SIEMENS

SIMATIC

ET 200S
Distributed I/O System

Manual

The following supplement is part of this documentation:

No.	Designation	Drawing number	Edition
1	Product Information	A5E00352937-02	01/2005
2	Product Information	A5E00437368-01	04/2005

This manual is part of the documentation package with the order number
6ES7151-1AA10-8BA0

Edition 12/2004

EWA-4NEB 780602402-12

Safety Guidelines

This manual contains notices intended to ensure personal safety, as well as to protect the products and connected equipment against damage. These notices are highlighted by the symbols shown below and graded according to severity by the following texts:

Danger

indicates that death, severe personal injury or substantial property damage will result if proper precautions are not taken.

Warning

indicates that death, severe personal injury or substantial property damage can result if proper precautions are not taken.

Caution

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

Caution

indicates that property damage can result if proper precautions are not taken.

Notice

draws your attention to particularly important information on the product, handling the product, or to a particular part of the documentation.

Qualified Personnel

Only **qualified personnel** should be allowed to install and work on this equipment. Qualified persons are defined as persons who are authorized to commission, to ground and to tag circuits, equipment, and systems in accordance with established safety practices and standards.

Correct Usage

Note the following:

Warning

This device and its components may only be used for the applications described in the catalog or the technical description, and only in connection with devices or components from other manufacturers which have been approved or recommended by Siemens.

This product can only function correctly and safely if it is transported, stored, set up, and installed correctly, and operated and maintained as recommended.

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Preface

Purpose of the Manual

The information in this manual is intended to enable you to operate the ET 200S Distributed I/O System

- as a DP slave on the PROFIBUS DP
- as a PROFINET I/O device on PROFINET

Required level of knowledge

Knowledge of the field of automation engineering is required to understand the manual.

Scope of the manual

This manual is valid for the components of the ET 200S distributed I/O system specified in Appendix A.

This manual contains a description of the components that were valid at the time the manual was published. We reserve the right to enclose a Product Information bulletin containing up-to-date information about new components and new versions of components.

Changes since the previous version

The following changes/additions have been made since the previous version of the manual:

- enhanced functions in the IM151-1 STANDARD and IM151-1 FO STANDARD interface modules
- 4AI I 2WIRE Standard analog electronic module added

Certification

See Section 7.1 Standards, certificates and approvals

CE Mark of Conformity

See Section 7.1 Standards, certificates and approvals

Identification for Australia (C-tick mark)

See Section 7.1 Standards, certificates and approvals

Standards

See Section 7.1 Standards, certificates and approvals

Position in the information landscape

The following list shows a summary of the documentation packages or manuals for the ET 200S:

ET 200S distributed I/O system

- Installing and wiring the ET 200S
- Commissioning and diagnostics for the ET 200S
- Technical specifications of the IM151-1, digital and analog electronic modules
- Order numbers for the ET 200S

SIMATIC ET 200S motor starter fail-safe motor starter SIGUARD safety equipment

6ES7151-1AA10-8xA0[1)]

- Installing and wiring motor starters
- Commissioning and diagnostics for motor starters
- Technical specifications of motor starters
- Fail-Safe Motor Starter
- Safety-integrated SIGUARD
- Order numbers for motor starters

PROFINET System - Description

- Basics of PROFINET
- Network components and structures
- Data interchange and communication
- PROFINET Engineering

From PROFIBUS DP to PROFINET IO

- Differences
- Blocks
- System status lists
- Diagnostics

ET 200S IM151-7 CPU interface module and operation list

- Addressing of the IM151-7 CPU
- ET 200S with IM151-7 CPU in the PROFIBUS network
- Commissioning and diagnostics for the IM151-7 CPU
- Technical specifications of the IM151-7 CPU

ET 200S FC frequency converter Operating manual

- Installation
- Commissioning
- Control and regulation processes
- Protection and monitoring functions
- Technical specifications

ET 200S FC frequency converter list manual

- Parameter list
- Function plans
- Interrupts, error messages

ET 200S Positioning

- EM 1STEP 5V/204kHz
- 1POS INC/Digital
- 1POS SSI/Digital
- 1POS INC/Analog
- 1POS SSI/Analog

ET 200S Process-Related Functions

- 1Count 24V/100kHz
- 1Count 5V/500kHz
- 1SSI
- 2PULSE

ET 200S serial interfaces and modules

- 1SI 3964/ASCII
- 1SI MODBUS/USS

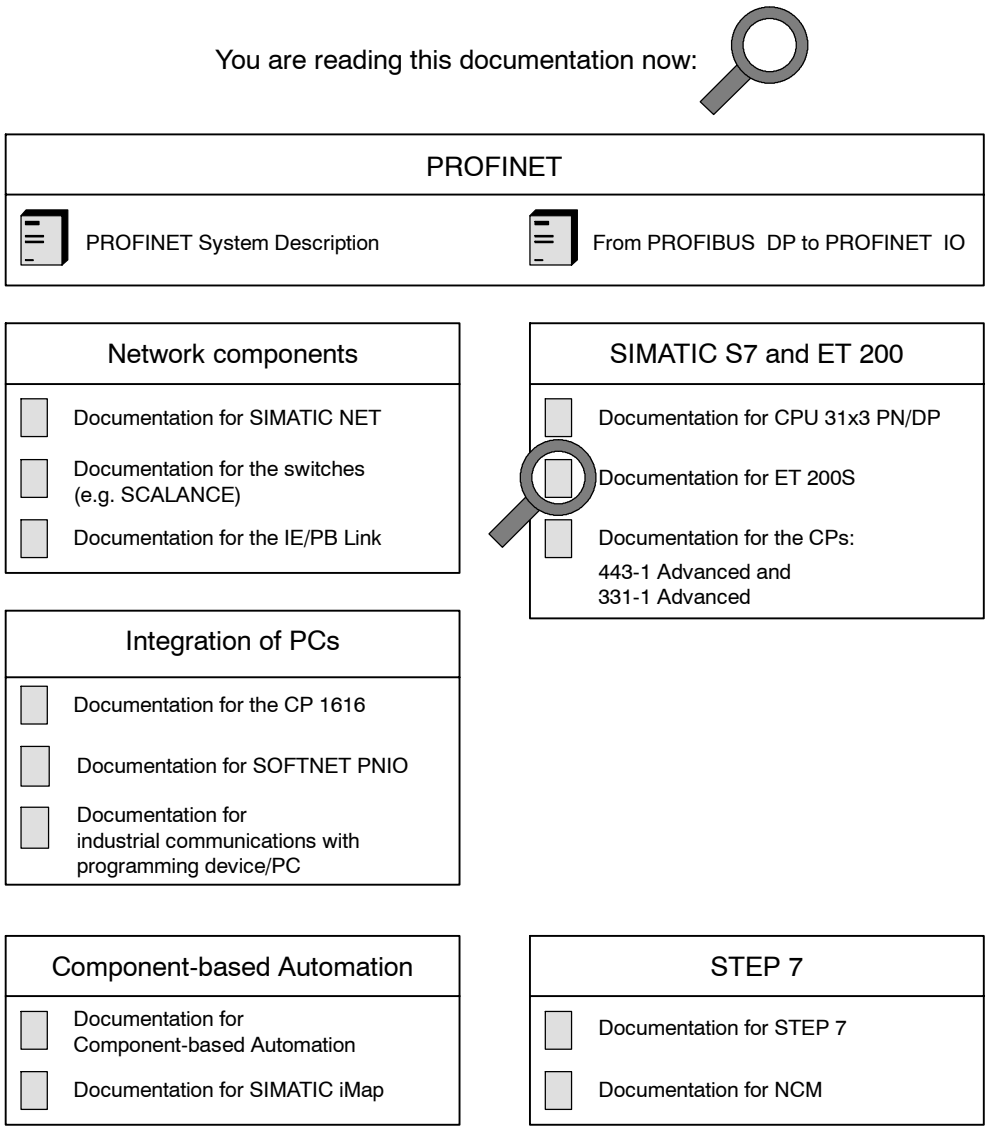
[1)] x = language designation for order numbers

The documentation packages or manuals can only be ordered in German and English. In addition, French, Spanish and Italian are available in the Internet (see Service & Support in the Internet)

Note

The *ET 200S distributed I/O system* manual is included in the *ET 200S FC frequency converter* documentation package.
The fail-safe modules are described in the *ET 200S distributed I/O system fail-safe modules* manual. This manual and other manuals for the fail-safe modules can be downloaded from the Internet.

A documentation overview for implementation of the ET 200S as an I/O device is given below.



Guide

You can quickly access specific information in the manual by using the following aids:

- At the start of the manual you will find a complete table of contents and a list of the diagrams and tables that appear in the manual.
- An overview of the contents of each section is provided in the left-hand column on each page of each chapter.
- Following the appendices, you will find a glossary in which important technical terms used in the manual are defined.
- At the end of the manual you will find a comprehensive index enabling rapid access to the information you are looking for.
- Language identification for the order numbers of the manuals, for example, 6ES7 151-1AA10-8xA0

  x is for : A = German,
  B = English

Special note

In addition to this manual, you will also need the manual for the DP master or PROFINET I/O controller (see Appendix A).

Note

You will find a complete list of the contents of the ET 200S manuals in Section1.4 of this manual. We recommend that you begin by reading this section so as to find out which parts of which manuals are most relevant to you in helping you to do what you want to do.

Recycling and disposal

Due to the fact that it is low in contaminants, the ET 200S is recyclable. Contact a certified electronic-waste disposal company to recycle and dispose of your old equipment in an environmentally-friendly manner.

Contact persons

See product information *Technical Support, Contact Persons and Training*

Training

See product information *Technical Support, Contact Persons and Training*

SIMATIC Technical Support

See product information *Technical Support, Contact Persons and Training*

Service & Support on the Internet

See product information *Technical Support, Contact Persons and Training*

Contents

Figures

Tables

Product Overview

1

Chapter overview

The product overview tells you:

- The place of the ET 200S distributed I/O system in the ET 200 distributed I/O system.
- The place of ET 200S as an I/O device in PROFINET IO.
- The components that make up the ET 200S distributed I/O system
- Which of the manuals in the ET 200S manual package contains the information you require.

Chapter overview

1.1 What are distributed I/O systems?

Distributed I/O systems – area of application

When a system is set up, the inputs and outputs from and to the process are often located centrally in the programmable logic controller.

If there are inputs and outputs at considerable distances from the programmable logic controller, there may be long runs of cabling which are not immediately comprehensible, and electromagnetic interference may impair reliability.

Distributed I/O systems are the ideal solution in such cases:

- The controller CPU is located centrally.
- The I/O systems (inputs and outputs) operate locally on a distributed basis.
- The high-performance PROFIBUS DP bus system with its high data transmission rates ensures that the PLC's CPU and the I/O systems communicate smoothly.

What is PROFIBUS DP?

PROFIBUS DP is an open bus system based on the *IEC 61784-1:2002 Ed1 CP 3/1* standard with the ”DP” transmission protocol (DP stands for distributed I/O).

PROFIBUS DP is physically either an electrical network based on a shielded two-wire line or an optical network based on a fiber-optic cable.

The ”DP” transmission protocol allows a rapid, cyclic exchange of data between the controller CPU and the distributed I/O systems.

What are DP masters and DP slaves?

The DP master links the controller CPU with the distributed I/O systems. The DP master exchanges data with the distributed I/O systems and monitors the PROFIBUS DP bus system via PROFIBUS DP.

The distributed I/O systems (= DP slaves) prepare the data of the sensors and actuators locally so that they can be transmitted to the PLC CPU by PROFIBUS DP.

Which devices can be connected to the PROFIBUS DP?

An extremely wide range of devices can be connected to the PROFIBUS as DP masters or DP slaves, provided their behavior complies with *IEC 61784-1:2002 Ed1 CP 3/1*. The devices that can be used include the following:

- SIMATIC S5
- SIMATIC S7/M7/C7
- SIMATIC programming device/PC
- SIMATIC human-machine interface, or HMI (operator panel, OP; operator station, OS; and text display, TD)
- Devices from other manufacturers

Structure of a PROFIBUS DP network

The figure below illustrates a typical PROFIBUS DP network structure. The DP masters are integrated into the relevant device – for example, the S7 400 has a PROFIBUS DP interface and the IM 308-C is inserted in an S5-115U. The DP slaves are the distributed I/O systems connected to the DP masters by PROFIBUS DP.

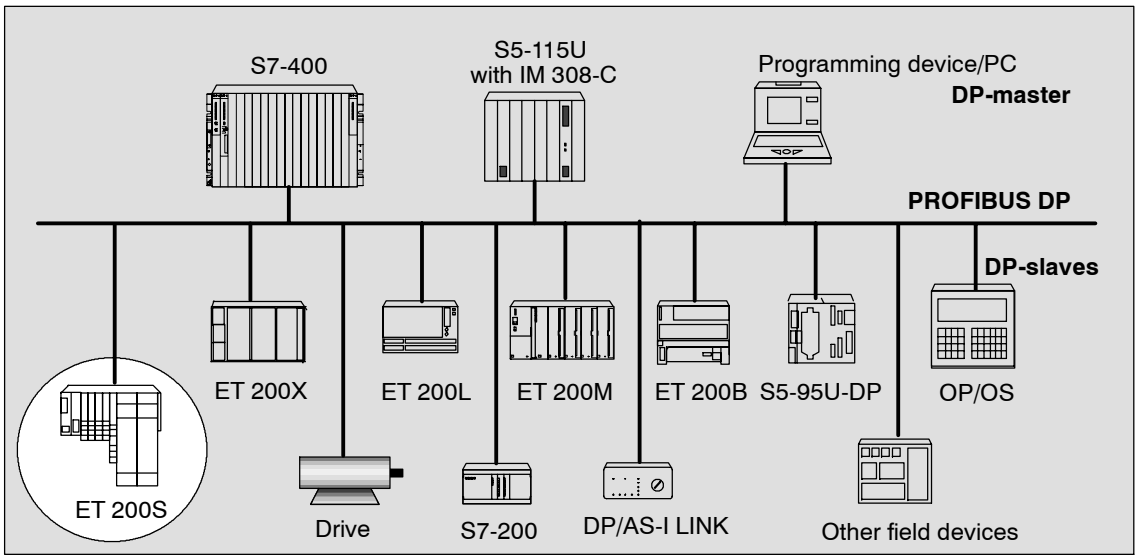


Figure 1-1 Typical PROFIBUS DP network structure

1.2 What is PROFINET IO?

PROFINET IO is the open transmission with realtime functions defined in accordance with the PROFINET standard.
The standard defines a manufacturer-independent communication, automation and engineering model.
Industrial quality connection designs are available for wiring the PROFINET components.

- PROFINET does not use the hierarchical PROFIBUS master-slave principle. A provider-consumer principle is used instead. The planning process specifies which modules of an I/O device will be subscribed to an I/O controller.
- The quantities are extended in accordance with the options offered by the PROFINET IO. Parameter limits are not exceeded during configuration.
- The transmission rate is 100 Mbps.
- The user view during configuration is generally the same as that on the PROFIBUS DP (STEP 7 → HWCONFIG is used for configuration).

Structure of a PROFINET IO network

The figure below illustrates a typical PROFINET IO network structure. Existing PROFIBUS slaves can be integrated by an IE/PB link.

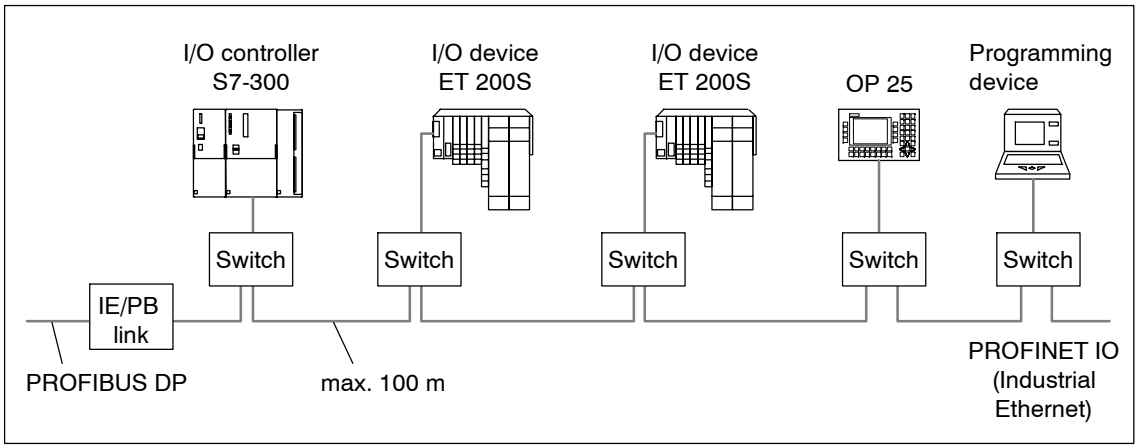


Figure 1-2 A typical PROFINET IO network structure

1.3 What is the ET 200S distributed I/O system?

Definition

The ET 200S distributed I/O system is a highly modular, extremely flexible DP slave I/O device with IP20 degree of protection.

Area of application

You can connect virtually any number of I/O modules in virtually any combination right next to the interface module that transfers the data to the DP master and I/O controller. This means you can adjust the configuration to suit local requirements.

Depending on the interface module, each ET 200S can consist of up to 63 modules – for example, power modules, I/O modules, and motor starters.

The fact that motor starters can be integrated (switching and protecting any three-phase load up to 7.5 kW) ensures that the ET 200S can be quickly adapted to suit virtually any process-related use of your machine.

The fail-safe modules of the ET 200S ensure the fail-safe reading and output of data to safety category 4 (EN 954-1)

Terminal modules and electronic modules

The ET 200S distributed I/O system is

- connected to PROFIBUS DP at the IM151 interface module by a plug connector for PROFIBUS DP
- connected to PROFINET IO at the IM151-3 PN interface module by a plug connector for PROFINET IO

Every ET 200S distributed I/O system is

- a DP slave on the PROFIBUS DP or
- an I/O device on the PROFINET IO.

View

The figure below shows an example of an ET 200S configuration.

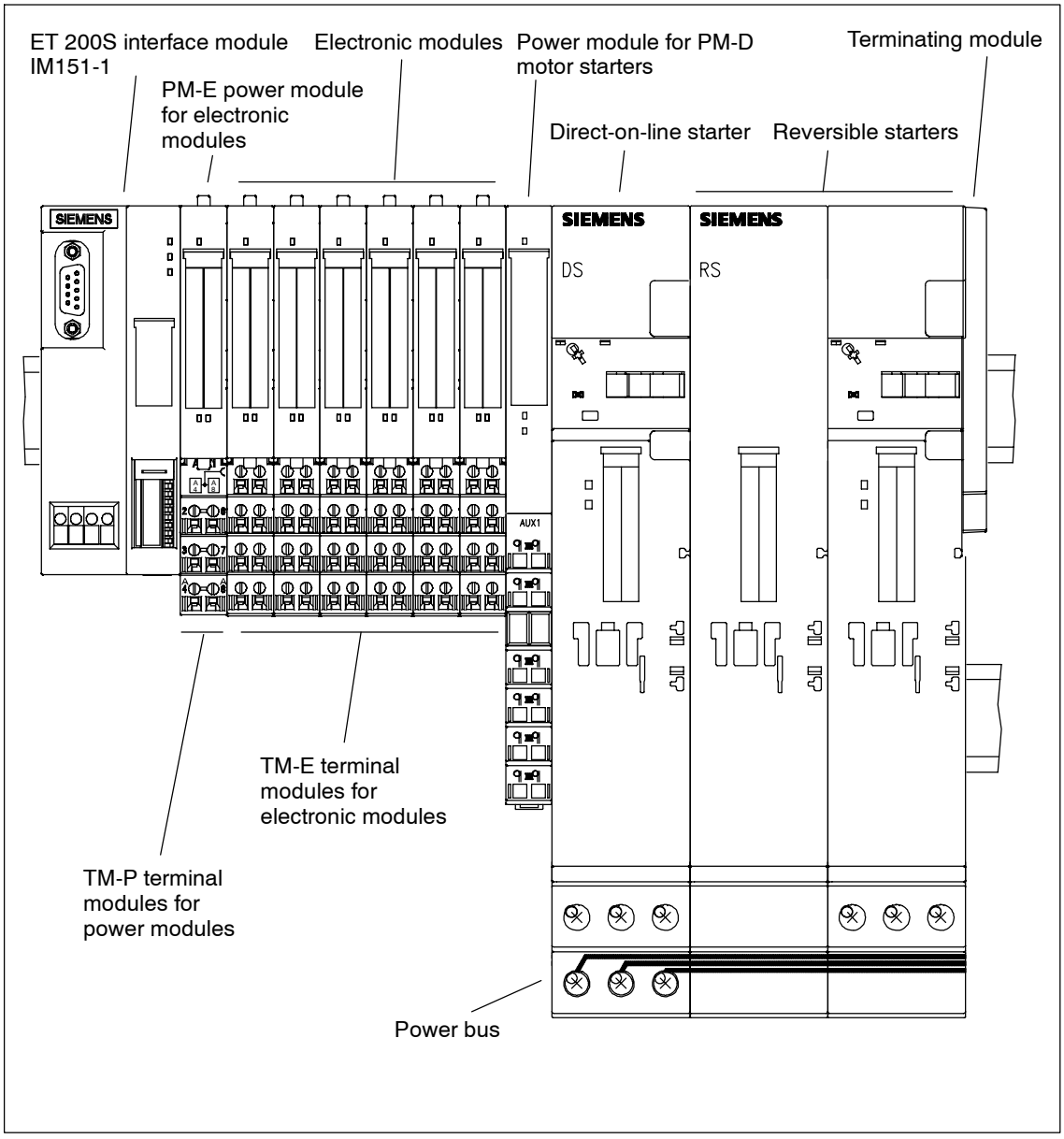


Figure 1-3 View of the ET 200S distributed I/O system

ET 200S components

The following table provides you with an overview of the most important components of the ET 200S:

Table 1-1 ET 200S components

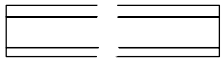
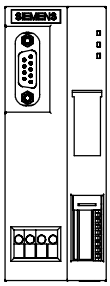
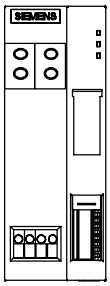
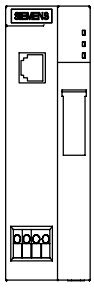
Component	Function	Drawing
Rail	...carries the ET 200S. You mount the ET 200S on the rail.	
Interface module • IM151-1 BASIC • IM151-1 STANDARD • IM151-1 FO STANDARD • IM151-1 HIGH FEATURE	...connects the ET 200S with the DP master and prepares the data for the electronic modules and motor starters.	RS485 interface  IM151-1 BASIC IM151-1 STANDARD IM151-1 HIGH FEATURE Fiber optic interface  IM151-1 FO STANDARD
Interface module • IM151-3 PN	...connects the ET 200S with PROFINET IO controllers and prepares the data for the electronic modules and motor starters.	PROFINET interface 

Table 1-1 ET 200S components

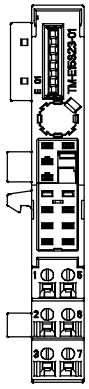
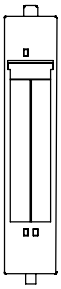
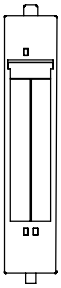
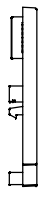
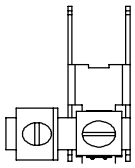
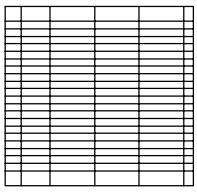
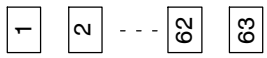
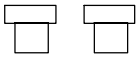
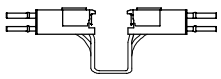
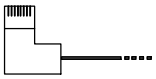
Component	Function	Drawing
Terminal module	...carries the wiring and receives the power and electronic modules. Terminal modules are available in the following variants: • For power modules • For electronic modules • With screw-type terminal • With spring terminal • With Fast Connect (quick connection method, no stripping required)	
Power module	...monitors the voltage for all the electronic modules in the potential group. The following power modules are available: • For a 24 VDC supply with diagnostics • For a 24 to 48 VDC supply with diagnostics • For a 24 to 48 VDC, 24 to 230 VAC supply with diagnostics and fuse	
Electronic module	...is connected to the terminal module and determines the function: • Digital input modules with 24 VDC, 120/230 VAC and NAMUR • Digital output modules with 24 VDC and 120/230 VAC • Relay modules • Analog input modules with voltage, current, and resistance measurement; thermal resistance; and thermocouples • Analog output modules for voltage and current • Process-related modules • Fail-safe modules • RESERVE	
Terminating module	...terminates the ET 200S and can be used to carry 6 reserve fuses (5 mm x 20 mm).	

Table 1-1 ET 200S components

Component	Function	Drawing
Shield contact	...for connecting cable shields.	
Labeling sheet (DIN A4, perforated, foil)	...for machine labeling or printing • 80 strips per labeling sheet	
Slot number labels	...for identifying the slots on the terminal module.	
Color identification labels	...permit customer and country-specific identification of the terminals on the terminal module	
PROFIBUS cable with bus connector	... connects nodes of a PROFIBUS DP configuration to each other.	
Fiber optic duplex line with simplex connector (in plug adapter for IM151-1 FO STANDARD)	... connects nodes of a PROFIBUS DP configuration to each other.	
PROFINET connector as per the specifications in the *PROFINET Installation Guide* and Industrial Ethernet FC installation lines	... connects nodes of a PROFINET IO configuration to each other.	

Features and benefits of the ET 200S

Table 1-2 Features and benefits of the ET 200S

Features	Benefits
Structure	
Finely-graduated modular design • 1/2/4 channel electronic modules • Power modules • Integrated motor starters	• Function-oriented, cost-optimized station design • Considerable reduction in outlay for configuration and documentation • Space savings due to arbitrary arrangement of the modules
Extensive range of electronic modules	Broad area of application
System-integrated motor starter with communications capability: Direct and reversing starter up to 7.5 kW	PLC inputs and outputs, terminal blocks, circuit breakers and contactors in a plug-in module save space and the effort involved in wiring
Permanent wiring due to the separation of mechanical and electronic components	• Prewiring possible • Module replacement during operation of the ET 200S (”hot swapping”)
Individual connection of power modules to common potential	• Individual formation of potential groups (identifiable by color coding of the TM-P terminal modules for power modules) • Simple load interruption
Robust structure for rough industrial conditions (5 g vibration resistance)	High operating reliability when mounted directly on the machine, high availability

Table 1-2 Features and benefits of the ET 200S

Features	Benefits
Connection system	
Integrated voltage buses	Reduced effort required for wiring
Power bus up to 50 A for motor starters	Minimization of wiring in 400 V range
Screw-type terminals, spring terminals and Fast Connect	A change in terminal connection method is not necessary
• and 3-wire connection, or • 2, 3 and 4 line connection	Optimal selection on grounds of space and cost
Fast Connect	• Quick connection method with no stripping required • Saves time with wiring
Terminal box in terminal module replaceable	No need to remove the terminal module in the event of terminal damage
Automatic coding of the I/O modules	Quick and reliable module replacement
Large label plate	Adequate space for clear identification
High data transmission speed of up to 12 Mbps on PROFIBUS DP and 100 Mbps on PROFINET IO	Short response times
Integrated safety functions With motor starters up to safety category 4 in accordance with EN 954-1	Saves spending money on costly safety equipment
Fail-safe modules	To detect and output fail-safe-signals via PROFIBUS (PROFIsafe) up to safety category 4 (EN 954-1)

1.4 Guide to the ET 200S manuals

You are using the following components ...

The components of ET 200S are described in various manuals. They are parts of various documentation packages. The figure below shows possible configuration variants of the ET 200S and the necessary manuals in the documentation packages.

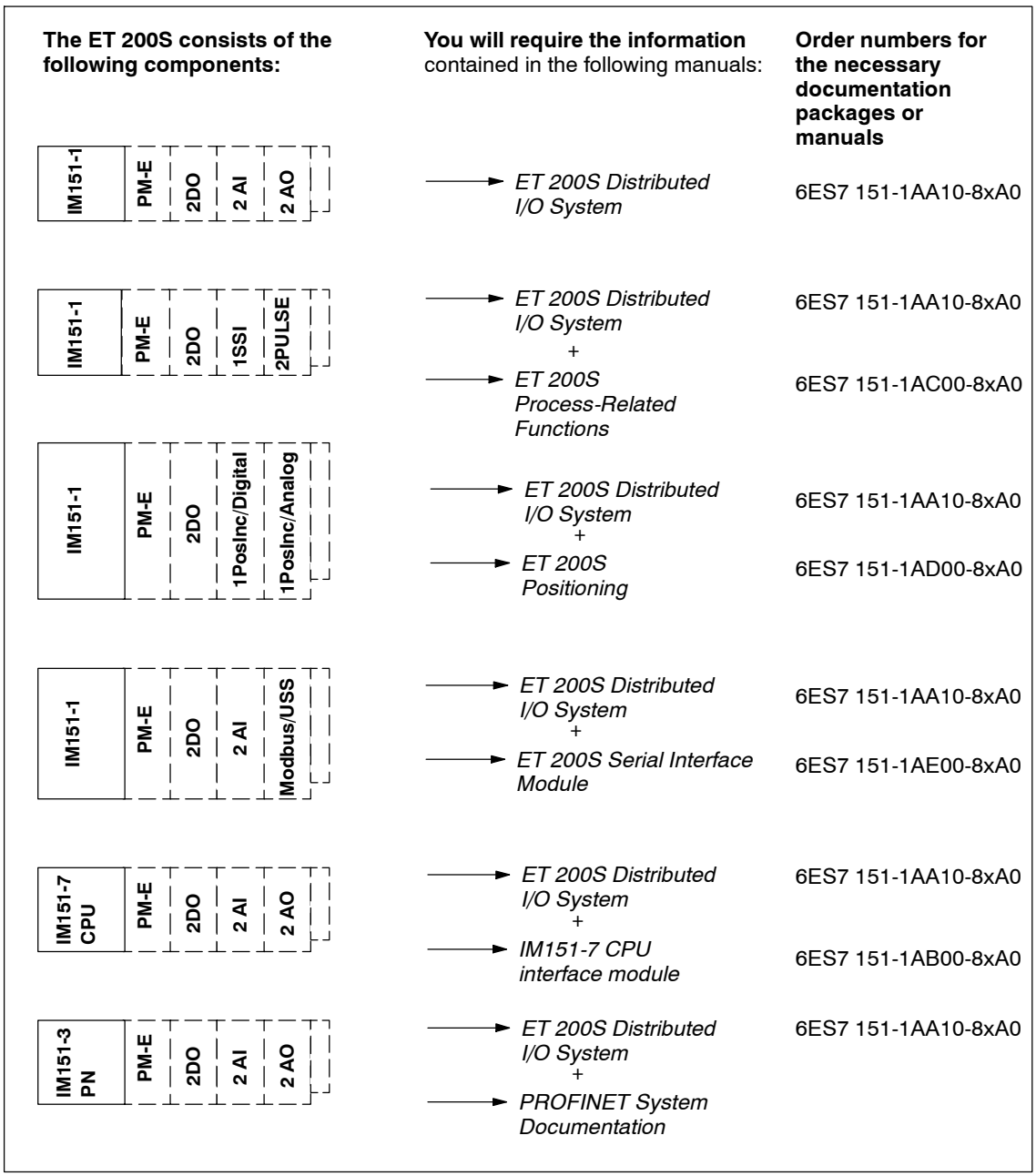
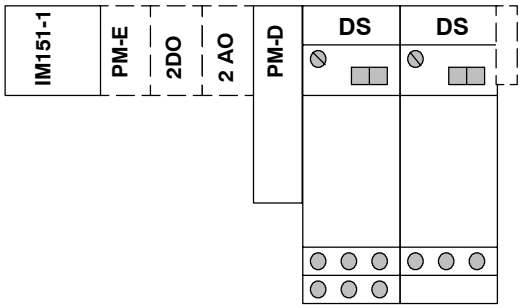
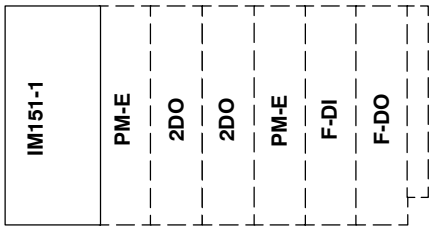
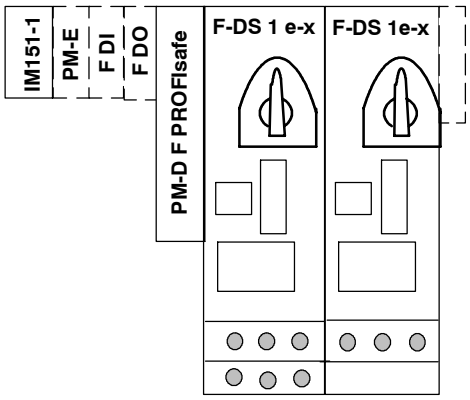
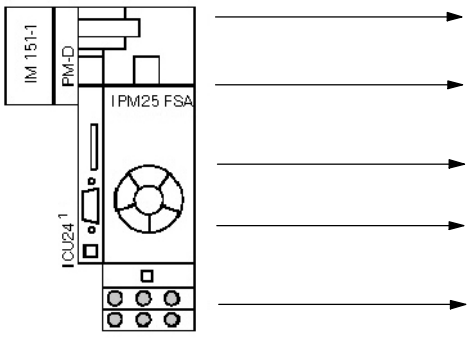


Figure 1-4 Components and the manuals required for them

The ET 200S consists of the following components:	You will require the information contained in the following manuals:	Order numbers for the necessary documentation packages or manuals
	→ *ET 200S Distributed I/O System* + *ET 200S motor starter Fail-safe motor starter* → *Safety-integrated SIGUARD*	6ES7 151-1AA10-8xA0
	→ *ET 200S Distributed I/O System* + → *ET 200S Distributed I/O system Fail-Safe modules*	6ES7 151-1AA10-8xA0 available in the Internet
	→ *ET 200S Distributed I/O System* + → *ET 200S Distributed I/O system Fail-Safe modules* + → *ET 200S motor starter Fail-safe motor starter* *Safety-integrated SIGUARD*	6ES7 151-1AA10-8xA0 available in the Internet 6ES7 151-1AA10-8xA0
In preparation:		
	→ *ET 200S FC frequency converter Operating manual* + → *ET 200S FC frequency converter List manual* → *ET 200S Distributed I/O System* + → *ET 200S FC frequency converter Operating manual* + → *ET 200S FC frequency converter List manual*	6SL3 298-0CA12-0xP0 6SL3 298-0CA12-1xP0

1) ICU24F for fail-safe frequency converter

Figure 1-5 Components and the manuals required for them (continued)

Where do you find what information?

The table below will help you get your bearings and find the information you need quickly. It tells you which manual you need to refer to and which chapter deals with the topic you are interested in.

Table 1-3 Topics of the manuals in the ET 200S manual package

Description	Manual										
	ET 200S Distributed I/O System	ET 200S motor starter Fail-safe motor starter	IM 151-7 CPU interface module	ET 200S Process-Related Functions	ET 200S Positioning	ET 200S Serial Interface Module	ET 200S Distributed I/O System Fail-Safe Modules	Safety Equipment System Description	S7 Distributed Safety Configuration and Programming	ET 200S FC FC frequency converter Operating manual	ET 200S FC frequency converter List manual
ET 200S components	1	1	1				2	2	2	1/2	
Brief Instructions on Commissioning	2	2	2								
Configuration Options	3	1	4,5				3	3	1	1	
Communication								4		4/5	
Configuration		4						7	3	1	
Addressing	4		3				5			3	
Installation	4	3					5			2	
Electrical configuration and wiring of the ET 200S	5						6				
Programming								8	5	6	1
Commissioning and Diagnostics	6	4	7				7			6-8	3
Functions			8							6-8	
General Technical Specifications	7	5					8			9	
Technical specifications			10	2-5	2	2,3				2	
Terminal modules	9	6, 10-12								2	
Power modules	10	7,10, 12									
Direct starters and soft starters		8									
Reversible starters		9									

Table 1-3 Topics of the manuals in the ET 200S manual package

Description	Manual										
	ET 200S Distributed I/O System	ET 200S motor starter Fail-safe motor starter	IM 151-7 CPU interface module	ET 200S Process-Related Functions	ET 200S Positioning	ET 200S Serial Interface Module	ET 200S Distributed I/O System Fail-Safe Modules	Safety Equipment System Description	S7 Distributed Safety Configuration and Programming	ET 200S FC FC frequency converter Operating manual	ET 200S FC frequency converter List manual
Safety-integrated ET 200S SIGUARD		10									
Interface Modules	8										
Electronic modules	11, 12										
Positioning module					3–6						
Expansion modules		11								2/3	
Fail-safe modules		12					9			2/3	
Monitoring, cycle and reaction times			9				12	9			
Order Numbers	A	A					11				
Dimension Drawings	B	B					10			A1	
Applications	C–F	C									
Glossary	GI	GI	GI				13	10	9	A2	

ET 200S fail-safe modules

The *ET 200S Distributed I/O System Fail-Safe Modules* manual is available on the Internet (see *Technical Support, Contacts and Training* product information).

ET 200S on the PROFINET IO

More information on the operation of the ET 200S as an I/O device can be found in the PROFINET System Description and in the *From PROFIBUS DP to PROFINET IO* programming manual.

Brief Instructions on Commissioning ET 200S

2

2.1 Commissioning on PROFIBUS DP

Introduction

The following simple example teaches you step by step how to commission the ET 200S on PROFIBUS DP:

- Installing and wiring the ET 200S
- Configuration with STEP 7 using the device database file
- Integration in the user program
- Switching the ET 200S on
- Evaluating the diagnosis:
  - Removal and insertion of modules
  - Switching off the load voltage on the power module
  - Wire break of the actuator wiring on the digital output module

The following figure illustrates the ET 200S components you require for the example on PROFIBUS DP:

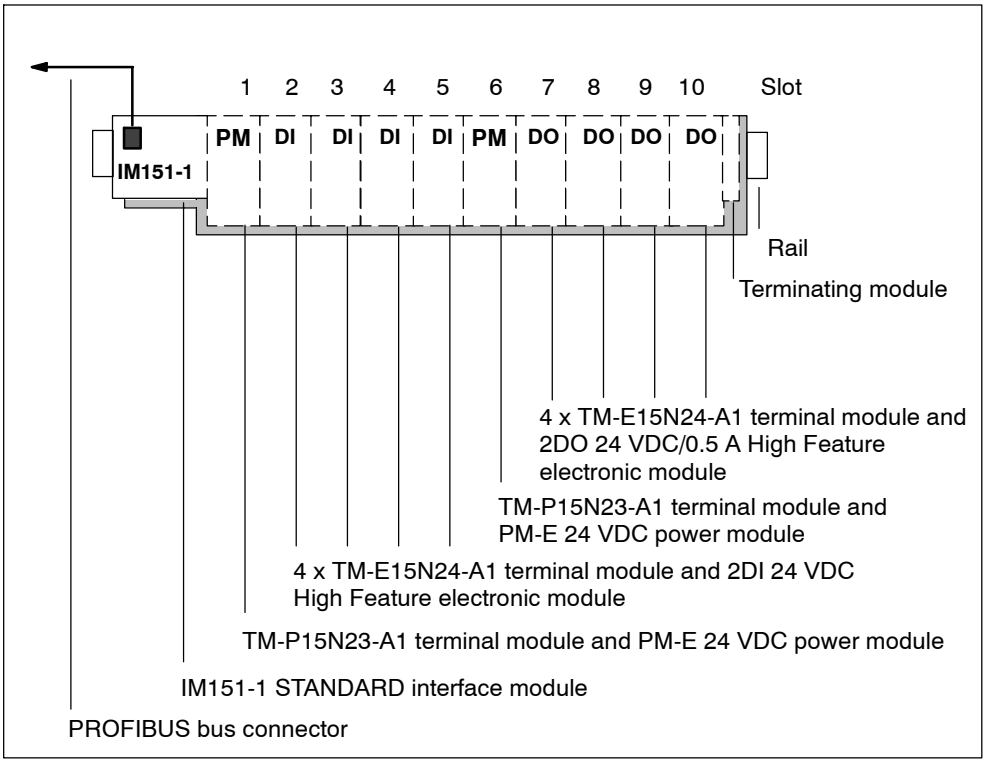


Figure 2-1 Components for the example on PROFIBUS DP

Order numbers for the example on PROFIBUS DP

Quantity	Order information	Order number
1 ×	Standard rail 35 mm (e.g. 483 mm length)	6ES5 710-8MA11
1 ×	IM151-1 STANDARD interface module and terminating module, 1 unit	6ES7 151-1AA03-0AB0
2 ×	TM-P15N23-A1 Fast Connect terminal module, 1 unit	6ES7 193-4CC70-0AA0
2 ×	TM-E15N24-A1 Fast Connect terminal module, 5 units	6ES7 193-4CA70-0AA0
2 ×	PM-E 24 VDC, 1 unit	6ES7 138-4CA00-0AA0
1 ×	2DI 24 VDC High Feature, 5 units	6ES7 131-4BB00-0AB0
1 ×	2DO 24 VDC/0.5 A High Feature, 5 units	6ES7 132-4BB00-0AB0
1 ×	Bus connector	6ES7 972-0BA10-0XA0

Prerequisites

- You must have set up an S7 station consisting of a power supply module and a DP master (for example, CPU 315-2 DP). A CPU 315-2 DP was used as the DP master in this example. However, any other DP master (IEC 61784-1:2002 Ed1 CP 3/1) could be used instead.
- *STEP 7* (V 5.0 with ServicePack 3 or higher) is fully installed on your programming device (PG). You must be familiar with STEP 7.
- The programming device must be connected to the DP master.

Installation

1. Mount the rail (35 mm x 7.5 mm or 15 mm) with a length of at least 210 mm on a solid base.
2. Install the various modules on the rail beginning on the left (hook on, swing in, move to the left). Adhere to the following sequence:
   - IM151-1 STANDARD interface module
   - TM-P15N23-A1 terminal module
   - 4 x TM-E15N24-A1 terminal modules
   - TM-P15N23-A1 terminal module
   - 4 x TM-E15N24-A1 terminal modules
   - Terminating module
3. Set the PROFIBUS address 3 on the IM 151-1 STANDARD interface module.

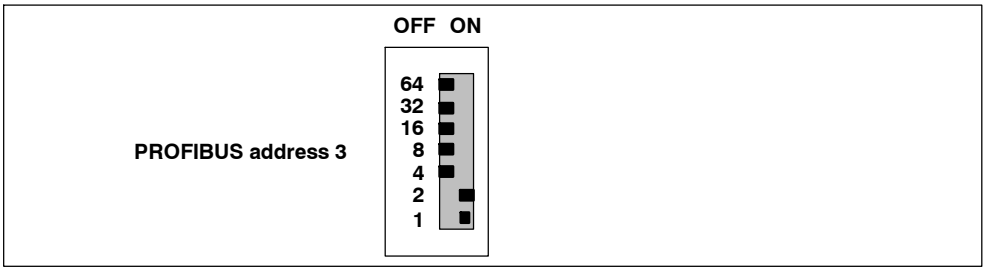


Figure 2-2 Setting PROFIBUS Address 3

Wiring and Fitting

1. Wire the ET 200S as shown below:

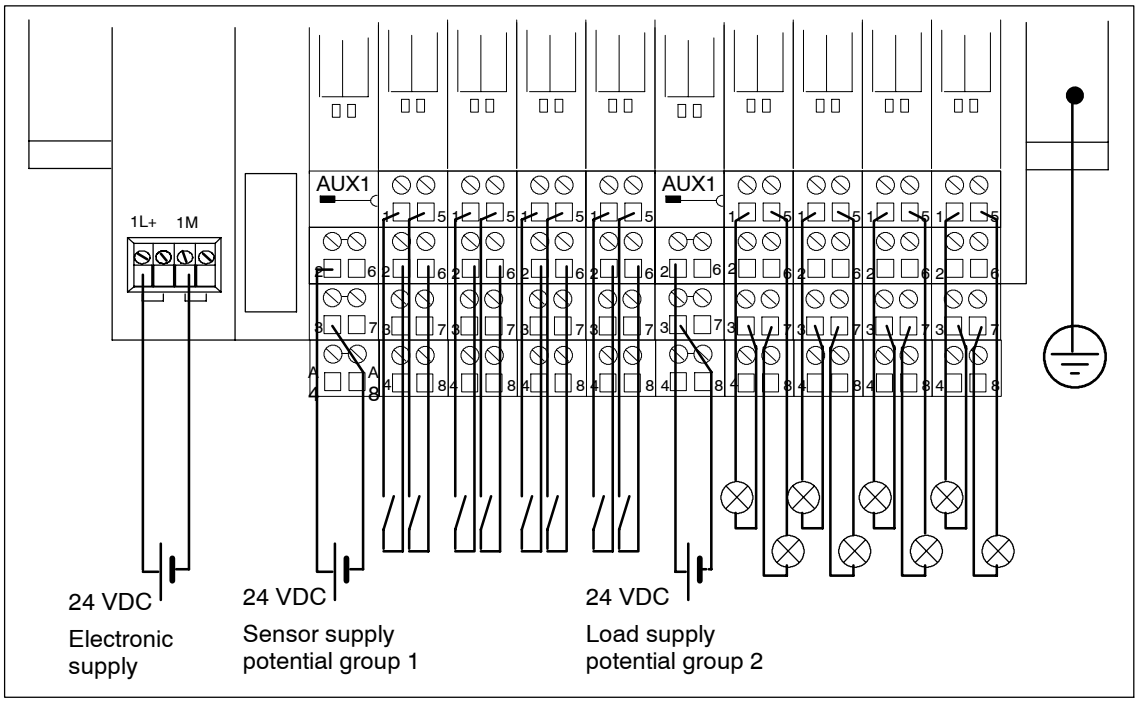


Figure 2-3 Wire the example on the PROFIBUS DP

2. Use the PROFIBUS bus connector to connect the DP master with the ET 200S. The PROFIBUS DP interface is located on the IM 151-1 STANDARD.
3. Insert the power and electronic modules into the terminal modules.
4. Switch on the voltage supply for the DP master.
5. Watch the status LEDs on the DP master.
   CPU 315-2 DP:
   - 5 VDC → lights up
   - SF DP → off
   - BUSF → flashes

Configuration

1. Start SIMATIC Manager, and create a new project with a DP master (CPU 315-2 DP, for example). Create OB 1 and OB 82 for the project.
2. Create the PROFIBUS subnet.
3. Connect the PROFIBUS subnet with the DP master in HWCONFIG.
4. Take the ET 200S from the hardware catalog and put it on the PROFIBUS.
5. Set the PROFIBUS address 3 for the ET 200S.
6. Drag the various ET 200S modules from the hardware catalog to the configuration table.
7. Mark the electronic modules in the configuration table, and click the ”Pack addresses” button.

Table 2-1 Configuration table in HWCONFIG for PROFIBUS DP

Module/DP identifier	Order number	I address	O address	Comment
1	6ES7 138-4CA00-0AA0 PM-E 24 VDC			Power module
2	6ES7 131-4BB00-0AB0 2DI 24 VDC	0		Bits 0.0 and 0.1
3	6ES7 131-4BB00-0AB0 2DI 24 VDC			Bits 0.2 and 0.3
4	6ES7 131-4BB00-0AB0 2DI 24 VDC			Bits 0.4 and 0.5
5	6ES7 131-4BB00-0AB0 2DI 24 VDC			Bits 0.6 and 0.7
6	6ES7 138-4CA00-0AA0 PM-E 24 VDC			Power module
7	6ES7 132-4BB00-0AB0 2DO 24 VDC		0	Bits 0.0 and 0.1
8	6ES7 132-4BB00-0AB0 2DO 24 VDC			Bits 0.2 and 0.3
9	6ES7 132-4BB00-0AB0 2DO 24 VDC			Bits 0.4 and 0.5
10	6ES7 132-4BB00-0AB0 2DO 24 VDC			Bits 0.6 and 0.7

8. Set the following parameters:
   - In the DP slave properties dialog box for ET 200S:

     Start at Preset <> Actual configuration enabled

     Replace modules during operation: enabled
   - In the DP slave properties dialog box for the PM-E 24 VDC, module/DP ID 1 (in the configuration table)

     Diagnosis: Load voltage not present
   - In the slave DP properties dialog box for 2 DO 24 VDC, module/DP ID 7 (in the configuration table)

     Diagnosis: wire break A0
9. Save the configuration.

Integration in the user program

1. Create the OB 1 user program in the LAD/STL/FBD editor.

   Example 1: Reading an input and controlling an output:

STL	Explanation
A I 0.0 A M 2.0 S Q 0.0	If input bit 0.0 and memory bit 2.0 are set, then set output bit 0.0

   Example 2: Transferring an input byte to an output byte:

STL	Explanation
L PIB 0	Load I/O byte 0 in the accumulator (bits 0.0 to 0.7)
T PQB 0	Transfer the contents of the accumulator to I/O output byte 0 (bits 0.0 to 0.7)

2. Save the project in SIMATIC Manager.
3. Load the configuration in the DP master.

Switching on

1. Switch on all the power supplies of the ET 200S.
2. Watch the status LEDs on the DP master and ET 200S.
   - CPU 315-2 DP:

     DC 5V: lit

     SF DP: off

     BUSF: off
   - ET 200S:

     SF: Off

     BF: Off

     ON: lit

Diagnostics

1. In the event of a fault, OB 82 is started. Evaluate the start information in OB 82.

   Tip: In OB 82 call SFC 13 and evaluate the diagnostic frame.
   See Section 6.1.6.1

Removing and inserting the 2 DI 24 VDC High Feature digital electronic module

1. Remove the 2 DI 24 VDC High Feature electronic module from the terminal module during operation.
2. Watch the status LEDs on the IM 151-1 STANDARD:
   - SF: lit ⇒ diagnostic message exists.
   - BF: Off
   - ON: lit

   Result: The ET 200S continues to operate problem-free.
3. Evaluate the diagnostic message.

   Result:
   - Station status 1 (byte 0): Bit 3 is set ⇒ External diagnostics
   - ID-related diagnostics: Byte 7.1 is set ⇒ slot 2
   - Module status: Byte 19.2 / 19.3: 11_B ⇒ no module
4. Insert the removed electronic module in the terminal module again.

   Result:
   - Status LEDs on the IM151-1 STANDARD:

     SF: Off

     BF: Off

     ON: lit
   - The diagnostic message is deleted.

Switching off the load voltage on the power module

1. Switch off the load voltage on the PM-E 24 VDC (slot 1).
2. Watch the status LEDs.

   IM 151 STANDARD:

   - SF: lit

   Power module:

   - PWR: off ⇒ No load voltage at power module
   - SF: lit ⇒ diagnostic message exists.

   I/O modules in the potential group:

   - LEDs: lit
3. Evaluate the diagnosis.

   Result:

   - Station status 1 (byte 0): Bit 3 is set ⇒ External diagnostics
   - ID-related diagnostics: Byte 7.0 is set ⇒ slot 1
   - Channel-specific diagnosis:

     Byte 35.0 to 35.5: 000000_B ⇒ slot 1

     Byte 37.0 to 37.4: 10001_B ⇒ encoder or load voltage missing
4. Switch on the load voltage on the power module again, and evaluate the diagnosis again.

   Result:

   - Status LEDs on the IM151-1 STANDARD:

     SF: Off
   - Status LEDs on the power module:

     PWR: on

     SF: Off
   - Status LEDs on the I/O module:

     LEDs: Off
   - The diagnostic message is deleted.

Wire break in the actuator wiring

1. Remove the cable from terminal 1 on the 2 DO 24 VDC/0.5 A; High Feature electronic module (slot 7)
2. Watch the status LEDs.

   IM151-1 STANDARD:

   - SF: lit

   2DO 24 VDC/0.5 A High Feature electronic module:

   - SF: lit ⇒ diagnostic message exists
   - 1: 1: Off ⇒ The output is not activated
3. Evaluate the diagnostic message.

   Result:

   - Station status 1 (byte 0): Bit 3 is set ⇒ External diagnostics
   - ID-related diagnostics: Byte 7.6 is set ⇒ slot 7
   - Channel-specific diagnosis:

     Byte 35.0 to 35.5: 000110_B ⇒ slot 7

     Byte 36.0 to 35.5: 000000_B ⇒ channel 0

     Byte 37.0 to 37.4: 00110_B ⇒ Wire break
4. Attach the cable to the actuator again in terminal 1, and evaluate the diagnosis again:

   - Status LEDs on the IM151-1 STANDARD:

     SF: Off
   - Status LEDs on the 2DO 24 VDC/0.5 A High Feature electronic module:

     SF: Off

     1: 1: Off/on
   - The diagnostic message is deleted.

2.2 Commissioning on the PROFINET IO

Introduction

The following simple example teaches you step by step how to commission the ET 200S on PROFINET IO:

- Installing and wiring the ET 200S
- Configuration with STEP 7 using the device database file
- Integration in the user program
- Switching the ET 200S on
- Evaluation of interrupts and diagnoses:
  - Removal and insertion of modules
  - Switching off the load voltage on the power module
  - Wire break of the actuator wiring on the digital output module

The following figure illustrates the ET 200S components you require for the example on PROFINET IO:

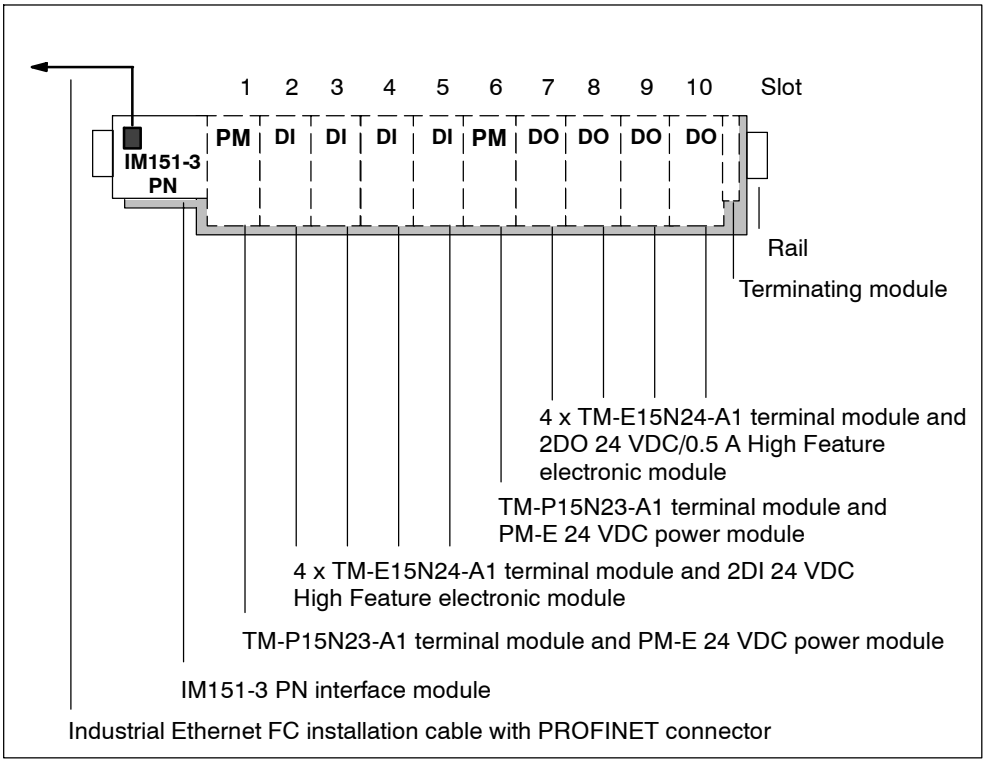


Figure 2-4 Components for the example on PROFINET IO

Order numbers for the example on PROFINET IO

Quantity	Order information	Order number
1 ×	Standard rail 35 mm (e. g. 483 mm length)	6ES5 710-8MA11
1 ×	IM151-3 PN interface module and terminating module, 1 unit	6ES7 151-3AA00-0AB0
1 ×	MMC (e. g. 64k)	6ES7 953-8LF11-0AA0
2 ×	TM-P15N23-A1 Fast Connect terminal module, 1 unit	6ES7 193-4CC70-0AA0
2 ×	TM-E15N24-A1 Fast Connect terminal module, 5 units	6ES7 193-4CA70-0AA0
2 ×	PM-E 24 VDC, 1 unit	6ES7 138-4CA00-0AA0
1 ×	2DI 24 VDC High Feature, 5 units	6ES7 131-4BB00-0AB0
1 ×	2DO 24 VDC/0.5 A High Feature, 5 units	6ES7 132-4BB00-0AB0
	PROFINET connector (conforming to the specifications in the *PROFINET Installation Guide*)	
	Suitable installation cables: • FC Standard Cable • FC Trailing Cable • FC Marine Cable	 6XV1 840-2AH10 6XV1 840-3AH10 6XV1 840-4AH10

Prerequisites

- You must have set up an S7 station consisting of a power supply module and an I/O controller (for example, CPU 317-2 PN/DP). A CPU 317-2 PN/DP was used as the I/O controller in this example.
- STEP 7 (V 5.3 with ServicePack 1 or higher) is fully installed on your programming device (PG). You must be familiar with STEP 7.
- The programming device is connected to the PROFINET IO.

Installation

1. Mount the rail (35 mm x 7.5 mm or 15 mm) with a length of at least 210 mm on a solid base.
2. Install the various modules on the rail beginning on the left (hook on, swing in, move to the left). Adhere to the following sequence:
   - IM151-3 PN interface module
   - TM-P15N23-A1 terminal module
   - 4 x TM-E15N24-A1 terminal modules
   - TM-P15N23-A1 terminal module
   - 4 x TM-E15N24-A1 terminal modules
   - Terminating module

Wiring and Fitting

1. Wire the ET 200S as shown below:

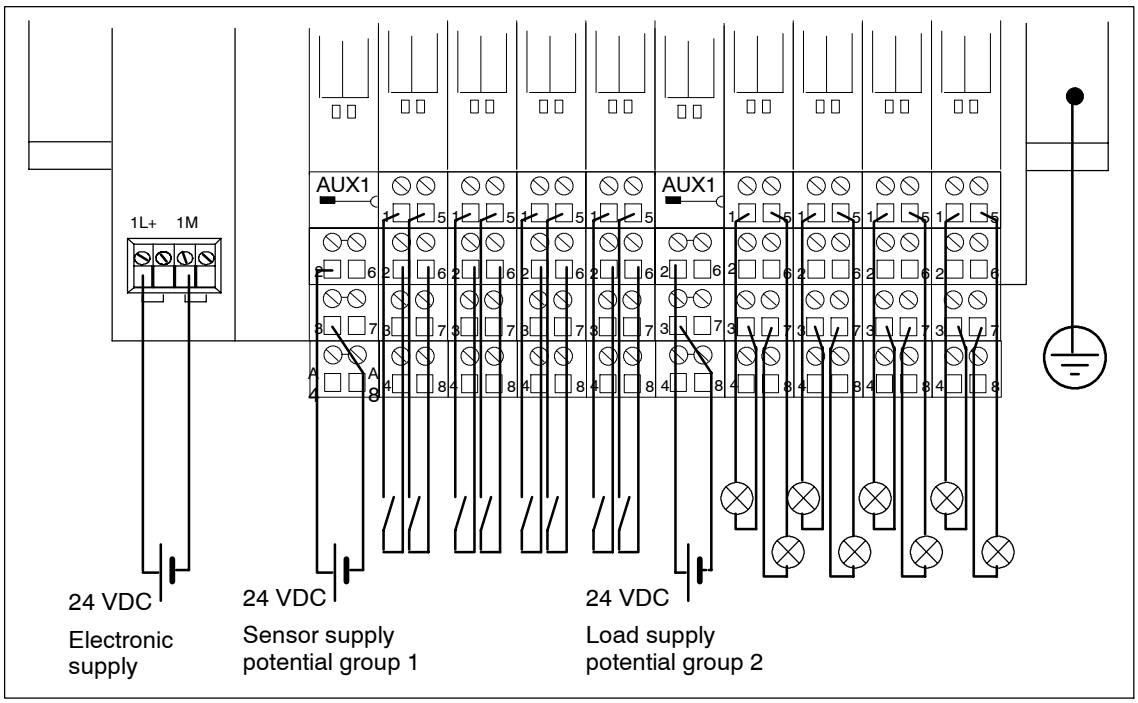


Figure 2-5 Wire the example on the PROFINET IO

2. Connect the ET 200S (IO device) to the I/O controller with the PROFINET connector via a switch. The PROFINET interface is located on the IM 151-3 PN.
3. Insert the power and electronic modules into the terminal modules.
4. Switch on the voltage supply for the I/O controller.
5. Watch the status LEDs on the I/O controller.
   CPU 317-2 PN/DP:
   - 5 VDC → lights up
   - SF → Off
   - BF2 → flashes

Configuration

1. Start SIMATIC Manager, and create a new project with an I/O controller (CPU 317-2 PN/DP, for example). Create OB 1, OB 82 and OB 83 for the project.
2. In HW CONFIG open the window **Properties - Ethernet interface** and create a subnet, for example, Ethernet(1).
3. From the hardware catalog add the IM151-3 PN from the ET 200S catalog on Ethernet(1):PROFINET IO system (100).
4. Drag the various ET 200S modules from the hardware catalog to the configuration table.

Table 2-2 Configuration table in HW CONFIG for PROFINET IO

Module	Order number	I address	O address	Comment
0	6ES7 151-3AA00-0AB0 IM151-3 PN			
1	6ES7 138-4CA00-0AA0 PM-E 24 VDC			Power module
2	6ES7 131-4BB00-0AB0 2DI 24 VDC	0		Bits 0.0 and 0.1
3	6ES7 131-4BB00-0AB0 2DI 24 VDC	1		Bits 1.0 and 1.1
4	6ES7 131-4BB00-0AB0 2DI 24 VDC	2		Bits 2.0 and 2.1
5	6ES7 131-4BB00-0AB0 2DI 24 VDC	3		Bits 3.0 and 3.1
6	6ES7 138-4CA00-0AA0 PM-E 24 VDC			Power module
7	6ES7 132-4BB00-0AB0 2DO 24 VDC		0	Bits 0.0 and 0.1
8	6ES7 132-4BB00-0AB0 2DO 24 VDC		1	Bits 1.0 and 1.1
9	6ES7 132-4BB00-0AB0 2DO 24 VDC		2	Bits 2.0 and 2.1
10	6ES7 132-4BB00-0AB0 2DO 24 VDC		3	Bits 3.0 and 3.1

5. Set the following parameters:
   - In the properties IO device dialog box for the PM-E 24 VDC, module 1 (in the configuration table)

     Diagnosis: Load voltage not present
   - In the I/O device properties dialog box for 2 DO 24 VDC, Module 7 (in the configuration table)

     Diagnosis: wire break A0
6. Compile and save the configuration.

Assigning device names for the I/O device

1. Install the MMC in the IM151-3 PN.
2. Switch on the voltage supply for the IM151-3 PN.
3. In HW CONFIG open the **Properties – IM151-3 PN** window and enter the device name for the I/O device.
4. An online PROFINET connection from the programming device to the I/O device via a switch is required to send the name to the IM151-3 PN.

   The device name is transferred to the IM151-3 PN via **Destination system > Ethernet > Assign device name**. You must press the **Assign name** button in the **Assign device name** window. The device name is saved to the MMC in the IM151-3 PN interface module.
   After assignment of the name the device name that you have assigned appears in the window.

Integration in the user program

1. Create the OB 1 user program in the LAD/STL/FBD editor.

   Example 1: Reading an input and controlling an output:

STL	Explanation
A I 0.0 A M 2.0 S Q 0.0	If input bit 0.0 and memory bit 2.0 are set, then set output bit 0.0

   Example 2: Transferring an input byte to an output byte:

STL	Explanation
L PIB 0	Load I/O byte 0 in the accumulator (bits 0.0 to 0.7)
T PQB 0	Transfer the contents of the accumulator to I/O output byte 0 (bits 0.0 to 0.7)

2. Save the project in SIMATIC Manager.
3. Load the configuration in the I/O controller.

Switching on

1. Switch on all the power supplies of the ET 200S.
2. Observe the status LEDs on the I/O controller, ET 200S and switch.
   - CPU 317-2 PN/DP:

     DC 5V: lit

     SF: off

     BF2: off

     LINK: lit
   - ET 200S:

     SF: Off

     BF: Off

     ON: lit

     LINK: lit
   - Switch:

     LINK: lit

     100MB: lit

Interrupts, for example, removing and inserting the 2 DI 24 VDC High Feature digital electronic module

1. Remove the 2 DI 24 VDC High Feature electronic module (e.g. from slot 2) from the terminal module during operation.
2. Watch the status LEDs on the IM 151-3 PN:
   - SF: lit ⇒ diagnostic message exists.
   - BF: Off
   - ON: lit

   Result: The ET 200S continues to operate problem-free.
3. OB 83 is started in the event of a remove interrupt. In OB 83 start SFB 52. Evaluate the diagnostic data set $E002_H$.

Byte	Contents	Meaning
Header information		
0 and 1	8104_H	Data record with discrepancies between the expected and actual configuration
2 and 3	0014_H	20 bytes follow
4 and 5	0100_H	Version 1.0
6 and 7	0001_H	0001_H if the preset deviates from the actual configuration
IO device header information		
8 and 9	0000_H	Fixed
10 and 11	0000_H	Fixed
12 and 13	0001_H	Number of slots in which there is a discrepancy between the expected and actual configuration
Configuration data of slots		
14 and 15	0002_H	Slot number of the slot with a discrepancy between expected and actual configuration
16 to 19	$XXXXXXXX_H$	Identification of the inserted module
20 and 21	0000_H	No module inserted
22 and 23	0000_H	Number of submodule slots with preset/actual deviation Because the content is 0000_H, there are no additional submodule data.

4. Insert the removed electronic module in the terminal module again.

   Result:

   - Status LEDs on the IM151-3 PN:

     SF: Off

     BF: Off

     ON: lit

   - After insertion of the module the diagnostic data set $E002_H$ no longer shows a preset/actual deviation for any slot.

Diagnostics

In the event of a fault, OB 82 is started. In OB 82 start SFB 52. Evaluate the diagnostic data set $C00A_H$.

Switching off the load voltage on the power module

1. Switch off the load voltage on the PM-E 24VDC (slot 1).
2. Monitor the status LEDs

   IM151-3 PN:

   - SF: lit

   Power module:

   - PWR: off ⇒ No load voltage at power module
   - SF: lit ⇒ diagnostic message exists.

   I/O modules in the potential group:

   - LEDs: lit
3. Evaluate diagnostic data set $C00A_H$.

Byte	Contents	Meaning
Header information		
0 and 1	0010_H	Data record with channel diagnostics
2 and 3	0012_H	18 bytes follow
4 and 5	0100_H	Version 1.0
Channel diagnostic data		
6 and 7	0001_H	Slot 1
8 and 9	0001_H	Submodule slot 1
10 and 11	8000_H	Error on submodule
12	08_H	Entering state
13	00_H	Reserved
14 and 15	8000_H	Submodule diagnostic information exists
Channel diagnostic data record 0 with detailed information on the problem		
16 and 17	0000_H	Channel 0
18	28_H	Error entering state at an input
19	01_H	Data format: 1 bits
20 and 21	0011_H	Encoder or load voltage missing

4. Switch on the load voltage on the power module again, and evaluate the diagnosis again.

   Result:

   Status LED IM151-3 PN:

   - SF: Off

   Status LEDs on the power module:

   - PWR: on
   - SF: Off

   Status LEDs on the I/O modules:

   - LEDs: Off
   - The diagnosis is deleted.

Wire break in the actuator wiring

1. Remove the cable from terminal 1 on the 2DO 24 VDC/0.5A HF electronic module (slot 7)
2. Monitor the status LEDs

   IM151-3 PN:

   - SF: lit

   2DO 24 VDC/0.5A HF electronic module:

   - SF: lit ⇒ diagnostic message exists
   - 1: Off ⇒ The output is not activated
3. Evaluate diagnostic data set $C00A_H$.

Byte	Contents	Meaning
Header information		
0 and 1	0010_H	Data record with channel diagnostics
2 and 3	0012_H	18 bytes follow
4 and 5	0100_H	Version 1.0
Channel diagnostic data		
6 and 7	0007_H	Slot 7
8 and 9	0001_H	Submodule slot 1
10 and 11	8000_H	Error on submodule
12	08_H	entering state
13	00_H	Reserved
14 and 15	8000_H	Submodule diagnostic information exists
Channel diagnostic data record 0 with detailed information on the problem		
16 and 17	0000_H	Channel 0
18	48_H	Error entering state at an output
19	01_H	Data format: 1 bits
20 and 21	0006_H	Wire break

4. Attach the cable to the actuator again in terminal 1 and evaluate the diagnosis again:

   Status LED IM151-3 PN:

   - SF: Off

   Status LEDs on the 2DO 24 VDC/0.5A High Feature electronic module:

   - SF: Off
   - 1: off/on
   - The diagnosis is deleted.

Configuration Options

3

Chapter overview

3.1 Finely-graduated modular system

Fine modular in the ET 200S means: The structure of the ET 200S can be adapted exactly to your application.

The figure below shows you a number of examples of ET 200S distributed I/O system configurations:

Table 3-1 Examples of ET 200S setups

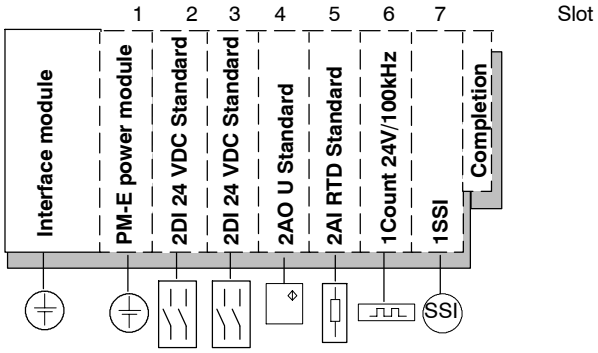
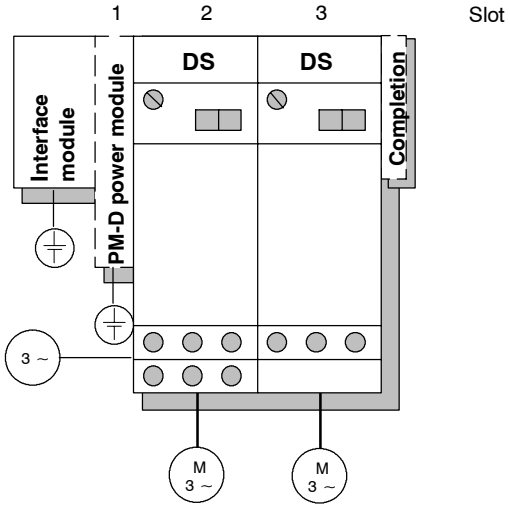
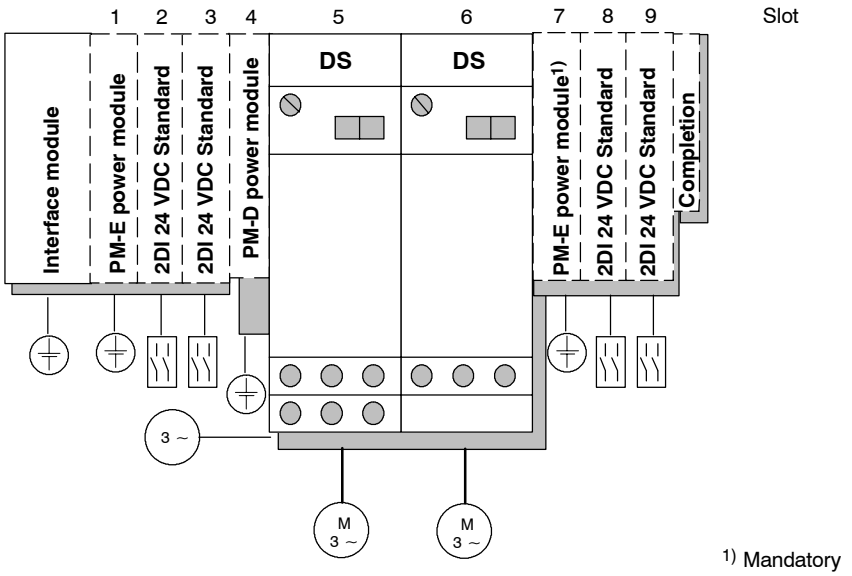
Example	Structure
ET 200S with • Digital electronic modules • Analog electronic modules • Technology modules	
ET 200S with motor starters	

Table 3-1 Examples of ET 200S setups

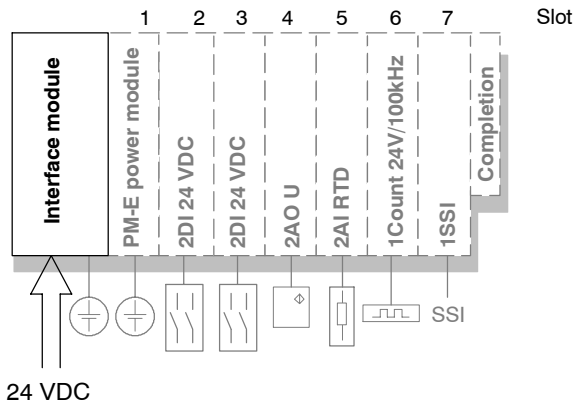
Example	Structure
ET 200S with • Electronic modules • Motor starters	

3.2 Power supply of the ET 200S

The following power supplies are available for the ET 200S

- DC 24 V on the interface module (see table 3-2).

Table 3-2 Power supply of the ET 200S

Power supply	Configuration (example)
24 VDC on the interface module	

3.3 Placement and connection to common potential of power modules

Placement and connection to common potential

You can choose where to position the power modules in the ET 200S. Each TM-P terminal module (for a power module) that you install in the ET 200S opens a new potential group. All the sensors and load supplies of the downstream electronic modules/motor starters are fed from this TM-P terminal module (for a power module). If you place an additional TM-P terminal module after an electronic module/motor starter, you interrupt the voltage buses (P1/P2) and simultaneously open a new potential group. This permits connection to common potential of sensor and load supplies.

AUX(iliary) bus (AUX 1)

A TM-P terminal module (for a power module) allows you to connect additional potential (up to the maximum rated load voltage of the module), which you can apply by means of the AUX(iliary) bus. You can set the AUX(iliary) bus individually as:

- A protective ground bar
- Additionally required voltage

Placement and connection to common potential of power modules

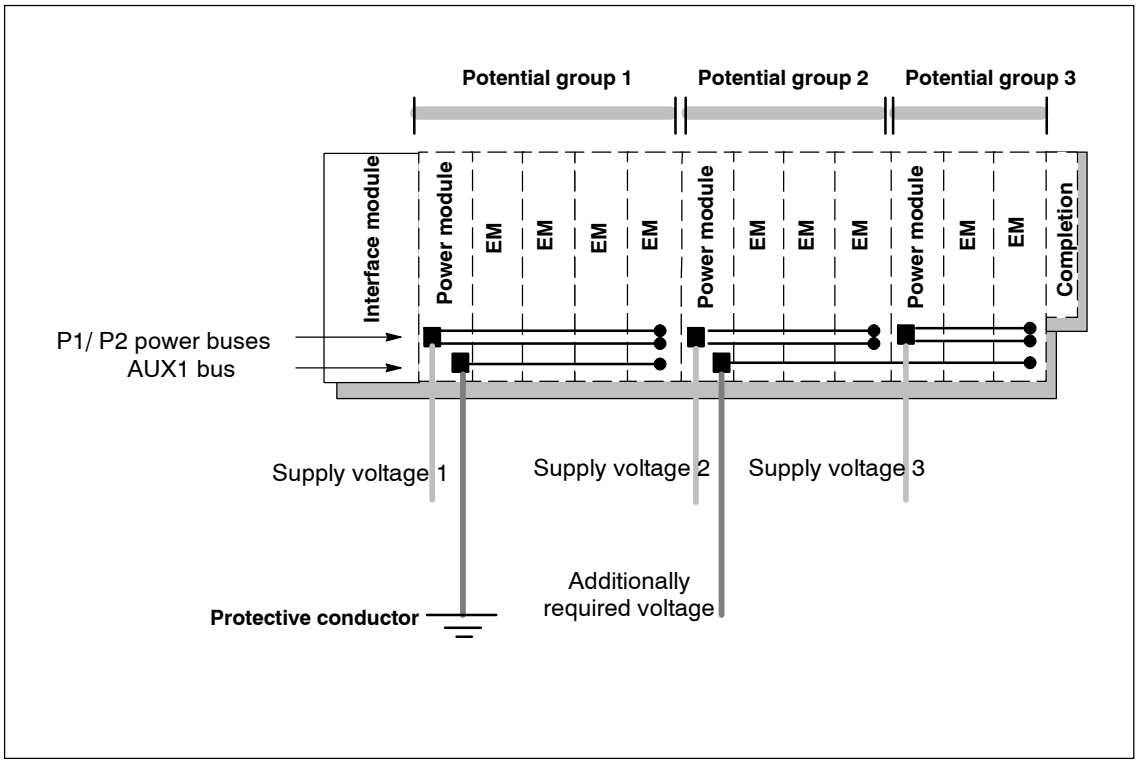


Figure 3-1 Placement and connection to common potential of power modules

Warning

If you connect the AUX1 bus to common potential independently of the P1/P2 buses (different voltages), there is no safe electrical isolation between the AUX1 bus and the P1/P2 buses.

Connecting different potentials to the AUX1 bus

Note

If you apply different potentials to the AUX1 bus in an ET 200S station, you must isolate the potential groups by means of a power module with the terminal module TM-P15S23-A0.

3.4 Configuration options of the interface modules

The interface module to suit your application:

Table 3-3 Interface modules and the applications for which they are suited

Applications		Interface module
• Connecting the PROFIBUS DP by means of the RS 485 interface • Operation as a DPV0 slave. • Direct Data Exchange • Bus length of the ET 200S: irrelevant • Number of modules: max. 12	Transmission rates: 9.6; 19.2; 45.45; 93.75; 187.5; 500 kbps, 1.5 ; 3; 6; 12 Mbps	IM151-1 BASIC
• Connecting the PROFIBUS DP by means of the RS 485 interface • Operation as a DPV0 slave. • Direct Data Exchange • Bus length of the ET 200S: max. 2 m (configurable) • Number of modules: max. 63 • Option handling and status byte for power modules from 6ES7 151-1AA04-0AB0 additionally: • Operation as a DPV1 slave. – Acyclic data exchange (read/write data record): – Diagnostics Interrupts – Process Alarms – Removal/Insertion Interrupt • Firmware update via PROFIBUS DP • Identification data	Transmission rates: 9.6; 19.2; 45.45; 93.75; 187.5; 500 kbps, 1.5 ; 3; 6; 12 Mbps	IM151-1 STANDARD
• Connecting the PROFIBUS DP by means of fiber-optic cable • Operation as a DPV0 slave. • Direct Data Exchange • Bus length of the ET 200S: max. 2 m (configurable) • Number of modules: max. 63 • Option handling and status byte for power modules from 6ES7 151-1AB03-0AB0 additionally: • Operation as a DPV1 slave. – Acyclic data exchange (read/write data record): – Diagnostics Interrupts – Process Alarms – Removal/Insertion Interrupt • Firmware update via PROFIBUS DP • Identification data	Transmission rates: 9.6; 19.2; 45.45; 93.75; 187.5; 500 kbps, 1.5 ; 12 Mbps	IM 151-1 FO STANDARD

Table 3-3 Interface modules and the applications for which they are suited

Applications		Interface module
• Connecting the PROFIBUS DP by means of the RS 485 interface • Use of fail-safe modules • Clocking as of 1.5 Mbps • Direct Data Exchange • The firmware can be updated via PROFIBUS DP using HWCONFIG. • Operation as a DPV0 slave. – Acyclic data exchange (read/write data record): class 2 services • Operation as a DPV1 slave. – Acyclic data exchange (read/write data record): – Diagnostics Interrupts – Process Alarms – Removal/Insertion Interrupt • Bus length of the ET 200S: max. 1 m (164 ft) • Number of modules: max. 63	Transmission rates: 9.6; 19.2; 45.45; 93.75; 187.5; 500 kbps, 1.5 ; 3; 6; 12 Mbps	IM151-1 HIGH FEATURE
• Connecting the PROFINET • Operation as I/O device – Start data records – Output data with provider status of the I/O controller – Input data with provider status of the I/O device – Diagnostics Interrupts – Process Alarms – Removal/Insertion Interrupt • Bus length of the ET 200S: max. 2 m (164 ft) • Number of modules: max. 63 • Status byte for power modules	Transmission rate: 100 Mbps Autosensing	IM151-3 PN

Rules for setting up a fiber-optic cable network with the IM 151-1 FO STANDARD

For a fiber-optic cable network with nodes that have integrated fiber-optic cable interfaces, note the following:

- The fiber-optic cable network can be set up only as a line segment.
- If you remove the fiber-optic cable from an integrated fiber-optic cable interface, or the supply voltage to the IM151-1 FO STANDARD fails, all the downstream nodes are no longer accessible.

Example configuration of a fiber-optic cable network with the IM151-1 FO STANDARD

Figure 3-2 provides an example of setting up a fiber-optic network with the ET 200S and the IM151-1 FO STANDARD as the interface module.

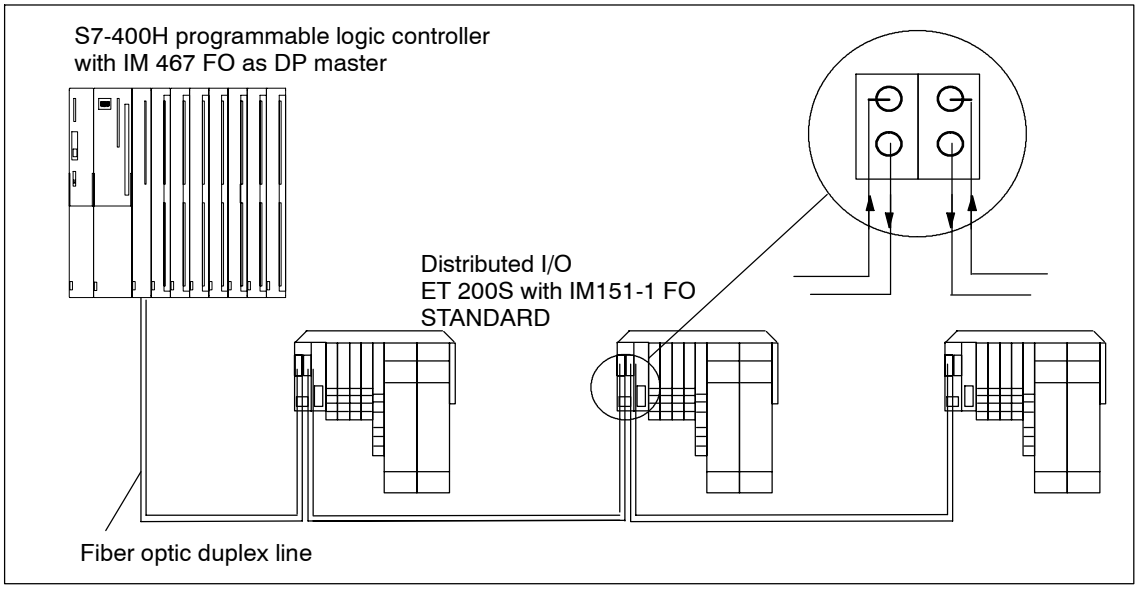


Figure 3-2 Fiber-optic cable network with the IM151-1 FO STANDARD

Rules for the structure of a PROFINET network

For information on the structure and commissioning of PROFINET see the PROFINET System Documentation.

3.5 Configuration options between the terminal modules and electronic modules

The electronic modules to suit your application:

Table 3-4 Electronic modules and the applications for which they are suitable

Applications		Electronic module
• Evaluating switches, proximity switches (BEROs), sensors, and encoders	24 VDC	2DI 24 VDC Standard 2DI 24 VDC High Feature 4DI 24 VDC Standard 4DI 24 VDC High Feature 4DI 24 VDC/SRC Standard
	24–48 VUC	4DI 24–48 VUC High Feature
• Evaluating NAMUR sensors • Evaluating connected, unconnected mechanical sensors	4 input channels	4DI NAMUR
• Evaluating switches, proximity switches (BEROs), sensors, and encoders	120 VAC	2DI 120 VAC Standard
	230 VAC	2DI 230 VAC Standard
• Switching solenoid valves, DC and AC contactors, indicator lights, actuators	VDC up to 0.5 A	2DO 24 VDC/0.5 A Standard 2DO 24 VDC/0.5 A High Feature 4DO 24 VDC/0.5 A Standard
	VDC up to 2 A	2DO 24 VDC/2 A Standard 2DO 24 VDC/2 A High Feature 4DO 24 VDC/2 A Standard
	VAC up to 1 A	2DO 24–230 VAC/1 A
	Up to 120 VDC/up to 230 VAC up to 5 A	2RO NO 24–120 VDC/5 A 24–230 VAC/5 A
	Up to 48 VDC/up to 230 VAC up to 5 A	2RO NO/NC 24–48 VDC/5 A 24–230 VAC/5 A
• Measuring voltages	±10V/ ± 5V/ 1 to 5V	2AI U Standard
• Measuring voltages with high resolution	±10V/ ± 5V/ 1 to 5V	2AI U High Feature
• Time-critical measuring of voltages	±10V/ ± 5V/ ± 2.5V/	2AI U High Speed
• Measuring of currents with two-wire measuring transducers	4 to 20 mA	2AI I 2WIRE ST 4AI I 2WIRE ST
• Time-critical measuring of currents with two-wire measuring transducers	4 to 20mA 0 to 20 mA	2AI I 2WIRE High Speed

Table 3-4 Electronic modules and the applications for which they are suitable

Applications		Electronic module
• Measuring of currents with four-wire measuring transducers	±20mA/ 4 to 20 mA	2AI I 4WIRE Standard
• Measuring of currents with two-wire, four-wire measuring transducers and high resolution	±20mA/ 4 to 20 mA	2AI I 2/4WIRE High Feature
• Time-critical measuring of currents with four-wire measuring transducers	4 to 20mA 0 to 20mA ”20mA	2AI I 4WIRE High Speed
• Measuring temperatures with resistance thermometers and resistors • Measuring reference junction temperatures in thermocouple applications	Pt100/ Ni100 150 Ω/300 Ω/600 Ω	2AI RTD Standard
• Measuring temperatures with resistance thermometers and resistors • Measuring reference junction temperatures in thermocouple applications • High degree of accuracy • Temperature coefficient can be parameterized	Pt100/ Ni100/ Pt 200/ Ni 120/ Pt 500/ Ni 500/ Pt 1000/ Ni 1000 150 Ω/ 300 Ω/ 600 Ω/ PTC	2AI RTD High Feature
• Measuring temperatures with thermocouples and voltages	Type E/N/J/K/L/S/R/B/T ” 80 mV	2AI TC Standard
• Measuring temperatures with thermocouples and voltages • Internal reference junction in connection with TM-E15S24-AT	Type E/N/J/K/L/S/R/B/T/C ” 80 mV	2AI TC High Feature
• Output of voltages	±10V/ 1 to 5V	2AO U Standard
• Output of voltages with high resolution	±10V/ 1 to 5V	2AO U High Feature
• Output of currents	±20mA/ 4 to 20V	2AO I Standard
• Output of currents with high resolution	±20mA/ 4 to 20V	2AO I High Feature
• Photoelectric proximity switch	Reflex sensor and diffuse sensor with the IQ-SENSE	4 IQ-SENSE
• Counting of pulses, measurement of frequency, operating speed, or period time by means of incremental encoders	24 V signals up to 100 kHz	1COUNT 24V/100kHz
	5 V signals up to 500 kHz	1Count 5V/500kHz

Table 3-4 Electronic modules and the applications for which they are suitable

Applications		Electronic module
• Detection and evaluation of path positions by means of absolute position encoders (SSI) • Simple positioning tasks	Absolute position encoder: 13 bits/21 bits/25 bits	1SSI
• Driving power circuits of stepper motors • Positioning stepper motors	5 V pulses up to 204 kHz	EM 1STEP 5V/204kHz
• Output of pulses in 4 different operating modes	Min. pulse duration of 200 µs	2PULSE
• Controlled positioning, incremental encoder 5V differential signals	Drive controlled by means of digital outputs: travel minus, travel plus, rapid traverse/creep speed	1POS INC/Digital
	Drive controlled by means of analog output +10 V	1POS INC/Analog
• Controlled positioning, SSI sensor	Drive controlled by means of digital outputs: travel minus, travel plus, rapid traverse/creep speed	1POS INC/Digital
	Drive controlled by means of analog output +10 V	1POS INC/Analog
• RS232C/RS422/RS485 serial data transmission	ASCII and 3964(R) protocol	1SI 3964/ASCII
	Protocol mode and USS	1SI Modbus/USS
• Reservation of a slot for any electronic module	Width 15 mm Width 30 mm	RESERVE

The electronic modules you can use on the various terminal modules:

You can combine the terminal modules in the ET 200S configuration.

Table 3-5 Assignment of TM-P terminal modules and power modules

Power modules	TM-P terminal modules for power modules				
Screw-type term. →	**15S23-A1**	**15S23-A0**	**15S22-01**	**30S44-A0**	**F30S47-F1**
Order number 6ES7193... →	**...4CC20-0AA0**	**...4CD20-0AA0**	**...4CE00-0AA0**	**...4CK20-0AA0**	**3RK1 903-3AA00**
Spring terminal: →	**15C23-A1**	**15C23-A0**	**15C22-01**	**30C44-A0**	**---**
Order number 6ES7193... →	**...4CC30-0AA0**	**...4CD30-0AA0**	**...4CE10-0AA0**	**...4CK30-0AA0**	
Fast Connect →	**15N23-A1**	**15N23-A0**	**15N22-01**	**---**	**---**
Order number 6ES7193... →	**...4CC70-0AA0**	**...4CD70-0AA0**	**...4CE60-0AA0**		
PM-E 24 VDC	●	●	●		
PM-E 24–48 VDC	●	●	●		
PM-E 24–48VDC/ 24–230VAC	●	●	●		
PM-E F pm 24VDC PROFIsafe*				●	
PM-E F pp 24VDC PROFIsafe*				●	
PM-D F 24VDC PROFIsafe*					●

* See *ET 200S Fail-Safe Modules* manual

Table 3-6 Assignment of TM-E terminal modules and electronic modules

Electronic modules	TM-E terminal modules for electronic modules						
Screw-type term. →	15S26-A1	15S24-A1	15S24-01	15S23-01	15S24-AT	30S44-01	30S46-A1
Order number 6ES7193... →	...4CA40-0AA0	...4CA20-0AA0	...4CB20-0AA0	...4CB00-0AA0	...4CL20-0AA0	...4CG20-0AA0	...4CF40-0AA0
Spring terminal: →	15C26-A1	15C24-A1	15C24-01	15C23-01	15C24-AT	30C44-01	30C46-A1
Order number 6ES7193... →	...4CA50-0AA0	...4CA30-0AA0	...4CB30-0AA0	...4CB10-0AA0	...4CL30-0AA0	...4CG30-0AA0	...4CF50-0AA0
Fast Connect →	15N26-A1	15N24-A1	15N24-01	15N23-01	---	---	---
Order number 6ES7193... →	...4CA80-0AA0	...4CA70-0AA0	...4CB70-0AA0	...4CB60-0AA0			
2DI 24 VDC Standard 2DI 24 VDC High Feature 4DI 24 VDC Standard 4DI 24 VDC High Feature 4DI 24 VDC/SRC Standard	●	●	●	●			
4DI 24–48 VUC High Feature	●	●	●	●			
4DI NAMUR	●	●	●	●			
2DI 120 VAC Standard	●	●	●	●			
2DI 230 VAC Standard	●	●	●	●			
2DO 24 VDC/0.5 A Standard 2DO 24 VDC/0.5 A High Feature 4DO 24 VDC/0.5 A Standard	●	●	●	●			
2DO 24 VDC/2 A Standard 2DO 24 VDC/2 A High Feature 4DO 24 VDC/2 A Standard	●	●	●	●			
2DO 24–230 VAC/2 A	●	●	●	●			
2RO NO 24–120 VDC/5 A 24–230 VAC/5 A 2RO NO/NC 24–48 VDC/5 A 24–230 VAC/5 A	●	●	●	●			
2AI U Standard 2AI U High Feature 2AI U High Speed	●	●	●	●			
2AI I 2WIRE Standard 2AI I 2WIRE High Speed	●	●	●	●			

Table 3-6 Assignment of TM-E terminal modules and electronic modules, continued

Electronic modules	TM-E terminal modules for electronic modules						
Screw-type term. →	**15S26-A1**	**15S24-A1**	**15S24-01**	**15S23-01**	**15S24-AT**	**30S44-01**	**30S46-A1**
Order number 6ES7193... →	**...4CA40-0AA0**	**...4CA20-0AA0**	**...4CB20-0AA0**	**...4CB00-0AA0**	**...4CL20-0AA0**	**...4CG20-0AA0**	**...4CF40-0AA0**
Spring terminal: →	**15C26-A1**	**15C24-A1**	**15C24-01**	**15C23-01**	**15C24-AT**	**30C44-01**	**30C46-A1**
Order number 6ES7193... →	**...4CA50-0AA0**	**...4CA30-0AA0**	**...4CB30-0AA0**	**...4CB10-0AA0**	**...4CL30-0AA0**	**...4CG30-0AA0**	**...4CF50-0AA0**
Fast Connect →	**15N26-A1**	**15N24-A1**	**15N24-01**	**15N23-01**	**---**	**---**	**---**
Order number 6ES7193... →	**...4CA80-0AA0**	**...4CA70-0AA0**	**...4CB70-0AA0**	**...4CB60-0AA0**			
4AI I 2WIRE ST	●		●				
2AI I 2/4WIRE High Feature	●		●				
2AI I 4WIRE Standard 2AI I 4WIRE High Speed	●		●				
2AI RTD Standard	●		●				
2AI RTD High Feature	●	●	●	●			
2AI TC Standard	●	●	●	●			
2AI TC High Feature					●		
2AO U Standard 2AO U High Feature	●		●				
2AO I Standard 2AO I High Feature	●	●	●	●			
4 IQ-SENSE	●		●				
1Count 24V/100kHz	●		●				
1Count 5V/500kHz						●	
1SSI	●		●				
EM 1STEP 5V/204kHz	●		●				
2PULSE	●		●				
1POS INC/Digital						●	
1POS INC/Digital						●	
1POS INC/Analog						●	
1POS INC/Analog						●	
1SI 3964/ASCII	●		●				
1SI Modbus/USS	●		●				
4/8 F-DI 24 VDC PROFIsafe*						●	●
4 F-DO 24 VDC/2A PROFIsafe*						●	●
RESERVE (width 15 mm)	●	●	●	●	●		

Table 3-6 Assignment of TM-E terminal modules and electronic modules, continued

Electronic modules	TM-E terminal modules for electronic modules						
Screw-type term. →	**15S26-A1**	**15S24-A1**	**15S24-01**	**15S23-01**	**15S24-AT**	**30S44-01**	**30S46-A1**
Order number 6ES7193... →	**...4CA40-0AA0**	**...4CA20-0AA0**	**...4CB20-0AA0**	**...4CB00-0AA0**	**...4CL20-0AA0**	**...4CG20-0AA0**	**...4CF40-0AA0**
Spring terminal: →	**15C26-A1**	**15C24-A1**	**15C24-01**	**15C23-01**	**15C24-AT**	**30C44-01**	**30C46-A1**
Order number 6ES7193... →	**...4CA50-0AA0**	**...4CA30-0AA0**	**...4CB30-0AA0**	**...4CB10-0AA0**	**...4CL30-0AA0**	**...4CG30-0AA0**	**...4CF50-0AA0**
Fast Connect →	**15N26-A1**	**15N24-A1**	**15N24-01**	**15N23-01**	**---**	**---**	**---**
Order number 6ES7193... →	**...4CA80-0AA0**	**...4CA70-0AA0**	**...4CB70-0AA0**	**...4CB60-0AA0**			
RESERVE (width 30 mm)						●	●

* See *ET 200S Fail-Safe Modules* manual

The power modules you can use with the various electronic modules:

Power modules	Electronic modules
PM-E 24 VDC	Can be used with all electronic modules except the 2DI 120 VAC Standard, 2DI 230 VAC Standard, and 2DO 120/230 VAC.
PM-E 24-48 VDC	Can be used with all electronic modules except the 2DI 120 VAC Standard, 2DI 230 VAC Standard, and 2DO 120/230 VAC.
PM-E 24-48 VDC/ 24-230 VAC	Can be used with all electronic modules.
PM-E F pm 24 VDC PROFIsafe	For the fail-safe modules. See *ET 200S Distributed I/O System Fail-Safe Modules* manual
PM-E F pp 24 VDC PROFIsafe	
PM-D F 24 VDC PROFIsafe	

How to find the right terminal module for a power module for your application:

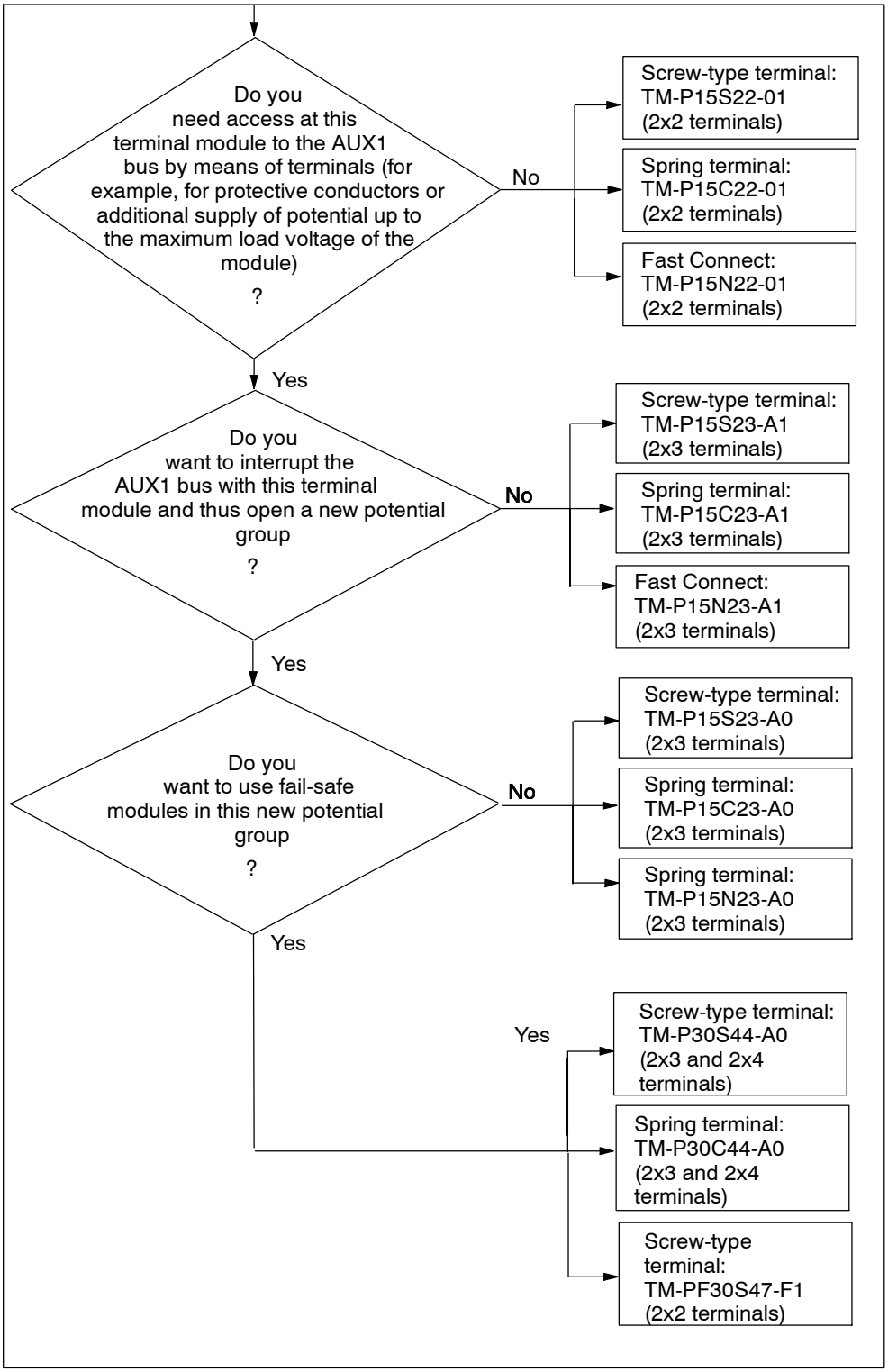


Figure 3-3 Selecting terminal modules for power modules

Configuration examples of terminal modules for power modules

Table 3-7 Terminal modules for power modules

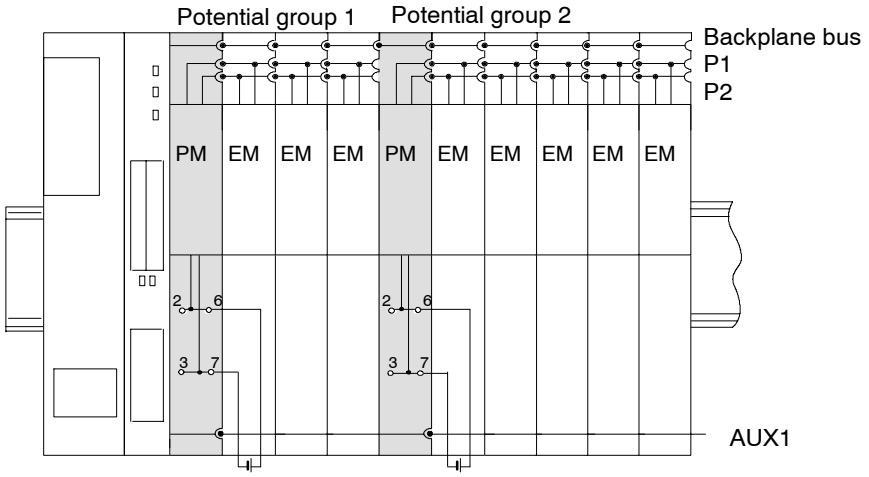
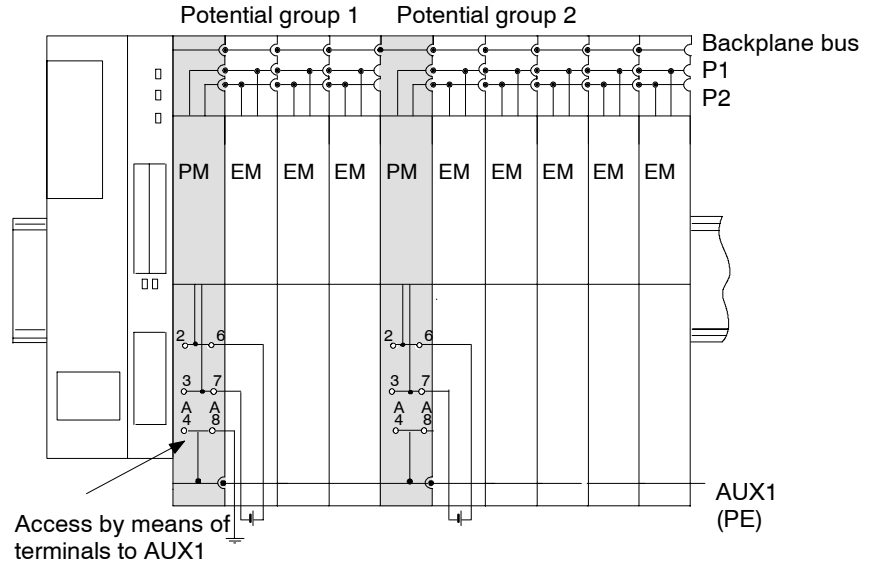
Terminal module	Structure
TM-P15S22-01 TM-P15C22-01 TM-P15N22-01	
TM-P15S23-A1 TM-P15C23-A1 TM-P15N23-A1	

Table 3-7 Terminal modules for power modules

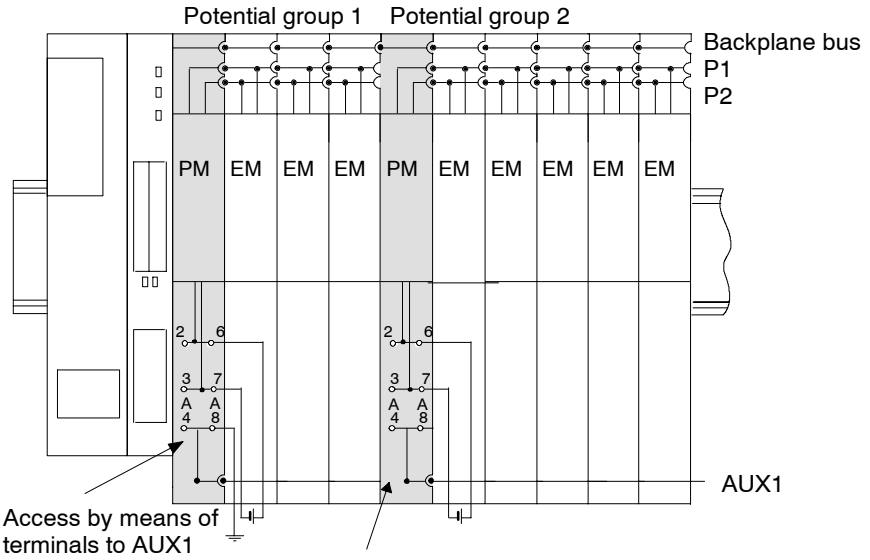
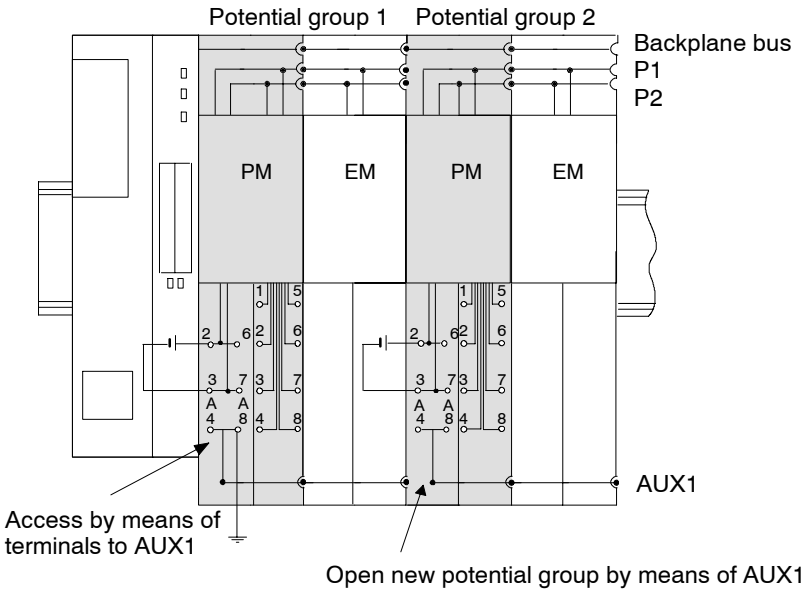
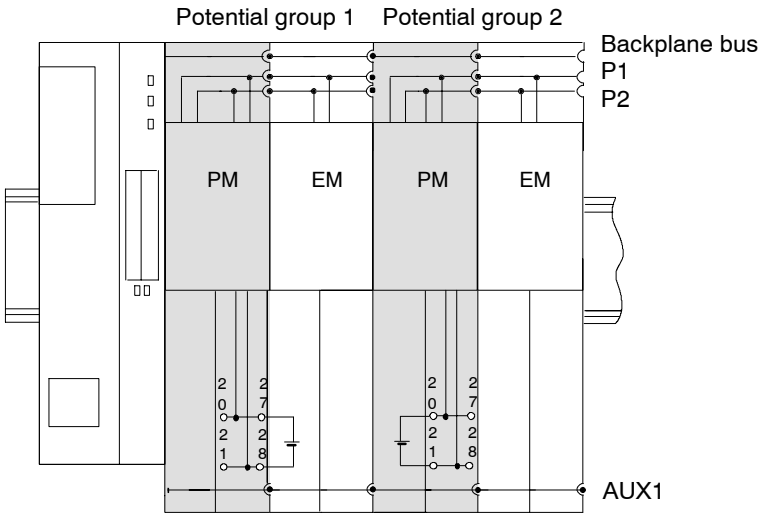
Terminal module	Structure
TM-P15S23-A0 TM-P15C23-A0 TM-P15N23-A0	
TM-P30S44-A0 TM-P30C44-A0	

Table 3-7 Terminal modules for power modules

Terminal module	Structure
TM-PF30S47-F1	

How to find the right terminal module for a electronic module for your application:

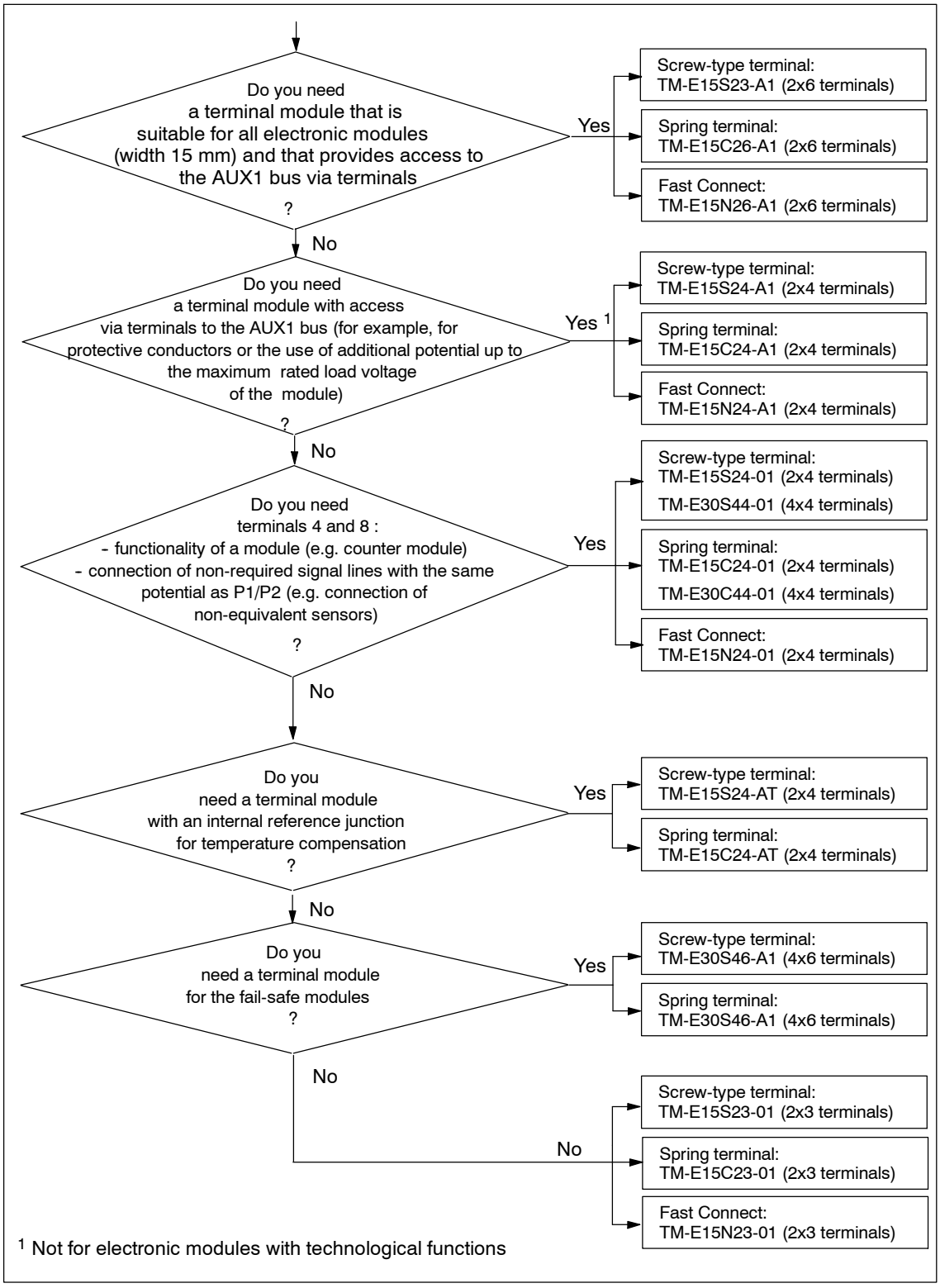


Figure 3-4 Selecting terminal modules for electronic modules

Configuration examples of terminal modules for electronic modules

Table 3-8 Terminal modules for electronic modules

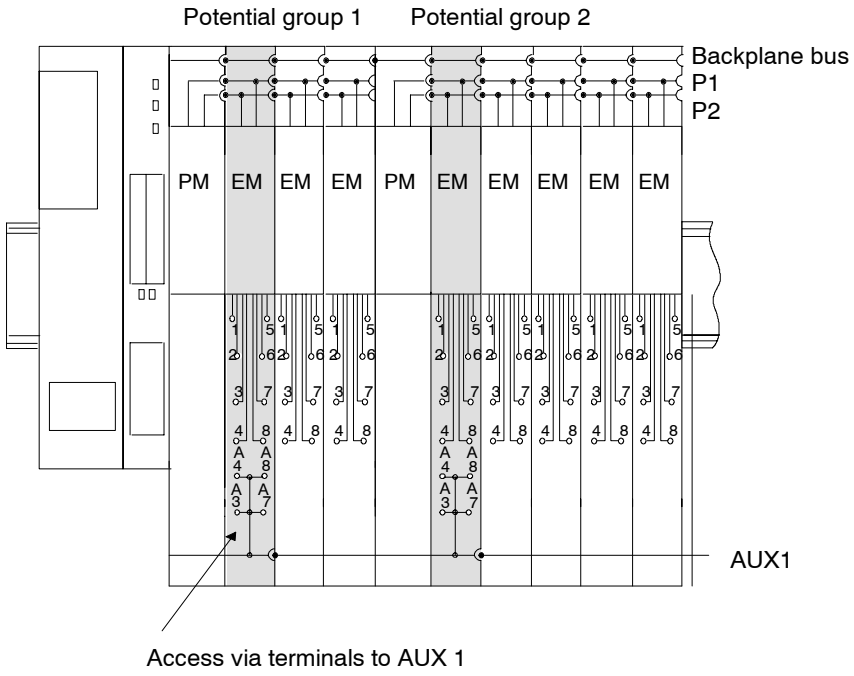
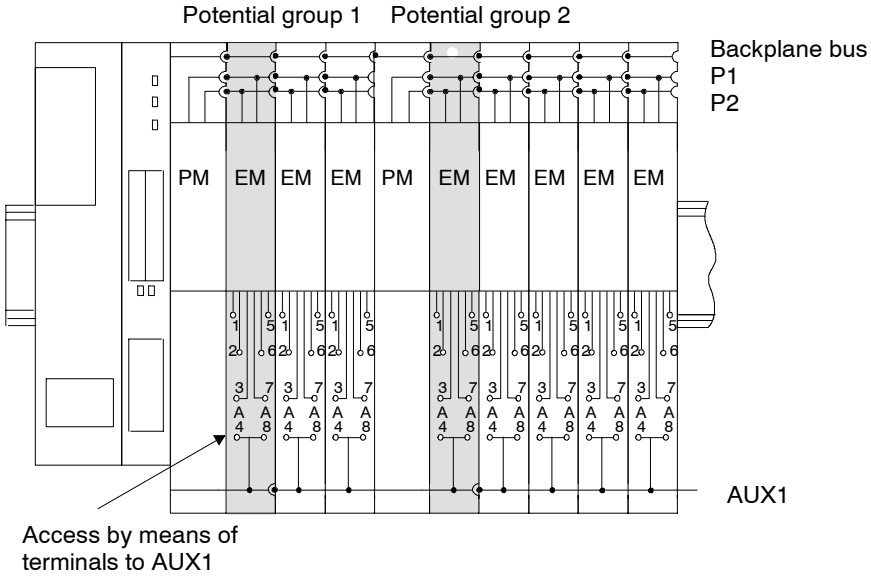
Terminal modules	Structure
TM-E15S26-A1 TM-E15C26-A1 TM-E15N26-A1	
TM-E15S24-A1 TM-E15C24-A1 TM-E15N24-A1	

Table 3-8 Terminal modules for electronic modules, continued

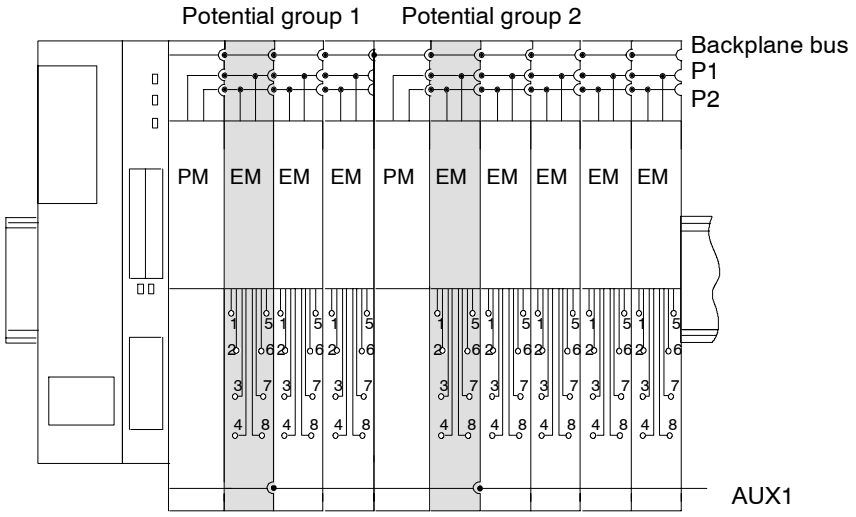
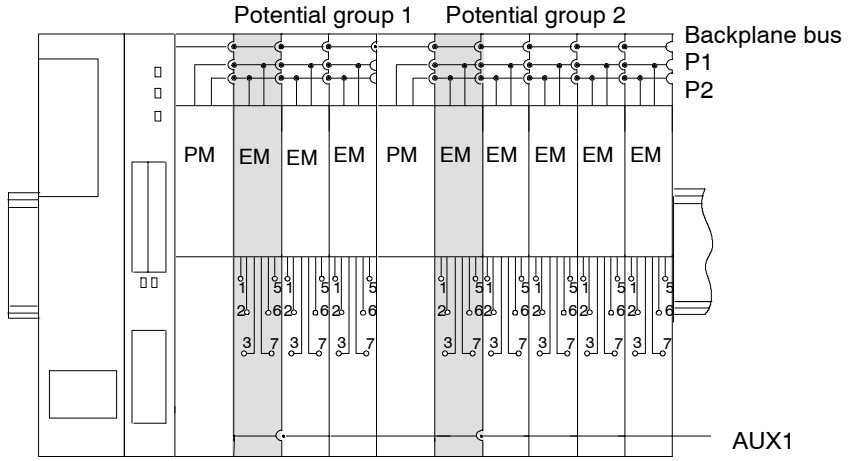
Terminal modules	Structure
TM-E15S24-01 TM-E15C24-01 TM-E15N24-01	
TM-E15S23-01 TM-E15C23-01 TM-E15N23-01	

Table 3-8 Terminal modules for electronic modules, continued

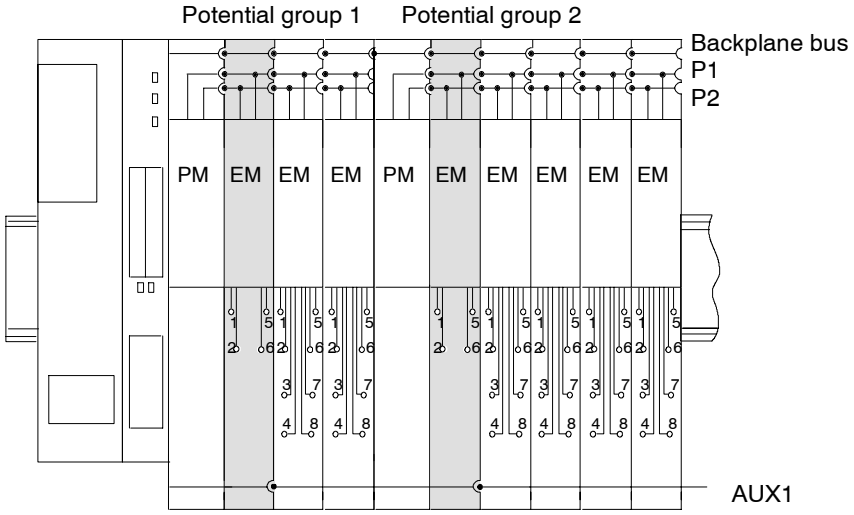
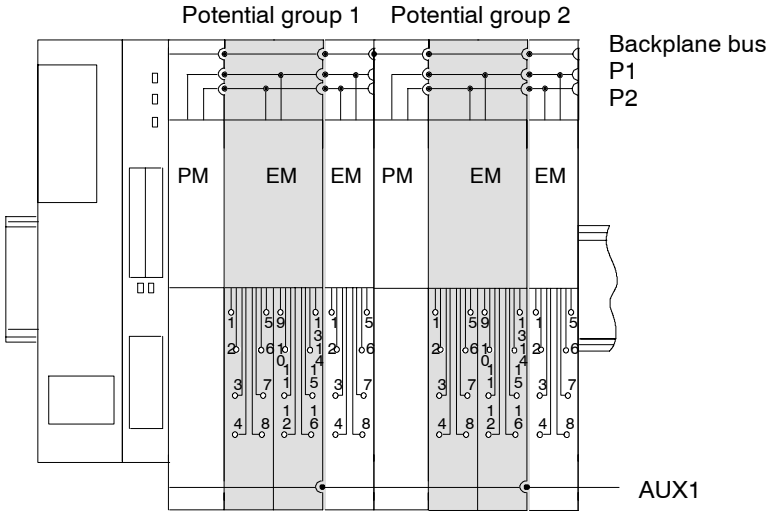
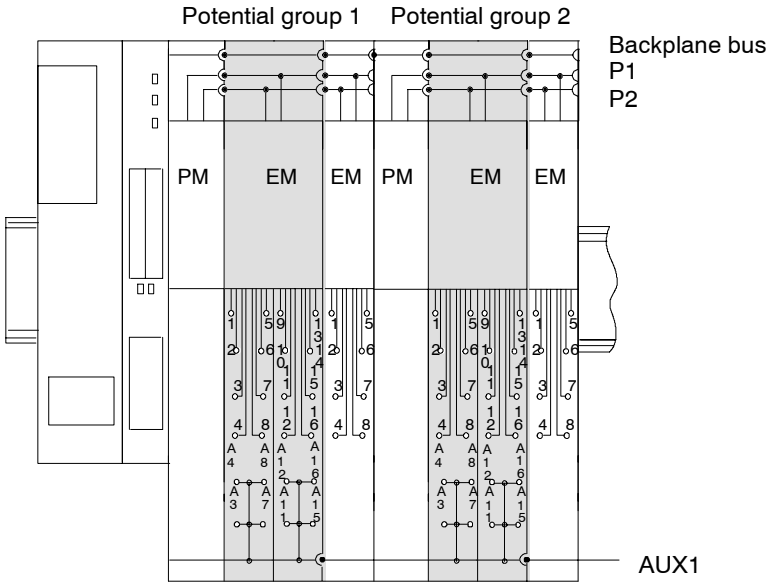
Terminal modules	Structure
TM-E15S24-AT TM-E15C24-AT	
TM-E30S44-01 TM-E30C44-01	

Table 3-8 Terminal modules for electronic modules, continued

Terminal modules	Structure
TM-E30S46-A1 TM-E30C46-A1	

3.6 Direct data exchange on the PROFIBUS DP

Prerequisites

- The ET 200S can be used as the sender (publisher) for direct communication.
- The DP master being used must, of course, also support direct communication. You will find information on this in the description of the DP master.

Principle

Direct communication is characterized by the fact that PROFIBUS DP nodes monitor the data sent back by a DP slave to its DP master.
By means of this mechanism the monitoring node (recipient/subscriber) can directly access changes to the input data of remote DP slaves.

During configuration in *STEP 7* you specify by means of the relevant I/O input addresses the address area of the recipient in which the data of the sender is to be placed.

Example

Figure 3-5 gives an example of the direct-communication relationships you can configure with an ET 200S as the sender and which nodes as possible recipients can monitor data sent back by DP slaves to the DP master.

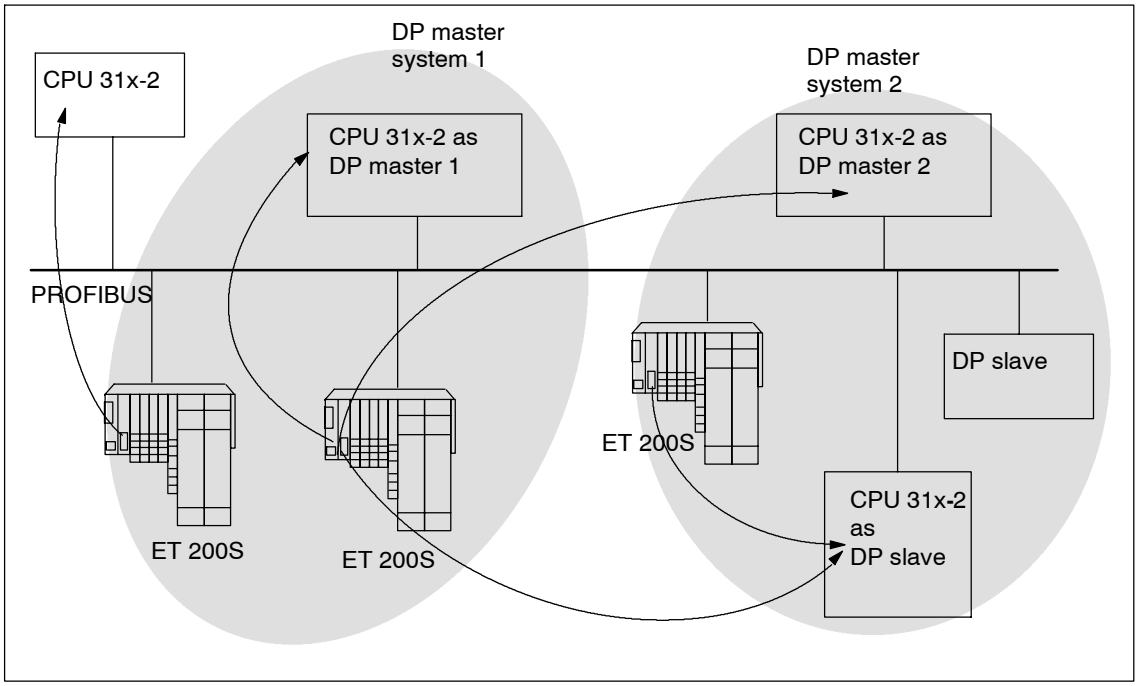


Figure 3-5 Direct Communication with the IM151-1 HIGH FEATURE

3.7 Clocking on PROFIBUS DP

Features

Reproducible response times (i.e. of equal length) are achieved in SIMATIC with an equidistant DP bus cycle, synchronization of the user program on the DP bus cycle, and the clocked transfer of I/O data to the I/O modules. The clocked sections of the user program are processed synchronously to the DP bus cycle by means of clocked interrupts (OB 61 to OB 64). The I/O data are transferred at defined and constant (clocked) intervals via the backplane bus of the DP slave to the I/O modules and switched through synchronously to the terminal.

In other words, clocking results in the synchronization of all the previously cyclic single cycles from the user program in the CPU to the DP cycle on the PROFIBUS subnetwork, to the cycle in the DP slave and, finally, to the cycle in the I/O modules of the DP slaves. The maximum jitter is 10 μs.

Prerequisites

- Clocking is possible with the IM 151-1 HIGH FEATURE with the following STEP 7 versions and modules:

STEP 7 version	Module	Order number	As of product version
As of V5.1 with ServicePack 3 and Hotfix 1	2DI 24 VDC High Feature	6ES7 131-4BB00-0AB0	1
	4DI 24 VDC High Feature	6ES7 131-4BD00-0AB0	1
	2DO 24 VDC/0.5 A High Feature	6ES7 132-4BB00-0AB0	1
	2DO 24 VDC/2 A High Feature	6ES7 132-4BB30-0AB0	1
As of V5.1 with ServicePack 4	1Count 24V/100kHz	6ES7 138-4DA03-0AB0	1
	1Count 5V/500kHz	6ES7 138-4DE01-0AB0	1
	1SSI	6ES7 138-4DB01-0AB0	1
As of V5.2	4DI 24-48 VUC High Feature	6ES7 131-4CD00-0AB0	1
	2AI U High Speed	6ES7 134-4FB51-0AB0	2
	2AI 2WIRE HS	6ES7 134-4GB51-0AB0	2
	2AI 4WIRE HS	6ES7 134-4GB61-0AB0	2
	2AO I High Feature	6ES7 135-4MB01-0AB0	1
	2AO U High Feature	6ES7 135-4LB01-0AB0	1

Other modules are possible in the ET 200S configuration but these do not support clocking.

- The transmission rate of the PROFIBUS DP is at least 1.5 Mbps (shorter equidistance times can be achieved with higher transmission rates).
- The maximum equidistance is 32 ms.
- The equidistance master (class 1) must be a class 1 DP master. In other words, a programming device (PG)/PC cannot be an equidistance master.
- In equidistant operation, only one DP master (class 1) can be active in the PROFIBUS DP bus system. PGs or PCs (class 2) can also be connected.
- Clocking can only be activated on the ET 200S if the equidistant bus cycle has been activated on the DP master system and at least one electronic module with synchronization support has been configured.
- No clocking (equidistance) is possible with the ET 200S during removal or insertion of electronic modules.
- In equidistant operation, the ET 200S requires a starting time of approx. 150 DP cycles to ensure clocking right through to the terminals.

Optimizing the equidistant time

- The longest delays for the digital input/output modules (parameterizable in the case of inputs) are decisive in determining the length of the equidistant DP cycle. Tip: During clocking make sure that all the digital modules in the ET 200S station have the same input delay.
- The shorter the input delays you set for the HIGH FEATURE digital input modules, the shorter the equidistance times that can be achieved. Tip: If possible, set an input delay of 0.1 ms for the HIGH FEATURE digital input modules.
- The processing time of the modules should be taken into account in the case of modules that support clocking.
- The minimum equidistance time depends on the number of modules in the ET 200S. Tip: If possible, use 4-channel HIGH FEATURE digital input modules to reduce the number of modules.
  You can also achieve shorter equidistance times if you distribute the modules of an ET 200S (with a large number of modules) between two ET 200S stations.
- The equidistance time is reduced if you increase the transmission rate.
  Tip: Set the fastest transmission rate possible.

Procedure for parameterizing clocking

1. Carry out settings on the CPU:

   ”Object Properties” of the CPU> ”Clocked interrupts” tab

   - Set the CPU clocked interrupt
   - Select the DP master system used.
   - Select the desired partial process image.

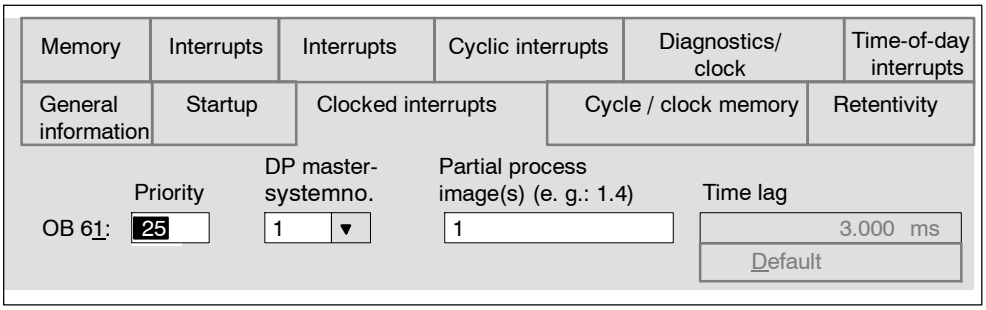


Figure 3-6 Clocked interrupts dialog box

2. Carry out settings on the DP master system:

   ”Object Properties” of the DP master > ”General” tab > ”Properties” button > ”Parameters” tab > ”Properties” button > ”Network Settings” tab > ”Options” button

   - Activate equidistance on the DP master system
   - Set the length of the equidistant DP cycle (max. 32 ms).
   - Set ”Times Ti and To same for all Slaves” (results in synchronization of the I/O data of the different DP slaves)
   - You can set the Ti and To times separately. Recommendation: Accept the default settings for Ti and To.

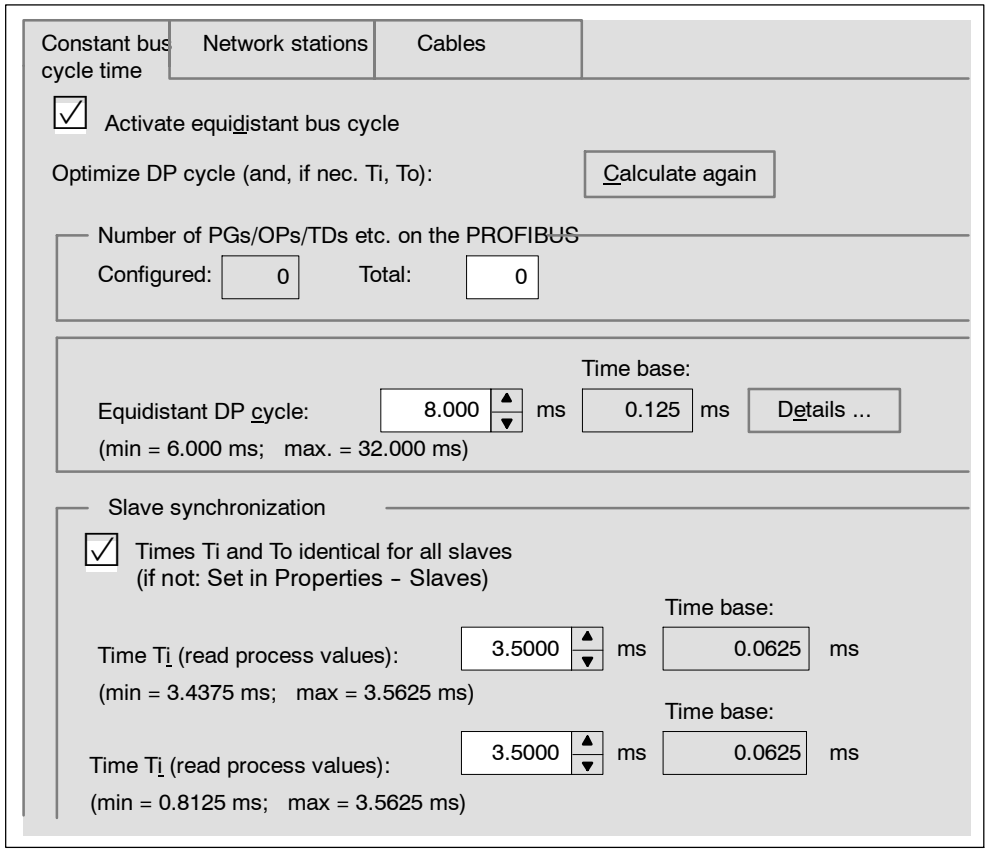


Figure 3-7 Options dialog box

Note

The ”Recalculate” button allows you to calculate a value from STEP 7 for the equidistant DP cycle that takes into account the current PROFIBUS DP configuration. This value is then automatically entered in the ”Equidistant DP cycle”, ”Time Ti (...)” and ”Time To (...)” boxes.

3. Carry out settings on the DP slave:

   ”Object Properties” of the DP slave > ”Clocking” tab

   - Enable ”Synchronize DP slave with DP cycle”.
   - Enter the times Ti and To (if ”Times Ti and To same for all slaves” has not been set on the DP master system). Recommendation: Accept the default settings for Ti and To.
   - Select the electronic modules to be synchronized, and assign them on the ”Addresses” tab to the partial process image defined in the CPU.

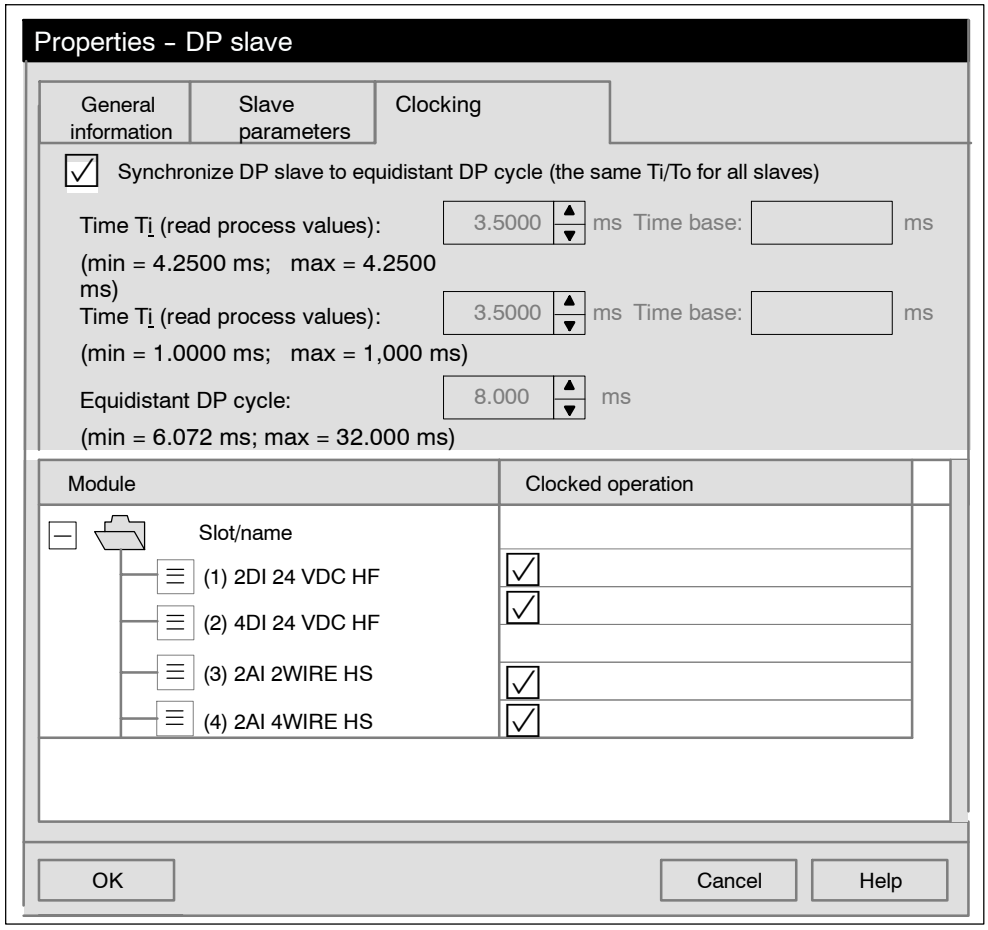


Figure 3-8 DP slave properties dialog box

Note

If you choose ”Clocking” from the ”Edit” menu, a configuration overview of the clocked modules appears.

4. Create a user program:
   - Create OB 61.
   - At the beginning of OB 61, SFC 126 must be called to upgrade the partial process image of the inputs.
   - At the end of OB 61, SFC 127 must be called to upgrade the partial process image of the outputs.
   - The partial process image to be used is the one parameterized in the CPU (”Clocked Interrupts” tab).

Troubleshooting in clocking

Action	Cause	Correction
Station failure of the ET 200S	Errored clocking (more than 10 lost or interrupted cycles).	Check the parameter assignment.
The equidistance times are too long.	The input delays of the HIGH FEATURE digital input modules are not optimally set.	Decrease the input delay of the HIGH FEATURE digital input modules.
No clocked signal detection/output.	Wrong process image partition used Neg. RET_VAL in the case of SFCs 126/127	Check whether the same process image partition was used in the OB 61 user program (or up to OB 64) when SFCs 126/127 are called and in the configuration of the DP master/DP slave.

Further information

You can find additional information on clocking in the STEP 7 help system and in the *Isochrone Mode* manual.

3.8 Option handling on PROFIBUS DP

Features

Option handling enables you to set up the ET 200S for future expansions (options). Option handling means that you install, wire, configure, and program the planned maximum configuration of the ET 200S. The electronic modules you require for this are initially replaced with inexpensive RESERVE modules which are then later simply exchanged for the required electronic modules.

This means that the ET 200S can be completely prewired (master wiring) because the RESERVE module is not connected to the terminals of the terminal module or therefore the process.

The RESERVE modules for future expansion at the right-hand end of the station are optional. In this case, preparatory installation and wiring are possible but not a prerequisite.

Note

You can find information on the removal and insertion of electronic modules in Section 5.5.

How it works

At option handling, the configuration of slots 2 to 63 of the ET 200S is checked. If the check is enabled for a slot, the RESERVE module (option) or the configured electronic module can take up this slot without a diagnosis being reported. If the check is disabled, only a configured electronic module can be located in this slot. Any other module will trigger a diagnosis. You can control the configuration of slots 2 to 63 and monitor the configuration of slots 1 to 63 using the control and feedback interface in the process input/output image (PII) and (PIQ).

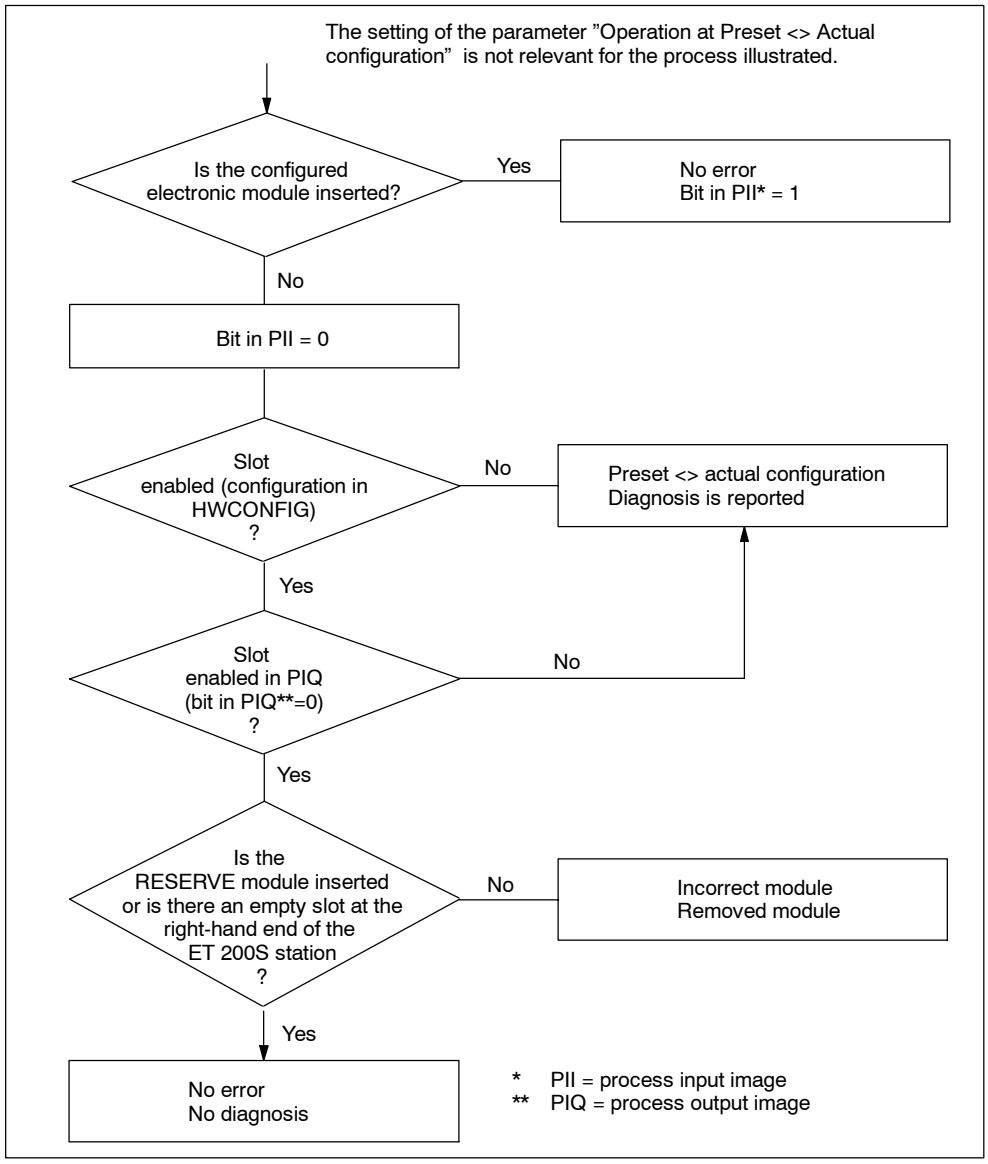


Figure 3-9 How option handling works

Prerequisites

For option handling you require:

- IM 151-1 STANDARD (from 6ES7 151-1AA03-0AB0) or IM 151-1 FO STANDARD interface module (from 6ES7 151-1AB02-0AB0)
- for configuring the GSD file as per the table below

	DPV0 operation		DPV0/DPV1 operation	
	SI02806A.GSx	SI02806B.GSx	SI03806A.GSx	SI03806B.GSx
	from 07/2003 (from V1.0)			
6ES7 151-1AA03-0AB0	X	-	-	-
6ES7 151-1AB02-0AB0	-	X	-	-
6ES7 151-1AA04-0AB0	X	-	X	-
6ES7 151-1AB03-0AB0	-	X	-	X

Note

You do not require a GSD file for option handling in STEP 7:

- as of STEP 7 V5.2 Service Pack 1 and
- the current HW update for the interface and power modules. Integrate the HW update in HWCONFIG using the **Options > Install HW Updates manu command.** You can download the HW updates from Customer Support on the Internet.

You can find the description of option handling in the STEP 7 help system.

- At least one PM E 24-48 VDC or PM E 24-48 VDC/24-230 VAC power module must be present in the configuration.
- RESERVE modules as replacements for future electronic modules

Note

If the actual configuration of an ET 200S station does not match the configured preset, a diagnosis is reported if the check for the slots is not enabled.

Example of the use of the RESERVE modules

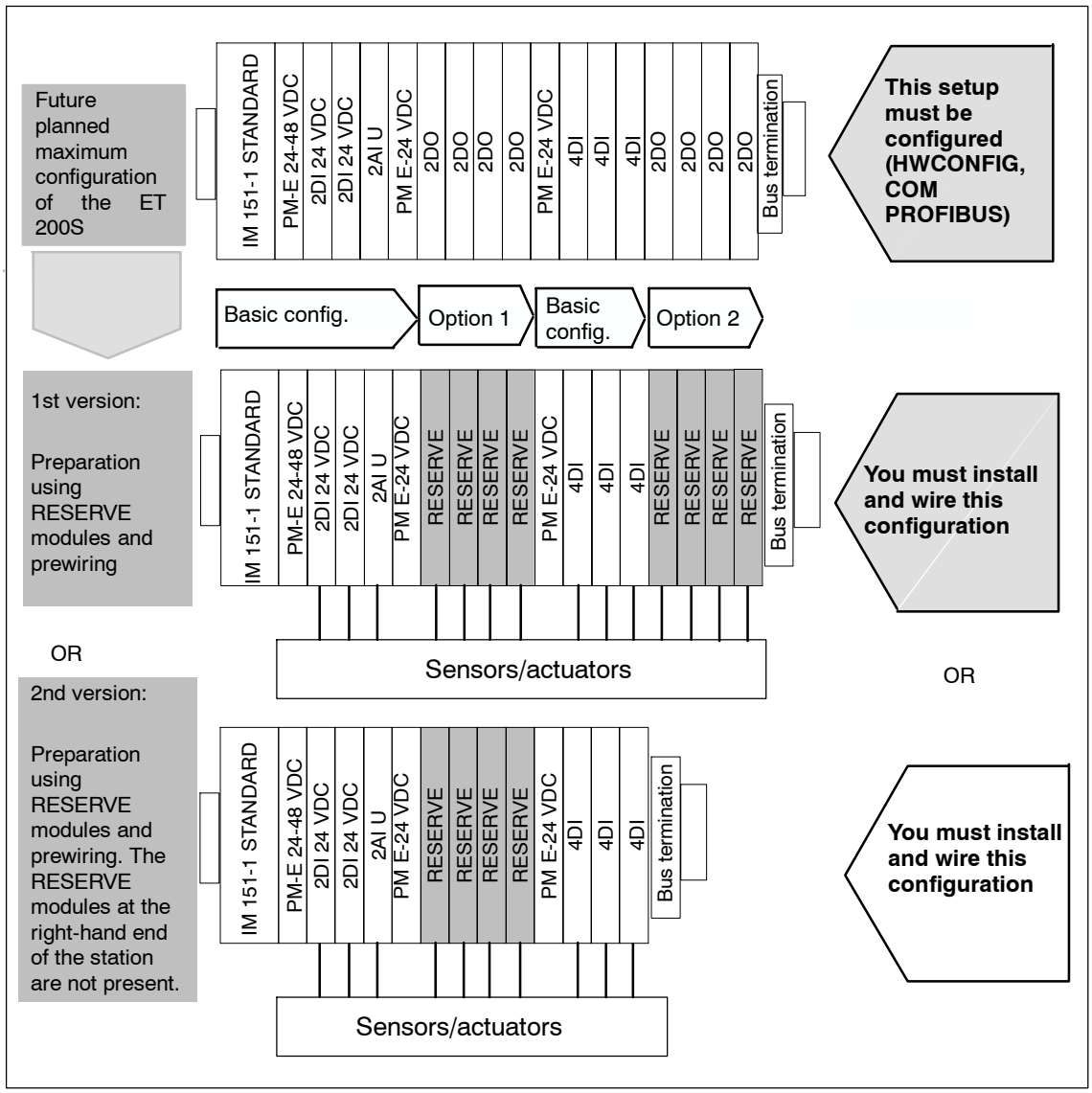


Figure 3-10 Example of the use of the RESERVE modules

Option handling parameter assignment

Note the following prerequisites when assigning parameters:

- In STEP 7 or COM PROFIBUS, parameterize the electronic modules you want to use for future applications, such as 4DI HF, on the slots of the RESERVE modules (or the expansion modules at the right-hand end of the station):
  - Drag the electronic module to the configuration table
  - Set the parameters
- Using one of the following entries, drag a PM E 24-48 VDC or PM E 24-48 VDC/24-230 VAC power module to the configuration table.
  - ...O (option handling) or
  - ...SO (status byte + option handling)

Note

There can only be **one** power module with the ending ...O or ...SO in the ET 200S configuration.

- Parameterize the interface module as follows:

Interface module	Parameters	Setting	Description
IM 151-1 STANDARD or IM 151-1 FO STANDARD	Option handling, general	Enable	Option handling is activated for the whole ET 200S.
	Option handling: Slots 2 to 63	Enable (all the slots on which RESERVE modules can be located)	There is a RESERVE module or configured electronic module on the slot. A diagnosis is not reported.

Note

If "Operation at Preset < > Actual Configuration" is blocked at parameter assignment, the following occurs:

- The ET 200S does not start up if a module is missing or if an incorrect module is inserted. A diagnostic report is output to the effect that there is no module or the module is incorrect.
- The ET 200S starts up if you enable option handling for the slot of an inserted RESERVE module. A diagnosis is not reported.

If you have parameterized an electronic module for the RESERVE module, the following substitute values are reported:

- Digital Input Modules: 0
- Analog Input Modules: $7FFF_H$
- Function Module: 0

Controlling and monitoring options

You can use the control feedback interface (PIQ) and feedback interface (PII) to control and monitor the options with the user program.

Recommendation: Before you use the optional expansion of the ET 200S, check using the feedback interface (see Table 3-10) whether all the configured electronic modules are inserted.

Note

Using SFCs 14/15 it is possible to consistently access the control and feedback interface.

The control and feedback interface is in the process image of the inputs and outputs of the PM E 24-48 VDC or PM E 24-48 VDC/24-230 VAC power modules. It is only available if you have selected the entries with the ending ...O or ...SO in the configuration software for that power module (see also Appendix C).

	7	6	5	4	3	2	1	0
	Bit no.							
IB/QB x	7	6	5	4	3	2	1	*
IB/QB x+1	15	14	13	12	11	10	9	8
IB/QB x+2	23	22	21	20	19	18	17	16
IB/QB x+3	31	30	29	28	27	26	25	24
IB/QB x+4	39	38	37	36	35	34	33	32
IB/QB x+5	47	46	45	44	43	42	41	40
IB/QB x+6	55	54	53	52	51	50	49	48
IB/QB x+7	63	62	61	60	59	58	57	56

There is one bit for each slot of the electronic or RESERVE modules in the ET 200S.

Control interface:
Slots 2 to 63

Feedback interface:
Slots 1 to 63

* Not applicable

Figure 3-11 Control (PIQ) and feedback interface (PII)

Control interface PIQ (AB x to AB x+7):

Using these bytes (8 bytes) you can control the diagnostic behavior of the slots you have enabled in HWCONFIG for option handling.

Only the bits of the slots you have enabled at parameter assignment for option handling are evaluated (they are marked with ”0”).

Table 3-9 Control interface

Slot	Value of the bit	Response
2 to 63	0	Parameter assignment for option handling applies. RESERVE modules are permitted: • The station is engaged in data transfer. • A diagnosis is not reported. • The SF LED on the interface module is off.
	1	Parameter assignment for option handling is cancelled. RESERVE modules are not accepted on this slot: • The station is engaged in data transfer. • The diagnosis ”Incorrect module” is reported. • The SF LED lights up on the interface module

Feedback interface PII (IB x to IB x+7):

The feedback interface (8 bytes) tells you which module is actually on each slot.

All slots are reported. Even slots that you have not enabled for option handling.

Table 3-10 Feedback interface

Slot	Value of the bit	Response
1 to 63	0	The RESERVE module or an incorrect module is on the slot or a module has been removed.
	1	The configured module is on the slot.

Troubleshooting for option handling

Table 3-11 Troubleshooting for option handling

Action	Cause	Correction
ET 200S does not start up; configuration error	There are **several** entries of power modules ending in ...O or ...SO in the ET 200S configuration.	Check and correct the configuration in HWCONFIG.
	There is **no** power module entry ending in ...O or ...SO in the ET 200S configuration.	Use a power module entry ending in ...O or ...SO in HWCONFIG.

3.9 Identification data

Identification data is information stored in a module that supports the user with the following:

- verification of the system configuration
- detection of HW changes in the system
- system troubleshooting

Modules can be precisely identified online with the identification data. In the case of the IM151-1 STANDARD (from 6ES7 151-1AA04-0AB0) and IM151-1 FO STANDARD (from 6ES7 151-1AB03-0AB0) the data are available on the ET 200S.
In STEP 7 the identification data are displayed in the tabs ”Module Status – IM 151” and ”Properties – DP Slave” (see STEP 7 online help).

Reading the identification data

The user can access specific identification data with **Read data set**. This requires access in two stages:

1. A directory which contains the data set numbers for the various indices is stored in data set 248 (see Table 3-12).

Table 3-12 Structure of DS 248 for ET 200S

Contents	Length (byte)	Coding (hex)
Header information		
ID of table of contents	2	00 01
Index of table of contents	2	00 00
Length of subsequent blocks in bytes	2	00 08
Number of blocks	2	00 05

Table 3-12 Structure of DS 248 for ET 200S, continued

Contents	Length (byte)	Coding (hex)
Block information for identification data		
SZL-ID Associated data set number Length of data set Index	2 2 2 2	F1 11 00 E7 00 40 00 01
SZL-ID Associated data set number Length of data set Index	2 2 2 2	F1 11 00 E8 00 40 00 02
SZL-ID Associated data set number Length of data set Index	2 2 2 2	F1 11 00 E9 00 40 00 03
SZL-ID Associated data set number Length of data set Index	2 2 2 2	F1 11 00 EA 00 40 00 04
8 bytes block information for additional data set objects		
	Σ: 48	

2. The component of the identification data assigned to the relevant index can be found under the associated data set number (see Table 3-14).
   - All data sets with identification data have a length of 64 bytes.
   - The data sets are structures as per the principle shown in Table 3-13.

Table 3-13 Principle structure of data sets with identification data

Contents	Length (byte)	Coding (hex)
Header information		
SSL-ID	2	F111
Index	2	00 0x
Length of identification data	2	00 38
Number of blocks with identification data	2	00 01
Identification data		
Index	2	00 0x
Identification data for the specific index (see Table 3-14)	54	

The identification data are assigned to the indices as per Table 3-14.
The data structures in data sets 231 to 234 correspond to the specifications of the PROFIBUS Guideline – Order No. 3.502, Version 1.1, May 2003.

Table 3-14 Identification data

Identification data	Access	Default setting	Explanation
Identification data 0: Index 1 (data record 231)			
MANUFACTURER_ID	read (2 bytes)	2A hex (=42 dec)	The name of the manufacturer is stored here. (42 dec = SIEMENS AG)
ORDER_ID	read (20 bytes)	depends on the module	Order number of the module
SERIAL_NUMBER	read (16 bytes)	irrelevant	
HARDWARE_REVISION	read (2 bytes)	irrelevant	
SOFTWARE_REVISION	read (4 bytes)	Firmware version	This indicates the firmware version of the module.
REVISION_COUNTER	read (2 bytes)	–	Provides information on the parameter changes on the module. REVISION_COUNTER increments with each change.
PROFILE_ID	read (2 bytes)	F600 hex	Generic Device
PROFILE_SPECIFIC_TYPE	read (2 bytes)	0005 hex	on interface modules
IM_VERSION	read (2 bytes)	0101 hex	Shows the version of the identification data (0101 hex = Version 1.1)
IM_SUPPORTED	read (2 bytes)	000E hex	Provides information on available identification data (index 2 to 4)
Maintenance data 1: Index 2 (data record 232)			
TAG_FUNCTION	read / write (32 bytes)	–	Enter a unique tag for the module here.
TAG_LOCATION	read / write (22 bytes)	–	Enter the installation location of the module here.
Maintenance data 2: Index 3 (data record 233)			
INSTALLATION_DATE	read / write (16 bytes)	–	Enter the installation date of the module here.
RESERVED	read / write (38 bytes)	–	Reserved
Maintenance data 3: Index 4 (data record 234)			
DESCRIPTOR	read / write (54 bytes)	–	Enter a comment describing the module here.

3.10 Limitations on the number of modules that can be connected/maximum configuration

- Number of modules:
  - ET 200S with IM151-1 BASIC: max. 12 modules.
  - ET 200S with IM151-1 STANDARD; IM151-1 FO STANDARD; IM151-1 HIGH FEATURE; IM151-3 PN: max. 63 modules.

  This includes power modules, electronic modules, RESERVE modules, and motor starters.
- Bus length of the ET 200S:
  - Not relevant to the IM151-1 BASIC (see Section 4.1).
  - max. 2 m (configurable): on IM151-1 STANDARD; IM151-1 FO STANDARD; IM151-3 PN
  - max. 1 m: with IM 151-1 HIGH FEATURE
- Parameter length:
  - with PROFIBUS DP: depends on the DP master used (maximum 244 bytes)
  - with PROFINET IO: not applicable for maximum structure

Table 3-15 Parameter length in bytes

Module	Parameter length
IM151-1 BASIC	19 byte
IM151-1 STANDARD IM151-1 FO STANDARD	27 bytes
IM151-1 HIGH FEATURE	27 bytes 56 bytes*
IM151-3 PN	-
PM-E 24 VDC PM-E 24-48 VDC PM-E 24-48 VDC/ 24-230 VAC	3 bytes
2DI 24 VDC High Feature 4DI 24 VDC High Feature	3 bytes 3 bytes
2DI 24 VDC Standard 4DI 24 VDC Standard 4DI 24 VDC/SRC Standard	1 bytes
4DI NAMUR	12 bytes
2DI 120 VAC Standard	3 bytes
2DI 230 VAC Standard	3 bytes
2DO 24 VDC/0.5 A High Feature	3 bytes
2DO 24 VDC/0.5 A Standard 4DO 24 VDC/0.5 A Standard	1 bytes
2DO 24 VDC/2 A High Feature	3 bytes
2DO 24 VDC/2 A Standard 4DO 24 VDC/2 A Standard	1 bytes
2DO 24-230 VAC/1 A	3 bytes
2RO NO 24-120 VDC/5 A 24-230 VAC/5 A	3 bytes
2RO NO/NC 24-48 VDC/5 A 24-230 VAC/5 A	3 bytes
2AI U Standard 2AI U High Feature	4 bytes
2AI U High Speed	12 bytes (4 bytes*****)
RESERVE	---
2AI I 2WIRE Standard 4AI I 2WIRE ST	4 bytes 7 bytes
2AI I 2WIRE High Speed	12 bytes (4 bytes***)
2AI I 4WIRE Standard 2AI I 2/4WIRE High Feature	4 bytes
2AI I 4WIRE High Speed	12 bytes (4 bytes****)
2AI RTD Standard	4 bytes
2AI RTD High Feature	7 bytes (4 bytes**)
2AI TC Standard 2AI TC High Feature	4 bytes
2AO U Standard 2AO U High Feature	7 bytes
2AO I Standard 2AO I High Feature	7 bytes
1Count 24V/100kHz	16 bytes
1Count 5V/500kHz	16 bytes
1SSI	8 byte
EM 1STEP 5V/204kHz	7 bytes
2PULSE	16 bytes
1POS INC/Digital 1POS INC/Digital 1POS INC/Analog 1POS INC/Analog	16 bytes
1SI 3964/ASCII 1SI Modbus/USS	4/8 bytes
4 IQ-SENSE	16 bytes
Motor starter STANDARD	3 bytes
Motor starter HIGH FEATURE	12 bytes

* Clocking is activated.
** When used as 2AI RTD Standard
*** When used as 6ES7 134 4GB50-0AB0
**** When used as 6ES7 134 4GB50-0AB0
***** When used as 6ES7 134 4GB50-0AB0

- Address space

  on the PROFIBUS DP (depends on the DP master)

  - IM151-1 BASIC interface module supports a maximum of 88 input bytes and 88 output bytes.
  - IM151-1 STANDARD and IM151-1 FO STANDARD interface modules support:
    - maximum 128 input bytes and 128 output bytes (up to 6ES7 151-1AA03-0AB0 or 6ES7 151-1AB02-0AB0)
    - maximum 244 input bytes and 244 output bytes (up to 6ES7 151-1AA04-0AB0 or 6ES7 151-1AB03-0AB0)
  - The IM151-1 HIGH FEATURE interface module supports a maximum of 244 input bytes and 244 output bytes.

  on the PROFINET IO

  - The IM151-3 PN interface module supports a maximum of 256 input bytes and 256 output bytes.

- Power modules: Maximum configuration per potential group

Table 3-16 Maximum configuration per potential group

Power modules	Maximum current-carrying capacity	Connectable modules
PM-E 24 VDC power module	10A	The number of modules that can be connected depends on the total current of all the modules in this potential group. This must not exceed 10 A in total. The total current is decisively affected by the digital output modules: • 2DO 24 VDC/0.5 A Standard • 2DO 24 VDC/0.5 A High Feature • 4DO 24 VDC/0.5 A Standard • 4DO 24 VDC/0.5 A High Feature • 2DO 24 VDC/2 A Standard • 2DO 24 VDC/2 A High Feature • 4DO 24 VDC/2 A Standard • 4DO 24 VDC/2 A High Feature • 2DO 24-230 VAC/2 A
PM-E power module 24..48 VDC	10A	
PM-E power module 24..48 VDC/ 24..230 VAC	10 A (24 VDC) 8 A (120/230 VAC)	

- Number of identifiers: one identifier per module (max. 63 identifiers)
- You can use the ET 200S with DP masters with a diagnostic frame length of 32 bytes because you can set the length of the diagnostic frame in all the interface modules (see Sections 6.1.6.2 and 8.1).

Installation

4

Important information

Warning

Open operating equipment

The modules of an ET 200S are open operating equipment. This means that you can only install the ET 200S in cases, cabinets or electrical plant rooms where they will only be accessible with a key or a tool. Only trained or authorized personnel should have access to the cases, cabinets or electrical plant rooms.

Simple installation

The ET 200S distributed I/O system is designed for simple installation.

Chapter overview

Chapter	Description	Page
4.1	Installation rules, installation position, rail, installation measurements and clearances	4-2
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4.3	Installing the TM-P and TM-E terminal modules	4-6
4.4	Replacing the terminal box on the terminal module	4-8
4.5	Installing the terminating module	4-10
4.6	Installing the shield contact	4-11
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4.1 Installation rules, installation position, rail, installation measurements and clearances

Installation rules

- The ET 200S distributed I/O system starts with an interface module.
- There is a power module after the interface module or at the beginning of each potential group.
- After a power module, come digital, analog, process-related, or RESERVE modules.
- The ET 200S distributed I/O system ends with the terminating module.
- The maximum configuration of the distributed I/O system is as follows:
  - IM151-1 BASIC: max. 13 modules (including interface module). The length of the bus is not relevant.
  - IM151-1 STANDARD / IM151-1 FO STANDARD / IM151-3 PN: max. 64 modules (including interface module) or max. 2 m bus length.
  - IM151-1 HIGH FEATURE: max. 64 modules (including interface module) or max. 1 m bus length.

Installation position

The preferred installation position is horizontal on a vertical wall. Any other installation position is also possible; however, there are limitations with regard to ambient temperature.

Rail

The ET 200S distributed I/O system is installed on a zinc-plated rail to EN 50022 (35 × 7.5 mm or 35 × 15 mm).

Note

If the ET 200S distributed IO device is exposed to increased vibrations and shock, we recommend that you screw the rail to the mounting surface at intervals of 200 mm.

To prevent the ET 200S distributed I/O system from slipping to the side, we recommend that you fit a mechanical stop (for example, with a ground terminal, 8WA2 011-1PH20) at both ends of the device.

If you install the rail on grounded, zinc-plated mounting plates, there is no need to ground the rail separately.

Installation measurements

Table 4-1 Installation measurements

Measurements	
Installation width	• Interface module: 45 mm • Terminal modules with electronic modules: 15 mm or 30 mm • Bus terminating module: 7.5 mm
Installation height	• Interface module: 119.5 mm • Electronic module with terminal module: – 3 levels with screw-type or spring terminals: 119.5 mm – 3 levels with Fast Connect: 143 mm – 3 levels with screw-type or spring terminals and shield contact: 151.5 mm – 3 levels with Fast Connect and shield contact: 175 mm – 4 levels with screw-type or spring terminals: 132 mm – 4 levels with Fast Connect: 164 mm – 4 levels with screw-type or spring terminals and shield contact: 164 mm – 4 levels with Fast Connect and shield contact: 196 mm – 6 levels with screw-type or spring terminals: 157 mm – 6 levels with Fast Connect: 204 mm – 6 levels with screw-type or spring terminals and shield contact: 189 mm – 6 levels with Fast Connect and shield contact: 236 mm – 7 levels with screw-type terminal: 196.5 mm
Installation depth	• ET 200S on rail with 7.5 mm depth: 75 mm • ET 200S on rail with 15 mm depth: 82.5 mm

Minimum clearances for installation, wiring, and ventilation

When installing the ET 200S in a housing, ensure that the distance to the lid of the housing or the front door is at least 2 mm.

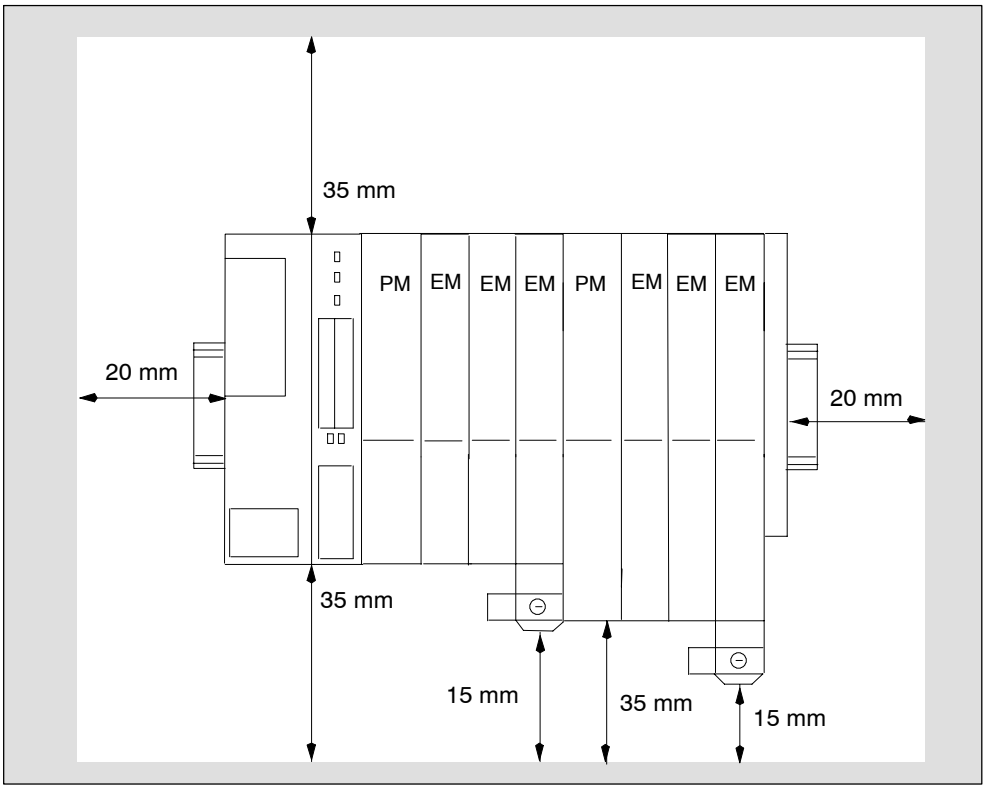


Figure 4-1 Minimum clearances

4.2 Installing the interface module

Features

- The interface module connects the ET 200S with the PROFIBUS DP/ PROFINET IO.
- The interface module transfers data between the higher-level controller and the I/O modules.

Prerequisites

- The rail must be installed.
- All the terminal modules must be installed to the right of the interface module. The maximum configuration of the ET 200S distributed I/O system is 12/63 modules (including power modules, I/O modules, reserve modules, and motor starters).

Tool required

3 mm screwdriver

Installing the interface module

1. Hang the interface module on the rail.
2. Tip the interface module back until you hear the locking mechanism engage.

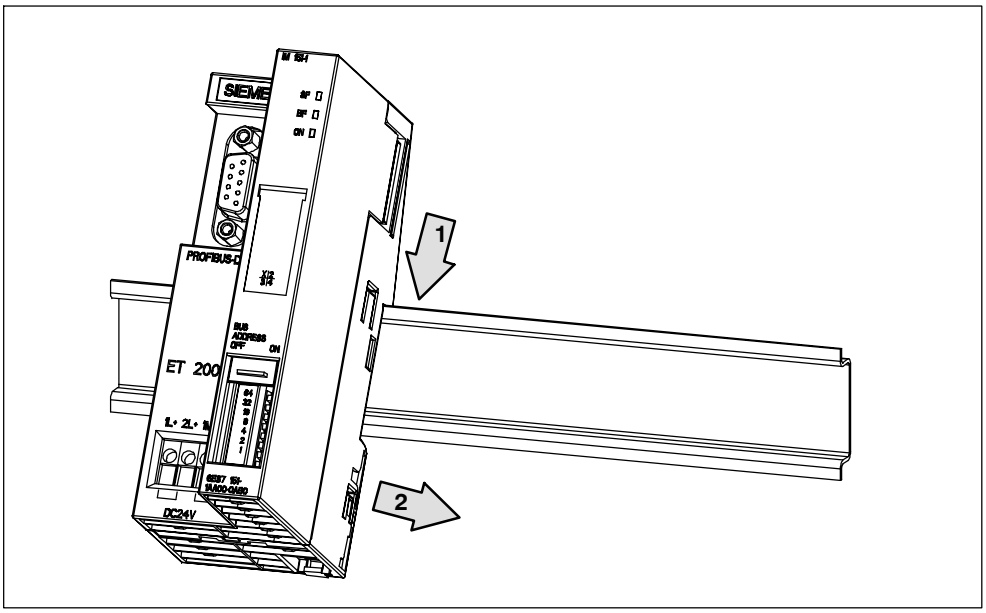


Figure 4-2 Installing the interface module

Removing the interface module

The interface module is wired, and the terminal modules are on the right:

1. Switch off the supply voltage on the interface module.
2. Disconnect the wiring and the bus connector on the interface module.
3. Use a screwdriver to push the locking mechanism on the interface module down until the mechanism stops, and move the interface module to the left.

   Note: the locking mechanism is under the interface module.
4. With the locking mechanism depressed, tip the interface module so that it comes off the rail.

4.3 Installing the TM-P and TM-E terminal modules

Features

- The terminal modules receive the I/O modules and power modules.
- The terminal modules can be prewired (without I/O modules).
- All the terminal modules must be installed to the right of the interface module.

Prerequisites

- The rail must be installed.

Tool required

3 mm screwdriver

Installing the terminal module

1. Hang the terminal module on the rail.
2. Tip the terminal module back until you hear the locking mechanism engage.
3. Move the terminal module to the left until you hear it snap into place at the previous interface module (if already installed) or the terminal module.

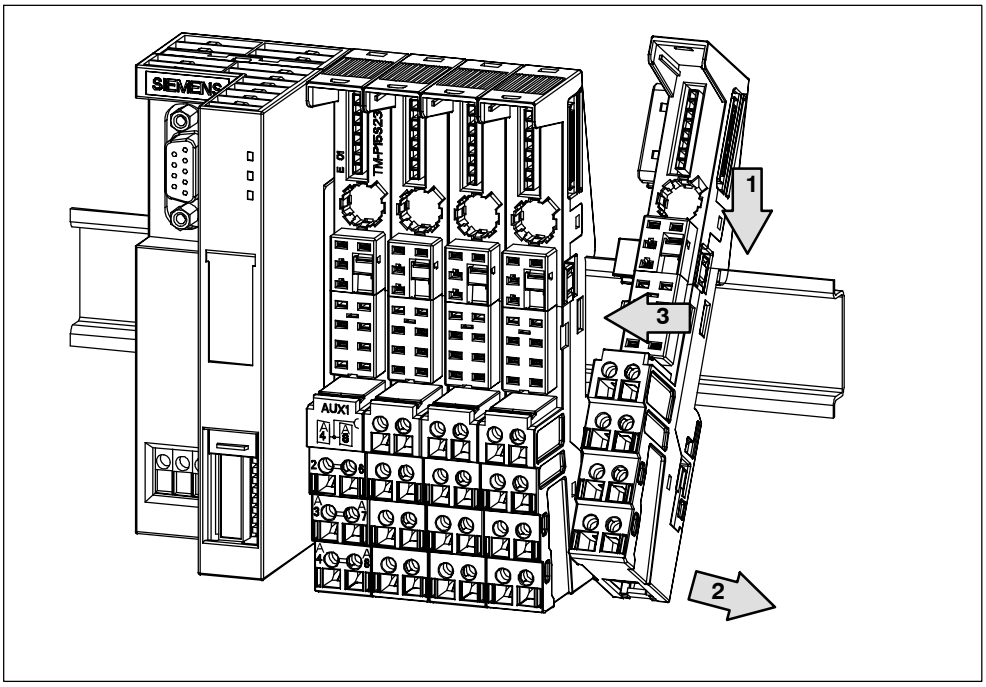


Figure 4-3 Installing the terminal module

Removing the terminal module

The terminal module is wired, and there are other terminal modules on the right and left.

A terminal module in the ET 200S distributed I/O system can only be removed when there is a clearance of around 8 mm to the adjacent terminal modules (you achieve this clearance by moving the adjacent modules).

1. Switch off the supply voltage on the terminal module and, if applicable, the power module.
2. Disconnect the wiring on the terminal module.
3. Removal from the right: Use a screwdriver to push the locking mechanism on the previous terminal module/interface module (on the left) down until the mechanism stops, and move the terminal module to the right.

   Removal from the left: Use a screwdriver to push the locking mechanism on the terminal module down until the mechanism stops, and move the terminal module to the left.

   Note: the locking mechanism is under the terminal module.
4. With the locking mechanism depressed, tip the terminal module so that it comes off the rail.

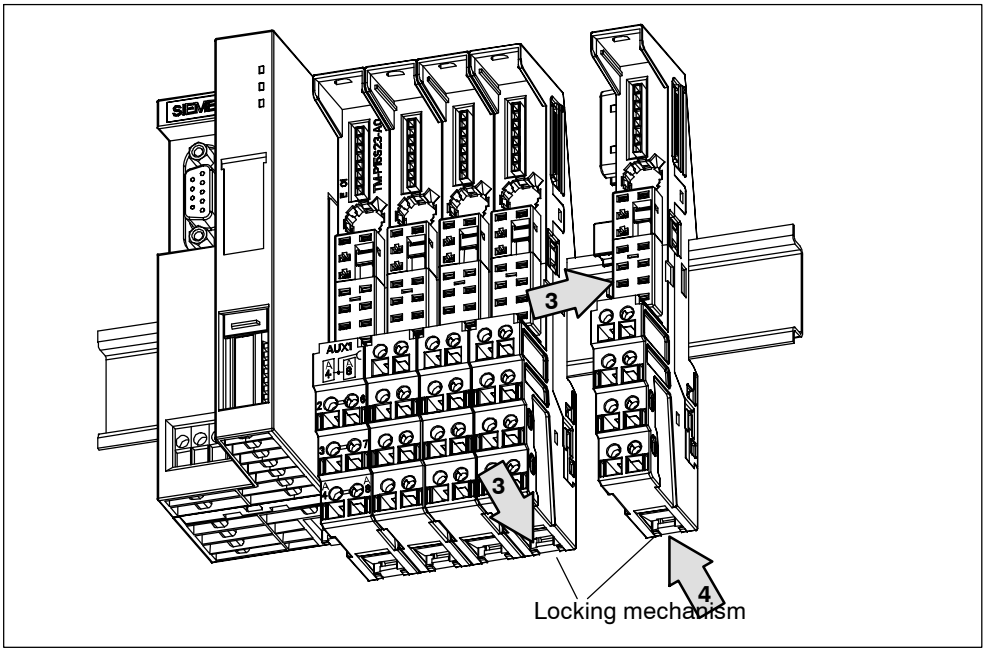


Figure 4-4 Removing the terminal module (from the right)

Note

It is not necessary to remove the terminal module in order to replace the terminal box. See Section 4.4

4.4 Replacing the terminal box on the terminal module

Features

The terminal box is part of the terminal module. If necessary, you can replace the terminal box.

Prerequisites

It is not necessary to remove the terminal module.

Tool required

3 mm screwdriver

Replacing the terminal box on the terminal module

The terminal module is installed, wired, and fitted with an electronic module.

1. Switch off the supply voltage on the terminal module and, if applicable, the power module.
2. Disconnect the wiring on the terminal module.
3. Simultaneously press the upper and lower release buttons of the electronic module, and remove it from the terminal module.
4. There is a small opening directly under the slot number label. Push the screwdriver into this opening diagonally from below, and at the same time pull the terminal box downward until it stops. Then pull the terminal box upward and out of the terminal module.
5. Replace the terminal box, and insert the new one into the terminal module from above (position: see Figure 4-5 Then push the terminal box upward until it snaps into place.
6. Insert the electronic module in the terminal module.
7. Wire the terminal module.
8. Switch on the supply voltage on the terminal module and, if applicable, the power module.

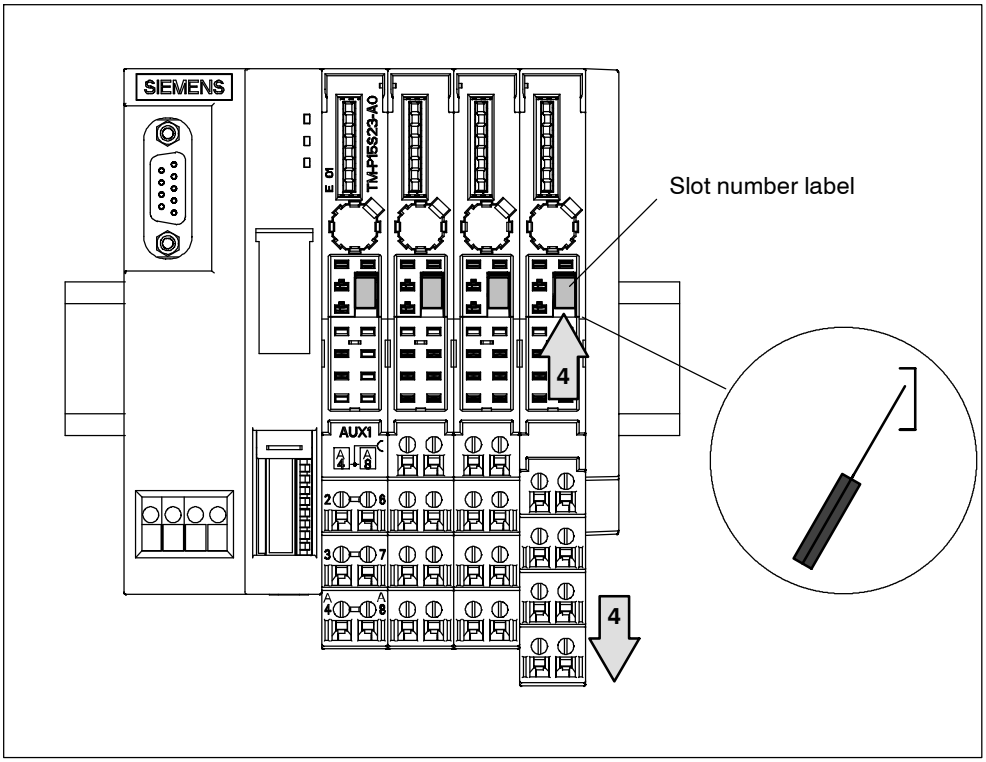


Figure 4-5 Replacing the terminal box on the terminal module

4.5 Installing the terminating module

Features

The ET 200S distributed I/O system is completed by the terminating module on the right-hand side. If you have not connected a terminating module, the ET 200S is not ready for operation.

Prerequisites

- The last terminal module must be installed.

Installing the terminating module

1. Hook the terminating module on the rail to the right of the last terminal module.
2. Tip the terminating module back on the rail.
3. Move the terminating module to the left until you hear it snap into place against the last terminal module.

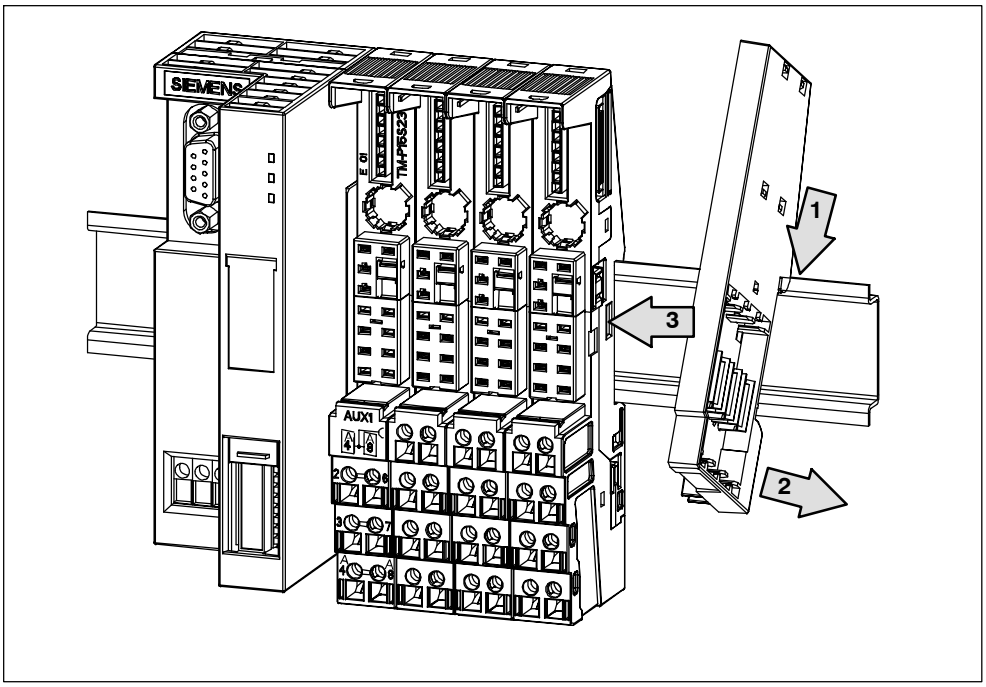


Figure 4-6 Installing the terminating module

Removing the terminating module

1. Use a screwdriver to push the locking mechanism on the last terminal module down until the mechanism stops, and move the terminating module to the right.
2. Tip the terminating module so that it comes off the rail.

Note

If

- the terminal module of the ET 200S is removed or replaced under power or
- while the ET 200S backplane bus is interrupted during operation , e. g. at a terminal module, and restored to function,

the complete power supply of the ET 200S must be switched off and on to achieve a defined station status.

4.6 Installing the shield contact

Features

- You need the shield contact to connect cable shields (for example, analog electronic modules, 1COUNT 24V/100kHz electronic module and 1SSI electronic module).
- Fit the shield contact on the terminal module.
- The shield contact consists of a shield contact element, a conductor rail, (3 x 10 mm), a shield terminal, and a ground connection terminal.

Prerequisites

- The terminal modules must be installed.

Tool required

- 3 mm screwdriver
- Metal-cutting saw

Installing the shield contact

1. Push the shield contact element onto the first terminal module from below.
2. Push the shield contact element onto the last terminal module from below.

   In order to achieve stability of the conductor rail between two shield contact elements during installation, you must connect an additional shield contact element after every sixth terminal module (given a width of 15 mm).
3. Saw off the correct length from the conductor rail. The length of the rail is: the distance between the shield contact + 45 mm.
4. Push the conductor rail into the shield contact element. After installation, the conductor rail must protrude from the shield contact element by 15 mm on the left or right.
5. Attach the shield terminals on the conductor rail (between the shield contact elements).
6. Attach the ground connection terminal to the protruding conductor rail.

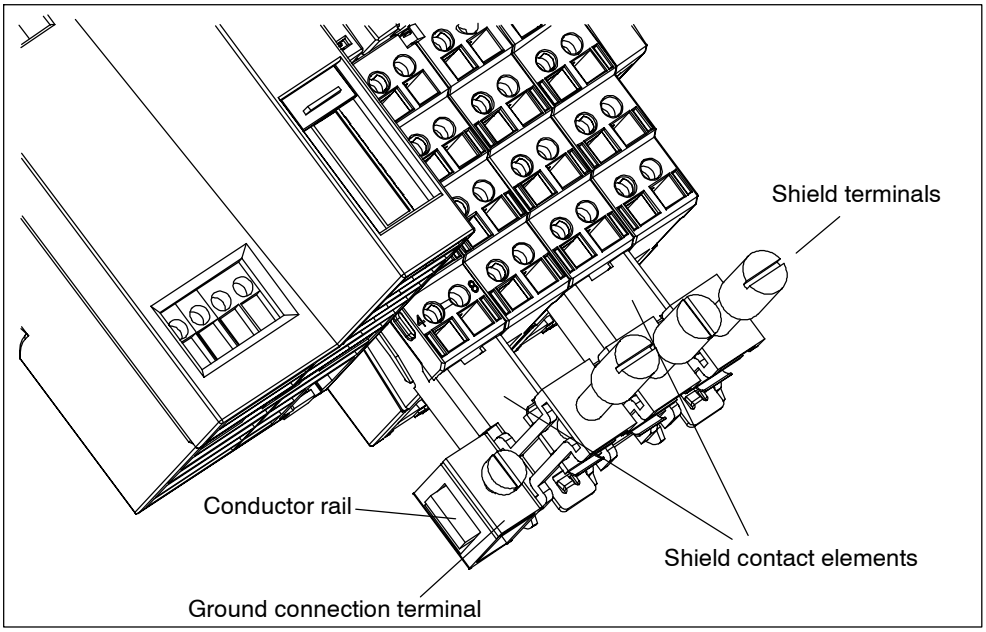


Figure 4-7 Installing the shield contact

4.7 Applying slot number labels and color identification labels

Features

- The slot number labels identify the individual I/O modules with a slot (1 to 63).
- The color identification labels permit individual color coding of the terminals in accordance with company or national conventions. The color identification labels are available in white, red, blue, brown, yellow, yellow-green, and turquoise. Each terminal on the terminal module can have a color identification label.

Prerequisites

- The terminal modules must be installed.
- There must be no electronic modules connected when you apply the slot number labels.
- The terminal modules should not be wired when you apply the color identification labels.
- The slot number labels and color identification labels are applied onto the terminal modules.
  - Position of slot number label: under the coding element on the terminal module.
  - Position of color identification labels: right next to each terminal on the terminal box.

Tool required

3 mm screwdriver (for removal only)

Applying slot number labels and color identification labels

Slot number labels:

1. Break the slot number label (1 to 63) off the strip.
2. Use your finger to press the slot number label onto the terminal module.

Color identification labels:

1. You can place the color identification labels in the opening next to the terminal while they are still on the strip and then bend the strip back to pull them off.
2. Use your finger to press the color identification labels onto the terminal module.

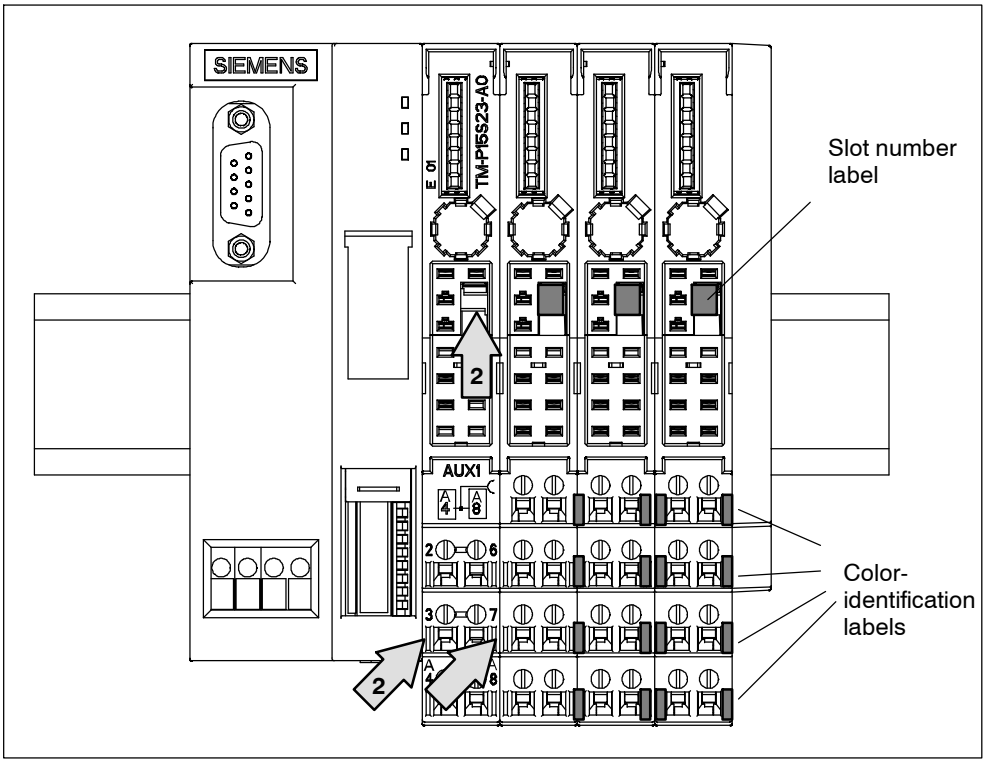


Figure 4-8 Applying slot number labels and color identification labels

Removing slot number labels and color identification labels

Slot number label:

1. Remove the electronic module from the terminal module.
2. Lever the slot number label out of its mount.

Color identification labels: Use a screwdriver to lever the color identification labels out of their mounts.

4.8 Setting the PROFIBUS address

Features

The PROFIBUS address defines the address at which the ET 200S distributed I/O system is found on the PROFIBUS DP.

Prerequisites

- The PROFIBUS DP address for the ET 200S is set on the IM151-1 interface module by means of DIP switches. The DIPswitches are on the front of the interface module, protected by a sliding window.
- The permitted PROFIBUS DP addresses are 1 to 125.
- Each address can be assigned only once on the PROFIBUS DP.

Tool required

3 mm screwdriver

Setting the PROFIBUS DP address

1. Slide the window on the interface module upward.
2. Use a screwdriver on the DIP switches to set the desired PROFIBUS DP address.
3. Close the window.

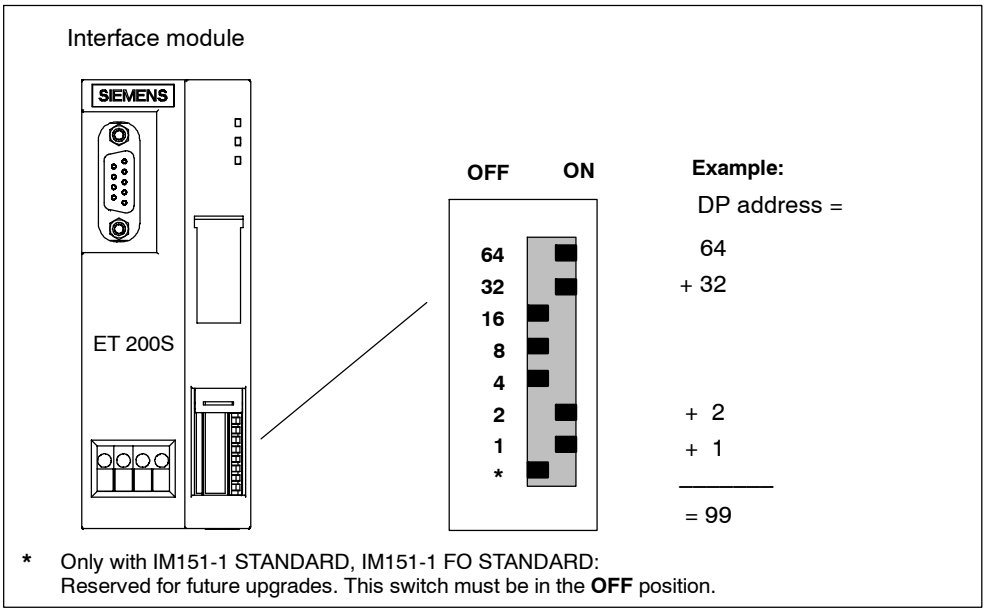


Figure 4-9 Setting the PROFIBUS Address

Changing the PROFIBUS DP address

You change the PROFIBUS DP address in exactly the same way as you set it. A change to the PROFIBUS DP address takes effect after power on at the interface module of the ET 200S.

Wiring and Fitting

5

Prewiring

The ET 200S distributed I/O system allows you to prewire the terminal modules with screw-type or spring terminals.

Chapter overview

5.1 General rules and regulations for operating the ET 200S

Introduction

When operating the ET 200S distributed I/O system as a component part of a plant or system, certain rules and regulations have to be followed depending on where the device is to be used.

This chapter provides an overview of the most important rules you have to observe when integrating the ET 200S distributed I/O system in a plant or system.

Specific applications

Note the safety and accident prevention regulations that apply to specific applications (for example, the Machine Directive).

EMERGENCY STOP devices

Emergency stop devices complying with IEC 204 (which corresponds to DIN VDE 113) must remain effective in all the operating modes of the plant or system.

Startup of the system after specific events

The following table tells you what you should do when the system starts up after the occurrence of specific events.

If ...	then ...
Startup follows a voltage drop or failure Startup of the ET 200S follows an interruption of bus communication	No dangerous operating states must occur. If necessary, force an emergency stop.
Startup follows unlocking of the emergency stop device	There must not be an uncontrolled or undefined start-up.

Line voltage

The following table tells you what you have to do with regard to the line voltage.

With ...	Requirements
Permanently installed plants or systems without all-pole line disconnect switches	There must be a line disconnect switch or a fuse in the building installation system.
Load power supplies, power supply modules	The set rated voltage range must correspond to the local line voltage.
All circuits of the ET 200S distributed I/O system	Any fluctuation/deviation in the line voltage from the rated value must be within the permitted tolerances (see Section 7.4)

24 VDC supply

The following table tells you what you have to do with regard to the 24 VDC supply.

With ...	Pay attention to ...	
Buildings	Outdoor lightning protection	Take lightning protection precautions (for example, lightning conductors)
24 VDC supply lines, signal lines	Indoor lightning protection	
24 VDC supply	Safe (electrical) isolation of extra-low voltage	

Protection against outside electrical influences

The following table tells you what to do to provide protection against electrical influences or faults.

With ...	You must ensure that...
All plants or systems in which the ET 200S is integrated	The plant or system is connected to a protective conductor for diverting electromagnetic interference.
Supply, signal, and bus lines	The wiring arrangement and installation are correct.
Signal and bus lines	Any break of a line or conductor does not result in undefined states of the plant or system.

5.2 Operating the ET 200S on a grounded supply

In this section, you will find information on the overall setup of an ET 200S distributed I/O system on a grounded supply (TN-S system). The specific subjects discussed are:

- Circuit-breaking devices, short-circuit and overload protection in accordance with DIN VDE 0100 and DIN VDE 0113
- Load power supplies and load circuits

Definition: Grounded mains

In a grounded supply, the neutral conductor of the system is grounded. A mere ground fault between a live conductor and ground or a grounded section of the plant causes the protective devices to trip.

Components and protective measures

Various components and protective measures are prescribed when setting up an entire plant. The types of component and the degree to which the protective measures are binding depend on the DIN VDE regulation that applies to your plant setup. The following table refers to Figure 5-1.

Compare ...	Refer to Figure 5-1	DIN VDE 0100	DIN VDE 0113
Circuit-breaking device for PLC, sensors and actuators	1	... Part 460: Main switch	... Part 1: Disconnector
Short-circuit and overload protection: Grouped for sensors and actuators	2 3	... Part 725: Single-pole protection of circuits	... Part 1: • With grounded secondary power circuit: **single-pole** protection • Otherwise: **all-pole** protection
Load power supply for AC load circuits with more than five electromagnetic devices	2 3	Isolation by transformer **recommended**	Isolation by transformer **recommended**

Safe electrical isolation

Safe electrical isolation must be provided for:

- Modules that must be operated at the following voltages: ≤60 VDC or ≤25 VAC
- 24 VDC operating current circuits

Setting up the ET 200S with ungrounded reference potential

From IM151-1 BASIC (6ES7 151-1CA00-0AB0), IM151-1 STANDARD (6ES7 151-1AA02-0AB0), IM151-1 FO STANDARD (6ES7 151-1AB01-0AB0), IM151-1 HIGH FEATURE (6ES7 151-1BA00-0AB0) and IM151-3 PN (6ES7 151-3AA00-0AB0) the reference potential M connected to the nominal supply voltage of the IM151-x at the rail (protective conductor) through an RC combination and so allows an ungrounded layout.

To divert interference current, the reference potential of the IM151-1 is connected internally to the rail (protective conductor) via an RC combination (R = 10 MΩ / C = 22 nF). High-frequency interference currents are thus discharged, and static charge is prevented.

Overall configuration of the ET 200S

Figure 5-1 shows the overall configuration of the ET 200S distributed I/O system (load voltage supply and grounding concept) with supply from a TN-S system.

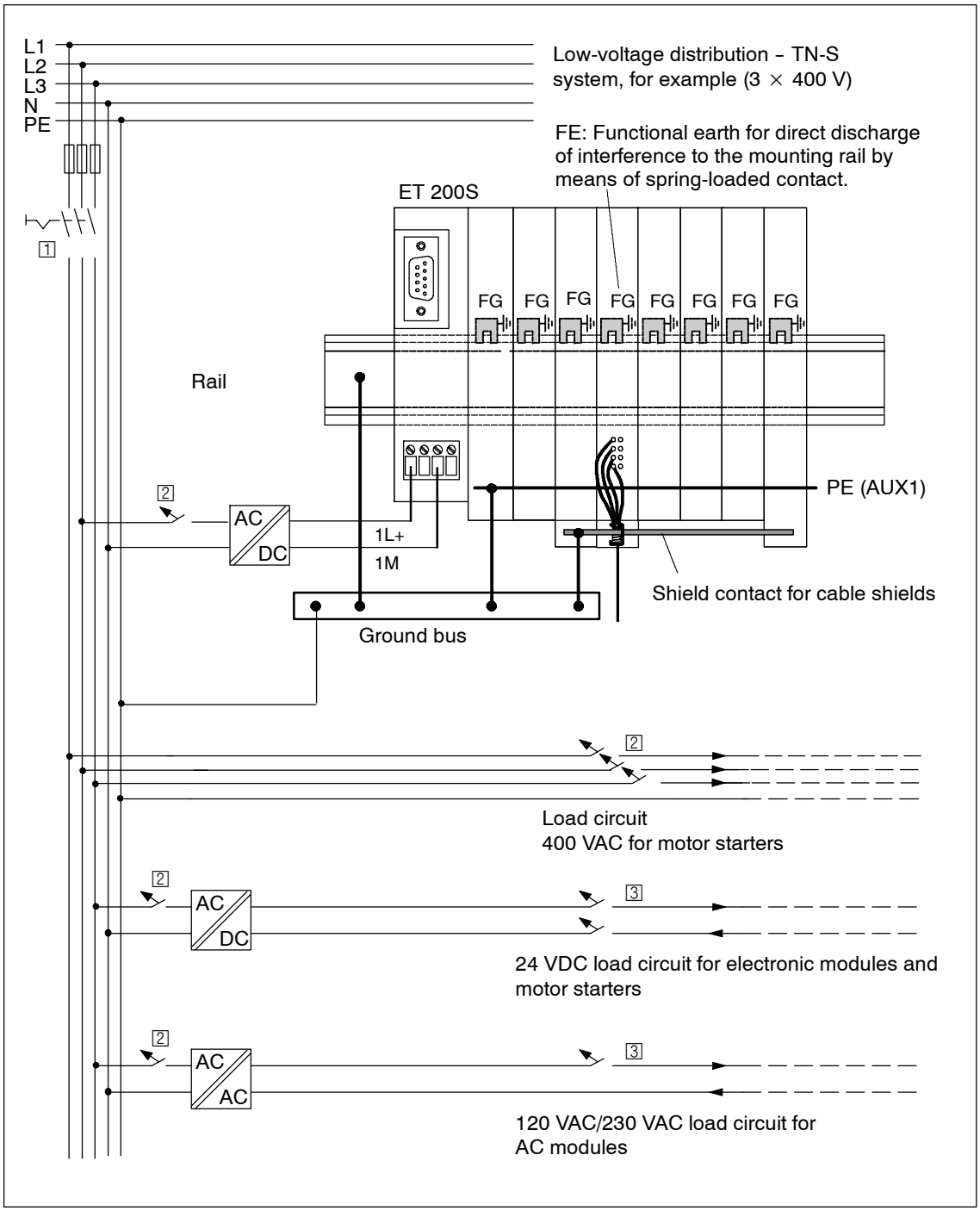


Figure 5-1 Configuring the ET 200S with grounded reference potential

5.3 Electrical design of the ET 200S

Isolation between ...

- The load circuits/process and all other circuit components of the ET 200S
- The PROFIBUS DP interface in the IM151-1 interface module and all other circuit components
- The PROFIBUS DP interface in the IM151-3 PN interface module and all other circuit components

The following figure shows the potentials of the ET 200S. Only the most important components are shown.

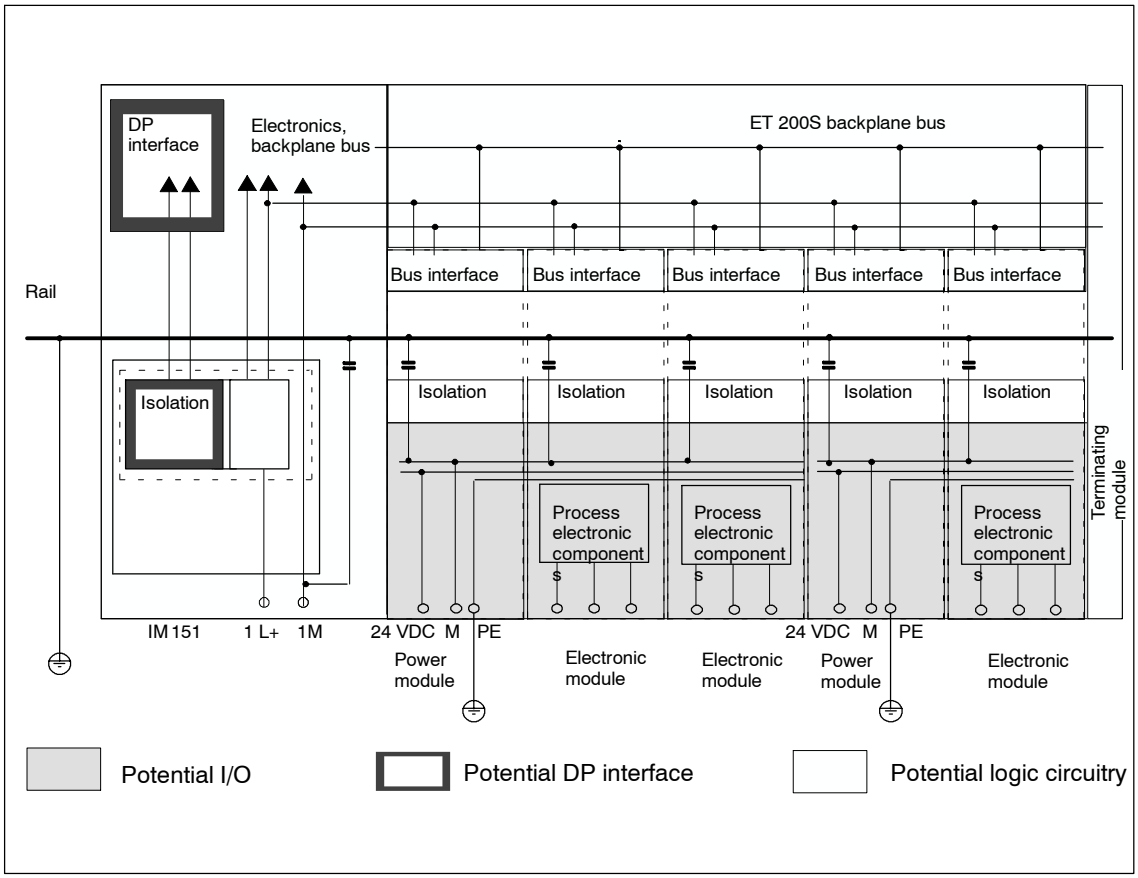


Figure 5-2 Potentials of the ET 200S with IM151-1

5.4 Wiring the ET 200S

Wiring rules for the ET 200S

Wiring rules for ...		Interface module (supply voltage)	Terminal modules (spring and screw-type terminals)	Terminal modules (Fast Connect)
Connectable wire cross-sections for rigid lines		No	0.14 to 2.5 mm^2	0.5 to 1.5 mm^2
Connectable wire cross-sections for flexible lines	Without wire end ferrule	0.25 to 2.5 mm^2	0.14 to 2.5 mm^2	0.5 to 1.5 mm^2
	With wire end ferrule	0.25 to 1.5 mm^2	0.14 to 1.5 mm^2	---
Number of wires per connection		1 or a combination of 2 wires up to 1.5 mm^2 (sum) in a common wire end ferrule		1
Maximum external diameter of the wire's insulation		∅ 3.8 mm	∅ 3.1 mm at 1.5 mm^2 ∅ 3.8 mm at 2.5 mm^2	∅ 3.2 mm at 1.5 mm^2
Stripping length of the wires		11 mm		---
Wire end ferrules to DIN 46228	Without insulating collar	Design A, 8 to 12 mm long	Design A, up to 12 mm long	---
	With insulating collar 0.25 to 1.5 mm^2	Design E, up to 12 mm long		---

5.4.1 Wiring a terminal module with screw-type terminals

Features

- In terminal modules with screw-type terminals, the individual wires are screwed into the terminal.
- No wire end ferrules are required.

Prerequisites

Adhere to the wiring rules.

Tool required

3 mm screwdriver

Wiring a terminal module with a screw-type terminal

1. Strip 11 mm of insulation from the wires.
2. Insert the individual wires in the terminal.
3. Screw the ends of the individual wires onto the terminal module (torque: 0.4...0.7 Nm).

5.4.2 Wiring a terminal module with spring terminals

Features

In terminal modules with spring terminals, the individual wires are held securely when you simply insert them in the terminal.

Prerequisites

Adhere to the wiring rules.

Tool required

3 mm screwdriver

Wiring a terminal module with spring terminals

1. Strip 11 mm of insulation from the wires.
2. Insert the screwdriver in the upper (round) opening of the terminal.
3. Insert the wire until it stops in the lower (square) opening of the terminal.
4. Release the terminal by pushing the screwdriver into the opening.
5. Push the wire into the released spring terminal, and pull the screwdriver out.

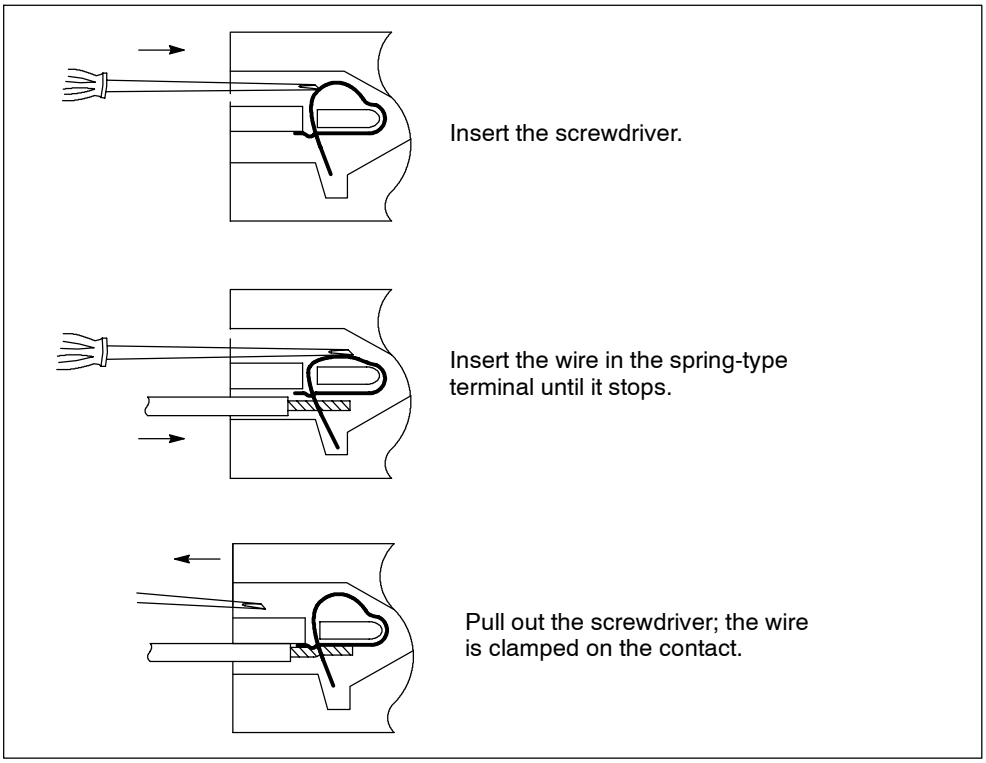


Figure 5-3 Wiring the spring terminal

5.4.3 Wiring terminal modules with Fast Connect

Features

- In the case of terminal modules with Fast Connect, the individual wires are attached using a quick connection method that requires no stripping.
- Fast Connect is a connection method that requires no preparation (i.e. the conductor does not have to be stripped).
- Each terminal of the terminal module with Fast Connect has a test opening (for measuring the voltage, for example). The test opening is suitable for test probes with a maximum diameter of ∅ 1.5 mm.
- Wire end ferrules are not permitted.
- Diagram of the Fast Connect terminal module

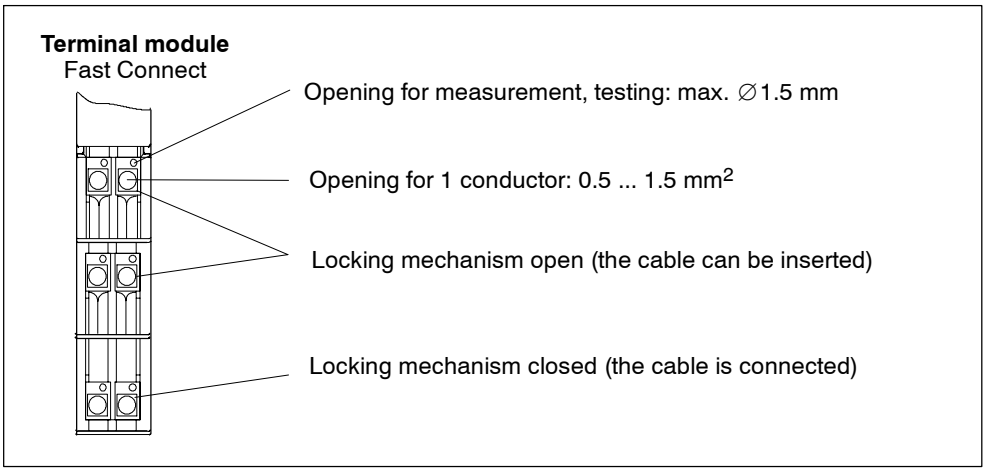


Figure 5-4 Block diagram of the terminal module with Fast Connect

Prerequisites

Adhere to the wiring rules.

Tool required

3 mm screwdriver

Connectable cables

You can connect rigid and flexible cables with PVC insulation with a conductor cross-section of 0.5 mm^2 to 1.5 mm^2 (max. external diameter 3.2 mm). If the cross-section of the conductors is the same, they can be wired fifty times. You can find a list of tested conductors at:
http://www.idc2.de

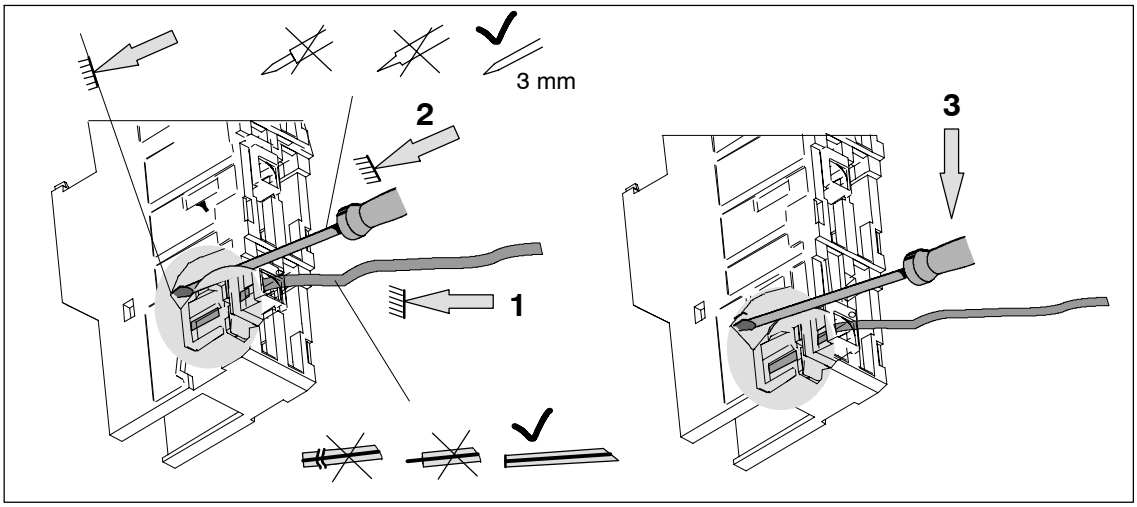
Cables and connections complying with UL

Wiring range for insulating piercing connection 22 –16 AWG solid/stranded PVC insulated conductors, UL style no. 1015 only.

Wiring terminal modules with Fast Connect

1. Insert the unstripped cable in the round opening until it stops (the insulation and conductor must form a flat surface).
2. Insert the screwdriver into the opening above the locking mechanism **until it stops**.
3. Press the screw driver downwards until the locking mechanism reaches the end.

   Result: The cable is connected.



Note

If you want to reconnect a cable that has already been connected, you must first cut it off.

Releasing the wiring of the terminal module with Fast Connect

1. Insert the screwdriver into the opening below the locking mechanism **until it stops**.
2. Use the screwdriver to lever and push the locking mechanism upwards.
3. The wiring is disconnected: remove the wire.

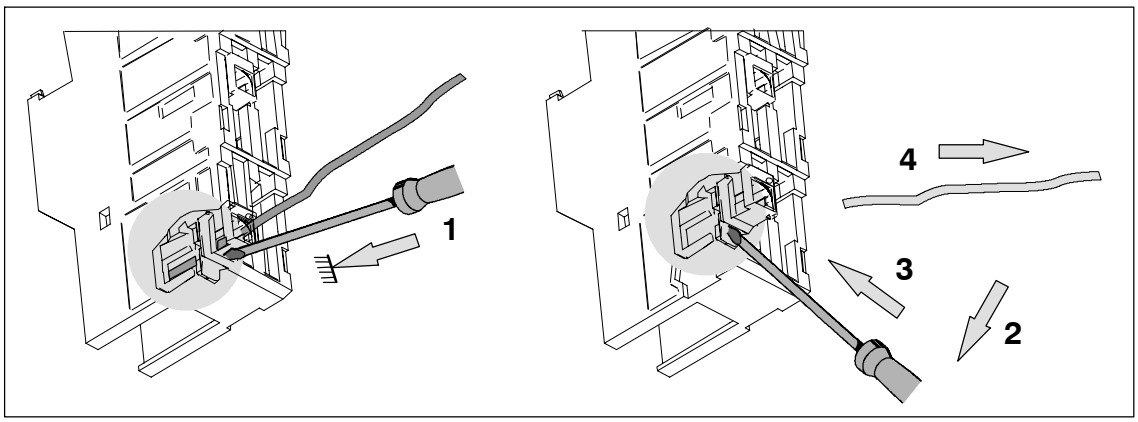


Figure 5-5 Releasing the wiring of the terminal module with Fast Connect

Removing any remains of the conductor (only if necessary)

To remove any remains of the conductor (insulation), you can deinstall the locking mechanism from the terminal module (see Step 3). To do this, the locking mechanism must be open (upper position). You can only insert the locking mechanism in the upper position (see Step 4).

1. Insert the screwdriver in the opening below the locking mechanism (the tip of the screwdriver is on the lip of the locking mechanism).
2. Press the screwdriver downwards to lever the locking mechanism out of the terminal module.
3. Remove the locking mechanism from the terminal module. Remove any remains of the conductor from the locking mechanism.
4. Use your fingers to press the locking mechanism back into the opening. Important: Make sure the locking mechanism is inserted in the correct position, otherwise you can damage the clamping unit.

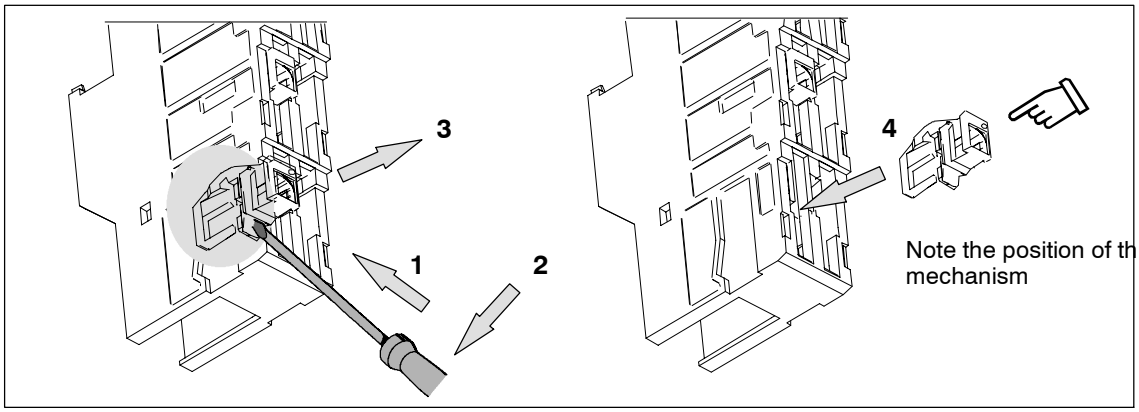


Figure 5-6 Removing the locking mechanism from the terminal module

5.4.4 Wiring terminal modules

Features

The ET 200S distributed I/O system comprises terminal modules for power modules and electronic modules:

- At the terminal modules for the power modules you connect the supply/load voltage for the respective potential group.
- Terminal modules for electronic modules connect the ET 200S with the process.
- At the terminal modules for electronic modules you can connect cable shields by means of a shield contact.

Prerequisites

- You must wire the terminal modules with the supply/load voltage switched off at the power module and the load voltage switched off at the electronic module.
- Adhere to the wiring rules.

Tool required

3 mm screwdriver

Wiring terminal modules for power modules

The terminal assignment of the terminal module depends on which power module is inserted. You will find information on this in the following chapters:

- Terminal modules in Chapter 9
- Power modules in Chapter 10

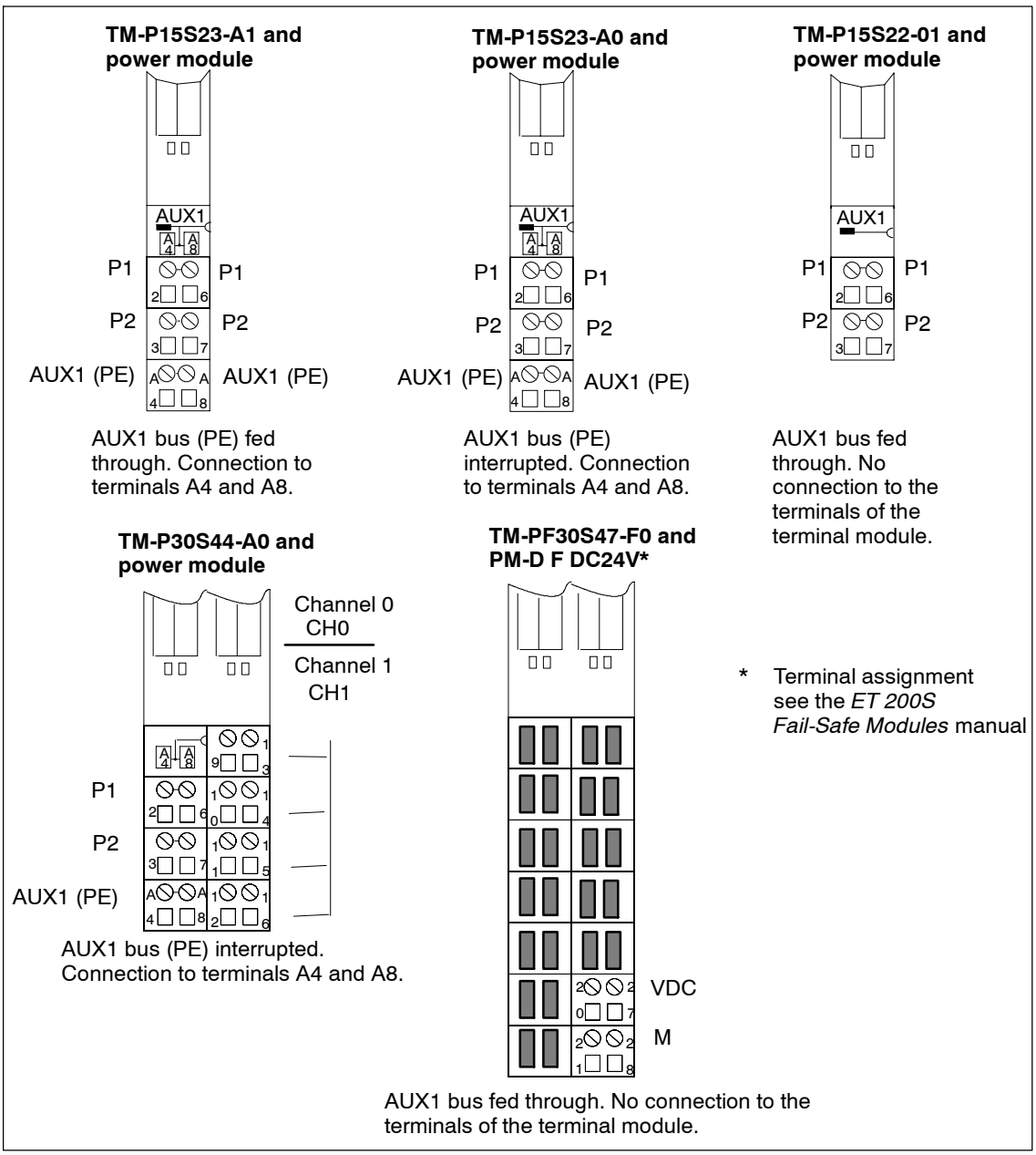


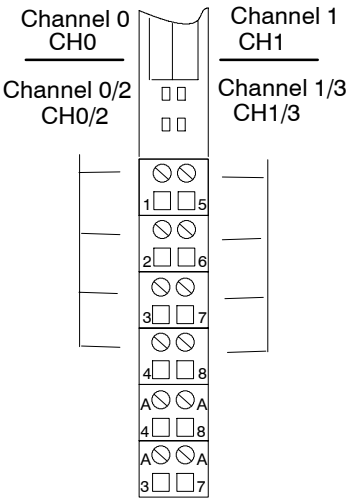
Figure 5-7 Wiring terminal modules for power modules

Wiring terminal modules for digital, analog, and process-related modules

The terminal assignment of the terminal module depends on which electronic module is inserted. You will find information on this in the following chapters:

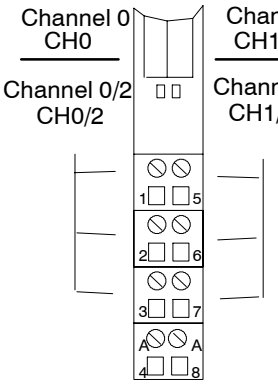
- Terminal modules in Chapter 9
- Digital electronic modules in Chapter 11
- Analog electronic modules in Chapter 12
- Process-related modules: See the *process-related functions* manual

TM-E15S26-A1 and electronic module/process-related module



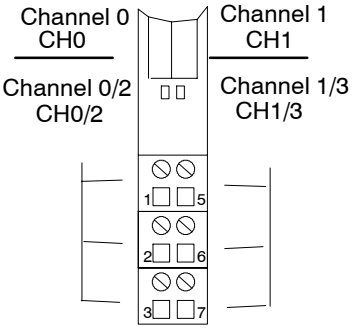
AUX1 bus (PE) fed through. Connection to terminals A4, A8 and A3, A7.

TM-E15S24-A1 and electronic module



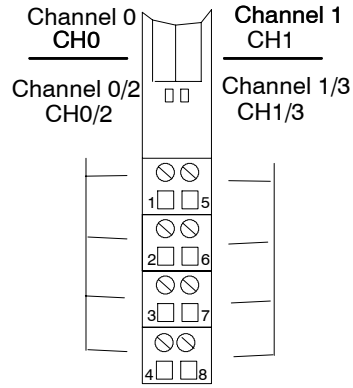
AUX1 bus (PE) fed through. Connection to terminals A4 and A8.

TM-E15S23-01 and electronic module



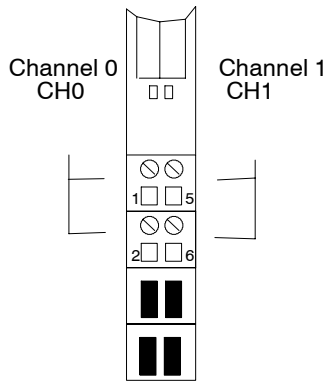
AUX1 bus fed through. No connection to the terminals.

TM-E15S23-01 and electronic module/process-related module



AUX1 bus (PE) fed through. No connection to terminals 4 and 8.

TM-E15S24-AT and 2AI TC HF



AUX1 bus (PE) fed through. No connection to the terminals of the terminal module.

Figure 5-8 Wiring terminal modules for electronic modules

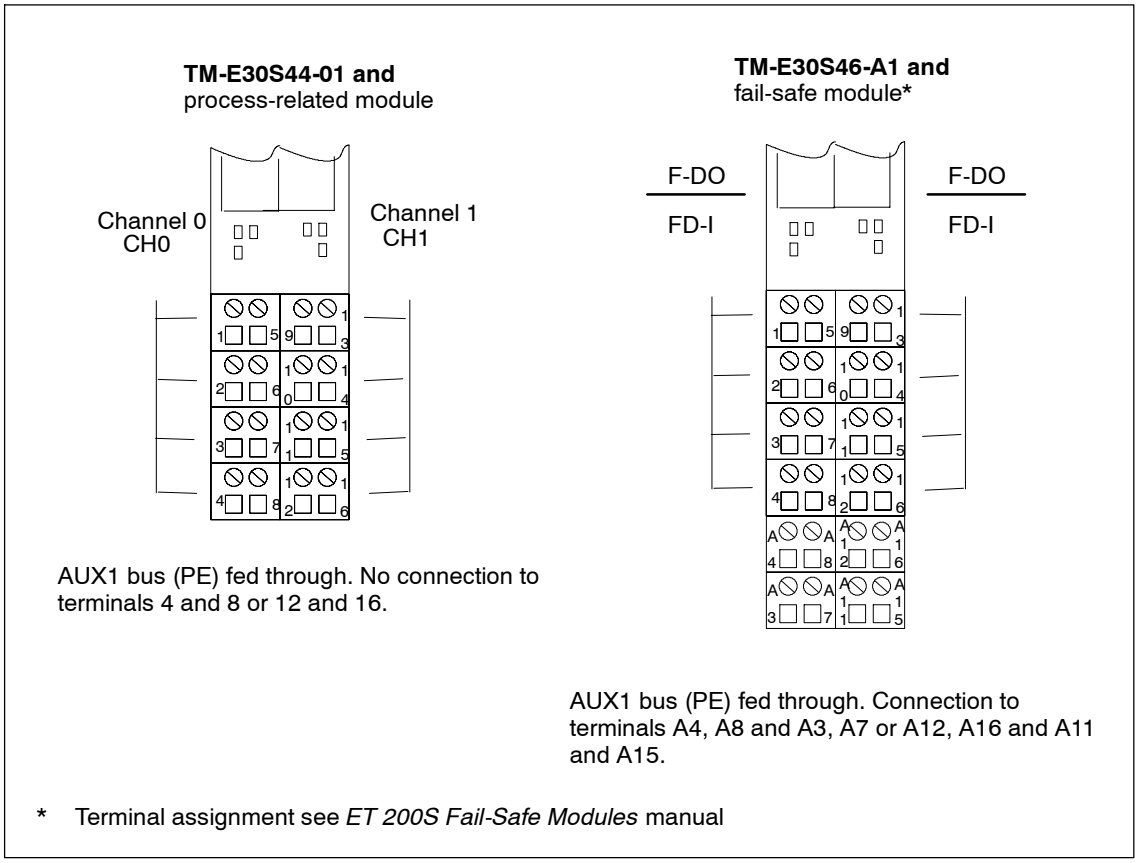


Figure 5-9 Wiring terminal modules for electronic modules, continued

Connecting cable shields

We recommend you use the shield contact to connect cable shields (in the case of analog electronic modules, the 1COUNT 24V/100kHz electronic module and the 1SSI electronic module, for example).

1. Remove the insulation material from the area around the shield terminal, and clamp the cable shield in the shield terminal (above the conductor rail). The shield terminal is suitable for one cable with a max. ∅ of 8 mm or two cables with a max. ∅ of 4 mm each.
2. Tighten the shield terminal (approximately 0.5 Nm)
3. Repeat steps 1 and 2 if you want to connect additional cable shields.
4. Strip the insulation from the ground wire (from 6 mm to 25 mm^2), and insert it in the ground connection terminal (under the conductor rail). Tighten the ground connection terminal (2 Nm to 2.5 Nm).
5. Attach the other end to the ground bus.

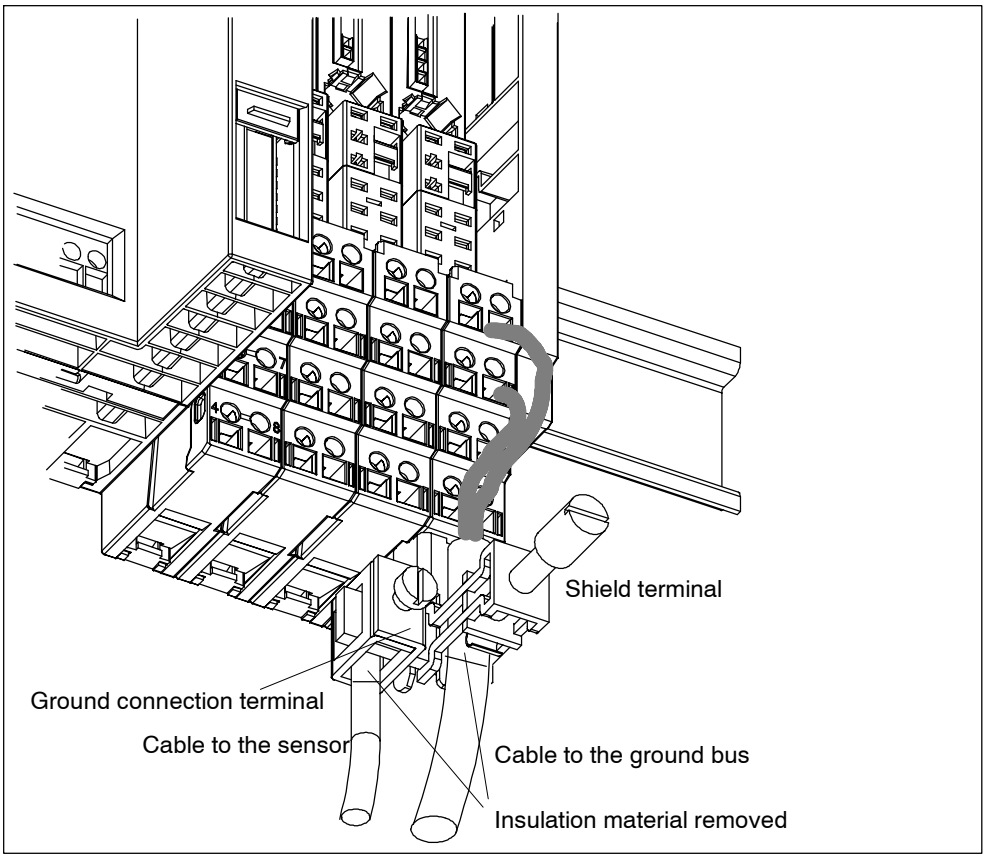


Figure 5-10 Connecting cable shields

Note

To stabilize the shield contact, you must mount and screw in at least one shield terminal over the shield contact element.

5.4.5 Wiring the IM151-1 BASIC, IM151-1 STANDARD and IM151-1 HIGH FEATURE interface modules

Features

You can connect the supply voltage and the bus connector (RS 485) to the interface modules IM151-1 BASIC, IM151-1 STANDARD and IM151-1 HIGH FEATURE.

Prerequisites

- Wire the interface module with the supply voltage switched off.
- Adhere to the wiring rules (see Section 5.4).

Tool required

3 mm screwdriver

Wiring interface module IM151-1

To connect the supply voltage:

1. Strip the insulation from the wires for the supply voltage of the interface module.
2. Tighten the individual wires in the screw-type terminal.

Connecting the PROFIBUS DP:

1. Insert the bus connector in the PROFIBUS DP port.
2. Tighten the screws of the bus connector.

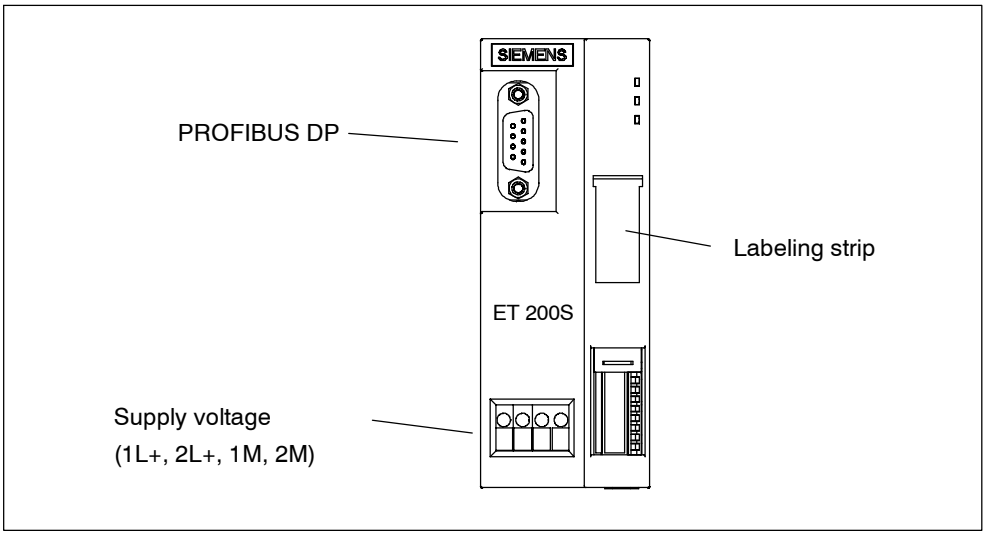


Figure 5-11 Wiring the IM151-1 BASIC, IM151-1 STANDARD and IM151-1 HIGH FEATURE interface modules

5.4.6 Wiring the IM151-3 PN interface module

Features

Connect the supply voltage and bus connection plug to the IM151-3 interface module.

Prerequisites

- Wire the interface module with the supply voltage switched off.
- Adhere to the wiring rules (see Section 5.4).

Tool required

- 3 mm screwdriver
- Industrial Ethernet Fast Connect Stripping Tool (6GK1 901-1GA00) (stripping tool for Industrial Ethernet Fast Connect installation lines)

Required accessories

- PROFINET connector conforming to the specifications in the *PROFINET Installation Guide*
- Industrial Ethernet Fast Connect installation lines

  The following are suitable:

  - Fast Connect Standard Cable 6XV1 840-2AH10
  - Fast Connect Trailing Cable 6XV1 840-3AH10
  - Fast Connect Marine Cable 6XV1 840-4AH10

Installing bus terminal connector

Install the PROFINET connector in accordance with the directions in the *PROFINET Installation Guide*.

Wiring the IM151-3 PN interface module

To connect the supply voltage:

1. Strip the insulation from the wires for the supply voltage of the interface module.
2. Tighten the individual wires in the screw-type terminal.

Connecting PROFINET:

1. Insert the bus connector in the PROFINET port.

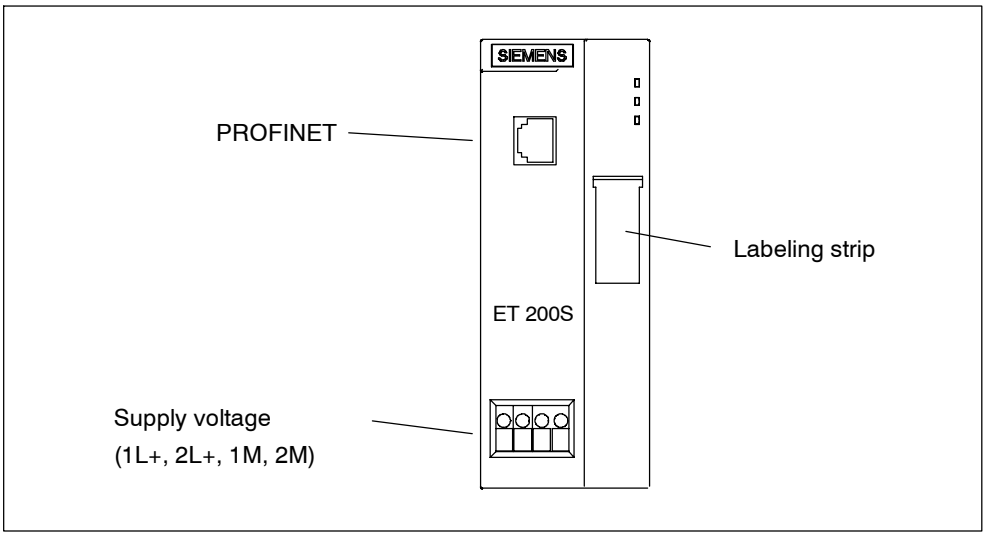


Figure 5-12 IM151-3 PN wiring

5.4.7 Wiring the IM151-1 FO STANDARD interface module

Features

Connect the supply voltage and the fiber-optic cable to the IM151-1 FO STANDARD interface module by means of a simplex connector.

Prerequisites

- Wire the interface module with the supply voltage switched off.
- Adhere to the wiring rules (see Section 5.4).

Tool required

3 mm screwdriver

Required accessories

- Packing with simplex connectors and polishing sets (6GK1901-0FB00-0AA0)
- Packing with plug adapters (6ES7 195-1BE00-0XA0)
- Fiber-optic duplex line see IK PI catalog

Installing simplex connector

Note

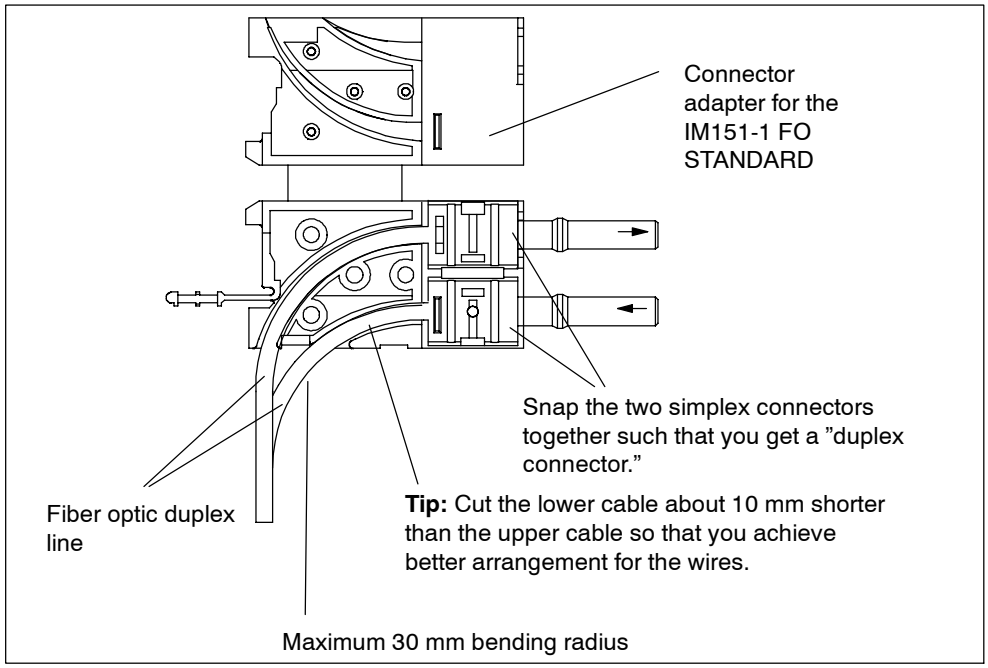
The fiber-optic duplex line cable have the following maximum lengths:

- PROFIBUS Plastic Fiber Optic Standard Cable 50 m
- PROFIBUS PCF Fiber Optic Standard Cable 300 m

1. Remove about 30 cm of the cladding of the fiber-optic duplex cable.
2. Attach the Simplex plugs to the fiber-optic duplex cable.
   For detailed assembly instructions for the Simplex plugs see the *"SIMATIC NET PROFIBUS Networks"* manual
   Tip: Do not simply attach the two Simplex plugs together, but connect them to form a duplex plug. In this manner you will achieve a better hold in the connector adapter.

   IMPORTANT: The cut and polished surface of the plastic fiber must be absolutely smooth and flat. The plastic cladding also must not stick out or be separated roughly. Each deviation causes strong attenuation of the light signal over the fiber-optic cable.
3. Put the simplex connector in the plug-in adapter for the IM151-1 FO STANDARD and the fiber-optic cable in the appropriate cable ducts. Snap the connector adapter closed so that you can hear clearly that the side units have made contact with each other.

   When inserting the plugs into the plug adaptor make sure that they are in the correct position: sender always up and receiver always down.



Bending radius for the fiber-optic cable

When placing the fiber-optic cable duplex core into the connector adapter and when placing things on top of them, make sure that you do not go below the permitted bending radius of 30 mm. Also read the installation guidelines for fiber-optic cables in the *ET 200S Distributed I/O System Manual* or in the *SIMATIC NET – PROFIBUS networks manual*.

Using the fiber-optic cable again

Note

If you place used fiber-optic cable in the connector adapter, you must shorten both cores of the fiber-optic cable by the bent lengths and remount the simplex connectors.
In this manner you avoid possible attenuation losses from parts of the fiber-optic cable duplex core that have been bent again and highly stressed.

Wiring the IM151-1 FO STANDARD interface module

To connect the supply voltage:

1. Strip the insulation from the wires for the supply voltage of the interface module.
2. Tighten the individual wires in the screw-type terminal.

Connecting the PROFIBUS DP:

1. Insert the fiber-optic cable with the mounted connector adapters in the IM151-1 FO STANDARD.
2. Push up the handle of the connector adapter that is sticking out.

Make sure they are in the correct position: the sender fiber-optic cable is plugged into the receiver socket and the receiver fiber-optic cable into the sender socket of the fiber-optic interface of the IM151-1 FO STANDARD.

If the IM151-1 FO STANDARD is the last node of the fiber-optic cable network, you must close the unoccupied fiber-optic cable interface with filler plugs (which are in place when the IM151-1 FO STANDARD is delivered).

Caution

Do not look directly into the opening of the transmission diodes.
The light beam that comes out could damage your eyes.

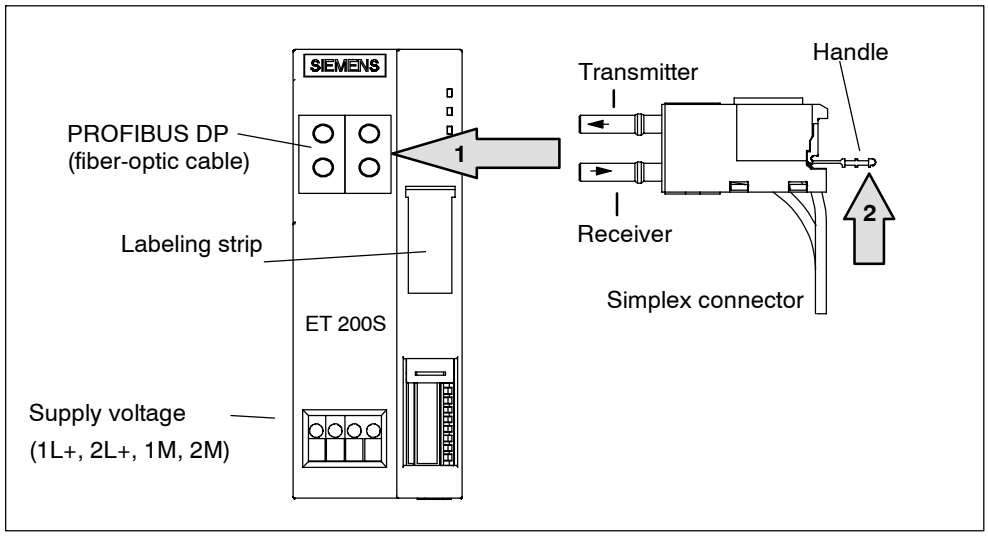


Figure 5-13 Wiring the IM151-1 FO STANDARD

5.5 Inserting and identifying the electronic modules

Features

- The electronic modules are inserted in the terminal modules.
- A labeling strip allows you to identify the electronic modules.
- Electronic modules are:
  - Self-coding
  - Type-coded

  The first time you insert an electronic module, a code element engages on the terminal module. This mechanically prevents the wrong electronic module from being inserted.

Prerequisites

Adhere to the rules below for inserting electronic modules. See Section 3.5 (The electronic modules you can use on the various terminal modules).

Inserting and identifying the electronic modules

1. Insert the electronic module in the terminal module until you hear it snap into place.
2. Pull the labeling strip up out of the electronic module in order to identify it.
3. Then put the labeling strip back into the electronic module.

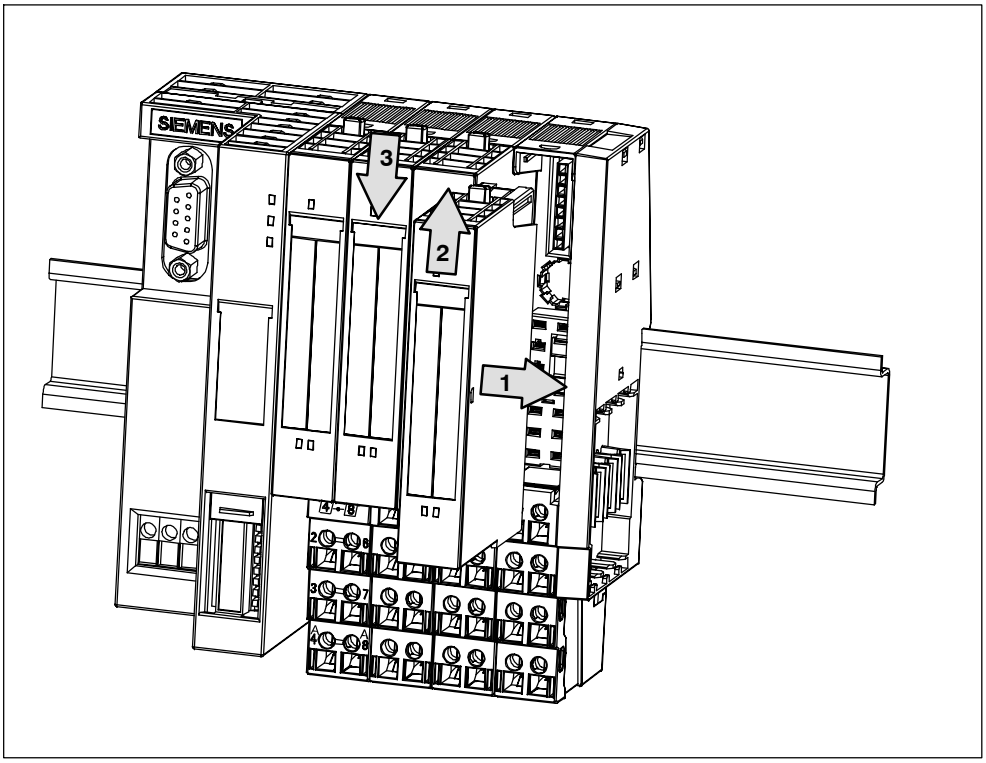


Figure 5-14 Inserting and identifying the electronic modules

Removing electronic modules

1. Simultaneously press the two release buttons on the top and bottom of the electronic module.
2. Pull the electronic module out from the terminal module at the front.

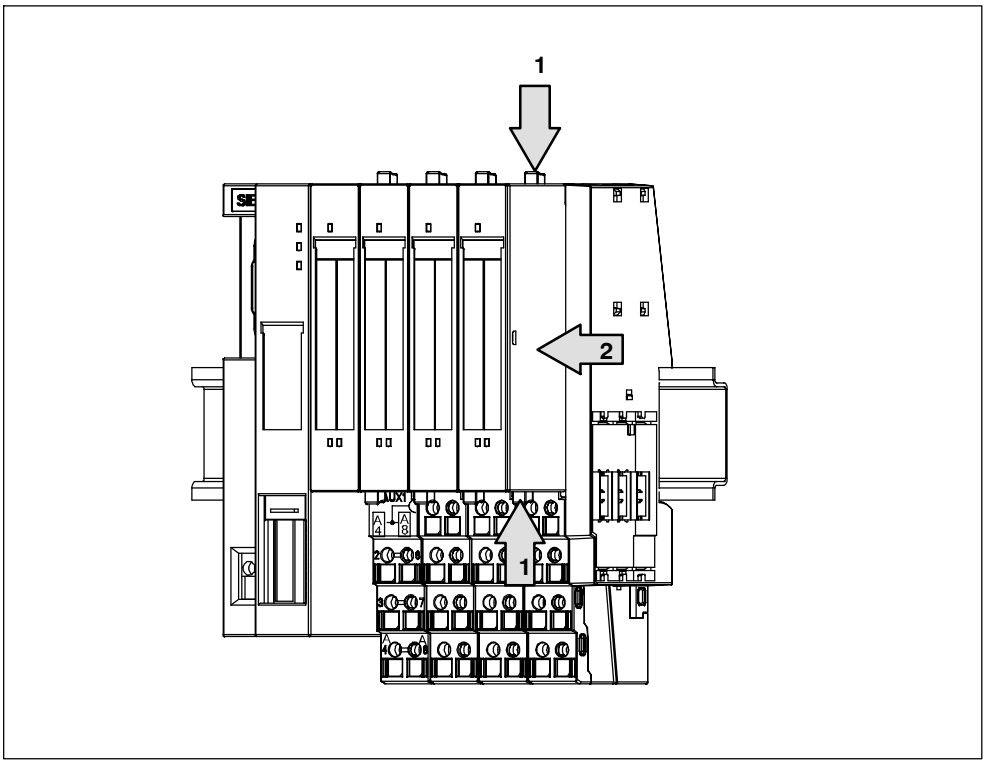


Figure 5-15 Removing electronic modules

Changing the type of an electronic module

You have already removed the electronic module:

1. Use a screwdriver to push the code element out of the terminal module.
2. Put the code element on the used electronic module again.
3. Insert the new electronic module (different type) in the terminal module until you hear it snap into place.
4. Identify the new electronic module.

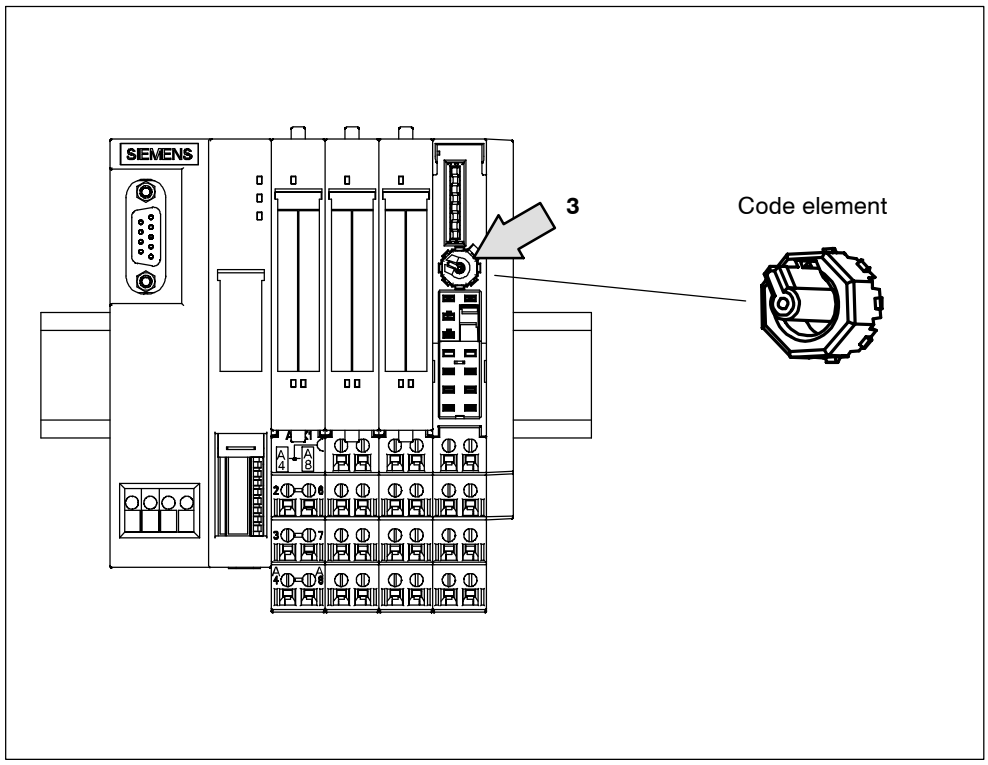


Figure 5-16 Removing the code element

Warning

When you make changes to the code, it can lead to dangerous states in your system.

Replacing a defective electronic module

You have already removed the electronic module:

1. Remove the code element from bottom of the new electronic module.
2. Insert the new electronic module (same type) in the terminal module until you hear it snap into place.
3. Identify the new electronic module.

Removing and inserting electronic modules during operation

ET 200S supports the removal and insertion of modules during operation (during the RUN operating mode). The ET 200S remains in RUN mode when an electronic module is removed. The protective conductor connections of the ET 200S are not interrupted.

Note

- You cannot remove and insert modules during operation unless the corresponding parameters have been assigned. See Section 8.1
- You can remove and insert modules during operation as of the IM151-1 BASIC, IM151-1 STANDARD (6ES7 151-1AA01-0AB0), IM151-1 FO STANDARD, IM151-1 HIGH FEATURE, and IM151-3 PN.
- If **one** module is missing (gap) and the ET 200S is switched on, the station will not start up (see Section 6.1.6.10 and 6.2.6.3).
- The removal and insertion of modules affects the clocking (equidistance).

If you replace more than one module, only one gap can result.

The following table indicates which modules you can remove and insert under which conditions:

Table 5-1 Removing and inserting electronic modules

Modules	Removing and inserting	Conditions
Interface module	No	---
Power modules	Yes	The load voltage must be switched off.
Digital electronic modules (input)	Yes	---
Digital electronic modules (output)	Yes	The load voltage must be switched off by means of an external switch/fuse.
Analog electronic modules	Yes	---
4 IQ-SENSE	Yes	The sensors can also be replaced during operation. These are then parameterized automatically by the electronic module.

Table 5-1 Removing and inserting electronic modules

Modules	Removing and inserting	Conditions
1Count 24V/100kHz	Yes	The load voltage must be switched off by means of an external switch/fuse.
1Count 5V/500kHz		
1SSI		
EM 1STEP 5V/204kHz		
2PULSE		
1POS INC/Digital		
1POS SSI/Digital		
1POS INC/Analog		
1POS SSI/Analog		
1SI 3964/ASCII	Yes	---
1SI Modbus/USS	Yes	---
RESERVE	Yes	---

5.6 Assigning device names for the I/O device

Features

Every PROFINET device has a unique factory-assigned device identification (MAC address).
Every ET 200S IO device is addressed with its device name during configuration and in the user program.

For detailed information on addressing in the PROFINET IO see the PROFINET system description.

Assigning device names

1. Install an empty MMC in the IM151-3 PN.
2. Switch on the voltage supply for the IM151-3 PN.
3. In HW Config, open the **Properties - IM151-3 PN** dialog box and enter the device name for your IO device.

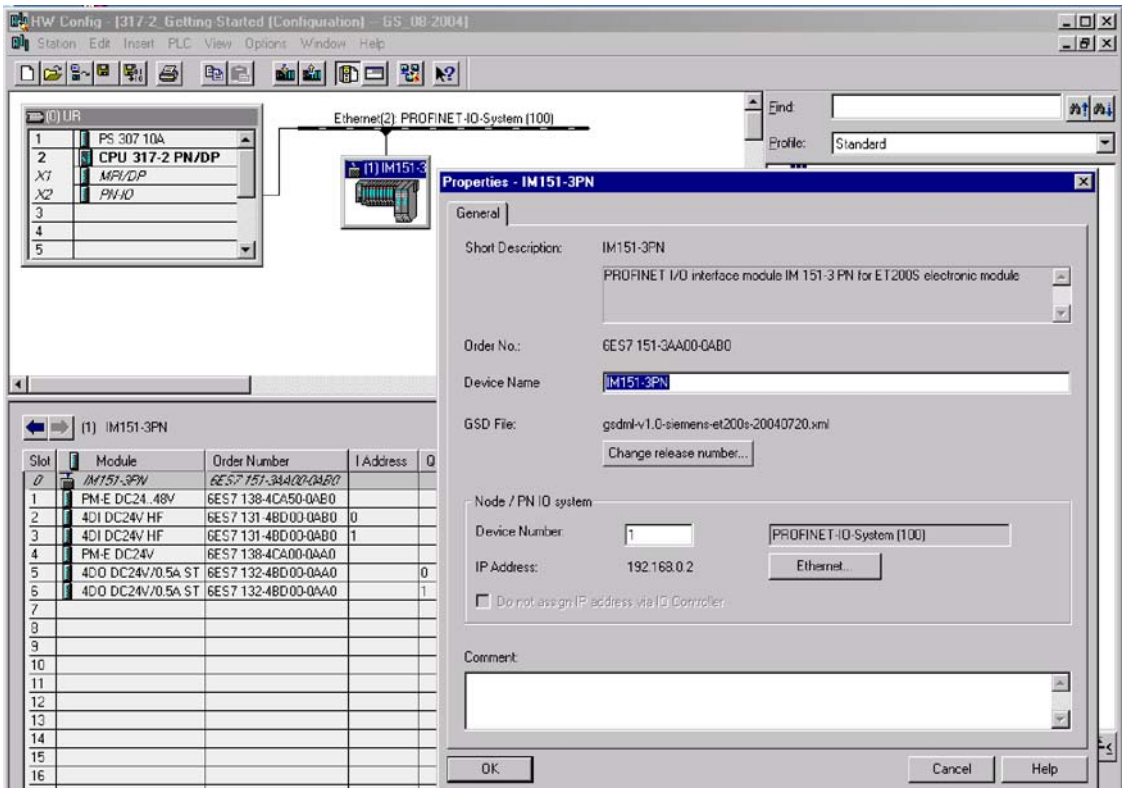


Figure 5-17 Assigning device names in HW CONFIG

4. To assign a name to the IM151 PN an online PROFINET connection from the programming device to the IO device via a switch is required.
   Use **Target system > Ethernet > Assign device name** to send the device name to the IM151-3 PN.

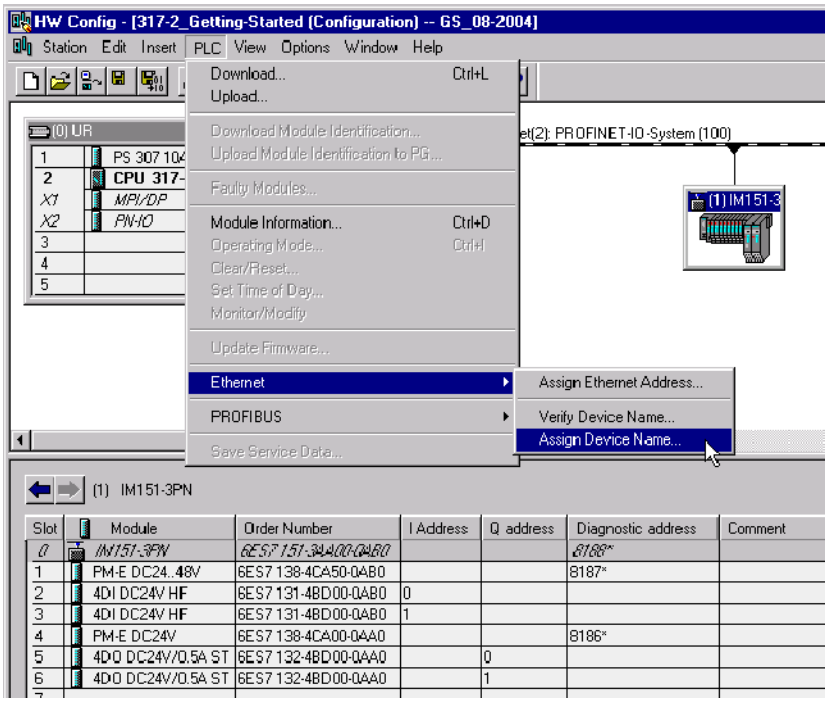


Figure 5-18 Send device name online to the IM151-3 PN

Click the **Assign name** button in the **Assign device name** dialog box. The device name is saved to the MMC in the IM151-3 PN interface module.

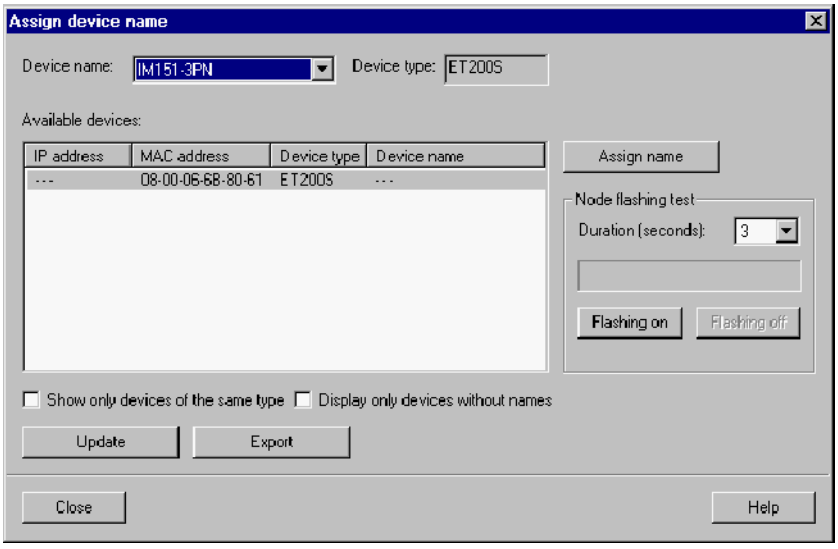


Figure 5-19 ”Assign device name” window before name assignment

The dialog box indicates the device name you assigned.

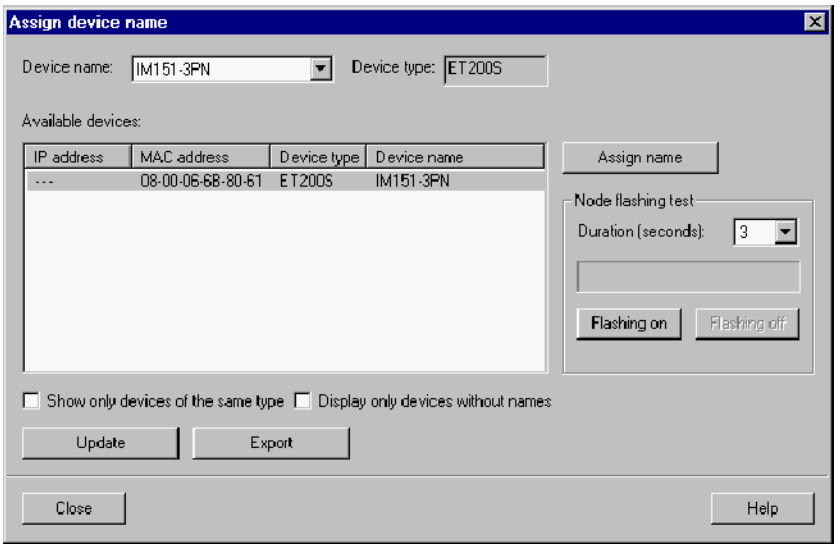


Figure 5-20 ”Assign device name” window after name assignment

Forwarding the device name on replacement of the interface module

The device name of the IO device is saved to the MMC.
To transfer the name if the IM151-3 PN interface module is replaced, remove the MMC from the ”old” IM151-3 PN and install it in the ”new” one.
It will import the device name from the MMC after the power to the IO device has been switched off and on again. Then the station can be addressed again and will operate in the same way as before the replacement.

Device flash test

When using more than one IO device, the system shows all of them in the **Assign device name** dialog box. In this case, compare the MAC address of the device with the indicated MAC address, then select the relevant IO device.

Identification of the IO devices is simplified by a device flash test. Enable the flash test as follows:

1. Select one of the displayed IO devices in the **Assign device name** window.
2. Select the flash duration you want to use.
3. Press the **Flash on** button.

The LINK LED on the selected device flashes (open front doors of the IM151-3 PN).

Commissioning and Diagnostics

6

Chapter overview

Chapter	Description	Page
6.1	Commissioning and diagnostics on PROFIBUS DP	6-1
6.2	Commissioning and diagnostics on PROFINET IO	6-57

Running tests

Note

You must make sure that your setup is safe. A complete function test and the relevant safety tests must be conducted before final commissioning of a setup. The tests must also include possible predictable errors. This will prevent danger to persons or the setup during operation.

6.1 Commissioning and diagnostics on PROFIBUS DP

Chapter overview

Chapter	Description	Page
6.1.1	Configuring the ET 200S on PROFIBUS DP	6-2
6.1.2	Commissioning and startup of the ET 200S on PROFIBUS DP	6-10
6.1.3	Diagnostics with LED display	6-12
6.1.4	Diagnostic messages of the electronic modules	6-22
6.1.5	Evaluating the interrupts of the ET 200S	6-23
6.1.6	Diagnostics using *STEP 5* and *STEP 7*	6-25

6.1.1 Configuring the ET 200S on PROFIBUS DP

Introduction

This chapter describes how to configure and assign parameters to the ET 200S.

- Configuring: The systematic arrangement of the different ET 200S modules (setup)
- Configuration: setting the ET 200S parameters using the configuration software

---

Note

The ET 200S is included in the hardware catalog of HWCONFIG:

- IM151-1 BASIC: from STEP 7 V5.2
- IM151-1 STANDARD: from STEP 7 V5.0 with ServicePack 3
- IM151-1 FO STANDARD: from STEP 7 V5.1 with ServicePack 1
- IM151-1 HIGH FEATURE: from STEP 7 V5.1 with ServicePack 3

You will not need a device database file (*.GSD file). Advantages:

- Simplified grouping of the modules (by means of the ”Pack Addresses” button in HW CONFIG)
- Plausibility checking of the parameters

The STEP 7 online help provides more detailed information on how to proceed.

DPV1 operation

If IM151-1 STANDARD (from 6ES7 151-1AA04-0AB0) or IM151-1 FO STANDARD (from 6ES7 151-1AB03-0AB0) is to be used on an S7 CPU that does not support a remove/insert interrupt, the ”Operation with preset <> actual setup” parameter must not be enabled in STEP 7. Otherwise if a module is removed (module failure) the station will fail (OB 86).

If ”Operation with preset <> actual setup” must be enabled, either DPV0 operation must be selected or IM151-1/FO STANDARD must be configured with the GSD file (in the STEP 7 hardware catalog under ”Additional bay units I/O”). ”Operation with preset <> actual setup” is thus also possible with a blocked remove/insert interrupt. The S7 CPU will not register removal (module failure) or insertion. These events can only be detected by cyclic reading of the diagnostic message and evaluation of the module status.

GSD file

You configure the ET 200S distributed I/O system using the device database file (*.GSD file). The ET 200S is integrated in your system as a standard slave by means of the device database file. You can download the *.GSD file in either of the following ways:

- From the Internet at http://www.ad.siemens.de/csi_e/gsd

The following *.GSD files are available:

- IM151-1 BASIC: ”SIEM80F3.GSx”
- IM151-1 STANDARD: ”SI03806A.GSx”
- IM151-1 FO STANDARD: ”SI03806B.GSx”
- IM151-1 HIGH FEATURE: ”SI0180E0.GSx”

Integrating the device database file in your configuration software

Table 6-1 below describes how to integrate the DDB file in SIMATIC S7 or SIMATIC S5 (COM PROFIBUS).

Table 6-1 Integrating the device database file in your configuration software

Step	STEP 7 as of V5.0, ServicePack 3	COM PROFIBUS, as of V5.1, ServicePack 2, Hotfix 1[1)]
1	Start STEP 7, and call the **Options ▶ Install New *.GSD Files** menu command from HW Config.	Copy the DDB file from ET 200S into the COM PROFIBUS directory: **...CPBV51\GSD** (default) The bitmap file is copied to the directory: **...CPBV51\BITMAPS**
2	From the next dialog box, select the GSD file you want to install and confirm with OK. Result: The field device is displayed in the hardware catalog in the PROFIBUS DP directory.	Start COM PROFIBUS, and call the **File ▶ Read device database file** menu command. Result: The ET 200S is displayed in the hardware catalog in the slave configuration section.
3	Configure the ET 200S using STEP 7 (refer to the help system in STEP 7).	Configure the ET 200S using COM PROFIBUS (refer to the integrated help system in COM PROFIBUS).

1) When using a different configuration program: see the relevant documentation

Configuration

The ET 200S has maximum address space of

- IM151-1 BASIC: up to 88 bytes for inputs and 88 bytes for outputs.
- IM151-1 STANDARD (up to 6ES7 151-1AA03-0AB0), IM151-1 FO STANDARD (up to 6ES7 151-1AB02-0AB0): up to 128 bytes for inputs and 128 bytes for outputs.
- IM151-1 STANDARD (up to 6ES7 151-1AA04-0AB0), IM151-1 FO STANDARD (up to 6ES7 151-1AB03-0AB0), IM151-1 HIGH FEATURE: up to 244 bytes for inputs and 244 bytes for outputs.

To better exploit the available address space of the DP master and reduce data transfer between the ET 200S and the DP master, you can group several electronic modules/load feeders in a single byte in the input or output area of the process image. This is achieved by the systematic arrangement and designation of the ET 200S electronic modules/motor starters.

In Appendix C you will find a table giving the address space required for the individual modules.

You can group the following module types in a single byte:

- Digital input modules
- Digital output modules
- Motor starters (direct-on-line starters and reversing starters)

How to proceed with groupable modules using the DDB file

1. Integrate the device database file in your configuration software.

   Result: In the hardware catalog of your configuration software you can recognize groupable modules by the fact that they are available in duplicate. The modules differ from each other only by a "*****" in the designation.

2. Configure the ET 200S setup, adhering to the following rules:
   - The modules that you can group in a single byte must be of the same module type (see above).
   - **IM151-1 STANDARD, 6ES7 151-1AA00-0AB0 interface module with product level 1 to 4:** The modules that can be grouped within a byte must be immediately adjacent. There can be only power modules between the electronic modules. Power modules do not open a new byte.
   - **As of IM151-1 BASIC; IM151-1 STANDARD, 6ES7 151-1AA00-0AB0 interface module with product level 5, 6ES7 151-1AA01-0AB0; IM151-1 FO STANDARD and IM151-1 HIGH FEATURE:** Any other module types can be inserted between the groupable modules.

Note

if the modules are grouped in DPV1 operation in STEP 7 applications with IM151-1 STANDARD, IM151-1 FO STANDARD or IM151-1 HIGH FEATURE,

- No insert/remove-module interrupts (OB 83) are triggered for these modules. In this case, you can recognize a module that has been removed from the module status in the diagnostic frame in the cyclic user program.
- Each grouped module then receives its own diagnostic address.

  - There can be a total of no more than 8 channels (1 byte).

3. Select from the hardware catalog of your configuration software the module designation without "*****". Result: you open a byte and store the first module there.
4. Select from the hardware catalog of your configuration software the module designation with "*****". Result: in the open byte, you store additional modules until all the bits are occupied.
5. If a byte is filled, you must configure a module again (that is, open a new byte without "*****").

Note

Configuration with the device database file: The configuration software does not check whether the modules have been grouped correctly. If you configure more than 8 channels in one byte, the modules that exceed the byte limit are reported as being incorrectly configured in the diagnosis:

Module status → 10_B: wrong module; invalid user data

These modules are not addressed.

Grouping of digital input modules

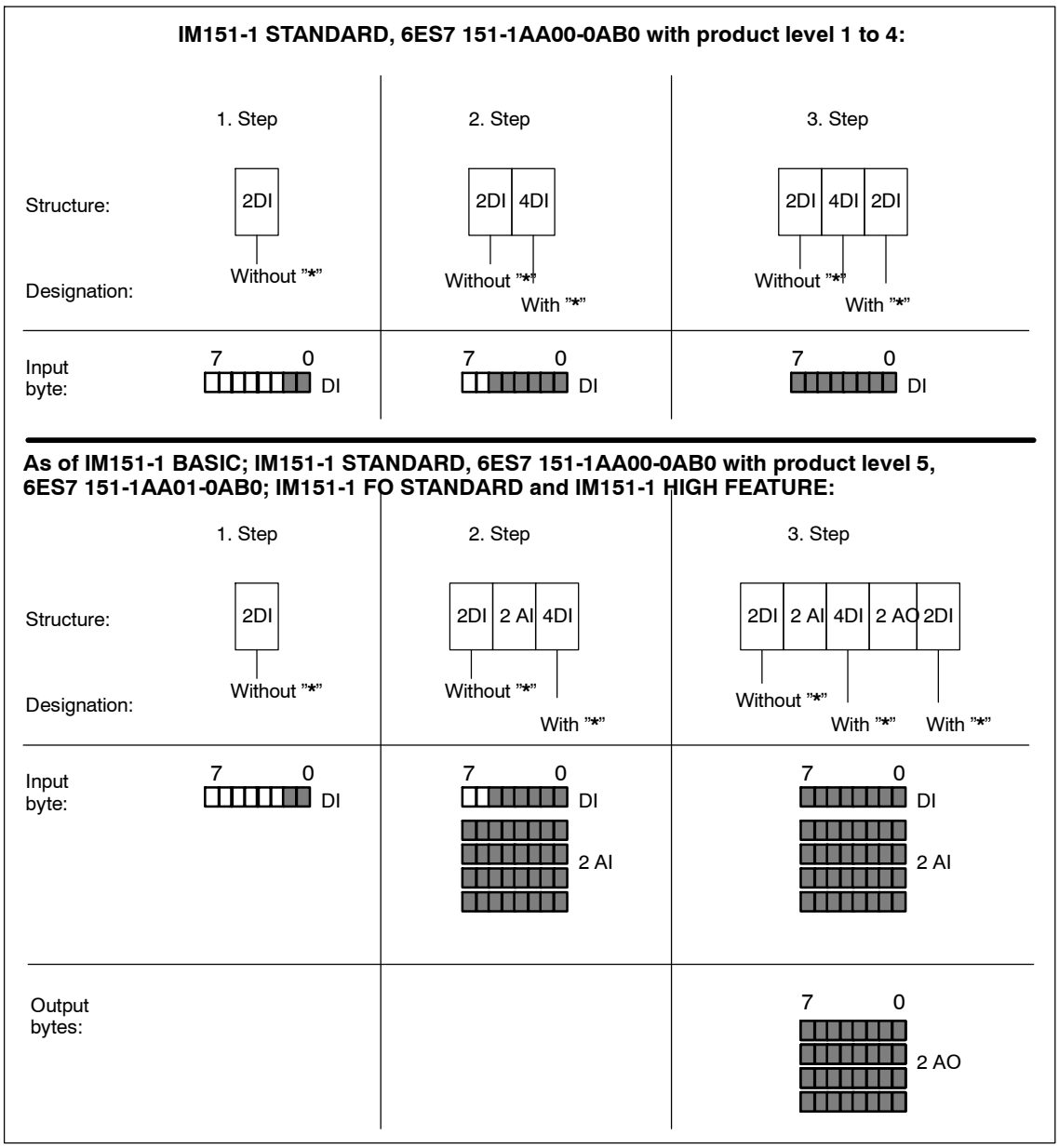


Figure 6-1 Grouping of input modules in a single byte

Grouping of digital output modules

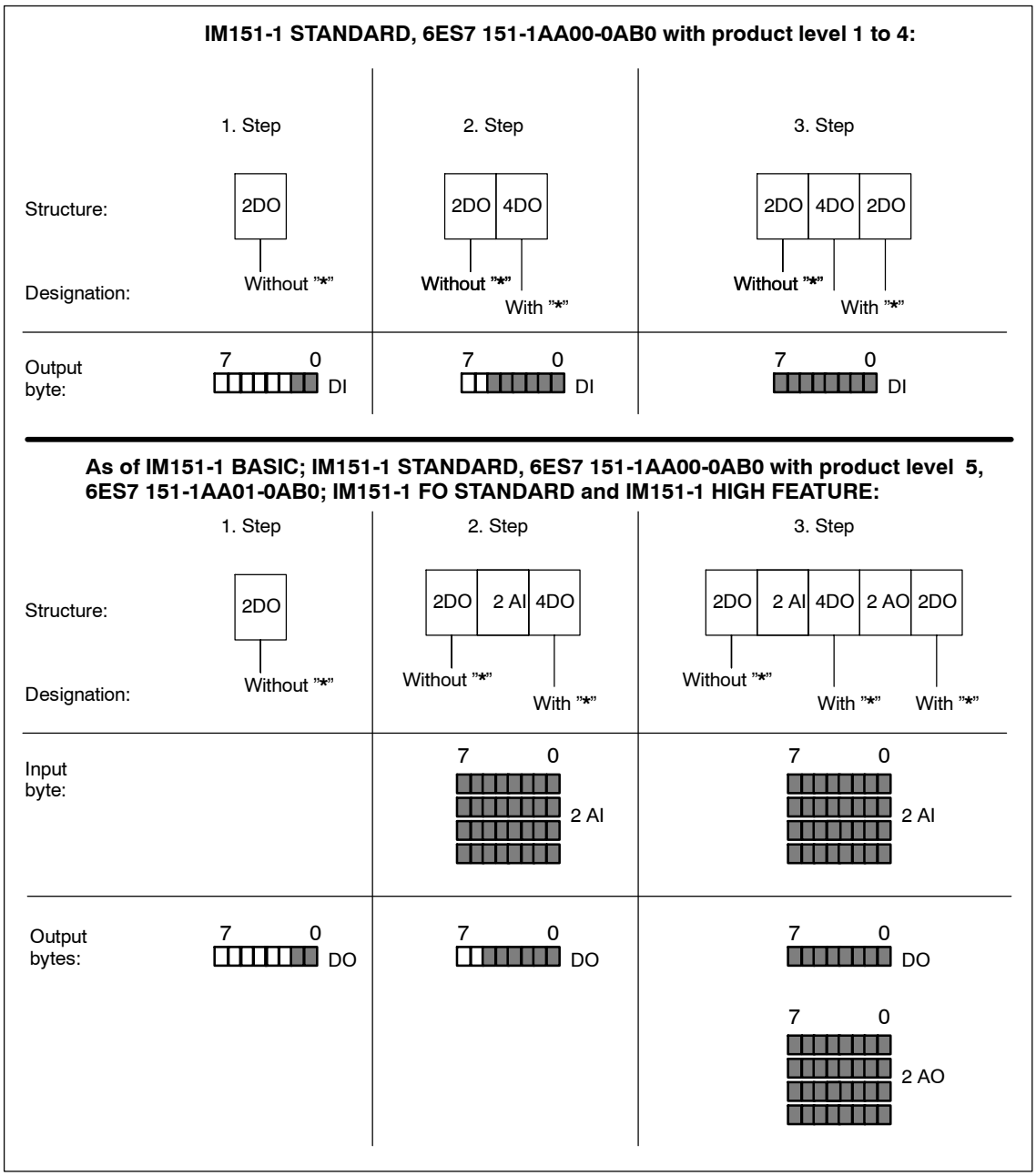


Figure 6-2 Grouping of digital output modules in a single byte

Grouping of motor starters

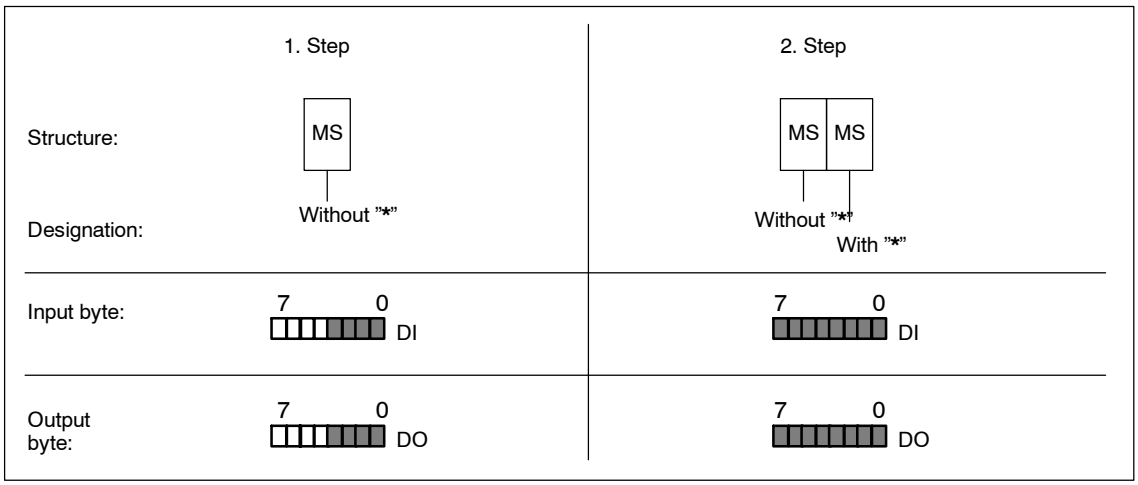
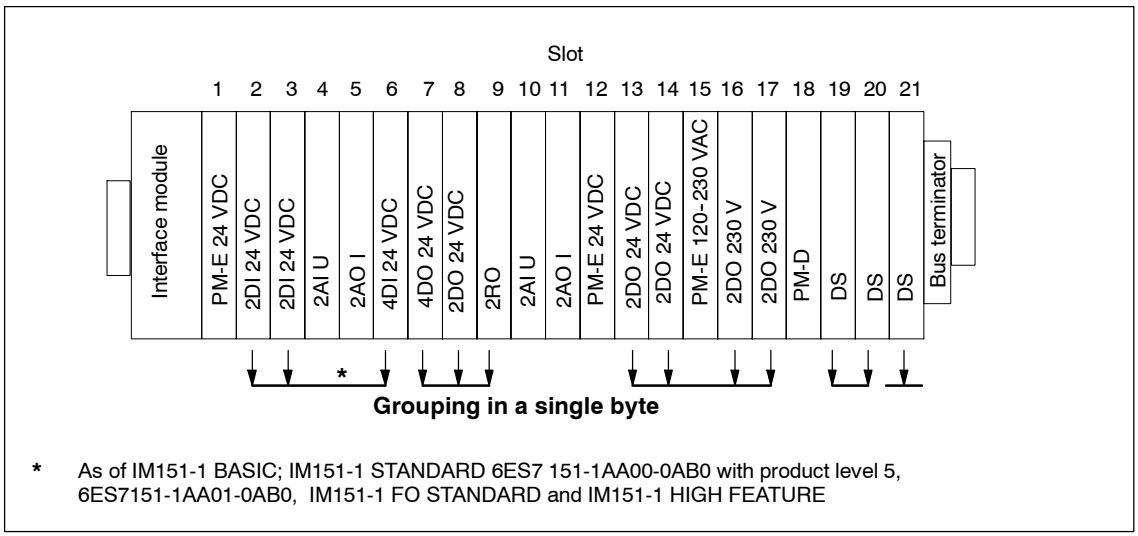


Figure 6-3 Grouping of motor starters within a byte

Configuration example

The following example describes how to configure an ET 200S setup:

Setup of the ET 200S



* As of IM151-1 BASIC; IM151-1 STANDARD 6ES7 151-1AA00-0AB0 with product level 5, 6ES7151-1AA01-0AB0, IM151-1 FO STANDARD and IM151-1 HIGH FEATURE

Figure 6-4 Setup of the ET 200S

Configuration table in your configuration software and address space

The byte addresses of the inputs and outputs can be freely selected (if the configuration software supports this). The bit addresses result automatically from the sequence of the grouped modules.

Table 6-2 Configuration table and address space

Slot	Module	Grouping	I/O address	
			Inputs	Outputs
1	6ES7 138-4CA00-0AA0 PM-E 24 VDC	---	---	---
2	6ES7 131-4BB00-0AB0 2DI 24 VDC	Yes	0.0 to 0.1	
3	6ES7 131-4BB00-0AB0*2DI 24 VDC		0.2 to 0.3	
4	6ES7 134-4FB00-0AB0 2AI U	No	1 to 4	
5	6ES7 135-4GB00-0AB0 2AO I	No		0 to 3
6	6ES7 131-4BD00-0AA0*4DI 24 VDC	Yes	0.4 to 0.7	
7	6ES7 132-4BD00-0AA0 4DO 24 VDC	Yes		4.0 to 4.3
8	6ES7 132-4BB00-0AB0*2DO 24 VDC			4.4 to 4.5
9	6ES7 132-4HB00-0AB0*2DO Rel.			4.6 to 4.7
10	6ES7 134-4FB00-0AB0 2AI U	No	5 to 8	
11	6ES7 135-4GB00-0AB0 2AO I	No		5 to 8
12	6ES7 138-4CA00-0AA0 PM-E 24 VDC	---	---	---
13	6ES7 132-4BB30-0AB0 2DO 24 VDC	Yes		9.0 to 9.1
14	6ES7 132-4BB30-0AB0* 2DO 24 VDC	Yes		9.2 to 9.3
15	6ES7 138-4CA00-0AA0 PM-E 230 VAC	---	---	---
16	6ES7 132-4FB00-0AB0* 2DO 230 V	Yes		9.4 to 9.5
17	6ES7 132-4FB00-0AB0* 2DO 230 V	Yes		9.6 to 9.7
18	3RK1903-0BA00 PM-D	---	---	---
19	3RK1301-xxB00-0AA0 DS	Yes	9.0 to 9.3	10.0 to 10.3
20	3RK1301-xxB00-0AA0 *DS		9.4 to 9.7	10.4 to 10.7
21	3RK1301-xxB00-0AA0 DS	Yes	10.0 to 10.3	11.0 to 11.3

No grouping

If you do not want to group the configuration of the ET 200S distributed I/O system digital input/output modules and motor starters in a single byte, use only those module designations without "*" in the hardware catalog of your configuration software.

Each electronic module/motor starter will then occupy one byte in the input or output area of the process image.

6.1.2 Commissioning and startup of the ET 200S on PROFIBUS DP

Software requirement NONE

Table 6-3 Software requirements for commissioning on PROFIBUS DP

Engineering software used	Version	Notes
STEP 7	As of Version 5.0 and ServicePack 3	You are using HW Config. As of ServicePack 3 the ET 200S is included in the hardware catalog.
COM PROFIBUS	As of Version 5.1, ServicePack 2, Hotfix 1	You have integrated the device database file of ET 200S in *COM PROFIBUS*.
Configuration software for a different DP master		You need the device database file of ET 200S.

Requirements for commissioning the ET 200S

Table 6-4 Requirements for commissioning the ET 200S on PROFIBUS DP

Prior Activity	See ...
1. DP slave installed	Chapter 4
2. PROFIBUS address set on the DP slave	Section 4.8
3. DP slave wired	Chapter 5
4. DP slave configured (configured and parameters assigned)	Section 6.1.1
5. Supply voltage switched on for DP master	DP master manual
6. DP master set to RUN mode	DP master manual

Commissioning the ET 200S

Table 6-5 Procedure for commissioning the DP slave

Step	Procedure	See .
1.	Switch on the supply voltage for the DP slave.	Section 8.2
2.	Switch on the supply voltage for the load as necessary.	

Startup of the ET 200S

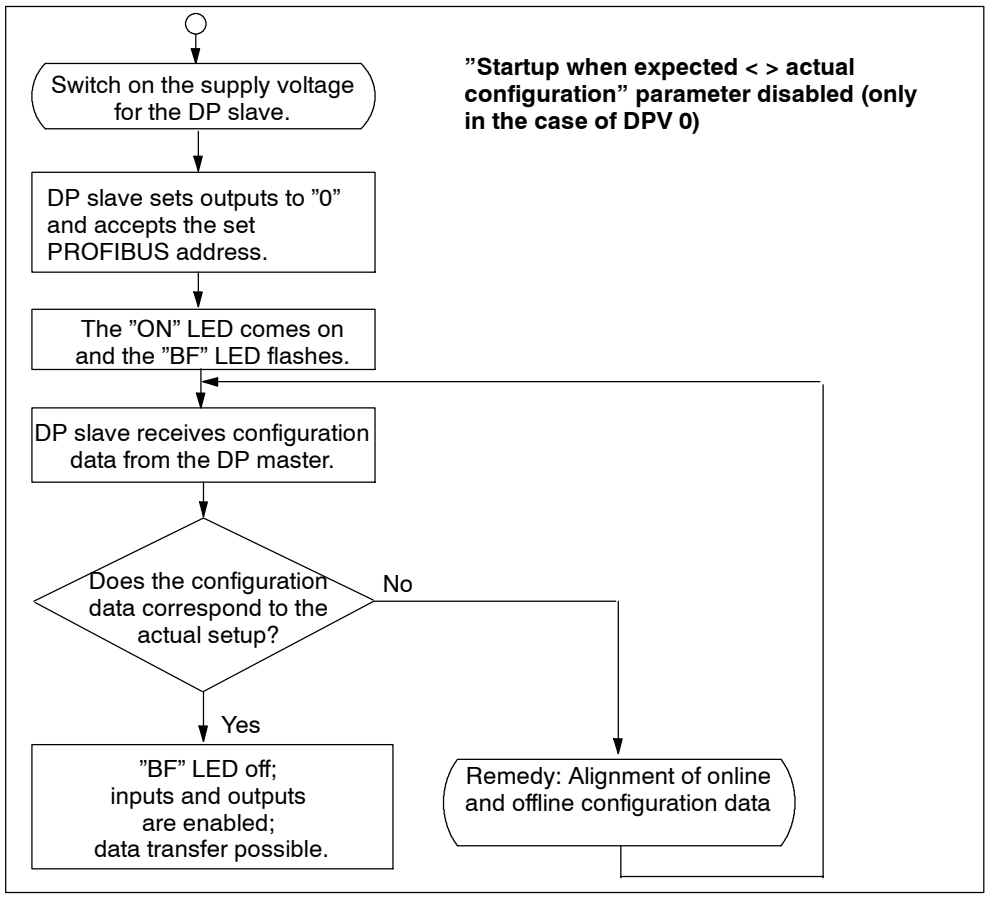


Figure 6-5 Configuring the ET 200S on PROFIBUS DP

Note

All interface modules support the default startup. In other words, you do not have to carry out configuration using the DDB file or HWCONFIG.

In this case the following conditions apply:

- The default parameters are used (see the parameters for the electronic modules).
- AKF (general identifier format in compliance with the PROFIBUS standard) in the configuration frame
- Grouping (packing) of the electronic modules is not possible without parameterization.
- All supply voltages must be switched on at the power modules.
- It is not possible to remove or insert modules during operation.

6.1.3 Diagnosis using the LEDs

Interface module

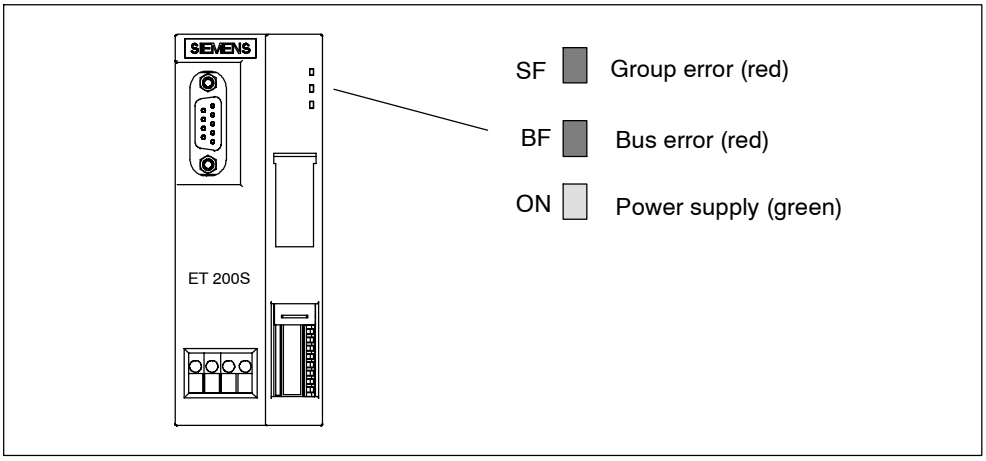


Figure 6-6 LED display on the IM151-1 interface module

Status and error displays using LEDs on the IM151-1 BASIC / IM151-1 STANDARD/ IM151-1 FO STANDARD / IM151-1 HIGH FEATURE

Table 6-6 Status and error displays using LEDs on the IM151-1 BASIC / IM151-1 STANDARD/ IM151-1 FO STANDARD / IM151-1 HIGH FEATURE

SF BF ON	SF: red BF: red ON: green			
LEDs			**Meaning**	**Remedy**
SF	**BF**	**ON**		
Off	Off	Off	There is no voltage applied to the interface module, or the interface module has a hardware defect.	Switch on the 24 VDC supply voltage at the interface module.
*	*	on	There is voltage applied to the interface module.	–
*	flashes	on	The interface module is not configured or is configured incorrectly. No data transfer is taking place between the DP master and the interface module. Causes: • The PROFIBUS address is incorrect. • Configuration error • Parameter assignment error	• Check the interface module. • Check the configuration data and parameters. • Check the PROFIBUS address.

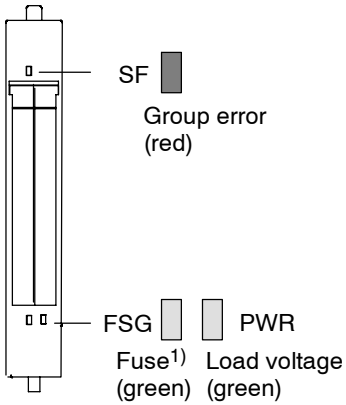
Table 6-6 Status and error displays using LEDs on the IM151-1 BASIC / IM151-1 STANDARD/ IM151-1 FO STANDARD / IM151-1 HIGH FEATURE

SF: red
BF: red
ON: green

LEDs			Meaning	Remedy
SF	**BF**	**ON**		
*	on	on	Transmission rate detection, illegal PROFIBUS address, or bottom DIP switch (PROFIBUS address) not in the OFF position. Causes: • The response monitoring time has elapsed. • Bus communication to the interface module via PROFIBUS DP has been interrupted.	Set a valid PROFIBUS address (1 to 125) at the interface module, or check the bus configuration. • Check that the bus connector is correctly inserted. • Check if the interconnecting cable to the DP master has been interrupted. • Switch the 24 VDC supply voltage on and off again at the interface module.
on	*	on	The configured setup of the ET 200S does not match the actual setup of the ET 200S. There is an error in an I/O module, or the interface module is defective.	Check the setup of the ET 200S, whether a module is missing or defective, or whether an unconfigured module is inserted. Check the configuration (using COM PROFIBUS or STEP 7, for example), and correct the parameter assignment error. Replace the interface module, or get in touch with your Siemens contact person.
Off	Off	on	Data transfer is taking place between the DP master and the ET 200S. The target configuration and actual configuration of the ET 200S match.	–

* Not relevant

Power modules

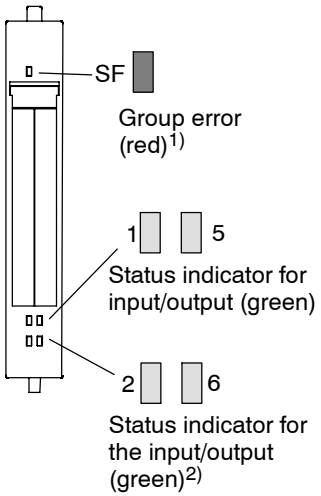


LEDs			Meaning	Remedy
SF	FSG	PWR		
on			No parameter assignment or incorrect module inserted. There is a diagnostic message.	Check the parameter assignment. Evaluate the diagnostic information.
	Off		The fuse in the power module has tripped.	Replace the fuse.
		Off	There is no load voltage at the power module.	Check the load voltage.

1) Only with the PM-E 24–48 VDC/120–230 VAC

Figure 6-7 LED display on the power module

Digital Electronic Modules



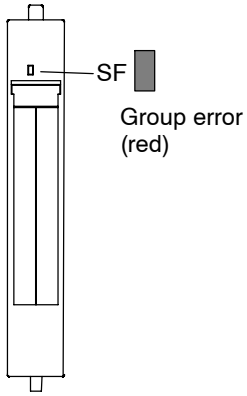
LEDs					Meaning	Remedy
SF	1	5	2	6		
on					No parameter assignment or incorrect module inserted. No load voltage. There is a diagnostic message.	Check the parameter assignment. Check the load voltage. Evaluate the diagnostic information.
	on				Input/output on channel 0 activated	
		on			Input/output on channel 1 activated	
			on		Input/output at channel 2 (only for 4DI/DO) activated	
				on	Input/output at channel 3 (only for 4DI/4DO) activated	

1) only in the case of the 2DI DC24V HF, 4DI DC24V HF, 2DO DC24V/0,5A HF, 2DO DC24V/2A HF and 4DI NAMUR

2) only in the case of the 4DI DC24V ST, 4DI DC24V HF, 4DO DC24V/0,5A ST, 4DO DC24V/2A ST, 4DI UC24..48V HF and 4DI NAMUR

Figure 6-8 LED Display on the Digital Electronic Modules

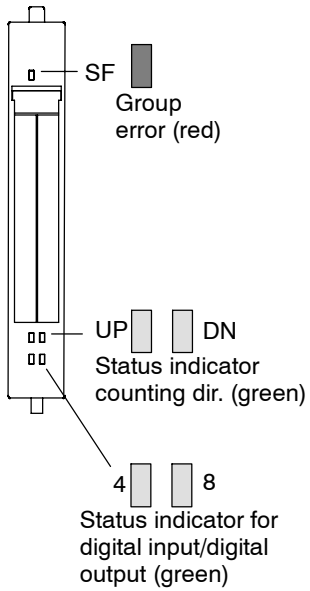
Analog electronic modules



LED	Meaning	Remedy
SF		
on	No parameter assignment or incorrect module inserted. No load voltage. There is a diagnostic message.	Check the parameter assignment. Check the load voltage. Evaluate the diagnostic information.

Figure 6-9 LED Display on the Analog Electronic Modules

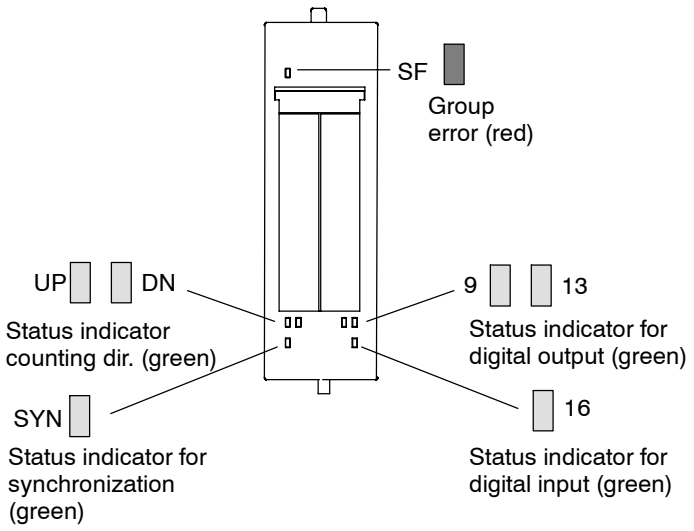
1COUNT 24V/100kHz



LEDs					Meaning	Remedy
SF	UP	DN	4	8		
on					No parameter assignment. There is a diagnostic message.	Check the parameter assignment. Evaluate the diagnostic information.
	on				Status of the counter's low bit if the counter is counting up	
		on			Status of the counter's inverted low bit if the counter is counting down	
			on		DO (direct control, comparator output) activated.	
				on	DI (HW gate, synchronization, latch) activated.	

Figure 6-10 LED display on the 1COUNT 24 V/100 kHz

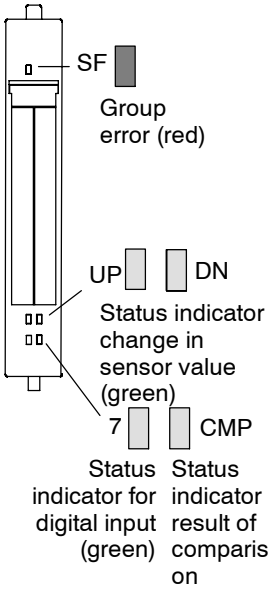
1COUNT 5V/500kHz



LEDs							Meaning	Remedy
SF	UP	DN	SYN	9	13	16		
on							No parameter assignment. There is a diagnostic message.	Check the parameter assignment. Evaluate the diagnostic information.
	on						Status of the counter's low bit if the counter is counting up	
		on					Status of the counter's inverted low bit if the counter is counting down	
			on				Synchronization is executed (only in count modes; image of STS_SYN feedback bit)	
				on			DO 1 is activated	
					on		DO 2 is activated	
						on	DI is activated	

Figure 6-11 LED display on the 1COUNT 5 V/500 kHz

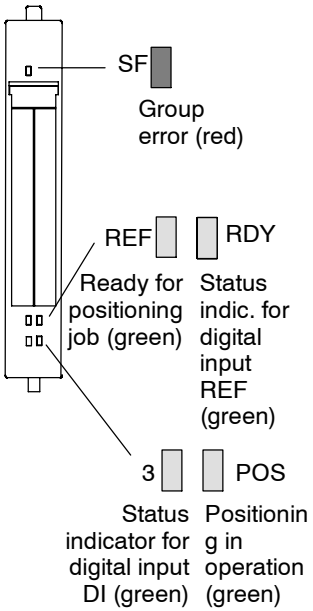
1SSI



LEDs					Meaning	Remedy
SF	UP	DN	7	CMP		
on					No parameter assignment. There is a diagnostic message.	Check the parameter assignment. Evaluate the diagnostic information.
	on				At value change from smaller to larger sensor values (including zero-crossing)	
		on			At value change from larger to smaller sensor values (including zero-crossing)	
			on		DI (latch) activated.	
				on	At comparator result CMP 1	

Figure 6-12 LED display on the EM 1SSI

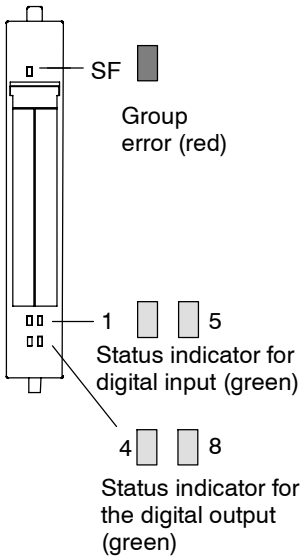
1STEP 5V/204kHz



LEDs					Meaning	Remedy
SF	REF	RDY	3	POS		
on					No parameter assignment. There is a diagnostic message.	Check the parameter assignment. Evaluate the diagnostic information.
	on				REF activated	
		on			If parameters were assigned to the module correctly and pulse enable has been activated.	
			on		DI activated	
				on	When a positioning operation is running	

Figure 6-13 LEDs on the EM 1STEP 5 V/204 kHz

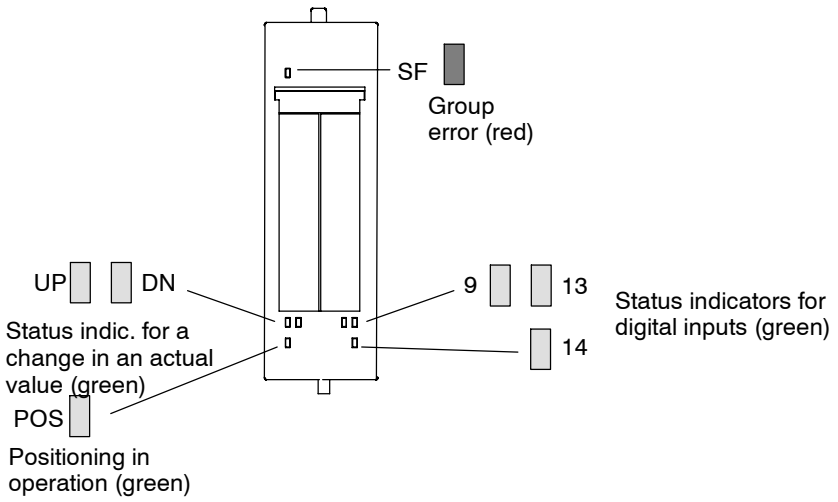
2PULSE



LEDs					Meaning	Remedy
SF	1	5	4	8		
on					No parameter assignment. There is a diagnostic message.	Check the parameter assignment. Evaluate the diagnostic information.
	on				Input on channel 0 is activated	
		on			Input on channel 1 is activated	
			on		Output on channel 0 is activated	
				on	Output on channel 1 is activated	

Figure 6-14 LED display on the 2PULSE

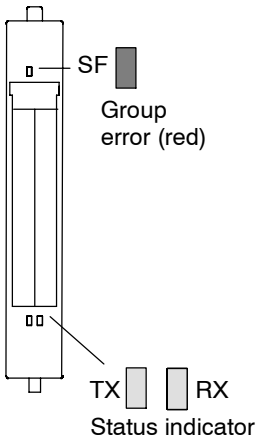
1POS INC/Digital, 1POS SSI/Digital, 1POS INC/Analog, 1POS SSI/Analog



LEDs							Meaning	Remedy
SF	UP	DN	POS	9	13	14		
on							No parameters set. Diagnostic message pending.	Check the parameter assignment. Evaluate the diagnosis.
	on						In the case of a change from lower to higher actual values	
		on					In the case of a change from higher to lower actual values	
			on				**Digital:** positioning is taking place, and one of the 3 digital outputs is set. **Analogously to:** positioning is taking place, and a voltage not equal to 0 V is being output at the analog output.	
				on			DI 0 is activated	
					on		DI 1 is activated	
						on	DI 2 is activated	

Figure 6-15 LEDs on the 1POS INC/Digital, 1POS SSI/Digital, 1POS INC/Analog, 1POS SSI/Analog

Serial interface module 1SI 3964/ASCII, 1SI Modbus/USS

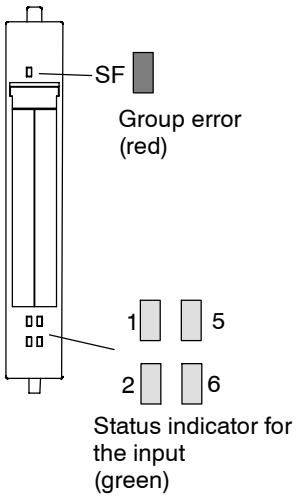


LEDs			Meaning	Remedy
SF	TX	RX		
on			Hardware fault	Check the module.
			Firmware error	
			Parameter assignment error	Check the parameter assignment. Evaluate the diagnostic information.
			Wire break or loose cable between the module and the communication partner [1]	Check the wiring.
			Communication error	Check the communication settings.
	on		The module is sending data via the interface.	
		on	The module is receiving data via the interface.	

[1] Only detected in the case of RS422 interface connections when the default for the receive line is set to R(A) 5V/R(B) 0V

Figure 6-16 LEDs on the 1SI 3964/ASCII, 1SI Modbus/USS

4 IQ-SENSE



LEDs					Meaning	Remedy
SF	1	5	2	6		
on					No parameter assignment. There is a diagnostic message. Excess gain lower limit violated. Teach-in process running.	Check the parameter assignment. Evaluate the diagnosis. Adjust the reflex sensor. Clean the optical system. Replace the sensor. Terminate the teach-in process.
	on				Input on channel 0 is activated	
		on			Input on channel 1 is activated	
			on		Input on channel 2 is activated	
				on	Input on channel 3 is activated	

Figure 6-17 LEDs on the 4 IQSENSE electronic module

6.1.4 Diagnostic messages of the electronic modules

Actions after a diagnostic message in DPV0 operation

The error is entered in the diagnostic frame in the channel-specific diagnosis:

- The SF LED on the interface module comes on.
- Several simultaneous diagnostic messages are possible.

Actions after a diagnostic message in DPV1 operation

Every diagnostic message leads to the following actions:

- Diagnoses can be reported as diagnostic interrupts in DPV1 operation.
- After a diagnostic message this is:
  - Entered in the diagnostic frame as a diagnostic interrupt block (always only one interrupt)
  - Stored in the diagnostic buffer of the CPU
- The SF LED on the interface module comes on.
- The OB 82 is called. If OB 82 is not available, the CPU goes into STOP mode.
- Acknowledgment of the diagnostic interrupt (following this a new interrupt is possible).

Causes of Errors and Remedies

The causes of the errors and the action to be taken when specific diagnostic messages appear are described in Section 6.1.6.8.

6.1.5 Evaluating the interrupts of the ET 200S

Introduction

At specific process states or errors the DP slave saves an interrupt block with the relevant information in the diagnostic messages (DPV1 interrupt mechanism). Independent of this the DP slave diagnostic status is executed in the ID-related diagnostics, in the module status and the channel-related diagnostics.

Interrupts in DPV0 operation

No interrupts are defined for DPV0 operation under the PROFIBUS standard. Therefore, an interface module in DPV0 operation does not trigger an interrupt.

Interrupts in DPV1 operation

The ET 200S supports the following interrupts:

- Diagnostics Interrupts
- Process Alarms
- Insert/remove-module interrupts

Requirement: Interrupts are only supported if the ET 200S is operated with the IM151-1 STANDARD (as of 6ES7 151-1AA04-0AB0), IM151-1 FO STANDARD (as of 6ES7 151-1AB03-0AB0) and IM151-1 HIGH FEATURE interface modules in DPV1 operation.

In the event of an interrupt, interrupt OBs are automatically executed in the CPU of the DP master (see the programming manual System Software for S7300/ S7400, Program Design).

Triggering of a diagnostic interrupt

When an incoming or outgoing event (for example wire break) is registered, the module triggers a diagnostic interrupt if ”Enable: Diagnostic interrupt” is set.

The CPU interrupts the processing of the user program and processes the OB 82 diagnostic block. The result that triggered the interrupt is added to the OB 82 start information.

Evaluating hardware interrupts with STEP 7

In the event of a hardware interrupt, the CPU interrupts the processing of the user program and processes the OB 40 hardware interrupt block instead.

The module channel that triggered the hardware interrupt is entered in the start information of OB 40 in the OB40_POINT_ADDR variable. In the figures below you will find the assignment to the bits of the local double word 8.

Hardware interrupts in:
2DI DC24V HF and 4DI DC24V HF electronic modules:

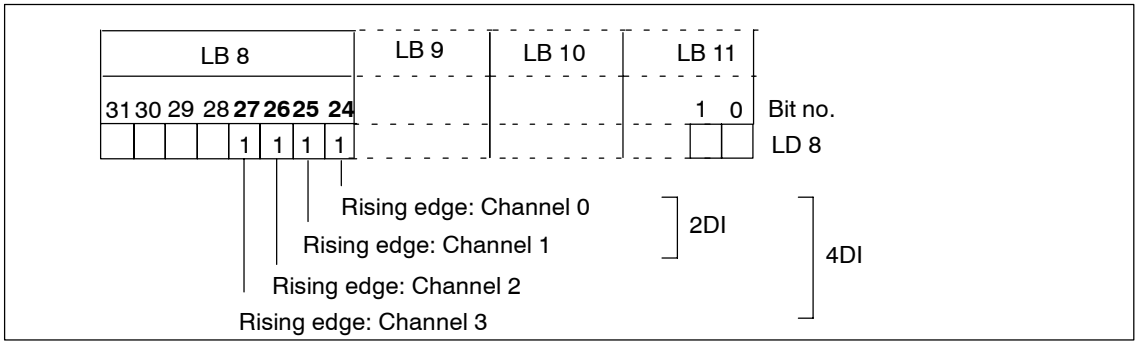


Figure 6-18 Start information of the OB 40: which event has triggered a process interrupt with digital input modules

Hardware interrupts in the case of:
2AI U High Speed, 2AI I 2WIRE High Speed, and 2AI I 4WIRE High Speed electronic modules:

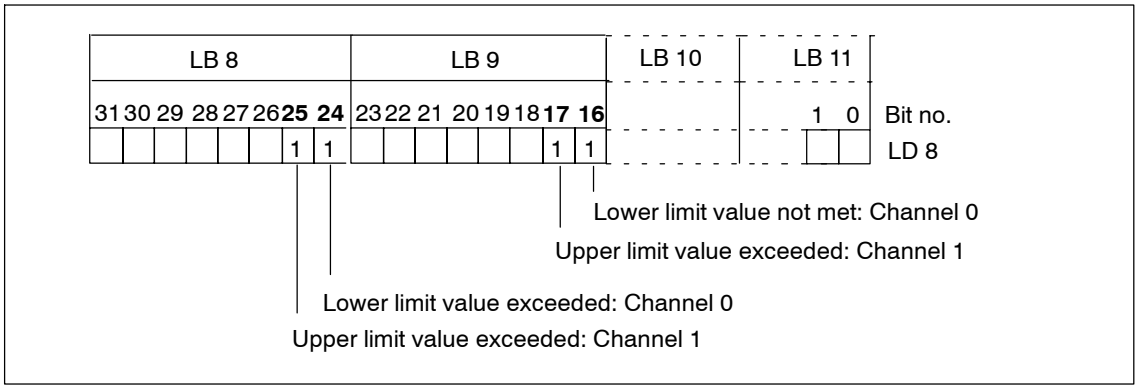


Figure 6-19 Start information of the OB 40: which event has triggered a process interrupt with analog input modules

You will find a description of the OBs 40 in the *System and Standard Functions* reference manual.

Triggering of an insert/remove module interrupt

Insert/remove module interrupts are supported in DPV1 operation. The CPU interrupts the processing of the user program and processes the OB 83 diagnostic block. The result that triggered the interrupt is added to the OB 83 start information.

6.1.6 Diagnostics using *STEP 5* and *STEP 7*

Slave diagnostics

The slave diagnosis complies with IEC 61784-1:2002 Ed1 CP 3/1. Depending on the DP master, it can be read out with *STEP 5* or *STEP 7* for all DP slaves that comply with the standard.

The reading out and structure of the slave diagnosis is described in the following sections.

6.1.6.1 Reading out the diagnosis

Length of the diagnostic message frame

- The maximum message frame length for the ET 200S is as follows:
  - IM151-1 BASIC: 43 bytes
  - IM151-1 STANDARD, IM151-1 FO STANDARD, IM151-1 HIGH FEATURE (DPV0 operation): 64 bytes
  - IM151-1 STANDARD, IM151-1 FO STANDARD (DPV1 operation): 110 bytes
  - IM151-1 HIGH FEATURE (DPV1 operation): 128 bytes
- The minimum frame length is
  - 6 bytes (module diagnosis, module status, and channel-specific diagnosis blocked by parameter assignment).

Ways of reading the diagnosis

Table 6-7 Reading the diagnosis out using *STEP 7* and *STEP 5* on PROFIBUS DP

Programmable logic controller with DP master	Block or register in *STEP 7*	Application	See .
SIMATIC S7/M7	”DP Slave Diagnostics” tab	Slave diagnosis in plain-text form on the STEP 7 user interface	The section on hardware diagnostics in the *STEP 7 online help system*
	SFC 13 ”DP NRM_DG”	Read out slave diagnosis (store in data area of the user program)	For the structure, see Section 6.1.6.2; for SFC, see the *STEP 7 online help system*
	SFC 59 ”RD_REC”	Read data records of the S7 diagnosis (store in the data area of the user program)	See the system and standard functions reference manual
	SFB 52 ”RDREC”	Read data records from the DP slave	For SFB, see the *STEP 7 online help system* (system functions/system function blocks)
	SFB 54 ”RALRM” 1)	Receive interrupts from the interrupt OBs	For SFB, see the *STEP 7 online help system* (system functions/system function blocks)
SIMATIC S5 with IM308-C as DP master	FB 192 ”IM308C”	Read out slave diagnosis (store in data area of the user program)	For the structure, see Section 6.1.6.2; for FBs, see the *ET 200 Distributed I/O System manual*
SIMATIC S5 with S5-95U PLC as DP master	FB 230 ”S_DIAG”		

1) Only with S7-400 as of V3.0 and with CPU 318 as of V3.0

Example of reading the slave diagnosis using FB 192 ”IM308C”

Here you will find an example of how to use FB 192 to read out the slave diagnosis for a DP slave in the *STEP 5* user program.

Assumptions

The following assumptions apply to this *STEP 5* user program:

- The IM 308-C operating in DP master mode uses the page frames 0 to 15 (number 0 of IM 308-C).
- The DP slave has the PROFIBUS address 3.
- The slave diagnosis is to be stored in DB20. However, you can also use any other data block for this.
- The slave diagnosis consists of a maximum 64 bytes (IM151-1 STANDARD).

STEP 5 user program

```
STL                                  Explanation
       :A      DB 30
       :SPA    FB 192
Name   :IM308C
DPAD   :       KH F800               Default address area of the IM 308-C
IMST   :       KY 0, 3               IM no. = 0, PROFIBUS address of DP slave = 3
FCT    :       KC SD                 Function: Read slave diagnostics
GCGR   :       KM 0                  Not evaluated
TYP    :       KY 0, 20              S5 data area: DB 20
STAD   :       KF +1                 Diagnostic data from data word 1
LENG   :       KF -1                 Diagnosis length = joker length (all permitted
ERR    :       DW 0                  bytes)
                                     Error code stored in DW0 of DB30
```

Example of reading the S7 diagnosis using SFC13 ”DP NRM_DG”

Here you will find an example of how to use SFC 13 to read out the slave diagnosis for a DP slave in the *STEP 7* user program.

Assumptions

The following assumptions apply to this *STEP 7* user program:

- The diagnostic address of the ET 200S is 1022 ($3FE_H$).
- The slave diagnostic information is to be stored in DB 82: starting at address 0.0, length 64 bytes.
- The slave diagnostics is max. 64 bytes (IM151-1 STANDARD in DPV0 operation).

STEP 7 user program

```
STL                                  Explanation

CALL SFC 13

REQ     :=TRUE                       Read request
LADDR   :=W#16#3FE                   Diagnostic address of the ET 200S
RET_VAL :=MW0                        RET_VAL of SFC13
RECORD  :=P#DB82.DBX 0.0 BYTE 64     Data mailbox for the diagnosis in DB82
BUSY    :=M2.0                       Read operation runs over several OB1 cycles
```

6.1.6.2 Structure of slave diagnostic data

Structure of slave diagnostic data

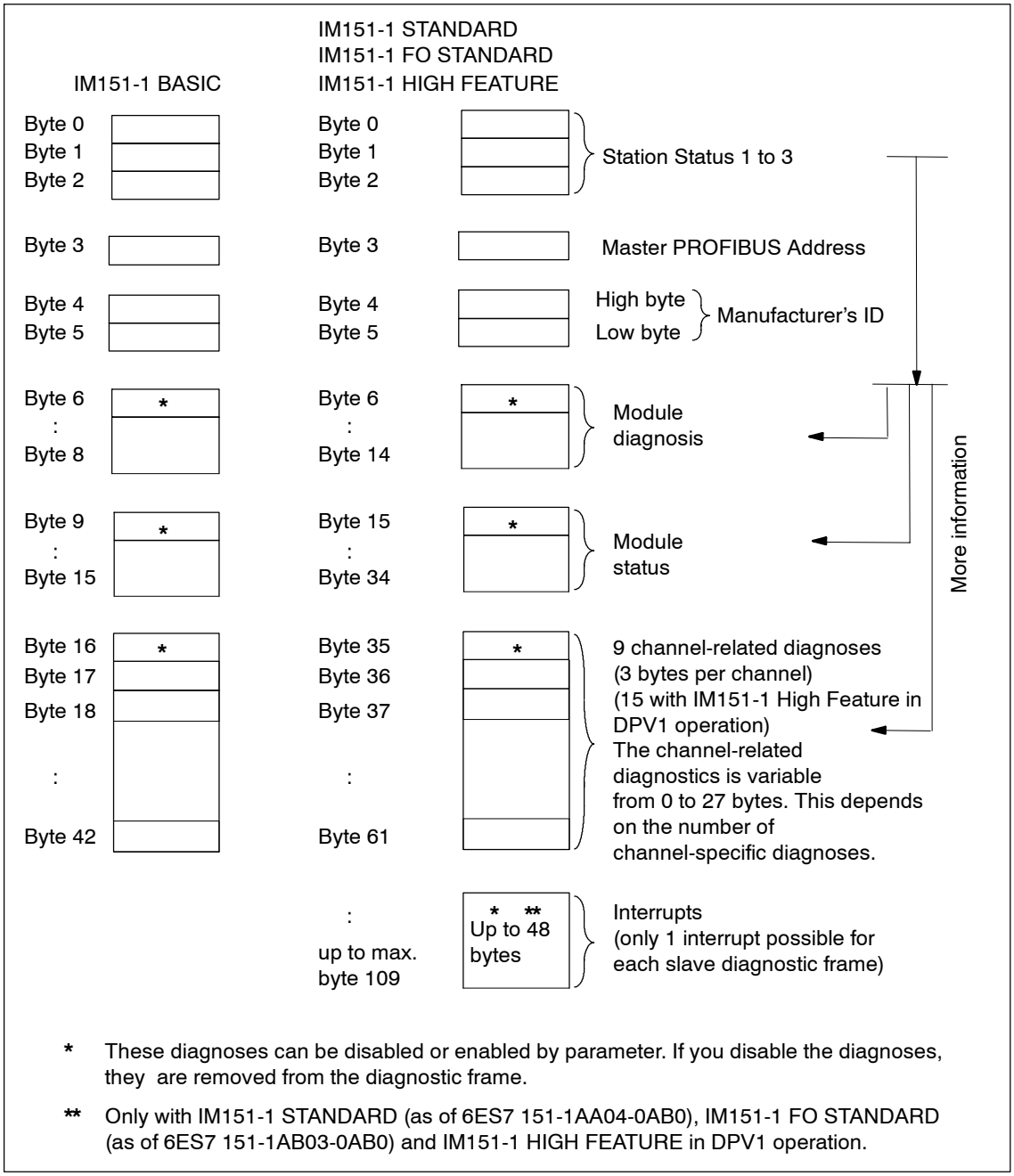


Figure 6-20 Structure of slave diagnostic data

Note

The length of the diagnostic message frame varies:

- Between 6 and 43 bytes in the IM151-1 BASIC
- with IM151-1 STANDARD, IM151-1 FO STANDARD and IM151-1 HIGH FEATURE (depending on configuration)
  - between 6 and 62 bytes in DPV0 operation
  - between 6 and 110 bytes in DPV0 operation (STANDARD)
  - between 6 and 128 bytes in DPV0 operation (HIGH FEATURE)

You can find out the length of the last diagnostic message frame received in:

- *STEP 7* from the RET_VAL parameter of the SFC 13.
- *STEP 5* from the ERR parameter of the FB 192.

6.1.6.3 Station statuses 1 to 3

Definition

Station statuses 1 to 3 provide an overview of the status of a DP slave.

Station status 1

Table 6-8 Structure of station status 1 (byte 0)

Bit	Meaning	Cause/remedy
0	1: The DP slave cannot be addressed by the DP master.	• Correct PROFIBUS address set on the DP slave • Bus connector connected? • Voltage at DP slave? • RS 485 repeater set correctly? • Reset carried out on DP slave?
1	1: The DP slave is not yet ready to exchange data.	• Wait while the DP slave starts up.
2	1: The configuration data sent by the DP master to the DP slave does not correspond to the setup of the DP slave.	• Correct station type or correct setup of the DP slave entered in the configuration software?
3	1: External diagnosis available. (Group diagnosis indication)	• Evaluate the module diagnosis, the module status and/or the channel-specific diagnosis. Bit 3 is reset as soon as all the faults have been rectified. The bit is reset when there is a new diagnostic message in the bytes of the diagnostics mentioned above.
4	1: The required function is not supported by the DP slave (for example, changing the PROFIBUS address by means of software).	• Check the configuration.
5	1: The DP master cannot interpret the response from the DP slave.	• Check the bus configuration.
6	1: The DP slave type does not correspond to the software configuration.	• Correct station type entered in the configuration software?
7	1: Parameters have been assigned to the DP slave by a different DP master (not the one that currently has access to the DP slave).	• The bit is always 1, for example, if you access the DP slave with the programming device or another DP master. The PROFIBUS address of the DP master that assigned parameters to the DP slave is located in the ”master PROFIBUS address” diagnostic byte.

Station status 2

Table 6-9 Structure of station status 2 (byte 1)

Bit	Meaning
0	1: New parameters have to be assigned to the DP slave.
1	1: A diagnostic message has been issued. The DP slave will not work until the fault has been corrected (static diagnostic message).
2	1: The bit is always set to ”1” in the DP slave.
3	1: Response monitoring has been enabled for this DP slave.
4	1: The DP slave has received the ”FREEZE” control command[1].
5	1: The DP slave has received the ”SYNC” control command[1].
6	0: The bit is always at 0.
7	1: The DP slave has been disabled, that is, it has been removed from the processing in progress.

[1] The bit is updated only if another diagnostic message changes, too.

Station status 3

Table 6-10 Structure of station status 3 (byte 2)

Bit	Meaning
0 to 6	0: The bits are always at 0.
7	1: • There are more diagnostic messages than the DP slave can store. • The DP master cannot enter all the diagnostic messages sent by the DP slave in its diagnostic buffer (channel-specific diagnosis).

6.1.6.4 Master PROFIBUS Address

Definition

The master PROFIBUS address diagnostic byte contains the PROFIBUS address of the DP master that:

- Assigned parameters to the DP slave and
- Has read and write access to the DP slave

The master PROFIBUS address is in byte 3 of the slave diagnosis.

6.1.6.5 Manufacturer ID

Definition

The manufacturer ID contains a code that describes the type of the DP slave.

Manufacturer ID

Table 6-11 Structure of the manufacturer ID (Bytes 4, 5)

Byte 4	Byte 5	Manufacturer ID for
80_H	$F3_H$	ET 200S with IM151-1 BASIC
80_H	$6A_H$	ET 200S with IM151-1 STANDARD
80_H	$6B_H$	ET 200S with IM151-1 FO STANDARD
80_H	$E0_H$	ET 200S with IM151-1 HIGH FEATURE

6.1.6.6 Module diagnosis

Definition

The module diagnosis indicates whether or not modules of the ET 200S have errors/faults. The module diagnosis begins as of byte 6 and comprises:

- 3 bytes in the case of the IM151-1 BASIC
- 9 bytes in the case of the IM151-1 STANDARD; IM151-1 FO STANDARD and IM151-1 HIGH FEATURE.

Module diagnosis

The module diagnosis for the ET 200S with the IM151-1 BASIC is structured as follows:

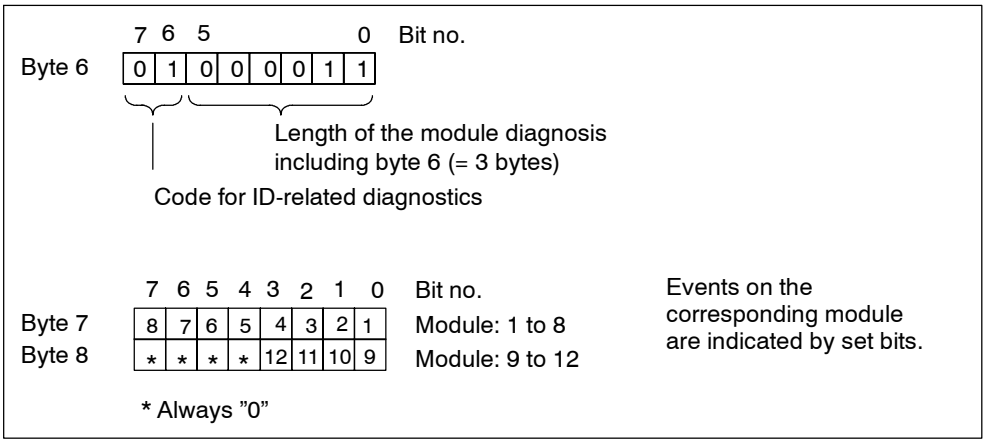


Figure 6-21 Structure of the ID-related diagnosis for the ET 200S with the IM151-1 BASIC

The module diagnosis for the ET 200S with the IM151-1 STANDARD, IM151-1 FO STANDARD and IM151-1 HIGH FEATURE is structured as follows:

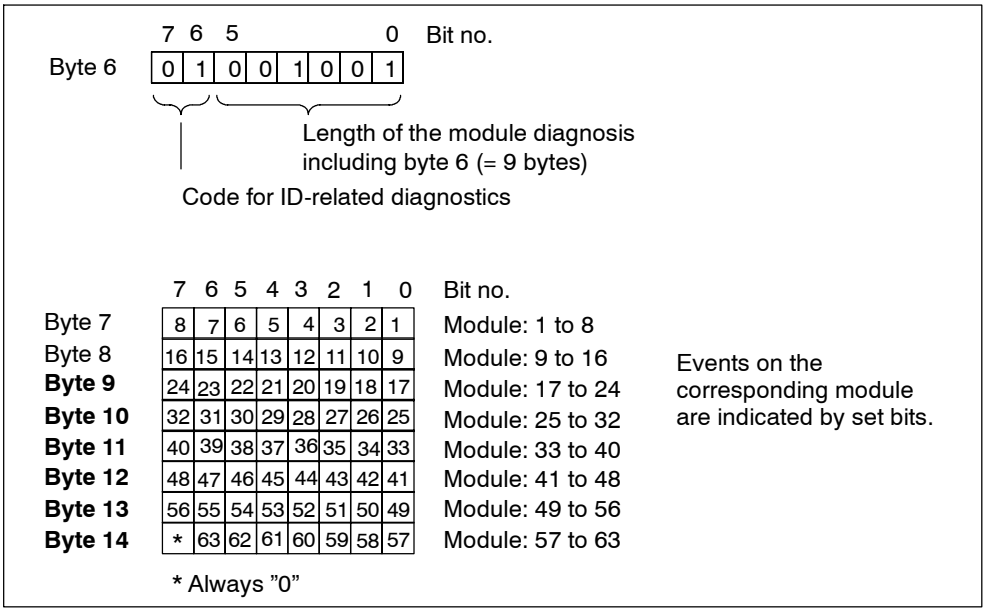


Figure 6-22 Structure of the ID-related diagnosis for the ET 200S with the IM151-1 STANDARD, IM151-1 FO STANDARD and IM151-1 HIGH FEATURE

6.1.6.7 Module information

Definition

The module status indicates the status of the configured modules and expands on the module diagnosis as regards the configuration. The module status begins after the module diagnosis and comprises:

- 7 bytes in the case of the IM151-1 BASIC
- 20 bytes in the case of the IM151-1 STANDARD, IM151-1 FO STANDARD and IM151-1 HIGH FEATURE.

Module status

The module status for the ET 200S with the IM151-1 BASIC is structured as follows:

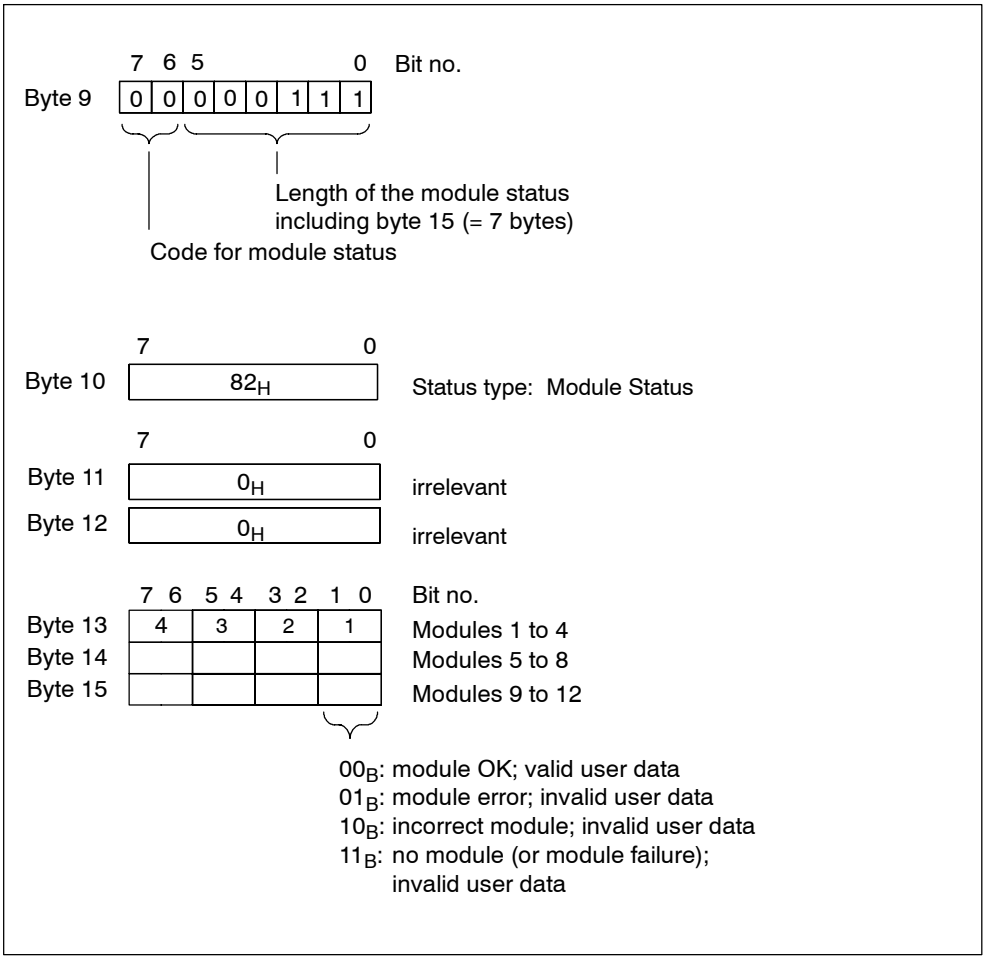


Figure 6-23 Structure of the module status for the ET 200S with the IM151-1 BASIC

The module status for the ET200S with the IM151-1 STANDARD, IM151-1 FO STANDARD, and IM151-1 HIGH FEATURE is structured as follows:

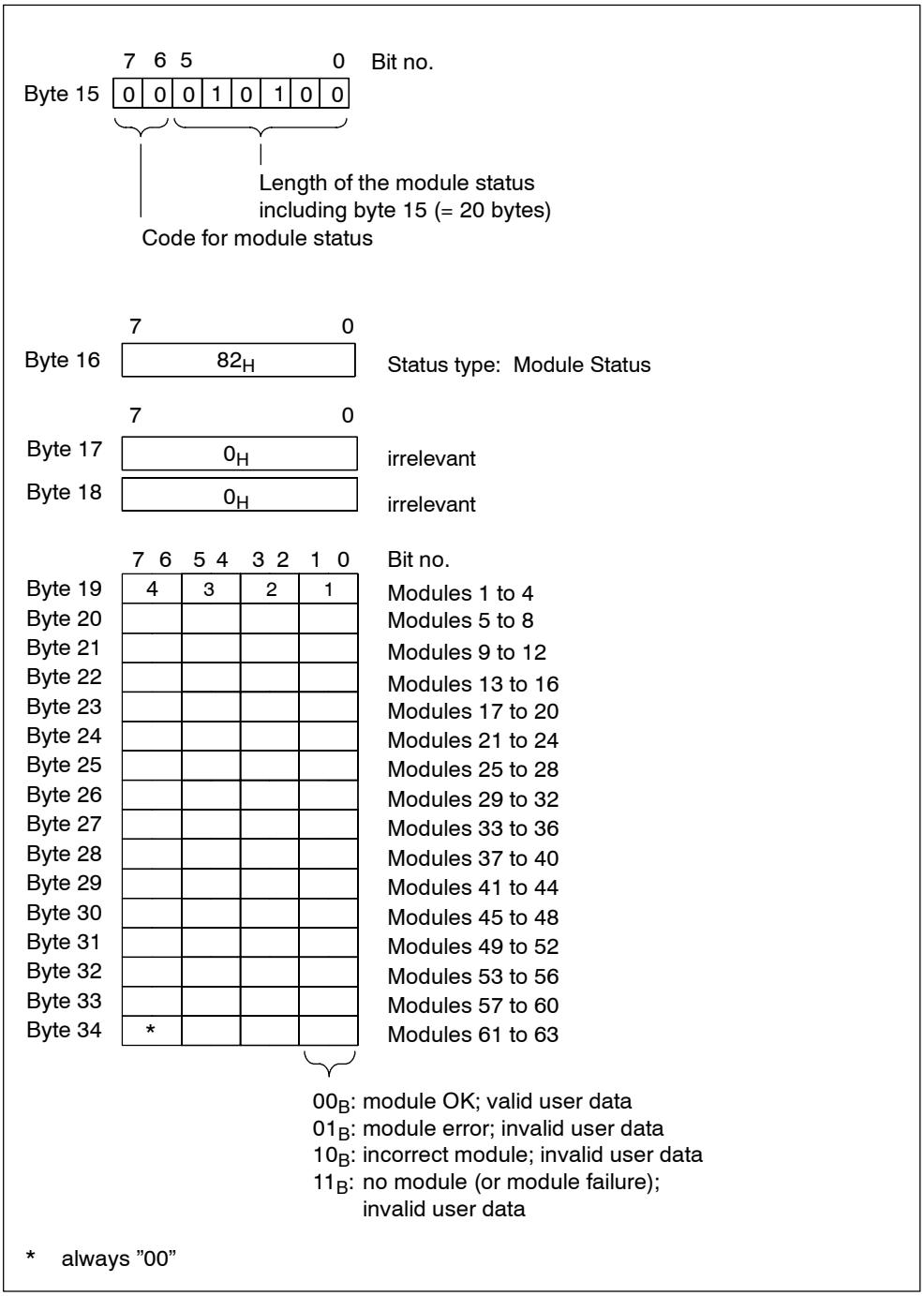


Figure 6-24 Structure of the module status for ET 200S with the IM151-1 STANDARD; IM151 FO STANDARD and IM151 HIGH FEATURE

6.1.6.8 Channel-specific diagnosis

Definition

The channel-specific diagnosis gives information on channel errors of modules and expands on the module diagnosis. The channel-specific diagnosis starts after the module status (if the parameters are preset accordingly). The maximum length is limited by the total maximum length of the slave diagnosis from 43/62 bytes in DPV0 mode or 110/128 bytes in DPV1 mode. The channel-specific diagnosis does not affect the module status.

A maximum of 9 (in DPV0 mode) or 15 (in DPV1 mode with IM151-1 HIGH FEATURE) channel-specific diagnostic messages are possible (see also station status 3, bit 7).

Channel-specific diagnostics

The channel-specific diagnosis for the ET 200S with the IM151-1 BASIC is structured as follows:

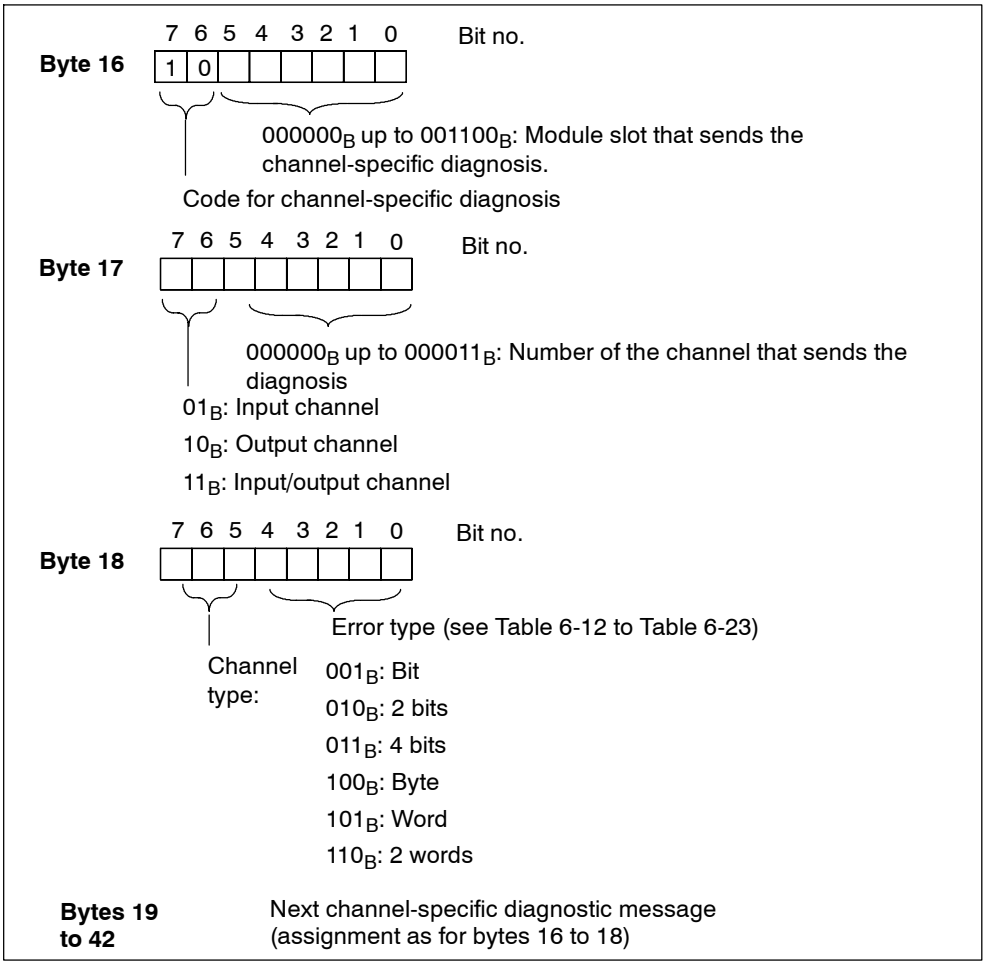


Figure 6-25 Structure of the channel-specific diagnosis for the ET 200S with IM151-1 BASIC

The channel-specific diagnosis for the ET 200S with the IM151-1 STANDARD, IM151-1 FO STANDARD and IM151-1 HIGH FEATURE is structured as follows:

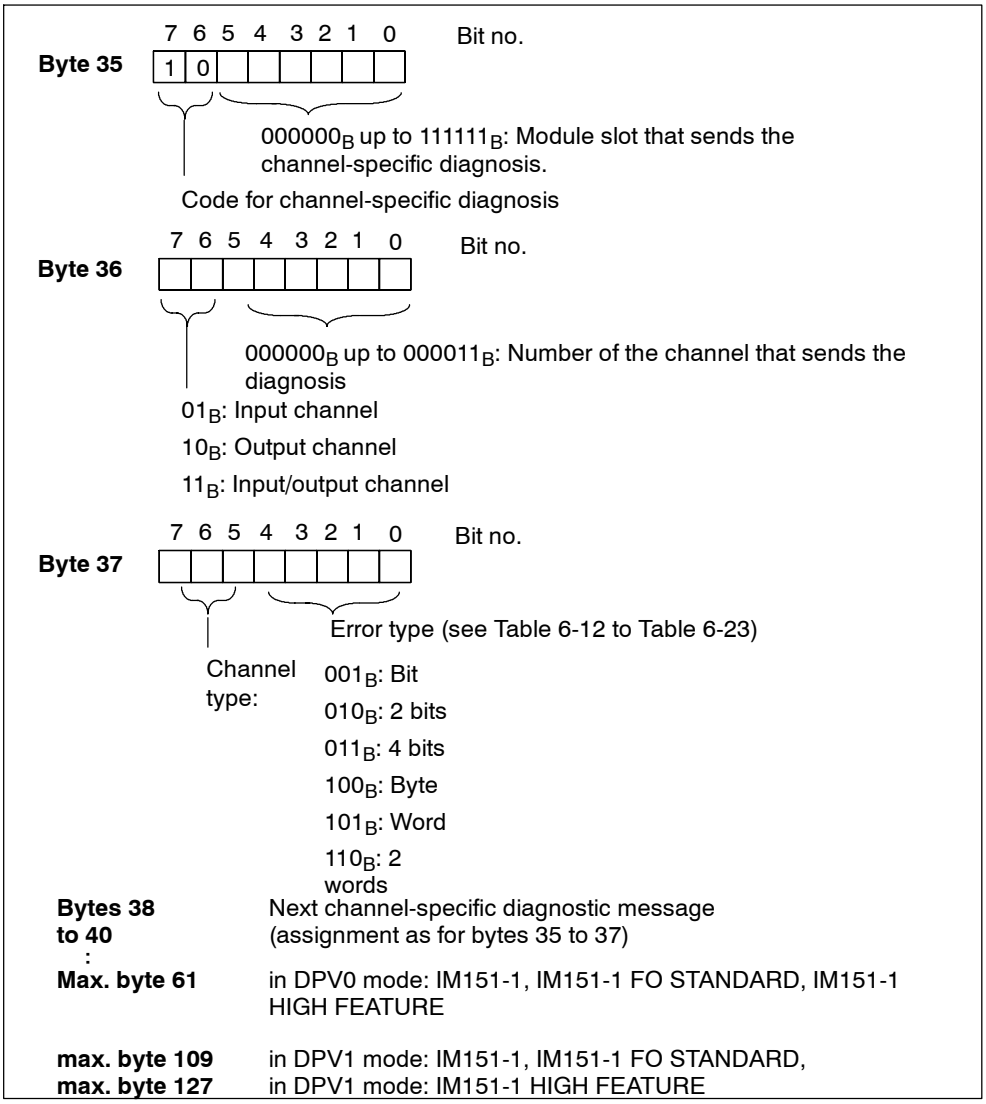


Figure 6-26 Structure of the channel.specific diagnosis for the ET 200S with the IM151-1 STANDARD, IM151-1 FO STANDARD and IM151-1 HIGH FEATURE

Note

The module slot is encrypted in byte 16/35, bit 0 to 5. The following applies: displayed number +1 ≙ slot of the module (0 ≙ slot 1; 1 ≙ slot 2; 3 ≙ slot 4, etc.)

In bits 6/7 of byte 17/36, 00_B is output if a power module reports a channel-specific diagnosis.

Power module error types

The diagnostic message is reported on channel 0 and applies to the whole module.

Table 6-12 Power module error types

Power modules electronic modules		Error type		Meaning	Remedy
PM-E 24–48 VDC/ 120–230 VAC	PM-E 24 VDC PM-E 24–48 VDC	17_D	10001: Encoder or load voltage missing	No supply voltage, or inadequate supply voltage.	Correct the process wiring. Check the supply voltage.
	---	18_D	10010: Fuse defect	The fuse in the power module has tripped.	Replace the fuse.

Digital electronic module error types

Table 6-13 Digital electronic module error types

Digital electronic modules	Error type		Meaning	Remedy
2DI 24 VDC High Feature	1_D	00001: Short-circuit	Short circuit of the sensor supply. The diagnostic message is issued on channel 0 and applies to the whole module.	Correct the process wiring (sensor wiring).
4DI 24 VDC High Feature	1_D	00001: Short-circuit (in connection with IM151-1 BASIC / IM151-1 STANDARD, as of 6ES7 151-1AA02 0AB0, IM151-1 FO STANDARD, as of 6ES7 151-1AB01-0AB0) or IM151-1 HIGH FEATURE	Short circuit of the sensor supply. The diagnostic message is issued on channel 0 and applies to the whole module.	Correct the process wiring (sensor wiring).
	26_D	11010: External error/fault (in connection with IM151-1 STANDARD, to 6ES7 151-1AA01-0AB0 or IM151-1 FO STANDARD, to 6ES7 151-1AB00-0AB0)		

Table 6-13 Digital electronic module error types

Digital electronic modules	Error type		Meaning	Remedy
4DI 24–48 VUC High Feature	26_D	11010: External error/fault	Line to the actuator interrupted.	Correct the process wiring.
			No supply voltage, or inadequate supply voltage.	Correct the process wiring. Check the supply voltage.
			Fuse triggered.	Replace the fuse.
2DO 24 VDC/0.5 A High Feature 2DO 24 VDC/2 A High Feature	1_D	00001: Short-circuit	Short circuit of the actuator supply to ground.	Correct the process wiring.
	6_D	00110: Wire break	Line to the actuator interrupted.	
4DI NAMUR	1_D	00001: Short-circuit	Short circuit in signal line to sensor	Correct the process wiring
			Defective encoder	Replace the sensor
			Wrong encoder type set	Correct the parameter assignment
			Load impedance too low.	Use a sensor with increased impedance.
	6_D	00110: Wire break	Signal line to a sensor interrupted.	Correct the process wiring
			Defective encoder	Replace the sensor
			Wrong encoder type set	Correct the parameter assignment.
			Load impedance too low.	Use a sensor with increased impedance.
	9_D	01001: Error	Internal module error occurred.	Replace the module
			Sensor signal flutters.	Eliminate cause
	16_D	10000: Parameter assignment error	Parameter assignment error	Correct the parameter settings
	26_D	11010: External error/fault	Sensor error.	Replace the sensor
			Changeover contact error.	Correct the process wiring

Analog input module error types

Table 6-14 Analog input module error types

Analog input modules			Error type		Meaning	Remedy
2AI U High Speed	2AI U Standard 2AI U High Feature 2AI I 2WIRE Standard 4AI I 2WIRE ST 2AI I 2WIRE High Speed 2AI I 4WIRE Standard 2AI I 2/4WIRE High Feature 2AI I 4WIRE High Speed 2AI RTD Standard 2AI RTD High Feature	2AI TC Standard 2AI TC High Feature	16_D	10000: Parameter assignment error	Module cannot use the parameter for the channel: Inserted module does not match the one configured. Parameter assignment error.	Correct the configuration (compare actual and desired configuration). Correct the parameter assignment (parameter assignment of wire break diagnosis only with the permitted measuring ranges).
			9_D	01001: Error	Internal module error has occurred (diagnostic message on channel 0 applies to the whole module).	Replace the module.
			7_D	00111: Violation of hi limit	Value is above the overrange.	Correct the module/actuator match.
			8_D	01000: Violation of lo limit	Value is below the underrange.	Correct the module/actuator match.
---			6_D	00110: Open circuit[1)]	Line to the sensor interrupted.	Correct the process wiring.
---	---		21_D	10101: Reference channel error[2)]	Error on the reference channel	Check the reference module (2AI RTD Standard).

1) In the case of the 2AI RTD High Feature, a wire break is reported for the measuring and constant-current lines of the sensor.
2) The following applies for the 2AI TC Standard and 2AI TC High Feature modules:
during configuration with the device database file reference channel errors are not reported if the reference channel is incorrectly configured (not Pt100 climate range).

Analog output module error types

Table 6-15 Analog output module error types

Analog output modules		Error type		Meaning	Remedy
2AO U Standard 2AO U High Feature	2AO I Standard 2AO I High Feature	16_D	10000: Parameter assignment error	Module cannot use the parameter for the channel: Inserted module does not match the one configured. Parameter assignment error.	Correct the configuration (compare actual and desired configuration). Correct the parameter assignment (parameter assignment of wire break diagnosis only with the permitted measuring ranges).
		9_D	01001: Error	Internal module error has occurred (diagnostic message on channel 0 applies to the whole module).	Replace the module.
	---	1_D	00001: Short-circuit	Short circuit of the actuator supply.	Correct the process wiring.
---	2AO I Standard 2AO I High Feature	6_D	00110: Wire break	Line to the actuator interrupted.	Correct the process wiring.

1SSI

Table 6-16 1SSI

Error type		Meaning	Remedy
1_D	00001: Short-circuit	Short circuit of the supply to the absolute position encoder.	Correct the process wiring.
9_D	01001: Error	Internal module error occurred. Load voltage from the power module is too low.	Replace the module. Correct the process wiring. Check the load voltage.
16_D	10000: Parameter assignment error	Parameters have not been assigned to the module.	Adjust the parameter assignment.
26_D	11010: External error/fault	Start/stop bit error (absolute sensor error): Wire break in the sensor cable or sensor cable is not connected. Sensor type, transmission rate, and monoflop time do not correspond to the sensor connected; programmable sensors do not correspond to the settings on the 1SSI EM. Sensor is defective or there are faults.	Replace the sensor; correct the process wiring. Correct the parameter settings

1COUNT 24V/100kHz

Table 6-17 1Count 24V/100kHz

Error type		Meaning	Remedy
1_D	00001: Short-circuit	Short circuit of the sensor supply or the actuator.	Check the wiring to the sensor. Correct the process wiring.
5_D	00101: Overtemperature	Digital output is overloaded.	Correct the process wiring.
6_D	00110: Wire break	Line to the actuator interrupted.	Correct the process wiring.
9_D	01001: Error	Internal module error occurred. Load voltage from the power module is too low.	Replace the module. Correct the process wiring. Check the load voltage.
16_D	10000: Parameter assignment error	Parameters have not been assigned to the module.	Adjust the parameter assignment.

1COUNT 5V/500kHz

Table 6-18 1Count 5V/500kHz

Error type		Meaning	Remedy
1_D	00001: Short-circuit	Short circuit of the sensor supply or the actuator.	Check the wiring to the sensor. Correct the process wiring.
5_D	00101: Overtemperature	Digital output is overloaded.	Correct the process wiring.
6_D	00110: Wire break	Line to the actuator interrupted.	Correct the process wiring.
9_D	01001: Error	Internal module error occurred.	Replace the module.
16_D	10000: Parameter assignment error	Parameters have not been assigned to the module.	Adjust the parameter assignment.
26_D	11010: External error/fault	Wire break/short circuit of the 5 V sensor signals: A, /A, B, /B, N, /N,	Correct the parameter settings

1STEP 5V/204kHz

Table 6-19 1STEP 5V/204kHz

Error type		Meaning	Remedy
1_D	00001: Short-circuit	Short circuit of the sensor supply.	Check the wiring to the switches. Correct the process wiring.
9_D	01001: Error	Internal module error occurred.	Replace the module.
16_D	10000: Parameter assignment error	Parameters have not been assigned to the module.	Adjust the parameter assignment.

2Pulse

Table 6-20 2PULSE

Error type		Meaning	Remedy
1_D	00001: Short-circuit	Short circuit of the sensor supply or the actuator.	Check the wiring to the momentary-contact switches and the actuators. Correct the process wiring.
9_D	01001: Error	Internal module error occurred.	Replace the module.
16_D	10000: Parameter assignment error	Parameters have not been assigned to the module.	Adjust the parameter assignment.

1POS INC/Digital, 1POS SSI/Digital, 1POS INC/Analog, 1POS SSI/Analog

Table 6-21 1POS INC/Digital, 1POS SSI/Digital, 1POS INC/Analog, 1POS SSI/Analog

Error type		Meaning	Remedy
1_D	00001: Short circuit	Short circuit of the sensor supply.	Check the wiring to the sensor. Correct the process wiring.
16_D	10000: Parameter assignment error	Parameters have not been assigned to the module.	Adjust the parameter assignment.
17_D	10001: Load voltage 2L+ missing	Only applies to the 1POS INC/Digital and 1POS SSI/Digital: No supply voltage, or inadequate supply voltage.	Correct the process wiring. Check the supply voltage.
26_D	11010: External fault	Wire break/short circuit of the sensor signals. Wire break in the sensor cable or sensor cable is not connected. Sensor is defective or there are faults. Sensor type, transmission rate, and monoflop time do not correspond to the sensor connected; programmable sensors do not correspond to the settings on the module.	Correct the process wiring Correct the parameter settings Replace the sensor.

Serial interface module 1SI 3964/ASCII, 1SI Modbus/USS

Table 6-22 1SI 3964/ASCII, 1SI Modbus/USS

Error type		Meaning	Remedy
6_D	00110: Open circuit	Wire broken or disconnected.	Check the wiring to the terminals. Check the cable to the partner.
7_D	00111: Upper limit violation	Buffer overflow; message length overflow	The P_RCV FB must be called more frequently.
8_D	01000: Lower limit violation	Message of length 0 sent[1]	Check why the communication partner is sending frames without user data.
9_D	01001: Error	Internal module error occurred.	Replace the module.
16_D	10000: Parameter assignment error	Parameters have not been assigned to the module.	Correct the parameter assignment.
22_D	10110: Message error	Frame error, parity error	Check the communication settings.

[1] EM 1SI: only with 3964(R)

4 IQ-SENSE

Table 6-23 4 IQ-SENSE

Error type		Meaning	Remedy
1_D	00001: Short circuit	Short circuit of the lines between the electronic module and sensor	Check the wiring to the sensor. Correct the process wiring.
6_D	00110: Open circuit	Line to the actuator interrupted. No sensor connected. Sensor does not respond.	Correct the process wiring. Connect the sensor. Replace the fuse.
8_D	01000: Lower limit violation	Maintenance requirement (signal quality < 130 %, excess gain), sensor-dependent	Adjust the reflex sensor. Clean the optical system.
9_D	01001: Error	Communication error between the electronic module and sensor	Replace the electronic module or the sensor. Check the wiring.
16_D	10000: Parameter assignment error	Parameter assignment error. Inserted module does not match the one configured. *Teach-in* error (a new value could not be determined/obtained) Inserted sensor does not match configured sensor.	Adjust the parameter assignment. Correct the configuration (compare actual and desired configuration). *Repeat* teach-in. Correct the configuration, or insert a different sensor type.
26_D	11010: External fault	Excess gain lower limit violated (signal quality < 110 %) or sensor error, sensor-dependent	Adjust the reflex sensor. Clean the optical system. Replace the sensor.
27_D	11011: Unclear error	*Teach-in* process running. Alignment tool is active.	Terminate the *teach-in* process. Terminate the alignment tool.

6.1.6.9 Interrupts

The information in this section is applicable for IM151-1 STANDARD (up to 6ES7 151-1AA04-0AB0), IM151-1 FO STANDARD (up to 6ES7 151-1AB03-0AB0), IM151-1 HIGH FEATURE:

Definition

The interrupt section of the slave diagnosis provides information on the interrupt type and the cause that led to the triggering of the interrupt. The interrupt section consists of a maximum of 48 bytes.

Position in the diagnostic frame

The position of the interrupt section is after the channel-specific diagnosis (DPV1 mode only).

Example: If there are three items of channel-related diagnostic information, the interrupt section starts at byte 44.

Data records

The diagnostic data of a module can be up to 44 bytes in length and is located in data records 0 and 1:

- Data record 0 contains 4 bytes of diagnostic data describing the current status of a programmable logic controller. Data record 0 (DS0) is part of the header information of OB 82 (local data bytes 8 to 11).
- Data record 1 contains the 4 bytes of diagnostic data that is also contained in data record 0 and, in addition, up to 40 bytes of module-specific diagnostic data.

You can read out data records 0 and 1 (DS0 and DS1) by means of SFC59 ”RD_REC”.

Contents

The content of the interrupt information depends on the interrupt type:

- In the case of diagnostic interrupts, diagnostic data record 1 (up to 44 bytes) is sent as the interrupt status information (as of byte x+4).
- In the case of hardware interrupts, the interrupt status information is 4 bytes in length.
- With remove/insert interrupts the length of the interrupt status information is
  - 5 byes with IM151-1 HIGH FEATURE
  - 0 bytes with IM151-1 STANDARD (as of 6ES7 151-1AA04-0AB0) and IM151-1 FO STANDARD (as of 6ES7 151-1AB03-0AB0)

Interrupts

If the configuration was done with STEP 7, the interrupt data will be evaluated and sent to the relevant organization function blocks (OBs).

The interrupt section for the ET 200S is structured as follows:

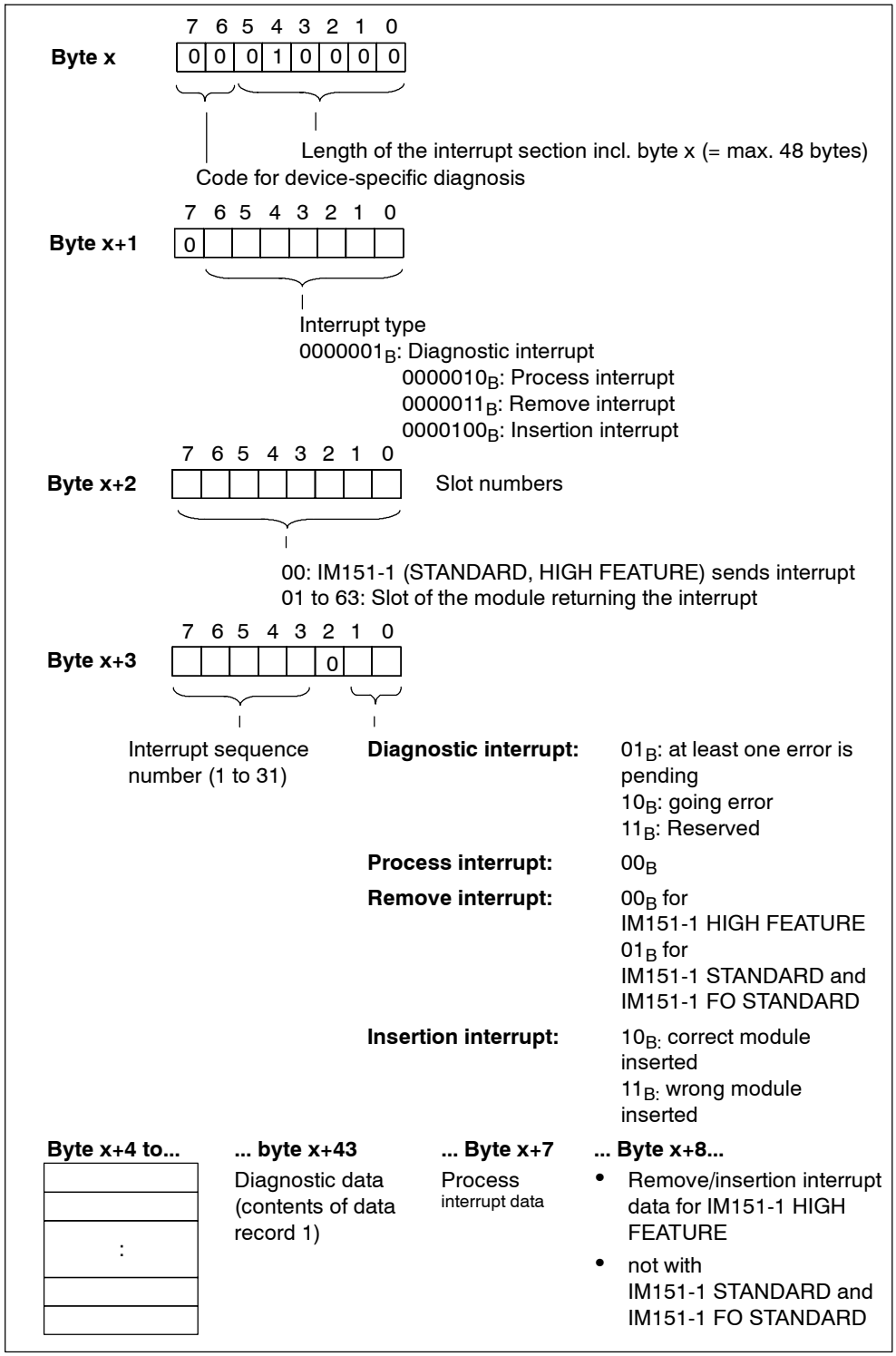


Figure 6-27 Structure of the interrupt status of the interrupt section

Diagnostic interrupt, byte x+4 to x+7

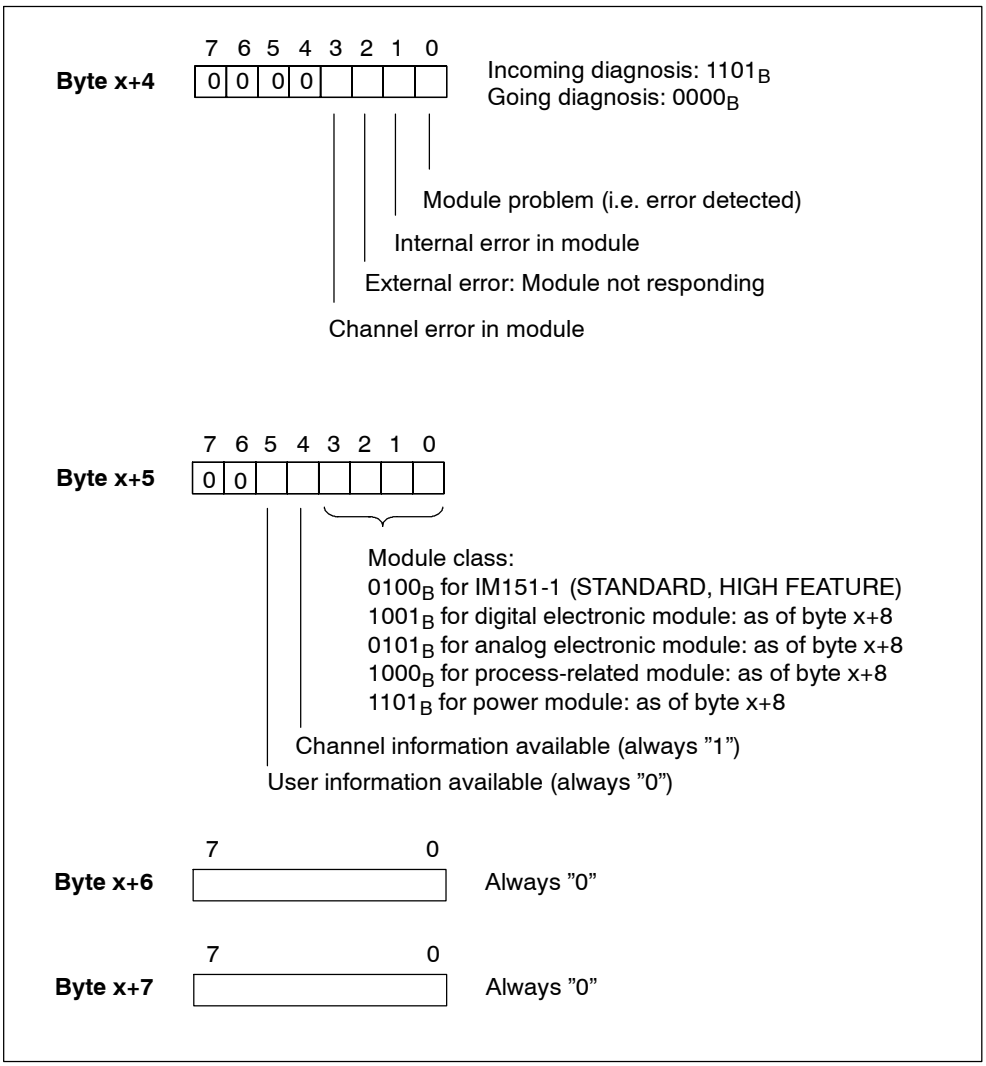


Figure 6-28 Structure of bytes x+4 to x+7 for diagnostic interrupt

Diagnostic interrupt of the modules

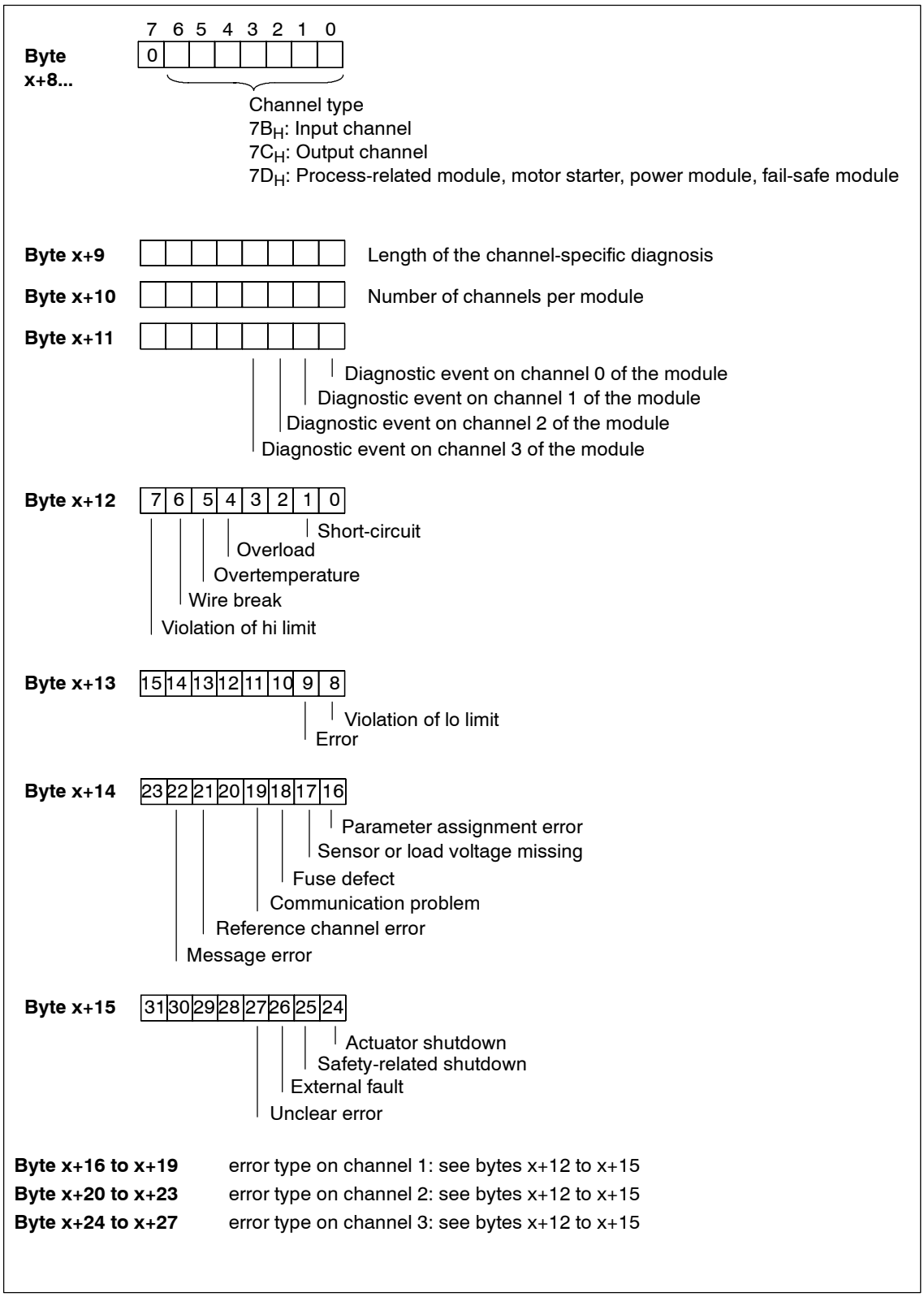


Figure 6-29 Structure as of byte x+8 for diagnostic frame

Example of a Diagnostic Interrupt

Example:
The 4DI electronic module reports the ”short circuit” diagnostic interrupt on channel 2

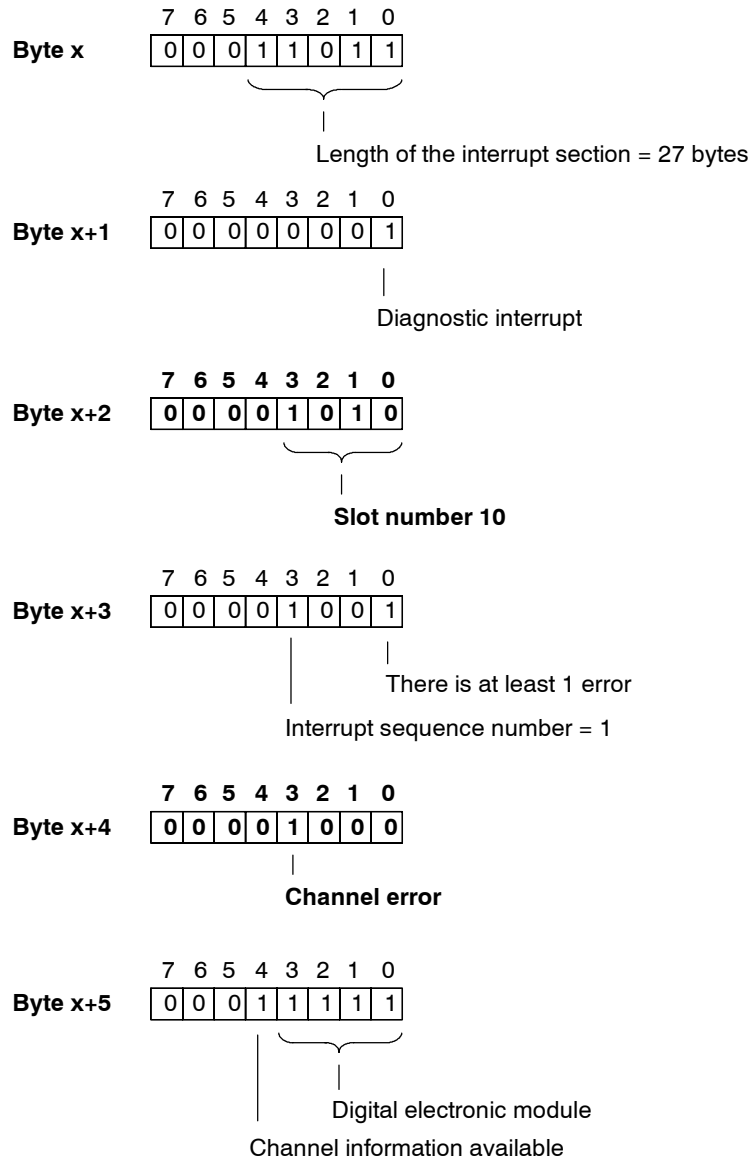


Figure 6-30 Example of a Diagnostic Interrupt

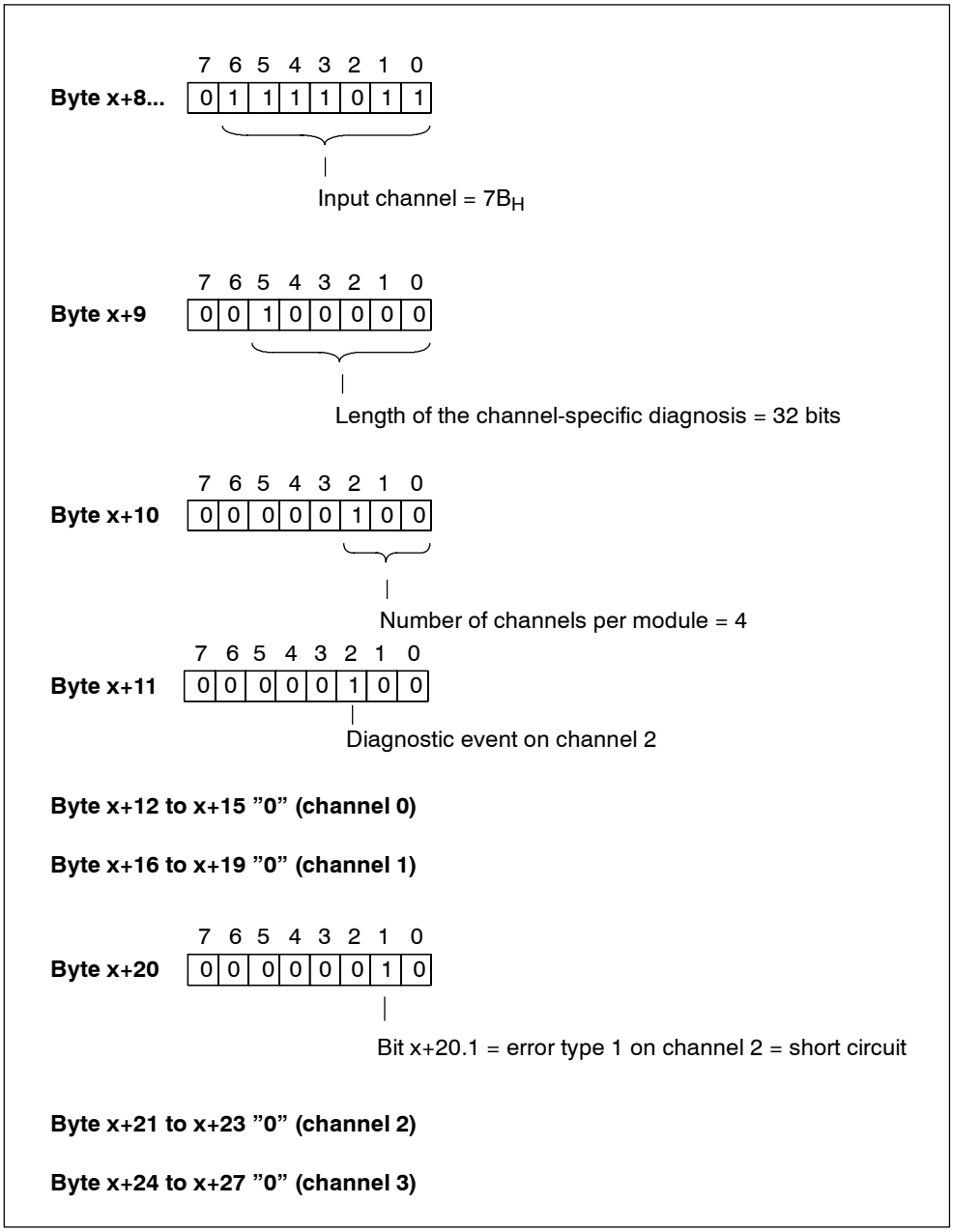


Figure 6-31 Example of a diagnostic interrupt (continued)

Hardware interrupt of digital input modules

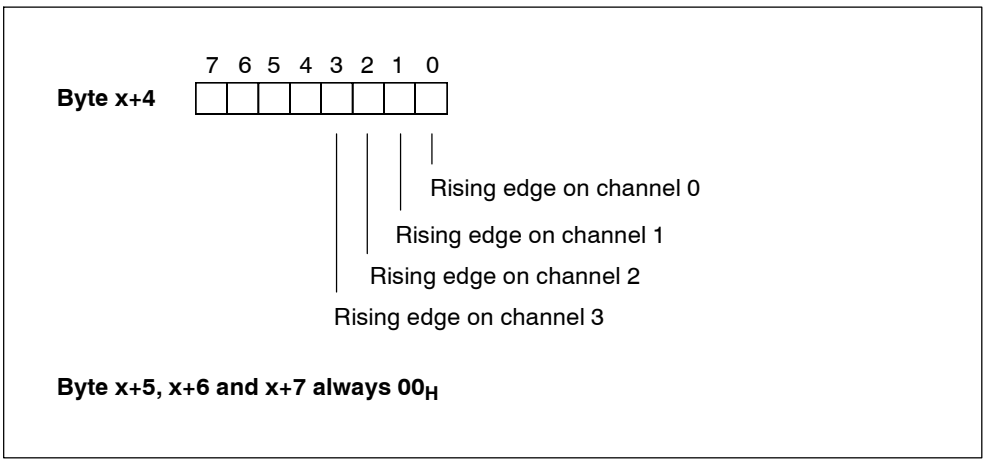


Figure 6-32 Structure as of byte x+4 for hardware interrupt (digital input)

Hardware interrupt of analog input modules

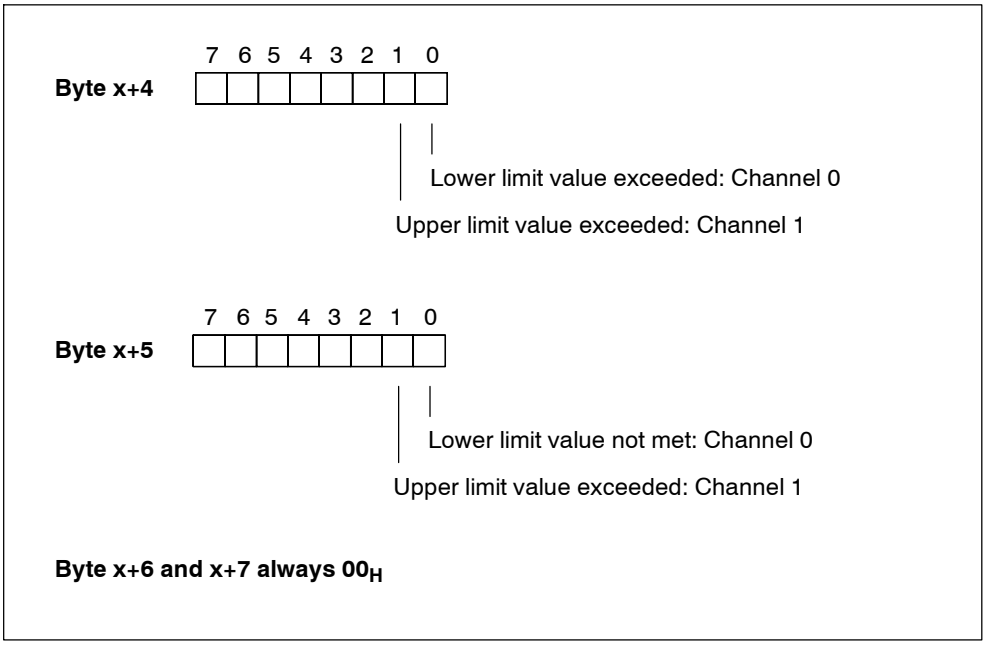


Figure 6-33 Structure as of byte x+4 and byte x+5 for hardware interrupt (analog input)

Remove/insertion interrupt by IM151-1 HIGH FEATURE

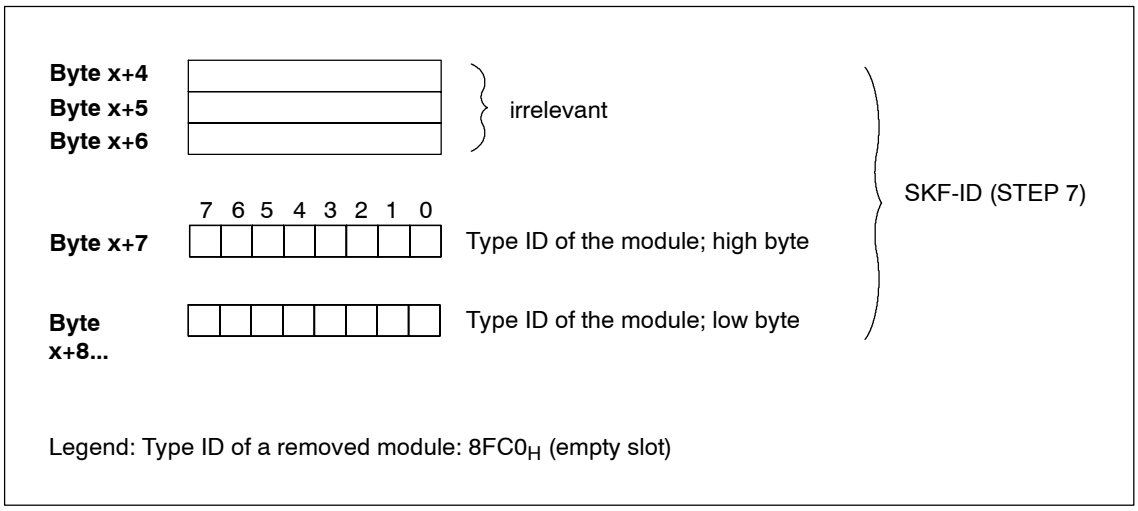


Figure 6-34 Structure starting at byte x+4 for remove/insert interrupts

Byte x+4 to x+8 contains the ID of the module that has been removed or inserted.

The interrupt type in byte x+1 indicates whether the modules have been removed or inserted (see Figure 6-27).

6.1.6.10 Diagnostics in the case of invalid ET 200S configuration states on the PROFIBUS DP

Invalid configuration states

The following invalid configuration states of the ET 200S lead to station failure of the ET 200S or prevent entry into data interchange. These responses occur irrespective of whether the IM parameters ”Operation at Preset <> Actual Configuration”, ”Replacement of Modules during Operation”, and ”Startup when Expected <> Actual Configuration” have been enabled.

- Two missing modules
- Bus termination module missing
- Number of modules exceeds maximum configuration
- Module missing in slot 1 (in the case of the IM151-1 STANDARD, 6ES7 151-1AA00-0AB0)
- Faulty backplane bus (for example, terminal module is defective)

Note

As of IM151-1 BASIC / IM151-1 STANDARD (6ES7 151-1AA01-0AB0), IM151-1 FO STANDARD and IM151-1 HIGH FEATURE: If one module is missing (gap) and the ET 200S is switched on, the station will not start up (see diagnosis below).

Diagnostics

The following diagnosis indicates all the invalid configuration states:

Interface module	ID-related diagnostics	Module status
IM151-1 BASIC	All 12 bits set	• 01_B: ”Module error; invalid user data” for all modules (slots) until the cause of the error is found • 11_B: ”No module; invalid user data” once the cause of the error is found
IM151-1 STANDARD IM151-1 FO STANDARD IM151-1 HIGH FEATURE	All 63 bits set	

6.2 Commissioning and diagnostics on PROFINET IO

Chapter overview

6.2.1 Configuring the ET 200S on PROFINET IO

Introduction

The IM151-3 PN interface module must have the device name assigned (see Section 5.6).
Configuration is the configuration and parameter setting of the ET 200S.

- Configuring: The systematic arrangement of the different ET 200S modules (setup)
- Configuration: setting the ET 200S parameters using the configuration software

Note

The ET 200S is included in the hardware catalog of HWCONFIG:

- IM151-3 PN: as of STEP 7 V5.3 and Service Pack 1

The STEP 7 online help provides more detailed information on how to proceed.

GSD file

You configure the ET 200S distributed I/O system using the device database file (*.GSD file). The ET 200S is added to your system as an I/O device with this file. You can download the *.GSD file in either of the following ways:

- From the Internet at http://www.ad.siemens.de/csi_e/gsd

The following device database file is available for the IM151-3 PN:

- GSDML-V1.0-Siemens-ET200S-”date in yyyymmdd format”.xml

Integrating the device database file in your configuration software

Table 6-24 below describes how you integrate the device database file in SIMATIC S7.

Table 6-24 Integrating the device database file in your configuration software

Step	STEP 7 as of V5.0, ServicePack 1
1	Start STEP 7, and call the **Options** ▶ **Install New *.GSD Files** menu command from HW Config.
2	From the next dialog box, select the GSD file you want to install and confirm with OK. Result: The IO device is displayed in the hardware catalog in the PROFINET IO directory.
3	Configure the ET 200S using STEP 7 (refer to the help system in STEP 7).

6.2.2 Commissioning and startup of the ET 200S on PROFINET IO

Software requirements

Table 6-25 Software requirements for commissioning on PROFINET IO

Engineering software used	Version	Notes
STEP 7	As of Version 5.3 and ServicePack 1	You use HWCONFIG and the supplied device database file.
Configuration software for a different I/O controller		You need the device database file of ET 200S.

Requirements for commissioning the ET 200S

Table 6-26 Requirements for commissioning the ET 200S on PROFINET IO

Prior Activity	See
1. I/O device installed	Section 4
2. I/O device wired	Section 5
3. MMC inserted; I/O device configured with device name (configured and parameters set)	Section 6.2.1
4. Supply voltage switched on for I/O controller	Manual for I/O controller
5. I/O controller switched to RUN mode	Manual for I/O controller

Commissioning the ET 200S

Table 6-27 Steps for commissioning the I/O device

Step	Procedure	See
1.	Switch on the supply voltage for the I/O device.	Section 8.6
2.	Switch on the supply voltage for the load as necessary.	

Startup of the ET 200S

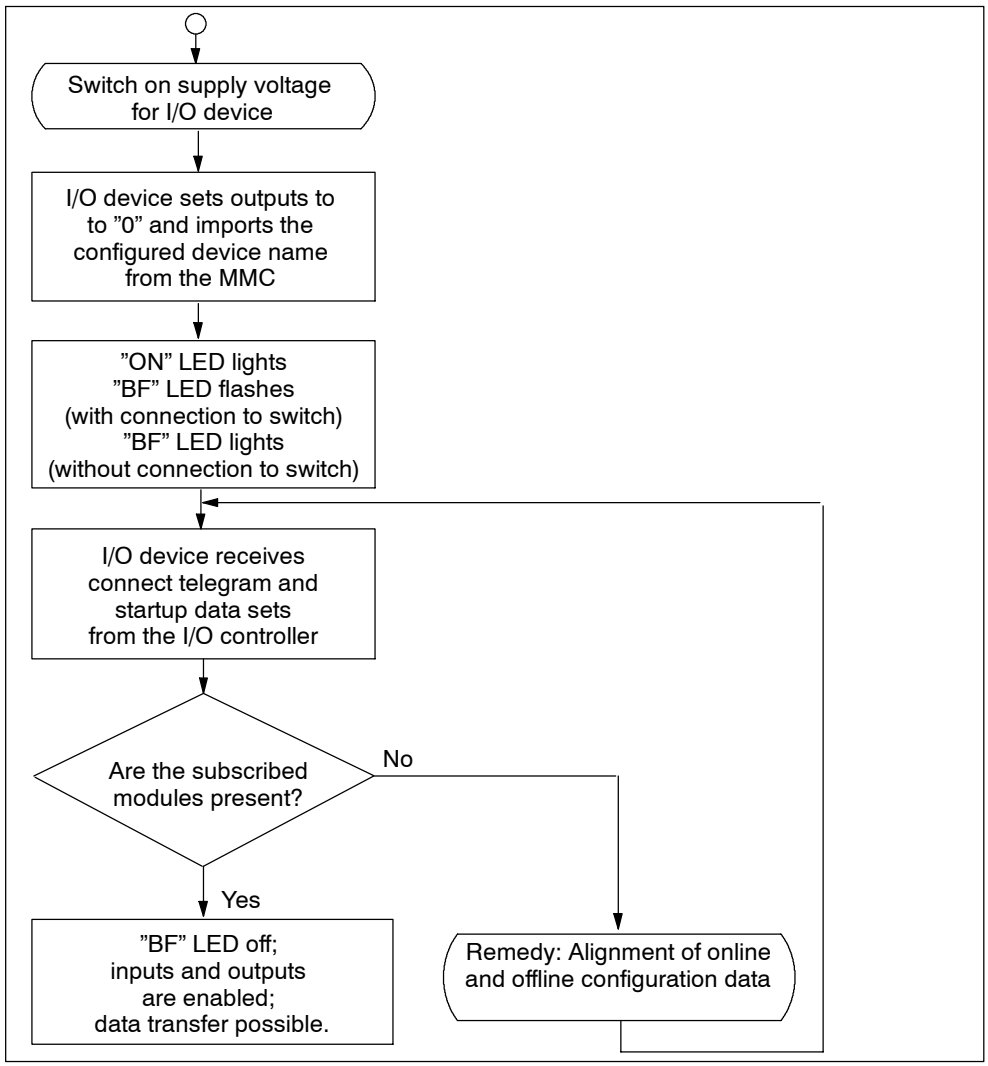


Figure 6-35 Configuring the ET 200S on PROFINET IO

Note

The IM151-3 PN interface module supports the default startup.

In this case the following conditions apply:

- The default parameters are used (see the parameters for the electronic modules).
- All supply voltages must be switched on at the power modules.

6.2.3 Diagnosis using the LEDs

Interface module

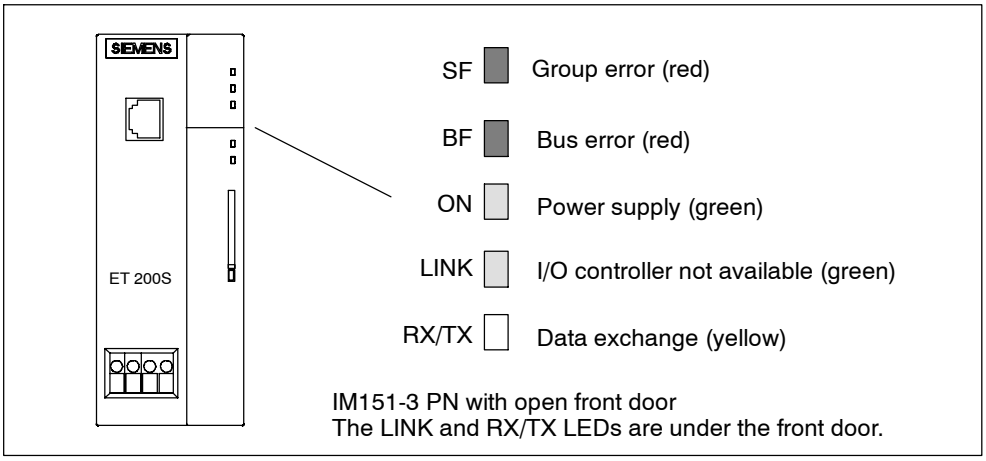


Figure 6-36 LED display on the IM151-3 PN interface module

Status and error displays with LEDs on IM151-3 PN

Table 6-28 Status and error displays of the IM151-3 PN

SF BF ON LINK RX/TX	SF: red BF: red ON: green LINK: green RX/TX: yellow	
LEDs	**Meaning**	**Remedy**
SF **BF** **ON**		
Off Off Off	There is no voltage applied to the interface module, or the interface module has a hardware defect.	Switch on the 24 VDC supply voltage at the interface module.
* * on	There is voltage applied to the interface module.	-

Table 6-28 Status and error displays of the IM151-3 PN

SF ■	SF: red
BF ■	BF: red
ON □	ON: green
LINK □	LINK: green
RX/TX □	RX/TX: yellow

LEDs			Meaning	Remedy
SF	**BF**	**ON**		
*	flashes	on	Incorrect or no connect telegram and startup data sets transferred to interface module – there is no data exchange between the I/O controller and the interface module (I/O device). Causes: • Device name is incorrect • Configuration error • Parameter assignment error	• Check the interface module. • Check the configuration data and parameters. • Check the device name.
*	on	on	No I/O controller on bus Causes: • No bus communication	• Establish a connection to the I/O controller (via a switch). • Assign a valid device name to the interface module. • Check the bus configuration. • Check that the bus connector is correctly inserted. • Check if the interconnecting cable to the I/O controller has been interrupted.
on	*	on	The configured setup of the ET 200S does not match the actual setup of the ET 200S. There is an error in an I/O module, or the interface module is defective. Incoming diagnosis	Check the setup of the ET 200S, whether a module is missing or defective, or whether an unconfigured module is inserted. Check the configuration (using STEP 7, for example), and correct the parameter assignment error. Replace the interface module, or get in touch with your Siemens contact person.
on	Off	on	• An MMC is not inserted. • The inserted MMC is full or does not have enough memory for the device names. • No suitable MMC is inserted (i.e. no MMC from Siemens).	Before power on insert an empty MMC into the IM151-3 PN.
Off	Off	on	Data transfer is taking place between the I/O controller and the ET 200S. The target configuration and actual configuration of the ET 200S match.	–

Table 6-28 Status and error displays of the IM151-3 PN

SF ■	SF: red
BF ■	BF: red
ON □	ON: green
LINK □	LINK: green
RX/TX □	RX/TX: yellow

LEDs			Meaning	Remedy
SF	**BF**	**ON**		
on	on	Off	FW update running	
Off	flashing 0.5 Hz	Off	FW update successfully completed	
on	flashing 0.5 Hz	Off	External error during FW update (incorrect FW, for example)	Use correct FW for update
on	flashing 2 Hz	Off	Internal error during FW update (read/write error, for example)	Repeat FW update
LINK	RX/TX			
Off	Off		There is no connection to the switch/I/O controller (no I/O controller is available on the network)	• No unified transmission rate • Autonegotiation not successful
on	*		Autonegotiation completed and PROFINET transmission rate accepted	-
on	on		Transmission/reception is in progress	-

* Not relevant

Power modules
Electronic modules
Process-related modules

See Section 6.1.3

6.2.4 Diagnostic messages of the electronic modules

Actions after a diagnosis message

Every diagnostic message leads to the following actions:

- The SF LED on the interface module comes on.
- Several simultaneous diagnostic messages are possible.
- Diagnoses are reported as diagnosis interrupts and can be read via data sets.
- After a diagnosis message it is saved in the diagnosis buffer of the I/O controller.
- The OB 82 is called. If OB 82 is not available, the I/O controller goes into STOP mode.
- Acknowledgment of the diagnostic interrupt (following this a new interrupt is possible).

Causes of Errors and Remedies

The causes of the errors and the action to be taken when specific diagnostic messages appear are described in Chapter 6.2.6.2.

6.2.5 Evaluating the interrupts of the ET 200S

Introduction

Interrupts are triggered by the I/O device in the event of specific errors occurring. Interrupt evaluation differs depending on the I/O controller used.

Evaluate interrupt with I/O controller

The ET 200S supports the following interrupts:

- Diagnostics Interrupts
- Process Alarms
- Insert/remove-module interrupts

In the event of an interrupt, interrupt OBs are automatically executed in the CPU of the I/O controller (see the System Software programming manual for S7300/ S7400, Program Design).

The OB number and the start information contain information on the cause of the error and the error type.
For detailed information on the error event see the error OB with the 54 RALRM SFB (read additional interrupt information).

Triggering of a diagnostic interrupt

When an incoming or outgoing event (for example wire break) is registered, the module triggers a diagnostic interrupt if ”Enable: Diagnostic interrupt” is set.

The CPU interrupts the processing of the user program and processes the OB 82 diagnostic block. The result that triggered the interrupt is added to the OB 82 start information.

Triggering a process interrupt

In the event of a process interrupt the CPU interrupts the processing of the user program and processes the OB 40 process interrupt block. The result that triggered the interrupt is added to the OB 40 start information.

Triggering of an insert/remove-module interrupt

The CPU interrupts the processing of the user program and processes the OB 83 diagnostic block. The result that triggered the interrupt is added to the OB 83 start information.

”Process interrupts lost” diagnosis

For the modules

- 2DI 24 VDC High Feature (6ES7 131-4BB00-0AB0)
- 4DI 24 VDC High Feature (6ES7 131-4BD00-0AB0) and
- 4DI 24–48 VUC High Feature (6ES7 131-4CD00-0AB0)

the ”Process interrupt lost” diagnosis is not currently available. This function will be implemented in a future product level of the IM151-3 PN.

Note

Process interrupts should not be used for process-related purposes (such as periodic generation of process interrupts), because they may be lost in the overall system.

6.2.6 Diagnostics with *STEP 7*

6.2.6.1 Reading out the diagnosis

Ways of reading the diagnosis

Table 6-29 Reading out the diagnosis with *STEP 7*

PLC system with I/O controller	Block or register in *STEP 7*	Application	See .
SIMATIC S7	Open in HWCONFIG via **station > online**	Device diagnosis as plain text on STEP 7 interface (in the fast view, diagnostics view or module status)	The section on hardware diagnostics in the *STEP 7 online help system*
	SFB 52 ”RDREC”	Read data sets from the I/O device	For SFB, see the *STEP 7* online help system (system functions/ system function blocks)
	SFB 54 ”RALRM”	Interrupt received from I/O device	For SFB, see the *STEP 7* online help system (system functions/ system function blocks)

6.2.6.2 Channel diagnostics

Definition

The channel diagnostics show information on channel errors in modules

Channel errors are shown as channel diagnoses in I/O diagnostics data sets. One data set contains 10 bytes.

All diagnoses for a submodular slot, slot, slots to which an I/O controller is assigned in a device, or for a device can be read. The decision is made by the data set number:

$800A_H$	channel diagnostics for a submodular slot
$C00A_H$	channel diagnostics for a slot
$E00A_H$	channel diagnostics to which an I/O controller is assigned slots in a device
$F00A_H$	channel diagnostics for a device

The data set is read with the 52 RDREC SFB (read data set).

Structure of data sets

You can find the structure of the data sets in the Internet at:

http://www.siemens.com/automation/service.

Search for the entry with the number 19327300.

Channel diagnostics

The channel diagnostics for the ET 200S with the IM151-3 PN are structured as follows:

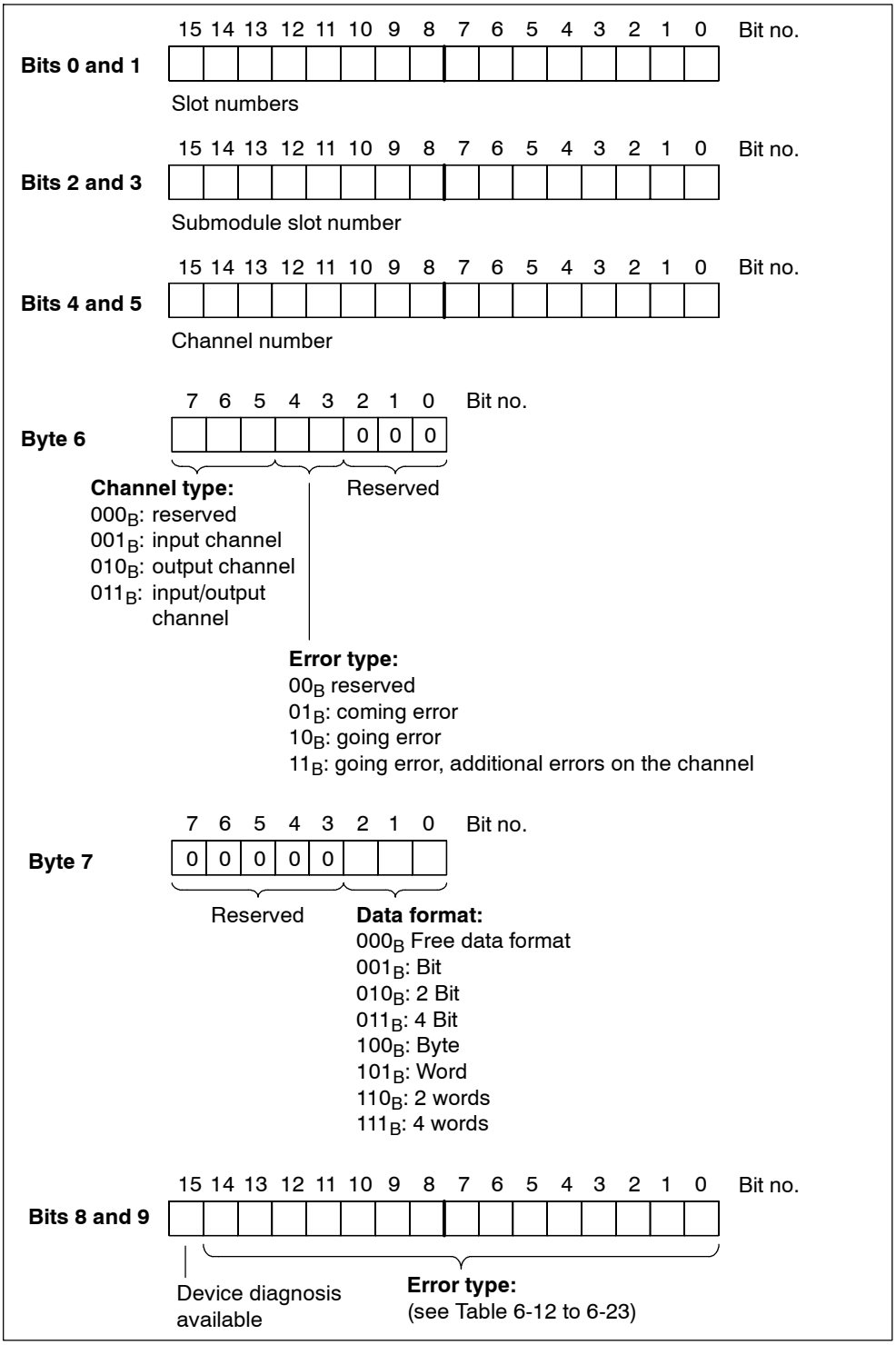


Figure 6-37 Structure of the channel diagnostics for the ET 200S with the IM151-3 PN

Power module error types
Digital electronic module error types
Analog electronic module error types
Process-related module error types

See Tables 6-12 to 6-23

6.2.6.3 Diagnostics in the case of invalid ET 200S configuration states on the PROFINET IO

Invalid configuration states

The following invalid configuration states of the ET 200S lead to failure of the ET 200S I/O device or prevent entry into data interchange.

- Two missing modules
- Bus termination module missing
- Number of modules exceeds maximum configuration
- Faulty backplane bus (for example, terminal module is defective)

Note

If **one** module is missing (gap) and the ET 200S is switched on, the I/O device will not start up.

6.2.6.4 Diagnostics in the case of interruption of the ET 200S backplane bus

If the ET 200S does not start or data interchange is interrupted, the cause of this behavior could be a faulty terminal module. The faulty terminal module physically interrupts the ET 200S backplane bus.

There is a 35-byte long manufacturer-specific diagnosis for the IM151-3 PN (slot 0) for localizing a bus interruption. The module status and the ID-related diagnosis is shown, as know with the PROFIBUS DP.

Contents of the manufacturer-specific diagnosis:

Byte 0 to 5:	reserved
Byte 6 to 14:	ID-related diagnosis (see Figure 6-22)
Byte 15 to 34:	Module status (see Figure 6-24)

No interrupt is generated if the ET 200S backplane bus is interrupted. The user must specifically read this information. The data set with the index $F00B_H$ is available for this.

6.2.6.5 Diagnostics in the case of failure of the load voltage from the power module

Load voltage failure

If the power module load voltage fails, electronic modules with their own controllers (i.e. analog and process-related modules) behave as follows:

- If such a module is removed during a load voltage failure, a remove-module interrupt is triggered.
- If such a module is inserted during a load voltage failure, the associated insertion interrupt is only triggered when the load voltage is restored and the module has started.

Restoration of load voltage

After restoration of the load voltage and startup of the electronic modules with their own controllers, the parameters of the modules are reset with the saved startup parameters by the IM151-3 PN.

Note

If the parameters of an electronic module with its own controller have been changed, the data with the new parameters is no longer available after restoration of the load voltage.

6.2.6.6 Diagnosis after a STOP of the I/O controller or after restart of the O/O device

If diagnoses are received from the I/O device in STOP status of the I/O controller, these diagnoses will not cause the corresponding organization blocks to start after startup of the I/O controller. You must generate an image of the status of the device yourself in the OB 100.

On restart of an I/O device data record $E00C_H$ must be read with SFB 52. This shows all diagnoses for the slots assigned to an I/O controller in one device.

General Technical Specifications

7

What are general technical specifications?

The general technical specifications comprise the standards and test specifications with which the ET 200S distributed I/O system complies, as well as the criteria on the basis of which the ET 200S distributed I/O system was tested.

Chapter overview

7.1 Standards, certificates, and approvals

CE Mark of Conformity

The ET 200S distributed I/O system meets the requirements and protection objectives of the following EC Directives and complies with the harmonized European Standards (EN) for programmable logic controllers published in the Official Gazettes of the European Community:

- 73/23/EEC ”Electrical Equipment for Use within Fixed Voltage Ranges” (Low-Voltage Directive)
- 89/336/EEC ”Electromagnetic Compatibility” (EMC Directive)
- 94/9/EC ”Equipment and protective systems intended for use in potentially explosive atmospheres” (Guidelines for Explosion Protection)

The EC declarations of conformity are kept available for the responsible authorities at the following address:

Siemens Aktiengesellschaft
Automation and Drives
A&D AS RD4
Postfach 1963
D-92209 Amberg, Germany

UL Approval

Underwriters Laboratories Inc. in accordance with

- UL 508 (Industrial Control Equipment)

CSA Approval

Canadian Standards Association in accordance with

- C22.2 No. 142 (Process Control Equipment)

or

Underwriters Laboratories Inc. in accordance with

- UL 508 (Industrial Control Equipment)
- CSA C22.2 No. 142, (Process Control Equipment)

or

HAZ. LOC.

Underwriters Laboratories Inc. in accordance with

- UL 508 (Industrial Control Equipment)
- CSA C22.2 No. 142, (Process Control Equipment)
- UL 1604 (Hazardous Location)
- CSA-213 (Hazardous Location)

APPROVED for use in
Class I, Division 2, Group A, B, C, D Tx;
Class I, Zone 2, Group IIC Tx

The ET 200S motor starters do not have cULus for HAZ. LOC.

Note

You can find the currently valid certificates and approvals on the type plate of each module.

FM Approval

Factory Mutual Research (FM) in accordance with
Approval Standard Class Number 3611, 3600, 3810
APPROVED for use in
Class I, Division 2, Group A, B, C, D Tx;
Class I, Zone 2, Group IIC Tx

The ET 200S motor starters do not have FM approval. All the other modules of the ET 200S have FM approval.

In accordance with EN 50021 (Electrical apparatus for potentially explosive atmospheres; Type of protection ”n”)

 II 3 G EEx nA II T4..T5

Warning

Personal injury and material damage may be incurred.

Personal injury and material damage may be incurred in hazardous areas if you disconnect plug-in connections while the ET 200S distributed I/O device is in operation.

Always deenergize the ET 200S in hazardous areas before disconnecting plug-in connections.

Identification for Australia

The ET 200S Distributed I/O System fulfills the requirements of AS/NZS 2064 (Class A).

IEC 61131

The ET 200S distributed I/O system meets the requirements and criteria of the IEC 61131-2 standard (Programmable Logic Controllers, part 2: equipment requirements and tests.)

PROFIBUS standard

The ET 200S distributed I/O system is based on *IEC 617841:2002 Ed1 CP 3/1.*

Shipbuilding Approval

Classifying organizations:

- ABS (American Bureau of Shipping)
- BV (Bureau Veritas)
- DNV (Det Norske Veritas)
- GL (Germanischer Lloyd)
- LRS (Lloyds Register of Shipping)
- Class NK (Nippon Kaiji Kyokai)

Use in industry

SIMATIC products designed for use in industry.

Table 7-1 Use in industry

Area of application	Requirement for	
	Emitted interference	Interference immunity
Industry	EN 50081-2: 1993	EN 50082-2: 1995

Use in residential areas

If you use the ET 200S in residential areas, you must adhere to limit value class B in accordance with EN 55011 regarding the emission of radio interference.

Suitable measures to achieve a level of radio interference corresponding to limit value class B are:

- Installation of the ET 200S in grounded switch cabinets/switch boxes
- Use of filters in supply lines

7.2 Electromagnetic compatibility, shipping and storage conditions

Definition

Electromagnetic compatibility is the capability of an electrical device to function satisfactorily in its electromagnetic environment without interfering with this environment.

The ET 200S distributed I/O system also meets the requirements of the European Union's EMC legislation. A requirement for this is that the ET 200S distributed I/O system meets the specifications and directives concerning electrical installation.

Pulse-shaped interference

The following table shows the electromagnetic compatibility of the ET 200S distributed I/O system when confronted with pulse-shaped interference.

Pulse-shaped interference	Tested with	Corresponds to severity
Electrostatic discharge According to IEC 61000-4-2	8 kV kV	3 (air discharge) 2 (contact discharge)
Burst pulses (rapid, transient interference) to IEC 61000-4-4.	2 kV (power supply line) 2 kV (signal line)	3 3
Surge to IEC 61000-4-5 Only with lightning conductors (see the DP master manual and the *SIMATIC NET PROFIBUS Network description*)		
• Asymmetrical interconnection	2 kV (power supply line) 2 kV (signal/data line)	3
• Symmetrical interconnection	1 kV (power supply line) 1 kV (signal/data line)	

Sine-shaped interference

The following table shows the electromagnetic compatibility of the ET 200S distributed I/O system when confronted with sinusoidal interference.

RF irradiation to IEC 61000-4-3 electromagnetic RF field		RF coupling to IEC 61000-4-6
Amplitude-modulated	**Pulse-modulated**	
80 to 1000 MHz	900 MHz ±5 MHz	0.15 to 80 MHz
10 V/m		10 V_{eff} unmodulated
80% AM (1 kHz)	50% ED	80% AM (1 kHz)
	200 Hz repetition frequency	150 Ω source impedance

Emission of radio interference

Emission of electromagnetic fields to EN 55011: Limit class A, group 1 (measured at a distance of 10 m.)

Frequency	Emitted interference
From 30 MHz to 230 MHz	< 40dB (μV/m)Q
From 230 MHz to 1000 MHz	< 47dB (μV/m)Q

Shipping and storage conditions

The ET 200S distributed I/O system exceeds the requirements of IEC 61131-2 as regards shipping and storage conditions. The following specifications apply to modules shipped or stored in their original packaging.

Type of condition	Permitted range
Free fall	≤ 1 m
Temperature	from –40 °C to + 70 °C
Temperature change	20 K/h
Air pressure	From 1080 hPa to 660 hPa (corresponds to an altitude of –1000 m to 3500 m)
Relative humidity	From 5 % to 95 %, without condensation

7.3 Mechanical and climatic environmental conditions

Climatic environmental conditions

The following climatic environmental conditions apply:

Environmental conditions	Operating ranges	Remarks
Temperature	from 0 to 60°C	For horizontal installation
	from 0 to 40°C	For all other mounting positions
	From 0 to 55°C **(see restrictions below)***	For vertical installation
Temperature change	10 K/h	
Relative humidity	From 15 % to maximum 95 %	Without condensation
Air pressure	From 1080 hPa to 795 hPa	Corresponds to an altitude of –1000 m to 2000 m
Contaminant concentration	SO_2: < 0.5 ppm; rel. humidity < 60 %, no dewing H_2S: < 0.1 ppm; rel. humidity < 60 %, no dewing	Test: 10 ppm; 4 days 1 ppm; 4 days

* Restrictions for the operating range of 0 to 55°C in a vertical position

The operating range of 0 to 55°C in a vertical installation position is only permitted for the following modules:

- IM151-1 STANDARD: 6ES7 151-1AA02-0AB0
- PM-E 24 VDC: 6ES7 138-4CA00-0AA0
- 2DI 24 VDC Standard: 6ES7 131-4BB00-0AA0
- 2DI 24 VDC High Feature: 6ES7 131-4BB00-0AB0
- 4DI 24 VDC Standard: 6ES7 131-4BD00-0AA0
- 4DI 24 VDC High Feature: 6ES7 131-4BD00-0AB0
- 2DO 24 VDC/0.5 A Standard: 6ES7 132-4BB00-0AA0
- 2DO 24 VDC/0.5 A High Feature: 6ES7 132-4BB00-0AB0
- 4DO 24 VDC/0.5 A High Feature: 6ES7 132-4BD00-0AA0
- 2DO 24 VDC/2 A Standard: 6ES7 132-4BB30-0AA0
- 2DO 24 VDC/2 A High Feature: 6ES7 132-4BB30-0AB0
- 4DO 24 VDC/2 A Standard: 6ES7 132-4BD30-0AA0
- 2RO NO 24-120 VDC/5 A 24-230 VAC/5 A: 6ES7 132-4HB00-0AB0

Note

All of the supply and load voltages of the ET 200S must not exceed 24 VDC. This voltage limit must be enforced.

Mechanical environmental conditions

The mechanical environmental conditions are shown in the following table in the form of sinusoidal oscillations.

ET 200S modules	Frequency range	Permanent	Occasional
Everything except motor starters	10 ≤ f ≤ 58Hz	0.15 mm amplitude	0.35 mm amplitude
	58 ≤ f ≤ 150Hz	2g constant acceleration	5g constant acceleration

Testing mechanical environmental conditions

The following table provides information on the type and extent of tests of mechanical environmental conditions.

Test for ...	Test Standard	Terminal modules and electronic modules
Oscillations	Oscillation test in accordance with IEC 60068-2-6	Vibration type: Frequency sweep with a rate of change of 1 octave/minute. 10 Hz ≤ f ≤ 58 Hz, constant amplitude 0.35 mm 58 Hz ≤ f ≤ 150 Hz, constant acceleration 5g Vibration duration: 20 frequency sweeps per axis in each of the 3 mutually vertical axes
Shock	Shock tested to IEC 60068-2-27	Type of shock: Half-sine Type of shock: 15 g peak value, duration of 11 ms Type of shock: 3 shocks each in +/– direction in each of the 3 mutually vertical axes
Repetitive shock	Shock tested to IEC 60068-29	Type of shock: Half-sine Type of shock: 25 g peak value, duration of 6 ms Type of shock: 10003 shocks each in +/– direction in each of the 3 mutually vertical axes

7.4 Information on insulation testing, safety class, degree of protection, and rated voltage of the ET 200S

Test voltage

Insulation strength is demonstrated in the type test with the following test voltage in accordance with IEC 61131-2:

Circuits with a rated voltage of U_e to other circuits or ground	Test voltage
< 50 V	500 VDC
< 150 V	2500 VDC
< 250 V	4000 VDC

Pollution severity/overvoltage category in accordance with IEC 61131

- Pollution severity 2
- Overvoltage category
  - When U_N = 120/ 230 VAC: III
  - at V_r = 24 V DC: II

Safety class

Safety class I as per IEC 60536

Degree of protection IP20

IP 20 protection in accordance with IEC 60529 for all ET 200S modules, which means:

- Protection against contact with standard test probes
- Protection against foreign bodies with a diameter greater than 12.5 mm
- No special protection against water

Rated voltage for operation

The ET 200S distributed I/O system works with the rated voltage and corresponding tolerances specified in the following table.

ET 200S modules	Rated voltage	Tolerance range
Everything except motor starters	24 VDC	20.4 to 28.8 VDC [1]
		18.5 to 30.2 VDC [2]
	120 VAC	VAC to 132 VAC (47 Hz to 63 Hz)
	230 VAC	VAC to 264 VAC (47 Hz to 63 Hz)

1) static value: generation as functional extra-low voltage with safe electrical isolation as per IEC 60364-4-41

2) dynamic value: including ripple e. g. with three-phase bridge rectification

7.5 Variations in technical data for the ET 200S FC frequency converter

The following table shows variations in the general technical data for the ET 200S FC frequency converter compared to the ET 200S.

Table 7-2 Variations in technical data for the ET 200S FC frequency converter

Chapter	different values
Standards, certificates and approvals	The frequency converter is **not** approved under • cULus for HAZ.LOC. • FM (Factory Mutual Research) • shipbuilding
Shipping and storage conditions	Free fall: ≤ 0.35 m
Climatic ambient conditions	Temperature for horizontal installation: from 0 to 60 °C
	Temperature for vertical installation: from 0 to 40 °C
Mechanical ambient conditions	See operating manual for ET 200S FC frequency converter (6SL3 298-0CA12-0xP0)
Rated operational voltage	
Use in Zone 2	The ET 200S FC frequency converter is **not** approved for operation in Zone 2 hazardous atmosphere.

Interface Modules

8

Chapter overview

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8.1 Parameters for interface modules

Parameters for the IM151-1 BASIC interface module

Table 8-1 Parameters for the IM151-1 BASIC interface module

IM151-1 BASIC	Value range	Default	Applicability
Operation at Preset – <> Actual configuration	Disable/enable	Disable	ET 200S
Module diagnosis	Disable/enable	Enable	ET 200S
Module status	Disable/enable	Enable	ET 200S
Channel-specific diagnosis	Disable/enable	Enable	ET 200S
Analog-value format	SIMATIC S7 SIMATIC S5	S7	ET 200S
Interference frequency suppression	50 Hz/60 Hz	50Hz	ET 200S
Reference junction slot	None/2 to 12	None	ET 200S
Reference junction input	RTD on channel 0/ RTD on channel 1	0	ET 200S

Parameters for the IM151-1 STANDARD and IM151-1 FO STANDARD interface modules

Table 8-2 Parameters for the IM151-1 STANDARD and IM151-1 FO STANDARD interface modules

IM151-1 STANDARD/IM151-1 FO STANDARD	Value range	Default[4]	Applicability
DP interrupt mode	DPV0/DPV1	DPV0	ET 200S
Bus length	≤ 1 m / > 1 m	≤1 m	ET 200S
Operation with Set and <> Actual Configuration[1]	Disable/enable	Disable	ET 200S
Diagnostic interrupt[3]	Disable/enable	disable	ET 200S
Process interrupt[3]	Disable/enable	disable	ET 200S
Insert/Remove module interrupt[2] [3]	Disable/enable	disable	ET 200S
Module diagnosis	Disable/enable	enabled	ET 200S
Module status	Disable/enable	enabled	ET 200S
Channel-specific diagnostics	Disable/enable	enabled	ET 200S
Option handling, general	Disable/enable	disable	ET 200S
Option handling: Slots 2 to 63	Disable/enable	disable	Module
Analog-value format	SIMATIC S7/ SIMATIC S5	S7	ET 200S
Interference Frequency Suppression	50 Hz/60 Hz	50 Hz	ET 200S
Reference junction slot	None/2 to 63	none	ET 200S
Reference junction input	RTD on channel 0/ RTD on channel 1	0	ET 200S

1) Note also the option handling parameters (see Chapter 3.8).
2) In the device database file, the default setting of the parameter is ”Disable”.
3) Only configurable in DPV1 mode.
4) The default settings are applicable for the default startup (if no other parameters are specified by the DP master).

Parameters for the IM151-1 HIGH FEATURE interface module

Table 8-3 Parameters for the IM151-1 HIGH FEATURE interface module (parameter assignment tab)

IM151-1 HIGH FEATURE	Value range	Default[3]	Effective range
DP interrupt mode	DPV0/DPV1	DPV1	ET 200S
Operation at Preset – <> Actual configuration	Disable/enable	enabled	ET 200S
Diagnostics interrupt[2]	Disable/enable	enabled	ET 200S
Hardware interrupt[2]	Disable/enable	enabled	ET 200S
Insert/Remove module interrupt[1] [2]	Disable/enable	enabled	ET 200S
Module diagnosis	Disable/enable	enabled	ET 200S
Module status	Disable/enable	enabled	ET 200S
Channel-specific diagnostics	Disable/enable	enabled	ET 200S
Analog-value format	SIMATIC S7/ SIMATIC S5	S7	ET 200S
Interference Frequency Suppression	50 Hz/60 Hz	50 Hz	ET 200S
Reference junction slot	None/2 to 63	none	ET 200S
Reference junction input	RTD on channel 0/ RTD on channel 1	0	ET 200S

1) In the device database file, the default setting of the parameter is ”Disable”.
2) Only configurable in DPV1 mode.
3) The default settings are applicable for the default startup (if no other parameters are specified by the DP master).

Table 8-4 Parameters for the IM151-1 HIGH FEATURE interface module (clocking tab)

IM151-1 HIGH FEATURE	Value range	Default setting	Effective range
Synchronize DP slave with DP cycle[1]	Disable/enable	disable	ET 200S
Time Ti (read in process values)[1]	(Values are preset by STEP 7)	(Value is preset by STEP 7)	ET 200S
Time To (output process values)[1]	(Values are preset by STEP 7)	(Value is preset by STEP 7)	ET 200S

1) Only parameterizable as of STEP 7 V5.1 with ServicePack 3

Parameters for the IM151-3 PN interface module

Table 8-5 Parameters for the IM151-3 PN interface module

IM151-3 PN	Value range	Default setting	Effective range
Bus length	≤ 1 m / > 1 m	≤1 m	ET 200S
Interference Frequency Suppression	50 Hz/60 Hz	50 Hz	ET 200S
Reference junction slot	None/2 to 63	none	ET 200S
Reference junction input	RTD on channel 0/ RTD on channel 1	0	ET 200S

DP interrupt mode (only with IM151-1 STANDARD (from 6ES7 151-1AA04-0AB0), IM151-1 FO STANDARD (from 6ES7 151-1AB03-0AB0) and IM151-1 HIGH FEATURE)

This parameter allows you to enable or disable DPV1 operation of the ET 200S. If DPV1 mode is enabled, data sets and interrupts are supported via class 1 services and class 2 services (configurable).

Requirements:

- The DP master also support DPV1.

Bus length

≤ 1 m: default, the maximum bus length is 1 m.

> 1 m: the bus length of the ET 200S is > 1 m and can be a maximum 2 m. This setting will, however, increase the response time of the ET 200S (see Appendix D).

Operation at Preset <> Actual configuration

If the parameter is enabled and:

- Modules are removed and inserted during operation, this does not lead to a station failure of the ET 200S.
- The actual configuration differs from the expected configuration, the ET 200S continues to exchange data with the DP master.

If the parameter is disabled and:

- Modules are removed and inserted during operation, this leads to a station failure of the ET 200S.
- The actual configuration differs from the expected configuration, there is no data transfer between the DP master and the ET 200S. Exception: option handling with RESERVE modules (see Chapter 3.8).

Option handling, general

Using this parameter you can enable or disable the option handling parameter for the entire ET 200S.

Option handling: Slots 2 to 63

Using this parameter you can enable or disable the checking of the configuration.

- Slot 2 to 63 is enabled. A RESERVE module can also be inserted into the slot instead of the configured electronic module without triggering a diagnosis.
- Slot 2 to 63 is disabled: Only the configured module may be inserted in the slot. RESERVE modules are treated as incorrect modules. Depending on the setting of the ”Operation at Preset <> Actual Configuration” parameter, the ET 200S will either fail or remain in data transfer.

Diagnostic interrupt

This parameter allows you to enable or disable diagnostic interrupts.
Diagnostic interrupts are supported

- on the PROFIBUS DP, if the ET 200S is in DPV1 mode.
- on the PROFINET IO.

Hardware interrupt

This parameter allows you to enable or disable hardware interrupts.
Hardware interrupts are supported

- on the PROFIBUS DP, if the ET 200S is in DPV1 mode.
- on the PROFINET IO.

Insert/remove module interrupts

This parameter allows you to enable or disable insert/remove module interrupts.
Insert/remove module interrupts are supported

- on the PROFIBUS DP, if the ET 200S is in DPV1 mode.
- on the PROFINET IO.

Analog-value format

Here you set the number format for all analog electronic modules.

Interference Frequency Suppression

The frequency of your alternating voltage system can affect measured values negatively, particularly in the case of both measurements in small voltage ranges and thermocouples. Specify here the dominant line frequency in your system (50 Hz or 60 Hz).

The interference frequency suppression parameter is valid for all analog electronic modules. The integration time and conversion time of the individual modules are also set by means of this parameter. See the technical specifications of the analog electronic modules in Chapter 12.

Reference junction slot

See chapter 12.2.2.

Reference junction input

See chapter 12.2.2.

Synchronize DP slave with DP cycle

You can use this parameter to enable or disable clocking.

If you enable clocking, the I/Os of the ET 200S are synchronized with the global control frame of the master (as an equidistance clocking).

Requirements: See Section 3.7

Time Ti (read in process values)

This value can only be set provided you have enabled the ”Synchronize DP slave with DP cycle” parameter.

Ti is the time reserved for reading in the input data at the ET 200S. At the beginning of Ti, the input data is converted at the terminals and stored in a buffer via the backplane bus of the ET 200S. Ti ends at the beginning of the next, equidistant DP cycle (i.e. with the global control frame).

At this point, the most recent, most up-to-date input data must be available to be read in on the PROFIBUS subnet. The time Ti must take into account the processing and delay times in the modules and in the backplane bus of the ET 200S and, in the case of modular slaves, is therefore dependent on the configuration.

The time Ti can only be set in the specified increments between the minimum and maximum values. Normally, the default values should be accepted.

Time To (output process values)

This value can only be set provided you have enabled the ”Synchronize DP slave with DP cycle” parameter.

The end of the To time is the point at which the output data is switched to the module terminals in its converted form. The time To includes the following:

- Distribution of the output data via the PROFIBUS DP bus system to the slaves (= cyclic data-exchange master slave)
- Distribution of the output data to the modules via the backplane bus of the slave
- Conversion and transfer of the output data to the output terminals of the module

To starts with the arrival of the global control frame. Like Ti, the time can be set in the specified increments between the minimum and maximum values. Normally, you should accept the default values.

8.2 IM151-1 BASIC interface module (6ES7 151-1CA00-0AB0)

Order number

6ES7 151-1CA00-0AB0

Features

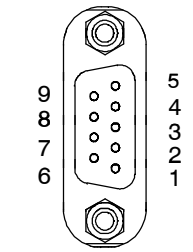
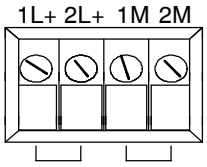
The IM151 1 BASIC interface module has the following features:

- It connects the ET 200S with PROFIBUS DP via the RS485 interface.
- It prepares the data for the electronic modules and motor starters that are fitted.
- It supplies the backplane bus.
- The PROFIBUS DP address of the ET 200S can be set by means of switches.
- If the 24 VDC power supply is disconnected, the IM151-1 BASIC interface module is also disconnected.
- The maximum address space is 88 bytes for inputs and 88 bytes for outputs.
- The reference potential M of the rated supply voltage of the IM151 1 BASIC to the rail (protective conductor) is connected by means of an RC combination, thus permitting an ungrounded configuration.
- Operation as a DPV0 slave.
- A maximum of 12 modules can be operated with the IM151 1 BASIC.
- The maximum bus length is not relevant.

Terminal assignment

The following table shows the terminal assignment of the IM151 1 BASIC interface module for the 24 VDC voltage supply and PROFIBUS DP:

Table 8-6 Terminal assignment of the IM151 1 BASIC interface module

View	Signal name		Name
	1	-	-
	2	-	-
	3	RxD/TxD-P	Data line B
	4	RTS	Request To Send
	5	M5V2	Data reference potential (station)
	6	P5V2	Supply plus (station)
	7	-	-
	8	RxD/TxD-N	Data line A
	9		
	1L+		VDC
	2L+		VDC (for loop through)
	1M		Chassis ground
	2M		Ground (for loop through)

Block diagram

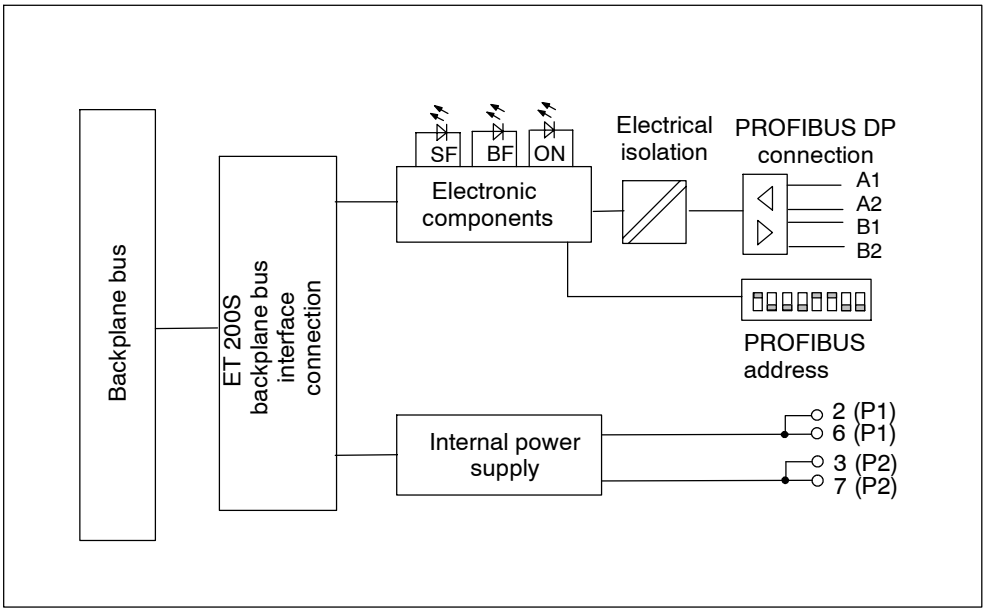


Figure 8-1 Block diagram for the IM151-1 BASIC interface module

Technical specifications

Dimensions and weight	
Dimensions W x H x D (mm)	45 x 119.5 x 75
Weight	Approx. 150 g
Module-specific data	
Data transfer rate	9.6; 19,2; 45,45; 93s,75; 187,5; 500 kbps, 1.5 ; 3; 6; 12 Mbps
Bus protocol	PROFIBUS DP
Interface	RS 485
SYNC capability	Yes
FREEZE capability	Yes
Manufacturer's ID	$80F3_H$
Direct Data Exchange	Yes
Clock synchronization	No
Max. output current of the PROFIBUS DP interface (5, 6)	80 mA
Voltages, currents, electrical potentials	
Rated supply voltage of the electronic components (1L+)	24 VDC
• Polarity reversal protection	Yes
• Power failure bypass	No
Electrical isolation	
• between backplane bus and electronic circuits	No
• Between the PROFIBUS DP and electronic components	Yes
• Between the supply voltage and electronic components	No
Permitted potential difference (to the rail)	75 VDC, 60 VAC
Insulation tested with	500 VDC

Current consumption from rated supply voltage (1L+)	Approx. 70 mA
Power dissipation of the module	Typ. 1.5 W
Status, interrupts, diagnostics	
Interrupts	No
Diagnostics function	Yes
• Group error	red LED "SF"
• PROFIBUS DP bus monitoring	red LED "BF"
• Monitoring of the power supply of the electronic system	green LED "ON"

8.3 IM151-1 STANDARD interface module (6ES7 151-1AA04-0AB0)

Order number

6ES7 151-1AA04-0AB0

Properties

The IM151-1 STANDARD interface module has the following features:

- It connects the ET 200S with PROFIBUS DP via the RS485 interface.
- It prepares the data for the electronic modules and motor starters that are fitted.
- It supplies the backplane bus.
- The PROFIBUS DP address of the ET 200S can be set by means of switches.
- If the 24 VDC power supply is disconnected, the IM151-1 STANDARD interface module is also disconnected.
- The maximum address space is 244 bytes for inputs, and 244 bytes for outputs.
- The reference potential M of the rated supply voltage of the IM151-1 STANDARD to the rail (protective conductor) is connected by means of an RC combination, thus permitting an ungrounded configuration.
- Operation as a DPV0 slave.
- A maximum of 63 modules can be operated with the IM151-1 STANDARD.
- The maximum bus length is 2 m (can be set).
- Supports option handling (see Chapter 3.8) and the status byte for power modules.

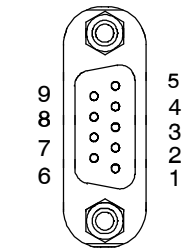
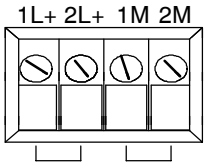
Supplementary properties compared to the IM151-1 STANDARD interface module (up to 6ES7 151-1AA03-0AB0):

- Operation as a DPV1 slave.
  - Acyclic data exchange (read/write data record): class 2 services and class 1 services
  - Diagnostics Interrupts
  - Process Alarms
  - Removal/Insertion Interrupt
- Firmware update via PROFIBUS DP
- Identification data (see Sec. 3.9)

Terminal assignment

The following table shows the terminal assignment of the IM151 1 STANDARD interface module for the 24 VDC voltage supply and PROFIBUS DP:

Table 8-7 Terminal assignment of the IM151 1 STANDARD interface module

View	Signal name		Name
	1	-	-
	2	-	-
	3	RxD/TxD-P	Data line B
	4	RTS	Request To Send
	5	M5V2	Data reference potential (station)
	6	P5V2	Supply plus (station)
	7	-	-
	8	RxD/TxD-N	Data line A
	9		
	1L+		24 VDC
	2L+		VDC (for loop through)
	1M		Chassis ground
	2M		Ground (for loop through)

Block diagram

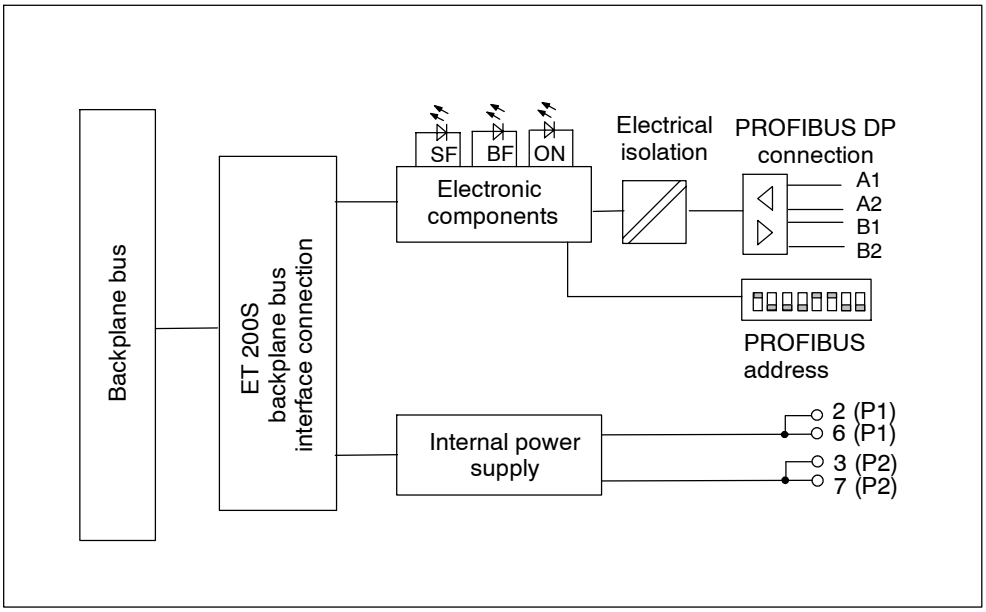


Figure 8-2 Block diagram for the IM151-1 STANDARD interface module

Technical specifications

Dimensions and weight	
Dimensions W × H × D (mm)	45 x 119.5 x 75
Weight	Approx. 150 g
Module-specific data	
Data transfer rate	9,6; 19,2; 45,45; 93s,75; 187,5; 500 kbps, 1,5 ; 3; 6; 12 Mbps
Bus protocol	PROFIBUS DP
Interface	RS 485
SYNC capability	Yes
FREEZE capability	Yes
Manufacturer's ID	$806A_H$
Direct Data Exchange	Yes
Clock synchronization	No
Max. output current of the PROFIBUS DP interface (5, 6)	80 mA
Voltages, currents, electrical potentials	
Rated supply voltage of the electronic components (1L+)	24 VDC
• Polarity reversal protection	Yes
• Power failure bypass	Min. 20 ms
Electrical isolation	
• between backplane bus and electronic circuits	No
• Between the PROFIBUS DP and electronic components	Yes
• Between the supply voltage and electronic components	No
Permitted potential difference (to the rail)	75 VDC, 60 VAC
Insulation tested with	500 VDC
Current consumption from rated supply voltage (1L+)	Approx. 200 mA
Power dissipation of the module	Typical 3.3 W
Status, interrupts, diagnostics	
Interrupts	Yes
Diagnostics function	Yes
• Group error	red LED "SF"
• PROFIBUS DP bus monitoring	red LED "BF"
• Monitoring of the power supply of the electronic system	green LED "ON"

Updating the firmware of the IM151-1 STANDARD

Properties

- As of STEP 7 V5.1, ServicePack 3, you can update the firmware of the IM151-1 STANDARD (via available devices).
- To update the firmware you receive files (*.UPD) with the current firmware.

Prerequisites

- The IM151-1 STANDARD at the station whose firmware should be updated must be online.
- The files with the current firmware version must be available in the file system of your programming device or PC.

Procedure

The STEP 7 online help system provides information on how to proceed.

Note

We recommend you update the firmware using PROFIBUS DP.

8.4 IM151-1 FO STANDARD interface module (6ES7 151-1AB03-0AB0)

Order number

6ES7 151-1AB03-0AB0

Properties

The IM151-1 FO STANDARD interface module has the following features:

- It connects the ET 200S with PROFIBUS DP via the fiber-optic interface.
- It prepares the data for the electronic modules and motor starters that are fitted.
- It supplies the backplane bus.
- The PROFIBUS DP address of the ET 200S can be set by means of switches.
- If the 24 VDC power supply is disconnected, the IM151-1 FO STANDARD interface module is also disconnected.
- The maximum address space is 244 bytes for inputs, and 244 bytes for outputs.
- The reference potential M of the supply voltage of the IM151-1 FO STANDARD to the rail (protective conductor) is connected by means of an RC combination, thus permitting an ungrounded configuration.
- Operation as a DPV0 slave.
- A maximum of 63 modules can be operated with the IM151-1 FO STANDARD.
- The maximum bus length is 2 m (can be set).
- Supports option handling (see Chapter 3.8) and the status byte for power modules.

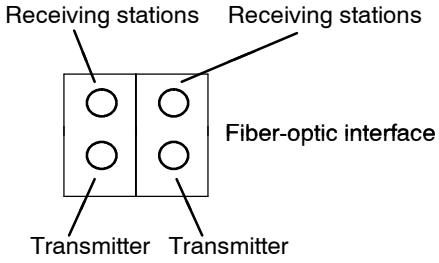
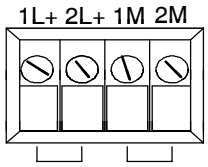
Supplementary properties compared to the IM151-1 FO STANDARD interface module (up to 6ES7 151-1AB02-0AB0):

- Operation as a DPV1 slave.
  - Acyclic data exchange (read/write data record): class 2 services and class 1 services
  - Diagnostics Interrupts
  - Process Alarms
  - Removal/Insertion Interrupt
- Firmware update via PROFIBUS DP
- Identification data (see Sec. 3.9)

Terminal assignment

The following table shows the terminal assignment of the IM151-1 FO STANDARD interface module for the 24 VDC voltage supply and
PROFIBUS DP with fiber-optic cable interface:

Table 8-8 Terminal assignment of the IM151 1 STANDARD interface module

View	Signal name	Name
		
	1L+	24 VDC
	2L+	VDC (for loop through)
	1M	Chassis ground
	2M	Ground (for loop through)

Block diagram

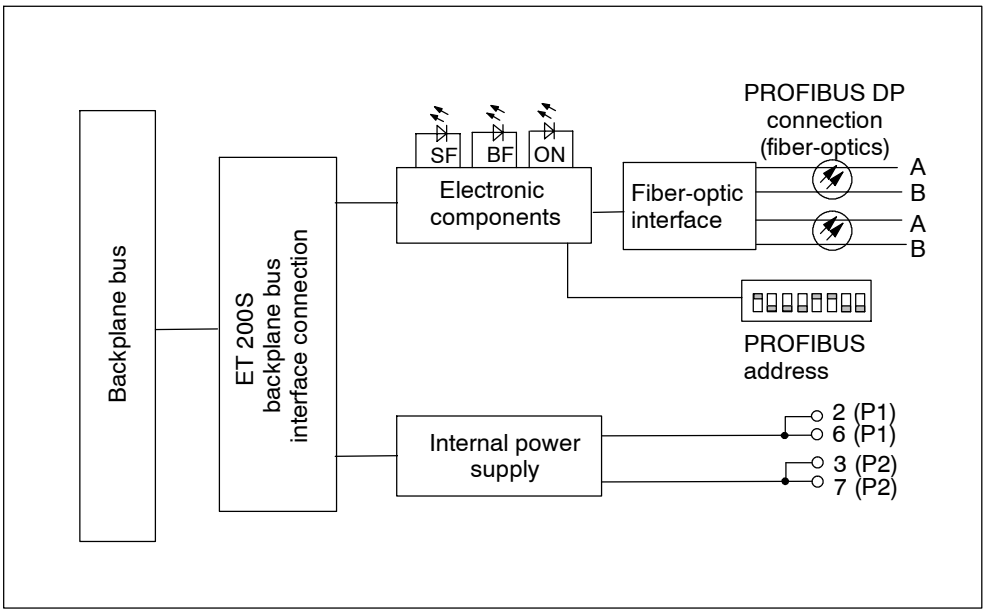


Figure 8-3 Block diagram for the IM151-1 FO STANDARD interface module

Technical specifications

Dimensions and weight	
Dimensions W x H x D (mm)	45 x 119.5 x 75
Weight	Approx. 150 g
Module-specific data	
Data transfer rate	9,6; 19,2; 45,45; 93,75; 187.5; 500 kbps, 1,5 ; 12 Mbps
Bus protocol	PROFIBUS DP
Interface	Fiber-optic cable
SYNC capability	Yes
FREEZE capability	Yes
Manufacturer's ID	$806B_H$
Direct Data Exchange	Yes
Clock synchronization	No
Voltages, currents, electrical potentials	
Rated supply voltage of the electronic components (1L+)	24 VDC
• Polarity reversal protection	Yes
• Power failure bypass	min. 20 ms
Electrical isolation	
• between backplane bus and electronic circuits	No
• Between the supply voltage and electronic components	No
Current consumption from rated supply voltage (1L+)	Approx. 200 mA
• Power supply for the ET 200S backplane bus	Max. 700 mA
Power dissipation of the module	Typical 3.3 W

Status, interrupts, diagnostics	
Interrupts	Yes
Diagnostics function	Yes
• Group error	red LED "SF"
• PROFIBUS DP bus monitoring	red LED "BF"
• Monitoring of the power supply of the electronic system	green LED "ON"

Updating the firmware of the IM151-1 FO STANDARD

Properties

- As of STEP 7 V5.1, ServicePack 3, you can update the firmware of the IM151-1 FO STANDARD (via available devices).
- To update the firmware you receive files (*.UPD) with the current firmware.

Prerequisites

- The IM151-1 FO STANDARD at the station whose firmware should be updated must be online.
- The files with the current firmware version must be available in the file system of your programming device or PC.

Procedure

The STEP 7 online help system provides information on how to proceed.

Note

We recommend you update the firmware using PROFIBUS DP.

8.5 IM151-1 HIGH FEATURE interface module (6ES7 151-1BA00-0AB0)

Order number

6ES7 151-1BA00-0AB0

Features

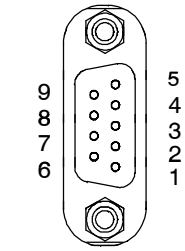
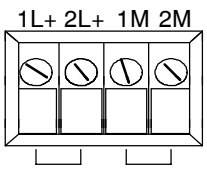
The IM151-1 HIGH FEATURE interface module has the following features:

- It connects the ET 200S with the PROFIBUS DP
- It prepares the data for the electronic modules and motor starters that are fitted.
- It supplies the backplane bus.
- It can be synchronized with the DP cycle (clocking).
- The firmware can be updated via PROFIBUS DP using HWCONFIG.
- The PROFIBUS DP address of the ET 200S can be set by means of switches.
- If the 24 VDC power supply is disconnected, the IM151-1 HIGH FEATURE interface module is also disconnected.
- The maximum address space is 244 bytes for inputs, and 244 bytes for outputs.
- The reference potential M of the rated supply voltage of the IM151-1 HIGH FEATURE to the rail (protective conductor) is connected by means of an RC combination, thus permitting an ungrounded configuration.
- Operation as a DPV0 slave.
  - Acyclic data exchange (read/write data record): class 2 services
- Operation as a DPV1 slave.
  - Acyclic data exchange (read/write data record): class 2 services and class 1 services
  - Diagnostics Interrupts
  - Process Alarms
  - Removal/Insertion Interrupt
- A maximum of 63 modules can be operated with the IM151-1 HIGH FEATURE.
- The maximum bus length is 1 m.

Terminal assignment

The following table shows the terminal assignment of the IM151-1 HIGH FEATURE interface module for the 24 VDC voltage supply and PROFIBUS DP:

Table 8-9 Terminal assignment of the IM151-1 HIGH FEATURE interface module

View	Signal name		Name
	1	-	-
	2	-	-
	3	RxD/TxD-P	Data line B
	4	RTS	Request To Send
	5	M5V2	Data reference potential (station)
	6	P5V2	Supply plus (station)
	7	-	-
	8	RxD/TxD-N	Data line A
	9		
	1L+		24 VDC
	2L+		VDC (for loop through)
	1M		Chassis ground
	2M		Ground (for loop through)

Block diagram

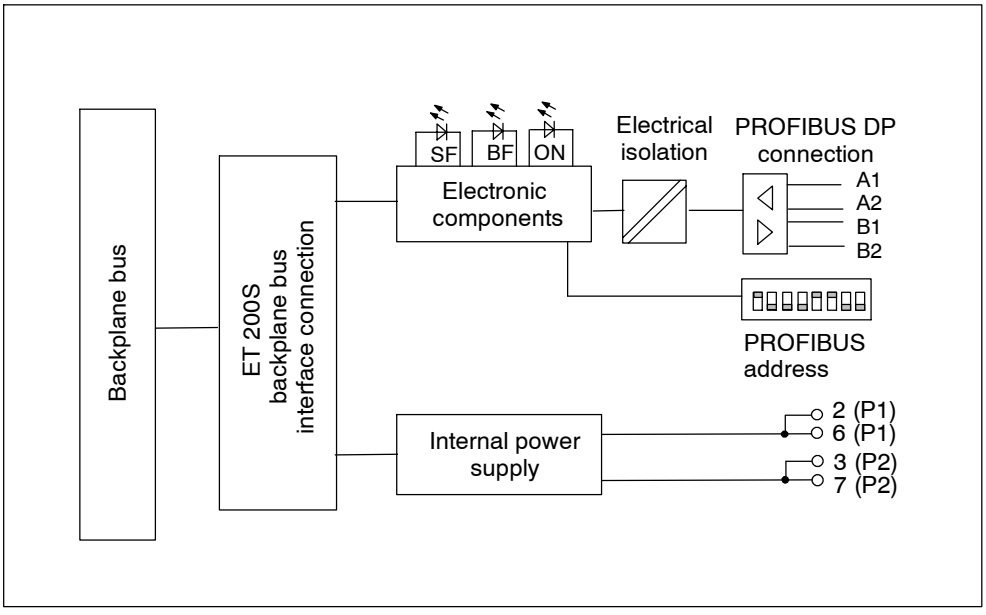


Figure 8-4 Block diagram for the IM151-1 HIGH FEATURE interface module

Technical specifications

Dimensions and weight	
Dimensions W x H x D (mm)	45 x 119.5 x 75
Weight	Approx. 150 g
Module-specific data	
Data transfer rate	9,6; 19,2; 45,45; 93s,75; 187,5; 500 kbps, 1,5 ; 3; 6; 12 Mbps
Bus protocol	PROFIBUS DP
Interface	RS 485
SYNC capability	Yes
FREEZE capability	Yes
Manufacturer's ID	$80E0_H$
Direct Data Exchange	Yes
Clock synchronization	Yes[1)]
Max. output current of the PROFIBUS DP interface (5, 6)	80 mA
Voltages, currents, electrical potentials	
Rated supply voltage of the electronic components (1L+)	24 VDC
• Polarity reversal protection	Yes
• Power failure bypass	min. 20 ms
Electrical isolation	
• Between the backplane bus and electronic components	No
• Between the PROFIBUS DP and electronic components	Yes
• Between the supply voltage and electronic components	No
Permitted potential difference (to the rail)	75 VDC, 60 VAC
Insulation tested with	500 VDC
Current consumption from rated supply voltage (1L+)	Approx. 200 mA
Power dissipation of the module	Typical 3.3 W
Status, interrupts, diagnostics	
Interrupts	Yes
Diagnostics function	Yes
• Group error	red LED "SF"
• PROFIBUS DP bus monitoring	red LED "BF"
• Monitoring of the power supply of the electronic system	green LED "ON"

1) from 1.5 Mbps

Updating the firmware of the IM151-1 HIGH FEATURE

Properties

- As of STEP 7 V5.1, ServicePack 3, you can update the firmware of the IM151-1 HIGH FEATURE.
- To update the firmware you receive files (*.UPD) with the current firmware.

Prerequisites

- The IM151-1 HIGH FEATURE in the station whose firmware is to be updated must be accessible online.
- The files with the current firmware version must be available in the file system of your programming device or PC.

Procedure

The STEP 7 online help system provides information on how to proceed.

Note

We recommend you update the firmware using PROFIBUS DP.

Restrictions when operating the modules with the IM 151 HIGH FEATURE

The following modules cannot be used with the IM 151 HIGH FEATURE:

Module	Up to order number	Up to product version
1Count 24V/100kHz	6ES7 138-4DA02-0AB0	1
1Count 5V/500kHz	6ES7 138-4DE00-0AB0	1
1SSI	6ES7 138-4DB00-0AB0	3
EM 1STEP 5V/204kHz	6ES7 138-4DC00-0AB0	3
1SI serial interface module	6ES7 138-4DF00-0AB0	1
Modbus/USS serial interface module	6ES7 138-4DF10-0AB0	1
2AI U; HIGH FEATURE	6ES7 134-4LB00-0AB0	1
2AI I 2/4DMU; HIGH FEATURE	6ES7 134-4MB00-0AB0	1
2AO U; HIGH FEATURE	6ES7 135-4LB00-0AB0	1

8.6 IM151-3 PN interface module (6ES7 151-3AA00-0AB0)

Order number

6ES7 151-3AA00-0AB0

Features

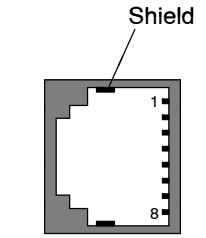
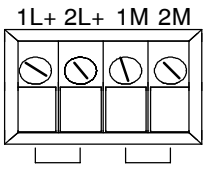
The IM151-3 PN interface module has the following features:

- It connects the ET 200S with the PROFINET IO
- It prepares the data for the electronic modules and motor starters that are fitted.
- It supplies the backplane bus.
- It manages import of the device name and backup on MMC
- Updating firmware via MMC
- The maximum address size is 256 bytes.
- The reference potential M of the rated supply voltage of the IM151 3 PN to the rail (protective conductor) is connected by means of an RC combination, thus permitting an ungrounded configuration.
- It supports Ethernet services
  - PROFINET I/O
  - Network diagnostics (SNMP)
- Interrupts
  - Diagnostics Interrupts
  - Process Alarms
  - Insert/remove module interrupts
- A maximum of 63 modules can be operated with the IM151-3 PN.
- The maximum bus length at the backplane bus is 2 m.

Terminal assignment

The following table shows the terminal assignment of the IM151 3 PN interface module for the 24 VDC voltage supply and PROFINET IO:

Table 8-10 Terminal assignment of the IM151 3 PN interface module

View	Signal name		Name
	1	TD	Transmit Data +
	2	TD_N	Transmit Data -
	3	RD	Receive Data +
	4	GND	Ground
	5	GND	Ground
	6	RD_N	Receive Data -
	7	GND	Ground
	8	GND	Ground
	1L+		24 VDC
	2L+		VDC (for loop through)
	1M		Chassis ground
	2M		Ground (for loop through)

Block diagram

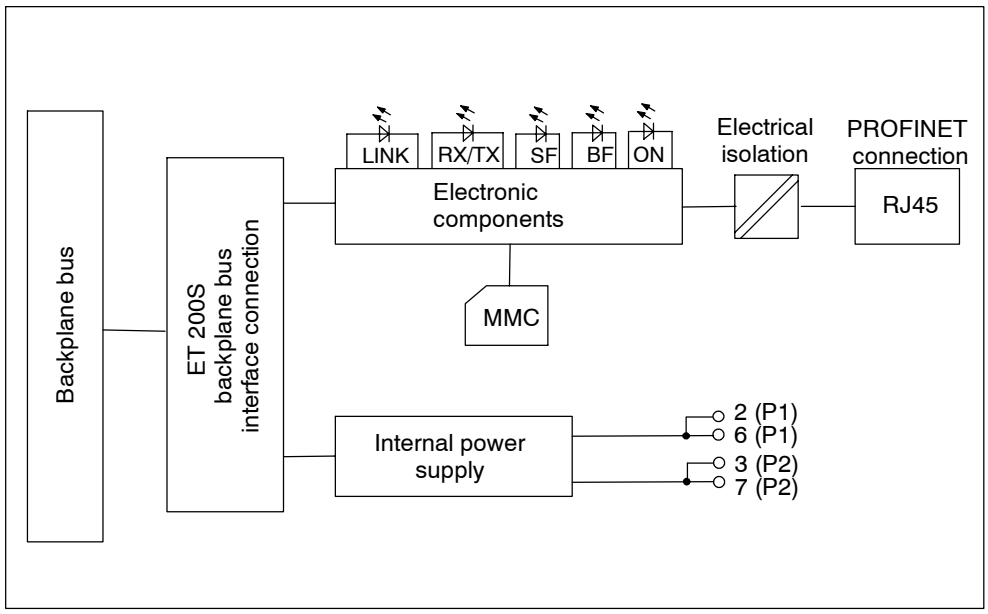


Figure 8-5 Block diagram for the IM151-3 PN interface module

Technical specifications

Dimensions and weight	
Dimensions W x H x D (mm)	45 x 119.5 x 75
Weight	Approx. 135 g
Module-specific data	
Data transfer rate	100 Mbps full duplex
Transmission procedure	100BASE-TX
Autonegotiation	Yes
Bus protocol	PROFINET I/O
It supports Ethernet services	PROFINET IO (device), TCP/IP Protocol Suite: • Network management functions • ping • arp Network diagnostics (SNMP)
PROFINET interface	RJ45
Manufacturer ID (VendorID)	$002A_H$
Device ID (DeviceID)	0301_H
Voltages, currents, electrical potentials	
Rated supply voltage of the electronic components (1L+)	24 VDC
• Polarity reversal protection	Yes
• Power failure bypass	min. 20 ms
Electrical isolation	
• Between the backplane bus and electronic components	No
• Between the backplane bus and electronic components	Yes
• Between the supply voltage and electronic components	No
Permitted potential difference (to the rail)	75 VDC, 60 VAC
Insulation tested with	500 VDC
Current consumption from rated supply voltage (1L+)	Approx. 200 mA
Power dissipation of the module	Approx. 2 W
Status, interrupts, diagnostics	
Interrupts	Yes
Diagnostics function	Yes
• Group error	red LED ”SF”
• Bus monitoring PROFINET IO	red LED ”BF”
• Monitoring of the power supply of the electronic system	green LED ”ON”
• Existing connection to network	Green ”LINK” LED
• Transmitting/ receiving over network	Yellow ”RX/TX” LED

SIMATIC Micro Memory Card

A SIMATIC Micro Memory Card (MMC) is used as the memory medium for the IM151-3 PN. The MMC can be used as a portable data medium.
The following data are saved on the MMC:

- Process-related data (device names)
- Data for a firmware update

Note

You can save **either** process-related data or update data on **one** MMC.

Life of an MMC

The life of an MMC depends on the following major factors:

1. The number of delete or programming cycles
2. External influences, such as the ambient temperature

At an ambient temperature up to 60 ° C, the MMC has a useful life of 10 years at maximum 100,000 deletion and write operations.

Caution

Always ensure that the maximum number of delete/write cycles is not exceeded to prevent data loss.

Available SIMATIC Micro Memory Cards

The following memory modules are available:

Table 8-11 Available MMCs

Type	Order Numbers
MMC 64k	6ES7 953-8LF11-0AA0
MMC 128k	6ES7 953-8LG11-0AA0
MMC 512k	6ES7 953-8LJ11-0AA0
MMC 2M	6ES7 953-8LL11-0AA0
MMC 4M	6ES7 953-8LM11-0AA0
MMC 8M	6ES7 953-8LP11-0AA0

A 64k MMC is enough to save the device name; MMCs from 2 MB and up are required for a firmware update.

Inserting/changing the card

The MMC is designed for removal and insertion under power. The slanted corner of the MMC prevents it from being inserted the wrong way round (reverse voltage protection).

The module slot is behind the front door on the IM151-3. The front door has an extended edge at the bottom for opening.

The module slot has an ejector mechanism for removing the card. Press the ejector mechanism with a small screwdriver or ballpoint pen to eject the card.

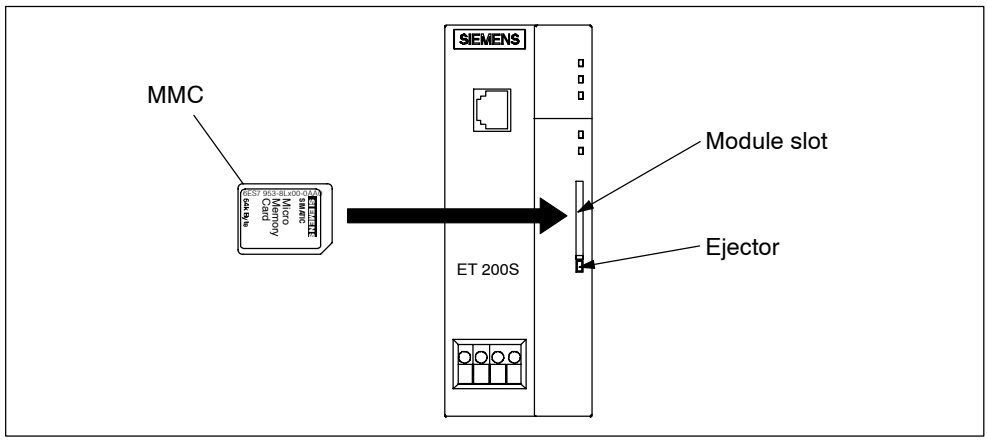


Figure 8-6 Position of the module slot for the MMC card on the IM151-3 PN

Updating the firmware of the IM151-3 PN

Properties

- As of STEP 7 V5.3, ServicePack 1, you can update the firmware of the IM151-3 PN.
- To update the firmware you receive files (*.UPD) with the current firmware.

Procedure

Update the firmware as follows:

Table 8-12 Firmware update with MMC

Step	Proceed as follows:	The following happens in the IM131-3 PN:
1.	Upload update files with *STEP 7* and your programming device to an empty MMC ($\geq$ 2 MB).	–
2.	Switch off power to the IM151-3 PN and insert the MMC with the FW update.	–
3.	Switch on power.	The IM151-3 PN automatically detects the MMC with the FW update and starts the FW update process. During the FW update the SF and BF LEDs are in and the ON LED is off. On completion of the FW update the BF LED flashes at a rate of 0.5 Hz.
4.	Switch off power to the IM151-3 PN and remove the MMC with the FW update.	–
5.	Insert the MMC with the device name and switch on the voltage supply again.	The IM151-3 PN starts up with the new firmware and is then ready for operation.

Restrictions with the operation of the modules with IM 151-3 PN

The following modules cannot be used with the IM 151 PN:

Module	Up to order number	Up to product version
2AO U; HIGH FEATURE	6ES7 135-4LB01-0AB0	3
2AO I; HIGH FEATURE	6ES7 135-4MB01-0AB0	3
1SI serial interface module	6ES7 138-4DF00-0AB0	4
Modbus/USS serial interface module	6ES7 138-4DF10-0AB0	4

Terminal Module

9

Chapter overview

Layout of terminal modules and electronic modules

The following table described which electronic modules you can use on the various terminal modules:

Table 9-1 Assignment of TM-P terminal modules and power modules

Power modules	**TM-P terminal modules for power modules**				
Screw-type term. →	**15S23-A1**	**15S23-A0**	**15S22-01**	**30S44-A0**	**F30S47-F1**
Order number 6ES7193... →	**4CC20-0AA0**	**4CD20-0AA0**	**4CE00-0AA0**	**4CK20-0AA0**	**3RK1 903-3AA00**
Spring terminal: →	**15C23-A1**	**15C23-A0**	**15C22-01**	**30C44-A0**	**---**
Order number 6ES7193... →	**4CC30-0AA0**	**4CD30-0AA0**	**4CE10-0AA0**	**4CK30-0AA0**	
Fast Connect →	**15N23-A1**	**15N23-A0**	**15N22-01**	**---**	**---**
Order number 6ES7193... →	**4CC70-0AA0**	**4CD70-0AA0**	**4CE60-0AA0**		
PM-E 24 VDC	●	●	●		
PM-E 24–48 VDC	●	●	●		
PM-E 24–48 VDC/ 120–230 VDC	●	●	●		
PM-E F pm 24 VDC PROFIsafe*				●	
PM-E F pp 24 VDC PROFIsafe *				●	
PM-D F 24 VDC PROFIsafe *					●

See *ET 200S Fail-Safe Modules manual*

Table 9-2 Assignment of TM-E terminal modules and electronic modules

Electronic modules	**TM-E terminal modules for electronics modules**						
Screw-type term. →	**15S26-A1**	**15S24-A1**	**15S24-01**	**15S23-01**	**15S24-AT**	**30S44-01**	**30S46-A1**
Order number 6ES7193... →	**4CA40-0AA0**	**4CA20-0AA0**	**4CB20-0AA0**	**4CB00-0AA0**	**4CL20-0AA0**	**4CG20-0AA0**	**4CF40-0AA0**
Spring terminal: →	**15C26-A1**	**15C24-A1**	**15C24-01**	**15C23-01**	**15C24-AT**	**30C44-01**	**30C46-A1**
Order number 6ES7193... →	**4CA50-0AA0**	**4CA30-0AA0**	**4CB30-0AA0**	**4CB10-0AA0**	**4CL30-0AA0**	**4CG30-0AA0**	**4CF50-0AA0**
Fast Connect →	**15N26-A1**	**15N24-A1**	**15N24-01**	**15N23-01**	**---**	**---**	**---**
Order number 6ES7193... →	**4CA80-0AA0**	**4CA70-0AA0**	**4CB70-0AA0**	**4CB60-0AA0**			
2DI 24 VDC Standard 2DI 24 VDC High Feature 4DI 24 VDC Standard 4DI 24 VDC High Feature 4DI 24 VDC/SRC Standard	●	●	●	●			
4DI 24–48 VUC High Feature	●	●	●	●			
4DI NAMUR	●	●	●	●			
2DI 120 VAC Standard	●	●	●	●			

Table 9-2 Assignment of TM-E terminal modules and electronic modules, continued

Electronic modules	TM-E terminal modules for electronics modules						
Screw-type term. →	**15S26-A1**	**15S24-A1**	**15S24-01**	**15S23-01**	**15S24-AT**	**30S44-01**	**30S46-A1**
Order number 6ES7193... →	**4CA40-0AA0**	**4CA20-0AA0**	**4CB20-0AA0**	**4CB00-0AA0**	**4CL20-0AA0**	**4CG20-0AA0**	**4CF40-0AA0**
Spring terminal: →	**15C26-A1**	**15C24-A1**	**15C24-01**	**15C23-01**	**15C24-AT**	**30C44-01**	**30C46-A1**
Order number 6ES7193... →	**4CA50-0AA0**	**4CA30-0AA0**	**4CB30-0AA0**	**4CB10-0AA0**	**4CL30-0AA0**	**4CG30-0AA0**	**4CF50-0AA0**
Fast Connect →	**15N26-A1**	**15N24-A1**	**15N24-01**	**15N23-01**	---	---	---
Order number 6ES7193... →	**4CA80-0AA0**	**4CA70-0AA0**	**4CB70-0AA0**	**4CB60-0AA0**			
2DI 230 VAC Standard	●	●	●	●			
2DO 24 VDC/0.5 A Standard 2DO 24 VDC/0.5 A High Feature 4DO 24 VDC/0.5 A Standard	●	●	●	●			
2DO 24 VDC/2 A Standard 2DO 24 VDC/2 A High Feature 4DO 24 VDC/2 A Standard	●	●	●	●			
2DO 24–230 VAC/2 A	●	●	●	●			
2RO NO 24–120 VDC/5 A 24–230 VAC/5 A 2RO NO/NC 24–48 VDC/5 A 24–230 VAC/5 A	●	●	●	●			
2AI U Standard, 2AI U High Feature, 2AI U High Speed	●	●	●	●			
2AI I 2WIRE Standard, 2AI I 2WIRE High Speed	●	●	●	●			
4AI I 2WIRE ST	●		●				
2AI 2/4WIRE High Feature	●		●				
2AI I 4WIRE Standard, 2AI I 4WIRE High Speed	●		●				
2AI RTD Standard	●		●				
2AI RTD High Feature	●	●	●	●			
2AI TC Standard	●	●	●	●			
2AI TC High Feature					●		

Table 9-2 Assignment of TM-E terminal modules and electronic modules, continued

Electronic modules	TM-E terminal modules for electronics modules						
Screw-type term. →	**15S26-A1**	**15S24-A1**	**15S24-01**	**15S23-01**	**15S24-AT**	**30S44-01**	**30S46-A1**
Order number 6ES7193... →	**4CA40-0AA0**	**4CA20-0AA0**	**4CB20-0AA0**	**4CB00-0AA0**	**4CL20-0AA0**	**4CG20-0AA0**	**4CF40-0AA0**
Spring terminal: →	**15C26-A1**	**15C24-A1**	**15C24-01**	**15C23-01**	**15C24-AT**	**30C44-01**	**30C46-A1**
Order number 6ES7193... →	**4CA50-0AA0**	**4CA30-0AA0**	**4CB30-0AA0**	**4CB10-0AA0**	**4CL30-0AA0**	**4CG30-0AA0**	**4CF50-0AA0**
Fast Connect →	**15N26-A1**	**15N24-A1**	**15N24-01**	**15N23-01**	---	---	---
Order number 6ES7193... →	**4CA80-0AA0**	**4CA70-0AA0**	**4CB70-0AA0**	**4CB60-0AA0**			
2AO U Standard 2AO U High Feature	●		●				
2AO I Standard 2AO I High Feature	●	●	●	●			
4 IQ-SENSE	●		●				
1Count 24V/100kHz	●		●				
1Count 5V/500kHz						●	
1SSI	●		●				
EM 1STEP 5V/204kHz	●		●				
2PULSE	●		●				
1POS INC/Digital						●	
1POS INC/Digital						●	
1POS INC/Analog						●	
1POS INC/Analog						●	
1SI 3964/ASCII	●		●				
1SI Modbus/USS	●		●				
4/8 F-DI 24 VDC PROFIsafe*						●	●
4 F-DO 24 VDC/2A PROFIsafe*						●	●
RESERVE (width 15 mm)	●	●	●	●	●		
RESERVE (width 30 mm)						●	●

* See *ET 200S Fail-Safe Modules* manual

9.1 TM-P15S23-A1, TM-P15C23-A1 and TM-P15N23-A1 terminal module; (6ES7 193 4CCx0-0AA0)

Order number

6ES7 193 4CC20-0AA0 (screw-type terminal)
6ES7 193 4CC30-0AA0 (spring terminal)
6ES7 193 4CC70-0AA0 (Fast Connect)

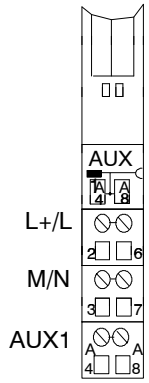
Properties

- Terminal module for power module
- Power supply for a new potential group to the next TM-P terminal module
- Connection with screw-type terminal with TM-P15S23-A1
- Connection with spring terminal with TM-P15C23-A1
- Connection with Fast Connect with TM-P15N23-A1
- 2 x 3 terminals
- Basic wiring of the terminal module
- Build-as-you-go interference conductor from electronics module to standard mounting rail over spring contact
- Inserting a shield connection element
- Continuous AUX1 rail with connection to terminals A4 and A8

Terminal assignment

See the following table for the terminal assignment of the terminal module:

Table 9-3 Terminal assignment of the TM-P15S23-A1, TM-P15C23-A1 and TM-P15N23-A1 terminal module

View	Terminal		Name
	2	L+/L	Rated load voltage for inserted power module and associated potential group
	3	M/N	
	A4	AUX1	Any terminal for PE or potential rail up to maximum rated load voltage of the module
	6	L+/L	Rated load voltage for inserted power module and associated potential group
	7	M/N	
	A8	AUX1	Any terminal for PE or potential rail up to maximum rated load voltage of the module

Block diagram

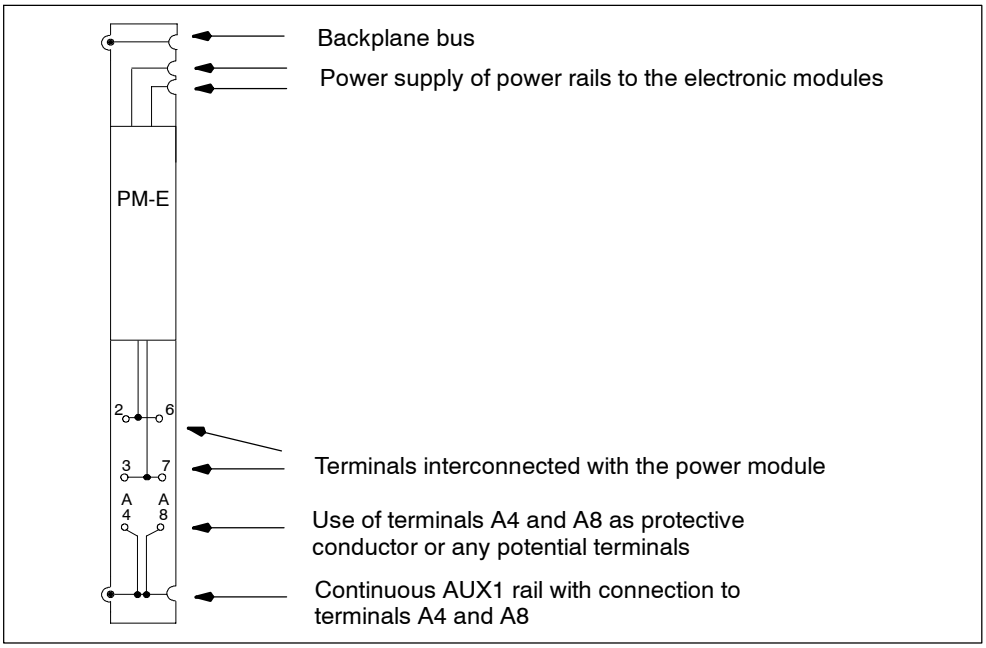


Figure 9-1 Terminal assignment of the TM-P15S23-A1, TM-P15C23-A1 and TM-P15N23-A1 terminal module

Technical data

Dimensions and weight	
Dimensions W x H x D (mm) • Screw-type/spring terminal • Fast Connect	 15 x 132 x 43 15 x 162 x 43
Weight	Approx. 65g
Module-specific data	
Number of terminals	2 x 3

9.2 TM-P15S23-A0, TM-P15C23-A0 and TM-P15N23-A0 terminal module; (6ES7 193-4CDx0-0AA0)

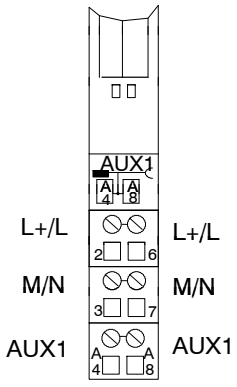
Order number

6ES7 193-4CD20-0AA0 (screw-type terminal)
6ES7 193-4CD30-0AA0 (spring terminal)
6ES7 193-4CD70-0AA0 (Fast Connect)

Properties

- Terminal module for power module
- Power supply for a new potential group to the next TM-P terminal module
- Connection with screw-type terminal with TM-P15S23-A0
- Connection with spring terminal with TM-P15C23-A0
- Connection with Fast Connect with TM-P15N23-A0
- 2 x 3 terminals
- Basic wiring of the terminal module
- Build-as-you-go interference conductor from electronics module to standard mounting rail over spring contact
- Inserting a shield connection element
- Interrupted AUX1 rail with connection to terminals A4 and A8

Table 9-4 Terminal assignment of the TM-P15S23-A0, TM-P15C23-A0 and TM-P15N23-A0 terminal module

View	Terminal		Name
	2	L+/L	Rated load voltage for inserted power module and associated potential group
	3	M/N	
	A4	AUX1	Any terminal for PE or potential rail up to the maximum rated load voltage of the module
	6	L+/L	Rated load voltage for inserted power module and associated potential group
	7	M/N	
	A8	AUX1	Any terminal for PE or potential rail up to the maximum rated load voltage of the module

Block diagram

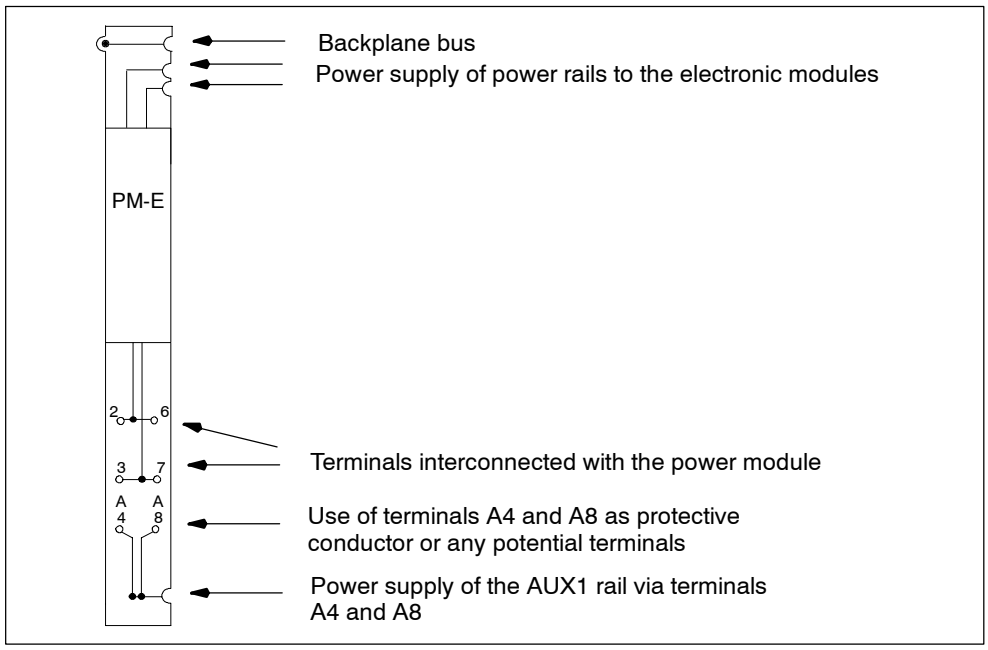


Figure 9-2 Block diagram of the TM-P15S23-A0, TM-P15C23-A0 and TM-P15N23-A0 terminal module

Technical data

Dimensions and weight	
Dimensions W x H x D (mm)	
• Screw-type/spring terminal	15 x 132 x 43
• Fast Connect	15 x 162 x 43
Weight	Approx. 65g
Module-specific data	
Number of terminals	2 x 3

9.3 TM-P15S22-01, TM-P15C22-01 and TM-P15N22-01 terminal module; (6ES7 193-4CEx0-0AA0)

Order number

6ES7 193-4CE00-0AA0 (screw-type terminal)
6ES7 193-4CE10-0AA0 (spring terminal)
6ES7 193-4CE60-0AA0 (Fast Connect)

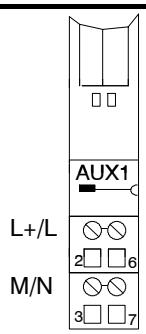
Properties

- Terminal module for power module
- Power supply for a new potential group to the next TM-P terminal module
- Connection via screw-type terminal with TM-P15S22-01
- Connection via spring terminal with TM-P15C22-01
- Connection with Fast Connect with TM-P15N22-01
- 2 x 2 terminals
- Basic wiring of the terminal module
- Build-as-you-go interference conductor from electronics module to standard mounting rail over spring contact
- Inserting a shield connection element
- Uninterrupted AUX1 bus without a connection to the terminals

Terminal assignment

See the following table for the terminal assignment of the terminal module:

Table 9-5 Terminal assignment to the TM-P15S22-01, TM-P15C22-01 and TM-P15N22-01 terminal module

View	Signal name		Name
	2	L+/L	Rated load voltage for inserted power module and associated potential group
	3	M/N	
	6	L+/L	Rated load voltage for inserted power module and associated potential group
	7	M/N	

Block diagram

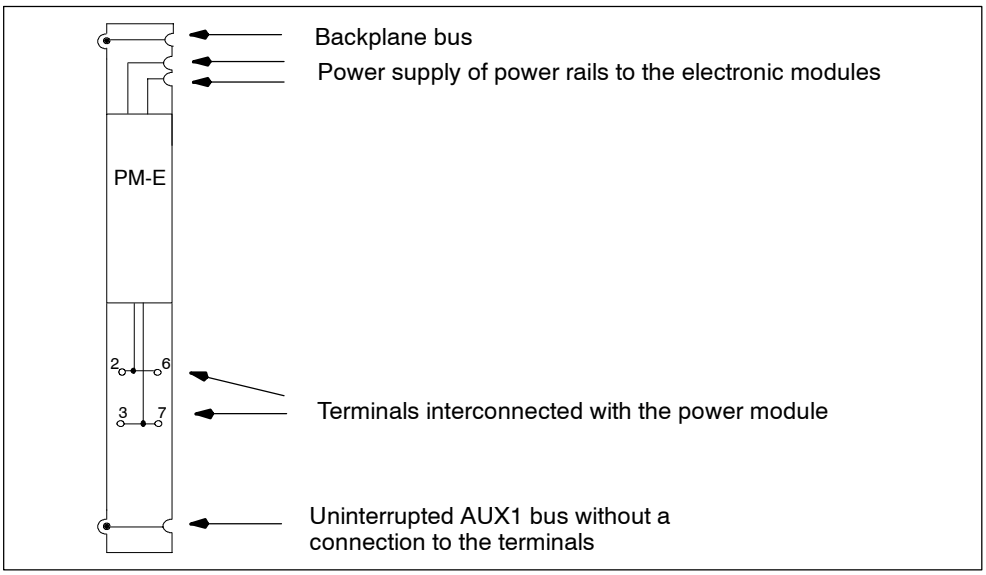


Figure 9-3 Block diagram of the TM-P15S22-01, TM-P15C22-01 and TM-P15N22-01 terminal module

Technical data

Dimensions and weight	
Dimensions W x H x D (mm)	15 x 119.5 x 43
• Screw-type/spring terminal	15 x 142 x 43
• Fast Connect	
Weight	Approx. 55g
Module-specific data	
Number of terminals	2 x 2

9.4 TM-P30S44-A0 and TM-P30C44-A0 terminal module; (6ES7 193-4CKx0-0AA0)

Order number

6ES7 193-4CK20-0AA0 (screw-type terminal)
6ES7 193-4CK30-0AA0 (spring terminal)

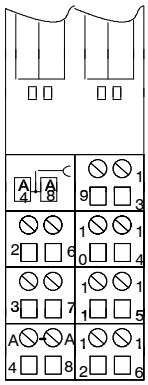
Properties

- Terminal module for fail-safe PM-E F 24 VDC PROFIsafe power module
- Power supply for new potential group to the next TM-P terminal module
- Wiring is possible for fail-safe digital output of the PM-E F DC 24V PROFIsafe
- Prewiring possible
- Build-as-you-go interference conductor from electronics module to standard mounting rail over spring contact
- Inserting a shield connection element
- Interrupted AUX1 rail with connection to terminals A4 and A8

Terminal assignment

See the following table for the terminal assignment of the terminal module:

Table 9-6 Terminal assignment of the TM-P30S44-A0 and TM-P30C44-A0 terminal module

View	Terminal		Name
	2	24 VDC	24 VDC load voltage for: inserted power module, associated potential group. DO 0 and DO 1 and P1 and P2 potential rails
	3	M	Chassis ground
	A4	AUX 1	Any terminal for PE or potential rail up to the maximum rated load voltage of the module
	6	24 VDC	24 VDC load voltage for: inserted power module, associated potential group. DO 0 and DO 1 and P1 and P2 potential rails
	7	M	Chassis ground
	A8	AUX 1	Any terminal for PE or potential rail up to the maximum rated load voltage of the module
	9	DO 0 P	Terminals for fail-safe digital output 0 (P-M switching)
	10	DO 0 M	
	11	DO 2 P	Terminals (relay contacts) for fail-safe switching of the P1 and P2 potential rails. P1 and P2 can also be used as DO 2 M and DO 2 P (for wiring diagram see *ET 200S Manual, Fail-safe Modules).*
	12	DO 2 M	
	13	DO 1 P	Terminals for fail-safe digital output 0 (P-M switching)
	14	DO 1 M	
	15	DO 2 P	Terminals (relay contacts) for fail-safe switching of the P1 and P2 potential rails. P1 and P2 can also be used as DO 2 M and DO 2 P (for wiring diagram see *ET 200S Manual, Fail-safe Modules).*
	16	DO 2M	

Caution

If high currents are encountered at DO 2 P and DO 2 M, terminals 11 and 15 (DO 2 P) and 12 and 16 (DO 2 M) must be wired in parallel.
Otherwise terminal overheating caused by the current load cannot be excluded.

Block diagram

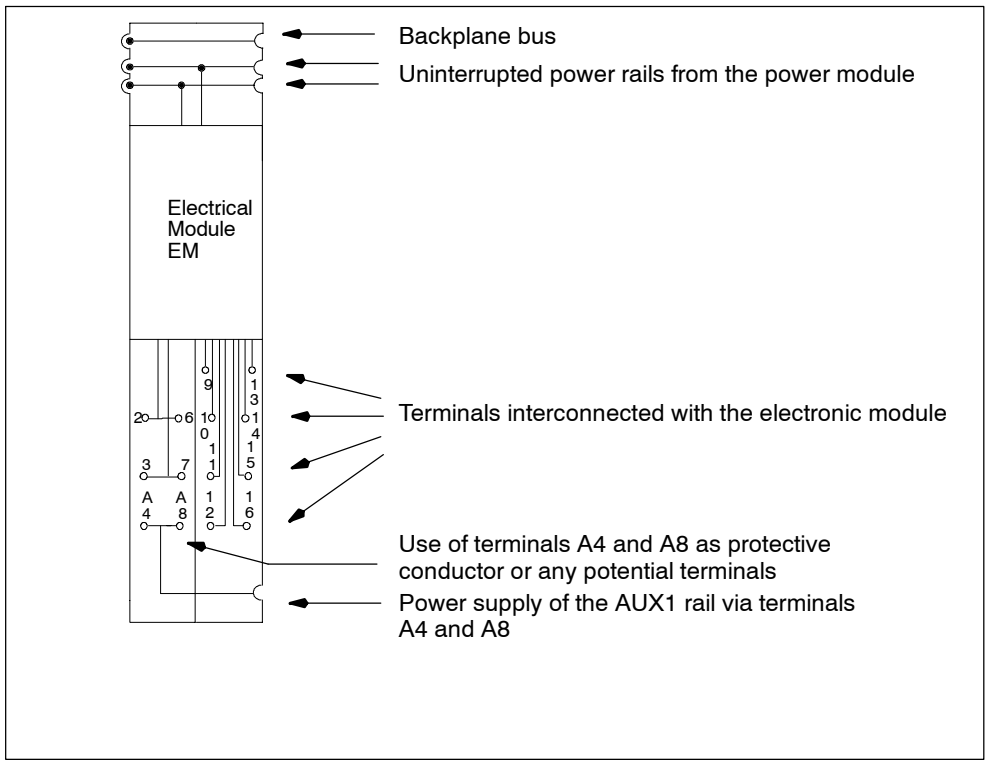


Figure 9-4 Block diagram of the TM-P30S44-A0 and TM-P30C44-A0 terminal module

Technical data

Dimensions and weight	
Dimensions W x H x D (mm)	30 x 132 x 43
Weight	Approx. 116 g (TM-P30S44-A0) Approx. 100 g (TM-P30C44-A0)
Module-specific data	
Number of terminals	14

Description of the PM-E F DC 24V PROFIsafe power module

The description of the PM-E F DC 24V PROFIsafe power module, which can be used with the above terminal modules, can be found in the *ET 200S Distributed I/O System Fail-safe Modules* manual.

9.5 TM-PF30S47-F1 terminal module (for PM-D F DC 24V); (3RK1 903-3AA00)

Order number

3RK1 903-3AA00 (screw-type terminal)

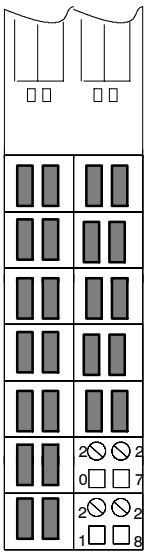
Properties

- Terminal module for fail-safe PM-D F 24 VDC PROFIsafe power module
- Power supply for a new potential group to the next TM-P terminal module
- Basic wiring of the terminal module
- Build-as-you-go interference conductor from electronics module to standard mounting rail over spring contact
- Inserting a shield connection element
- Uninterrupted AUX1 bus without a connection to the terminals

Terminal assignment

See the following table for the terminal assignment of the terminal module:

Table 9-7 Terminal assignment of the TM-PF30S47-F1 terminal module

View	Terminal		Name
	20	24 VDC	24 VDC rated load voltage: for inserted power module and SG 1 to SG 6 and U 1 potential rails
	21	M	Chassis ground
	27	24 VDC	24 VDC rated load voltage: for inserted power module and SG 1 to SG 6 and U 1 potential rails
	28	M	Chassis ground

Block diagram

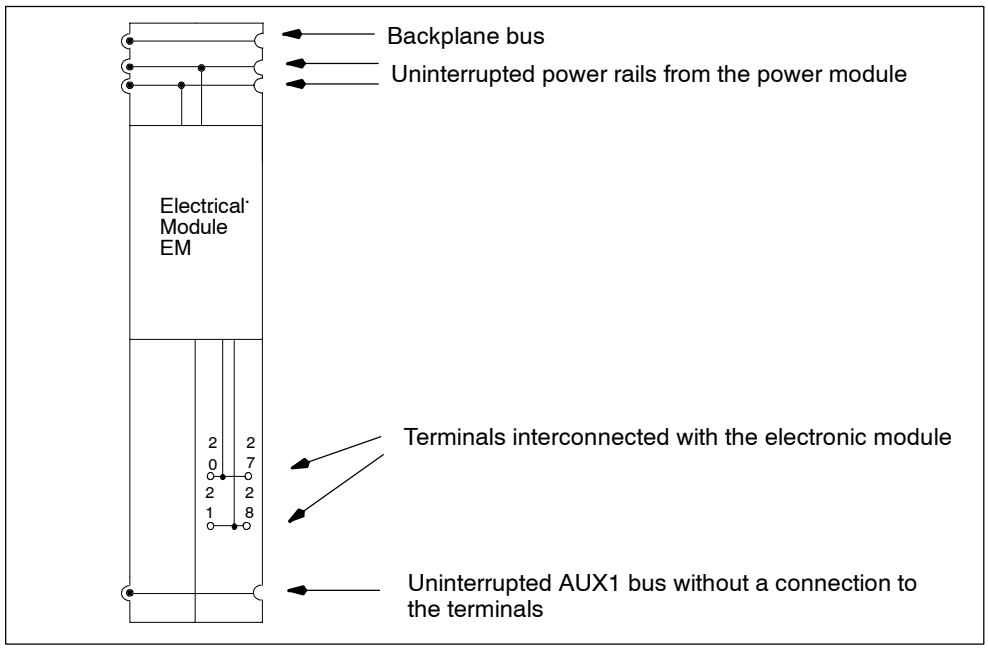


Figure 9-5 Block diagram of the TM-PF30S47-F1 terminal module

Technical data

Dimensions and weight	
Dimensions W x H x D (mm)	30 x 196.5 x 102
Weight	Approx. 300g
Module-specific data	
Number of terminals	4

9.6 TM-E15S26-A1, TM-E15C26-A1 and TM-E15N26-A1 universal terminal module; (6ES7 193-4CAx0-0AA0)

Order number

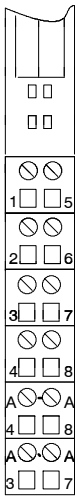
6ES7 193-4CA40-0AA0 (screw-type terminal)
6ES7 193-4CA50-0AA0 (spring terminal)
6ES7 193-4CA80-0AA0 (Fast Connect)

Properties

- Universal terminal module for the electronic modules
- Connection with screw-type terminal with TM-E15S26-A1
- Connection with spring terminal with TM-E15C26-A1
- Connection with Fast Connect with TM-E15N26-A1
- 2 x 6 terminals
- Basic wiring of the terminal module
- Build-as-you-go interference conductor from electronics module to standard mounting rail over spring contact
- Inserting a shield connection element
- Uninterrupted AUX1 rail with connection to terminals A4, A8 and A3, A7

Terminal assignment

- Terminal assignment of the TM-E15S26-A1, TM-E15C26-A1 and TM-E15N26-A1 terminal module with the 4-channel digital electronic modules:

View	Terminal		Name
	1	DI_0/DO_0	DI: Digital input DO: Digital output 24 VDC: Sensor supply M : Load power supply ground
	2	DI_2/DO_2	
	3	24 VDC for DI_0/ M for DO_0	
	4	24 VDC for DI_2/ M for DO_2	
	5	DI_1/DO_1	
	6	DI_3/DO_3	
	7	24 VDC for DI_1/ M for DO_1	
	8	24 VDC for DI_3/ M for DO_3	
	A4	AUX1 bus fed through. Connection to terminals A4, A8 and A3, A7.	
	A3		
	A8		
	A7		

- Terminal assignment of the TM-E15S26-A1, TM-E15C26-A1 and TM-E15N26-A1 terminal module with the 2-channel electronic modules and process-related modules:

  The terminal assignment of terminals 1 to 8 corresponds to the TM-E15S24-01, TM-E15C24-01 or TM-E15N24-01 terminal module. See the technical specifications for the various electronic modules for the different terminal assignments.

  For the terminal assignment of terminals A4, A8 and A3, A7 see the table above.

Block diagram

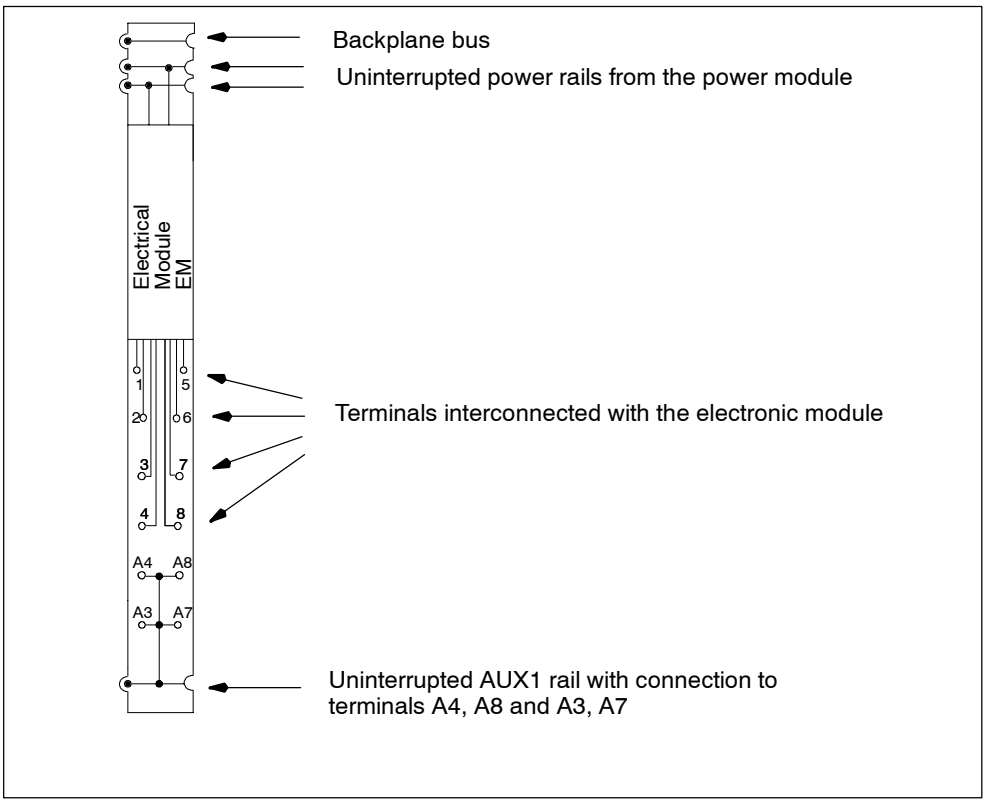


Figure 9-6 Block diagram of the TM-E15S26-A1, TM-E15C26-A1 and TM-E15N26-A1 terminal module

Technical data

Dimensions and weight	
Dimensions W x H x D (mm)	
• Screw-type/spring terminal	15 x 157 x 43
• Fast Connect	15 x 202 x 43
Weight	Approx. 70 g (TM-E15C26-A1) Approx. 83 g (TM-E15S26-A1) Approx. 95 g (TM-E15N26-A1)
Module-specific data	
Number of terminals	2 x 6

9.7 TM-E15S24-A1, TM-E15C24-A1 and TM-E15N24-A1 terminal module; (6ES7 193-4CAx0-0AA0)

Order number

6ES7 193-4CA20-0AA0 (screw-type terminal)
6ES7 193-4CA30-0AA0 (spring terminal)
6ES7 193-4CA70-0AA0 (Fast Connect)

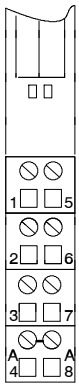
Properties

- Terminal modules for electronic modules
- Connection with screw-type terminal with TM-E15S24-A1
- Connection with spring terminal with TM-E15C24-A1
- Connection with Fast Connect with TM-E15N24-A1
- 2 x 4 terminals
- Basic wiring of the terminal module
- Build-as-you-go interference conductor from electronics module to standard mounting rail over spring contact
- Inserting a shield connection element
- Continuous AUX1 rail with connection to terminals A4 and A8

Terminal assignment

See the following table for the terminal assignment of the terminal module:

Table 9-8 Terminal assignment of the TM-E15S24-A1, TM-E15C24-A1 and TM-E15N24-A1 terminal module

View	Terminal		Name
	1	The assignment depends on the inserted electronic module	
	2		
	3		
	A4	AUX1	Any terminal for PE or potential rail up to the maximum rated load voltage of the module
	5	The assignment depends on the inserted electronic module	
	6		
	7		
	A8	AUX1	Any terminal for PE or potential rail up to the maximum rated load voltage of the module

Block diagram

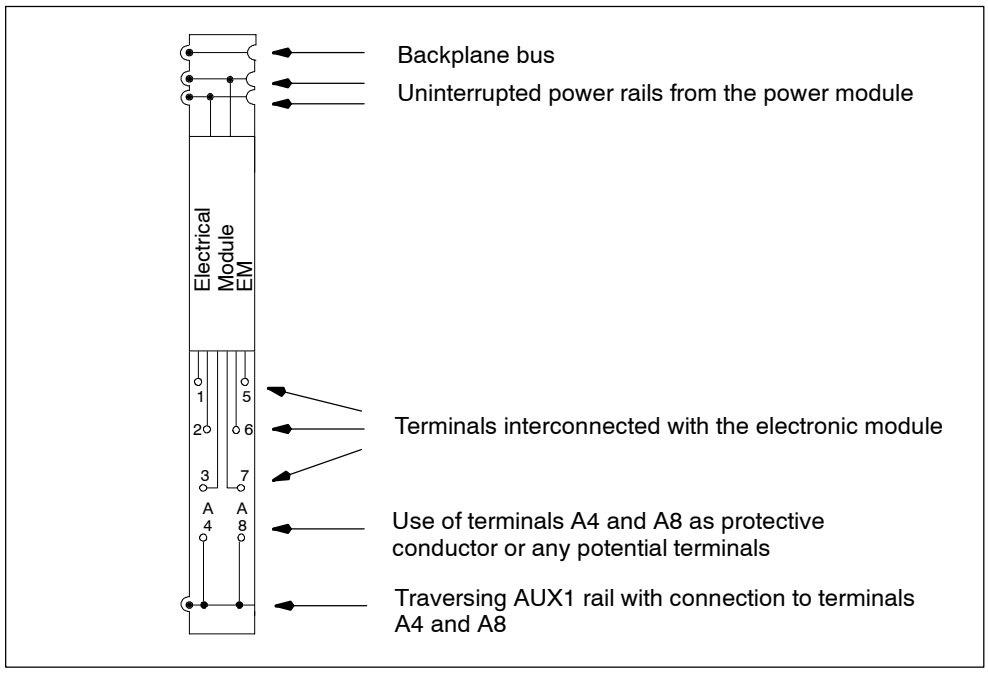


Figure 9-7 Block diagram of the TM-E15S24-A1, TM-E15C24-A1 and TM-E15N24-A1 terminal module

Technical data

Dimensions and weight	
Dimensions W x H x D (mm)	
• Screw-type/spring terminal	15 x 132 x 43
• Fast Connect	15 x 162 x 43
Weight	Approx. 65 g (TM-E15S24-A1 and TM-E15C24-A1) Approx. 72g (TM-E15N24-A1)
Module-specific data	
Number of terminals	2 x 4

9.8 TM-E15S24-01, TM-E15C24-01 and TM-E15N24-01 terminal module; (6ES7 193-4CBx0-0AA0)

Order number

6ES7 193-4CB20-0AA0 (screw-type terminal)
6ES7 193-4CB30-0AA0 (spring terminal)
6ES7 193-4CB70-0AA0 (Fast Connect)

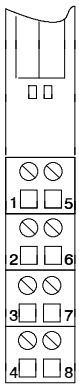
Properties

- Terminal modules for electronic modules
- Connection via screw-type terminal with TM-P15S24-01
- Connection via spring terminal with TM-P15C24-01
- Connection with Fast Connect with TM-P15N24-01
- 2 x 4 terminals
- Basic wiring of the terminal module
- Build-as-you-go interference conductor from electronics module to standard mounting rail over spring contact
- Inserting a shield connection element
- Traversing AUX1 rail without connection to terminals 4 and 8

Terminal assignment

See the following table for the terminal assignment of the terminal module:

Table 9-9 Terminal assignment of the TM-E15S24-01, TM-E15C24-01 and TM-E15N24-01 terminal module

View	Terminal	Name
	1	The assignment depends on the inserted electronic module No access to AUX1 rail. Terminals that are not used by the electronic module can be used for attaching terminal wires that are not required. This means that the approved potential corresponds to the potential of the electronic module in use.
	2	
	3	
	4	
	5	
	6	
	7	
	8	

Block diagram

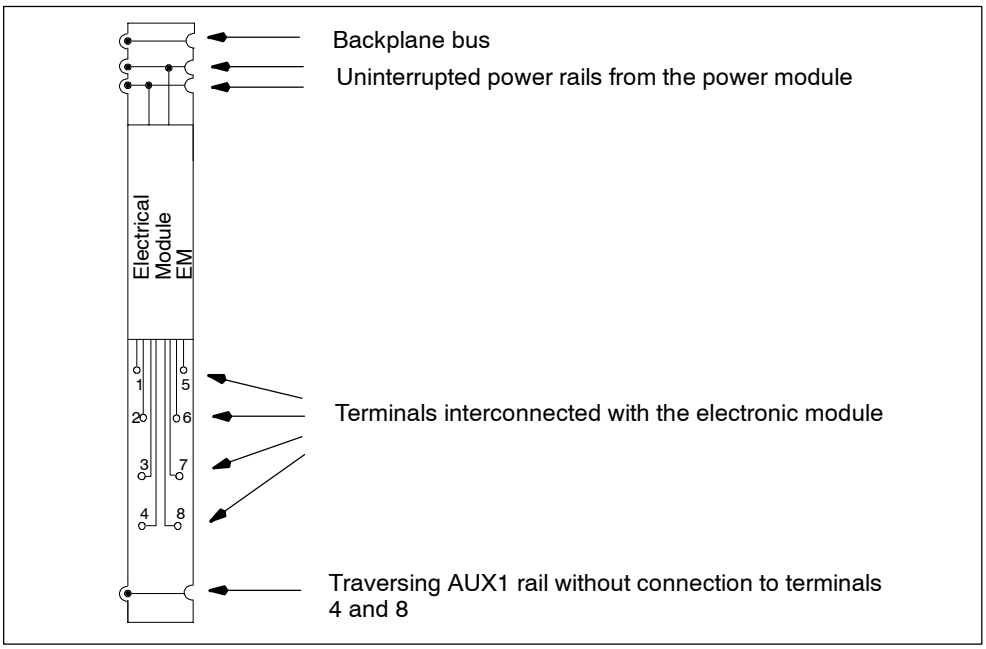


Figure 9-8 Block diagram of the TM-E15S24-01, TM-E15C24-01 and TM-E15N24-01 terminal module

Technical data

Dimensions and weight	
Dimensions W x H x D (mm)	15 x 132 x 43
• Screw-type/spring terminal	15 x 162 x 43
• Fast Connect	
Weight	Approx. 65 g (TM-E15S24-01 and TM-E15C24-01) Approx. 72 g (TM-E15N24-01)
Module-specific data	
Number of terminals	2 x 4

9.9 TM-E15S23-01, TM-E15C23-01 and TM-E15N23-01 terminal module; (6ES7 193-4CBx0-0AA0)

Order number

6ES7 193-4CB00-0AA0 (screw-type terminal)
6ES7 193-4CB10-0AA0 (spring terminal)
6ES7 193-4CB60-0AA0 (Fast Connect)

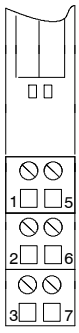
Properties

- Terminal modules for electronic modules
- Connection via screw-type terminal with TM-E15S23-01
- Connection via spring terminal with TM-E15C23-01
- Connection with Fast Connect with TM-E15N23-01
- 2 x 3 terminals
- Basic wiring of the terminal module
- Build-as-you-go interference conductor from electronics module to standard mounting rail over spring contact
- Inserting a shield connection element
- Uninterrupted AUX1 bus without a connection to the terminals

Terminal assignment

See the following table for the terminal assignment of the terminal module:

Table 9-10 Terminal assignment of the TM-E15S23-01, TM-E15C23-01 and TM-E15N23-01 terminal module

View	Terminal	Name
	1	The assignment depends on the inserted electronic module
	2	
	3	No access to AUX1 rail.
	5	
	6	
	7	

Block diagram

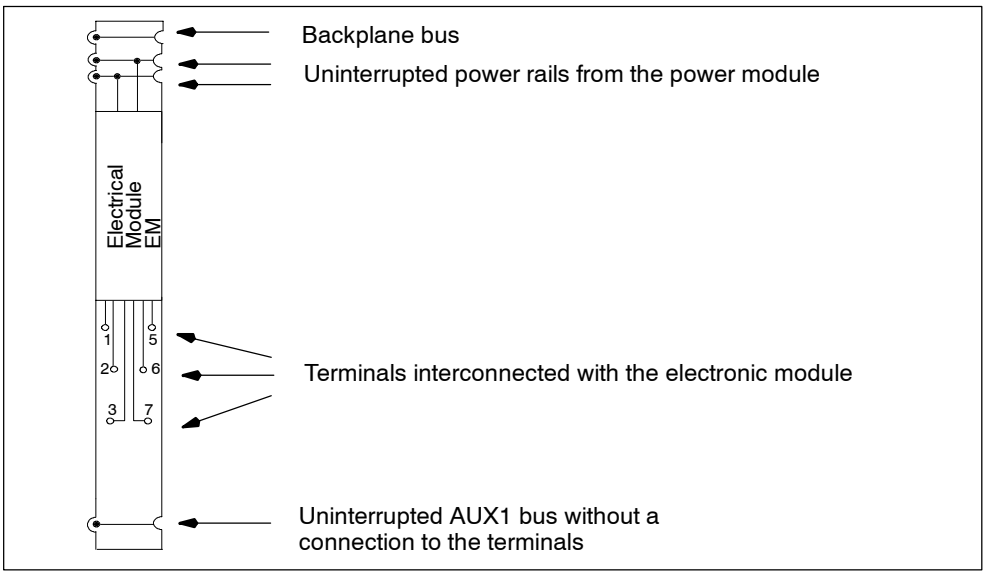


Figure 9-9 Block diagram of the TM-E15S23-01, TM-E15C23-01 and TM-E15N23-01 terminal module

Technical data

Dimensions and weight	
Dimensions W x H x D (mm)	15 x 120 x 43
• Screw-type/spring terminal	15 x 142 x 43
• Fast Connect	
Weight	Approx. 55 g (TM-E15S23-01 and TM-E15C23-01) Approx. 60 g (TM-E15N23-01)
Module-specific data	
Number of terminals	2 x 3

9.10 TM-E15S24-AT and TM-E15C24-AT terminal module; (6ES7 193-4CLx0-0AA0)

Order number

6ES7 193-4CL20-0AA0 (screw-type terminal)
6ES7 193-4CL30-0AA0 (spring terminal)

Properties

- Terminal module for electronic module 2AI TC High Feature

Caution

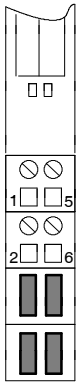
Only the 2AI TC High Feature electronic module can be attached to the TM-E15S24-AT / TM-E15C24-AT terminal module. If a different electronic module is attached, the internal reference junction of the terminal module may be destroyed.

- The terminal module has an internal reference junction for temperature compensation. This enables temperature compensation directly at the reference junction of the thermal element.
- Connection with screw-type terminal with TM-E15S24-AT
- Connection with spring terminal with TM-E15C24-AT
- 2 x 2 terminals
- Basic wiring of the terminal module
- Build-as-you-go interference conductor from electronics module to standard mounting rail over spring contact
- Inserting a shield connection element
- Traversing AUX1 rail without connection to terminals 4 and 8

Terminal assignment

See the following table for the terminal assignment of the terminal module:

Table 9-11 Terminal assignment of the TM-E15S24-AT and TM-E15C24-AT terminal module

View	Terminal	Name
	1	Assignment: see 2AI TC High Feature electronic module
	2	
	3	not available
	4	
	5	Assignment: see 2AI TC High Feature electronic module
	6	
	7	not available
	8	

Block diagram

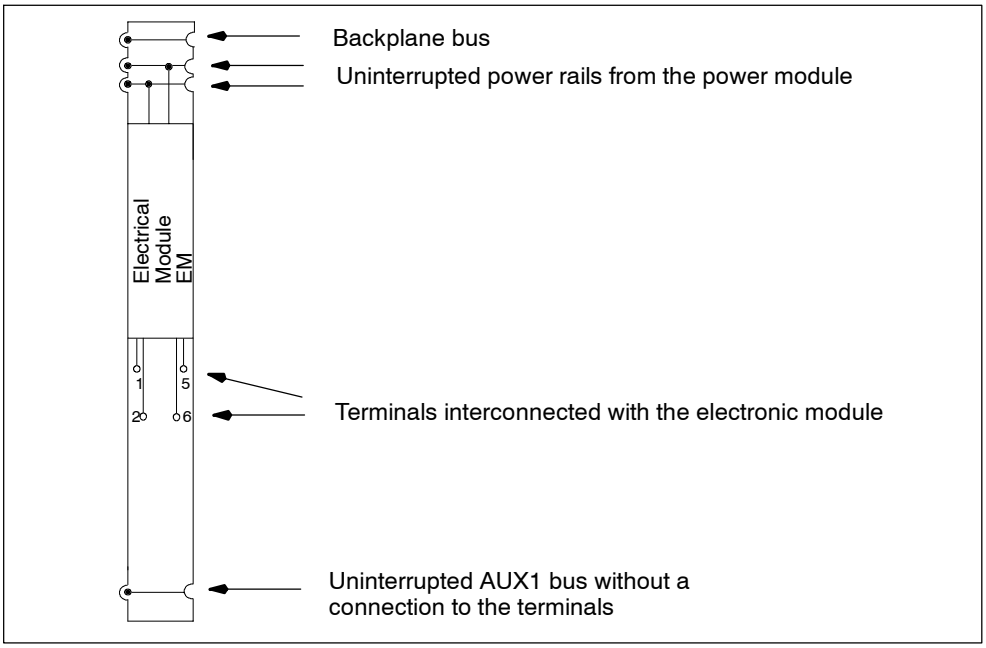


Figure 9-10 Block diagram of the TM-E15S24-AT and TM-E15C24-AT terminal module

Technical data

Dimensions and weight	
Dimensions W x H x D (mm)	15 x 132 x 43
Weight	Approx. 55g
Module-specific data	
Number of terminals	2 x 2

Note

For the precision information on the internal reference junction see Section 12.17

9.11 TM-E30S44-01 and TM-E30C44-01 terminal module; (6ES7 193-4CGx0-0AA0)

Order number

6ES7 193-4CG20-0AA0 (screw-type terminal)
6ES7 193-4CG30-0AA0 (spring terminal)

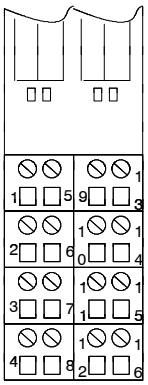
Properties

- Terminal module for electronic modules 30 mm installation width and fail-safe electronic modules
- Connection via screw-type terminal with TM-E30S44-01
- Connection via spring terminal with TM-E30C44-01
- 4 x 4 terminals
- Basic wiring of the terminal module
- Build-as-you-go interference conductor from electronics module to standard mounting rail over spring contact
- Inserting a shield connection element
- Traversing AUX1 rail without connection to terminals 4 and 8 or 12 and 16

Terminal assignment

See the following table for the terminal assignment of the terminal module:

Table 9-12 Terminal assignment of the TM-E30S44-01 and TM-E30C44-01 terminal module

View	Terminal	Name
	1	The assignment depends on the inserted electronic module No access to AUX1 rail. Terminals that are not used by the electronic module can be used for attaching terminal wires that are not required. This means that the approved potential corresponds to the potential of the electronic module in use.
	2	
	3	
	4	
	5	
	6	
	7	
	8	
	9	
	10	
	11	
	12	
	13	
	14	
	15	
	16	

Block diagram

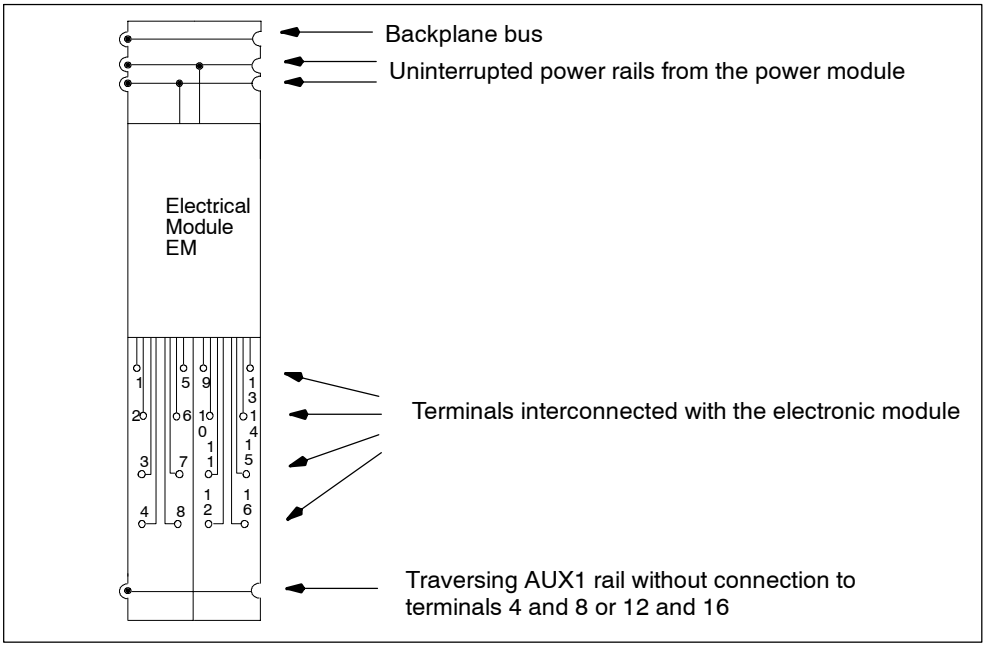


Figure 9-11 Block diagram of the TM-E30S44-01 and TM-E30C44-01 terminal module

Technical data

Dimensions and weight	
Dimensions W x H x D (mm)	30 x 132 x 43
Weight	Approx. 110 g (TM-E30C44-01) Approx. 125 g (TM-E30S44-01)
Module-specific data	
Number of terminals	4 x 4

9.12 TM-E30S46-A1 and TM-E30C46-A1 terminal module; (6ES7 193-4CFx0-0AA0)

Order number

6ES7 193-4CF40-0AA0 (screw-type terminal)
6ES7 193-4CF50-0AA0 (spring terminal)

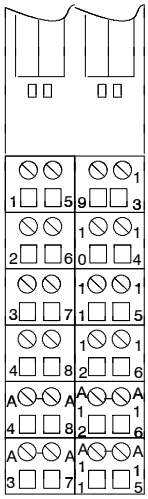
Properties

- Terminal module for fail-safe 4/8 F-DI DC 24 V PROFIsafe and 4 F-DO DC 24 V/2A PROFIsafe electronic module.
- Connection with screw-type terminal with TM-E30S46-A1
- Connection with spring terminal with TM-E30C46-A1
- 6 x 4 terminals
- Basic wiring of the terminal module
- Build-as-you-go interference conductor from electronics module to standard mounting rail over spring contact
- Inserting a shield connection element
- Uninterrupted AUX1 rail with connection to terminals A4, A8, A3, A7 or A12, A16, A11, A15.

Terminal assignment

See the following table for the terminal assignment of the terminal module:

Table 9-13 Terminal assignment of the TM-E30S46-A1 and TM-E30C46-A1 terminal module

View	Terminal	F-DI	F-DO	Name
	1	DI 0	DO 0 P	DI: Digital input DO P and DO M: Terminal for fail-safe digital output (P-M switching) Vs1: internal encoder power supply 1 for DI 0 to DI 3 Vs2: internal encoder power supply 2 for DI 4 to DI 7
	2	Vs1	DO 0 M	
	3	DI 2	–	
	4	Vs1	–	
	5	DI 1	DO 1 P	
	6	Vs1	DO 1 M	
	7	DI 3	–	
	8	Vs1	–	
	9	DI 4	DO 2 P	
	10	Vs2	DO 2 M	
	11	DI 6	–	
	12	Vs2	–	
	13	DI 5	DO 3 P	
	14	Vs2	DO 3 M	
	15	DI 7	–	
	16	Vs 2	–	
	A4, A3, A8, A7	AUX1		AUX1 bus fed through. Connection to terminals A4, A8 and A3, A7.
	A12; A11, A16, A15	AUX1		AUX1 bus fed through. Connection to terminals A12, A11 and A16, A15.

Block diagram

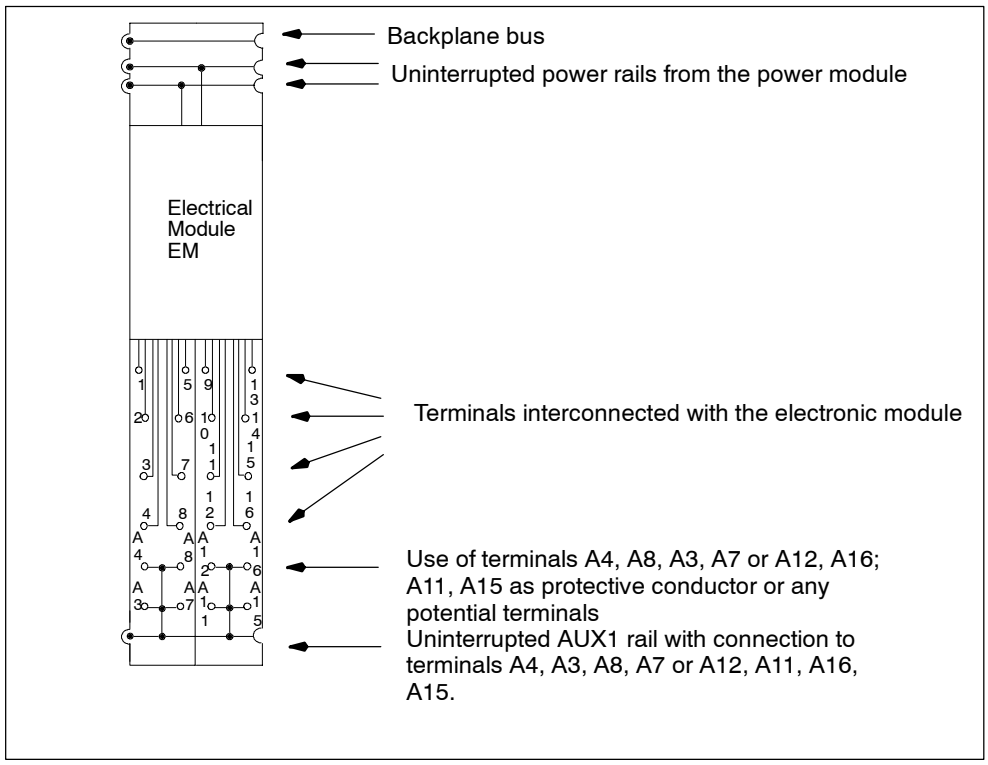


Figure 9-12 Block diagram of the TM-E30S46-A1 and TM-E30C46-A1 terminal module

Technical data

Dimensions and weight	
Dimensions W x H x D (mm)	30 x 157 x 43
Weight	Approx. 158 g (TM-E30S46-A1) Approx. 131 g (TM-E30C46-A1)
Module-specific data	
Number of terminals	6 x 4

Description of the electronic modules

For the description of the F-DI DC 24V PROFIsafe and 4 F-DO DC 24V/2A PROFIsafe electronic modules 4/8 that can be used with the above terminal modules see the *ET 200S Distributed I/O System Fail-safe Modules* manual.

Power modules

10

Chapter overview

10.1 Parameters for power modules

Parameter

The following table describes the parameters for the power modules.

Table 10-1 Parameters for power modules

Power module			Value range	Default settings	Effective range
PM E 24 VDC	**PM-E 24-48 VDC**	**PM-E 24-48 VDC/ 24-230 VAC**			
Diagnostics: No load voltage	Diagnostics: No load voltage	Diagnostics: No load voltage	Disable/ enable	disable	Power module
---	---	Diagnosis: fuse cases	Disable/ enable	disable	Power module
---	---	Voltage type	DC/AC	DC	Power module

Diagnosis: Load voltage not present

The parameter is used to enable a diagnostic message as a result of no load voltage.

If there is no load voltage only the diagnostic message from the affected power module is sent to the DP master. The SF error LEDs of all modules in the affected potential group are lit.

Diagnosis: fuse cases

The parameter is used to enable a diagnostic message as a result of fuse cases.

If there is a fuse problem only the diagnostic message from the affected power module is sent to the DP master. The SF error LEDs of all modules in the affected potential group are lit.

Voltage type

This parameter is used to select the load voltage that is connected to the power module: direct voltage or alternating voltage.

This enables the correct diagnosis if there is no load voltage or if there is a fuse problem.

10.2 PM-E 24 VDC power module (6ES7 138-4CA00-0AA0)

Order number

6ES7 138-4CA00-0AA0

Properties

- The PM-E 24 VDC power module monitors the supply voltage for all electronics modules which are part of the potential group. The supply voltage is supplied via the TM-P terminal module
- All electronic modules can be inserted in the potential group of the PM-E 24 VDC power module, except for 2DI AC120V ST, 2DI AC230V ST and 2DO 24–230 VAC/1 A.

Caution

Only apply the specified rated load voltage of 24 VDC to the TM-P terminal module of the power module.

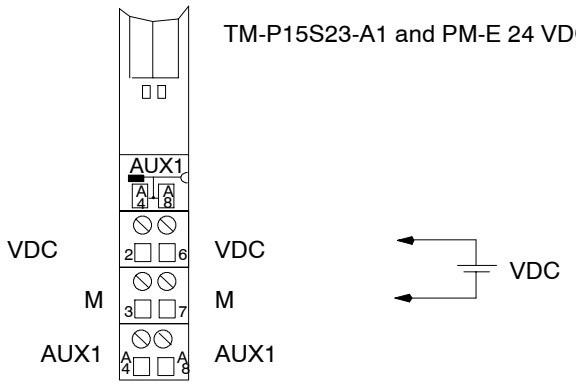
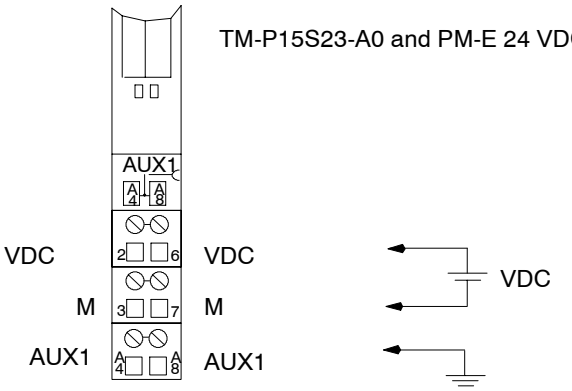
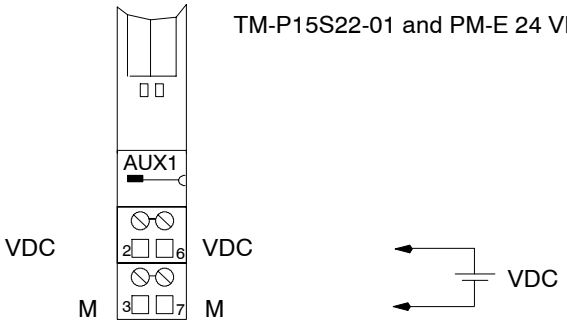
The rated load voltage applied must correspond to the power supply of the electronic modules in the potential group.

- The current status of the power module is saved in the process image of the inputs (PII) via the status byte. The update is independent of enabling the ”No load voltage” diagnosis (see Appendix C).

Terminal assignment

The following table shows the terminal assignment of the PM-E 24 VDC power module for the various terminal modules:

Table 10-2 Terminal assignment of the PM-E 24 VDC power module

View	Terminal assignment	Remarks
	TM-P15S23-A1 and PM-E 24 VDC	24 VDC: Rated load voltage M : Chassis ground AUX1: can be used as protective conductor terminal or any potential rail up to the total load voltage.
	TM-P15S23-A0 and PM-E 24 VDC	24 VDC: Rated load voltage M : Chassis ground AUX1: can be used as protective conductor terminal or any potential rail up to the total load voltage. AUX1 is used as PE.
	TM-P15S22-01 and PM-E 24 VDC	24 VDC: Rated load voltage M : Chassis ground

Block diagram

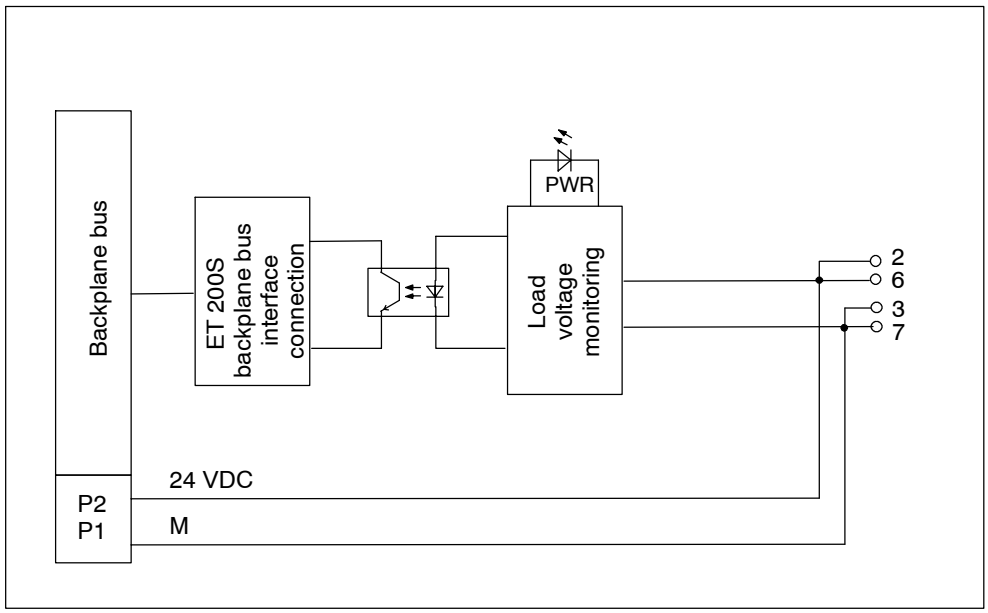


Figure 10-1 Block diagram of the PM-E 24 VDC power module

Technical data

Dimensions and weight	
Dimensions W x H x D (mm)	15 x 81 x 52
Weight	Approx. 35g
Voltages, currents, electrical potentials	
Rated load voltage	24 V DC
• Overvoltage protection	No
Fusing with external miniature circuit-breakers	yes, tripping characteristic C
max. current carrying capacity (up to 60 °C)	10A
• Short-circuit protection	No
Electrical isolation	
• Between rated load voltage and backplane bus	Yes
• Between the power modules	Yes
Insulation tested with	500 V DC
Current consumption	
• From load voltage L+ (without load)	max. 4mA (164 ft)
Power loss of the module	Typ. 100 mW

Status, interrupts, diagnostics	
Diagnostics function	Yes
• Group error	red LED ”SF”
• Rated load voltage monitoring	Green LED ”PWR”
• Reading of diagnostic data	Yes

10.3 PM-E 24-48 VDC power module (6ES7 138-4CA50-0AA0)

Order number

6ES7 138-4CA50-0AA0

Properties

- The PM-E 24–48 VDC power module monitors the supply voltage for all electronics modules which are part of the potential group. The supply voltage is supplied via the TM-P terminal module
- All electronic modules can be inserted in the potential group of the PM-E 24–48 VDC power module, except for 2DI 120 VAC ST, 2DI 230 VAC ST and 2DO 24–230 VAC/1 A.
- Control (PIQ) and feedback interface (PII) in the process image for option handling (see Appendix C).
- The current status of the power module is saved in the process image of the inputs (PII) via the status byte. The update is independent of enabling the ”No load voltage” diagnosis (see Appendix C).
- The PM-E 24–48 VDC power module is suitable for fail-safe modules.

Caution

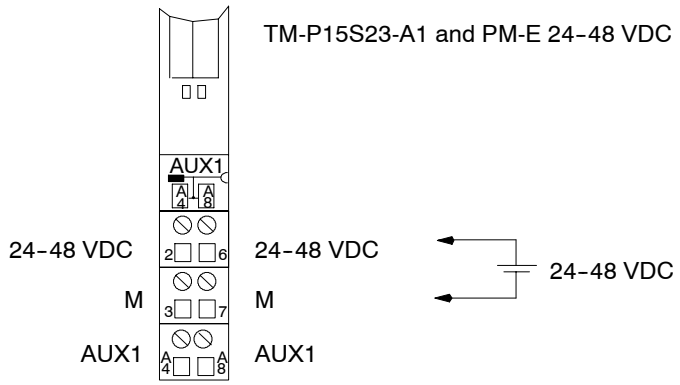
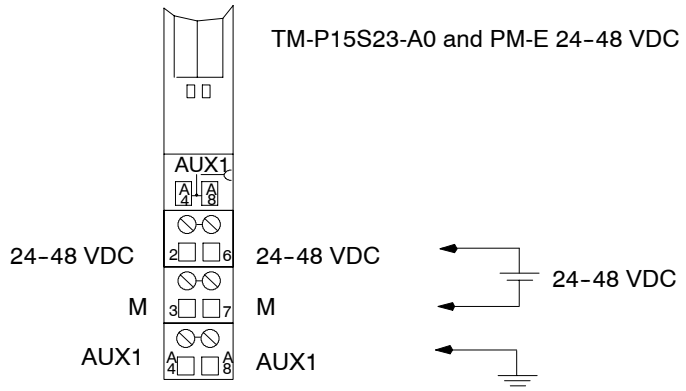
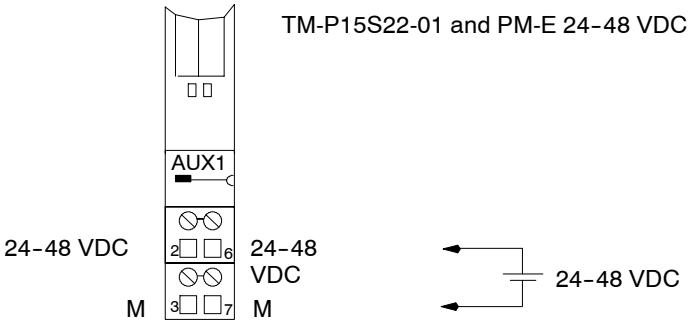
Only apply the specified rated load voltage of 24–48 VDC to the TM-P terminal module of the power module.

The rated load voltage applied must correspond to the power supply of the electronic modules in the potential group.

Terminal assignment

The following table shows the terminal assignment of the PM-E 24–48 VDC power module for the various terminal modules:

Table 10-3 Terminal assignment of the PM-E 24–48 VDC power module

View	Terminal assignment	Remarks
	TM-P15S23-A1 and PM-E 24–48 VDC	24–48 VDC: Rated load voltage M : Chassis ground AUX1: can be used as protective conductor terminal or any potential rail up to the total load voltage.
	TM-P15S23-A0 and PM-E 24–48 VDC	24–48 VDC: Rated load voltage M : Chassis ground AUX1: can be used as protective conductor terminal or any potential rail up to the total load voltage. AUX1 is used as PE.
	TM-P15S22-01 and PM-E 24–48 VDC	24–48 VDC: Rated load voltage M : Chassis ground

Block diagram

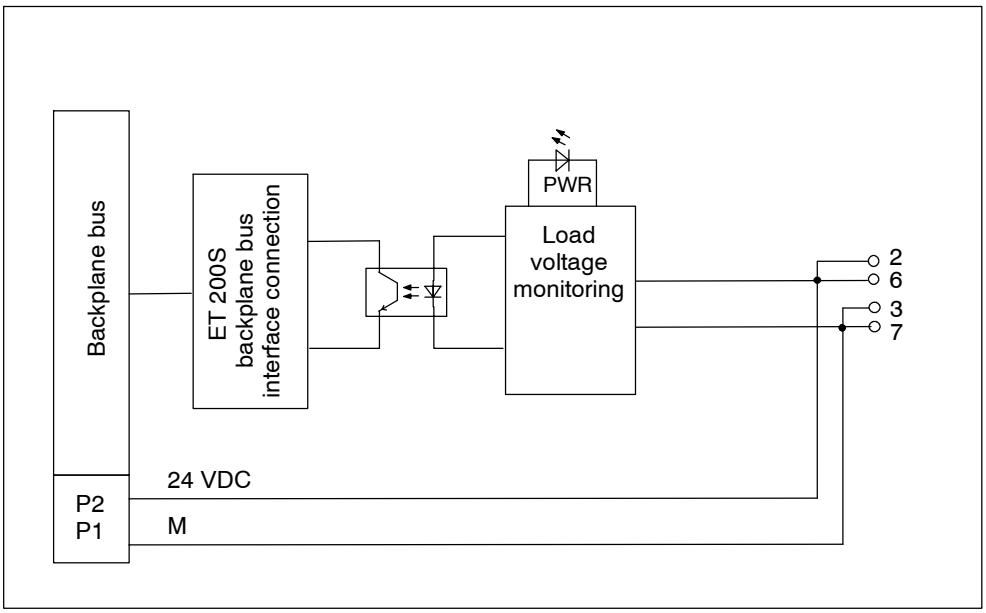


Figure 10-2 Block diagram of the PM-E 24–48 VDC power module

Technical data

Dimensions and weight	
Dimensions W x H x D (mm)	15 x 81 x 52
Weight	Approx. 35g
Voltages, currents, electrical potentials	
Rated load voltage	24–48 VDC
• Polarity reversal protection	Yes
• Overvoltage protection	No
Fusing with external miniature circuit-breakers	yes, tripping characteristic B, C
max. current carrying capacity (up to 60 °C)	10A
• Short-circuit protection	No
Electrical isolation	
• Between rated load voltage and backplane bus	Yes
• Between the power modules	Yes
Insulation tested with	500 V DC
Current consumption	
• From load voltage L+ (without load)	max. 12mA (164 ft)
Power loss of the module	Typ. 500 mW

Status, interrupts, diagnostics	
Diagnostics function	Yes
• Group error	red LED ”SF”
• Rated load voltage monitoring	Green LED ”PWR”
• Reading of diagnostic data	Yes

10.4 PM-E 24-48 VDC/24-230 VAC (6ES7 138-4CB10-0AB0)

Order number

6ES7 138-4CB10-0AB0

Properties

The PME power module 24–48 VDC/24–230 VAC

- monitors the power supply voltage for all the electronic modules in the potential group. The supply voltage is supplied via the TM-P terminal module
- can be used anywhere and can be configured for DC and AC load voltage for operation with every electronic module.
- with the ET 200S is required at least once (right beside the interface module).
- Control (PIQ) and feedback interface (PII) in the process image for option handling (see Appendix C).
- The current status of the power module is saved in the process image of the inputs (PII) via the status byte. The update is independent of enabling the ”No load voltage” diagnosis (see Appendix C).
- is also fitted with a removable fuse (5 x 20 mm).

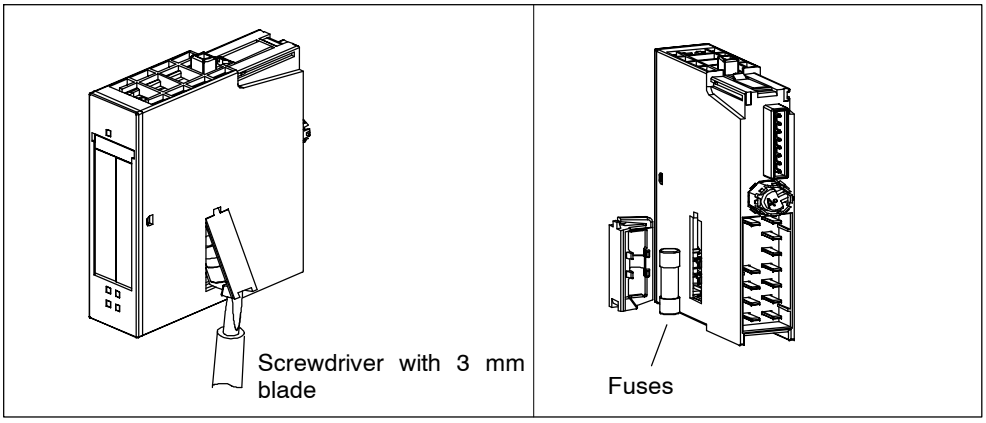


Figure 10-3 Replacing fuse

Note

The PM-E 24–48 VDC/24–230 VAC power module (6ES7 138-4CB10-0AB0) is not a direct replacement for the device with the order number 6ES7 138-4CB00-0AB0 for AC applications, because either AC or DC power supply must be specified. The new module is a direct replacement with DC applications, because the default for the new parameter is ”DC”. If you wish to use the 6ES7 138-4CB00-0AB0 device for AC applications, a new hardware configuration must be set up and the value ”AC” must be specified for the ”Load voltage type” parameter.

If the hardware configuration is not changed for AC applications, the SF status LED remains on continuously. If the ”Lo load voltage” diagnostic alarm is activated, multiple interrupts are activated in every AC cycle. However, the electronic modules connected to the potential group of this PM-E operate normally.

Terminal assignment

The following table shows the terminal assignment of the PM-E 24–48 VDC/24–230 VAC power module for the various terminal modules:

Table 10-4 Terminal assignment of the PM-E 24–48 VDC/24–230 VAC power module

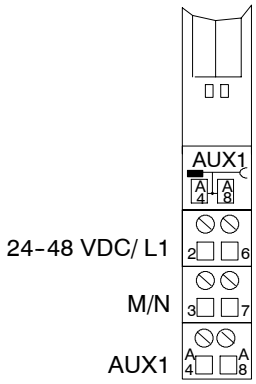
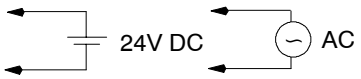
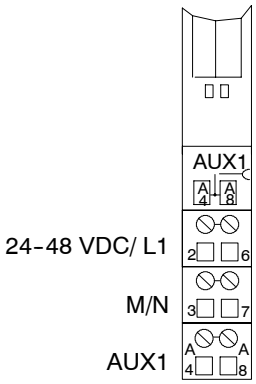
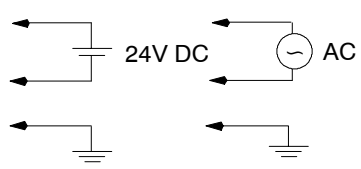
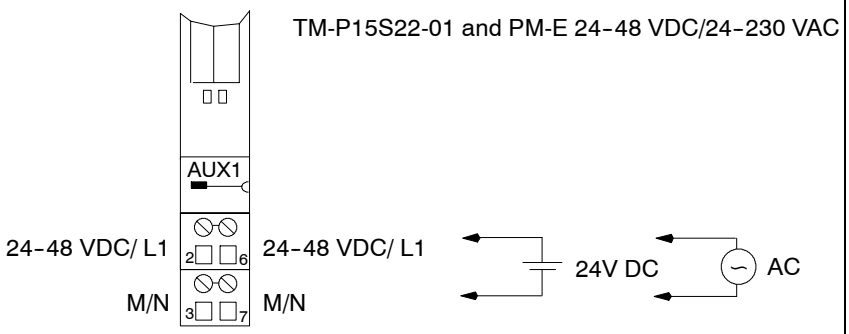
View	Terminal assignment	Remarks
 TM-P15S23-A1 and PM-E 24–48 VDC/24–230 VAC 		24–48 VDC/ L1: Rated load voltage M/ N: Ground/neutral conductor AUX1: can be used as protective conductor terminal or any potential rail up to the total load voltage.
 TM-P15S23-A0 and PM-E 24–48 VDC/24–230 VAC 		24–48 VDC/ L1: Rated load voltage M/ N: Ground/neutral conductor AUX1: can be used as protective conductor terminal or any potential rail up to the total load voltage. AUX1 is used as PE.

Table 10-4 Terminal assignment of the PM-E 24–48 VDC/24–230 VAC power module, continued

View	Terminal assignment	Remarks
		24–48 VDC/ L1: Rated load voltage M/ N: Ground/neutral conductor

Block diagram

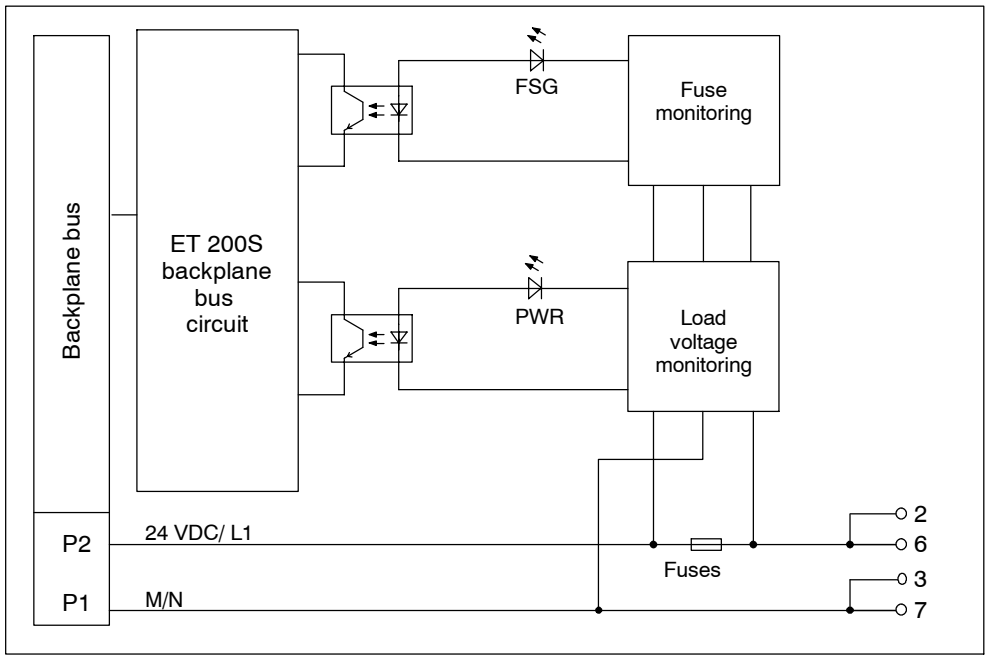


Figure 10-4 Block diagram of the PM-E 24–48 VDC/24–230 VAC power module

Technical data

Dimensions and weight	
Dimensions W x H x D (mm)	15 x 81 x 52
Weight	34g
Voltages, currents, electrical potentials	
Rated load voltage	24–56.7 VDC 24–48 VAC/ 120 V/230 VAC
• Overvoltage protection	Yes
Max. current capacity	10A
• for 24–56.7 VDC	to 30°C: max. 10A (164 ft) to 40°C: max. 9A (164 ft) to 60°C: max. 7A (164 ft)
• for 24–48/120/230 VAC	to 30°C: max. 8A (164 ft) to 40°C: max. 7A (164 ft) to 60°C: max. 5A (164 ft)
• Short-circuit protection	yes, IEC 127-2/1, 250 V, 10 A, fast-acting fuse (5 x 20 mm), replaceable[1)]
Electrical isolation	
• Between rated load voltage and backplane bus	Yes
• Between the power modules	Yes
Insulation tested with	1500 VAC
Current consumption	
From the backplane bus	max. 9.5mA (164 ft)
• From load voltage L1/L+ (without load)	max. 9mA (164 ft)
Power loss of the module	Max. 5W

Status, alarms, diagnostics	
Diagnostics function	Yes
• Group error	red LED ”SF”
• Rated load voltage monitoring	Green LED ”PWR”
• Fuses	Green LED ”FSG”
• Reading of diagnostic data	Yes

1) The fuses on this module are only auxiliary fuses; external overcurrent protection (suitable for branch circuits depending on the local electrotechnical regulations) is required in the power supply cables of the load current circuit.

Digital Electronic Modules

11

Introduction

The range of the digital electronic modules (EM) includes input and output modules for 24 VDC. Input and output modules are also available for 120/230 VAC.

A relay module is used for switching voltages for AC and DC.

Chapter overview

11.1 Parameters for digital electronic modules

Parameters for digital input modules

Table 11-1 Parameters for digital input modules

2DI 24 VDC High Feature	4DI 24 VDC High Feature	4DI 24-48 VUC High Feature	2DI/4DI 24 VDC Standard 4DI 24 VDC/SRC Standard 2DI 120 VAC Standard 2DI 230 VAC Standard	Value range	Default setting	Effective range
Hardware interrupt[3]		---	---	• disable • enabled	disable	Module
---		Diagnostic alarm	---	• disable • enabled	disable	Module
Input delay[1]		---	---	• 0.1 ms • 0.5 ms • 3 ms • 15 ms	3 ms	Module
Diagnosis: Short circuit as per M[2]		---	---	• disable • enabled	disable	Module
---		Diagnosis: wire break[4]	---	• disable • enabled	disable	Module
---		Diagnosis: Fuse defect	---	• disable • enabled	disable	Module
---		Diagnosis: no load voltage	---	• disable • enabled	disable	Module
Trigger for process interrupt, rising edge[3]	Trigger for process interrupt, rising edge[3]	---	---	• disable • enabled	disable	Channel 0
						Channel 1
---						Channel 2
						Channel 3

1) The input delay applies to ”0” after ”1” and to ”1” after ”0”
2) Short circuit of the sensor supply
3) Configurable only with IM151-1 HIGH FEATURE and IM151-7 CPU interface module
4) If the wire-break test is enabled, all free inputs must be stabilized so they do not trigger a module wire break. This requires a resistor between terminal 24/48 V (3, A4, 7, A8) and the free input. The resistor must supply an input current of at least 0.5 mA (see ”Sensor circuit” in the technical specifications table). This ensures that sufficient current will flow to prevent wire-break detection.
When switched off the sensor must supply at least 0.5 mA (otherwise a wire-break will be detected when switched off). Alternatively a resistor can be installed parallel to the sensor terminals (current must be at least 0.5 mA).

Parameters for 4DI NAMUR

Table 11-2 Parameters for 4DI NAMUR

4DI NAMUR	Value range	Default setting	Effective range
Diagnostic alarm	• enabled • disable	disable	Module
Sensor type	• Channel disabled • NAMUR sensor • Single contact without load resistance • Single contact with 10 kΩ with load resistance • NAMUR changeover contact • Changeover contact without load resistance • Changeover contact with 10 kΩ with load resistance	disable	Channel
Pulse stretching	• No • 0.5 s • 1 s • 2 s	No	Channel
Diagnostics No sensor power supply	• enabled • disable	disable	Module
Wire break diagnostics	• enabled • disable	disable	Channel
Short-circuit diagnostics	• enabled • disable	disable	Channel
Flutter monitoring: Monitoring window[1)]	• 0.5 s • 1 s to 100s (can be set in 1 s increments)	0.5 s	Channel
Flutter monitoring: Number of signal changes	• disable • 2 to 31	disable	Channel

1) Parameters can only be set if the number of signal changes for flutter monitoring is enabled

Parameters for digital output modules

Table 11-3 Parameters for digital output modules

2DO 24 VDC/ 0.5A High Feature	2DO 24-230 VAC/ 1A	2RO NO NC 24-48 VDC/5 A 24-230 VAC/5 A	2DO/ 4DO 24 VDC/ 0.5 A ST	Value range	Default setting	Effective range
2DO 24 VDC/ 2A High Feature	2RO NO 24-120 VDC/ 5 A 24-230 VAC/ 5 A		2DO/ 4DO 24 VDC/ 2 A ST			
Response at CPU/master STOP			---	• apply substitute value • hold last value	apply substitute value	Module
Substitute value [1]			---	• ”0” • ”1”	”0”	Channel
---				• disable • enabled	disable	Module
Diagnosis: Wire break[2]	---			• disable • enabled	disable	Channel
Diagnosis: Short circuit as per M	---			• disable • enabled	disable	Channel

1) If the interface module is without power, the digital output module does not output substitute values. Output value = 0.
2) Wire break is only detected when the output is switched off.

Process alarm

This parameter enables the process interrupts for the module.

Input delay

Signal interference can be suppressed with this parameter. Changes in the signal are only detected after the specified time.

Trigger for process interrupt, rising edge

This parameter can be used in channels to enable a process interrupt with a rising edge (a signal status change).

Pulse stretching

The pulse stretching is a function used to modify a digital input signal. A pulse at a digital input is stretched to at least the length set in the parameters. If the input pulse is already longer than the selected length, it is not changed

Principle of Pulse Stretching

The figure below shows a few examples of input pulse modification.

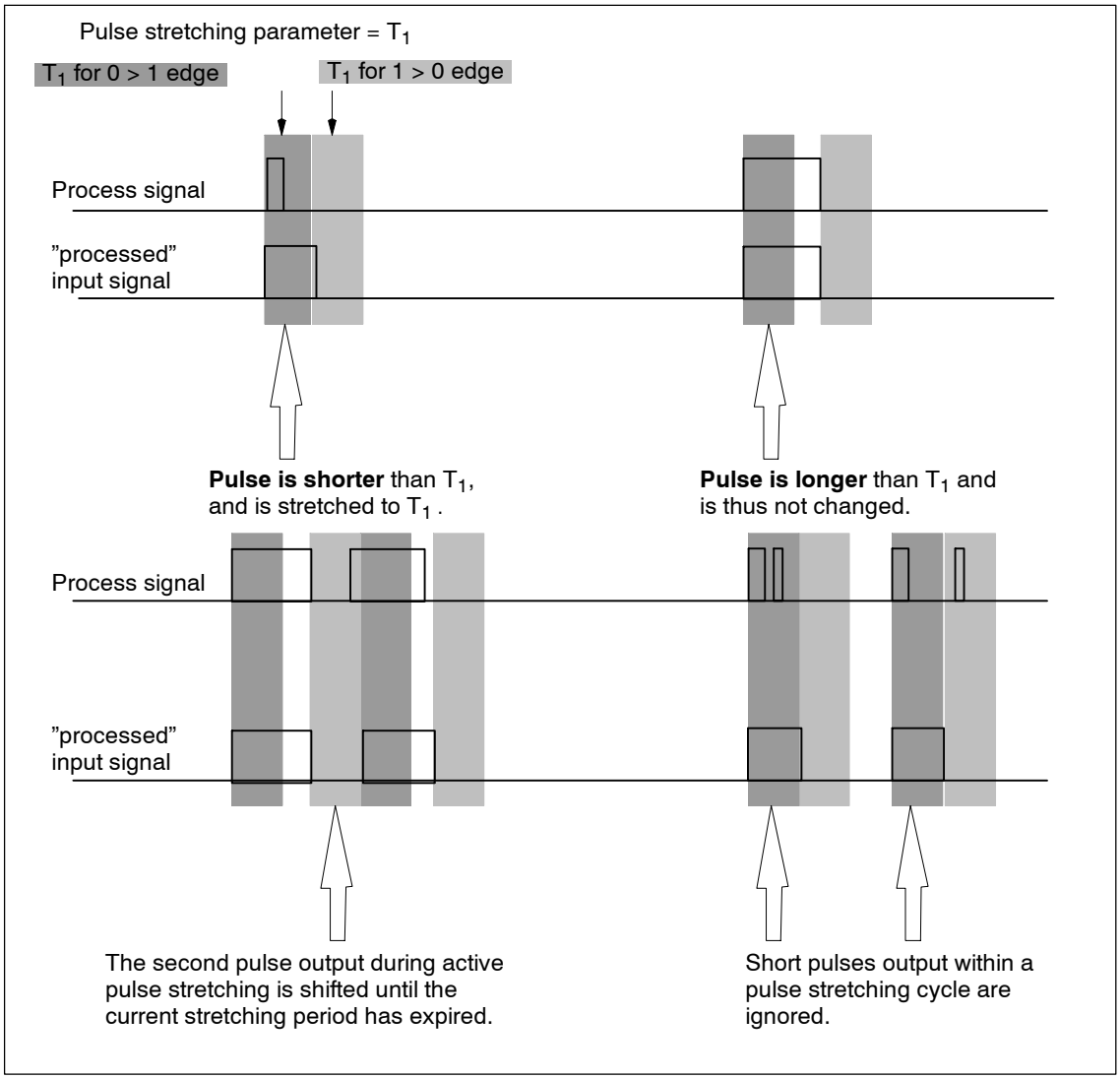


Figure 11-1 Principle of Pulse Stretching

Note

If you set pulse stretching for an input channel, this also affects the flutter monitoring enabled for this channel. The "pulse stretched" signal is the input signal for flutter monitoring. You should therefore adapt the pulse stretching parameters and flutter monitoring functions to each other. Select appropriate parameter values in order to tune the functions to your process.

Flutter monitoring

Flutter monitoring is a process control function for digital input signals. It detects and reports unusual process control signal patterns, for example, frequent fluctuation of the ”0” and ”1” input signal. Such signal activities are an indication that a sensor is defective or that the process is unstable.

Enabling flutter monitoring

Enable flutter monitoring by setting the number of signal transitions to a value other than ”0.”

Detection of unusual signal patterns

A configurable monitoring window is available for each input channel. The monitoring window is started at the first transition of the input signal. If the number of input signal transitions within the monitoring window exceeds the set number, the system detects a flutter error. If a flutter error is not detected within the monitoring window, the monitoring window is started again at the next signal change.

Reporting a Flutter Error

If a flutter error occurs, the current signal state is entered in the process image and the value status of the signal is set to ”invalid”. The diagnostic information ”flutter error” is entered and a diagnostic interrupt entering the state is triggered.

You must evaluate and process the value status and the diagnostic information in the user program.

Resetting a Flutter Error

If no further fluttering of the input signal is detected during the triple monitoring window, the diagnostic entry is removed and an outgoing diagnostic interrupt is triggered. The value status of the current signal in the process image is set to ”valid”.

Principle

The following figure illustrates the principle behind flutter monitoring.

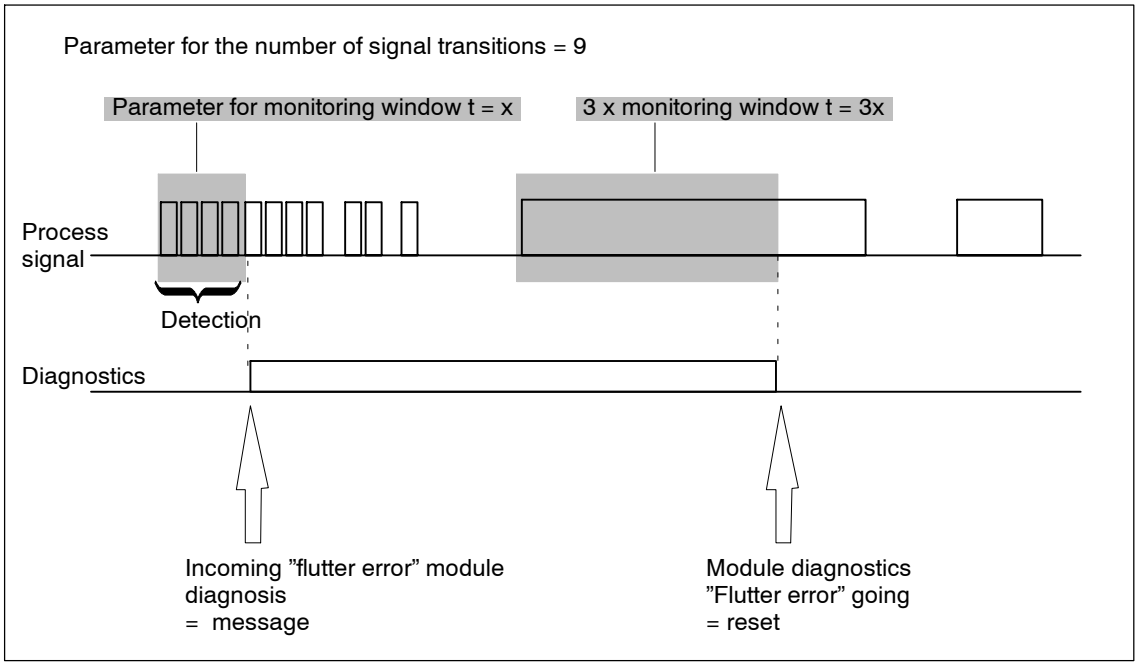


Figure 11-2 Principle of Flutter Monitoring

11.2 2DI 24 VDC ST digital electronic module (6ES7 131-4BB00-0AA0)

Order number

6ES7 131-4BB00-0AA0

Features

- Digital electronic module with two inputs
- Rated input voltage 24 V DC
- Suitable for switches and proximity switches (BEROs)

Terminal assignment

The following table shows the terminal assignment of the 2DI 24 VDC Standard for the various terminal modules:

Table 11-4 Terminal assignment of the 2DI 24 VDC Standard

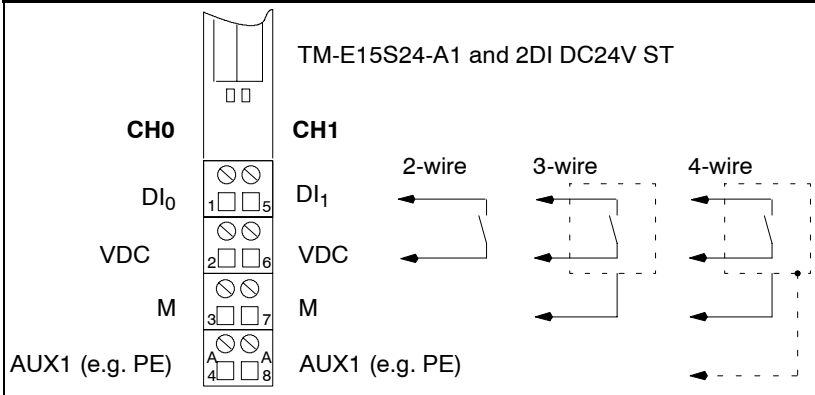
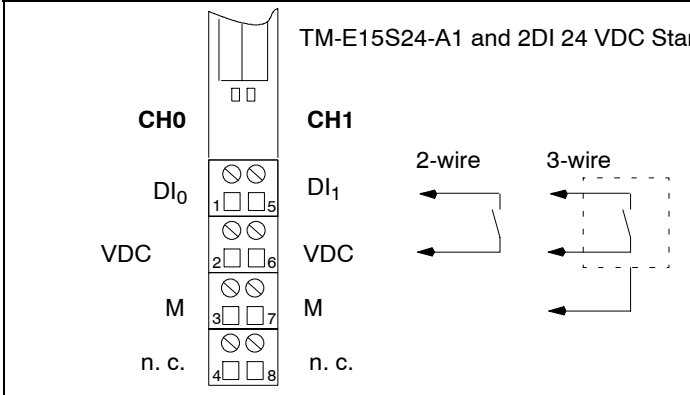
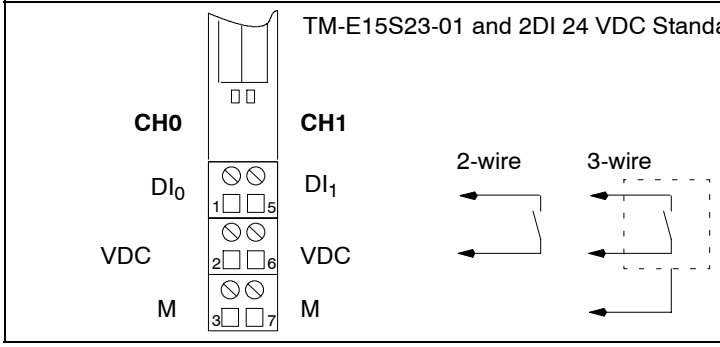
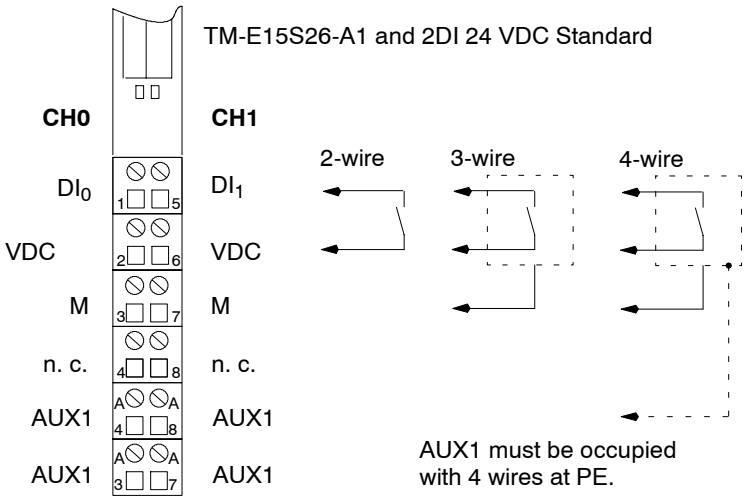
View	Terminal assignment	Remarks
		Channel 0: Terminals 1 to A4 Channel 1: Terminals 5 to A8 DI: Input signal 24 VDC: Sensor supply M : Chassis ground
		Channel 0: Terminals 1 to 4 Channel 1: Terminals 5 to 8 DI: Input signal 24 VDC: Sensor supply M : Chassis ground Terminals 4 and 8 can be used for connection of cables that are not required up to 30 VDC.
		Channel 0: Terminals 1 to 4 Channel 1: Terminals 5 to 8 DI: Input signal 24 VDC: Sensor supply M : Chassis ground

Table 11-4 Terminal assignment of the 2DI 24 VDC Standard

View	Terminal assignment	Remarks
		Channel 0: Terminals 1 to A3 Channel 1: Terminals 5 to A7 DI: Input signal 24 VDC: Sensor supply M : Chassis ground Terminals 4 and 8 can be used for connection of cables that are not required up to 30 VDC.

Block diagram

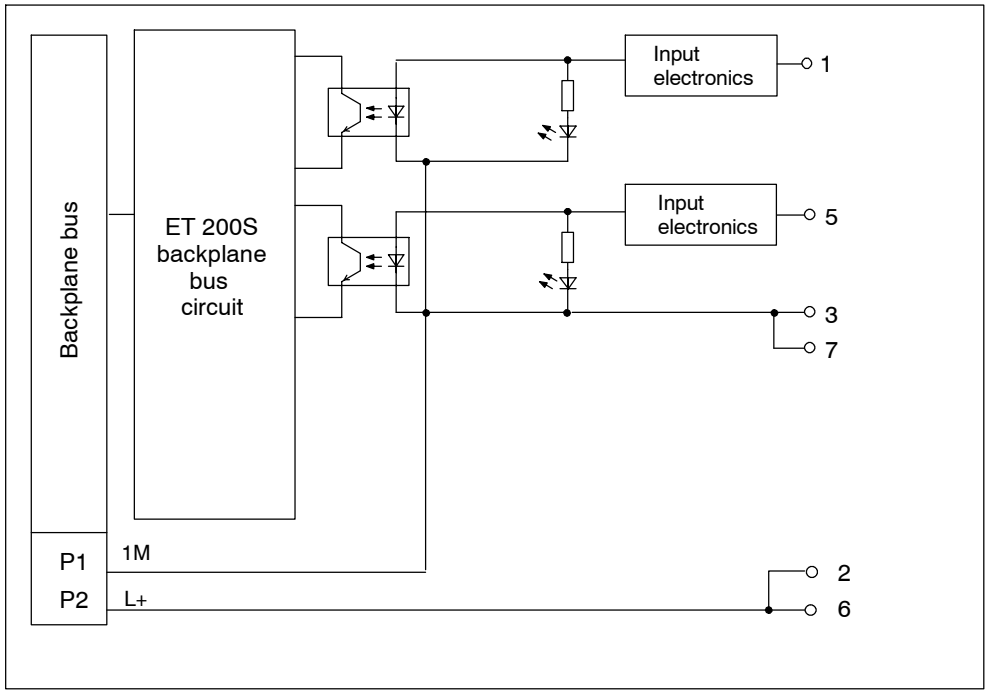


Figure 11-3 Block diagram of the 2DI 24 VDC Standard

Technical data

Dimensions and weight	
Dimensions W x H x D (mm)	15 x 81 x 52
Weight	Approx. 35 g
Module-specific data	
Number of inputs	2
Cable length	
• Unshielded	max. 600 m (164 ft)
• shielded	max. 1,000 m (164 ft)
Voltages, currents, electrical potentials	
Rated supply voltage (from power module)	24 VDC
• Polarity reversal protection	Yes
Electrical isolation	
• Between the channels	No
• Between channels and backplane bus	Yes
Permissible potential difference	
• Between different circuits	75 VDC / 60 VAC
Insolation tested with	500 VDC
Current consumption	
• From power supply	Dependent on the sensor
Power loss of the module	Typical 0.4 W
Status, interrupts, diagnostics	
Status display	Green LED per channel
Diagnostic functions	No

Sensor power supply output	
Output voltage	
• Loaded	Min. L+ (–0.5 V)
Output current	
• Rated value	500 mA
• Permitted range	0 to 500 mA
Data for selecting an sensor	
Input voltage	
• Rated value	24 VDC
• for ”1” signal	15 to 30 V
• for ”0” signal	–30 to 5 V
Input current	
• For signal ”1”	Typ. 7 mA (at 24 V)
Input delay	
• ”0” to ”1” transition	Typ. 3 ms (2.0 to 4.5 ms)
• ”1” to ”0” transition	Typ. 3 ms (2.0 to 4.5 ms)
Input characteristic curve	To IEC 61131, type 1
Connection of 2wire BEROs	possible
• permitted quiescent current	max. 1.5 mA

11.3 4DI 24 VDC ST digital electronic module (6ES7 131-4BD00-0AA0)

Order number

6ES7 131-4BD00-0AA0

Features

- Digital electronics module with four inputs
- Rated input voltage 24 V DC
- Suitable for switches and proximity switches (BEROs)

Terminal assignment

The following table shows the terminal assignment of the 4DI 24 VDC Standard for the various terminal modules:

Table 11-5 Terminal assignment of the 2DI 24 VDC Standard

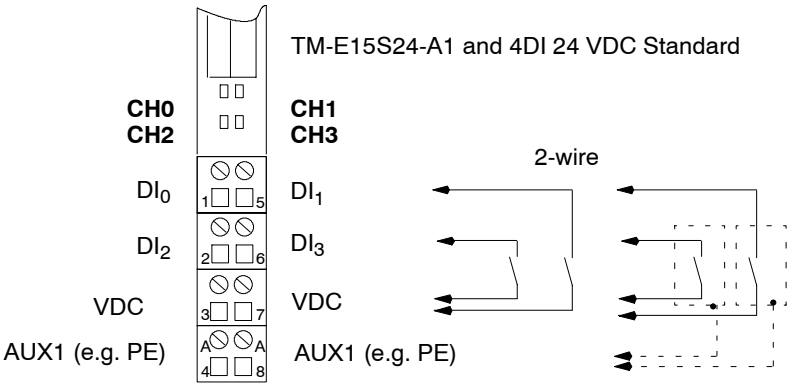
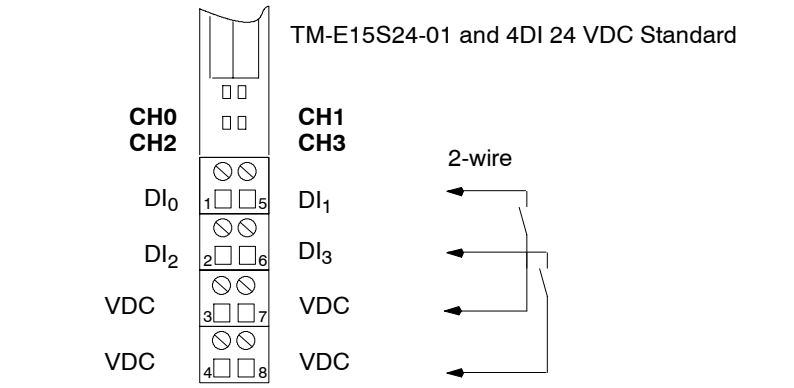
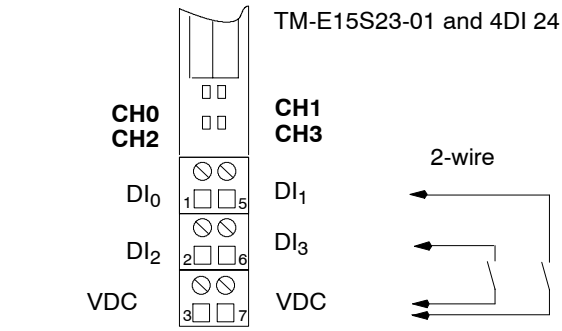
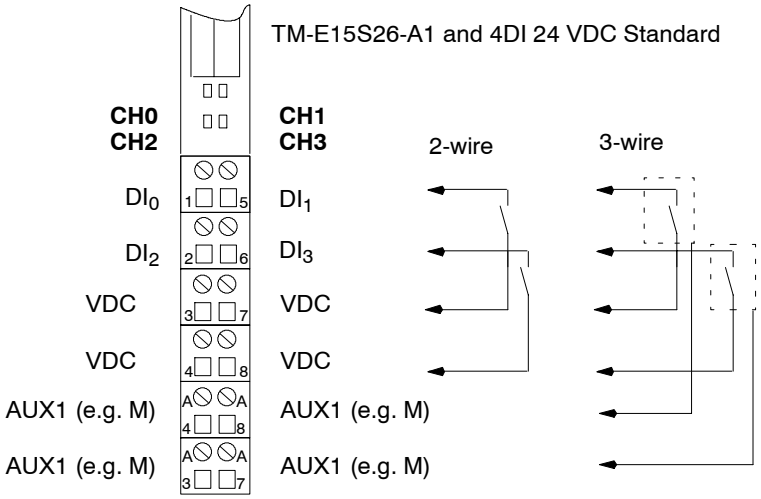
View	Terminal assignment	Remarks
		Channel 0: Terminals 1 and 3 Channel 1: Terminals 5 and 7 Channel 2: Terminals 2 and 3 Channel 3: Terminals 6 and 7 DI: Input signal 24 VDC: Sensor supply
		Channel 0: Terminals 1 and 3 Channel 1: Terminals 5 and 7 Channel 2: Terminals 2 and 4 Channel 3: Terminals 6 and 8 DI: Input signal 24 VDC: Sensor supply

Table 11-5 Terminal assignment of the 2DI 24 VDC Standard, continued

View	Terminal assignment	Remarks
		Channel 0: Terminals 1 and 3 Channel 1: Terminals 5 and 7 Channel 2: Terminals 2 and 3 Channel 3: Terminals 6 and 7 DI: Input signal 24 VDC: Sensor supply
		Channel 0: Terminals 1 and 3 Channel 1: Terminals 5 and 7 Channel 2: Terminals 2 and 4 Channel 3: Terminals 6 and 8 DI: Input signal 24 VDC: Sensor supply

Block diagram

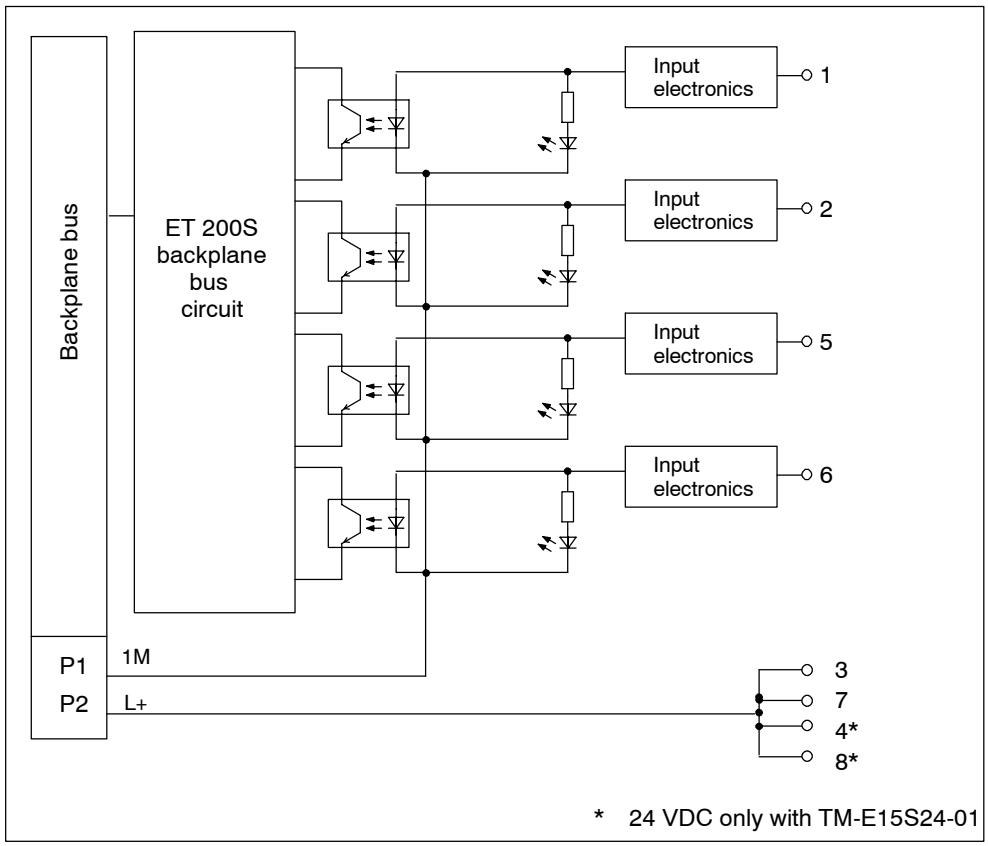


Figure 11-4 Block diagram of the 4DI 24 VDC Standard

Technical data

Dimensions and weight	
Dimensions W x H x D (mm)	15 x 81 x 52
Weight	Approx. 35 g
Module-specific data	
Number of inputs	4
Cable length	
• Unshielded	max. 600 m (164 ft)
• shielded	max. 1,000 m (164 ft)
Voltages, currents, electrical potentials	
Rated supply voltage (from power module)	24 VDC
• Polarity reversal protection	Yes
Electrical isolation	
• Between the channels	No
• Between channels and backplane bus	Yes
Permissible potential difference	
• Between different circuits	75 VDC / 60 VAC
Insolation tested with	500 VDC
Current consumption	
• From power supply	Dependent on the sensor
Power loss of the module	Typical 0.7 W
Status, interrupts, diagnostics	
Status display	Green LED per channel
Diagnostic functions	No

Sensor power supply output	
Output voltage	
• Loaded	Min. L+ (–0.5 V)
Output current	
• Rated value	500 mA
• Permitted range	0 to 500 mA
Data for selecting an sensor	
Input voltage	
• Rated value	24 VDC
• for ”1” signal	15 to 30 V
• for ”0” signal	–30 to 5 V
Input current	
• For signal ”1”	Typ. 7 mA (at 24 V)
Input delay	
• ”0” to ”1” transition	Typ. 3 ms (2.0 to 4.5 ms)
• ”1” to ”0” transition	Typ. 3 ms (2.0 to 4.5 ms)
Input characteristic curve	To IEC 61131, type 1
Connection of 2wire BEROs	possible
• permitted quiescent current	max. 1.5 mA

11.4 4DI 24 VDC/SRC ST digital electronic module (6ES7 131-4BD50-0AA0)

Order number

6ES7 131-4BD50-0AA0

Features

- Digital electronics module with four inputs
- M read
- Rated input voltage 24 V DC
- Suitable for switches and proximity switches (BEROs)

NULLConnection assignment

The following table shows the terminal assignment of the 4DI 24 VDC/SRC Standard for the various terminal modules:

Table 11-6 Terminal assignment of the 4DI 24 VDC/SRC Standard

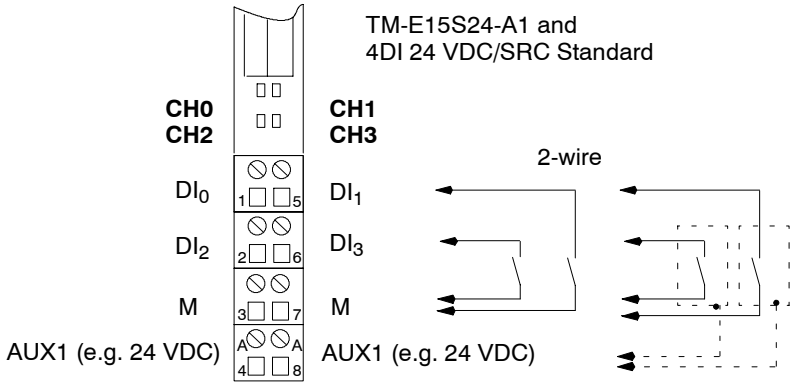
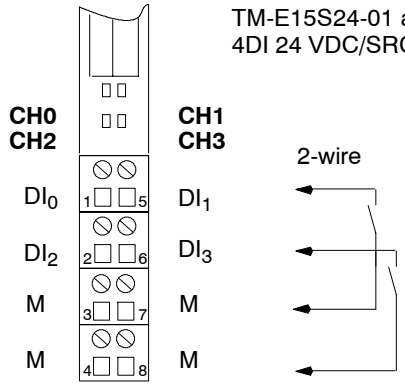
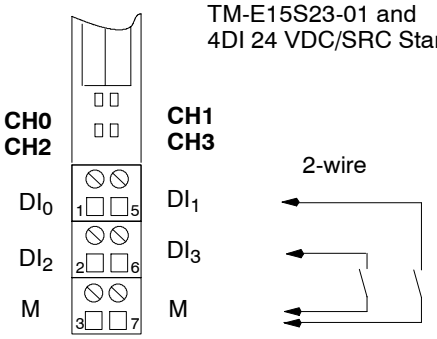
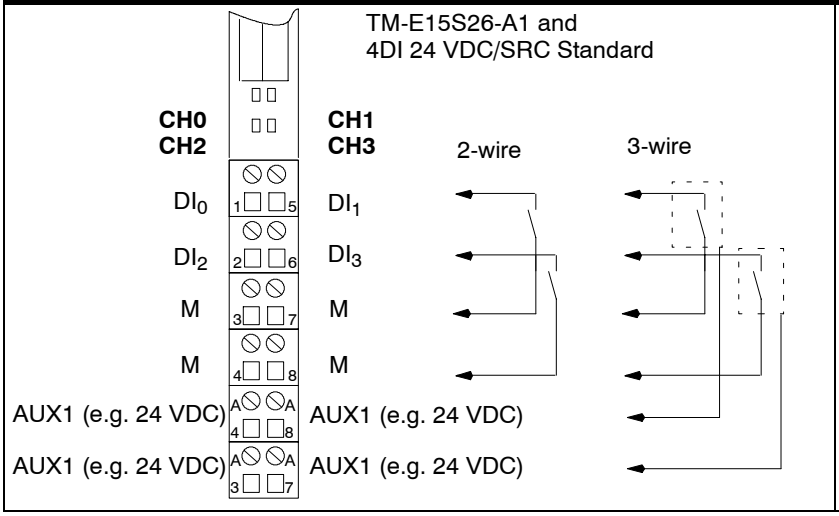
View	Terminal assignment	Remarks
		Channel 0: Terminals 1 and 3 Channel 1: Terminals 5 and 7 Channel 2: Terminals 2 and 3 Channel 3: Terminals 6 and 7 DI: Input signal M : Sensor supply
		Channel 0: Terminals 1 and 3 Channel 1: Terminals 5 and 7 Channel 2: Terminals 2 and 4 Channel 3: Terminals 6 and 8 DI: Input signal M : Sensor supply
		Channel 0: Terminals 1 and 3 Channel 1: Terminals 5 and 7 Channel 2: Terminals 2 and 3 Channel 3: Terminals 6 and 7 DI: Input signal M : Sensor supply

Table 11-6 Terminal assignment of the 4DI 24 VDC/SRC Standard, continued

View	Terminal assignment	Remarks
		Channel 0: Terminals 1 and 3 Channel 1: Terminals 5 and 7 Channel 2: Terminals 2 and 4 Channel 3: Terminals 6 and 8 DI: Input signal M : Sensor supply

Block diagram

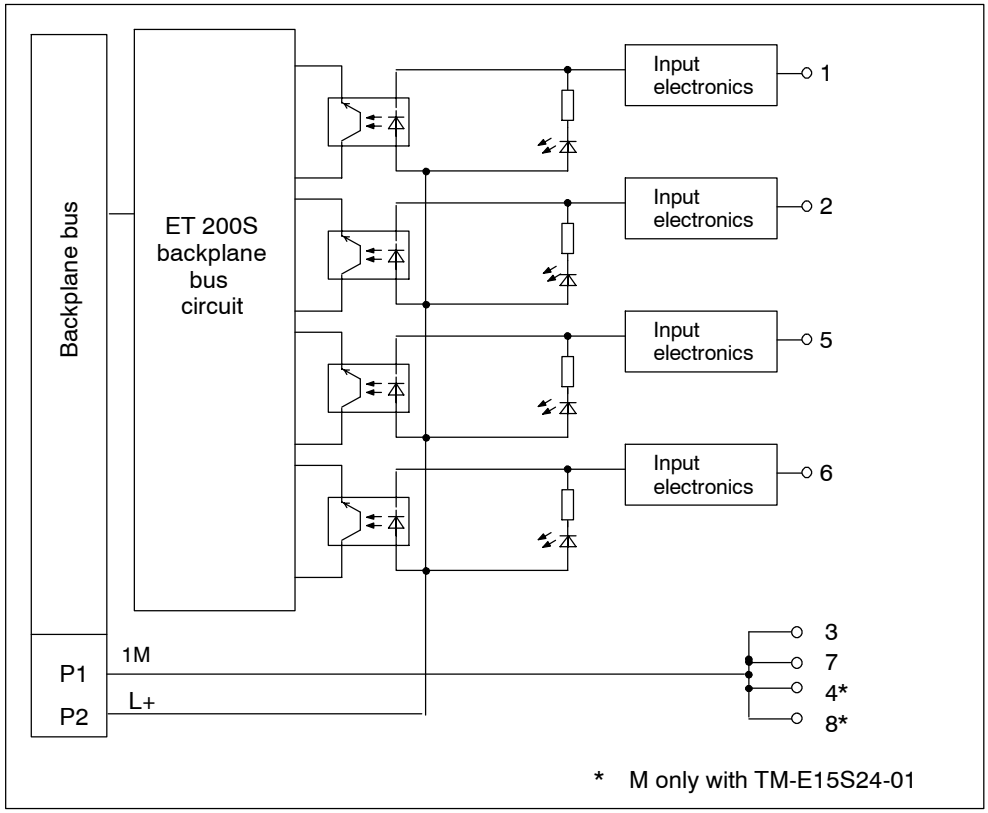


Figure 11-5 Block diagram of the 4DI 24 VDC/SRC Standard

Technical data

Dimensions and weight	
Dimensions W x H x D (mm)	15 x 81 x 52
Weight	Approx. 35 g
Module-specific data	
Number of inputs	4
Cable length	
• Unshielded	max. 600 m (164 ft)
• shielded	max. 1,000 m (164 ft)
Voltages, currents, electrical potentials	
Rated supply voltage (from power module)	24 VDC
• Polarity reversal protection	Yes
Electrical isolation	
• Between the channels	No
• Between channels and backplane bus	Yes
Permissible potential difference	
• Between different circuits	75 VDC / 60 VAC
Insolation tested with	500 VDC
Current consumption	
• From power supply	Dependent on the sensor
Power loss of the module	Typical 0.7 W
Status, interrupts, diagnostics	
Status display	Green LED per channel
Diagnostic functions	No

Sensor power supply output	
Output voltage	
• Loaded	Max. M +0.5 V
Output current	
• Rated value	500 mA
• Permitted range	0 to 500 mA
Data for selecting an sensor	
Input voltage	
• Rated value	24 VDC
• for ”1” signal	–15 to –30 V[1)]
• for ”0” signal	30 to –5 V[1)]
Input current	
• For signal ”1”	Typ. 7 mA (at 24 V)
Input delay	
• ”0” to ”1” transition	Typ. 3 ms (2.0 to 4.5 ms)
• ”1” to ”0” transition	Typ. 3 ms (2.0 to 4.5 ms)
Input characteristic curve	To IEC 61131, type 1
Connection of 2wire BEROs	possible
• permitted quiescent current	max. 1.5 mA

1) Reference potential is L+

11.5 2DI 24 VDC High Feature digital electronic module (6ES7 131-4BB00-0AB0)

Order number

6ES7 131-4BB00-0AB0

Features

- Digital electronic module with two inputs
- Rated input voltage 24 V DC
- Suitable for switches and proximity switches (BEROs)
- Supports clock synchronized mode

Connection assignment

The following table shows the terminal assignment of the 2DI 24 VDC High Feature for the various terminal modules:

Table 11-7 Terminal assignment of the 2DI 24 VDC High Feature

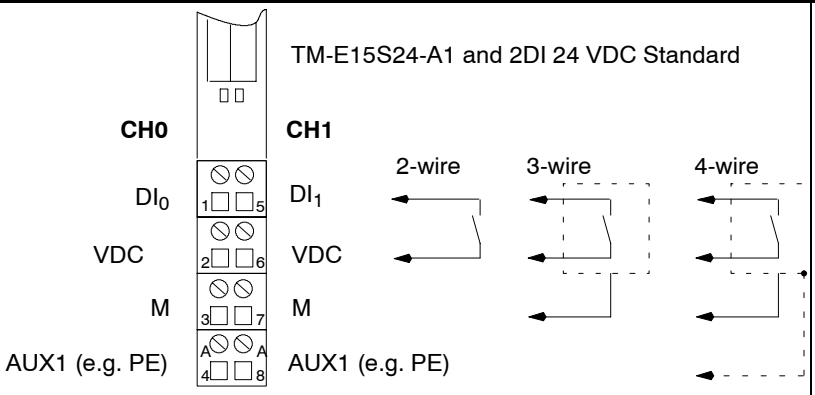
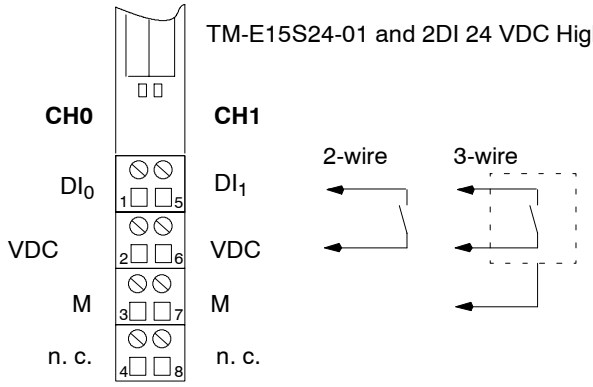
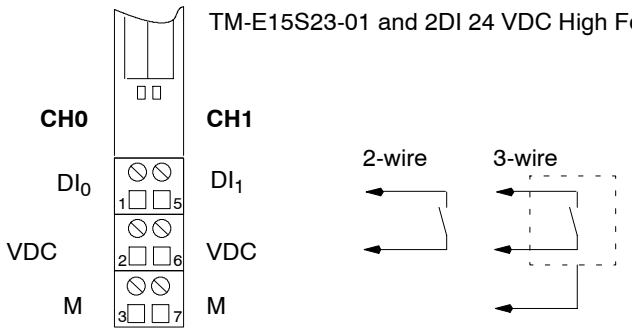
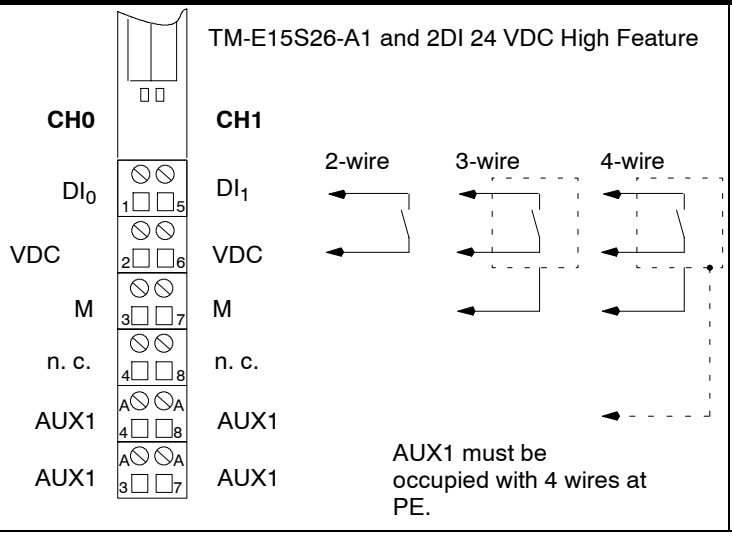
View	Terminal assignment	Remarks
		Channel 0: Terminals 1 to A4 Channel 1: Terminals 5 to A8 DI: Input signal 24 VDC: Sensor supply M : Chassis ground
		Channel 0: Terminals 1 to 4 Channel 1: Terminals 5 to 8 DI: Input signal 24 VDC: Sensor supply M : Chassis ground Terminals 4 and 8 can be used for connection of cables that are not required up to 30 VDC.
		Channel 0: Terminals 1 to 4 Channel 1: Terminals 5 to 8 DI: Input signal 24 VDC: Sensor supply M : Chassis ground

Table 11-7 Terminal assignment of the 2DI 24 VDC High Feature, continued

View	Terminal assignment	Remarks
		Channel 0: Terminals 1 to A3 Channel 1: Terminals 5 to A7 DI: Input signal 24 VDC: Sensor supply M : Chassis ground Terminals 4 and 8 can be used for connection of cables that are not required up to 30 VDC.

Block diagram

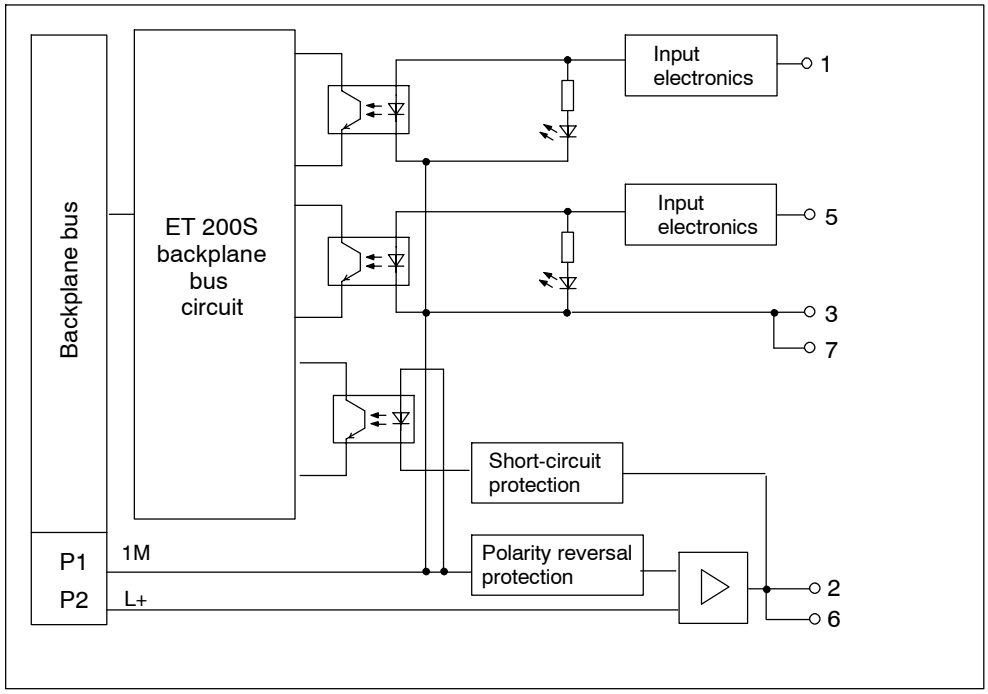


Figure 11-6 Block diagram of the 2DI 24 VDC High Feature

Technical data

Dimensions and weight	
Dimensions W x H x D (mm)	15 x 81 x 52
Weight	Approx. 35 g
Module-specific data	
Supports clock synchronized mode	Yes
Number of inputs	2
Cable length	
• Unshielded	max. 600 m (164 ft)
• shielded	max. 1,000 m (164 ft)
Voltages, currents, electrical potentials	
Rated supply voltage (from power module)	24 VDC
• Polarity reversal protection	Yes
Electrical isolation	
• Between the channels	No
• Between channels and backplane bus	Yes
Permissible potential difference	
• Between different circuits	75 VDC / 60 VAC
Insolation tested with	500 VDC
Current consumption	
• From power supply	Dependent on the sensor
Power loss of the module	Typical 0.4 W
Status, interrupts, diagnostics	
Status display	Green LED per channel
Interrupts	
• Process alarm	Configurable
Diagnostic functions	
• Group error	red LED ”SF”
• Reading of diagnostic data	Yes

Sensor power supply output	
Output voltage	
• Loaded	Min. L+ (–0.5 V)
Output current	
• Rated value	500 mA
• Permitted range	0 to 500 mA
Short-circuit protection	Yes, electronic[1)]
Data for selecting an sensor	
Input voltage	
• Rated value	24 VDC
• for ”1” signal	11 to 30 V
• for ”0” signal	–30 to 5 V
Input current	
• For signal ”1”	Typical 8 mA
Input delay (configurable)	
• ”0” to ”1” transition	0.1 ms (0.05 to 0.15 ms) 0.5 ms (0.4 to 0.6 ms) 3 ms (2.7 to 3.3 ms) 15 ms (14.85 to 15.15 ms)
• ”1” to ”0” transition	0.1 ms (0.05 to 0.15 ms) 0.5 ms (0.4 to 0.6 ms) 3 ms (2.7 to 3.3 ms) 15 ms (14.85 to 15.15 ms)
Input characteristic curve	To IEC 61131, type 1
Connection of 2wire BEROs	possible
• permitted quiescent current	max. 1.5 mA

1) per module

11.6 4DI 24 VDC High Feature digital electronic module (6ES7 131-4BD00-0AB0)

Order number

6ES7 131-4BD00-0AB0

Features

- Digital electronics module with four inputs
- Rated input voltage 24 V DC
- Suitable for switches and proximity switches (BEROs)
- Supports clock synchronized mode

Connection assignment

The following table shows the terminal assignment of the 4DI 24 VDC High Feature for the various terminal modules:

Table 11-8 Terminal assignment of the 4DI 24 VDC High Feature

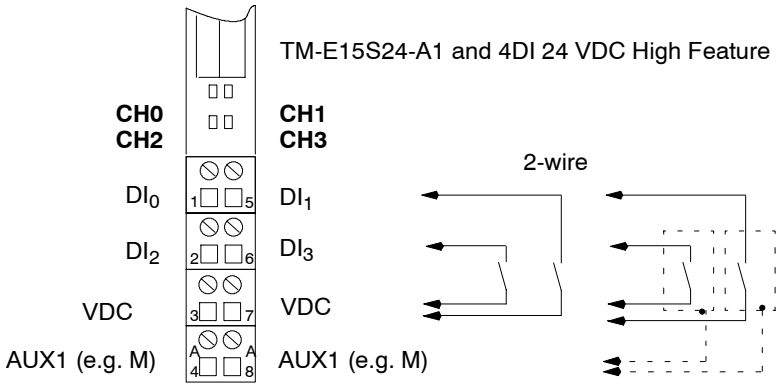
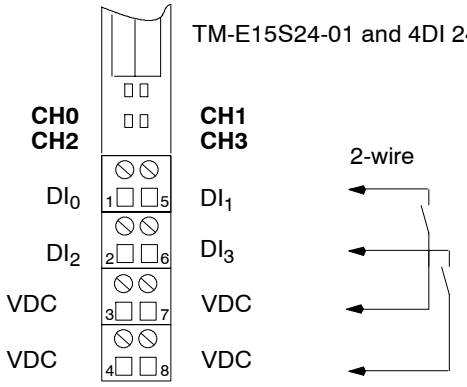
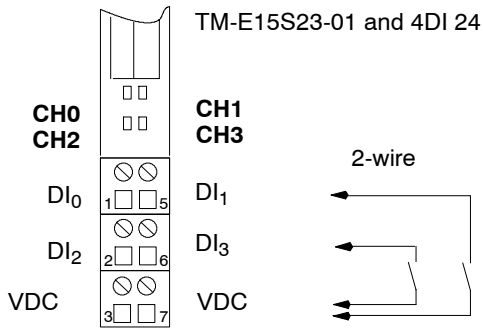
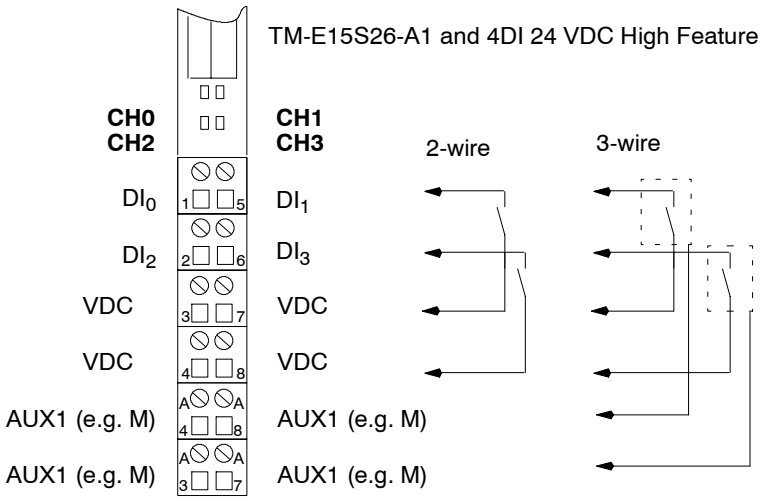
View	Terminal assignment	Remarks
		Channel 0: Terminals 1 and 3 Channel 1: Terminals 5 and 7 Channel 2: Terminals 2 and 3 Channel 3: Terminals 6 and 7 DI: Input signal 24 VDC: Sensor supply
		Channel 0: Terminals 1 and 3 Channel 1: Terminals 5 and 7 Channel 2: Terminals 2 and 4 Channel 3: Terminals 6 and 8 DI: Input signal 24 VDC: Sensor supply
		Channel 0: Terminals 1 and 3 Channel 1: Terminals 5 and 7 Channel 2: Terminals 2 and 3 Channel 3: Terminals 6 and 7 DI: Input signal 24 VDC: Sensor supply

Table 11-8 Terminal assignment of the 4DI 24 VDC High Feature, continued

View	Terminal assignment	Remarks
		Channel 0: Terminals 1 and 3 Channel 1: Terminals 5 and 7 Channel 2: Terminals 2 and 4 Channel 3: Terminals 6 and 8 DI: Input signal 24 VDC: Sensor supply

Block diagram

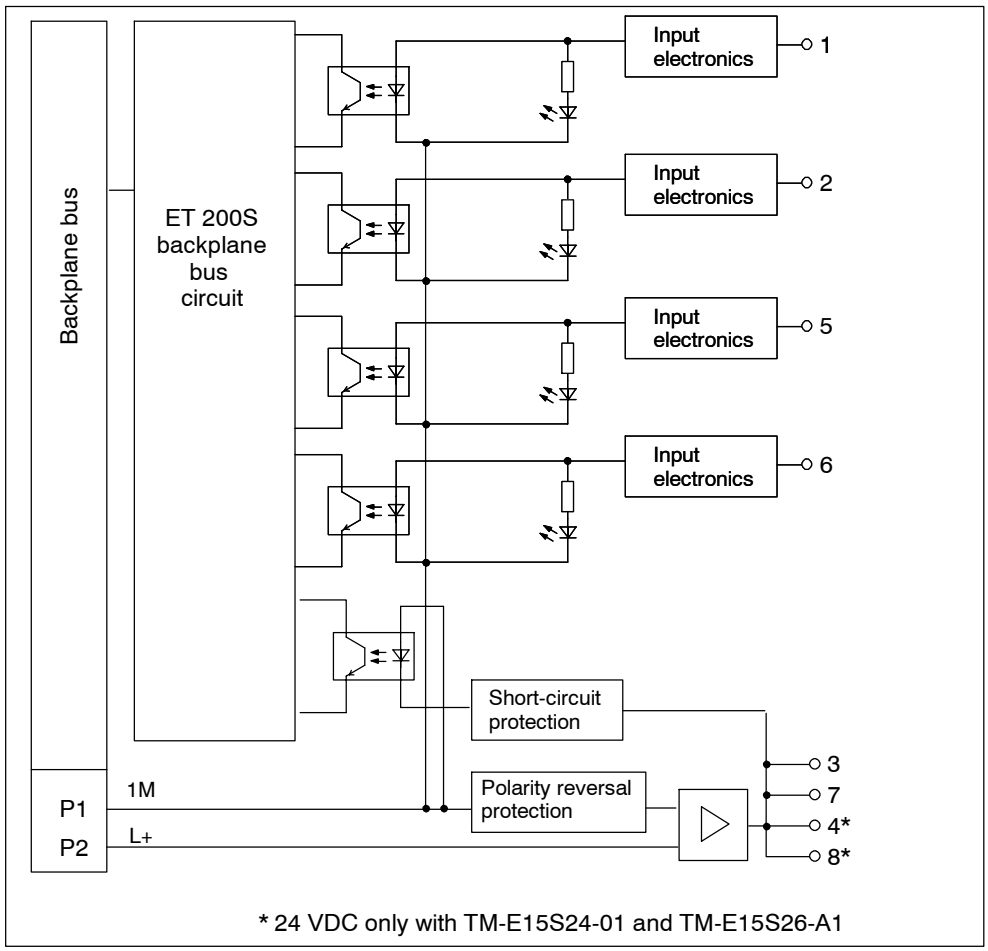


Figure 11-7 Block diagram of the 4DI 24 VDC High Feature

Technical data

Dimensions and weight	
Dimensions W x H x D (mm)	15 x 81 x 52
Weight	Approx. 35 g
Module-specific data	
Supports clock synchronized mode	Yes
Number of inputs	4
Cable length	
• Unshielded	max. 600 m (164 ft)
• shielded	max. 1,000 m (164 ft)
Voltages, currents, electrical potentials	
Rated supply voltage (from power module)	24 VDC
• Polarity reversal protection	Yes
Electrical isolation	
• Between the channels	No
• Between channels and backplane bus	Yes
Permissible potential difference	
• Between different circuits	75 VDC / 60 VAC
Insolation tested with	500 VDC
Current consumption	
• From power supply	Dependent on the sensor
Power loss of the module	Typical 0.7 W
Status, interrupts, diagnostics	
Status display	Green LED per channel
Interrupts	
• Process alarm	Configurable
Diagnostic functions	
• Group error	red LED ”SF”
• Reading of diagnostic data	Yes

Sensor power supply output	
Output voltage	
• Loaded	Min. L+ (–0.5 V)
Output current	
• Rated value	500 mA
• Permitted range	0 to 500 mA
Short-circuit protection	Yes, electronic[1)]
Data for selecting a sensor	
Input voltage	
• Rated value	24 VDC
• for ”1” signal	11 to 30 V
• for ”0” signal	–30 to 5 V
Input current	
• For signal ”1”	Typical 8 mA
Input delay (configurable)	
• ”0” to ”1” transition	0.1 ms (0.05 to 0.15 ms) 0.5 ms (0.4 to 0.6 ms) 3 ms (2.7 to 3.3 ms) 15 ms (14.85 to 15.15 ms)
• ”1” to ”0” transition	0.1 ms (0.05 to 0.15 ms) 0.5 ms (0.4 to 0.6 ms) 3 ms (2.7 to 3.3 ms) 15 ms (14.85 to 15.15 ms)
Input characteristic curve	To IEC 61131, type 1
Connection of 2wire BEROs	possible
• permitted quiescent current	max. 1.5 mA

1) per module

11.7 4DI 24–48 VUC High Feature digital electronic module (6ES7 131-4CD00-0AB0)

Order number

6ES7 131-4CD00-0AB0

Features

- Digital electronics module with four inputs
- Rated input voltage 24.48 VAC/VDC
- Configuration length: 3 bytes
- Diagnosis: Wire break
- Diagnosis: fuse cases
- Diagnosis: no load voltage
- Suitable for switches and proximity switches (BEROs)
- Supports clock synchronized mode

Terminal assignment

The following table shows the terminal assignment of the 4DI 24–48 VUC High Feature for the various terminal modules:

Table 11-9 Terminal assignment of the 4DI 24 VUC High Feature

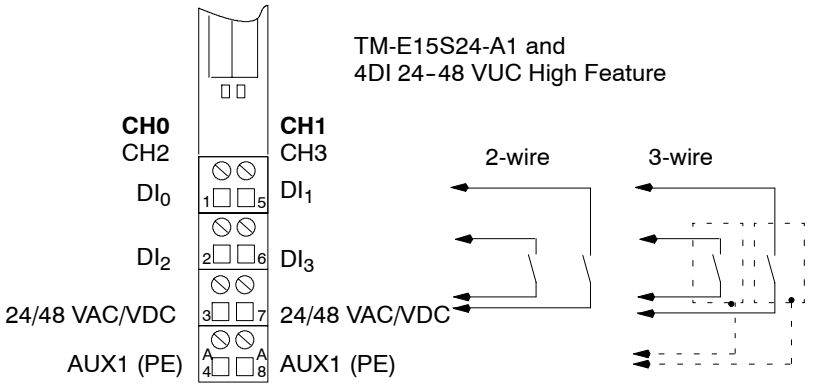
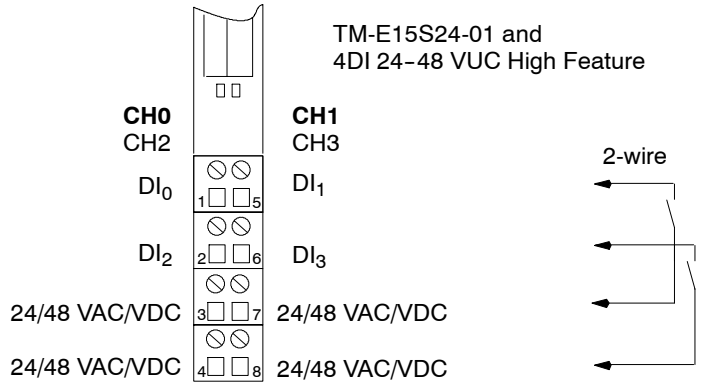
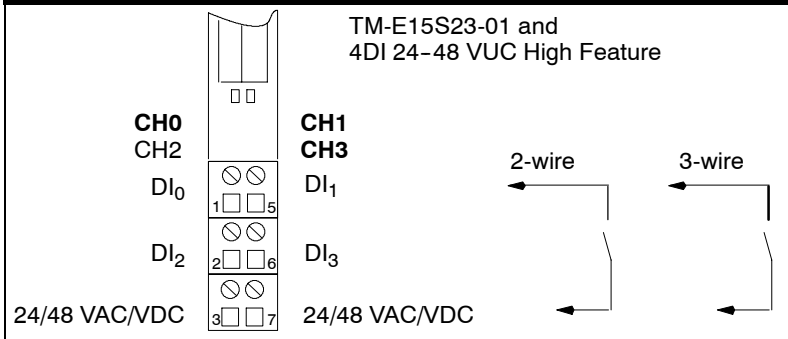
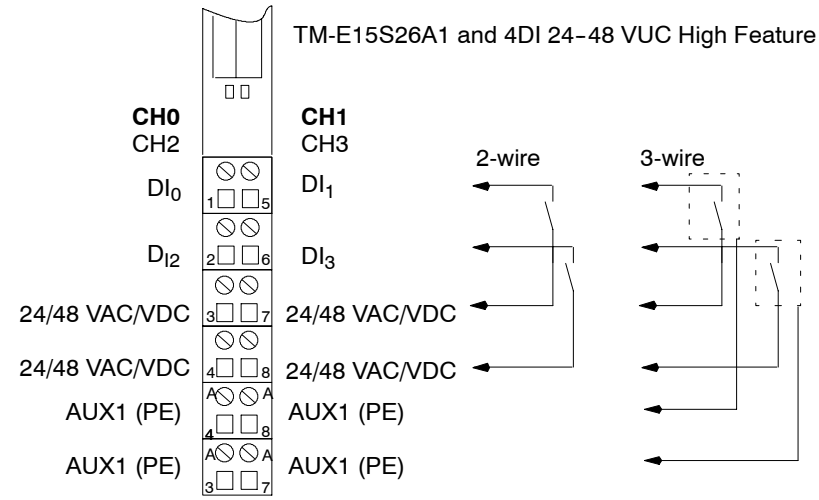
View	Terminal assignment	Remarks
		Channel 0: terminals 1 and 3 Channel 1: terminals 5 and 7 Channel 2. terminals 2 and 3 Channel 3: terminals 6 and 7 DI: Input signal 24 V DC sensor power supply PE: Chassis ground
		Channel 0: terminals 1 and 3 Channel 1: terminals 5 and 7 Channel 2: terminals 2 and 4 Channel 3: terminals 6 and 8 DI: Input signal 24 V DC sensor power supply

Table 11-9 Terminal assignment of the 4DI 24 VUC High Feature, continued

View	Terminal assignment	Remarks
		Channel 0: terminals 1 and 3 Channel 1: terminals 5 and 7 Channel 2: terminals 2 and 3 Channel 3: terminals 6 and 7 DI: Input signal 24 V DC sensor power supply
		Channel 0: terminals 1 and 3 Channel 1: terminals 5 and 7 Channel 2: terminals 2 and 4 Channel 3: terminals 6 and 8 DI: Input signal 24 V DC sensor power supply AUX: Terminals A4, A3, A8 DC/AC and A7 can be used for free cables up to DC30 V.

Block diagram

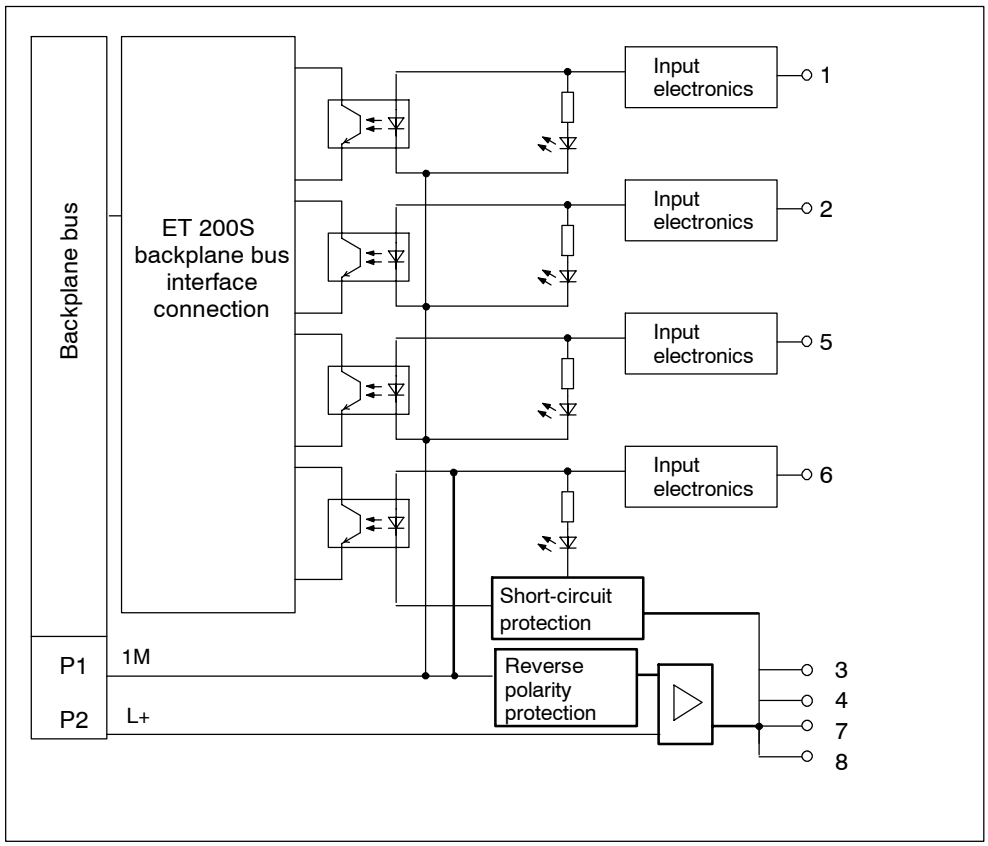


Figure 11-8 Terminal assignment of the 4DI 24–48 VUC High Feature

Technical data

Dimensions and weight	
Dimensions W x H x D	15 x 81 x 52 (mm)
Weight	Approx. 35 g
Module-specific data	
Supports clock synchronized mode	Yes
Number of inputs	4
Cable length	
• Unshielded	max. 600 m (164 ft)
• shielded	max. 1,000 m (164 ft)
Voltages, currents, electrical potentials	
Rated supply voltage (from power module)	24/–48 VAC/VDC
• horizontal installation up to 60 °C	
• vertical installation up to 40 °C	
• Polarity reversal protection	Ac or DC automatically
Electrical isolation	
• Between the channels	No
• Between channels and backplane bus	Yes
Permitted potential difference	
• Between different circuits	75 VDC, 60 VAC
Insolation tested with	2500 V DC
Current consumption	
• from power supply L+	Dependent on the sensor
• From the backplane bus	max. 10 mA
Power loss of the module	Typical 0.7 W
Status, interrupts, diagnostics	
Status display	green LEDs per channel
Diagnostic functions	Configurable
• Group error display	red LEDs (SF)

Sensor Power Supply Outputs	
Output voltage	
• Loaded	Min. L+ (–0.5 V)
Output current	
• Rated value	500 mA
• Permitted range	0 to 500 mA
Short-circuit protection	Yes, by module
Data for selecting a sensor	
Input voltage	
• Rated value	24 to 48 VUC
• for ”1” signal	–15 VDC up to –57.6 VDC 15 V DC up to 57.6 V DC 15 V AC up to 48 V AC
• for ”0” signal	–6 VDC up to 6 VDC 0 VAC up to 5 VAC
• Frequency range	47 Hz to 63 Hz
Input current	from 4 mA to 10 mA
• For signal ”1”	
Input delay	
• ”0” to ”1” transition	Max. 15 ms
• ”1” to ”0” transition	Max. 15 ms
Input characteristic[1)]	
Connection of 2wire BEROs	possible
• permitted quiescent current	max. 0.5 up to 2 mA[2)]
Sensor circuit	
Resistor circuit of sensor to wire-break monitor	
• Rated voltage 24 V (15 V to 35 V)	18 kΩ
• Rated voltage 48 V (30 V to 60 V)	39 kΩ

1) IEC 61131 does not provide specification for UC modules. However, the values comply with IEC 61131 to the extent possible.

2) A minimum load current is required with wire-break monitoring.

11.8 4DI NAMUR digital electronic module (6ES7 131-4RD00-0AB0)

Order number

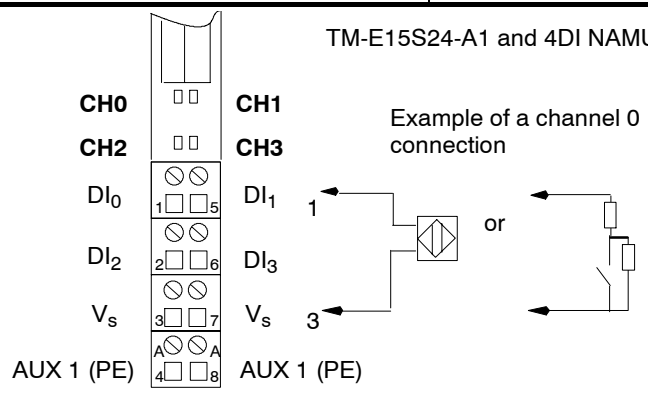
6ES7 131-4RD00-0AB0

Properties

- Digital electronics module with four inputs
- 8.2 VDC sensor supply
- Suitable for NAMUR sensors and wired and unwired mechanical contacts

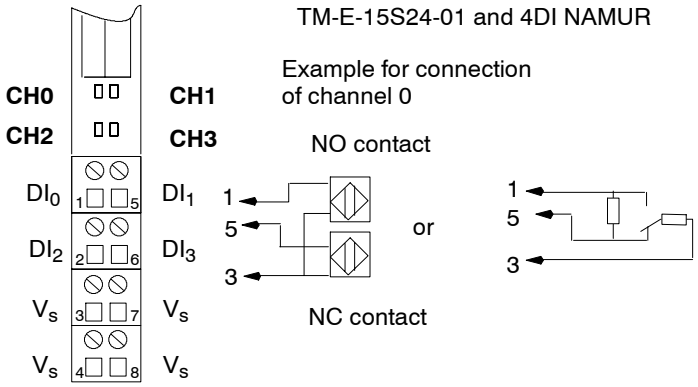
Terminal assignment of NAMUR sensors or sensors as per DIN 19234

Table 11-10 Terminal assignment of NAMUR sensors or sensors as per DIN 19234

View	Terminal assignment	Remarks
		**Sensor 1:** Channel 0: Terminals 1 and 3 **Sensor 2:** Channel 1: Terminals 5 and 7 **Sensor 3:** Channel 2: Terminals 2 and 3 **Sensor 4:** Channel 3: Terminals 6 and 7 DI: Input signal V_s: Sensor supply

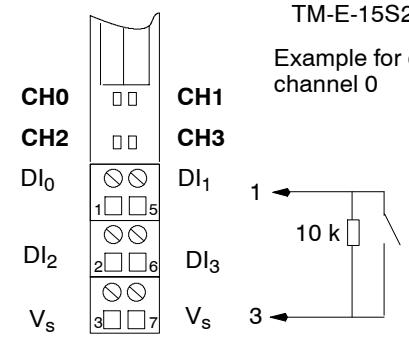
Terminal assignment of NAMUR changeover contacts or sensors as per DIN 19234

Table 11-11 Terminal assignment of NAMUR changeover contacts or sensors as per DIN 19234

View	Terminal assignment	Remarks
		**Changeover contact 1.** Terminals 1, 5 and 3 **Changeover contact 2** Terminals 2, 6 and 7 DI: Input signal Vs: Sensor supply

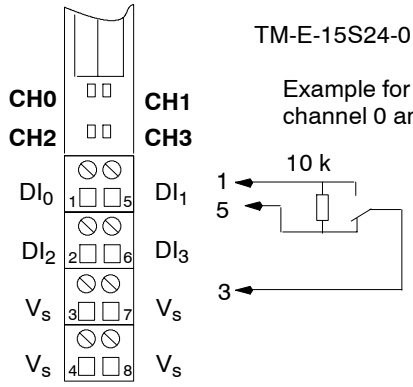
Terminal assignment of single contact with 10 kΩ (mechanical NO contact)

Table 11-12 Terminal assignment of single contact with 10 kΩ (mechanical NO contact)

View	Terminal assignment	Remarks
		**Single contact 1:** Channel 0: Terminals 1 and 3 **Single contact 2:** Channel 1: Terminals 5 and 7 **Single contact 3:** Channel 2: Terminals 2 and 3 **Single contact 4:** Channel 3: Terminals 6 and 7 DI: Input signal Vs: Sensor supply

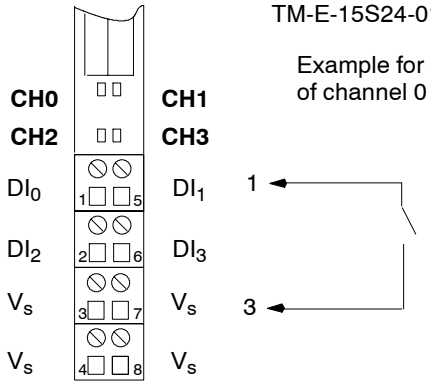
Terminal assignment of changeover contact with 10 kΩ (mechanical changeover contact)

Table 11-13 Terminal assignment of changeover contact with 10 kΩ (mechanical changeover contact)

View	Terminal assignment	Remarks
	TM-E-15S24-01 and 4DI NAMUR Example for connection of channel 0 and channel 1	**Changeover contact 1:** Terminals 1, 5 and 3 **Changeover contact 2:** Terminals 2, 6 and 7 DI: Input signal Vs: Sensor supply

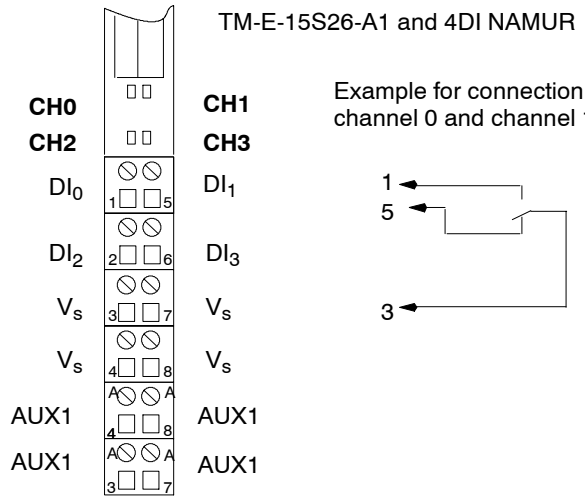
Terminal Assignment of a Single Contact without Load Resistance (Mechanical NO Contact with Single Contact)

Table 11-14 Terminal Assignment of a Single Contact without Load Resistance (Mechanical NO Contact with Single Contact)

View	Terminal assignment	Remarks
	TM-E-15S24-01 and 4DI NAMUR Example for connection of channel 0	**Single contact 1:** Channel 0: Terminals 1 and 3 **Single contact 2:** Channel 1: Terminals 5 and 7 **Single contact 3:** Channel 2: Terminals 2 and 4 **Single contact 4:** Channel 3: Terminals 6 and 8 DI: Input signal Vs: Encoder supply

Terminal Assignment of a Changeover Contact without Load Resistance (Mechanical Changeover Contact)

Table 11-15 Terminal Assignment of a Changeover Contact without Load Resistance (Mechanical Changeover Contact)

View	Terminal assignment	Remarks
		**Changeover contact 1:** Terminals 1, 5 and 3 **Changeover contact 2:** Terminals 2, 6 and 7 DI: Input signal Vs: Encoder supply

Block diagram

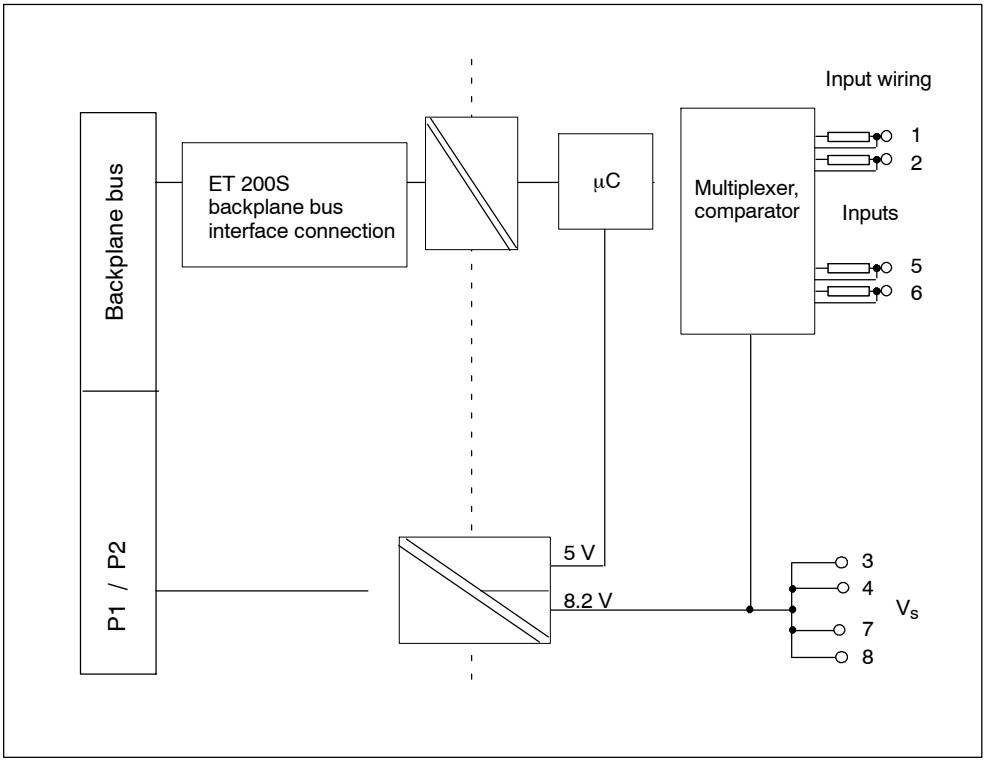


Figure 11-9 Block diagram of the 4D NAMUR

Technical data

Dimensions and weight	
Dimensions W x H x D (mm)	15 x 81 x 52
Weight	Approx. 35 g
Module-specific data	
Number of inputs	4
Cable length	
• shielded	max. 200 m (164 ft)
Voltages, currents, electrical potentials	
Number of inputs that can be addressed simultaneously	4
• horizontal installation up to 60 °C	4
• all other installation 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
Approved potential difference	
• Between different circuits	75 VDC, 60 VAC
Insulation tested at:	
• Channels against backplane bus and load voltage	500 V DC
• Load voltage against backplane bus	500 V DC
Current consumption	
• with load voltage L+	Dependent on the encoder
Power loss of the module	Typically 1.6 W
Status, interrupts, diagnostics	
Status display	Green LED pro Channel
Interrupts	
• Process alarm	No
• Diagnostic alarm	Yes, configurable
Diagnostic functions	
• Group error display	red LED ”SF”
• Reading of diagnostic data	possible
Monitoring function	
• Short-circuit	I > 7 mA*
• Wire break	I < 0.35 mA*

* Only for NAMUR encoders and contacts with load resistance.

Data for selecting an encoder	
Input current for NAMUR encoder	to NAMUR or EN 50227
• For signal ”1”	2.1 mA to 7 mA
• For signal ”0”	0.35 mA to 1.2 mA
Input current for a switched contact	
• For signal ”1”	2.1 mA to 7 mA
• for ”0” signal	0.35 mA to 1.2 mA
Input current for an non-switched contact	
• For signal ”1”	Typical 8 mA
• permitted quiescent current	0.5 mA
Input delay	
• ”0” to ”1” transition	Max. 4.6 ms
• ”1” to ”0” transition	Max. 4.6 ms
Tolerated settling time for changeover contacts	300 ms
Parallel wiring of inputs	No

Sensor Power Supply Outputs	
Number of outputs	1
Output voltage	
• Loaded	Min. 8.2 V
Output current	
• Rated value	45 mA
Additional (redundant) supply	Not permitted
Short-circuit protection	Yes, electronic

Value status

The value status is additional binary information on a digital input signal. The value status is input to the process image of the inputs at the same time as the signal and supplied information on the validity of the input signal. The value status is influenced by:

- Wire-break test / short circuit
- Flutter monitoring
- Pulse stretching
- Validity check of encoder type changeover contact

Significance of value status:

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

Assignment in process image of inputs

The data are transferred to the process image in 2 byes (16 bits).

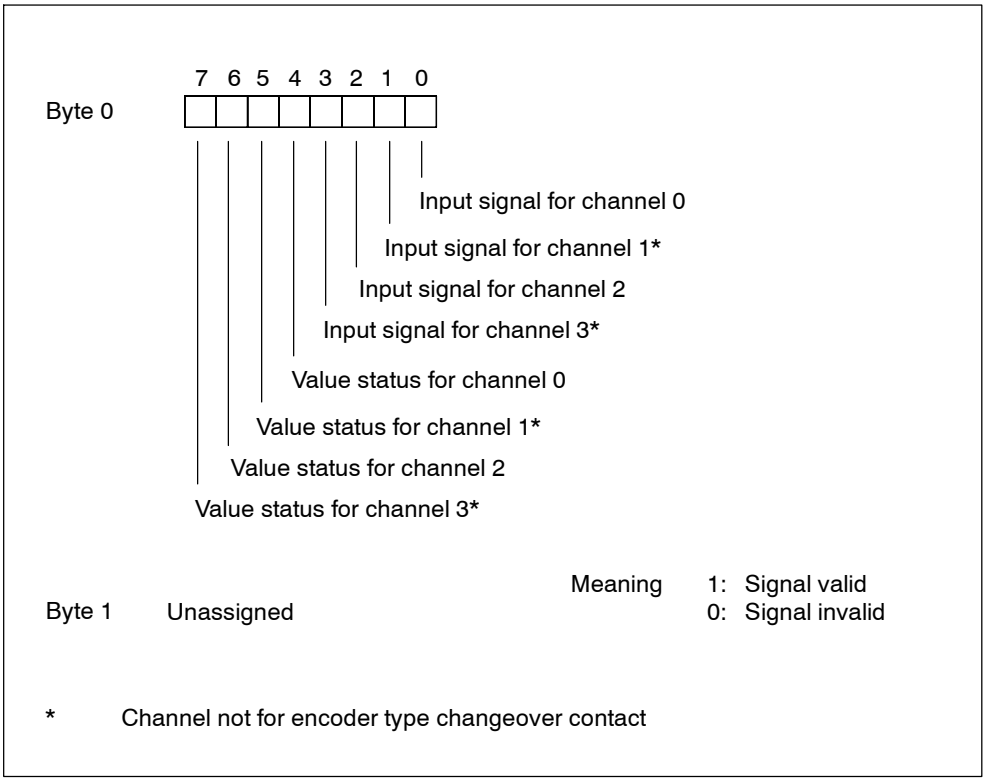


Figure 11-10 Assignment in the process image of the inputs with 4DI NAMUR

Diagnostics with the changeover encoder type

With the diagnostic functions for the changeover encoder type, the digital electronic module monitors the changeover between two input channels. If there is no signal transition at the NC contact when the specified changeover time (see technical specifications) has expired, the module outputs diagnostics information.

Purpose

You can use the diagnostics function to

- analyze the encoder
- verify that the switch has changed between the NO contact and the NC contact.

Principle

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

If the plausibility check returns a negative result,

- 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.
- A diagnostics interrupt is triggered.

The digital input signal and the value status are updated only for the NO channel (channel 0, 2). For the NC channel (channel 1, 3), the digital input signal is set to the fixed value ”zero,” and the value status is ”invalid” because this channel is used only for the validation of the sensor.

Note the following points in the diagnosis for the changeover contact type of sensor:

- 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. Changeover errors are still monitored on the other channel.
- You will find further details in the table below:

Table 11-16 Changeover Contact Diagnostics

Changeover contact	**Negative check means ...**	
Changeover switch as NAMUR	• Short-circuit or • Wire break	Also: Changeover error or external error (in DP diagnostics)
changeover switch with load resistance	• Sensor defective or short-circuit No distinction between a defective sensor and short-circuit is possible.	
changeover switch without R-circuit	Important: no differentiation possible between • ”0” signal and wire break • ”1” signal and short-circuit	

11.9 2DI 120 VAC Standard digital electronic module (6ES7 131-4EB00-0AB0)

Order number

6ES7 131-4EB00-0AB0

Properties

- Digital electronic module with two inputs
- Rated input voltage 120 V AC
- Suitable for switches

Connection assignment

The following table shows the terminal assignment of the 2DI 120 VAC Standard for the various terminal modules:

Table 11-17 Terminal assignment of the 2DI 24 VDC Standard

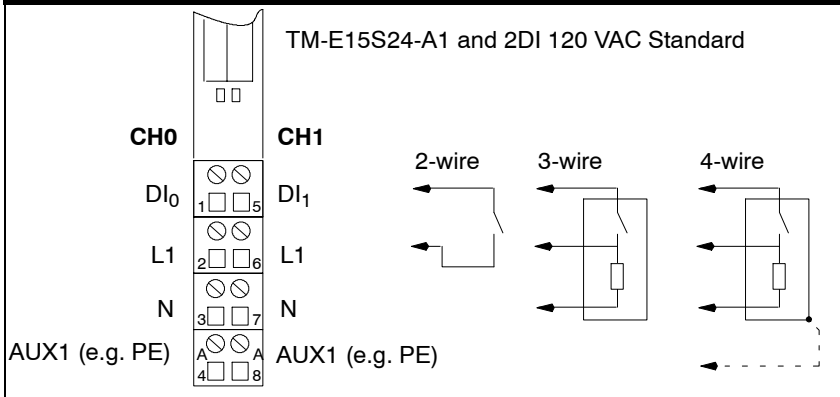
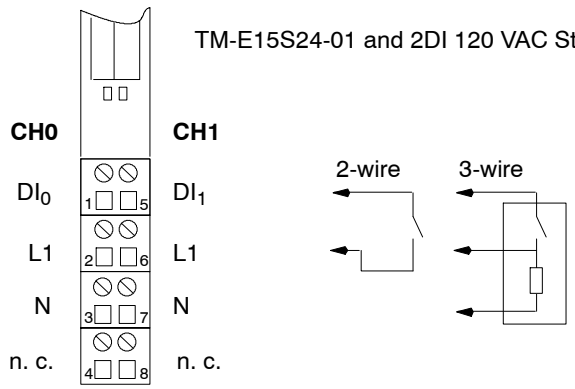
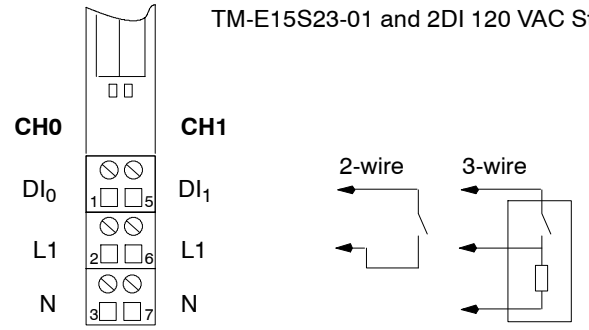
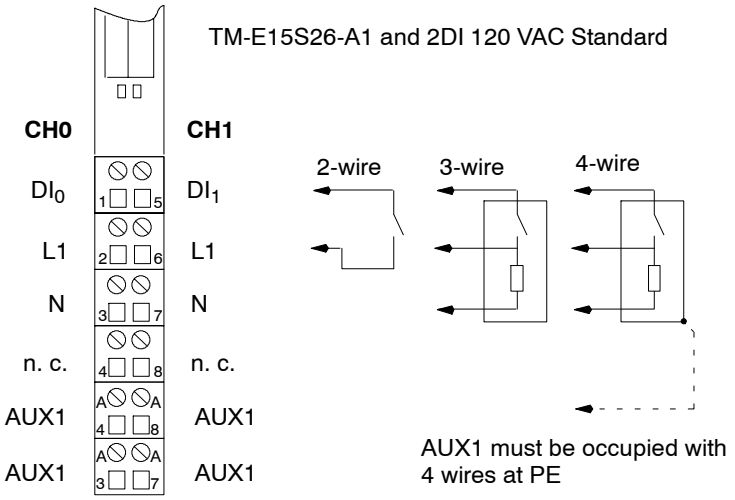
View	Terminal assignment	Remarks
		Channel 0: Terminals 1 to A4 Channel 1: Terminals 5 to A8 DI: Input signal L1: Sensor supply N: Neutral wire
		Channel 0: Terminals 1 to 4 Channel 1: Terminals 5 to 8 DI: Input signal L1: Sensor supply N: Neutral wire Terminals 4 and 8 can be used for connection of cables that are not required up to 120 VAC.

Table 11-17 Terminal assignment of the 2DI 24 VDC Standard, continued

View	Terminal assignment	Remarks
		Channel 0: Terminals 1 to 3 Channel 1: Terminals 5 to 7 DI: Input signal L1: Sensor supply N: Neutral wire
		Channel 0: Terminals 1 to A3 Channel 1: Terminals 5 to A7 DI: Input signal L1: Sensor supply N: Neutral wire Terminals 4 and 8 can be used for connection of cables that are not required up to 120 VAC.

Block diagram

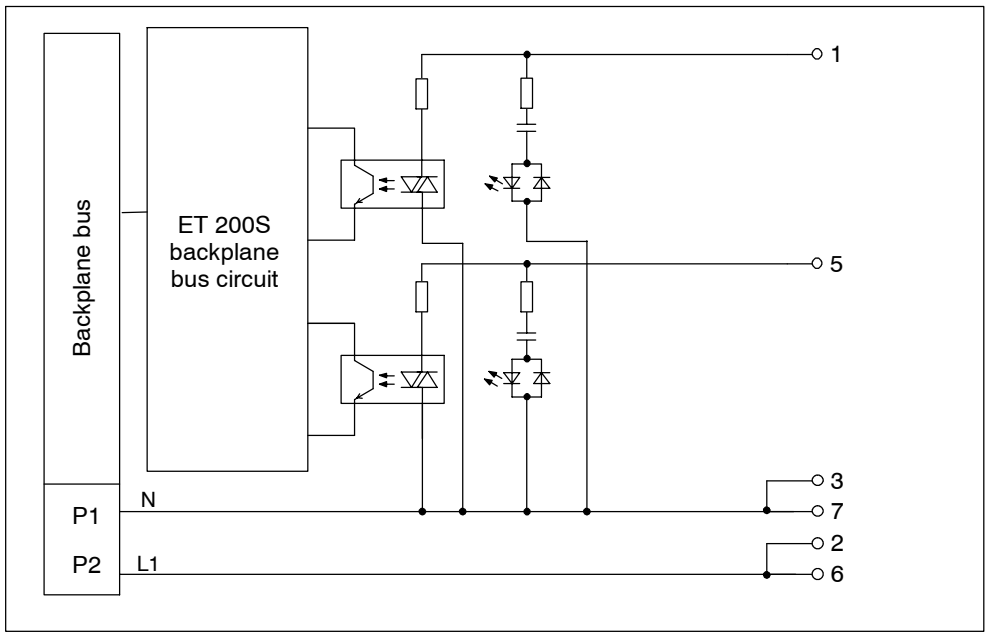


Figure 11-11 Block diagram of the 2DI 120 VAC Standard

Technical data

Dimensions and weight	
Dimensions W x H x D (mm)	15 x 81 x 52
Weight	Approx. 31 g
Module-specific data	
Supports clock synchronized mode	No
Number of inputs	2
Cable length	
• Unshielded	max. 600 m (164 ft)
• shielded	max. 1,000 m (164 ft)
Voltages, currents, electrical potentials	
Power supply (from the power module)	120 VAC
• Frequency	47 to 63 Hz
Electrical isolation	
• Between the channels	No
• Between channels and backplane bus	Yes
Permissible potential difference	
• Between $M_{internal}$ and the inputs	1500 VAC
Insolation tested with	2500 VDC
Power loss of the module	Typical 0.5 W

Status, interrupts, diagnostics	
Status display	Green LED per channel
Diagnostic functions	No
Data for selecting a sensor	
Input voltage	
• Rated value	120 VAC
• for ”1” signal	79 V to 132 V AC
• for ”0” signal	0 V to 20 V AC
Input current	
• For signal ”1”	3 to 9 mA
Input delay	
• ”0” to ”1” transition	15 ms
• ”1” to ”0” transition	25 ms
Input characteristic curve	To IEC 61131, type 1
Connection of 2wire BEROs	No
• permitted quiescent current	max. 1 mA

11.10 2DI 230 VAC Standard digital electronic module (6ES7 131-4FB00-0AB0)

Order number

6ES7 131-4FB00-0AB0

Properties

- Digital electronic module with two inputs
- Rated input voltage 230 V AC
- Suitable for switches

Connection assignment

The following table shows the terminal assignment of the 2DI 230 VAC Standard for the various terminal modules:

Table 11-18 Terminal assignment of the 2DI 230 VAC Standard

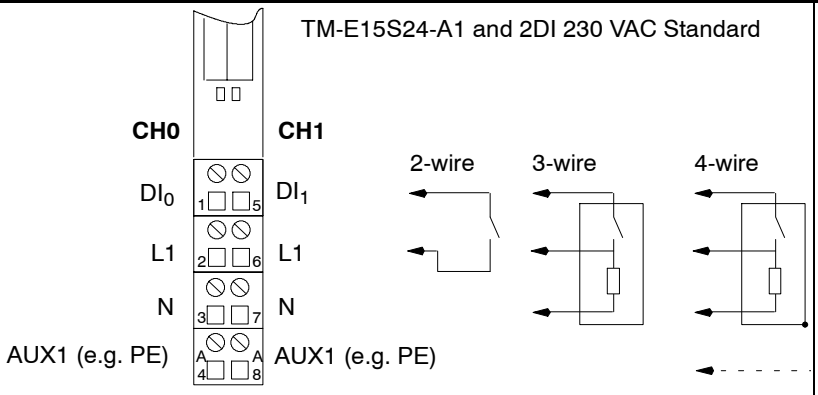
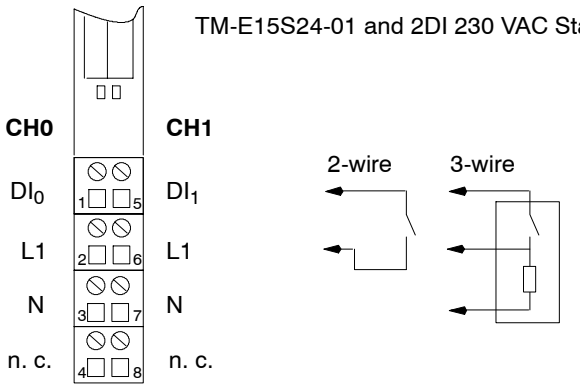
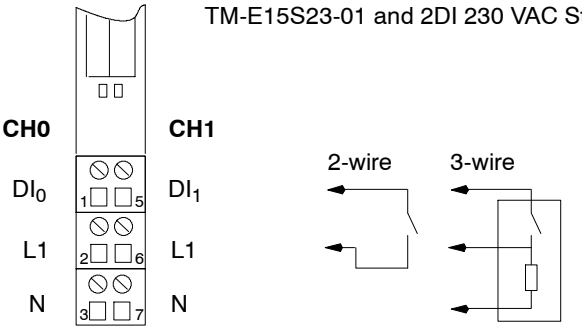
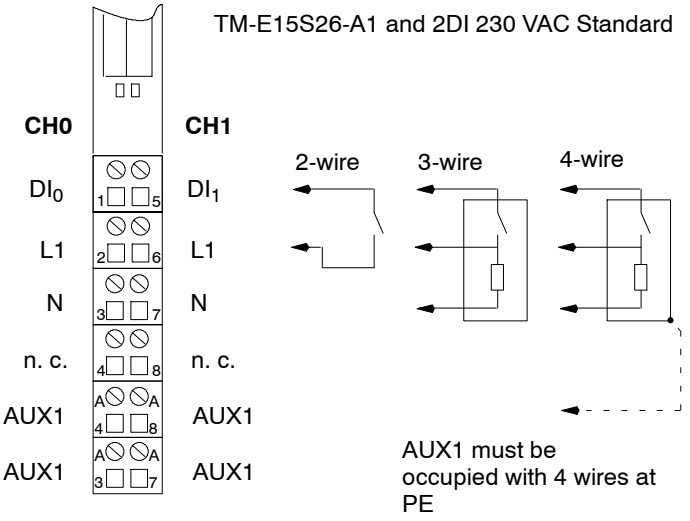
View	Terminal assignment	Remarks
		Channel 0: Terminals 1 to A4 Channel 1: Terminals 5 to A8 DI: Input signal L1: Sensor supply N: Neutral wire
		Channel 0: Terminals 1 to 4 Channel 1: Terminals 5 to 8 DI: Input signal L1: Sensor supply N: Neutral wire Terminals 4 and 8 can be used for connection of cables that are not required up to 230 VAC.
		Channel 0: Terminals 1 to 3 Channel 1: Terminals 5 to 7 DI: Input signal L1: Sensor supply N: Neutral wire

Table 11-18 Terminal assignment of the 2DI 230 VAC Standard, continued

View	Terminal assignment	Remarks
		Channel 0: Terminals 1 to A3 Channel 1: Terminals 5 to A7 DI: Input signal L1: Sensor supply N: Neutral wire Terminals 4 and 8 can be used for connection of cables that are not required up to 230 VAC.

Block diagram

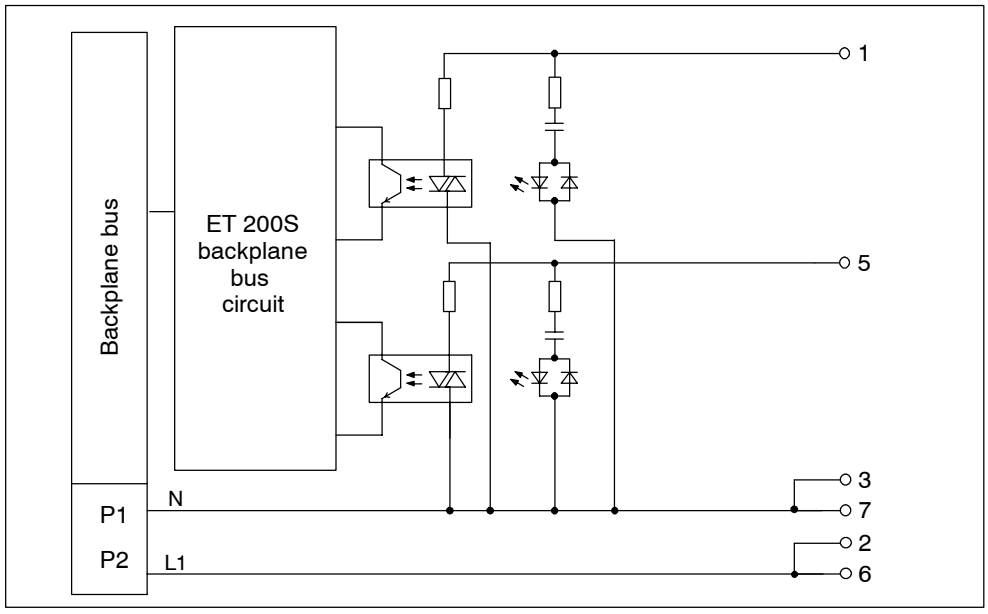


Figure 11-12 Block diagram of the 2DI 230 VAC Standard

Technical data

Dimensions and weight	
Dimensions W x H x D (mm)	15 x 81 x 52
Weight	Approx. 31 g
Module-specific data	
Supports clock synchronized mode	No
Number of inputs	2
Cable length	
• Unshielded	max. 600 m (164 ft)
• shielded	max. 1,000 m (164 ft)
Voltages, currents, electrical potentials	
Power supply (from the power module)	230 VAC
• Frequency	47 to 63 Hz
Electrical isolation	
• Between the channels	No
• Between channels and backplane bus	Yes
Permissible potential difference	
• Between $M_{internal}$ and the inputs	1500 VAC
Insolation tested with	4000 VDC
Power loss of the module	Typical 0.7 W

Status, interrupts, diagnostics	
Status display	Green LED per channel
Diagnostic functions	No
Data for selecting a sensor	
Input voltage	
• Rated value	230 VAC
• for ”1” signal	164 V to 264 V AC
• for ”0” signal	0 V to 40 V AC
Input current	
• For signal ”1”	5 to 15 mA
Input delay	
• ”0” to ”1” transition	15 ms
• ”1” to ”0” transition	45 ms
Input characteristic curve	To IEC 61131, type 1
Connection of 2wire BEROs	No
• permitted quiescent current	max. 2 mA

11.11 2DO 24 VDC/0.5 A Standard digital electronic module (6ES7 132-4BB00-0AA0)

Order number

6ES7 132-4BB00-0AA0

Properties

- Digital electronic module with two outputs
- Output current 0.5 A per output
- A nominal load voltage of 24 V DC
- Suitable for solenoids, DC current protection and warning lights

Special feature

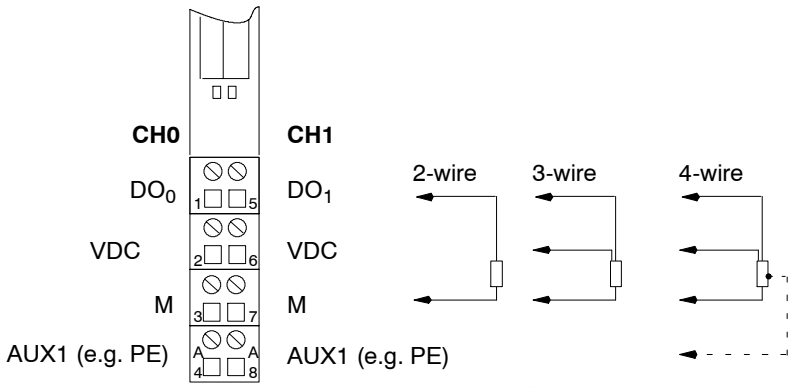
When the rated load voltage of 24 VDC is connected at the power module via a mechanica contact, the digital outputs carry a ”1” signal for approx. 50 μs because of the circuit type. This must be considered when the module is connected to fast counters.

Connection assignment

The following table shows the terminal assignment of the 2DO 24 VDC/0.5 A Standard for the various terminal modules:

Table 11-19 Terminal assignment of the 2DO 24 VDC/0.5 A Standard

View	Terminal assignment	Remarks
TM-E15S24-A1 and 2DO 24 VDC/o.5 A Standard		Channel 0: Terminals 1 to A4 Channel 1: Terminals 5 to A8 DO: Output signal (max. 0.5 A per channel) 24 VDC: Sensor supply M : Load power supply ground
TM-E15S24-01 and 2DO 24 VDC/0.5 A Standard		Channel 0: Terminals 1 to 4 Channel 1: Terminals 5 to 8 DO: Output signal (max. 0.5 A per channel) 24 VDC: Sensor supply M : Load power supply ground Terminals 4 and 8 can be used for connection of cables that are not required u to 30 VDC.



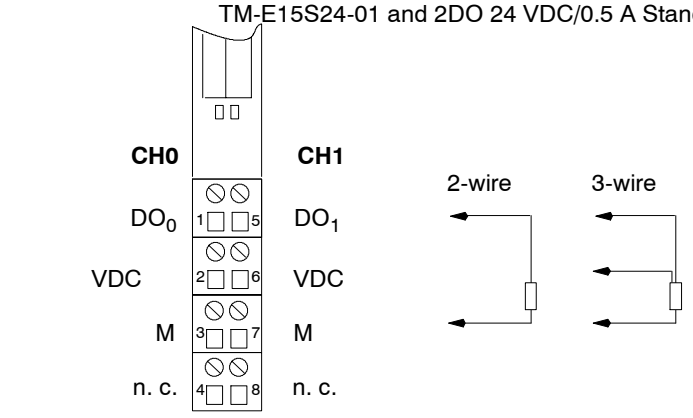
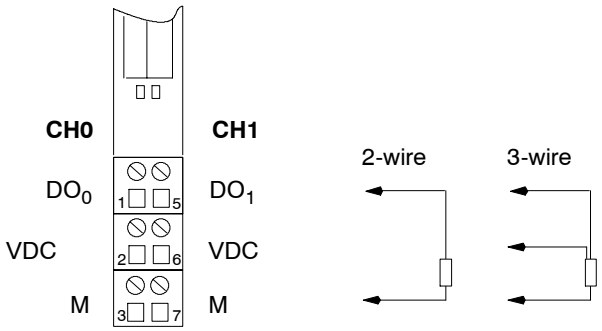
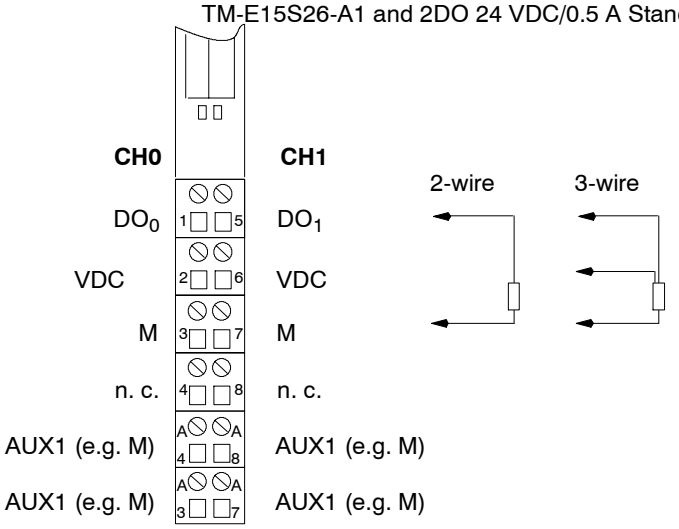


Table 11-19 Terminal assignment of the 2DO 24 VDC/0.5 A Standard, continued

View	Terminal assignment	Remarks
TM-E15S23-01 and 2DO 24 VDC/0.5 A Standard  		Channel 0: Terminals 1 to 3 Channel 1: Terminals 5 to 7 DO: Output signal (max. 0.5 A per channel) 24 VDC: Sensor supply M : Load power supply ground
TM-E15S26-A1 and 2DO 24 VDC/0.5 A Standard  		Channel 0: Terminals 1 to A3 Channel 1: Terminals 5 to A7 DO: Output signal (max. 0.5 A per channel) 24 VDC: Sensor supply M : Load power supply ground Terminals 4 and 8 can be used for connection of cables that are not required u to 30 VDC.

Block diagram

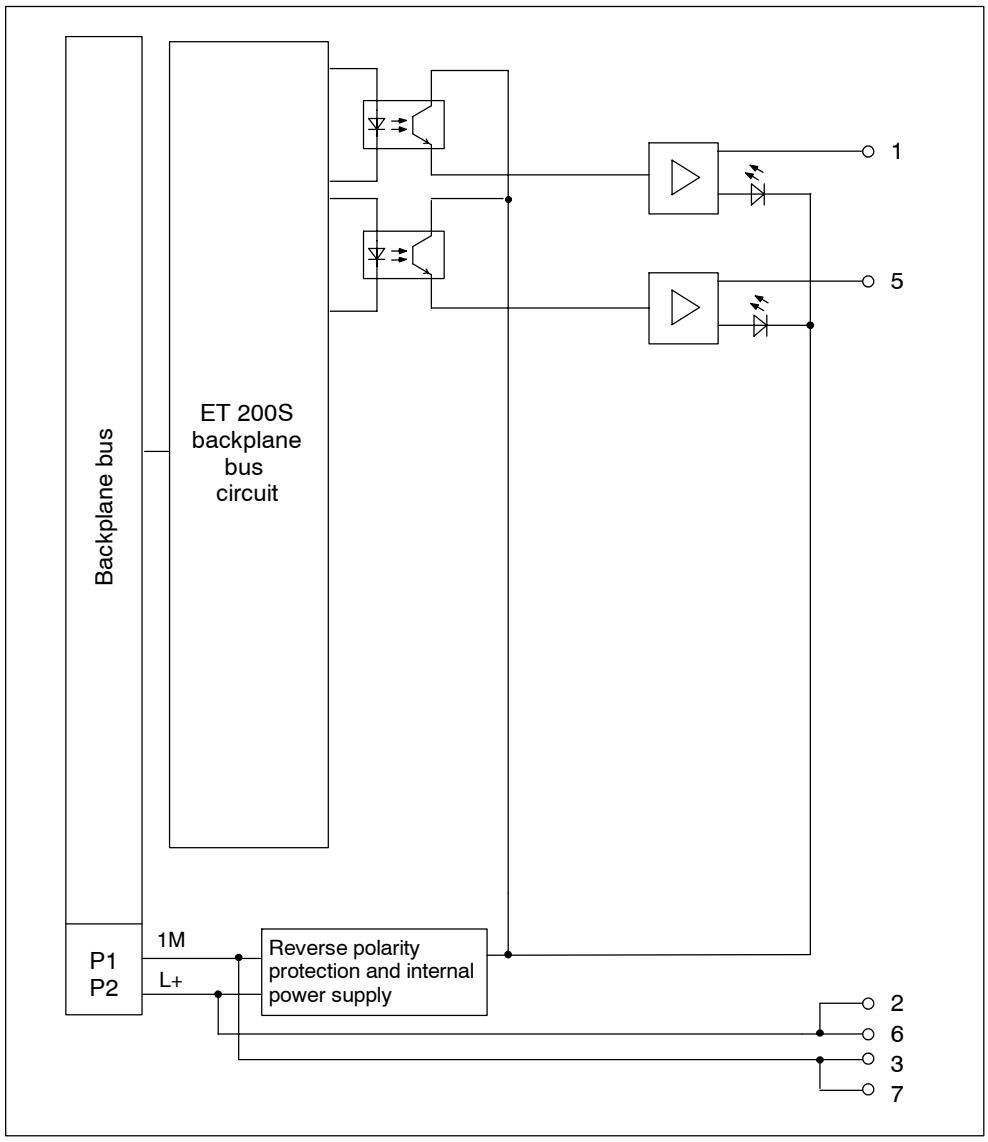


Figure 11-13 Block diagram of the 2DO 24 VDC/0.5 A Standard

Technical data

Dimensions and weight	
Dimensions W x H x D (mm)	15 x 81 x 52
Weight	Approx. 40 g
Module-specific data	
Supports clock synchronized mode	No
Number of outputs	2
Cable length	
• Unshielded	max. 600 m (164 ft)
• shielded	max. 1,000 m (164 ft)
Voltages, currents, electrical potentials	
Rated load voltage L+ (from power module)	24 VDC
• Polarity reversal protection	Yes[1)]
Total current of outputs (per module)	1 A
Electrical isolation	
• Between the channels	No
• Between channels and backplane bus	Yes
Permissible potential difference	
• Between different circuits	75 VDC / 60 VAC
Isolation tested	500 VDC
Current consumption	
• From load voltage L+ (without load)	max. 5 mA per channel
Power loss of the module	Typical 0.4 W
Status, interrupts, diagnostics	
Status display	Green LED pro Channel
Diagnostic functions	No

Data for selection of an actuator	
Output voltage	
• For signal ”1”	min. L+ (–1 V)
Output current	
• For signal ”1”	
– Rated value	0.5 A
– Permitted range	7 mA to 600 mA
• For signal ”0” (residual current)	max. 0.3 mA
Output delay (with ohmic load)	
• ”0” to ”1” transition	max. 200µs
• ”1” to ”0” transition	Max. 1.3 ms
Load resistor range	48 Ω up to 3.4 kΩ
Lamp load	max. 5 W
Connecting 2 outputs in parallel	
• For redundant triggering of a load	Yes (per module)
• To increase performance	No
Actuation of a digital input	Yes
Switching frequency	
• with ohmic load	100 Hz
• with inductive load	2 Hz
• With lamp load	10 Hz
Limitation (internal) of the inductive disconnection voltage	Typically L+ (–55 to –60 V)
Reverse voltage protection	Yes, when using the same load voltage as at the power module
Short-circuit protection of the output	Yes[2)]
• Response threshold	Typically 0.7 to 1.8 A

1) Polarity reversal can cause interconnection of the digital outputs

2) Per channel

11.12 4DO 24 VDC/0.5 A Standard digital electronic module (6ES7 132-4BD00-0AA0)

Order number

6ES7 132-4BD00-0AA0

Properties

- Digital electronic module with four outputs
- Output current 0.5 A per output
- 24 VDC rated load voltage
- Suitable for solenoids, DC current protection and warning lights

Special feature

When the rated load voltage of 24 VDC is connected at the power module via a mechanical contact, the digital outputs carry a ”1” signal for approx. 50 µs because of the circuit type. This must be considered when the module is connected to fast counters.

Connection assignment

The following table shows the terminal assignment of the 4DO 24 VDC/0.5 A Standard for the various terminal modules:

Table 11-20 Terminal assignment of the 4DO 24 VDC/0.5 A Standard

View	Terminal assignment	Remarks
TM-E15S24-A1 and 4DO 24 VDC/0.5 A Standard		Channel 0: Terminals 1 and 3 Channel 1: Terminals 5 and 7 Channel 2: Terminals 2 and 3 Channel 3: Terminals 6 and 7 DO: Output signal (max. 0.5 A per channel) M : Load power supply ground

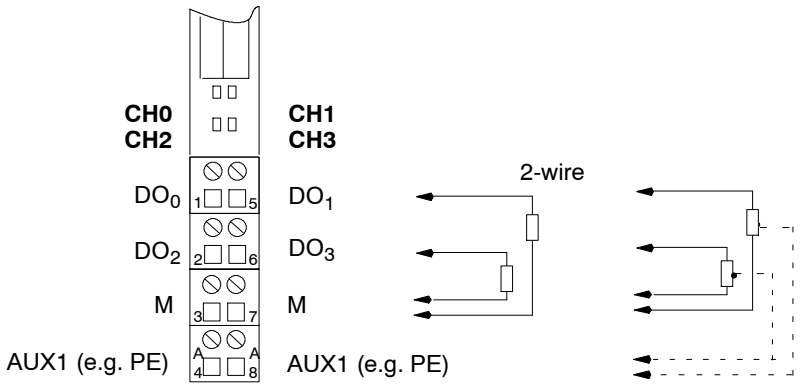
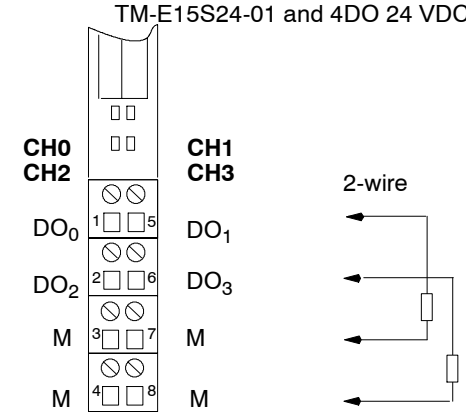
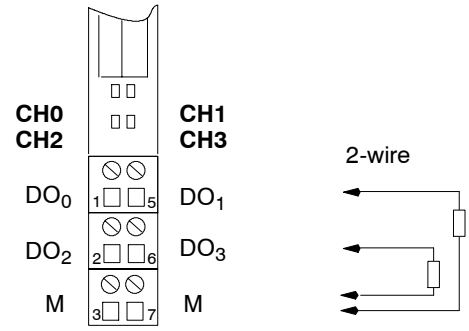
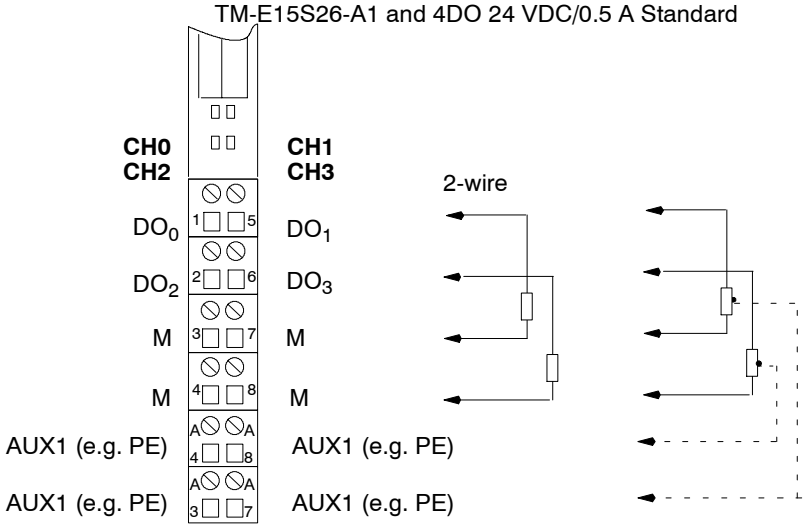


Table 11-20 Terminal assignment of the 4DO 24 VDC/0.5 A Standard, continued

View	Terminal assignment	Remarks
TM-E15S24-01 and 4DO 24 VDC/0.5 A Standard  		Channel 0: Terminals 1 and 3 Channel 1: Terminals 5 and 7 Channel 2: Terminals 2 and 4 Channel 3: Terminals 6 and 8 DO: Output signal (max. 0.5 A per channel) M : Load power supply ground
TM-E15S24-01 and 4DO 24 VDC/0.5 A Standard  		Channel 0: Terminals 1 and 3 Channel 1: Terminals 5 and 7 Channel 2: Terminals 2 and 3 Channel 3: Terminals 6 and 7 DO: Output signal (max. 0.5 A per channel) M : Load power supply ground
TM-E15S26-A1 and 4DO 24 VDC/0.5 A Standard  		Channel 0: Terminals 1 and 3 Channel 1: Terminals 5 and 7 Channel 2: Terminals 2 and 4 Channel 3: Terminals 6 and 8 DO: Output signal (max. 0.5 A per channel) M : Load power supply ground

Block diagram

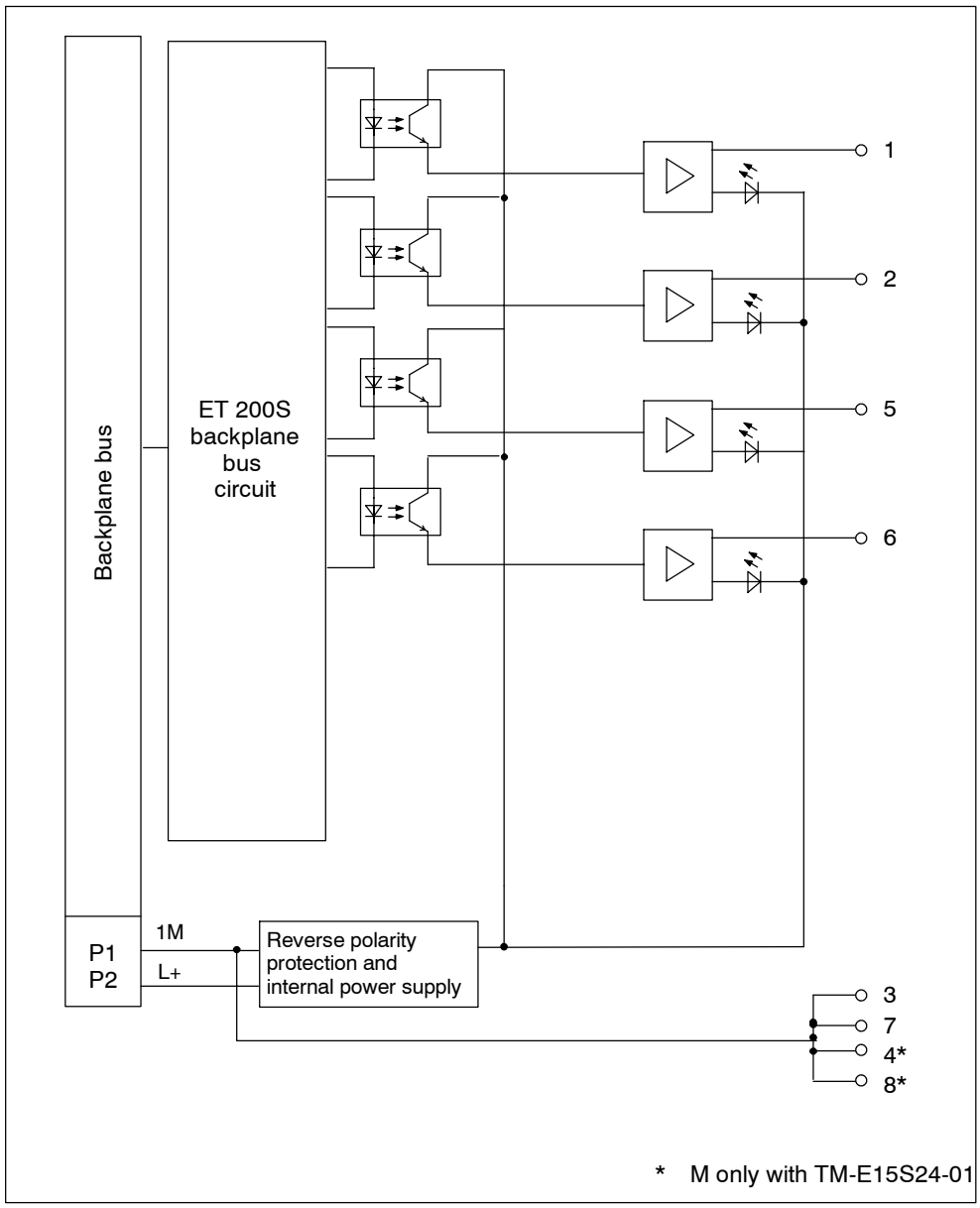


Figure 11-14 Block diagram of the 4DO 24 VDC/0.5 A Standard

Technical data

Dimensions and weight	
Dimensions W x H x D (mm)	15 x 81 x 52
Weight	Approx. 40 g
Module-specific data	
Supports clock synchronized mode	No
Number of outputs	4
Cable length	
• Unshielded	max. 600 m (164 ft)
• shielded	max. 1,000 m (164 ft)
Voltages, currents, electrical potentials	
Rated load voltage L+ (from power module)	24 VDC
• Polarity reversal protection	Yes[1)]
Total current of outputs (per module)	2 A
Electrical isolation	
• Between the channels	No
• Between channels and backplane bus	Yes
Permissible potential difference	
• Between different circuits	75 VDC / 60 VAC
Isolation tested	500 VDC
Current consumption	
• From load voltage L+ (without load)	max. 5 mA per channel
Power loss of the module	Typical 0.8 W
Status, interrupts, diagnostics	
Status display	Green LED pro Channel
Diagnostic functions	No

Data for selection of an actuator	
Output voltage	
• For signal ”1”	min. L+ (–1 V)
Output current	
• For signal ”1”	
– Rated value	0.5 A
– Permitted range	7 mA to 600 mA
• For signal ”0” (residual current)	max. 0.3mA (164 ft)
Output delay (with ohmic load)	
• ”0” to ”1” transition	max. 100µs
• ”1” to ”0” transition	max. 300µs
Load resistor range	48 Ω up to 3.4 kΩ
Lamp load	max. 5 W
Connecting 2 outputs in parallel	
• For redundant triggering of a load	Yes (per module)
• To increase performance	No
Actuation of a digital input	Yes
Switching frequency	
• with ohmic load	100 Hz
• with inductive load	2 Hz
• With lamp load	10 Hz
Limitation (internal) of the inductive disconnection voltage	Typically L+ (–55 to –60 V)
Reverse voltage protection	Yes, when using the same load voltage as at the power module[2)]
Short-circuit protection of the output	Yes[3)]
• Response threshold	Typically 0.7 to 1.5 A

1) Polarity reversal can cause interconnection of the digital outputs

2) The module must be supplied with power.

3) Per channel

11.13 2DO 24 VDC/0.5 A High Feature digital electronic module (6ES7 132-4BB00-0AB0)

Order number

6ES7 132-4BB00-0AB0

Properties

- Digital electronic module with two outputs
- Output current 0.5 A per output
- 24 VDC rated load voltage
- Suitable for solenoids, DC current protection and warning lights
- Supports clock synchronized mode

Special feature

When the rated load voltage of 24 VDC is connected at the power module via a mechanical contact, the digital outputs carry a ”1” signal for approx. 50 µs because of the circuit type. This must be considered when the module is connected to fast counters.

Connection assignment

The following table shows the terminal assignment of the 2DO 24 VDC/0.5 A High Feature for the various terminal modules:

Table 11-21 Terminal assignment of the 2DO 24 VDC/0.5 A High Feature

View	Terminal assignment	Remarks
TM-E15S24-A1 and 2DO 24 VDC/0.5 A High Feature		Channel 0: Terminals 1 to A4 Channel 1: Terminals 5 to A8 DO: Output signal (max. 0.5 A per channel) 24 VDC: Sensor supply M : Load power supply ground

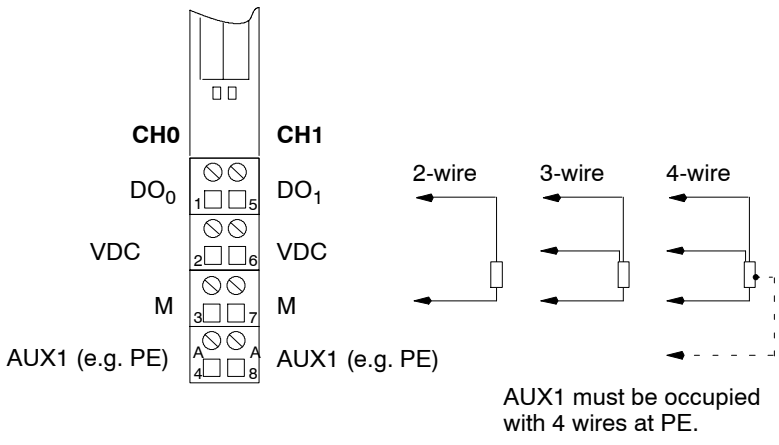
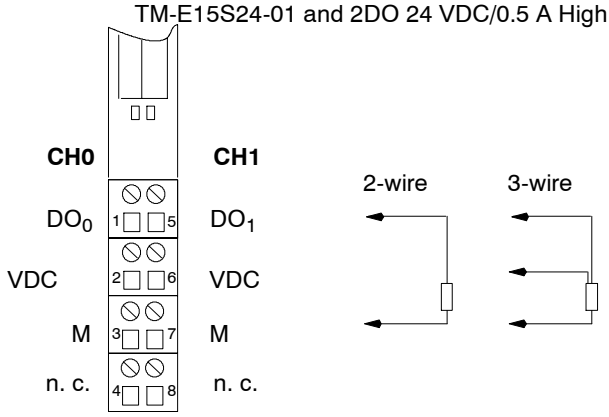
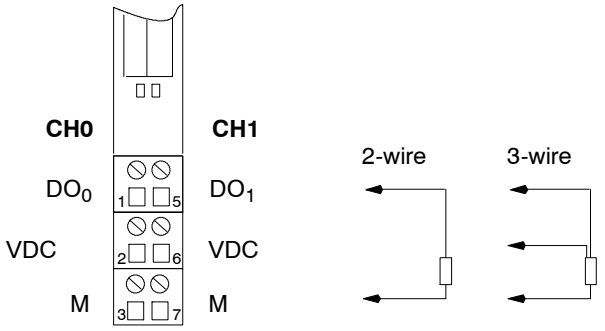
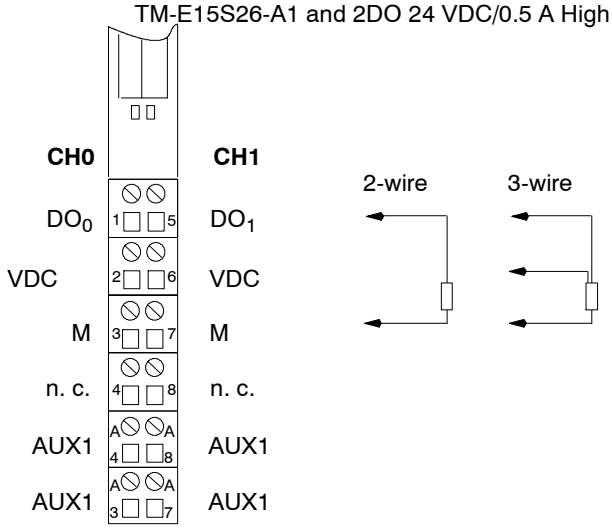


Table 11-21 Terminal assignment of the 2DO 24 VDC/0.5 A High Feature, continued

View	Terminal assignment	Remarks
TM-E15S24-01 and 2DO 24 VDC/0.5 A High Feature  		Channel 0: Terminals 1 to 4 Channel 1: Terminals 5 to 8 DO: Output signal (max. 0.5 A per channel) 24 VDC: Sensor supply M : Load power supply ground Terminals 4 and 8 can be used for connection of cables that are not required u to 30 VDC.
TM-E15S23-01 and 2DO 24 VDC/0.5 A High Feature  		Channel 0: Terminals 1 to 3 Channel 1: Terminals 5 to 7 DO: Output signal (max. 0.5 A per channel) 24 VDC: Sensor supply M : Load power supply ground
TM-E15S26-A1 and 2DO 24 VDC/0.5 A High Feature  		Channel 0: Terminals 1 to A7 Channel 1: Terminals 5 to A3 DO: Output signal (max. 0.5 A per channel) 24 VDC: Sensor supply M : Load power supply ground Terminals 4 and 8 can be used for connection of cables that are not required u to 30 VDC.

Block diagram

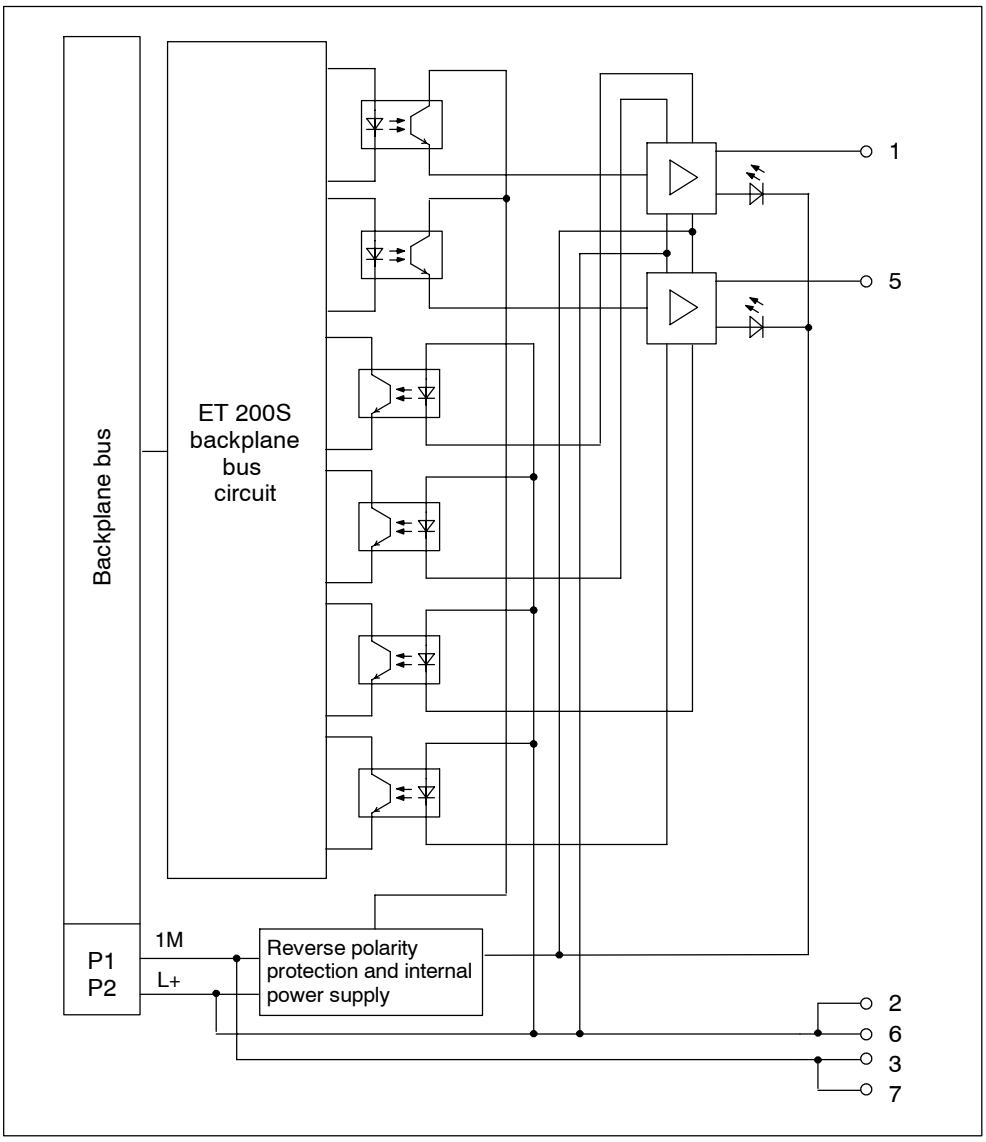


Figure 11-15 Block diagram of the 2DO 24 VDC/0.5 A High Feature

Technical data

Dimensions and weight	
Dimensions W x H x D (mm)	15 x 81 x 52
Weight	Approx. 40 g
Module-specific data	
Supports clock synchronized mode	Yes
Number of outputs	2
Cable length	
• Unshielded	max. 600 m (164 ft)
• shielded	max. 1,000 m (164 ft)
Voltages, currents, electrical potentials	
Rated load voltage L+ (from power module)	24 VDC
• Polarity reversal protection	Yes[1)]
Total current of outputs (per module)	1A
Electrical isolation	
• Between the channels	No
• Between channels and backplane bus	Yes
Permissible potential difference	
• Between different circuits	75 VDC / 60 VAC
Isolation tested	500 VDC
Current consumption	
• From load voltage L+ (without load)	max. 5 mA per channel
Power loss of the module	Typical 0.4 W
Status, interrupts, diagnostics	
Status display	Green LED pro Channel
Diagnostic functions	
• Group error	red LED "SF"
• Reading of diagnostics functions	Yes

Data for selection of an actuator	
Output voltage	
• For signal "1"	min. L+ (–1 V)
Output current	
• For signal "1"	
– Rated value	0.5 A
– Permitted range	7 mA to 600 mA
• For signal "0" (residual current)	max. 0.3 mA
Output delay (with ohmic load)	
• "0" to "1" transition	max. 100 µs
• "1" to "0" transition	max. 400 µs
Load resistor range	48 Ω up to 3.4 kΩ
Lamp load	max. 2.5 W
Connecting 2 outputs in parallel	
• For redundant triggering of a load	Yes (per module)
• To increase performance	No
Actuation of a digital input	Yes
Switching frequency	
• with ohmic load	100 Hz
• with inductive load	2 Hz
• With lamp load	10 Hz
Limitation (internal) of the inductive disconnection voltage	Typically L+ (–55 to –60 V)
Reverse voltage protection	Yes, when using the same load voltage as at the power module
Short-circuit protection of the output	Yes[2)]
• Response threshold	Typical 1.5 A

1) Polarity reversal can cause interconnection of the digital outputs

2) Per channel

11.14 2DO 24 VDC/2 A ST digital electronic module (6ES7 132-4BB30-0AA0)

Order number

6ES7 132-4BB30-0AA0

Properties

- Digital electronic module with two outputs
- Output current 2 A per output
- 24 VDC rated load voltage
- Suitable for solenoids, DC current protection and warning lights

Special feature

When the rated load voltage of 24 VDC is connected at the power module via a mechanical contact, the digital outputs carry a ”1” signal for approx. 50 µs because of the circuit type. This must be considered when the module is connected to fast counters.

Connection assignment

The following table shows the terminal assignment of the 2DO 24 VDC/2 A Standard for the various terminal modules:

Table 11-22 Terminal assignment of the 2DO 24 VDC/2 A Standard

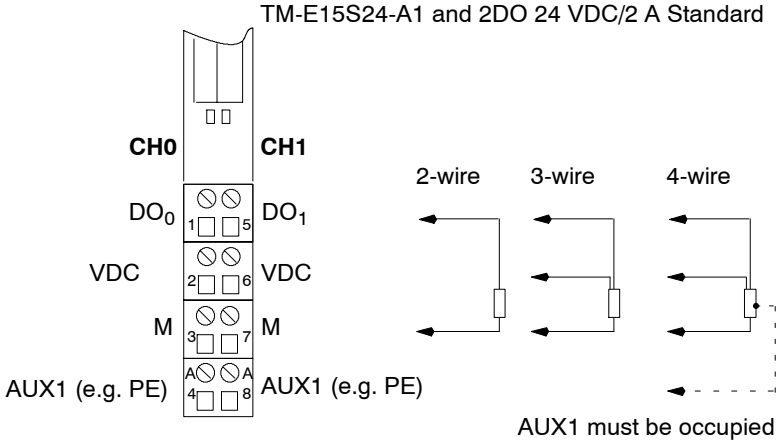
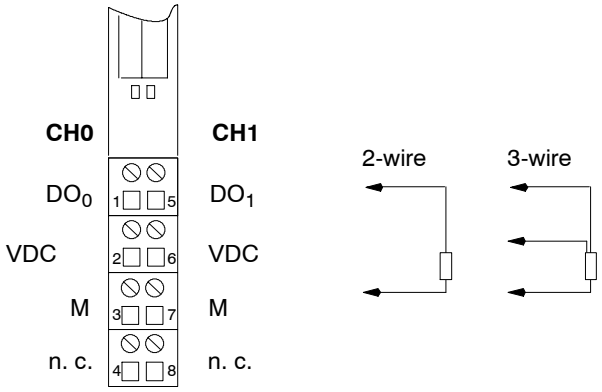
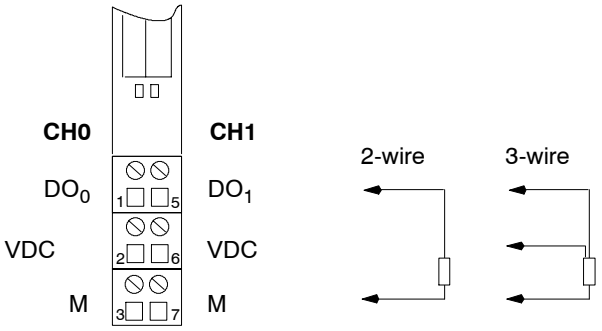
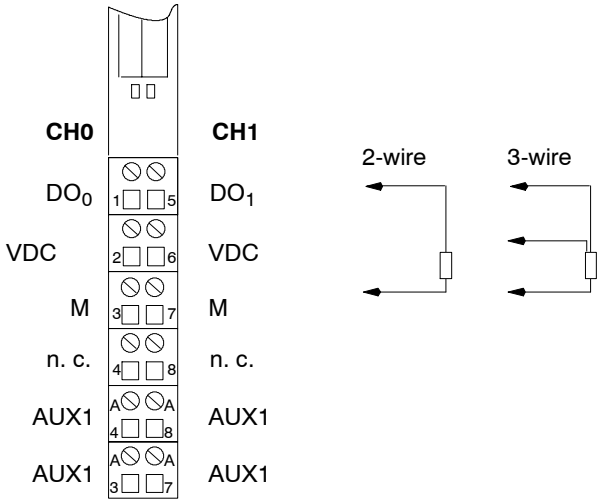
View	Terminal assignment	Remarks
TM-E15S24-A1 and 2DO 24 VDC/2 A Standard  AUX1 must be occupied with 4 wires at PE.		Channel 0: Terminals 1 to A4 Channel 1: Terminals 5 to A8 DO: Output signal (max. 2 A per channel) 24 VDC: Sensor supply M : Load power supply ground

Table 11-22 Terminal assignment of the 2DO 24 VDC/2 A Standard, continued

View	Terminal assignment	Remarks
TM-E15S24-01 and 2DO 24 VDC/2 A Standard 		Channel 0: Terminals 1 to 4 Channel 1: Terminals 5 to 8 DO: Output signal (max. 2 A per channel) 24 VDC: Sensor supply M : Load power supply ground Terminals 4 and 8 can be used for connection of cables that are not required u to 30 VDC.
TM-E15S23-01 and 2DO 24 VDC/2 A Standard 		Channel 0: Terminals 1 to 3 Channel 1: Terminals 5 to 7 DO: Output signal (max. 2 A per channel) 24 VDC: Sensor supply M : Load power supply ground
TM-E15S26-A1 and 2DO 24 VDC/2 A Standard 		Channel 0: Terminals 1 to A3 Channel 1: Terminals 5 to A7 DO: Output signal (max. 2 A per channel) 24 VDC: Sensor supply M : Load power supply ground Terminals 4 and 8 can be used for connection of cables that are not required u to 30 VDC.

Block diagram

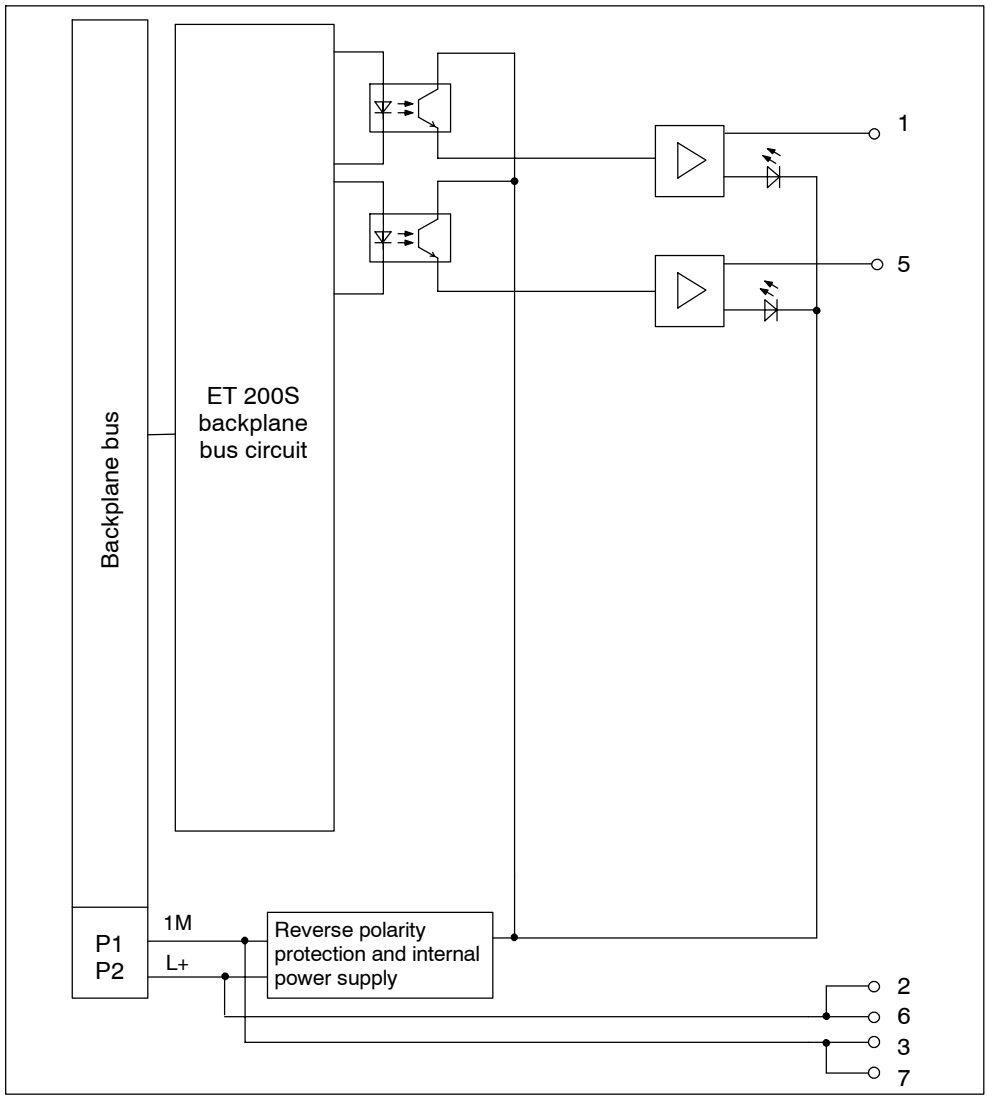


Figure 11-16 Block diagram of the 2DO 24 VDC/2 A Standard

Technical data

Dimensions and weight	
Dimensions W x H x D (mm)	15 x 81 x 52
Weight	Approx. 40 g
Module-specific data	
Supports clock synchronized mode	No
Number of outputs	2
Cable length	
• Unshielded	max. 600 m (164 ft)
• shielded	max. 1,000 m (164 ft)
Voltages, currents, electrical potentials	
Rated load voltage L+ (from power module)	24 VDC
• Polarity reversal	Yes[1)]
Total current of outputs (per module)	4 A
Electrical isolation	
• Between the channels	No
• Between channels and backplane bus	Yes
Permissible potential difference	
• Between different circuits	75 VDC / 60 VAC
Isolation tested	500 VDC
Current consumption	
• From rated load voltage L+ (without load)	max. 5 mA per channel
Power loss of the module	Typical 1.4 W
Status, interrupts, diagnostics	
Status display	Green LED pro Channel
Diagnostic functions	No

Data for selection of an actuator	
Output voltage	
• For signal ”1”	min. L+ (–1 V)
Output current	
• For signal ”1”	
– Rated value	2 A
– Permitted range	7 mA to 2.4 A
• For signal ”0” (residual current)	max. 0.5mA (164 ft)
Output delay (with ohmic load)	
• ”0” to ”1” transition	max. 200µs
• ”1” to ”0” transition	Max. 1.3 ms
Load resistor range	12 Ω up to 3.4 kΩ
Lamp load	max. 10 W
Connecting 2 outputs in parallel	
• For redundant triggering of a load	Yes (per module)
• To increase performance	No
Actuation of a digital input	Yes
Switching frequency	
• with ohmic load	100 Hz
• with inductive load	2 Hz (0.5 H)
• With lamp load	10 Hz
Limitation (internal) of the inductive disconnection voltage	Typically L+ (–55 to –60 V)
Reverse voltage protection	Yes, when using the same load voltage as at the power module
Short-circuit protection of the output	Yes[2)]
• Response threshold	Typically 2.8 to 7.2 A

1) Polarity reversal can cause interconnection of the digital outputs

2) Per channel

11.15 4DO 24 VDC/2 A Standard digital electronic module (6ES7 132-4BD30-0AA0)

Order number

6ES7 132-4BD30-0AA0

Properties

- Digital electronic module with four outputs
- Output current 2 A per output
- 24 VDC rated load voltage
- Suitable for solenoids, DC current protection and warning lights

Special feature

When the rated load voltage of 24 VDC is connected at the power module via a mechanical contact, the digital outputs carry a ”1” signal for approx. 50 µs because of the circuit type. This must be considered when the module is connected to fast counters.

Connection assignment

The following table shows the terminal assignment of the 4DO 24 VDC/2 A Standard for the various terminal modules:

Table 11-23 Terminal assignment of the 4DO 24 VDC/2 A Standard

View	Terminal assignment	Remarks
TM-E15S24-A1 and 4DO 24 VDC/2 A Standard		Channel 0: Terminals 1 and 3 Channel 1: Terminals 5 and 7 Channel 2: Terminals 2 and 3 Channel 3: Terminals 6 and 7 DO: Output signal (max. 2 A per channel) M : Load power supply ground

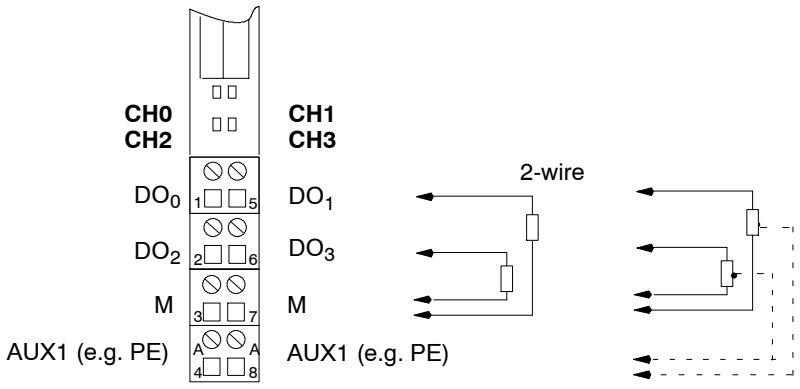
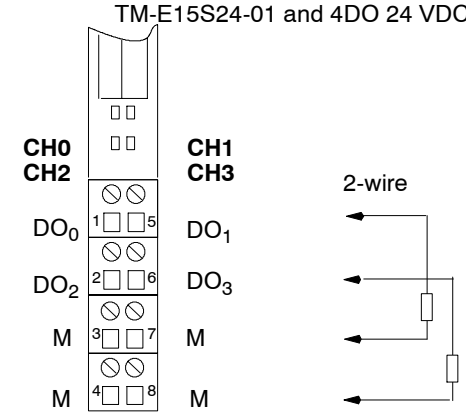
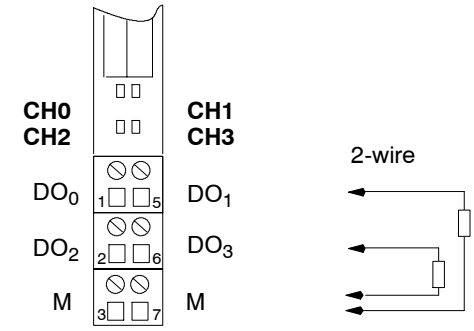
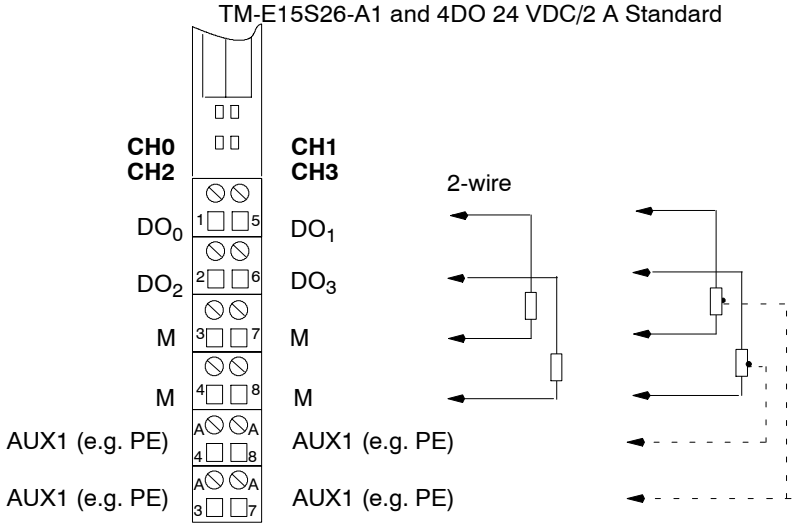


Table 11-23 Terminal assignment of the 4DO 24 VDC/2 A Standard, continued

View	Terminal assignment	Remarks
TM-E15S24-01 and 4DO 24 VDC/2 A Standard  		Channel 0: Terminals 1 and 3 Channel 1: Terminals 5 and 7 Channel 2: Terminals 2 and 4 Channel 3: Terminals 6 and 8 DO: Output signal (max. 2 A per channel) M : Load power supply ground
TM-E15S23-01 and 4DO 24 VDC/2 A Standard  		Channel 0: Terminals 1 and 3 Channel 1: Terminals 5 and 7 Channel 2: Terminals 2 and 3 Channel 3: Terminals 6 and 7 DO: Output signal (max. 2 A per channel) M : Load power supply ground
TM-E15S26-A1 and 4DO 24 VDC/2 A Standard  		Channel 0: Terminals 1 and 3 Channel 1: Terminals 5 and 7 Channel 2: Terminals 2 and 4 Channel 3: Terminals 6 and 8 DO: Output signal (max. 2 A per channel) M : Load power supply ground

Block diagram

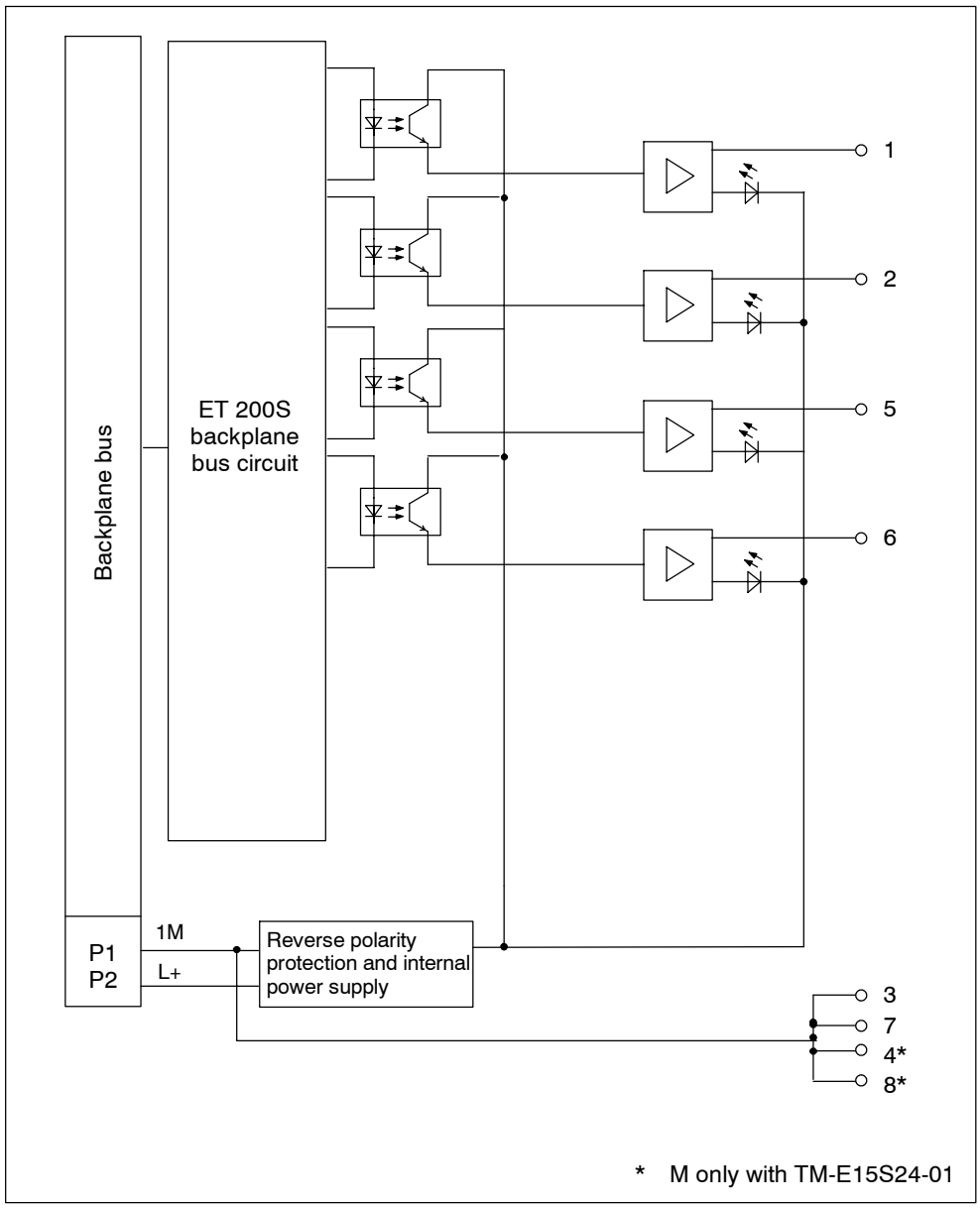


Figure 11-17 Block diagram of the 4DO 24 VDC/2 A Standard

Technical data

Dimensions and weight	
Dimensions W x H x D (mm)	15 x 81 x 52
Weight	Approx. 40 g
Module-specific data	
Supports clock synchronized mode	No
Number of outputs	4
Cable length	
• Unshielded	max. 600 m (164 ft)
• shielded	max. 1,000 m (164 ft)
Voltages, currents, electrical potentials	
Rated load voltage L+ (from power module)	24 VDC
• Polarity reversal	Yes[1)]
Total current of outputs (per module)	4 A
Electrical isolation	
• Between the channels	No
• Between channels and backplane bus	Yes
Permissible potential difference	
• Between different circuits	75 VDC / 60 VAC
Isolation tested	500 VDC
Current consumption	
• From rated load voltage L+ (without load)	max. 5 mA per channel
Power loss of the module	Typical 1.6 W
Status, interrupts, diagnostics	
Status display	Green LED pro Channel
Diagnostic functions	No

Data for selection of an actuator	
Output voltage	
• For signal ”1”	min. L+ (–1 V)
Output current	
• For signal ”1”	
– Rated value	2 A
– Permitted range	7 mA to 2.4 A
• For signal ”0” (residual current)	max. 0.5mA (164 ft)
Output delay (with ohmic load)	
• ”0” to ”1” transition	max. 200µs
• ”1” to ”0” transition	Max. 1.3 ms
Load resistor range	12 Ω up to 3.4 kΩ
Lamp load	max. 10 W
Connecting 2 outputs in parallel	
• For redundant triggering of a load	Yes (per module)
• To increase performance	No
Actuation of a digital input	Yes
Switching frequency	
• with ohmic load	100 Hz
• with inductive load	2 Hz (0.5 H)
• With lamp load	10 Hz
Limitation (internal) of the inductive disconnection voltage	Typically L+ (–55 to –60 V)
Reverse voltage protection	Yes, when using the same load voltage as at the power module
Short-circuit protection of the output	Yes[2)]
• Response threshold	Typically 2.8 to 7.2 A

1) Polarity reversal can cause interconnection of the digital outputs

2) Per channel

11.16 2DO 24 VDC/2 A High Feature digital electronic module (6ES7 132-4BB30-0AB0)

Order number

6ES7 132-4BB30-0AB0

Properties

- Digital electronic module with two outputs
- Output current 2 A per output
- 24 VDC rated load voltage
- Suitable for solenoids, DC current protection and warning lights
- Supports clock synchronized mode

Special feature

When the rated load voltage of 24 VDC is connected at the power module via a mechanical contact, the digital outputs carry a ”1” signal for approx. 50 µs because of the circuit type. This must be considered when the module is connected to fast counters.

Connection assignment

The following table shows the terminal assignment of the 2DO 24 VDC/2 A High Feature for the various terminal modules:

Table 11-24 Terminal assignment of the 2DO 24 VDC/2 A High Feature

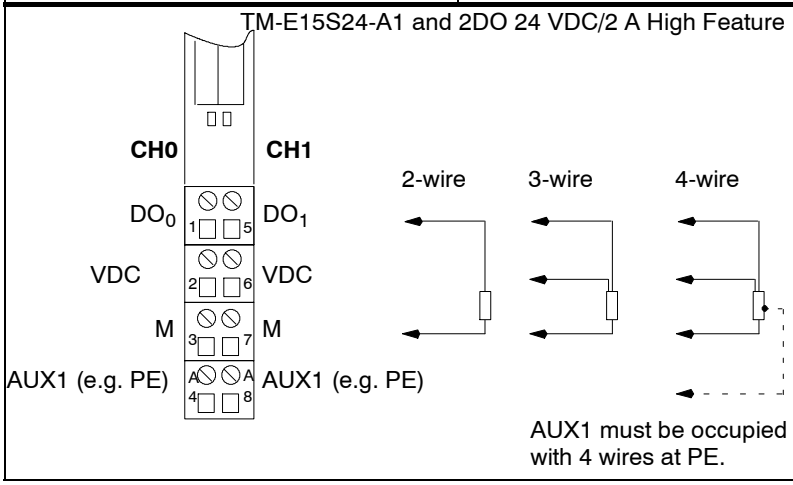
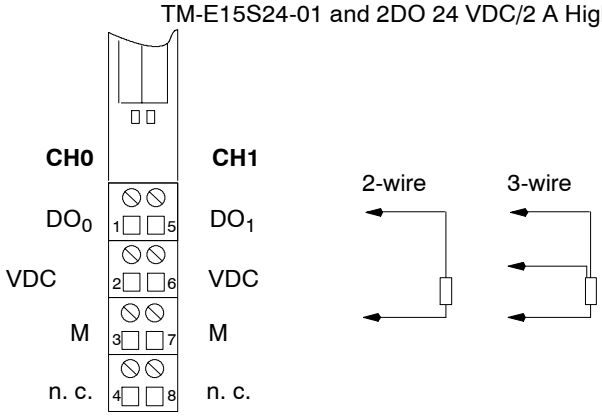
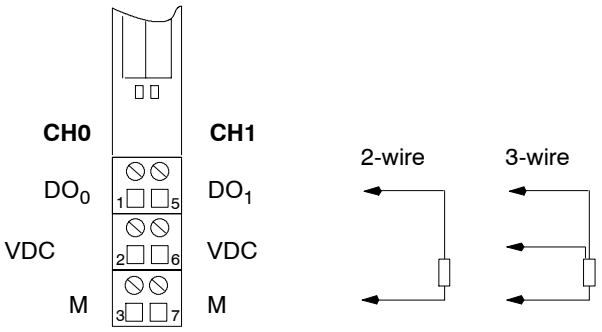
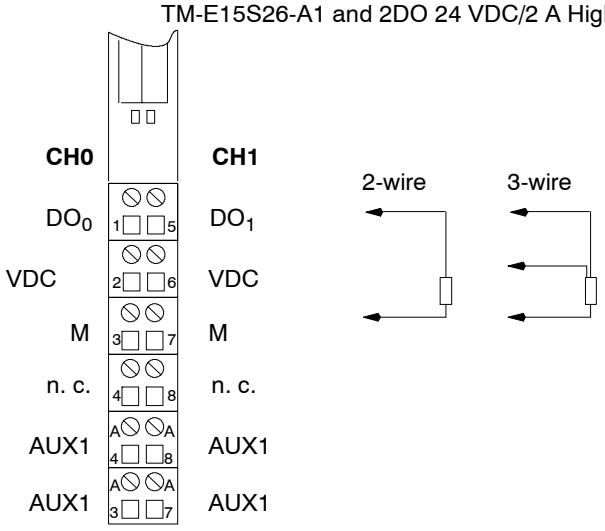
View	Terminal assignment	Remarks
		Channel 0: Terminals 1 to A4 Channel 1: Terminals 5 to A8 DO: Output signal (max. 2 A per channel) 24 VDC: Sensor supply M : Load power supply ground

Table 11-24 Terminal assignment of the 2DO 24 VDC/2 A High Feature, continued

View	Terminal assignment	Remarks
TM-E15S24-01 and 2DO 24 VDC/2 A High Feature 		Channel 0: Terminals 1 to 4 Channel 1: Terminals 5 to 8 DO: Output signal (max. 2 A per channel) 24 VDC: Sensor supply M : Load power supply ground Terminals 4 and 8 can be used for connection of cables that are not required u to 30 VDC.
TM-E15S23-01 and 2DO 24 VDC/2 A High Feature 		Channel 0: Terminals 1 to 3 Channel 1: Terminals 5 to 7 DO: Output signal (max. 2 A per channel) 24 VDC: Sensor supply M : Load power supply ground
TM-E15S26-A1 and 2DO 24 VDC/2 A High Feature 		Channel 0: Terminals 1 to A3 Channel 1: Terminals 5 to A7 DO: Output signal (max. 2 A per channel) 24 VDC: Sensor supply M : Load power supply ground Terminals 4 and 8 can be used for connection of cables that are not required u to 30 VDC.

Block diagram

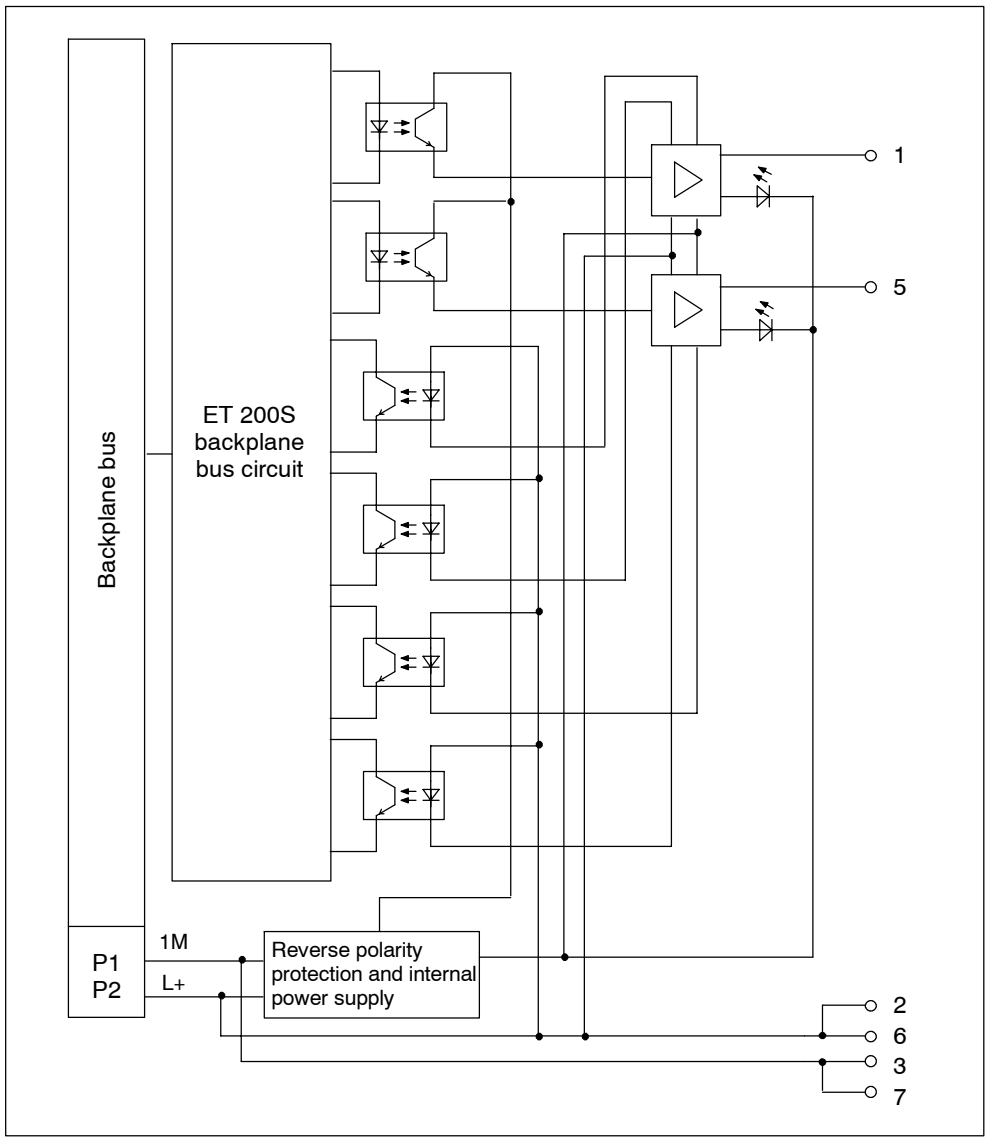


Figure 11-18 Block diagram of the 2DO 24 VDC/2 A High Feature

Technical data

Dimensions and weight	
Dimensions W x H x D (mm)	15 x 81 x 52
Weight	Approx. 40 g
Module-specific data	
Supports clock synchronized mode	Yes
Number of outputs	2
Cable length	
• Unshielded	max. 600 m (164 ft)
• shielded	max. 1,000 m (164 ft)
Voltages, currents, electrical potentials	
Rated load voltage L+ (from power module)	24 VDC
• Polarity reversal	Yes[1]
Total current of outputs (per module)	4 A
Electrical isolation	
• Between the channels	No
• Between channels and backplane bus	Yes
Permissible potential difference	
• Between different circuits	75 VDC / 60 VAC
Isolation tested	500 VDC
Current consumption	
• From rated load voltage L+ (without load)	max. 5 mA per channel
Power loss of the module	Typical 1.4 W
Status, interrupts, diagnostics	
Status display	Green LED pro Channel
Diagnostic functions	
• Group error	red LED ”SF”
• Reading of diagnostics functions	Yes

Data for selection of an actuator	
Output voltage	
• For signal ”1”	min. L+ (–1 V)
Output current	
• For signal ”1”	
– Rated value	2A
– Permitted range	7 mA to 2.4 A
• For signal ”0” (residual current)	max. 0.5 mA
Output delay (with ohmic load)	
• ”0” to ”1” transition	max. 100µs
• ”1” to ”0” transition	max. 400µs
Load resistor range	12 Ω up to 3.4 kΩ
Lamp load	max. 5 W
Connecting 2 outputs in parallel	
• For redundant triggering of a load	Yes (per module)
• To increase performance	No
Actuation of a digital input	Yes
Switching frequency	
• with ohmic load	100 Hz
• with inductive load	2 Hz (0.5 H)
• With lamp load	10 Hz
Limitation (internal) of the inductive disconnection voltage	Typically L+ (–55 to –60 V)
Reverse voltage protection	Yes, when using the same load voltage as at the power module
Short-circuit protection of the output	Yes[2]
• Response threshold	Typical 4 A

1 Polarity reversal can cause interconnection of the digital outputs

2 Per channel

11.17 2DO 24–230 VAC digital electronic module (6ES7 132-4FB00-0AB0)

Order number

6ES7 132-4FB00-0AB0

Properties

- Digital electronic module with two outputs
- Output current 2 A per output
- Rated load voltage 24–48/120/230 VAC
- Substitute value
- Configuration length: 3 bytes
- Suitable for solenoids, AC current protection and warning lights

Connection assignment

The following table shows the terminal assignment of the 2DO 24–230 VAC for the various terminal modules:

Table 11-25 Terminal assignment of the 2DO 24–230 VAC

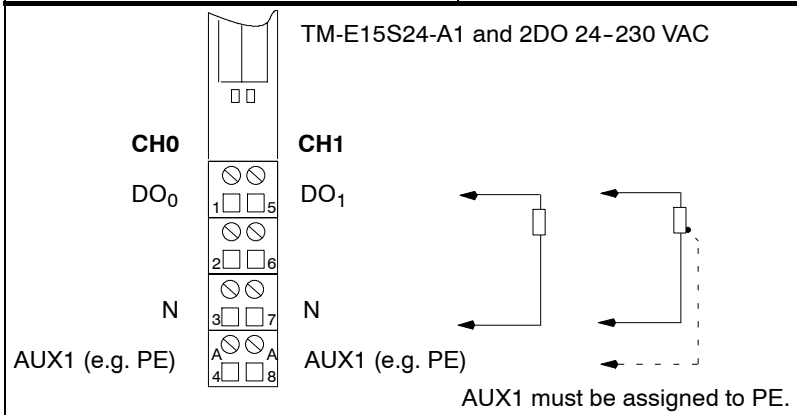
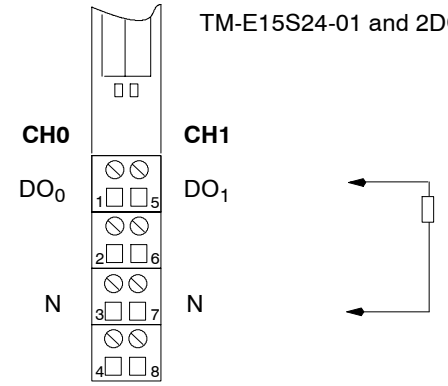
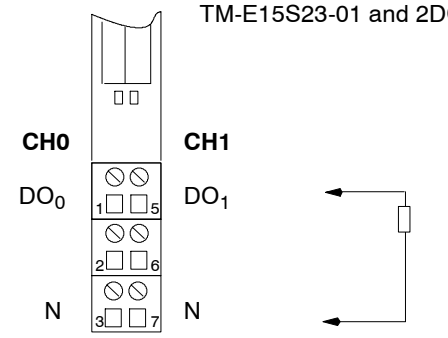
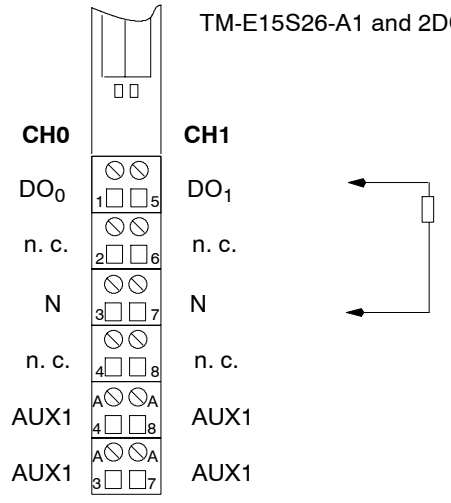
View	Terminal assignment	Remarks
		Channel 0: Terminals 1 to 3 Channel 1: Terminals 5 to 7 DO: Output signal (max. 2 A per channel) N: Neutral wire

Table 11-25 Terminal assignment of the 2DO 24–230 VAC

View	Terminal assignment	Remarks
		Channel 0: Terminals 1 to 3 Channel 1: Terminals 5 to 7 DO: Output signal (max. 2 A per channel) N: Neutral wire Terminals 4 and 8 can be used for connection of cables that are not required up to 230 VAC.
		Channel 0: Terminals 1 to 3 Channel 1: Terminals 5 to 7 DO: Output signal (max. 2 A per channel) N: Neutral wire
		Channel 0: Terminals 1 to 3 Channel 1: Terminals 5 to 7 DO: Output signal (max. 2 A per channel) N: Neutral wire Terminals 4 and 8 can be used for connection of cables that are not required up to 230 VAC.

Block diagram

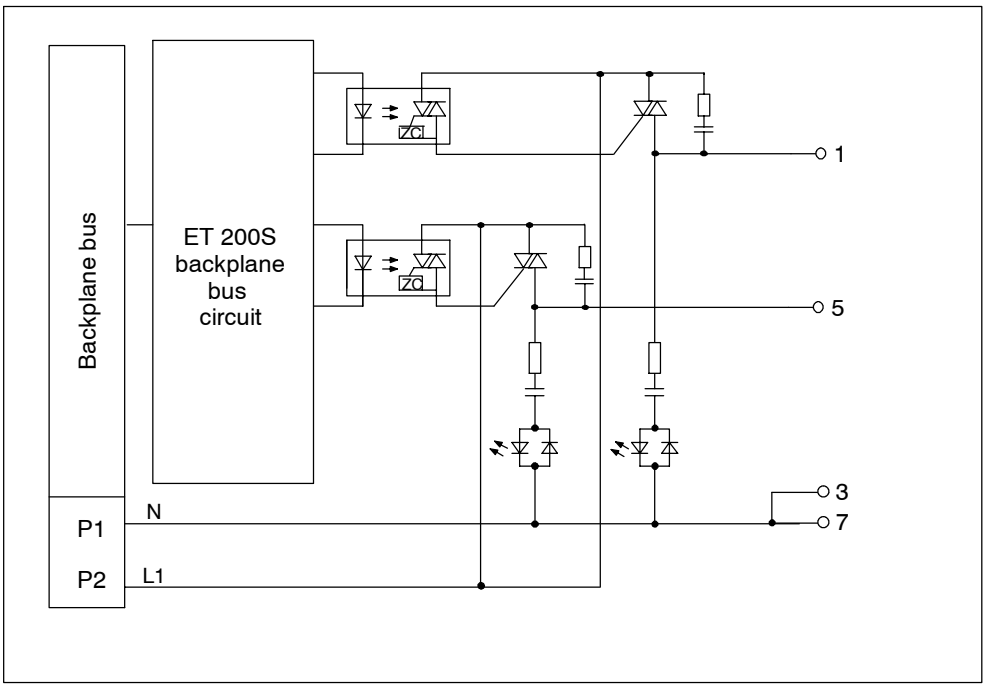


Figure 11-19 Block diagram of the 2DO 24–230 VAC

Technical data

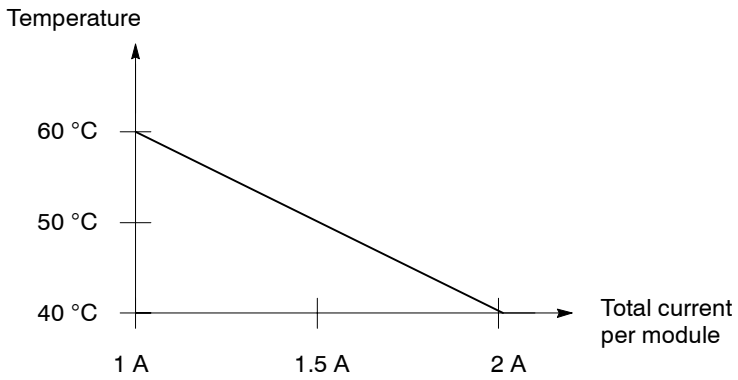
Dimensions and weight	
Dimensions W x H x D (mm)	15 x 81 x 52
Weight	Approx. 37 g
Module-specific data	
Supports clock synchronized mode	No
Number of outputs	2
Cable length	
• Unshielded	max. 600 m (164 ft)
• shielded	max. 1,000 m (164 ft)

Voltages, currents, electrical potentials	
Rated load voltage L1 (from power module)	24–230 VAC
• Frequency	47 to 63 Hz
Total current of outputs (per module)	
• to 40°C	Max. 2 A*
• to 60°C	Max. 1 A*
Electrical isolation	
• Between the channels	No
• Between channels and backplane bus	Yes
Isolation tested	2500 VDC
Current consumption	
• From the backplane bus	max. 18 mA
• From rated load voltage L1 (without load)	max. 15 mA per channel
Power loss of the module	max. 4 W

Status, interrupts, diagnostics	
Status display	Green LED pro Channel
Diagnostic functions	No
Data for selection of an actuator	
Output voltage	
• For signal ”1”	min. L (–1.5 V)
Output current (per channel)	
• For signal ”1”	
– Rated value	2 A
– Permitted range	0.1 mA to 2.2 A
• For signal ”0” (residual current)	max. 3 mA
Output delay (with ohmic load)	
• ”0” to ”1” transition	Max. 15 ms
• ”1” to ”0” transition	Max. 15 ms
Zero crossover	Max. 25 V

Motor starter size	
• to 40°C	Max. size as per NEMA: 5
• to 60°C	Max. size as per NEMA: 4
Lamp load	max. 100 W
Connecting 2 outputs in parallel	
• For redundant triggering of a load	Yes (per module)
• To increase performance	No
Actuation of a digital input	possible
Switching frequency	
• with ohmic load	Max. 10 Hz
• with inductive load	Max. 0.5 Hz
• With lamp load	Max. 1 Hz
Short-circuit protection of the output	Yes, via fuse in power module

* Total current of outputs (per module)



11.18 2RO NO 24–120 VDC/5 A 24–230 VAC/5 A digital electronic module (6ES7 132-4HB00-0AB0)

Order number

6ES7 132-4HB00-0AB0

Note

If an SELV/PELF low voltage is connected to a channel of the 2RO NO 24–120 VDC/5 A 24–230 VAC/5 A, only one SELV/ PELF low voltage can be connected to the other channel.

From product level 2 of the 2RO NO 24–120 VDC/5 24–230 VAC/5 A the internal bridge between terminals 2 and 6 is not installed. If you require this bridge, it can be replaced by an external bridge between terminals 3 and 7 (see Figure 11-20).

Features

- Digital electronic module with two relay outputs
- Output current 5 A per output
- Rated load voltage up to 120 VDC/230 VAC
- Suitable for solenoids, DC current protection and warning lights
- Potential isolated to power supply

Caution

The rated power supply of the 2RO NO 24–120 VDC/5 A 24–230 VAC/5 A is 24 VDC. The 2RO NO 24–120 VDC/5 A 24–230 VAC/5 A must only be in a potential group with 24 VDC (from the power module).

Terminal assignment

The following table shows the terminal assignment of the 2RO NO 24–120 VDC/5 A 24–230 VAC/5A for the various terminal modules:

Table 11-26 Terminal assignment of the 2RO NO 24–120 VDC/5 A 24–230 VAC/5 A (from product level 2)

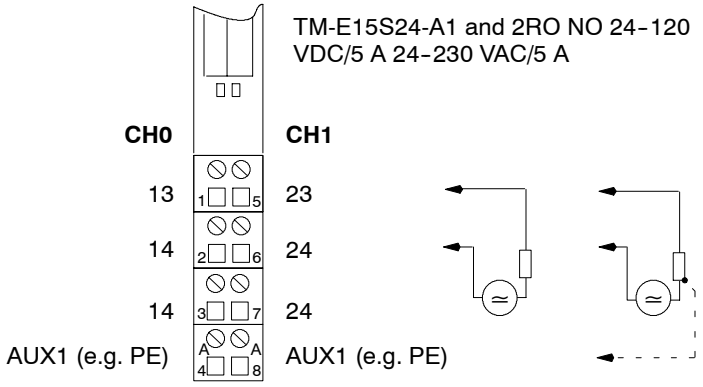
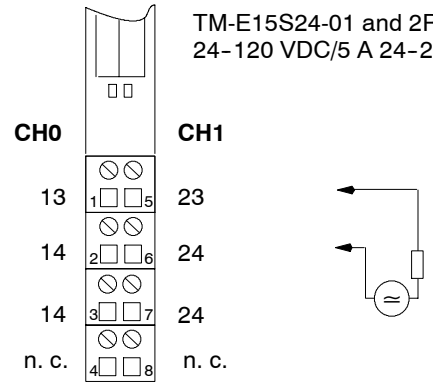
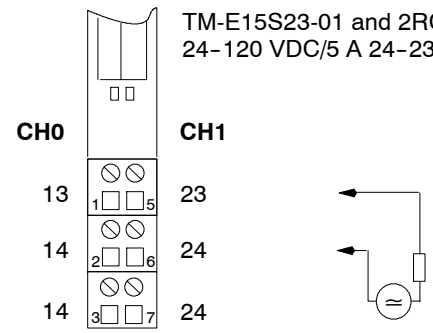
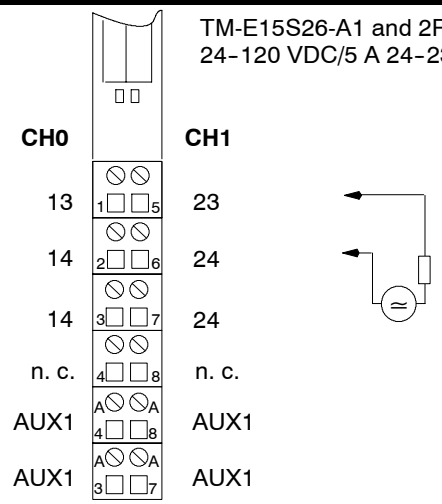
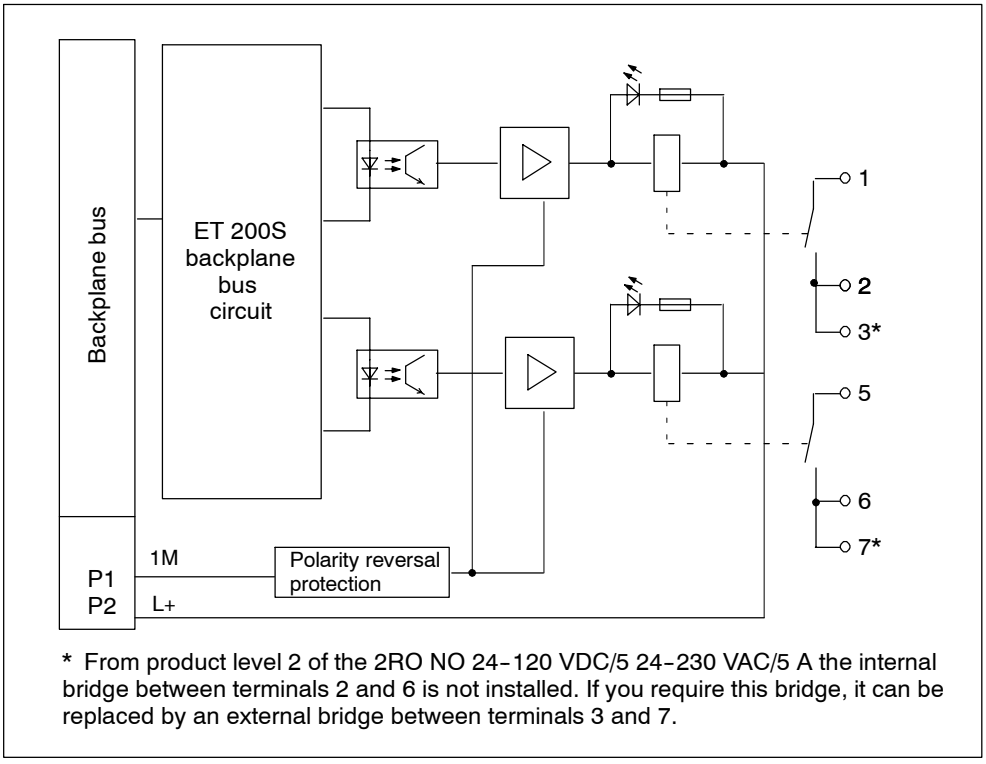
View	Terminal assignment	Remarks
	TM-E15S24-A1 and 2RO NO 24–120 VDC/5 A 24–230 VAC/5 A	Channel 0: Terminals 1 to 3 Channel 1: Terminals 5 to 7 13, 14: Channel 0 NO contact 23, 24: Channel 1 NO contact Internal bridge between terminal 2 and 3, 6 and 7
	TM-E15S24-01 and 2RO NO 24–120 VDC/5 A 24–230 VAC/5 A	Channel 0: Terminals 1 to 3 Channel 1: Terminals 5 to 7 13, 14: Channel 0 NO contact 23, 24: Channel 1 NO contact Terminals 4 and 8 can be used for connection of cables that are not required up to the amount of the load voltage in use. Internal bridge between terminal 2 and 3, 6 and 7
	TM-E15S23-01 and 2RO NO 24–120 VDC/5 A 24–230 VAC/5 A	Channel 0: Terminals 1 to 3 Channel 1: Terminals 5 to 7 13, 14: Channel 0 NO contact 23, 24: Channel 1 NO contact Internal bridge between terminal 2 and 3, 6 and 7

Table 11-26 Terminal assignment of the 2RO NO 24–120 VDC/5 A 24–230 VAC/5 A (from product level 2)

View	Terminal assignment	Remarks
		Channel 0: Terminals 1 to 3 Channel 1: Terminals 5 to 7 13, 14: Channel 0 NO contact 23, 24: Channel 1 NO contact Terminals 4 and 8 can be used for connection of cables that are not required up to the amount of the load voltage in use. Internal bridge between terminal 2 and 3, 6 and 7

Block diagram



* From product level 2 of the 2RO NO 24–120 VDC/5 24–230 VAC/5 A the internal bridge between terminals 2 and 6 is not installed. If you require this bridge, it can be replaced by an external bridge between terminals 3 and 7.

Figure 11-20 Block diagram of the 2RO NO 24–120 VDC/5 A 24–230 VAC/5 A

Technical data

Dimensions and weight	
Dimensions W x H x D (mm)	15 x 81 x 52
Weight	Approx. 50 g
Module-specific data	
Supports clock synchronized mode	No
Number of outputs	2
Cable length	
• Unshielded	max. 600 m (164 ft)
• shielded	max. 1,000 m (164 ft)
Voltages, currents, electrical potentials	
Rated power supply voltage L+ (from power module)	24 V DC
Reverse polarity protection current per channel	Yes
• to 50°C	Max. 5 A
• to 60°C	Max. 4 A
Electrical isolation	
• Between the channels	Yes
• Between channels and backplane bus	Yes
• Between channels and backplane bus	Yes
• Between power supply voltage and backplane bus	Yes
Permissible potential difference	
• Between power supply voltage and backplane bus	75 VDC / 60 VAC
• Between channels and backplane bus	240 VAC
• Between channels and power supply voltage	240 VAC
Isolation tested	Yes
• Between power supply voltage and backplane bus	500 VDC
• Between channels and backplane bus	1500 VAC
• Between channels and power supply voltage	1500 VAC
Current consumption	
• from L+ power supply	max. 30 mA
Power loss of the module	Typical 0.6 W
Status, interrupts, diagnostics	
Status display	Green LED pro Channel
Diagnostic functions	No
Data for selection of an actuator	
Output current	
• Continuous thermal current	Max. 5 A
• Minimum load current	8 mA
• Minimum voltage	17 V
Connecting 2 outputs in parallel	
• For redundant triggering of a load	No
• To increase performance	No
Actuation of a digital input	Yes
Switching frequency	
• with ohmic load	2 Hz
• with inductive load	0.5 Hz
• With lamp load	2 Hz
Limitation (internal) of the inductive disconnection voltage	No
Short-circuit protection of the output[1)]	No

1) The relay outputs must be fuse-protected with 6 A externally.

Switching capacity and service life of contacts

An external protective circuit offers a higher service life that that given in the table:

Table 11-27 Switching capacity and service life of relay contacts

Resistive load	Voltage	Current	Switching cycles (typical)
For resistive load	24 VDC	5.0 A	0.1 million
		4.0 A	0.2 million
		2.0 A	0.5 million
		1.0 A	1.6 million
		0.5 A	4 million
		0.1 A	7 million
	60 VDC	0.5 A	1.6 million
	120 VDC	0.2 A	1.6 million
	48 VAC	2.0 A	1.6 million
	60 VAC	2.0 A	1.2 million
	120 VAC	5.0 A	0.1 million
		3.0 A	0.2 million
		2.0 A	0.4 million
		1.0 A	0.8 million
		0.5 A	1.5 million
	230 VAC	5.0 A	0.1 million
		3.0 A	0.2 million
		2.0 A	0.4 million
		1.0 A	0.8 million
		0.5 A	1.5 million
For inductuve load as per IEC 947-5-1 DC 13/ AC 15	24 VDC	2.0 A	0.1 million
		1.0 A	0.2 million
		0.5 A	0.5 million
	60 VDC	0.5 A	0.2 million
	120 VDC	0.2 A	0.5 million
	48 VAC	1.0 A	0.7 million
	60 VAC	1.0 A	0.5 million
	120 VAC	2.0 A	0.1 million
		1.0 A	0.3 million
		0.5 A	1 million
		0.1 A	2 million
For inductuve load as per IEC 947-5-1 DC 13/ AC 15	230 VAC	2.0 A	0.1 million
		1.0 A	0.3 million
		0.5 A	1 million

11.19 Digital electronic module 2RO NO/NC 24-48 VDC/5 A 24-230 VAC/5 A (6ES7 132-4HB10-0AB0)

Note

If a low voltage (SELV/PELF) is connected to a channel of the relay module, only one low voltage (SELV/PELF) can be connected to the other channel.

Features

- Digital electronic module with two relay outputs
- Output current 5 A per output
- Substitute value
- Configuration length: 3 bytes
- Suitable for solenoids, DC current protection and warning lights
- Potential isolated to power supply
- NO contacts and NC contacts

Terminal assignment

The following table shows the terminal assignment of the 2RO NO/NC 24–48 VDC/5 A 24–230 VAC/5A for the various terminal modules:

Table 11-28 Terminal assignment of the 2RO NO/NC 24–48 VDC/5 A 24–230 VAC/5 A

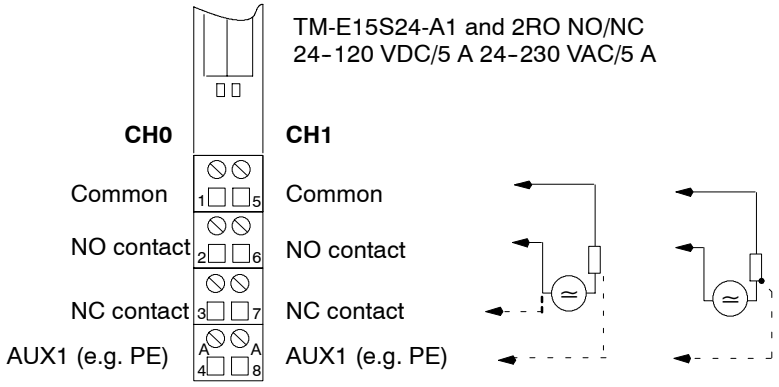
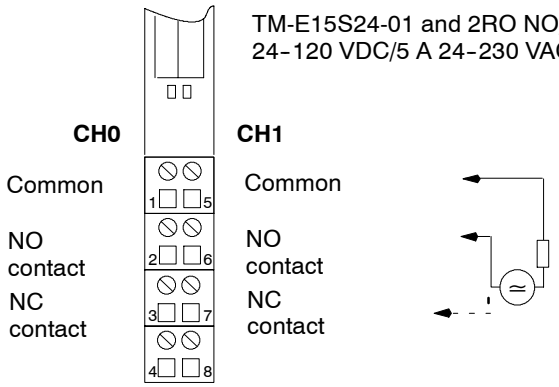
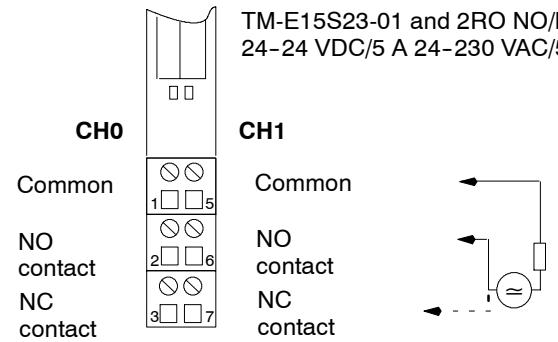
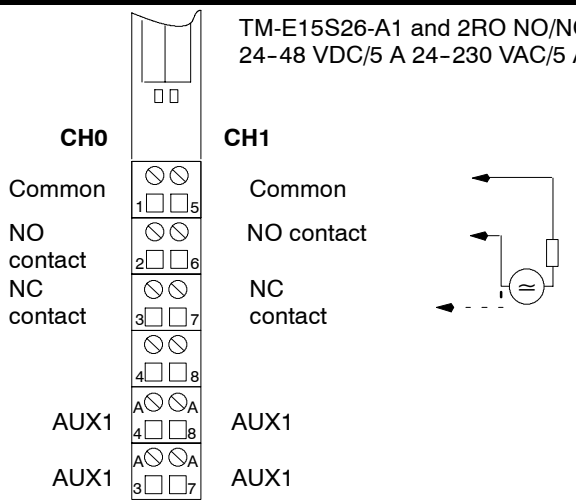
View	Terminal assignment	Remarks
		Channel 0: Terminals 1 to 3 Channel 1: Terminals 5 to 7 1, 2: Channel 0 NO contact 1, 3: NC contact channel 0 5, 6: Channel 1 NO contact 5, 7: NC contact channel 1
		Channel 0: Terminals 1 to 3 Channel 1: Terminals 5 to 7 1, 2: Channel 0 NO contact 1, 3: NC contact channel 0 5, 6: Channel 1 NO contact 5, 7: NC contact channel 1
		Channel 0: Terminals 1 to 3 Channel 1: Terminals 5 to 7 1, 2: Channel 0 NO contact 1, 3: NC contact channel 0 5, 6: Channel 1 NO contact 5, 7: NC contact channel 1

Table 11-28 Terminal assignment of the 2RO NO/NC 24–48 VDC/5 A 24–230 VAC/5 A, continued

View	Terminal assignment	Remarks
		Channel 0: Terminals 1 to 3 Channel 1: Terminals 5 to 7 1, 2: Channel 0 NO contact 1, 3: NC contact channel 0 5, 6: Channel 1 NO contact 5, 7: NC contact channel 1

Block diagram

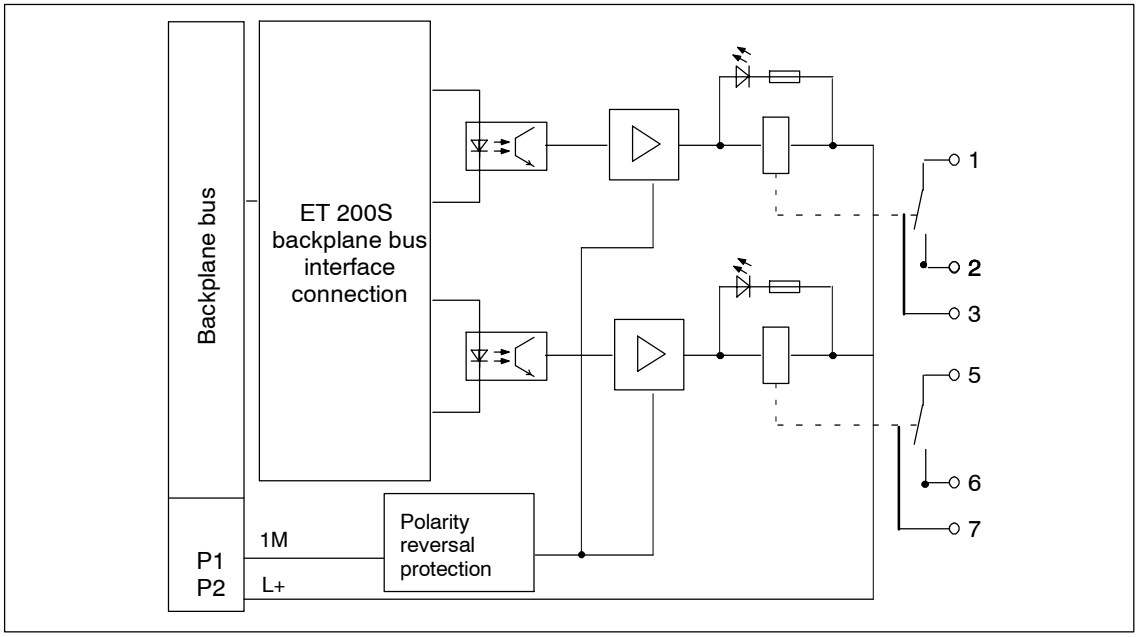


Figure 11-21 Block diagram of the 2RO NO/NC 24–48 VDC/5 A 24–230 VAC/5 A

Technical specifications

Dimensions and weight	
Dimensions W x H x D	15 x 81 x 52 (mm)
Weight	Approx. 50 g
Module-specific data	
Supports clock synchronized mode	No
Number of outputs	2
Cable length	
• Unshielded	max. 600 m (164 ft)
• shielded	max. 1,000 m (164 ft)
Voltages, currents, electrical potentials	
Rated power supply voltage L+ (from power module)	24 VDC
Reverse polarity protection current per channel	Yes
• up to 50°C	Max. 5 A
• to 60°C	Max. 4 A
Electrical isolation	
• Between the channels	Yes
• Between channels and backplane bus	Yes
• Between channels and power supply voltage	Yes
• Between power supply voltage and backplane bus	Yes
Approved potential difference	
• Between power supply voltage and backplane bus	75 VDC, 60 VAC
• Between channels and backplane bus	240 VAC
• Between channels and power supply voltage	240 VAC
Isolation tested	
• Between power supply voltage and backplane bus	500 VDC
• Between channels and backplane bus	2500 VDC
• Between channels and power supply voltage	2500 VDC
Current consumption	
• From power supply L+	max. 30 mA
• From the backplane bus	max. 10 mA
Power loss of the module	Typical 0.6 W
Status, interrupts, diagnostics	
Status display	Green LEDs pro Channel
Diagnostic functions	No
Data for Selecting an Actuator	
Output current	
• Continuous thermal current	Max. 5 A
• Minimum load current	8 mA
Connecting 2 outputs in parallel	
• For redundant triggering of a load	No
• To increase performance	No
Actuation of a digital input	Yes
Switching frequency	
• with ohmic load	2 Hz
• with inductive load	0.5 Hz
• With lamp load	2 Hz
Limitation (internal) of the inductive disconnection voltage	No
Short-circuit protection of the output[1)]	No

1) The relay outputs must be externally fused with 6 A.
When installed in a hazardous zone as per the National Electric Code (NEC) the fuse must only be removed with a suitable tool if the module is not in the explosive zone.

Switching capacity and service life of contacts

An external protective circuit offers a higher service life that that given in the table below:

The NO and NC contacts of the relay have a different service life.

Table 11-29 Switching capacity and service life of contacts

Resistive load	Voltage	Current	Operating cycles (typical) NO contacts	Operating cycles (typical) NC contacts
For resistive load	24 VDC	5.0 A	0.1 million	0.15 million
		4.0 A	0.2 million	0.175 million
		2.0 A	0.45 million	0.3 million
		0.5 A	1.4 million	1.1 million
		0.1 A	1.5 million	1.5 million
	48 V DC	2.0 A	0.15 million	0.11 million
		1.0 A	0.3 million	0.2 million
		0.5 A	0.6 million	0.6 million
		0.1 A	0.8 million	0.6 million
	48 VAC	2.0 A	0.45 million	0.35 million
	60 VAC	2.0 A	0.45 million	0.35 million
	120 VAC	5.0 A	0.1 million	0.1 million
		3.0 A	0.2 million	0.2 million
		2.0 A	0.4 million	0.3 million
		1.0 A	0.8 million	0.6 million
		0.5 A	1.5 million	1.0 million
	230 VAC	5.0 A	0.1 million	0.1 million
		3.0 A	0.2 million	0.2 million
		2.0 A	0.4 million	0.3 million
		1.0 A	0.8 million	0.6 million
		0.5 A	1.5 million	1.0 million

Table 11-29 Switching capacity and service life of contacts, continued

Resistive load	Voltage	Current	Operating cycles (typical) NO contacts	Operating cycles (typical) NC contacts
With inductive load as per IEC 947-5-1, DC 13/AC 15	24 VDC	2.0 A	0.1 million	0.1 million
		1.0 A	0.2 million	0.2 million
		0.5 A	0.5 million	0.5 million
	48 V DC	2.0 A	0.07 million	0.05 million
		1.0 A	0.15 million	0.1 million
		0.5 A	0.4 million	0.25 million
	48 VAC	1.0 A	0.5 million	0.3 million
	60 VAC	1.0 A	0.5 million	0.3 million
	120 VAC	2.0 A	0.1 million	0.1 million
		1.0 A	0.3 million	0.1 million
		0.5 A	0.9 million	0.6 million
		0,1 A	1.5 million	1.0 million
	230 VAC	2.0 A	0.1 million	0.1 million
		1.0 A	0.5 million	0.3 million
		0.5 A	0.9 million	0.6 million
		0.1 A	1.0 million	1.0 million

Analog Electronic Modules

12

Introduction

The range of analog electronic modules (EM) includes modules for measuring voltages and currents. HIGH SPEED modules can be used to measure voltages and currents. HIGH FEATURE modules have greater resolution and precision.

Modules for connection to thermal elements and resistive thermometers or resistors are also available.

The range is completed with modules for connection of loads and actuators to current and voltage outputs.

Chapter overview

12.1 Analog value visualization

Electronic modules with analog inputs

With the electronics module with analog inputs, continuously variable signals, such as those occurring in temperature measurement and pressure measurement, can be acquired, evaluated, and converted to digital values for further processing.

Electronic modules with analog outputs

With the electronics modules with analog outputs, digital values set by a controller can be converted to a corresponding analog signal (current) in an analog output module and used to control suitable actuators (setpoint input for speed controllers, temperature controllers and similar).

Measured Values in the Event of Wire Break Dependent on Enabled Diagnostics

For the measuring range tables

- 1 to 5 V, 4 to 20 mA
- Temperature sensor Pt xxx Standard and Climatic, Ni xx Standard and Climatic, Cu 10 Standard and Climatic
- Thermocouple type E, N, J, K, L, S, R, B, T, U

the following supplements and rules apply:

Table 12-1 Measured Values in the Event of Wire Break Dependent on Enabled Diagnostics

Format	Parameter assignment	Measured Values		Explanation
		decimal	hexadecimal	
S7	• ”Wire-break” diagnosis enabled (at 1 to 5 V, 4 to 20 mA, RTD)[1)]	32767	$7FFF_H$	• Diagnostics message ”wire break”
	• ”Wire-break test” diagnosis enabled (with TC)	32767	$7FFF_H$	• Diagnostics message ”wire break”
	• ”Wire-break” diagnosis blocked (at 1 to 5 V, 4 to 20 mA, RTD)[1)] • ”Overflow/underflow” diagnostics enabled	-32767	8000_H	• Measured value after leaving the undershoot range • ”Value under low limit” diagnostic message
	• ”Wire-break” diagnosis blocked (at 1 to 5 V, 4 to 20 mA, RTD)[1)] • ”Overflow/underflow” diagnostics disabled	-32767	8000_H	• Measured value after leaving the undershoot range
	• ”Wire-break test” diagnosis blocked (with TC)	---	---	• Open input: Undefined measured value

1) Measurement range limits for detection of wire break/underflow:
1 to 5 V: at 0. 296 V
4 to 20 mA: at 1.185 mA

12.1.1 Analog Value Representation for measuring ranges with SIMATIC S7

Analog value visualization

With the same nominal range, the digitized analog value is the same for input and output values. Analog values are represented in two's complement.

The following table shows the analog value representation of the analog electronics modules.

Table 12-2 Analog Value Representation (SIMATIC S7 Format)

Resolution	Analog Value															
Bit number	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Significance of the bits	S	2^{14}	2^{13}	2^{12}	2^{11}	2^{10}	2^{9}	2^{8}	2^{7}	2^{6}	2^{5}	2^{4}	2^{3}	2^{2}	2^{1}	2^{0}

Sign

The sign (S) of the analog value is always in bit number 15:

- "0" → +
- "1" → –

Measured Value Resolution

The following table shows the representation of the binary analog values and the corresponding decimal and hexadecimal representation of the units of the analog values.

The table12-3 shows the resolutions 11, 12, 13, and 15 bit + sign are shown. Each analog value is entered left aligned in the ACCU. The bits marked with "x" are set to "0".

Table 12-3 Measured Value Resolution of the Analog Values (SIMATIC S7 Format)

Resolution in Bits	Units		Analog Value	
	decimal	hexadecimal	high byte	low byte
11+S	16	10_H	S 0 0 0 0 0 0 0	0 0 0 1 x x x x
12+S	8	8_H	S 0 0 0 0 0 0 0	0 0 0 0 1 x x x
13+S	4	4_H	S 0 0 0 0 0 0 0	0 0 0 0 0 1 x x
15+S	1	1_H	S 0 0 0 0 0 0 0	0 0 0 0 0 0 0 1

Note: This resolution does not apply for temperature values. The converted temperature values are the result of a conversion in the analog electronics module (see table 12-3).

Note

The following applies with temperature measurements: The existing slope of the characteristic line is retained in the over or under controller range when leaving the linearized nominal range.

12.1.2 Analog value visualization for measurement ranges of the analog input modules in SIMATIC S7 format

Introduction

The tables in this section contain the digitized analog values for the measuring ranges of the analog input modules.

Since the binary representation of the analog values is always the same, these tables contain only a comparison of the measuring ranges with the units.

Voltage measuring ranges: ±80 mV, ±2.5 V, ±5 V, ±10 V

Table 12-4 SIMATIC S7 Format: Measuring ranges ±80 mV, ±2.5 V, ±5 V and ±10 V

Measuring range ±80 mV	Measuring range ± 2.5 V	Measuring range ± 5 V	Measuring range ± 10 V	Units		Area
				decimal	hexadecimal	
> 94,071	> 2,9397	> 5,8794	> 11,7589	32767	$7FFF_H$	Overflow
94,071	2,9397	5,8794	11,7589	32511	$7EFF_H$	Overshoot range
:	:	:	:	:	:	
80,003	2,5001	5,0002	10,0004	27649	$6C01_H$	
80,000	2,5	5,00	10,00	27648	$6C00_H$	Nominal range
60,000	1,86	3,75	7,50	20736	5100_H	
:	:	:	:	:	:	
- 60,000	- 1,86	- 3,75	- 7,50	-20736	$AF00_H$	
- 80,000	- 2,50	- 5,00	- 10,00	-27648	9400_H	
- 80,003	- 2,5001	- 5,0002	- 10,0004	-27649	$93FF_H$	Undershoot range
:	:	:	:	:	:	
- 94,074	- 2,9397	- 5,8796	- 11,759	-32512	8100_H	
< - 94,074	< - 2,9397	< - 5,8796	< - 11,759	-32768	8000_H	Underflow

Measuring ranges for voltage and current: 1 to 5 V, 0 to 20 mA, 4 to 20 mA

Table 12-5 SIMATIC S7 Format: Measuring ranges 1 to 5 V, 0 to 20 mA, 4 to 20 mA

Measuring range 1 to 5 V	Measuring range 0 to 20 mA	Measuring range 4 to 20 mA	Units		Area
			decimal	hexadecimal	
> 5,704	> 23,5178	> 22,8142	32767	$7FFF_H$	Overflow
5,704 : 5,000145	23,5178 : 20,0007	22,8142 : 20,0005	32511 : 27649	$7EFF_H$: $6C01_H$	Overshoot range
5,000 4,000 : 1,000	20,0000 15,0000 : 0,0000	20,0000 16,0000 : 4,0000	27648 20736 : 0	$6C00_H$ 5100_H : 0_H	Nominal range
0,999855 : 0,296	Negative values are not possible	3,9995 1,1852	-1 : -4864	$FFFF_H$: $ED00_H$	Undershoot range
< 0,296		< 1,1852	-32768	8000_H	Underflow

Measuring range for current: ±20 mA

Table 12-6 SIMATIC S7 Format: Measuring range ±20 mA

Measuring range ±20 mA	Units		Area
	decimal	hexadecimal	
> 23,5150	32767	$7FFF_H$	Overflow
23,5150 : 20,0007	32511 : 27649	$7EFF_H$: $6C01_H$	Overshoot range
20,0000 14,9980 : - 14,9980 - 20,0000	27648 20736 : -20736 -27648	$6C00_H$ 5100_H : $AF00_H$ 9400_H	Nominal range
- 20,0007 : - 23,5160	-27649 : -32512	$93FF_H$: 8100_H	Undershoot range
< - 23,5160	-32768	8000_H	Underflow

Measuring ranges for resistive sensors: 150 Ω, 300 Ω, 600 Ω, 3000 Ω

Table 12-7 SIMATIC S7 Format: Measuring ranges 150 Ω, 300 Ω, 600 Ω, 3000 Ω

Measuring range 150 Ω	Measuring range 300 Ω	Measuring range 600 Ω	Measuring range 3000 Ω	Units		Area
				decimal	hexadecimal	
> 176.38	> 352,77	> 705,53	> 3527,67	32767	$7FFF_H$	Overflow
176,38	352,77	705,53	3527,67	32511	$7EFF_H$	Overshoot range
:	:	:	:	:	:	
150,005	300,01	600,02	3000,11	27649	$6C01_H$	
150,00	300,00	600,00	3000,00	27648	$6C00_H$	Nominal range
112,50	225,00	450,00	2250,00	20736	5100_H	
:	:	:	:	:	:	
0,00	0,00	0,00	0,00	0	0_H	
(negative values are not physically possible)				-1	$FFFF_H$	Undershoot range*
				:	:	
				-4864	$ED00_H$	
				-32768	8000_H	Underflow*

* With faulty connection of terminators

Measuring range of resistive thermometer Pt x100 Standard

Table 12-8 SIMATIC S7 Format: Measuring Ranges Pt 100, 200, 500, 1000 Standard in °C and °F

Pt x100 Standard in °C (1 digit = 0.1°C)	Units		Pt x100 Standard in °F (1 digit = 0.1 °F)	Units		Area
	decimal	hexa decimal		decimal	hexa decimal	
> 1000,0	32767	$7FFF_H$	> 1832,0	32767	$7FFF_H$	Overflow
1000,0 : 850,1	10000 : 8501	2710_H : 2135_H	1832,0 : 1562,1	18320 : 15621	4790_H : $3D05_H$	Overshoot range
850,0 : -200,0	8500 : -2000	2134_H : $F830_H$	1562,0 : -328,0	15620 : -3280	$3D04_H$: $F330_H$	Nominal range
-200,1 : -243,0	-2001 : -2430	$F82F_H$: $F682_H$	-328,1 : -405,4	-3281 : -4054	$F32F_H$: $F02A_H$	Undershoot range
< - 243,0	-32768	8000_H	< - 405,4	-32768	8000_H	Underflow

Measuring range of resistive thermometer Pt x100 Climatic

Table 12-9 SIMATIC S7 Format: Measuring Ranges Pt 100, 200, 500, 1000 Climatic in °C and °F

Pt x100 Climatic in °C (1 digit = 0.01°C)	Units		Pt x100 Climate in °F (1 digit = 0.01 °F)	Units		Area
	decimal	hexa decimal		decimal	hexa decimal	
> 155,00	32767	$7FFF_H$	> 311,00	32767	$7FFF_H$	Overflow
155,00 : 130,01	15500 : 13001	$3C8C_H$: $32C9_H$	311,00 : 266,01	31100 : 26601	$797C_H$: $67E9_H$	Overshoot range
130,00 : -120,00	13000 : -12000	$32C8_H$: $D120_H$	266,00 : -184,00	26600 : -18400	$67E8_H$: $B820_H$	Nominal range
-120,01 : -145,00	-12001 : -14500	$D11F_H$: $C75C_H$	-184,01 : -229,00	-18401 : -22900	$B81F_H$: $A68C_H$	Undershoot range
< - 145,00	-32768	8000_H	< - 229,00	-32768	8000_H	Underflow

Measuring range of resistive thermometer Ni x100 Standard

Table 12-10 SIMATIC S7 Format: Measuring Ranges Ni 100, 200, 500, 1000 Standard in °C and °F

Ni x00 Standard in °C (1 digit = 0.1°C)	Units		Ni x00 Standard in °F (1 digit = 0.1 °F)	Units		Area
	decimal	hexa decimal		decimal	hexa decimal	
> 295,0	32767	$7FFF_H$	> 563,0	32767	$7FFF_H$	Overflow
295,0 : 250,1	2950 : 2501	$B86_H$: $9C5_H$	563,0 : 482,1	5630 : 4821	$15FE_H$: $12D5_H$	Overshoot range
250,0 : -60,0	2500 : -600	$9C4_H$: $FDA8_H$	482,0 : -76,0	4820 : -760	$12D4_H$: $FDA8_H$	Nominal range
-60,1 : -105,0	-601 : -1050	$FDA7_H$: $FBE6_H$	-76,1 : -157,0	-761 : -1570	$FD07_H$: $F9DE_H$	Undershoot range
< -105,0	-32768	8000_H	< -157,0	-32768	8000_H	Underflow

Measuring range of resistive thermometer Ni x00 Climatic

Table 12-11 SIMATIC S7 Format: Measuring Ranges Ni 100, 120, 200, 500, 1000 Climatic in °C and °F

Ni x00 Climatic in °C (1 digit = 0.01°C)	Units		Ni x00 Climatic in °F (1 digit = 0.01 °F)	Units		Area
	decimal	hexa decimal		decimal	hexa decimal	
> 295,00	32767	$7FFF_H$	> 325,11	32767	$7FFF_H$	Overflow
295,00 : 250,01	29500 : 25001	$733C_H$: $61A9_H$	327,66 : 280,01	32766 : 28001	$7FFE_H$: $6D61_H$	Overshoot range
250,00 : -60,00	25000 : -6000	$61A8_H$: $E890_H$	280,00 : -76,00	28000 : -7600	$6D60_H$: $E250_H$	Nominal range
-60,01 : -105,00	-6001 : -10500	$E88F_H$: $D6FC_H$	-76,01 : -157,00	-7601 : -15700	$E24F_H$: $C2AC_H$	Undershoot range
< - 105,00	-32768	8000_H	< - 157,00	-32768	8000_H	Underflow

Measuring ranges of resistive thermometer Cu 10 Standard

Table 12-12 SIMATIC S7 Format: Measuring Ranges Cu 10 Standard in °C and °F

Cu 10 Standard in °C (1 digit = 0.1°C)	Units		Cu 10 Standard in °F (1 digit = 0.1°F)	Units		Area
	decimal	hexa decimal		decimal	hexa decimal	
> 312,0	32767	$7FFF_H$	> 593,6	32767	$7FFF_H$	Overflow
312,0 : 260,1	3120 : 2601	$C30_H$: $A29_H$	593,6 : 500,1	5936 : 5001	1730_H : $12D5_H$	Overshoot range
260,0 : -200,0	2600 : -2000	$A28_H$: $F830_H$	500,0 : -328,0	5000 : -3280	1389_H : $F330_H$	Nominal range
-200,1 : -240,0	-2001 : -2400	$F82F_H$: $F6A0_H$	-328,1 : -400,0	-3281 : -4000	$F32F_H$: $F060_H$	Undershoot range
< - 240,0	-32768	8000_H	< - 400,0	-32768	8000_H	Underflow

Measuring ranges of resistive thermometer Cu 10 Climatic

Table 12-13 SIMATIC S7 Format: Measuring Ranges Cu 10 Climatic in °C and °F

Cu 10 Climatic in °C (1 digit = 0.01°C)	Units		Cu 10 Climatic in °F (1 digit = 0.01 °F)	Units		Area
	decimal	hexa decimal		decimal	hexa decimal	
> 180,00	32767	$7FFF_H$	> 325,11	32767	$7FFF_H$	Overflow
180,00 : 150,01	18000 : 15001	4650_H : $3A99_H$	327,66 : 280,01	32766 : 28001	$7FFE_H$: $6D61A_H$	Overshoot range
150,00 : -50,00	15000 : -5000	$3A98_H$: $EC78_H$	280,00 : -58,00	28000 : -5800	$6D60_H$: $E958_H$	Nominal range
-50,01 : -60,00	-5001 : -6000	$EC77_H$: $E890_H$	-58,01 : -76,00	-5801 : -7600	$E957_H$: $E250_H$	Undershoot range
< - 60,00	-32768	8000_H	< - 76,00	-32768	8000_H	Underflow

Measuring Range for Thermocouple: Type B

Table 12-14 SIMATIC S7 Format: Measuring Range Type B in °C and °F

Type B in °C	Units		Type B in °F	Units		Area
	decimal	hexa decimal		decimal	hexa decimal	
> 2070,0	32767	$7FFF_H$	> 3276,6	32767	$7FFF_H$	Overflow
2070,0 : 1820,1	20700 : 18201	$50DC_H$: 4719_H	3276,6 : 2786,6	32766 : 27866	$7FFE_H$: $6CDA_H$	Overshoot range
1820,0 : 0,0	18200 : 0	4718_H : 0000_H	2786,5 : 32	27865 : 320	$6CD9_H$: 0140_H	Nominal range
-0,1 : -120,0	-1 : -1200	$FFFF_H$: $FB50_H$	31,9 : -184,0	319 : -1840	$013F_H$: $F8D0_H$	Undershoot range
< -120,0	-32768	8000_H	< -184,0	-32768	8000_H	Underflow

Measuring Range for Thermocouple: Type C

Table 12-15 SIMATIC S7 Format: Measuring Range Type C in °C and °F

Type C in °C	Units		Type C in °F	Units		Area
	decimal	hexa decimal		decimal	hexa decimal	
> 2500,0	32767	$7FFF_H$	> 3276,6	32767	$7FFF_H$	Overflow
2500,0 : 2315,1	25000 : 23151	$61A8_H$: $5A6F_H$	3276,6 : 2786,6	32766 : 27866	$7FFE_H$: $6CDA_H$	Overshoot range
2315,0 : 0,0	23150 : 0	$5A6E_H$: 0000_H	2786,5 : 32,0	27865 : 320	$6CD9_H$: 0140_H	Nominal range
0,1 : -120,0	-1 : -1200	$FFFF_H$: $FB50_H$	31,9 : -184,0	319 : -1840	$013F_H$: $F8D0_H$	Undershoot range
< -120,0	-32768	8000_H	< -184,0	-32768	8000_H	Underflow

Measuring range for thermocouple type E

Table 12-16 SIMATIC S7 Format: Measuring Range Type E in °C and °F

Type E in °C	Units		Type E in °F	Units		Area
	decimal	hexa decimal		decimal	hexa decimal	
> 1200,0	32767	$7FFF_H$	> 2192,0	32767	$7FFF_H$	Overflow
1200,0 : 1000,1	12000 : 10001	$2EE0_H$: 2711_H	2192,0 : 1832,1	21920 : 18321	$55A0_H$: 4791_H	Overshoot range
1000,0 : -270,0	10000 : -2700	2710_H : $F574_H$	1832,0 : -454,0	18320 : -4540	4790_H : $EE44_H$	Nominal range
< -270,0	- 32768	8000_H	< -454,0	- 32768	8000_H	Underflow

Measuring range for thermocouple type J

Table 12-17 SIMATIC S7 Format: Measuring Range Type J in °C and °F

Type J in °C	Units		Type J in °F	Units		Area
	decimal	hexa decimal		decimal	hexa decimal	
> 1450,0	32767	$7FFF_H$	> 2642,0	32767	$7FFF_H$	Overflow
1450,0 : 1200,1	14500 : 12010	$38A4_H$: $2EEA_H$	2642,0 : 2192,1	26420 : 21921	6734_H : $55A1_H$	Overshoot range
1200,0 : -210,0	12000 : -2100	$2EE0_H$: $F7CC_H$	2192,0 : -346,0	21920 : -3460	$55A0_H$: $F27C_H$	Nominal range
< -210,0	- 32768	8000_H	< -346,0	- 32768	8000_H	Underflow

Measuring range for thermocouple type K

Table 12-18 SIMATIC S7 Format: Measuring range type K in °C and °F

Type K in °C	Units		Type K in °F	Units		Area
	decimal	hexa decimal		decimal	hexa decimal	
> 1622,0	32767	$7FFF_H$	> 2951,6	32767	$7FFF_H$	Overflow
1622,0 : 1372,1	16220 : 13721	$3F5C_H$: 3599_H	2951,6 : 2501,7	29516 : 25062	$734C_H$: $61B9_H$	Overshoot range
1372,0 : -270,0	13720 : -2700	3598_H : $F574_H$	2501,6 : -454,0	25061 : -4540	$61B8_H$: $EE44_H$	Nominal range
< -270,0	- 32768	8000_H	< -454,0	- 32768	8000_H	Underflow

Measuring range for thermocouple type L

Table 12-19 SIMATIC S7 Format: Measuring Range Type L in °C and °F

Type L in °C	Units		Type L in °F	Units		Area
	decimal	hexa decimal		decimal	hexa decimal	
> 1150,0	32767	$7FFF_H$	> 2102,0	32767	$7FFF_H$	Overflow
1150,0 : 900,1	11500 : 9001	$2CEC_H$: 2329_H	2102,0 : 1652,1	21020 : 16521	$521C_H$: 4089_H	Overshoot range
900,0 : -200,0	9000 : -2000	2328_H : $F830_H$	1652,0 : -328,0	16520 : -3280	4088_H : $F330_H$	Nominal range
< -200,0	-32768	8000_H	< -328,0	-32768	8000_H	Underflow

Measuring range for thermocouple type N

Table 12-20 SIMATIC S7 Format: Measuring Range Type N in °C and °F

Type N in °C	Units		Type N in °F	Units		Area
	decimal	hexa decimal		decimal	hexa decimal	
> 1550,0	32767	$7FFF_H$	> 2822,0	32767	$7FFF_H$	Overflow
1550,0 : 1300,1	15500 : 13001	$3C8C_H$: $32C9_H$	2822,0 : 2372,1	28220 : 23721	$6E3C_H$: $5CA9_H$	Overshoot range
1300,0 : -270,0	13000 : -2700	$32C8_H$: $F574_H$	2372,0 : -454,0	23720 : -4540	$5CA8_H$: $EE44_H$	Nominal range
< -270,0	-32768	8000_H	-32768	8000_H	$<EE44_H$	Underflow

Measuring range for thermocouple type R, S

Table 12-21 SIMATIC S7 Format: Measuring Range Type R, S in °C and °F

Type R, S in °C	Units		Type R, S in °F	Units		Area
	decimal	hexa decimal		decimal	hexa decimal	
> 2019,0	32767	$7FFF_H$	> 3276,6	32767	$7FFF_H$	Overflow
2019,0 : 1769,1	20190 : 17691	$4EDE_H$: $451B_H$	3276,6 : 3216,3	32766 : 32163	$7FFE_H$: $7DA3_H$	Overshoot range
1769,0 : -50,0	17690 : -500	$451A_H$: $FE0C_H$	3216,2 : -58,0	32162 : -580	$7DA2_H$: $FDBC_H$	Nominal range
-50,1 : -170,0	-510 : -1700	$FE0B_H$: $F95C_H$	-58,1 : -274,0	-581 : -2740	$FDBB_H$: $F54C_H$	Undershoot range
< -170,0	-32768	8000_H	< -274,0	-32768	8000_H	Underflow

Measuring range for thermocouple type T

Table 12-22 SIMATIC S7 Format: Measuring Range Type T in °C and °F

Type T in °C	Units		Type T in °F	Units		Area
	decimal	hexa decimal		decimal	hexa decimal	
> 540,0	32767	$7FFF_H$	> 1004,0	32767	$7FFF_H$	Overflow
540,0 : 400,1	5400 : 4001	1518_H : $0FA1_H$	1004,0 752,1	10040 7521	2738_H $1DC1_H$	Overshoot range
400,0 : -270,0	4000 : -2700	$0FA0_H$: $F574_H$	752,0 : -454,0	7520 : -4540	$1D60_H$: $EE44_H$	Nominal range
< -270,0	-32768	8000_H	< -454,0	-32768	8000_H	Underflow

12.1.3 Analog value visualization for measurement ranges of the analog output modules in SIMATIC S7 format

Introduction

The table in this section contains the digitized analog values for the measuring ranges of the analog output modules.

Since the binary representation of the analog values is always the same, these tables contain only a comparison of the measuring ranges with the units.

Output ranges for voltage and current: ±5 V; ±10 V; ±20 mA

Table 12-23 SIMATIC S7 format: Output ranges ±5 V; ±10 V; ±20 mA

Output range ±5 V	Output range ±10 V	Output range ±20 mA	Units		Area
			decimal	hexadecimal	
0	0	0	> 32511	> $7EFF_H$	Overflow
5,8800 : 5,0002	11,7589 : 10,0004	23,5150 : 20,0007	32511 : 27649	$7EFF_H$: $6C01_H$	Overshoot range
5,0000 3,7500 : - 3,7500 - 5,0000	10,0000 7,5000 : - 7,5000 - 10,0000	20,0000 14,9980 : - 14,9980 - 20,0000	27648 20736 : -20736 -27648	$6C00_H$ 5100_H : $AF00_H$ 9400_H	Nominal range
- 5,0002 : - 5,8800	- 10,0004 : - 11,7589	- 20,0007 : - 23,5160	-27649 : -32512	$93FF_H$: 8100_H	Undershoot range
0	0	< - 23,5160	< -32512	<8100_H	Underflow

Output ranges for voltage and current: 1 to 5 V; 4 to 20 mA

Table 12-24 SIMATIC S7 Format: Output ranges 1 to 5 V; 4 to 20 mA

Output range 1 to 5 V	Output range 4 to 20 mA	Units		Area
		decimal	hexadecimal	
0	0	> 32511	> $7EFF_H$	Overflow
5,7000 : 5,0002	22,8100 : 20,0005	32511 : 27649	$7EFF_H$: $6C01_H$	Overshoot range
5,0000 : 1,0000	20,0000 : 4,0000	27648 : 0	$6C00_H$: 0_H	Nominal range
0,9998 : 0	3,9995 : 0	-1 : -6912	$FFFF_H$: $E500_H$	Undershoot range
0	0	< -6913	< $E4FF_H$	Underflow

12.2 Basics of Analog Value Processing

12.2.1 Connecting sensors

Introduction

Depending on the module various sensors can be connected to the analog input modules:

- Voltage sensor
- Current sensor as
  - 2-wire measuring transducer
  - 4-wire measuring transducer
- Resistance

This chapter describes how to connect the sensors and what you must consider when connecting the sensors.

Cables for analog signals

Shielded and twisted-pair cables must be used for the analog signals. This reduces influences from interference. The shield for the analog cables must be grounded at both ends of the cable. If there are potential differences between the ends of the cable, an equipotential bonding current flows through the shield, which may interfere with the analog signals. In this case the shield should be grounded at one end only.

Analog input modules

The analog input modules are isolated:

- Between logic and backplane bus
- Between load voltage and the channels. There are the following differences:
  - (no galvanic isolation). connection between M_{ANA} and the central ground point
  - Electrical isolation: no connection between M_{ANA} and the central ground point (U_{ISO})

Analog Output Modules

The analog output modules are generally isolated

- Between logic and backplane bus
- Between load voltage and $M_{ANA.}$

Note

Make sure that the potential difference U_{ISO} does not exceed the approved value. If there is a possibility of exceeding the approved value connect the M_{ANA} terminal and the central ground point.

Connecting sensors to analog inputs

Only a limited potential difference U_{CM} (common mode voltage/common mode) is permitted between measurement cables M– of the input channels and the reference point of the measuring circuit M_{ANA}. To ensure that the approved value is not exceeded, various actions must be implemented depending in the sensor potential connection (isolated, non-isolated). The actions required are explained in this chapter.

However, the general rule is that there must not be a connection from M– to M_{ANA} when connecting 2-wire measurement transducers and resistor sensors. This applies for correspondingly configured but unused inputs.

Note

Unused analog inputs on the 2AI U, 2AI RTD and 2AI TC analog input modules must be short-circuited.

Abbreviations used

The abbreviations used in the following diagrams have the following meanings:

M +:	measuring line (positive)
M –:	measuring line (negative)
M_{ANA}:	reference potential of the analog measuring circuit
M:	ground connection
L +:	24 VDC rated load voltage
U_{CM}:	potential difference between inputs and reference potential of the M_{ANA} measuring circuit
U_{ISO}:	potential difference between M_{ANA} and the central ground point

Isolated sensors

The isolated sensors are not connected to the local ground potential. They can be operated potential-free. Local conditions or interference can cause potential differences U_{CM} (static or dynamic) between the M– measuring lines of the input channels and the reference point of the measuring circuit M_{ANA}.

The following applies to ensure that the approved value for U_{CM} is not exceeded during operation in areas with high EMC interference:

- with the 2AI U, 2AI I 4WIRE and 2AI TC analog input modules: Connect M– with M_{ANA}!
- There must not be a connection from M– to M_{ANA} when connecting 2-wire measurement transducers for current measurement and resistor sensors.

Isolated sensors, continued

Figure 12-1 shows the general connection of isolated sensors to the isolated analog input modules..

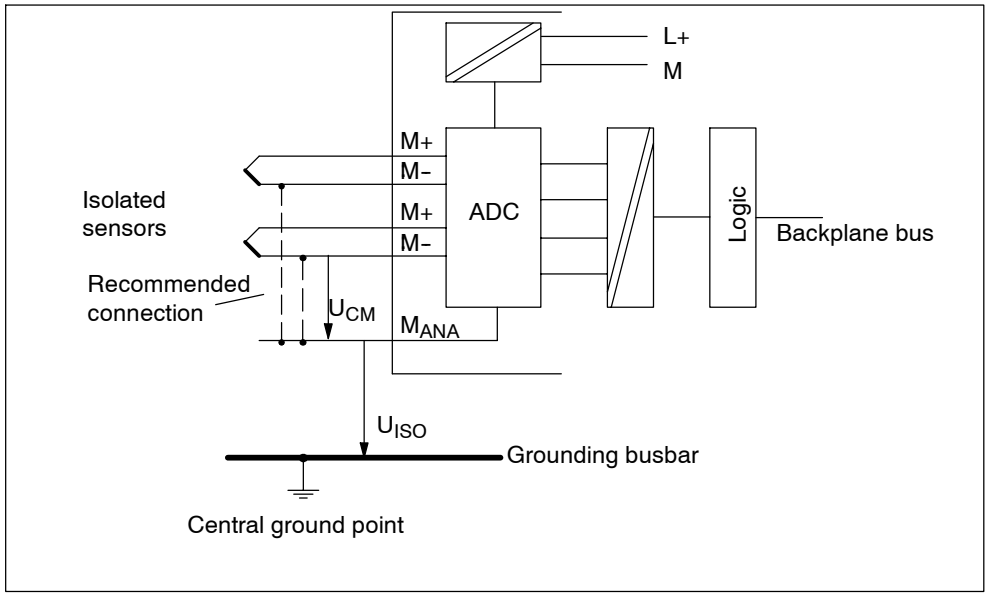


Figure 12-1 Connection of isolated sensors to an isolated analog input module.

Non-isolated sensors

The non-isolated sensors are locally connected to the ground potential. M_{ANA} must be connected to the ground potential. Depending on local conditions or interference potential differences U_{CM} (static or dynamic) may be encountered between the locally distributed measuring points.

If the permitted value for U_{CM} is exceeded, equipotential bonding lines must be installed between the sensor locations.

Figure 12-2 shows the general connection of non-isolated sensors to an equipotentially bonded analog input module.

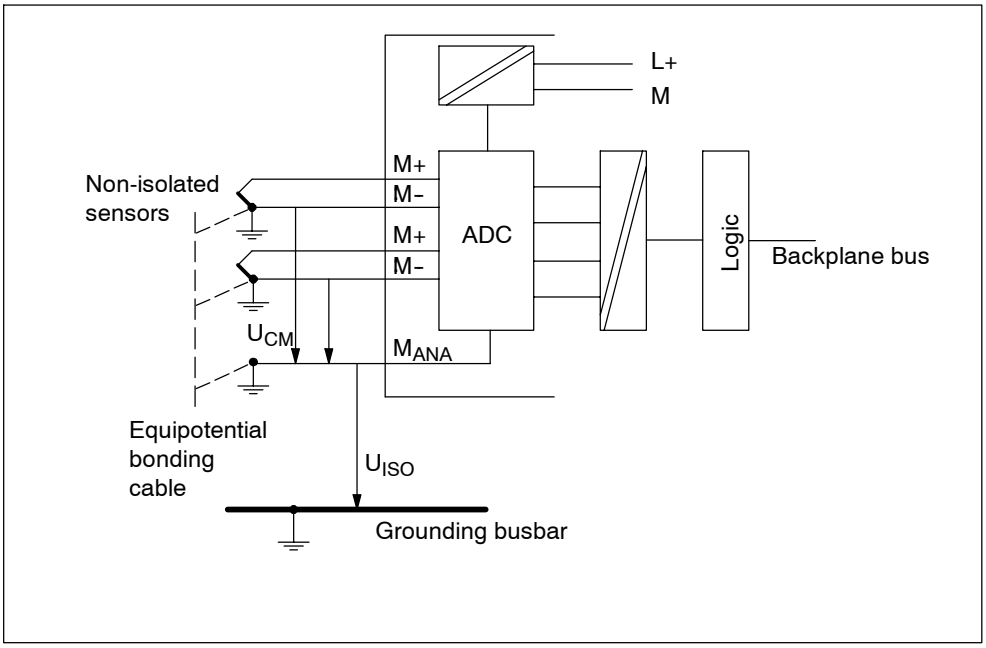


Figure 12-2 Connection of non-isolated sensors to an equipotentially bonded analog input module.

Operating 4-wire measuring transducers (MU) at external power supply

If the MU output and power supply is isolated, the MU can be connected to the 2AI I 4WIRE without any additional connections.

If the MU output and power supply is not isolated, the MU can be connected to the 2AI I 4WIRE only if the power supply voltages have the same reference potentials connections.

If the interference is increased, we recommend a connection between M- and M_{ana} to the terminal module of the 2AI I 4WIRE.

12.2.2 Connecting Thermocouples

Introduction

This section contains additional information on connecting thermocouples.

Compensation of the Reference Junction Temperature

There are several ways in which you can measure the reference junction temperature to obtain an absolute temperature value from the difference in temperature between the reference junction and the measurement junction.

Table 12-25 Compensation of the Reference Junction Temperature

Option	Explanation	Reference junction parameter
No compensation	You obtain not only the temperature of the measurement junction. The temperature of the reference junction (transition from copper line to thermocouple line) influences the thermal voltage. The measured value is thus faulty.	No
Using a compensation unit in the input lines of a single thermocouple	They are compensated via a compensation unit. The compensation unit is the transition point of Cu wire to the thermocouple cable. No additional processing by the 2AI TC ST is required.	No
Use of a resistance thermometer Pt100 climate range to measure the reference junction temperature (practical method)	You can measure the reference junction temperature using a resistance thermometer (Pt100 climate range). With suitable parameter settings, this temperature value is distributed to the 2AI TC Standard modules in the ET 200S and is used to correct the measured temperature value of the measurement junction in the modules. Number of reference junctions: 1	The parameters of IM151-1 and of the 2AI TC must be adapted: • 2AI RTD Standard configured to Pt100 climate range in the correct slot; • 2AI TC Standard: Reference junction: RTD; select reference junction number 1 • IM : assignment of junction to a slot with 2AI RTD Standard; selection of a channel;
Internal compensation with 2AI TC High Feature	A temperature sensor is installed in the TM-E15S24-AT and TM-E15C24-AT terminal modules. The temperature sensor reports the terminal temperature to the 2AI TC High Feature. This value is computed with the measured value of the channel of the electronic module.	• 2AI TC High Feature: Reference junction: Yes

Extension to a reference junction

The thermocouples can be extended from their connection side by compensation cables as far as the reference junction (transition to copper wiring). The reference junction can also be an ET 200S terminal module.

The compensation cables are made of the same material as the wires of the thermocouple. The connecting cables are made of copper. Make sure that you do not reverse polarity.

Use of a compensation unit

The influence of the temperature on the reference junction of a thermocouple (e.g. terminal box) can be compensated with a compensation unit.

The compensation unit contains a bridge circuit that is compensated for a specific reference junction temperature (compensation temperature). The thermocouples or their compensation wiring are connected to the compensation unit. The compensation unit then forms the reference junction.

If the actual reference temperature deviates from the compensation temperature, the temperature-dependent bridge resistance changes. A positive or negative compensation voltage is generated and added to the thermal voltage.

Compensation units with the **reference junction temperature of 0 °C** must be used for compensation of the analog input module.

Note:

- The compensation unit must have an isolated power supply.
- The power unit must have sufficient interference filtering, e.g. by a grounded shield winding.

Compensation by resistance thermometer on the 2AI RTD

If thermocouples connected to the inputs of the 2 AI TC have the same reference junction, compensate using a 2AI RTD.

You can selected ”RTD” or ”none” as reference junction for the two channels of the 2AI TC module. If you select ”RTD”, the same reference junction (RTD channel) is always used for both channels.

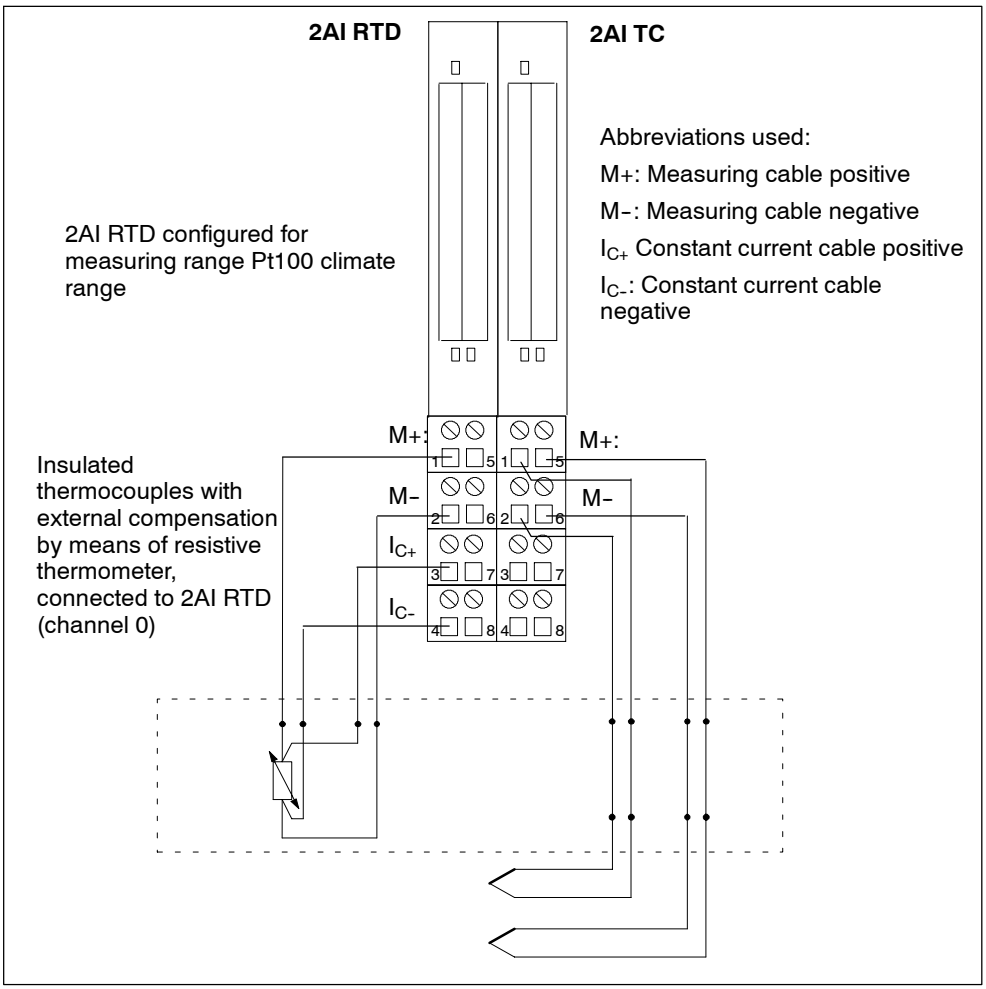


Figure 12-3 Compensation by 2AI RTD

Configuring the reference junction with 2AI TC and interface module

You can set the reference junctions for the 2AI TC electronics modules using the following parameters:

Table 12-26 Reference Junction Parameters

Parameters	Module	Value range	Description
Reference junction slot	IM 151	none, 2 to 12 (IM151-1 BASIC) none, 2 to 63 (IM151-1 HIGH FEATURE) IM 151-1 STANDARD IM 151-1FO STANDARD	With this parameter, you can assign a slot (none, 2 to 12 or 2 to 63) on which the channels for reference temperature measurement are situated (calculating the compensation value).
Reference junction input	IM 151	RTD on channel 0 RTD on channel 1	With this parameter you specify the channel (0/1) for reference temperature measurement (calculating the compensation value) for the relevant slot.
Reference junction E0 and reference junction E1	2AI TC	none, RTD	With these parameters, you can enable the use of the reference junction.
Reference junction number	2AI TC	1	With this parameter, you assign the reference junction (1) containing the reference temperature (compensation value).

Example of the Configuration of Reference Junctions

- Structure: To simplify the situation, the following figure 12-4 shows only RTD and TC modules:

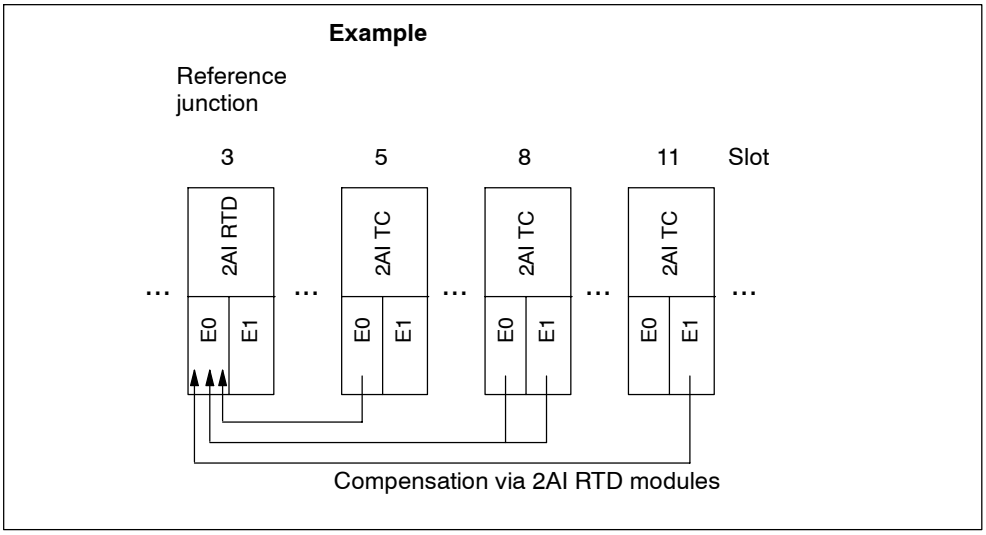


Figure 12-4 Example of the Configuration of Reference Junctions

- Relevant parameters for interface module

Parameters	Value
Reference junction slot	3
Reference junction input	RTD on channel 0

- Relevant parameters for 2AI RTD and 2AI TC:

Slot	Parameters	Value
8 (2AI RTD)	Measurement type / range I0	RTD-4L Pt100 terminal
5 (2AI TC)	Reference junction I0	RTD
	Reference junction E1	No
	Reference junction number	1
	Measurement type / range I0	TC-EL type...
	Measurement type / range I1	(any)
8 (2AI TC)	Reference junction I0	RTD
	Reference junction E1	RTD
	Reference junction number	1
	Measurement type / range I0	TC-EL type...
	Measurement type / range I1	TC-EL type...
11 (2AI TC)	Reference junction I0	No
	Reference junction E1	RTD
	Reference junction number	1
	Measurement type / range I0	(any)
	Measurement type / range I1	TC-EL type...

Non-insulated thermocouples

If you use non-insulated thermocouples, make sure that you adhere to the permitted common mode voltage.

12.2.3 Instructions and circuits for unused channels of the analog input modules

- ”Disable” unused input channels in the configuration.
- A disabled channel always return the value $7FFF_H$.
- The cycle time of the modules is halved with the standard modules 2AI U, 2AI I 2WIRE, 2AI I 4WIRE, 2AI RTD Standard, 2AI RTD High Feature and 2AI TC Standard, 2AI TC High Feature.
- The cycle time remains unchanged with the 4AI I 2WIRE standard module.
- The cycle time remains unchanged at 1 ms with the 2AI U, 2AI I 2WIRE and 2AI I 4WIRE high-speed modules.
- To maintain the approved potential differences (U_{CM}) bridges must be wired to the terminal module on the unused channels. This is required for the following modules:

Analog input module	TM connection terminal							
	Channel 0				Channel 1			
	1	2	3	4	5	6	7	8
2AI U Standard	●	●	●		●	●	●	
2AI RTD Standard, 2AI RTD High Feature, 2AI TC High Feature	●	●			●	●		
2AI TC Standard	●	●	●		●	●	●	
2AI U High Speed	●	●	●		●	●	●	

12.3 Response of the Analog Modules during Operation and if Faults Occur

This chapter describes:

- The dependence of the analog input and output values on the supply voltage of the electronic module and the operating states of the PLC.
- The response of the analog electronic modules depending on the state of the analog values in the specific value range.
- The influence of errors on the analog inputs and outputs.
- Use of the shield.

Influence of the Power Supply and the Operating State

The input and output values of the analog modules are dependent on the power supply for electronics/sensors and on the operating state of the PLC (CPU of the DP master).

Table 12-27 Dependence of the Input and Output Values on the Operating State of the PLC (CPU of the DP Master) and the Power Supply Voltage L +

Operating State of the PLC (CPU of the DP Master)		Power supply L + at ET 200S (power module)	Input Value of the Electronics Module with Analog Inputs (Evaluation Possible on the CPU of the DP Master)	Output Value of the Electronics Module with Analog Outputs
POWER ON	RUN	L + present	Process values	PLC values
			$7FFF_H$ until first conversion after startup, or after assignment of parameters for the module is completed.	Until first value output: • After startup, a signal of 0 V is output. • Dependent on the parameter ”CPU/ master STOP”
		L + missing	$7FFF_H$	–
POWER ON	STOP	L + present	Process value	Dependent on the parameter ”CPU/ master STOP”
		L + missing	$7FFF_H$	–
POWER OFF	–	L + present	–	Dependent on the parameter ”CPU/ master STOP”
		L + missing	–	–

Influence of the Value Range on the Analog Input

The response of the electronics modules with analog inputs depends on the part of the value range in which the input values are located. The following table 12-28 illustrates the relationship.

Table 12-28 Response of the Analog Modules, Depending on the Location of the Analog Input Value in the Range of Values

Measured value is in	Input value in SIMATIC S7 Format	Input value in SIMATIC S5 Format
Nominal range	Measured value	Measured value
Overshoot / undershoot range	Measured value	Measured value
Overflow	$7FFF_H$	End of the overshoot range +1 plus overflow bit
Underflow	8000_H	End of the undershoot range -1 plus overflow bit
Before configuration or with incorrect configuration[1)]	$7FFF_H$	$7FFF_H$

1) With 2AI U ST, 2AI I 2WIRE ST, 2AI I 4WIRE ST, 2AI RTD ST, 2AI TC ST with product level 1 the following applies: If you trigger the configuration error diagnostic message as a result of incorrect configuration (e.g. wire break at measuring range ± 20 mA), the SF-LED on the module lights and you can evaluate the diagnosis. Correct input values are sent to the DP master in this status.

Influence of the Value Range on the Analog Output

The response of the electronics modules with analog outputs depends on the part of the value range in which the output values are located. The following table illustrates the relationship.

Table 12-29 Response of the Analog Modules, Depending on the Location of the Analog Output Value in the Range of Values

Output Value is in	Output value in SIMATIC S5/S7 format
Nominal range	Value from DP master
Overshoot / undershoot range	Value from DP master
Overflow	0-signal
Underflow	0-signal
Before configuration or with incorrect configuration[1)]	0-signal

1) With 2AO U ST, 2AO I ST with product level 1 the following applies: If the configured substitute values are outside the nominal range, a configuration error diagnostic message is registered and the SF-LED lights. In this status the output values sent from the DP master are output at the analog output modules.

Use of the shield

We recommend the following with the analog modules to prevent interference:

- Use shielded cables to the sensors and actuators.
- Connect cable shields to the shield component.
- Connect the shield to the ground collector cable.

12.4 Parameters for analog electronic modules

Parameters for

- 2AI U Standard analog electronic module
- 2AI I 2WIRE Standard electronic module
- 4AI I 2WIRE Standard electronic module
- 2AI I 4WIRE Standard electronic module

Table 12-30 Parameters for analog input modules U, I ST

2AI U Standard	2AI I 2WIRE Standard 4AI I 2WIRE ST	2AI I 4WIRE Standard	Value range	Default setting	Effective range
Group diagnostics (configuration error, internal error)			• disable • enabled	disable	Module
Diagnosis: underflow/overflow			• disable • enabled	disable	Module
Diagnosis: wire break[2)]	Diagnosis: Wire break	Diagnosis: Wire break[1)]	• disable • enabled	disable	Channel
Smoothing			• No • weak • medium • strong	No	Channel
Measurement type / range	---	---	• disabled • ± 5 V • 1 to 5V • ± 10 V	± 10 V	Channel
---	Measurement type / range	---	• disabled • 2WIRE: 4 to 20mA	2WIRE: 4 to 20mA	Channel
---	---	Measurement type / range	• disabled • 4WIRE: 4 to 20mA • 4WIRE: ±20 mA	2WIRE: 4 to 20 mA	Channel

1) Only in 4 to 20 mA measurement range
2) Only in 1 to 5 V measurement range

Parameters for

- 2AI U High Feature analog electronic module
- 2AI I 2/4WIRE High Feature analog electronic module

Table 12-31 Parameters for analog input modules U, I High Feature

2AI U High Feature	2AI I 2/4WIRE High Feature	Value range	Default setting	Effective range
Group diagnostics (configuration error, internal error)		• disable • enabled	disable	Module
Diagnosis: underflow/overflow		• disable • enabled	disable	Module
---	Diagnosis: wire break[1)]	• disable • enabled	disable	Channel
Smoothing		• No • weak • medium • strong	No	Channel
Measurement type / range	---	• disabled • ±5 V • 1 to 5V • ±10 V	±10 V	Channel
---	Measurement type / range	• disabled • 4 to 20mA • ±20 mA	4 to 20mA	Channel
Interference Frequency Suppression		• disable • enabled	disable	Module
Run time calibration		• disable • enabled	disable	Module

1) Only in 4 to 20 mA measurement range

Parameters for

- 2AI U High Speed analog electronic module
- 2AI I 2WIRE High Speed electronic module
- 2AI I 4WIRE High Speed electronic module

Table 12-32 Parameters for analog input modules U, I High Speed

2AI U High Speed	2AI I 2WIRE High Speed	2AI I 4WIRE High Speed	Value range	Default setting	Effective range
Group diagnostics (configuration error, internal error)			• disable • enabled	disable	Module
Diagnosis: underflow/overflow			• disable • enabled	disable	Module
---	Diagnosis: Wire break	Diagnosis: Wire break	• disable • enabled	disable	Channel
Smoothing			• No • weak • medium • strong	No	Channel
Measurement type / range	---	---	• disabled • ± 10 V • ± 5 V • ± 2.5 V • 1 to 5 V	± 10 V	Channel
---	Measurement type / range	---	• disabled • 4 to 20 mA • 0 to 20 mA	4 to 20 mA	Channel
---	---	Measurement type / range	• disabled • 4 to 20 mA • 0 to 20 mA • ± 20 mA	4 to 20 mA	Channel

Note

If you disable a channel of the High Speed modules, this will not increase speed because of the measuring process in use.

Parameters for

- 2AI RTD Standard analog electronic module
- 2AI TC Standard analog electronic module
- 2AI TC High Feature analog electronic module

Table 12-33 Parameters RTD, TC analog electronic modules

2AI RTD Standard	2AI TC Standard	2AI TC High Feature	Value range	Default setting	Effective range
Group diagnostics (configuration error, internal error)			• disable • enabled	disable	Module
Diagnosis: underflow/overflow			• disable • enabled	disable	Module
Diagnosis: wire break[2)]	Diagnosis: wire-break test[1)]		• disable • enabled	disable	Channel
Smoothing			• No • weak • medium • strong	No	Channel
		Temperature Unit	• Centigrade • Fahrenheit	Centigrade	Module
---	Reference junction	---	• No • RTD	No	Channel
---		Reference junction	• No • Yes (means internal)	No	Channel
---	Reference junction number	---	• No • 1 to 8 (with IM151-1 STANDARD, IM151-1 FO STANDARD) • 1 (with IM151-1 BASIC, IM151-1 HIGH FEATURE)	No	Module
Measurement type / range	---		• disabled • 150 ohms • 300 ohms • 600 ohms • Pt100 climate range • Ni100 climate range • Pt100 standard range • Ni100 standard range	Pt100 standard range	Channel

Table 12-33 Parameters RTD, TC analog electronic modules

2AI RTD Standard	2AI TC Standard	2AI TC High Feature	Value range	Default setting	Effective range
---	Measurement type/range	---	• disabled • Voltage ± 80 mV • TC-EL Type T (Cu-CuNi) • TC-EL Type K (NiCr-Ni) • TC-EL Type B (PtRh-PtRh) • TC-EL Type N (NiCrSi-NiSi) • TC-EL Type E (NiCr-CuNi) • TC-EL Type R (PtRh-Pt) • TC-EL Type S (PtRh-Pt) • TC-EL Type J (Fe-Cu-Ni) • TC-EL Type L (Fe-Cu-Ni)	TC-EL Type K (NiCr-Ni)	Channel
		Measurement type /range	• disabled • Voltage ± 80 mV • TC-EL Type T (Cu-CuNi) • TC-EL Type K (NiCr-Ni) • TC-EL Type B (PtRh-PtRh) • TC-EL Type C (WRe-WRe) • TC-EL Type N (NiCrSi-NiSi) • TC-EL Type E (NiCr-CuNi) • TC-EL Type R (PtRh-Pt) • TC-EL Type S (PtRh-Pt) • TC-EL Type J (Fe-Cu-Ni) • TC-EL Type L (Fe-Cu-Ni)	TC-EL Type K (NiCr-Ni)	Channel

1) With thermocouples only. A configuration error occurs when wire-break diagnostics and voltage measuring range are enabled. The module does not start.
2) Wire break is only detected with the constant current cables.

Parameters for

- 2AI RTD High Feature analog electronic module

Table 12-34 Parameters for 2AI RTD High Feature analog electronic module

Parameters	Value range	Default setting	Effective range
Group diagnostics	• disable • enabled	disable	Module
Diagnosis: underflow/overflow	• disable • enabled	disable	Module
Diagnosis: Wire break	• Disable[1)] • enabled	disable	Channel
Smoothing	• No • weak • medium • strong	No	Channel
Temperature Unit	• Centigrade • Fahrenheit	Centigrade	Module
Measurement type	• disabled • 4-wire resistor • 3-wire resistor • 2-wire resistor • 4-wire thermal resistor • 3-wire thermal resistor • 2-wire thermal resistor	Thermal resistor 4-wire	Channel
Temperature coefficient	• Pt 0.003850 • Pt 0.003916 • Pt 0.003902 • Pt 0.003920 • Pt 0.003851 • Ni 0.006180 • Ni 0.006720 • Ni 0.005000 • Cu 0.00427	Pt 0.003851	Channel

Table 12-34 Parameters for 2AI RTD High Feature analog electronic module

Parameters	Value range	Default setting	Effective range
Measuring range	• 150 Ω • 300 Ω • 600 Ω • 3000 Ω • PTC • Pt100 climate range • Ni100 climate range • Pt100 standard range • Ni100 standard range • Pt500 standard range • Pt1000 standard range • Ni1000 standard range • Pt200 climate range • Pt500 climate range • Pt1000 climate range • Ni1000 climate range • Pt200 standard range • Ni120 standard range • Ni120 climate range • Cu10 climate range • Cu10 standard range • Ni200 standard range • Ni200 climate range • Ni500 standard range • Ni500 climate range	Pt100 standard	Channel

1) Wire-break diagnostics is blocked if
- measuring type = ”disabled” or
- measuring range = ” PTC” have been configured.

Measuring range – temperature coefficient – measuring range

The following table shows which temperature coefficients and which measuring ranges can be configured for the specific measuring type:

Measurement type	Temperature coefficient	Measuring range
disabled	–	–
4-wire resistor 3-wire resistor	–	150 Ω / 300 Ω / 600 Ω / 3000 Ω
2-wire resistor	–	150 Ω / 300 Ω / 600 Ω / 3000 Ω / PTC
3-wire thermal resistor	Pt 0.003850/ Pt 0.003916 / Pt 0.003902 / Pt 0.003920 / Pt 0.003851[1)]	Pt100 climate range / Pt100 standard range / Pt200 climate range / Pt200 standard range / Pt500 climate range / Pt500 standard range / Pt1000 climate range / Pt1000 standard range
	Ni 0.006180[1)] / Ni 0.006720	Ni100 climate range / NI100 standard range / Ni120 climate range / Ni120 standard range / Ni200 climate range / Ni200 standard range / Ni500 climate range / Ni500 standard range / Ni1000 climate range / Ni1000 standard range
	Ni 0.005000	Ni 1000 climate range[2)] Ni 1000 standard range[2)]
	Cu 0.00427[1)]	Cu10 climate range / Cu10 standard range

[1)] The preceding temperature coefficient are applicable for Europe.

Measurement type	Temperature coefficient	Measuring range
2-wire thermal resistor 4-wire thermal resistor	Pt 0.003850 / Pt 0.003916 / Pt 0.003902 / Pt 0.003920 / Pt 0.003851	Pt100 climate range Pt100 standard range Pt200 climate range / Pt200 standard range / Pt500 climate range / Pt500 standard range / Pt1000 climate range / Pt1000 standard range
	Ni 0.006180 / Ni 0.006720	Ni100 climate range / Ni100 standard range / Ni120 climate range / Ni120 standard range / Ni200 climate range / Ni200 standard range / Ni500 climate range / Ni500 standard range / Ni1000 climate range / Ni1000 standard range
	Ni 0.005000	Ni 1000 climate range[2)] Ni 1000 standard range[2)]

1) The preceding temperature coefficient are applicable for Europe.
2) For LG-Ni 1000 sensors from Siemens Building Ltd (Landis & Stäfa)

Temperature coefficient

The correction factor for the temperature coefficients (α value) indicates the relative change of the resistance of a specified material if the temperature increases by 1 °C.

The temperature coefficient depends on the chemical composition of the material. In Europe only one value is used per sensor type (default value).

The additional values enabled sensor-specific adjustment of the temperature coefficients and therefore even greater precision.

Parameters for

- 2AO U Standard, 2AO U High Feature analog electronic module
- 2AO I Standard, 2AO I High Feature analog electronic module

Table 12-35 Parameters for analog output modules U, I

2AO U Standard 2AO U High Feature	2AO I Standard 2AO I High Feature	Value range	Default setting	Effective range
Group diagnostics (configuration error, internal error)		• disable • enabled	disable	Module
Diagnosis: Short circuit as per M	---	• disable • enabled	disable	Channel
---	Diagnosis: Wire break	• disable • enabled	disable	Channel
Response at CPU/master STOP		• Output without current and voltage • apply substitute value • hold last value	Output without current and voltage	Module
Output type / range	---	• disabled • 1 to 5 V • ± 10 V	± 10 V	Channel
---	Output type / range	• disabled • 4 to 20 mA • ± 20 mA	4 to 20 mA	Channel
Substitute value [1]		0 to 65535 (value range must be within the nominal range)	±10 V/ ±20 V: 0 V 4 to 20 mA: 4 mA 1 to 5 V: 1 V	Channel

[1] If the power to the IM is disconnected and the analog output modules are still powered, the configured substitute values are output. Substitute values must be within the nominal range. Values from –27648 to +27648 are configured (when configured with the GSD file).

Smoothing

The individual measured values are smoothed by means of digital filters. The smoothing can be configured in four levels, in which the smoothing factor multiplied by the cycle time of the electronic module corresponds to the time constant of the smoothing filter. The greater the smoothing the greater the time constant of the filter.

The following diagrams show the jump response with the various smoothing factors depending on the number of module cycles.

- Smoothing with 2AI U Standard, 2AI U High Feature, 2AI I 2WIRE Standard, 2AI I 4WIRE Standard, 2AI I 2/4WIRE High Feature, 2AI RTD Standard, 2AI RTD High Feature, 2AI TC Standard, 2AI TC High Feature

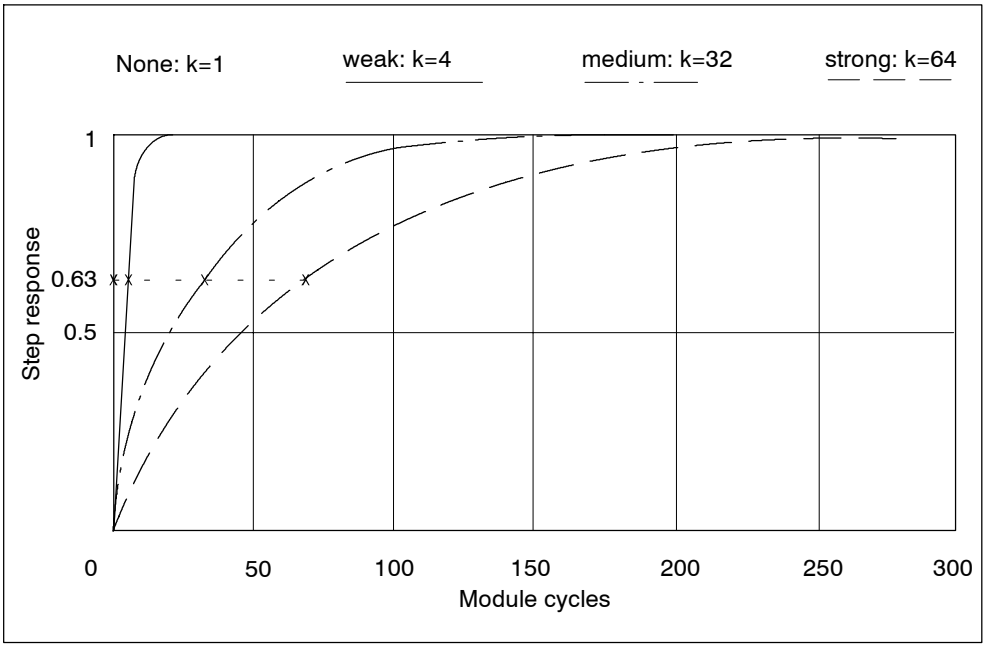
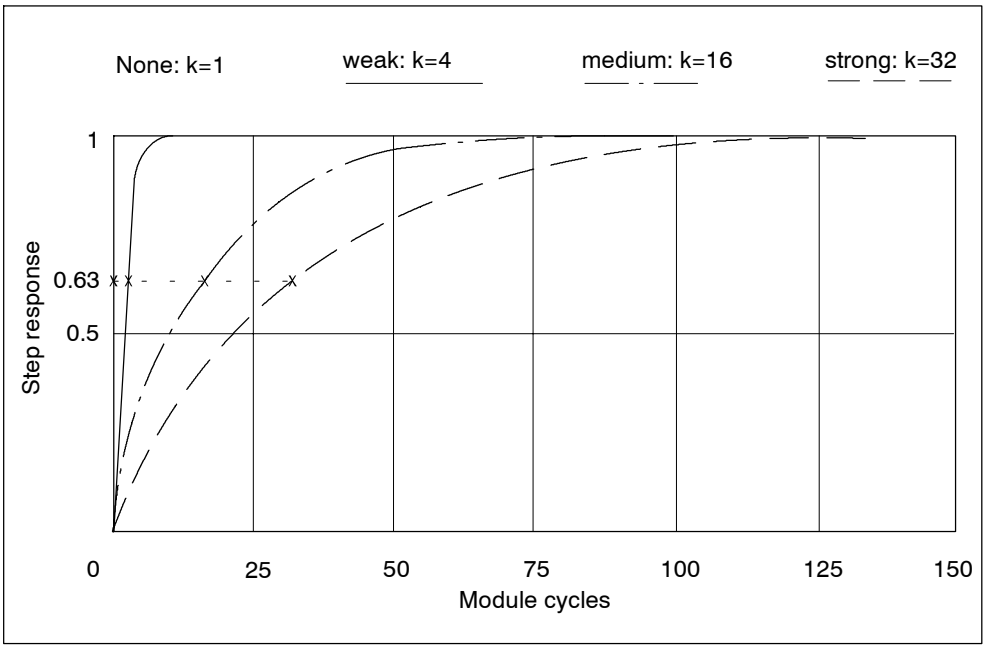


Figure 12-5 Smoothing with 2AI U Standard, 2AI U High Feature, 2AI I 2WIRE Standard, 2AI I 4WIRE Standard,
2AI I 2/4WIRE High Feature, 2AI RTD Standard, 2AI RTD High Feature, 2AI TC Standard, 2AI TC High Feature

- Smoothing with 4AI I 2WIRE Standard



- Smoothing with 2AI U High Speed, 2AI I 2WIRE High Speed, 2AI I 4WIRE High Speed

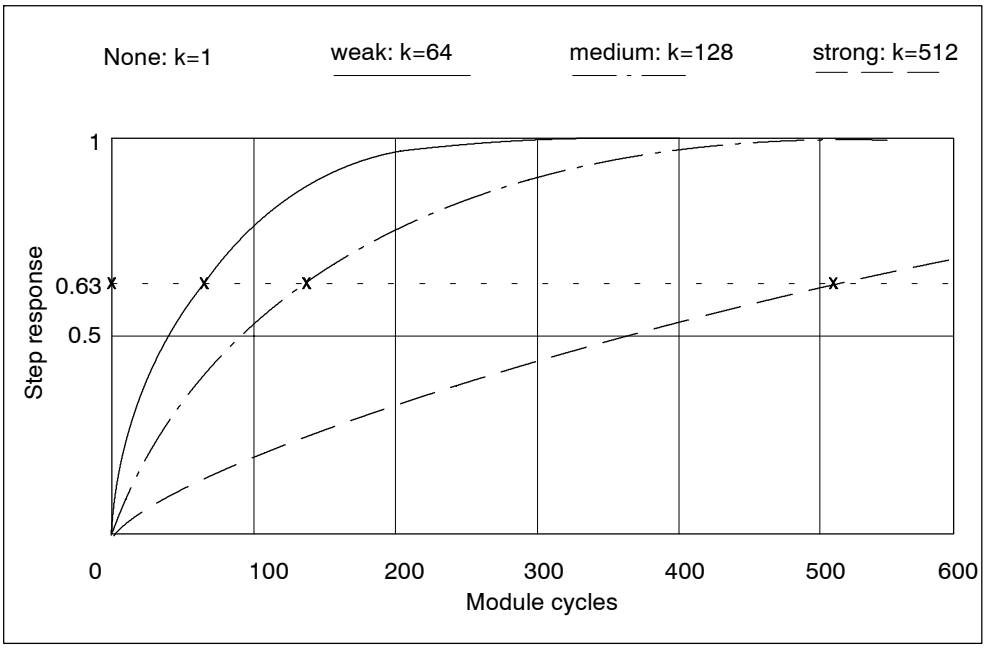


Figure 12-6 Smoothing with 2AI U High Speed, 2AI I 2WIRE High Speed, 2AI I 4WIRE High Speed

Interference Frequency Suppression

The 2AI U High Feature and 2AI I 2/4WIRE High Feature analog input modules support the setting of interference frequency suppression (50 Hz or 60 Hz) with the interface module. These analog input modules (HIGH FEATURE) also allow blocking of interference frequency suppression; this means that this setting can be ignored on the interface module. If interference frequency suppression is blocked, the conversion and cycle times of these modules are improved.

Runtime calibration

- 2AI U High Feature

  When configuring the module the runtime calibration can be enabled for the 2AI U High Feature analog electronic module to compensate for component changes resulting from changes in the ambient temperature. The update of new data is delayed by 250 ms during the calibration interval. A calibration is conducted at every change of 5° C in the ambient temperature.

- 2AI I 2/4WIRE High Feature

  When calibrating the module a runtime calibration for the 2AI I 2WIRE High Feature analog electronic module can be enabled for periodic compensation of the error voltage change of the A/D converter. The update of new data is delayed by 200 ms during the calibration interval. The precision limits of the module are reached without run time calibration.

Reference junction

See chapter 12.2.2.

Reference junction number:

See chapter 12.2.2

12.5 2AI U Standard analog electronic module (6ES7 134-4FB00-0AB0)

Order number

6ES7 134-4FB00-0AB0

Properties

- 2 inputs for voltage measuring
- Input ranges:

  ± 10 V, resolution 13 bits + sign

  ± 5 V, resolution 13 bits + sign

  1 to 5 V, resolution 13 bits
- Isolated for load voltage L+
- Allowable common-mode voltage 2 VAC_{SS}

Terminal assignment

The following table shows the terminal assignment of the 2AI U Standard for the various terminal modules:

Table 12-36 Terminal assignment of the 2AI U Standard

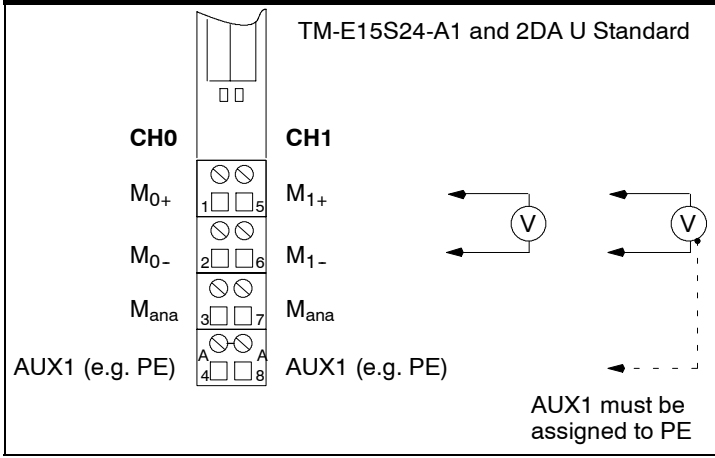
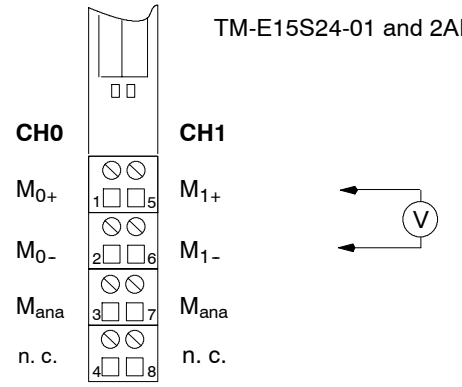
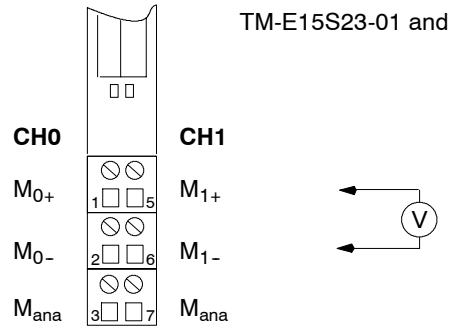
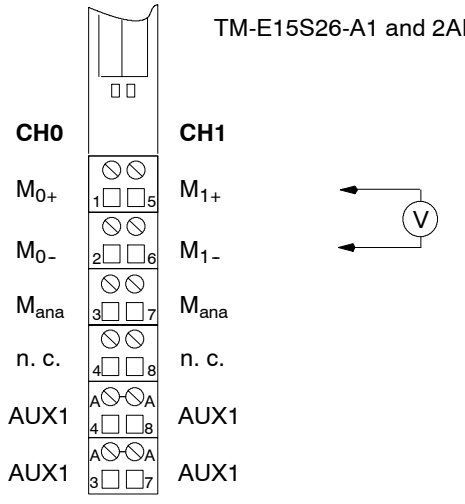
View	Terminal assignment	Remarks
		Channel 0: Terminals 1 to A4 Channel 1: Terminals 5 to A8 M+: Input signal "+" M–: Input signal "–" M_{ana}: Module ground

Table 12-36 Terminal assignment of the 2AI U Standard

View	Terminal assignment	Remarks
		Channel 0: Terminals 1 to 4 Channel 1: Terminals 5 to 8 M+: Input signal "+" M-: Input signal "-" M_{ana}: Module ground Terminals 4 and 8 can be used for connection of cables that are not required up to 30 VDC.
		Channel 0: Terminals 1 to 3 Channel 1: Terminals 5 to 7 M+: Input signal "+" M-: Input signal "-" M_{ana}: Module ground
		Channel 0: Terminals 1 to A3 Channel 1: Terminals 5 to A7 M+: Input signal "+" M-: Input signal "-" M_{ana}: Module ground Terminals 4 and 8 can be used for connection of cables that are not required up to 30 VDC.

Block diagram

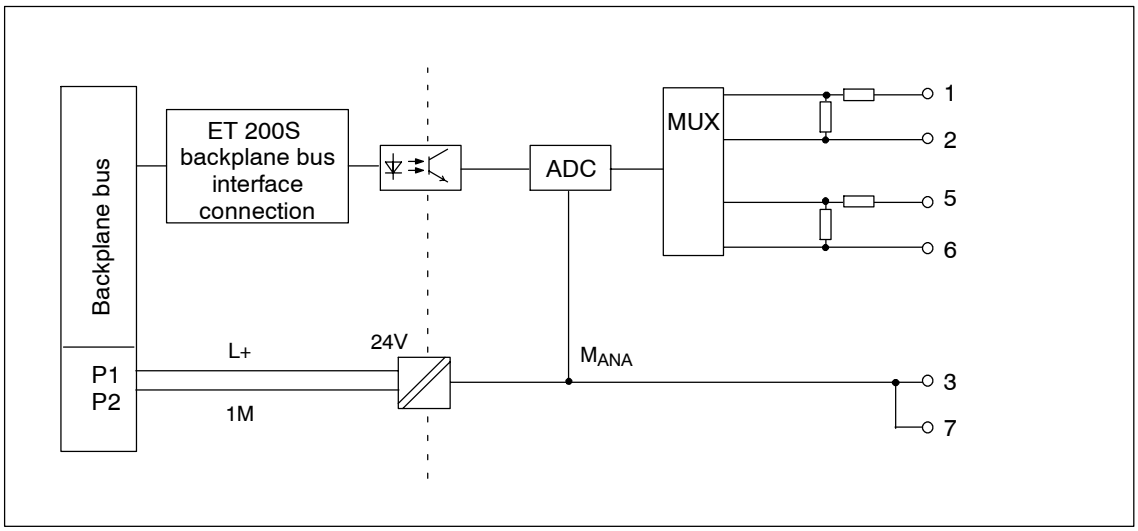


Figure 12-7 Block diagram of the 2AI U Standard

Technical data

Dimensions and weight	
Dimensions W x H x D (mm)	15 x 81 x 52
Weight	Approx. 40 g
Module-specific data	
Supports clock synchronized mode	No
Number of inputs	2
Cable length	
• shielded	max. 200 m (164 ft)
Voltages, currents, electrical potentials	
Rated load voltage L+ (from power module)	24 VDC
• Polarity reversal protection	Yes
Electrical isolation	
• Between channels and backplane bus	Yes
• Between channels and load voltage L+	Yes
• Between the channels	No

Permitted potential difference	
• Between inputs and M_{ANA} (U_{CM})	2 VAC_{SS}
• Between M_{ANA} and the central ground point (U_{ISO})	75 VDC / 60 VAC
Isolation tested	500 VDC
Current consumption	
• with load voltage L+	max. 30 mA
Power loss of the module	Typical 0.6 W
Status, interrupts, diagnostics	
Diagnostic functions	
• Group error	red LED "SF"
• Reading of diagnostics functions	Yes

Analog Value Formation		
Measurement principle	integrating	
Integration and cycle time / resolution per channel:		
• Integration time selectable	Yes	
• Interference frequency suppression in Hz	60	50
• Integration time in ms	16,7	20
• Conversion time in ms	55	65
• Cycle time in ms	Number of active channels per module × conversion time	
• Resolution (incl. overshoot range)	±10 V/ 13 Bit + VZ ±5 V/ 13 Bit + VZ 1 to 5 V/13 bits	

Interference Suppression, Error Limits	
Interference voltage suppression for f= n x (f1± 1%), (f1 = interference frequency)	
• Common mode interference (U_{SS})	min. 90 dB min. 70 dB
• Common mode interference (peak value of interference < rated value of the input range)	min. –50 dB
• Crosstalk between inputs	
Operational error limits (across complete temperature range, in relation to input range)	± 0.6 %
Basic error limit (operational error limit at 25 °C, related to the input range)	±0.4 %
Temperature error (in relation to input range)	±0.01 %/K
Linearity error (relative to the input range)	±0.01 %
Repetition accuracy (in transient state at 25 °C, relative to input range)	±0.05 %

Data for selection of the sensor		
Input range (rated value)/input resistance		
• Voltage		±5 V/min. 100 kΩ 1 up to 5 V/min.100 kΩ ±10 V/min. 100 kΩ
Permitted continuous input voltage (destruction limit)		35 V continuous, 75 V for max. 1 ms (sampling ratio 1:20)
Smoothing of measured values		Yes, configurable in 4 stages by digital filtering
	Level	Time constant
	No	1 x cycle time
	weak	4 x cycle time
	medium	32 x cycle time
	strong	64 x cycle time

12.6 2AI U High Feature analog electronic module (6ES7 134-4LB00-0AB0)

Order number

6ES7 134-4LB00-0AB0

Features

- 2 Inputs for voltage measurement
- Input ranges:
  - ± 10V, resolution 15 bits + sign
  - ± 5V, resolution 15 bits + sign
  - 1 to 5 V, resolution 15 bits
- Isolated for load voltage L+
- allowable common-mode voltage between the channels 100 VAC

Terminal assignment

The following table shows the terminal assignment of the 2AI U for the various terminal modules:

Table 12-37 Terminal assignment of the 2AI U High Feature

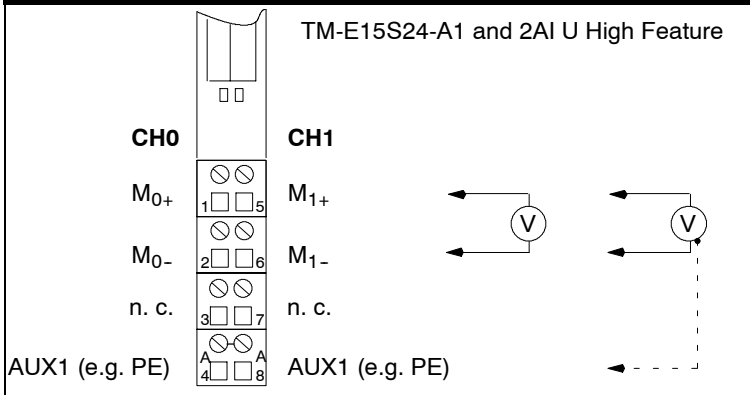
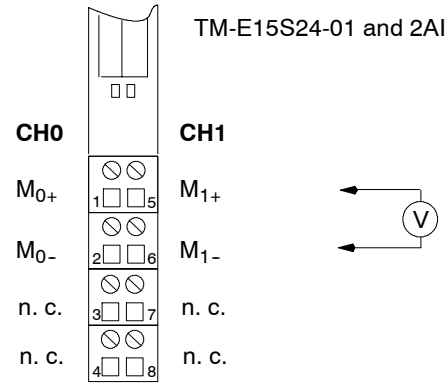
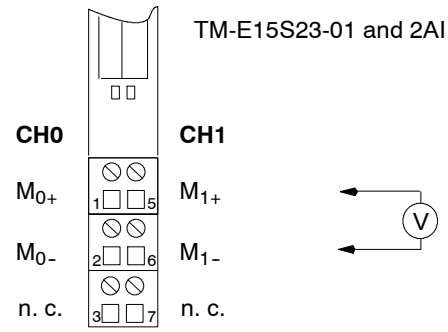
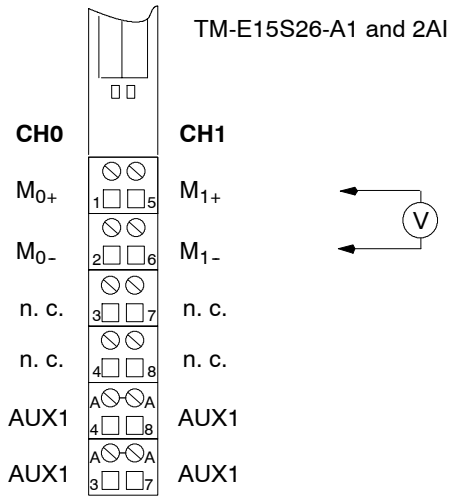
View	Terminal assignment	Remarks
		Channel 0: Terminals 1 to A4 Channel 1: Terminals 5 to A8 M+: Input signal "+" M-: Input signal "-"

Table 12-37 Terminal assignment of the 2AI U High Feature

View	Terminal assignment	Remarks
		Channel 0: Terminals 1 to 4 Channel 1: Terminals 5 to 8 M+: Input signal "+" M-: Input signal "-" Terminals 4 and 8 can be used for connection of cables that are not required up to 30 VDC.
		Channel 0: Terminals 1 to 3 Channel 1: Terminals 5 to 7 M+: Input signal "+" M-: Input signal "-" Terminals 4 and 8 can be used for connection of cables that are not required up to 30 VDC.
		Channel 0: Terminals 1 to A3 Channel 1: Terminals 5 to A7 M+: Input signal "+" M-: Input signal "-" Terminals 4 and 8 can be used for connection of cables that are not required up to 30 VDC.

Block diagram

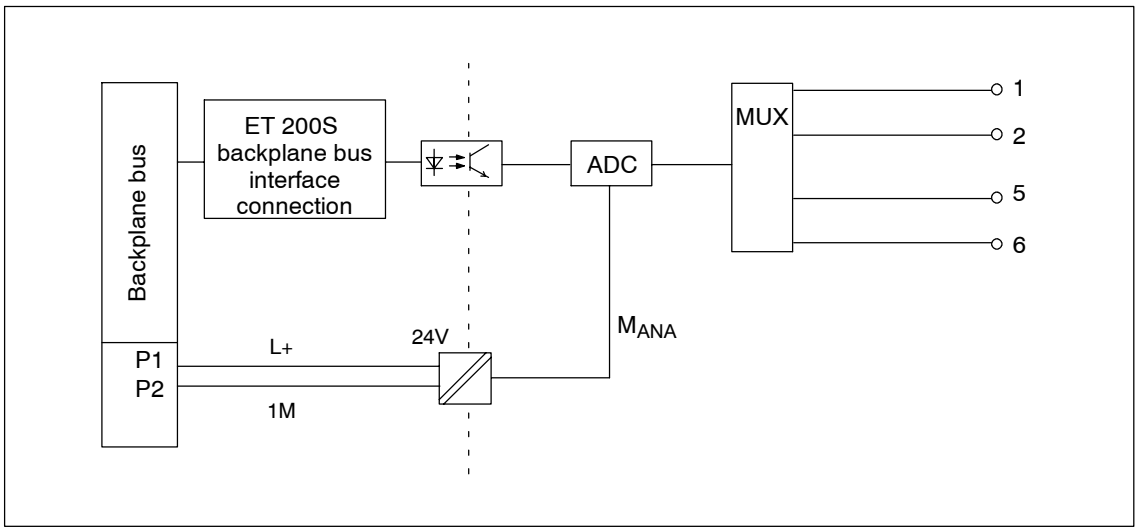


Figure 12-8 Block diagram of the 2AI U High Feature

Technical data

Dimensions and weight	
Dimensions W x H x D (mm)	15 x 81 x 52
Weight	Approx. 40 g
Module-specific data	
Supports clock synchronized mode	No
Number of inputs	2
Cable length	
• shielded	max. 200 m (164 ft)
Voltages, currents, electrical potentials	
Rated load voltage L+ (from power module)	24 VDC
• Polarity reversal protection	Yes
Electrical isolation	
• Between the channels and backplane bus	Yes
• Between the channels and load voltage L+	Yes
• Between the channels and PE	Yes
• Between the channels	No

Permitted potential difference	
• Between the channels	140 VDC/100 VAC
Isolation tested	500 VDC
Current consumption	
• with load voltage L+	max. 53 mA
Power loss of the module	Typical 0.85 W
Status, interrupts, diagnostics	
Diagnostic functions	
• Group error	red LED ”SF”
• Diagnostic function can be read (wire-break diagnostics not supported in this module)	Yes

Analog Value Formation			
Measurement principle	Integrating		
Integration and cycle time / resolution per channel			
• Integration time selectable	Yes		
• Interference frequency suppression in Hz	60	50	no
• Integration time in ms	16,67	20	7,5
• Conversion time in ms			
– 1 channel per module active	25	30	10
– 2 channels active per module	58,3	70	26
• Cycle time in ms			
– 1 channel per module active	75	90	30
– 2 channels active per module	175	210	78
• Resolution (incl. overshoot range)	±10 V/ 15 Bit +VZ ±5 V/ 15 Bit + VZ 1 to 5 V/15 bits		

Interference Suppression, Error Limits	
Interference voltage suppression for f= n x (f1±0.5%), (f1 = interference frequency)	
• Common mode interference (U_{SS})	min. 100 dB min. 90 dB
• Common mode interference (peak value of interference < rated value of the input range)	min. –100 dB
• Crosstalk between inputs	
Operational limits (in the entire temperature range, relative to the input range [1])	±0.1 %
Operational error limits (across complete temperature range, in relation to input range; calibration blocked)	±0.5 %
Basic error limit (operational error limit at 25°C, relative to input range; calibration enabled[1])	±0.05 %
Temperature error (based on input range; calibration enabled[1])	±0.003 %/K
Temperature error (in relation to input range; calibration blocked)	±0.015 %/K
Linearity error (relative to the input range)	±0.03 %
Repetition accuracy (in transient state at 25 °C, relative to input range)	±0.01 %

Data for selection of the sensor		
Input range (rated value)/input resistance		
• Voltage	±10 V/min. 1 MΩ ±5 V/min. 1 MΩ 1 to 5 V/min.1 MΩ	
Permitted continuous input voltage (destruction limit)	35 V continuous, 75 V for max. 1 ms	
Smoothing of measured values	Yes, configurable in 4 stages by digital filtering	
	Level	Time constant
	No	1 x cycle time
	weak	4 x cycle time
	medium	32 x cycle time
	strong	64 x cycle time

1) When configuring modules the runtime calibration can be enabled to compensate for component changes resulting from changes in the ambient temperature. The update of new data is delayed by 250 ms during the calibration interval. A calibration is conducted at every change of 5°C in the ambient temperature.

12.7 2AI U High Speed analog electronic module (6ES7 134-4FB51-0AB0)

Order number

6ES7 134-4FB51-0AB0

Properties

- 2 inputs for voltage measuring
- Input ranges:

  ± 10 V, resolution 13 bits + sign

  ± 5 V, resolution 13 bits + sign

  ± 2.5 V, resolution 13 bits + sign

  1 to 5 V, resolution 13 bits
- Isolated for load voltage L+
- Allowable common-mode voltage 100 VAC_{SS}
- Supports clock synchronized mode
  - Minimum possible time for the clock-synchronized DP cycle (T_{DPmin}): 2.5 ms
  - Minimum possible conversion time of the input module (T_{WEmin}): 1.1 ms

Terminal assignment

The following table shows the terminal assignment of the 2AI U High Speed for the various terminal modules:

Table 12-38 Terminal assignment of the 2AI U High Speed

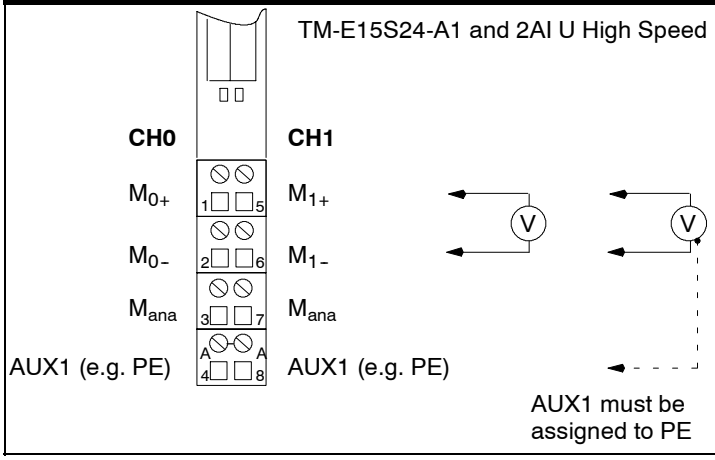
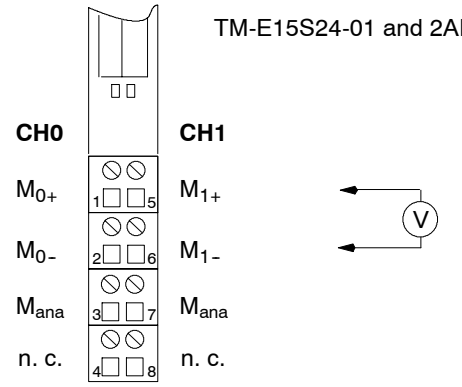
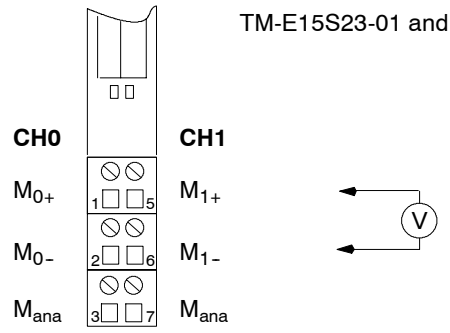
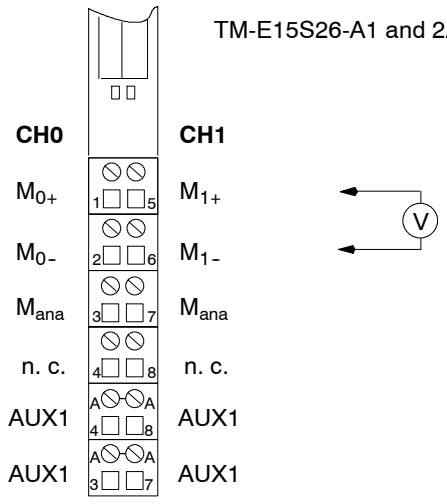
View	Terminal assignment	Remarks
		Channel 0: Terminals 1 to A4 Channel 1: Terminals 5 to A8 M+: Input signal "+" M-: Input signal "-" M_{ana}: Module ground

Table 12-38 Terminal assignment of the 2AI U High Speed, continued

View	Terminal assignment	Remarks
		Channel 0: Terminals 1 to 4 Channel 1: Terminals 5 to 8 M+: Input signal "+" M-: Input signal "-" M_{ana}: Module ground Terminals 4 and 8 can be used for connection of cables that are not required up to 30 VDC.
		Channel 0: Terminals 1 to 3 Channel 1: Terminals 5 to 7 M+: Input signal "+" M-: Input signal "-" M_{ana}: Module ground
		Channel 0: Terminals 1 to A3 Channel 1: Terminals 5 to A7 M+: Input signal "+" M-: Input signal "-" M_{ana}: Module ground Terminals 4 and 8 can be used for connection of cables that are not required up to 30 VDC.

Block diagram

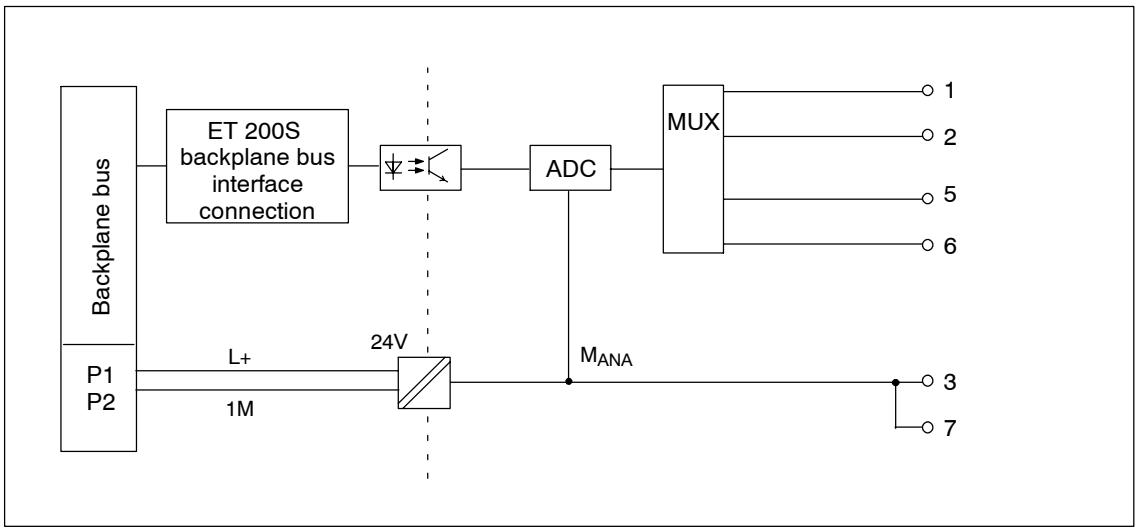


Figure 12-9 Block diagram of the 2AI U High Speed

Technical data

Dimensions and weight	
Dimensions W x H x D (mm)	15 x 81 x 52
Weight	Approx. 40 g
Module-specific data	
Supports clock synchronized mode	Yes
Number of inputs	2
Cable length	
• shielded	max. 200 m (164 ft)
Voltages, currents, electrical potentials	
Rated load voltage L+ (from power module)	24 VDC
• Polarity reversal protection	Yes
Electrical isolation	
• Between channels and backplane bus	Yes
• Between channels and load voltage L+	Yes
• Between the channels	No

Permitted potential difference	
• Between inputs and M_{ANA} (U_{CM})	100 VAC_{SS}
• Between M_{ANA} and the central ground point (U_{ISO})	75 VDC / 60 VAC
Isolation tested	500 VDC
Current consumption	
• Power supply and load voltage L+ (without load)	max. 35 mA
Power loss of the module	Typical 0.8 W
Status, interrupts, diagnostics	
Interrupts	
• Process alarm	Configurable[1)]
Diagnostic functions	
• Group error display	red LED "SF"
• Reading of diagnostic data	possible[2)]

Analog Value Formation	
Measurement principle	Momentary value encryption
Cycle time/resolution:	
• Conversion time in ms (per channel)	0.1
• Cycle time in ms (per module)	1
• Resolution (incl. overshoot range)	± 10 V/ 13 Bit + VZ ± 5 V/13 Bit + VZ ± 2.5 V/13 Bit + VZ 1 to 5 V/13 bits

Interference Suppression, Error Limits	
• Commonmode interference (U_{cm} < 100 V_{SS})	> 70 dB
Crosstalk between inputs	> 50 dB
Operational error limits (across complete temperature range, in relation to input range)	± 0.3 %
Basic error limit (operational error limit at 25 °C, related to the input range)	±0.2 %
Temperature error (in relation to input range)	±0.01 %/K
Linearity error (relative to the input range)	±0.01 %
Repetition accuracy (in transient state at 25 °C, relative to input range)	±0.05 %

Data for selection of the sensor	
Input ranges (rated value)/input resistance	
• Voltage	±10 V/min. 100 kΩ ±5 V/min. 100 kΩ ±2.5 V/min. 100 kΩ 1 – 5 V/min. 100 kΩ
Permitted input voltage for voltage input (destruction limit)	50 V continuous, 100 V for max. 1 ms (sampling ratio 1:20)
Connection of signal generators	
• With voltage measuring	possible
Smoothing of measured values	Yes, configurable in 4 stages by digital filtering
Level	Time constant
No	1 x cycle time
weak	64 x cycle time
medium	128 x cycle time
strong	512 x cycle time

1) DPV1 only

2) Configuration error
Violation of lower limit value
Violation of upper limit value
Open circuit (1 to 5 V only)
Process interrupt lost

12.8 2AI I 2WIRE Standard analog electronic module (6ES7 134-4GB00-0AB0)

Order number

6ES7 134-4GB00-0AB0

Properties

- 2 inputs for current measuring
- Input range:

  4 to 20 mA, resolution 13 bits

Terminal assignment

The following table shows the terminal assignment of the 2AI I 2WIRE Standard for the various terminal modules:

Table 12-39 Terminal assignment of the 2AI I 2WIRE Standard

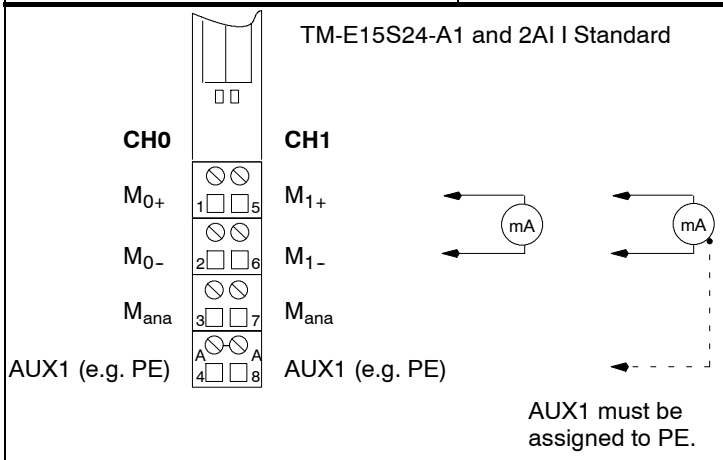
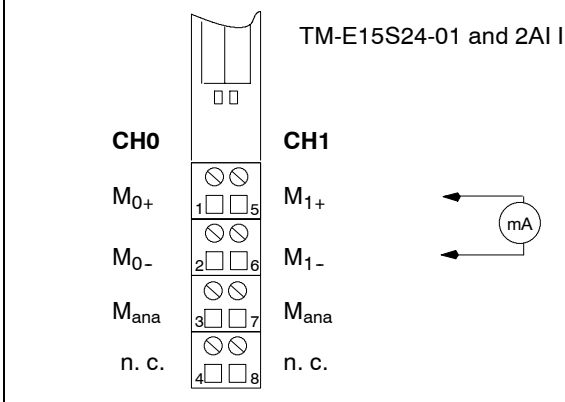
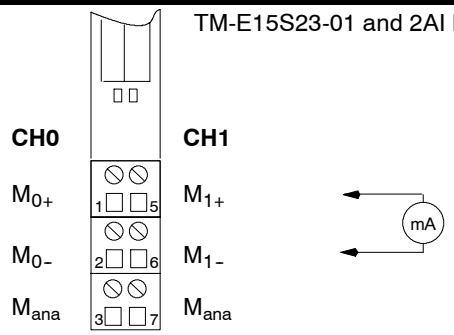
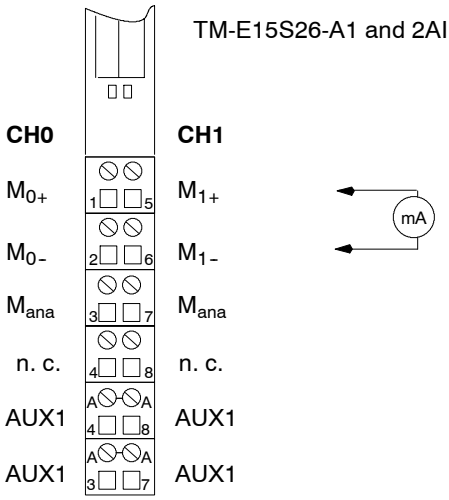
View	Terminal assignment	Remarks
		Channel 0: Terminals 1 to A4 Channel 1: Terminals 5 to A8 M+: Input signal "+" M–: Input signal "–" M_{ana}: Ground (from power module) The 2-wire transducers are powered over the measurement leads.
		Channel 0: Terminals 1 to 4 Channel 1: Terminals 5 to 8 M+: Input signal "+" M–: Input signal "–" M_{ana}: Ground (from power module) The 2-wire transducers are powered over the measurement leads. Terminals 4 and 8 can be used for connection of cables that are not required up to 30 VDC.

Table 12-39 Terminal assignment of the 2AI I 2WIRE Standard, continued

View	Terminal assignment	Remarks
		Channel 0: Terminals 1 to 3 Channel 1: Terminals 5 to 7 M+: Input signal "+" M-: Input signal "-" M_{ana}: Ground (from power module) The 2-wire transducers are powered over the measurement leads.
		Channel 0: Terminals 1 to A3 Channel 1: Terminals 5 to A7 M+: Input signal "+" M-: Input signal "-" M_{ana}: Ground (from power module) The 2-wire transducers are powered over the measurement leads. Terminals 4 and 8 can be used for connection of cables that are not required up to 30 VDC.

Block diagram

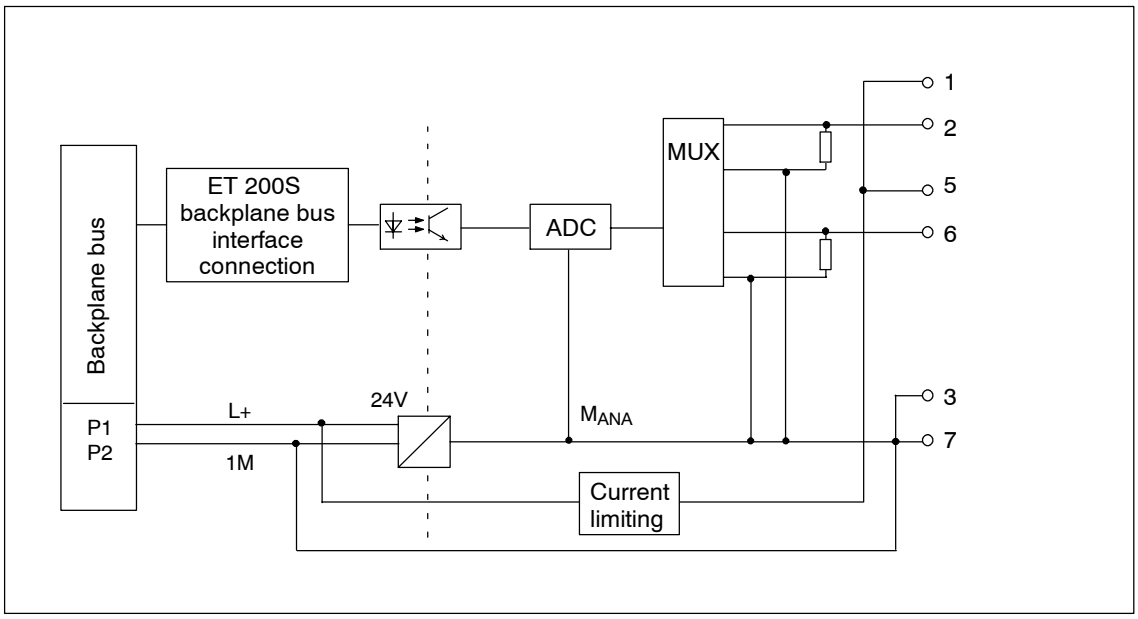


Figure 12-10 Block diagram of the 2AI I 2WIRE Standard

Technical data

Dimensions and weight	
Dimensions W x H x D (mm)	15 x 81 x 52
Weight	Approx. 40 g
Module-specific data	
Supports clock synchronized mode	No
Number of inputs	2
Cable length	
• shielded	max. 200 m (164 ft)
Voltages, currents, electrical potentials	
Rated load voltage L+ (from power module)	24 VDC
• Polarity reversal protection	Yes
Transducer power supply	Yes
• Short-circuit protection	Yes (destruction limit 35 mA per channel)

Electrical isolation	
• Between channels and backplane bus	Yes
• Between channels and load voltage L+	No
• Between the channels	No
Isolation tested	500 VDC
Current consumption	
• with load voltage L+	max. 80 mA
Power loss of the module	Typical 0.6 W
Status, interrupts, diagnostics	
Diagnostic functions	
• Group error	red LED ”SF”
• Reading of diagnostics functions	Yes

Analog Value Formation		
Measurement principle	integrating	
Integration and cycle time / resolution per channel:		
• Integration time selectable	Yes	
• Interference frequency suppression in Hz	60	50
• Integration time in ms	16,7	20
• Conversion time in ms	55	65
• Cycle time in ms	Number of active channels per module × conversion time	
• Resolution (incl. overshoot range)	4 to 20 mA/13 bits	

Interference Suppression, Error Limits	
Interference voltage suppression for f= n x (f1 ± 1%), (f1 = interference frequency)	
• Common mode interference (peak value of interference < rated value of the input range)	min. 70 dB
Crosstalk between inputs	min. –50 dB
Operational error limits (across complete temperature range, in relation to input range)	± 0.6 %
Basic error limit (operational error limit at 25 °C, related to the input range)	± 0.4 %
Temperature error (in relation to input range)	± 0.005 %/K
Linearity error (relative to the input range)	± 0.01 %
Repetition accuracy (in transient state at 25 °C, relative to input range)	± 0.05 %

Data for selection of the sensor	
Input range (rated value)/input resistance	
• Current	4 to 20 mA/50 Ω
Permitted continuous input current (destruction limit)	40 mA
Load of the 2-wire transducer	max. 750Ω
Smoothing of measured values	Yes, configurable in 4 stages by digital filtering
Level	Time constant
No	1 x cycle time
weak	4 x cycle time
medium	32 x cycle time
strong	64 x cycle time

12.9 4AI I 2WIRE Standard analog electronic module (6ES7 134-4GD00-0AB0)

Order number

6ES7 134-4GD00-0AB0

Properties

- 4 inputs for current measuring
- Input range:

  4 to 20 mA, resolution 13 bits

Terminal assignment

The following table shows the terminal assignment of the 4AI I 2WIRE Standard for the various terminal modules:

Table 12-40 Terminal assignment of the 4AI I 2WIRE Standard

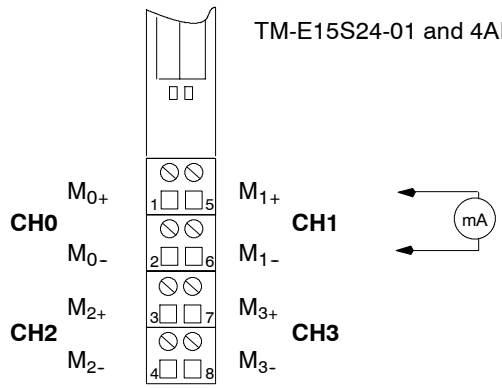
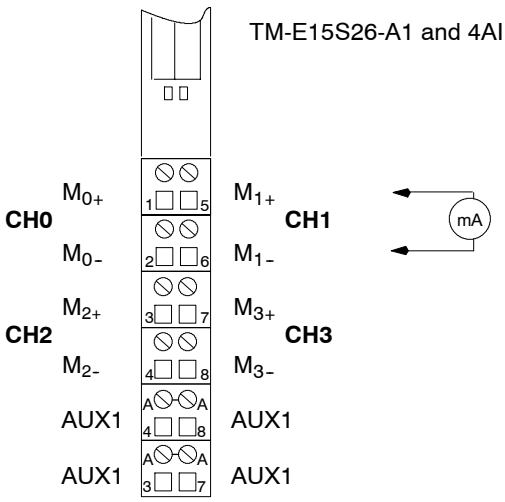
View	Terminal assignment	Remarks
		Channel 0: Terminals 1 and 2 Channel 1: Terminals 5 and 6 Channel 2: Terminals 3 and 4 Channel 3: Terminals 7 and 8 M+: Input signal "+" M–: Input signal "–" The 2-wire transducers are powered over the measurement leads.

Table 12-40 Terminal assignment of the 4AI I 2WIRE Standard, continued

View	Terminal assignment	Remarks
		Channel 0: Terminals 1 and 2 Channel 1: Terminals 5 and 6 Channel 2: Terminals 3 and 4 Channel 3: Terminals 7 and 8 M+: Input signal "+" M–: Input signal "–" The 2-wire transducers are powered over the measurement leads.

Block diagram

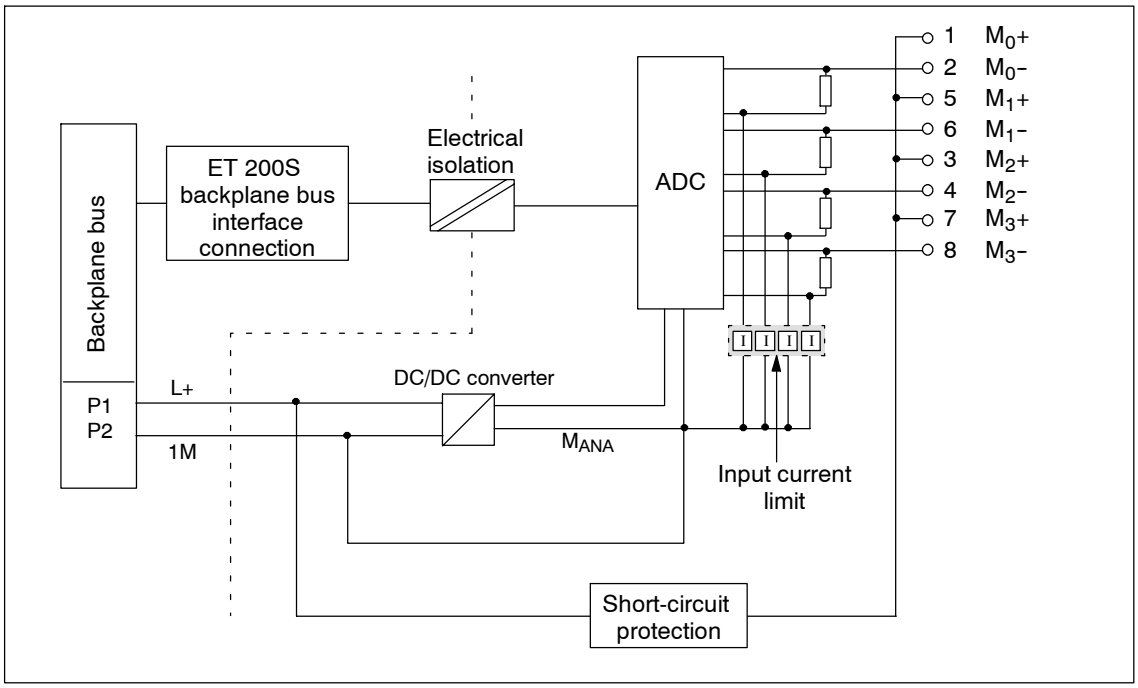


Figure 12-11 Block diagram of the 4AI I 2WIRE Standard

Technical data

Dimensions and weight	
Dimensions W x H x D (mm)	15 x 81 x 52
Weight	Approx. 40 g
Module-specific data	
Supports clock synchronized mode	No
Number of inputs	4
Cable length	
• shielded	max. 200 m (164 ft)
Voltages, currents, electrical potentials	
Rated load voltage L+ (from power module)	24 VDC
• Polarity reversal protection	Yes
Transducer power supply	Yes
• Short-circuit protection	Yes (approx. 200 mA for module)

Electrical isolation	
• Between channels and backplane bus	Yes
• Between channels and load voltage L+	No
• Between the channels	No
Isolation tested	500 VDC
Power consumption of module	
• From load voltage L+ (with sensor power supply)	max. 125 mA
Power loss of the module	Typical 0.6 W
Status, interrupts, diagnostics	
Diagnostic functions	
• Group error	red LED ”SF”
• Reading of diagnostics functions	Yes

Analog Value Formation		
Measurement principle	integrating	
Integration and cycle time / resolution per channel:		
• Integration time selectable	Yes	
• Interference frequency suppression in Hz	60	50
• Integration time in ms	16,7	20
• Cycle time per module in ms	33	40
• Resolution (incl. overshoot range)	4 to 20 mA/13 bits	
Interference Suppression, Error Limits		
Interference voltage suppression for f= n x (f1 ± 1%), (f1 = interference frequency)		
• Common mode interference (peak value of interference < rated value of the input range)	min. 70 dB	
Crosstalk between inputs	min. –50 dB	
Operational error limits (across complete temperature range, in relation to input range)	± 0.4 %	
Basic error limit (operational error limit at 25 °C, related to the input range)	± 0.3 %	
Temperature error (in relation to input range)	± 0.003 %/K	
Linearity error (relative to the input range)	± 0.01 %	
Repetition accuracy (in transient state at 25 °C, relative to input range)	± 0.05 %	
Data for selection of the sensor		
Input range (rated value)/input resistance		
• Current	4 to 20 mA/25 Ω	
Permitted continuous input current (destruction limit)	approx. 30 mA (electronically limited)	
Load of the 2-wire transducer	max.750 Ω	
Smoothing of measured values	yes, configurable in 4 levels	
	Level	Time constant
	No	1 x cycle time
	weak	4 x cycle time
	medium	16 x cycle time
	strong	32 x cycle time

12.10 2AI I 2WIRE High Speed analog electronic module (6ES7 134-4GB51-0AB0)

Order number

6ES7 134-4GB51-0AB0

Properties

- 2 inputs for current measuring
- Current-limited sensor power supply (90 mA)
- Input ranges:

  4 to 20 mA, resolution 13 bits

  0 to 20 mA, resolution 13 bits
- Supports clock synchronized mode
  - Minimum possible time for the clock-synchronized DP cycle (T_{DPmin}): 2.5 ms
  - Minimum possible conversion time of the input module (T_{WEmin}): 1.1 ms

Terminal assignment

The following table shows the terminal assignment of the 2AI I 2WIRE High Speed for the various terminal modules:

Table 12-41 Terminal assignment of the 2AI I 2WIRE High Speed

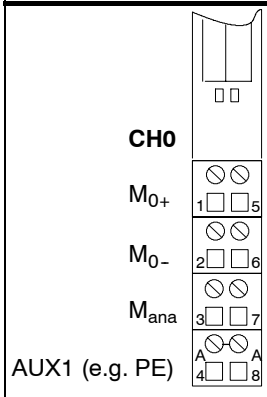
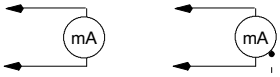
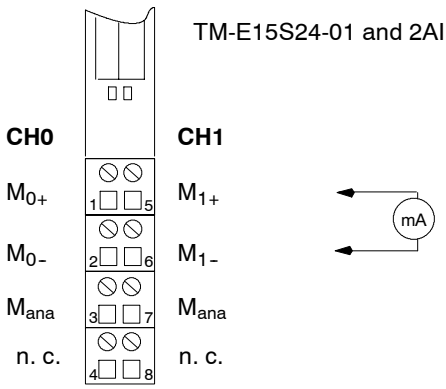
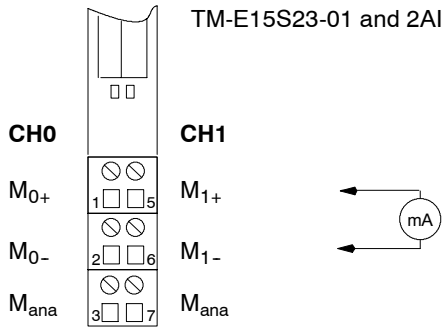
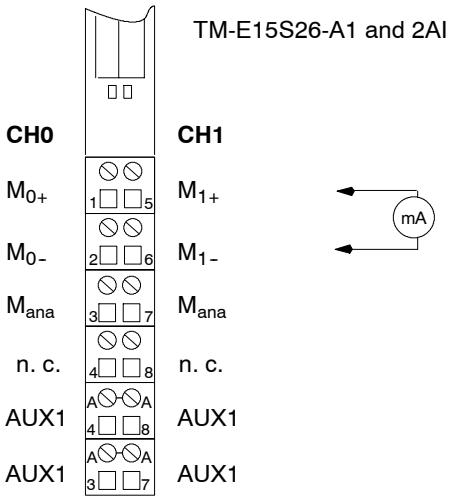
View	Terminal assignment	Remarks
	TM-E15S24-A1 and 2AI I 2WIRE High Speed  AUX1 must be assigned to PE.	Channel 0: Terminals 1 to A4 Channel 1: Terminals 5 to A8 M+: Input signal "+" M–: Input signal "–" M_{ana}: Ground (from power module) The 2-wire transducers are powered over the measurement leads.

Table 12-41 Terminal assignment of the 2AI I 2WIRE High Speed, continued

View	Terminal assignment	Remarks
		Channel 0: Terminals 1 to 4 Channel 1: Terminals 5 to 8 M+: Input signal "+" M-: Input signal "-" M_{ana}: Ground (from power module) The 2-wire transducers are powered over the measurement leads. Terminals 4 and 8 can be used for connection of cables that are not required up to 30 VDC.
		Channel 0: Terminals 1 to 3 Channel 1: Terminals 5 to 7 M+: Input signal "+" M-: Input signal "-" M_{ana}: Ground (from power module) The 2-wire transducers are powered over the measurement leads.
		Channel 0: Terminals 1 to A3 Channel 1: Terminals 5 to A7 M+: Input signal "+" M-: Input signal "-" M_{ana}: Ground (from power module) The 2-wire transducers are powered over the measurement leads. Terminals 4 and 8 can be used for connection of cables that are not required up to 30 VDC.

Block diagram

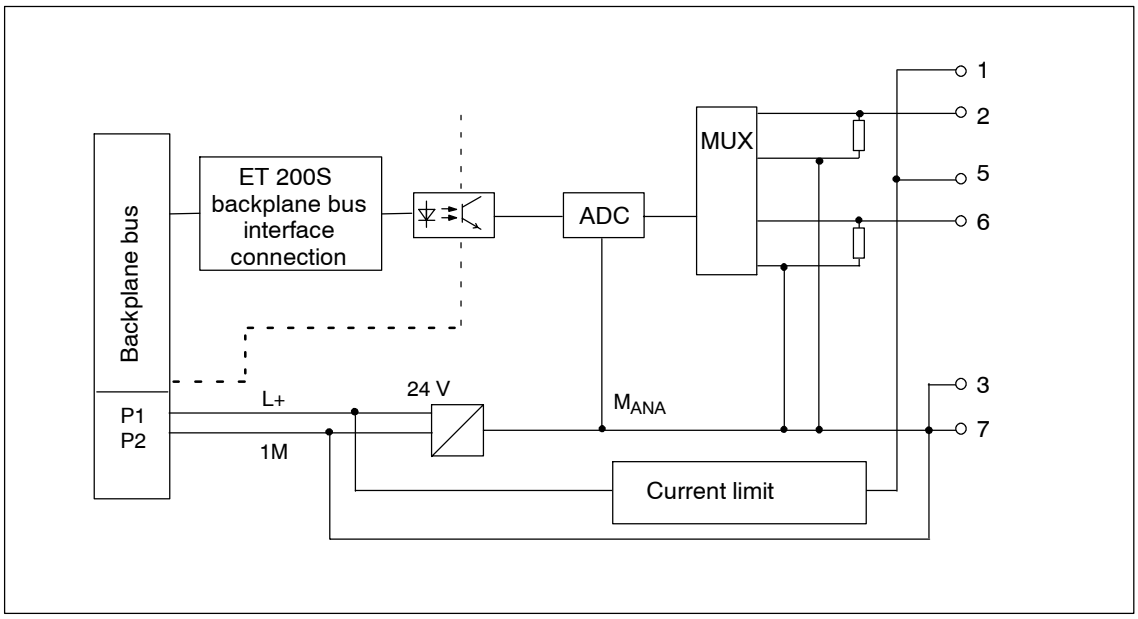


Figure 12-12 Block diagram of the 2AI I 2WIRE High Speed

Technical data

Dimensions and weight	
Dimensions W x H x D (mm)	15 x 81 x 52
Weight	Approx. 40 g
Module-specific data	
Supports clock synchronized mode	Yes
Number of inputs	2
Cable length	
• shielded	max. 200 m (164 ft)
Voltages, currents, electrical potentials	
Rated load voltage L+ (from power module)	24 VDC
• Polarity reversal protection	Yes
• Short-circuit protection	Yes (destruction limit 35 mA per channel)
Electrical isolation	
• Between channels and backplane bus	Yes
• Between channels and load voltage L+	No
• Between channels	No
Approved potential difference	
• between M_{ANA} and $M_{internal}$ (U_{ISO})	75 VDC, 60 VAC
Insolation tested with	500 V DC
Current consumption	
• Power supply and load voltage L+ (without load)	max. 35 mA[1)]
Power loss of the module	Typical 0.8 W
Status, interrupts, diagnostics	
Interrupts	
• Process alarm	Configurable[2)]
Diagnostic functions	
• Group error display	red LED "SF"
• Reading of diagnostics functions	possible[3)]

Analog Value Formation	
Measurement principle	Momentary value encryption
Cycle time/resolution:	
• Conversion time in ms (per channel)	0.1
• Cycle time in ms (per module)	1
• Resolution (incl. overshoot range)	4 to 20 mA/13 bits 0 to 20 mA/13 bits
Interference Suppression, Error Limits	
Crosstalk between inputs	> 50 dB
Operational error limits (across complete temperature range, in relation to input range)	±0.3 %
Basic error limit (operational error limit at 25 °C, related to the input range)	±0.2 %
Temperature error (in relation to input range)	±0.01 %/K
Linearity error (relative to the input range)	±0.01 %
Repetition accuracy (in transient state at 25 °C, relative to input range)	±0.05 %
Sensor Power Supply Outputs	
Number of outputs	2
Output voltage	
• Loaded	L+ (-2.5 V)
Output current	
• Rated value	90 mA (both channels)
• Permitted range	0 mA to 90 mA
Short-circuit protection	Yes, electronic

Data for selection of the sensor	
Input range (rated value/input resistance)	
• Current	4 to 20 mA/50 Ω
	0 to 20 mA/50 Ω
Connection of signal generators	
• for current measuring as 2-wire measuring transducer	possible
Load of the 2-wire transducer	max. 670Ω
Permitted current at current input (destruction limit)	60 mA

Smoothing of measured values	Yes, configurable in 4 stages by digital filtering
Level	Time constant
No	1 x cycle time
weak	64 x cycle time
medium	128 x cycle time
strong	512 x cycle time

1) without sensor power supply

2) DPV1 only

3) configuration error
violation of lower limit value
violation of upper limit value
open circuit (at 4 to 20mA only)
process interrupt lost

12.11 2AI I 2WIRE Standard analog electronic module (6ES7 134-4GB10-0AB0)

Order number

6ES7 134-4GB10-0AB0

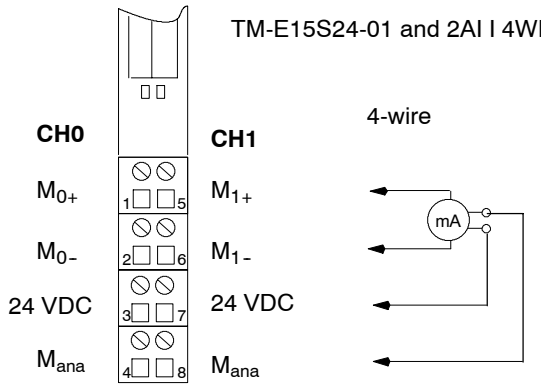
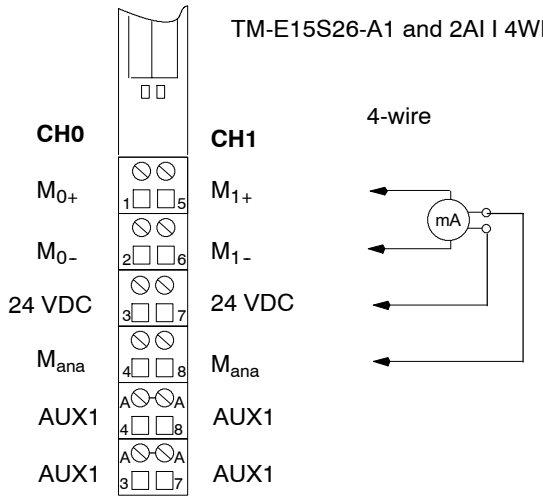
Properties

- 2 inputs for current measuring
- Input ranges:
  - ± 20 mA, resolution 13 bits + sign
  - 4 to 20 mA, resolution 13 bits
- Allowable common-mode voltage 2 VAC_{SS}

Terminal assignment

The following table shows the terminal assignment of the 2AI I 4WIRE Standard for the various terminal modules:

Table 12-42 Terminal assignment of the 2AI I 4WIRE Standard

View	Terminal assignment	Remarks
		Channel 0: Terminals 1 to 4 Channel 1: Terminals 5 to 8 M+: Input signal "+" M–: Input signal "–" DC 24V: Power supply for 4-wire measuring transducer M_{ana}: Ground (from power module) The 4-wire transducers are powered from the module.
		Channel 0: Terminals 1 to A3 Channel 1: Terminals 5 to A7 M+: Input signal "+" M–: Input signal "–" DC 24V: Power supply for 4-wire measuring transducer M_{ana}: Ground (from power module) The 4-wire transducers are powered from the module.

Block diagram

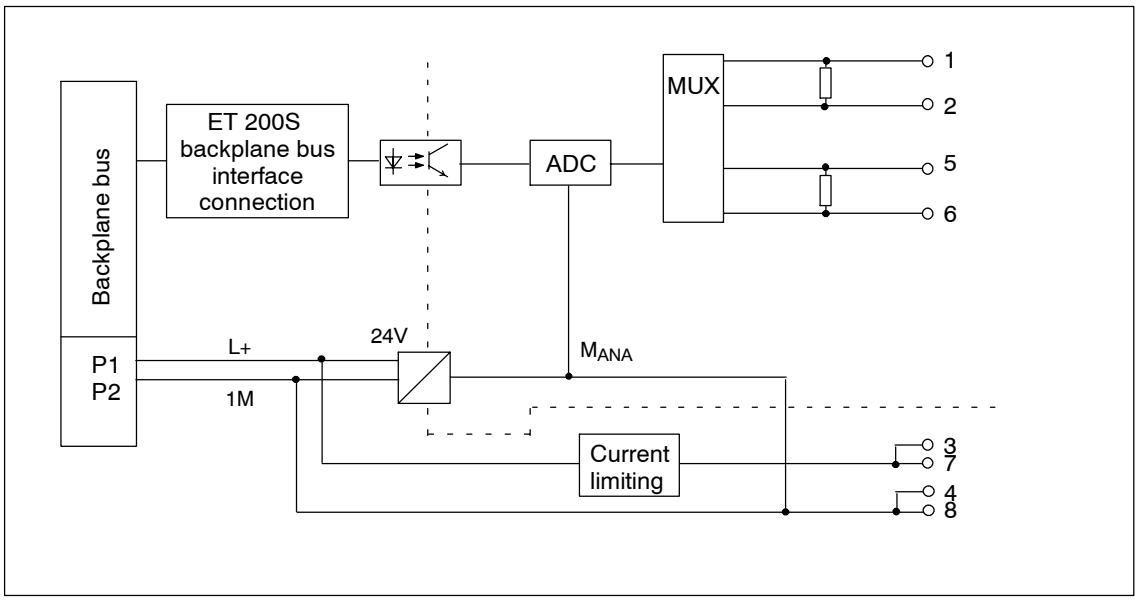


Figure 12-13 Block diagram of the 2AI I 4WIRE Standard

Technical data

Dimensions and weight	
Dimensions W × H × D (mm)	15 x 81 x 52
Weight	Approx. 40 g
Module-specific data	
Supports clock synchronized mode	No
Number of inputs	2
Cable length	
• shielded	max. 200 m (164 ft)
Voltages, currents, electrical potentials	
Rated load voltage L+ (from power module)	24 VDC
• Polarity reversal protection	Yes
Transducer power supply	Yes
• Short-circuit protection	Yes, 60 mA (for both channels)

Electrical isolation	
• Between channels and backplane bus	Yes
• Between channels and load voltage L+	No
• Between the channels	No
Isolation tested	500 VDC
Current consumption	
• with load voltage L+	max. 30 mA
Power loss of the module	Typical 0.6 W
Status, interrupts, diagnostics	
Diagnostic functions	
• Group error	red LED ”SF”
• Reading of diagnostics functions	Yes

Analog Value Formation		
Measurement principle	integrating	
Integration and cycle time / resolution per channel:		
• Integration time selectable	Yes	
• Interference frequency suppression in Hz	60	50
• Integration time in ms	16,7	20
• Conversion time in ms	55	65
• Cycle time in ms	Number of active channels per module × conversion time	
• Resolution (incl. overshoot range)	± 20 mA/13 Bit + VZ 4 to 20 mA/13 bits	

Interference Suppression, Error Limits	
Interference voltage suppression for f= n x (f1 ± 1%), (f1 = interference frequency)	
• Common mode interference (peak value of interference < rated value of the input range)	min. 70 dB
Crosstalk between inputs	min. – 50 dB

Operational error limits (across the temperature range, in relation to input range)	± 0.6 %
Basic error limit (operational error limit at 25 °C, related to the input range)	± 0.4 %
Temperature error (in relation to input range)	± 0.005 %/K
Linearity error (relative to the input range)	± 0.01 %
Repetition accuracy (in transient state at 25 °C, relative to input range)	± 0.05 %

Data for selection of the sensor	
Input range (rated value)/input resistance	
• Current	± 20 mA/50 Ω 4 to 20 mA/50 Ω
Permitted continuous input current (destruction limit)	40 mA
Smoothing of measured values	Yes, configurable in 4 stages by digital filtering
Level	Time constant
No	1 x cycle time
weak	4 x cycle time
medium	32 x cycle time
strong	64 x cycle time

12.12 2AI I 2/4WIRE High Feature analog electronic module (6ES7 134-4MB00-0AB0)

Order number

6ES7 134-4MB00-0AB0

Properties

- 2 Input for current measuring
- Input ranges:
  - ± 20 mA, resolution 15 Bit + sign
  - 4 to 20 mA, resolution 15 Bit
- Isolated for load voltage L+
- Allowable common-mode voltage between the channels 100 VAC
- Supports 2-wire or 4-wire transducer

Terminal assignment

The following table shows the terminal assignment of the 2AI I 2/4WIRE High Feature

Table 12-43 Terminal assignment of the 2AI I 2/4WIRE High Feature

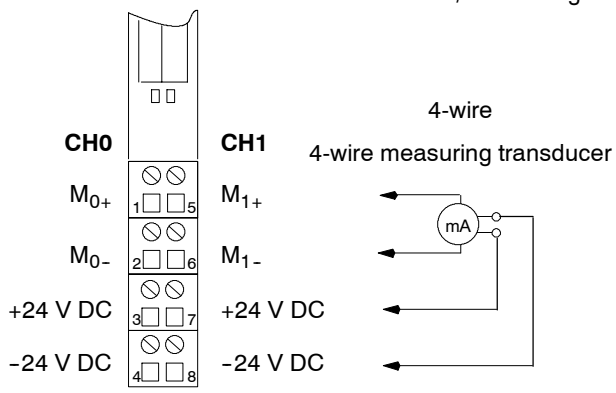
View	Terminal assignment	Remarks
TM-E15S24-01 and 2AI I 2/4WIRE High Feature  		Channel 0: Terminals 1 to 4 Channel 1: Terminals 5 to 8 M+ : input signal "+" M-: Input signal "-" + 24 VDC: Power supply for 4-wire measuring transducer - 24 VDC: Return circuit for transducer power supply 4-wire transducers can be powered through the module. An external power supply for one of the transducers must be used to ensure isolation between the channels.

Table 12-43 Terminal assignment of the 2AI I 2/4WIRE High Feature, continued

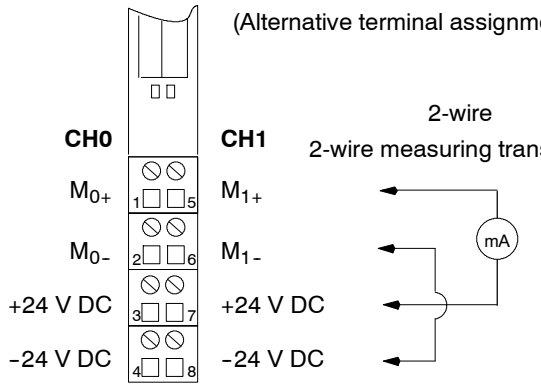
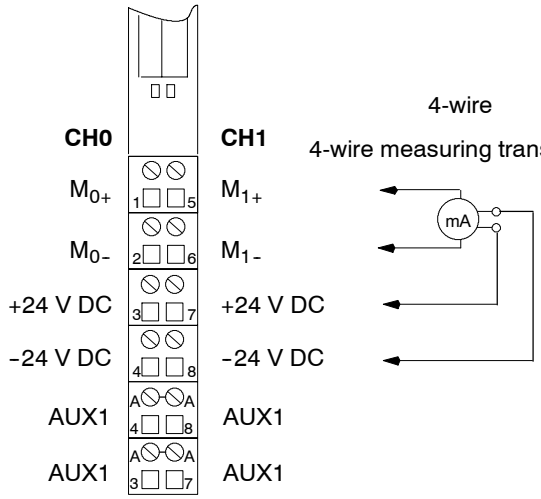
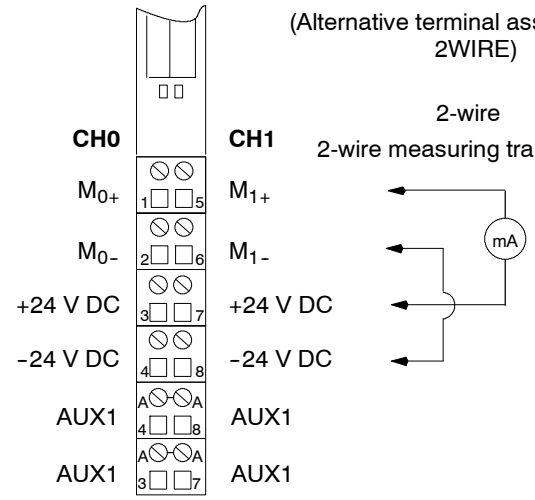
View	Terminal assignment	Remarks
TM-E15S24-01 and 2AI I 2/4WIRE High Feature (Alternative terminal assignment for 2WIRE)  		Channel 0: Terminals 1 to 4 Channel 1: Terminals 5 to 8 M+ : input signal ”–” M– : connect to – 24 VDC + 24 VDC: Input signal ”+” The 2-wire transducers are powered over the measurement leads. A mixture of 2-wire and 4-wire transducers is allowable. An external power supply for one of the transducers must be used to ensure isolation between the channels.
TM-E15S26-01 and 2AI I 2/4WIRE High Feature  		Channel 0: Terminals 1 to A3 Channel 1: Terminals 5 to A7 M+ : input signal ”+” M–: Input signal ”–” + 24 VDC: Power supply for 4-wire measuring transducer – 24 VDC: Return circuit for transducer power supply 4-wire transducers can be powered through the module. An external power supply for one of the transducers must be used to ensure isolation between the channels.

Table 12-43 Terminal assignment of the 2AI I 2/4WIRE High Feature, continued

View	Terminal assignment	Remarks
TM-E15S26-01 and 2AI I 2/4WIRE High Feature (Alternative terminal assignment for 2WIRE)  2-wire 2-wire measuring transducer		Channel 0: Terminals 1 to A3 Channel 1: Terminals 5 to A7 M+ : input signal "-" M- : connect to - 24 VDC + 24 VDC: Input signal "+" The 2-wire transducers are powered over the measurement leads. A mixture of 2-wire and 4-wire transducers is allowable. An external power supply for one of the transducers must be used to ensure isolation between the channels.

Block diagram

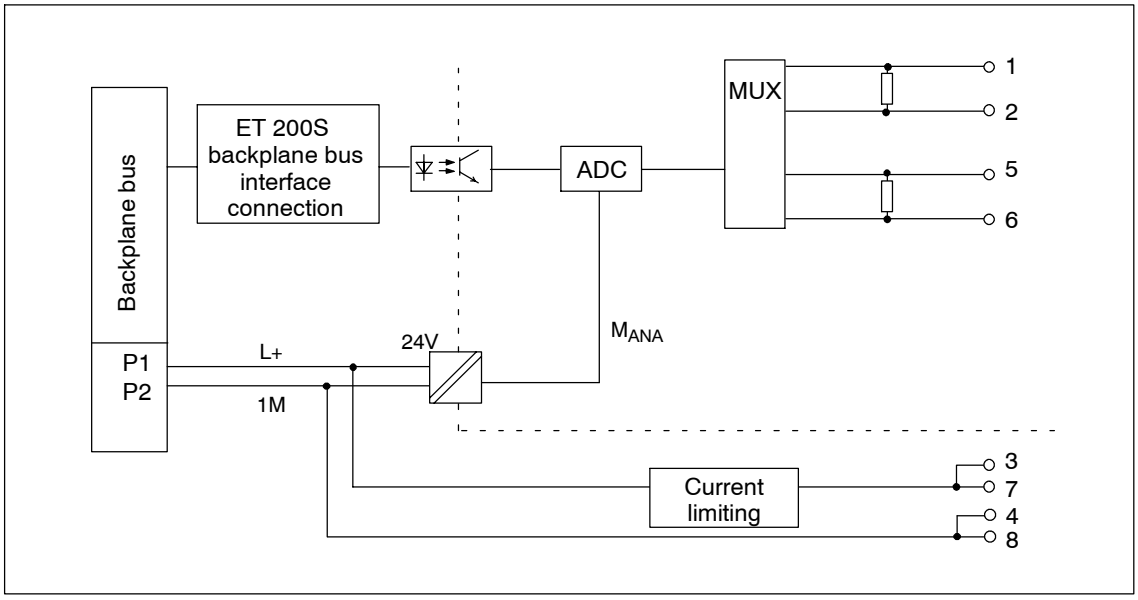


Figure 12-14 Block diagram of the 2AI I 2/4WIRE High Feature

Technical data

Dimensions and weight	
Dimensions W x H x D (mm)	15 x 81 x 52
Weight	Approx. 40 g
Module-specific data	
Supports clock synchronized mode	No
Number of inputs	2
Cable length	
• shielded	max. 200 m (164 ft)
Voltages, currents, electrical potentials	
Rated load voltage L+ (from power module)	24 VDC
• Polarity reversal protection	Yes
Transducer power supply	Yes
• Short-circuit protection	Yes, 60 mA (for both channels)
Electrical isolation	
• Between the channels and backplane bus	Yes
• Between channels and load voltage L+	Yes
• Between the channels and PE	Yes
• Between the channels	No
Permitted potential difference	
• Between the channels	140 VDC/100 VAC (with isolated power supply for the transducers)
Isolation tested	500 VDC
Current consumption	
• with load voltage L+	max. 53 mA
Power loss of the module	Typical 0.85 W

Status, interrupts, diagnostics			
Diagnostic functions			
• Group error	red LED "SF"		
• Reading of diagnostics functions	Yes		
Analog Value Formation			
Measurement principle	Integrating		
Integration and cycle time / resolution per channel:			
• Integration time selectable	Yes		
• Interference frequency suppression in Hz	60	50	no
• Integration time in ms	16,67	20	7,5
• Conversion time in ms			
– 1 channel per module active	25	30	10
– 2 channels per module active	58,3	70	26
• Cycle time in ms			
– 1 channel per module active	75	90	30
– 2 channels per module active	175	210	78
• Resolution (incl. overshoot range)	±20 mA/15 Bit + VZ 4 to 20 mA/15 bits		
Interference Suppression, Error Limits			
Interference voltage suppression for f = n x (f1 ± 0.5%), (f1 = interference frequency)			
• Common mode interference (U_{SS})	min. 100 dB		
• Common mode interference (peak value of interference < rated value of the input range)	min. 90 dB		
Crosstalk between inputs	min. –100 dB		
Operational error limits[1)] (across complete temperature range, in relation to input range)	±0.1 %		

Basic error limit[1] (operational error limit at 25 °C, related to the input range)	±0.05 %
Temperature error (in relation to input range)	±0.003 %/K
Linearity error (relative to the input range)	±0.03 %
Repetition accuracy (in transient state at 25 °C, relative to input range)	±0.01 %
Data for selection of the sensor	
Input range (rated value)/input resistance	
• Current	±20 mA/50 Ω 4 to 20 mA/50 Ω
Permitted continuous input current (destruction limit)	40 mA (on one single channel)

Load of the 2-wire transducer	max. 750Ω
Smoothing of measured values	Yes, configurable in 4 stages by digital filtering
Level	Time constant
No	1 x cycle time
weak	4 x cycle time
medium	32 x cycle time
strong	64 x cycle time

1) When configuring modules the runtime calibration can be enabled for periodic compensation of error voltage changes of the A/D converter. The update of new data is delayed by 200 ms during the calibration interval. The precision limits of the module are reached without runtime calibration.

12.13 2AI I 4WIRE High Speed analog electronic module (6ES7 134-4GB61-0AB0)

Order number

6ES7 134-4GB61-0AB0

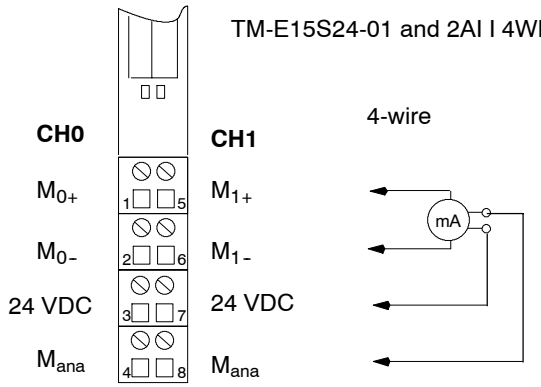
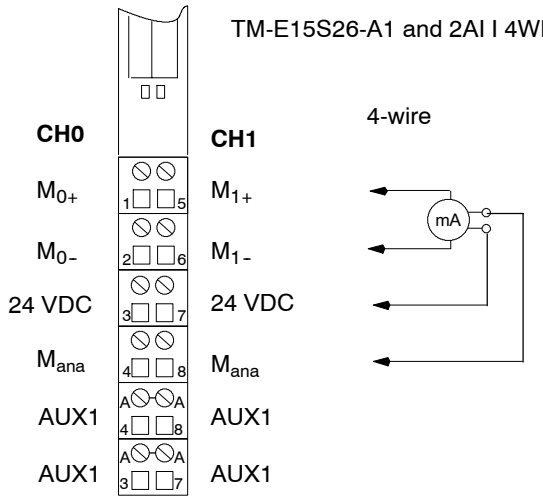
Properties

- 2 inputs for current measuring
- Current-limited sensor power supply (90 mA)
- Input ranges:
  - 4 to 20 mA, resolution 13 bits
  - 0 to 20 mA, resolution 13 bits
  - ±20 mA, resolution 13 bits + sign
- Supports clock synchronized mode
  - Minimum possible time for the clock-synchronized DP cycle (T_{DPmin}): 2.5 ms
  - Minimum possible conversion time of the input module (T_{WEmin}): 1.1 ms

Terminal assignment

The following table shows the terminal assignment of the 2AI I 4WIRE High Speed for the various terminal modules:

Table 12-44 Terminal assignment of the 2AI I 4WIRE High Speed

View	Terminal assignment	Remarks
		Channel 0: Terminals 1 to 4 Channel 1: Terminals 5 to 8 M+: Input signal "+" M–: Input signal "–" DC 24V: Power supply for 4-wire measuring transducer M_{ana}: Ground (from power module) The 4-wire transducers are powered from the module.
		Channel 0: Terminals 1 to A3 Channel 1: Terminals 5 to A7 M+: Input signal "+" M–: Input signal "–" DC 24V: Power supply for 4-wire measuring transducer M_{ana}: Ground (from power module) The 4-wire transducers are powered from the module.

Block diagram

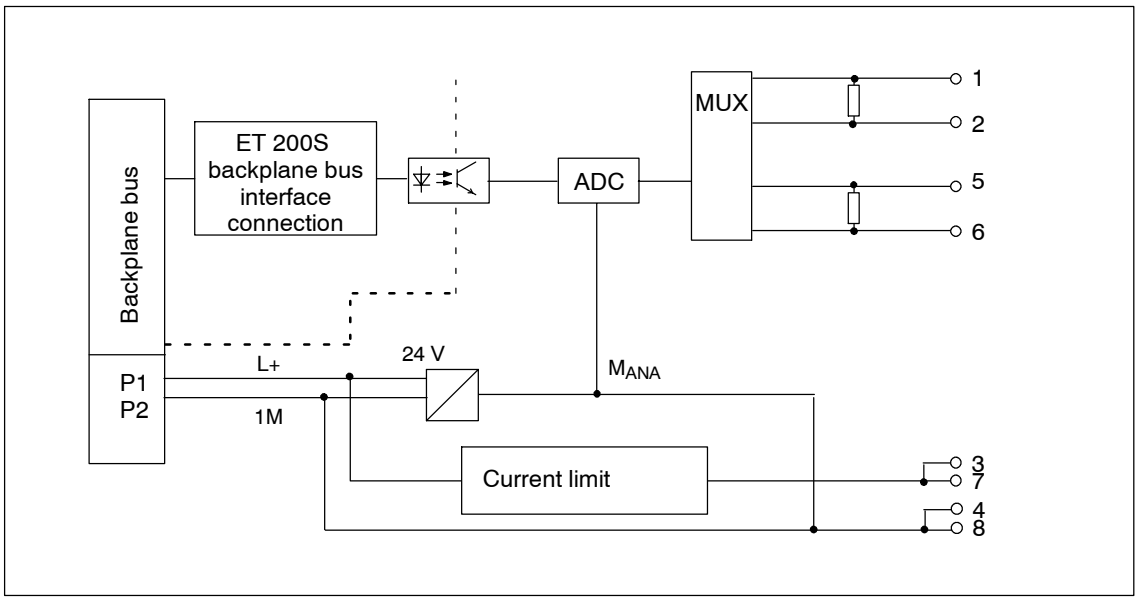


Figure 12-15 Block diagram of the 2AI I 4WIRE High Speed

Technical data

Dimensions and weight	
Dimensions W x H x D (mm)	15 x 81 x 52
Weight	Approx. 40 g
Module-specific data	
Supports clock synchronized mode	Yes
Number of inputs	2
Cable length	
• shielded	max. 200 m (164 ft)
Voltages, currents, electrical potentials	
Rated load voltage L+ (from power module)	24 VDC
• Polarity reversal protection	Yes
Electrical isolation	
• Between channels and backplane bus	Yes
• Between channels and load voltage L+	No
• Between channels	No

Permitted potential difference	
• between M_{ANA} and $M_{internal}$ (U_{ISO})	75 VDC, 60 VAC
Isolation tested with	500 V DC
Current consumption	
• Power supply and load voltage L+ (without load)	max. 35 mA[1)]
Power loss of the module	Typical 0.8 W
Status, interrupts, diagnostics	
Interrupts	
• Process alarm	Configurable[2)]
Diagnostic functions	
• Group error display	red LED "SF"
• Reading of diagnostic data	possible[3)]

Analog Value Formation	
Measurement principle	Momentary value encryption
Cycle time/resolution:	
• Conversion time in ms (per channel)	0.1
• Cycle time in ms (per module)	1
• Resolution (incl. overshoot range)	4 to 20 mA/13 bits 0 to 20 mA/13 bits ±20 mA/13 bits + sign

Interference Suppression, Error Limits	
Crosstalk between inputs	> 50 dB
Operational error limits (across complete temperature range, in relation to input range)	±0.3 %
Basic error limit (operational error limit at 25 °C, related to the input range)	±0.2 %
Temperature error (in relation to input range)	±0.01 %/K
Linearity error (relative to the input range)	±0.01 %
Repetition accuracy (in transient state at 25 °C, relative to input range)	±0.05 %

Sensor Power Supply Outputs	
Number of outputs	2
Output voltage	
• Loaded	L+ (-2.5 V)
Output current	
• Rated value	90 mA (both channels)
• Permitted range	0 mA to 90 mA
Short-circuit protection	Yes, electronic

Data for selection of the sensor	
Input range (rated value)/input resistance	
• Current	4 to 20 mA/50 Ω 0 to 20 mA/50 Ω ±20 mA/50 Ω
Connection of signal generators	
• for current measuring as 2-wire measuring transducer	possible
Load of the 2-wire transducer	max. 670Ω
Permitted current at current input (destruction limit)	60 mA
Smoothing of measured values	Yes, configurable in 4 stages by digital filtering
Level	Time constant
No	1 x cycle time
weak	64 x cycle time
medium	128 x cycle time
strong	512 x cycle time

1) without sensor power supply

2) DPV1 only

3) configuration error
violation of lower limit value
violation of upper limit value
open circuit (at 4 to 20mA only)
process interrupt lost

12.14 2AI RTD Standard analog electronic module (6ES7 134-4JB50-0AB0)

Order number

6ES7 134-4FB50-0AB0

Properties

- 2 inputs for resistance thermometer or resistance measurement
- Input ranges:
  - Resistance thermometer: Pt100; Ni100; resolution 15 bits + sign
  - Resistance measurement: 150 Ω; 300 Ω ; 600 Ω, resolution max. 15 bits + sign
- Isolated for load voltage L+
- Linearization of the sensor characteristic curves

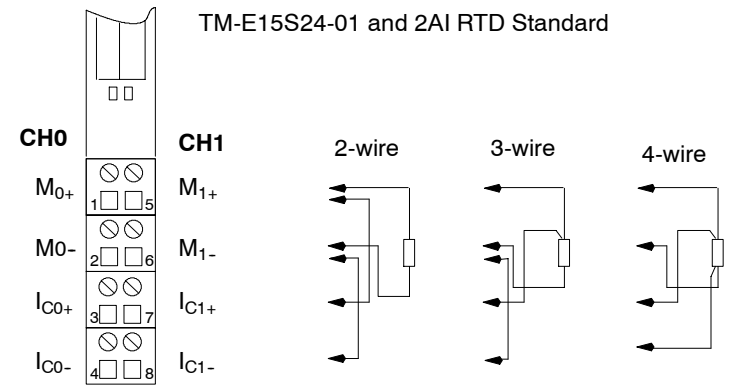
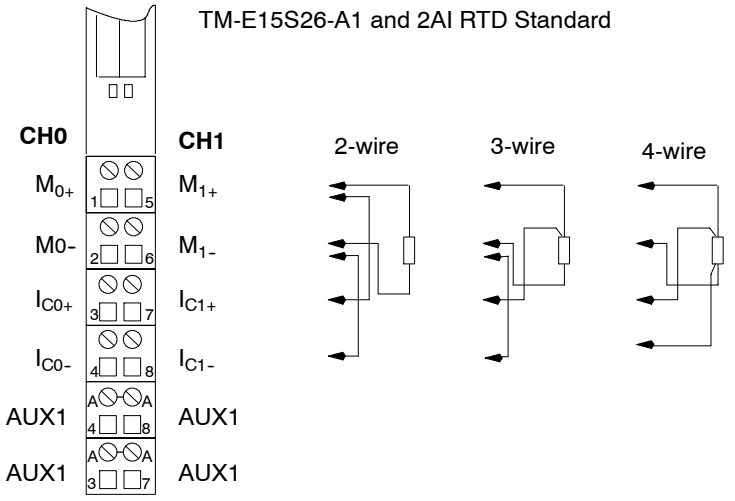
Terminal assignment

The resistance thermometer/resistances are measured in 4-wire connection. A constant current is fed to the resistance thermometers/resistances through the terminals I_C + and I_C –. The voltage at the resistance thermometer/resistance is measured through terminals M + and M –. This provides a high degree of precision in the measurement results with the 4-wire terminal.

With the 2-3-wire terminal appropriate bridges are required on the module between M+ and I_c+ or M– and I_c–. However, this involves a loss of precision in the measurement results.

The following table shows the terminal assignment of the 2AI RTD Standard at the terminal module.

Table 12-45 Terminal assignment of the 2AI RTD Standard

View	Terminal assignment	Remarks
		Channel 0: Terminals 1 to 4 Channel 1: Terminals 5 to 8 M+: Measuring cable positive I_{C-}: Constant current cable negative M–: Measuring cable negative I_{C+} Constant current cable positive
		Channel 0: Terminals 1 to A3 Channel 1: Terminals 5 to A7 M+: Measuring cable positive I_{C-}: Constant current cable negative M–: Measuring cable negative I_{C+} Constant current cable positive

Note

A wire break in the measuring wires of the temperature sensor is not detected with a 3 or 4-wire terminal (terminals 1 and 2 or 5 and 6). Undefined words may be returned.

Block diagram

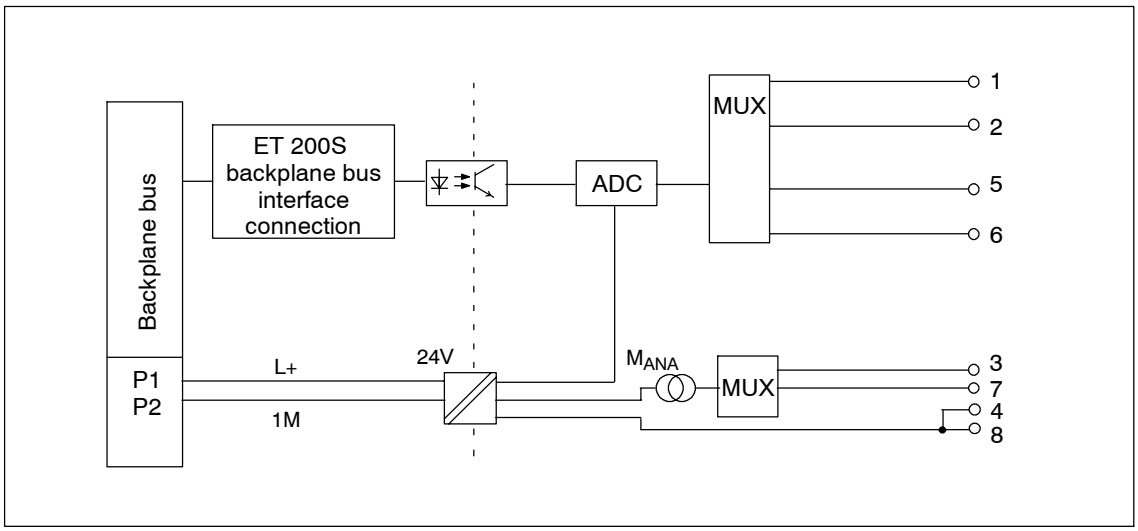


Figure 12-16 Block diagram of the 2AI RTD Standard

Technical data

Dimensions and weight	
Dimensions W x H x D (mm)	15 x 81 x 52
Weight	Approx. 40 g
Module-specific data	
Supports clock synchronized mode	No
Number of inputs	2
Cable length	
• shielded	max. 200 m (164 ft)
Voltages, currents, electrical potentials	
Rated load voltage L+ (from power module)	24 VDC
• Polarity reversal protection	Yes
Transducer power supply	Yes
• Constant power supply for resistive sensors	Approx. 1.5 mA
• Short-circuit protection	Yes

Electrical isolation	
• Between channels and backplane bus	Yes
• Between channels and load voltage L+	Yes
• Between the channels	No
Permitted potential difference	
• Between M_{ANA} and the central ground point (U_{ISO})	75 VDC / 60 VAC
Isolation tested	500 VDC
Current consumption	
• with load voltage L+	max. 30 mA
Power loss of the module	Typical 0.6 W
Status, interrupts, diagnostics	
Diagnostic functions	
• Group error	red LED ”SF”
• Reading of diagnostics functions	Yes

Analog Value Formation		
Measurement principle	integrating	
Integration and cycle time / resolution per channel:		
• Integration time selectable	Yes	
• Interference frequency suppression in Hz	60	50
• Integration time in ms	16.7	20
• Conversion time in ms	110	130
• Cycle time in ms	Number of active channels per module x conversion time	
• Resolution (incl. overshoot range)	Pt100, Ni100/ 15 Bit + VZ 150 Ω/14 Bit/ 300 Ω, 600 Ω/15 Bit	

Interference Suppression, Error Limits	
Interference voltage suppression for f= n x (f1 ± 1%), (f1 = interference frequency)	
• Common mode interference (U_{SS})	min. 90 dB
• Common mode interference (peak value of interference < rated value of the input range)	min. 70 dB
Crosstalk between inputs	min. –50 dB
Operational error limits (across the temperature range, in relation to input range)	± 0.6 %
Basic error limit (operational error limit at 25 °C, related to the input range)	± 0.4 %
Temperature error (in relation to input range)	± 0.005 %/K
Linearity error (relative to the input range)	± 0.01 %
Repetition accuracy (in transient state at 25°C, relative to input range)	± 0.05 %

Data for selection of the sensor		
Input range (rated value)/input resistance		
• Resistance		150 Ω/min. 2 MΩ 300 Ω/min. 2 MΩ 600 Ω/min. 2 MΩ
• Resistive thermometer		Pt100/min. 2 MΩ Ni100/min. 2 MΩ
Permitted continuous input voltage (destruction limit)		Max. 9 V
Connection of signal generators		
• for measuring resistance		Yes, wire resistances are also measured, bridges on T_R
– 2 and 3-wire connection		Yes
– 4-wire connection		
Characteristics linearization		Yes, configurable for Pt100, Ni100
Smoothing of measured values		Yes, configurable in 4 stages by digital filtering
	Level	Time constant
	No	1 x cycle time
	weak	4 x cycle time
	medium	32 x cycle time
	strong	64 x cycle time

12.15 2AI RTD High Feature analog electronic module (6ES7 134-4NB50-0AB0)

Order number

6ES7 134-4NB50-0AB0

Features

- 2 inputs for resistance thermometer or resistance measurement
- Input ranges:
  - Resistance thermometer: Pt100; Ni100; Ni120; Pt200; Ni200; Pt500; Ni500; Pt1000; Ni1000; Cu10;
    resolution max. 15 bits + sign
  - Resistance measurement: 150 Ω; 300 Ω; 600 Ω; 3000 Ω; PTC;
    resolution max. 15 bits
- Automatic compensation of wire resistances with 3-wire connection.
- Configurable temperature coefficient with resistive sensors
- High degree of accuracy
- Isolated for load voltage
- Linearization of the sensor characteristic curves
- Parameter length 7 bytes
- Allowable common-mode voltage 2 VACss
- Recording of the reference junction temperature (in connection with the 2AI TC Standard electronic module)
- Compatible with 2AI RTD Standard (6ES7 134-4JB50-0AB0)

Note

The 2AI RTD High Feature electronic module can replace a 2AI RTD Standard in an existing system.

- Changes to the wiring are not required. The additional bridges on the 2AI RTD Standard terminal module need not be removed.
- No change in the configuration (hardware or GSD file) is required. In this case only the new functions of the 2AI RTD High Feature are not configurable.

Terminal assignment

The following table shows the terminal assignment of the 2AI RTD High Feature at the terminal module.

Table 12-46 Terminal assignment of the 2AI RTD High Feature

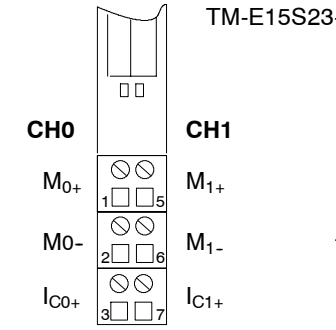
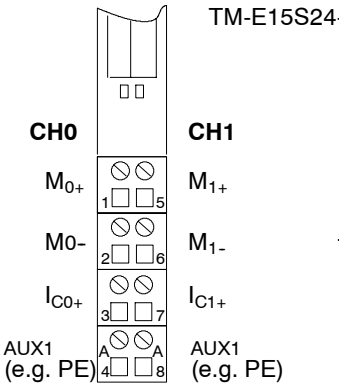
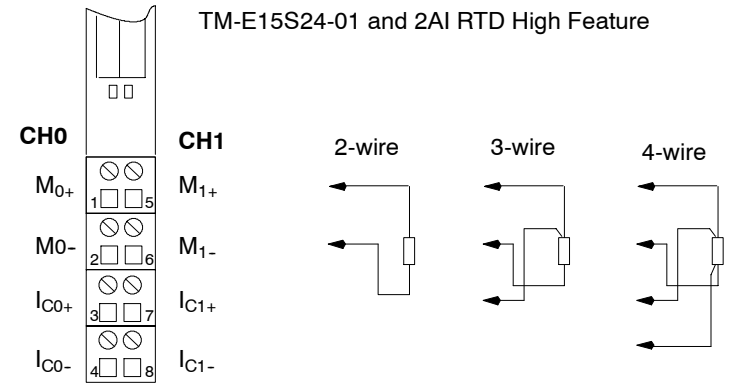
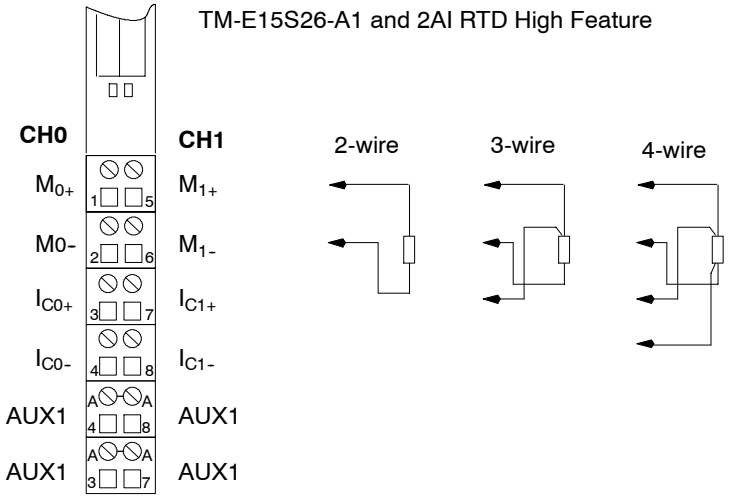
View	Terminal assignment	Remarks
	TM-E15S23-01 and 2AI RTD High Feature	Channel 0: Terminals 1 to 3 Channel 1: Terminals 5 to 7 M+: Measuring cable positive M–: Measuring cable negative I_{C+} Constant current cable positive
	TM-E15S24-A1 and 2AI RTD High Feature	Channel 0: Terminals 1 to A4 Channel 1: Terminals 5 to A8 M+: Measuring cable positive M–: Measuring cable negative I_{C+} Constant current cable positive

Table 12-46 Terminal assignment of the 2AI RTD High Feature, continued

View	Terminal assignment	Remarks
		Channel 0: Terminals 1 to 4 Channel 1: Terminals 5 to 8 M+: Measuring cable positive I_{C-}: Constant current cable negative M–: Measuring cable negative I_{C+} Constant current cable positive
		Channel 0: Terminals 1 to A3 Channel 1: Terminals 5 to A7 M+: Measuring cable positive I_{C-}: Constant current cable negative M–: Measuring cable negative I_{C+} Constant current cable positive

Block diagram

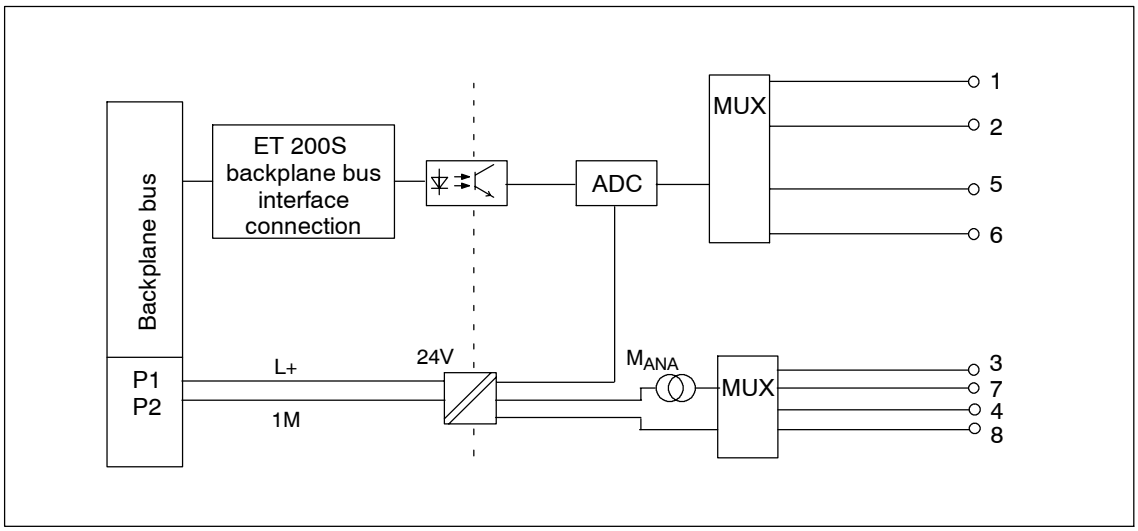


Figure 12-17 Block diagram of the 2AI RTD High Feature

Technical data

Dimensions and weight	
Dimensions W x H x D (mm)	15 x 81 x 52
Weight	Approx. 40 g
Module-specific data	
Supports clock synchronized mode	No
Number of inputs	2
Cable length	
• shielded	max. 200 m (164 ft)
Voltages, currents, electrical potentials	
Rated load voltage L+ (from power module)	24 VDC
• Polarity reversal protection	Yes
Transducer power supply	Yes
• Constant power supply for resistive sensors	Approx. 1.25 mA
• Short-circuit protection	Yes

Electrical isolation	
• Between channels and backplane bus	Yes
• Between channels and load voltage L+	Yes
• Between the channels	No
Permitted potential difference	
• Between M_{ANA} and the central ground point (U_{ISO})	75 VDC / 60 VAC
Isolation tested	500 VDC
Current consumption	
• with load voltage L+	max. 30 mA
Power loss of the module	Typical 0.6 W
Status, interrupts, diagnostics	
Diagnostic functions	
• Group error	red LED ”SF”
• Reading of diagnostics functions	Yes

Analog Value Formation		
Measurement principle	integrating (Sigma-Delta)	
Integration and cycle time / resolution per channel:		
• Integration time selectable	Yes	
• Interference frequency suppression in Hz	60	50
• Integration time in ms	16.7	20
• Basic conversion time incl. integration time in ms	50	60
• Additional conversion time for wire break diagnostics in ms	5	5
• Additional conversion time for wire compensation with 3-wire connection in ms	50	60
• Cycle time in ms	Number of active channels per module x conversion time	
• Resolution (incl. overshoot range)	Pt100; Ni100; Ni120; Pt200; Ni200; Pt500; Ni500; Pt1000; Ni1000; Cu10 / 15 bits + sign	
	150 Ω; 300 Ω; 600 Ω; 3000 Ω; / 15 bits	
	PTC[1] / 1 bit	

Interference Suppression, Error Limits	
Interference voltage suppression for f= n x (f1 ± 1%), (f1 = interference frequency)	
• Common mode interference (U_{SS})	min. 90 dB
• Common mode interference (peak value of interference < rated value of the input range)	min. 70 dB
Crosstalk between inputs	min. –50 dB
Operational error limits (across the temperature range, in relation to input range)	
• Resistive encoder	± 0.1 %
• Pt100, Pt200, Pt500, Pt1000 Standard	± 1.0 K
• Pt100, Pt200, Pt500, Pt1000 Climatic	± 0.25 K
• Ni100, Ni120, Ni200, Ni500, Ni 1000 Standard and Climatic	± 0.4 K
• Cu10	± 1.5 K
Basic error limit for resistive sensor (operational error limit at 25 °C, related to the input range)	
• Resistive encoder	± 0.05 %
• Pt100, Pt200, Pt500, Pt1000 Standard	± 0.6 K
• Pt100, Pt200, Pt500, Pt1000 Climatic	± 0.13 K
• Ni100, Ni120, Ni200, Ni500, Ni1000 Standard and Climatic	± 0.2 K
• Cu10	± 1.0 K
Temperature error (in relation to input range)	± 0.0009 %/K
Linearity error (relative to the input range)	± 0.01 %
Repetition accuracy (in transient state at 25°C, relative to input range)	± 0.05 %

Data for selection of the sensor	
Input range (rated value)/input resistance	
• Resistance	150 Ω/min. 10 MΩ 300 Ω/min. 10 MΩ 600 Ω/min. 10 MΩ 3000 Ω/min. 10 MΩ PTC min 10 MΩ
• Resistive thermo-meter	Pt100/min. 10 MΩ Ni100/min. 10 MΩ Ni120/min. 10 MΩ Pt200/min. 10 MΩ Ni200/min. 10 MΩ Pt500/min. 10 MΩ Ni500/min. 10 MΩ Pt1000/min. 10 MΩ Ni1000/min. 10 MΩ Cu10/min. 10 MΩ

Permitted continuous input voltage (destruction limit)	Max. 9 V
Connection of signal generators	
• For resistance measuring	Yes,
– 2-wire connection	internal
– 3-wire connection	compensation of wire resistances
– 4-wire connection	Yes
Characteristics linearization	Yes, configurable for Ptxxx, Nixxx
Smoothing of measured values	Yes, configurable in 4 stages by digital filtering
Level	Time constant
No	1 x cycle time
weak	4 x cycle time
medium	32 x cycle time
strong	64 x cycle time

1) As per VDE 0660 Part 302/303, Type A

Use of Cu10 sensors

- Select ”Thermal resistance 3-wire” and ”Cu10” during configuration.
- Wire the Cu10 sensor in 3-wire connection technology
- During operation the wire resistance of the missing measuring wire is automatically compensated internally.

Note

For optimum wire compensation with Cu10 please observe the following:

- The total of wire resistance and measuring resistance must not exceed 31 Ω.
- The resistance of the wire must be a maximum of 8 Ω if you want to use the temperature range up to above 312 °C. Example: A 200 m long Cu cable with a cross-section of 0.5 mm^2 has about 7 Ω, a small cross section reduces the allowable cable length accordingly.

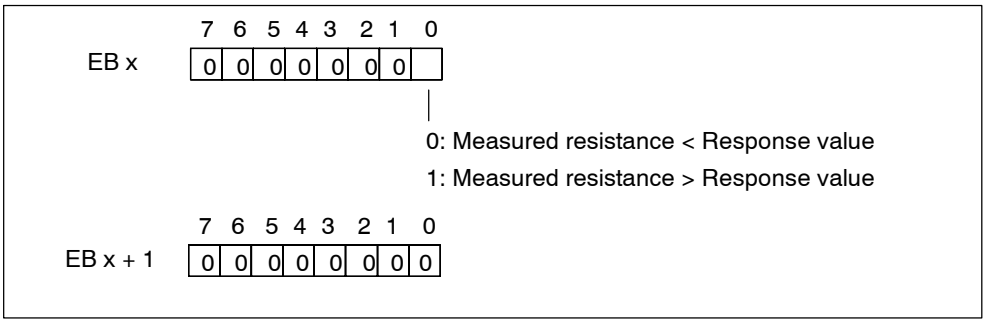
Use of PTC resistances

PTCs are suitable for temperature monitoring or as a thermal protective device for complex drives and transformer windings.

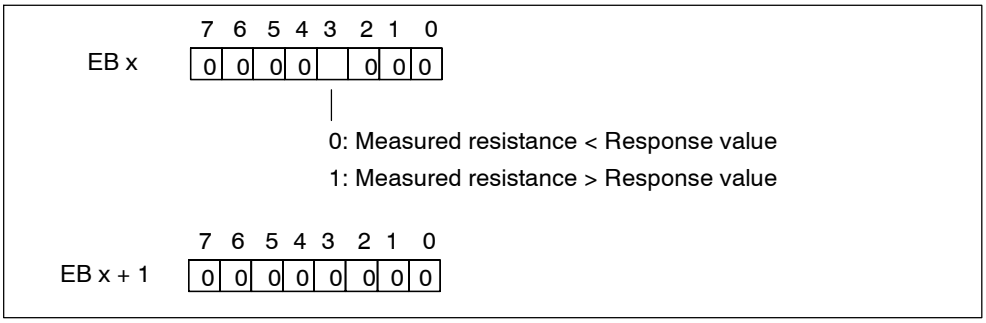
- Select ”Resistance 2-wire” and ”PTC” during configuration.
- Connect the PTC in 2-wire technology.
- Use PTC resistances of Type A (PTC thermistor) as per DIN / VDE 0660, Part 302.
- Sensor data for PTC resistance:

Feature	Technical specifications	Remarks
Switching points	Switch on/release max. 750Ω	**Measured resistance < Response value** • SIMATIC S7: Bit 0 = ”0” (in PII) • SIMATIC S5: Bit 3 = ”0” (in PII)
	Powering-down from 1650 Ω to 4000 Ω	Temperature rise **Measured resistance > Response value** • SIMATIC S7: Bit 0 = ”1” (in PII) • SIMATIC S5: Bit 3 = ”1” (in PII)
	Switch on/release from 1650 Ω to 750 Ω	Temperature fall **Measured resistance < Response value** • SIMATIC S7: Bit 0 = ”0” (in PII) • SIMATIC S5: Bit 3 = ”0” (in PII)
(TNF–5) °C (TNF+5) °C (TNF+15) °C Measuring circuit voltage Voltage at PTC	max. 550Ω Min. 1330 Ω Min. 4000 Ω Max. 7.5 V	TNF = rated response temperature

- Assignment in process image of inputs (PII) with SIMATIC S7



- Assignment in process image of inputs (PII) with SIMATIC S5



- Notes on Programming

Attention

- Only bit 0/3 is relevant for the evaluation in the process image of the inputs. The temperature of, for example, a motor can be monitored via bit 0/3.
- Bit 0/3 in the process image of the inputs does not save data. During configuration note that, for example, a motor makes a controlled start (via an acknowledgment).
- For safety reasons always evaluate the diagnostic entries of the 2AI RTD High Feature, because measuring is not possible when the electronic module is removed, failure of the power supply or the measuring wires are broken or short circuited.

12.16 2AI TC Standard analog electronic module (6ES7 134-4JB00-0AB0)

Order number

6ES7 134-4JB00-0AB0

Properties

- 2 inputs for thermocouples or voltage measurement
- Input ranges:
  - Voltage measurement: ± 80 mA, resolution 15 bits + sign
  - Thermocouples: Type E, N, J, K, L, S, R, B, T, resolution 15 bits + sign
- Isolated for load voltage L+
- Linearization of the sensor characteristic curves
- Allowable common-mode voltage 2 VAC_{SS}

Terminal assignment

The following table shows the terminal assignment of the 2AI TC Standard for the various terminal modules:

Voltage measuring as with 2AI U Standard (see Chap. 12.5).

Table 12-47 Terminal assignment of the 2AI TC Standard

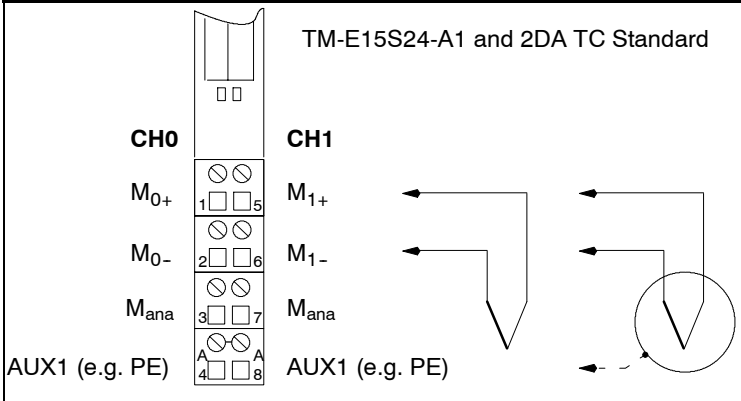
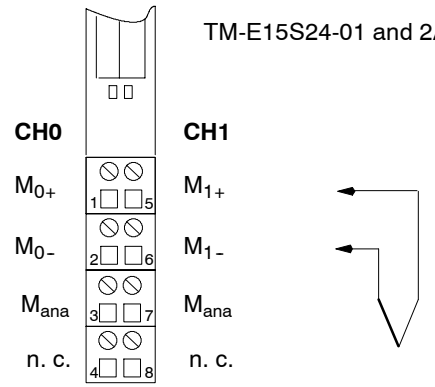
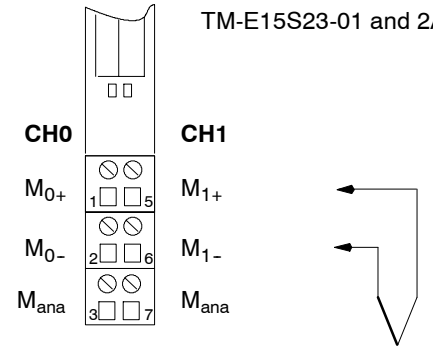
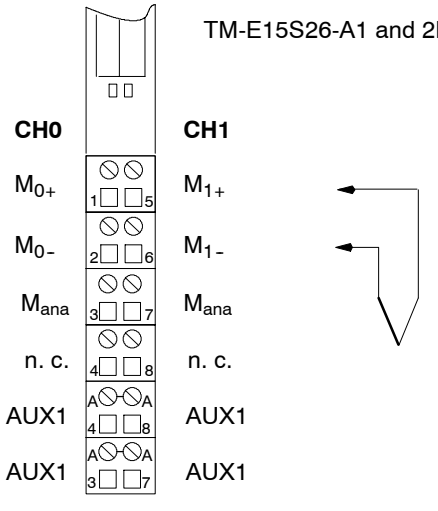
View	Terminal assignment	Remarks
		Channel 0: Terminals 1 to A4 Channel 1: Terminals 5 to A8 M+: Measuring cable positive M–: Measuring cable negative M_{ana}: Module ground

Table 12-47 Terminal assignment of the 2AI TC Standard, continued

View	Terminal assignment	Remarks
		Channel 0: Terminals 1 to 4 Channel 1: Terminals 5 to 8 M+: Measuring cable positive M–: Measuring cable negative M_{ana}: Module ground Terminals 4 and 8 can be used for connection of cables that are not required up to 30 VDC.
		Channel 0: Terminals 1 to 3 Channel 1: Terminals 5 to 7 M+: Measuring cable positive M–: Measuring cable negative M_{ana}: Module ground
		Channel 0: Terminals 1 to A3 Channel 1: Terminals 5 to A7 M+: Measuring cable positive M–: Measuring cable negative M_{ana}: Module ground Terminals 4 and 8 can be used for connection of cables that are not required up to 30 VDC.

Block diagram

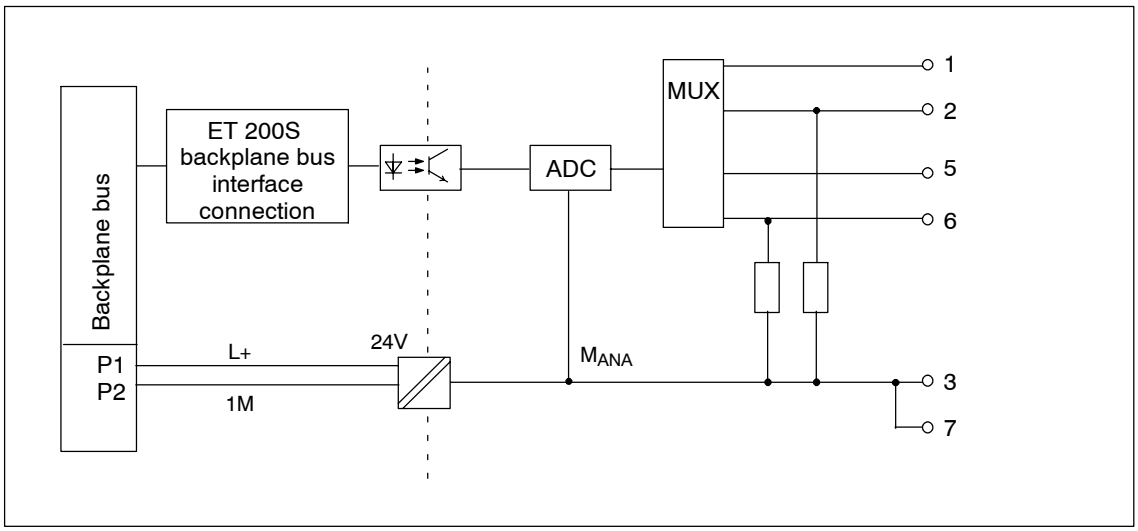


Figure 12-18 Block diagram of the 2AI TC Standard

Technical data

Dimensions and weight	
Dimensions W x H x D (mm)	15 x 81 x 52
Weight	Approx. 40 g
Module-specific data	
Supports clock synchronized mode	No
Number of inputs	2
Cable length	
• shielded	max. 50 m (164 ft)
Voltages, currents, electrical potentials	
Rated load voltage L+ (from power module)	24 VDC
• Polarity reversal protection	Yes
Electrical isolation	
• Between channels and backplane bus	Yes
• Between channels and load voltage L+	Yes
• Between the channels	No
• Between channels and 24 V power supply	Yes

Permitted potential difference	
• Between M_{ANA} and the central ground point (U_{iso})	75 VDC / 60 VAC
• Between inputs and M_{ANA} (U_{CM})	2 VAC_{SS}
Isolation tested	500 VDC
Current consumption	
• with load voltage L+	max. 30 mA
Power loss of the module	Typical 0.6 W
Status, interrupts, diagnostics	
Diagnostic functions	
• Group error	red LED "SF"
• Reading of diagnostics functions	Yes

Analog Value Formation		
Measurement principle	integrating	
Integration / conversion time / resolution per channel:		
• Integration time selectable	Yes	
• Interference frequency suppression in Hz	60	50
• Integration time in ms	16.7	20
• Basic conversion time incl. integration time in ms	55	65
• Additional conversion time for wire break diagnostics in ms	20	20
• Cycle time in ms	Number of active channels per module x conversion time	
• Resolution (incl. overshoot range)	15 bits + sign	

Interference Suppression, Error Limits	
Interference voltage suppression for f= n x (f1 ± 1%), (f1 = interference frequency)	
• Common mode interference (U_{SS})	min. 90 dB
• Common mode interference (peak value of interference < rated value of the input range)	min. 70 dB
Crosstalk between inputs	min. –50 dB
Operational error limits (across complete temperature range, in relation to input range)[1]	± 0.6 %
Basic error limit (operational error limit at 25 °C, related to the input range)[1)]	± 0.4 %
Temperature error (in relation to input range)	± 0.005 %/K
Linearity error (relative to the input range)	± 0.01 %
Repetition accuracy (in transient state at 25°C, relative to input range)	± 0.05 %

Data for selection of the sensor	
Input range (rated value)/input resistance	
• Voltage	± 80 mV/min. 1 MΩ
• Thermocouple	Type E, N, J, K, L, S, R, B, T/min. 1 M
Permitted continuous input voltage (destruction limit)	± 10 V, continuous
Connection of signal generators	
• For voltage measurement	possible
Characteristics linearization	Yes, configurable for Type E, N, J, K, L, S, R, B, T as per IEC 584
Temperature compensation	
• Internal temperature compensation	Not possible
• External temperature compensation by looping a compensation unit into the measuring circuit	Possible, one external compensation unit per channel
• External compensation by means of temperature value acquired at an analog module of the same ET 200S station	Yes
Smoothing of measured values	Yes, configurable in 4 stages by digital filtering
Level	Time constant
No	1 x cycle time
weak	4 x cycle time
medium	32 x cycle time
strong	64 x cycle time

1) with Type N: from –150 °C, Type B: from 200 °C,
Type T: from –230 °C

Compensation of thermocouples with a compensation unit

In addition to the error limits of the 2AI TC Standard electronic module (see ”Technical Specifications” table in this chapter), you must also consider the precision of the compensation unit.

Compensation of thermocouples with a Pt100 on the 2AI RTD Standard

Factors that influence the precision of the temperature measurement	
Rules for wiring	Make sure that there is a good thermal contact between the reference junction and the Pt100 used for compensation.
	We recommend wiring the Pt100 with a 4-wire connection.
Supplementary technical specifications for the error limits of the 2A TC	The precision of the thermal resistor (Pt100) used for compensation must be considered.*
	The errors of the measuring input (2AI RTD Standard) used for compensation must be considered*

* This error can result in a greater measurement deviation when using thermocouples with a very low rise of the thermocouple characteristic.
With the following thermocouples this results in a restriction of the input range of the thermocouple for which the precision specifications of the manual apply:
Type N: –100 °C
Type K: –230 °C
Type E: –230 °C

12.17 2AI TC High Feature analog electronic module (6ES7 134-4NB00-0AB0)

Order number

6ES7 134-4NB00-0AB0

Properties

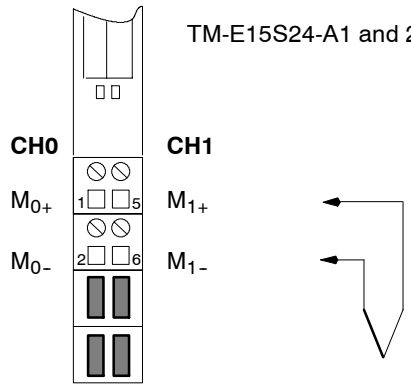
- 2 inputs for thermocouples or voltage measurement
- Input ranges:
  - Voltage measurement: ± 80 mA, resolution 15 bits + sign
  - Thermocouples: Type E, N, J, K, L, S, R, B, T, C, resolution 15 bits + sign
- 2AI TC High Feature is inserted on TM-E15S24-AT or TM-E15C24-AT
- Isolated for load voltage L+
- Linearization of the sensor characteristic curves
- Allowable common.mode voltage 140 VDC/100 VAC
- Internal reference junction in connection with TM-E15S24-AT or TM-E15C24-AT

Terminal assignment

The following table contains the terminal assignment of the 2AI TC High Feature for the TM-E15S24-AT or TM-E15C24-AT terminal module

Voltage measuring as with 2AI U Standard (see Chap. 12.5).

Table 12-48 Terminal assignment of the 2AI TC High Feature

View	Terminal assignment	Remarks
		Channel 0: Terminals 1 to 2 Channel 1: Terminals 5 to 6 M+: Measuring cable positive M–: Measuring cable negative

Block diagram

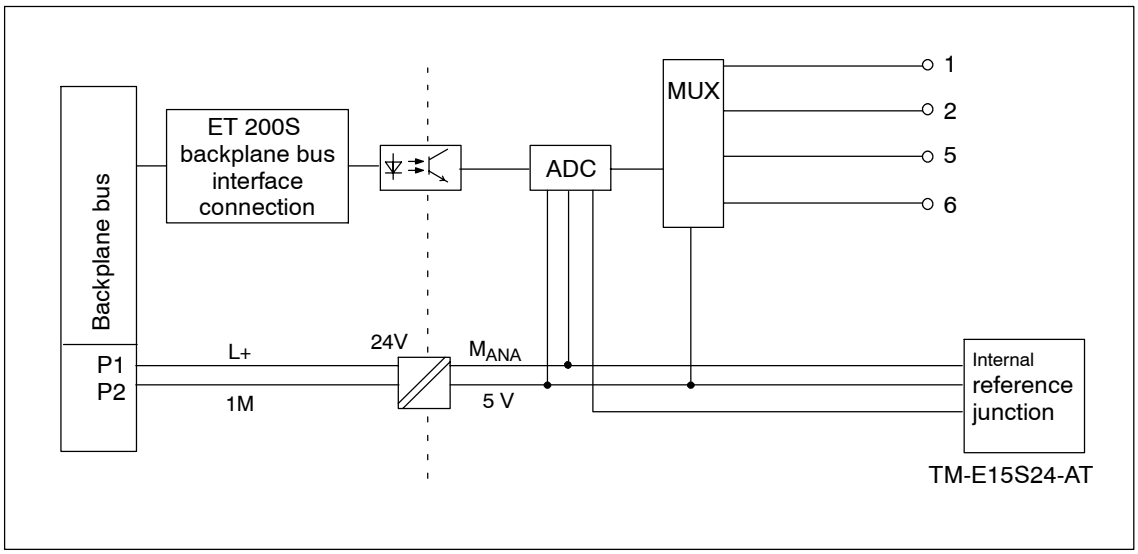


Figure 12-19 Block diagram of the 2AI TC High Feature

Technical data

Dimensions and weight	
Dimensions W x H x D (mm)	15 x 81 x 52
Weight	Approx. 40 g
Module-specific data	
Supports clock synchronized mode	No
Number of inputs	2
Cable length	
• shielded	max. 50 m (164 ft)
Voltages, currents, electrical potentials	
Rated load voltage L+ (from power module)	24 V DC
• Polarity reversal protection	Yes
Electrical isolation	
• Between channels and backplane bus	Yes
• Between channels and load voltage L+	Yes
• Between the channels	No
• Between channels and 24 V power supply	Yes

Permitted potential difference	
• Between M_{ANA} and the central ground point (U_{iso})	75 VDC / 60 VAC
• Between inputs and M_{ANA} (U_{CM})	140 VDC / 100 VAC
Isolation tested	500 VDC
Current consumption	
• with load voltage L+	max. 30 mA
Power loss of the module	Typical 0.6 W
Status, interrupts, diagnostics	
Diagnostic functions	
• Group error	red LED "SF"
• Reading of diagnostics functions	Yes

Analog Value Formation		
Measurement principle	integrating	
Integration / conversion time / resolution per channel:		
• Integration time selectable	Yes	
• Interference frequency suppression in Hz	60	50
• Integration time in ms	16.7	20
• Basic conversion time incl. integration time in ms	66	80
• Additional conversion time for wire break diagnostics in ms	5	5
• Cycle time in ms	Number of active channels per module x conversion time	
• Resolution (incl. overshoot range)	15 bits + sign	

Interference Suppression, Error Limits	
Interference voltage suppression for f= n x (f1 ± 1 %), (f1 = interference frequency)	
• Common mode interference (U_{SS})	min. 90 dB
• Common mode interference (peak value of interference < rated value of the input range)	min. 70 dB
Crosstalk between inputs	min. –50 dB
Operational error limit for 80 mV (across complete temperature range, in relation to input range)	± 0.1 %
Operational error limit for thermocouple (across complete temperature range, in relation to input range)[1)]	± 1.5 K
Operational error limit for thermocouple Type C (across complete temperature range, in relation to input range)[1)]	± 7 K
Basic error limit for ± 80 mV (operational error limit at 25 °C, related to the input range)	± 0.05 %
Basic error limit for thermocouples (operational error limit at 25 °C, related to the input range)[1)]	± 1 K
Basic error limit for thermocouple Type C (operational error limit at 25 °C, related to the input range)[1)]	± 5 K
Temperature error (in relation to input range)	± 0.005 %/K
Linearity error (relative to the input range)	± 0.01 %
Repetition accuracy (in transient state at 25 °C, relative to input range)	± 0.05 %
Total errors limits when using internal compensation	
• Operational error limit (over complete temperature range in static thermal state, ambient temperature fluctuation < 0.3 K/min)[2)]	± 2.5 K
• Basic error limit (operational error limit at 25 °C in static thermal state, ambient temperature fluctuation < 0.3 K/min)[3)]	± 1.5 K

Data for selection of the sensor	
Input range (rated value)/input resistance	
• Voltage	±80 mV/min. 1 MΩ
• Thermocouple	Type E, N, J, K, L, S, R, B, T, C/min. 1 MΩ
Permitted continuous input voltage (destruction limit)	±20 V, continuous
Connection of signal generators	
• For voltage measurement	possible
Characteristics linearization	Yes, configurable for Type E, N, J, K, L, S, R, B, T, C as per IEC 584
Temperature compensation	
• Internal temperature compensation	Possible, with TM-E15S24-AT TM-E15C24-AT
• External temperature compensation by looping a compensation unit into the measuring circuit	Possible, one external compensation unit per channel
Smoothing of measured values	Yes, configurable in 4 stages by digital filtering
Level	Time constant
No	1 x cycle time
weak	4 x cycle time
medium	32 x cycle time
strong	64 x cycle time

1) the specified error limits apply as of the following temperatures:
thermocouple type T: –200 °C
thermocouple type K: –100 °C
thermocouple type B: +700 °C
thermocouple type N: –150 °C
thermocouple type E: –150 °C
thermocouple type R: +200 °C
thermocouple type S: +100 °C

2) With thermocouple Type C: ±8 K

3) With thermocouple Type C: ±6 K

Compensation of thermocouples with a compensation unit

In addition to the error limits of the 2AI TC High Feature electronic module (see ”Technical Specifications” table in this chapter), you must also consider the precision of the compensation unit.

Internal compensation with TM-E 15S24-AT or TM-E15C24-AT

Factors that influence the precision of the temperature measurement	
Rules for use of the internal temperature compensation	The connected channel with internal compensation must be configured separately.
	Do not install the 2AI TC High Feature immediately adjacent to a power module with high infeed current (> 3 A). With an infeed current of 10 A an additional error of ±2 K may occur.
Supplementary technical specifications for the error limits of the 2A TC High Feature	The station must be in a static state* to reach the specified precision.
	The precision is reached 30 minutes after entry to the static state.
	The total error of the channel results from the addition of the input error and the error from the internal compensation.

* The static state is defined with a virtually constant ambient temperature (e.g. there is no air flow in the enclosed switch cabinet).

12.18 2AO U Standard analog electronic module (6ES7 135-4FB00-0AB0)

Order number

6ES7 135-4FB00-0AB0

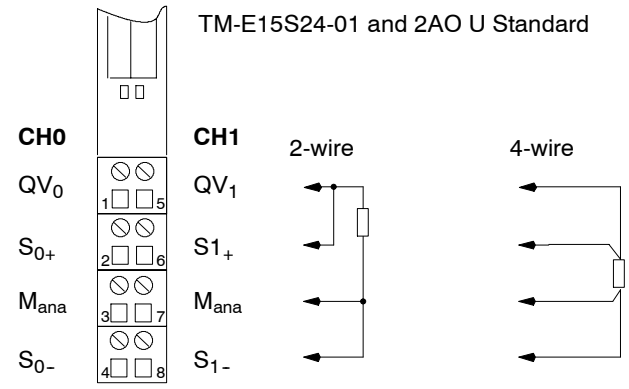
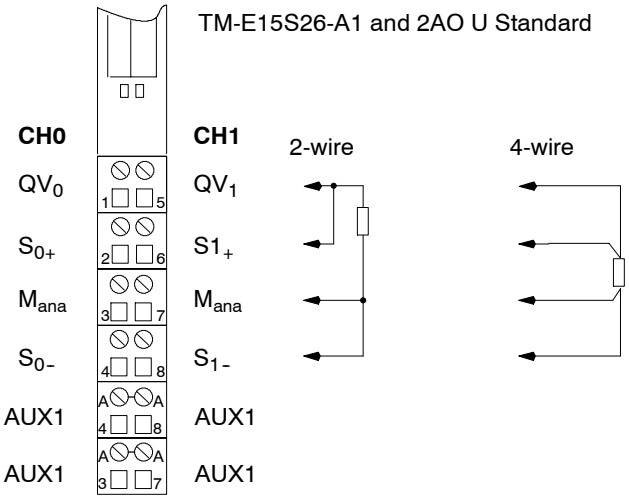
Properties

- 2 outputs for voltage output
- Output range:
  - ±10 V, resolution 13 bits + sign
  - 1 to 5 V, resolution 12 bits
- Isolated for load voltage L+

Terminal assignment

The following table shows the terminal assignment of the 2AO U Standard for the terminal module:

Table 12-49 Terminal assignment of the 2AO U Standard

View	Terminal assignment	Remarks
		Channel 0: Terminals 1 to 4 Channel 1: Terminals 5 to 8 CR: Analog output voltage (output voltage) S+: Positive feeler line M_{ana}: Module ground S–: Negative feeler line
		Channel 0: Terminals 1 to A3 Channel 1: Terminals 5 to A7 CR: Analog output voltage (output voltage) S+: Positive feeler line M_{ana}: Module ground S–: Negative feeler line

Block diagram

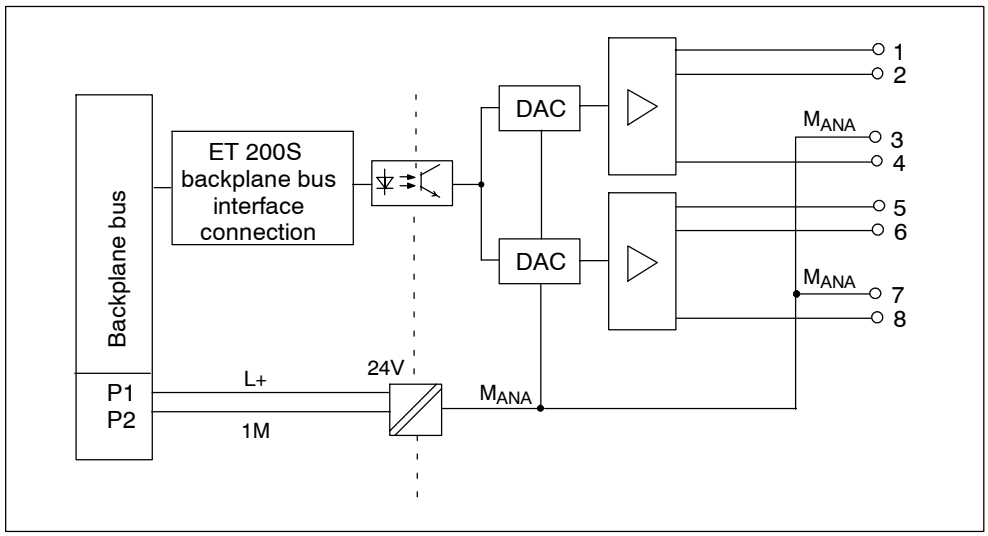


Figure 12-20 Block diagram of the 2AO U Standard

Technical data

Dimensions and weight	
Dimensions W x H x D (mm)	15 x 81 x 52
Weight	Approx. 40 g
Module-specific data	
Supports clock synchronized mode	No
Number of outputs	2
Cable length	
• shielded	max. 200 m (164 ft)
Voltages, currents, electrical potentials	
Rated load voltage L+ (from power module)	24 VDC
• Polarity reversal protection	Yes
Electrical isolation	
• Between channels and backplane bus	Yes
• Between channels and load voltage L+	Yes
• Between the channels	No

Permitted potential difference	
• Between M_{ANA} and the central ground point (U_{iso})	75 VDC / 60 VAC
Isolation tested	500 VDC
Current consumption	
• with load voltage L+	max. 130 mA
Power loss of the module	max. 2 W
Status, interrupts, diagnostics	
Diagnostic functions	
• Group error	red LED ”SF”
• Reading of diagnostics functions	Yes

Analog Value Formation	
Resolution (incl. overshoot range)	± 10 V/ 13 Bit + VZ 1 to 5 V/12 bits
Cycle time	Max. 1.5 ms
Settling time	
• For resistive load	0.1 ms
• For capacitive load	0.5 ms
• For inductive load	0.5 ms
Substitute value configurable	Yes
Interference Suppression, Error Limits	
Crosstalk between outputs	min. –40 dB
Operational error limits (across the temperature range, in relation to output range)	± 0.4 %
Basic error limit (operational error limit at 25 °C, related to the output range)	± 0.2 %
Temperature error (in relation to output range)	± 0.01 %/K
Linearity error (in relation to output range)	± 0.02 %
Repetition accuracy (in transient state at 25 °C, relative to output range)	± 0.05 %
Output ripple (in relation to output range, bandwidth 0 to 50 kHz)	± 0.02 %
Data for selection of the actuator	
Output range (nominal value)	± 10 V 1 to 5 V
Load resistance	Min. 1.0 kΩ
• For capacitive load	max. 1 μF
• Short-circuit protection	Yes
• Short-circuit current	Approx. 25 mA
Destruction limit for externally applied voltages/currents	
• Voltage measured between the outputs and M_{ANA}	Max. 15 V continuous, 75 V for max. 1 s (sampling ratio 1:20)
• Current	max. DC 50 mA
Connection of actuators	
• 2-wire connection	Possible, without compensation of cable resistance
• 4-wire connection	Yes

12.19 2AO U High Feature analog electronic module (6ES7 135-4LB01-0AB0)

Order number

6ES7 135-4LB01-0AB0

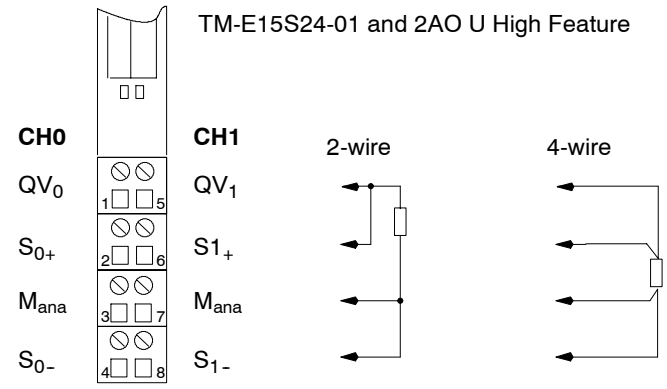
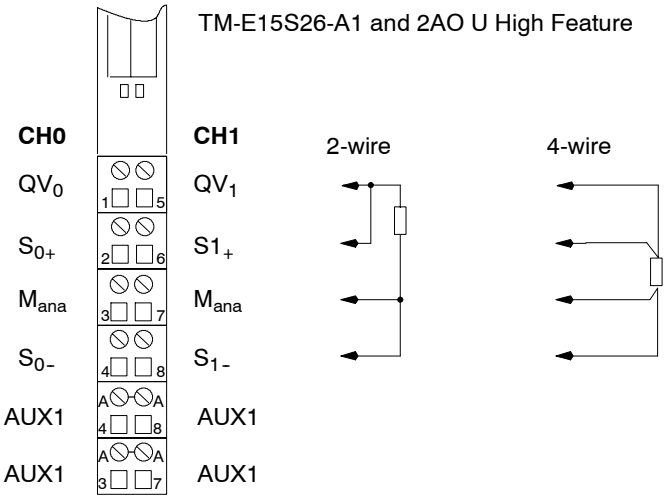
Properties

- 2 outputs for voltage output
- Output range:
  - ± 10 V, resolution 15 bits + sign
  - 1 to 5 V, resolution 14 bits
- Isolated for load voltage L+
- Supports clock synchronized mode
  - Minimum possible time for the clock-synchronized DP cycle (T_{DPmin}): 3.75 ms
  - Minimum possible conversion time of output modules: (T_{WAmin}): 1.5 ms

Terminal assignment

The following table shows the terminal assignment of the 2AO U High Feature for the terminal module:

Table 12-50 Terminal assignment of the 2AO U High Feature

View	Terminal assignment	Remarks
		Channel 0: Terminals 1 to 4 Channel 1: Terminals 5 to 8 CR: Analog output voltage (output voltage) S+: Positive feeler line M_{ana}: Module ground S−: Negative feeler line
		Channel 0: Terminals 1 to A3 Channel 1: Terminals 5 to A7 CR: Analog output voltage (output voltage) S+: Positive feeler line M_{ana}: Module ground S−: Negative feeler line

Block diagram

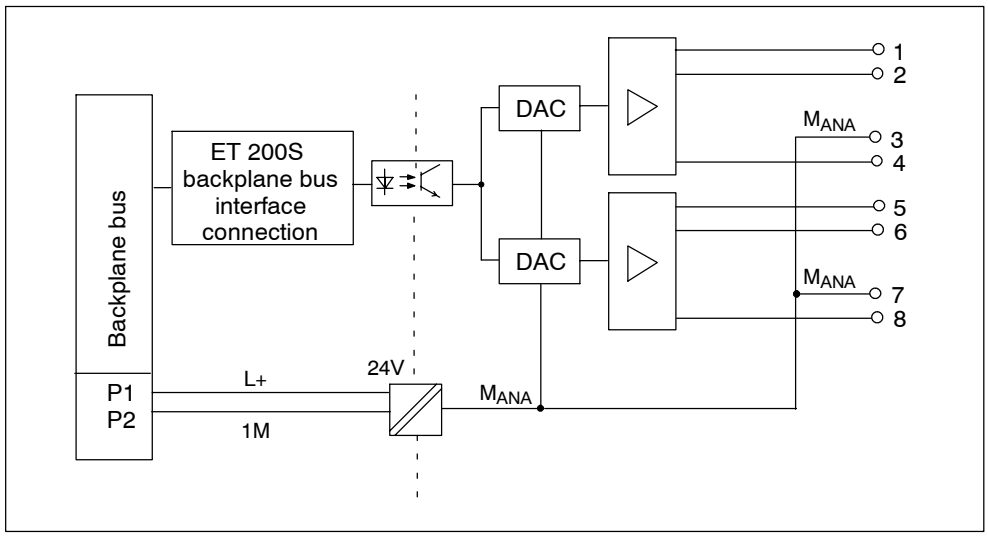


Figure 12-21 Block diagram of the 2AO U High Feature

Technical data

Dimensions and weight	
Dimensions W x H ≦ D (mm)	15 x 81 x 52
Weight	Approx. 40 g
Module-specific data	
Supports clock synchronized mode	Yes
Number of outputs	2
Cable length	
• shielded	max. 200 m (164 ft)
Voltages, currents, electrical potentials	
Rated load voltage L+ (from power module)	24 VDC
• Polarity reversal protection	Yes
Electrical isolation	
• Between channels and backplane bus	Yes
• Between channels and load voltage L+	Yes
• Between the channels	No

Permitted potential difference	
• Between M_{ANA} and the central ground point (U_{iso})	75 VDC / 60 VAC
Isolation tested	500 VDC
Current consumption	
• with load voltage L+	max. 130 mA
Power loss of the module	max. 2 W
Status, interrupts, diagnostics	
Diagnostic functions	
• Group error display	red LED ”SF”
• Reading of diagnostic data	possible
Interconnectable substitution values	Yes, configurable

Analog Value Formation	
Resolution (including sign)	± 10 V/ 16 Bit 1 to 5 V/14 bits
Conversion time (per channel)	Max. 1.0 ms
Settling time	
• For resistive load	0.1 ms
• For capacitive load	0.5 ms
• For inductive load	0.5 ms
Interference Suppression, Error Limits	
Crosstalk between outputs	> 60 dB
Operational error limits (across the temperature range, in relation to output range)	± 0.07 %
Basic error limit (operational error limit at 25 °C, related to the output range)	± 0.03 %
Temperature error (in relation to output range)	± 0.001 %/K
Linearity error (in relation to output range)	± 0.02 %
Repetition accuracy (in transient state at 25 °C, relative to output range)	± 0.01 %
Output ripple, bandwidth 0 to 50 kHz (in relation to output range)	± 0.02 %

Data for selection of the actuator	
Output range (nominal value)	± 10 V 1 to 5 V
Load impedance (in the nominal range of the output)	
• With voltage outputs	Min. 1.0 kΩ
Capacitive load	max. 1 μF
Voltage output	
• Short-circuit protection	Yes
• Short-circuit current	Approx. 25 mA
Destruction limit for externally applied voltages/currents	
• Voltage measured between the outputs and M_{ANA}	Max. 15 V continuous, 75 V for max. 1 s (sampling ratio 1:20)
• Current	max. DC 50 mA
Connection of actuators	
• Voltage output	
2-wire connection	Possible, without compensation of cable resistance
4-wire connection	possible

12.20 2AO I Standard analog electronic module (6ES7 135-4GB00-0AB0)

Order number

6ES7 135-4GB00-0AB0

Properties

- 2 current outputs
- Output range:
  - ± 20 mA, resolution 13 bits + sign
  - 4 to 20 mA, resolution 13 bits
- Isolated for load voltage L+

Terminal assignment

The following table shows the terminal assignment of the 2AO I TC Standard for the various terminal modules:

Table 12-51 Terminal assignment of the 2AO I Standard

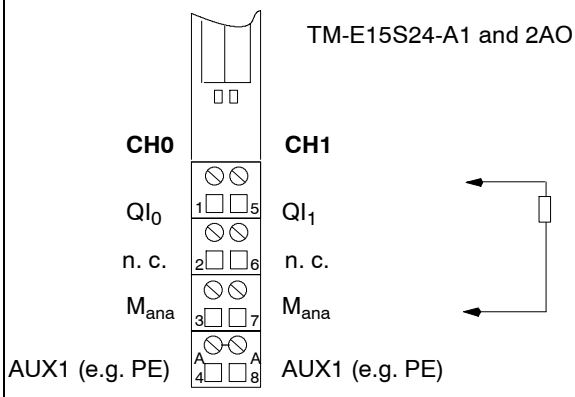
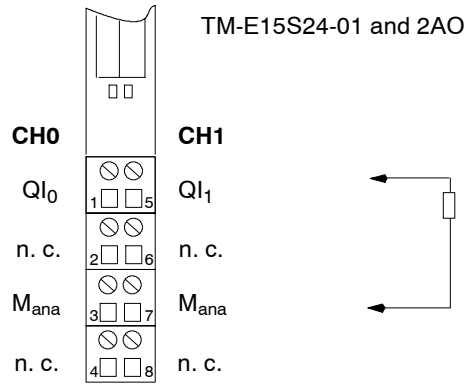
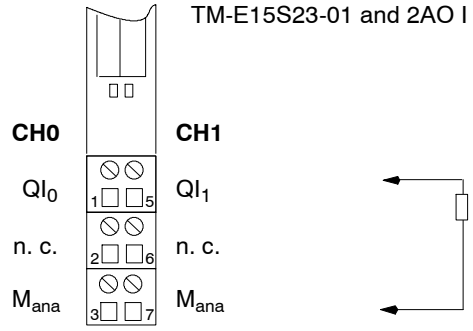
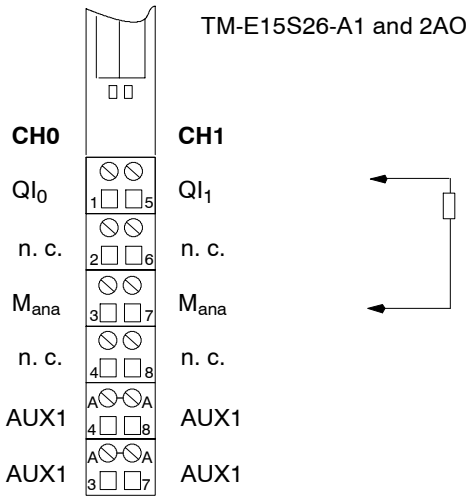
View	Terminal assignment	Remarks
		Channel 0: Terminals 1 to A4 Channel 1: Terminals 5 to A8 QI: analog output current M_{ana}: Module ground Terminals 2 and 6 can be used for connection of cables that are not required up to 30 VDC.

Table 12-51 Terminal assignment of the 2AO I Standard

View	Terminal assignment	Remarks
		Channel 0: Terminals 1 to 4 Channel 1: Terminals 5 to 8 QI: analog output current M_{ana}: Module ground Terminals 2 and 6, 4 and 8 can be used for connection of cables that are not required up to 30 VDC.
		Channel 0: Terminals 1 to 3 Channel 1: Terminals 5 to 7 QI: analog output current M_{ana}: Module ground Terminals 2 and 6 can be used for connection of cables that are not required up to 30 VDC.
		Channel 0: Terminals 1 to A3 Channel 1: Terminals 5 to A7 QI: analog output current M_{ana}: Module ground Terminals 2 and 6, 4 and 8 can be used for connection of cables that are not required up to 30 VDC.

Block diagram

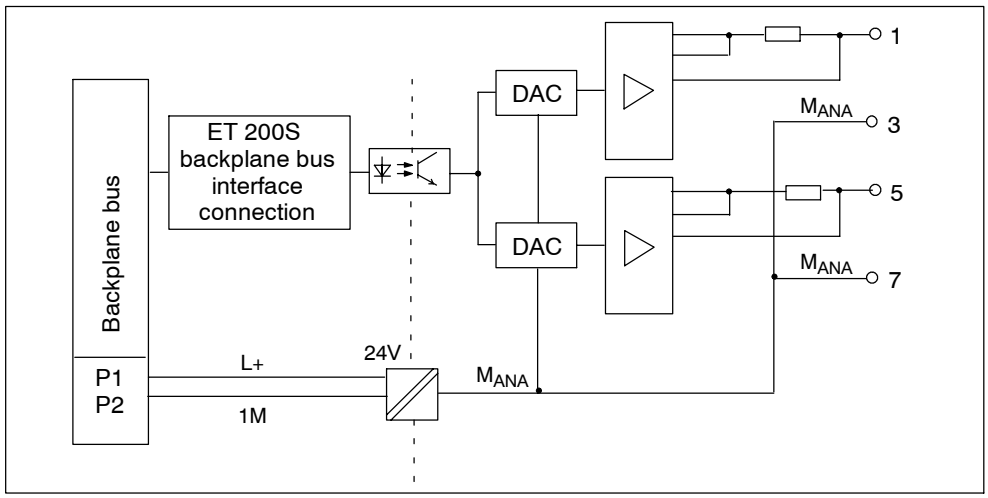


Figure 12-22 Block diagram of the 2AO I Standard

Technical data

Dimensions and weight	
Dimensions W x H x D (mm)	15 x 81 x 52
Weight	Approx. 40 g
Module-specific data	
Supports clock synchronized mode	No
Number of outputs	2
Cable length	
• shielded	max. 200 m (164 ft)
Voltages, currents, electrical potentials	
Rated load voltage L+ (from power module)	24 VDC
• Polarity reversal protection	Yes
Electrical isolation	
• Between channels and backplane bus	Yes
• Between channels and load voltage	Yes
• Between the channels	No
Permitted potential difference	
• Between M_{ANA} and the central ground point (U_{iso})	75 VDC / 60 VAC
Isolation tested	500 VDC
Current consumption	
• from L+ power supply	max. 150 mA
Power loss of the module	max. 2 W
Status, alarms, diagnostics	
Diagnostic functions	
• Group error	red LED "SF"
• Reading of diagnostics functions	Yes
Analog Value Formation	
Resolution (incl. overshoot range)	± 20 mA/13 Bit + VZ 4 to 20 mA/13 bits
Cycle time	Max. 1.5 ms
Settling time	
• For resistive load	0.1 ms
• For capacitive load	0.5 ms
• For inductive load	0.5 ms
Interconnectable substitution values	Yes
Interference Suppression, Error Limits	
Crosstalk between outputs	min. -40 dB
Operational error limits (across the temperature range, in relation to output range)	± 0.5 %
Basic error limit (operational error limit at 25 °C, related to the output range)	± 0.3 %
Temperature error (in relation to output range)	± 0.01 %/K
Linearity error (in relation to output range)	± 0.02 %
Repetition accuracy (in transient state at 25 °C, relative to output range)	± 0.05 %
Output ripple (in relation to output range, bandwidth 0 to 50 kHz)	± 0.02 %
Data for selection of the actuator	
Output range (nominal value)	± 20 mA 4 to 20 mA
Load resistance	max. 500Ω
• For inductive load	1 mH
• No-load voltage	18 V
Destruction limit for externally applied voltages/currents	
• Voltage measured between the outputs and M_{ANA}	Max. 15 V continuous, 75 V for max. 1 s (sampling ratio 1:20)
• Current	max. DC 50 mA
Connection of actuators	
• 2-wire connection	Yes
• 4-wire connection	No

12.21 2AO I High Feature analog electronic module (6ES7 135-4MB01-0AB0)

Order number

6ES7 135-4MB01-0AB0

Properties

- 2 current outputs
- Output range:
  - ± 20 mA, resolution 15 bits + sign
  - 4 to 20 mA, resolution 15 bits
- Isolated for load voltage L+
- Supports clock synchronized mode
  - Minimum possible time for the clock-synchronized DP cycle (T_{DPmin}): 3.75 ms
  - Minimum possible conversion time of output modules: (T_{WAmin}): 1.5 ms

Terminal assignment

The following table shows the terminal assignment of the 2AO I High Feature for the various terminal modules.

Table 12-52 Terminal assignment of the 2AO I High Feature

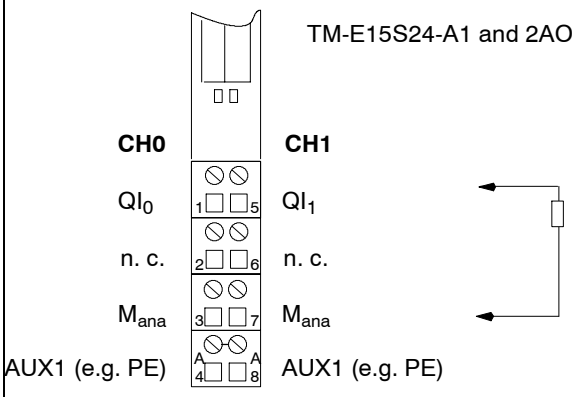
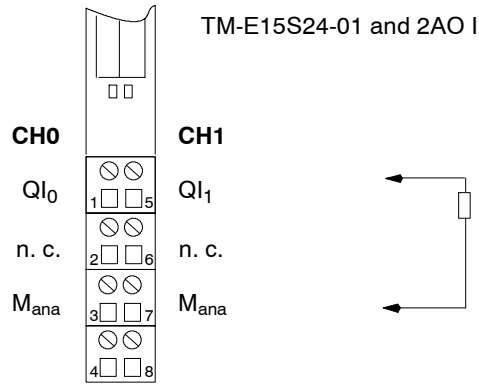
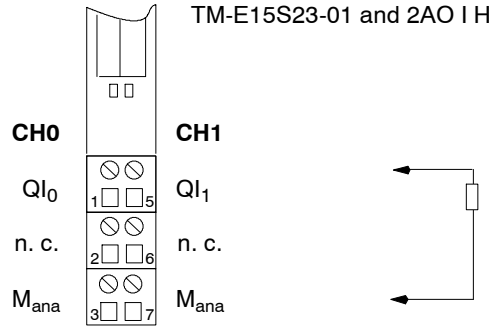
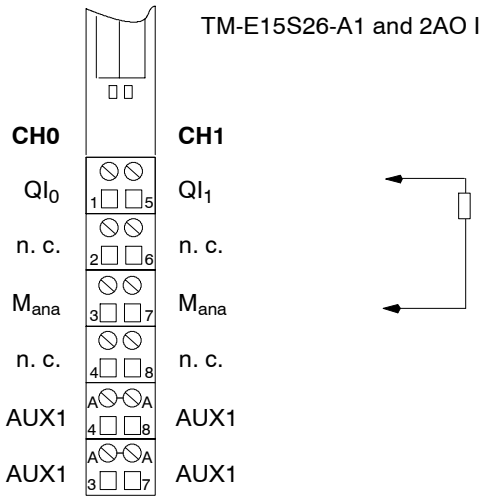
View	Terminal assignment	Remarks
		Channel 0: Terminals 1 to A4 Channel 1: Terminals 5 to A8 QI: analog output current M_{ana}: Module ground Terminals 2 and 6 can be used for connection of cables that are not required up to 30 VDC.

Table 12-52 Terminal assignment of the 2AO I High Feature, continued

View	Terminal assignment	Remarks
		Channel 0: Terminals 1 to 4 Channel 1: Terminals 5 to 8 QI: analog output current M_{ana}: Module ground Terminals 2 and 6, 4 and 8 can be used for connection of cables that are not required up to 30 VDC.
		Channel 0: Terminals 1 to 3 Channel 1: Terminals 5 to 7 QI: analog output current M_{ana}: Module ground Terminals 2 and 6 can be used for connection of cables that are not required up to 30 VDC.
		Channel 0: Terminals 1 to A3 Channel 1: Terminals 5 to A7 QI: analog output current M_{ana}: Module ground Terminals 2 and 6, 4 and 8 can be used for connection of cables that are not required up to 30 VDC.

Block diagram

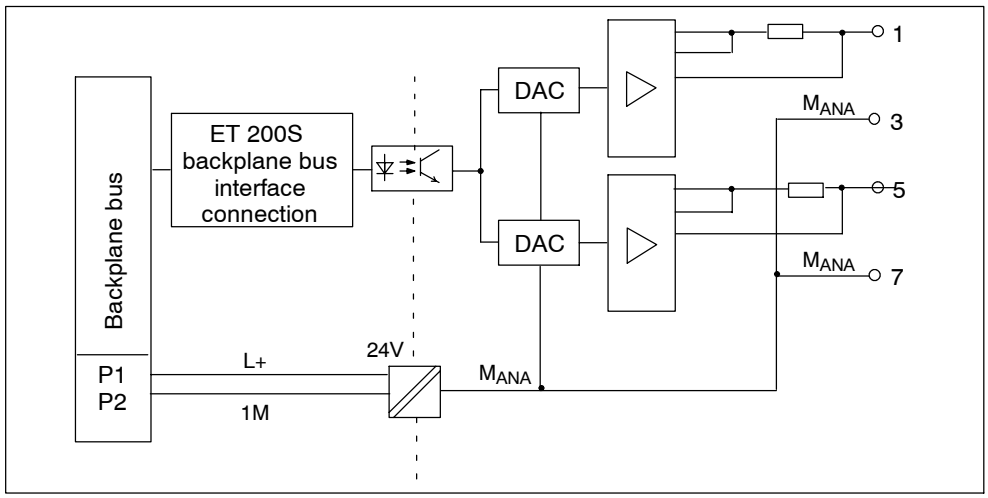


Figure 12-23 Block diagram of the 2AO I High Feature

Technical data

Dimensions and weight	
Dimensions W x H x D (mm)	15 x 81 x 52
Weight	Approx. 40 g
Module-specific data	
Supports clock synchronized mode	Yes
Number of outputs	2
Cable length	
• shielded	max. 200 m (164 ft)
Voltages, currents, electrical potentials	
Rated power supply of the electronics L+	24 VDC
• Polarity reversal protection	Yes
Electrical isolation	
• Between channels and backplane bus	Yes
• Between channels and electronics power supply	Yes
• Between the channels	No
Permitted potential difference	
• between M_{ANA} and $M_{internal}$ (U_{ISO})	75 VDC / 60 VAC
Isolation tested	500 VDC
Current consumption	
• from L+ power supply	max. 150 mA
Power loss of the module	max. 2 W
Status, interrupts, diagnostics	
Diagnostic functions	
• Group error display	red LED ”SF”
• Reading of diagnostic data	Yes
Interconnectable substitution values	yes, configurable

Analog Value Formation	
Resolution (including sign)	± 20 mA/ 16 Bit 4 to 20 mA/15 bits
Conversion time (per channel)	Max. 1.0 ms
Settling time	
• For resistive load	0.25 ms
• For capacitive load	1.0 ms
• For inductive load	0.5 ms
Interference Suppression, Error Limits	
Crosstalk between outputs	> 60 dB
Operational error limits (across the temperature range, in relation to output range)	± 0.07 % (at 250 Ω load resistance) ± 0.3 % (at all other load resistances)
Basic error limit (operational error limit at 25 °C, related to the input range)	± 0.03 % (at 250 Ω load resistance) ± 0.26 % (at all other load resistances)
Temperature error (in relation to output range)	± 0.001 %/K
Linearity error (in relation to output range)	± 0.02 %
Repetition accuracy (in transient state at 25 °C, relative to output range)	± 0.01 %
Output ripple (in relation to output range, bandwidth 0 to 50 kHz)	± 0.02 %

Data for selection of the actuator	
Output range (nominal value)	± 20 mA 4 to 20 mA
Load impedance (in the nominal range of the output)	
• For current outputs	max. 500Ω
For inductive load	1 mH
Current output	
• No-load voltage	18 V
Destruction limit for externally applied voltages/currents	
• Voltage measured between the outputs and M_{ANA}	Max. 15 V continuous; 75 V for max. 1 s (sampling ratio 1:20)
• Current	max. DC 50 mA
Connection of actuators	
• Current output	
2-wire connection	possible

4 IQ-SENSE

13

Chapter overview

Order number

6ES7 138-4GA00-0AB0

Features

The 4 IQ-SENSE has the following features:

- Connection of sensors with IQ-SENSE®, photo-electric proximity switches: e.g. reflection light barriers, reflection light and laser probes.
- Up to 4 sensors can be connected to every module. One 2-wire cable is required per sensor.
- Function reserve and monitoring
- Configurable time functions, differential travel, synchronization groups
- Specification of sensitivity and distance values *(IntelliTeach* via FB ”IQ-SENSE Opto”*)*
- Teach-in
- Removal and insertion of module during operation (restart of *Teach-in* via *”IQ-SENSE Opto”* function module or button on sensor required)
- Removal and insertion of sensors during operation (automatic reconfiguration)
- Supports sensors with alignment assistance
- The 4 IQ-SENSE is a single-width (15 mm) electronic module and can be used with the following terminal modules:
  - TM-E15S24-01, TM-E15C24-01 or TM-E15N24-01
  - TM-E15S26-A1, TM-E15C26-A1 or TM-E15N26-A1

Parameter assignment

The parameters for the 4 IQ-SENSE are configured with the STEP7.

Configuration rules	
STEP 7 as of V5.1, ServicePack 3	**STEP 7 as of V5.0, ServicePack 3 or other configuration software**
Included in the hardware catalog of HWConfig A GSD file is not required.	IM151-1 BASIC: GSD file SIEM80F3.GSx as of 09/02 (from V1.0)
	IM151-1 STANDARD: GSD file SIEM806A.GSx as of 10/01 (from V1.10)
	IM151-1 FO STANDARD: GSD file SIEM806B.GSx as of 10/01 (from V1.5)
	IM151-1 HIGH FEATURE: GSD file SIR380E0.GSx as of 12/01 (from V1.0)

13.1 Parameters for 4 IQ-SENSE

Parameters

Table 13-1 Parameters for 4 IQ-SENSE

Parameters	Value range	Default setting	Effective range
Group diagnostics	• disable • enabled	disable	Module
Synchronization group	• 1 • 2 • 3 • 4	1	Module
Sensor type	• Reflection light barrier • Reflection light probe • disabled	Reflection light barrier	Channel
Differential travel	• 5 % • 10 % • 20 % • 50 %	20 %	Channel
Time functions	• None • Resetting time • Pickup delay • Pickup and resetting delay • Momentary impulse	None	Channel
Time value	• 5 ms • 10 ms • 20 ms • 50 ms • 100 ms • 200 ms • 500 ms • 1 s • 2 s • 5 s • 10 s	5 ms	Channel
Teach-in block	• *Teach-in* with button possible • *Teach-in* with button not possible	*Teach-in* with button possible	Channel

Note

Unused channels of the module must be disabled, otherwise the diagnostics will report wire break.

Parameter measuring type: **disabled**

- All diagnostics are suppressed.
- Sensitivity/distance values and switching states are set to ”0”.
- The sensor is switched off.

13.1.1 Group diagnostics parameter

If you enable group diagnostics, a pending diagnostic message is registered (see Chapter 6.1.6.8 or 6.2.6.2).

13.1.2 Synchronization group parameters

Features

- Sensors between different modules of the 4 IQ-SENSE may influence one another (e.g. by scattered light).
- To prevent this interference from adjacent sensors on different modules you can assign every module to a separate synchronization group with this parameter. Modules with different synchronization groups do not influence each other.
- Sensors on the same module cannot interfere with one another.

Function principle

The diagram below clarifies the functioning of the synchronization group parameter:

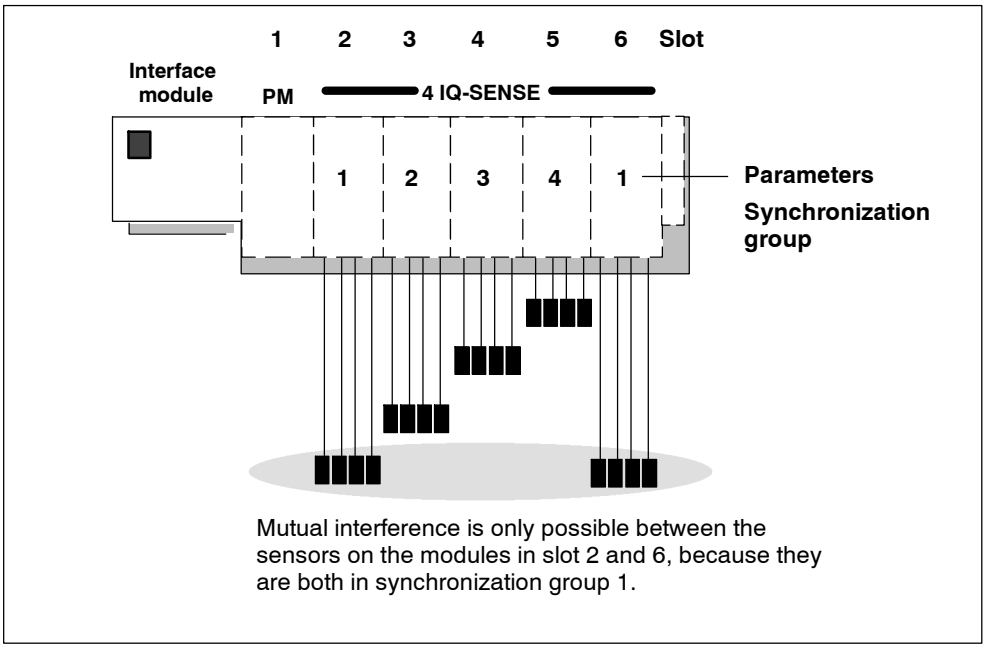


Figure 13-1 Synchronization group

Note

Sensors in the same synchronization groups must be installed so they are at the minimum distance apart (see sensor package insert) to ensure that mutual interference is prevented.

13.1.3 Sensor type parameter

Features

This parameter is used to specify the sensor type per channel:

- Reflection light barrier or
- reflection light probe or
- disabled

Reflection light probe

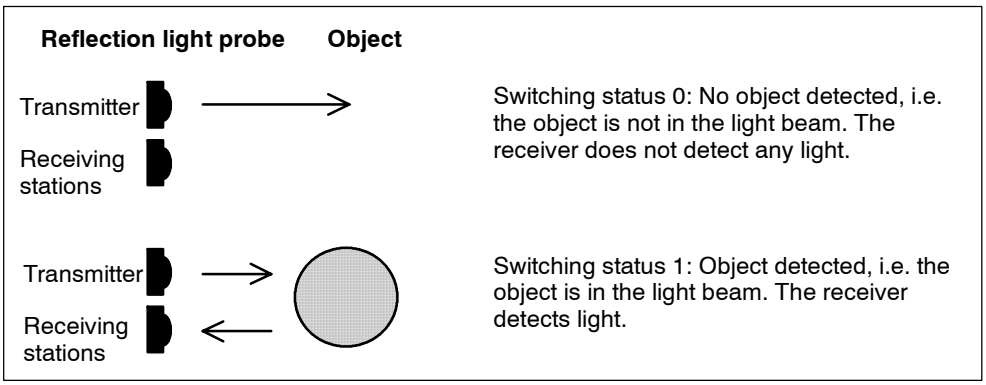


Figure 13-2 Reflection light probe

Reflection light barrier

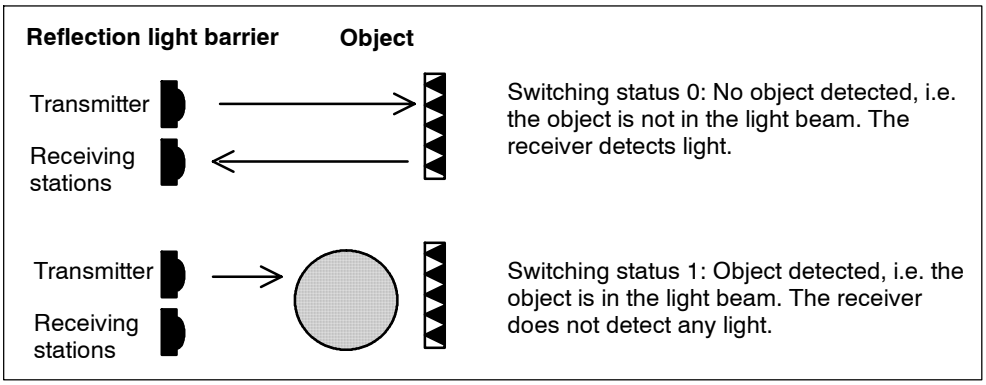


Figure 13-3 Reflection light barrier

13.1.4 Differential travel parameter

Features

”Signal flutter” may occur as a result of interference at the reflection light probe or during the production process. The measured value will swing around the switching threshold of 100% (object detected – object not detected). This flutter at the switching threshold can be prevented with the differential travel parameter. This will ensure a stable output signal at the sensor.

The ranges 5/ 10/ 20/ 50% can be configured as differential travel.

Prerequisites

The differential travel parameter can only be configured for reflection light probes with background shielding.

Function principle

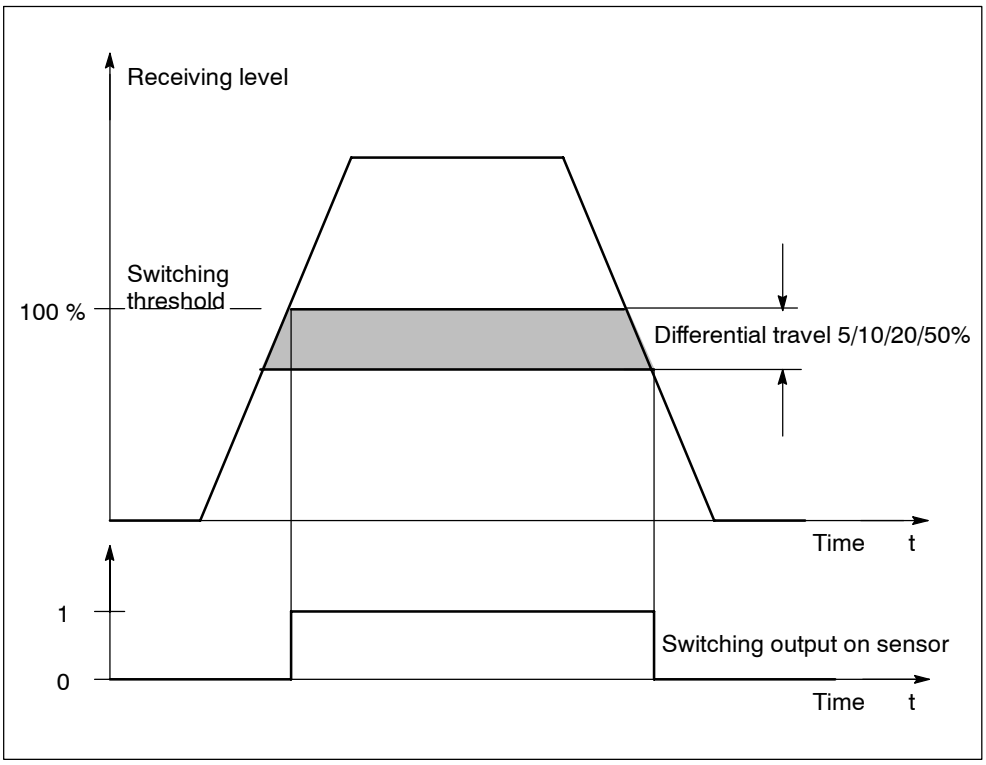


Figure 13-4 Differential travel parameter

13.1.5 Time functions, time value parameter

Features

This parameter can be used to configure the electronic module for the specific application.

Function principle

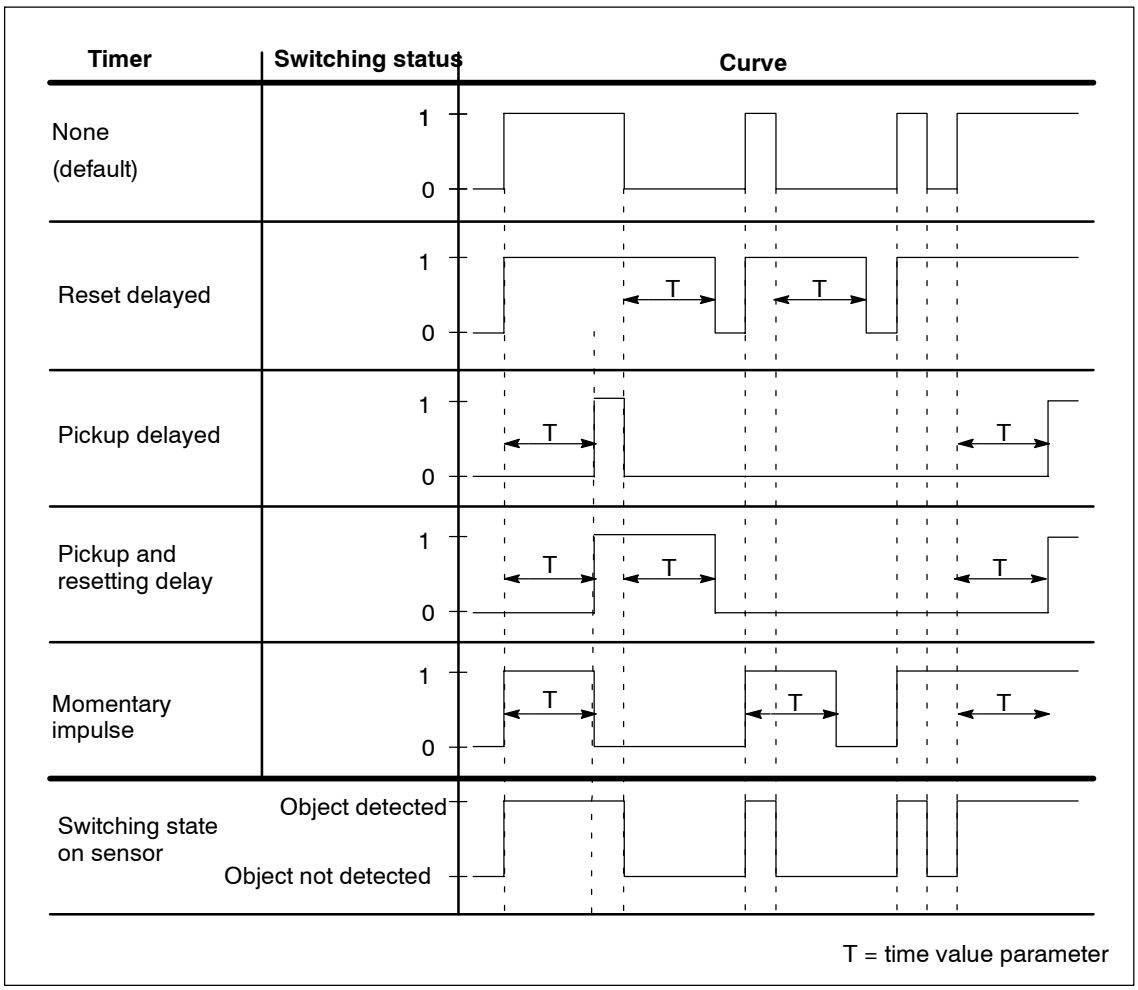


Figure 13-5 Time value, time functions parameter

13.1.6 Teach-in block parameter

Features

This parameter can be used to block the *Teach-in* button at the sensor.

13.2 Control (PIQ) and feedback interface (PII)

The addressing scope of the control and feedback interface of the 4 IQ-SENSE can be configured. You can select between **Standard** and **Enhanced**.

Standard properties

- The 4 IQ-SENSE occupies 4 bits in the feedback interface.
- The switching state for every channel can be evaluated via the feedback interface.

Enhanced properties

- The 4 IQ-SENSE occupies 1 byte in the control interface and 1 byte in the feedback interface
- The sensitivity/distance values for every channel can be preset with the control interface (*IntelliTeach* via FB ”IQ-SENSE Opto”) and *Teach-in* conducted.
- The learnt sensitivity/distance value /switching threshold) and the switching state can be evaluated for every channel via the feedback interface.

Requirements:

- The ”IQ-SENSE Opto” function block can be used. The function block enables easy access to the control and feedback interface.
- Please note that in this case PII is the same as PIQ.
- The function block and the associated product information can be downloaded from **http://www.ad.siemens.de/csi_e/gsd**.

Configuring address space

Address space	STEP 7 as of V5.1, ServicePack 3	STEP 7 as of V4.2 or COM PROFIBUS or other configuration software
Standard	Select the entry **4IQ-SENSE Opto S** in the HW CONFIG hardware catalog	Select the entry **S 6ES7 138-4GA00-0AB0** IQ-SENSE Opto from the GSD file
Enhanced	Select the entry **4IQ-SENSE Opto E** in the HW CONFIG hardware catalog	Select the entry **E 6ES7 138-4GA00-0AB0** IQ-SENSE Opto from the GSD file

13.2.1 Standard

Feedback interface (PII)

Table 13-2 Standard feedback interface

Address	Assignment
Byte 0	Bit 7: 0 (not assigned)
	Bit 6: 0 (not assigned)
	Bit 5: 0 (not assigned)
	Bit 4: 0 (not assigned)
	Bit 3: sensor switching status on channel 3 1: object detected 0: object not detected
	Bit 2: sensor switching status on channel 2 1: object detected 0: object not detected
	Bit 1: sensor switching status on channel 1 1: object detected 0: object not detected
	Bit 0: sensor switching status on channel 0 1: object detected 0: object not detected

13.2.2 Enhanced

Feedback interface (PII)

Table 13-3 Enhanced feedback interface

Address	Assignment	Designation on "IQ-SENSE Opto" function block
Byte 0	**Bit 0:** sensor switching status on channel 0 1: object detected 0: object not detected	Q_CH0
	Bit 1 to bit 7: Learned sensitivity/distance value on channel 0 by **Teach-in ***	TEACH_VAL_OUT

Table 13-3 Enhanced feedback interface

Address	Assignment	Designation on "IQ-SENSE Opto" function block
Byte 1	**Bit 0:** sensor switching status on channel 1 1: object detected 0: object not detected	Q_CH1
	Bit 1 to bit 7: Learned sensitivity/distance value on channel 1 by **Teach-in** *	TEACH_VAL_OUT
Byte 2	**Bit 0:** sensor switching status on channel 2 1: object detected 0: object not detected	Q_CH2
	Bit 1 to bit 7: Learned sensitivity/distance value on channel 2 by **Teach-in** *	TEACH_VAL_OUT
Byte 3	**Bit 0:** sensor switching status on channel 3 1: object detected 0: object not detected	Q_CH3
	Bit 1 to bit 7: Learned sensitivity/distance value on channel 3 by **Teach-in** *	TEACH_VAL_OUT

* The current sensitivity/distance value is registered:
- after completion of Teach-in at the sensor
- after completion of Teach-in via the "IQ-SENSE Opto" function block

Control interface (PIQ)

Table 13-4 Enhanced control interface

Address	Assignment	Designation on "IQ-SENSE Opto" function block
Byte 0	**Set sensitivity/distance value at channel 0** • **Bit 0:** 1: Sensitivity/distance value transferred to sensor on channel 0 (by rising edge) 0: disabled	WR_TEACH_VAL
	• **Bit 1 to bit 7:** sensitivity/distance value at channel 0 1 to 126, (sensor-dependent)	TEACH_VAL_IN
	Teach-in at sensor channel 0 • **Bit 0:** 1: Start Teach-in at sensor channel 0 (by rising edge) 0: disabled	START_TEACH
	• **Bit 1 to bit 7:** 0	
Byte 1	**Set sensitivity/distance value at channel 1** • **Bit 0:** 1: Sensitivity/distance value transferred to sensor on channel 1 (by rising edge) 0: disabled	WR_TEACH_VAL
	• **Bit 1 to bit 7:** sensitivity/distance value at channel 1 1 to 126 (sensor-dependent)	TEACH_VAL_IN
	Teach-in at sensor channel 1 • **Bit 0:** 1: Start Teach-in at sensor channel 1 (by rising edge) 0: disabled	START_TEACH
	• **Bit 1 to bit 7:** 0	
Byte 2	**Set sensitivity/distance value at channel 2** • **Bit 0:** 1: Sensitivity/distance value transferred to sensor on channel 2 (by rising edge) 0: disabled	WR_TEACH_VAL
	• **Bit 1 to bit 7:** sensitivity/distance value at channel 2 1 to 126 (sensor-dependent)	TEACH_VAL_IN
	Teach-in at channel 2 • **Bit 0:** 1: Start Teach-in at sensor channel 2 (by rising edge) 0: disabled	START_TEACH
	• **Bit 1 to bit 7:** 0	

Table 13-4 Enhanced control interface

Address	Assignment	Designation on "IQ-SENSE Opto" function block
Byte 3	**Set sensitivity/distance value at channel 3** • **Bit 0:** 1: Sensitivity/distance value transferred to sensor on channel 3 (by rising edge) 0: disabled • **Bit 1 to bit 7:** sensitivity/distance value at channel 3 1 to 126 (sensor-dependent)	WR_TEACH_VAL TEACH_VAL_IN
	Teach-in at sensor channel 3 • **Bit 0:** 1: Start Teach-in at sensor channel 3 (by rising edge) 0: disabled • **Bit 1 to bit 7:** 0	START_TEACH

Mode of Operation: Preset of a sensitivity/distance value (IntelliTeach)

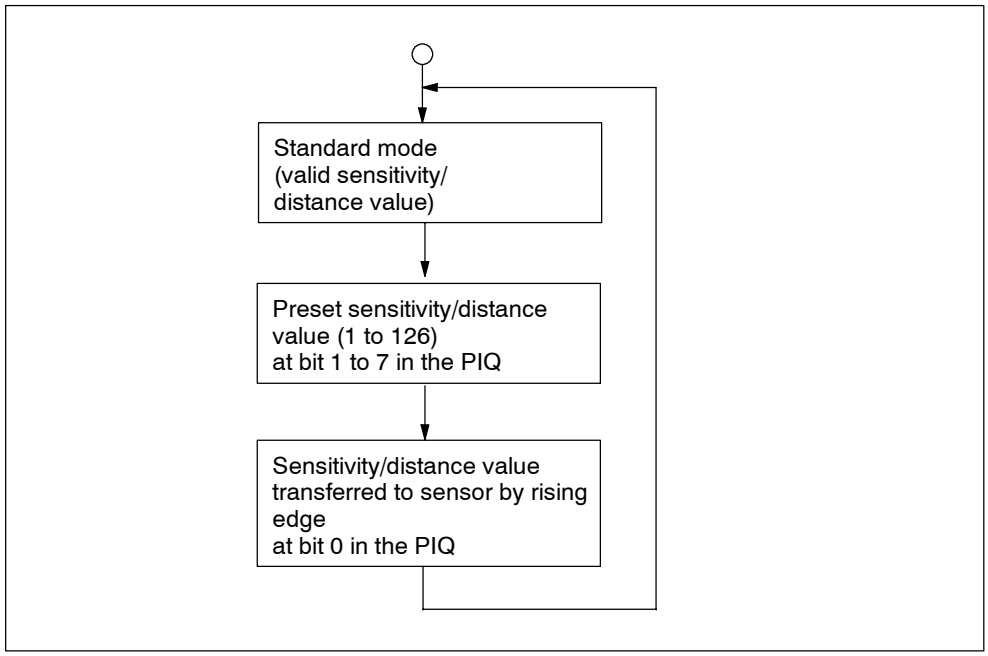


Figure 13-6 Mode of Operation: Preset of a sensitivity/distance value (IntelliTeach)

Mode of Operation: Teach-in

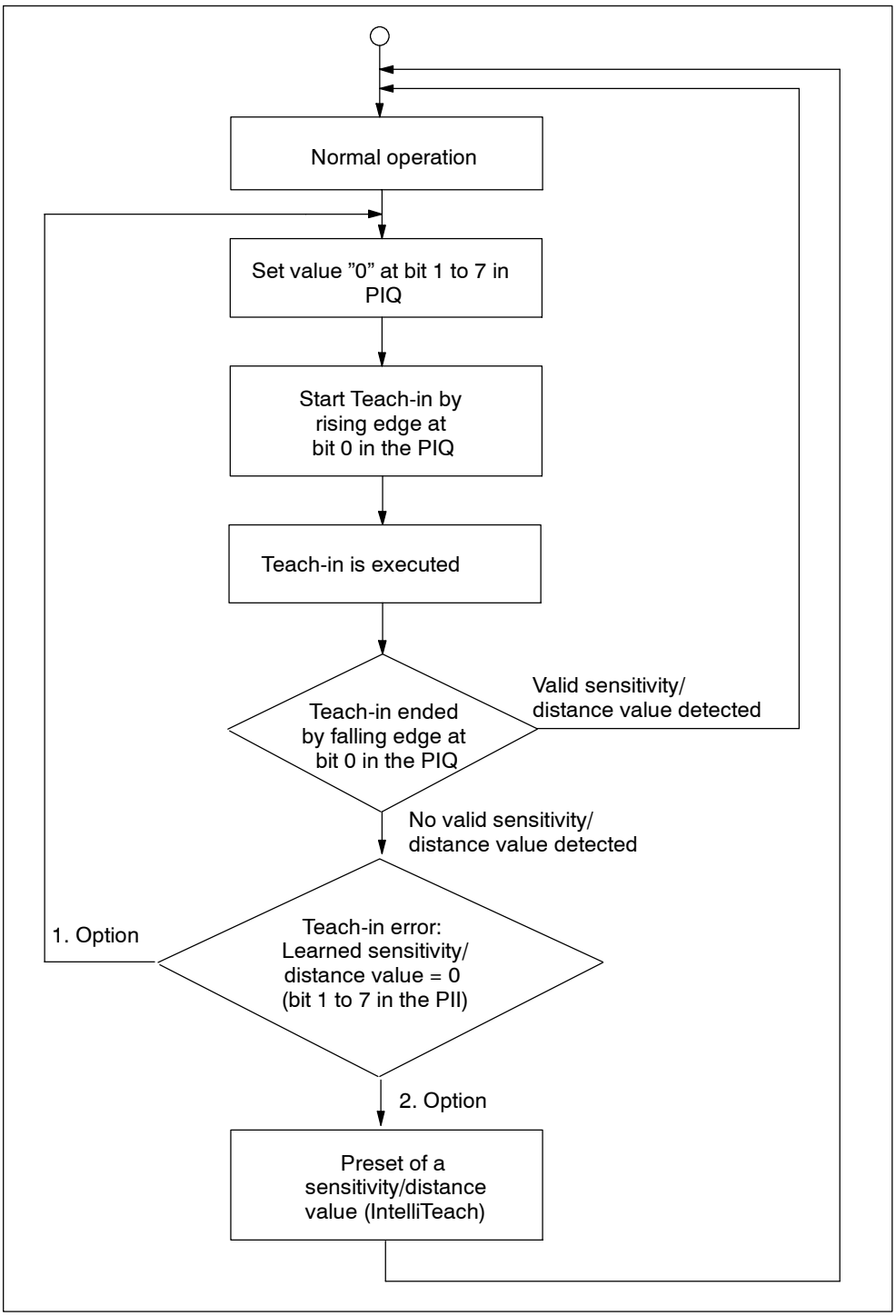
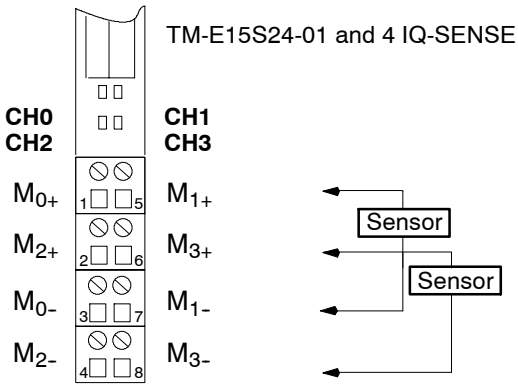
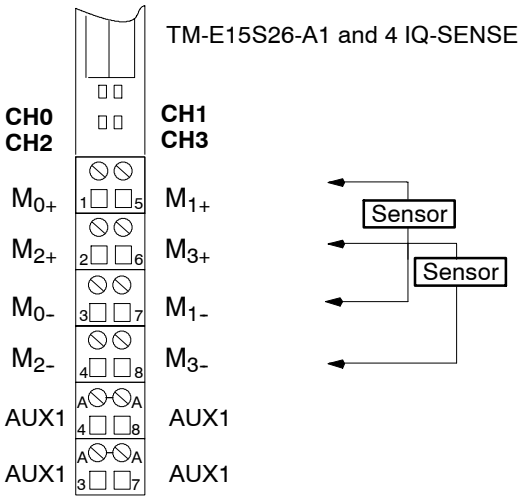


Figure 13-7 Mode of Operation: Teach-in

13.3 Terminal assignment

The following table shows the terminal assignment of the 4 IQ-SENSE for the various terminal modules:

Table 13-5 Terminal assignment of the 4 IQ-SENSE

View	Terminal assignment	Remarks
		Channel 0: Terminals 1 and 3 Channel 1: Terminals 5 and 7 Channel 2: Terminals 2 and 4 Channel 3: Terminals 6 and 8 M_+: Input signal "+" M_-: Input signal "–"
		Channel 0: Terminals 1 and 3 Channel 1: Terminals 5 and 7 Channel 2: Terminals 2 and 4 Channel 3: Terminals 6 and 8 M_+: Input signal "+" M_-: Input signal "–"

Note

- The connections to the sensors cannot be reversed.
- The minimum wiring cross secton for the sensors is 0.25 mm^2
- Connecting cables for the sensors can be found in Chapter A.

13.4 Block diagram

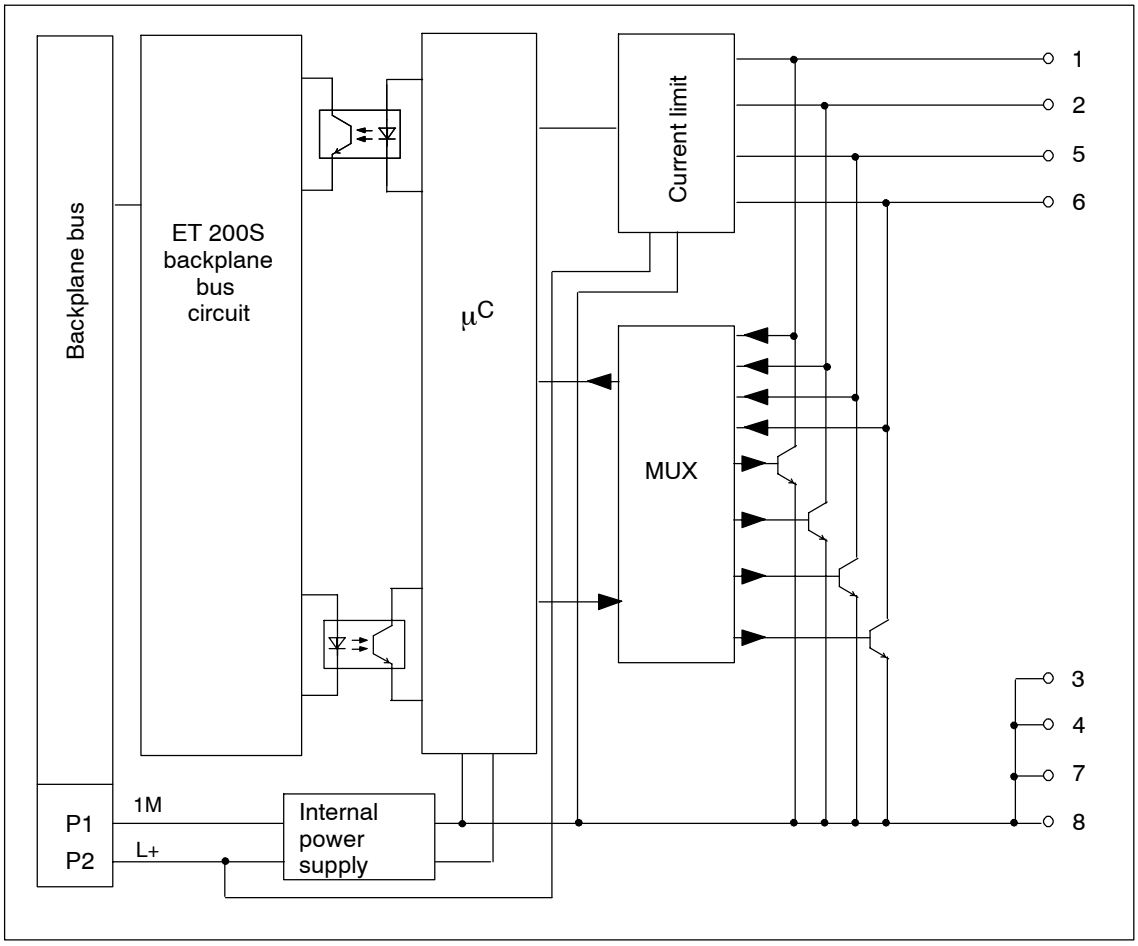


Figure 13-8 Block diagram of the 4 IQ-SENSE

13.5 Technical specifications

Dimensions and weight	
Dimensions W x H x D (mm)	15 x 81 x 52
Weight	Approx. 35g
Module-specific data	
Number of inputs	4
Cable length	
• Unshielded	max. 50m (164 ft)
• shielded	max. 50m (164 ft)
Voltages, currents, electrical potentials	
Rated supply voltage (from power module)	24 VDC
• Polarity reversal protection	Yes
Electrical isolation	
• Between the channels	No
• Between channels and backplane bus	Yes
Permissible potential difference	
• Between different circuits	75 VDC, 60 VAC
Insulation tested with	500 VDC
Current consumption	
• From power supply	max. 0.3A (164 ft)
Power loss of the module	Typically 0.85 W

Status, interrupts, diagnostics	
Status display	Green LED per channel
Diagnostic functions	
• Group error	red LED ”SF”
• Reading of diagnostic data	Yes
Data for selecting an sensor	
Connectable sensors	Photoelectric proximity switch with IQ-SENSE
Reaction times	
Cycle time	max. 3.24 ms

RESERVE modules

14

Order number

6ES7 138-4AA00-0AA0 (installation width 15 mm)

6ES7 138-4AA10-0AA0 (installation width 30 mm)

Features

The RESERVE module has the following features:

- suitable for all TM-E terminal modules (installation width 15 mm and 30 mm)
- reserved for a slot on any electronic module. Insert the RESERVE module into the reserved slot of the ET 200S configuration.

Note

- Note the following with the IM 151 (6ES7 151-1AA01-0AB0, 6ES7 151-1AA02-0AB0), IM 151 FO (6ES7 151-1AB00-0AB0, 6ES7 151-1AB01-0AB0) and IM 151/ CPU (6ES7 151-7AA00-0AB0): If an electronic module is removed and replaced with a RESERVE module while the ET 200S is operating, the power supply must be cycled at the POWER ON/POWER OFF interface module.
- Note the following with the IM 151 (6ES7 151-1AA00-0AB0): The RESERVE module cannot be installed in the ET 200S.

Configuration (without option handling)

- In STEP 7 or COM PROFIBUS configure the desired electronic module in the RESERVE module slot that you want to use for future applications, e. g. 4DI DC High Feature.
  - Drag the module to the configuration table
  - Set the parameters

- Configure the interface module as follows:

Parameters	Setting
Operation at Preset <> Actual configuration	enabled

- If you have configured an electronic module with inputs for the RESERVE module, the following substitute values are reported:
  - Digital Input Modules: 0
  - Analog Input Modules: $7FFF_H$
  - Function Module: 0

Note

If you use the RESERVE module,

- the SF LED lights up on the interface module
- a channel-related diagnosis and module status "10_B: incorrect module" is returned for that slot of the RESERVE module.

For the functioning and configuration with option handling see Chapter 3.8.

Terminal assignment

The RESERVE module is not connected to the terminals of the TM-E terminal module. This means that the TM-E terminal module can be fully wired and prepared for the future application.

Technical data

Dimensions and weight	
Dimensions W x H x D (mm)	15 x 81 x 52
	30 x 81 x 52
Weight	approx. 33 g (installation width 15 mm)
	approx. 55g (installation width 30 mm)
Voltages, currents, electrical potentials	
Power loss of the module	Typically 0.025 W

Status, Interrupts, Diagnostics	
Status display	No
Diagnostic functions	No

Order Numbers

A

Introduction

You will find below the order numbers for the ET 200S distributed I/O system and the PROFIBUS accessories that you may need to use with the ET 200S.

Interface module

Table A-1 Interface module order numbers

Designation	Order number
IM151-1 BASIC interface module and terminating module, 1 unit	6ES7 151-1CA00-0AB0
IM151-1 STANDARD interface module and terminating module, 1 unit	6ES7 151-1AA04-0AB0
IM151-1 FO STANDARD interface module and terminating module, 1 unit	6ES7 151-1AB03-0AB0
IM151-1 HIGH FEATURE interface module and terminating module, 1 unit	6ES7 151-1BA00-0AB0
IM151-3 PN interface module and terminating module, 1 unit	6ES7 151-3AA00-0AB0

Terminal module

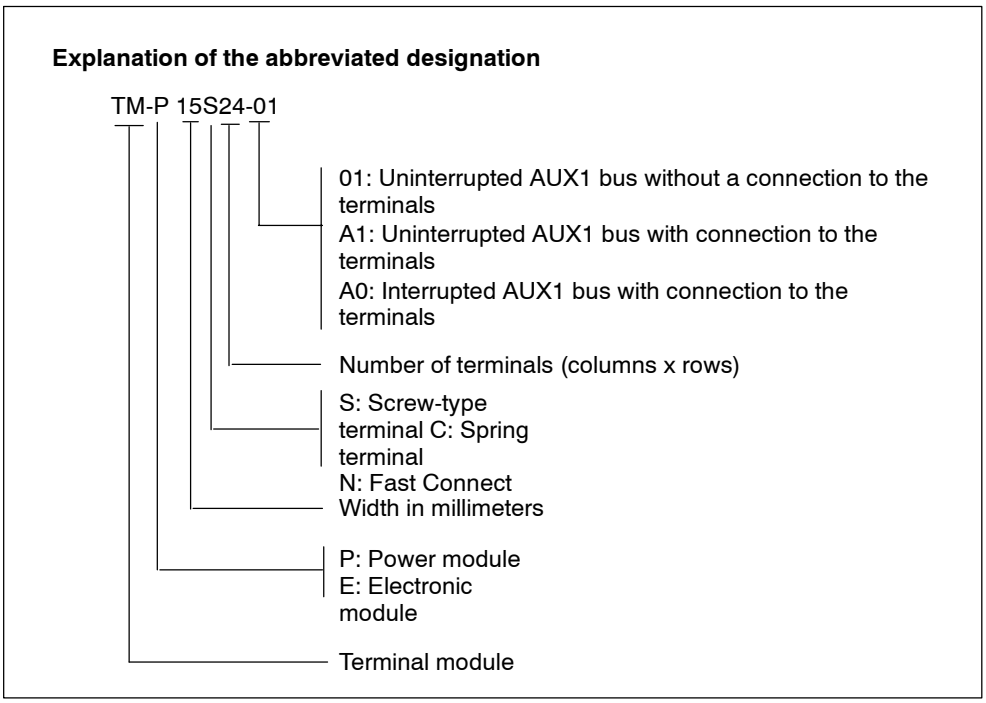


Figure A-1 Explanation of the abbreviated designation

Table A-2 Terminal module order numbers

Designation	Order number
TM-P15S23-A1 (screw-type terminal), 1 unit	6ES7 193-4CC20-0AA0
TM-P15S23-A1 (spring terminal), 1 unit	6ES7 193-4CC30-0AA0
TM-P15N23-A1 (Fast Connect), 1 unit	6ES7 193-4CC70-0AA0
TM-P15S23-A0 (screw-type terminal), 1 unit	6ES7 193-4CD20-0AA0
TM-P15C23-A0 (spring terminal), 1 unit	6ES7 193-4CD30-0AA0
TM-P15N23-A0 (Fast Connect), 1 unit	6ES7 193-4CD70-0AA0
TM-P15S22-01 (screw-type terminal), 1 unit	6ES7 193-4CE00-0AA0
TM-P15C22-01 (spring terminal), 1 unit	6ES7 193-4CE10-0AA0
TM-P15N22-01 (Fast Connect), 1 unit	6ES7 193-4CE60-0AA0
TM-P30S44-A0 (screw-type terminal), 1 unit	6ES7 193-4CK20-0AA0
TM-P30C44-A0 (screw-type terminal), 1 unit	6ES7 193-4CK30-0AA0
TM-PF30S47-F1 (screw-type terminal), 1 unit	3RK1 903-3AA00
TM-E15S26-A1 (screw-type terminal), 5 units	6ES7 193-4CA40-0AA0
TM-E15C26-A1 (spring terminal), 5 units	6ES7 193-4CA50-0AA0
TM-E15N26-A1 (Fast Connect), 5 units	6ES7 193-4CA80-0AA0
TM-E15S24-A1 (screw-type terminal), 5 units	6ES7 193-4CA20-0AA0
TM-E15C24-A1 (spring terminal), 5 units	6ES7 193-4CA30-0AA0

Table A-2 Terminal module order numbers, continued

Designation	Order number
TM-E15N24-A1 (Fast Connect), 5 units	6ES7 193-4CA70-0AA0
TM-E15S24-01 (screw-type terminal), 5 units	6ES7 193-4CB20-0AA0
TM-E15C24-01 (spring terminal), 5 units	6ES7 193-4CB30-0AA0
TM-E15N24-01 (Fast Connect), 5 units	6ES7 193-4CB70-0AA0
TM-E15S23-01 (screw-type terminal), 5 units	6ES7 193-4CB00-0AA0
TM-E15C23-01 (spring terminal), 5 units	6ES7 193-4CB10-0AA0
TM-E15N23-01 (Fast Connect), 1 unit	6ES7 193-4CB60-0AA0
TM-E15S24-AT (screw-type terminal), 5 units	6ES7 193-4CL20-0AA0
TM-E15C24-AT (spring terminal), 5 units	6ES7 193-4CL30-0AA0
TM-E30S44-01 (screw-type terminal), 1 unit	6ES7 193-4CG20-0AA0
TM-E30C44-01 (screw-type terminal), 1 unit	6ES7 193-4CG30-0AA0
TM-E30S46-A1 (screw-type terminal), 1 unit	6ES7 193-4CF40-0AA0
TM-E30C46-A1 (spring terminal), 1 unit	6ES7 193-4CF50-0AA0

Power modules

Table A-3 Power module order numbers

Name	Order number
PM-E 24 VDC, 1 unit	6ES7 138-4CA00-0AA0
PM-E 24-48 VDC/24-230 VAC, 1 unit	6ES7 138-4CB10-0AB0
PM-E 24-48 VDC, 1 unit	6ES7 138-4CA50-0AB0

Digital Electronic Modules

Table A-4 Digital electronic module order numbers

Name	Order number
2DI 24 VDC Standard, 5 units	6ES7 131-4BB00-0AA0
4DI 24 VDC Standard, 5 units	6ES7 131-4BD00-0AA0
4DI 24 VDC/SRC Standard, 5 units	6ES7 131-4BD50-0AA0
2DI 24 VDC High Feature, 5 units	6ES7 131-4BB00-0AB0
4DI 24 VDC High Feature, 5 units	6ES7 131-4BD00-0AB0
4DI 24-48 VUC High Feature, 5 units	6ES7 131-4CD00-0AB0
4DI NAMUR	6ES7 131-4RD00-0AB0
2DI 120 VAC Standard, 5 units	6ES7 131-4EB00-0AB0
2DI 230 VAC Standard, 5 units	6ES7 131-4FB00-0AB0
2DO 24 VDC/0.5 A Standard, 5 units	6ES7 132-4BB00-0AA0

Table A-4 Digital electronic module order numbers, Fortsetzung

Name	Order number
4DO 24 VDC/0.5 A Standard, 5 units	6ES7 132-4BD00-0AA0
2DO 24 VDC/0.5 A High Feature, 5 units	6ES7 132-4BB00-0AB0
2DO 24 VDC/2 A Standard, 5 units	6ES7 132-4BB30-0AA0
4DO 24 VDC/2 A Standard, 5 units	6ES7 132-4BD30-0AA0
2DO 24 VDC/2 A High Feature, 5 units	6ES7 132-4BB30-0AB0
2DO 24–230 VAC/2 A, 5 units	6ES7 132-4FB00-0AB0
2RO NO 24–120 VDC/5 A, 24–230 VAC/5 A, 5 units	6ES7 132-4HB00-0AB0
2RO NO/NC 24–48 VDC/5 A, 24–230 VAC/5 A, 5 units	6ES7 132-4HB10-0AB0
4 IQ-SENSE, 5 units	6ES7 138-4GA00-0AB0

Analog electronic modules

Table A-5 Analog electronic module order numbers

Name	Order number
2AI U Standard, 1 unit	6ES7 134-4FB00-0AB0
2AI U High Feature, 1 unit	6ES7 134-4LB00-0AB0
2AI U High Speed, 1 unit	6ES7 134-4FB51-0AB0
2AI I 2WIRE Standard, 1 unit	6ES7 134-4GB00-0AB0
4AI I 2WIRE Standard, 1 unit	6ES7 134-4GD00-0AB0
2AI I 2WIRE High Speed, 1 unit	6ES7 134-4GB51-0AB0
2AI I 4WIRE Standard, 1 unit	6ES7 134-4GB10-0AB0
2AI I 2/4WIRE High Feature, 1 unit	6ES7 134-4MB00-0AB0
2AI I 4WIRE High Speed, 1 unit	6ES7 134-4GB61-0AB0
2AI RTD Standard, 1 unit	6ES7 134-4JB50-0AB0
2AI RTD High Feature, 1 unit	6ES7 134-4NB50-0AB0
2AI TC Standard, 1 unit	6ES7 134-4JB00-0AB0
2AI TC High Feature, 1 unit	6ES7 134-4NB00-0AB0
2AO U Standard, 1 unit	6ES7 135-4FB00-0AB0
2AO U High Feature, 1 unit	6ES7 135-4LB01-0AB0
2AO I Standard, 1 unit	6ES7 135-4GB00-0AB0
2AO I High Feature, 1 unit	6ES7 135-4MB01-0AB0

Process-related modules

Table A-6 Process-related module order numbers

Name	Order number
1Count 24V/100kHz, 1 unit	6ES7 138-4DA03-0AB0
1Count 5V/500kHz, 1 unit	6ES7 138-4DE01-0AB0
1 SSI, 1 unit	6ES7 138-4DB01-0AB0
1 STEP 5 V/204 kHz, 1 unit	6ES7 138-4DC00-0AB0
2PULSE, 1 unit	6ES7 138-4DD00-0AB0
1POS INC/Digital	6ES7 138-4DG00-0AB0
1POS SSI/Digital	6ES7 138-4DH00-0AB0
1POS INC/Analog	6ES7 138-4DJ00-0AB0
1POS INC/Analog	6ES7 138-4DK00-0AB0
1SI 3964/ASCII serial interface module	6ES7 138-4DF00-0AB0
1SI Modbus/USS serial interface module	6ES7 138-4DF10-0AB0
SIWAREX CS approximation module	7MH4 910-0AA01

RESERVE modules

Table A-7 Reserve module order numbers

Name	Order number
RESERVE (with 15mm), 5 unit	6ES7 138-4AA00-0AA0
RESERVE (with 30 mm), 1 unit	6ES7 138-4AA10-0AA0

ET 200S accessories

Table A-8 ET 200S accessories order numbers

Name	Order number
Shield contact:	
Shield contact element, 5 units	6ES7 193-4GA00-0AA0
Power rail, 1 units at 1 m, 3x10 mm	8WA2 842
Shield terminal, 5 units	6ES7 193-4GB00-0AA0
Ground connection terminal	8WA2 868
DIN A4 labeling sheet, white, 10 units	6ES7 193-4BA00-0AA0
DIN A4 labeling sheet, red, 10 units	6ES7 193-4BD00-0AA0
DIN A4 labeling sheet, yellow, 10 units	6ES7 193-4BB00-0AA0
DIN A4 labeling sheet, petrol, 10 units	6ES7 193-4BH00-0AA0
Color identification labels (10 strips each containing 20 items in each color)	
• White	6ES7 193-4LA10-0AA0
• Red	6ES7 193-4LD10-0AA0
• Yellow	6ES7 193-4LB10-0AA0
• yellow-green	6ES7 193-4LC10-0AA0
• Brown	6ES7 193-4LG10-0AA0
• Blue	6ES7 193-4LF10-0AA0
• Turquoise	6ES7 193-4LH10-0AA0
Slot number labels, 10x (1 to 20), 200 units	8WA8 861-0AB
Slot number labels, 5x (1 to 40), 200 units	8WA8 861-0AC
Terminating module, 1 unit	6ES7 193-4JA00-0AA0

Network components for the ET 200S

The tables below list all the network components for the ET 200 distributed I/O system that you may require to use the ET 200S.

Table A-9 Network components (PROFIBUS DP) for ET 200S order numbers

Name	Order number
RS 485 repeater, PROFIBUS DP, IP20	6ES7 972-0AA00-0XA0
PROFIBUS bus connector (12 Mbps)	
• Anthracite (without programming port)	6ES7 972-0BA11-0XA0
• Anthracite (with programming port)	6ES7 972-0BB11-0XA0
Bus cable	
• Normal	6XV1 830-0EH10
• Drum cable	6XV1 830-3BH10
• Direct-buried cable	6XV1 830-3AH10
Repeater adapter	6GK1 510-1AA00
Active RS 485 terminating element	6ES7 972-0DA00-0AA0
Optical link modules for glass fiber-optic cable	6GK1 502-3AB10 6GK1 502-4AB10
PROFIBUS connecting cable	6ES7 901-4BD00-0XA0
Fiber-optic cable	
• SIMATIC NET PROFIBUS plastic fiber-optic, duplex core (50 m ring)	6XV1 821-2AN50
• SIMATIC NET PROFIBUS plastic fiber-optic, standard cable by the meter 50 m ring 100 m ring	 6XV1 821-0AH10 6XV1 821-0AN50 6XV1 821-0AT10
• SIMATIC NET PROFIBUS PCF fiber-optic, standard cable various lengths from 50 m to 300 m	6XV1 821-1Bxxx
Plugs for fiber-optic cable	
• Package of 100 simplex plugs and 5 polishing sets	6GK1 901-0FB00-0AA0
• Package of 50 plug adapters	6ES7 195-1BE00-0XA0

Table A-10 Network components (PROFINET I/O) for ET 200S order numbers

Name	Order number
Industrial Ethernet FC RJ45 plug 90 (RJ45-connector for Industrial Ethernet with robust metal case and integrated insulation-piercing contacts for connection of Industrial Ethernet FC installation cables; with 90° cable outlet	
• 1 unit	6GK1 901-1BB20-2AA0
• 10 units	6GK1 901-1BB20-2AB0
• 50 units	6GK1 901-1BB20-2AE0
Industrial Ethernet Fast Connect installation lines	
• Fast Connect standard cable	6XV1 840-2AH10
• Fast Connect trailing cable	6XV1 840-3AH10
• Fast Connect marine cable	6XV1 840-4AH10
Industrial Ethernet Fast Connect stripping tool	6GK1 901-1GA00

Spare parts

Table A-11 Fuse for digital input module and power module

Name	Order number
Fuse for 4DI 24-48 VUC HF	
• ET200S Spare Fuse Kit 1 A, (10 ea.)	6ES7 193-4KA00-0AA0
Fuse for PM-E 24-48 VDC/24-230 VAC	
• ET200S Spare Fuse Kit 10 A, (ea.)	6ES7 193-4KA10-0AA0

Connecting cable for 4 IQ-SENSE electronic module

The following table contains the connecting cables for the sensors on the 4 IQ-SENSE electronic module. You will also find these connecting cables in the NS BERO catalog (in the chapter on 3RX1 plug connections).

Table A-12 Connecting cable for 4 IQ-SENSE electronic module

Name	Order number
Cable box (M12) for screw-type attachment with 5 m PUR connecting cable 3 x 0.34 mm^2	3RX1 533
Cable box (M12) for screw-type attachment with 5 m PUR connecting cable 4 x 0.34 mm^2	3RX1 536

Distributed I/O system ET 200S manuals

Table A-13 ET 200S documentation packages or manuals

Name	Order number
The ET 200S documentation package consists of • *ET 200S Distributed I/O System* manual • *ET 200S Motor Starter* manual • *PROFINET* system description • *From PROFIBUS DP to PROFINET I/O* programming manual	6ES7 151-1AA10-8xA0[1)]
ET 200S Interface Module IM 151-7 CPU manual and operation list	6ES7 151-1AB00-8xA0[1)]
ET 200S Technological Functions manual	6ES7 151-1AC00-8xA0[1)]
ET 200S Positioning manual	6ES7 151-1AD00-8xA0[1)]
ET 200S Serial Interface Module manual	6ES7 151-1AE00-8xA0[1)]
ET 200S Distributed I/O System Fail-safe Modules manual	available in the Internet only
ET 200S Frequency Converter FC documentation package consisting of • *ET 200S FC Frequency Converter Operating Manual* • *ET 200S Frequency Converter FC List manual* (In preparation)	6SL3 298-0CA12-0xP0[1)]
ET 200S Frequency Converter FC documentation package consisting of • *ET 200S Distributed I/O System manual* • *ET 200S FC Frequency Converter Operating Manual* • *ET 200S Frequency Converter FC List manual* (In preparation)	6SL3 298-0CA12-1xP0[1)]

1) x= language designation for order numbers
The documentation packages or manuals can only be ordered in German and English. In addition, the languages French, Spanish and Italian are available in the Internet (see Service & Support in the Internet)

STEP 7 and SIMATIC S7 manuals

To program and commission the ET 200S with *STEP 7*, you require one of the following manuals.

Table A-14 STEP 7 and SIMATIC S7 manuals

Name	Contents
S7 300 Programmable Controller documentation package consisting of:	For example,
• Reference manual – CPU data: CPU 312 IFM to 318-2 DP and operation list – CPU Data: CPU 31xC and CPU 31x and operation list	• Operating instructions and a description of the functions and technical specifications of the CPUs • List of the instruction set of CPUs and their execution times. List of executable blocks and their execution times
• Manual – CPU 31xC: Process-related functions including CD with examples	• Description of the different process-related functions
• Installation manual – Automation system S7-300: Installation: CPU 312 IFM to 318-2 DP – Automation system S7-300: Installation: CPU 31xC and CPU 31x	• Description of the configuration, mounting, wiring, networking and commissioning of an S7-300
• Reference manual: – S7-300 Programmable Controller Module Specifications	• Functional descriptions and technical specifications of the signal modules, power supply modules and interface modules
• Getting Started	• Examples of different commissioning steps leading up to a functional application

Table A-14 STEP 7 and SIMATIC S7 manuals, continued

Name	Contents
S7 F/FH Programmable Controllers manual	For example, • Description of the tasks that have to be executed to create and commission a fail-safe S7 F Systems system
S7 Distributed Safety Configuration and Programming manual	For example, • Description of the tasks that have to be executed to create and commission a fail-safe S7 Distributed Safety system
Automation systems S7-400, M7-400 *Hardware and Installation*	For example, • Description of the PROFIBUS DP master interface in S7-400 and M7-400 • Structure of a PROFIBUS DP network • RS 485 repeater
System software for S7-300/400 *Program Design* *Programming Manual*	Among other things: Description of addressing and diagnostics in SIMATIC S7
System software for S7-300/400 *System and standard functions* *Reference manual*	Description of the SFCs in *STEP 7*
Description	SIMATIC NET PROFIBUS networks laying of lines and cables (primarily)

ET 200 manual in SIMATIC S5

To program and commission the ET 200S with *STEP 7* and *COM PROFIBUS*, you need the following manual.

Table A-15 STEP 7 and SIMATIC S7 manuals

Name	Contents
ET 200 Distributed I/O System	For example, • Description of the IM308-C master interface for S5-115U/H, S5-135U, and S5-155U/H • Description of the S5-95U with the PROFIBUS DP master interface • Description of the procedure for installing a DP system and an FMS system with the CP 5412 (A2) as master • Handling *COM PROFIBUS* • Working with the FB IM308C/FB 230

Technical guide to PROFIBUS DP with SIMATIC S7 and STEP 7

Table A-16 Technical Guide to PROFIBUS DP and SIMATIC S7

Technical guide	Order Numbers	Contents
Decentralizing with PROFIBUS DP – Aufbau, Projektierung und Einsatz des PROFIBUS–DP mit SIMATIC S7 (Structure, Configuration, and Use of the PROFIBUS DP with the SIMATIC S7) Josef Weigmann, Gerhard Kilian Publicis MCD Verlag, 1998	In bookshops: ISBN 3-89578-074-X At your SIEMENS branch: A19100-L531-B714	Instruction manual for a simple introduction to the PROFIBUS DP and implementation of automation tasks with the PROFIBUS DP and SIMATIC S7. Use of the PROFIBUS DP is illustrated for the SIMATIC S7 with a large number of practical examples.

Dimension Drawings

B

Introduction

You will find below dimension drawings of the most important components of the ET 200S.

Minimum clearances for installation, wiring, and ventilation

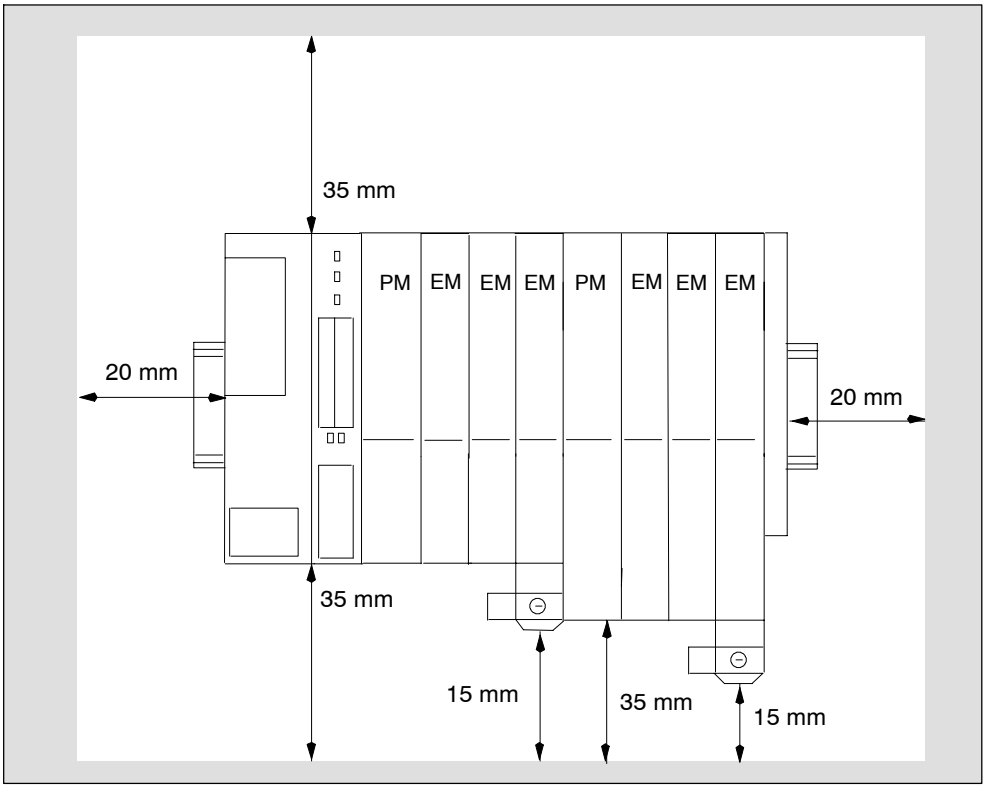


Figure B-1 Minimum clearances

Interface modules

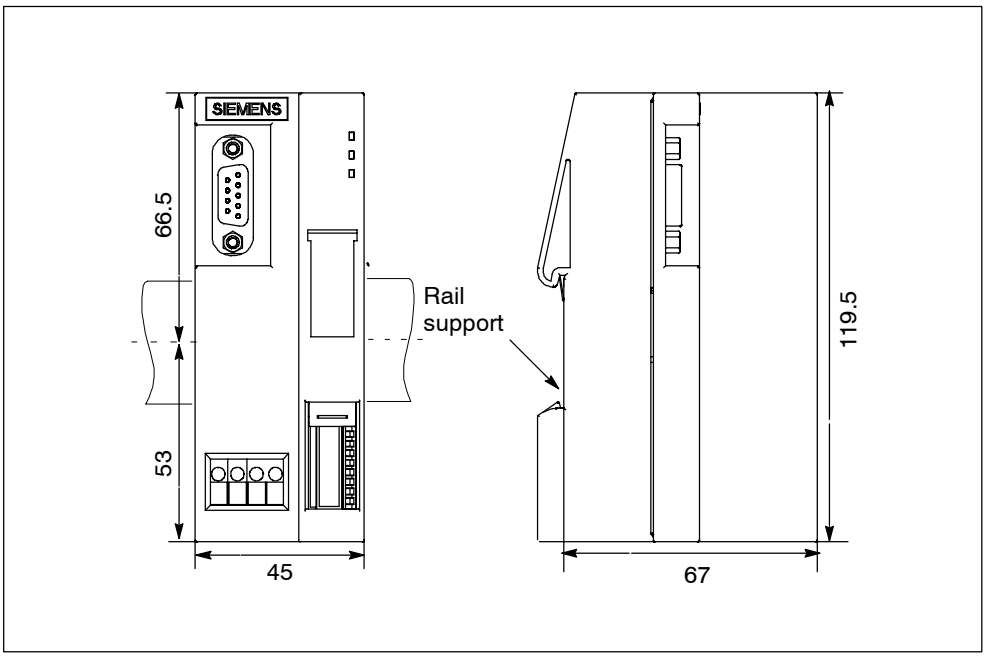


Figure B-2 IM151-1 interface module dimension drawing

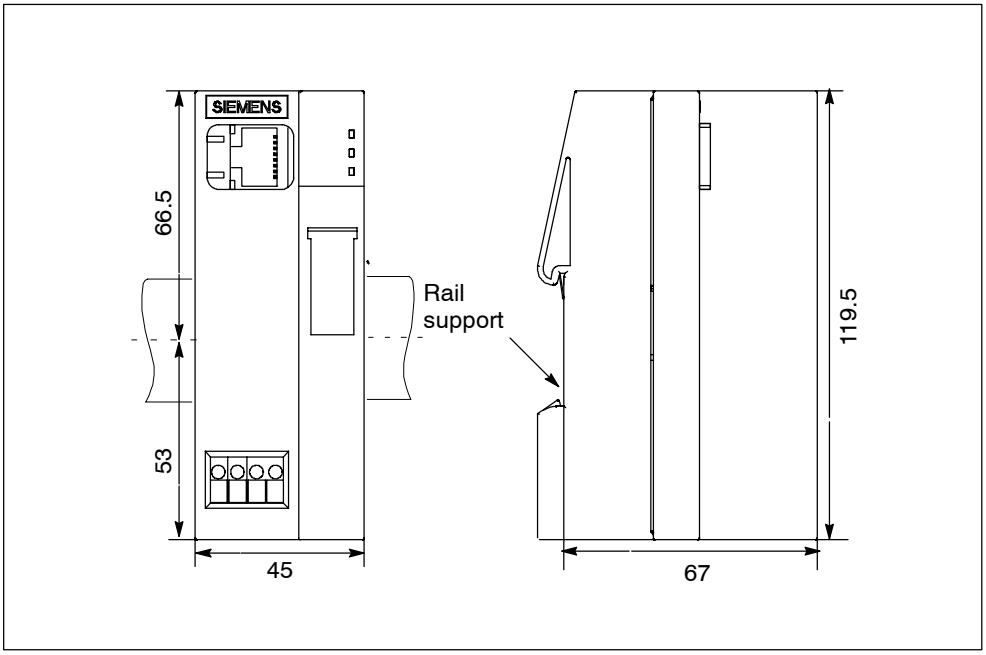


Figure B-3 Interface Module IM151-3 PN dimension drawing

Terminal modules (screw-type/spring terminals) with an electronic module inserted

The dimensions of the terminal modules with the power module inserted are identical.

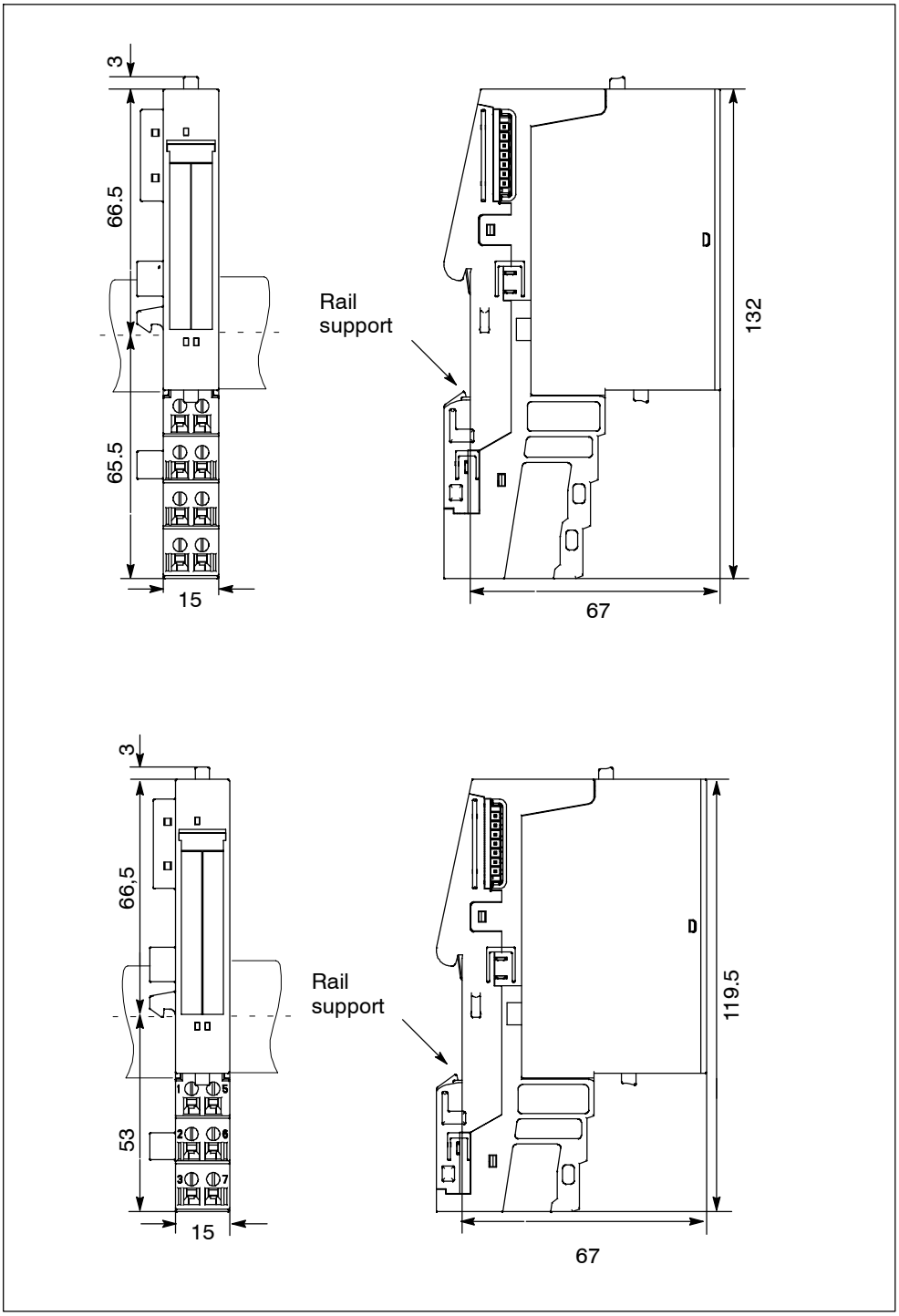


Figure B-4 Dimension drawing for terminal modules (screw-type/spring terminals) with an electronic module inserted

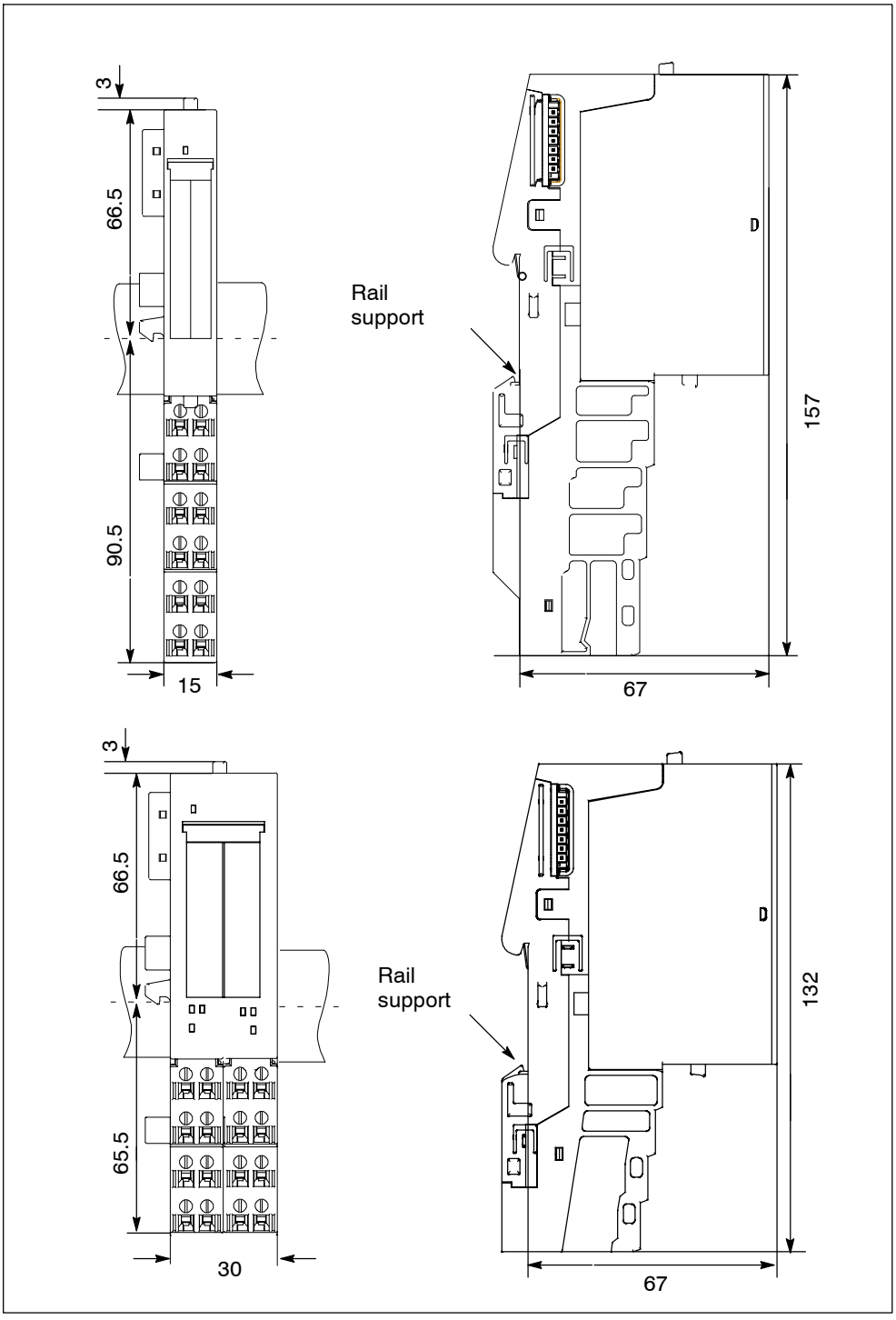


Figure B-5 Dimension drawing for terminal modules (screw-type/spring terminals) with an electronic module inserted

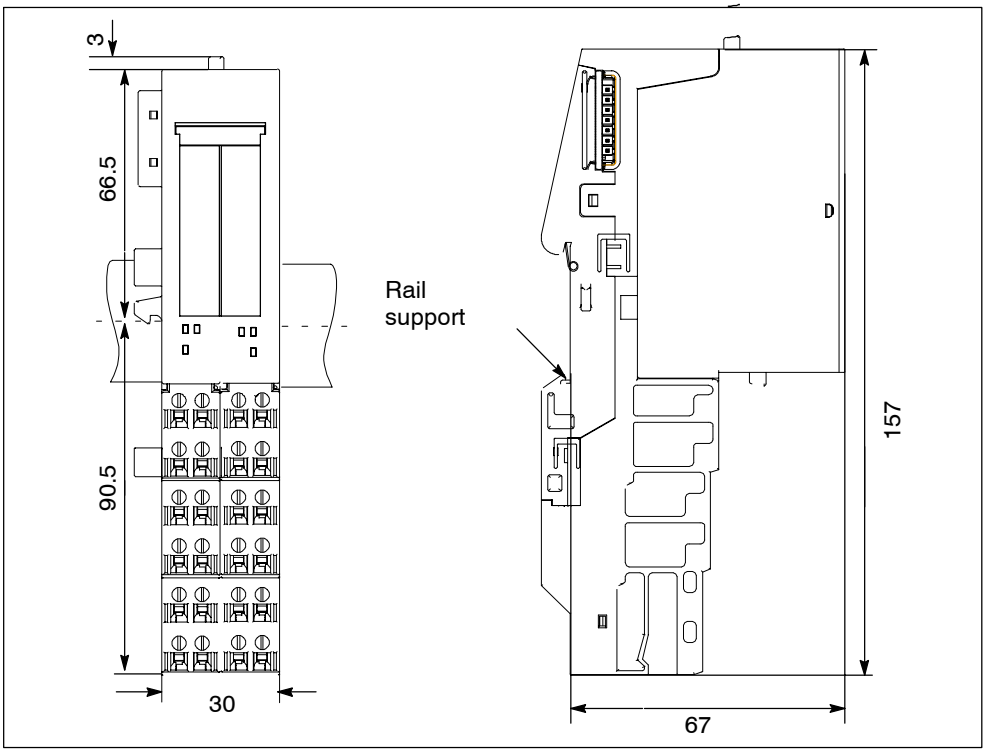


Figure B-6 Dimension drawing for terminal modules (screw-type/spring terminals) with an electronic module inserted

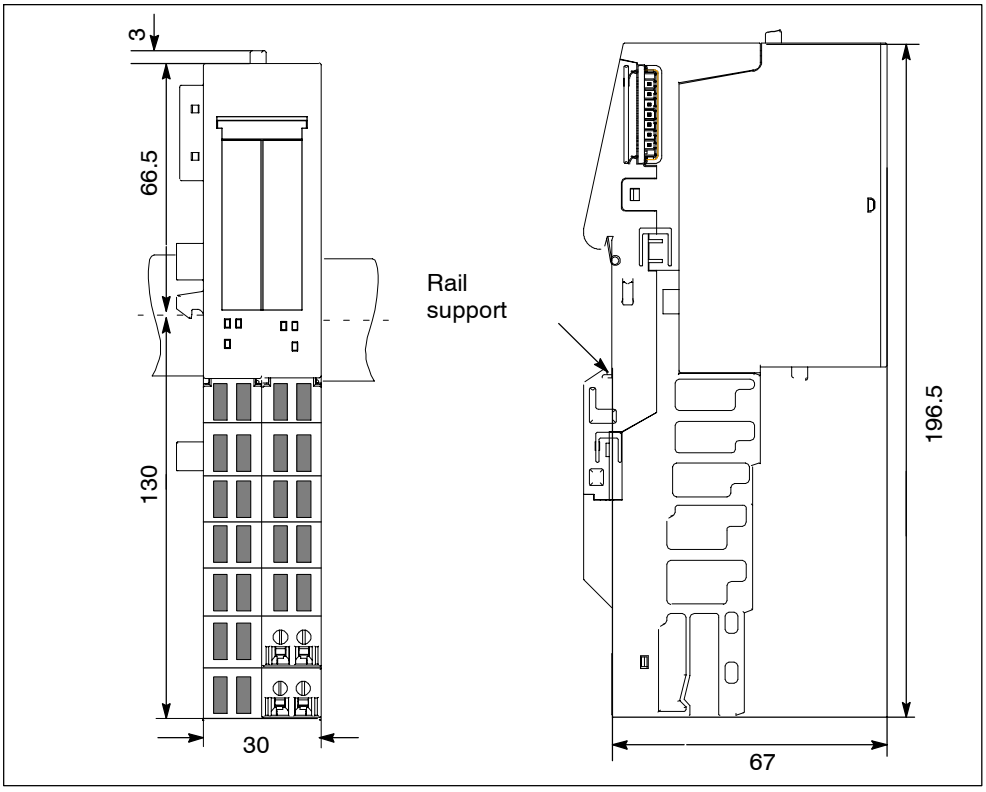


Figure B-7 Dimensioned drawing of a terminal module (screw-type terminal) with an electronic module inserted

Terminal modules (Fast Connect) with an electronic module inserted

The dimensions of the terminal modules with the power module inserted are identical.

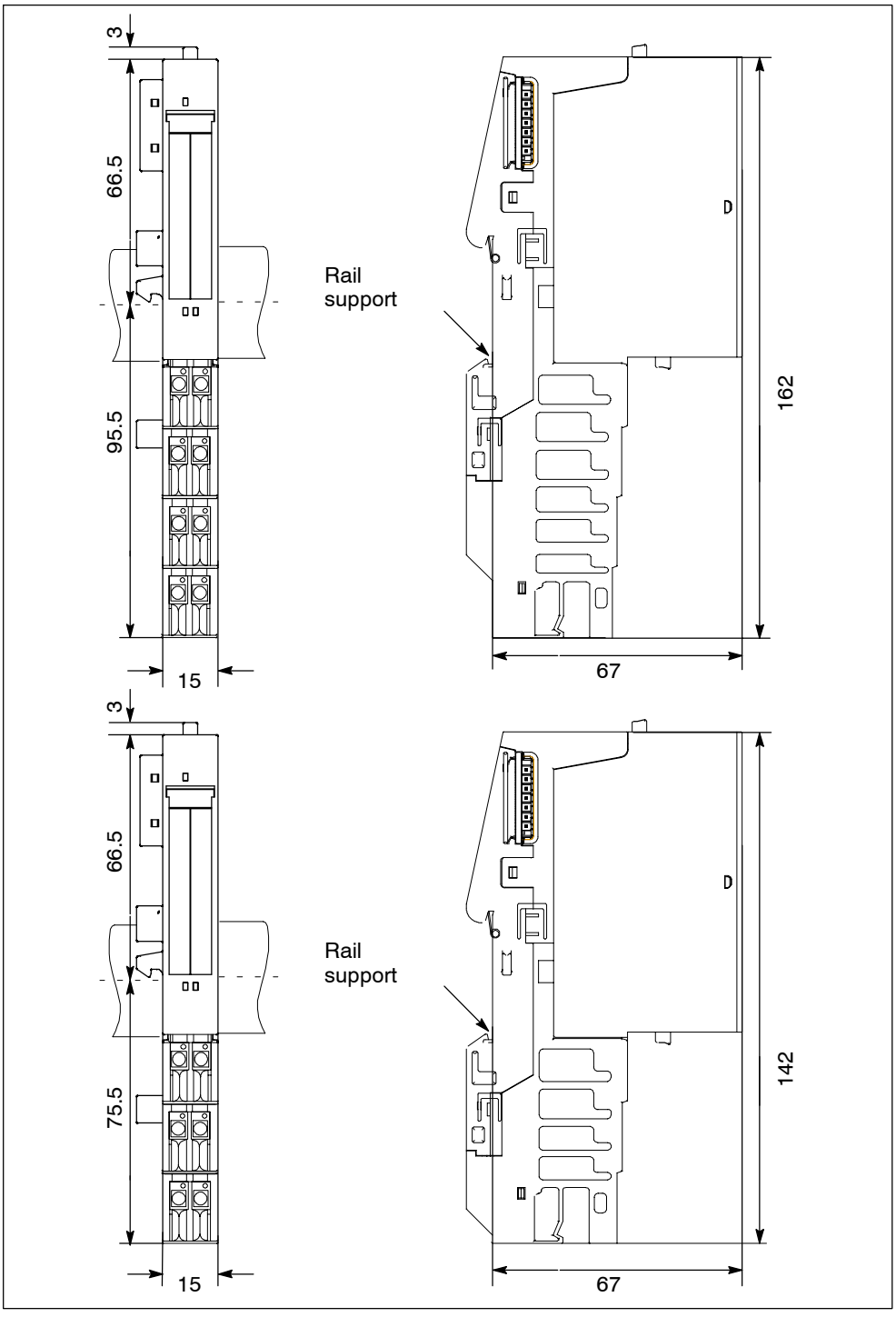


Figure B-8 Dimensioned drawing of terminal modules (Fast Connect) with an electronic module inserted

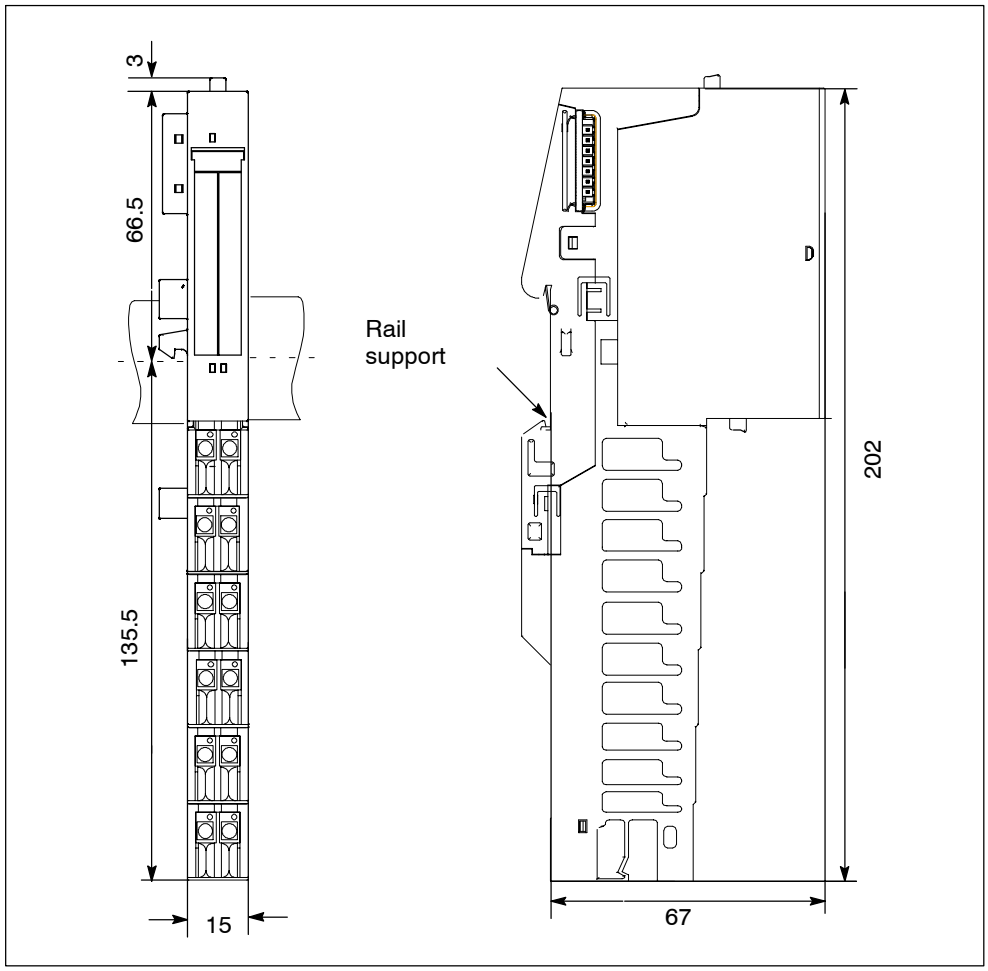


Figure B-9 Dimensioned drawing of terminal modules (Fast Connect) with an electronic module inserted

Terminating module

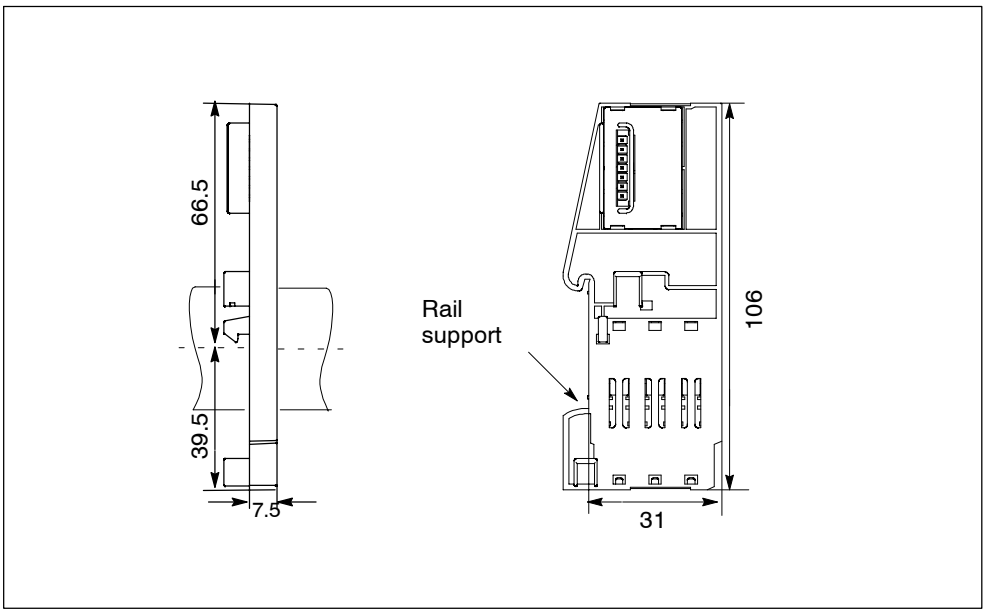


Figure B-10 Terminating module dimensioned drawing

Shield contact

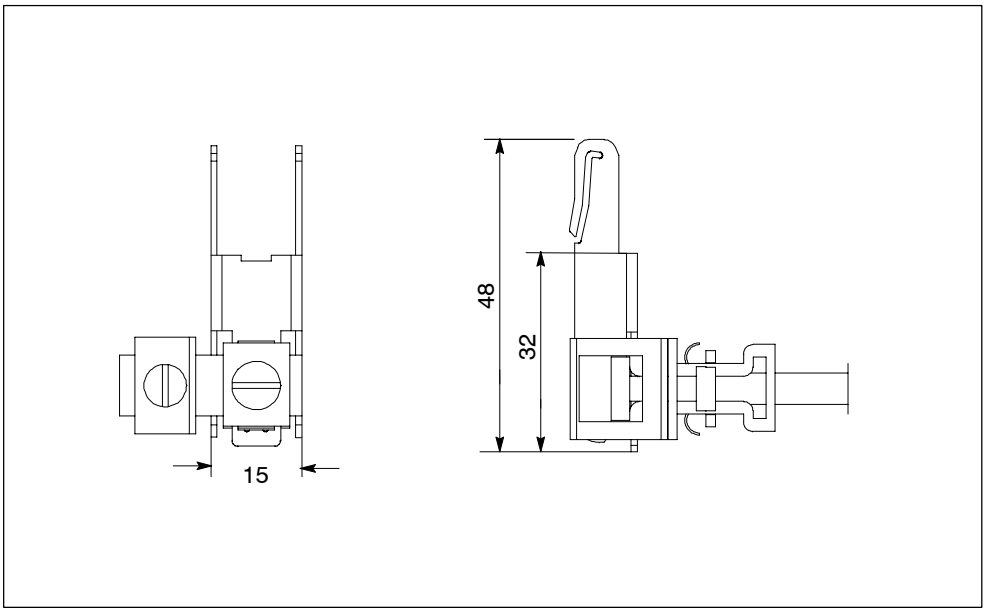


Figure B-11 Shield contact dimension drawing

Address Space of the Input and Outputs of the ET 200S

C

Address area of the modules

Table C-1 Inputs and outputs for the ET 200S

Module	Address space of the inputs		Address space of the outputs	
	Without grouping	With grouping[1)]	Without grouping	With grouping[1)]
Power modules				
With status byte (S)[2)]	1 byte		---	
With option handling (O)[2)]	8 byte		8 byte	
With status byte and option handling (SO)[2)]	9 byte		9 bytes (9th byte not relevant)	
Digital input modules	1 byte	2 bits (2DI) 4 bits (4DI)	---	---
4DI NAMUR	2 bytes		---	
Digital output modules	---	---	1 bytes	2 bits (2DO) 4 bits (4DO)
Analog input modules	4 bytes (2AI) 8 bytes (4AI)		---	---
Analog output modules	---	---	4 bytes	
1Count 24V/100kHz	8 byte		8 byte	
1Count 5V/500kHz	8 byte		8 byte	
1SSI	8 bytes		8 bytes	
1SSI fast	4 bytes		---	
EM 1STEP 5V/204kHz	8 byte		8 byte	
2PULSE	8 byte		8 byte	
1POS INC/Digital	8 byte		8 byte	
1POS SSI/Digital	8 byte		8 byte	
1POS INC/Analog	8 byte		8 byte	
1POS SSI/Analog	8 bytes		8 bytes	
1SI 3964/ASCII serial interface module	4/8 bytes		4/8 bytes	
1SI Modbus/USS serial interface module	4/8 bytes		4/8 bytes	

Table C-1 Inputs and outputs for the ET 200S, Fortsetzung

Module	Address space of the inputs		Address space of the outputs	
	Without grouping	With grouping[1)]	Without grouping	With grouping[1)]
4 IQ-SENSE (standard)	1 bytes	---	---	
4 IQ-SENSE (Enhanced)	4 bytes		4 bytes	
ET 200S FC frequency converter	8 bytes		8 bytes	

1) See Section 6.1.1 (Configuring the ET 200S on the PROFIBUS DP)
2) Additional optional entries you can select from the DBB file

Address area for option handling and status byte

You can control and monitor option handling, and evaluate the status byte of the power module using the control (PIQ) and feedback interface (PII).

The address range of the control (PIQ) and feedback interface (PII) depends on the configuration or selection of the corresponding entry in the configuration software.

In STEP 7, HWCONFIG or COM PROFIBUS or other configuration software	Feedback interface (PII)	Control interface (PIQ)
Usual entry for the Power module	---	---
Ends in ...S	EBx Status Byte	---
Ends in ...O	EBx : EBx+7 Option handling	ABx : ABx+7 Option handling
Ends in ...SO	EBx : EBx+7 Option handling EBx+8 Status Byte	ABx : ABx+7 Option handling ABx+8 Not applicable

Option handling in PIQ/PII

	7	6	5	4	3	2	1	0	Bit no.
QB/IB x	7	6	5	4	3	2	1	*	
QB/IB x+1	15	14	13	12	11	10	9	8	
QB/IB x+2	23	22	21	20	19	18	17	16	
QB/IB x+3	31	30	29	28	27	26	25	24	
QB/IB x+4	39	38	37	36	35	34	33	32	
QB/IB x+5	47	46	45	44	43	42	41	40	
QB/IB x+6	55	54	53	52	51	50	49	48	
QB/IB x+7	63	62	61	60	59	58	57	56	

* Not applicable

PIQ: AB x to AB x+7

Slots 2 to 63

0: Parameter assignment for option handling applies. RESERVE modules are permitted:

- The station is engaged in data transfer.
- A diagnosis is not reported.
- The SF LED on the interface module is off.

1: Parameter assignment for option handling is cancelled. RESERVE modules are not accepted on this slot:

- The station is engaged in data transfer.
- The diagnosis ”Incorrect module” is reported.
- The SF LED lights up on the interface module

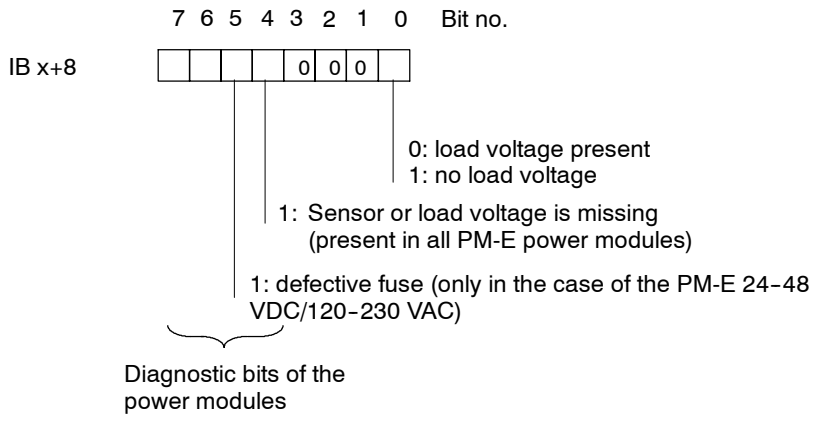
PII: : EB x to EB x+7

Slots 1 to 63

0: The RESERVE module or an incorrect module is on the slot or a module has been removed.

1: The configured module is on the slot.

Status byte power modules



Response Times

D

Introduction

The figure below shows the different response times between the DP master and the ET 200S.

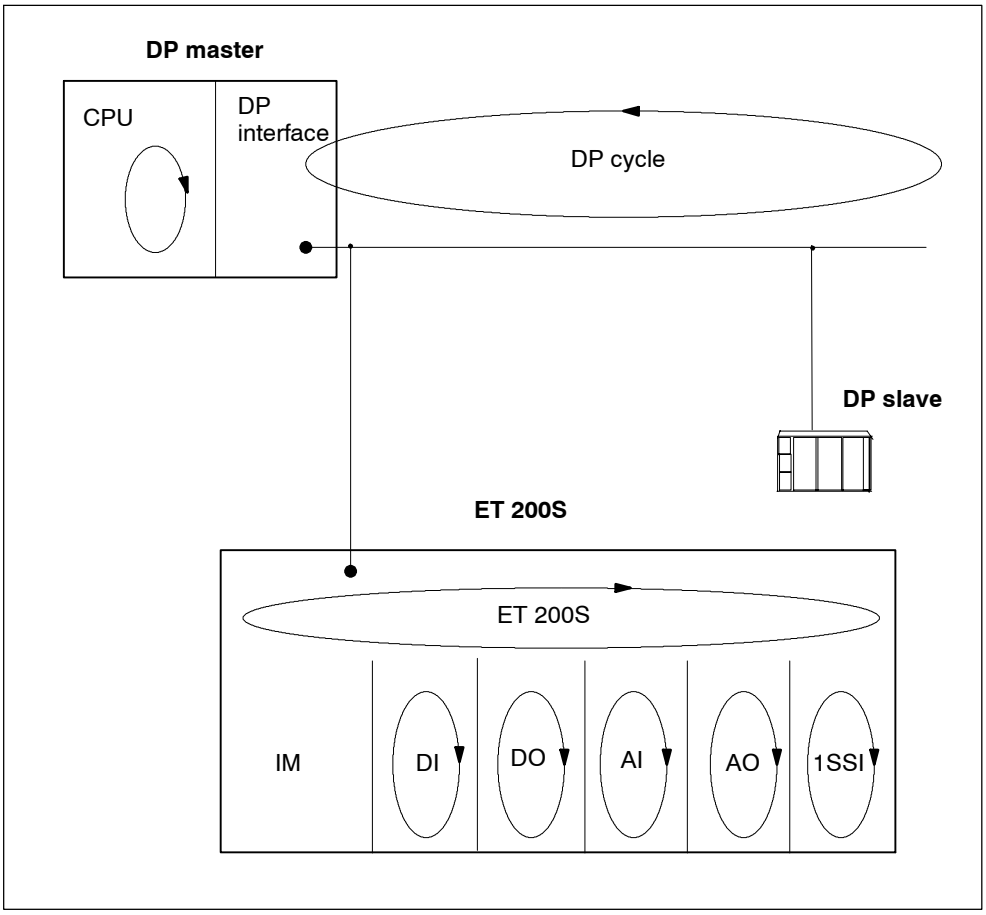


Figure D-1 Response times between DP master and ET 200S

D.1 Response times at the DP master

You will find information on the response times in the manual for the DP master.

D.2 Response times for the ET 200S

Calculation of response time with IM151-1 BASIC

The following formula enables you to make an approximate calculation of the ET 200S response time:

Response time [µs] = 156 · m +33 · do + 486 · ai + 374 · ao + 1633 · t + 934

Explanation of the parameters:

- **m**: Total number of all modules (power modules, digital electronic modules, analog electronic modules, IQ-SENSE electronic modules, process-related modules, and motor starters)
- **do**: Sum of all digital output modules
- **ai**: Sum of all analog input modules and 1SSI fast electronic modules
- **ao**: Sum of all analog output modules
- **t**: Number of all process-related modules (except 1SSI fast)

Example for calculation of the ET 200S response time in the case of the IM151-1 BASIC

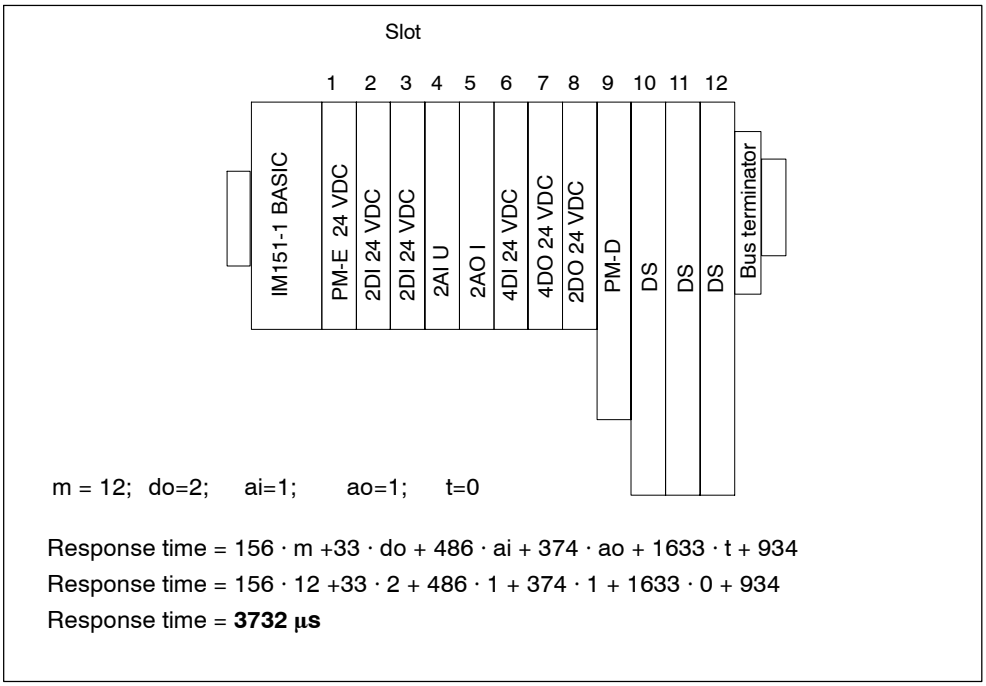


Figure D-2 Example setup for calculating the response time in the case of the IM151-1 BASIC

Calculation of the response time with the IM151-1 STANDARD and IM151-1 FO STANDARD

The following formula enables you to make an approximate calculation of the ET 200S response time:

Response time [µs]* = 55 · m +110 · a + 400 · t + 190

* Parameter bus length > 1m: The response also increases by 40%.

Explanation of the parameters:

- **m**: Total number of all modules (power modules, digital electronic modules, analog electronic modules, IQ-SENSE electronic modules, process-related modules, and motor starters)
- **a**: Sum of all analog electronic modules, 4 IQ-SENSE electronic modules, and 1SSI fast electronic modules
- **t**: Number of all process-related modules (except 1SSI fast)

Note

The formula specified applies to cyclic data transfer. The following prerequisites must be fulfilled:

- No diagnoses are reported.
- No modules are removed and inserted.

Example for calculation of the ET 200S response with the IM151-1 STANDARD and IM151-1 FO STANDARD

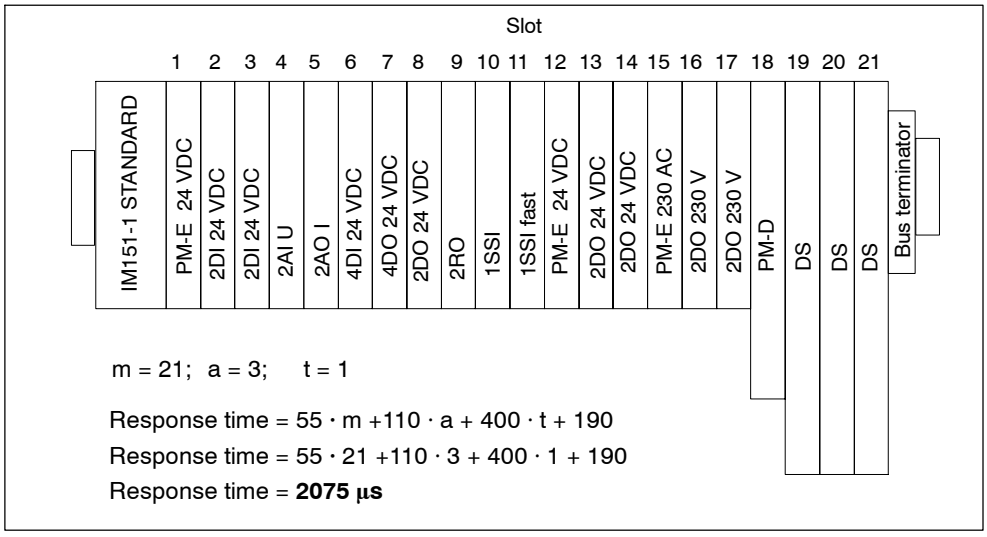


Figure D-3 Example of the calculation of the response time in the case of the IM151-1 STANDARD, IM 151-1 FO STANDARD

Calculation of the response time in the case of the IM151-1 HIGH FEATURE

When you calculate the ET 200S response time, you have to choose between 2 setup variants:

1. If you only have power modules, digital electronic modules and motor starters in your ET 200S system (exception: **no** motor starters; High Feature), use the following formula:

Response time [µs] = response time $_{PII}$ + response time $_{PIQ}$ + 1000*

Response time $_{PII}$ [µs] = 55 · m +130

Response time$_{PIQ}$ [µs] = 10 · m_{do} +90

2. If your ET 200S setup differs from no.1, the following formula applies:

Response time [µs] = response time $_{PII}$ + response time $_{PIQ}$ + 1000*

Response time$_{PII}$ [µs] = 55 · m +125 · ai + 175 · t +250

Response time$_{PIQ}$ [µs] = 10 · m_{do} +125 · ao + 175 · t +130

Explanation of the parameters:

- **m**: Total number of all modules (power modules, digital electronic modules, analog electronic modules, IQ-SENSE electronic modules, process-related modules, and motor starters)
- **m_{do}**: Slot number of the last digital output module, 4 IQ-SENSE electronic module, or motor starter in the ET 200S setup. You should place these modules or motor starters on the front slots to improve the response time.
- **ai**: Sum of all analog output modules
- **ao**: Sum of all analog output modules
- **t**: Number of all process-related modules
- *: In the case of clocking, this value can be increased by configuration (settings on the DP master system in HWCONFIG equidistant DP cycle). Note: This value (1000 µs) must be included in the calculation even if you have not set clocking.

Example of the calculation of the ET 200S response time in the case of the IM151-1 HIGH FEATURE

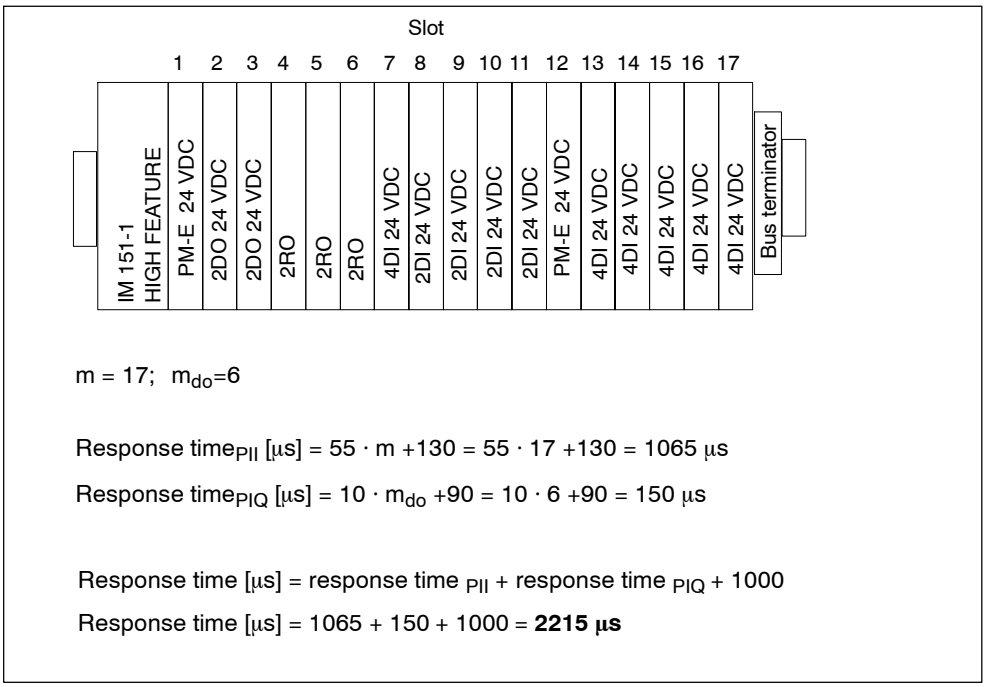


Figure D-4 Example setup for the calculation of the ET 200S response time in the case of the IM151-1 HIGH FEATURE

D.3 Response times for the digital input modules

Input delay

The response times of the digital input modules depend on the input delay. See the technical data in chapter 11.

D.4 Response times for the digital output modules

Output delay

The response times correspond to the output delay. See the technical specifications in Chapter 11.

D.5 Response times for analog input modules

Conversion time

The conversion time comprises the basic conversion time and the processing time for the wire break monitoring diagnosis (see the technical specifications for the 2AI TC STANDARD in Section 12.16 and 2AI TC HIGH FEATURE, Section 12.17).

In integrative conversion processes, the integration time is included directly in the conversion time.

Cycle time

The analog/digital conversion and the transfer of the digitized measured values to memory or to the backplane bus take place sequentially. In other words, the analog input channels are converted one after the other. The cycle time, that is, the time until an analog output value is converted again, is the sum of the conversion times of all the activated analog output channels of the analog input modules. You should deactivate unused analog input channels during parameter assignment in order to reduce the cycle time. The conversion and integration time for a deactivated channel is 0.

Fig. D-5 provides an overview of how the cycle time for an n-channel analog input module is made up.

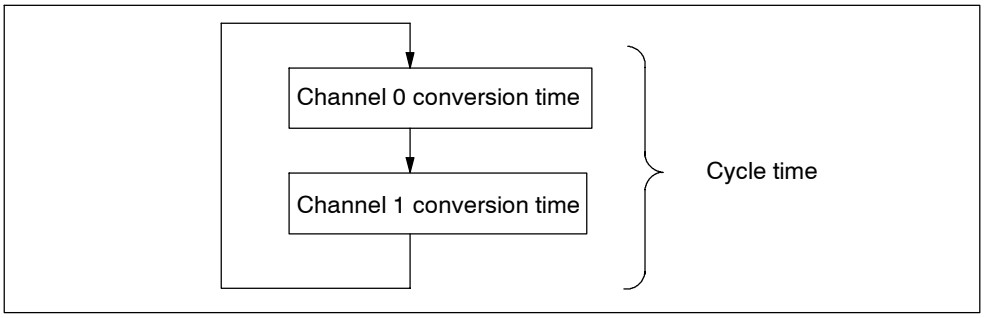


Figure D-5 Cycle time of the analog input module

D.6 Response times for analog output modules

Conversion time

The conversion time of the analog output channels comprises the time for the transfer of the digitized output values from internal memory and the digital/analog conversion.

Cycle time

The conversion of the analog output channels for the module takes place with a processing time and sequentially with a conversion time for channels 0 and 1.

The cycle time, that is, the time until an analog output value is converted again, is the sum of the conversion times of all the activated analog output channels and of the processing time of the analog output module.

Fig. D-6 provides an overview of how the cycle time for an analog output module is made up.

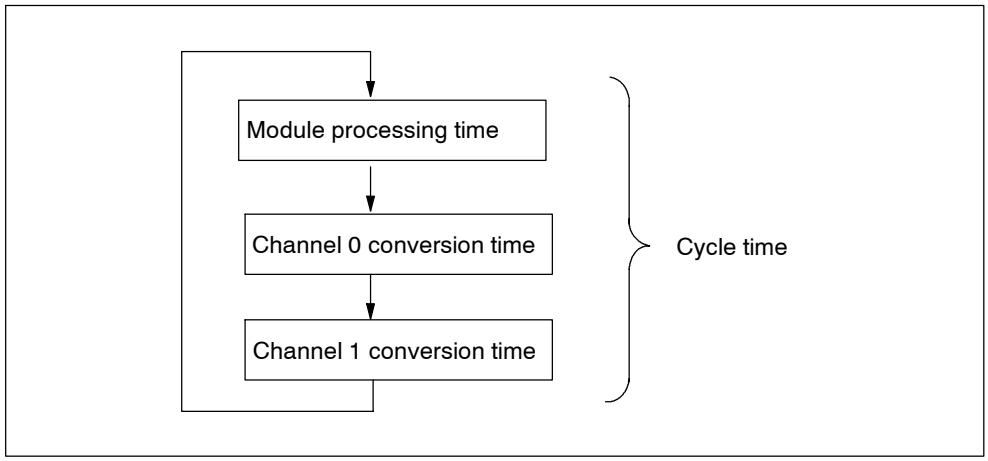


Figure D-6 Cycle time of the analog output module

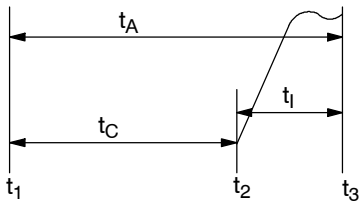
Settling time

The settling time (t_2 to t_3) – that is, the time from the application of the converted value until the specified value is obtained at the analog output – depends on the load. A distinction must be drawn between resistive, capacitive, and inductive loads.

Response time

The response time (t_1 to t_3) – that is, the time from the application of the digital output values in internal memory until the specified value is obtained at the analog output – is, in the most unfavorable case, the sum of the cycle time and the settling time. The most unfavorable case is when the analog channel is converted shortly before the transfer of a new output value and is not converted again until after the conversion of the other channels (cycle time).

Fig. D-7 shows the response time of an analog output channel.



t_A= response time

t_C = cycle time according to the processing time of the module and conversion time of the channel

t_I = settling time

t_1 = a new digital output value is queued

t_2 = output value accepted and processed

t_3 = specified output value reached

Figure D-7 Response time of an analog output channel

D.7 Response times for a 4 IQ-SENSE electronic module

The response time of the 4 IQ-SENSE electronic module is specified as a cycle time in the technical specifications.

D.8 Response times for process-related modules

The response times of the process-related modules are indicated as response time or update rate in the technical specifications. See the *ET 200S Process-Related Functions manual*

D.9 Response times of PROFINET IO

The response time of PROFINET IO generally corresponds to the response time of PROFIBUS DPV1 with 1.5 Mbps transfer rate.

Depending in the ET 200S setup this extends the device cycle with IM151-3 PN by approximately 25% to 100% compared to an ET 200S with IM151-1 HIGH FEATURE.

Determining the Leakage Resistance of an ET 200S Station

E

Ohmic resistance

When determining the leakage resistance for an ET 200S station (for a ground-fault detector, for example), you must take into account the ohmic resistance from the RC combination of each module:

Module	Ohmic resistance from RC network
Interface module	10 MΩ (–5%)
PM-E 24 VDC power module	10 MΩ (–5%)
PM-E 24 VDC / 120/230 VAC power module	---

Formula

You can use the following formula to calculate the leakage resistance of an ET 200S station if you secure all the modules listed above with **one** ground-fault detector:

$$R_{ET\ 200S} = \frac{R_{Modul}}{N}$$

$R_{ET\ 200S}$ Leakage resistance of the ET 200S station
R_{module} Leakage resistance of a module
N Number of power/interface modules in the ET 200S station

$$R_{IM\ 151} = R_{PM-E\ DC24V} = R_{Modul} = 9.5\ M\Omega$$

$R_{IM\ 151}$ Leakage resistance of the IM1511 interface module
$R_{PM\text{-}E\ 24\ VDC}$ Leakage resistance of the PM-E 24 VDC power module

Figure E-1 Formula for calculating the leakage resistance of an ET 200S station

If you secure the modules listed above in an ET 200S station with a number of ground-fault detectors, you must obtain the leakage resistance for each ground-fault detector.

Example

An ET 200S configuration contains an IM151-1 STANDARD, two PM-E 24 VDC power modules, and various input and output modules. The entire ET 200S station is equipped with **one** ground-fault detector:

$$R_{ET\ 200S} = \frac{9,5\ M\Omega}{3} = 3.17\ M\Omega$$

Figure E-2 Leakage resistance example

Special Measures for Interference-Free Operation

F

Inductive voltages

Overvoltage occurs when sources of inductance are switched off. Examples of this are relay coils and contactors.

Integrated overvoltage protection

The digital output modules of the ET 200S have an integrated overvoltage protection device.

Additional overvoltage protection

Inductance can only be wired with additional overvoltage protection devices in the following cases:

- If digital output circuits can be switched off by additionally installed contacts, such as relay contacts.
- If the inductance cannot be controlled by digital output modules.

Note: Request information on relevant surge protection rating from the supplier of inductive devices.

Example

The following figure shows an output circuit that requires additional overvoltage protection devices.

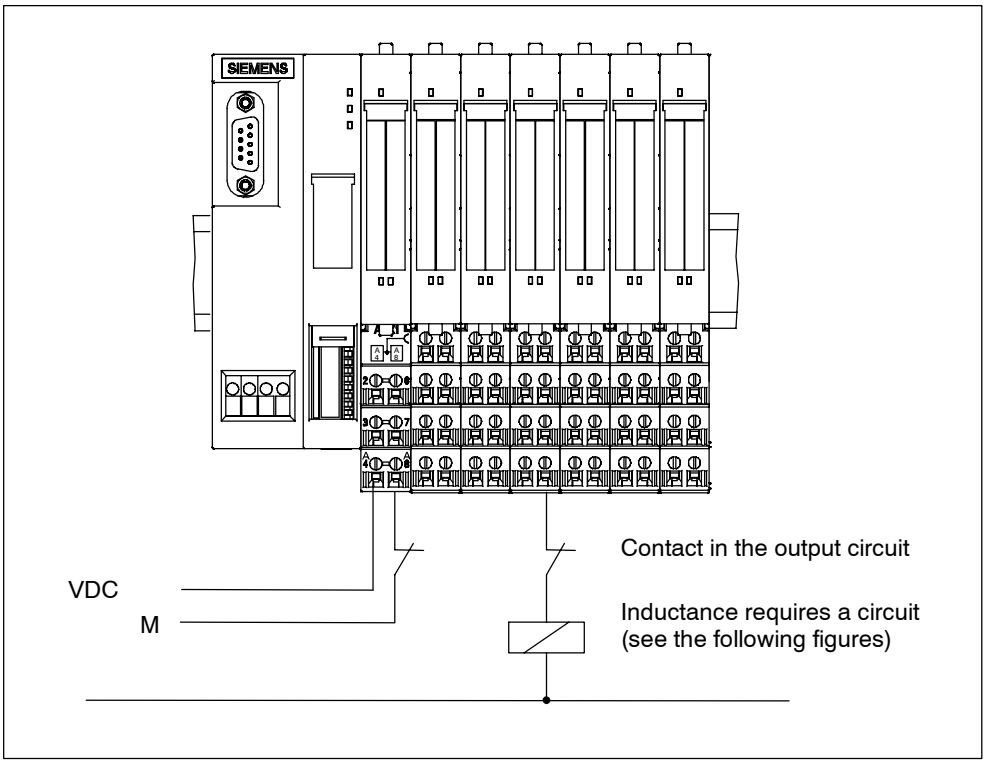


Figure F-1 EMERGENCY-OFF relay contact in the output circuit

Wiring of DC-operated coils

DC-operated coils are wired with diodes and Zener diodes as illustrated in the following figure.

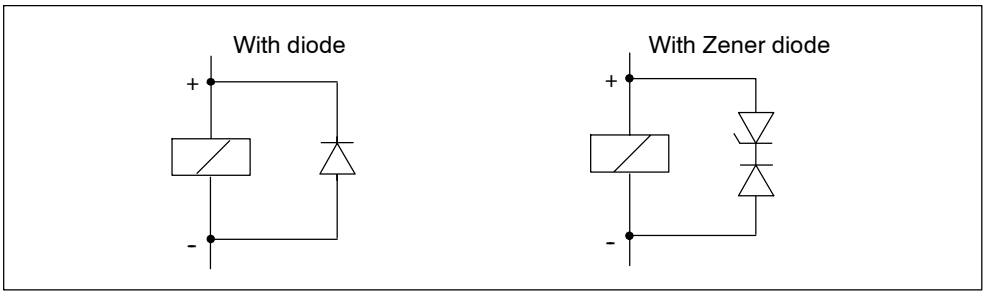


Figure F-2 Wiring of DC-operated coils

A circuit with diodes/Zener diodes has the following features:

- Switching overvoltages can be completely avoided.

  A Zener diode has higher circuit interruption voltage.
- Long switch-off delay (6 to 9 times longer than without a protective circuit).

  A Zener diode switches off quicker than a diode circuit

Wiring of AC-operated coils

AC-operated coils are wired with varistors or RC elements as illustrated in the figure.

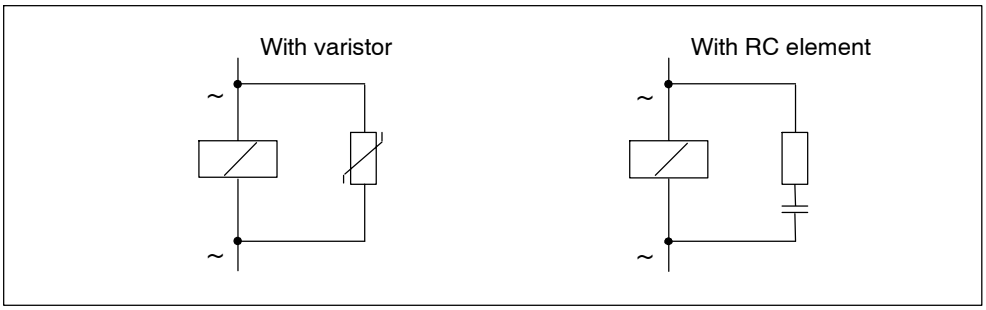


Figure F-3 Wiring of AC-operated coils

A circuit with a varistor has the following features:

- The amplitude of the switching overvoltage is limited but not dampened.
- The gradient of the overvoltage remains the same.
- The switch-off delay is short.

A circuit with RC elements has the following properties:

- The amplitude and gradient of the switching overvoltage are reduced.
- The switch-off delay is short.

Glossary

Aggregate current

The sum of the currents of all the output channels of a digital output module.

AUX1 bus

Power modules permit you to connect additional potentials (up to 230 VAC), which you can apply by means of the AUX(iliary) bus. You can set the AUX(iliary) bus individually as:

- A protective ground bar
- Additionally required voltage

Backplane bus

The backplane bus is a serial data bus via which the IM151-1 interface communicates with the electronic modules/motor starters, supplying them with the required voltage. The connection between the individual modules is established by means of the terminal modules.

Bus

A common transfer route connecting all notes and having two defined ends.

In the case of the ET 200, the bus is a two-wire or fiber-optic cable.

Bus connector

A physical connection between the bus nodes and the bus line.

Chassis ground

Chassis ground refers to all the interconnected inactive parts of a piece of equipment that, even in the event of a fault, cannot carry voltage that is dangerous to the touch.

Configuration

The systematic arrangement of the different ET 200S modules (setup)

Device names

Before an I/O device can be addressed by an I/O controller, it must have a device name. This procedure is selected in PROFINET, because names are easier to handle than complex IP addresses.

The assignment of a device name for a physical I/O device can be compared with setting the PROFIBUS address on a DP slave.

An I/O device is delivered without a device name. An I/O device can only be addressed by an I/O controller, e.g. for transmission of configuration data (including the IP address) or for interchange of user data in cyclic operation, after a device name has been assigned.

Diagnostics

Diagnostics involves the identification, localization, classification, display, and further evaluation of errors, faults, and messages.

Diagnostics includes monitoring functions that run automatically while the system is in operation. This increases the availability of systems by reducing setup times and downtimes.

Direct-on-line starter

A direct-on-line starter is a → motor starter that switches a motor on or off directly. It consists of a circuit breaker and a contactor.

Distributed I/O systems

These are input/output units that are not located in the base unit; instead, they are distributed at some distance from the CPU.

- ET 200M, ET 200X, ET 200L, ET 200S
- DP/AS-I Link
- S5-95U with PROFIBUS DP slave interface
- Other DP slaves from either Siemens or other vendors

The distributed I/O systems are connected to the DP master by means of PROFIBUS DP.

DP standard

The DP standard is the bus protocol of the ET 200 distributed I/O system in accordance with IEC 61784-1:2002 Ed1 CP 3/1.

DP master

A → master that complies with IEC 61784-1:2002 Ed1 CP 3/1 is known as a DP master.

DP slave

A → slave running on the PROFIBUS on the basis of the PROFIBUS DP protocol in accordance with IEC 61784-1:2002 Ed1 CP 3/1 is known as a DP slave.

Equipotential bonding

Electrical connection (equipotential bonding conductor) that brings the exposed conductive parts of electrical equipment and other conductive parts to the same or approximately the same potential in order to prevent troublesome or dangerous voltages arising between these parts.

ET 200

The ET 200 distributed I/O system with the PROFIBUS-DP protocol enables distributed I/O devices to be connected to a CPU or an appropriate DP master. A feature of the ET 200 is its fast response times, since only a small amount of data (bytes) is transferred.

The ET 200 is based on IEC 61784-1:2002 Ed1 CP 3/1.

The ET 200 works on the master/slave principle. Examples of DP masters are the IM308-C master interface or the CPU 315-2 DP.

DP slaves can be the distributed I/O devices ET 200M, ET 200X, ET 200L, or ET 200S or DP slaves from Siemens or other vendors.

FREEZE

This is a control command of the DP master to a group of DP slaves.

When a DP slave receives the FREEZE control command, it freezes the current status of the inputs and transfers them cyclically to the DP master.

After each subsequent FREEZE control command, the DP slave freezes the status of the inputs again.

The input data is not transferred from the DP slave to the DP master again cyclically until the DP master sends the UNFREEZE control command.

Ground

The conductive mass of earth, the electrical potential of which is equivalent to zero. In the vicinity of grounding electrodes, the potential may not be zero. The term “reference ground” is often used here.

Grounding

Grounding means connecting an electrically conductive part to a grounding electrode by means of a grounding system.

Grouping

The opening of a new potential group by a power module. This permits the individual grouping of the sensor and load supplies.

GSD file

The properties of a PROFINET device are described in a GSD file (General Station Description), which contains all information required for configuration.

Just as with PROFIBUS, you can integrate a PROFINET device in STEP 7 with a GSD file.

In PROFINET I/O the GSD file is in XM format. The structure of the GSD file complies with ISO 15734, the world standard for device descriptions.

In PROFIBUS the GSD file in in ASCII format (compliant with IEC 61784-1:2002 Ed1 CP 3/1).

Hot Swapping

This is the removal and insertion of modules during the operation of the ET 200S.

Isolated

In the case of isolated input/output modules, the reference potentials of the control and load circuit are galvanically isolated – for example, by means of optical isolators, relays, or transformers. Input/output circuits can be grouped.

MAC address

A unique device identification is assigned to every PROFINET device at the factory. The 6-byte-long device identification is the MAC address.

The MA address is divided into:

- 3 bytes manufacturer ID and
- 3 bytes device ID (sequential number).

The MAC address is generally placed on the front of the device for easy access. For Example. : 08–00–06–6B–80–C0

Master

When it has a token, a master can send data to and request data from other nodes (= active participants). Examples of DP masters are the CPU 315-2 DP or the IM308-C.

Motor starter (MS)

Motor starter is the generic term for → direct-on-line and → reversing starters. The startup and direction of rotation of a motor are determined by motor starters.

Node

A device that can send, receive, or repeat data on the bus (for example, a DP master, DP slave, or RS 485 repeater).

Non-isolated

In the case of non-isolated input/output modules, the reference potentials of the control and load circuit are electrically connected.

Parameter assignment

Parameter assignment is the transfer of slave parameters from the DP master to the DP slave.

PELV

Protective Extra Low Voltage = functional extra-low voltage with safe disconnection

Potential group

A group of electronic modules supplied by a power module.

Power buses (P1/ P2)

Two internal buses (P1 and P2) that supply the electronic modules with voltage. The power buses are fed by the power module and connected by means of the terminal modules.

Prewiring

The wiring of the terminal modules before the electronic modules are inserted.

Process image

The process image is a component of the system memory of the DP master. The signal states of the input modules are transferred to the process-image input area at the beginning of the cyclic program. At the end of the cyclic program, the values of the process-image output area are transferred to the DP slave as the signal states.

Process-related modules

Modules that are equipped with technological functions, such as counting pulses, positioning, and controlling stepping motor power units.

PROFIBUS

PROcess FIeld BUS, process and field-bus standard, which is defined in IEC 61784-1:2002 Ed1 CP 3/1. It defines the functional, electrical and mechanical properties for a bit-serial field-bus system.

PROFIBUS is available with the protocols DP (which stands for distributed peripherals, that is, distributed or remote I/O), FMS (which stands for field bus message specification), PA (= process automation), or TF (= technology functions).

PROFIBUS address

Each bus node must receive a PROFIBUS address to identify it uniquely on the PROFIBUS.

The PC/programming device has the PROFIBUS address “0”.

The PROFIBUS addresses 1 to 125 are permitted for the ET 200S distributed I/O system.

PROFINET

In the field of Totally Integrated Automation (TIA) PROFINET is the logical extension of:

- PROFIBUS DP, the established field bus, and
- Industrial Ethernet, the communications bus for the cell level.

The experience from both systems have been are are being integrated in PROFINET.

PROFINET, as an Ethernet-based automation standard of PROFIBUS International (formerly PROFIBUS Nutzerorganisation e.V. [user organization]), defines a manufacturer-independent communication, automation and engineering model.

PROFINET components

A PROFINET component includes the complete data of the hardware configuration, the parameters of the modules, and the associated user program. The PROFINET component consists of the following:

- Technological function

  The (optional) technological (software) function includes the interface to other PROFINET components in the form of switchable inputs and outputs.

- Device

The device is the manifestation of the physical automation device or field device, including the distributed devices, sensors and actuators, mechanics, and the device firmware.

PROFINET device

A PROFINET device always has at least one Industrial Ethernet terminal. A PROFINET device can also have a PROFIBUS terminal and can act as a master with proxy functions. In exceptional cases a PROFINET device can also have multiple PROFIBUS terminals (such as CP 5614).

PROFINET I/O

PROFINET I/O as a subset of PROFINET is a communications concept for the implementation of modular, distributed applications.

PROFINET I/O can be used to establish automation solutions similar to those known and made familiar under PROFIBUS.

PROFINET I/O is implemented by the PROFINET standard for automatic devices and also by the STEP 7 engineering tool.

This means that in STEP 7 you have the same application view – regardless of whether you are configuring PROFINET devices or PROFIBUS devices.
You program your user program in the same way for both PROFINET I/O and PROFIBUS DP if you use the blocks and system status lists enhanced for PROFINET I/O.

PROFINET I/O Controller

Device that is addressed via the connected I/O devices. This means that the I/O controller exchanges input and output signals with associated field devices. With the I/O controller this often means the controller in which the automation program is running.

PROFINET I/O device

Distributed field device to which the I/O controller is assigned (for example, remote I/O, valve blocks, frequency converter, switches)

Programmable controller

A programmable controller is a programmable logic controller consisting of at least one CPU, various input and output modules, and operator interfaces.

Provider-Consumer principle

On the PROFINET I/O, unlike PROFIBUS DP, both partners are independent providers in the transmission of data.

Real time

Real time means that a system processes external events in a defined time.

Determinism means that a system responds predictably (deterministic).

Both requirements are important in industrial networks. PROFINET meets these requirements. PROFINET is therefore designed as a deterministic real-time network as follows:

- Transmission of time-critical data between different stations over a network in a defined time interval is guaranteed.

  PROFINET offers an optimized communication channel for real-time communication: Real Time (RT).
- The time of transmission can be determined exactly (prediction).
- It ensures that smooth communications can take place in the same network via other standard protocols, such as industrial communication for PC/programming device.

Reference potential

Potential from which the voltages of the circuits involved can be observed and/or measured.

Reversing starter

A reversing starter is a → motor starter that determines the direction of rotation of a motor. It consists of a circuit breaker and two contactors.

Segment

The bus line between two terminating resistors forms a segment. A segment contains 0 to 32 → bus nodes. Segments can be interconnected by means of RS 485 repeaters.

SELV

Protective Extra Low Voltage = safe low voltage

Slave

A slave can only exchange data with a → master when requested by it to do so. By slaves we mean, for example, all DP slaves such as ET 200X, ET 200M, ET 200S, etc.

SNMP

SNMP (Simple Network Management Protocol) is the standardized program for diagnosis and setting parameters on the Ethernet infrastructure

Devices from many different manufacturers support SNMP on the Ethernet in the office and in automation engineering.

Applications based on SNMP can be run in parallel with applications on PROFINET on the same network.

The scope of supported functions varies depending on the device type. For example, a switch has more functions than a CP 1616.

SSI

The position information is transferred synchronously on the basis of the SSI (synchronous serial interface) protocol. The SSI protocol is used with absolute encoders.

Stationary wiring

All the wiring-carrying elements (terminal modules) are mounted on a rail. The power and electronic modules are inserted in the terminal modules.

Switch

PROFIBUS is a linear network. The communication devices are connected by a passive cable – the bus.

In contrast, the Industrial Ethernet consists of point-to-point connections: every communication device is directly connected to exactly one other communication device.

If a communication device is connected to multiple communication devices, this communication device is connected to the port of an active network components – the switch. Now additional communication devices (including switches) can be connected to the other ports of the switch. The connection between a communication device and the switch remains a point-to-point connection.

A switch also regenerates and distributes received signals. The switch “learns” the Ethernet address(es) of a connected PROFINET device and other switches and only forwards the signals that are directed to the connected PROFINET device or the connected switch.

A switch has a specific number of terminals (ports). Connect a maximum of one PROFINET device or another switch to every port.

SYNC

This is a control command of the DP master to a group of DP slaves.

By means of the SYNC control command, the DP master causes the DP slave to freeze the current statuses of the outputs. With the subsequent frames, the DP slave stores the output data, but the statuses of the outputs remain unchanged.

After each new SYNC control command, the DP slave sets the outputs that it has stored as output data. The outputs are not cyclically updated again until the DP master sends the UNSYNC control command.

Terminating module

The ET 200S distributed I/O system is completed by the terminating module. If you have not connected a terminating module, the ET 200S is not ready for operation.

Transmission rate

The transmission rate of a data transfer is measured in bits transmitted per second.

In the case of the ET 200S, transmission rates of 9.6 kbps to 12 Mbps are possible.

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SIEMENS

SIMATIC

Product Information

01/2005

Use of subassemblies/modules in a Zone 2 Hazardous Area

Siemens Aktiengesellschaft A5E00352937-02

Einsatz der Baugruppen/Module im explosionsgefährdeten Bereich Zone 2

Zone 2

Explosionsgefährdete Bereiche werden in Zonen eingeteilt. Die Zonen werden nach der Wahrscheinlichkeit des Vorhandenseins einer explosionsfähigen Atmosphäre unterschieden.

Zone	Explosionsgefahr	Beispiel
2	explosive Gasatmosphäre tritt nur selten und kurzzeitig auf	Bereiche um Flanschverbindungen mit Flachdichtungen bei Rohrleitungen in geschlossenen Räumen
sicherer Bereich	nein	• außerhalb der Zone 2 • Standardanwendungen von dezentraler Peripherie

Nachfolgend finden Sie wichtige Hinweise für die Installation der Baugruppen/Module im explosionsgefährdeten Bereich.

Weitere Informationen

Weitere Informationen zu den Baugruppen/Modulen finden Sie im dazugehörigen Handbuch.

Fertigungsort / Zulassung

II 3 G **EEx nA II T3 .. T6** nach EN 50021 : 1999

Prüfnummer: *siehe Tabelle*

Fertigungsort	Baugruppen/Module	Prüfnummer
Siemens AG, Bereich A&D Werner-von-Siemens-Straße 50 92224 Amberg Germany	ET 200S ET 200S Fehlersichere Module	KEMA 01 ATEX 1238X
	S7-300 ET 200M Buskopplung DP/PA Diagnoserepeater S7-300 Fehlersichere Baugruppen	KEMA 02 ATEX 1096X
Siemens AG, Bereich A&D Östliche Rheinbrückenstr. 50 76187 Karlsruhe Germany	S7-400	KEMA 03 ATEX 1125X
	S7-300 CP TS Adapter II	KEMA 03 ATEX 1228X
	SIMATIC NET	KEMA 03 ATEX 1226X

Hinweis

Baugruppen/Module mit der Zulassung  II 3 G EEx nA II T3 .. T6 dürfen nur in SIMATIC-Systemen der Gerätekategorie 3 eingesetzt werden.

Instandhaltung

Für eine Reparatur müssen die betroffene Baugruppen/Module an den Fertigungsort geschickt werden. Nur dort darf die Reparatur durchgeführt werden.

Besondere Bedingungen

1. Baugruppen/Module müssen in einen Schaltschrank oder ein metallisches Gehäuse eingebaut werden. Diese müssen mindestens die Schutzart IP 54 (nach EN 60529) gewährleisten. Dabei sind die Umgebungsbedingungen zu berücksichtigen, in denen das Gerät installiert wird. Für das Gehäuse muss eine Herstellererklärung für Zone 2 vorliegen (gemäß EN 50021).
2. Wenn am Kabel bzw. an der Kabeleinführung dieses Gehäuses unter Betriebsbedingungen eine Temperatur > 70 °C erreicht wird oder wenn unter Betriebsbedingungen die Temperatur an der Aderverzweigung > 80 °C sein kann, müssen die Temperatureigenschaften der Kabel mit den tatsächlich gemessenen Temperaturen übereinstimmen.
3. Die eingesetzten Kabeleinführungen müssen der geforderten IP-Schutzart und dem Abschnitt 7.2 (gemäß EN 50021) entsprechen.
4. Alle Geräte, einschließlich Schalter etc., die an den Ein- und Ausgängen von SIMATIC-Systemen angeschlossen werden, müssen für den Explosionsschutz Typ EEx nA oder EEx nC genehmigt sein.
5. Es müssen Maßnahmen getroffen werden, dass die Nennspannung durch Transienten um nicht mehr als 40 % überschritten werden kann.
6. Umgebungstemperaturbereich: 0° C bis 60° C
7. Innerhalb des Gehäuses ist an einem nach dem Öffnen gut sichtbaren Platz ein Schild mit folgender Warnung anzubringen:

Warnung
Das Gehäuse darf nur kurze Zeit geöffnet werden, z. B. für visuelle Diagnose. Betätigen Sie dabei keine Schalter, ziehen oder stecken keine Baugruppen und trennen keine elektrischen Leitungen (Steckverbindungen).
Diese Warnung kann unberücksichtigt bleiben, wenn bekannt ist, dass keine explosionsgefährdete Atmosphäre herrscht.

Liste der zugelassenen Baugruppen/Module

Die Liste mit den zugelassenen Baugruppen/Module finden Sie im Internet:

http://www4.ad.siemens.de/view/cs/

unter der Beitrags-ID 13702947.

Use of subassemblies/modules in a Zone 2 Hazardous Area

Zone 2

Hazardous areas are divided up into zones. The zones are distinguished according to the probability of the existence of an explosive atmosphere.

Zone	Explosion Hazard	Example
2	Explosive gas atmosphere occurs only seldom and for a short time	Areas around flange joints with flat gaskets in pipes in enclosed spaces
Safe area	No	• Outside zone 2 • Standard distributed I/O applications

Below you will find important information on the installation of the subassemblies/modules in a hazardous area.

Further Information

You will find further information on the subassemblies/modules in the corresponding manual.

Production Location / Certification

 **II 3 G** **EEx nA II T3 .. T6** to EN 50021 : 1999

Test number: *see table below*

Production Location	Subassemblies/Modules	Test Number
Siemens AG, Bereich A&D Werner-von-Siemens-Straße 50 92224 Amberg Germany	ET-200S ET 200S fault-tolerant modules	KEMA 01 ATEX 1238X
	S7-300 ET-200M DP/PA bus interface Diagnostics repeater S7-300 fault-tolerant modules	KEMA 02 ATEX 1096X
Siemens AG, Bereich A&D Östliche Rheinbrückenstr. 50 76187 Karlsruhe Germany	S7-400	KEMA 03 ATEX 1125X
	S7-300 CP TS Adapter II	KEMA 03 ATEX 1228X
	SIMATIC NET	KEMA 03 ATEX 1226X

Note

Subassemblies/modules with  II 3 G EEx nA II T3 .. T6 certification can only be used in SIMATIC systems rated as category 3 equipment.

Maintenance

If repair is necessary, the affected subassemblies/modules must be sent to the production location. Repairs can only be carried out there.

Special Conditions

1. Subassemblies/modules must be installed in a cabinet or metal housing. These must comply with the IP 54 degree of protection as a minimum. The environmental conditions under which the equipment is installed must be taken into account. There must be a manufacturer's declaration for zone 2 available for the housing (in accordance with EN 50021).
2. If a temperature of > 70 °C is reached in the cable or at the cable entry of this housing under operating conditions, or if a temperature of > 80 °C can be reached at the junction of the conductors under operating conditions, the temperature-related properties of the cables must correspond to the temperatures actually measured.
3. The cable entries used must comply with the required IP degree of protection and Section 7.2 (in accordance with EN 50021).
4. All devices (including switches, etc.) that are connected to the inputs and outputs of SIMATIC systems must be approved for EEx nA or EEx nC explosion protection.
5. Steps must be taken to ensure that the rated voltage through transients cannot be exceeded by more than 40 %.
6. Ambient temperature range: 0° C to 60° C
7. A sign containing the following warning must be put up inside the housing in an easily visible position when the housing is opened:

Warning
The housing can only be opened for a short time (e.g. for visual diagnostics). If you do this, do not operate any switches, remove or install any modules or disconnect any electrical cables (plug-in connections).
You can disregard this warning if you know that the atmosphere is not hazardous (i.e. there is no risk of explosion).

List of Approved Subassemblies/Modules

You will find the list of approved subassemblies/modules under the ID 13702947 on the Internet:

http://www4.ad.siemens.de/view/cs/.

Utilisation des modules / coupleurs dans la zone à risque d'explosion 2

Zone 2

Les environnements à risque d'explosion sont répartis en zones. Les zones se distinguent par la probabilité de présence d'une atmosphère explosive.

Zone	Risque d'explosion	Exemple
2	Formation rare et brève d'une atmosphère gazeuse explosive	Environnement de raccords à joints plats dans le cas de conduites dans des locaux fermés
Zone sûre	Non	• A l'extérieur de la zone 2 • Utilisation standard de périphérie décentralisée

Vous trouverez ci-après des remarques importantes pour l'installation de la station de périphérie décentralisée des modules / coupleurs dans la zone à risque d'explosion.

Informations complémentaires

Des informations complémentaires sur les modules / cartouches se trouvent dans le manuel correspondant.

Lieu de fabrication / Homologation

 **II 3 G** **EEx nA II T3 .. T6** selon EN 50021 : 1999

Numéro de contrôle : *voir tableau*

Lieu de fabrication	Modules / coupleurs	Numéro de contrôle
Siemens AG, Bereich A&D Werner-von-Siemens-Straße 50 92224 Amberg Germany	ET 200S Modules à sécurité intrinsèque ET 200S	KEMA 01 ATEX 1238X
	S7-300 ET 200M Couplage de bus DP/PA Répéteur de diagnostic Modules à sécurité intrinsèque S7-300	KEMA 02 ATEX 1096X
Siemens AG, Bereich A&D Östliche Rheinbrückenstr. 50 76187 Karlsruhe Germany	S7-400	KEMA 03 ATEX 1125X
	S7-300 CP TS Adapter II	KEMA 03 ATEX 1228X
	SIMATIC NET	KEMA 03 ATEX 1226X

Nota

Les modules / coupleurs homologués ⟨Ex⟩ II 3 G EEx nA II T3 .. T6 ne peuvent être utilisés que dans des systèmes SIMATIC de catégorie 3.

Entretien

Si une réparation est nécessaire, le module / coupleur concerné doit être expédié au lieu de production. La réparation ne doit être effectuée qu'en ce lieu.

Conditions particulières

1. Les modules / coupleurs doivent être installés dans une armoire ou un boîtier métallique. Ceux-ci doivent assurer au moins l'indice de protection IP 54. Il faut alors tenir compte des conditions d'environnement dans lesquelles l'appareil est installé. Le boîtier doit faire l'objet d'une déclaration de conformité du fabricant pour la zone 2 (selon EN 50021).
2. Si dans les conditions d'exploitation, une température > 70 °C est atteinte au niveau du câble ou de l'entrée du câble dans ce boîtier, ou bien si la température au niveau de la dérivation des conducteurs peut être > 80 °C, les capacités de résistance thermique des câbles doivent corespondre aux températures effectivement mesurées.
3. Les entrées de câbles utilisées doivent avoir le niveau de protection IP exigé et être conformes au paragraphe 7.2 (selon EN 50021).
4. Tous les appareillages (y compris les interrupteurs, etc.) raccordés aux entrées et sorties de systèmes SIMATIC doivent être homologués pour la protection antidéflagrante type EEx nA ou EEx nC.
5. Il faut prendre des mesures pour que la tension nominale ne puisse pas être dépassée de plus de 40% sous l'influence de transitoires.
6. Plage de température ambiante : 0° C à 60° C
7. A l'intérieur du boîtier, il faut placer, à un endroit bien visible après ouverture, une plaquette comportant l'avertissement suivant :

⚠

Avertissement
Ouvir le boîtier le moins longtemps possible, par exemple pour effectuer un diagnostic visuel. Ce faisant, n'actionnez aucun commutateur, ne déconnectez aucun module et ne débanchez pas de câbles électriques (connexions).
Le respect de cet avertissement n'est pas impératif s'il est certain que l'environnement ne présente pas de risque d'explosion.

Liste des modules / coupleurs homologués

Vous trouverez sur Internet la liste des modules / coupleurs homologués :

http://www4.ad.siemens.de/view/cs/

référence ID 13702947.

Aplicación de los módulos / tarjetas en áreas con peligro de explosión, zona 2

Zona 2

Las áreas con peligro de explosión se clasifican en zonas. Las zonas se diferencian según la probabilidad de la existencia de una atmósfera capaz de sufrir una explosión.

Zona	Peligro de explosión	Ejemplo
2	La atmósfera explosiva de gas sólo se presenta rara vez y muy brevemente	Áreas alrededor de uniones abridadas con juntas planas en tuberías en locales cerrados
Área segura	no	• fuera de la zona 2 • Aplicaciones estándar de la periferia descentralizada

A continuación encontrará importantes informaciones para la instalación de los módulos / tarjetas en áreas con peligro de explosión.

Otras informaciones

Encontrará otras informaciones relativas a los módulos / tarjetas en el Manual correspondiente.

Lugar de fabricación / Homologación

 **II 3 G** **EEx nA II T3 .. T6** según norma EN 50021 : 1999

Número de comprobación: *véase tabla*

Lugar de fabricación	Módulos / tarjetas	Número de comprobación
Siemens AG, Bereich A&D Werner-von-Siemens-Straße 50 92224 Amberg Germany	ET 200S Grupos ET 200S a prueba de fallos	KEMA 01 ATEX 1238 X
	S7-300 ET 200M Acoplamiento de bus DP/PA Repetidor de diagnóstico Grupos S7-300 a prueba de fallos	KEMA 02 ATEX 1096 X
Siemens AG, Bereich A&D Östliche Rheinbrückenstr. 50 76187 Karlsruhe Germany	S7-400	KEMA 03 ATEX 1125 X
	S7-300 CP TS Adapter	KEMA 03 ATEX 1228 X
	SIMATIC NET	KEMA 03 ATEX 1226 X

Nota

Los módulos / tarjetas con la homologación ⟨Ex⟩ II 3 G EEx nA II T3 .. T6 pueden utilizarse únicamente en los sistemas SIMATIC de la categoría de equipo 3.

Mantenimiento

Para una reparación se ha de remitir el módulo / tarjeta afectado al lugar de fabricación. Sólo allí se puede realizar la reparación.

Condiciones especiales

1. Los módulos / tarjetas se han de montar en un armario eléctrico de distribución o en una carcasa metálica. Éstos deben garantizar como mínimo el grado de protección IP 54 (conforme a EN 60529). Para ello se han de tener en cuenta las condiciones ambientales, en las cuales se instala el equipo. La caja deberá contar con una declaración del fabricante para la zona 2 (conforme a EN 50021).
2. Si durante la operación se alcanzara una temperatura > 70° C en el cable o la entrada de cables de esta caja o bien una temperatura > 80° C en la bifurcación de hilos, deberán adaptarse las propiedades térmicas de los cables a las temperaturas medidas efectivamente.
3. Las entradas de cable utilizadas deben cumplir el grado de protección IP exigido y lo expuesto en el apartado 7.2 (conforme a EN 50021).
4. Todos los dispositivos –inclusive interruptores, etc.– conectados a las entradas y salidas de sistemas SIMATIC deben estar homologados para la protección contra explosiones del tipo EEx nA o EEx nC.
5. Es necesario adoptar las medidas necesarias para evitar que la tensión nominal pueda rebasar en más del 40 % debido a efectos transitorios.
6. Margen de temperatura ambiente: 0° C hasta 60° C
7. Dentro de la caja deberá colocarse en un lugar perfectamente visible tras su apertura un rótulo con la siguiente advertencia:

Precaución
Abrir la caja sólo brevemente, p.ej. para el diagnóstico visual. Durante este tiempo Ud. no deberá activar ningún interruptor, desenchufar o enchufar módulos ni separar conductores eléctricos (conexiones enchufables).
Esta advertencia puede ignorarse si Ud. sabe que en la atmósfera existente no hay peligro de explosión.

Lista de los módulos / tarjetas homologados

En la internet hallará Ud. una lista con los módulos / tarjetas homologados:

http://www4.ad.siemens.de/view/cs/

bajo el ID de asignación 13702947.

Impiego delle unità/moduli nell'area a pericolo di esplosione zona 2

Zona 2

Le aree a pericolo di esplosione vengono suddivise in zone. Le zone vengono distinte secondo la probabilità della presenza di un'atmosfera esplosiva.

Zona	Pericolo di esplosione	Esempio
2	L'atmosfera esplosiva si presente solo raramente e brevemente	Aree intorno a collegamenti a flange con guarnizioni piatte nelle condotte in ambienti chiusi
Area sicura	No	• Al di fuori della zona 2 • Applicazioni standard di periferia decentrata

Qui di seguito sono riportate delle avvertenze importanti per l'installazione delle unità/moduli nell'area a pericolo di esplosione.

Ulteriori informazioni

Ulteriori informazioni sulle unità/moduli si trovano nel corrispondente manuale.

Luogo di produzione / Omologazione

 **II 3 G** **EEx nA II T3 .. T6** secondo EN 50021 : 1999

Numero di controllo: *vedi tabella*

Luogo di produzione	Unità/moduli	Numero di controllo
Siemens AG, Bereich A&D Werner-von-Siemens-Straße 50 92224 Amberg Germany	ET 200S Unità ad elevata sicurezza ET 200S	KEMA 01 ATEX 1238X
	S7-300 ET 200M Accoppiamento di bus DP/PA Repeater di diagnostica Unità ad elevata sicurezza S7-300	KEMA 02 ATEX 1096X
Siemens AG, Bereich A&D Östliche Rheinbrückenstr. 50 76187 Karlsruhe Germany	S7-400	KEMA 03 ATEX 1125X
	S7-300 CP TS Adapter II	KEMA 03 ATEX 1228X
	SIMATIC NET	KEMA 03 ATEX 1226X

Avvertenza

Le unità/moduli con l'omologazione ⟨Ex⟩ II 3 G EEx nA II T3 .. T6 possono essere impiegati solo nei sistemi SIMATIC della categoria di apparecchiature 3.

Manutenzione

Per una riparazione, le unità/i moduli interessati devono essere inviati al luogo di produzione. La riparazione può essere effettuata solo lì.

Condizioni particolari

1. Le unità/i moduli devono essere montati in un armadio elettrico o in un contenitore metallico. Questi devono assicurare almeno il tipo di protezione IP 54. In questo caso bisogna tenere conto delle condizioni ambientali nelle quali l'apparecchiatura viene installata. Per il contenitore deve essere presente una dichiarazione del costruttore per la zona 2 (secondo EN 50021).
2. Se nei cavi o nel loro punto di ingresso in questo contenitore viene raggiunta in condizioni di esercizio una temperatura > 70 °C o se in condizioni di esercizio la temperatura nella derivazione dei fili può essere > 80 °C, le caratteristiche di temperatura dei cavi devono essere conformi alla temperatura effettivamente misurata.
3. Gli ingressi dei cavi usati devono essere conformi al tipo di protezione richiesto e alla sezione 7.2 (secondo EN 50021).
4. Tutte le apparecchiature, inclusi interruttori, ecc. che vengono collegati agli ingressi/uscite di sistemi SIMATIC, devono essere stati omologati per la protezione da esplosione tipo EEx nA o EEx nC.
5. Devono essere prese delle misure per evitare che la tensione nominale possa essere superata per più del 40% da parte di transienti.
6. Campo termico ambientale: da 0° C a 60° C
7. All'interno del contenitore va apportata, in un luogo ben visibile dopo l'apertura, una targhetta con il seguente avvertimento:

⚠

Attenzione
Il contenitore può rimanere aperto solo per breve tempo, ad esempio per una diagnostica a vista. In tal caso non azionare alcun interruttore, non disinnestare o innestare unità e non staccare connessioni elettriche (connettori).
Non è necessario tenere conto di questo avvertimento se è noto che non c'è un'atmosfera a rischio di esplosione

Elenco delle unità/moduli omologati

L'elenco con le unità/moduli omologati si trova in Internet al sito:

http://www4.ad.siemens.de/view/cs/

all'ID di voce 13702947.

Gebruik van de componenten/modulen in het explosief gebied zone 2

Zone 2

Explosieve gebieden worden ingedeeld in zones. Bij de zones wordt onderscheiden volgens de waarschijnlijkheid van de aanwezigheid van een explosieve atmosfeer.

Zone	Explosiegevaar	Voorbeeld
2	Een explosieve gasatmosfeer treedt maar zelden op en voor korte duur	Gebieden rond flensverbindingen met pakkingen bij buisleidingen in gesloten vertrekken
Veilig gebied	neen	• Buiten de zone 2 • Standaardtoepassingen van decentrale periferie

Hierna vindt u belangrijke aanwijzingen voor de installatie van de componenten/modulen in het explosief gebied.

Verdere informatie

In het bijhorende handboek vindt u verdere informatie over de componenten/modulen

Productieplaats / Vergunning

 **II 3 G** **EEx nA II T3 .. T6** conform EN 50021 : 1999

Keuringsnummer: *zie tabel*

Productieplaats	Componenten/modulen	Keuringsnummer
Siemens AG, Bereich A&D Werner-von-Siemens-Strasse 50 92224 Amberg Germany	ET 200S ET 200S tegen fouten beveiligde componenten	KEMA 01 ATEX 1238X
	S7-300 ET 200 M Buskoppeling DP/PA Diagnoserepeater S7-300 tegen fouten beveiligde componenten	KEMA 02 ATEX 1096X
Siemens AG, Bereich A&D Östliche Rheinbrückenstr. 50 76187 Karlsruhe Germany	S7-400	KEMA 03 ATEX 1125X
	S7-300 CP TS Adapter II	KEMA 03 ATEX 1228X
	SIMATIC NET	KEMA 03 ATEX 1226X

Opmerking

Componenten/modulen met de vergunning ⟨Ex⟩ II 3 G EEx nA II T3 .. T6 mogen slechts worden gebruikt in SIMATIC-systemen van de apparaatcategorie 3.

Instandhouding

Voor een reparatie moeten de betreffende componenten/modulen naar de plaats van vervaardiging worden gestuurd. Alleen daar mag de reparatie worden uitgevoerd.

Speciale voorwaarden

1. Componenten/modulen moeten worden ingebouwd in een schakelkast of in een behuizing van metaal. Deze moeten minstens de veiligheidsgraad IP 54 waarborgen. Hierbij dient rekening te worden gehouden met de omgevingsvoorwaarden waarin het apparaat wordt geïnstalleerd. Voor de behuizing dient een verklaring van de fabrikant voor zone 2 te worden ingediend (volgens EN 50021).
2. Als aan de kabel of aan de kabelinvoering van deze behuizing onder bedrijfsomstandigheden een temperatuur wordt bereikt > 70 °C of als onder bedrijfsomstandigheden de temperatuur aan de adervertakking > 80 °C kan zijn, moeten de temperatuureigenschappen van de kabel overeenstemmen met de werkelijk gemeten temperaturen.
3. De aangebrachte kabelinvoeringen moeten de vereiste IP-veiligheidsgraad hebben en in overeenstemming zijn met alinea 7.2 (volgens EN 50021).
4. Alle apparaten, schakelaars enz. inbegrepen, die worden aangesloten op de in- en uitgangen van SIMATIC-systemen, moeten zijn goedgekeurd voor de explosiebeveiliging type EEx nA of EEx nC.
5. Er dienen maatregelen te worden getroffen, zodat de nominale spanning door transiënten met niet meer dan 40 % kan worden overschreden.
6. Omgevingstemperatuurbereik: 0° C tot 60° C
7. Binnen de behuizing dient op een na het openen goed zichtbare plaats een bord te worden aangebracht met de volgende waarschuwing:

⚠

Waarschuwing
De behuizing mag slechts voor korte tijd worden geopend, bijv. voor een visuele diagnose. Bedien hierbij geen schakelaar, trek of steek geen modulen en ontkoppel geen elektrische leidingen (steekverbindingen).
Deze waarschuwing kan buiten beschouwing blijven, indien bekend is dat er geen explosieve atmosfeer heerst.

Lijst van de toegelaten componenten/modulen

De lijst met de toegelaten componenten/modulen vindt u in het internet:

http://www4.ad.siemens.de/view/cs/

onder de bijdrage-ID 13702947.

Brug af komponenter/moduler i det eksplosionsfarlige område zone 2

Zone 2

Eksplosionsfarlige områder inddeles i zoner. Zonerne adskiller sig indbyrdes efter hvor sandsynligt det er, at der er en eksplosiv atmosfære.

Zone	Eksplosionsfare	Eksempel
2	Eksplosiv gasatmosfære optræder kun sjældent og varer kort	Områder rundt om flangeforbindelser med flade pakninger ved rørledninger i lukkede rum
Sikkert område	Nej	• Uden for zone 2 • Standardanvendelser decentral periferi

I det følgende findes vigtige henvisninger vedr. installation af komponenter/moduler i det eksplosionsfarlige område.

Yderligere informationer

Yderligere informationer om komponenterne/modulerne findes i den pågældende manual.

Produktionssted / Godkendelse

 **II 3 G** **EEx nA II T3 .. T6** efter EN 50021 : 1999

Kontrolnummer: *se tabel*

Produktionssted	Komponenter/moduler	Kontrolnummer
Siemens AG, Bereich A&D Werner-von-Siemens-Straße 50 92224 Amberg Germany	ET 200S ET 200S fejlsikre komponenter	KEMA 01 ATEX 1238X
	S7-300 ET 200M Buskobling DP/PA Diagnoserepeater S7-300 fejlsikre komponenter	KEMA 02 ATEX 1096X
Siemens AG, Bereich A&D Östliche Rheinbrückenstr. 50 76187 Karlsruhe Germany	S7-400	KEMA 03 ATEX 1125X
	S7-300 CP TS Adapter II	KEMA 03 ATEX 1228X
	SIMATIC NET	KEMA 03 ATEX 1226X

Bemærk

Komponenter/moduler med godkendelsen  II 3 G EEx nA II T3 .. T6 må kun monteres i SIMATIC-systemer for udstyrskategori 3.

Vedligeholdelse

Hvis de pågældende komponenter/moduler skal repareres, bedes De sende dem til produktionsstedet. Reparation må kun udføres der.

Særlige betingelser

1. Komponenterne/modulerne skal monteres i et kontrolskab eller et metalkabinet. Disse skal mindst kunne sikre beskyttelsesklasse IP 54. I denne forbindelse skal der tages højde for de omgivelsestemperaturer, i hvilke udstyret er installeret. Der skal være udarbejdet en erklæring fra fabrikanten for kabinettet for zone 2 (iht. EN 50021).
2. Hvis kablet eller kabelindføringen på dette hus når op på en temperatur på > 70 °C under driftsbetingelser eller hvis temperaturen på åreforegreningen kan være > 80 °C under driftsbetingelser, skal kablernes temperaturegenskaber stemme overens med de temperaturer, der rent faktisk måles.
3. De benyttede kabelindføringer skal være i overensstemmelse med den krævede IP-beskyttelsestype og afsnittet 7.2 (iht. EN 50021).
4. Alle apparater, inkl. kontakter osv., der forbindes med ind- og udgangene til SIMATIC-systemerne, skal være godkendt til eksplosionsbeskyttelse af type EEx nA eller EEx nC.
5. Der skal træffes foranstaltninger, der sørger for, at den nominelle spænding via transienter ikke kan overskrides mere end 40 %.
6. Omgivelsestemperaturområde: 0° C til 60° C
7. I kabinettet skal der anbringes et skilt, der skal kunne ses, når kabinettet åbnes. Dette skilt skal have følgende advarsel:

Advarsel
Kabinettet må kun åbnes i kort tid, f.eks. til visuel diagnose. Tryk i denne forbindelse ikke på kontakter, træk eller isæt ikke komponenter og afbryd ikke elektriske ledninger (stikforbindelser).
Der skal ikke tages højde for denne advarsel, hvis man ved, at der ikke er nogen eksplosionsfarlig atmosfære.

Liste over godkendte komponenter/moduler

Listen med de godkendte komponenter/moduler findes på internettet:

http://www4.ad.siemens.de/view/cs/

under bidrags-ID 13702947.

Rakenneryhmien/moduulien käyttö räjähdysvaarannetuilla alueilla, vyöhyke 2

Vyöhyke 2

Räjähdysvaarannetut alueet jaetaan vyöhykkeisiin. Vyöhykkeet erotellaan räjähdyskelpoisen ilmakehän olemassa olon todennäköisyyden mukaan.

Vyöhyke	Räjähdysvaara	Esimerkki
2	Räjähtävä kaasuilmakehä ilmaantuu vain harvoin ja lyhytaikaisesti	Alueet putkistojen lattatiivisteillä varustuilla laippaliitoksilla suljetuissa tiloissa
turvallinen alue	ei	• vyöhykkeen 2 ulkopuolella • Hajautetun ulkopiirin vakiosovellukset

Seuraavasta löydätte tärkeitä ohjeita rakenneryhmien/moduulien asennukseen räjähdysvaarannetuilla alueilla.

Lisätietoja

Lisätietoja rakenneryhmiin/moduuleihin löydätte niihin kuuluvista ohjekirjasta.

Valmistuspaikka / Hyväksyntä

 **II 3 G** **EEx nA II T3 .. T6** EN 50021 mukaan: 1999

Tarkastusnumero: *katso taulukko*

Valmistuspaikka	Rakenneryhmät/moduulit	Tarkastusnumero
Siemens AG, Bereich A&D Werner-von-Siemens-Straße 50 92224 Amberg Germany	ET 200S ET 200S läpi-iskuvarmat rakenneryhmät	KEMA 01 ATEX 1238X
	S7-300 ET 200M Väyläkytkin DP/PA Dignoositoistin S7-300 läpi-iskuvarmat rakenneryhmät	KEMA 02 ATEX 1096X
Siemens AG, Bereich A&D Östliche Rheinbrückenstr. 50 76187 Karlsruhe Germany	S7-400	KEMA 03 ATEX 1125X
	S7-300 CP TS Adapter II	KEMA 03 ATEX 1228X
	SIMATIC NET	KEMA 03 ATEX 1226X

Ohje

Rakenneryhmät/moduulit hyväksynnän  II 3 G EEx nA II T3 .. T6 kanssa saadaan käyttää ainoastaan laitekategorian 3 SIMATIC-järjestelmissä.

Kunnossapito

Korjausta varten täytyy kyseinen rakenneryhmä/moduuli lähettää valmistuspaikkaan. Korjaus voidaan suorittaa ainoastaan siellä.

Erityiset vaatimukset

1. Rakenneryhmät/moduulit täytyy asentaa kytkentäkaappiin tai metalliseen koteloon. Näiden täytyy olla vähintään kotelointiluokan IP 54 mukaisia. Tällöin on huomioitava ympäristöolosuhteet, johon laite asennetaan. Kotelolle täytyy olla valmistajaselvitys vyöhykettä 2 varten (EN 50021 mukaan).
2. Kun johdolla tai tämän kotelon johdon sisäänviennillä saavutetaan > 70 °C lämpötila tai kun käyttöolosuhteissa lämpötila voi piuhajaotuksella olla > 80 °C, täytyy johdon lämpötilaominaisuuksien vastata todellisesti mitattuja lämpötiloja.
3. Käytettyjen johtojen sisäänohjauksien täytyy olla vaaditun IP-kotelointiluokan ja kohdan 7.2 (EN 50021 mukaan) mukaisia.
4. Kaikkien laitteiden, kytkimet jne. mukaan lukien, jotka liitetään SIMATIC-järjestelmien tuloille ja lähdöille, täytyy olla hyväksyttyjä tyypin EEx nA tai EEx nC räjähdyssuojausta varten.
5. Toimenpiteet täytyy suorittaa, ettei nimellisjännite voi transienttien kautta ylittyä enemmän kuin 40 %.
6. Ympäristölämpötila-alue: 0° C ... 60° C
7. Kotelon sisälle, avauksen jälkeen näkyvälle paikalle, on kiinnitettävä kilpi, jossa on seuraava varoitus:

Varoitus
Kotelo saadaan avata ainoastaan lyhyeksi ajaksi, esim. visuaalista diagnoosia varten. Älä tällöin käytä mitään kytkimiä, vedä tai liitä mitään rakenneryhmiä, äläkä erota mitään sähköjohtoja (pistoliittimiä).
Tätä varoitusta ei tarvitse huomioida, kun on tiedossa, että minkäänlaista räjähdysvaarannettua ilmakehää ei ole olemassa.

Hyväksyttyjen rakenneryhmien/moduulien lista

Lista hyväksytyistä rakennesarjoista/moduuleista löytyy internetistä osoitteesta:

http://www4.ad.siemens.de/view/cs/

käyttäjätunnuksella 13702947.

Användning av komponentgrupperna/modulerna i explosionsriskområde zon 2

Zon 2

Explosionsriskområden delas in i zoner. Zonerna delas in enligt sannolikheten att en atmosfär med explosionsfara föreligger.

Zon	Explosionsfara	Exempel
2	Explosiv gasatmosfär uppstår endast sällan eller kortvarigt	Områden kring flänsförbindelser med packningar vid rörledningar i slutna utrymmen
Säkert område	Nej	• Utanför zon 2 • Standardanvändning av decentral periferi

Nedan följer viktiga anvisningar om installationen av komponentgrupperna/modulerna i ett explosionsriskområde.

Ytterligare information

Ytterligare information om komponentgrupperna/modulerna finner du i tillhörande handbok.

Tillverkningsort / Godkännande

II 3 G **EEx nA II T3 .. T6** enligt EN 50021 : 1999

Kontrollnummer: *se tabell*

Tillverkningsort	Komponentgrupper/ moduler	Kontrollnummer
Siemens AG, Bereich A&D Werner-von-Siemens-Straße 50 92224 Amberg Germany	ET 200S ET 200S Felsäkra komponentgrupper	KEMA 01 ATEX 1238X
	S7-300 ET 200M Busskoppling DP/PA Diagnosrepeater S7-300 Felsäkra komponentgrupper	KEMA 02 ATEX 1096X
Siemens AG, Bereich A&D Östliche Rheinbrückenstr. 50 76187 Karlsruhe Germany	S7-400	KEMA 03 ATEX 1125X
	S7-300 CP TS Adapter II	KEMA 03 ATEX 1228X
	SIMATIC NET	KEMA 03 ATEX 1226X

Anvisning

Komponentgrupper/moduler med godkännande Ex II 3 G EEx nA II T3 .. T6 får endast användas i SIMATIC-system i apparatgrupp 3.

Underhåll

Vid reparation måste den aktuella komponentgrupperna/modulerna insändas till tillverkaren. Reparationer får endast genomföras där.

Särskilda villkor

1. Komponentgrupperna/modulerna måste monteras i ett kopplingsskåp eller metallhus. Dessa måste minst vara av skyddsklass IP 54. Därvid ska omgivningsvillkoren där enheten installeras beaktas. För kåpan måste en tillverkardeklaration för zon 2 föreligga (enligt EN 50021).
2. Om en temperatur på > 70°C uppnås vid husets kabel resp kabelinföring under driftvillkor eller om temperaturen vid trådförgreningen kan vara > 80°C under driftvillkor, måste kabelns temperaturegenskaper överensstämma med den verkligen uppmätta temperaturen.
3. De använda kabelinföringarna måste uppfylla kraven i det krävda IP-skyddsutförandet och i avsnitt 7.2 (enligt EN 50021).
4. Alla apparater, inklusive brytare osv, som ansluts till in- och utgångarna på SIMATIC-system, måste vara godkända för explosionsskydd av typ EEx nA eller EEx nC.
5. Åtgärder måste vidtas så, att märkspänningen ej kan överskridas med mer än 40 % genom transienter.
6. Omgivningstemperatur: 0° C till 60° C
7. När huset öppnats ska en skylt med följande varning monteras på ett tydligt synligt ställe huset:

Varning
Huset får endast öppnas under kort tid, t ex för visuell diagnos. Använd därvid inga brytare, lossa eller anslut inga enheter och frånskilj inga elektriska ledningar (insticksanslutningar).
Ingen hänsyn måste tas till denna varning om det är säkert att det inte råder någon explosionsfarlig atmosfär.

Lista över godkända komponentgrupper/moduler

Lista över godkända komponentgrupper/moduler finns på Internetadressen:

http://www4.ad.siemens.de/view/cs/

under bidrags-ID 13702947.

Uso de grupos construtivos/módulos em área exposta ao perigo de explosão 2

Zona 2

As áreas expostas ao perigo de explosão são divididas em zonas. As zonas são diferenciadas de acordo com a probabilidade da existência de uma atmosfera explosiva.

Zona	Perigo de explosão	Exemplo
2	Só raramente e por um breve período de tempo surgem atmosferas explosivas	Áreas em torno de ligações flangeadas com vedações chatas em tubulações em recintos fechados
Área segura	não	• fora da zona 2 • Aplicações descentralizadas de periferia descentralizada

A seguir, o encontrará avisos importantes para a instalação de grupos construtivos/ módulos em área exposta ao perigo de explosão.

Mais informações

Para obter mais informações sobre grupos construtivos/módulos, consulte o respectivo manual.

Local de produção / Licença

 **II 3 G** **EEx nA II T3 .. T6** seg. EN 50021 : 1999

Número de ensaio: *veja a tabela*

Local de produção	Grupos construtivos/módulos	N° de ensaio
Siemens AG, Bereich A&D Werner-von-Siemens-Straße 50 92224 Amberg Alemanha	ET 200S ET 200S Grupos construtivos protegidos contra erro	KEMA 01 ATEX 1238X
	S7-300 ET 200M Acoplador bus DP/PA Repetidor de diagnóstico S7-300 Grupos construtivos protegidos contra erro	KEMA 02 ATEX 1096X
Siemens AG, Bereich A&D Östliche Rheinbrückenstr. 50 76187 Karlsruhe Alemanha	S7-400	KEMA 03 ATEX 1125X
	S7-300 CP TS Adapter II	KEMA 03 ATEX 1228X
	SIMATIC NET	KEMA 03 ATEX 1226X

Aviso

Os grupos construtivos/módulos com a licença ⟨Ex⟩ II 3 G EEx nA II T3 .. T6 só podem ser aplicados em sistemas SIMATIC da categoria de aparelho 3.

Reparo

Os grupos construtivos/módulos em questão devem ser remetidos para o local de produção a fim de que seja realizado o reparo. Apenas lá deve ser efetuado o reparo.

Condições especiais

1. Os grupos construtivos/módulos devem ser montados em um armário de distribuição ou em uma caixa metálica. Estes devem garantir no mínimo o tipo de protecção IP 54. Durante este trabalho deverão ser levados em consideração as condições locais, nas quais o aparelho será instalado. Para a caixa deverá ser apresentada uma declaração do fabricante para a zona 2 (de acordo com EN 50021).
2. Caso no cabo ou na entrada do cabo desta carcaça sob as condições operacionais seja atingida uma temperatura de > 70 °C, ou caso sob condições operacionais a temperatura na ramificação do fio poderá atingir > 80 °C, as caraterísticas de temperatura deverão corresponder às temperaturas realmente medidas.
3. As entradas de cabo utilizadas devem corresponder ao tipo exigido de protecção IP e à seção 7.2 (de acordo com o EN 50021).
4. Todos os aparelhos, inclusive as chaves, etc., que estejam conectadas em entradas e saídas dos sistemas SIMATIC devem possuir a licença para a protecção de explosão do tipo EEx nA ou EEx nC.
5. Precisam ser tomadas medidas para que a tensão nominal através de transitórios não possa ser ultrapassada em mais que 40 %.
6. Área de temperatura ambiente: 0° C até 60° C
7. No âmbito da carcaça deve ser colocada, após a abertura, em um ponto bem visível uma placa com a seguinte advertência:

Advertência
A carcaça deve ser aberta apenas por um breve período de tempo, por ex. para diagnóstico visual. Não acione nenhum interruptor, não retire ou conecte nenhum módulo e não separe nenhum fio elétrico (ligações de tomada).
Esta advertência poderá ser ignorada caso se saiba que não há nenhuma atmosfera sujeita ao perigo de explosão.

Lista dos grupos construtivos/módulos autorizados

A lista com os grupos construtivos/módulos autorizados encontram-se na Internet:

http://www4.ad.siemens.de/view/cs/

sob o número de ID 13702947.

Χρήση των δομικών συγκροτημάτων/μονάδων σε επικίνδυνη για έκρηξη περιοχή, ζώνη 2

Ζώνη 2

Οι επικίνδυνες για έκρηξη περιοχές χωρίζονται σε ζώνες. Οι ζώνες διαφέρουν σύμφωνα με την πιθανότητα ύπαρξης ενός ικανού για έκρηξη περιβάλλοντος.

Ζώνη	Κίνδυνος έκρηξης	Παράδειγμα
2	Εκρηκτικό περιβάλλον αερίου παρουσιάζεται μόνο σπάνια και για σύντομο χρονικό διάστημα	Περιοχές γύρω από φλαντζωτές συνδέσεις με τσιμούχες σε σωληνώσεις σε κλειστούς χώρους
Ασφαλής περιοχή	όχι	• Εκτός της ζώνης 2 • Τυπικές εφαρμογές αποκεντρωμένης περιφέρειας

Στη συνέχεια θα βρείτε σημαντικές υποδείξεις για την εγκατάσταση των δομικών συγκροτημάτων/μονάδων σε επικίνδυνη για έκρηξη περιοχή.

Επιπλέον πληροφορίες

Επιπλέον πληροφορίες για τα δομικά συγκροτήματα/μονάδες θα βρείτε στο αντίστοιχο εγχειρίδιο.

Τόπος κατασκευής / Άδεια

 **II 3 G** **EEx nA II T3 .. T6** σύμφωνα με το πρότυπο EN 50021 : 1999

Αριθμός ελέγχου: *βλέπε πίνακα*

Τόπος κατασκευής	Δομικά συγκροτήματα/μονάδες	Αιθμ. ελέγχου
Siemens AG, Bereich A&D Werner-von-Siemens-Straße 50 92224 Amberg Germany	ET 200S ET 200S Ασφαλή σε περίπτωση βλάβης δομικά συγκροτήματα	KEMA 01 ATEX 1238X
	S7-300 ET 200M Σύζευξη διαύλου DP/PA Επαναλήπτης διάγνωσης S7-300 Ασφαλή σε περίπτωση βλάβης δομικά συγκροτήματα	KEMA 02 ATEX 1096X
Siemens AG, Bereich A&D Östliche Rheinbrückenstr. 50 76187 Karlsruhe Germany	S7-400	KEMA 03 ATEX 1125X
	S7-300 CP TS Adapter II	KEMA 03 ATEX 1228X
	SIMATIC NET	KEMA 03 ATEX 1226X

Υπόδειξη

Τα δομικά συγκροτήματα/οι μονάδες με την άδεια ⟨Ex⟩ II 3 G EEx nA II T3 .. T6 επιτρέπεται να τοποθετηθούν μόνο σε συστήματα αυτοματισμού SIMATIC της κατηγορίας συσκευής 3.

Συντήρηση

Για μια επισκευή πρέπει να σταλθούν τα αντίστοιχα δομικά συγκροτήματα/μονάδες στον τόπο κατασκευής. Μόνο εκεί επιτρέπεται να γίνει η επισκευή.

Ιδιαίτερες προϋποθέσεις

1. Τα δομικά συγκροτήματα/μονάδες πρέπει να ενσωματωθούν σε ένα ερμάριο ζεύξης ή σε ένα μεταλλικό περίβλημα. Αυτά πρέπει να εξασφαλίζουν το λιγότερο το βαθμό προστασίας IP 54 (κατά EN 60529). Σε αυτήν την περίπτωση πρέπει να ληφθούν υπόψη οι περιβαλλοντικές συνθήκες, στις οποίες θα εγκατασταθεί η συσκευή. Για το περίβλημα πρέπει να προβλέπεται δήλωση του κατασκευαστή για τη ζώνη 2 (σύμφωνα με το πρότυπο EN 50021).
2. Εάν στο καλώδιο ή στην είσοδο του καλωδίου αυτού του περιβλήματος κάτω από συνθήκες λειτουργίας η θερμοκρασία ξεπεράσει τους 70 °C ή όταν κάτω από συνθήκες λειτουργίας η θερμοκρασία στη διακλάδωση του σύρματος μπορεί να είναι μεγαλύτερη από 80 °C, πρέπει οι θερμοκρασιακές ιδιότητες των καλωδίων να ταυτίζονται με τις πραγματικά μετρημένες θερμοκρασίες.
3. Οι χρησιμοποιούμενες εισόδοι καλωδίων πρέπει να συμμορφώνονται με το βαθμό προστασίας IP 54 στην ενότητα 7.2 (σύμφωνα με το πρότυπο EN 50021).
4. Όλες οι συσκευές, συμπεριλαμβανομένων διακοπτών κ.α., που συνδέονται στις εισόδους και εξόδους των συστημάτων SIMATIC, πρέπει να φέρουν εγκριμένη προστασία κατά έκρηξης τύπου EEx nA ή EEx nC.
5. Πρέπει να ληφθούν μέτρα, να μην μπορεί να γίνει υπέρβαση της ονομαστικής τάσης μέσω αιφνίδιας μεταβολής της τάσης πάνω από 40 %.
6. Περιοχή θερμοκρασίας περιβάλλοντος: 0° C έως 60° C
7. Πρέπει να τοποθετηθεί μέσα στο περίβλημα σε ευδιάκριτο σημείο μετά το άνοιγμα μία πινακίδα με την ακόλουθη προειδοποίηση:

Προειδοποίηση
Το περίβλημα επιτρέπεται να ανοίγει μόνο για μικρό χρονικό διάστημα, π.χ. για τη διενέργεια οπτικής διάγνωσης. Μην κάνετε χρήση διακοπτών, μην τραβάτε ή εμβυσματώνετε δομικά συγκροτήματα και μη διαχωρίζετε ηλεκτροφόρους αγωγούς (εμβυσματώσιμες συνδέσεις).
Η προειδοποίηση αυτή δε χρειάζεται να ληφθεί υπ' όψιν, εάν είναι γνωστό ότι δεν υφίσταται ατμόσφαιρα παρουσιάζουσα κίνδυνο έκρηξης**.**

Κατάλογος των εγκεκριμένων δομικών συγκροτημάτων/μονάδων

Η λίστα με τα εγκριμένα δομικά συγκροτήματα/μονάδες υπάρχει στο διαδίκτυο:

http://www4.ad.siemens.de/view/cs/

με τον κωδικό συνδρομής 13702947.

Použití konstrukčních skupin / modulů v prostředí s nebezpečím výbuchu Zóna 2

Zóna 2

Oblasti s nebezpečím výbuchu jsou rozděleny do zón. Zóny jsou rozlišeny podle pravděpodobnosti výskytu explosivní atmosféry.

Zóna	Nebezpečí exploze	Příklad
2	Explosivní plynová atmosféra se vyskytuje pouze zřídka a krátkodobě	Oblasti kolem přírubových spojů s plochým těsněním u potrubí v uzavřených prostorech
Bezpečná oblast	není	• Mimo zónu 2 • Standardní aplikace necentrálních periferií

Dále naleznete důležité pokyny pro instalaci konstrukčních skupin/modulů v oblastech s nebezpečím výbuchu.

Další informace

Další informace ke konstrukčním skupinám/modulům naleznete v příslušné příručce.

Místo výroby / Registrace

II 3 G **EEx nA II T3 .. T6** dle EN 50021 : 1999

Zkušební číslo: *viz tabulka*

Místo výroby	Konstrukční skupiny/Moduly	Kontrolní číslo
Siemens AG, Bereich A&D Werner-von-Siemens-Straße 50 92224 Amberg Germany	ET 200S ET 200S Konstrukční skupiny odolné proti chybám	KEMA 01 ATEX 1238X
	S7-300 ET 200M Spojka sběrnice DP/PA Diagnostické translační relé S7-300 Konstrukční skupiny odolné proti chybám	KEMA 02 ATEX 1096X
Siemens AG, Bereich A&D Östliche Rheinbrückenstr. 50 76187 Karlsruhe Germany	S7-400	KEMA 03 ATEX 1125X
	S7-300 CP TS Adapter II	KEMA 03 ATEX 1228X
	SIMATIC NET	KEMA 03 ATEX 1226X

Upozornění

Konstrukční skupiny/Moduly s osvědčením ⟨Ex⟩ II 3 G EEx nA II T3 .. T6 smějí být použity pouze v systémech SIMATIC, přístrojové kategorie 3.

Údržba

K opravě musí být příslušné konstrukční skupiny/moduly zaslány do výrobního místa. Oprava smí být provedena pouze zde.

Zvláštní podmínky

1. Konstrukční skupiny/moduly musí být zabudovány v rozvaděči nebo kovovém krytu. Ty musí minimálně zajišťovat druh ochrany IP 54 (dle EN 60529). Přitom je nutno respektovat okolní podmínky, v nichž je přístroj instalován. Pro kryt musí být k dispozici prohlášení výrobce pro zónu 2 (dle EN 50021).
2. Pokud je na kabelu popř. kabelovém vedení tohoto krytu dosaženo za provozních podmínek teploty > 70 °C, nebo když za provozních podmínek může být na kabelových větvích teplota > 80 °C, musí teplotní vlastnosti kabelu souhlasit se skutečně naměřenými teplotami.
3. Použité kabelové přívody musí odpovídat požadovanému druhu ochrany IP a odstavci 7.2 (dle EN 50021).
4. Všechny přístroje, včetně spínačů atd. napojených na vstupy a výstupy systémů SIMATIC, musí mít osvědčení vůči výbuchu typu EEx nA nebo EEx nC.
5. Musí být provedena opatření k zamezení přechodného překročení jmenovitého napětí, nepřesahující více než 40 %.
6. Rozsah teploty okolí: 0° C do 60° C
7. Uvnitř krytu je nutno na dobře viditelném místě po otevření připevnit štítek s následujícím varováním:

Varování
Kryt smí být otevřen pouze krátce, např. pro vizuální diagnostiku. Nepoužívejte přitom žádný spínač, nevytahujte ani nezasunujte žádné konstrukční skupiny a neoddělujte žádná elektrická vedení (konektorové spoje).
Toto varování nemusíte respektovat, pokud je známo, že se na místě nevyskytuje explozivní atmosféra.

Seznam konstrukčních skupin/modulů s osvědčením

Seznam konstrukčních skupin/modulů s osvědčením naleznete na Internetu:

http://www4.ad.siemens.de/view/cs/

pod identifikací příspěvku ID 13702947.

Sõlmede/moodulite kasutamine plahvatusohtliku piirkonna tsoonis 2

Tsoon 2

Plahvatusohtlikud piirkonnad jagatakse tsoonideks. Tsoone eristatakse vastavalt plahvatusohtliku keskkonna esinemise tõenäosusele.

Tsoon	Plahvatusoht	Näide
2	üldine plahvatav keskkond esineb ainult harva ja lühiajaliselt	Piirkonnad lamedate rõngastihenditega torustike äärikliidete ümbruses suletud ruumides
ohutu piirkond	ei	• väljaspool tsooni 2 • Mittstsentraalse välisseadme standardsed rakendused

Järgnevalt leaite Te olulisi juhiseid sõlmede/moodulite paigaldamiseks plahvatusohtlikus piirkonnas.

Täiendav info

Üksikasjalik info sõlmede/moodulite kohta on toodud seadme juurde kuuluvas käsiraamatus.

Valmistamiskoht / Kasutusluba

 **II 3 G** **EEx nA II T3 .. T6** vastavalt standardile EN 50021 : 1999

Katsetusnumber: *vaadake tabelit*

Valmistamiskoht	Sõlmed/moodulid	Katsetusnumber
Siemens AG, Bereich A&D Werner-von-Siemens-Straße 50 92224 Amberg Germany	ET 200S ET 200S Rikkekindlad sõlmed	KEMA 01 ATEX 1238X
	S7-300 ET 200M Siinühendus DP/PA Diagnostikarepiiter S7-300 Rikkekindlad sõlmed	KEMA 02 ATEX 1096X
Siemens AG, Bereich A&D Östliche Rheinbrückenstr. 50 76187 Karlsruhe Germany	S7-400	KEMA 03 ATEX 1125X
	S7-300 CP TS Adapter II	KEMA 03 ATEX 1228X
	SIMATIC NET	KEMA 03 ATEX 1226X

Juhis

Sõlmi/mooduleid kasutusloaga  II 3 G EEx nA II T3 .. T6 tohib kasutada ainult SIMATIC-süsteemides, mille seadmeklass on 3.

Korrashoid

Parandamiseks tuleb sõlmed/moodulid saata valmistamiskohta. Parandustöid tohib teha ainult seal.

Eritingimused

1. Sõlmed/moodulid tuleb monteerida jaotuskarpi või metallkorpusesse. Need peavad tagama kaitseastme vähemalt IP 54 (vastavalt standardile EN 60529). Seejuures peab arvesse võtma seadme paigaldamise keskkonna tingimusi. Korpuse jaoks peab tsooni 2 jaoks olema tootja juhis (vastavalt standardile EN 50021).
2. Kui selle korpuse kaabli juures või kaabelvaheliku (kaabelsisestuse) juures töötingimustes saavutatakse temperatuur > 70 °C või, kui töötingimustes temperatuur soone hargnemiskoha juures võib olla > 80 °C, peavad kaabli termilised omadusd olema vastavuses tegelikult mõõdetud temperatuuridega.
3. Kasutatavad kaabelvahelikud (kaabelsisestused) peavad vastama nõutud IP-kaitseastmele ja osas 7.2 toodud nõuetele (vastavalt standardile EN 50021).
4. Kõik seadmed, kaasa arvatud lülitid, jt., mis SIMATIC-süsteemide sisendite ja väljundite külge ühendatakse, peavad võimaldama plahvatuskaitse tüüpi EEx nA või EEx nC.
5. Peab rakendama abinõusid, et nimipinget üleminekute tõttu ei saaks ületatada üle 40 %.
6. Ümbritseva keskkona temperatuurivahemik: 0° C kuni 60° C
7. Korpuse sisse tuleb sellisesse kohta, mis pärast avamist on hästi nähtav, panna silt järgmise hoiatusega:

Ettevaatust
Korpust tohib avada ainult lühikeseks ajals, näiteks visuaalse diagnostika jaoks. Seejuures ärge kasutage ühtegi lülitit ega võtke välja ega pange sisse ühtegi sõlme ega lahutage ühtegi elektrijuhet (pistikühendused).
Seda hoiatust võib mitte arvesse võtta, kui on teada, et ei esine mingit plahvatusohtlikku keskkonda.

Lubatud sõlmede/moodulite loetelu

Lubatud sõlmede/modulite loetelu leiate Te internetist:

http://www4.ad.siemens.de/view/cs/

lisas-ID 13702947.

Ierīču/moduļu pielietojums sprādzienbīstamas teritorijas zonā 2

Zona 2

Sprādzienbīstamās teritorijas ir sadalītas zonās. Šīs zonas atšķir pēc sprādzienbīstamas atmosfēras pastāvēšanas iespējamības.

Zona	Sprādzienbīstamība	Piemērs
2	eksplozīva gāzes atmosfēra izveidojas reti un uz īsu laiku	Teritorijas ap atloku savienojumiem ar plakaniem blīvējumiem uz cauruļvadiem slēgtās telpās
droša teritorija	nē	• Ārpus zonas 2 • Decentralizētas perifērijas ierīces standartlietojumi

Turpmāk atrodamas svarīgas norādes par ierīču/moduļu uzstādīšanu sprādzienbīstamajā zonā.

Turpmāka informācija

Turpmāka informācija par ierīcēm/moduļiem ir atrodama attiecīgajā rokasgrāmatā.

Izgatavošanas vieta / Atļauja

II 3 G **EEx nA II T3 .. T6** saskaņā ar EN 50021 : 1999

Pārbaudes numurs: *skatīt tabulu*

Izgatavošanas vieta	Ierīces/moduļi	Pārbaudes numurs
Siemens AG, Bereich A&D Werner-von-Siemens-Straße 50 92224 Amberg Germany	ET 200S	KEMA 01 ATEX 1238X
	S7-300 ET 200M Kopnes savienotājs DP/PA Diagnostikas atkārtotājs S7-300 Pret kļūdām aizsargātas ierīces	KEMA 02 ATEX 1096X
Siemens AG, Bereich A&D Östliche Rheinbrückenstr. 50 76187 Karlsruhe Germany	S7-400	KEMA 03 ATEX 1125X
	S7-300 CP TS Adapter II	KEMA 03 ATEX 1228X
	SIMATIC NET	KEMA 03 ATEX 1226X

Norāde

Ierīces/moduļi ar atļauju ⟨Ex⟩ II 3 G EEx nA II T3 .. T6 var tikt pielietotas tikai 3.kategorijas SIMATIC sistēmās.

Tehniskā apkope

Attiecīgu ierīču/moduļu remontam tie ir jānosūta ražotājam. Remontu drīkst veikt tikai tur.

Īpaši apstākļi

1. Ierīces/moduļi jāiebūvē sadales skapī vai metāla korpusā. Tiem jānodrošina aizsardzības līmenis ne mazāks kā IP 54 (saskaņā ar EN 60529). Turklāt, ierīces uzstādīšanā jāievēro apkārtējas vides apstākļi. Korpusam ir nepieciešams izgatavotāja apliecinājums zonai 2 (saskaņā ar EN 50021).
2. Ja uz kabeļa vai šī korpusa kabeļu ievades ekspluatācijas apstākļos tiek sasniegta temperatūra > 70 °C vai ja ekspluatācijas apstākļos uz kabeļa atzariem var būt temperatūra > 80 °C, kabeļu temperatūras īpašībām jāatbilst faktiski nomērītām temperatūrām.
3. Pielietojamām kabeļu ievadēm jāatbilst nepieciešamajam aizsardzības veidam IP un sadaļai 7.2 (saskaņā ar EN 50021).
4. Visām ierīcēm, ieskaitot pārslēgus utt., kas tiek pieslēgti pie SIMATIC sistēmu ievadēm un izvadēm, jābūt atļaujām EEx nA vai EEx nC tipa sprādzienaizsardzībai.
5. Nepieciešams veikt pasākumus, lai pārejas spriegums nepārsniegtu nominālo spriegumu vairāk kā par 40 %.
6. Apkārtējas temperatūras diapazons: 0° C līdz 60° C
7. Korpusa iekšpusē, vietā, kas ir labi redzama, atverot to, ir jāizvieto plāksne ar sekojošo brīdinājumu:

Brīdinājums
Korpusu var atvērt tikai īslaicīgi, piemēram, vizuālai diagnostikai. Pie tam nenospiediet nekādus slēdžus, neievietojiet un neizņemiet nekādas ierīces un nepārtrauciet elektriskās līnijas (spraudsavienojumus).
Šis brīdinājums var tikt neņemts vērā, ja ir zināms, ka nepastāv sprādzienbīstama atmosfēra.

Pieļaujamo ierīču/moduļu saraksts

Pieļaujamo ierīču/moduļu saraksts ir atrodams Internetā:

http://www4.ad.siemens.de/view/cs/

zem datu ID 13702947.

Konstrukcinių grupių/modulių panaudojimas sprogioje 2 zonos aplinkoje

Zona 2

Sprogi aplinka yra apibūdinama keliomis zonomis. Zonos skirstomos pagal galimos sprogios terpės atsiradimo tikimybę.

Zona	Sprogimo pavojus	Pavyzdys
2	sprogi atmosfera būna retai ir trumpai	Uždarų patalpų vamzdynuose - flanšo su tarpikliais sujungimų vietose
saugioji sritis	nėra	• ne zonoje 2 • Standartinė periferinė sistema

Toliau pateikiamas informacija apie konstrukcinių grupių ir modulių montavimą sprogioje aplinkoje.

Papildoma informacija

Papildomos informacijos apie konstrukcines grupes/modulius rasite eksploatacijos vadove.

Pagaminimo vieta / Saugos reikalavimai

II 3 G **EEx nA II T3 .. T6** pagal EN 50021 : 1999

Patikros numeris: žiūr. *lentelėje*

Pagaminimo vieta	Konstrukcinės grupės/moduliai	Patikros numeris
Siemens AG, Bereich A&D Werner-von-Siemens-Straße 50 92224 Ambergas Vokietija	ET 200S ET 200S nuo trukdžių apsaugotos konstrukcinės grupės	KEMA 01 ATEX 1238X
	S7-300 ET 200M Magistralinė jungtis DP/PA Diagnozės retransliatorius S7-300 nuo trukdžių apsaugotos konstrukcinės grupės	KEMA 02 ATEX 1096X
Siemens AG, Bereich A&D Östliche Rheinbrückenstr. 50 76187 Karlsruhe Vokietija	S7-400	KEMA 03 ATEX 1125X
	S7-300 CP	KEMA 03 ATEX 1228X
	SIMATIC NET	KEMA 03 ATEX 1226X

Nuoroda

Konstrukcines grupes/modulius, kurių leidimas eksploatuoti yra ⟨Ex⟩ II 3 G EEx nA II T3 .. T6 galima naudoti tik 3 kategorijos sistemose "SIMATIC".

Priežiūra

Esant gedimams, konstrukcinę grupę/modulį išsiųskite gamintojui. Tik jis gali kvalifikuotai suremontuoti įtaisą.

Specialiosios sąlygos

1. Konstrukcines grupes/modulius montuokite jungimo spintoje arba metaliniame korpuse. Korpuso ar jungimo spintos saugos klasė turi būti mažiausiai "IP 54" (pagal EN 60529). Būtina atsižvelgti į kitas aplinkos sąlygas. Norint korpusą eksploatuoti zonoje 2, būtinas gamintojo pažymėjimas (pagal EN 50021).
2. Jei korpuso kabelio arba kabelio prijungimo temperatūra pakyla daugiau nei 70 °C arba laidų atšakoje temperatūra padidėja daugiau nei 80 °C, reikia naudoti kabelius, kurių terminės savybės atitinka išmatuotas temperatūros vertes.
3. Kabelių sujungimai turi būti saugos klasės IP ir atitikti 7.2 skyriaus (pagal EN 50021) reikalavimus.
4. Visi prietaisai, įskaitant ir jungiklius, jungiami sistemų "SIMATIC" įeigose ir išeigose, turi būti tipo "EEx nA" arba "EEx nC" - apsaugoti nuo sprogimo.
5. Būtina imtis priemonių, kad pereinamųjų grandžių vardinė įtampa neviršytų 40 %.
6. Leistina aplinkos temperatūra: 0° C iki 60° C
7. Atidarę korpusą, jo viduje gerai matomoje vietoje, įtaisykite lentelę su įspėjimu:

Įspėjimas
Korpusą` atidaryti tik trumpam laikui, pvz., patikrai. Neliesti jungiklių, konstrukcinių grupių neištraukti ir nekišti, neatjungti elektrinių sujungimų (kištukinių sujungimų).
Šio įspėjimo galima nepaisyti, kai yra žinoma, jog darbinė aplinka yra nesprogi.

Leistinų konstrukcinių grupių/modulių sąrašas

Leistinų konstrukcinių grupių/modulių sąrašą rasite interneto puslapyje:

http://www4.ad.siemens.de/view/cs/

įvedę kodą 13702947.

A főegységek/modulok alkalmazása a 2. zóna robbanásveszélyes környezetben

2. zóna

A robbanásveszélyes környezeteket zónákba sorolják be. A robbanásveszélyes légkör előfordulásának valószínűsége alapján különböztetik meg a zónákat.

Zóna	Robbanásveszély	Példa
2	robbanásveszélyes gázat tartalmazó légkör csak ritkán és rövid ideig lép fel	zárt helységekben elhelyezett csővezetékeknél a lapos tömítéssel rendelkező karimás kötések környezetében
biztonságos környezet	nem	• a 2. zónán kívül • a decentrális periféria készülékek standard alkalmazásai

A következőkben fontos utasításokat talál a főegységek/modulok telepítéséhez a robbanásveszélyes környezetbe.

További információk

A további információkat a főegységekhez/modulokhoz megtalálja a hozzátartozó kézikönyvben.

Gyártási hely / Engedélyezés

II 3 G **EEx nA II T3 .. T6** az EN 50021 : 1999 szerint

Ellenőrző szám: *lásd a táblázatot*

Gyártási hely	Főegységek/modulok	Ellenőrző szám
Siemens AG, Bereich A&D Werner-von-Siemens-Straße 50 92224 Amberg Germany	ET 200S ET 200S hibabiztos főegységek	KEMA 01 ATEX 1238X
	S7-300 ET 200M DP/PA buszcsatoló Diagnózisrepeater S7-300 hibabiztos főegységek	KEMA 02 ATEX 1096X
Siemens AG, Bereich A&D Östliche Rheinbrückenstr. 50 76187 Karlsruhe Germany	S7-400	KEMA 03 ATEX 1125X
	S7-300 CP TS Adapter II	KEMA 03 ATEX 1228X
	SIMATIC NET	KEMA 03 ATEX 1226X

Utasítás

Az II 3 G EEx nA II T3 .. T6 engedélyezéssel rendelkező főegységeket/modulokat alkalmazhatja csak a 3. felszerelés-kategóriába tartozó SIMATIC rendszerekbe.

Karbantartás

Javítás esetén küldje az érintett főegységeket/modulokat a gyártási helyre. Csak itt hajthatják végre a javítást.

Különleges feltételek

1. A főegységeket/modulokat egy kapcsolószekrénybe vagy egy fém házba kell beszerelni. Ezeknek kell biztosítaniuk legalább az IP 54 védettségi fokozatot (EN 60529 szerint). Itt figyelembe kell venni azokat a környezeti feltételeket, amelyek fellépnek a készülék telepítésekor. A házhoz meg kell legyen a gyártói nyilatkozat a 2. zónához (az EN 50021 szerint).
2. Ha a jelen ház kábelén ill. kábelvezetésen üzemi feltételek mellett a hőmérséklet > 70 °C, vagy ha az üzemi feltételek mellett a hőmérséklet > 80 °C az érelágazásokon, akkor meg kell egyezzenek a kábel hőmérsékleti tulajdonságai a ténylegesen mért hőmérsékletekkel.
3. Az alkalmazott kábelvezetések meg kell feleljenek a követelt IP védettségi fokozatnak és a 7.2. bekezdésnek (EN 50021 szerint).
4. Minden készülék, kapcsolót stb. beleértve, amelyeket a SIMATIC rendszerek be- és kimeneteire csatlakoztattak, engedélyezve kell legyen az EEx nA vagy EEx nC típusú robbanásvédelemhez.
5. Intézkedéseket kell hozni, hogy a tranziensek ne lépjék túl a névleges feszültséget több mint 40 %-al.
6. Környezeti hőmérséklet tartomány: 0° C ... 60° C
7. A házon belül -a nyitáskor jól látható helyen- helyezzen el egy táblát a következő figyelmeztetéssel:

Figyelmeztetés
A házat csak rövid ideig szabad nyitani, pl. optikai diagnózishoz. Eközben ne működtessen egy kapcsolót sem, ne húzzon ki vagy dugjon be egy főegységet sem és ne válasszon le villamos vezetékeket (dugós csatlakozók).
Ez a figyelmeztetés mellőzhető, ha tudott, hogy nem áll fenn robbanásveszélyes légkör.

A megengedett főegységek/modulok listája

A megengedett főegységek/modulok listáját megtalálja az interneten:

http://www4.ad.siemens.de/view/cs/

a 13702947 cikk azonosító szám alatt.

Tqegħid tal-Komponenti / *Modules* fiż-Żona 2, fejn hemm Riskju ta' Splużjoni

Żona 2

Sezzjonijiet fejn hemm riskju ta' splużjoni jitqassmu f'żoni. Tagħmel distinzjoni bejn żona u oħra skond il-probabbiltà li jkun hemm ambjent li jista' jwassal għal splużjoni.

Żona	Periklu ta' Splużjoni	Eżempju
2	ambjent gassuż li jista' jisplodi jfeġġ rarament u għal żmien qasir	Żoni madwar flanġ ġojnts b'gaskits ċatti f'kanni ġewwa spazji magħluqin
żona ż-żgura	le	• barra miż-żona 2 • użu normali ta' *devices* periferali deċentralizzati

Issib hawn taħt indikazzjonijiet importanti għall-installazzjoni ta' komponenti / *modules* fiż-żona fejn hemm riskju ta' splużjoni.

Aktar Tagħrif

Aktar tagħrif fuq il-komponenti / *modules* jinstab fil-manwal ikkonċernat.

Post ta' Manifattura / Approvazzjoni

II 3 G **EEx nA II T3 .. T6** skond EN 50021 : 1999

Numru taċ-Ċertifikat: ara t-tabella

Post ta' Manifattura	Komponenti / Modules	Numru taċ-Ċertifikat
Siemens AG, Bereich A&D Werner-von-Siemens-Straße 50 92224 Amberg Germany	ET 200S ET 200S *modules* ma jistgħux ifallu	KEMA 01 ATEX 1238X
	S7-300 ET 200M *bus coupling* DP/PA Ripetitur ta' dijanjosi S7-300 *modules* ma jistgħux ifallu	KEMA 02 ATEX 1096X
Siemens AG, Bereich A&D Östliche Rheinbrückenstr. 50 76187 Karlsruhe Germany	S7-400	KEMA 03 ATEX 1125X
	S7-300 CP TS Adapter	KEMA 03 ATEX 1228X
	SIMATIC NET	KEMA 03 ATEX 1226X

Nota

Komponenti / *modules* bl-approvazzjoni II 3 G EEx nA II T3 .. T6 jistgħu jintużaw biss ġewwa sistemi SIMATIC tal-kategorija 3.

Manutenzjoni

Fil-każ li jkun hemm bżonn ta' tiswija, il-komponenti / *modules* ikkonċernati għandhom jintbagħtu fil-post ta' manifattura. It-tiswijiet jistgħu jsiru biss f'dan il-post.

Kundizzjonijiet Speċjali

1. Komponenti / *modules* għandhom jiġu mmontati ġewwa swiċċ kabinett jew kaxxa tal-metall. Dawn iridu jiggarantixxu protezzjoni mill-inqas tat-tip IP 54 (skond EN 60529). Inti u tagħmel hekk, trid taħseb għall-kundizzjonijiet ambjentali ta' waqt l-installazzjoni tad-*device*. Irid ikun hemm dikjarazzjoni tal-manifatturier għall-kaxxa għaż-żona 2 (skond EN 50021).
2. Jekk fil-kejbil, jew fil-kaxxa mad-daħla għall-kejbil, tintlaħaq temperatura ta' aktar minn 70 °C taħt kundizzjonijiet ta' ħidma, jew jekk fil-post fejn jinfirdu l-wajers jista' jkun li hemm temperatura ta' aktar minn 80 °C, il-kejbil irid ikollu proprjetajiet ta' temperatura xierqa għat-temperaturi tabilħaqq imkejlin.
3. Id-daħliet għall-kejbil li jintużaw iridu jikkonformaw mat-tip ta' protezzjoni IP mitlub u t-taqsima 7.2 (skond EN 50021).
4. Id-*devices* kollha, swiċċijiet etc. inklużi, li jitqabbdu ma' l-*inputs* u l-*outputs* ta' sistemi SIMATIC, iridu jkunu approvati għal protezzjoni kontra splużjoni tat-tip EEx nA jew EEx nC.
5. Iridu jittieħdu miżuri biex il-vultaġġ nominali ma jitqabbiżx b'aktar minn 40% minħabba transitorji.
6. Varjazzjoni tat-temperatura ambjentali: 0° C sa 60° C
7. Għandha titqiegħed tabella bit-twissija li ġejja ġewwa l-kaxxa, f'post li jidher sew wara li tinfetaħ il-kaxxa:

Twissija
Il-kaxxa tista' tinfetaħ biss għal żmien qasir, per eżempju għal dijanjosi viżwali. Inti u tagħmel hekk, ma tista' tmiss l-ebda swiċċ, ddaħħal jew tneħħi l-ebda *module* u tneħħi l-ebda kejbil elettriku (konnessjonijiet li tipplaggjahom).
Tista' ma tagħtix każ ta' din it-twissija meta taf li m'hemmx riskju ta' splużjoni fl-ambjent.

Lista ta' Komponenti / *Modules* Approvati

Issib il-lista ta' komponenti / *modules* approvati fl-internet:

http://www4.ad.siemens.de/view/cs/

bin-numru ta' identifikazzjoni 13702947.

Zastosowanie grup konstrukcyjnych / modułów w 2 strefie zagrożenia wybuchem

Strefa 2

Otoczenie zagrożone wybuchem dzielone jest na strefy. Strefy dzielą się ze względu na stopień prawdopodobieństwa powstania atmosfery stwarzającej możliwość powstania wybuchu.

Strefa	Niebezpieczeństwo eksplozji	Przykład
2	atmosfera gazowa z zagrożeniem wybuchem występuje rzadko i na krótki okres czasu	miejsca wokół łącz w kanałach technicznych z opaskami przy przewodach instalacyjnych w pomieszczeniach zamkniętych
obszar bezpieczny	nie	• poza 2 strefą • standardowe zastosowanie decentralnych urządzeń peryferyjnych

Dalej znajdą Państwo informacje dotyczące instalacji grup konstrukcyjnych / modułów w otoczeniu zagrożonym wybuchem.

Pozostałe informacje

Dalsze informacje dotyczące grup konstrukcyjnych / modułów znajdą państwo w odpowiedniej instrukcji.

Miejsce produkcji / Rejestracja

II 3 G **EEx nA II T3 .. T6** stosownie do EN 50021 : 1999

Nr testu: *zobacz tabela*

Miejsce produkcji	Grupy konstrukcyjne / moduły	Nr testu
Siemens AG, Bereich A&D Werner-von-Siemens-Straße 50 92224 Amberg Niemcy	ET 200S ET 200S grupy konstrukcyjne odporne na uszkodzenia	KEMA 01 ATEX 1238X
	S7-300 ET 200M Zbierające łącze sprzężające DP/PA powtarzacz diagnozy S7-300 grupy konstrukcyjne odporne na uszkodzenia	KEMA 02 ATEX 1096X
Siemens AG, Bereich A&D Östliche Rheinbrückenstr. 50 76187 Karlsruhe Niemcy	S7-400	KEMA 03 ATEX 1125X
	S7-300 CP TS Adapter II	KEMA 03 ATEX 1228X
	SIMATIC NET	KEMA 03 ATEX 1226X

Uwaga

Grupy konstrukcyjne / moduły zarejestrowane jako ⟨Ex⟩ II 3 G EEx nA II T3 .. T6 wolno stosować jedynie w systemach SIMATIC o 3 kategorii urządzenia.

Konserwacja

W celu naprawy należy odpowiednie grupy konstrukcyjne / moduły przesłać do miejsca produkcji. Jedynie serwis producenta jest upoważniony do dokonywania napraw.

Warunki szczególne

1. Grupy konstrukcyjne / moduły muszą zostać zamontowane do skrzynki ochronnej lub metalowej puszki ochronnej. Muszą one spełniać wymagania co najmniej stopnia IP 54 (stosownie do EN 60529). Należy brać pod uwagę warunki otoczenia, w którym urządzenie będzie instalowane. Należy posiadać oświadczenie producenta dopuszczające puszkę do użytku w strefie 2 (stosownie do EN 50021).
2. W przypadku, gdyby na przewodzie tej puszki podczas pracy temperatura mogła przekroczyć > 70 °C, lub żyła przewodu mogłaby osiągnąć temperaturę > 80 °C, właściwości cieplne przewodu muszą zostać dobrane do takich wartości.
3. Wszystkie stosowane przewody muszą odpowiadać właściwemu stopniowi ochrony IP oraz warunkom określonym w punkcie 7.2 (stosownie do EN 50021).
4. Wszystkie urządzenia włączając w to przełączniki itp., które podłączane są do wejść lub wyjść systemów SIMATIC muszą być dopuszczone do ochrony przeciw wybuchom typu EEx nA lub EEx nC.
5. Muszą zostać spełnione takie warunki, aby napięcie miana w przejściach nie mogło przekroczyć więcej niż 40 %.
6. Temperatura otoczenia: od 0° C do 60° C
7. W puszce w dobrze widocznym po otwarciu miejscu należy umieścić ostrzeżenie następującej treści:

Uwaga
Puszkę wolno otworzyć jedynie na krótki okres czasu na przykład w celu kontroli optycznej. Nie wolno przy tym naciskać na żaden z przełączników, nie wolno wyciągać ani montować żadnej grupy konstrukcyjnej ani też odłączać żadnych przewodów elektrycznych (łącza wsuwkowe).
Powyższego ostrzeżenia nie trzeba przestrzegać jeśli wiadomo jest, iż na miejscu nie ma zagrożenia wybuchem.

Lista dopuszczonych grup konstrukcyjnych / modułów

Wykaz dopuszczonych grup konstrukcyjnych / modułów znajduje się na stronie internetowej:

http://www4.ad.siemens.de/view/cs/

w części ID 13702947.

Použitie konštrukčných skupín / modulov v prostredí s nebezpečenstvom výbuchu zóny 2

Zóna 2

Prostredia s nebezpečenstvom výbuchu sa rozdeľujú do zón. Zóny sa rozlišujú podľa pravdepodobnosti prítomnosti atmosféry so schopnosťou výbuchu.

Zóna	Nebezpečenstvo explózie	Príklad
2	plynová atmosféra s nebezpečenstvom výbuchu sa vyskytuje len zriedka a krátkodobo	priestory okolo prírubových spojov s plochými tesneniami pri potrubných vedeniach v uzavretých priestoroch
bezpečná oblasť	nie	• mino zóny 2 • štandardné použitia decentrálnej periférie

Ďalej nájdete dôležité pokyny pre inštaláciu konštrukčných skupín / modulov v prostredí s nebezpečenstvom výbuchu.

Ďalšie informácie

Ďalšie informácie ku konštrukčným skupinám / modulom nájdete v príslušnej príručke.

Miesto vyhotovenia / Osvedčenie

II 3 G **EEx nA II T3 .. T6** podľa EN 50021 : 1999

Číslo skúšky : *pozri tabuľka*

Miesto vyhotovenia	Konštrukčné skupiny / moduly	Číslo skúšky
Siemens AG, divízia A&D Werner-von-Siemens-Straße 50 92224 Amberg Nemecko	ET 200S ET 200S konštrukčné skupiny odolné voči poruchám	KEMA 01 ATEX 1238X
	S7-300 ET 200M Zbernicový väzbový člen DP/PA opakovač diagnózy S7-300 konštrukčné skupiny odolné voči poruchám	KEMA 02 ATEX 1096X
Siemens AG, divízia A&D Östliche Rheinbrückenstr. 50 76187 Karlsruhe Nemecko	S7-400	KEMA 03 ATEX 1125X
	S7-300 CP TS Adapter II	KEMA 03 ATEX 1228X
	SIMATIC NET	KEMA 03 ATEX 1226X

Upozornenie

Konštrukčné skupiny / moduly s osvedčením ⟨Ex⟩ II 3 G EEx nA II T3 .. T6 sa smú používať len v systémoch SIMATIC kategórie zariadenia 3.

Údržba

Za účelom opravy sa musia príslušné konštrukčné skupiny / moduly zaslať na miesto vyhotovenia. Oprava sa smie vykonávať len na tomto mieste !

Špeciálne podmienky

1. Konštrukčné skupiny / moduly sa musia vmontovať do spínacej skrine alebo do kovového puzdra schránky. Tie musia zabezpečovať druh ochrany minimálne IP 54 (podľa EN 60529). Pritom je potrebné zohľadniť podmienky prostredia, do ktorého sa bude zariadenie inštalovať. V prípade puzdra musí existovať vyhlásenie výrobcu pre zónu 2 (podľa EN 50021).
2. V prípade, že na kábli, prípadne na káblovom prívode tohto puzdra presiahne teplota pri prevádzkových podmienkach hodnotu > 70 °C, alebo ak na vetve žily môže byť pri prevádzkových podmienkach teplota > 80 °C, musia tepelné vlastnosti kábla vyhovovať skutočne nameraným hodnotám.
3. Všetky použité káblové prívody musia zodpovedať požadovanému druhu ochrany IP a odseku 7.2 (podľa EN 50021).
4. Všetky zariadenia, vrátane prepínača, atď., ktoré sa pripoja na vstupy a výstupy systémov SIMATIC, musia byť schválené pre ochranu voči výbuchu typu EEx nA alebo EEx nC.
5. Musia sa splniť také opatrenia, aby sa menovité napätie cez prechody nemohlo prekročiť o viac ako 40 %.
6. Rozsah okolitých teplôt: 0° C až 60° C
7. V puzdre je na dobre viditeľné miesto po otvorení potrebné umiestniť štítok s nasledovnou výstrahou:

⚠

Výstraha
Puzdro sa môže otvoriť len počas krátkej doby, napríklad pre vizuálnu diagnózu. Nestlačte pritom žiadny prepínač, nevytiahnite alebo nezasuňte žiadnu konštrukčnú skupinu a neoddeľte žiadne elektrické vedenia (zástrčkové spojenia).
Túto výstrahu si nemusíte všímať v takom prípade, ak je známe, že sa na mieste nevyskytuje atmosféra s nebezpečenstvom výbuchu.

Zoznam dovolených konštrukčných skupín / modulov

Zoznam dovolených konštrukčných skupín / modulov sa nachádza na internete :

http://www4.ad.siemens.de/view/cs/

v článku ID 13702947.

Uporaba sklopov/modulov v eksplozivno ogroženem območju cone 2

Cona 2

Eksplozivno ogrožena območja se delijo na cone. Cone se ločijo po verjetnosti prisotnosti eksplozivne atmosfere.

Cona	Nevarnost eksplozije	Primer
2	eksplozivna zmes plinov v atmosferi je redka in traja le kratko.	Območja okoli pririobnih spojev z ploskimi tesnili pri cevnih napeljavah v zaprtih prostorih.
sigurno območje	ne	• izven cone 2 • Standardna uporaba decentralne periferije.

Sledijo pomembni napotki o inštalaciji sklopov/modulov v eksplozivno ogroženem območju.

Nadaljnje informacije

Nadaljnje informacije o sklopih/modulih najdete v priloženem priročniku.

Mesto izdelave / Dovoljenje - Atest

 **II 3 G** **EEx nA II T3 .. T6** po EN 50021 : 1999

kontrolna številka: *glej tabelo*

Mesto izdelave	Sklopi/moduli	kontrolna številka:
Siemens AG, Bereich A&D Werner-von-Siemens-Straße 50 92224 Amberg Germany	ET 200S ET 200S Sklopi varovani proti okvari	KEMA 01 ATEX 1238X
	S7-300 ET 200M bus vezava DP/PA Diagnozni repeater S7-300 Sklopi varovani proti okvari	KEMA 02 ATEX 1096X
Siemens AG, Bereich A&D Östliche Rheinbrückenstr. 50 76187 Karlsruhe Germany	S7-400	KEMA 03 ATEX 1125X
	S7-300 CP TS Adapter II	KEMA 03 ATEX 1228X
	SIMATIC NET	KEMA 03 ATEX 1226X

Opozorilo

Sklopi/moduli z dovoljenjem  II 3 G EEx nA II T3 .. T6 se lahko uporabijo samo v SIMATIC-Sistemih kategorije 3 .

Vzdrževanje

V primeru popravila pošljete sklope/module na kraj izdelave. Popravila lahko izvajajo samo na tem naslovu!

Posebni pogoji

1. Sklopi/moduli se morajo vgraditi v elektro omaro ali metalno ohišje. Omara/ohišje mora zadostiti varovanju IP 54 (po EN 60529). Pri tem je potrebno upoštevati tudi pogoje okolice, v kateri se naprava nahaja. Ohišje mora imeti izjavo (atest) proizvajalca za uporabo v coni 2 (po EN 50021).
2. Če na kablu oz. uvodnici tega ohišja v režimu obratovanja temperatura doseže vrednost > 70 °C ali če doseže na razcepih vodnikov v obratovanju temperatura vrednost > 80 °C, se morajo temperaturne lastnosti kablov skladati z dejansko namerjenimi.
3. Uporabljene uvodnice morajo ustrezati predpisani IP zaščiti in poglavju 7.2 (po EN 50021).
4. Vse naprave, vključno s stikali itd., ki so priklopljene na vhodih oz. izhodih sistemov SIMATIC, morajo biti odobrene za zaščito proti eksplozijam tipa EEx nA ali EEx nC.
5. Zagotoviti se mora, da nazivna napetost ne prekorači več kot 40% pri tranzienci (preklopih, vklopih,...).
6. Temperaturno območje okolice: 0° C do 60° C
7. V notranjosti ohišja, na odprtem dobro vidljivem mestu, se pritrdi napis z naslednjim opozorilom:

Opozorilo
Ohišje se lahko odpre samo za kratek čas, npr. za vizualno diagnozo. Pri tem ne vklapljajte/izklaplajte stikal, sklopov ali električnih vodnikov (vtičnih spojev). Opozorilo ne velja, kadar je znano, da ni eksplozivne atmosfere.

Seznam dovoljenih sklopov/modulov

Seznam dovoljenih sklopov/modulov najdete na internetu na spletni strani:

http://www4.ad.siemens.de/view/cs/

pod ID prispevka 13702947.

Patlama tehlikesi olan Alan 2 bölgesinde ünite gruplarının/modüllerin kullanılması

Alan 2

Patlama tehlikesi olan bölgeler alanlara ayrılır. Alanlar, patlayabilecek atmosfere sahip ortam ihtimaline göre farklı derecelere ayrılır.

Alan	Patlama tehlikesi	Örnek
2	Patlayıcı gaz atmosferi sadece nadir ve kısa bir süre için söz konusu	Kapalı alanlardaki boru bağlantılarında yassı contalı flanş bağlantıları civarındaki bölgeler
Güvenli bölge	hayır	• Alan 2 haricinde • Merkezi olmayan periferi standart uygulamaları

Aşağıda, ünite gruplarının/modüllerin patlama tehlikesi olan bölgelerde kurulması için önemli bilgiler bulacaksınız.

Daha başka bilgiler

Ünite grupları/modüller hakkında daha fazla bilgi için ilgili kılavuza bakınız.

İmalat yeri / Lisans

II 3 G **EEx nA II T3 .. T6** EN 50021 standartına göre: 1999

Test numarası: *bkz. Tablo*

İmalat yeri	Ünite grupları/Modüller	Kontrol numarası
Siemens AG, Bereich A&D Werner-von-Siemens-Straße 50 92224 Amberg Germany	ET 200S ET 200S Hataya karşı emniyetli ünite grupları	KEMA 01 ATEX 1238X
	S7-300 ET 200M Bus kuplajı DP/PA Diyagnoz repeater ünitesi S7-300 Hataya karşı emniyetli ünite grupları	KEMA 02 ATEX 1096X
Siemens AG, Bereich A&D Östliche Rheinbrückenstr. 50 76187 Karlsruhe Germany	S7-400	KEMA 03 ATEX 1125X
	S7-300 CP TS Adapter II	KEMA 03 ATEX 1228X
	SIMATIC NET	KEMA 03 ATEX 1226X

Bilgi

⟨Ex⟩ II 3 G EEx nA II T3 .. T6 lisanslı ünite grupları/modüller sadece 3 numaralı cihaz kategorisine ait SIMATIC sistemlerine kullanılabilir.

Bakım ve koruma

Bir onarım gerekli olması halinde, ilgili ünite grupları/modüller imalat yerine gönderilmelidir. Onarım sadece orada yapılabilir ve yapılmalıdır.

Özel koşullar

1. Ünite grupları/modüller bir şalter dolabı içine veya metal kasa içine monte edilmelidir. Bu kasalar en az IP 54 (EN 60529 standartına göre) koruma türüne ait olmalıdır. Burada, cihazın kurulduğu çevre koşulları dikkate alınmalıdır. Kullanılacak kasa için, alan 2 için geçerli bir üretici beyanı mevcut olmalıdır (EN 50021 standartına istinaden).
2. Kabloda ya da bu kasanın kablo girişindeki işletme koşullarında sıcaklık > 70 °C oluyorsa veya işletme koşullarında kablo telleri (damarları) ayrılma noktasında sıcaklık > 80 °C olma ihtimali varsa, kablonun sıcaklık ile ilgili özellikleri, gerçekten ölçülmüş sıcaklıklara uygun olmalıdır.
3. Kullanılmış olan kablo girişleri, talep edilen IP koruma türüne ve bölüm 7.2 (EN 50021 standartına göre) dahilindeki taleplere uygun olmalıdır.
4. SIMATIC sistemlerinin giriş ve çıkışlarına bağlanan tüm cihazlar (şalterler vs. dahil) için, EEx nA veya EEx nC patlamaya karşı koruma tipine istinaden izin alınmış olmalıdır.
5. Nominal gerilimin transiyentlerden (hatlardaki dalgalanmalardan dolayı ani gerilim ve akım değişiklikleri) dolayı azami %40 aşılması için gerekli önlemler alınmalıdır.
6. Çevre sıcaklığı aralığı: 0° C ile 60° C arasında
7. Kasa dahilinde, açıldıktan sonra iyi görülebilen bir yere aşağıdaki uyarı takılmalıdır:

⚠ **İkaz**
Kasa sadece kısa bir süre açılmalıdır, örn. görsel diyagnoz için. Herhangi bir şaltere basmayınız, herhangi bir ünite grubunu çekip çıkarmayınız veya takmayınız, elektrik hatlarını (soket bağlantıları) ayırmayınız.
Eğer patlama tehlikesi söz konusu olan bir atmosfer olmadığı biliniyorsa, işbu ikaz göz ardı edilebilir.

İzin verilmiş olan ünite gruplarının/modüllerin listesi

İzin verilmiş olan ünite gruplarının/modüllerin listesi için internete bakınız:

http://www4.ad.siemens.de/view/cs/

Doküman ID 13702947.

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Produktinformation zum Handbuch

Dezentrales Peripheriesystem ET 200S, Ausgabe 12/2004

Einleitung

Diese Produktinformation beschreibt Korrekturen und Ergänzungen zum Handbuch ET 200S (Bestandteil des Dokumentationspaketes ET 200S mit der Bestellnummer 6ES7151-1AA10-8AA0).

Neue Bestellnummern der Module

Folgende Module werden schrittweise überarbeitet und die Bestellnummer erhöht:

Die neuen Module sind

- für zukünftige Funktionen vorbereitet
- kompatibel zum Vorgänger-Modul
- in HW-Konfig über ein aktuelles HW-Update projektierbar.

Hinweis

Da die neuen Module zum Vorgänger kompatibel sind, können Sie die Module in HW-Konfig auch mit der ursprünglichen-Bestellnummer projektieren. Allerdings sind dann keine Funktionserweiterungen nutzbar.

Module	Neue Bestellnummer
2DI DC24V ST	6ES7-131-4BB0**1**-0AA0
2DI DC24V HF	6ES7 131-4BB0**1**-0AB0
4DI DC24V ST	6ES7 131-4BD0**1**-0AA0
4DI DC24V/SRC ST	6ES7 131-4BD5**1**-0AA0
4DI DC24V HF	6ES7 131-4BD0**1**-0AB0
2DO DC24V/0,5A ST	6ES7 132-4BB0**1**-0AA0
2DO DC24V/2A ST	6ES7 132-4BB3**1**-0AA0
2DO DC24V/0,5A HF	6ES7 132-4BB0**1**-0AB0
2DO DC24V/2A HF	6ES7 132-4BB3**1**-0AB0

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Module	Neue Bestellnummer
4DO DC24V/0,5A ST	6ES7 132-4BD0**1**-0AA0
4DO DC24V/2A ST	6ES7 132-4BD3**1**-0AA0
2RO NO DC24..120V/5A AC24..230V/5A	6ES7 132-4HB0**1**-0AB0
2AI I 2WIRE ST	6ES7 134-4GB0**1**-0AB0
2AI I 4WIRE ST	6ES7 134-4GB1**1**-0AB0
2AI U ST	6ES7 134-4FB0**1**-0AB0
2AI RTD HF	6ES7 134-4NB5**1**-0AB0
2AI TC HF	6ES7 134-4NB0**1**-0AB0
2AO U ST	6ES7 135-4FB0**1**-0AB0
2AO I ST	6ES7 135-4GB0**1**-0AB0
RESERVE (Baubreite 15 mm)	6ES7 138-4AA0**1**-0AA0
RESERVE (Baubreite 30 mm)	6ES7 138-4AA1**1**-0AA0
Powermodul PM-E DC24V	6ES7 138-4CA0**1**-0AA0

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Product information

ET 200S Distributed I/O System manual, version 12/2004

Introduction

This product information document describes the corrections and additions to the ET 200S manual (part of the ET 200S documentation package with the order number 6ES7151-1AA10-8BA0).

New order numbers of the modules

The following modules are being revised step by step and the order numbers increased:

The new modules are

- prepared for future functions
- compatible with the previous module
- can be configured in HW config using a current HW update.

Note

Because the new modules are compatible with the previous modules, you can also configurethe modules in HW config with the original order number. However, no functional upgrade is effective.

Module	New order number
2DI 24 VDC ST	6ES7-131-4BB0**1**-0AA0
2DI 24 VDC HF	6ES7 131-4BB0**1**-0AB0
4DI 24 VDC ST	6ES7 131-4BD0**1**-0AA0
4DI 24 VDC/SRC ST	6ES7 131-4BD5**1**-0AA0
4DI 24 VDC HF	6ES7 131-4BD0**1**-0AB0
2DO 24 VDC/0.5A ST	6ES7 132-4BB0**1**-0AA0

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Module	New order number
2DO 24 VDC/2A ST	6ES7 132-4BB31-0AA0
2DO 24 VDC/0.5A HF	6ES7 132-4BB01-0AB0
2DO 24 VDC/2A HF	6ES7 132-4BB31-0AB0
4DO 24 VDC/0.5A ST	6ES7 132-4BD01-0AA0
4DO 24 VDC/2A ST	6ES7 132-4BD31-0AA0
2RO NO DC24..120V/5A 24..230V AC/5A	6ES7 132-4HB01-0AB0
2AI I 2WIRE ST	6ES7 134-4GB01-0AB0
2AI I 4WIRE ST	6ES7 134-4GB11-0AB0
2AI U ST	6ES7 134-4FB01-0AB0
2AI RTD HF	6ES7 134-4NB51-0AB0
2AI TC HF	6ES7 134-4NB01-0AB0
2AO U ST	6ES7 135-4FB01-0AB0
2AO I ST	6ES7 135-4GB01-0AB0
RESERVE (Width15 mm)	6ES7 138-4AA01-0AA0
RESERVE (Width30 mm)	6ES7 138-4AA11-0AA0
Power module PM-E 24 VDC	6ES7 138-4CA01-0AA0

SIEMENS

Information produit

Système de périphérie décentralisée ET 200S, édition 12/2004

Introduction

Cette information produit décrit les corrections et compléments apportés au manuel Système de périphérie décentralisée ET 200S (EWA-4NEB7806024-03 12).

Nouveaux numéros de référence des modules

Les modules suivants ont été révisés l'un après l'autre et leur numéro de référence a été incrémenté :

Les nouveaux modules sont

- préparés pour des fonctions à venir
- compatibles avec le module précédent
- configurables dans HW Config via une mise à jour matérielle actuelle.

Nota

Les nouveaux modules étant compatibles avec le module précédent, vous pouvez configurer les modules dans HW Config aussi avec le numéro de référence original. Les extensions fonctionnelles ne seront toutefois pas utilisables.

Module	Nouveau numéro de référence
2DI DC24V ST	6ES7-131-4BB**0**1-0AA0
2DI DC24V HF	6ES7 131-4BB**0**1-0AB0
4DI DC24V ST	6ES7 131-4BD**0**1-0AA0
4DI DC24V/SRC ST	6ES7 131-4BD**5**1-0AA0
4DI DC24V HF	6ES7 131-4BD**0**1-0AB0
2DO DC24V/0,5A ST	6ES7 132-4BB**0**1-0AA0
2DO DC24V/2A ST	6ES7 132-4BB**3**1-0AA0

A5E00437368-01

Module	Nouveau numéro de référence
2DO DC24V/0,5A HF	6ES7 132-4BB01-0AB0
2DO DC24V/2A HF	6ES7 132-4BB31-0AB0
4DO DC24V/0,5A ST	6ES7 132-4BD01-0AA0
4DO DC24V/2A ST	6ES7 132-4BD31-0AA0
2RO NO DC24..120V/5A AC24..230V/5A	6ES7 132-4HB01-0AB0
2AI I 2WIRE ST	6ES7 134-4GB01-0AB0
2AI I 4WIRE ST	6ES7 134-4GB11-0AB0
2AI U ST	6ES7 134-4FB01-0AB0
2AI RTD HF	6ES7 134-4NB51-0AB0
2AI TC HF	6ES7 134-4NB01-0AB0
2AO U ST	6ES7 135-4FB01-0AB0
2AO I ST	6ES7 135-4GB01-0AB0
RESERVE (encombrement 15 mm)	6ES7 138-4AA01-0AA0
RESERVE (encombrement 30 mm)	6ES7 138-4AA11-0AA0
Module de puissance PM-E DC24V	6ES7 138-4CA01-0AA0

SIEMENS

Información de producto

Unidad de periferia descentralizada ET 200S, edición 12/2004

Introducción

Esta información de producto describe las correcciones y ampliaciones realizadas del manual ET 200S (A5E00171904-11).

Nuevas referencias de los módulos

Los módulos siguientes se modifican periódicamente y se clasifican cada vez bajo un número de referencia más alto:

Los nuevos módulos

- están preparados para futuras funciones
- son compatibles con módulos anteriores
- se configuran en HW–Config con una actualización de HW.

Nota

Dado que los nuevos módulos son compatibles con módulos anteriores, también es posible configurarlos en HW–Config con las referencias anteriores. En tal caso, no es necesario ampliar las funciones.

Módulos	Nuevas referencias
2DI DC24V ST	6ES7-131-4BB**0**1-0AA0
2DI DC24V HF	6ES7 131-4BB**0**1-0AB0
4DI DC24V ST	6ES7 131-4BD**0**1-0AA0
4DI DC24V/SRC ST	6ES7 131-4BD**5**1-0AA0
4DI DC24V HF	6ES7 131-4BD**0**1-0AB0
2DO DC24V/0,5A ST	6ES7 132-4BB**0**1-0AA0
2DO DC24V/2A ST	6ES7 132-4BB**3**1-0AA0

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Módulos	Nuevas referencias
2DO DC24V/0,5A HF	6ES7 132-4BB01-0AB0
2DO DC24V/2A HF	6ES7 132-4BB31-0AB0
4DO DC24V/0,5A ST	6ES7 132-4BD01-0AA0
4DO DC24V/2A ST	6ES7 132-4BD31-0AA0
2RO NO DC24..120V/5A AC24..230V/5A	6ES7 132-4HB01-0AB0
2AI I 2WIRE ST	6ES7 134-4GB01-0AB0
2AI I 4WIRE ST	6ES7 134-4GB11-0AB0
2AI U ST	6ES7 134-4FB01-0AB0
2AI RTD HF	6ES7 134-4NB51-0AB0
2AI TC HF	6ES7 134-4NB01-0AB0
2AO U ST	6ES7 135-4FB01-0AB0
2AO I ST	6ES7 135-4GB01-0AB0
RESERVE (Ancho15 mm)	6ES7 138-4AA01-0AA0
RESERVE (Ancho 30 mm)	6ES7 138-4AA11-0AA0
Módulo de potencia PM-E DC24V	6ES7 138-4CA01-0AA0

SIEMENS

Informazione sul prodotto

Sistema di perifieria decentrata ET 200S, edizione 12/2004

Introduzione

Nelle informazioni sul prodotto sono contenute le correzioni, nonché le integrazioni relative al manuale ET 200S (A5E00158304-11).

Nuovi numeri di ordinazione dei moduli

I seguenti moduli vengono aggiornati gradualmente e i numeri di ordinazione aumentati:

I nuovi moduli sono

- preparati per funzioni future
- compatibili con i moduli precedenti
- progettabili nella Configurazione HW con un aggiornamento HW.

Avvertenza

Poiché i nuovi moduli sono compatibili con i precedenti è possibile progettarli nella Cofigurazione HW anche con i numeri di ordinazione originali. In questo caso non sono però applicabili ampliamenti funzionali.

Moduli	Nuovo numero di ordinazione
2DI DC24V ST	6ES7-131-4BB**0**1-0AA0
2DI DC24V HF	6ES7 131-4BB**0**1-0AB0
4DI DC24V ST	6ES7 131-4BD**0**1-0AA0
4DI DC24V/SRC ST	6ES7 131-4BD**5**1-0AA0
4DI DC24V HF	6ES7 131-4BD**0**1-0AB0
2DO DC24V/0,5A ST	6ES7 132-4BB**0**1-0AA0
2DO DC24V/2A ST	6ES7 132-4BB**3**1-0AA0

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Moduli	Nuovo numero di ordinazione
2DO DC24V/0,5A HF	6ES7 132-4BB01-0AB0
2DO DC24V/2A HF	6ES7 132-4BB31-0AB0
4DO DC24V/0,5A ST	6ES7 132-4BD01-0AA0
4DO DC24V/2A ST	6ES7 132-4BD31-0AA0
2RO NO DC24..120V/5A AC24..230V/5A	6ES7 132-4HB01-0AB0
2AI I 2WIRE ST	6ES7 134-4GB01-0AB0
2AI I 4WIRE ST	6ES7 134-4GB11-0AB0
2AI U ST	6ES7 134-4FB01-0AB0
2AI RTD HF	6ES7 134-4NB51-0AB0
2AI TC HF	6ES7 134-4NB01-0AB0
2AO U ST	6ES7 135-4FB01-0AB0
2AO I ST	6ES7 135-4GB01-0AB0
RESERVE (larghezza15 mm)	6ES7 138-4AA01-0AA0
RESERVE (larghezza 30 mm)	6ES7 138-4AA11-0AA0
Modulo power PM-E DC24V	6ES7 138-4CA01-0AA0