal injury **may** result if proper precautions are not taken.

CAUTION

with a safety alert symbol, indicates that minor personal injury can result if proper precautions are not taken.

CAUTION

without a safety alert symbol, indicates that property damage can result if proper precautions are not taken.

NOTICE

indicates that an unintended result or situation can occur if the corresponding information is not taken into account.

If more than one degree of danger is present, the warning notice representing the highest degree of danger will be used. A notice warning of injury to persons with a safety alert symbol may also include a warning relating to property damage.

Qualified Personnel

The product/system described in this documentation may be operated only by **personnel qualified** for the specific task in accordance with the relevant documentation for the specific task, in particular its warning notices and safety instructions. Qualified personnel are those who, based on their training and experience, are capable of identifying risks and avoiding potential hazards when working with these products/systems.

Proper use of Siemens products

Note the following:

WARNING

Siemens products may only be used for the applications described in the catalog and in the relevant technical documentation. If products and components from other manufacturers are used, these must be recommended or approved by Siemens. Proper transport, storage, installation, assembly, commissioning, operation and maintenance are required to ensure that the products operate safely and without any problems. The permissible ambient conditions must be adhered to. The information in the relevant documentation must be observed.

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Disclaimer of Liability

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 manual

This manual supplements the *ET 200S Distributed I/O System* Operating Instructions. General functions for the ET 200S are described in the ET 200S Distributed I/O System Operating Instructions (<http://support.automation.siemens.com/WW/view/en/1144348>).

The information in this document along with the operating instructions enables you to commission the ET 200S.

Basic knowledge requirements

To understand these operating instructions you should have general knowledge of automation engineering.

Scope of the manual

This manual applies to this ET 200S module. It describes the components that are valid at the time of publication.

Recycling and disposal

Thanks to the fact that it is low in contaminants, this ET 200S module is recyclable. For environmentally compliant recycling and disposal of your electronic waste, please contact a company certified for the disposal of electronic waste.

Additional support

If you have any questions relating to the products described in this manual and do not find the answers in this document, please contact your local Siemens representative (<http://www.siemens.com/automation/partners>).

A guide to the technical documentation for the various SIMATIC products and systems is available on the Internet. (<http://www.siemens.com/simatic-docu>).

The online catalog and ordering systems are available on the Internet (<http://www.siemens.com/automation/mall>).

Training center

We offer courses to help you get started with the ET 200S and the SIMATIC S7 automation system. Please contact your regional training center or the central training center in D -90327, Nuremberg, Germany (<http://www.siemens.com/sitrain>).

Properties

1.1 Digital electronic module 4DI NAMUR (6ES7131-4RD02-0AB0)

Properties

- Digital electronic module with four inputs
- Encoder power supply 8.2 VDC
- Suitable for NAMUR sensors and both closed and open mechanical contacts

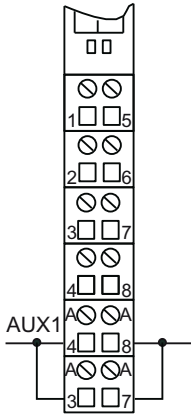
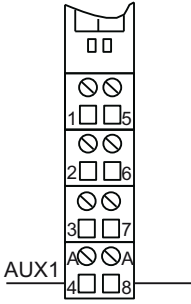
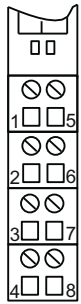
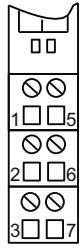
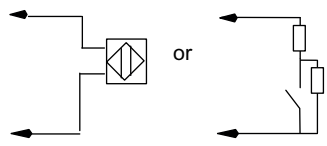
General terminal assignment

Note

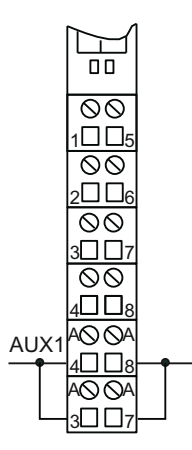
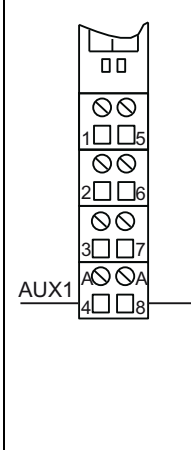
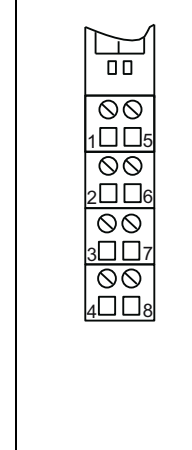
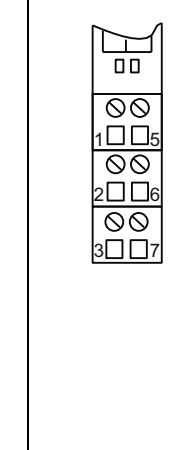
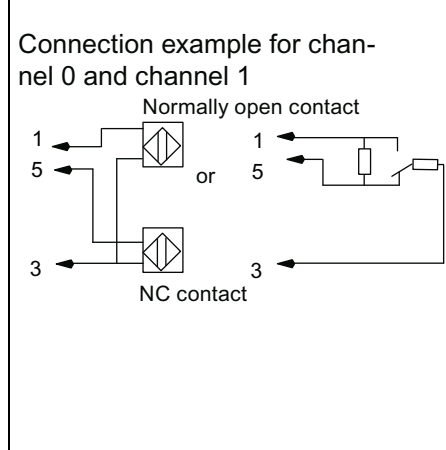
Terminals 4, 8, A4, A8, A3 and A7 are only available at specified terminal modules.

Terminal assignment of the 4DI NAMUR (6ES7131-4RD02-0AB0)				
Terminal	Assignment	Terminal	Assignment	Notes
1	DI ₀	5	DI ₁	• DI_n: Input signal, Channel n • V_S: Encoder power supply 8.2 VDC • AUX1: Protective-conductor terminal or potential bus (freely usable up to 230 VAC)
2	DI ₂	6	DI ₃	
3	V _S	7	V _S	
4	V _S	8	V _S	
A4	AUX1	A8	AUX1	
A3	AUX1	A7	AUX1	

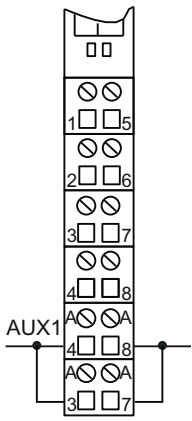
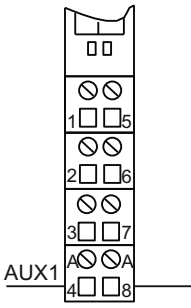
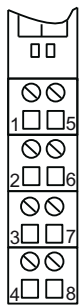
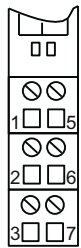
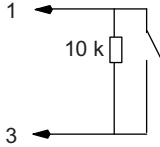
Usable terminal modules for connection of NAMUR sensors and sensors to IEC 60947-5-6

Usable terminal modules for the 4DI NAMUR (6ES7131-4RD02-0AB0)				
TM-E15C26-A1 (6ES7193-4CA50-0AA0)	TM-E15C24-A1 (6ES7193-4CA30-0AA0)	TM-E15C24-01 (6ES7193-4CB30-0AA0)	TM-E15C23-01 (6ES7193-4CB10-0AA0)	← Spring terminal
TM-E15S26-A1 (6ES7193-4CA40-0AA0)	TM-E15S24-A1 (6ES7193-4CA20-0AA0)	TM-E15S24-01 (6ES7193-4CB20-0AA0)	TM-E15S23-01 (6ES7193-4CB00-0AA0)	← Screw-type terminal
TM-E15N26-A1 (6ES7193-4CA80-0AA0)	TM-E15N24-A1 (6ES7193-4CA70-0AA0)	TM-E15N24-01 (6ES7193-4CB70-0AA0)	TM-E15N23-01 (6ES7193-4CB60-0AA0)	← Fast Connect
				Connection example for channel 0 

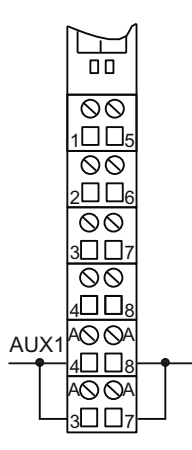
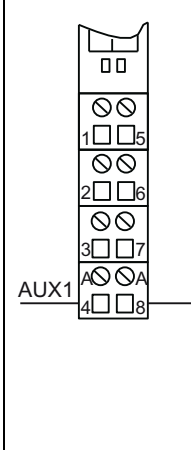
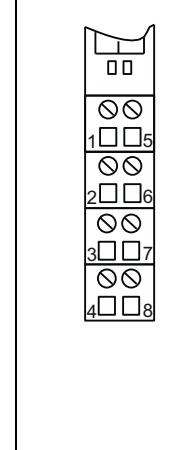
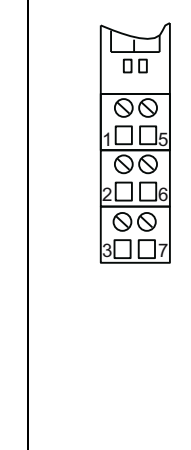
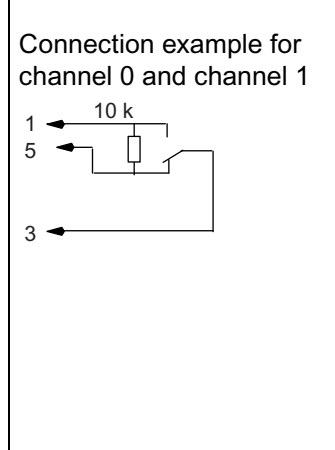
Usable terminal modules for connection of NAMUR changeover contacts and sensors to IEC 60947-5-6

Usable terminal modules for the 4DI NAMUR (6ES7131-4RD02-0AB0)				
TM-E15C26-A1 (6ES7193-4CA50-0AA0)	TM-E15C24-A1 (6ES7193-4CA30-0AA0)	TM-E15C24-01 (6ES7193-4CB30-0AA0)	TM-E15C23-01 (6ES7193-4CB10-0AA0)	← Spring terminal
TM-E15S26-A1 (6ES7193-4CA40-0AA0)	TM-E15S24-A1 (6ES7193-4CA20-0AA0)	TM-E15S24-01 (6ES7193-4CB20-0AA0)	TM-E15S23-01 (6ES7193-4CB00-0AA0)	← Screw-type terminal
TM-E15N26-A1 (6ES7193-4CA80-0AA0)	TM-E15N24-A1 (6ES7193-4CA70-0AA0)	TM-E15N24-01 (6ES7193-4CB70-0AA0)	TM-E15N23-01 (6ES7193-4CB60-0AA0)	← Fast Connect
				Connection example for channel 0 and channel 1 

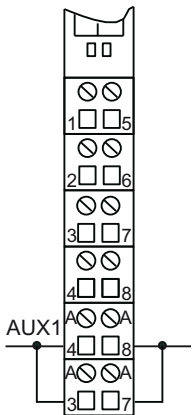
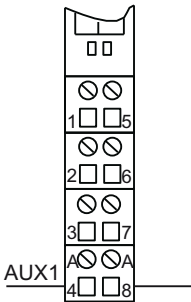
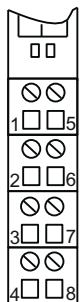
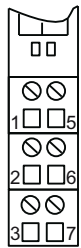
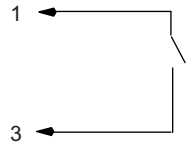
Usable terminal modules for connection of a single contact with 10 k Ω circuit (mechanical normally open contact)

Usable terminal modules for the 4DI NAMUR (6ES7131-4RD02-0AB0)				
TM-E15C26-A1 (6ES7193-4CA50-0AA0)	TM-E15C24-A1 (6ES7193-4CA30-0AA0)	TM-E15C24-01 (6ES7193-4CB30-0AA0)	TM-E15C23-01 (6ES7193-4CB10-0AA0)	← Spring terminal
TM-E15S26-A1 (6ES7193-4CA40-0AA0)	TM-E15S24-A1 (6ES7193-4CA20-0AA0)	TM-E15S24-01 (6ES7193-4CB20-0AA0)	TM-E15S23-01 (6ES7193-4CB00-0AA0)	← Screw-type terminal
TM-E15N26-A1 (6ES7193-4CA80-0AA0)	TM-E15N24-A1 (6ES7193-4CA70-0AA0)	TM-E15N24-01 (6ES7193-4CB70-0AA0)	TM-E15N23-01 (6ES7193-4CB60-0AA0)	← Fast Connect
				Connection example for channel 0 

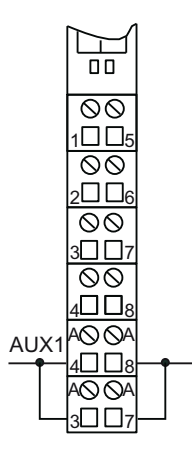
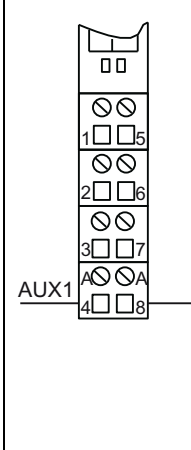
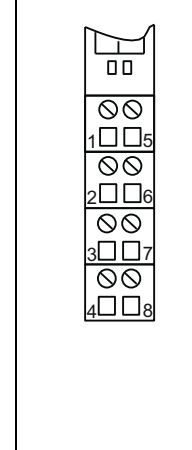
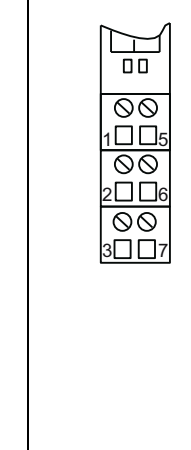
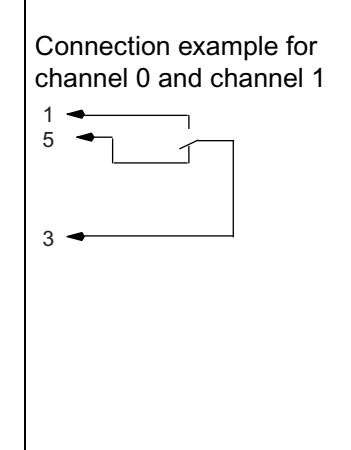
Usable terminal modules for connection of a changeover contact with 10 k Ω circuit (mechanical changeover contact)

Usable terminal modules for the 4DI NAMUR (6ES7131-4RD02-0AB0)				
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TM-E15S26-A1 (6ES7193-4CA40-0AA0)	TM-E15S24-A1 (6ES7193-4CA20-0AA0)	TM-E15S24-01 (6ES7193-4CB20-0AA0)	TM-E15S23-01 (6ES7193-4CB00-0AA0)	← Screw-type terminal
TM-E15N26-A1 (6ES7193-4CA80-0AA0)	TM-E15N24-A1 (6ES7193-4CA70-0AA0)	TM-E15N24-01 (6ES7193-4CB70-0AA0)	TM-E15N23-01 (6ES7193-4CB60-0AA0)	← Fast Connect
				Connection example for channel 0 and channel 1 

Usable terminal modules for connection of a single contact, open (mechanical normally open contact with single contact)

Usable terminal modules for the 4DI NAMUR (6ES7131-4RD02-0AB0)				
TM-E15C26-A1 (6ES7193-4CA50-0AA0)	TM-E15C24-A1 (6ES7193-4CA30-0AA0)	TM-E15C24-01 (6ES7193-4CB30-0AA0)	TM-E15C23-01 (6ES7193-4CB10-0AA0)	← Spring terminal
TM-E15S26-A1 (6ES7193-4CA40-0AA0)	TM-E15S24-A1 (6ES7193-4CA20-0AA0)	TM-E15S24-01 (6ES7193-4CB20-0AA0)	TM-E15S23-01 (6ES7193-4CB00-0AA0)	← Screw-type terminal
TM-E15N26-A1 (6ES7193-4CA80-0AA0)	TM-E15N24-A1 (6ES7193-4CA70-0AA0)	TM-E15N24-01 (6ES7193-4CB70-0AA0)	TM-E15N23-01 (6ES7193-4CB60-0AA0)	← Fast Connect
    Connection example for channel 0 				

Usable terminal modules for connection of a changeover contact, open (mechanical changeover contact)

Usable terminal modules for the 4DI NAMUR (6ES7131-4RD02-0AB0)				
TM-E15C26-A1 (6ES7193-4CA50-0AA0)	TM-E15C24-A1 (6ES7193-4CA30-0AA0)	TM-E15C24-01 (6ES7193-4CB30-0AA0)	TM-E15C23-01 (6ES7193-4CB10-0AA0)	← Spring terminal
TM-E15S26-A1 (6ES7193-4CA40-0AA0)	TM-E15S24-A1 (6ES7193-4CA20-0AA0)	TM-E15S24-01 (6ES7193-4CB20-0AA0)	TM-E15S23-01 (6ES7193-4CB00-0AA0)	← Screw-type terminal
TM-E15N26-A1 (6ES7193-4CA80-0AA0)	TM-E15N24-A1 (6ES7193-4CA70-0AA0)	TM-E15N24-01 (6ES7193-4CB70-0AA0)	TM-E15N23-01 (6ES7193-4CB60-0AA0)	← Fast Connect
				Connection example for channel 0 and channel 1 

Block diagram

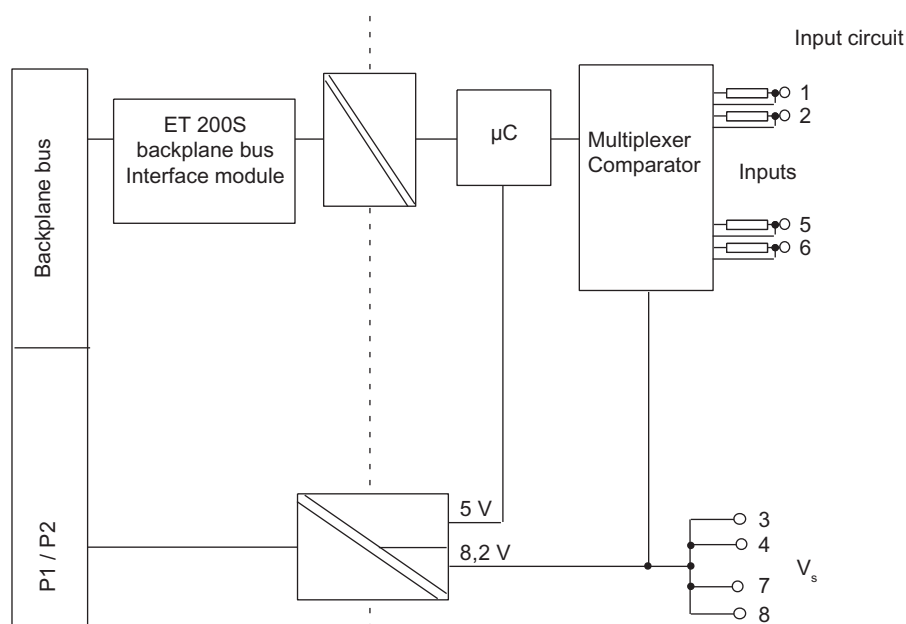


Figure 1-1 Block diagram of the 4DI NAMUR

Technical data 4DI NAMUR (6ES7131-4RD02-0AB0)

Dimensions and weight	
Width (mm)	15
Weight	Approx. 35 g
Module-specific data	
Supports isochronous operation	No
Number of inputs	4
Cable length	
• Shielded	Max. 200 m
Voltages, currents, potentials	
Number of inputs that can be triggered simultaneously	4
• Horizontal mounting up to 60°C	4
• All other mounting positions up to 40°C	4
Electrical isolation	
• Between the channels	No
• Between channels and backplane bus	Yes
• Between channels and load voltage	Yes
• Between load voltage and backplane bus	Yes

Permissible potential difference	
• Between different circuits	75 VDC, 60 VAC
Insulation test voltage:	
• Channels against the backplane bus and load voltage	500 VDC
• Load voltage against the backplane bus	500 VDC
Current consumption	
• From load voltage L+	Dependent on the sensor
Power dissipation of the module	Typically 1.6 W
Parameter length	12 bytes
Address space	2 bytes
Status, interrupts, diagnostics	
Status display	Green LED per channel
Interrupts	
• Hardware interrupt	No
• Diagnostic interrupt	Yes, can be set
Diagnostics function	
• Batch error display	Red "SF" LED
• Diagnostic information can be displayed	Yes
Monitoring for	
• Short circuit	$I > 7 \text{ mA}^1$
• Wire break	$I < 0.35 \text{ mA}^1$
Data for selecting a sensor	
Input current for NAMUR sensors	To NAMUR or EN 50227
• At signal "1"	2.1 mA to 7 mA
• At signal "0"	0.35 mA to 1.2 mA
Input current for a closed contact	
• At signal "1"	2.1 mA to 7 mA
• For signal "0"	0.35 mA to 1.2 mA
Input current for an open contact	
• At signal "1"	Typ. 8 mA
• Permitted bias current	0.5 mA
Input delay	
• At "0" to "1"	Max. 4.6 ms
• At "1" to "0"	Max. 4.6 ms
Tolerated switchover time with changeover contacts	300 ms
Parallel connection of inputs	No

Sensor power supply outputs	
Output voltage	
• With load	Min. 8,2 V
Output current	
• Rated value	45 mA
Additional (redundant) supply	Not permitted
Short-circuit protection	Yes, electronic
¹ Only for NAMUR sensors and closed contacts.	

Value status

The value status provides additional binary information on a digital input signal. The value status is entered in the process input image at the same time as the signal, and it provides information on the validity of the input signal. The value status is affected by:

- Wire break check/short circuit
- Chatter monitoring
- Pulse stretching
- Validity check of changeover contact sensor types

Meaning of the value status:

- "1": Input signal is valid
- "0": Input signal is invalid

Assignment in the process input image

The data are transferred to the process image in two bytes (16 bits).

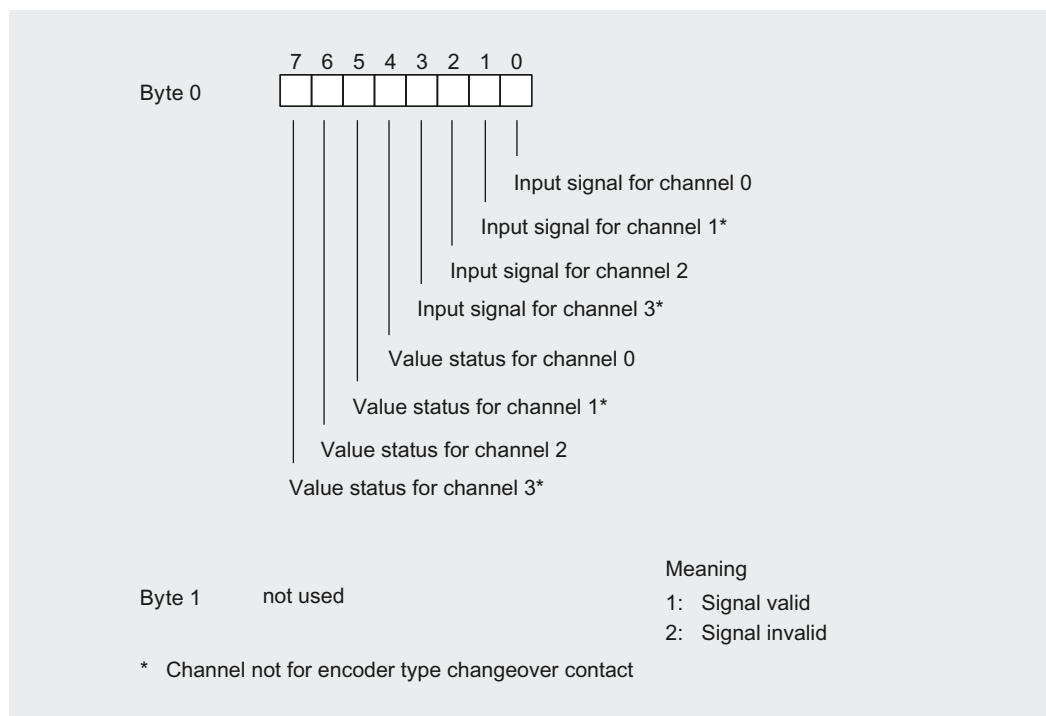


Figure 1-2 Assignment in the process input image for 4DI NAMUR

Parameters

2.1 Parameters

This table shows the parameters for 4DI NAMUR:

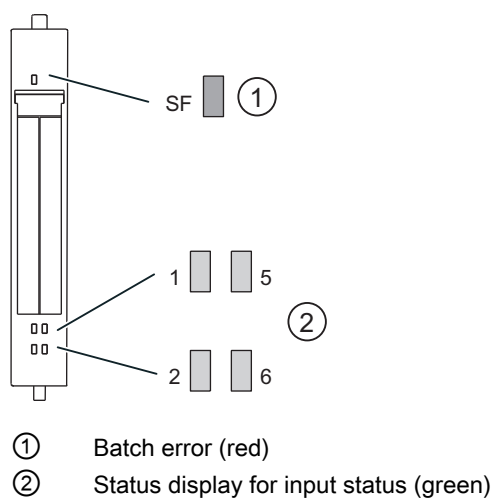
Table 2- 1 Parameters for 4DI NAMUR

4DI NAMUR	Range of values	Default setting	Applicability
Diagnostic interrupt	• Enable • Disable	Disable	Module
Sensor type	• Channel disabled • NAMUR sensor • Open single contact • Single contact, closed with 10 kΩ • NAMUR changeover contact • Open changeover contact • Changeover contact, closed with 10 kΩ	Channel disabled	Channel
Pulse stretching	• None • 0.5 s • 1 s • 2 s	None	Channel
Diagnostics No sensor supply	• Enable • Disable	Disable	Module
Diagnostics: Wire break	• Enable • Disable	Disable	Channel
Short-circuit diagnostics ¹	• Enable • Disable	Disable	Channel
Chatter monitoring: Monitoring window ²	• 0.5 s • 1 s to 100 s (can be set at increments of 1 s)	0.5 s	Channel
Chatter monitoring: Number of signal changes	• Disable • 2 to 31	Disable	Channel
¹ Only for NAMUR changeover contacts and NAMUR sensors.			
² The parameters can only be set when the number of signal changes for chatter monitoring is activated.			

Diagnostics

3.1 Diagnostics using LED display

LED display



Status and error displays

Event (LEDs)					Cause	Remedy
SF	1	5	2	6		
On					No parameter assignment or incorrect module plugged in. A diagnostic message is pending.	Check the parameter assignment. Evaluate the diagnostics.
	On				Input on channel 0 activated.	—
		On			Input on channel 1 activated.	—
			On		Input on channel 2 activated.	—
				On	Input on channel 3 activated.	—

3.2 Diagnostics for changeover contact encoder type

Diagnostics for changeover contact encoder type

When a diagnosis is made for the changeover contact encoder type, the digital electronic module controls the switchover between two input channels. If there is no signal change in the normally closed contact after the set switchover time (see technical data), the module outputs diagnostics.

Purpose of changeover contact diagnostics

You can use the diagnostics for the following:

- Encoder diagnostics
- To verify that there has been a switchover between a normally open contact and normally closed contact.

Principle of changeover contact diagnostics

If the digital inputs of a channel group are configured as "changeover contacts", the module for this channel group carries out diagnostics for the changeover contact encoder type. The tolerated changeover time between the two channels is set to the fixed value of 300 ms.

If the validity check is negative, the following applies:

- The module identifies the value status of the normally open contact channel as "invalid".
- The module creates a diagnostic entry for the normally open contact channel.
- The module triggers a diagnostic interrupt.

The digital input signal and the value status are only updated for the normally open contact channel (channel 0 and 2). In the case of the normally closed contact channel (channel 1 and 3) the digital input signal is fixed at "zero" and the value status is "invalid" because this channel is only used for a validity check of the sensor.

Note the following points when carrying out diagnostics for a changeover contact encoder type:

- If there is already an error on the normally open contact channel (a wire break, for example), the module no longer performs diagnostics for changeover contact errors. Diagnostics for changeover contact errors continue to be carried out on the second channel.
- Additional points to note are listed in the table below:

Table 3- 1 Diagnostics for changeover contacts

Changeover contact	A negative check means...	
Changeover contact as NAMUR	• Short circuit or • Wire break	Additionally: Changeover contact error or external fault (in the case of DP diagnosis)
Closed changeover contact	• Defective encoder or short circuit No distinction can be made here between a defective encoder and short circuit	
Open changeover contact	Important: No distinction possible between • Signal "0" and wire break • Signal "1" and short circuit	

3.3 Error types

Digital electronic module error types

Table 3- 2 Error types

Error type		Meaning	Remedy
1 _D	00001: Short circuit (only NAMUR changeover contacts and NAMUR encoders)	Short circuit on signal line to encoder	Correct the process wiring
		Encoder is defective.	Replace the encoder.
		Wrong encoder type assigned.	Correct the parameter assignment.
		Load impedance too low	Use an encoder with higher impedance
6 _D	00110: Open circuit	Signal line to an encoder interrupted.	Correct the process wiring
		Encoder is defective.	Replace the encoder.
		Wrong encoder type assigned.	Correct the parameter assignment.
		Load impedance too low	Use an encoder with higher impedance
		Load impedance too high	Use an encoder with lower impedance
9 _D	01001: Error	Internal module error occurred.	Replace the module.
		Encoder supply missing	
		Sensor signal flutters.	Eliminate cause of error.
16 _D	10000: Parameter assignment error	Faulty parameter assignment	Correct the parameter assignment.
26 _D	11010: External error	Encoder error.	Replace the encoder.
		Changeover contact error.	Correct the process wiring