SIEMENS

SIMATIC

ET 200iS Distributed I/O Station

Manual

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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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Disclaimer of Liability

We have checked the contents of this manual for agreement with the hardware and software described. Since deviations cannot be precluded entirely, we cannot guarantee full agreement. However, the data in this manual are reviewed regularly and any necessary corrections included in subsequent editions. Suggestions for improvement are welcomed.

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Preface 1

1.1 Preface

Purpose of the Manual

With the information in this manual, you will be able to operate the ET 200iS distributed I/O station as a DP slave on PROFIBUS DP Ex i over a fieldbus isolating transformer.

Basic Knowledge Required

To understand the manual, you require general experience in the field of automation engineering.

The following qualifications are also required:

Table 1-1 Qualified Personnel

Activities	Qualifications
Setting up the ET 200iS	• Basic technical training • Knowledge of safety regulations regarding the workplace
Wiring the ET 200iS	• Basic practical training in electro-engineering • Knowledge of the relevant electrotechnical safety regulations • Knowledge of methods of installing explosion-proof electrical equipment • Knowledge of safety regulations regarding the workplace
Commissioning the ET 200iS	• Knowledge of all electrical and functional parameters and properties of the ET 200iS • Knowledge of the functions and commissioning of PROFIBUS-DP • Knowledge of the connected encoders, actuators, and HART field devices • Knowledge of the safety regulations regarding the workplace, particularly regarding procedures in hazardous areas

Scope of the Manual

This manual is valid for the distributed I/O station ET 200iS.

Approbations, Standards, and Approvals

Approbations

The distributed I/O station ET 200iS complies with the following directives:

- EU directive 73/23/EEC on low voltages
- EU directive 89/336/EEC on electromagnetic compatibility
- EU directive 94/9/EC on correct usage in hazardous plants

Standards and Approvals

The distributed I/O station ET 200iS

- is based on the standard IEC 61158/ EN 50170, Volume 2, PROFIBUS.
- meets the requirements and criteria of IEC 61131-2 and the requirements for the CE mark.
- is approved for FM (applied for), CENELEC.

For more detailed information on the standards and approvals, refer to *General Technical Specifications*.

Where this Documentation Fits In

In addition to this manual, you also require the manual for the DP master you are using (see *Appendix Order Numbers*).

In the *Appendix Order Numbers*, you will find a list with further sources of information on SIMATIC S7 and the ET 200 distributed I/O system.

A description of the parameter assignment and configuration frame is not included in this manual. You will find a description on the Internet at http://www.ad.siemens.de/simatic-cs

Guide to the Manual

This manual describes the hardware of the ET 200iS distributed I/O station. It consists of introductory chapters and reference chapters (technical specifications).

The manual deals with the following topics:

- Installing and wiring the ET 200iS distributed I/O station
- Commissioning and diagnostics of the ET 200iS distributed I/O station
- Components of the ET 200iS distributed I/O station
- Order Numbers

Further Support

If you have questions about using the products described in the manual and you cannot find the answers here, please contact your local Siemens representative.

http://www.ad.siemens.de/partner

Training Centers

Courses are available to help you become familiar with the distributed I/O. Please contact your regional or the central training center.

Phone: +49 (911) 895–3200

http://www.sitrain.com

SIMATIC Documentation on the Internet

You can obtain documentation free of charge on the Internet at:

http://www.ad.siemens.de/support

Here, you can use the Knowledge Manager to locate the documentation you require quickly. If you have questions or suggestions regarding the documentation, a "Documentation" conference is available in the Internet Forum.

SIMATIC Customer Support Hotline

Open round the clock, worldwide:

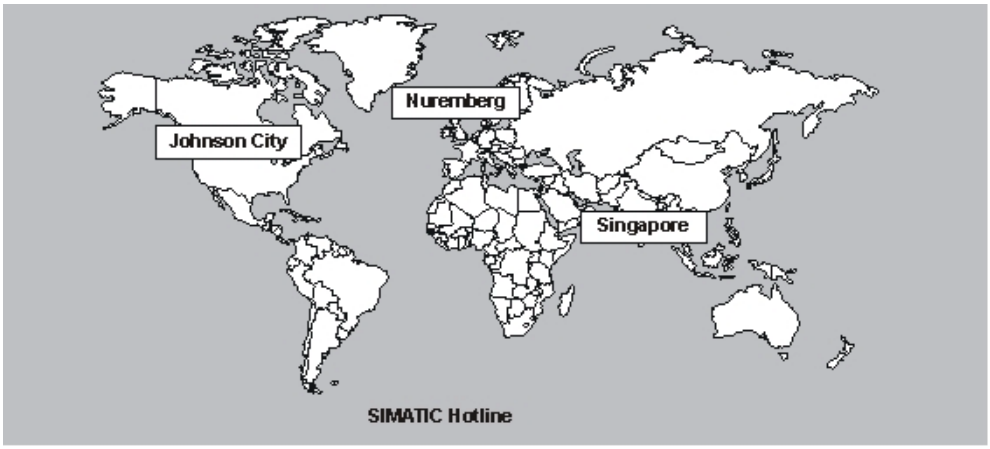


Figure 1-1 SIMATIC Customer Support Hotline

Worldwide (Nuremberg) **Technical Support** (FreeContact) Local time: Mo.-Fr. 7:00 to 17:00 Phone: +49 (180) 5050 222 Fax: +49 (180) 5050 223 E-mail: techsupport@ad.siemens.de GMT: +1:00	**Worldwide** (Nuremberg) **Technical Support** (charged, only with SIMATIC Card) Local time: Mo.-Fr. 0:00 to 24:00 Phone: +49 (911) 895-7777 Fax: +49 (911) 895-7001 GMT: +1:00	
Europe / Africa (Nuremberg) **Authorization** Local time: Mo.-Fr. 7:00 to 17:00 Phone: +49 (911) 895-7200 Fax: +49 (911) 895-7201 E-mail: authorization@nbgm.siemens.de GMT: +1:00	**America** (Johnson City) **Technical Support and Authorization** Local time: Mo.-Fr. 8:00 to 19:00 Phone: +1 423 262-2522 Fax: +1 423 262-2289 E-mail: simatic.hotline@sea.siemens.com GMT: –5:00	**Asia / Australia** (Singapore) **Technical Support and Authorization** Local time: Mo.-Fr. 8:30 to 17:30 Phone: +65 740-7000 Fax: +65 740-7001 E-mail: simatic.hotline@sea.siemens.com.sg GMT: +8:00
English and German are spoken on all hotlines. On the authorization hotline, French, Italian and Spanish are also spoken.		

Service & Support on the Internet

In addition to our documentation services, you can also make use of all our knowledge on the Internet.

http://www.ad.siemens.de/support

Here, you will find:

- Current product information (Updates), FAQs (Frequently Asked Questions), Downloads, Tips and Tricks.
- The Newsletter keeps you constantly up to date with the latest information on the products you use.
- The Knowledge Manager will find the documents you need.
- In the Forum, users and specialists exchange information and experience.
- You can find your local contact for Automation & Drives in our contacts database.
- Information on local service, repair, spares and much more is available to you under the rubric Service.

Product Overview

2

2.1 What are Distributed I/O Stations?

Distributed I/O Stations - Area of Application

When designing a system, the inputs and outputs from and to the process are often installed in the programmable controller.

When the inputs/outputs are at a distance from the programmable controller, the wiring involved can be extensive and confusing; electromagnetic interference can also reduce the reliability.

In such systems, it is often advisable to use distributed I/O stations:

- the control CPU is located centrally
- the I/O devices are distributed on site
- PROFIBUS-DP allows high data transmission rates so that the control CPU and I/O devices communicate both quickly and reliably.
- less installation effort since less cables are required.

What is PROFIBUS-DP?

PROFIBUS-DP is an open bus system complying with the *IEC 61158/EN 50170, Volume 2, PROFIBUS* standard with the "DP" protocol (DP stands for distributed (peripheral) I/O).

Physically, PROFIBUS-DP is an electrical network based on a shielded twisted pair or an optical network using fiber optic cable.

The "DP" protocol allows fast, cyclic data exchange between the control CPU and the distributed I/O devices.

What is PROFIBUS-DP Ex i

In contrast to PROFIBUS-DP, PROFIBUS-DP Ex i is intrinsically save (type of protection intrinsically safe i). The intrinsic safety is assured by the use of a fieldbus isolating transformer that acts like a safety barrier.

What are DP Masters and DP Slaves?

The link between the control CPU and the distributed I/O devices is the DP master. The DP master exchanges data over PROFIBUS-DP with the distributed I/O devices and monitors PROFIBUS-DP.

The distributed I/O devices (= DP slaves) prepare the data of the encoders and actuators locally so that they can be transferred to the control CPU over PROFIBUS-DP.

Which Devices Can Be Connected to PROFIBUS-DP?

A wide variety of devices can be attached to PROFIBUS-DP as DP masters or DP slaves providing they operate in compliance with the *IEC 61158/EN 50170 , Volume 2, PROFIBUS* standard. These include the devices of the following product families:

- SIMATIC S5
- SIMATIC S7/C7
- SIMATIC programming devices/PCs
- SIMATIC HMI (operator control and monitoring devices OP, OS, TD)
- Distributed I/O devices
- Devices from other vendors

Structure of a PROFIBUS-DP Network

The schematic below illustrates the typical structure of a PROFIBUS-DP network. The DP master is integrated in the relevant device, for example the S7-400 as a PROFIBUS-DP interface. The ET 200iS distributed I/O stations are connected to the DP master over PROFIBUS-DP Ex i and PROFIBUS DP.

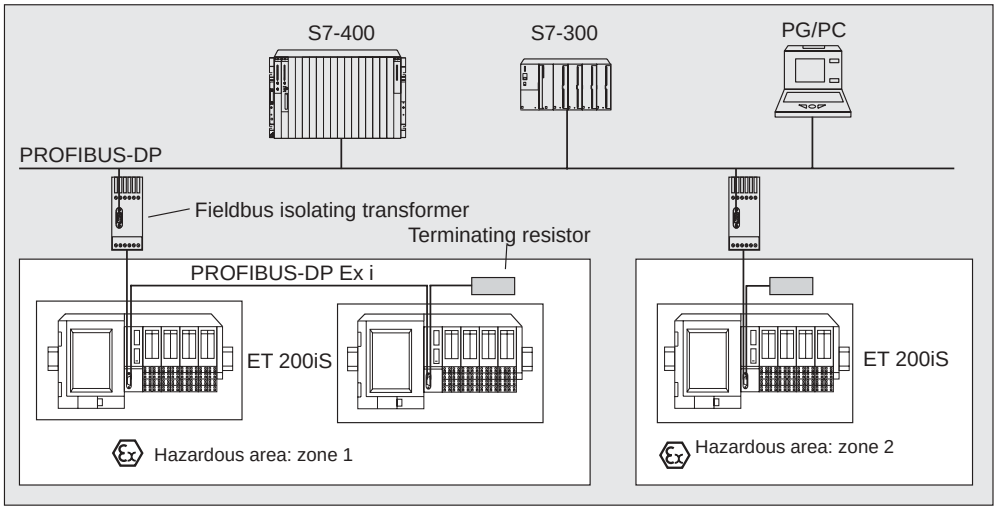


Figure 2-1 Typical Structure of a PROFIBUS-DP Network

2.2 What Is the ET 200iS Distributed I/O Station?

Definition

The ET 200iS distributed I/O station is a highly modular and intrinsically safe DP slave with degree of protections IP 30.

Areas of Application

The ET 200iS distributed I/O station can be used in hazardous areas in zone 1. The inputs and outputs of the ET 200iS to the actuators/sensors are intrinsically safe (EEx ia IIC T4 or EEx ib IIC T4).

Of course, the ET 200iS can also be used in zone 2 or in the safe area.

Directly beside the interface module that transfers the data to the DP master, you can insert almost any combination of I/O modules belonging to the ET 200iS. This allows you to tailor the station exactly to your needs locally.

Every ET 200iS consists of a power supply module, an interface module, and a maximum of 32 electronics modules (for example digital electronics modules).

Terminal and Electronics Modules

In principle, the ET 200iS distributed I/O station consists of various passive terminal modules onto which you plug the electronics modules.

The ET 200iS is connected to the PROFIBUS-DP Ex 1 using a connector on the terminal module TM-IM. Every ET 200iS is a DP slave on PROFIBUS-DP Ex i.

Layout

The following figure shows an example of an ET 200iS configuration.

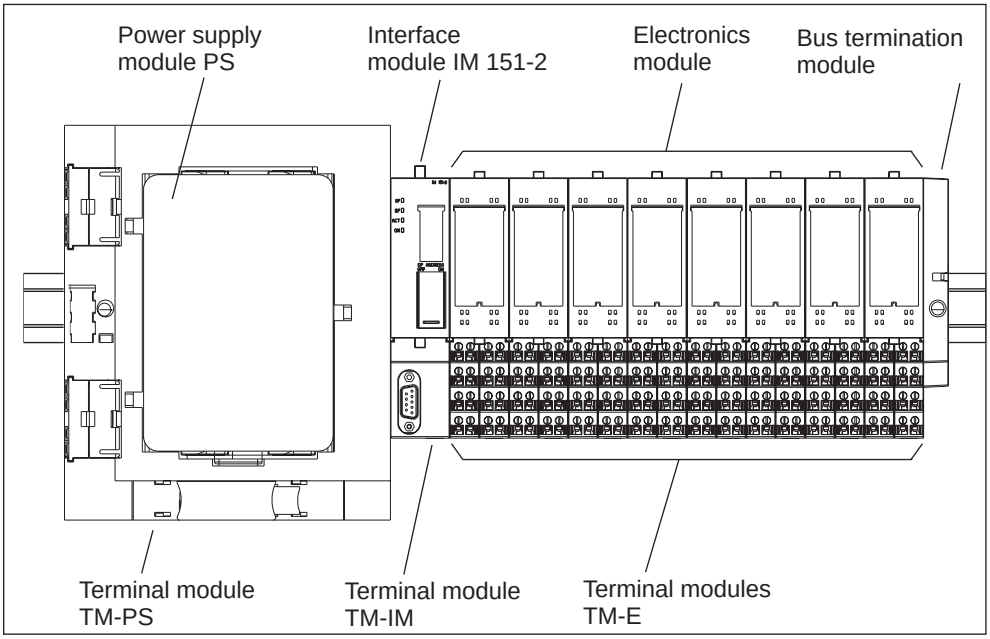


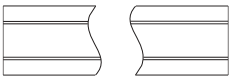
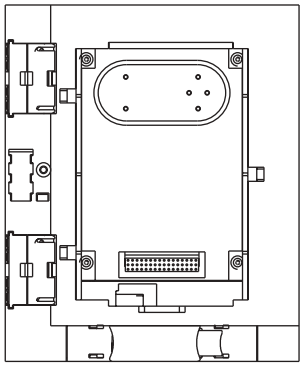
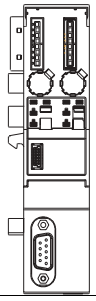
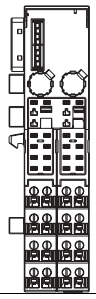
Figure 2-2 View of the ET 200iS Distributed I/O Station

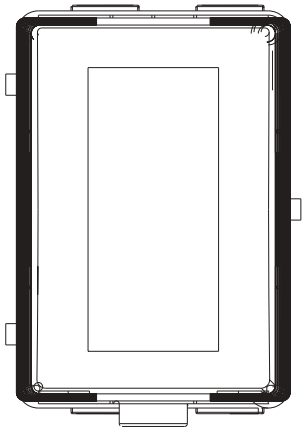
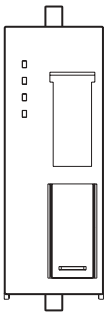
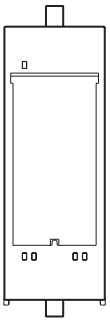
Components of the ET 200iS

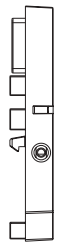
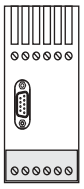
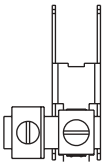
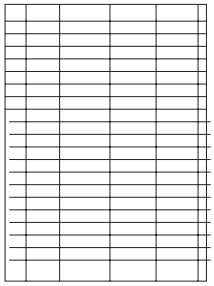
The table below provides you with an overview of the most important components of the ET 200iS.

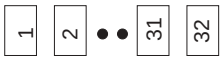
Table 2-1 Components of the ET 200iS

Component	Function	Appearance
Enclosure	... is an additional measure to further increase safety avoiding the production of high temperatures, sparks and electric arcs. • Zone 1: Enclosure with degree of protection EEx e • Zone 2: Enclosure with at least degree of protection IP54	

Component	Function	Appearance
DIN rail (35 x 15 mm, tin-plated or hot-galvanized in compliance with DIN 50022)	... is the rack of the ET 200iS. You install the ET 200iS on the DIN rail.	
Terminal module	...carries the wiring and accommodates the power supply module, interface module, and the electronics modules. The following types of terminal modules are available: • for the power supply module TM-PS • for the interface module TM-IM • for the electronics modules TM-E	Terminal module TM-PS  Terminal module TM-IM  Terminal module TM-E 

Component	Function	Appearance
Power supply module	... is plugged onto the terminal module TM-PS. The power supply module supplies the electronics and encoders with voltage.	
Interface module	... is plugged onto the terminal module TM-IM. The interface module connects the ET 200iS with the DP master and conditions the data for the inserted electronics modules.	
Electronics module	... is plugged onto the terminal module TM-E and decides which function is performed: • Digital electronics modules for NAMUR encoders, digital output • Analog electronics modules with current and resistance measurement, thermoresistors and thermocouples • Analog electronics modules with HART, analog output	

Component	Function	Appearance
Bus termination module	...completes the ET 200iS.	
Fieldbus isolating transformer	...converts PROFIBUS-DP to PROFIBUS-DP Ex i	
Shield contact	...used to contact cable shields.	
Label sheet (DIN A4, perforated, foil)	...for machine labeling or printing; 80 strips per sheet	

Component	Function	Appearance
Slot number labels	...for identifying the slots on the terminal module	
Color labels	...allow customer and country-specific identification of the terminals on the terminal module	
PROFIBUS cable with bus connector	...interconnects the nodes of a PROFIBUS-DP Ex i system or connects the fieldbus isolating transformer with the ET 200iS.	
Bus terminating resistor	...terminates PROFIBUS-DP Ex i	

Properties and Uses of the ET 200iS

Table 2-2 Properties and Uses

Features	Uses
The design	
Scalable modular design with 2 or 4-channel electronics modules	• Station design optimized to contain costs • Reduced configuration and documentation effort • Space-saving with no fixed order for the modules
Wide range of electronics modules	Extensive area of application
Permanent wiring by separating mechanical and electronic components	• Prewiring possible • Hot swapping of modules while the ET 200iS is operating when at least two electronics modules are present.
Integrated powerbus	Reduced wiring effort
Screw or spring terminals	Use of most suitable terminating technique

Features	Uses
Terminals and Connections	
Intrinsically safe inputs and outputs complying with EEx ia IIC T4 and EEx ib IIC T4.	Intrinsically safe encoders, actuators and HART field devices from zone 0, 1, and 2 can be connected
Terminal box in terminal module can be replaced	No need to remove the terminal module if terminals are damaged
Automatic coding of the I/O modules	Fast and safe module replacement
Large labels	Adequate space for clear labeling
Functionality	
Changing parameter settings during operation	No restart of the ET 200iS necessary
Time stamping, flutter monitoring, pulse stretching	Efficient monitoring of the inputs
Identification data	Unique identification/assignment of the modules used (for example, for validation, quality assurance)

DP master

All modules of the ET 200iS can communicate with all DP masters that comply with the *IEC 61158/EN 50170, Volume 2, PROFIBUS* standard.

2.3 ET 200iS in the Hazardous Area

Properties of the Zones

Areas in which there is a risk of explosion are divided into zones. The zones are distinguished according to the probability of the existence of an explosive atmosphere.

The ET 200iS can be used in hazardous areas in zone 1, zone 2 (division 2) and in the safe area.

You can connect intrinsically save encoders, actuators, and HART field devices to the ET 200iS that are permitted in zone 0, zone 1, zone 2 of the hazardous area and in the safe area. The encoders, actuators, and HART field devices must be certified for the relevant zones.

The following table provides an overview of the zone categories:

Table 2-3 Classification of Zones

Zone	Degree of Hazard	Example
0	Explosive atmosphere is continuously present or present for long periods or often present	Within containers.
1	Explosive gas atmosphere is sometimes present	In the region of openings for filling and emptying.
2	Explosive gas atmosphere is seldom present and then only for a short time	Areas bordering on zone 1
Safe area	No	Standard Applications or distributed I/O

Types of Protection of the ET 200iS

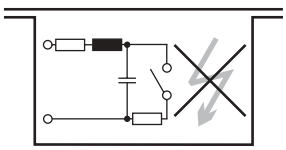
The types of protection include design and electrical measures relating to the equipment to achieve explosion protection in the hazardous areas .

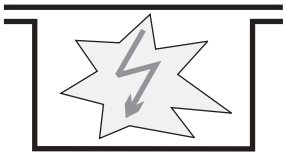
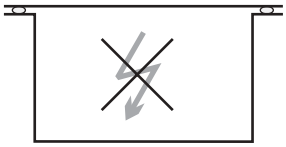
The ET 200iS has the following types of protection:

Properties and Types of Protection

The types of protection of the ET 200iS have the following significance:

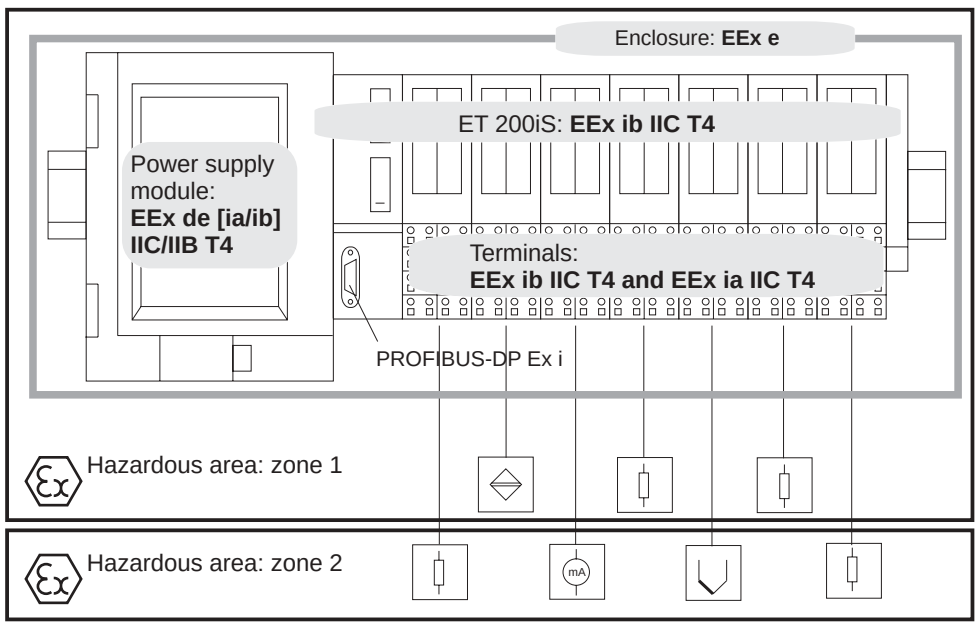
Table 2-4 Properties and Types of Protection

Type of Protection	Meaning	Representation
Intrinsic safety i	All voltages, currents, inductance and capacitance occurring are limited by electrical measures (intrinsically safe) - sparks or thermal effects capable of causing ignition cannot occur.	

Type of Protection	Meaning	Representation
Explosion-proof enclosure d	The power supply module is installed in a stable (explosion-proof) enclosure. If the explosive atmosphere within the enclosure ignites, the enclosure will withstand the explosion and contain the explosion within the power supply module.	
Increased-safety enclosure e	In zone 1 of the hazardous area, the ET 200iS must be installed in an additional enclosure. The enclosure must have the increased safety e type of protection. This type of protection involves additional measures to avoid the occurrence of high temperatures, sparks and arc-over. In zone 2 of the hazardous area, this type of protection is unnecessary. Here, the ET 200iS must simply be installed in an enclosure suitable for zone 2 with at least degree of protection IP 54.	

Identification Codes of the ET 200iS

All equipment intended for use in hazardous areas must have an identification code indicating the type of hazardous environment for which the equipment is suited.The ET 200iS has the following types of identification code:



Key:

Eex: Explosion-protection identifier
ib: Type of protection: intrinsic safety (use of the ET 200iS in zone 1)
ia: Type of protection: intrinsic safety (use of sensors, actuators, HART field devices up to zone 0)
d: Type of protection: explosion-proof enclosure
e: Type of protection: increased safety
IIC: Explosion group for hydrogen
IIB: Explosion group for ethylene

Figure 2-3 Identification Codes of the ET 200iS

2.4 Integration in Process Control System

PCS 7

PCS 7 is a powerful process control system. Through PCS 7, the ET 200iS has a direct attachment to the control system.

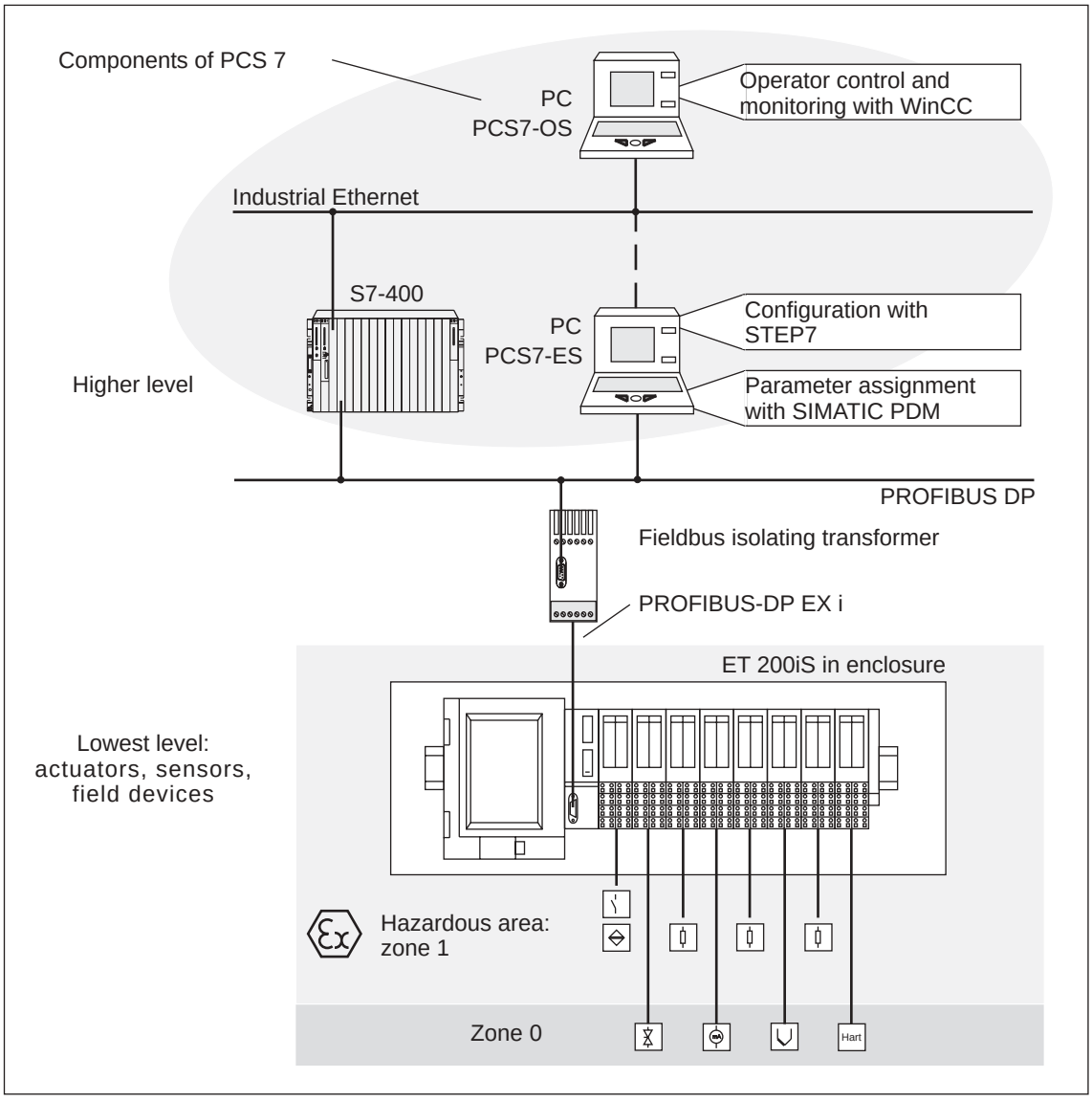


Figure 2-4 Integration in the Control System

Brief Instructions on Commissioning

3

3.1 Introduction

Introduction

This manual guides you step-by-step through a concrete example until you have created a functioning application. While working through the example, you will learn the basic hardware and software functions ET 200iS.

3.2 Requirements

Requirements

The following requirements must be met:

- You must be familiar with the basics of electrical and electronic engineering and the procedures relating to hazardous areas as well as experience of working with computers and Microsoft(R) Windows(TM) 95/98/ME/NT/2000.
- Full versions of STEP 7 and SIMATIC PDM (Version 5.1, Service Pack 2, Hotfix 1 or higher) are installed on your PG and you are familiar with the basics of working with STEP 7. Older versions of STEP 7 can also be used. See *Commissioning and Diagnostics*
- If you implement this example in zone 1 or zone 2, you must adhere to all the rules and regulations explained and listed in this manual.

Note

When checking the functionality make sure that you keep to the stipulations in EN 60 079-17. This standard contains the regulations of the international standard IEC 60 079-17.

Danger

When laying cables and wiring, make sure that you adhere to the installation regulations complying with EN 60 079-14 and any regulations specific to your country.

Warning

When used in systems, the ET 200iS is subject to special rules and regulations depending on the area of application.
Please note and adhere to the valid safety and accident prevention regulations, for example IEC 204 (EMERGENCY STOP devices).
If you do not adhere to these regulations, this can result in serious injury and damage to machines and facilities.

3.3 Materials and Tools Required to Set Up the Example

Table 3-1 Required Material and Tools

Number	Article	Order Number (Siemens)
2	Rails complying with EN 50022 (35 x 15 mm)	e.g. 6ES5 710-8MA11
1	Enclosure for ET 200iS with degree of protection EEx e	Contact your Siemens representative
1	Terminal module TM-PS	6ES7 193-5DA00-0AA0
1	Terminal module TM-IM with bus termination module	6ES7 193-5DB00-0AA0
7	Terminal module TM-E30S44-iS	6ES7 193-5CB00-0AA0
1	Interface module IM 151-2	6ES7 151-2AA0-0AB0
1	Power supply PS	6ES7 138-5EA00-0AA0
3	4DI NAMUR	6ES7 131-5RD00-0AB0
3	2DO DC25V/25mA	6ES7 132-5SB00-0AB0
1	EEx e-terminal WPE 16/E	17522900 (manufacturer Weidmüller)
1	Fieldbus isolating transformer 9373 with terminating resistor	Can be ordered from R. Stahl Schaltgeräte GmbH order number 93 730 05 01 2
2	PROFIBUS bus connector (for master)	6ES7 972-0BB10-0XA0
1	PROFIBUS bus connector (for ET 200iS)	6ES7 972-0BA30-0XA0
1	PROFIBUS-DP cable	e.g. 6XV1 830-0EH10
2	NAMUR sensor	e.g. BERO 3RG 4612-1NA00
1	1-wire On button	normal suppliers
3	LEDs with series resistor	normal suppliers
1	Power supply module PS S7-400	e.g. 6ES7 405-0KA00-0AA0
1	CPU S7-416-3 DP	6ES7 416-3XL00-0AB0
1	Rack for S7-400	e.g. 6ES7 400-1TA01-0AA0
1	Programming device (PG) with PROFIBUS-DP interface, installed software STEP 7 (Version 5.1, Service Pack 2, Hotfix 1 or higher) communications processor CP 5611 and PG cable	various
1	Screwdriver with 3 mm blade	normal suppliers

Number	Article	Order Number (Siemens)
1	Screwdriver with 7 mm blade	normal suppliers
1	Cutting tool for the DIN rails	normal suppliers
1	Cable cutters and wire stripping tools	normal suppliers
1	Tool for crimping wire-end ferrules	normal suppliers
X m	Cable for grounding DIN rails with 10 mm cross-section with terminal end to fit M6, length to suit local situation	normal suppliers
approx. 2 m	Flexible lead with 1 mm^2 cross section and suitable wire-end ferrules, form A, length 6 mm	normal suppliers

3.4 Overview of the Setup

Overview of the Example Setup (wiring and power sources not illustrated)

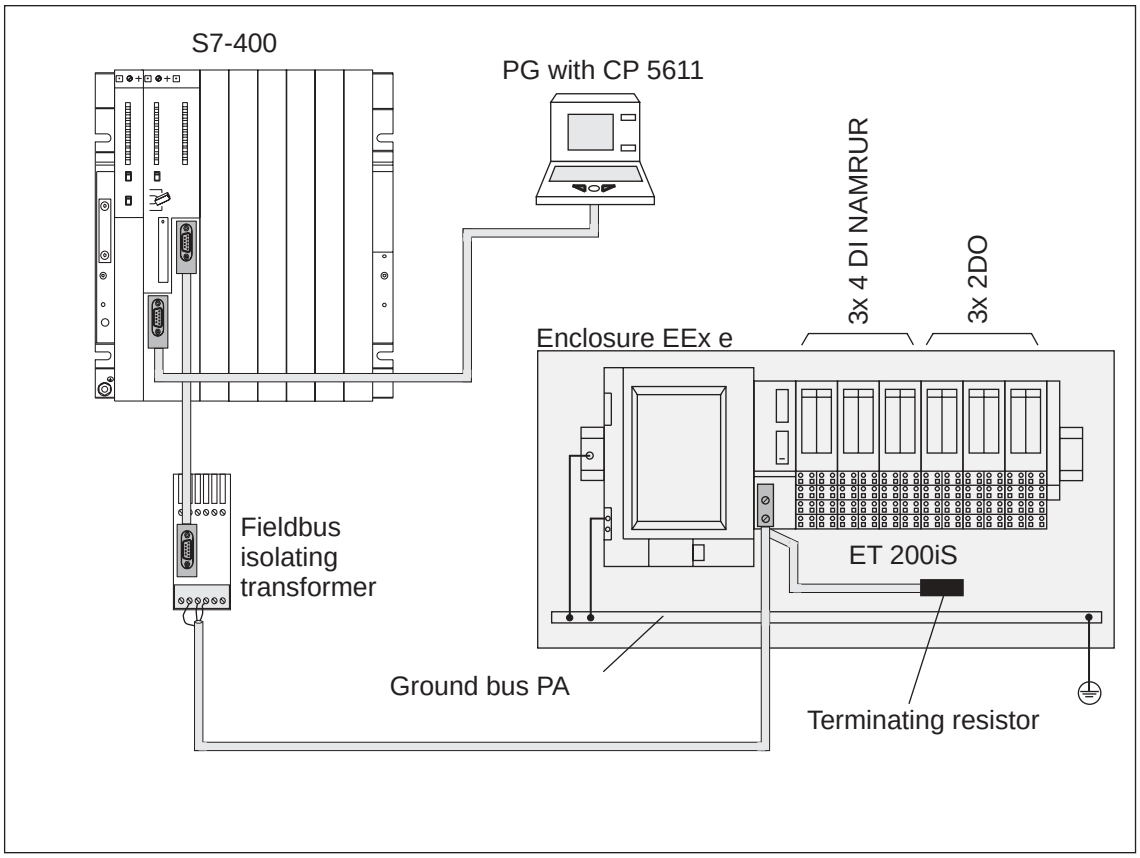


Figure 3-1 Overview of the Example Setup

3.5 Setting Up the Configuration for the Example

3.5.1 Setting up the ET 200iS

1. Install the DIN rail (483 mm) in the EEx e enclosure EEx e, that is secured to a firm base. See also *Section: Installation*.
2. Start to install the modules starting at the left of the rail. Begin with the terminal module TM-PS (fit onto rail – push in). Continue with the rest of the modules (fit onto the rail – push in – slide left).
   Make sure you install in the order shown below:
   - Terminal module TM-PS
   - Terminal module TM-IM
   - 6x terminal module TM-E30S44-iS
   - Bus termination module

3.5.2 Setting Up the S7-400

1. Install the rack on a stable surface. See also the manual: *Installing an S7-400.*
2. Start installing the individual modules in the rack from the left (fit to the rail – push in – secure the screws). Make sure you install in the order shown below:
   - Power supply PS
   - CPU S7-416-3 DP

3.5.3 Installing the Fieldbus Isolating Transformer

1. Install the second DIN rail on a firm surface.
2. Fit the fieldbus isolating transformer onto the rail and push it in.

Note

Install the fieldbus isolating transformer in an enclosure outside the hazardous area and check the settings (DIP switches) on the fieldbus isolating transformer based on the accompanying operating instructions.

3.6 Wiring the Example Setup

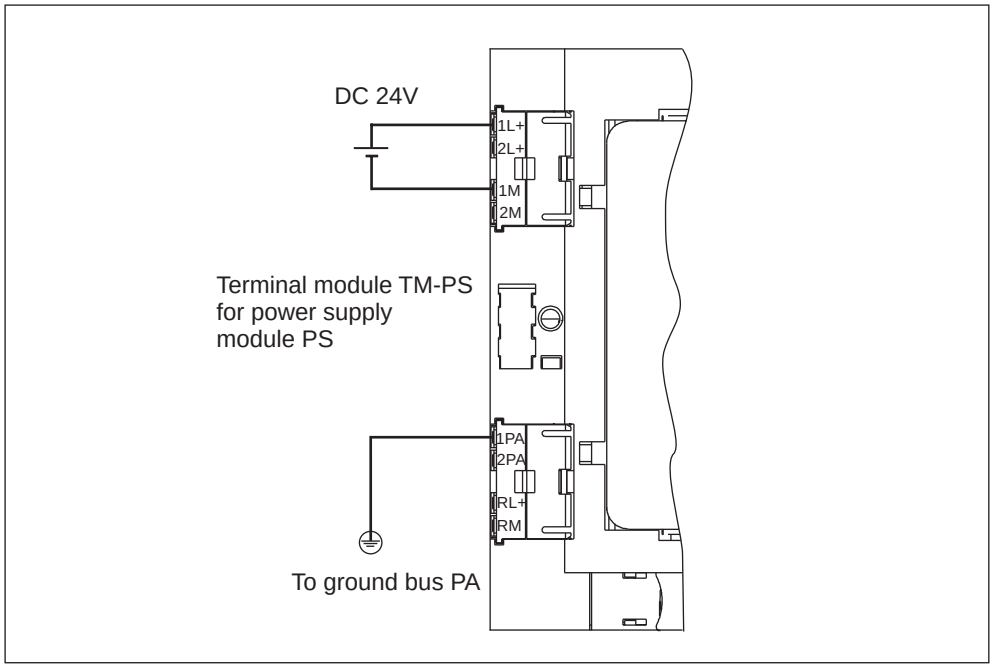


Figure 3-2 Wiring TM-PS

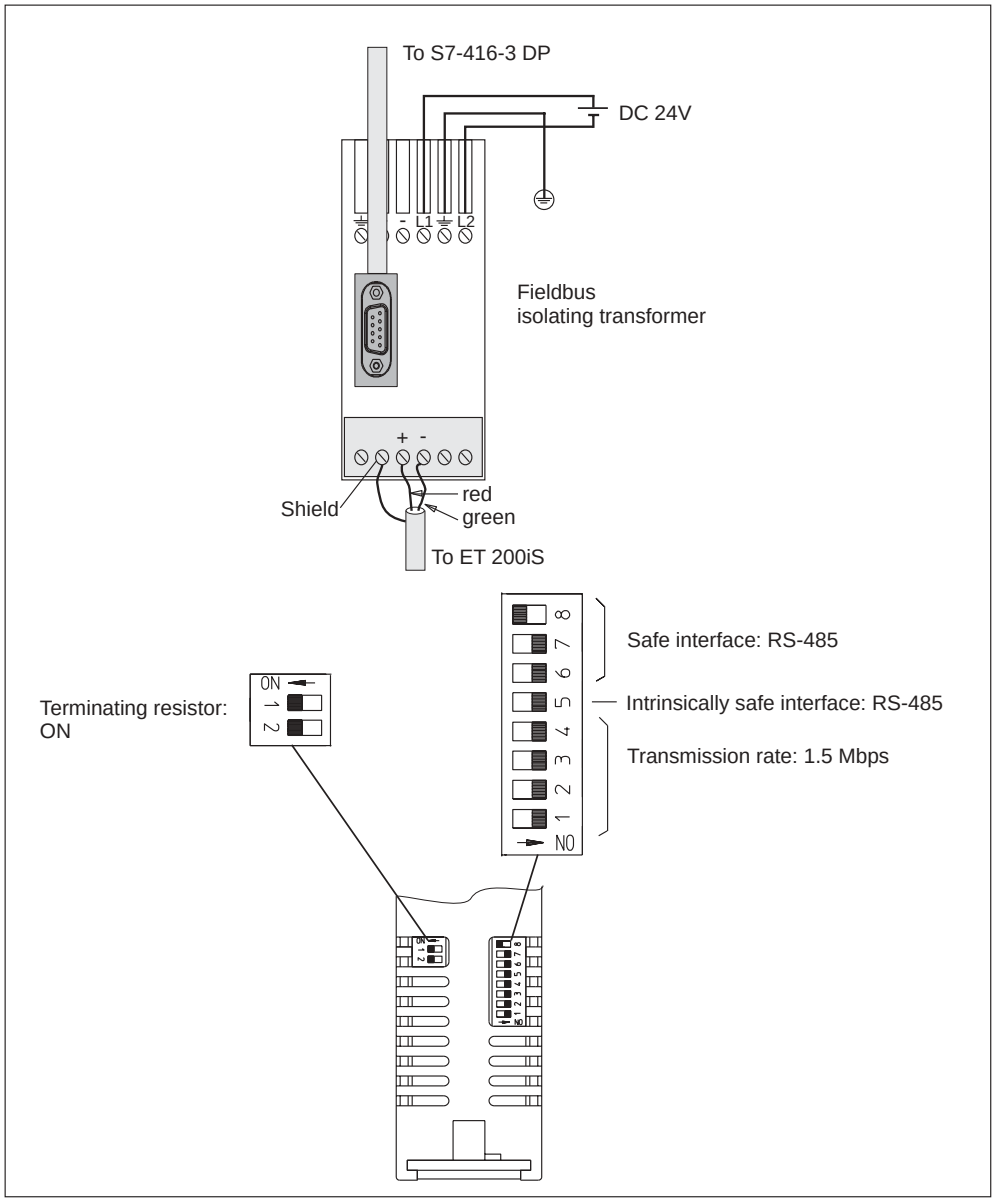


Figure 3-3 Wiring Fieldbus Isolating Transformer

Connect the following:

1. the programming device (PG) and the S7-416-3 DP-CPU (interface: X1 MPI) with a PG cable
2. the S7-416-3 DP CPU (interface: X3 DP) with the fieldbus isolating transformer, as shown above, with a PROFIBUS-DP cable (use PROFIBUS bus connector 6ES7 972-0BB10-0XA0)
3. the interface module IM 151-2 with the fieldbus isolating transformer as shown above using a PROFIBUS-DP cable (use a PROFIBUS bus connector 6ES7 972-0BA30-0XA0)

4. the terminating resistor supplied with the fieldbus isolating transformer, with the interface module IM 151-2
5. the power supply PS, the fieldbus isolating transformer, and the power supply PS S7-400 with the power supply
6. the rack of the S7-400 with the grounding conductor
7. the DIN rail of the ET 200iS and the power supply module PS with the equipotential bonding system PA. To secure to the DIN rail, use the EEx e-terminal.

Wire the ET 200iS as shown below:

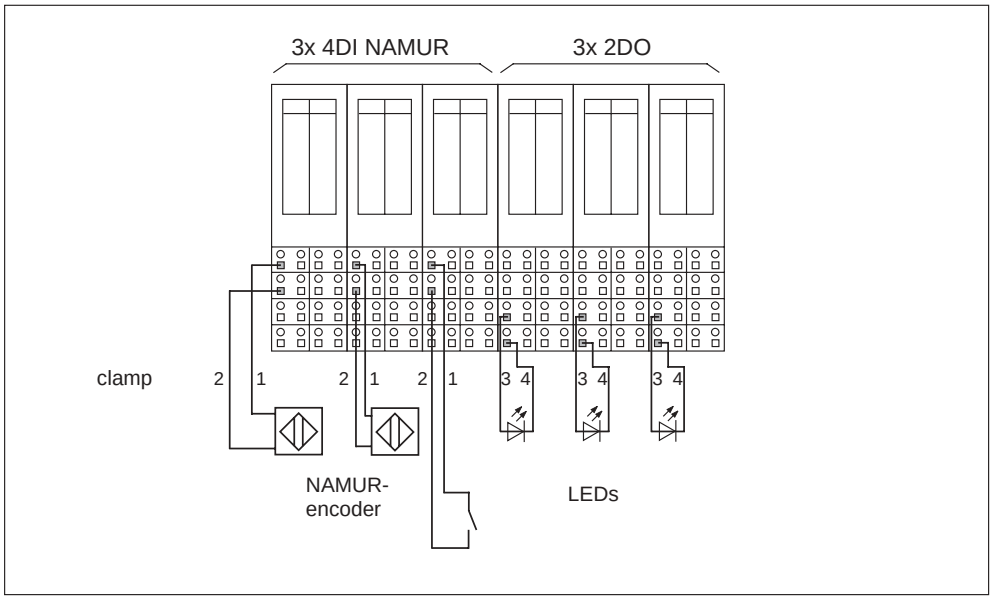


Figure 3-4 Wiring the ET 200iS Modules

3.7 Insert the interface module and the electronics modules

Start at the left by inserting the electronics modules. See also: *Inserting and Labeling the Power Supply, Interface Module, and Electronics Modules*.

Make sure you install in the order shown below:

- Power supply PS
- Interface module IM 151-2
- 3x 4DI NAMUR
- 3x 2DO DC25V/25mA

3.8 Setting the PROFIBUS Address

On the IM 151-2 interface module, set PROFIBUS address 3. See also: *Setting the PROFIBUS Address*.

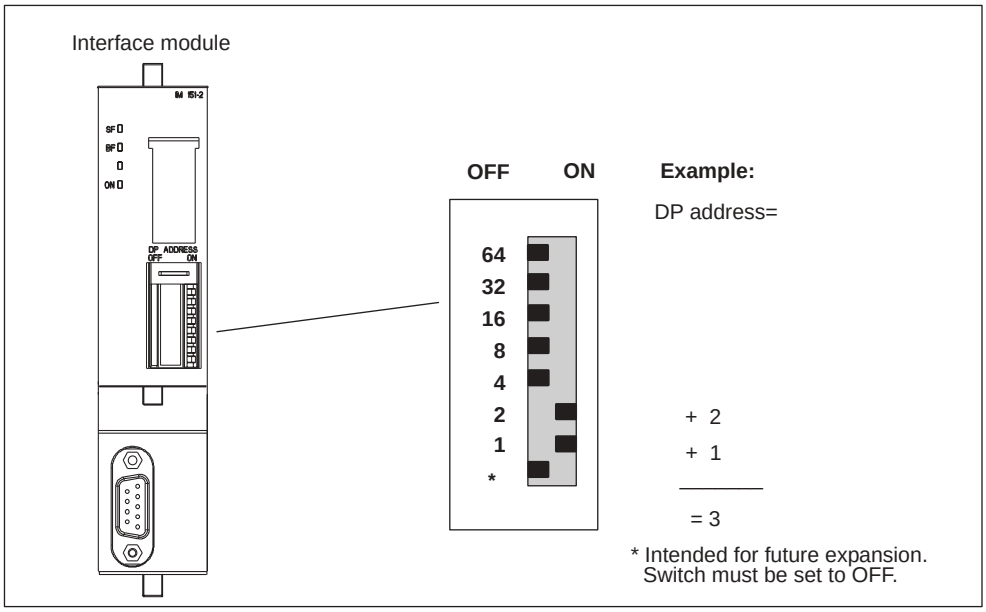


Figure 3-5 Setting PROFIBUS Address 3

3.9 Configuring the Example

3.9.1 Configuring the S7-400

Step 1

Open STEP 7.

Step 2

If the New Project Wizard opens, close it with **Cancel**.

Step 3

Go to the main menu of the SIMATIC Manager and select **File > New**. A dialog box opens in which you enter "ET 200iS" as the name and then close the dialog with **OK**.

Step 4

Click**InsertClick Insert > Station** in the menu and select **SIMATIC 400 Station** from the list. An icon with the name SIMATIC 400(1) is created in the right-hand pane of the project window.

Step 5

Now double-click on the icon of the SIMATIC 400 station in the SIMATIC Manager. An icon labeled "Hardware" now appears in the right-hand pane of the window. Double-click on this icon. HW Config opens.

Step 6

If no catalog with components is displayed on the right-hand side of the window, activate the display by selecting **View > Catalog** in the menu.

Expand the SIMATIC 400 folder and RACK-400 folder until you can see UR1. Double-click on this icon. In the lower part of the window on the left, you can now see the slots.

Step 7

Select slot 1 (it changes to blue) and then return to the catalog and open the folders SIMATIC 400, PS 400 and Standard PS 400 until you can see PS 407 10A. Double-click on this icon. The power supply module now occupies slots 1 and 2.

Step 8

Next, select slot 3 and then return to the catalog and open folders SIMATIC 400, CPU 400, CPU 416-3 DP and 6ES7 416-3XL00-0AB0 until you can see V1.2. When you double-click on the icon, a window with the title "Properties - PROFIBUS interface DP R0/S3.1)“ opens and you can acknowledge this window with **OK**. The CPU is entered in slots 3 and 4.

Step 9

In the lower left-hand window, locate the row labeled DP and select it. Right-click on the row and select **Object Properties**. The "Properties DP (R0/S3.1)" dialog opens. Click the **Properties** button and in the next dialog, click **New**. A new DP subnet operating at 1.5 Mbps is created. Now confirm by clicking **OK** three times in succession.

Step 10

In the main menu, you can save the changes with **Station > Save and Compile**.

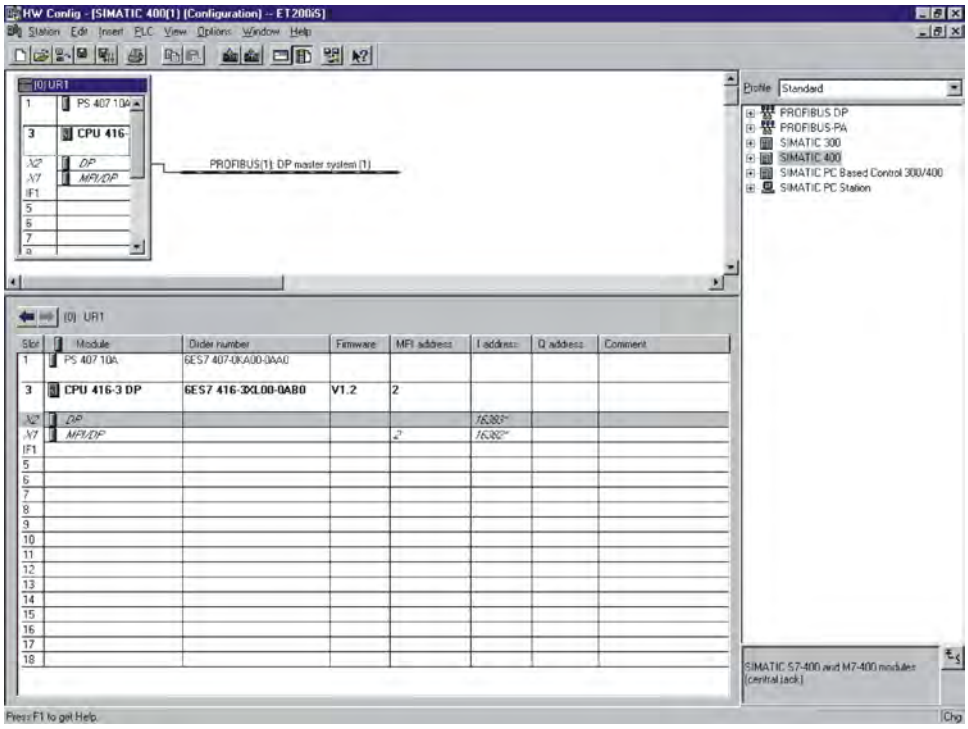


Figure 3-6 Configuration of the S7-400

3.9.2 Configuration of the ET 200iS

Step 1

In the upper left-hand window of HW Config, click on the stylized PROFIBUS to select it. Now go to the catalog and open PROFIBUS DP and ET 200iS so that you can see IM 151-2. Double-click on this icon to insert an ET 200iS station. In the dialog box that opens, change the address to 3 and confirm with **OK**. At the bottom left, you can now see the new slots with an IM 151-2 in slot 2.

Step 2

Select slot 1 and then go the catalog to power module PS, which is located under IM 151-2 in the tree, and insert this by double-clicking on it.

Step 3

Since slot 3 must remain free, select slot 4 and starting from there insert three NAMUR 4DI modules and three 2DO DC25V/25mA modules.

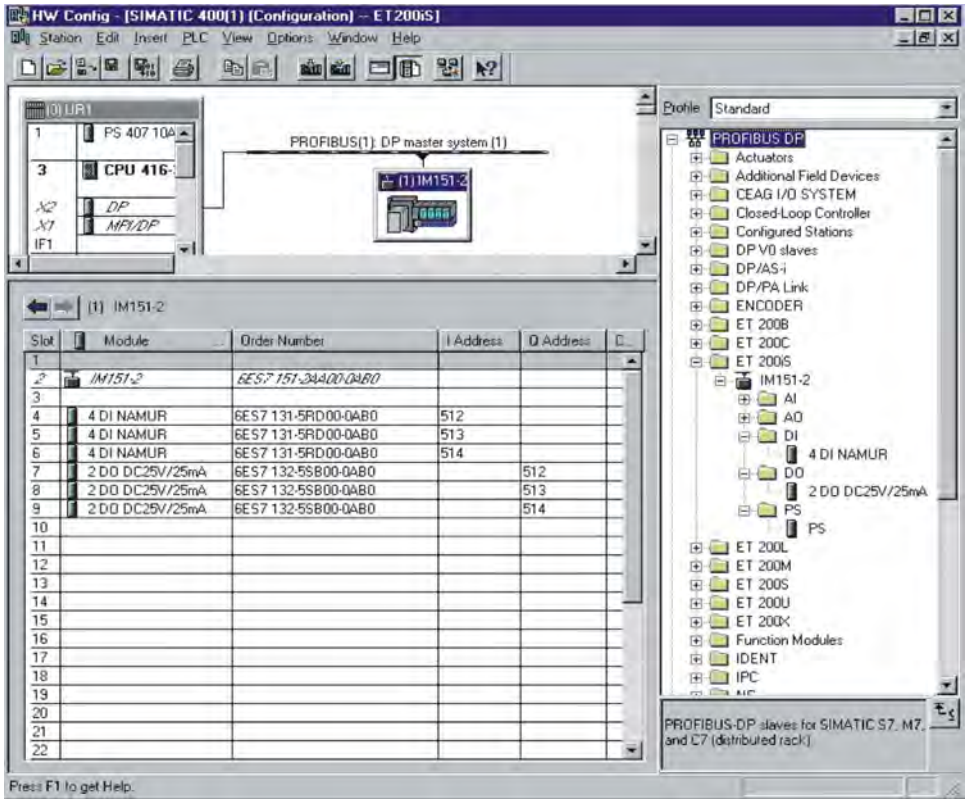


Figure 3-7 Configuration of the ET 200iS

Step 4

After saving the project with the menu command **Station > Save and Compile**, you can exit HW Config.

3.9.3 Setting Parameters for the ET 200iS

Requirements

To be able to work online with SIMATIC PDM, you must set the CP 5611 to the PROFIBUS-DP interface (in the SIMATIC Manager: menu command **Options > Set PG/ PC Interface**).

Step 1

You are still in HW Config. Double-click on the first module in the configuration table (slot 4: 4DI NAMUR).

Step 2

In the next dialog, select "Specialist" as the user and confirm with "OK". In this mode, you can make parameter settings.

Result: SIMATIC PDM is started with the parameters and identification data of the module.

Step 3

For channels 1-3 change the encoder type to "channel disabled" and save the changes with **File > Save**. With **Device > Download to Device**, you can download the parameters to the ET 200iS. Close SIMATIC PDM.

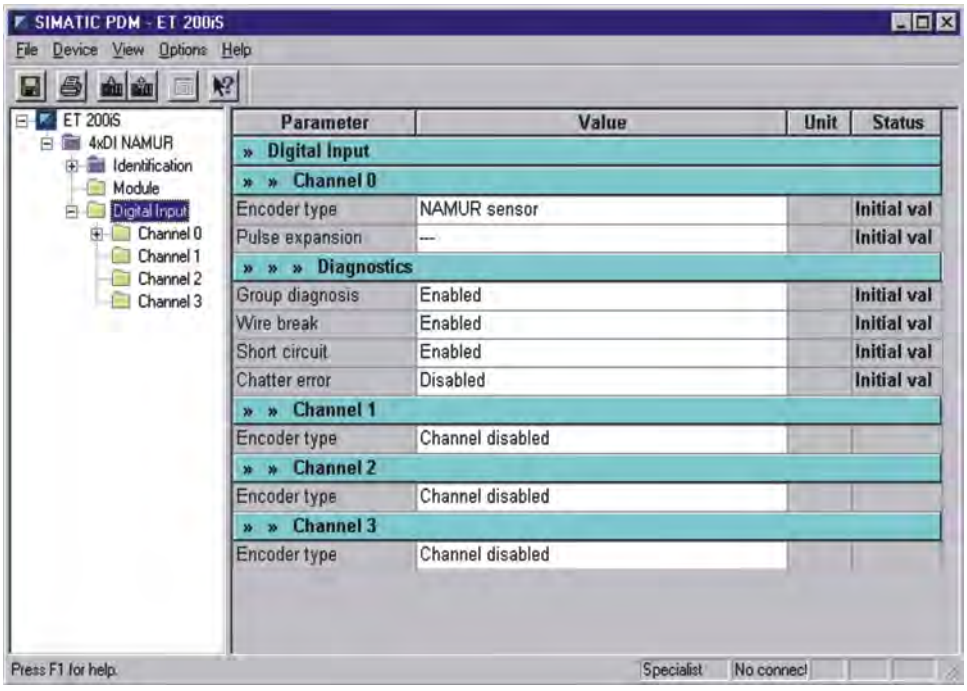


Figure 3-8 Disabling ET 200iS Channels

Step 4

Follow the same procedure as described in points 1 through 3 for each of the ET 200iS modules and make the changes as outlined in the table below.

Table 3-2 Changes

Module	Slot	Type	Channel 0	Channel 1	Channel 2-3
1	4	4xDI NAMUR	No change	Encoder type: Channel disabled	Encoder type: Channel disabled
2	5	4xDI NAMUR	No change	Encoder type: Channel disabled	Encoder type: Channel disabled
3	6	4xDI NAMUR	No change	Encoder type: Channel disabled	Encoder type: Channel disabled
4	7	2xDO	No change	No change	-
5	8	2xDO	No change	No change	-
6	9	2xDO	No change	No change	-

Note

If you double-click on the DP slave "IM 151-2" (in the upper part of the station window) in HW Config, SIMATIC PDM starts and all the modules of the ET 200iS are downloaded. If you then select the menu command **Device > Full Upload to PG/PC** all the parameters and identification data of the ET 200iS are loaded. In SIMATIC PDM, you can select individual modules, assign the parameters for them, and save them (menu command **File > Save**) and download them to the ET 200iS (Menu command **Device > Full Download to Device**).

3.10 Programming the Example

How it Works

The state of the encoders connected to inputs I512.0 , I513.0 and I514.0 is queried and evaluated. I512.0 increments an internal counter and I513.0 decrements it. Input I514.0 resets the counter to zero.

Depending on the counter value, outputs Q512.0, Q513.0 and Q514.0 are set or deleted. Q512.0 is set when the counter value is 0. At a counter value < 3, Q514.0 is set and at ≥ 3, Q513.0 is set.

Programming

Change to the component view with **View > Component View**.

Open the following in succession: SIMATIC 400(1), CPU 416-3 DP, S7 Program(1) and Blocks until you can see OB1. Double-click on OB1 and confirm the dialog with **OK**.

Enter the following STL program:

Table 3-3 Program for the Example

STL	Remarks
A I 514.0	If button 514.0 is active,
R C 0	set counter to 0
A I 512.0	If BERO 512.0 is active,
CU C 0	increment by 1
A I 513.0	If BERO 513.0 is active
CD C 0	decrement by 1
AN C 0	Is counter = 0 ?
= Q 512.0	YES, then output 512.0 is active
L C 0	Load counter in ACCU
L 3	Load 10 in ACCU
>=I	Is counter => 3 ?
= Q 513.0	YES, then output 513.0 is active
<I	Is counter < 3 ?
= Q 514.0	YES, then output 514.0 is active

Save the program with **File > Save** and download it to the CPU with**PLCwith PLC > Download**.

3.11 Putting the Example into Operation

Turn on the power supply of the ET 200iS.

Watch the status LEDs on the S7-400 and on the ET 200iS:

- CPU 416-3 DP :

  DC 5V: lit

  SF DP: off

  BUSF: off

- ET 200iS:

  SF: off

  BF: off

  ON: lit

3.12 Evaluating the Diagnostics

If an error occurs, OB82 is started. Evaluate the startup information in OB82.

Tip: Call SFC13 in OB82 and evaluate the diagnostic frame. See *Commissioning and Diagnostics*.

3.13 Removing and inserting modules

Removing and Inserting Digital Electronics Module 4 DI NAMUR

1. Remove the **first** of the three electronics modules 4 DI NAMUR from the terminal module during operation.
2. Monitor the status LEDs on the IM 151-2:
   - SF: lit -> diagnostic message exists
   - BF: off
   - ON: lit
     Result: The ET 200iS 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 : Bit 3 in byte 7 is set -> slot 4
   - Module status: Byte 16.7/16.6: 11_B -> no module
4. Insert the removed electronics module in the terminal module again
   Result:
   - Status LEDs IM 151-2:
     SF: off
     BF: off
     ON: lit
   - The diagnostic message is deleted

3.14 Wire break of the NAMUR encoder connected to the digital input module

1. Remove the wire from terminal 1 of the **first** of the three electronics modules 4 DI NAMUR.
2. Monitor the status LEDs
   IM 151-2:
   - SF: lit
   - Electronics module 4 DI NAMUR
   - SF: lit -> diagnostic message exists
   - 1: off -> 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 7.3 is set -> slot 4
   - Channel-related diagnostics:
     Byte 25: 10000011_B -> slot 4
     Byte 26: 01000000_B -> channel 0
     byte 27: 00110_B -> wire break
4. Secure the wire to the BERO again in terminal 1 and evaluate the diagnostics again:
   - Status LED IM151-2
     SF: off
   - Status LEDs electronics module 4 DI NAMUR:
     SF: off
     1: off/on
   - The diagnostic message is deleted.

Configuration Options

4

4.1 System with Scalable Modularity

System with Scalable Modularity

With the ET 200iS scalable modularity means that you can adapt the structure exactly to match your applications with 2 and 4-channel electronics modules.

Example

The following schematic shows an example of a possible configuration of the ET 200iS distributed I/O station:

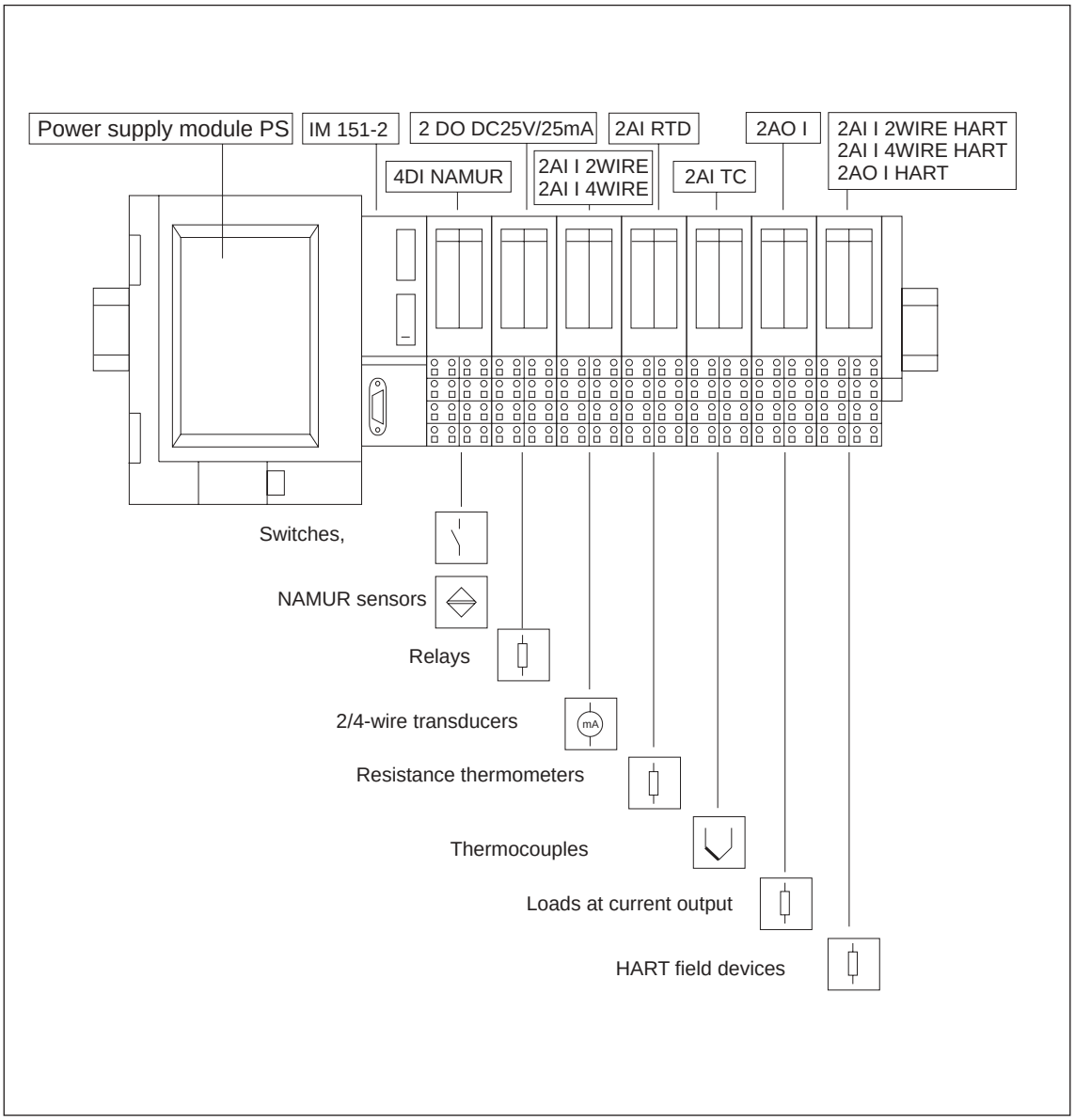


Figure 4-1 Example of an ET 200iS Configuration

4.2 Electronics Modules to Suit your Application

Which Electronics Module Does What?

In the following table, you will find a guide to the applications of the electronics modules of the ET 200iS distributed I/O station.

Electronics Modules to Suit your Application

Table 4-1 Electronics Modules to Suit your Application

Application		Electronics Modules
Evaluation of NAMUR encoders Evaluation of connected, unconnected mechanical contacts	4 input channels	4DI NAMUR
Switching solenoid valves, d.c. relays, indicator lamps, actuators	2 output channels	2DO DC25V/25mA
Measuring currents with 2-wire transducers	2 input channels Input ranges: • 4 to 20 mA	2AI I 2WIRE
Measuring currents with 4-wire transducers	2 input channels Input ranges: • 0 to 20 mA • 4 to 20 mA	2AI I 4WIRE
Measuring currents with HART field devices (2 wire transducers) HART communication	2 input channels Input range 4 to 20mA	2AI I 2WIRE HART
Measuring currents with HART field devices (4-wire transducers) HART communication	2 input channels Input range 4 to 20mA	2AI I 4WIRE HART
Measuring temperatures with resistance thermometers Measuring resistance	2 input channels Input ranges: • Pt100, Ni100 • 600 ohms	2AI RTD
Measuring temperatures with thermocouples Measuring thermal e.m.f.	2 input channels Input ranges: • ± 80 mV • Type E, N, S, K, L, S, R, B, T, U	2AI TC
Output of currents	2 output channels Output ranges: • 0 to 20 mA • 4 to 20 mA	2 AO I
Output of currents with HART field devices HART communication	Output range 4 to 20mA	2AO I HART

4.3 Which Electronics Modules Match the Terminal Modules?

Selecting the Terminal Modules

In the following table, you will find information to help you select the terminal modules you require.

Which Electronics Modules Match the Terminal Modules?

Table 4-2 Which Electronics Modules Match the Terminal Modules?

Electronics Modules	Terminal Modules
Power supply module PS	Terminal module TM-PS
Interface module IM 151-2	Terminal module TM-IM
• 4DI NAMUR • 2DO DC25V/25mA • 2AI I 2WIRE • 2AI I 4WIRE • 2AI I 2WIRE HART • 2AI I 2WIRE HART • 2AI RTD • 2AI TC • 2 AO I • 2AO I HART	Terminal module TM-E30S44-iS (screw terminal) or Terminal module TM-E30C44-iS (spring terminal)
Bus termination module	---

4.4 Configuration Options in Zones

General Rules

Regardless of the configuration of the ET 200iS in zone 1, zone 2 or in the safe area, the following rules apply:

If the inputs and outputs to the actuators are intrinsically safe, then PROFIBUS-DP must also be intrinsically safe (Ex i):

1. Fieldbus isolating transformer required (for example, from R. STAHL Schaltgeräte GmbH; Refer to the order numbers)
2. Marking of PROFIBUS-DP as Ex i (not only in zone 1!)
3. Marking of the cables/wires to the actuators and sensors as Ex i (for example, using the color light blue).

Warning

All devices you connect to PROFIBUS-DP Ex i (on the Ex side of the fieldbus isolating transformer) must be intrinsically safe.

Connecting voltage measurement devices, oscillographs, and bus testers to PROFIBUS-DP Ex i is not permitted.

Rules for Configuring the ET 200iS in Zone 1:

If you use the ET 200iS in zone 1, you must adhere to the following rules:

1. The ET 200iS must be installed in an enclosure with type of protection EEx e (increased safety). For information on ordering such enclosures, contact your Siemens representative
2. PROFIBUS-DP must be isolated using a fieldbus isolating transformer. The fieldbus isolating transformer (for example from R. STAHL Schaltgeräte GmbH; refer to the section Order Numbers) guarantees degree of protection EEx i for PROFIBUS-DP in hazardous areas (zone 1).
   The fieldbus isolating transformer must be installed in the safe area. See Appendix *Order Numbers*.
3. Normal PROFIBUS-DP bus cables can be used in zone 1. See appendix *Order Numbers*. You must, however, mark these as "EEx i bus cable" (for example with a blue band/blue shrink-on sleeve at the ends or mark the cable with a blue color).

4. The PROFIBUS-DP bus cable must be connected to the IM 151-2 over the bus connectors operating at 1.5 Mbps (order number 6ES7 972-0BA30-0XA0).
5. PROFIBUS-DP Ex i must be terminated in zone 1 with the RS-485 terminating resistor (included with the fieldbus isolating transformer). The maximum length (total length of PROFIBUS-DP cabling) is 200m.

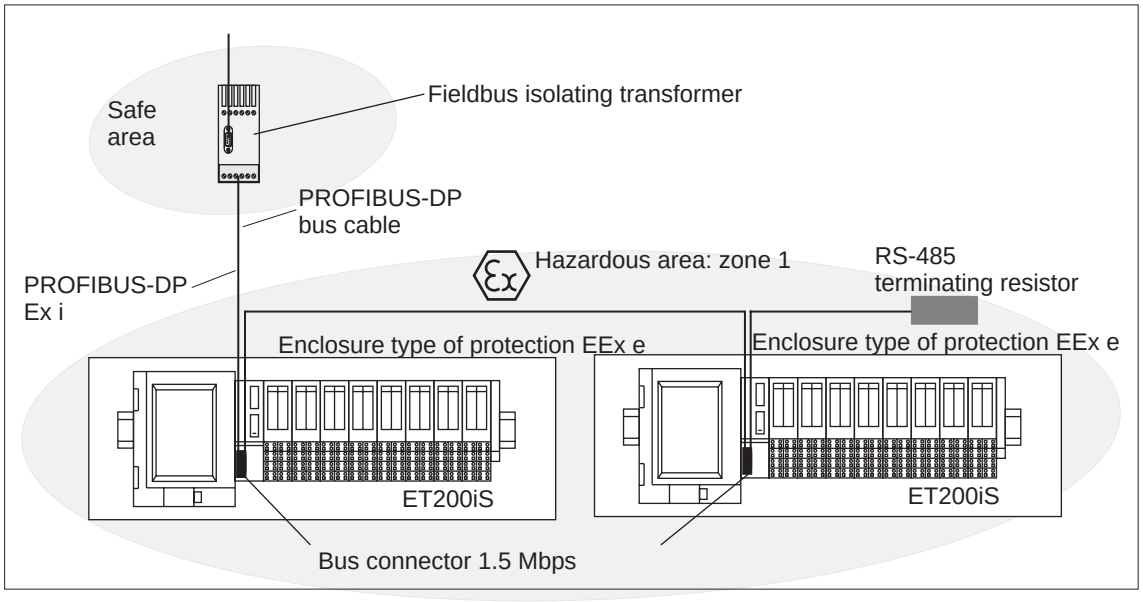


Figure 4-2 Configuration Options for the ET 200iS in Zone 1

Rules for Configuring the ET 200iS in Zone 2:

If you use the ET 200iS in zone 2, you must adhere to the following rules:

1. The ET 200iS must be installed in an enclosure with at least degree of protection IP 54. The enclosure must have a manufacturer's certification for zone 2 (complying with EN 50021: Protection from mechanical damage; degree of protection IP 54; avoidance of ignition due to electrostatic charge).
2. See points 2 to 5: *Rules for Configuring the ET 200iS in Zone 1*

Rules for Configuring the ET 200iS in the Safe Area:

If you use the ET 200iS in the safe area, you must adhere to the following rules:

1. The ET 200iS must be installed in a metallic enclosure with at least degree of protection IP 20.
2. See points 2, 4 and 5: *Rules for Configuring the ET 200iS in Zone 1*

Rules for Configuring Encoders, Actuators, HART Field Devices in Zone 1 and Zone 0

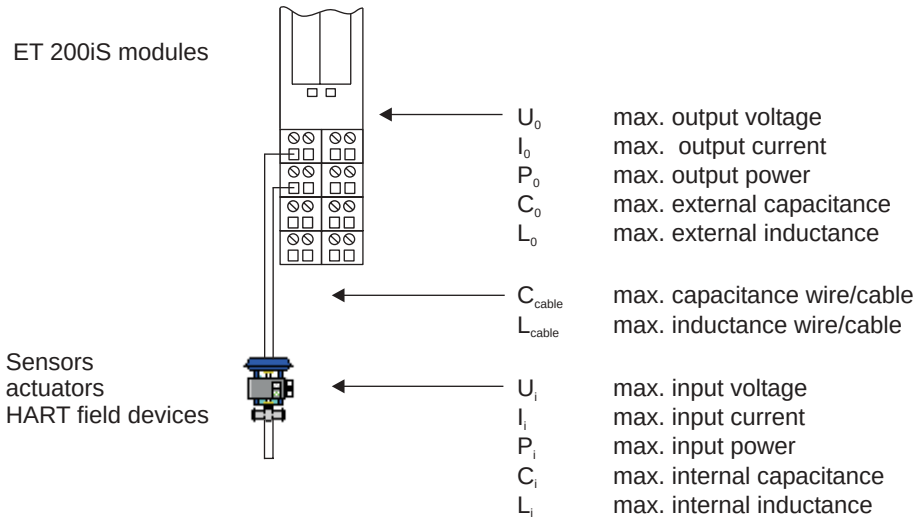
The verification of intrinsic safety for each field circuit must be made according to the regulations stipulated by the relevant standards for configuration, selection and installation.

A simple, intrinsically safe circuit results from attaching an encoder, actuator or HART field device to an input or output of an electronics module.

The following table describes the conditions for checking the maximum safe values for a simple, intrinsically safe circuit:

Table 4-3 Rules for Configuration

Relevant Standard / Conditions for Electrical Parameters	Usable Encoders and Actuators
Standard: EN 60 079-14 The electrical parameters must be as follows: • $U_o \leq U_i$ • $I_o \leq I_i$ • $P_o \leq P_i$ • $C_o \geq C_i + C_{cable}$ • $L_o \geq L_i + L_{cable}$	The maximum safe values of the encoders and actuators must be adapted to the maximum values of the electronics modules. You will find these maximum values • in the Ex certification of the encoders and actuators • in the technical specifications of the electronics modules of the ET 200iS



Safety-Related Notices

Note

During configuration, make sure that you keep to the stipulations in EN 60 079-14. See table above.

Warning

Connecting an intrinsically safe sensor, actuator, or HART field device to the input/output of an electronics module must produce an intrinsically safe circuit! For this reason:

When you select the encoder, actuator, or HART field device to be connected to the electronics module, the resulting safety-related values must be checked!

The inductance and capacitance of the cable must also be taken into account!

4.5 Power Supply of the ET 200iS

Power supply PS

Connect the power supply of the ET 200iS to the TM-PS terminal module of the power supply module PS. The power supply module PS provides the required output voltages for the ET 200iS. The output voltages are electrically isolated from the supply voltage and intrinsically safe.

- Electronics of the IM 151-2/ backplane bus
- PROFIBUS-DP Ex i interface
- Powerbus

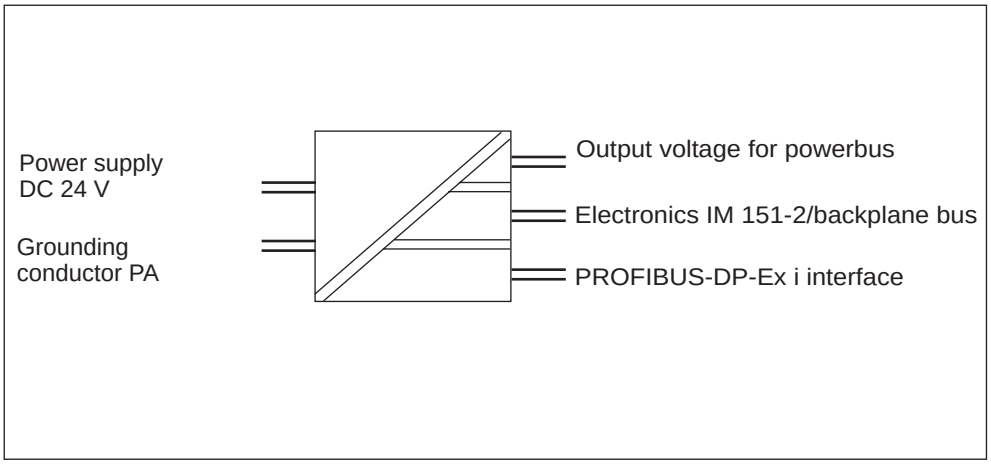


Figure 4-3 Power Supply Module PS

Powerbus

The electronics modules are supplied with the necessary supply and rated load voltages over the powerbus.

4.6 Direct Data Exchange

Requirements

The ET 200iS can be used as publisher for direct data exchange (cross communication). This requires no configuration.

Naturally, the DP master used must also support direct data exchange. You will find information on this in the description of the DP master.

Principle

The main feature of direct data exchange is that PROFIBUS-DP nodes "listen in" and know which data a DP slave returns to its DP master. With this mechanism, the "listener" (recipient) can access changes to the input data of remote DP slaves directly.

During configuration in STEP 7, you use the peripheral input addresses to specify the address area of the recipient in which the required data of the publisher will be read.

Example

The schematic below illustrates the direct data exchange "relationships" that you can configure with an ET 200iS as publisher and which nodes can "listen in" as potential recipients.

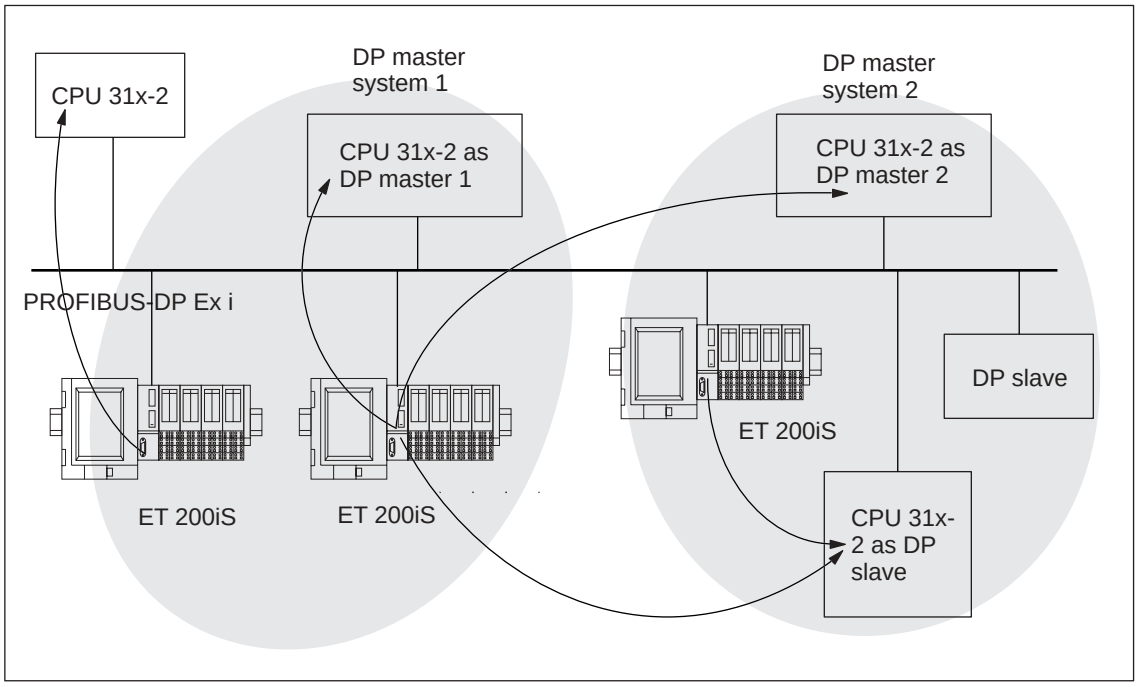


Figure 4-4 Example of Direct Data Exchange

4.7 Using the ET 200iS in a Redundant Standard DP Master System

Features

The ET 200iS can be included in a redundant DP standard master system as a DPV0 slave using the Y-Link.

Requirements

- STEP 7
- GSD file
- SIMATIC PDM

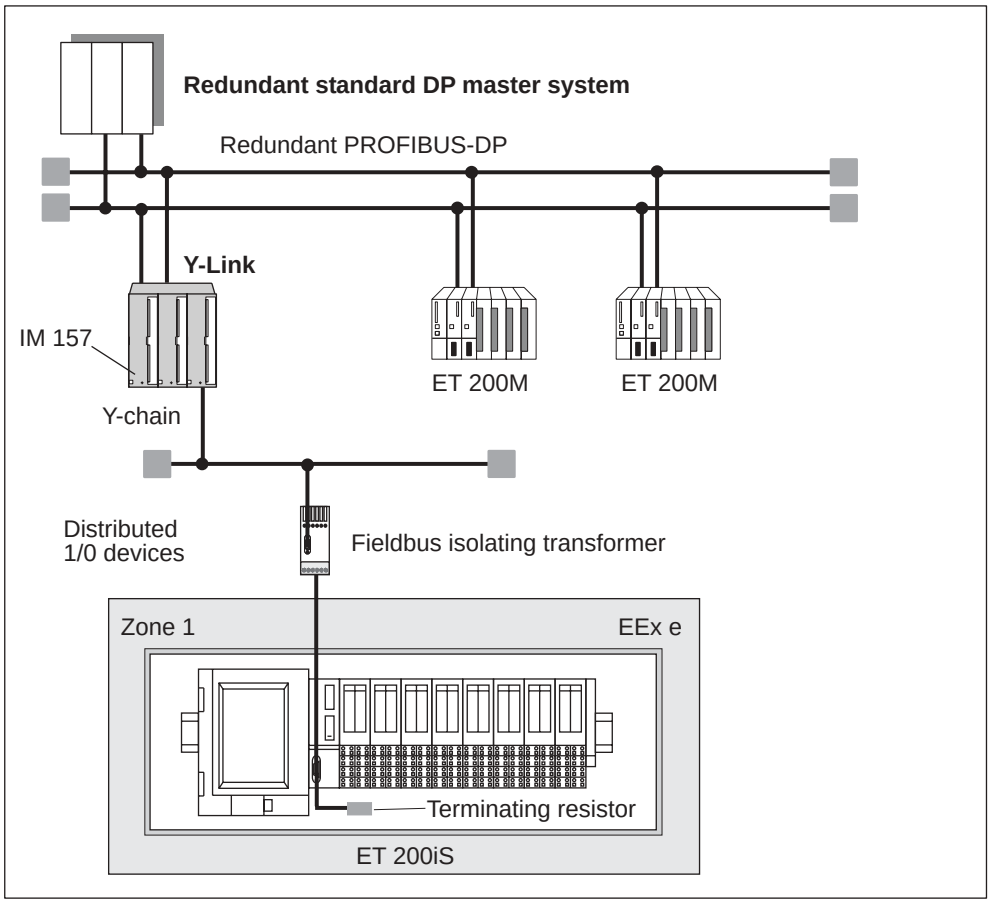


Figure 4-5 ET 200iS and the Y-Link

Procedure

1. Configure the redundant DP standard master system (redundant DP master, PROFIBUS-DP, slaves)
2. Configure the ET 200iS with the GSD file (DPV0 slave)
3. Make the parameter settings for the ET 200iS with SIMATIC PDM.

Restrictions

- The ET 200iS can only be configured as a DPV0 slave;
  in other words,
  - no time stamp
  - no interrupts
  - no support by the PCS 7 drivers supplied with PCS 7. If you want to include the ET 200iS into PCS 7, you must create your own drivers.
- Configuration is in two stages (with the GSD file and SIMATIC PDM):
  It is not possible to exchange the data of the configuration between STEP 7 and SIMATIC PDM.
- The transfer of the diagnostic messages of the ET 200iS to the DP master is restricted (only the module status per module, no channel-related diagnostics).

Reference

You will find further information in the documentation on the Y-Link (manual or product information bulletin).

4.8 Restricted Number of Connectable Electronics Modules/Maximum Configuration

Number of ET 200iS Stations

You can operate a maximum of 16 ET 200iS stations on one chain of PROFIBUS-DP Ex i (over a fieldbus isolating transformer).

Number of Electronics Modules

Each ET 200iS station consists of a **maximum of 32 electronics modules**. These include digital and analog electronics modules.

The actual number of electronics modules is limited by the current of the power supply module PS.

The limit value for the **maximum permitted current is < 4300 mA**. This value must **not** be exceeded.

- **ET 200iS with up to 15 electronics modules:**
  The current consumption is < 4300 mA. The configuration is OK.
- **ET 200iS with 16 to 32 electronics modules:**
  You must check the maximum current consumption of the electronics modules using the following calculation table:
  - Multiply the current consumption per module by the number of modules and enter the values in the columns *x Number of Modules* and = *Current Consumption in mA* .
  - Add all modules and enter the value in the *Total Modules* box (maximum of 32 electronics modules)
  - Add the current consumption and enter the value in the *Total Current Consumption* box (< 4300 mA)

Table 4-4 Calculation Table for Current Consumption

Electronics Modules	Current Consumption per Module in mA	x Number of Modules	= Current Consumption in mA
		Enter the values in these columns!	
2DO DC25V/25mA	280 mA	x	=
2AI I 2WIRE		x	=
2AI I 2WIRE HART		x	=
2 AO I		x	=
2AO I HART		x	=
4DI NAMUR	140 mA	x	=
2AI I 4WIRE	70 mA	x	=
2AI I 4WIRE HART		x	=
2AI RTD		x	=
2AO TC		x	=
		Total Modules =	Total Current Consumption =
		max. 32 modules	< 4300 mA

- **Example**
  An ET 200iS consists of 10 x 4DI NAMUR modules, 7 x 2DO DC25V/25mA modules and 10 x 2AI I 4WIRE modules.
  This configuration therefore consists of 30 electronics modules; in other words, you must calculate the current consumption (16 to 32 electronics modules):

Table 4-5 Example of a Calculation Table for Current Consumption

Electronics Modules	Current Consumption per Module in mA	x Number of Modules	= Current Consumption in mA
		Enter the values in these columns!	
2DO DC25V/25mA	280 mA	x **7**	= **1960 mA**
2AI I 2WIRE		x	=
2AI I 2WIRE HART		x	=
2 AO I		x	=
2AO I HART		x	=
4DI NAMUR	140 mA	x **10**	= **1400 mA**
2AI I 4WIRE	70 mA	x **10**	= **700 mA**
2AI I 4WIRE HART		x	=
2AI RTD		x	=
2AO TC		x	=
		Total Modules = **27 modules**	Total Current Consumption = **4060 mA** The configuration is OK
		max. 32 modules	< 4300 mA

Current Consumption of the ET 200iS with its Maximum Configuration

See Technical Specifications of the Power Supply Module PS.

Width of the ET 200iS:

The maximum width of the ET 200iS is 1.17 m (power supply module + interface module + 32 electronics modules).

Address Space:

The maximum address space depends on the DP master you are using. The interface module supports a maximum of 128 input and 128 output bytes.

Installation

5

5.1 Rules for Installation

Safety-Related Notices

Danger

During installation, make sure that you keep to the stipulations in EN 60079-14. The conditions for the electrical parameters in the standard apply to simple electrical circuits. See section *Configuration Options*.

Danger

In some circumstances, sparks or unacceptable surface temperatures capable of ignition can occur during installation.

Never install when an explosive atmosphere is present!

The following activities/jobs are forbidden when the ET 200iS is operating and the DC 24 V power supply is applied to the terminal module TM-PS:

Disconnecting the DC 24V power supply and the terminal module TM-PS.

Uninstalling the bus termination module and any other modifications that affect the configuration of the terminal modules.

Releasing the screw terminal element on the terminal module TM-PS and on the bus termination module. The screw terminal element on the terminal module TM-PS and on the bus termination module lock the ET 200iS in position mechanically.

Installation Dimensions

Table 5-1 Installation Dimensions

Dimensions		
Width	Terminal module with power supply module	165 mm
	Terminal module with interface module	30 mm
	Terminal modules with electronics modules	30 mm
	Bus Termination Module	12.5 mm
Height	Terminal module with power supply module	200 mm
	Terminal module with interface module	132 mm
	Terminal modules with electronics modules	132 mm
	Bus Termination Module	106.2 mm
Depth	ET 200iS on DIN rail with depth of 15 mm	176.2 mm

Enclosure for the ET 200iS in Zone 1

The ET 200iS must be installed in an enclosure with type of protection EEx e (increased safety). For information on ordering such enclosures, contact your Siemens representative

Use the following cable glands:

- Power supply: type of protection EEx e
- PROFIBUS-DP Ex i, inputs and outputs Ex i: type of protection EEx i

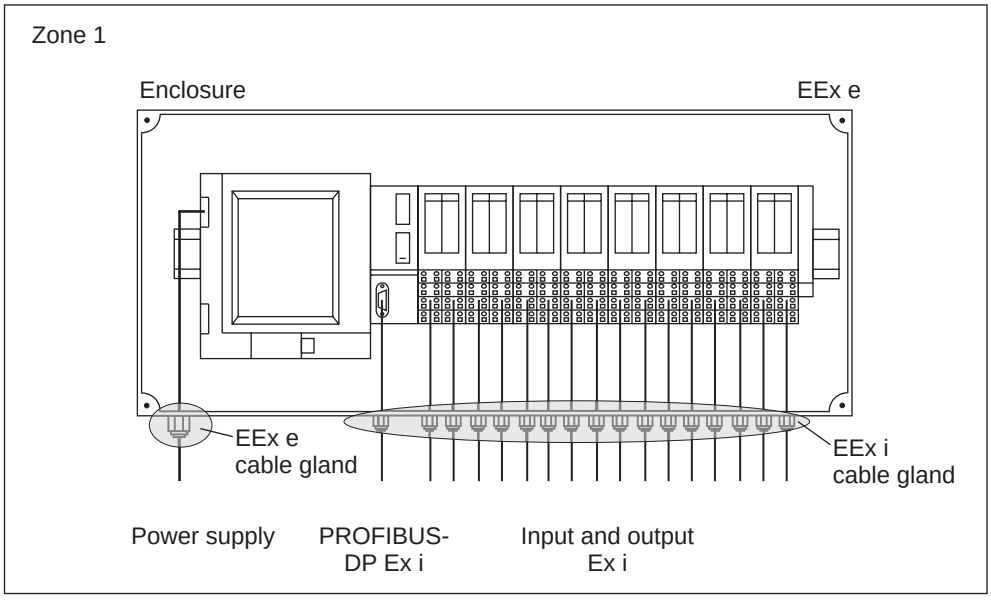


Figure 5-1 Enclosure for the ET 200iS in Zone 1

Enclosure for the ET 200iS in Zone 2

The ET 200iS must be installed in an enclosure with at least degree of protection IP 54. The enclosure must have a manufacturer's certification for zone 2 (complying with EN 50021).

Use the following cable glands:

- Power supply and PROFIBUS-DP Ex i: Cable gland with manufacturer's certification for Zone 2
- Inputs and outputs Ex i: type of protection EEx i

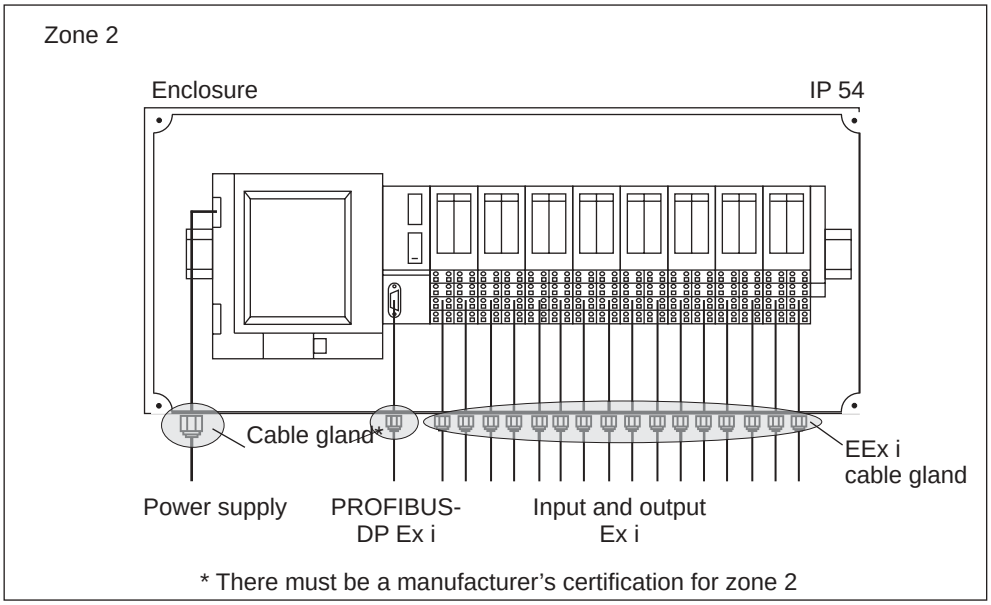


Figure 5-2 Enclosure for the ET 200iS in Zone 2

Enclosure for ET 200iS in the Safe Area

The ET 200iS must be installed in a metallic enclosure with at least degree of protection IP 20.

Installation Position

The ideal installation position is horizontal on a vertical surface. All other positions are possible although there are then restrictions regarding the ambient temperature.

DIN Rail

The ET 200iS distributed I/O station is installed on a tin-plated or galvanized DIN rail complying with EN 50022 (35 x 15 mm).

Note

If the ET 200iS distributed I/O station will be subjected to higher levels of vibration and shock, we recommend that you screw the DIN rail to the mounting surface approximately every 200 mm.

Minimum Clearances to the Enclosure for Installation, Wiring, and Ventilation

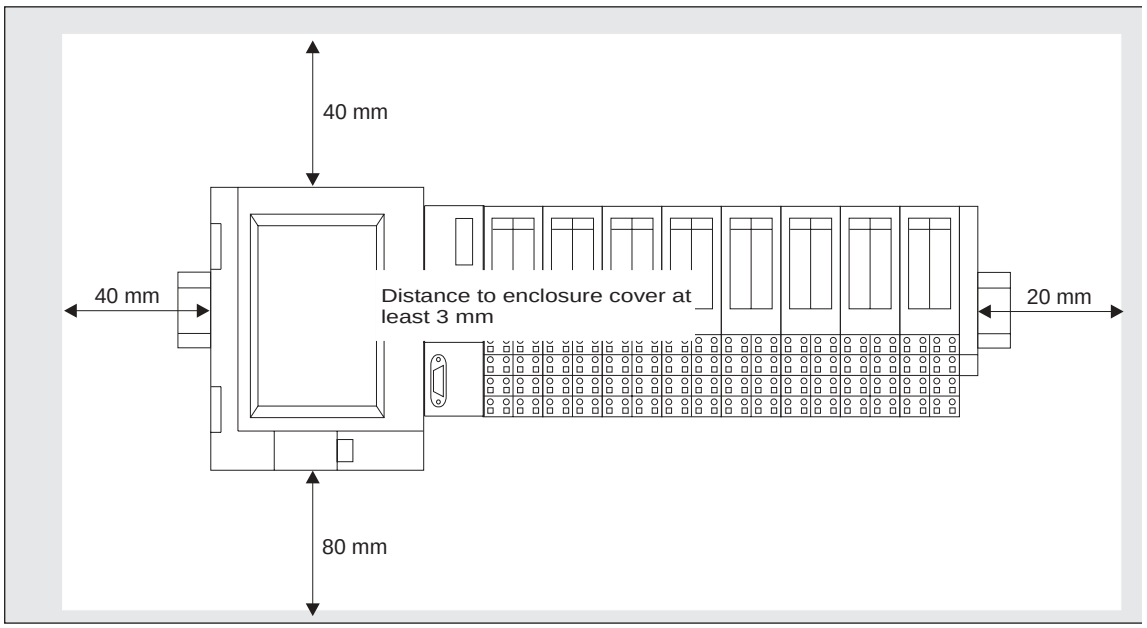


Figure 5-3 Minimum Clearances to the Enclosure

Rules for Installation

During installation, make sure that you keep to the following rules:

- The mechanical installation of the ET 200iS begins with the terminal module TM-PS.
- The terminal module TM-PS is followed by the terminal module TM-IM.
- These are followed by the terminal modules TM-E.
- The ET 200iS is completed by the bus termination module. The bus termination module is supplied with the terminal module TM-IM.
- The maximum configuration of the distributed I/O station ET 200iS is 1 power supply module, 1 interface module and 32 electronics modules. Make sure that you do not exceed the maximum current consumption (see section *Configuration Options*).

5.2 Installing the Terminal Module for the Power Supply Module

Features

- The terminal module TM-PS is used to accommodate the power supply module PS.
- The terminal module TM-PS can be prewired (without the power supply module PS).
- All other terminal modules are installed to the right of the terminal module TM-PS.

Requirements

The DIN rail is already installed.

Required Tools

Screwdriver with 7 mm blade

Installing the Terminal Module TM-PS

1. Fit the terminal module onto the rail.
2. Push in the terminal module at the bottom until you can hear the catch lock.
3. Tighten the securing screw of the screw terminal element with a 7 mm screw driver (tightening torque 1.5 - 2 Nm).

   To avoid the ET 200iS slipping to the side, you must secure the terminal module mechanically with the screw terminal element. The securing screw of the screw terminal element is located at the front left on the terminal module.

   You can recognize whether or not it is mechanically secured by the color displayed in the opening directly below the securing screw:

   - Orange signal color: Terminal module TM-PS is not secured to the DIN rail.
   - No signal color: Terminal module TM-PS is secured to the DIN rail.

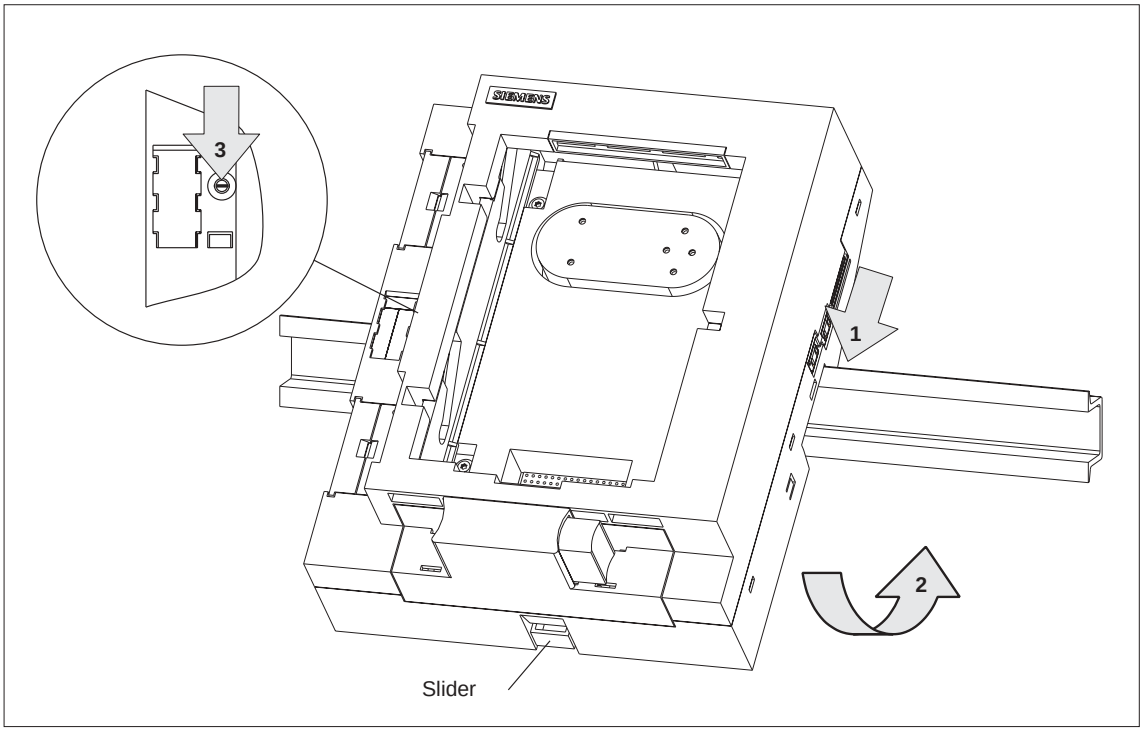


Figure 5-4 Installing the Terminal Module TM-PS

Uninstalling Terminal Module TM-PS

The terminal module is wired up and there are further terminal modules to the right of it.

1. Turn off the power supply on the terminal module TM-PS.
2. Open the hinged cover on the screw terminal and release the wiring on the terminal module TM-PS with the screwdriver.
3. Release the mechanical securing mechanism of the terminal module: Orange signal color in the opening below the securing screw.
4. Using the screwdriver press down the slider on the terminal module TM-PS as far as it will go and shift the terminal module to the left.

   Note: The slider is located below the terminal module. See figure above.
5. Holding down the slider, pull the bottom of the terminal module away from the DIN rail.

5.3 Installing Terminal Modules for the Interface Module and Electronics Modules

Features

- The terminal modules are used to accommodate the interface module and the electronics modules
  - TM-IM: The terminal module for the interface module is located directly to the right beside the terminal module TM-PS
  - TM-E: The terminal modules for the electronics modules are located to the right of the terminal module TM-IM
- The terminal modules can be prewired (without electronics modules).

Requirements

The DIN rail is already installed.

Required Tools

Screwdrivers with 7 and 3 mm blades

Installing the Terminal Module TM-IM and TM-E

1. Fit the terminal module onto the rail.
2. Push in the terminal module at the bottom until you can hear the catch lock.
3. Push the terminal module to the left until you hear it lock into the previous terminal module.

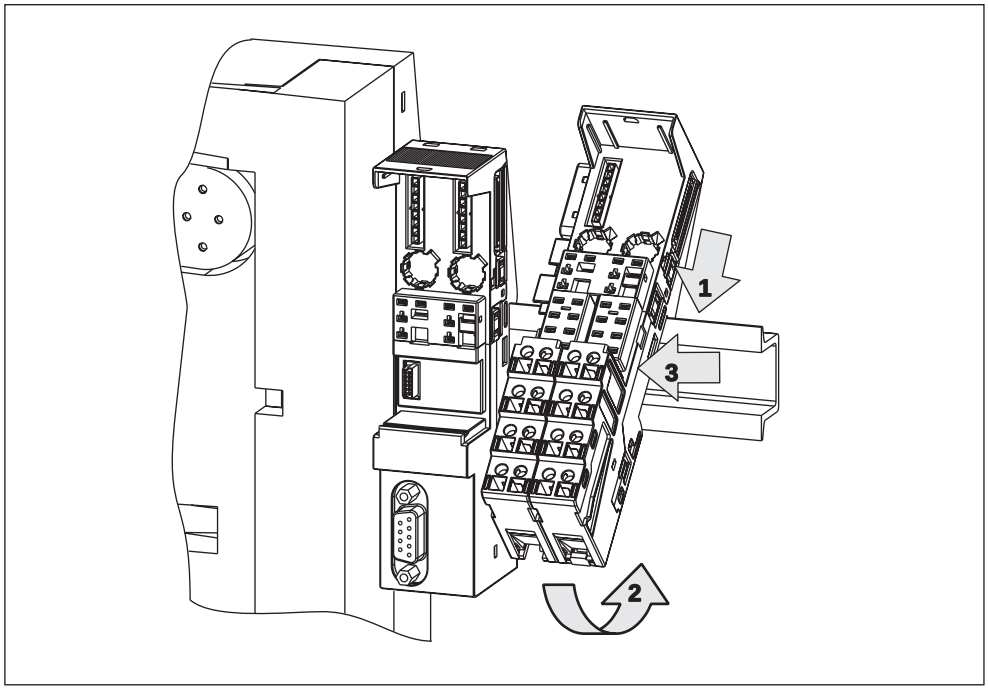


Figure 5-5 Installing the Terminal Module TM-IM and TM-E

Uninstalling the Terminal Module TM-IM or TM-E

The terminal module is wired up and there are further terminal modules to the right of it.

It is only possible to uninstall a single terminal module within the ET 200iS when there is a clearance of approximately 8 mm to the adjacent terminal modules (created by moving the adjacent modules to the side).

It is possible to uninstall a single terminal module within the configuration both from the right (starting with the bus termination module) or from the left (starting with the TM-PS).

The description below explains how to uninstall from the right:

1. Turn off the power supply on the power supply module.
2. Release the wiring on the terminal module with a screwdriver (3 mm).
3. Release the mechanical locking mechanism on the bus termination module (orange signal color) with a screwdriver (7 mm) and move the bus termination module approximately 8 mm to the right.
4. Using the screwdriver press down the slider on the adjacent (left) terminal module is far as it will go.
5. And the same time, move the terminal module (you want to remove) to the right.

6. Holding down the slider, pull the bottom of the terminal module away from the DIN rail.

Note

To remove the terminal box, you do not need to remove the terminal module! See *Replacing the Terminal Box on a Terminal Module*.

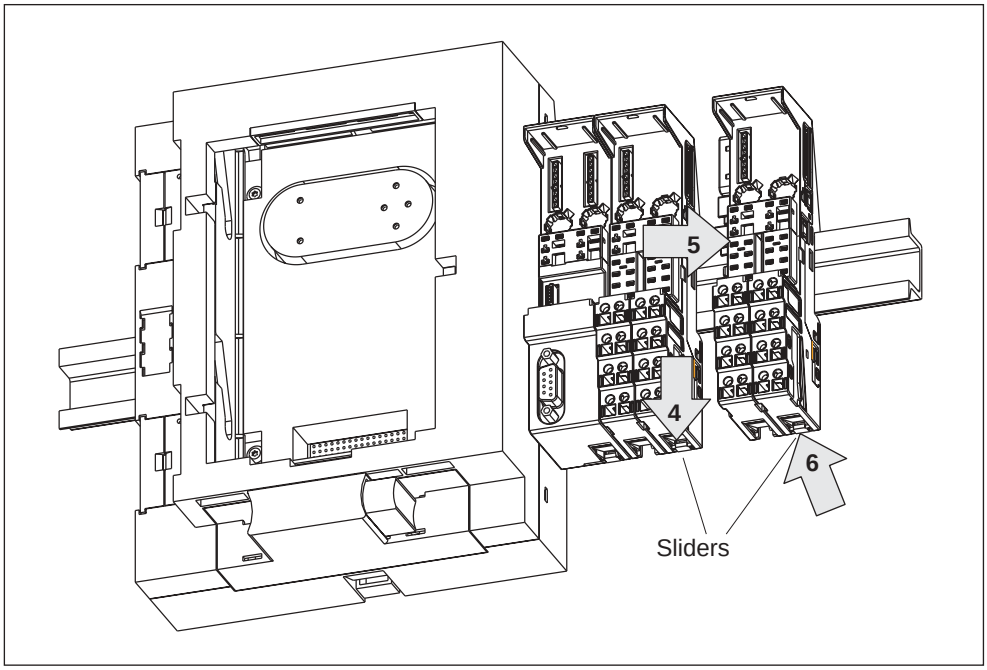


Figure 5-6 Uninstalling the Terminal Module TM-IM or TM-E from the Right

5.4 Installing the Bus Termination Module

Features

- The ET 200iS distributed I/O station is terminated with the bus termination module at the right hand end of the ET 200iS. If you do not insert a bus termination module, the ET 200iS cannot be operated.
- To secure the ET 200iS mechanically, the bus termination module has a screw terminal element.

Requirements

The last terminal module of the ET 200iS has been installed.

Required Tools

Screwdriver with 7 mm blade

Installing the Bus Termination Module

1. Fit the bus termination module onto the rail to the right of the last terminal module.
2. Push in the bus termination module onto the DIN rail.
3. Push the bus termination module to the left until you hear it lock into the last terminal module.
4. Tighten the securing screw of the screw terminal element with a 7 mm screw driver (tightening torque 1.5 - 2 Nm).

   To avoid the ET 200iS slipping to the side, you must secure the bus termination module mechanically with the screw terminal element. The securing screw of the screw terminal element is located at the front on the bus termination module.

   You can recognize whether or not it is mechanically secured by the color displayed in the opening directly below the securing screw.

   - Orange signal color: Bus termination module not screwed to DIN rail.
   - Nor signal color: Bus termination module is screwed to the DIN rail.

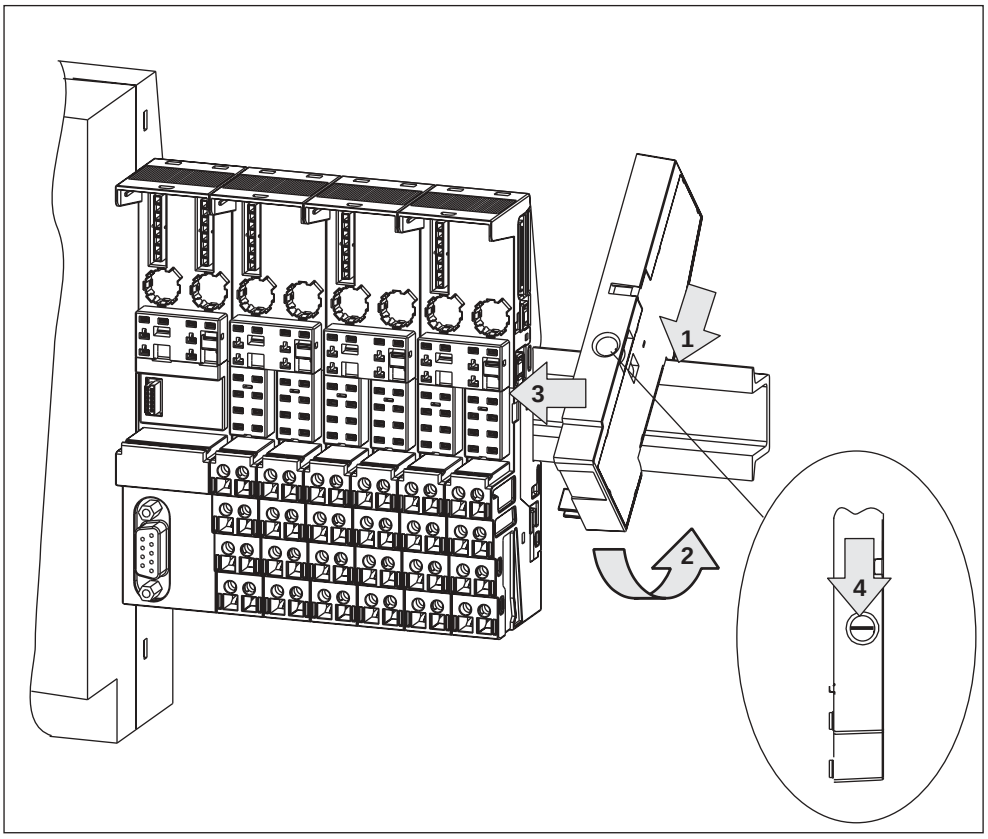


Figure 5-7 Installing the Bus Termination Module

Uninstalling the Bus Termination Module

1. Turn off the power supply on the power supply module.
2. Release the mechanical securing mechanism of the terminal module: Orange signal color in the opening above the securing screw.
3. Using the screwdriver press down the slider on the last terminal module as far as it will go and shift the bus termination module to the right.
4. Pull the bottom of the bus termination module away from the DIN rail.

5.5 Installing the Shield Contact

Features

- You require the shield contact so that you can contact the cable shields (for example on the analog electronics modules).
- You secure the shield contact to the terminal module.
- The shield contact consists of a shield contact element, conductor bar (3 x 10 mm), ground connection terminal (ZB 16 of obtainable from Weidmüller, see order numbers) and shield terminal.

Requirements

- The terminal modules are installed.

Required Tools

- Screwdriver with 3 mm blade
- Tool for stripping the conductor bar (3 x 10 mm)

Installing the Shield Contact

1. Push the shield contact element onto the first terminal module TM-E (requiring a shield contact) from below.
2. Push the shield contact element onto the last terminal module TM-E (requiring a shield contact) from below.

   To retain the stability of the conductor bar between two shield contact elements under stress, you must insert a further screen contract element after every third terminal module.
3. Saw off a suitable piece of conductor bar. The conductor bar must be cut so that it extends at least 15 mm to the right and left of the shield contract element. This extra length is required to fit the ground connection terminals.
4. Press the conductor bar into the shield contact element.
5. Secure a ground connection terminal to both ends of the conductor bar. To avoid the conductor bar from slipping to the side, the ground connection terminals must be located directly at the shield contact elements. **Use ground connection terminals ZB 16 from Weidmüller, see order numbers.**

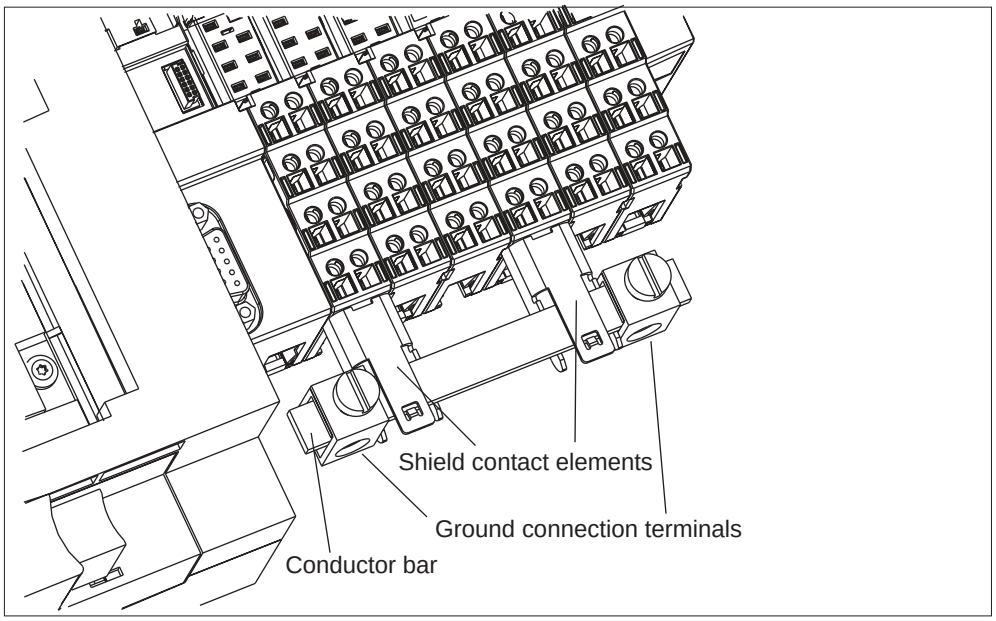


Figure 5-8 Installing the Shield Contact

5.6 Fitting Slot Number Labels and Color Identification Labels

Features

- The slot number labels identify the individual I/O modules with a slot (1 to 32).
- The color identification labels allow you to color code the terminals individually according to company or national regulations. The color identification labels are available in the colors white, red, yellow, blue, brown, yellow-green and turquoise. Every terminal on the terminal module can be labeled with a color.

Requirements

- The terminal modules are installed.
- You can only fit the slot number labels when no electronics modules are installed.
- You can only fit the color identification labels when the terminal modules are still unwired.
- The slot number labels and the color identification labels are fitted to the terminal modules.
  - Position of the slot number labels: Below the right coding element on the terminal module.
  - Position of the color identification labels: Directly beside each terminal on the terminal box.

Required Tools

Screwdriver with 3 mm blade (only for removal)

Fitting Slot Number Labels and Color Identification Labels

Table 5-2 Fitting Slot Number Labels and Color Identification Labels

Step	Slot Number Labels	Color Identification Labels
1	Break the slot number label (1 to 32) out of the strip.	You can insert the colour identification labels directly from the strip into the opening beside the terminal and twist off the label.
2	Using a finger, press the slot number label into the terminal module.	Using a finger, press the color identification label into the terminal module.

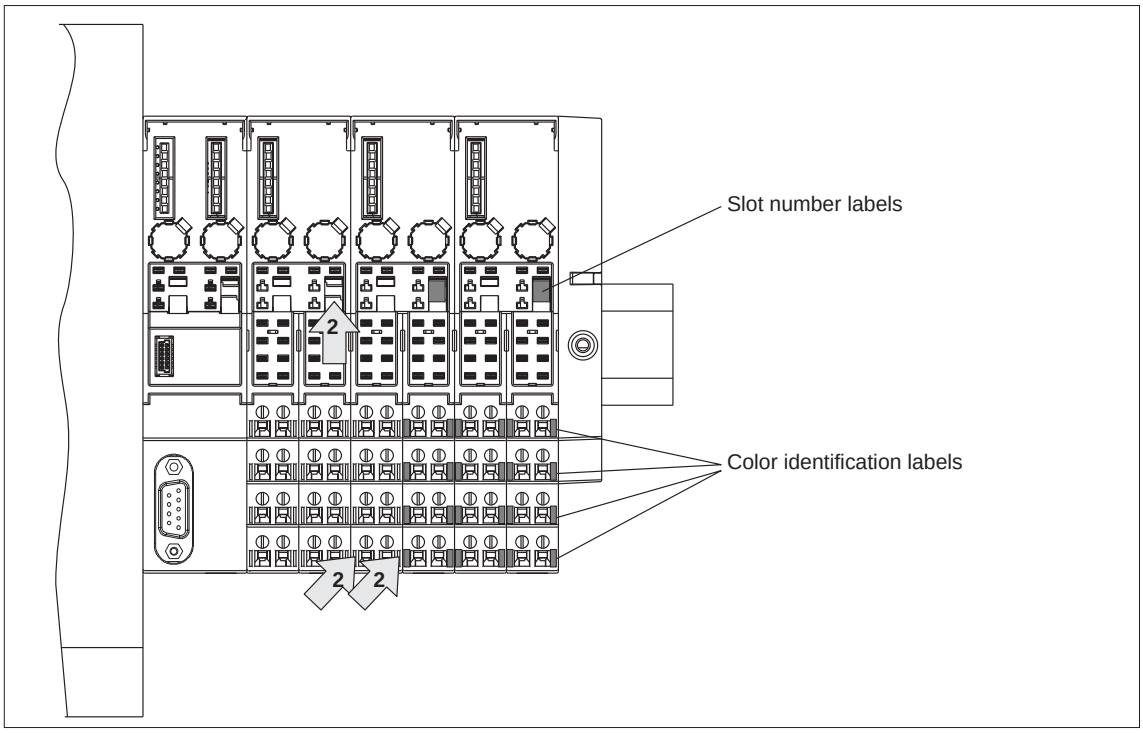


Figure 5-9 Fitting Slot Number Labels and Color Identification Labels

Removing Slot Number Labels and Color Identification Labels

Table 5-3 Removing Slot Number Labels and Color Identification Labels

Step	Slot Number Labels	Color Identification Labels
1	Remove the electronics module from the terminal module.	Lever the color identification label out of the holder with the screwdriver.
2	Lever the slot number label out of the holder with the screwdriver.	---

5.7 Replacing the Bus Interface Module and Terminal Box on the Terminal Module

Features

The terminal box/bus interface module is part of the terminal modules TM-IM/ TM-E. When necessary, you can replace the terminal box/bus interface module. You do not need to remove the terminal module.

Required Tools

Screwdriver with 3 mm blade

Replacing the Bus Interface Module on the Terminal Module TM-IM

The terminal module is installed, connected to PROFIBUS-DP Ex i and the interface module is inserted.

1. Release the bus connector on the terminal module and remove it.
2. Press the upper and lower release buttons on the interface module at the same time and pull it out of the terminal module.
3. To the left of the slot number label, there is a small opening: Press the screwdriver into the upper opening from the front.
4. At the same time, pull the bus interface module down as far as it will go.
5. Then pull the bus interface module up and out of the terminal module.
6. Replace the bus interface module and insert it into the terminal module from the front. Then push the bus interface module up until the catch locks.
7. Plug the bus connector into the terminal module.
8. Insert the interface module into the terminal module.

Replacing the Terminal Box on the Terminal Module TM-E

The terminal module is installed, wired, and the electronics module is inserted.

1. Release the wiring on the terminal module.
2. Press the upper and lower release buttons on the electronics module at the same time and pull it out of the terminal module.

3. Each terminal module has two terminal boxes. Each terminal box can be replaced separately:
   - **Right-hand terminal box:**

     Press the screwdriver into the small opening below the slot number label from the front.
   - **Left-hand terminal box:**

     Press the screwdriver into the small opening to the left of the slot number label from the front.
4. At the same time, pull the terminal box down as far as it will go.
5. Then pull the terminal box up and out of the terminal module.
6. Replace the terminal box and insert it into the terminal module from the front. Then push the terminal box up until the catch locks.
7. Wire up the terminal module.
8. Insert the electronics module in the terminal module.

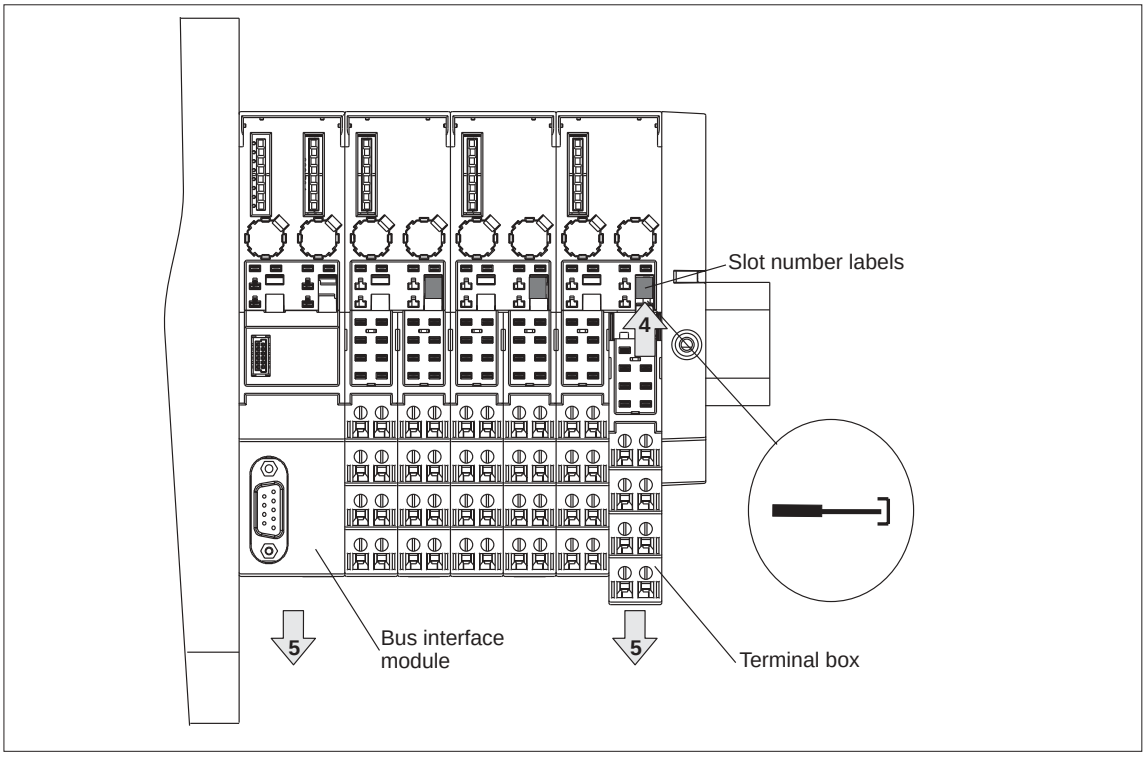


Figure 5-10 Replacing the Bus Interface Module and Terminal Box

Wiring

6

6.1 General Rules and Regulations for Wiring

Introduction

As a component in plants or systems, the distributed I/O station ET 200iS is subject to special rules and regulations depending on its application.

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

Specific Applications

Make sure that you and adhere to the valid safety and accident prevention regulations, for example machine protection regulations for your specific application.

When laying cables and wiring, make sure that you adhere to the installation regulations complying with EN 60 079-14 and any regulations specific to your country.

EMERGENCY STOP Mechanisms in the Safe Area

EMERGENCY STOP mechanisms in compliance with IEC 204 (corresponds to DIN VDE 113) must remain effective in all statuses of the plant or system.

Plant Startup after Certain Events

The following table describes points to remember when your plant starts up following certain events:

Table 6-1 Plant Startup after Certain Events

If...	then...
Startup after voltage dip or power outage, Startup of the ET 200iS after a breakdown of bus communication,	no dangerous states must result. If necessary, force an EMERGENCY STOP!
Startup after releasing the EMERGENCY STOP mechanism,	there must be no uncontrolled or undefined startup.

System Power Supply in the Safe Area

The following table describes points to remember relating to the system power supply:

Table 6-2 System Power Supply in the Safe Area

For...	Then...
a fixed installation or systems without all-pole disconnector	a disconnector or a fuse must exist in the building installation.
load power supplies, power supply modules	the set nominal voltage range must match the local power supply.
all circuits of the ET 200iS distributed I/O station	the fluctuation/deviation of the power supply from the nominal value must be within the permitted tolerance (see section *General Technical Specifications*)

24 V DC Supply in the Safe Area

The following table describes points to remember relating to the 24 V DC supply:

Table 6-3 24 V DC Supply in the Safe Area

For...	Make sure of...	
buildings	external lightning protection	Take measures to protect from lightning (for example, lightning protection elements)
24V DC supply cables, signal cables	internal lightning protection	
DC 24 V supply	reliable isolation of the extra-low voltage	

Protection from External Electrical Influences

The following table describes points to remember relating to the protection from electrical influences or faults:

Table 6-4 Protection from External Electrical Influences

For...	make sure that...
all plants or systems in which the ET 200iS is installed	the plant or system is connected to a grounding conductor to divert electromagnetic interference.
power supply, signal, and bus cables	the cables are installed and routed correctly.
signal and bus cables	a cable or wire break cannot lead to undefined statuses in the plant or system.

6.2 Operate the ET 200iS with a Grounded-Neutral Supply

Definition: Grounded-Neutral Supply

With a grounded-neutral supply, the neutral lead of the power supply is grounded. A single ground fault between a live conductor and ground or a grounded part of the system causes the protection devices to react.

Components and Protective Measures

When setting up a system, various components and protective devices are mandatory. The type of component and the necessity of the protective measures depends on the DIN VDE regulations that apply to your system configuration. The table below relates to the schematic that follows.

Table 6-5 Components and Protective Measures

Compare...	Relates to figure	DIN VDE 0100	DIN VDE 0113
Shutdown device for controllers, transducers and actuators	(1)	...Part 460: main switch	...Part 1: disconnector
Short-circuit and overload protection	(2)	...Part 725: Single pole fusing of circuits	...Part 1: single pole fusing of grounded secondary circuit

Reliable Electrical Isolation

Reliable electrical isolation is required with modules that are powered with voltages ≤ DC 60 V or ≤ AC 25 V, in other words, the power supply of the ET 200iS must be reliably electrically isolated.

Setting up the ET 200iS with a Grounded Reference Potential

When the ET 200iS distributed I/O station is configured with a grounded reference potential, any interference currents are diverted to the grounding conductor.

ET 200iS within the Entire System

The following schematic shows the ET 200iS distributed I/O station within the entire system in zone 1 (power supply and grounding concept) when powered from a TN-S system.

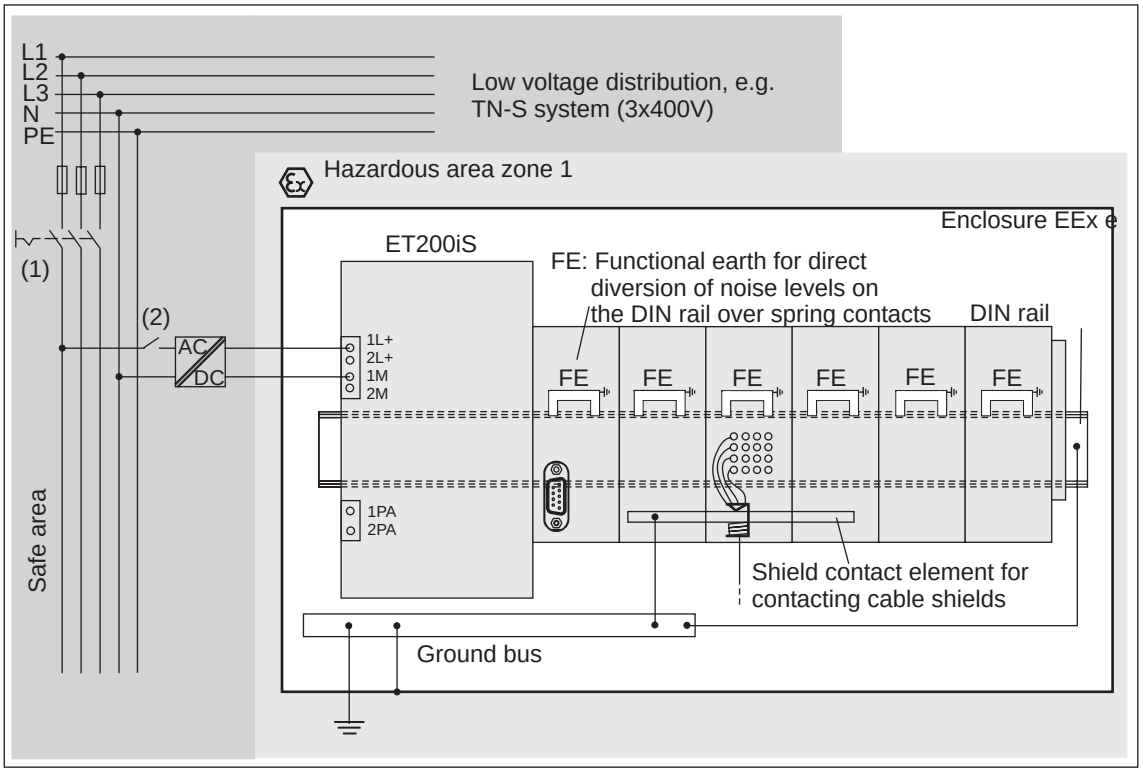


Figure 6-1 Operating the ET 200iS with a Grounded Reference Potential

Equipotential Bonding

The following must be connected to the equipotential bonding system

- the DIN rail of the ET 200iS system with an EEx e terminal
- the terminal module TM-PS via the connecting terminal 1PA or 2PA

Danger

It is not permitted to connect the equipotential bonding system to the ground in conductor of the power supply system.

The equipotential bonding system is the equipotential bonding in hazardous areas complying with EN 50 079-14.

6.3 Electrical Design of the ET 200iS

Electrical isolation between...

- the load circuits/process and all other circuitry of the ET 200iS
- the PROFIBUS-DP interface in the interface module and all other circuits

The following schematic shows the various potentials with the ET 200iS. The figure shows only the most important components:

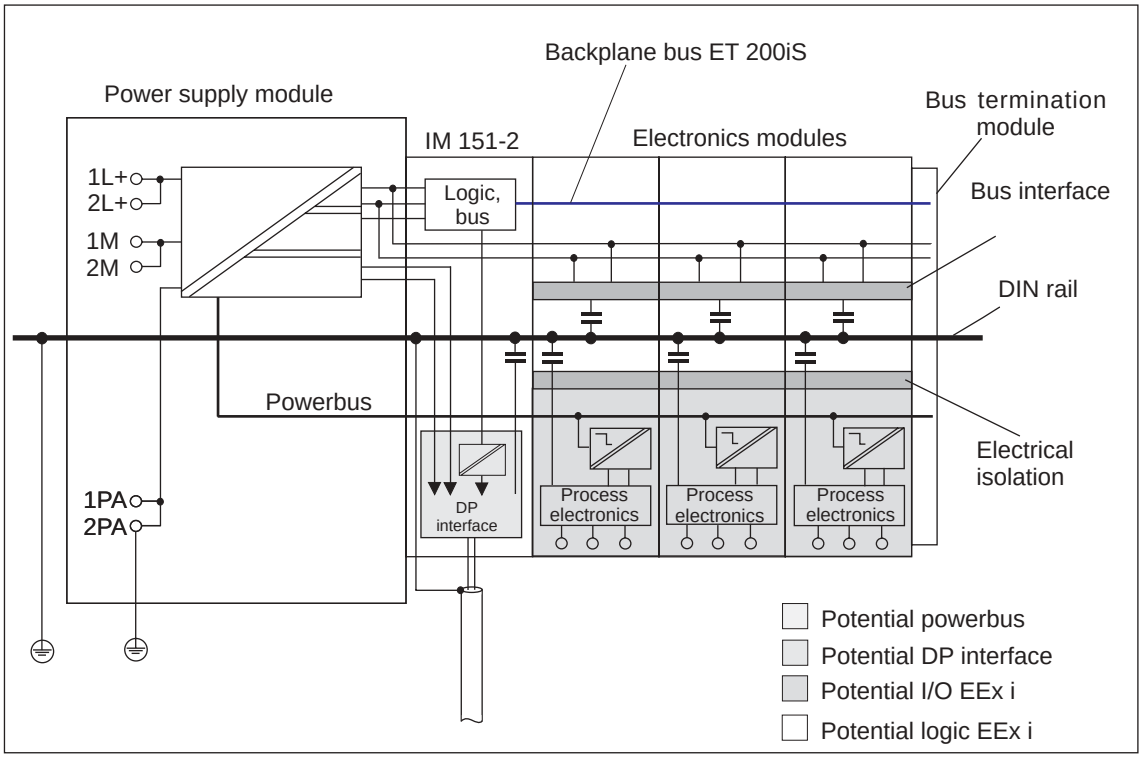


Figure 6-2 Potentials on the ET 200iS

6.4 Lightning and Overvoltage Protection

6.4.1 Overview

Introduction

One of the most common causes of failure is overvoltage caused by:

- Atmospheric discharge or
- Electrostatic discharge

First, will show the basis of the theory of overvoltage protection: The lightning protection zone concept.

We will then outline the rules for the transitions between the individual lightning protection zones.

Note

This section can only provide you with the general guide on protecting the ET 200iS from overvoltage.

Complete protection from overvoltage is only guaranteed when the entire system is designed to protect from overvoltage. This relates particularly to building structures included in the planning of the building.

We therefore recommend that you contact your Siemens representative or a company specialized in lightning protection if you require more detailed information about overvoltage.

Further Sources

The solutions explained in these manuals are based on the lightning protection zone concept described in the standard IEC IEC 61312-1 - "Protection against LEMP".

6.4.2 The Lightning Protection Zone Concept

Principal of the Lightning Protection Zone Concept complying with IEC 61312-1/DIN VDE 0185 T103

The principle of a lightning protection zone requires that facilities to be protected from overvoltages, for example a control room, should be divided into lightning protection zones based on EMC considerations (see figure below).

The individual lightning protection zones are formed as follows:

Table 6-6 Lightning Protection Zones

Lightning Protection Zones	
the external lightning protection of the building peripheral parts of the system in which no galvanic coupling of lightning stroke current can occur (field side)	Lightning protection zone 0_A Lightning protection zone 0_B
the shielding of • buildings • rooms and/or • Devices	 Lightning protection zones 1 Lightning protection zones 2 Lightning protection zones 3

Effects of a Lightning Stroke

Direct lightning strokes occur in lightning protection zone 0_A. The effects of the lightning stroke are high-energy, electromagnetic fields that must be reduced or weakened from one lightning protection zone to the next using suitable lightning protection elements/measures.

As described in the EN 1127-1 standard, lightning strokes ignite explosive atmospheres directly. For this reason, our advice is to prevent the effects of direct lightning strokes (galvanic coupling) reaching hazardous areas by taking suitable building measures.

Lightning protection measures can, for example, prevent direct lightning strikes in hazardous zones or to cables leading into hazardous zones. A closely meshed equipotential bonding system involving all parts of the plant with a minimum of 16 mm Cu, prevents the flow of lightning currents within the plant. If these measures are taken in the building, lightning protection zone 0_B results for installation in the outer area. Indirect lighting effects (inductive, capacitive) can be reduced to a harmless level with suitable shielding measures and surge arresters.

Overvoltages

In lightning protection zone 0_B, lightning currents can no longer occur, however, pulse overvoltages can be expected in the magnitude of 10 kV and more. In lightning protection zone 1 and high, in addition to the effects of a lightning strike, overvoltages can also occur as a result of switching, induced voltage etc.

Lightning Protection Zone Scheme

The following schematic illustrates the lightning protection zone concept for a free-standing building.

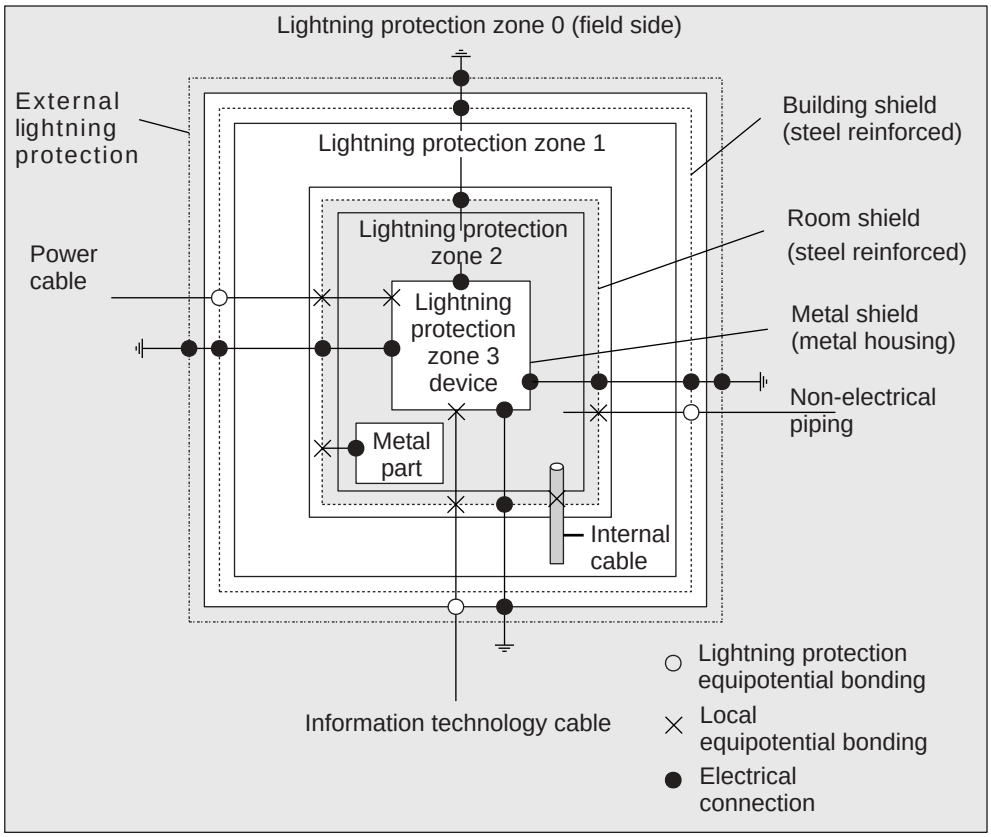


Figure 6-3 Lightning Protection Zones of a Building

Principle of the Interfaces between Lightning Protection Zones

At the interfaces between the lightning protection zones, you must implement measures to prevent the transfer of overvoltages.

The principle of a lightning protection zone also requires that at the interfaces between the lightning protection zones, all cables and piping capable of carrying lightning stroke current (!) must be included in the equipotential bonding system.

The cables and piping capable of carrying lightning stroke current include:

- metal pipes (for example water, gas, and heat),
- active cables
  - power cables (for example, system power supply, 24 V power supply)
  - signal cables (for example a bus cable).

6.4.3 Rules for the Interface between Lightning Protection Zones 0...1

Rule for the interface 0A <-> 1 (lightning protection equipotential bonding)

The following measures are suitable for lightning protection equipotential bonding at the interface lightning protection zone 0 <-> 1:

- Keep lightning stroke currents away from hazardous areas and cables that lead into hazardous areas.
- Define the zone transition 0_A <-> 1 in the non-hazardous area.

Since this zone transition is not relevant for the typical applications of the ET 200iS, this will be discussed in no further detail in this manual.

Rule for the interface 0B <-> 1 (strong electromagnetic coupling)

The following measures are suitable for overvoltage protection at the interface lightning protection zone 0_B <-> 1:

- Use conductive spiral metal bands or metal braids, grounded at both ends as the cable shields, for example, NYCY or A2Y(K)Y
- and run the cables
  - through metal pipes without breaks and grounded at both ends or
  - in conduits of reinforces concrete with interconnected armour or
  - on closed metal cable racks grounded at both ends.
- as an alternative, you can use fiber-optic cable instead of metal cables.

Additional Measures

If you are not able to take the measures outlined above, provide protection at the interface 0_B <-> 1 with a surge voltage protector. The following table lists the components you can use to provide coarse protection for your system.

Lightning protection zone 1 can, for example, be defined as the interior of a building with a shielded outer skin or as the interior of a metal distributor. If the shielding effect of the building outer skin is uncertain, the metal distributor is preferable. We recommend that you install overvoltage protection devices for the signal lines in metal distributors. The protective devices for the 24 V supply must be integrated in an explosion-proof enclosure and should also be installed in the metal distributor.

Danger

To increase the availability of a cable connection with overvoltage protection, both ends of the cable should be connected to protective devices.

Overvoltage Protection Components

Table 6-7 Protection of Cables with Overvoltage Protection Components

Cons. No.	Cables for ...	... connect at the interface 0_B <-> 1 with:	Order Number
1	Power supply module PS for power supply and looping through • DC 24V	1 x Netz-AK/1+1/ÜS/FM/Ex d with EEx d enclosure, explosion-proof, ready to connect	4225* (serial number)
2	Interface module IM 151-2 • PROFIBUS-DP Ex i	1 x Blitzductor CT Type MD HFD Ex 6 2 x shield clamps for bus cable	919507* and 919 583* 919 508*
3	• 4DI NAMUR	4 x Blitzductor CT Type MD/Ex 30	919 507* and 919 581*
4	• 2DO	2 x Blitzductor CT Type MD/Ex 30	919 507* and 919 581*
5	• 2AI I	2 x Blitzductor CT Type MD/Ex 30	919 507* and 919 581*
6	• 2AI HART	2 x Blitzductor CT Type MD/Ex 30	919 507* and 919 581*
7	• 2AO	2 x Blitzductor CT Type MD/Ex 30	919 507* and 919 581*
8	• 2AO I HART	2 x Blitzductor CT Type MD/Ex 30	919 507* and 919 581*
9	• 2AI RTD	2 x Blitzductor CT Type MD/Ex 30	919 507* and 919 581*
10	• 2AI TC	2 x Blitzductor CT Type MD/Ex 30	919 507* and 919 581*

* These components can be ordered directly from:

DEHN +SÖHNE
GmbH + Co. KG
Elektrotechnische Fabrik
Hans-Dehn-Str. 1
D-92318 Neumarkt, Germany
www.dehn.de

Note

For all the other PROFIBUS-DP components outside the hazardous area, we recommend that you follow the instructions in the PROFIBUS SIMATIC NET manual.

Caution

If you use overvoltage protection devices, the equipotential bonding should be installed using a minimum cross section of 6 mm^2.

6.4.4 Rules for the Interfaces between Lightning Protection Zones 1...2 and higher

Rules of Interfaces 1 <-> 2 and higher (local equipotential bonding)

The following rules apply to lightning protection zone interfaces 1 <-> 2 and higher:

- Implement local equipotential bonding at every other lightning protection zone interface.
- At all other lightning protection zone interfaces, include all cables as well as metal pipes in the local equipotential bonding system.
- Include all metal installations located within the lightning protection zone in the local equipotential bonding system (for example, metal parts within lightning protection zone 2 at interface 1 <-> 2).

Additional Measures

We recommend additional protection

- for all lightning protection zone interfaces 1 <-> 2 and higher and
- for all cables that run through a lightning protection zone and that are longer than 100 m.

Lightning Protection Elements for the 24 V DC Power Supply

Danger

To protect the TM-PS module, the lightning protection element must be installed in an EEx d enclosure. One protective device per TM-PS module is adequate even when the 24 V power supply is looped through.
The overload of the protective element is indicated by a floating contact led out to the exterior.

Lightning Protection Element for Signal Modules

The protective devices have a shield connecting clamp and the input and output. If the bus connection is looped through, two protective devices must be used per IM module. The overload of a lightning protection element is indicated by the permanent short-circuit (fail-safe) between the signal cores.

Protective Elements for 1 <-> 2 and higher

When installing the ET 200iS, zone transition 1 <-> 2 and higher is not normally used. If it is required, consult the table above and discuss the required measures with your Siemens representative.

6.4.5 Example of Protection from Overvoltage for Networked ET 200iS Stations

Wiring Example

The schematic below shows an example of how to wire two networked ET 200iS stations to achieve effective protection from overvoltages:

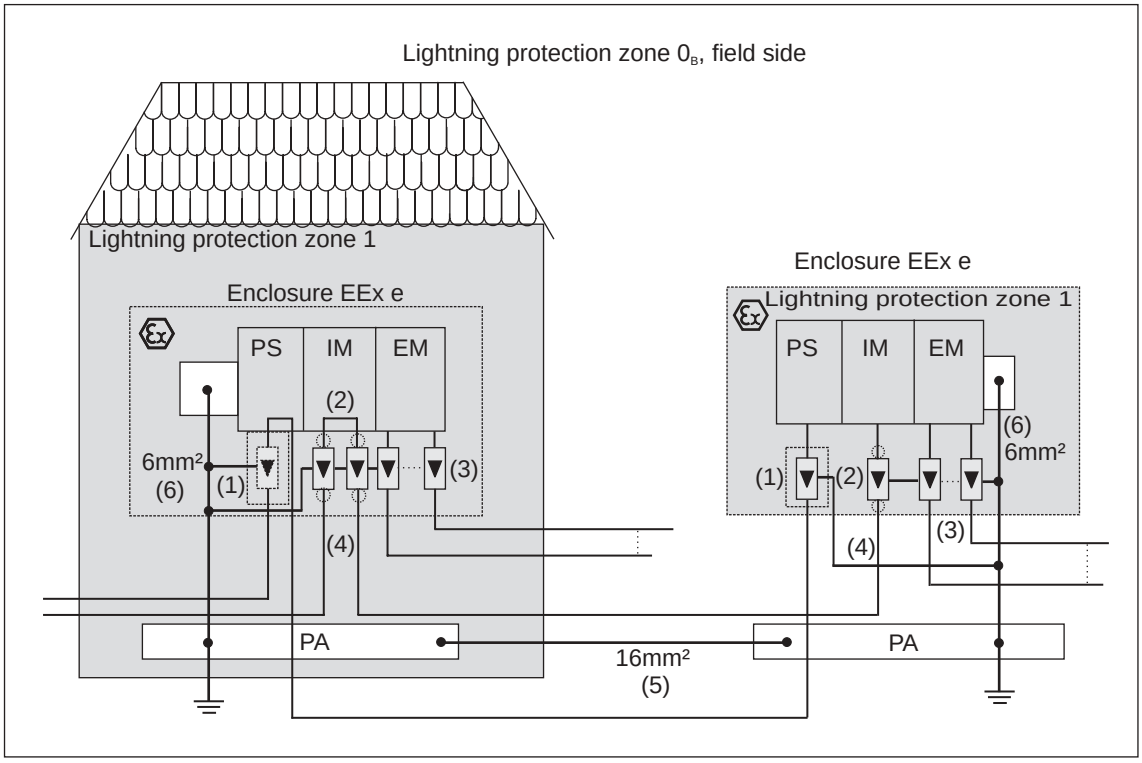


Figure 6-4 Example of Wiring Networked ET 200iS Stations

Components for the Wiring Example

The following table explains the consecutive numbers in the wiring example.

Table 6-8 Example of a Lightning-Protected Configuration

Cons. no. from figure	Component	Meaning
(1)	24 V supply surge arrester, depending on EEx d enclosure: 1 x Netz-AK/1+1/ÜS/FM/Ex d Serial number 4225*	Protection from indirect lightning effects and overvoltages from interface 0_B <-> 1 onwards
(2)	PROFIBUS-DP Ex i surge arrester, dependent on looping through 1 St. Blitzductor CT Typ MD HFD Ex 6 Order no.: 919 507* and 919 583* 1 x Blitzductor CT Typ MD HFD Ex 6 Order no.: 919 507* and 919 583*	Protection from indirect lightning effects and overvoltages from interface 0_B <-> 1 onwards
(3)	I/O surge arrester dependent on the number of double cores used 1 x Blitzductor CT Typ MD/Ex 30 Order no.: 919 507* and 919 581* per double core	Protection from indirect lightning effects and overvoltages from interface 0_B <-> 1 onwards
(4)	Shield clamp for bus cable via EMC spring terminal on the face section of the Blitzductor CT Order no.: 919 508*	Diverting interference currents
(5)	Equipotential bonding cable 16 mm^2	Establishment of uniform reference potentials
(6)	Equipotential bonding cable 6 mm^2	Diverting interference currents

* These components can be ordered directly from

DEHN + SÖHNE
GmbH + Co. KG
Elektrotechnische Fabrik
Hans-Dehn-Str. 1
D-92318 Neumarkt, Germany
www.dehn.de

6.5 Wiring the ET 200iS

6.5.1 Wiring Rules for the ET 200iS

Safety-Related Notices

Danger

When laying cables and wiring, make sure that you adhere to the installation regulation complying with EN 60 079-14 and any regulations specific to your country.

Danger

Connecting an intrinsically safe sensor, actuator, or HART field device to the input/output of an electronics module must produce an intrinsically safe circuit! For this reason:

When you select the encoder, actuator, or HART field device to be connected to the electronics module, the resulting safety-related values must be checked!

The inductance and capacitance of the cable must also be taken into account! See section*Configuration Options*.

Warning

If the wrong electronics module is used all the terminals are connected incorrectly to the sensors, actuators, or HART field devices, the intrinsic safety is put at risk:
Connect only EEx i circuits to the intrinsically safe inputs and outputs of the electronics modules!
Check the wiring between the electronics modules and sensors, actuators, and HART field devices!

Table 6-9 Wiring Rules for the ET 200iS

Wiring Rules for...		TM-PS	TM-E (spring and screw terminals)
Connectable wire cross-sections for solid-core cables		0.5 to 4 mA	0.14 to 2.5 mA
Connectable wire cross-sections for flexible cables	Without wire-end ferrule	0.5 to 2.5 mA	0.14 to 2.5 mA
	With wire-end ferrule	0.5 to 2.5 mA	0.14 to 1.5 mA
Number of wires per connection		1 wire	1 or combination of 2 wires up to 1.5mm (total) in a common wire-end ferrule
Length of insulation to be stripped		9 mm	
Wire-end ferrules complying with DIN 46228	Without installation collar	Shape A, 8 to 9 mm long	Shape A, up to 21 mm long
	With insulation collar 0.25 to 1.5 mm	Shape E, 8 to 9 mm long	Shape E, up to 12 mm long
Tightening torque		0.5 - 0.7 Nm	

Danger

When connecting the wiring to the TM-PS, you must keep to degree of protection IP 30. This is only possible if you keep to the values specified in the column **Wiring Rules for... TM-PS**.

6.5.2 Wiring Terminal Module TM-E30S44-iS with Screw Terminals

Features

- When wiring terminal modules with screw terminals, the wires are secured in the terminal by screwing down the terminal.
- Wire-end ferrules are not necessary.

Requirements

Keep to the wiring rules.

Required Tools

Screwdriver with 3 mm blade

Wiring a Terminal Module with Screw Terminals

1. Strip 9 mm of insulation from the wire.
2. Insert the individual wires into the terminal.
3. Tighten the screw. Result: The wire is clamped into the terminal module.

6.5.3 Wiring Terminal Module TM-E30C44-iS with Spring Terminals

Features

When wiring terminal modules with spring terminals, the wires are secured in the terminal simply by inserting them into the terminal.

Requirements

Keep to the wiring rules.

Required Tools

Screwdriver with 3 mm blade

Wiring a Terminal Module with Spring Terminals

1. Strip 9 mm of insulation from the wire.
2. Insert the screwdriver into the upper (round) opening of the terminal and press it into the opening.
3. Insert the wire as far as it will go into the lower (square) opening in the terminal.
4. Remove the screwdriver.

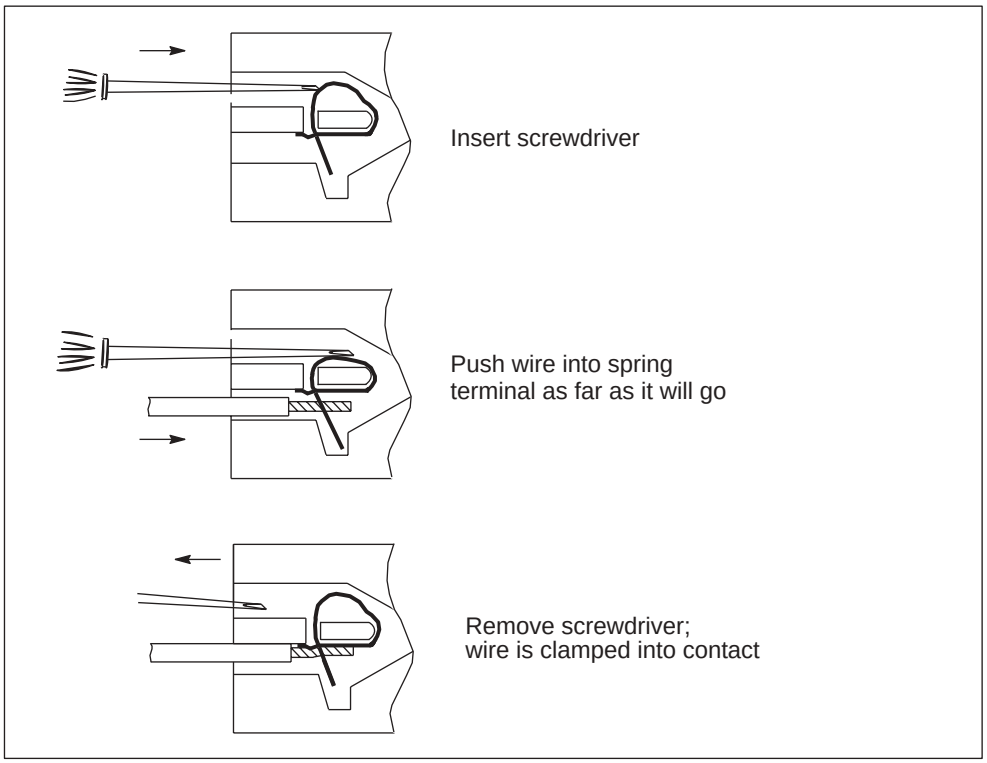


Figure 6-5 Wiring with Spring Terminals

6.5.4 Wiring Terminal Module TM-PS

Safety-Related Notices

Danger

Endangering Explosion Protection in Zone 1:
Disconnectthe wires for the power supply on the terminal module TM-PS in zone 1 only when the power is turned off.

Danger

Endangering Explosion Protection in Zone 2:
Disconnect the wires for the power supply on the terminal module TM-PS in zone 2 when the power supply is turned off if there is any risk of explosion.
If there is no risk of explosion, the wires for the power supply can be disconnected on terminal module TM-PS in zone 2 while the power supply is on.

Features

You connect the power supply for the ET 200iS at terminal module PM-PS. This voltage supplies the interface module IM 151-2 and all the electronics modules.

Requirements

- Wire the terminal module with the power supply turned off.
- Keep to the wiring rules.

Required Tools

- Screwdriver with 3 mm blade
- Insulation stripper

Connecting the Power Supply to Terminal Module TM-PS

1. Strip the wires for the power supply to the ET 200iS.
2. Each terminal on the terminal module TM-PS is fitted with a cover. Insert the screwdriver between the cover and the terminal and break out the cover.

   Note: The covers of the terminals are required for degree of protection IP 30; in other words, remove the covers only from the terminals you intend to use.
3. Open the hinged cover of the screw turned and secure the individual wires with the screwdriver.
4. Close the cover again.

   Note: The closed cover of the screw terminal provides degree of protection IP 30.

Wiring the Grounding Conductor PA on the Terminal Module TM-PS

1. Strip the wire for protective ground PA. Note: Die The grounding conductor must have a cross-section of at least 4 mm^2 or 2 x 1.5 mm^2.
2. Insert the screwdriver between the cover and the terminal and break out the cover.
3. Open the hinged cover of the screw turned and secure the wire with the screwdriver.
4. Close the cover again
5. Connect the protective ground conductor PA to the ground bus.

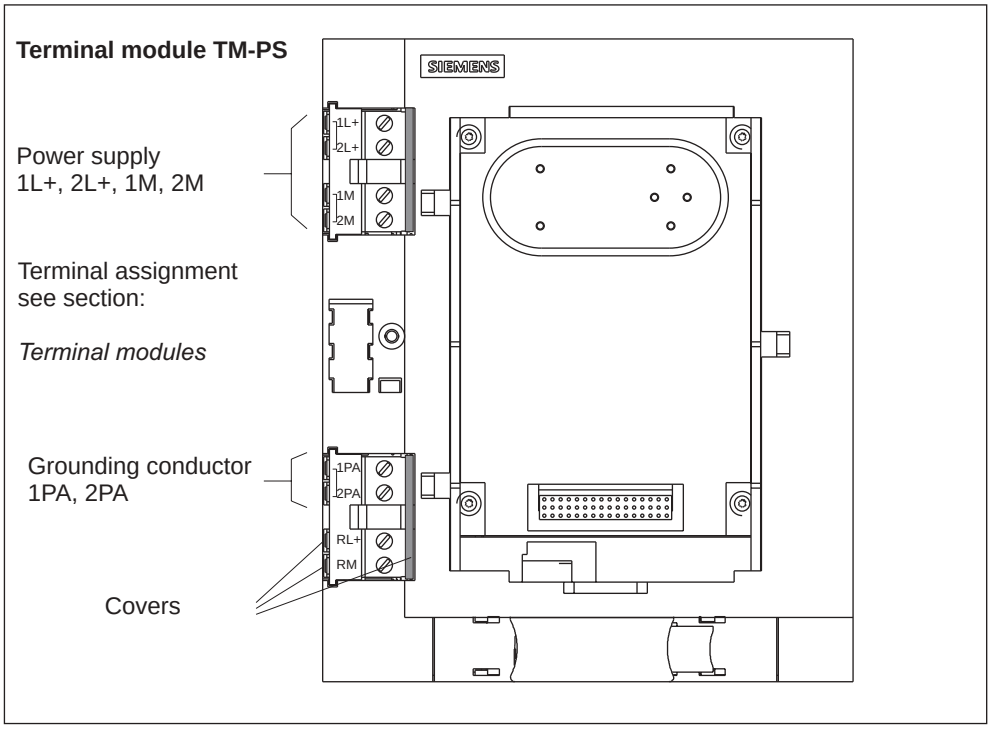


Figure 6-6 Connecting the Power Supply and Grounding Conductor on the TM-PS

6.5.5 Wiring Terminal Module TM-IM

Features

You connect the bus connector (RS-485) for PROFIBUS-DP Ex i at the TM-IM terminal module.

Requirements for Zone 1

Keep to the following rules in zone 1:

1. Use the fieldbus isolating transformer (from R. STAHL Schaltgeräte GmbH; Refer to the order numbers).
2. Connect PROFIBUS-DP Ex i to the RS-485 terminating resistor. The RS-485 terminating resistor is supplied with the fieldbus isolating transformer.
3. Use bus connector 1.5 Mbps (order number 6ES7 972-0BA30-0XA0). If you want to loop PROFIBUS-DP Ex i through to the next ET 200iS, connect the bus cable to the second cable outlet of the bus connector.

4. Use the bus cable specified in the *Order Numbers* appendix for PROFIBUS-DP Ex i and mark the bus cable as "EEx i bus cable". If you use a color as the identifier, you must select light blue.
5. The shield of the bus cable can be connected to one of the following locations providing a sure ground connection PA:
   - Either at the transition of the bus cable from the safe area to the hazardous area
   - or in the safe area directly at the fieldbus isolating transformer. In this case, the shield must be installed like an active circuit; in other words, protection against accidental touch must also exist for the shield of the bus cable (IP 20).

Requirements for Zone 2

Keep to the following rules in zone 2:

- See points 1 to 5: *Requirements for Zone 1*

Requirements for the Safe Area

- See points 1 to 4: *Requirements for Zone 1*

Note

If the inputs and outputs to the actuators/sensors are intrinsically safe, then PROFIBUS-DP must also be intrinsically safe (Ex i).

Wiring Terminal Module TM-IM

1. Insert the bus connector into the PROFIBUS-DP connector.
   Note: During operation, the cable shield of the PROFIBUS-DP cable is connected to the DIN rail and therefore with the equipotential bonding via a spring contact in the terminal module TM-IM.
2. Tighten the securing screws of the bus connector.
3. Mark the bus cable as "EEx i bus cable".

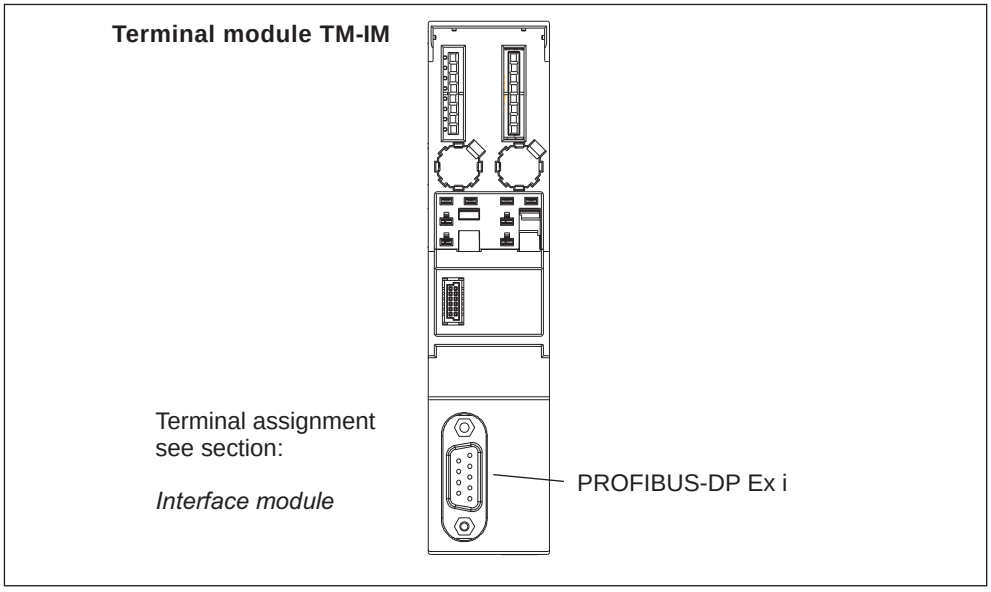


Figure 6-7 Wiring Terminal Module TM-IM

Note

The PROFIBUS-DP of the ET 200iS is intrinsically safe due to the fieldbus isolating transformer. This means that removing and inserting the bus connector is permitted during operation in zone 1, zone 2, and in the safe area.

6.5.6 Wiring Terminal Module TM-E

Features

The terminal module TM-E is the interface to the actuators and sensors.

Requirements

- Keep to the wiring rules.

Required Tools

Screwdriver with 3 mm blade

Wiring Terminal Module TM-E

1. Strip the insulation from the wires to the sensors / actuators.
2. Secure the individual wires in the screw or spring terminals.

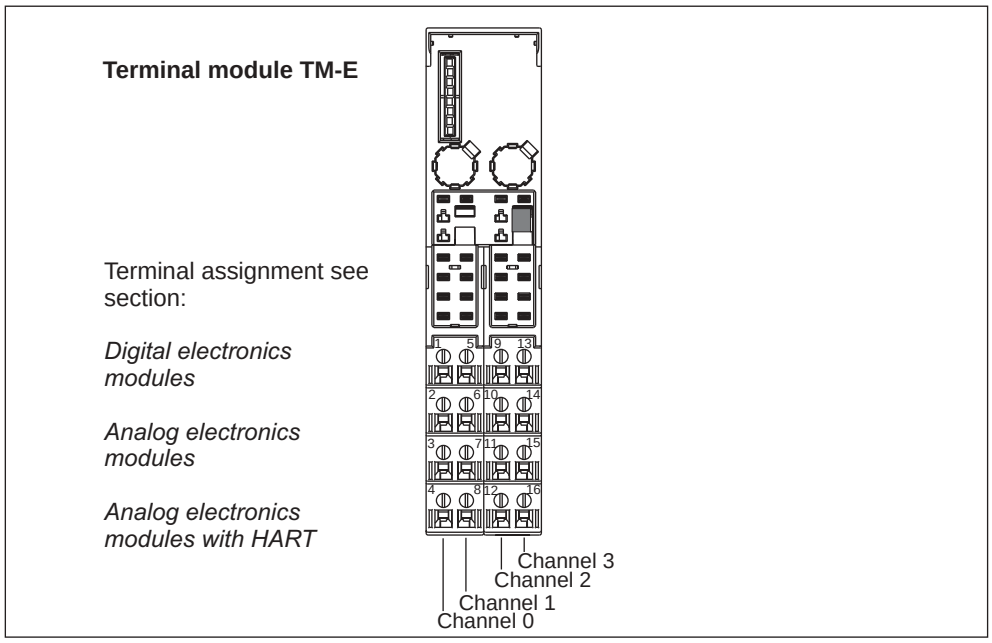


Figure 6-8 Wiring Terminal Module TM-E

Note

The inputs and outputs of the ET 200iS distributed I/O station are intrinsically safe. Disconnecting wires to the sensors, actuators and HART field devices on the terminal module TM-E is permitted during operation in zone 1 and zone 2.

6.5.7 Contacting the Cable Shields

Features

- To contact the cable shields (for the analog electronics modules), we recommend that use the shield contact.

Requirements

- The shield contact element has been fitted.

Required Tools

- Screwdriver with 7 mm blade
- Insulation stripper

Contacting the Cable Shields

1. Remove the insulating material in the vicinity of the conductor bar (approximately 25 mm) and clamp the cable shield into the shield clamp (above the conductor bar).
2. Place the cable shield on the conductor bar and fit the shield clamp over the cable shield from below as far as it will go. Make sure that the shield clamp contacts only the cable shield. **Use the shield clamp KLBÜ CO 1, from Weidmüller, see Order Numbers.**
3. Repeat steps 1 and 2 if you want to contact further cable shields.

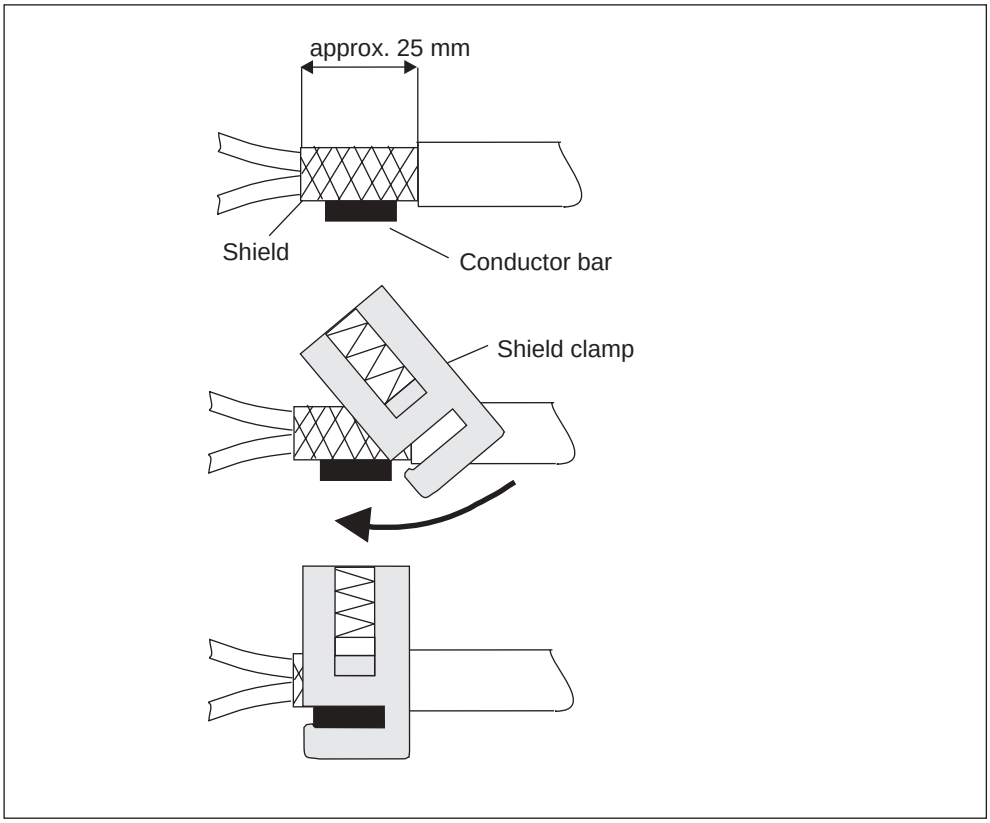


Figure 6-9 Contacting the Cable Shields

Connecting the Conductor Bar to the Ground Bus PA

1. Strip the insulation from the wire you want to ground (from 4 to 16 ^{mm2}) and insert it in one of the ground connector terminals (below the conductor bar). Tighten the ground connector terminal(2 to 2.5 Nm).
2. **Use ground connection terminals ZB 16 from Weidmüller, see order numbers.**
3. At the other end, make contact with the ground bus PA.

6.5.8 Grounding the DIN Rail

Features

The DIN rail of the distributed I/O station must be connected to the ground bus.

Requirements

- Perform the wiring with the power supply turned off .
- Keep to the wiring rules.
- Secure the grounding conductor:
  - Zone 1: EEx e terminal. **Use the terminal WP 16/E, from Weidmüller, see Order Numbers.**
  - Zone 2 or safe area: e terminal or cable lug
- To avoid interference, the cross-section of the grounding conductor for the DIN rail must be greater than the cross-section of the grounding conductor on the terminal module TM-PS.

Required Tools

- Screwdrivers with 3 and 7 mm blades
- Insulation stripper
- Possibly cable lug pliers

Grounding the DIN Rail

1. Strip the insulation from the grounding conductor. Note: The grounding conductor must have a cross-section of at least 4 mm^2 or 2 x 1.5 mm^2.
2. Secure the grounding conductor to the DIN rail to the right beside the bus termination module:
   - Zone 1: EEx e terminal
   - Zone 2 and safe area: e terminal or cable lug
   - Torque: 2 to 2.5 Nm
3. Secure the other end to the ground bus PA.

6.6 Inserting and Labeling the Power Supply, Interface Module, and Electronics Modules

Features

- The modules are inserted in the relevant terminal modules.
- Using a labeling strip, you can identify the interface module and the electronics modules.
- When you first insert an interface or electronics module, coding elements slot into the terminal module. This prevents the wrong module being inserted.

  The interface module and the electronics modules are
  - self-coding
  - type-coded

Requirements

Keep to the wiring rules. See *Configuration Options.*

Inserting the Power Supply Module PS

1. Press the button and the same time pulldown the release slider as far as it will go. The release slider with the button is located on the bottom front of the terminal module.
2. Insert the power supply module into the terminal module until it locks in place.

3. Press the button again and push the release slider up until it catches. Result: The power supply module is pulled into the terminal module TM-PS, is contacted, and secured.
4. To allow identification, take the labeling strip out of the terminal module TM-PS towards the top. The labeling strip is on the terminal module TM-PS to the left.
5. Finally, reinsert the labeling strip in the terminal module TM-PS again.

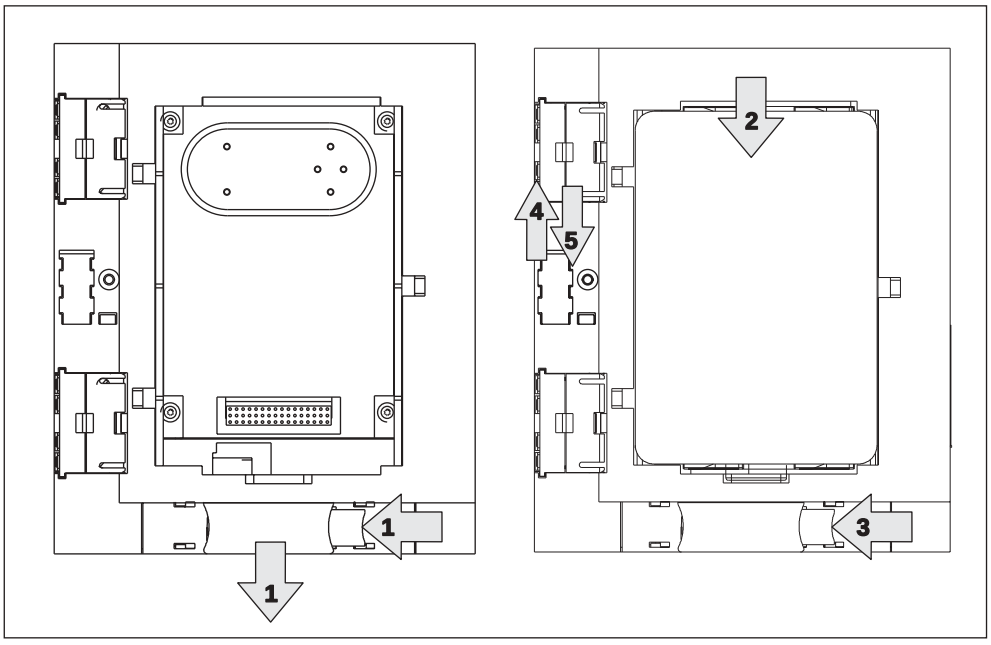


Figure 6-10 Inserting and Identifying the Power Supply Module PS

Caution

Risk of Injury!
Due to its compact design, the power supply module PS weighs 2.5 kg despite its small size; in other words, **get a good hold of the power supply module PS**.

Removing the Power Supply Module PS

1. Press the button and the same time pulldown the release slider as far as it will go. Result: The power supply module is ejected and the contact with the terminal module is broken. Release the button when the release slider has reached the stop.
2. Press the button again and pull the release slider further down and hold it against the limit stop.

3. Pull the power supply module PS out of the terminal module TM-PS keeping a firm hold on it (weight, approx. 2.5 kg).
4. Now push the release slider fully up while pressing in the button.

Inserting and Labeling the Interface Module and Electronics Modules

1. Insert the interface or electronics module into the terminal module until you hear it lock in place.
2. To allow identification, take the labeling strip out of the interface or electronics module towards the top.
3. Finally, reinsert the labeling strip in the interface or electronics module again.

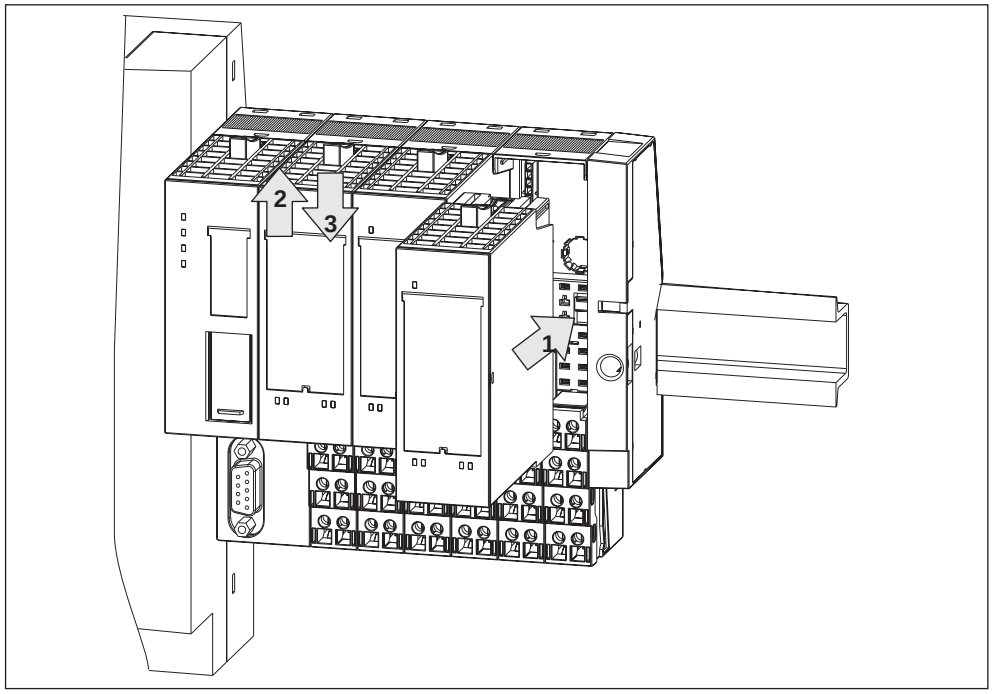


Figure 6-11 Inserting and Labeling the IM 151-2 and Electronics Modules

Note

To operate the ET 200iS, and electronics module must be inserted on every terminal module TM-E.

Removing Interface and Electronics Modules

1. Press both release buttons above and below the interface or electronics module at the same time.
2. Pull the interface or electronics module out of the terminal module towards the front.

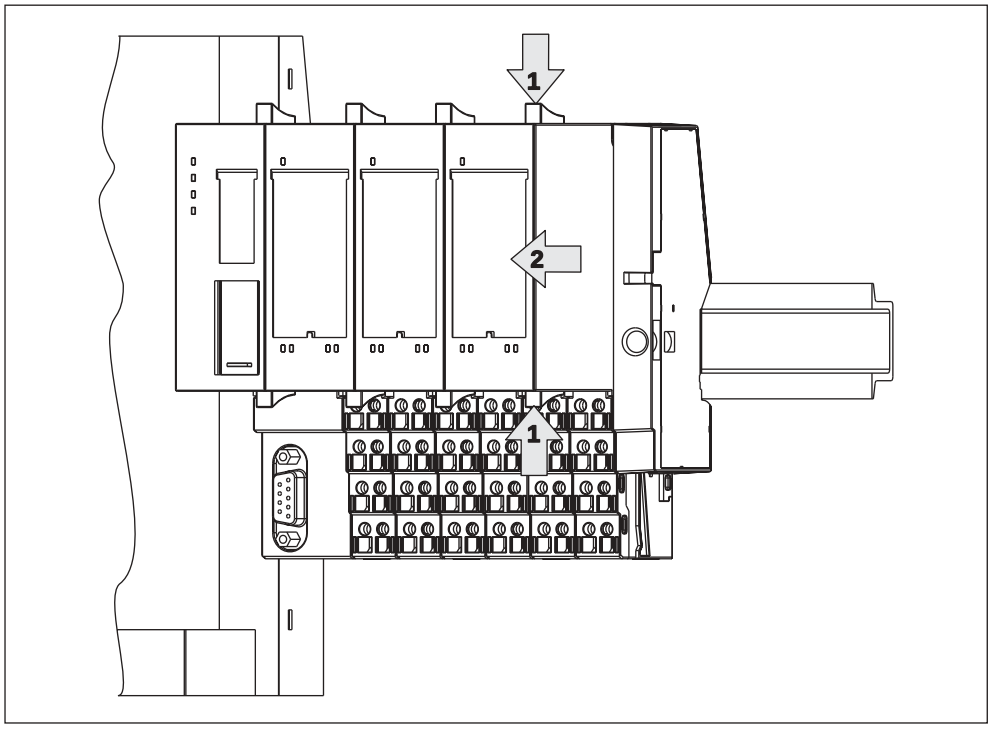


Figure 6-12 Removing Interface and Electronics Modules

Replacing a Defective Interface or Electronics Module

You have already removed the interface or electronics module:

1. Remove the two coding elements from the new interface or electronics module. The coding elements are located on the bottom of the interface or electronics module.
2. Insert the new interface or electronics module (of the same type) into the terminal module until you hear it lock in place.
3. Label the new electronics module.

Note

Check the two coding elements before inserting the new electronics module in the terminal module.

Replacing and Electronics Module with a Different Type

You have already removed the electronics module:

1. Work out the two coding elements from the terminal module using a screwdriver.
2. Insert these coding elements in the old electronics module.
3. Insert the new electronics module (of a different type) into the terminal module until you hear it lock in place.
4. Label the new electronics module.

Danger

If you make changes to the coding, this can lead to dangerous states in your plant.

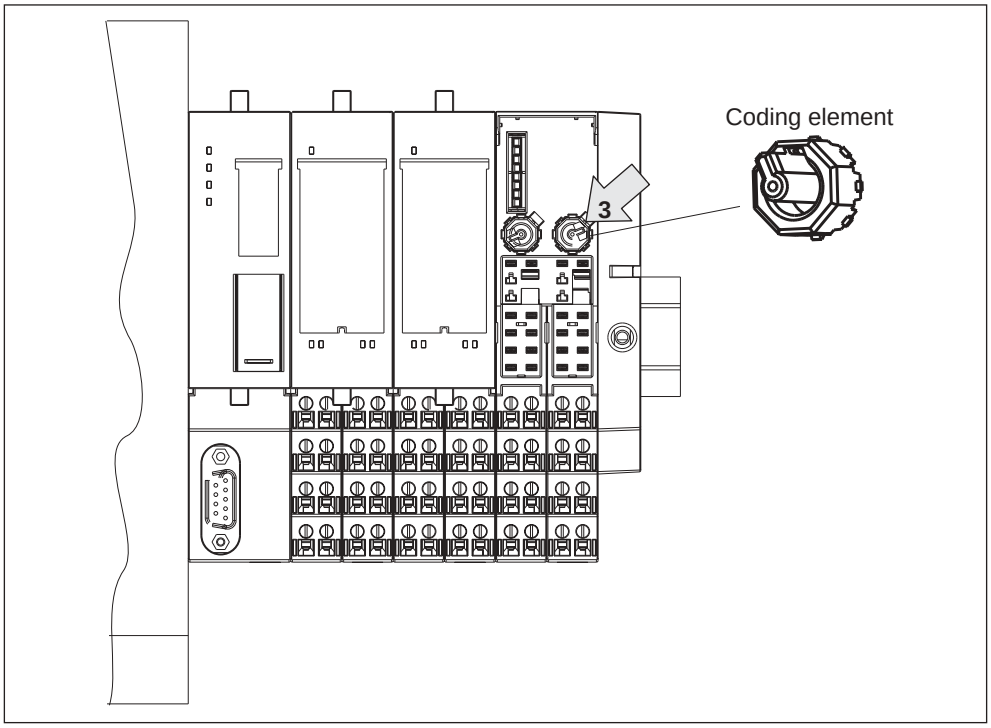


Figure 6-13 Replacing and Electronics Module with a Different Type

6.7 Setting the PROFIBUS Address

Features

With the PROFIBUS address, you specify the address at which the ET 200iS distributed I/O station will be accessed on PROFIBUS-DP.

Requirements

- The PROFIBUS-DP address for the ET 200iS is set on the interface module using DIL switches. The DIL switches are located on the front of the interface module protected by a sliding window.
- The permitted PROFIBUS-DP addresses are 1 to 125
- An address can only be assigned once on PROFIBUS-DP.

Required Tools

Screwdriver with 3 mm blade

Setting the PROFIBUS Address

1. Push up the window on the interface module.
2. Set the required PROFIBUS-DP address with the DIL switches using a screwdriver.
3. Close the window.

Changing the PROFIBUS 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 following POWER UP on the power supply module for the ET 200iS.

Note

If you change the PROFIBUS address, the flash memory (parameters and identification data) of the interface module is erased.

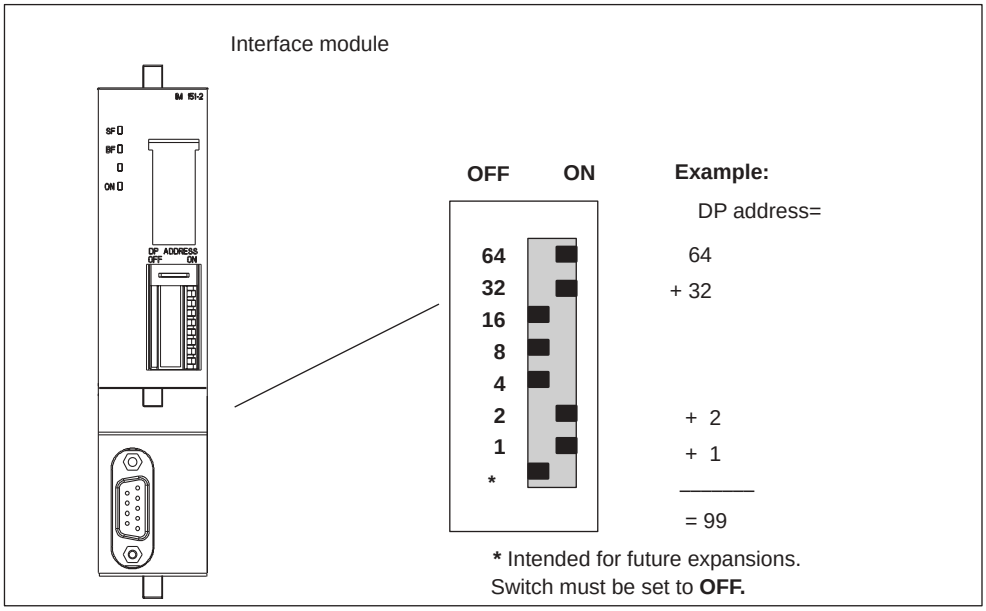


Figure 6-14 Setting the PROFIBUS Address

Commissioning and Diagnostics 7

7.1 Overview of Defining the Configuration

Principle of Defining a Configuration

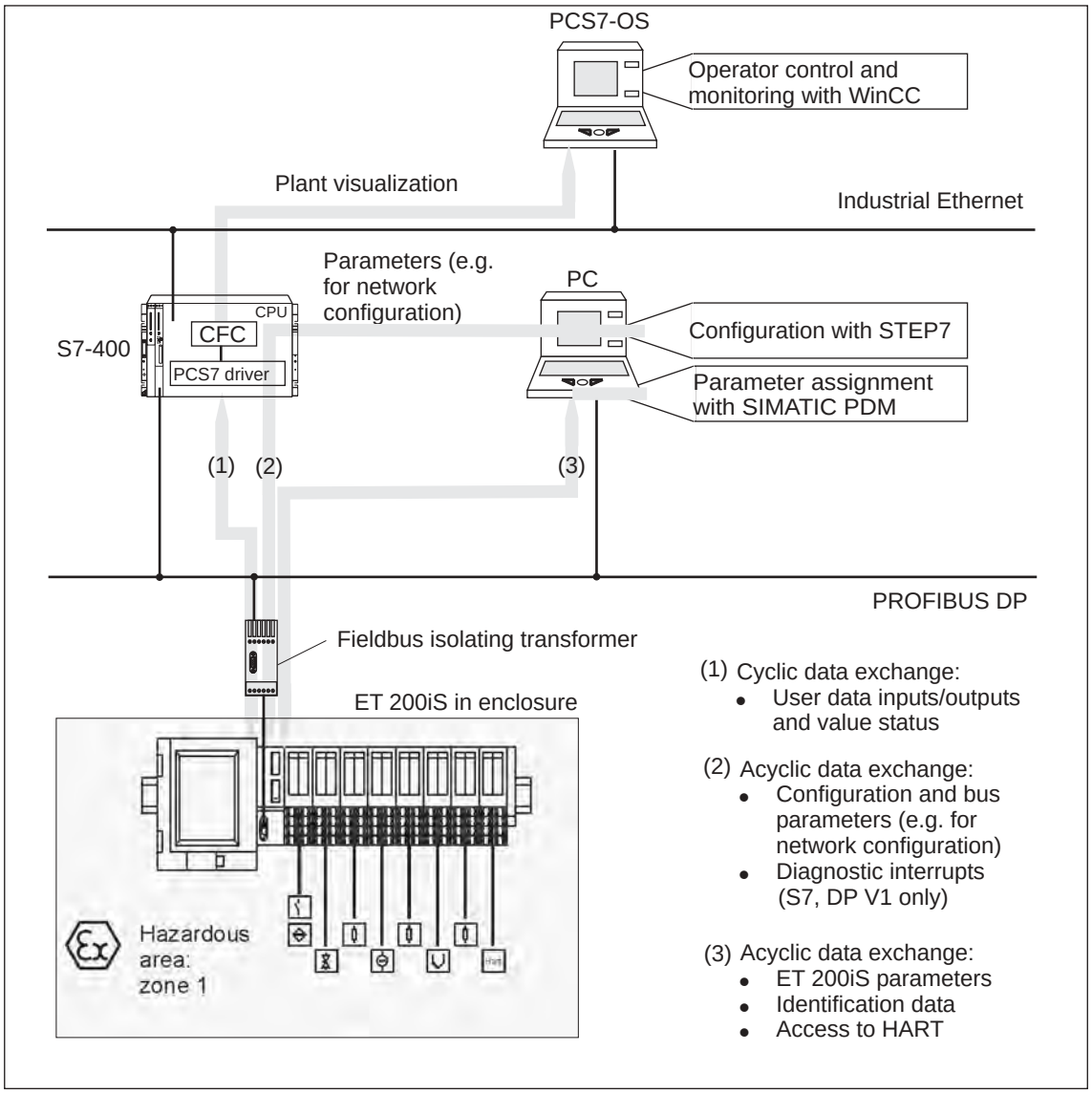


Figure 7-1 Basis on Which Configuration Takes Place

Defining a Configuration

Configuration involves configuring and setting parameters for the ET 200iS with a programming device (PG).

Configuration

When you configure your project, you set the basic characteristics of the DP slaves (for example, network parameters, module selection in HW Config).

You configure the ET 200iS with

- STEP 7
- COM PROFIBUS or with suitable configuration software (using the GSD file).

Parameter Assignment

When you make the parameter assignments, you set the parameters of the ET 200iS and the HART field devices.

- With STEP 7, you make the parameter settings for the ET 200iS in HW Config. SIMATIC PDM is integrated as an optional package in STEP 7.
- Outside STEP 7, you set the parameters for the ET 200iS and the HART field devices with SIMATIC PDM. SIMATIC PDM installed as a standalone version.

Cyclic Data Transfer Via PROFIBUS DP

Data is exchanged between the CPU (for example, S7-400) and the ET 200iS. The following data is transferred:

- the cyclic user data of the inputs and outputs including the value status of the inputs

On the CPU, this data is prepared by the PCS 7 drivers and CFC (Continuous Function Chart) for plant visualization. This data is then presented on the OS by means of WINCC.

For plant visualization, this data can be prepared by the PCS 7 drivers and CFC (Continuous Function Chart) on the CPU and then displayed on the OS with WINCC.

The parameters (for network configuration, for example) are also transferred cyclically.

Acyclic Data Transfer Via PROFIBUS DP

Acyclic data exchange takes place between the ET 200iS and the PG / PC (SIMATIC PDM). The ET 200iS receives its parameters using acyclic data exchange. Identification data is also transferred and displayed in SIMATIC PDM.

- Diagnostics and interrupts
- Data records (S7 only)

PROFIBUS DPV1

The ET 200iS meet the requirements of DPV1. Naturally, the DP master must also meet the requirements of DPV1 (refer to the documentation of the DP master).

The following table shows the new functions of PROFIBUS DPV1 slaves compared with an S7 DP and PROFIBUS DPV0 slave:

Table 7-1 Comparison of DPV1, S7 DP and DPV0

Function		DPV0 Slave	S7 DP Slave	DPV1 Slave	Note
Parameter assignment and configuration with GSD file		X	---	---	
Parameter assignment and configuration with HW Config		x	x	x	
Cyclic data exchange		X	X	X	
Acyclic data exchange (read/write data record): • Free access to parameters on the field device • Reassignment of parameters of the application process	Class 1 services (parameter assignment master, e.g. PLC)	---	X	X	
	Class 2 services (e.g. PG/OP)	X	X	X	
Diagnostics					One interrupt can be reported per diagnostic frame. In DPV1 and S7 DP, an interrupt consists of a slave diagnostic message that is accompanied by an acknowledgment mechanism that does not exist in DPV0.
• ID-Related diagnostics		X	X	X	
• Module status		X	---	X	
• Channel-related diagnostics		X	---	X	
Interrupts					
• Diagnostic interrupt		---	X	X*	
• Hardware interrupt		---	X	X*	
• Remove/insert interrupt		---	X	X*	
• Update interrupt		---	---	X*	
• Time stamp		---	X	X	

* in DPV1, interrupts are also reported with the CPU in the RUN mode. Exception If you operate the ET 200iS with an S7-400, the interrupts are only reported when the CPU is in the STOP mode.

Software Requirements

Table 7-2 Software Requirements

Configuration Software Used	Version	Notes
STEP 7 and SIMATIC PDM (SIMATIC PDM is embedded in STEP 7 HW Config and is available as an add-on package) or PCS 7 (includes, among other things STEP 7 and SIMATIC PDM)	STEP 7 Version 5.1 Service Pack 2 Hotfix 1 or higher SIMATIC PDM Version 5.1 Service Pack 2 or higher PCS 7 Version 5.2 or higher	• Configuring with STEP 7 The ET 200iS is included in the hardware catalog. • To make the parameter settings, SIMATIC PDM is started automatically in HW Config.
STEP 7 and SIMATIC PDM (SIMATIC PDM can also be obtained as a stand-alone version)	STEP 7 Version 4.02 or higher SIMATIC PDM Version 5.1 Service Pack 2 or higher	• You require the GSD file of the ET 200iS and configure with STEP 7. • Setting Parameters with SIMATIC PDM
COM PROFIBUS with SIMATIC PDM (SIMATIC PDM can also be obtained as a stand-alone version)	COM PROFIBUS Version 3.0 or higher SIMATIC PDM Version 5.1 Service Pack 2 or higher	• You require the GSD file of the ET 200iS and configure with COM PROFIBUS. • Setting Parameters with SIMATIC PDM
Other configuration software and SIMATIC PDM (SIMATIC PDM can also be obtained as a stand-alone version)	Configuration software see manufacturer SIMATIC PDM Version 5.1 Service Pack 2 or higher	• You require the DDB file, and you carry out configuration with appropriate configuration software. • Setting Parameters with SIMATIC PDM

7.2 Configuration

Configuration

The following table describes the most important steps in configuration:

Table 7-3 Configuration

	STEP 7 Version 5.1, Service Pack 2, Hotfix 1 or higher **or** **PCS 7 Version 5.2 or higher**	**STEP 7 Version 4.02 or higher**	**COM PROFIBUS Version 3.0 or higher** **or** **Other configuration software**
Features	• The ET 200iS is included in the hardware catalog of STEP 7 • Diagnostic interrupts, hardware interrupts, remove & insert interrupts and time stamps are supported	• You require the GSD file • The ET 200iS is entered in the project as a DP standard slave	
Requirements	The required software has been installed on the PG/ PC or PCS7-ES.		
Procedure	1. Start the SIMATIC Manager. 2. Configure the ET 200iS with HW Config. – Create a new project. – Drag modules from the hardware catalog to the configuration table 3. Configure the time stamping (option) 4. Save the configuration and download the configuration to the DP master.	1. Start the SIMATIC Manager. 2. Include the GSD file in HW Config. 3. Configure the ET 200iS with HW Config. – Create a new project. – Drag modules from the hardware catalog to the configuration table 4. Save the configuration and download the configuration to the DP master.	1. Start COM PROFIBUS / configuration software. 2. Include the GSD file in COM PROFIBUS / configuration software. 3. Configure the ET 200iS with COM PROFIBUS / your configuration software. 4. Save the configuration and download the configuration to the DP master.

Reference: For more detailed information on configuring, refer to the online help of STEP 7 / COM PROFIBUS.

Including the GSD File in STEP 7 / COM PROFIBUS

The name of the GSD file for the ET 200iS is *sir3806e.gse*.

The following table describes how to include the GSD file in SIMATIC S7 or SIMATIC S5 (COM PROFIBUS).

Table 7-4 Including the GSD File in STEP 7 / COM-PROFIBUS

STEP 7	COM PROFIBUS, as of V3.0
1. Start STEP 7, open HW Config, and select the menu command **Options / Install New GSD File**.	1. Copy the GSD file of the ET 200iS to the COM PROFIBUS folder: **...COMPB3\GSD** (default) Copy the bitmap file to the folder:**...COMPB3\BITMAPS**
2. In the next dialog, 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.	2. Start COM PROFIBUS and select the menu command **File / Read in GSD File**. Result: ET 200iS is displayed in the hardware catalog during the slave configuration

Downloading the GSD File

You can download the GSD file *sir3806e.gse* for the ET 200iS

- On the Internet at http//www.ad.siemens.de/csi_e/gsd
- Via modem on +49 (911) 73 79 72

7.3 Parameter Assignment

Setting Parameters with STEP 7

The following table describes the most important steps in parameter assignment:

Table 7-5 Setting Parameters with STEP 7 or PCS 7

STEP 7 Version 5.1, Service Pack 2, Hotfix 1 or higher and optional package SIMATIC PDM Version 5.1, Service Pack 2 or higher or PCS 7 Version 5.2 or higher		
Features	You set the parameters for the ET 200iS.	
Requirements	• The required software has been installed on the PG/ PC or PCS7-ES. • To work with PDM online, you require a PROFIBUS-DP interface, for example CP 5611 (6GK1 561-1AA00). The CP must be set to the PROFIBUS-DP interface (in the SIMATIC Manager: menu command **Options > Set PG/PC Interface**).	
How to set parameters for the electronics modules	1.	You are still in HW Config. Double-click on the first electronics module in the configuration table.
	2.	In the next dialog, select "Specialist" as the user and confirm with "OK". In this mode, you can make parameter settings. Result: SIMATIC PDM is started with the current parameters and identification data of the module.
	3.	Set the parameters of the electronics module with SIMATIC PDM, save the parameters (menu command **File > Save**) and download the parameters to the electronics module with the menu command **Device > Download to Device**. Close SIMATIC PDM.
	4.	Double-click on the next electronics module in the configuration table and repeat steps 2 and 3 until you have set the parameters for all the electronics modules.
How to set parameters for the interface module	1.	Double-click on the DP slave "IM 151-2" in HW Config (in the upper part of the station window). Select "Specialist" in the next window. Result: SIMATIC PDM is started.
	2.	Set the parameters of the interface module IM 151-2, save the parameters (menu command **File > Save**) and download the parameters to the interface module with the menu command **Device > Download to Device**. Close SIMATIC PDM.

STEP 7 Version 5.1, Service Pack 2, Hotfix 1 or higher and optional package SIMATIC PDM Version 5.1, Service Pack 2 or higher or PCS 7 Version 5.2 or higher		
How to set parameters for all modules of the ET 200iS	1.	Double-click on the DP slave "IM 151-2" in HW Config (in the upper part of the station window). Select "Specialist" in the next window. Result: SIMATIC PDM is started and all modules of the ET 200iS are loaded.
	2.	Upload all parameters of the modules (menu command **File > Full Upload to PG/PC**).
	3.	Set the parameters for all required modules. In the left-hand pane of the SIMATIC PDM window, you can select all the modules of the ET 200iS.
	4.	Save the changes (menu command **File > Save**) so that the file is updated.
	5.	Download all parameters to the modules (menu command **Device > Full Download to Device**). Close SIMATIC PDM.

Setting Parameters with SIMATIC PDM (stand-alone version)

The following table describes the most important steps in parameter assignment:

Table 7-6 Setting Parameters with SIMATIC PDM

SIMATIC PDM Version 5.1, Service Pack 2 or higher (stand-alone version)		
Characteristics	•	You set the parameters for the ET 200iS.
Requirements	•	The required software has been installed on the PG/ PC or PCS7-ES.
	•	To work with PDM online, you require a PROFIBUS-DP interface, for example CP 5611 (6GK1 561-1AA00). The CP must be set to the PROFIBUS-DP interface (in the SIMATIC Manager: menu command **Options > Set PG/PC Interface**).
How to set parameters for the electronics modules	1.	Start the SIMATIC Manager.
	2.	Select the process device network view as the standard view with the menu command **Options > Settings > View > Process Network View**.
	3.	Create a new project with the menu command **File > New**. The "New" dialog opens in which you enter the required project name and confirm with "OK".
	4.	Now select the Networks icon, right-click and select **Insert New Object > PC** and **Insert New Object > PROFIBUS DP Network**
	5.	In the left-hand pane of the window, select the PC icon. An icon labeled DP Interface now appears in the right-hand pane of the window. Right-click on this icon and select "Object Properties". In the next dialog, select "PROFIBUS-DP Networks" under networks and confirm with "OK"**.**

SIMATIC PDM Version 5.1, Service Pack 2 or higher (stand-alone version)		
	6.	Now select the icon labeled "PROFIBUS DP Network", right-click and select **Insert New Object > Remote I/O**. Make the following entries in the dialog that opens: **Name** of the ET 200iS station (for example ET 200iS) **Address**: PROFIBUS address you set on the interface module **Number of "Remote I/O" objects**: Number of ET 200iS stations for which you are setting parameters Confirm with "OK". Result: The ET 200iS station is now displayed in the right-hand pane of the window.
	7.	Now select the remote I/O object you created in the previous step (ET 200iS), right-click and select the **Insert New Object > Remote I/O Module** menu command. Make the following entries in the dialog that opens: **Name**: Name of the module (for example 4DI NAMUR) **Address**: Slot of the first electronics module in the ET 200iS station (4) **Number of "Remote I/O" objects**: Number of electronics modules in the ET 200iS station. Confirm with "OK". Result: The electronics modules are now displayed in the right-hand pane of the window.
	8.	Select the first remote I/O object (electronics module in the left pane of the SIMATIC Manager), right-click and select the **Open Objects** menu command. In the next dialog, "SIMATIC PDM Select Device", select **SIEMENS > ET 200iS > Modules** and confirm with "OK".
	9.	In the next dialog, select "Specialist" as the user and confirm with "OK". In this mode, you can make parameter settings. Result: SIMATIC PDM is started.
	10.	Once SIMATIC PDM has started, select the relevant electronics module as the "module type". Then click in one of the gray fields to update the window. Result: The parameters and identification data of the electronics module are displayed.
	11.	Now set the parameters of the electronics module. Save the changes with the**File > Save** menu command and download the parameters to the electronics module with the**Device > Download to Device** menu command. Close SIMATIC PDM.
	12.	Follow the same procedure as described in points 8 through 11 for each of the ET 200iS objects (electronics modules).
How to set parameters for the interface module	1.	Select the first remote I/O object (ET 200iS in the left pane of the SIMATIC Manager), right-click and select the **Open Objects** menu command. In the next dialog, "SIMATIC PDM Select Device", select **SIEMENS > ET 200iS > Head-end Station** and confirm with "OK".
	2.	In the next dialog, select "Specialist" as the user and confirm with "OK". In this mode, you can make parameter settings. Result: SIMATIC PDM is started.
	3.	Now set the parameters of the interface module. Save the changes with the**File > Save** menu command and download the parameters to the interface module with the**Device > Download to Device** menu command. Close SIMATIC PDM.

SIMATIC PDM Version 5.1, Service Pack 2 or higher (stand-alone version)		
How to set parameters for all modules of the ET 200iS	1.	Select the first remote I/O object (ET 200iS in the left pane of the SIMATIC Manager), right-click and select the **Open Objects** menu command. In the next dialog, "SIMATIC PDM Select Device", select **SIEMENS > ET 200iS > Head-end Station** and confirm with "OK".
	2.	In the next dialog, select "Specialist" as the user and confirm with "OK".
	3.	Upload all parameters of the modules (menu command **File > Full Upload to PG/PC**).
	4.	Set the parameters for all required modules. In the left-hand pane of the SIMATIC PDM window, you can select all the modules of the ET 200iS.
	5.	Save the changes (menu command **File > Save**) so that the file is updated.
	6.	Download all parameters to the modules (menu command **Device > Full Download to Device**). Close SIMATIC PDM.

Reference

For more detailed information on parameter assignment, refer to the documentation and online help of *SIMATIC PDM*.

7.4 Commissioning and Starting up the ET 200iS

Safety-Related Notices

Note

When you commission the ET 200iS, make sure that you adhere to the national regulations!

Note

When checking the functionality, make sure that you keep to the stipulations in EN 60 079-17. This standard contains the regulations of the international standard IEC 60 079-17.

Requirements for Commissioning

Table 7-7 Requirements for Commissioning

Step	Prior Activity	See...
1	ET 200iS is installed	Section *Installation*
2	PROFIBUS address is set on the ET 200iS	Section *Wiring*
3	ET 200iS is wired up	Section *Wiring*
4	Zone 1 and Zone 2: Additional check of the installation and wiring of the ET 200iS, connections, enclosure, and supply lines.	
5	ET 200iS is configured and the parameters are set	Section *Commissioning and Diagnostics*
6	The power supply for the DP master is on	*DP Master Manual*
7	The DP master has been set to RUN mode	*DP Master Manual*

Commissioning the ET 200iS

Table 7-8 Commissioning the ET 200iS

Step	Procedure	See...
1	Turn on the power supply for the ET 200iS.	Section *Wiring*
2	Observe the STATUS LEDs on the ET 200iS and on the DP master.	• Section *Commissioning and Wiring* • *DP Master Manual*

Startup of the ET 200iS

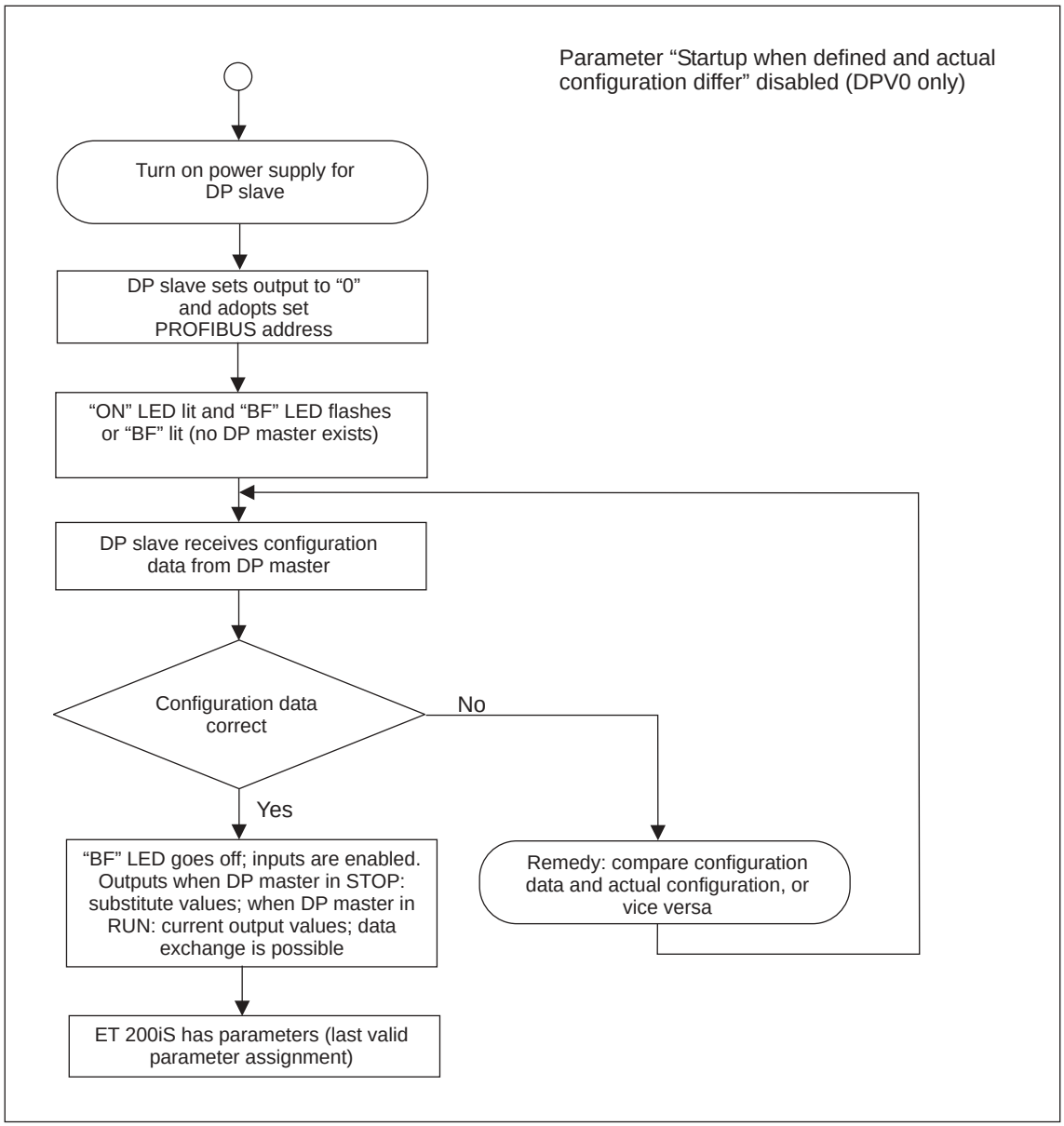


Figure 7-2 Starting up the ET 200iS

Starting up the Time-of-Day Synchronization/Time Stamping of Signal Changes (STEP 7 only)

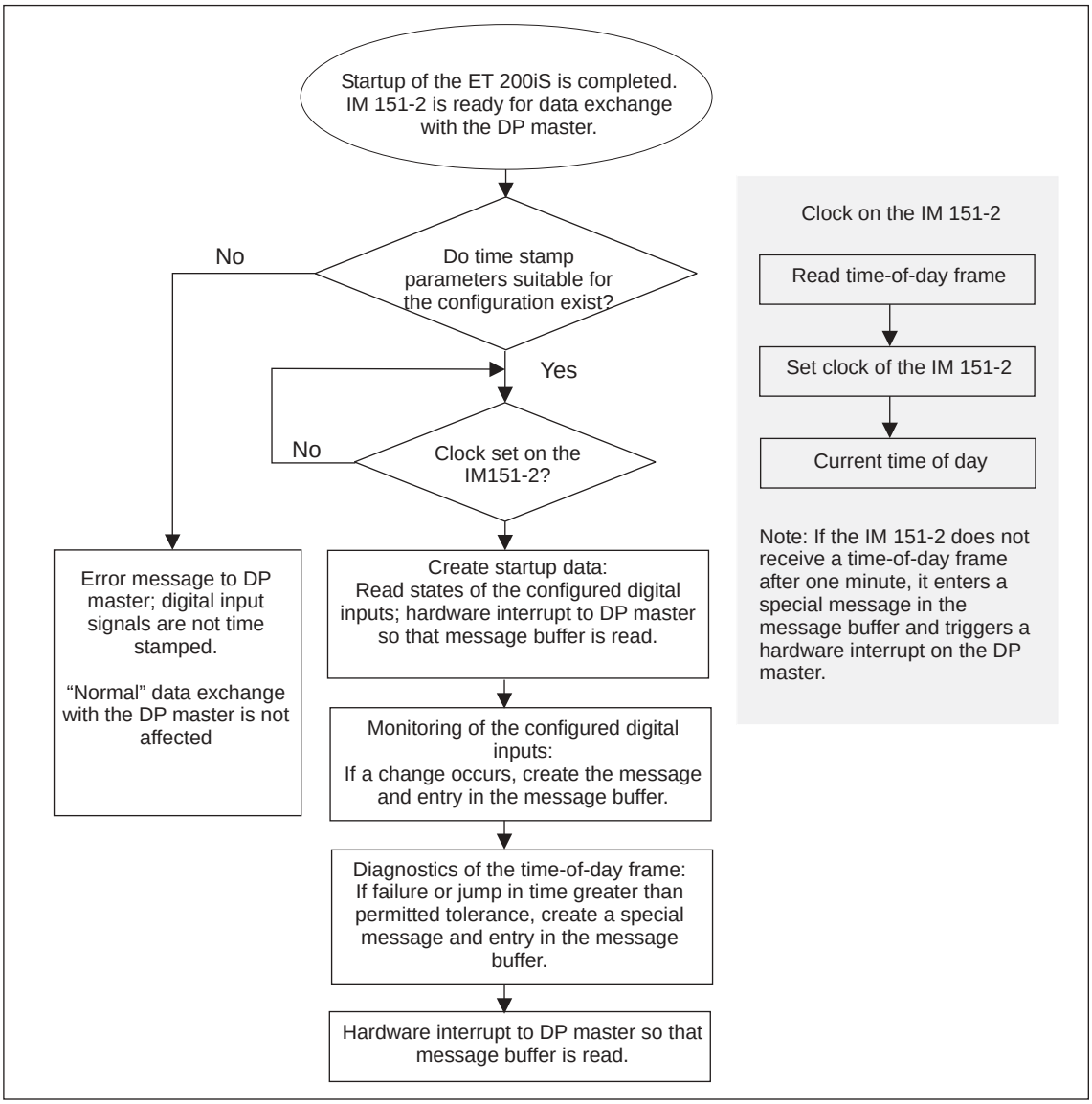


Figure 7-3 Starting up the Time-of-Day Synchronization/Time Stamping

7.5 Reassign Parameters for the ET 200iS during Operation

Features

- All modules have basic parameter settings when they leave the factory (refer to the parameter defaults). After you turn on the power supply for the ET 200iS, the modules are initially in a safe state:
  - Digital inputs: input values 0, value status 0
  - Digital outputs: no current or voltage (no substitute values)
  - Analog inputs: input value $7FFF_H$
  - Analog outputs: no current or voltage (no substitute values)
  - All parameters (that you can set with SIMATIC PDM): deactivated

---

Note

The modules of the ET 200iS only change to the operating state after you have first loaded the parameters from the module to SIMATIC PDM using SIMATIC PDM (for example, menu command **Device > Full Upload to PG/ PC**) and then write the parameters back from SIMATIC PDM to the module (for example, menu command **Device > Full Download to Device**).

- Using the parameter assignment function with STEP 7, HW Config, SIMATIC PDM you can also reassign module parameters during operation. Each new parameter setting that is correct is adopted by the module and stored in non-volatile memory.
- When the modules are restarted (after turning the power supply of the ET 200iS off
  --> on) the currently stored parameter settings on the modules are adopted (SF LED of the modules goes off). The modules are then in a safe state (see above).

Note

Adopting the retentive parameter settings on modules takes place regardless of the communication between the ET 200iS and the DP master.

Reassigning Parameters

The following table describes the most important steps when changing the parameter settings of the ET 200iS:

Table 7-9 Reassigning Parameters

	STEP 7 Version 5.1, Service Pack 2, Hotfix 1 or higher with optional package SIMATIC PDM Version 5.1, Service Pack 2 or higher, or PCS 7 Version 5.2 or higher	**SIMATIC PDM Version 5.1, Service Pack 2 or higher**
Features	• You can reassign parameters for the ET 200iS during operation.	
Requirements	SIMATIC PDM is already installed on the PG / PC or PCS7-ES.	SIMATIC PDM must be installed as a standalone version
How to proceed	1. Start the SIMATIC Manager of STEP 7 2. Open the project in which you configured the ET 200iS. 3. Double-click on the module for which you want to change parameter settings in HW Config Result: SIMATIC PDM is started. 4. Upload the parameters/identification data of the module to the PG/PC. 5. Change the parameters/identification data. 6. Save the changes and download the parameters/identification data to the module. 7. Check: Upload the parameters/identification data of the module to the PG/PC again and check that the parameter changes have been made.	1. Start SIMATIC PDM. 2. Open the project. 3. Change the view in the SIMATIC Manager: Menu Command **View > Process Network View**. 4. In the left-hand pane of the window, select the required ET 200iS module. Right-click on the module and select **Open Objects** from the menu. Result: SIMATIC PDM is started. 5. Upload the parameters/identification data of the module to the PG/PC. 6. Change the parameters/identification data. 7. Save the changes and download the parameters/identification data to the module. 8. Check: Upload the parameters/identification data of the module to the PG/PC again and check that the parameter changes have been made.

Reference

For more detailed information on parameter assignment, refer to the documentation and online help of *SIMATIC PDM*.

7.6 Diagnostics Using the Process Image Input Table

Introduction

In addition to the diagnostic information available with the LEDs and module/DP diagnostics, the module also provides information about the validity of every input signal – the value status. The value status is entered in the process image along with the input signal.

Value Status of the Digital Input Modules

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

- Wire break check / short circuit
- Flutter monitoring
- Pulse extension
- Validation check of changeover contacts

Significance of the value status:

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

Digital Input and Value Status Assignment

In the process image, a value status is assigned to every input in the input byte IB x of the module.

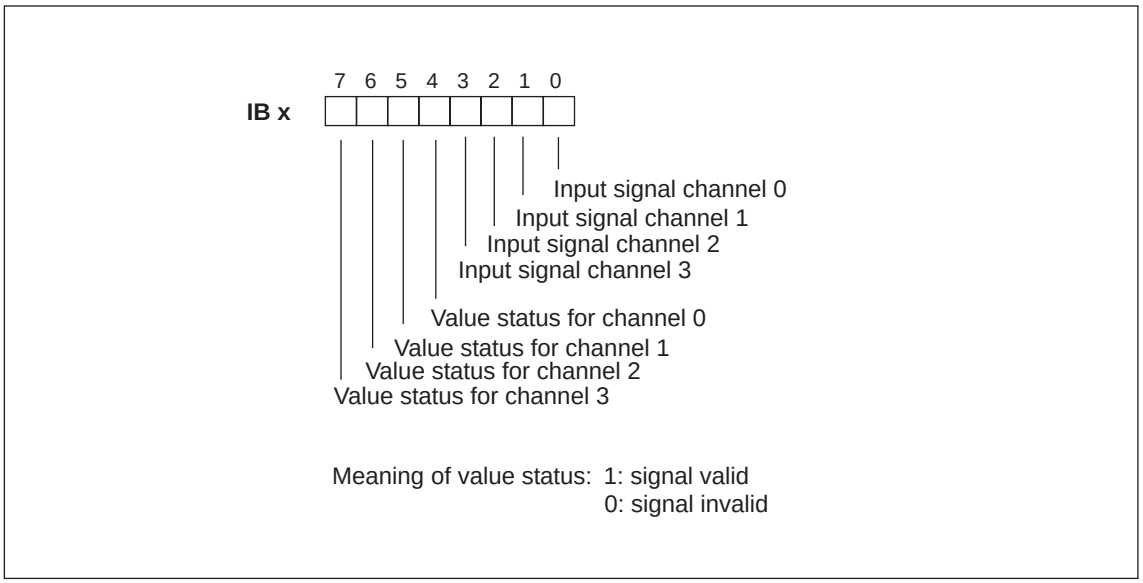


Figure 7-4 Assignment of the Value Status to the Digital Input

Value Status of the Analog Input Modules

The input values of the analog input modules are entered in the process image input table. If a measured value is invalid, the following value status is entered as the input value:

- in S7: $7FFF_H$
- in S5: $7FFB_H$

Evaluation of the Value Status in PCS 7

The value status is evaluated using the PCS 7 channel driver.

1. The PCS 7 channel driver reads the value status from the process image input table...
2. ...and forms the quality code for PCS 7.

Detailed Description

You will find a detailed description of evaluating and processing the input signals in the *PCS 7 Documentation*.

7.7 Status and Error LEDs on the IM 151-2

Interface module IM 151-2

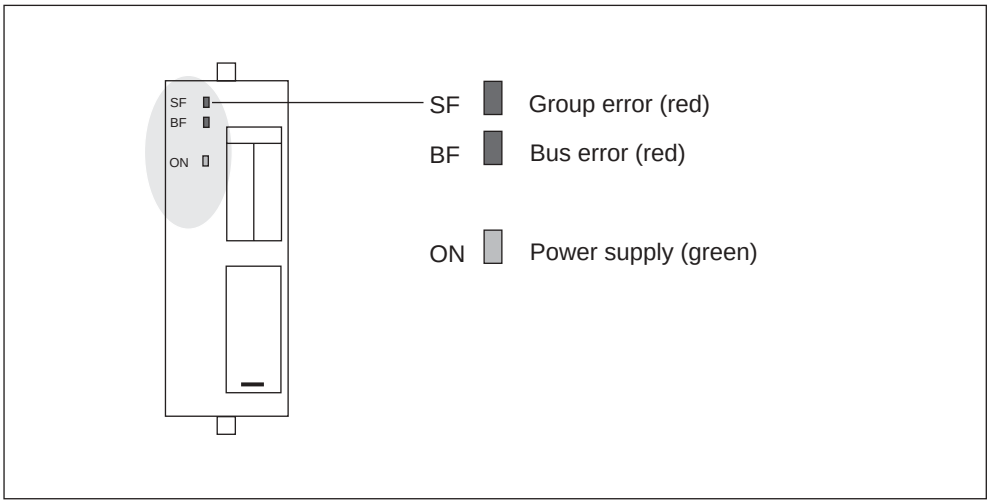


Figure 7-5 LED Display on the Interface Module

Status and Error LEDs on the IM 151-2

Table 7-10 Status and Error LEDs on the IM 151-2

LEDs			Meaning	Remedy
SF	**BF**	**ON**		
off	off	off	There is no voltage applied to the IM 151-2 or the IM 151-2 has a hardware fault	Turn on the DC 24V power supply on the terminal module TM-PS. Replace the IM 151-2.
*	*	on	Power is being supplied to the IM 151-2.	-
*	flashes	on	IM 151-2 is incorrectly configured – there is no data exchange between the DP master and the IM 151-2. Cause: PROFIBUS address is incorrect.	• Check the IM 151-2. • Check the DP configuration. • Check the PROFIBUS address.
*	on	on	Baud rate detection, illegal PROFIBUS address all lowest DIL switch (PROFIBUS address) not set to OFF. Causes: • the watchdog has elapsed. • bus communication to the IM 151-2 over PROFIBUS-DP is interrupted. • no DP master exists.	Set a valid PROFIBUS address (1 - 125) on the IM 151-2 or check the bus setup. • Check whether the bus connector is correctly inserted. • Check whether the bus cable to the DP master is interrupted. • Turn the DC 24 V power supply on the terminal module TM-PS off and on again.
on	*	on	Configuration of the ET 200iS defined in the project does not match the actual configuration of the ET 200iS. Problem in an I/O module Module reports diagnostic information	Check the configuration of the ET 200iS. Is a module missing, defective, or is there an unconfigured module plugged in? Check the configuration (for example with COM PROFIBUS or STEP 7). Check the process wiring.
off	off	on	Data exchange is taking place between the DP master and the ET 200iS. Configuration defined in the project and actual the configuration of the ET 200iS match.	-

* not relevant

Power Supply Module

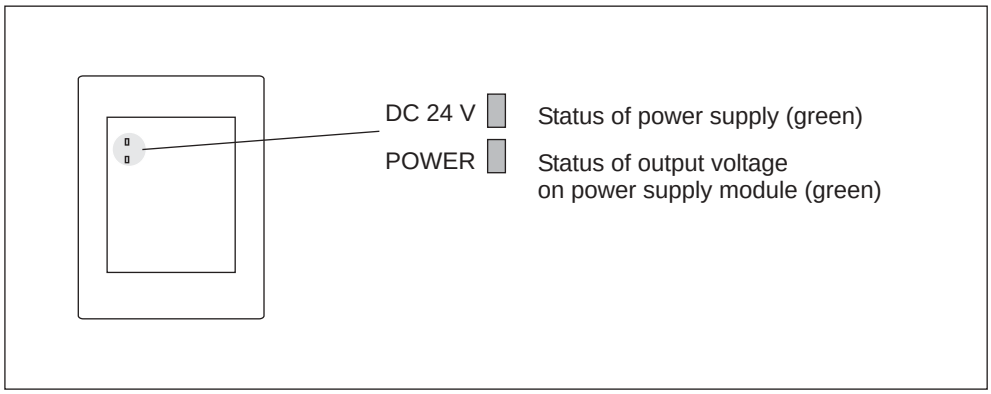


Figure 7-6 Status LEDs on the Power Supply Module

Status LEDs on the Power Supply Module

Table 7-11 Status LEDs on the Power Supply Module

LEDs		Meaning	Remedy
DC 24 V	**POWER**		
off		No power supply on the terminal module TM-PS.	Check the power supply on the terminal module TM-PS.
	off	Some of the output voltages of the power supply module do not exist.	Replace the power supply module.

Digital Electronics Modules

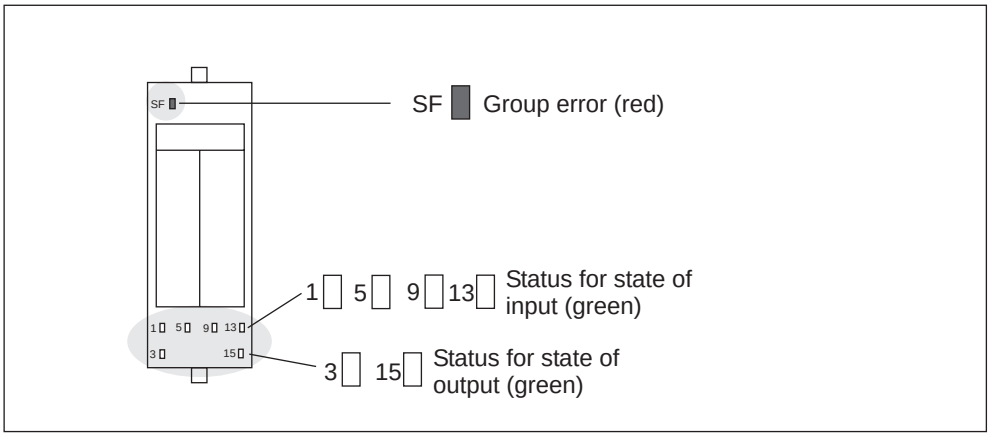


Figure 7-7 Status and Error LEDs on the Digital Electronics Modules

Status and Error LEDs on the Digital Electronics Modules

Table 7-12 LED Display on the Digital Electronics Modules

LEDs							Meaning	Remedy
SF	1	5	9	13	3	15		
on							Wrong module inserted. Diagnostic message exists.	Evaluate the diagnostic information.
	on						Input DI 0 activated	
		on					Input DI 1 activated	
			on				Input DI 2 activated	
				on			Input DI 3 activated	
					on		Output DO 0 activated	
						on	Output DO 3 activated	

Analog Electronics Modules

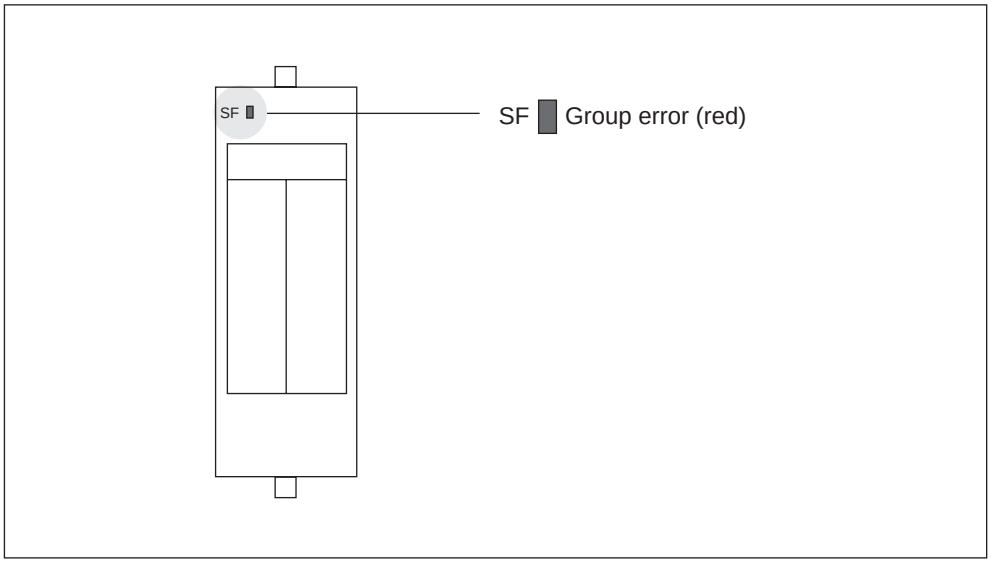


Figure 7-8 Error LEDs on the Analog Electronics Modules

Error LEDs on the Analog Electronics Modules

Table 7-13 Error LEDs on the Analog Electronics Modules

LED	Meaning	Remedy
SF		
on	Wrong module inserted. Diagnostic message exists.	Evaluate the diagnostic information.

7.8 Diagnostics with STEP 5 and STEP 7

7.8.1 Introduction

Introduction

Slave diagnostics complies with the standard EN 50170, Volume 2, PROFIBUS. Depending on the DP master, diagnostic information can be read out for all DP slaves that comply with the standard using STEP 7 or STEP 5.

Reading out slave diagnostic information and the structure of the information is described in the following sections.

7.8.2 Reading out Diagnostic Information

Options for Reading out Diagnostic Information

Table 7-14 Reading out Diagnostic Information with STEP 7 and STEP 5

Programmable Controller with DP Master	Block or Tab in STEP 7	Application	See...
SIMATIC S7	"DP Slave Diagnostics" tab	Slave diagnostic information in plain language on the STEP 7 user interface	"Hardware Diagnostics" in the STEP 7 online help
	SFC13 "DPNRM_DG"	Reading out the slave diagnostic information (storing in the data area of the user program)	For the structure, see section *Structure of the Slave Diagnostic Information*; SFC see reference manual *System and Standard Functions*
	SFC59 "RD_REC"	Reading out data records of S7 diagnostics (storing in the data area of the user program)	
SIMATIC S5 with IM 308C as DP master	FB192 "IM308C"	Reading out slave diagnostic information (storing in the data area of the user program)	For the structure, see section *Structure of the Slave Diagnostic Information*; FB see manual *ET 200 Distributed I/O Station*

Example of Reading out S7 Diagnostic Information with SFC13 "DPNRM _DG"

Here, you will find an example of how you can read out the slave diagnostic information for a DP slave in the STEP 7 user program using SFC13.

Assumptions

For this STEP 7 user program, the following is assumed:

- The diagnostic address of the ET 200iS is 1022 ($3FE_H$).
- The slave diagnostic information will be stored in DB82: starting at address 0.0, length 96 bytes.
- The slave diagnostic information consists of 96 bytes.

STEP 7 User Program

STL	Explanation
CALL SFC 13	
REQ :=TRUE	Read request
LADDR :=W#16#3FE	Diagnostic address of the ET 200iS
RET_VAL :=MW 0	RET_VAL of SFC 13
RECORD :=P#DB82.DBX 0.0 BYTE 96	Data record for the diagnostic information in DB82
BUSY :=M2.0	Reading takes several OB1 cycles

Example of Reading out the Slave Diagnostic Information with FB192 "IM 308C"

Here, you will find an example of how you can read out the slave diagnostic information for a DP slave in the STEP 5 user program using FB192.

Assumptions

For this STEP 5 user program, the following is assumed:

- The IM 308-C as DP master occupies pages 0 to 15 (number 0 of the IM 308-C).
- The DP slave has PROFIBUS address 3.
- The slave diagnostic information will be entered in DB20. You can also use a different data block.
- The slave diagnostic information consists of 96 bytes.

STEP 5 User Program

```
STL                                 Explanation
 :C DB 30
 :JU FB 192
Name :IM308C
DPAD : KH F800                      Default address range of the IM 308-C
IMST : KY 0, 3                      IM no. = 0, PROFIBUS address of the DP slave = 3
FCT : KS SD                         Function: Read out slave diagnostic information
GCGR : KM 0                         not evaluated
TYP : KY 0, 20                      S5 data area: DB20
STAD : KF +1                        Diagnostic data starting and data word 1
LENG : KF -1                        Diagnostic length = joker length (all permitted
                                    bytes)
ERR : DW 0                          Error code stored in DW 0 of DB 30
```

7.8.3 Diagnostic Messages of the Electronics Modules

Introduction

With SIMATIC PDM, you can set the diagnostic messages for the following modules:

- Digital input modules
- Digital output modules
- Analog input modules
- Analog output modules

Digital Input Modules

Table 7-15 Digital Input Modules

Diagnostic Message	Effective for	Parameters can be assigned
Short circuit	Channel	yes
Wire break	Channel	yes
Error	Module	No
Bad parameter	Module	No
External error	Channel	No

Digital Output Modules

Table 7-16 Digital Output Modules

Diagnostic Message	Effective for	Parameters can be assigned
Short circuit	Channel	yes
Wire break	Channel	yes
Error	Module	No
Bad parameter	Module	No
External error	Channel 0, channel 3	No

Analog Input Modules

Table 7-17 Analog Input Modules

Diagnostic Message	Effective for	Parameters can be assigned
Short circuit*	Channel	yes
Wire break	Channel	yes
Value above upper measuring range	Channel	yes
Value below lower measuring range	Channel	yes
Error	Module	No
Bad parameter	Module	No

*2AI I 2WIRE, 2AI RTD, 2AI I 2WIRE HART only

Analog Output Modules

Table 7-18 Analog Output Modules

Diagnostic Message	Effective for	Parameters can be assigned
Short circuit	Channel	yes
Wire break	Channel	yes
Error	Module	No
Bad parameter	Module	No

Actions Following a Diagnostic Message in STEP 7 or DPV1

Every diagnostic message leads to the following actions:

- In S7 or DPV1 mode, diagnostic information is reported as a diagnostic interrupt.
- In DPV1 mode, diagnostic information is also reported when the CPU is in STOP mode. The diagnostic frame also includes the module status and channel-related diagnostics.
- Following a diagnostic message,
  - it is entered in the diagnostic frame as a diagnostic interrupt field (always one interrupt only)
  - it is stored in the diagnostic buffer of the CPU
- The SF-LED on the IM 151-2 is lit.
- OB82 is called. If OB82 does not exist, the CPU changes to STOP mode.
- Acknowledgment of the diagnostic interrupt (following this a new interrupt is possible)

Actions Following a Diagnostic Message in DPV0

The error is entered in the channel-related diagnostic information in the diagnostic frame:

- The SF-LED on the IM 151-2 is lit.
- There can be more than one diagnostic message at the same time.

Causes of Errors and Remedies

The causes of errors and remedies following diagnostic messages are described in section *Channel-Related Diagnostics*.

7.8.4 Evaluating Interrupts from the ET 200iS (S7-DP Slave/ DPV1 Slave)

Introduction

Certain error scores the DP slave to trigger an interrupt. Depending on the DP master you are using, the evaluation of the interrupt follows different procedures.

Evaluating Interrupts with an S7 DP Master or DPV1 Master

Requirement: You have configured the ET 200iS with STEP 7 (Version 5.1, Service Pack 2, Hotfix 1 or higher) or PCS 7 (Version 5.2 or higher); in other words, interrupts are only supported if the ET 200iS functions as an S7-DP slave or DPV1 slave.

If an interrupt occurs, interrupt LPs are called automatically in the CPU of the DP master (see programming manual *System Software for S7-300/S7-400, Program Design*).

Evaluating Interrupts with Other DP Masters

If you operate the ET 200iS with a different DP master or as a DP standard slave, no interrupts are generated.

Triggering a Diagnostic Interrupt

When an event (for example wire break) enters all leaves the state, the module triggers a diagnostic interrupt if "Enable: Diagnostic interrupt“ is set.

The CPU interrupts execution of the user program and runs the diagnostic block OB82. The event that led to the interrupt been triggered is entered in the startup information of OB82.

Triggering a Hardware Interrupt

If a hardware interrupt occurs, the CPU interrupts execution of the user program and runs the hardware interrupt block OB40.

The channel of the module that triggered the hardware interrupt is entered in the startup information of OB40 in the variable OB40_POINT_ADDR. The schematic below shows the assignment to the bits of the local data double word 8.

- Analog input modules

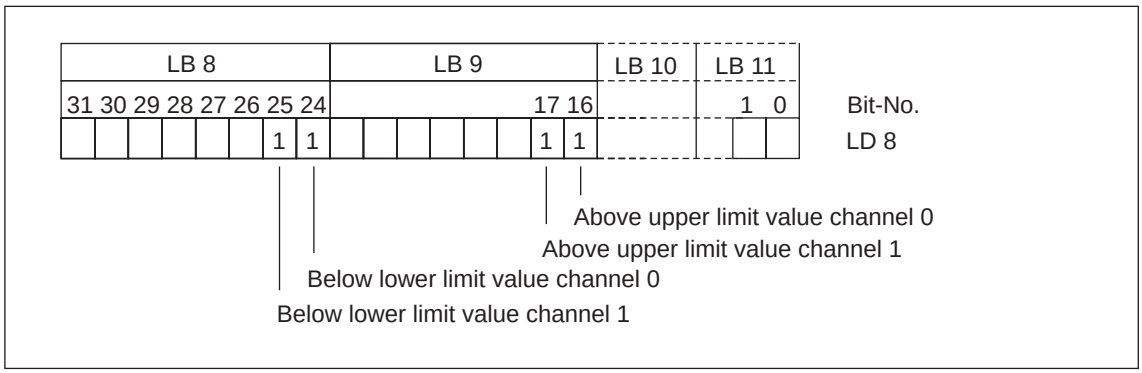


Figure 7-9 Interrupts from Analog Input Modules

Note

You will find a description of OB40 in the reference manual *System and Standard Functions*

Triggering a Remove/Insert Interrupt

Remove/insert interrupts are supported only by S7-400s and in the DPV1 mode.

The CPU (S7-400) interrupts execution of the user program and runs the diagnostic block OB83. The event that led to the interrupt been triggered is entered in the startup information of OB83.

Triggering an Update Interrupt

Update interrupts are supported only in the DPV1 mode.

The CPU interrupts execution of the user program and runs the diagnostic block OB56. The event that led to the interrupt been triggered is entered in the startup information of OB56.

7.8.5 Structure of the Slave Diagnostic Information

Structure of the Slave Diagnostic Information

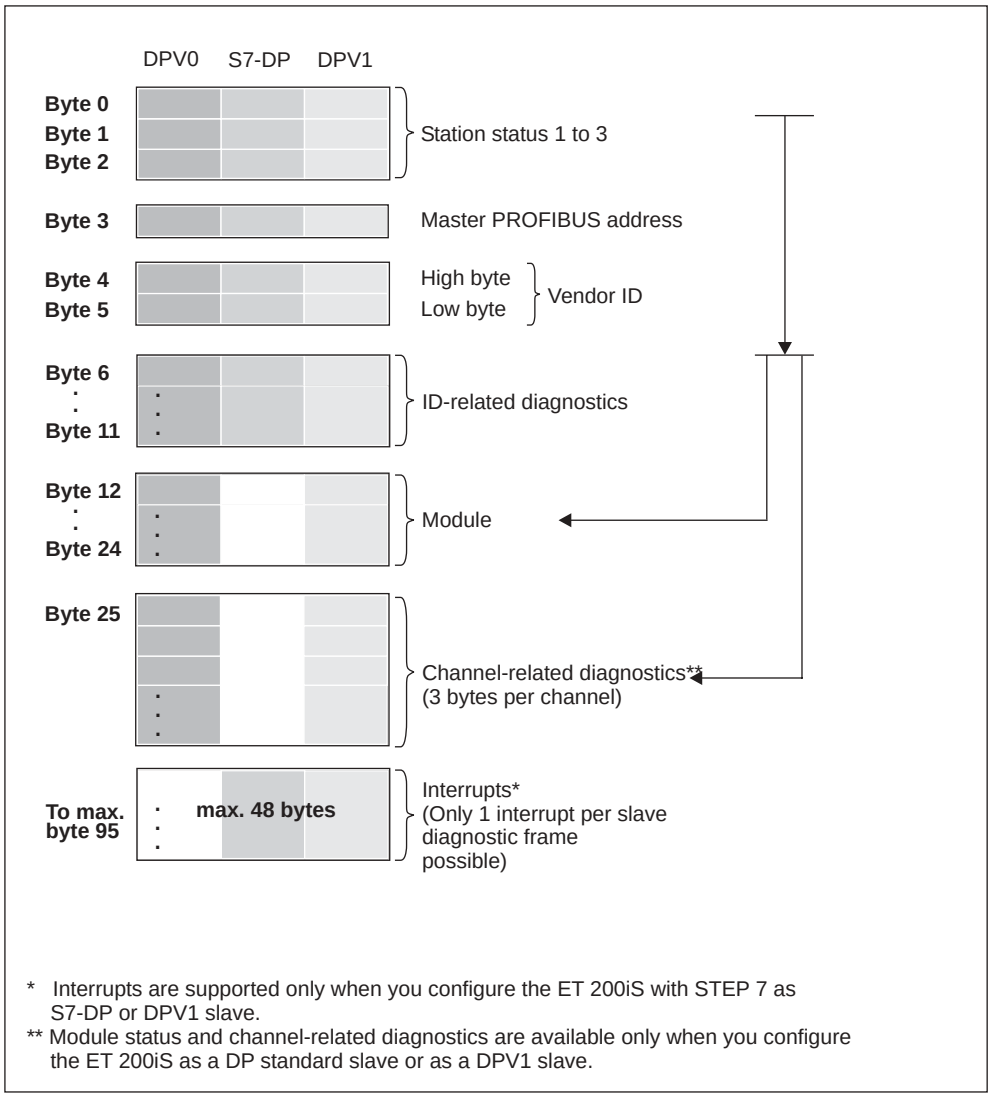


Figure 7-10 Structure of the Slave Diagnostic Information

7.8.6 Station Status 1 to 3

Definition

Stations status 1 to 3 provides an overview of the status of a DP slave.

Station Status 1

Table 7-19 Structure of Station Status 1 (Byte 0)

Bit	Meaning	Cause / Remedy
0	1: The DP slave cannot be accessed by the DP master. The bit on the DP slave is always "0".	• Is the correct PROFIBUS address set on the DP slave? • Is the bus connector plugged in? • Is the power supply for the DP slave on? • RS-485 repeater set correctly? • Has there been a RESET on the DP slave (off/on)?
1	1: The DP slave is not yet ready for data exchange.	• Wait, the DP slave is currently starting up.
2	1: The configuration data sent to the DP slave by the DP master do not match the actual configuration of the DP slave.	Has the correct station type or correct configuration of the DP slave been entered in the configuration software?
3	1: External diagnostic information exists.	Evaluate the channel-related diagnostic information, the module status and/or the channel-related diagnostic information. As soon as all errors have been eliminated, bit 3 will be reset. The bit will be set again when there is a new diagnostic message in the bytes of the diagnostic information.
4	1: The requested function is not supported by the DP slave (for example, changing the PROFIBUS addressusing the software).	Check the configuration.
5	1: The DP master cannot interpret the reply from the DP slave.	Check the bus configuration.
6	1: The DP slave type does not match the software configuration.	Compare the defined and actual configuration.
7	1: The parameters for the DP slave were set by a different DP master (not by the DP master that currently has access to the DP slave).	The bit is always 1 if, for example, you are currently accessing the DP slave from the programming device or a different DP master. The PROFIBUS address of the DP master that set the parameters for the DP slave is in the diagnostic byte "master PROFIBUS address".

Station Status 2

Table 7-20 Structure of Station Status 2 (Byte 1)

Bit	Meaning
0	1: The parameters for the DP slave must be reassigned.
1	1: A diagnostic message exists. The DP slave will not operate until the problem is eliminated (static diagnostic message).
2	1: The bit on the DP slave is always "1".
3	1: The watchdog is activated for this DP slave.
4	1: The DP slave has received the "FREEZE" control command.
5	1: The DP slave has received the "SYNC" control command.
6	0: The bit is always "0".
7	1: Bit is always "0". Note: When reading the station status from the DP master, the bit is "1" if the DP slave was deactivated in the DP master. The DP slave is activated; in other words, it is not included in the current processing.

Station Status 3

Table 7-21 Structure of Station Status 3 (Byte 2)

Bit	Meaning
0 to 6	0: Bits are always "0".
7	1: There are more channel-related diagnostic messages than can be shown in the diagnostic frame

7.8.7 Master PROFIBUS Address

Definition

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

- that assigned the parameters to the DP slave and
- that has read and write access to the DP slave.

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

DP Slave not Assigned Parameters by the DP Master (Class 1)

If the value FF_H is entered as the master PROFIBUS address in byte 3, the DP slave was not assigned parameters by the DP master.

No cyclic data exchange takes place.

7.8.8 Vendor ID

Definition

The vendor ID contains a code describing the type of the DP slave.

Vendor ID

Table 7-22 Structure of the Vendor ID (Byte 4, 5)

Byte 4	Byte 5	Vendor ID for
80	6E	IM 151-2

7.8.9 ID-Related Diagnostics

Definition

The ID-related diagnostic information indicates whether or not modules of the ET 200iS have faults. ID-related diagnostic information starts and byte 6 and is 6 bytes long.

ID-Related Diagnostics

The ID-related diagnostic information for the ET 200iS has the following structure:

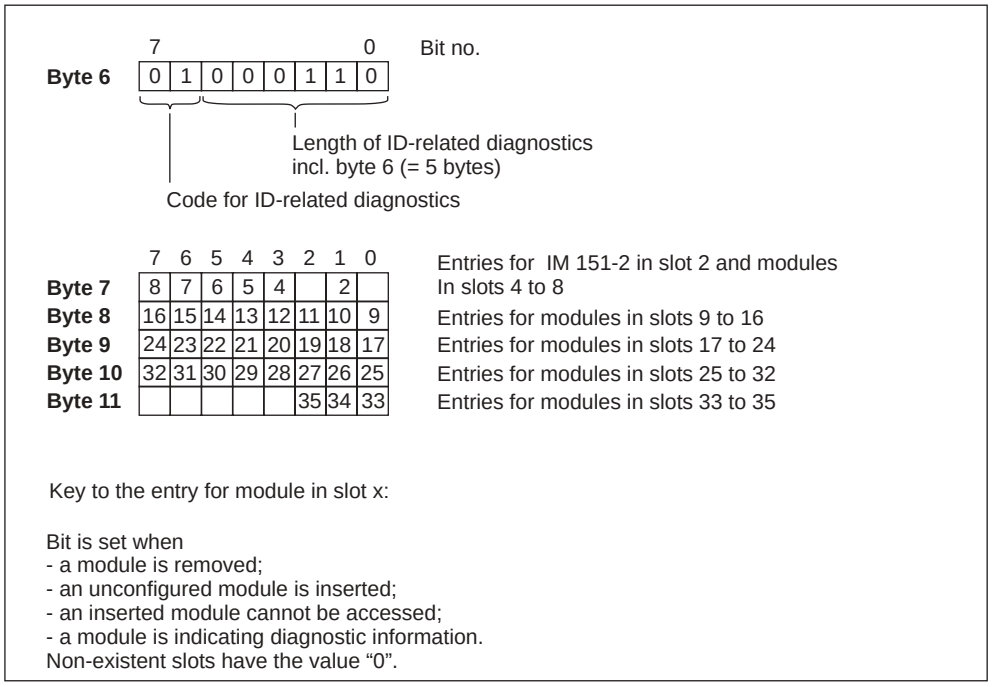


Figure 7-11 Structure of the ID-Related Diagnostic Information for the ET 200iS

7.8.10 Module Status

Definition

The module status indicates the status of the configured modules and provides details of the ID-related diagnostic information relating to the configuration and indicates any module fault.The module status follows the ID-related diagnostic information and is 13 bytes long.

Module Status

The module status for the ET 200iS is structured as follows:

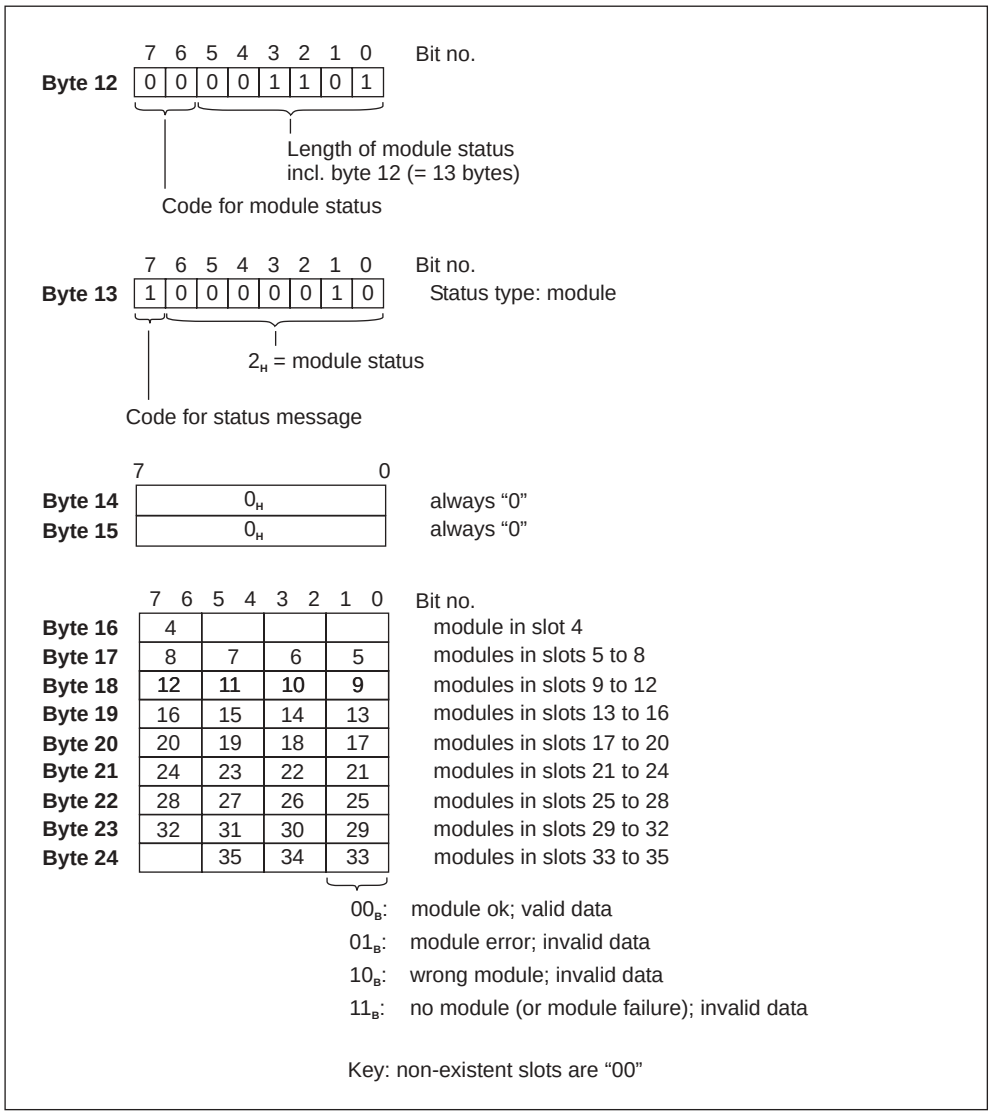


Figure 7-12 Module Status

7.8.11 Channel-Related Diagnostics

Definition

Channel-related diagnostics provides information about channel errors of modules and provides details of the ID-related diagnostics.

For each item of channel-related diagnostic information, three bytes are inserted in compliance with the standard IEC 61158/EN 50170, Volume 2, PROFIBUS.

The channel-related diagnostic information follows the module status.

The channel-related diagnostic information does not influence the module status.

Important: Group diagnostics must be activated for each module!

Channel-Related Diagnostics

The maximum amount of channel-related diagnostic information is limited by the maximum total length of the slave diagnostic information of 96 bytes for the IM 151-2. The length of the slave diagnostic information depends on the number of items of channel-related diagnostic information currently pending. If there is more channel-related diagnostic information than can be included in the slave diagnostic information, bit 7 "diagnostics overflow“ is set in station status 3.

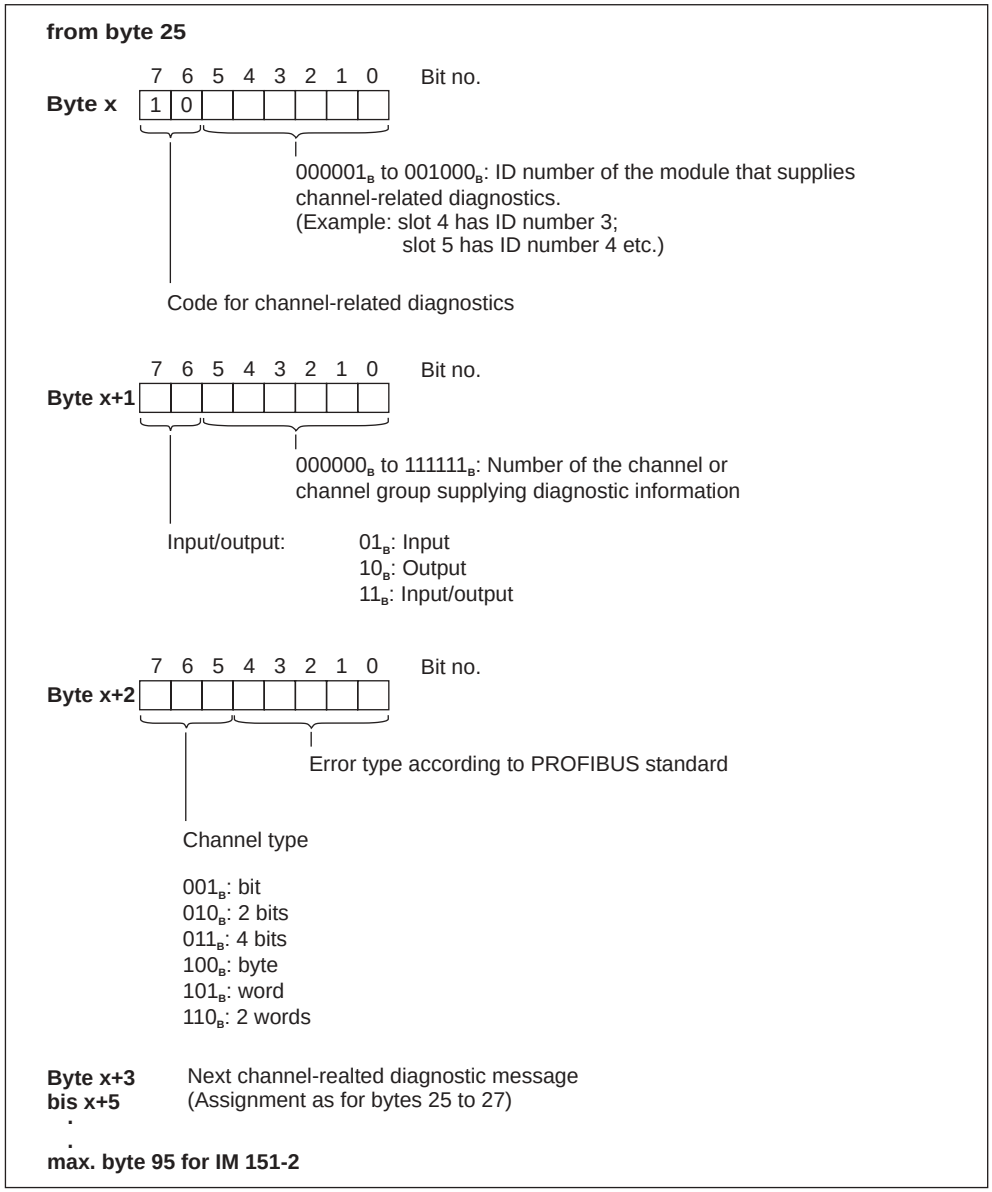


Figure 7-13 Structure of the Channel-Related Diagnostic Information

Types of Error/Fault of the Electronics Modules

Table 7-23 Types of Error/Fault of the Electronics Modules

Error/Fault Type		Error Text	Meaning	Remedy
00001_B	1_D	Short circuit	• Sensor cable short-circuited to P potential • Sensor cable short-circuited to M potential • Output cable short-circuited to P potential • Output cable short-circuited to M potential	Correct the process wiring
			Defective sensor	Replace the sensor
			Wrong sensor type set	Correct the parameter settings
			Output overload	Eliminate overload
00110_B	6_D	Wire break	• Break on the signal line to a sensor • Break on the signal line from an actuator • Break on the sensor power supply cable	Correct the process wiring
			Fault on the external circuit (resistor)	Eliminate problem
			Defective sensor	Replace the sensor
			Wrong sensor type set	Correct the parameter settings
			Input/output channel unused (open)	Deactivate the "group diagnostics" parameter for this output channel
			Load impedance too high	Use an actuator with a lower load impedance
00111_B	7_D	Value over upper limit	The value is above the over-range	• Match the module/actuator correctly • Change the measuring range in the parameter settings
01000_B	8_D	Value under lower limit	The value is below the under-range	• Match the module/actuator correctly • Change the measuring range in the parameter settings
01001_B	9_D	Error	EMC problem	Eliminate the cause of the problem
			Hardware fault on the module	Replace the module
			Sensor signal flutters	Eliminate the cause of the problem

Error/Fault Type		Error Text	Meaning	Remedy
10000_B	16_D	Bad parameter	The module cannot evaluate parameters for the channel	Correct the parameter settings
11010_B	26_D	External error	• Sensor fault • Actuator fault • Changeover contact fault	• Replace the sensor/actuator • Correct the process wiring

7.8.12 Interrupts

Definition

The interrupt section of the slave diagnostic information indicates the interrupt type and the event that led to an interrupt being triggered. The interrupt section can be a maximum of 48 bytes long.

Position in the Diagnostic Frame

The interrupt section is located after the channel-related diagnostic information or after the ID-related diagnostic information (with STEP 7)

Example: If there are three items of channel-related diagnostic information, the interrupt section starts at byte 34.

Content

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

With diagnostic interrupts, diagnostic data record 1 for SIMATIC S7 (44 bytes) is sent as additional interrupt information (starting at byte x+4).

With hardware interrupts, the length of the additional interrupt information is 4 bytes.

With remove/insert interrupts, the length of the interrupt information is 5 bytes.

The following pages describe the significance of these bytes.

Interrupts

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

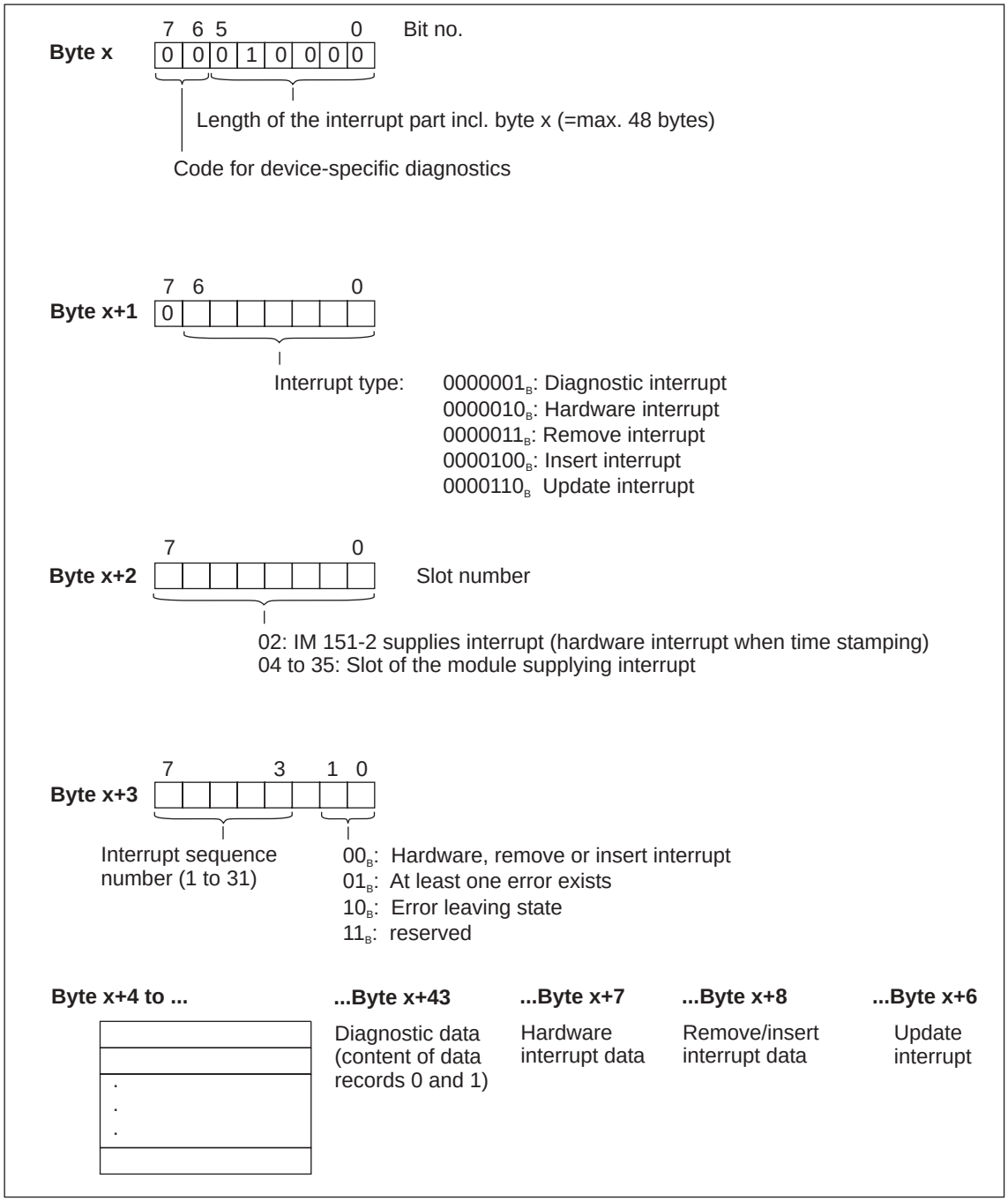


Figure 7-14 Structure of the Interrupt Status of the Interrupt Section

Diagnostic Interrupt, Bytes x+4 to x+7

Bytes x+4 to x+7 correspond to a diagnostic data record 0 in STEP 7.

The bytes from byte x+8 to x+43 correspond to diagnostic data record1 in STEP 7.

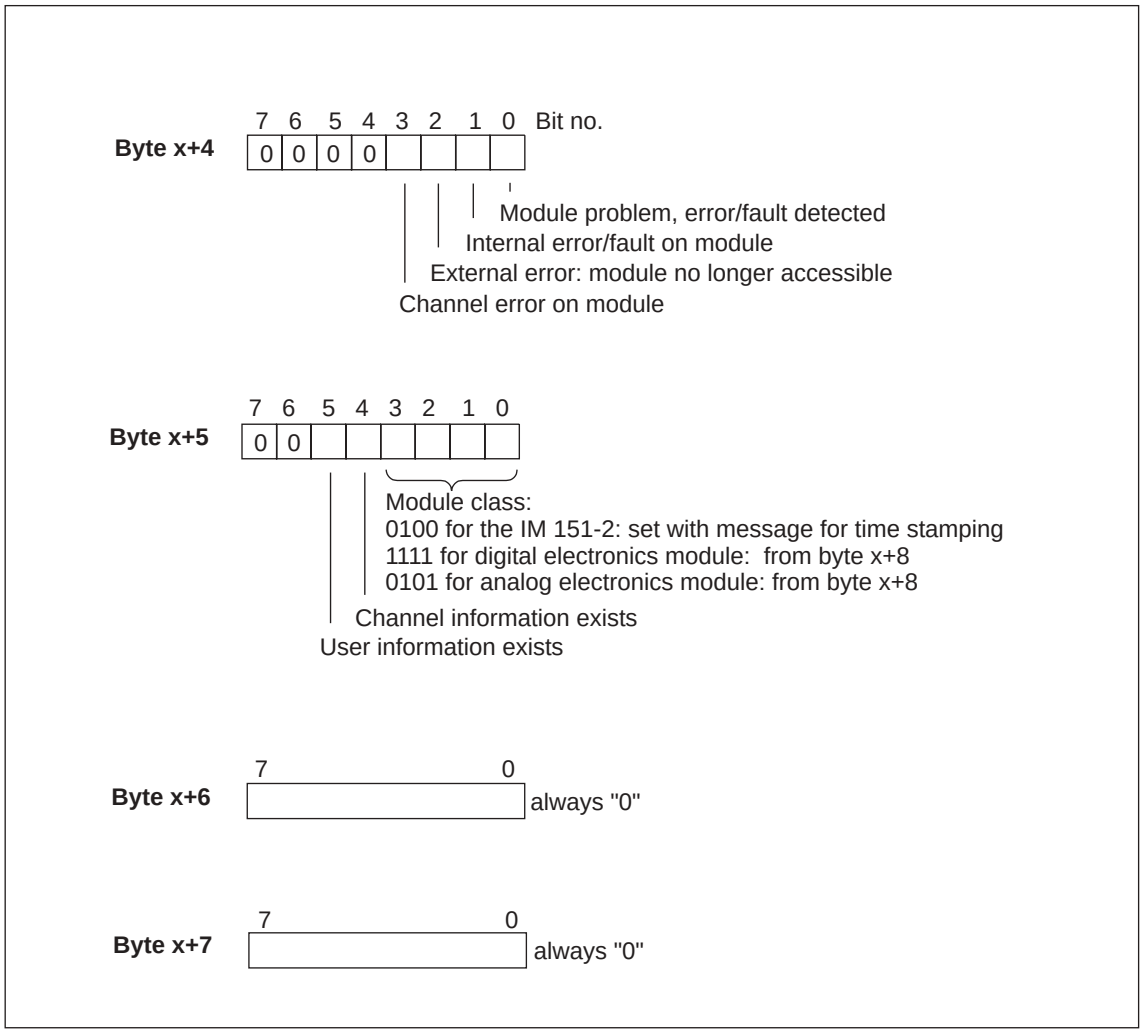


Figure 7-15 Structure of Bytes x+4 to x+7 for Diagnostic Interrupts

Diagnostic Interrupt of Input or Output Modules

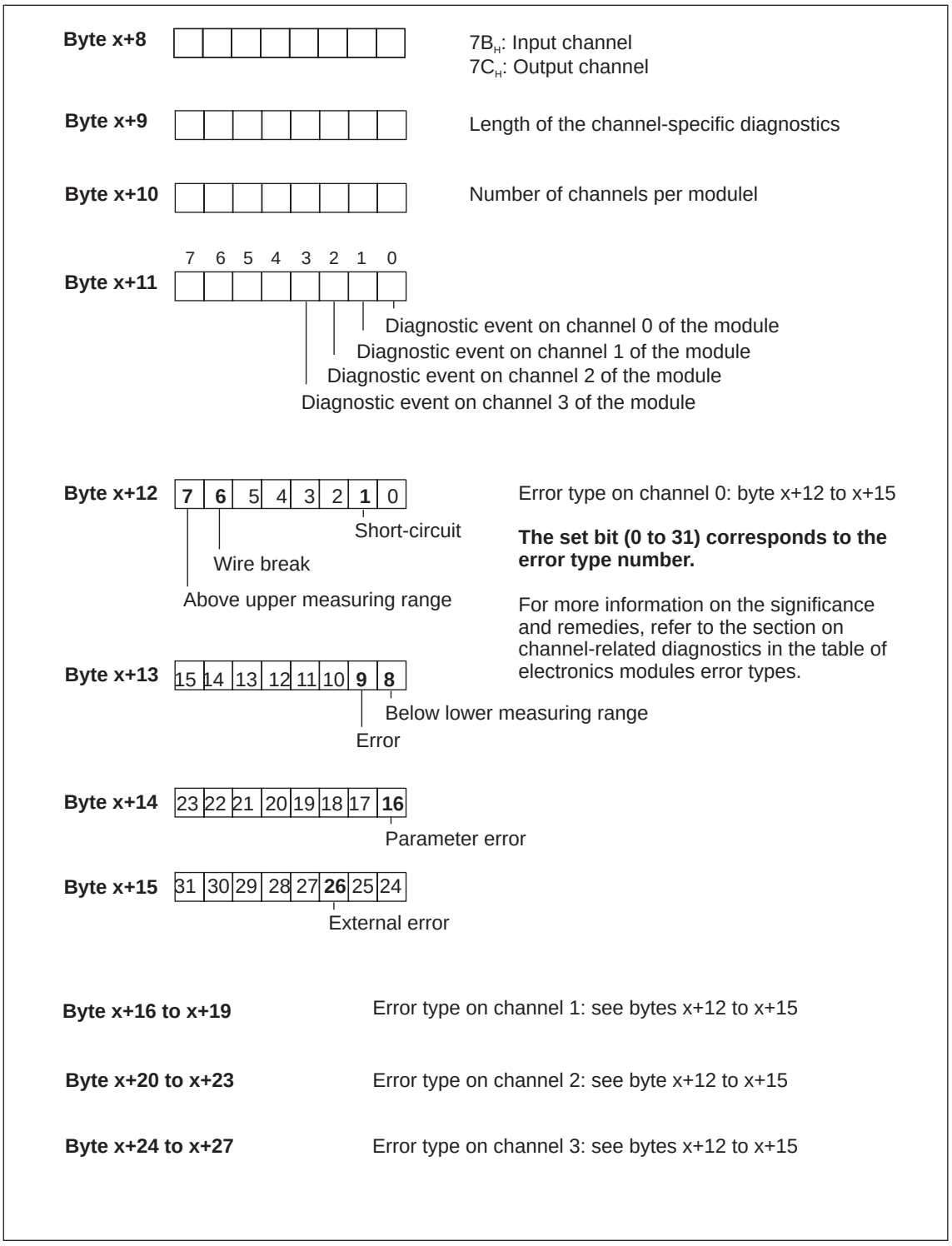


Figure 7-16 Structure Starting at Byte x+8 for Diagnostic Interrupts (Input or Output Modules)

Example of a Diagnostic Interrupt

Example: The 4DI NAMUR electronics module reports the “wire break” diagnostic interrupt on channel 2"

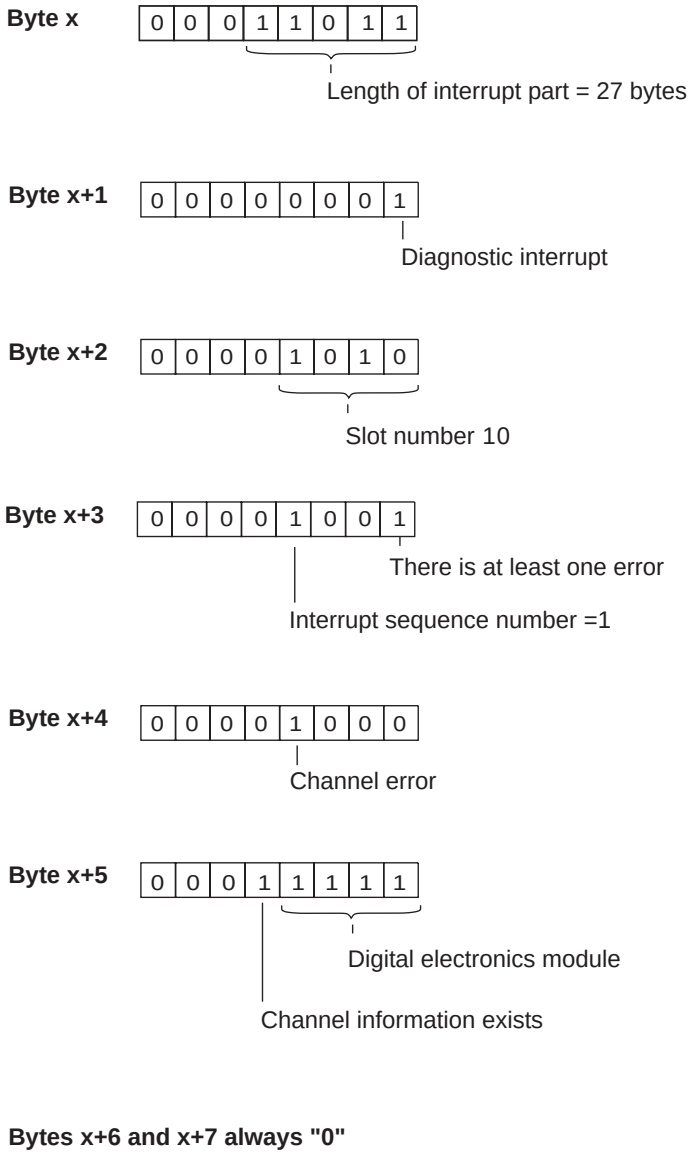


Figure 7-17 Example of a Diagnostic Interrupt

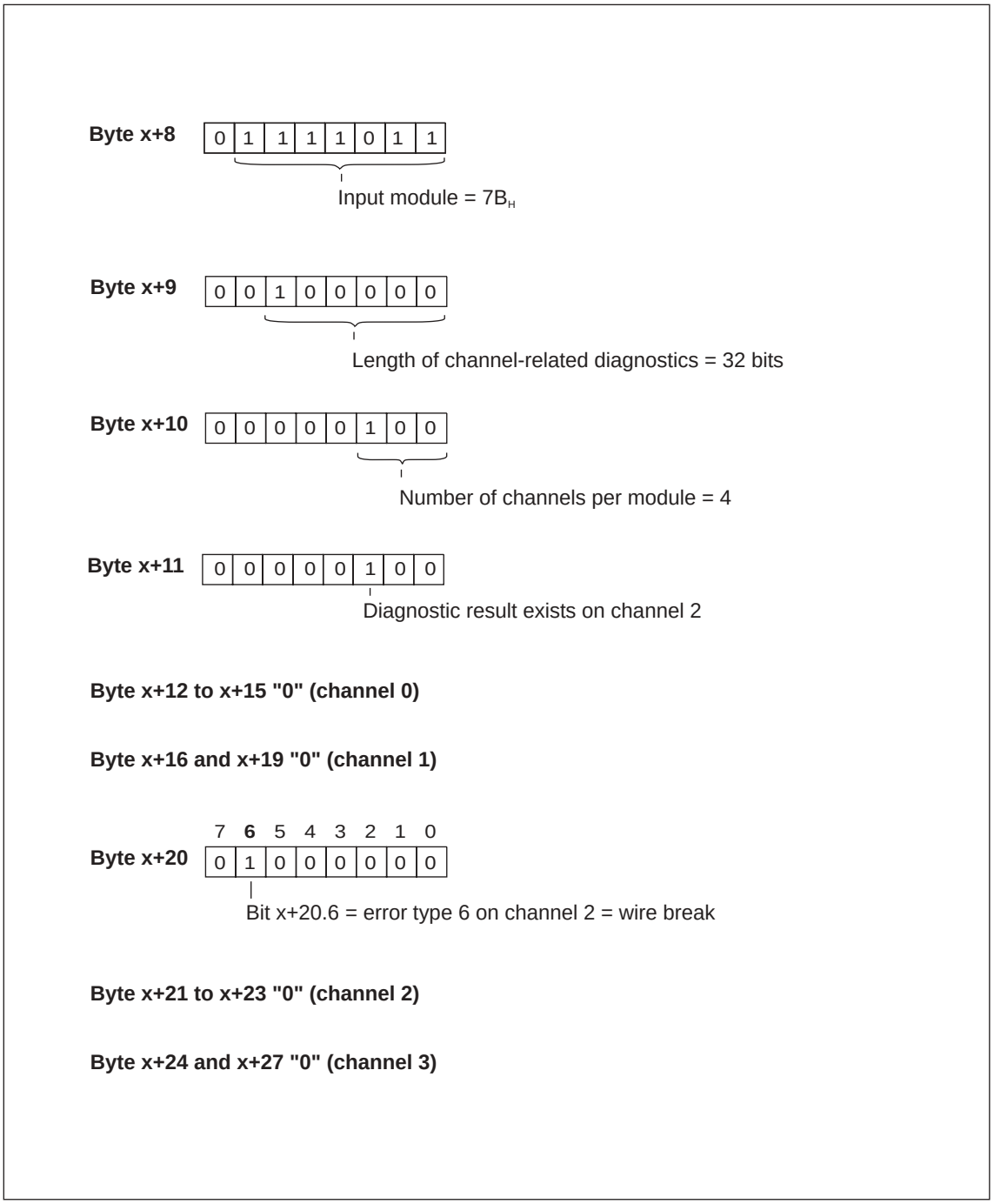


Figure 7-18 Example of a Diagnostic Interrupt (continued)

Hardware Interrupt of Analog Input Modules

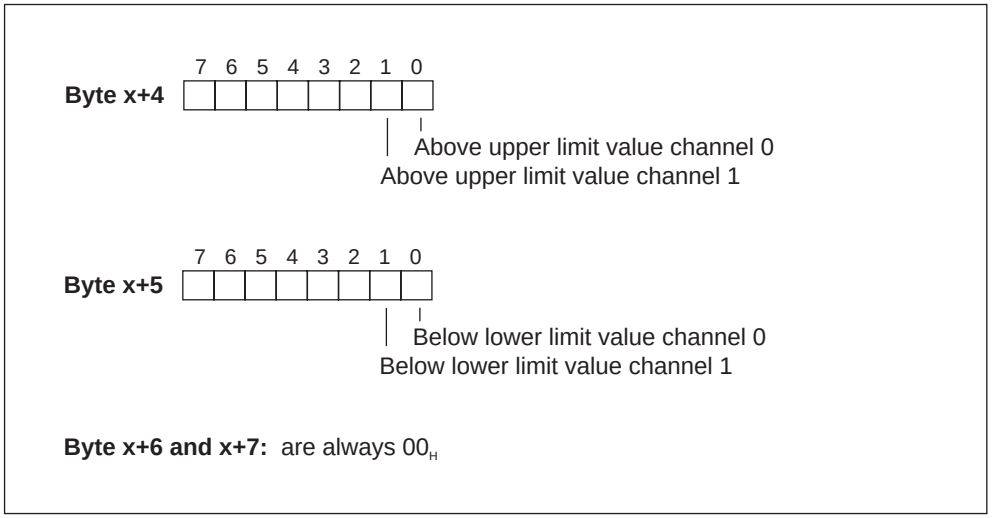


Figure 7-19 Structure Starting at Byte x+4 for Hardware Interrupts (Analog Input)

Remove/Insert Interrupt

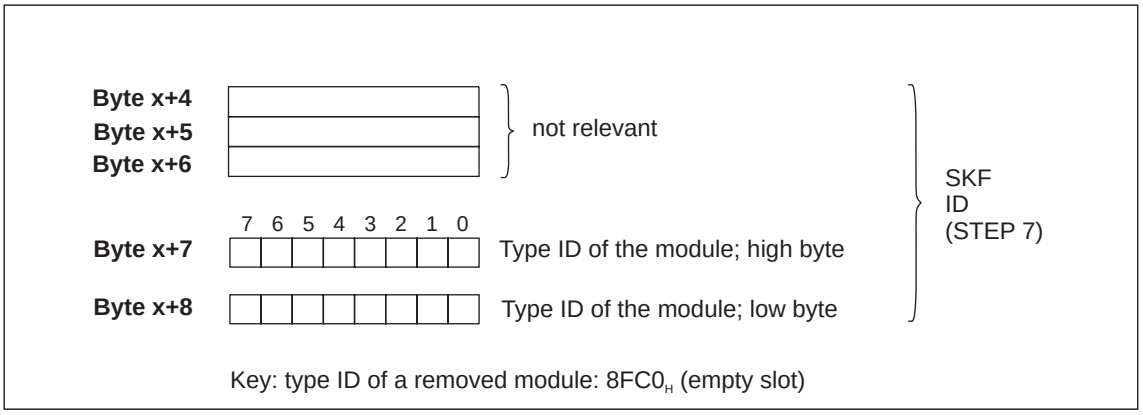


Figure 7-20 Structure Starting at Byte x+4 for Remove/Insert Interrupts

Bytes x+4 to x+8 contain the ID of the module that was removed or inserted. The IDs of the modules can be found in the GSD file.

You can recognize whether the modules were removed or inserted by the interrupt type in byte x+1. (See *Structure of the Interrupt Status of the Interrupt Section*)

Update Interrupt

The update interrupt is signaled when the following conditions are met:

- The parameter assignment is a free of errors.
- The parameter settings for the ET 200iS differ from the parameters and identification data stored in retentive memory on the modules.

Byte x+4		Data record index: is the number of the parameter assignment data record that led to the update interrupt.
Byte x+5		Number of updates that could not be signaled to the CPU.

Figure 7-21 Structure Starting at Byte x+4 for Update Interrupt

7.8.13 Diagnostics for Incorrect Module Configuration of the ET 200iS

Incorrect Module Configuration

The following incorrect module configurations in the ET 200iS lead to an ET 200iS station failure or prevent startup of the data exchange. These reactions are not dependent on whether or not IM 151-2 parameter "Startup when defined and actual configuration differ" is enabled:

- 2 modules missing
- Bus termination module missing
- Number of modules exceeds maximum configuration
- Module in the slot 1 missing
- Backplane bus fault (for example defective terminal module)

Note

If a module is missing (there is a gap) and the ET 200iS power supply is turned off and then on again, this leads to an ET 200iS station failure.

Diagnostics

You can recognize all the incorrect module configuration states based on the following diagnostic information:

Table 7-24 Diagnostics for Incorrect Module Configuration of the ET 200iS

ID-Related Diagnostics	Module Status
All the bits from slot 4 to 35 are set	01_B: "Module error, invalid user data" from slot 4 to 35

Maintenance

8

8.1 Activities During Operation

Features

The table below describes the activities that can be performed on the ET 200iS in zone 1 and zone 2:

Requirements

The ET 200iS is in operation.

Permitted Activities in Zone 1

Table 8-1 Permitted Activities in Zone 1

Activities	See...
Removing and inserting modules during operation (hot swapping)	Section *Maintenance*
Maintenance during operation (visual checks)	Section *Maintenance*
Cleaning	Section *Maintenance*
Removing and inserting the bus connector at the terminal module TM-IM	Section *Wiring*
Disconnecting the cables to the sensors, actuators, and HART field devices and the terminal module TM-E	Section *Wiring*
Making new parameter settings and diagnostics for the ET 200iS	Section *Commissioning and Diagnostics*

Permitted Activities in Zone 2

In addition to the activities permitted in zone 1, the following activity is also permitted:

Caution

Disconnecting and connecting cables for the DC 24V power supply at the terminal module TM-PS during operation. This activity is permitted only when there is no risk of explosion or when there is no power applied to the terminal module TM-PS.

8.2 Removing and Inserting Electronics Modules during Operation (Hot Swapping)

Features

- The ET 200iS distributed I/O station supports the removal and insertion of one electronics module (1 gap) during operation (RUN mode).
- If one electronics module is removed, the ET 200iS remains in the RUN mode.
- If you remove more than one electronics module, this leads to an ET 200iS station failure. Once you have inserted all the electronics modules again, you must restart the ET 200iS; in other words, turn the power supply off and on at the power supply module PS.
- If you install only one electronics module in an ET 200iS, removing this electronics module will lead to an ET 200iS station failure. When you insert the electronics module, the ET 200iS starts up again.
- All current parameters and identification data of the ET 200iS are stored in an internal flash memory on the IM 151-2. After replacing a module, IM 151-2 automatically transfers the current parameters and identification data to the new module. This function is always active on the ET 200iS and cannot be influenced by the user.
  - The current parameters and identification data are retained on the IM 151-2 even if the power supply for the ET 200iS fails.
  - The default parameters of an electronics module are overwritten.

Note

The flash memory (parameters and identification data) of the IM 151-2 is erased if you change the PROFIBUS address and turn on the power supply for the ET 200iS at the power supply module.

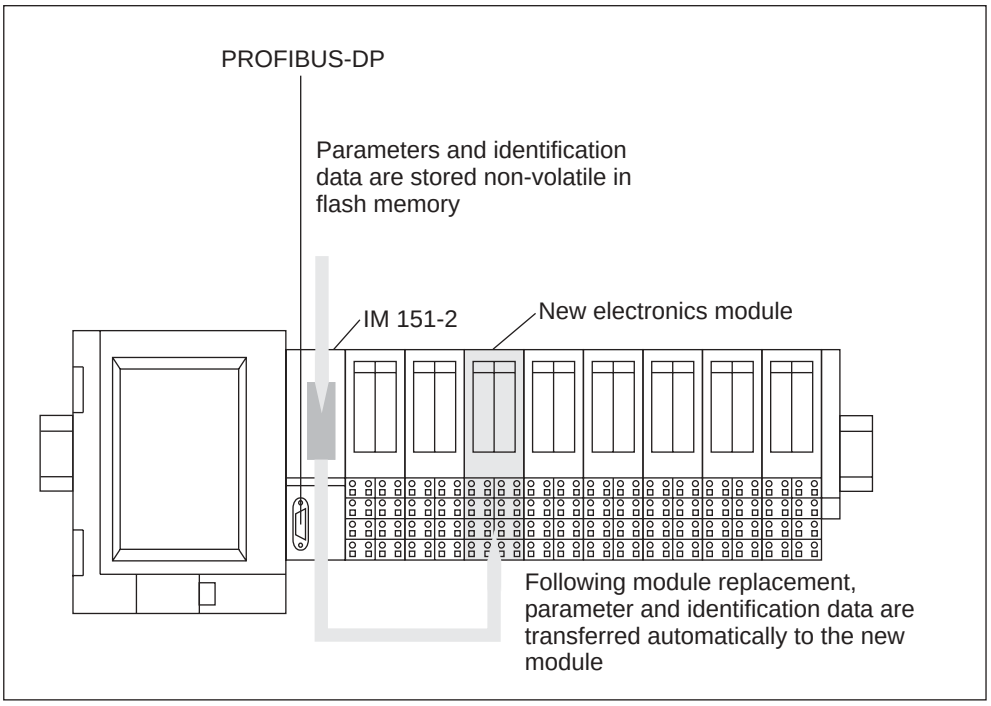


Figure 8-1 Automatic Parameter Assignment after Replacing a Module

Requirements

- When the ET 200iS starts up, all modules must be inserted.
- Removing and inserting electronics modules during operation (RUN mode) is possible only if you have enabled the **Startup when defined and actual configuration differ** parameter for the IM 151-2.
- Only **one** electronics module may be removed and one time.
- The following table describes which modules you can remove and insert during operation:

Table 8-2 Requirements

Module	Remove and Insert	Effects on the ET 200iS
Power supply module PS	yes	Remove: Failure of the ET 200iS (the same status as if the power supply is turned off). Insert: Startup of the ET 200iS
Interface module IM 151-2	yes	Remove: Failure of the ET 200iS Insert: The ET 200iS parameters must be assigned from a PG.
Electronics module	yes	Remove: Failure of the sensor/actuator Insert: Sensor/actuator operational

Removing and Inserting Electronics Modules

Remove and insert the electronics modules as described in the section *Wiring*.

Note

Check the two coding elements before inserting the new electronics module in the terminal module.

8.3 Maintenance During Operation

Features

Maintenance of the ET 200iS is effectively restricted to visual inspections. These can be performed while the ET 200iS is operating.

Requirements

In zone 1 and zone 2, a visual inspection should be made every six months.

Procedure

1. Check that the cable inlets in the enclosure are sealed and intact.
2. Check whether there is any water or liquid inside the enclosure. If there is, find out how it got there.
3. Check that the wiring is secure (connectors, cables).

8.4 Cleaning

Note on Safety

Warning

Plastics can develop an electrostatic charge when they are cleaned. If you are operating the ET 200iS in zone 1 or zone 2, this can represent a danger:

Clean the ET 200iS only with damp cloths.

A sign with the warning "Clean the ET 200iS only with damp cloths" must be placed inside the enclosure.

Following cleaning, run a functional check of the ET 200iS.

General Technical Specifications 9

9.1 General Technical Specifications

What Are General Technical Specifications?

The general technical specifications contain the standards and test values to which the ET 200iS distributed I/O station complies and adheres and the test criteria with which the ET 200iS distributed I/O station was tested.

9.2 Standards, certificates and approvals

Introduction

This section contains the following information on the components of the ET 200iS:

- The most important standards, with which the ET 200iS complies
- Approvals for the ET 200iS

PROFIBUS Standard

The ET 200iS distributed I/O station is based on the standard IEC 61158/EN 50170, Volume 2, PROFIBUS.

IEC 61131

The ET 200iS distributed I/O station meets the requirements and criteria of the IEC 61131-2 standard.

CE Mark

Our products meet the requirements and protective aims of the following EU directives and comply with the harmonized European standards (EN) published by the European Union for programmable logic controllers:

- 89/336/EEC "Electromagnetic Compatibility" (EMC Directive)
- 73/23/EEC" Electrical Equipment Designed for Use within Certain Voltage Limit"s (Low Voltage Directive)

The EU declarations of conformity are available for the relevant authorities and are kept at:

Siemens Aktiengesellschaft
Bereich Automatisierungstechnik
A & D AS E 4
Postfach 1963
D-92209 Amberg

CE Mark in Compliance with ATEX 100a

In addition to the information on the CE mark above, the ET 200iS also meets the following harmonized European directive (EN) for use explosive atmospheres:

94/9/EC "Equipment and Protective Systems for Use in Explosive Atmosphere"s.

Mark for Australia

Our products meet the requirements of the AS/NZS 2064 standard (Class A).

Figure 9-1 Mark for Australia

Safety Standards Complying with CENELEC

The ET 200iS meets the following safety standards

- EN 50014
- EN 50018
- EN 50019
- EN 50020
- EN 50284

FM Approval (applied for)

Factory Mutual Approval Standard Class Number 3611, Class I, Division 2, Group A, B, C, D, Class I, Zone 2

Factory Mutual Approval Standard Class Number 3610, Class I, Zone 1

Note

Please observe the instructions in the sections *Installation*, *Wiring* and *Maintenance*!

Shipbuilding Approvals (applied for)

Classification Societies:

- ABS (American Bureau of Shipping)
- BV (Bureau Veritas)
- DNV (Det Norske Veritas)
- GL (Germanischer Lloyd)
- LRS (Lloyds Register of Shipping)

9.3 Electromagnetic Compatibility, Transport and Storage Conditions

Definition

Electromagnetic compatibility is the ability of electrical equipment to function satisfactorily in its electromagnetic environment without influencing this environment.

The ET 200iS distributed I/O station also meets the requirements of the EMC laws of the European Single Market. This is only possible if the ET 200iS distributed I/O station corresponds to the regulations and directives for electrical installation.

Pulse-Shaped Disturbance

The following table shows the electromagnetic compatibility of the ET 200iS distributed I/O station with relation to pulse-shaped disturbances.

Table 9-1 Pulse-Shaped Disturbances

Pulse-Shaped Disturbance	Tested with	Corresponds to severity
Electrostatic discharge according to IEC 61000-4-2	8 kV 4 kV	3(air discharge) 2(contact discharge)
Burst pulse (fast transients) according to IEC 61000-4-4	2 kV (power supply line) 2 kV (signal line)	3 3
Surge according to IEC 61000-4-5 Only with lightning protection elements (see section *Wiring*) • asymmetrical coupling • symmetrical coupling	 2 kV (power supply line) 2 kV (signal/data line) 1 kV (power supply line) 1 kV (signal/data line)	3

Sinusoidal Disturbances

The following table shows the electromagnetic compatibility of the ET 200iS distributed I/O station with relation to sinusoidal disturbances.

Table 9-2 Sinusoidal Disturbances

Radiated electromagnetic energy according to IEC 61000-4-3 Radio frequency electromagnetic field		Induced RF voltage according 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 Veff unmodulated
80 % AM (1 kHz)	50 % ED	80 % AM (1 kHz)
	200 Hz repetition frequency	150 ohms source impedance

Emission of Radio Interference

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

Table 9-3 Emission of Radio Interference

Frequency	Noise emission
from 30 to 230 MHz	< 40 dB (µV/m)Q
from 230 to 1000 MHz	< 47 dB (µV/m)Q

Transport and Storage Conditions

In terms of the transport and storage conditions, the ET 200iS distributed I/O station is better than the requirements of IEC 61131-2. The following information applies to modules transported or stored in their original packing.

Table 9-4 Transport and Storage Conditions

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 to 660 hPa (corresponds to a height of - 1000 to 3500 m)
Relative humidity	from 5 to 95 % without condensation

9.4 Mechanical and climatic environmental conditions

Climatic Ambient Conditions

The following climatic ambient conditions apply:

Table 9-5 Climatic Ambient Conditions

Ambient Conditions	Applications	Remarks
Temperature	from - 20 to 60°C	for horizontal installation
	from - 20 to 40°C	for all other installation positions
Temperature change	10 K/h	
Relative humidity	from 5 to max. 95 %	intermittent condensation for brief time
Air pressure	from 1080 to 795 hPa	corresponds to a height of -1000 to 2000 m
Pollutant concentration	SO_2: < 0.5 ppm; rel. humidity < 60 %, no condensation H_2S: < 0.1 ppm; rel. humidity < 60 %, no condensation	Test: 10 ppm; 4 days 1 ppm; 4 days

Mechanical Ambient Conditions

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

Mechanical Ambient Conditions

Frequency Range	Permanent	Intermittent
$5 \leq f \leq 9$ Hz	3.5 mm amplitude	7 mm amplitude
$9 \leq f \leq 150$ Hz	1 g constant acceleration	2 g constant acceleration

Testing for Mechanical and Climatic Ambient Conditions

The following table contains information on the type and scope of the testing for mechanical ambient conditions.

Table 9-6 Testing for Mechanical and Climatic Ambient Conditions

Testing for ...	Test Standard	Terminal and Electronics Modules
Oscillation	Oscillation test according to IEC 60068-2-6 (sine)	Type of oscillation: Frequency sweep with a rate of change of 1 octave/minute. 5 Hz≤ f ≤ 9 Hz, constant amplitude 7 mm 9 Hz≤ f ≤ 150 Hz, constant acceleration 2 g Period of oscillation: 10 frequency sweeps per axis in each of the 3 mutually vertical axes
Shock	Shock test according to IEC 60068-2-27	Type of shock: half sine Strength of shock: 15 g peak value, 11 ms duration Direction of shock: 3 shocks each in +/- direction in each of the 3 mutually vertical axes

9.5 Information on Dielectric Strength Tests, Class of Protection, Degree of Protection and Rated Voltage of the ET 200iS

Dielectric Strength

The dielectric strengthis tested in the routine tests with the following test voltage according to IEC 61131-2:

Table 9-7 Dielectric Strength

Circuits with rated voltage U_e with respect to other circuits or ground	Dielectric Strength
0 V < U_e ≤ 50 V	DC 500 V
50 V < U_e ≤ 300 V	2 x U_{RATED} + 1000 V
300 V < U_e ≤ 600 V	

Degree of Pollution / Overvoltage Category according to IEC 61131

- Pollution degree 2
- Overvoltage category
  - At U_N = DC 24 V: II

Class of Protection

Class of protection I according to IEC 60536

Degree of Protection IP 30

Degree of protection IP 30 according to IEC 60529 for all modules of the ET 200iS; in other words:

- Protection against touch with standard test fingers
- Protection against foreign bodies with a diameter greater than 2.5 mm
- No particular protection against water

Rated Voltage for Operation

The ET 200iS distributed I/O station operates with the following rated voltage:

Table 9-8 Rated Voltage for Operation

Rated Voltage	Tolerance Range
DC 24 V	DC 20.4 to 28.8 V

Terminal Modules

10

10.1 Overview of the Contents

Assignment of Electronics Modules to Terminal Modules

The table below shows you which modules you can use on the various terminal modules.

Table 10-1 Terminal Modules and Electronics Modules

Electronics Modules	**Terminal Modules**		
	TM-PS	TM-IM	TM-E30S44-iS / TM-E30C44-iS
Order number 6ES7 193-	5DA00-0AA0	5DB00-0AA0	5CB00-0AA0 / 5CB10-0AA0
Power supply module PS	X		
Interface module IM 151-2		X	
I/O modules:			
4DI NAMUR			X
2DO DC25V/25mA			X
2AI I 2WIRE			X
2AI I 4WIRE			X
2AI RTD			X
2AI TC			X
2 AO I			X
2AI I 2WIRE HART			X
2AI I 4WIRE HART			X
2AO I HART			X

10.2 Terminal Module for the Power Supply Module TM-PS

Order Number

6ES7 193-5DA00-0AA0

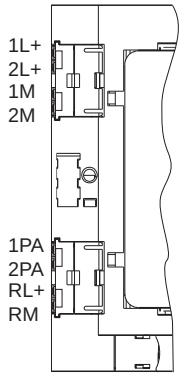
Features

- Terminal module for the power supply module
- Provides power for the entire ET 200iS station
- Connected using screw terminals
- 3 terminals for connection of the supply voltage/ equipotential bonding (load voltage)
- 3 terminals for looping through the supply voltage / equipotential bonding
- 2 terminals for looping through the powerbus voltage (prepared)
- Prewiring of the terminal module possible
- Automatic interference diversion from the power supply module to the DIN rail via spring contacts
- Polarity reversal protection guaranteed by the power supply module.

Terminal Assignment

The following table shows the terminal assignment on the terminal module.

Table 10-2 Terminal Assignment on the Terminal Module TM-PS

Layout	Terminal	Description
	1 L+	Load voltage for inserted power supply module (20 to 30 V DC)
	1 M	
	1 PA	Equipotential bonding
	2 L+	Loop through the load voltage
	2 M	
	2 PA	Equipotential bonding
	RL+	Powerbus voltage for looping through (prepared)
	RM	

Block Diagram

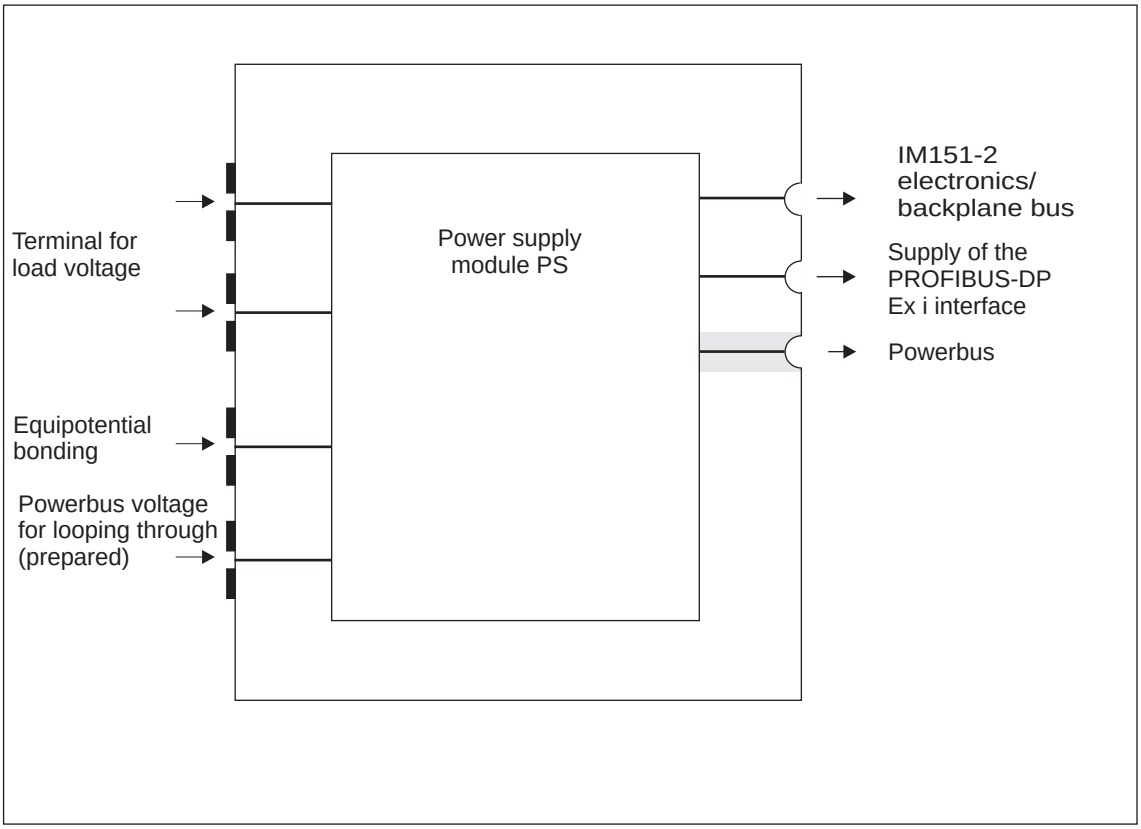


Figure 10-1 Block Diagram of the Terminal Module TM-PS

Technical Specifications

Table 10-3 Technical Specifications of the Terminal Module for the Power Supply Module TM-PS

Dimensions and Weight	
Dimensions	
W x H x D (mm)	165 x 200 x 75
Weight	approx. 700 g
Data Specific to the Module	
Number of terminals	3 low voltage/ equipotential bonding 3 loop through the load voltage/ equipotential bonding 2 loop through powerbus voltage (prepared)
Cable cross-section	0.5 to 4 ^{mm2} *

*Keep to the wiring rules. See section Wiring.

10.3 Terminal Module for the Interface Module TM-IM

Order Number

6ES7 193-5DB00-0AA0

Features

- Terminal module for the interface module
- PROFIBUS-DP Ex i connection over 9-pin sub-D female connector
- Bus interface module (can be replaced when necessary)
- The shape of the protective collars on the left-hand connectors only permits insertion of the TM-IM on a terminal module for the power supply module TM-PS
- Automatic interference diversion from the interface module to the DIN rail via spring contact

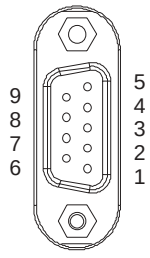
Note

The spring contact to the DIN rail is used to connect the cable shield of the PROFIBUS DP cable with the equipotential bonding system during operation.

Terminal Assignment

The following table shows the pinning of the PROFIBUS-DP Ex i socket on the terminal module.

Table 10-4 Pinning of the PROFIBUS-DP Ex i Socket on the TM-IM

Layout	Signal Name		Description
	1	-	-
	2	-	-
	3	RxD / TxD-P	Data line B
	4	-	-
	5	-	-
	6	-	-
	7	-	-
	8	RxD / TxD-N	Data line A
	9	-	-

Block Diagram

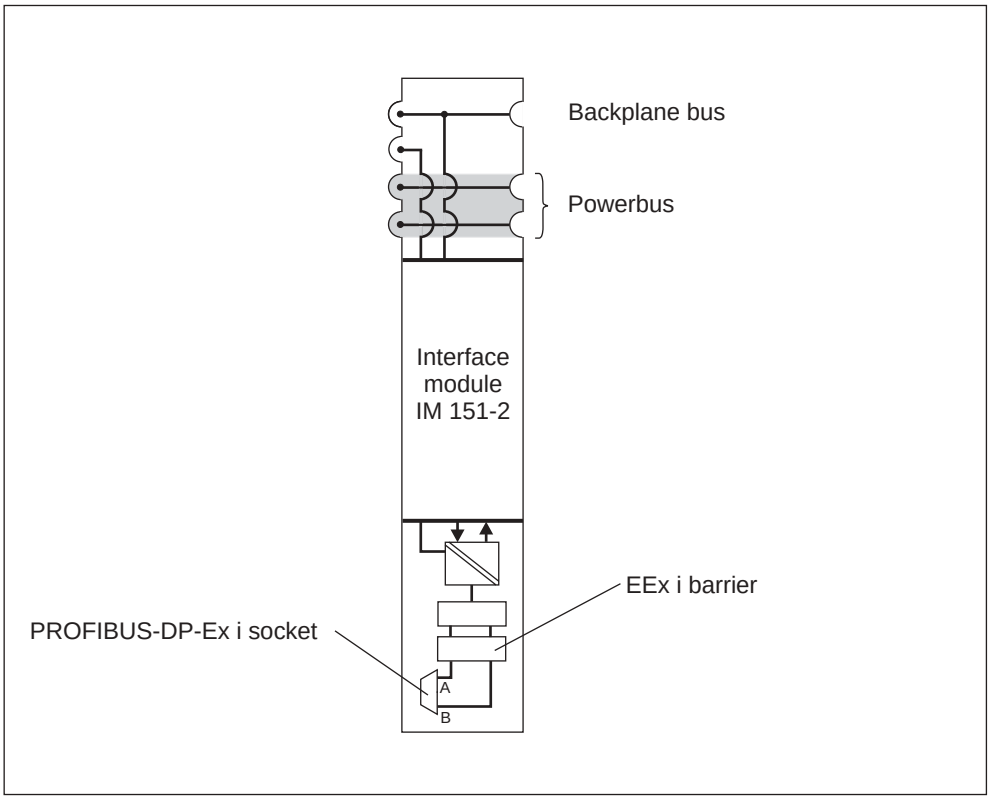


Figure 10-2 Block Diagram of the Terminal Module TM-IM

Technical Specifications

Table 10-5 Technical Specifications of the Terminal Module for the Interface Module TM-IM

Dimensions and Weight	
Dimensions W x H x D (mm)	30 x 132 x 43.5
Weight	approx. 90 g
Data Specific to the Module	
Connectors	1 x 9-pin sub-D female connector for PROFIBUS-DP Ex i
Data Relevant to Safety	
Maximum values of the RS-485 interface	
• U_o	± 4.2 V
• I_o	max. 100 mA
• P_o	106 mW
• U_i	± 4.2 V

10.4 Terminal Modules for Electronics Modules TM-E30S44-iS / TM-E30C44-iS

Order Numbers

6ES7 193-5CB00-0AA0 (screw terminal)

6ES7 193-5CB10-0AA0 (spring terminal)

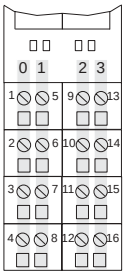
Features

- Terminal module for electronics modules (I/O modules)
- Connection using screw terminals with TM-E30S44-iS
- Connection using spring terminals with TM-E30C44-iS
- 2 terminal blocks each with 2 x 4 terminals for process wiring
- Prewiring of the terminal module possible
- The shape of the connectors on the left-hand side of the terminal module TM-E30S44-iS / E30C44-iS allows only insertion in a terminal module for the interface module TM-IM or in an already inserted terminal module for electronics modules TM-E30S44-iS / E30C44-iS
- Automatic interference diversion from the electronics module to the DIN rail via spring contact

Terminal Assignment

The following table shows the terminal assignment of the terminal module.

Table 10-6 Terminal Assignment of the Terminal Module TM-E30S44-iS / E30C44-iS

Layout	Terminal	Description
	1 5 9 13 2 6 10 14 3 7 11 15 4 8 12 16	The assignment depends on the electronics module inserted

Block Diagram

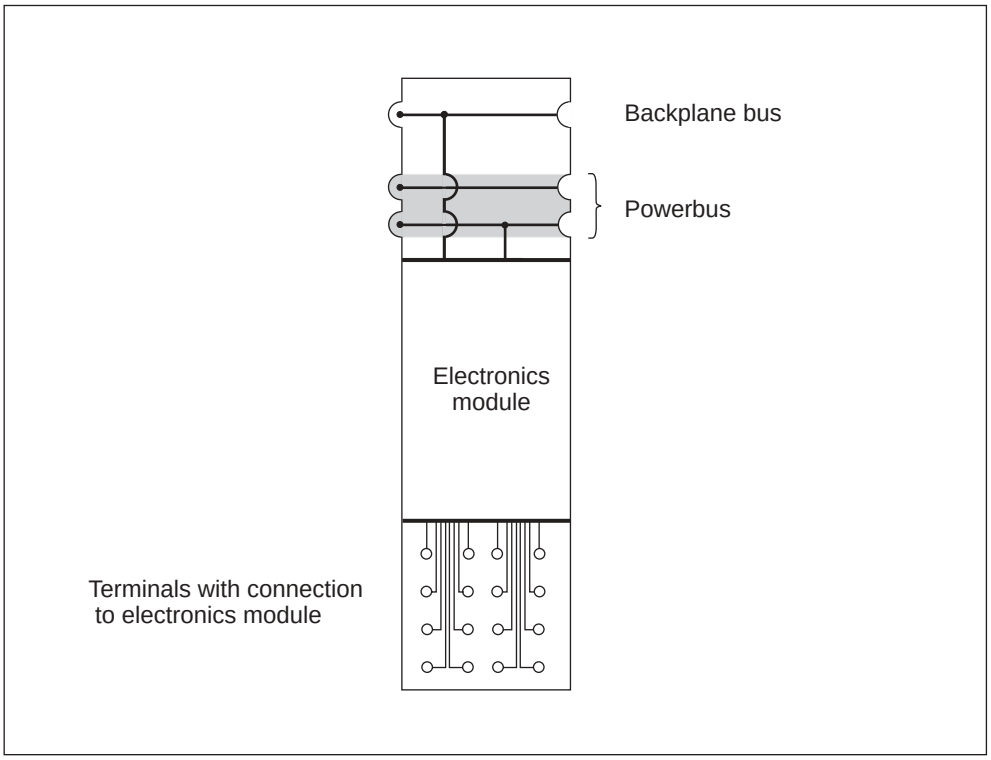


Figure 10-3 Block Diagram of the Terminal Module TM-E30S44-iS / E30C44-iS

Technical Specifications

Table 10-7 Technical Data of the Terminal Modules for Electronics Modules TM-E30S44iS/ TME30C44-iS

Dimensions and Weight	
Dimensions W x H x D (mm)	30 x 132 x 43.5
Weight	approx. 150 g
Data Specific to the Module	
Number of terminals	4 x 4
Wire cross-sections	0.14 to 2.5 ^{mm2} *

*Keep to the wiring rules. See section Wiring.

Power Supply Module

11

11.1 Power Supply Module

Order Number

6ES7 138-5EA00-0AA0

Features

- Supplies the ET 200iS with the required operating voltages for the following while providing reliable electrical isolation:
  - Electronics of the IM 151-2/ backplane bus
  - PROFIBUS-DP Ex i interface of the IM 151-2
  - Powerbus
- Handles the safety-related limitation of the output voltages

Block Diagram

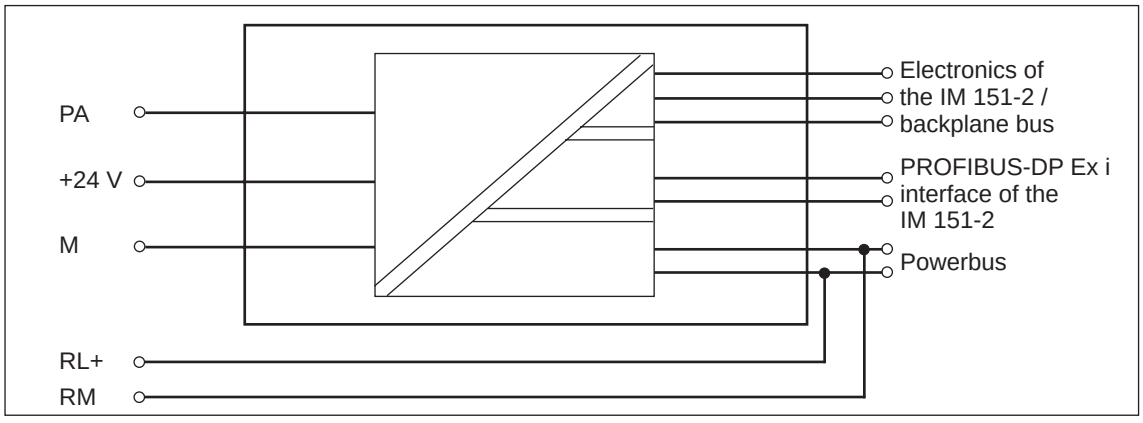


Figure 11-1 Block Diagram of the Power Supply Module

Technical Specifications

Table 11-1 Technical Specifications

Dimensions and Weights	
Dimensions W x H x D (mm)	96.5 x 150 x 150
Weight	approx. 2500 g
Data Specific to the Module	
Type of protection of the module	
• CENELEC	⟨Ex⟩ II2G EEx de [ia/ib] IIC/IIB T4 CE 0344
• FM (applied for)	Class Number 3611: Class I, Division 2, Group A, B, C, D, Class I, Zone 2 Class Number 3610: Class I, Zone 1 T_u = - 20 to 60°C
Voltages, Currents, Potentials	
Power supply	DC 24 V*
• Polarity reversal protection	yes
• Power failure buffering	min. 20 ms (for the backplane bus/ electronics of the IM 151-2 and for the PROFIBUS-DP Ex i interface)
Electrical isolation	
• between the supply voltage and powerbus	yes
• between the supply voltage and backplane bus and PROFIBUS-DP Ex i interface	yes
• between Powerbus and backplane bus and PROFIBUS-DP Ex i interface	yes
• between the backplane bus and PROFIBUS-DP Ex i interface	yes
Permitted potential difference	
• between supply voltage and all output voltages	375 V
Insulation tested with	
• between supply voltage and all secondary voltages	AC 1500 V
• between all output voltages	AC 500 V

Dimensions and Weights	
Current consumption	
• Power supply module PS	max. 2.8 A
Power loss power supply module PS	max. 14 W
Status, Interrupts, Diagnostic Information	
Interrupts	No
Diagnostic Functions	
Supply voltage display (primary side)	green LED "DC24V“
Output voltage display	green LED "POWER“
Diagnostic information readable	No
Data Relevant to Safety	
U_m	250 V

* Protected by circuit breaker

Interface Module

12

12.1 Interface module IM 151-2

Order Number

6ES7 151-2AA00-0AB0

Features

The IM 151-2 interface module has the following characteristics:

- Connects the ET 200iS to PROFIBUS-DP Ex i
- Prepares the data for the inserted electronics modules
- The PROFIBUS address of the ET 200iS can be set at a switch
- Turning off the DC 24V supply voltage at the terminal module TM-PS also turns off the IM 151-2 interface module.
- The maximum area for addresses is 128 bytes for inputs and 128 bytes for outputs.

Block Diagram

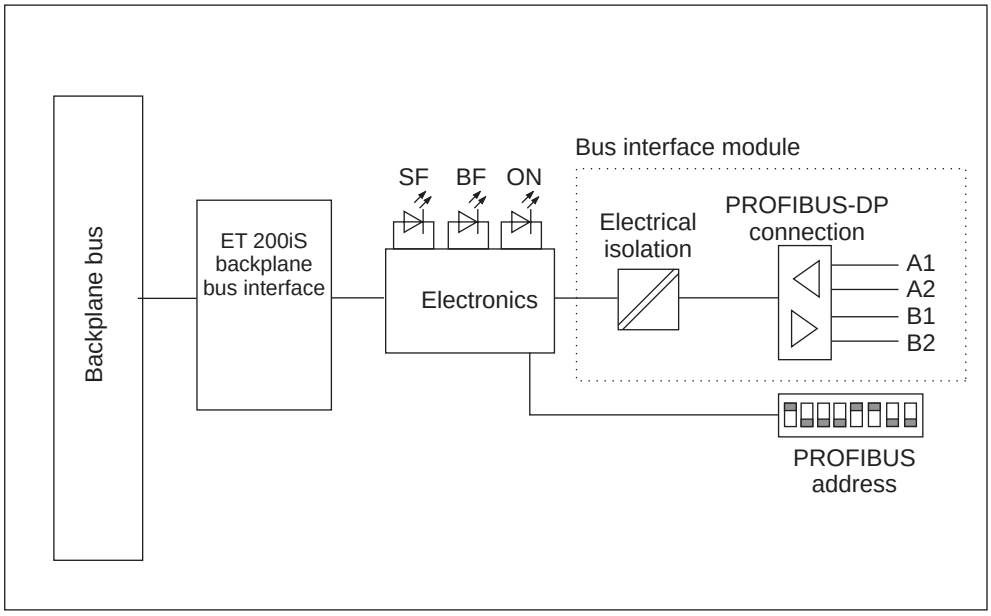


Figure 12-1 Block Diagram of the IM 151-2

Technical Specifications

Table 12-1 Technical Specifications

Dimensions and Weights	
Dimensions W x H x D (mm)	30 x 81 x 76
Weight	approx. 80 g
Data Specific to the Module	
Transmission rate	9.6; 19.2; 45.45; 93.75; 187.5; 500 Kbps; 1.5 Mbps
Bus protocol	PROFIBUS-DP Ex i
Interface	RS-485 (intrinsically safe)
SYNC capability	yes
FREEZE capability	yes
Vendor ID	806_{EH}
PROFIBUS addresses	1 to 125 permitted
Direct Data Exchange	yes, slave to slave as publisher
Constant scan time mode	No

Dimensions and Weights	
Time stamping	yes (STEP 7 only)
• Accuracy class	10 ms
• Time resolution	1 ms
• Number of digital input signals	max. 128
• Message buffer	15 message buffers each for a maximum of 20 messages
• Time interval for sending the message buffers when a message is pending	1 s
• Time stamp	• per digital input
	• per digital input module
	• entire ET 200iS
• Time stamp for	rising/falling change as signal entering or leaving state
• Time-of-day format	RFC 1119 Internet (ISP)
Acyclic function	
• Interrupts	yes
• Diagnostics	yes
• Parameters	yes
• Data records	yes
Type of protection of the module	
• CENELEC	Ex II2G EEx ib IIC T4 CE 0344
• FM (applied for)	Class Number 3611: Class I, Division 2, Group A, B, C, D, Class I, Zone 2 Class Number 3610: Class I, Zone 1
Voltage, Currents, Potentials	
Electrical isolation	
• between backplane bus and electronics	No
• between PROFIBUS-DP Ex i and electronics	yes
Permitted potential difference	
• Insulation tested with	DC 500 V
Power loss of the module	typ. 0.5 W
Status, Interrupts, Diagnostics	
Interrupts	yes
Diagnostic Functions	yes
• Group error	red LED "SF"
• Bus monitoring	red LED "B"F
• Monitoring of the supply voltage of the electronics	green LED "ON"

12.2 Parameters for the Interface Module

Parameters for the Interface Module IM 151-2

The parameters can be set using the GSD file, HW Config and SIMATIC PDM.

Table 12-2 Parameters for the Interface Module IM 151-2

IM 151-2 Parameter	Range of Values	Default	Effective for
Startup when defined and actual configuration differ *	• disable • enable	enabled	ET 200iS
Time stamping ** (enable parameter)	• yes • no	No	ET 200iS
Edge evaluation event entering state **	• rising edge (0-->1) • falling edge (1-->0) • channel-specific	rising edge (0-->1)	ET 200iS
Format of the analog values	• SIMATIC S5 • SIMATIC S7	SIMATIC S7	ET 200iS
Interference frequency suppression	• 50 Hz • 60 Hz	50 Hz	ET 200iS
Temperature unit	• Celsius • Fahrenheit	Celsius	ET 200iS
Slot reference junction 1 to 8***	• none • 4 to 35	none	ET 200iS
Input reference junction 1 to 8	• RTD on channel 0 • RTD on channel 1	RTD on channel 0	ET 200iS

Apart from the following exceptions, all the parameters are set with SIMATIC PDM:
* Parameters can be set using the GSD file and in HW Config.
** Parameters can be set only in HW Config and when you operate the ET 200iS as an S7 DP slave.
*** Here, SIMATIC PDM offers you the slots you set as reference junctions.

Identification Data

The identification data contain further information on the module and are read out with SIMATIC PDM. The identification data are resident on the module.

Table 12-3 Identification Data

Identification Data	Range of Values	Default	Effective for
Device			
Vendor	read	SIEMENS AG	Module
Device identification	read	Order Number	
Device serial number	read	depends on the product version	
Hardware revision	read		
Software revision	read		
Static revision no.	read	---	
Installation date	read/ write (max. 16 characters)	---	
Operating unit			
TAG	read/ write (max. 32 characters)	---	Module
Description	read/ write (max. 54 characters)	---	

12.3 Parameter Description

12.3.1 Startup when defined and actual configuration differ

Parameter

The effect of this parameter is that ET 200iS distributed I/O station starts up even if the defined and actual configuration do not match.

12.3.2 Time stamping / edge evaluation

Time stamping / edge evaluation

The time stamping of binary signal changes is supported in the PCS 7 system by all hardware and software components: from the ET 200iS over the S7-400 right to the OS.

Time stamping parameter: With this parameter, you activate time stamping for all the digital input modules of the ET 200iS.

Edge evaluation parameter: With this parameter, you specify the type of signal change that is time stamped. You can decide whether you want to report the rising or falling signal edge as a signal entering the state.

Example of a Configuration with the ET 200iS and Time Stamping of Signal Changes.

Example

You can configure the monitoring of digital inputs for signal changes in HW Config. The following can be monitored: " Signal entering/leaving state“ (as "rising or falling edge“). The ET 200iS adds the current time of day (time stamp) to these changed input signals and saves them as message lists. Such a message list is a data record with a maximum of 20 messages about time-stamped signal changes. The ET 200iS can store up to 15 data records.

After a certain time and if messages exist or when a data record is full, the ET 200iS triggers a hardware interrupt on the DP master (S7-400). The CPU then reads the data record and passes on the message lists to WinCC on an OS using the driver block FB90 "IM_DRV".

For a detailed description of time stamps and time-of-day synchronization, refer to the *PCS 7 documentation*.

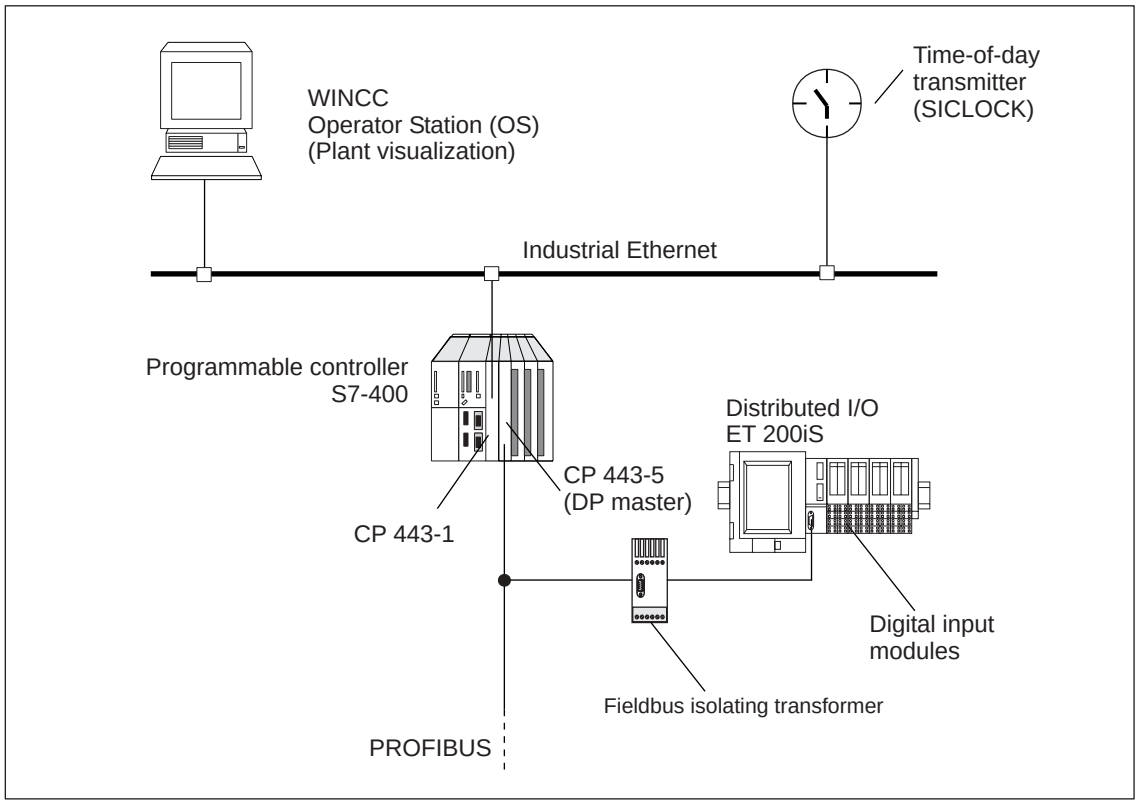


Figure 12-2 Example of Time Stamping and Edge Evaluation

12.3.3 Format of the analog values

Parameter

With this parameter, you set the numeric format of all analog electronics modules of the ET 200iS. You can select between SIMATIC S5 and SIMATIC S7.

12.3.4 Interference Frequency Suppression

Parameter

The frequency of your a.c. power system can interfere with the measured value, particularly when measuring in low voltage ranges and when using thermocouples. Here, you enter the frequency of the power supply in your system (50 Hz or 60 Hz).

The interference frequency suppression parameter is valid for all analog electronics modules of the ET 200iS that use this parameter. With this parameter, you also specify the integration and conversion time of the individual modules. See *Technical Specifications of the Analog Electronics Modules*.

12.3.5 Temperature unit

Parameter

With this parameter, you set the temperature unit for the temperature sensor and thermocouples. You can choose between "Celsius" and "Fahrenheit". The parameter is valid for all analog electronics modules of the ET 200iS that use this parameter.

12.3.6 Slot Reference Junction/Reference Junction Input

See also

Connecting Thermocouples *[→ Page 14-33]*

12.3.7 Identification Data

Identification Data

Table 12-4 Identification Data

Identification Data	Explanation
Vendor	The name of the manufacturer is stored here.
Device identification	Order number of the module.
Device serial number	The serial number of the module is stored here. This makes unique identification of the module possible.
Hardware revision	This provides information on the product version of the module. This is incremented when the product version and/or the firmware of the module changes.
Software revision	This indicates the firmware version of the module. If the firmware version is incremented, then the version (hardware version) of the module is incremented as well.
Static revision no.	Provides information on the parameter changes on the module. Depending on the change, the static revision no. is incremented.
Installation date	The date the module was installed. Enter the date here. DD.MM.YYYY format
TAG	Location designation of the module. Enter a unique tag for the module here.
Description	Free text stored in the module. Here, you can enter an additional information on the characteristics of the module.

Digital Electronics Modules

13

13.1 Digital Electronics Module 4DI NAMUR

Order Number

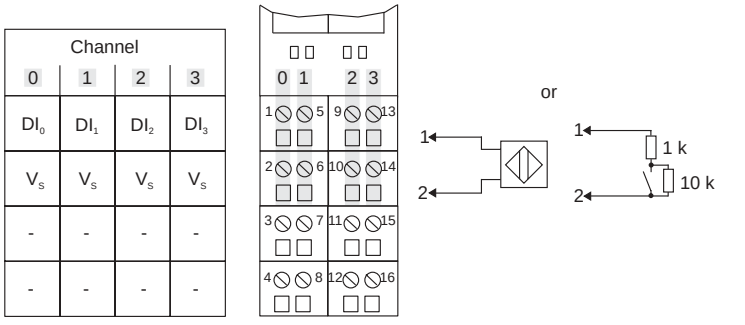
6ES7 131-5RD00-0AB0

Features

- Digital electronics module with four inputs
- Sensor power supply DC 8V
- Suitable for NAMUR sensors and wired and unwired mechanical contacts

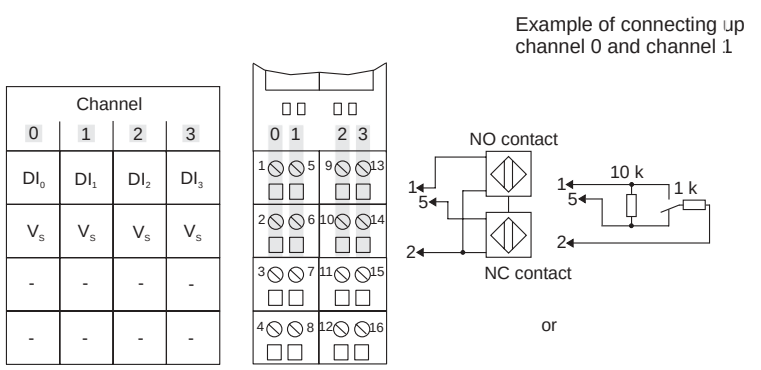
Terminal Assignment of NAMUR Sensors or Sensors Complying with DIN 19234

Table 13-1 Terminal Assignment of NAMUR Sensors or Sensors Complying with DIN 19234

Terminal Assignment and View	Remarks
	**Sensor 1**: Channel 0: Terminals 1 and 2 **Sensor 2**: Channel 1: Terminals 5 and 6 **Sensor 3**: Channel 2: Terminals 9 and 10 **Sensor 4**: Channel 3: Terminals 13 and 14 DI: Input signal V_S: Sensor supply

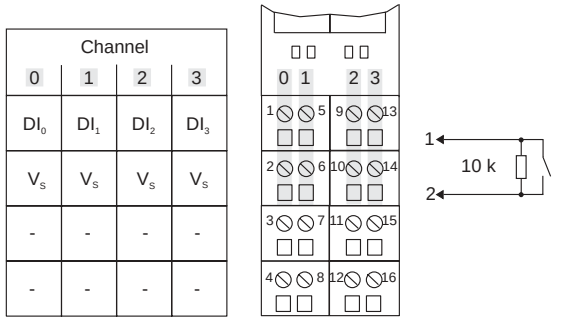
Terminal Assignment of NAMUR Changeover Contacts or Changeover Contacts Complying with DIN 19234

Table 13-2 Terminal Assignment of NAMUR Changeover Contacts or Changeover Contacts Complying with DIN 19234

Terminal Assignment and View	Remarks
	**Changeover contact 1** Channel 0: Terminals 1 and 2 Channel 1: Terminal 5 **Changeover contact 2** Channel 2: Terminals 9 and 10 Channel 3: Terminal 13 DI: Input signal V_S: Sensor supply

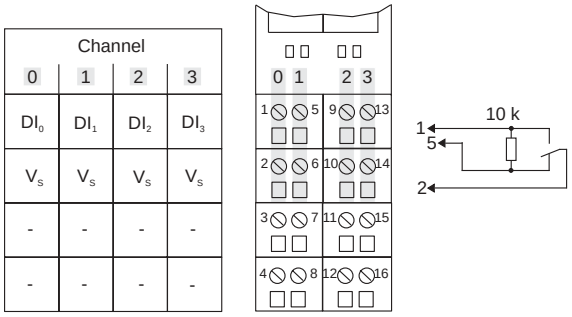
Terminal Assignment of a Single Contact Wired with 10 kΩ (mechanical NO contact)

Table 13-3 Terminal Assignment of a Single Contact Wired with 10 kΩ (mechanical NO contact)

Terminal Assignment and View	Remarks
	**Single contact 1**: Channel 0: Terminals 1 and 2 **Single contact 2**: Channel 1: Terminals 5 and 6 **Single contact 3**: Channel 2: Terminals 9 and 10 **Single contact 4**: Channel 3: Terminals 13 and 14 DI: Input signal V_S: Sensor supply

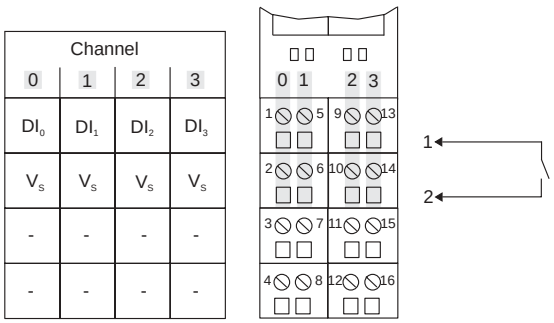
Terminal Assignment of a Changeover Contact Wired with 10 kΩ (mechanical changeover contact)

Table 13-4 Terminal Assignment of a Changeover Contact Wired with 10 kΩ (mechanical changeover contact)

Terminal Assignment and View	Remarks
Example of connecting channel 0 and channel 1  	**Changeover contact 1** Channel 0: Terminals 1 and 2 Channel 1: Terminal 5 **Changeover contact 2** Channel 2: Terminals 9 and 10 Channel 3: Terminal 13 DI: Input signal V_S: Sensor supply

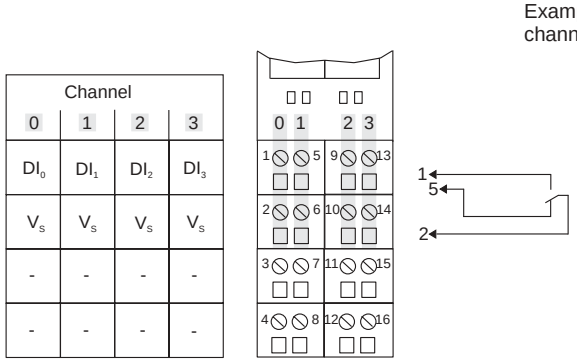
Terminal Assignment of a Single Contact Unswitched (mechanical NO contact with single contact)

Table 13-5 Terminal Assignment of a Single Contact Unswitched (mechanical NO contact with single contact)

Terminal Assignment and View	Remarks
Example of connecting channel 0  	**Single contact 1**: Channel 0: Terminals 1 and 2 **Single contact 2**: Channel 1: Terminals 5 and 6 **Single contact 3**: Channel 2: Terminals 9 and 10 **Single contact 4**: Channel 3: Terminals 13 and 14 DI: Input signal V_S: Sensor supply

Terminal Assignment of a Changeover Contact Unswitched (mechanical changeover contact)

Table 13-6 Terminal Assignment of a Changeover Contact Unswitched (mechanical changeover contact)

Terminal Assignment and View	Remarks
	**Changeover contact 1** Channel 0: Terminals 1 and 2 Channel 1: Terminal 5 **Changeover contact 2** Channel 2: Terminals 9 and 10 Channel 3: Terminal 13 DI: Input signal V_S: Sensor supply

Block Diagram

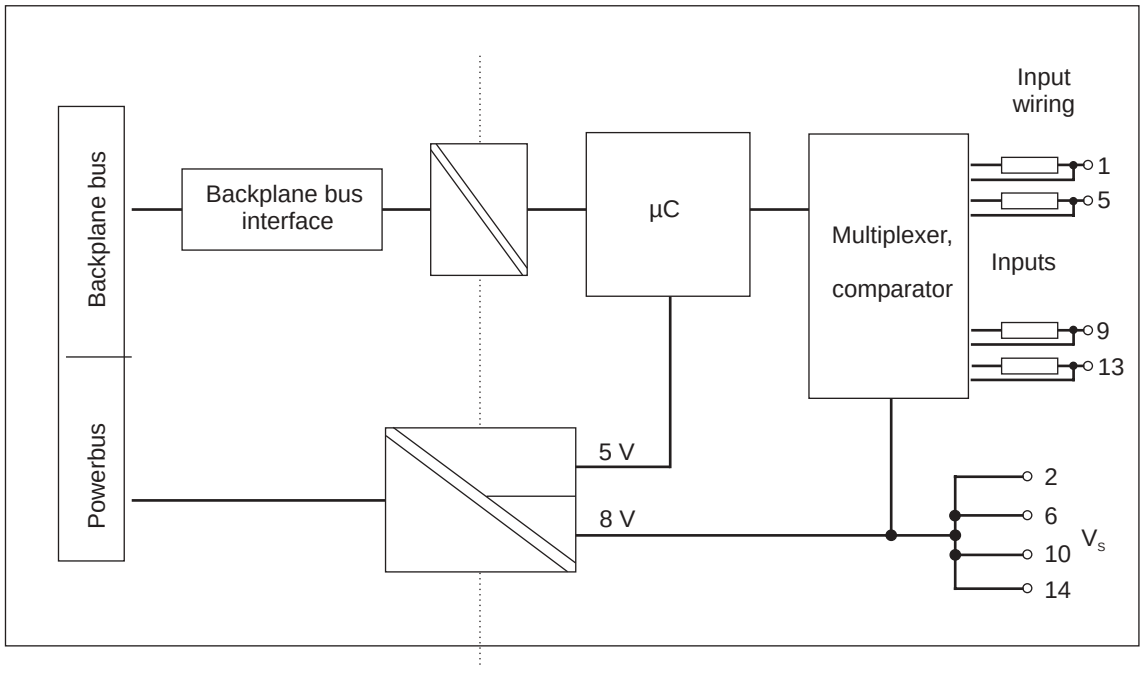


Figure 13-1 Block Diagram of the 4DI NAMUR

Technical Specifications

Table 13-7 Technical Specifications

Dimensions and Weight	
Dimensions W x H x D (mm)	30 x 81 x 76
Weight	approx. 120 g
Data Specific to the Module	
Number of inputs	4
Cable length	
• shielded	max. 200m
Type of Protection	
• CENELEC	Ex II2(1)G EEx ib[ia] IIC T4 CE 0344
• FM (applied for)	Class Number 3611: Class I, Division 2, Group A, B, C, D, Class I, Zone 2 Class Number 3610: Class I, Zone 1
Voltages, Currents, 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 channels and backplane bus	yes
• Between the channels	No
• Between channels and load voltage (powerbus)	yes
• Between load voltage (powerbus) and backplane bus	yes
Permitted potential difference	
• Between different circuits	DC 60 V; AC 30 V
Insulation tested with	
• Channels with respect to backplane bus and load voltage (powerbus)	AC 500 V
• Load voltage (powerbus) with respect to backplane bus	AC 500 V
Current consumption	
• from load voltage L+ (powerbus)	typ. 140 mA
Power loss of the module	typ. 1.68 W

Status, Interrupts, Diagnostic Information	
Status display	
• Inputs	Green LED per channel
Interrupts	
• Hardware interrupt	No
• Diagnostic interrupt	yes, selectable
Diagnostic Functions	
• Group error display	red LED "SF"
• Diagnostic information readable	yes
Monitoring for	
• Short circuit	I> 7 mA*
• Wire break	I< 0.35 mA*
Data Relevant to Safety	
See EU Prototype Test Certificate: KEMA 01 ATEX 1150 X	
Data for Selecting a Sensor	
Input current for NAMUR sensor	complying with 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 signal "0"	0.35 mA to 1.2 mA
Input current for an unswitched contact	
• for signal "1"	typ. 8 mA
• permitted zero signal current	0.5 mA
Input delay	
• for "0" to "1"	2.8 to 3.5 ms
• for "1" to "0"	2.8 to 3.5 ms
Tolerated changeover time for changeover contacts	300 ms
Parallel connection of inputs	No

* applies only to NAMUR sensors and a switched contact

13.2 Digital Electronics Module 2DO DC25V/25mA

Order Number

6ES7 132-5SB00-0AB0

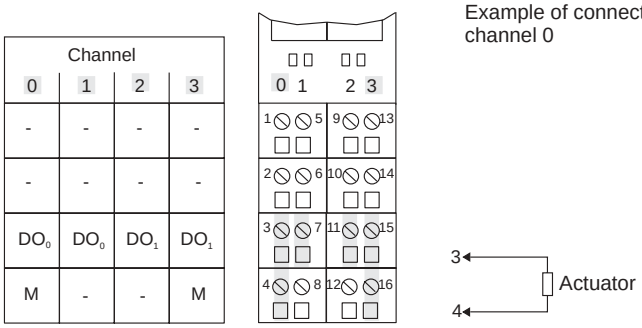
Features

- Digital electronics module with two outputs
- A rated load voltage of 25 VDC
- Outputs suitable for EX i solenoid valves, d.c. relay and actuators

Terminal Assignment

The following table shows the terminal assignment of the 2DO DC25V/25mA.

Table 13-8 Terminal Assignment of the 2DO DC25V/25mA

Terminal Assignment and View	Remarks
	**Actuator 1** Channel 0: Terminals 3 and 4 **Actuator 2** Channel 3: Terminals 15 and 16 **Increased power** Jumper between terminal 7 and 11 DO: Output signal M: Load power supply chassis

Note

To increase the power, the two digital outputs on the 2DO DC25V/25mA can be connected in parallel by inserting a jumper between terminals 7 and 11. Such a power increase is only permitted on the same module. In this case, only one actuator is connected to the module.

Block Diagram

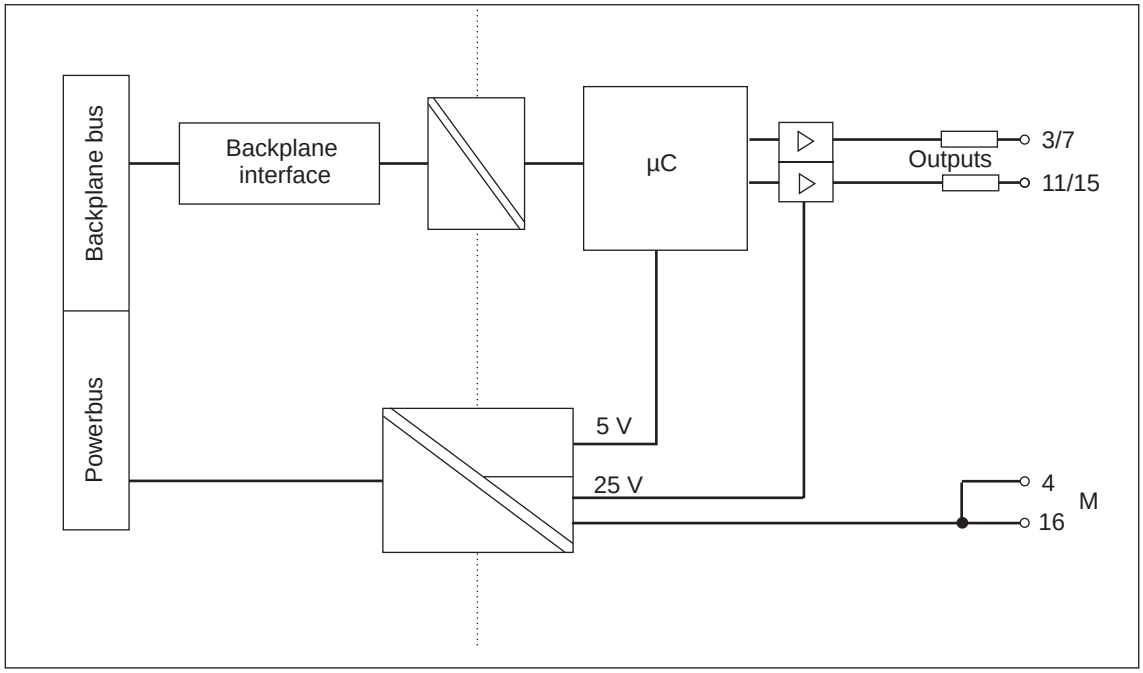


Figure 13-2 Block Diagram of the 2DO DC25V/25mA

Technical Specifications

Table 13-9 Technical Specifications

Dimensions and Weight	
Dimensions W x H x D (mm)	30 x 81 x 76
Weight	approx. 130 g
Data Specific to the Module	
Number of outputs	2
Cable length	
• Unshielded	max. 200m
• shielded	max. 200m
Type of Protection	
• CENELEC	Ex II2(1)G EEx ib[ia] IIC T4 CE 0344
• FM (applied for)	Class Number 3611: Class I, Division 2, Group A, B, C, D, Class I, Zone 2 Class Number 3610: Class I, Zone 1

Voltages, Currents, Potentials	
Electrical isolation	
• Between channels and backplane bus	yes
• Between the channels	No
• Between channels and load voltage (powerbus)	yes
• Between load voltage (powerbus) and backplane bus	yes
Permitted potential difference	
• Between different circuits	DC 60 V; AC 30 V
Insulation tested with	
• Channels with respect to backplane bus and load voltage (powerbus)	AC 500 V
• Load voltage (powerbus) with respect to backplane bus	AC 500 V
Current consumption	
• from load voltage L+ (powerbus)	typ. 280 mA
Power loss of the module	typ. 3.4 W
Status, Interrupts, Diagnostic Information	
Status display	
• Outputs	Green LED per channel
Interrupts	
• Hardware interrupt	No
• Diagnostic interrupt	yes, selectable
Diagnostic Functions	
• Group error display	red LED "SF"
• Diagnostic information readable	yes
Monitoring for	
• Short circuit	R** < 80 Ω (one output) R** < 40 Ω (outputs connected in parallel)
• Wire break	R** > 250 kΩ, I < 100 µA
Safety-Related Data for the Outputs	
See EU Prototype Test Certificate: KEMA 01 ATEX 1156 X	
Data for Selecting an Actuator	
No load voltage U_{AO}	min. 25 V
Internal resistance R_i	630 Ω
Vertices of the curve E	
• Voltage U_E	min. 8.4 V
• Current I_E	min 25 mA (one output) min. 50 mA (outputs connected in parallel)

Voltages, Currents, Potentials	
Output delay (with ohmic load)	
• for "0" to "1"	2 ms
• for "1" to "0"	1.5 ms
Connecting 2 outputs in parallel	yes
Switching frequency	
• with ohmic load	100 Hz
• with inductive load ($L < L_O$)	2 Hz
Short-circuit protection of the output	yes
• Response threshold	> 25 mA
Leakage current of the output	max. 25µA *

* Required for operation of piezo-valves

** R = Load impedance + cable impedance

Output characteristics curve

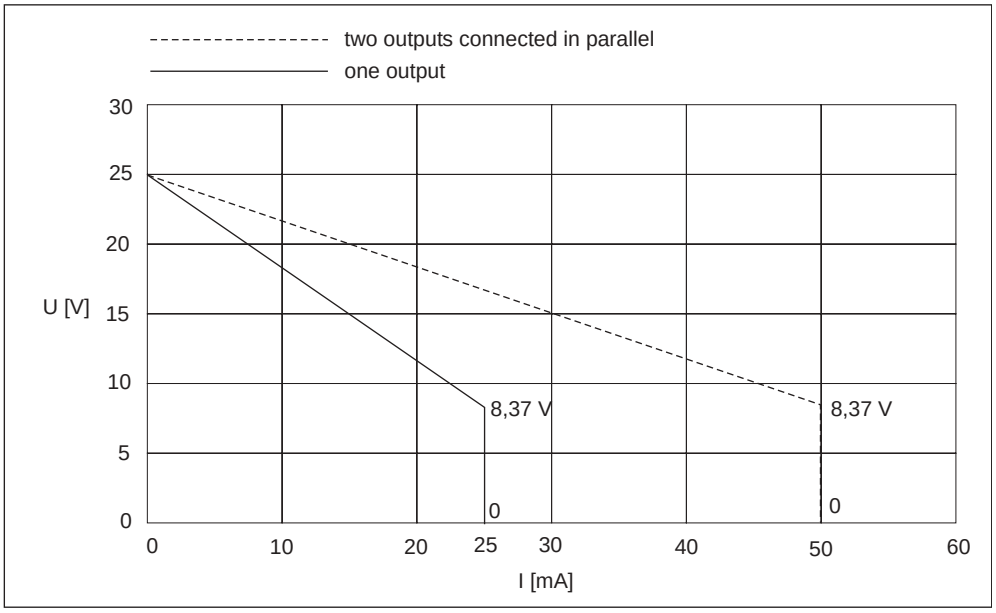


Figure 13-3 Output Curve

13.3 Parameters of the Digital Electronics Modules

4 DI NAMUR Parameters

All parameters are set with SIMATIC PDM and HW Config.

Table 13-10 Parameters for 4 DI NAMUR

4 DI NAMUR Parameters	Range of Values	Default	Effective for
Time stamping*	• enabled • disabled	disabled	Channel
Edge evaluation event entering state*	• falling edge (1-->0) • rising edge (0-->1)	rising edge (1-->0)	Channel

Input channel x (x = 0 to 3)			
Sensor type	• Channel disabled • NAMUR sensor • Single contact unswitched • Single contact switched with 10 kΩ • NAMUR changeover contact • Changeover contact unswitched • Changeover contact switched with 10 kΩ	NAMUR sensor	Channel
Pulse extension	• none • 0.5s • 1 s • 2 s	none	Channel
Group diagnostics	• enabled • disabled	enabled	Channel
Wire break diagnostics	• enabled • disabled	enabled	Channel
Short circuit diagnostics	• enabled • disabled	enabled	Channel
Flutter error diagnostics	• enabled • disabled	disabled	Channel
Flutter monitoring Monitoring window**	• 0.5 s • 1 s to 100 s (can be set in steps of 1 s)	2 s	Channel
Flutter monitoring Number of signal changes**	2 to 31	5	Channel

* Parameters can be set only in HW Config and when you operate the ET 200iS as an S7 DP slave.
** Parameter can only be set if you have enabled flutter error diagnostics

Parameters of the 2DO DC25V/25mA

All parameters are set with SIMATIC PDM.

Table 13-11 Parameters of the 2DO DC25V/25mA

Parameters of the 2DO DC25V/25mA	Range of Values	Default	Effective for
Parallel connection of channels	• yes • no	no	Module
Output channel x (x = 0 to 1)			
Response to CPU/ master STOP	• Apply substitute value • Hold last value	Apply substitute value	Channel
Substitute value	• 0 • 1	0	Channel
Group diagnostics	• enabled • disabled	enabled	Module
Wire break diagnostics	• enabled • disabled	enabled	Channel
Short circuit diagnostics	• enabled • disabled	enabled	Channel

Identification Data

The identification data contain further information on the module and are read out with SIMATIC PDM. The identification data are resident on the module.

Table 13-12 Identification Data

Identification Data	Range of Values	Default	Effective for
Device			
Vendor	read	SIEMENS AG	Module
Device identification	read	Order Number	
Device serial number	read	depends on the product version	
Hardware revision	read		
Software revision	read		
Static revision no.	read	---	
Installation date	read/ write (max. 16 characters)	---	
Operating unit			
TAG	read/ write (max. 32 characters)	---	Module
Description	read/ write (max. 54 characters)	---	

13.4 Parameter Description

13.4.1 Pulse extension

Introduction

Pulse extension is a function for changing a digital input signal. A pulse at a digital input is extended 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 Behind Pulse Lengthening

The following figure illustrates with examples if and how input pulses are changed.

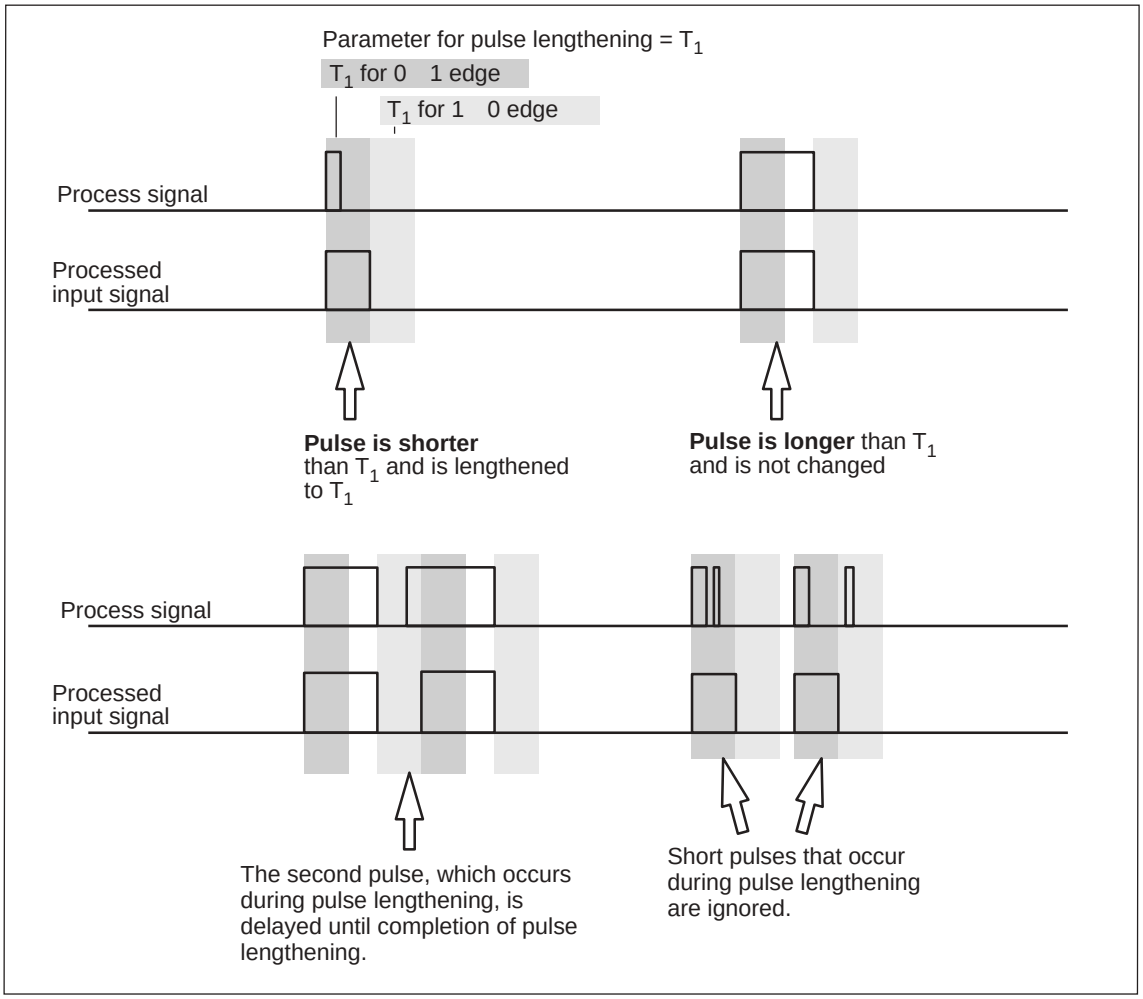


Figure 13-4 Principle of Pulse Extension

Note

If you set pulse extension for an input channel, this also affects the flutter monitoring enabled for this channel. The "pulse extended" signal is the input signal for flutter monitoring. Make sure therefore that the parameters for pulse extension and flutter monitoring correspond to each other. By selecting the appropriate values for the parameters, you can adapt the functions to suit your process.

Reference

You can find out which settings you can assign for pulse extensionin the parameter table and in the *SIMATIC PDM* online help system.

13.4.2 Flutter monitoring

Introduction

Flutter monitoring is a process control function for digital input signals. It detects and reports unusual process control signal patterns such as when a fluctuation in the input signal between "0" and "1" occurs too often. The occurrence of such signal activity is an indication that a sensor is defective or that the process is unstable.

Enabling Flutter Monitoring

You enable flutter monitoring with "Diagnostics: Flutter error".

Tip: Also enable the group diagnostics at parameter assignment so that, if there is a flutter error, a diagnostic interrupt is also reported in addition to the diagnostic entry.

Detecting Unusual Signal Patterns

A monitoring window is available for each input channel. The monitoring window is started with the first change of the input signal. If the input signal changes more within the monitoring window than the set number of signal changes, this is recognized as 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.

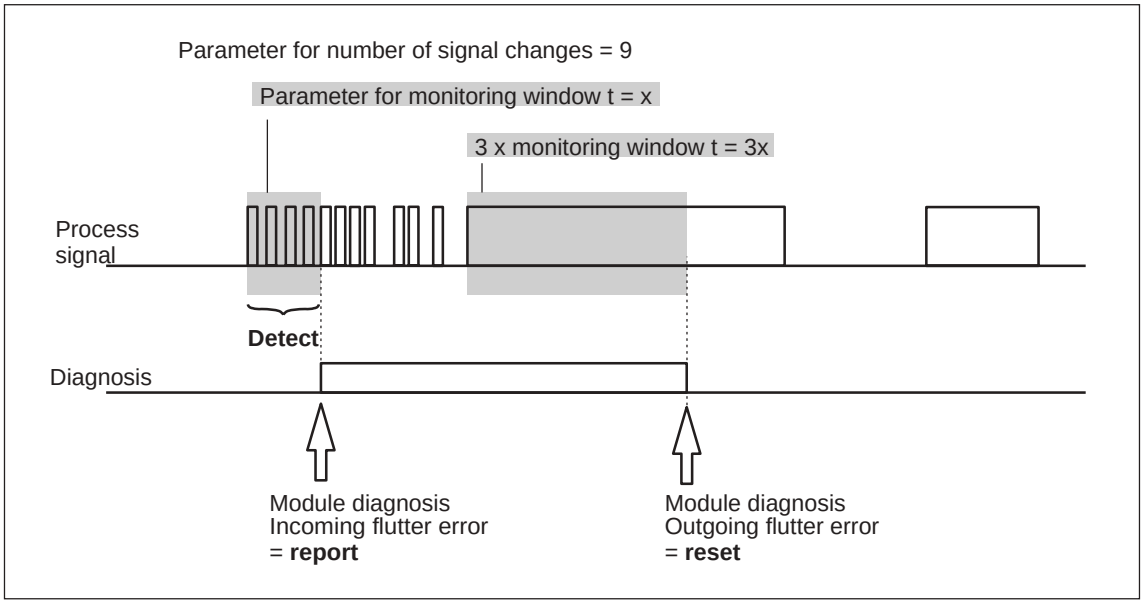


Figure 13-5 Principle Behind Flutter Monitoring

Reference

You can find out which settings you can make for flutter monitoring in the parameter table and in the *SIMATIC PDM* online help system.

13.4.3 Identification Data

13.5 Diagnostics with the Changeover Transducer Type

Brief Description

With the diagnostic functions for the changeover transducer type, the digital electronics module checks the switchover between two input channels. If there is no signal change after the specified switchover time (see technical specifications), the module signals diagnostic information.

Purpose

You can use the diagnosis as follows:

- for diagnostic checking of the transducer
- to make certain that the switchover between NO contact and NC contact took place

Principle

If the digital inputs of a channel group are set to "changeover", the module runs diagnostics for the changeover transducer type for this channel group. The tolerated switchover time between the two channels is set to the fixed value of 300 ms.

If the validation is negative,

- the module indicates the value status of the NO channel as "invalid",
- The module creates a diagnostic entry for the normally open contact channel.
- triggers a diagnostic interrupt.

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" since 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 carries out a diagnosis for changeover contact errors. Changeover errors are still monitored on the second channel.
- You will find further details in the table below:

Table 13-13 Principle

Changeover Switch	Negative check means ...	
Changeover switch as NAMUR	• Short circuit or • Wire break	Also: Changeover error or external error (in DP diagnostics)
Switched changeover switch	• Transducer defective or short circuit Here, no distinction between a defective transducer and short circuit is possible.	
Unswitched changeover switch	Caution: no difference possible between • Signal "0" and wire break • Signal "1" and short circuit	

Analog Electronics Modules

14

14.1 Analog Value Representation

14.1.1 Overview

Electronics 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.

Electronics 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

- 4 to 20 mA
- temperature sensor Pt100 standard and climatic, Ni100 standard and climatic
- Thermocouples types E, N, J, K, L, S, R, B, T, U

the following additional information and rules apply in the S7 and S5 format:

Format of the Analog Values S7

Table 14-1 Measured Values in the Event of Wire Break Dependent on Enabled Diagnostics (Format S7)

Modules	Parameter Assignment	Measured Values		Notes
		dec.	hex.	
2AI I	• "Wire break" diagnostics enabled	32767	7_{FFFH}	• Wire break" diagnostic message
	• "Wire break" diagnostics disabled * • "Overflow/underflow" diagnostics enabled	-32768	8000_{H}	• Measured value after leaving the under-range • "Value under lower limit" diagnostic message
	• "Wire break" diagnostics disabled * • "Overflow/underflow" diagnostics disabled	-	-	• Measured value after leaving the under-range
2AI RTD 2AI TC	• "Wire break" diagnostics enabled	32767	7_{FFFH}	• Wire break" diagnostic message
	• "Wire break" diagnostics disabled	-	-	• Open input: Undefined measured value

* Measured value limits for wire break detection:
4 to 20 mA: at 3.6 mA

Format of the Analog Values S5

Table 14-2 Measured Values in the Event of Wire Break Dependent on Enabled Diagnostics (Format S5)

Modules	Parameter Assignment	Measured Values		Notes
		dec.	hex.	
2AI I	• "Wire break" diagnostics enabled *	4095 (2^0 to 2^{12})	7_{FFBH}	• "Wire break" diagnostic message
	• "Wire break" diagnostics disabled * • "Overflow/underflow" diagnostics enabled	150	04_{B1H}	• Measured value after leaving the under-range • "Value under lower limit" diagnostic message
	• "Wire break" diagnostics disabled * • "Overflow/underflow" diagnostics disabled	-	-	• Measured value after leaving the under-range
2AI RTD 2AI TC	• "Wire break" diagnostics enabled	4095 (2^0 to 2^{12})	7_{FFBH}	• "Wire break" diagnostic message
	• "Wire break" diagnostics disabled	-	-	• Open input: Undefined measured value

* Measured value limits for wire break/underflow detection:
4 to 20 mA: at 3.6 mA

14.1.2 Analog Value Representation for Measuring Ranges with SIMATIC S7

Analog Value Representation

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 14-3 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
Place values 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“ = -

Examples

Table 14-4 Examples

Analog Value		
decimal	**binary**	**hexadecimal**
-1	1111 1111 1111 1111	$FFFF_H$
-32768	1000 0000 0000 0000	8000_H

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.

In the following table, the resolutions 11, 12, 13, and 15 bit + sign are shown. Each analog value is entered left justified in the ACCU. The bits marked with "x" are set to "0".

Table 14-5 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 to temperature values. The converted temperature values are the results of a conversion in the analog electronics module (see *following table*)

14.1.3 Analog Value Representation for the Measuring 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.

Measuring Range for Thermal e.m.f.: ± 80 mV

Table 14-6 SIMATIC S7 format: Measuring range ± 80 mV

Measuring Range ± 80 mV	Units		Range
	decimal	hexadecimal	
>94.071	32767	7_{FFFH}	Overflow
94.071 : 80,003	32511 : 27649	7_{EFFH} : 6_{C01H}	Over-range
80,000 60,000 : -60,000 -80,000	27648 20736 : -20736 -27648	6_{C00H} 5100_H : $AF00_H$ 9400_H	Nominal range
-80,003 : -94,074	-27649 : -32512	93_{FFH} : 8100_H	Under-range
<-94.074	-32768	8000_H	Underflow

Measuring Ranges for Current: 0 to 20 mA, 4 to 20 mA

Table 14-7 SIMATIC S7 Format: Measuring Range 0/4 to 20 mA

Measuring Range 0 to 20 mA	Measuring Range 4 to 20 mA	Units		Range
		decimal	hexadecimal	
>23.5178	>22.8142	32767	7_{FFFH}	Overflow
23,5178 : 20,0007	22,8142 : 20,0006	32511 : 27649	7_{EFFH} : 6_{C01H}	Over-range
20,0000 16,0000 : 0,0000	20,0000 16,0000 : 4,0000	27648 20736 : 0	6_{C00H} 5100_H : 0_H	Nominal range
neg. values not possible	3,9994 3.6000* : 1,1852	-1 -691* : -4864*	$FFFF_H$ $FD4D_H$ * : $ED00_H$ *	Under-range
	<1.1852	-32768*	8000_H *	Underflow

* If you have enabled the wire break diagnostic parameter, the wire break diagnostic message is reported if the value drops below 3.6 mA and the following values are entered: decimal 32767/ hexadecimal 7FFF.

Measuring Ranges for Resistance-type Sensor: 600 ohms absolute

Table 14-8 SIMATIC S7 format: Measuring range 600 ohms absolute

Measuring Range 0 to 600 ohms absolute	Units		Range
	decimal	hexadecimal	
>705.534	32767	7_{FFFH}	Overflow
705,534 : 600,022	32511 : 27649	7_{EFFH} : 6_{C01H}	Over-range
600,000 450,000 : 0,000	27648 20736 : 0	6_{C00H} 5100_H : 0_H	Nominal range
(negative values are not physically possible)	-1 : -4864	$FFFF_H$: $ED00_H$	Under-range
	-32768	8000_H	Underflow*

* If resistors are connected incorrectly

Measuring Range for Temperature Sensors: Pt100 Standard

Table 14-9 SIMATIC S7 Format: Measuring Range Pt100 Standard in °C

Pt100 Standard in °C (1 digit = 0.1°C)	Units		Range
	decimal	hexadecimal	
>1000.0	32767	7_{FFFH}	Overflow
1000,0 : 850,1	10000 : 8501	2710_H : 2135_H	Over-range
850,0 : -200,0	8500 : -2000	2134_H : $F830_H$	Nominal range
-200,1 : -234,0	-2001 : -2340	$F82F_H$: $F682_H$	Under-range
<-243.0	-32768	8000_H	Underflow

Table 14-10 SIMATIC S7 Format: Measuring Range Pt100 Standard in °F

Pt100 Standard in °F (1 digit = 0.1°F)	Units		Range
	decimal	hexadecimal	
>1832.0	32767	7_{FFFH}	Overflow
1832,0 : 1562,1	18320 : 15621	4790_H : 3_{D05H}	Over-range
1562,0 : -328,0	15620 : -3280	3_{D04H} : $F330_H$	Nominal range
-328,1 : -405,4	-3281 : -4054	$F32F_H$: $F02A_H$	Under-range
<-405.4	-32768	8000_H	Underflow

Measuring Range for Temperature Sensors: Pt100 Climatic

Table 14-11 SIMATIC S7 Format: Measuring Range Pt100 Climatic in °C

Pt100 Climatic in °C (1 digit = 0.01°C)	Units		Range
	decimal	hexadecimal	
>155.00	32767	7_{FFFH}	Overflow
155,00 : 130,01	15500 : 13001	3_{C8CH} : 32_{C9H}	Over-range
130,00 : -120,00	13000 : -12000	32_{C8H} : $D120_{H}$	Nominal range
-120,01 : -145,00	-12001 : -14500	$D11F_{H}$: $C75C_{H}$	Under-range
<-145.00	-32768	8000_{H}	Underflow

Table 14-12 SIMATIC S7 Format: Measuring Range Pt100 Climatic in °F

Pt100 Climatic in °F (1 digit = 0.01°F)	Units		Range
	decimal	hexadecimal	
>311.00	32767	7_{FFFH}	Overflow
311,00 : 266,01	31100 : 26601	797_{CH} : 67_{E9H}	Over-range
266,00 : -184,00	26600 : -18400	67_{E8H} : $B820_{H}$	Nominal range
-184,01 : -229,00	-18401 : -22900	$B81F_{H}$: $A68C_{H}$	Under-range
<-229.00	-32768	8000_{H}	Underflow

Measuring Range for Temperature Sensors: Ni100 Standard

Table 14-13 SIMATIC S7 Format: Measuring Range Ni100 Standard in °C

Ni100 Standard in °C (1 digit = 0.1°C)	Units		Range
	decimal	hexadecimal	
>295.0	32767	7_{FFFH}	Overflow
295,0 : 250,1	2950 : 2501	$B86_{H}$: 9_{C5H}	Over-range
250,0 : -60,0	2500 : -600	9_{C4H} : $FDA8_{H}$	Nominal range
-60,1 : -105,0	-601 : -1050	$FDA7_{H}$: $FBE6_{H}$	Under-range
<-105.0	-32768	8000_{H}	Underflow

Table 14-14 SIMATIC S7 Format: Measuring Range Ni100 Standard in °F

Ni100 Standard in °F (1 digit = 0.1°F)	Units		Range
	decimal	hexadecimal	
>563.0	32767	7_{FFFH}	Overflow
563,0 : 482,1	5630 : 4821	15_{FEH} : 12_{D5H}	Over-range
482,0 : -76,0	4820 : -760	12_{D4H} : $FD08_{H}$	Nominal range
-76,1 : -157,0	-761 : -1570	$FD07_{H}$: $F9DE_{H}$	Under-range
<-157.0	-32768	8000_{H}	Underflow

Measuring Range for Temperature Sensors: Ni100 Climatic

Table 14-15 SIMATIC S7 Format: Measuring Range Ni100 Climatic in °C

Ni100 Climatic in °C (1 digit = 0.01°C)	Units		Range
	decimal	hexadecimal	
>295.00	32767	7_{FFFH}	Overflow
295,00 : 250,01	29500 : 25001	733_{CH} : 61_{A9H}	Over-range
250,00 : -60,00	25000 : -6000	61_{A8H} : $E890_{H}$	Nominal range
-60,01 : -105,00	-6001 : -10500	$E88F_{H}$: $D6FC_{H}$	Under-range
<-105.00	-32768	8000_{H}	Underflow

Table 14-16 SIMATIC S7 Format: Measuring Range Ni100 Climatic in °F

Ni100 Climatic in °F (1 digit = 0.01°F)	Units		Range
	decimal	hexadecimal	
>325.11	32767	7_{FFFH}	Overflow
327,66 : 280,01	32766 : 28001	7_{FFEH} : 6_{D61H}	Over-range
280,00 : -76,00	28000 : -7600	6_{D60H} : $E250_{H}$	Nominal range
-76,01 : -157,00	-7601 : -15700	$E24F_{H}$: $C2AC_{H}$	Under-range
<-157.00	-32768	8000_{H}	Underflow

Measuring Range for Thermocouple: Type E

Table 14-17 SIMATIC S7 Format: Measuring Range Type E in °C

Type E in °C (1 digit = 0.1°C)	Units		Range
	decimal	hexadecimal	
>1200.0	32767	7_{FFFH}	Overflow
1200,0 : 1000,1	12000 : 10001	2_{EE0H} : 2711_H	Over-range
1000,0 : -270,0	10000 : -2700	2710_H : $F574_H$	Nominal range
<-270.0	-32768	8000_H	Underflow

Table 14-18 SIMATIC S7 Format: Measuring Range Type E in °F

Type E in °F (1 digit = 0.1°F)	Units		Range
	decimal	hexadecimal	
>2192.0	32767	7_{FFFH}	Overflow
2192,0 : 1832,1	21920 : 18321	55_{A0H} : 4791_H	Over-range
1832,0 : -454,0	18320 : -4540	4790_H : $EE44_H$	Nominal range
<-454.0	-32768	8000_H	Underflow

Measuring Range for Thermocouple: Type N

Table 14-19 SIMATIC S7 Format: Measuring Range Type N in °C

Type N in °C (1 digit = 0.1°C)	Units		Range
	decimal	hexadecimal	
>1550.0	32767	7_{FFFH}	Overflow
1550,0 : 1300,1	15500 : 13001	3_{C8CH} : 32_{C9H}	Over-range
1300,0 : -270,0	13000 : -2700	32_{C8H} : $F574_{H}$	Nominal range
<-270.0	-32768	8000_{H}	Underflow

Table 14-20 SIMATIC S7 Format: Measuring Range Type N in °F

Type N in °F (1 digit = 0.1°F)	Units		Range
	decimal	hexadecimal	
>2822.0	32767	7_{FFFH}	Overflow
2822,0 : 2372,1	28220 : 23721	6_{E3CH} : $5CA9_{H}$	Over-range
2372,0 : -454,0	23720 : -4540	5_{CA8H} : $EE44_{H}$	Nominal range
<-454.0	-32768	8000_{H}	Underflow

Measuring Range for Thermocouple: Type J

Table 14-21 SIMATIC S7 Format: Measuring Range Type J in °C

Type J in °C (1 digit = 0.1°C)	Units		Range
	decimal	hexadecimal	
>1450.0	32767	7_{FFFH}	Overflow
1450,0 : 1200,1	14500 : 12001	38_{A4H} : 2_{EE1H}	Over-range
1200,0 : -210,0	12000 : -2100	2_{EE0H} : $F7CC_H$	Nominal range
<-210.0	-32768	8000_H	Underflow

Table 14-22 SIMATIC S7 Format: Measuring Range Type J in °F

Type J in °F (1 digit = 0.1°F)	Units		Range
	decimal	hexadecimal	
>2642.0	32767	7_{FFFH}	Overflow
2642,0 : 2192,1	26420 : 21921	6734_H : $55A1_H$	Over-range
2192,0 : -346,0	21920 : -3460	55_{A0H} : $F27C_H$	Nominal range
<-346.0	-32768	8000_H	Underflow

Measuring Range for Thermocouple: Type K

Table 14-23 SIMATIC S7 Format: Measuring Range Type K in °C

Type K in °C (1 digit = 0.1°C)	Units		Range
	decimal	hexadecimal	
>1622.0	32767	7_{FFFH}	Overflow
1622,0 : 1372,1	16220 : 13721	3_{F5CH} : 3599_H	Over-range
1372,0 : -270,0	13720 : -2700	3598_H : $F574_H$	Nominal range
<-270.0	-32768	8000_H	Underflow

Table 14-24 SIMATIC S7 Format: Measuring Range Type K in °F

Type K in °F (1 digit = 0.1°F)	Units		Range
	decimal	hexadecimal	
>2951.6	32767	7_{FFFH}	Overflow
2951,6 : 2501,7	29516 : 25062	734_{CH} : $61B9_H$	Over-range
2501,6 : -454,0	25061 : -4540	61_{B8H} : $EE44_H$	Nominal range
<-454.0	-32768	8000_H	Underflow

Measuring Range for Thermocouple: Type L

Table 14-25 SIMATIC S7 Format: Measuring Range Type L in °C

Type L in °C (1 digit = 0.1°C)	Units		Range
	decimal	hexadecimal	
>1150.0	32767	7_{FFFH}	Overflow
1150,0 : 900,1	11500 : 9001	2_{CECH} : 2329_H	Over-range
900,0 : -200,0	9000 : -2000	2328_H : $F830_H$	Nominal range
<-200.0	-32768	8000_H	Underflow

Table 14-26 SIMATIC S7 Format: Measuring Range Type L in °F

Type L in °F (1 digit = 0.1°F)	Units		Range
	decimal	hexadecimal	
>2102.0	32767	7_{FFFH}	Overflow
2102,0 : 1652,1	21020 : 16521	521_{CH} : 4089_H	Over-range
1652,0 : -328,0	16520 : -3280	4088_H : $F330_H$	Nominal range
<-328.0	-32768	8000_H	Underflow

Measuring Range for Thermocouple: Type S, R

Table 14-27 SIMATIC S7 Format: Measuring Range Type S, R in °C

Type S, R in °C (1 digit = 0.1°C)	Units		Range
	decimal	hexadecimal	
>2019.0	32767	7_{FFFH}	Overflow
2019,0 : 1769,1	20190 : 17691	4_{EDEH} : $451B_H$	Over-range
1769,0 : -50,0	17690 : -500	451_{AH} : $FE0C_H$	Nominal range
-50,1 : -170,0	-501 : -1700	$FE0B_H$: $F95C_H$	Under-range
<-170.0	-32768	8000_H	Underflow

Table 14-28 SIMATIC S7 Format: Measuring Range Type S, R in °F

Type S, R in °F (1 digit = 0.1°F)	Units		Range
	decimal	hexadecimal	
>3276.6	32767	7_{FFFH}	Overflow
3276,6 : 3216,3	32766 : 32163	7_{FFEH} : $7DA3_H$	Over-range
3216,2 : -58,0	32162 : -580	7_{DA2H} : $FDBC_H$	Nominal range
-58,1 : -274,0	-581 : -2740	$FDBB_H$: $F54C_H$	Under-range
<-274.0	-32768	8000_H	Underflow

Measuring Range for Thermocouple: Type B

Table 14-29 SIMATIC S7 Format: Measuring Range Type B in °C

Type B in °C (1 digit = 0.1°C)	Units		Range
	decimal	hexadecimal	
>2070.0	32767	7_{FFFH}	Overflow
2070,0 : 1820,1	20700 : 1820,1	50_{DCH} : 4719_H	Over-range
1820,0 : 0,0	18200 : 0	4718_H : 0000_H	Nominal range
-0,1 : -120,0	-1 : -1200	$FFFF_H$: $FB50_H$	Under-range
< -120.0	-32768	8000_H	Underflow

Table 14-30 SIMATIC S7 Format: Measuring Range Type B in °F

Type B in °F (1 digit = 0.1°F)	Units		Range
	decimal	hexadecimal	
>3276.6	32767	7_{FFFH}	Overflow
3276,6 : 2786,6	32766 : 27866	7_{FFEH} : 6_{CDAH}	Over-range
2786,5 : 32	27865 : 320	6_{CD9H} : 0140_H	Nominal range
31,9 : -184	319 : -1840	$013F_H$: $F8D0_H$	Under-range
<-184	-32768	8000_H	Underflow

Measuring Range for Thermocouple: Type T

Table 14-31 SIMATIC S7 Format: Measuring Range Type T in °C

Type T in °C (1 digit = 0.1°C)	Units		Range
	decimal	hexadecimal	
>540.0	32767	7_{FFFH}	Overflow
540,0 : 400,1	5400 : 4001	1518_H : $0FA1_H$	Over-range
400,0 : -270,0	4000 : -2700	0_{FA0H} : $F574_H$	Nominal range
<-270.0	-32768	8000_H	Underflow

Table 14-32 SIMATIC S7 Format: Measuring Range Type T in °F

Type T in °F (1 digit = 0.1°F)	Units		Range
	decimal	hexadecimal	
>1004.0	32767	7_{FFFH}	Overflow
1004,0 : 752,1	10040 : 7521	2738_H : $1D61_H$	Over-range
752,0 : -454,0	7520 : -4540	1_{D60H} : $EE44_H$	Nominal range
<-454.0	-32768	8000_H	Underflow

Measuring Range for Thermocouple: Type U

Table 14-33 SIMATIC S7 Format: Measuring Range Type U in °C

Type U in °C (1 digit = 0.1°C)	Units		Range
	decimal	hexadecimal	
>850.0	32767	7_{FFFH}	Overflow
850,0 : 600,1	8500 : 6001	2134_H : 1771_H	Over-range
600,0 : -200,0	6000 : -2000	1770_H : $F830_H$	Nominal range
< -200.0	-32768	8000_H	Underflow

Table 14-34 SIMATIC S7 Format: Measuring Range Type U in °F

Type U in °F (1 digit = 0.1°F)	Units		Range
	decimal	hexadecimal	
>1562.0	32767	7_{FFFH}	Overflow
1562,0 : 1112,1	15620 : 11121	3_{D04H} : $2B71_H$	Over-range
1112,0 : -328,0	11120 : -3280	2_{B70H} : $F330_H$	Nominal range
<-328.0	-32768	8000_H	Underflow

14.1.4 Analog Value Representation for the Output 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, this table contains only a comparison of the output ranges with the units.

Output Ranges for Current: 0 to 20 mA, 4 to 20 mA

Table 14-35 SIMATIC S7 Format: Measuring Range 0/4 to 20 mA

Output Range 0 to 20 mA	Output Range 4 to 20 mA	Units		Range
		decimal	hexadecimal	
0	0	>32511	>7EFF$_H$	Overflow
23,5178 : 20,0007	22,8142 : 20,0006	32511 : 27649	7$_{EFFH}$: 6$_{C01H}$	Over-range
20,0000 : 0	20,0000 : 4,0000	27648 : 0	6$_{C00H}$: 0$_H$	Nominal range
0 : 0	3,9994 : 0	-1 : -6912	FFFF$_H$: E500$_H$	Under-range
0	0	<-6912	<E4FF$_H$	Underflow

14.1.5 Analog Value Representation for Measuring Ranges with SIMATIC S5

Analog Value Representation

The analog inputs have a resolution of 11 bits + sign/ 12 bits + sign; The analog outputs have 11 bits + sign Each analog value is always entered left justified in the ACCU.

The analog values are represented as two's complement.

Analog Inputs

The following table shows the analog value representation of the analog electronics modules with analog inputs. With smaller resolutions, the lower-order bits are padded with "0".

Table 14-36 Analog Value Representation of the Analog Inputs (SIMATIC S5 Format)

Resolution	Analog Value															
Bit number	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Place values of the bits	S	2^{11}	2^{10}	2^{9}	2^{8}	2^{7}	2^{6}	2^{5}	2^{4}	2^{3}	2^{2}	2^{1}	2^{0}	x	E	O
	S	2^{10}	2^{9}	2^{8}	2^{7}	2^{6}	2^{5}	2^{4}	2^{3}	2^{2}	2^{1}	2^{0}	x	x	E	O

Sign

The sign (S) of the analog value is always in bit number 15:

- "0“ = +
- "1“ = -

Irrelevant Bits

Irrelevant bits are indicated by "x".

Diagnostic Bits

Bit numbers 0 and 1 are reserved for diagnostic functions, bit number 2 has no significance.

- F = error bit (0 = no wire break; 1 = wire break)
- O = overflow bit

Analog Outputs

The following table shows the analog value representation of the electronics modules with analog outputs.

Table 14-37 Analog Value Representation of the Analog Outputs (SIMATIC S5 Format)

Resolution	Analog Value															
Bit number	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Place values of the bits	S	2^{10}	2^{9}	2^{8}	2^{7}	2^{6}	2^{5}	2^{4}	2^{3}	2^{2}	2^{1}	2^{0}	x	x	x	x

14.1.6 Analog Value Representation for the Measuring Ranges of the Analog Input Modules in SIMATIC S5 Format

Introduction

The tables in this section contain the digitized analog values for the measuring ranges of the analog input modules.

Calculation

The SIMATIC S5 format is calculated from the SIMATIC S7 format in the analog module. The over-range therefore has the same magnitude in both formats (approximately 17.6%).

Measuring Range for Thermal e.m.f.: ± 80 mV

Table 14-38 SIMATIC S5 Format: Measuring Range ± 80 mV

Measuring Range ± 80 mV	Units (decimal)	Data Word																Range
		12	11	10	9	8	7	6	5	4	3	2	1	0	X	E	O	
>94.071	2409	0	1	0	0	1	0	1	1	0	1	0	0	1	0	0	1	Overflow
94,071	2408	0	1	0	0	1	0	1	1	0	1	0	0	0	0	0	0	Over-range
80,040	2049	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	
80,000	2048	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Nominal range
0,039	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	
0,0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
-0,039	-1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	
-80,000	-2048	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
-80,040	-2049	1	0	1	1	1	1	1	1	1	1	1	1	1	0	0	0	Underrange
-94,074	-2408	1	0	1	1	0	1	0	0	1	1	0	0	0	0	0	0	
< -94.074	-2409	1	0	1	1	0	1	0	0	1	0	1	1	1	0	0	1	Underflow

Measuring Ranges for Current: 0 to 20 mA, 4 to 20 mA

Table 14-39 SIMATIC S5 Format: Measuring Ranges 0 to 20 mA, 4 to 20 mA

Measuring Range		Units (decimal)	Data Word																Range
0 to 20 mA	4 to 20 mA		12	11	10	9	8	7	6	5	4	3	2	1	0	X	E	O	
>22.8125	>22.8142	2921	0	1	0	1	1	0	1	1	0	1	0	0	1	0	0	1	Overflow
22,8125	22,8142	2920	0	1	0	1	1	0	1	1	0	1	0	0	0	0	0	0	Over-range
20,0078	20,0078	2561	0	1	0	1	0	0	0	0	0	0	0	0	1	0	0	0	
20	20	2560	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	Nominal range
:	4,0078	513	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0	0	
0	4	512	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	
Negative values are not possible	3,9922	511	0	0	0	0	1	1	1	1	1	1	1	1	1	0	0	0	Underrange
	3.6000*	461*	0	0	0	0	1	1	1	0	0	1	1	0	1	0	0	0	
	1,1852	151*	0	0	0	0	0	1	0	0	1	0	1	1	1	0	0	0	
	<1.1852	150*	0	0	0	0	0	1	0	0	1	0	1	1	0	0	0	1	Underflow

* If you have enabled the wire break diagnostic parameter, the wire break diagnostic message is reported if the value drops below 3.6 mA and the following values are entered: decimal 4095 (bits 0 to 12)/ hexadecimal 7FFB.

Measuring Range for Resistance-type Sensor: 600 ohms absolute

Table 14-40 SIMATIC S5 format: Measuring range 600 ohms absolute

Measured value °C	**Units (decimal)**	**Data Word**																**Range**
600 ohms		**12**	**11**	**10**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**	**X**	**E**	**O**	
>705.534	2409	0	1	0	0	1	0	1	1	0	1	0	0	1	0	0	1	Overflow
705,534	2408	0	1	0	0	1	0	1	1	0	1	0	0	0	0	0	0	Over-range
600,29	2049	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	
600	2048	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Nominal range
0,288	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
negative values (not physically possible)	-1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	Underrange *
	-360	1	1	1	1	0	1	0	0	1	1	0	0	0	0	0	0	
	-361	1	1	1	1	0	1	0	0	1	0	1	1	1	0	0	1	Underflow*

* If resistors are connected incorrectly

Measuring Range for Temperature Sensors: Pt100 Standard

Table 14-41 SIMATIC S5 Format: Measuring Range Pt100 Standard in °C

Meas. val. in °C (1 digit = 0.5 °C)	Units (decimal)	Data Word																Range
		12	11	10	9	8	7	6	5	4	3	2	1	0	X	E	O	
> 1000	2001	0	0	1	1	1	1	1	0	1	0	0	0	1	0	0	1	Overflow
1000	2000	0	0	1	1	1	1	1	0	1	0	0	0	0	0	0	0	Over-range
850,5	1701	0	0	1	1	0	1	0	1	0	0	1	0	1	0	0	0	
850,0	1700	0	0	1	1	0	1	0	1	0	0	1	0	0	0	0	0	Nominal range
0,5	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	
0,0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
-0,5	-1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	
-200,0	-400	1	1	1	1	0	0	1	1	1	0	0	0	0	0	0	0	
-200,5	-401	1	1	1	1	0	0	1	1	0	1	1	1	1	0	0	0	Underrange
-243	-486	1	1	1	1	0	0	0	0	1	1	0	1	0	0	0	0	
< -243.0	-487	1	1	1	1	0	0	0	0	1	1	0	0	1	0	0	1	Underflow

Table 14-42 SIMATIC S5 Format: Measuring Range Pt100 Standard in °F

Meas. val. in °F (1 digit = 0.5 °F)	Units (decimal)	Data Word																Range
		12	11	10	9	8	7	6	5	4	3	2	1	0	X	E	O	
> 1832	3665	0	1	1	1	0	0	1	0	1	0	0	0	1	0	0	1	Overflow
1832	3664	0	1	1	1	0	0	1	0	1	0	0	0	0	0	0	0	Over-range
1562,5	3125	0	1	1	0	0	0	0	1	1	0	1	0	1	0	0	0	
1562	3124	0	1	1	0	0	0	0	1	1	0	1	0	0	0	0	0	Nominal range
0,5	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0,0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
-0,5	-1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	
-328	-656	1	1	1	0	1	0	1	1	1	0	0	0	0	0	0	0	
-328,5	-657	1	1	1	0	1	0	1	1	0	1	1	1	1	0	0	0	Underrange
-405,4	-811	1	1	1	0	0	1	1	0	1	0	1	0	1	0	0	0	
< -405.4	-812	1	1	0	0	1	1	0	1	0	1	0	0	0	0	0	1	Underflow

Measuring Range for Temperature Sensors: Pt100 Climatic

Table 14-43 SIMATIC S5 Format: Measuring Range Pt100 Climatic in °C

Meas. val. in °C (1 digit = 0.05 °C)	Units (decimal)	Data Word																Range
		12	11	10	9	8	7	6	5	4	3	2	1	0	X	E	O	
> 155	3101	0	1	1	0	0	0	0	0	1	1	1	0	1	0	0	1	Overflow
155	3100	0	1	1	0	0	0	0	0	1	1	1	0	0	0	0	0	Over-range
130,05	2601	0	1	0	1	0	0	0	1	0	1	0	0	1	0	0	0	
130	2600	0	1	0	1	0	0	0	1	0	1	0	0	0	0	0	0	Nominal range
0,05	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	
0,0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
-0,05	-1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	
-120	-2400	1	0	1	1	0	1	0	1	0	0	0	0	0	0	0	0	
-120,05	-2401	1	0	1	1	0	1	0	0	1	1	1	1	1	0	0	0	Underrange
-145	-2900	1	0	1	0	0	1	0	1	0	1	1	0	0	0	0	0	
< -145	-2901	1	0	1	0	0	1	0	1	0	1	0	1	1	0	0	1	Underflow

Table 14-44 SIMATIC S5 Format: Measuring Range Pt100 Climatic in °F

Meas. val. in °F (1 digit = 0.1 °F)	Units (decimal)	Data Word																Range
		12	11	10	9	8	7	6	5	4	3	2	1	0	X	E	O	
> 311	3111	0	1	1	0	0	0	0	1	0	0	1	1	1	0	0	1	Overflow
311	3110	0	1	1	0	0	0	0	1	0	0	1	1	0	0	0	0	Over-range
266,1	2661	0	1	0	1	0	0	1	1	0	0	1	0	1	0	0	0	
266	2660	0	1	0	1	0	0	1	1	0	0	1	0	0	0	0	0	Nominal range
0,1	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	
0,0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
-0,1	-1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	
-184	-1840	1	1	0	0	0	1	1	0	1	0	0	0	0	0	0	0	
-184,1	-1841	1	1	0	0	0	1	1	0	0	1	1	1	1	0	0	0	Underrange
-229	-2290	1	0	1	1	1	0	0	0	0	1	1	1	0	0	0	0	
< -229	-2291	1	0	1	1	1	0	0	0	0	1	1	0	1	0	0	1	Underflow

Measuring Range for Temperature Sensors: Ni100 Standard

Table 14-45 SIMATIC S5 Format: Measuring Range Ni100 Standard in °C

Meas. val. in °C (1 digit = 0.5 °C)	Units (decimal)	Data Word																Range
		12	11	10	9	8	7	6	5	4	3	2	1	0	X	E	O	
> 295	591	0	0	0	1	0	0	1	0	0	1	1	1	1	0	0	1	Overflow
295	590	0	0	0	1	0	0	1	0	0	1	1	1	0	0	0	0	Over-range
250,5	501	0	0	0	0	1	1	1	1	1	0	1	0	1	0	0	0	
250	500	0	0	0	0	1	1	1	1	1	0	1	0	0	0	0	0	Nominal range
0,5	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	
0,0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
-0,5	-1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	
-60,0	-120	1	1	1	1	1	1	0	0	0	1	0	0	0	0	0	0	
-60,5	-121	1	1	1	1	1	1	1	1	0	0	0	0	1	0	0	0	Underrange *
-105	-210	1	1	1	1	1	0	0	1	0	1	1	1	0	0	0	0	
< -105.0	-211	1	1	1	1	1	0	0	1	0	1	1	0	1	0	0	1	Underflow

* In the over-range and range, the existing slope of the characteristic curve is retained when the value leaves the linearized nominal range.

Table 14-46 SIMATIC S5 Format: Measuring Range Ni100 Standard in °F

Meas. val. in °F (1 digit = 0.5 °F)	Units (decimal)	Data Word																Range
		12	11	10	9	8	7	6	5	4	3	2	1	0	X	E	O	
> 563	1127	0	0	1	0	0	0	1	1	0	0	1	1	1	0	0	1	Overflow
563	1126	0	0	1	0	0	0	1	1	0	0	1	1	0	0	0	0	Over-range
482,5	965	0	0	0	0	1	1	1	1	0	0	0	0	1	0	0	0	
482	964	0	0	0	1	1	1	1	0	0	0	1	0	0	0	0	0	Nominal range
0,5	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	
0,0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
-0,5	-1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	
-76	-152	1	1	1	1	1	0	1	1	0	1	0	0	0	0	0	0	
-76,5	-153	1	1	1	1	1	0	1	1	0	0	1	1	1	0	0	0	Underrange *
-157	-314	1	1	1	1	0	1	1	0	0	0	1	1	0	0	0	0	
< -157	-315	1	1	1	1	0	1	1	0	0	0	1	0	1	0	0	1	Underflow

* In the over-range and range, the existing slope of the characteristic curve is retained when the value leaves the linearized nominal range.

Measuring Range for Temperature Sensors: Ni100 Climatic

Table 14-47 SIMATIC S5 Format: Measuring Range Ni100 Climatic in °C

Meas. val. in °C (1 digit = 0.1 °C)	Units (decimal)	Data Word																Range
		12	11	10	9	8	7	6	5	4	3	2	1	0	X	E	O	
> 295	2951	0	1	0	1	1	1	0	0	0	0	1	1	1	0	0	1	Overflow
295	2950	0	1	0	1	1	1	0	0	0	0	1	1	0	0	0	0	Over-range*
250,1	2501	0	1	0	0	1	1	1	0	0	0	1	0	1	0	0	0	
250	2500	0	1	0	0	1	1	1	0	0	0	1	0	0	0	0	0	Nominal range
0,1	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	
0,0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
-0,1	-1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	
-60,0	-600	1	1	1	0	1	1	0	1	0	1	0	0	0	0	0	0	
-60,1	-601	1	1	1	0	1	1	0	1	0	0	1	1	1	0	0	0	Underrange *
-105	-1050	1	1	0	1	1	1	1	1	0	0	1	1	0	0	0	0	
< -105	-1051	1	1	0	1	1	1	1	1	0	0	1	0	1	0	0	1	Underflow

* In the over-range and range, the existing slope of the characteristic curve is retained when the value leaves the linearized nominal range.

Table 14-48 SIMATIC S5 Format: Measuring Range Ni100 Climatic in °F

Meas. val. in °F (1 digit = 0.2 °F)	Units (decimal)	Data Word																Range
		12	11	10	9	8	7	6	5	4	3	2	1	0	X	E	O	
> 563	2816	0	1	0	1	1	0	0	0	0	0	0	0	0	0	0	1	Overflow
563	2815	0	1	0	1	0	1	1	1	1	1	1	1	1	0	0	0	Over-range*
482,2	2411	0	1	0	0	1	0	1	1	0	1	0	1	1	0	0	0	
482	2410	0	1	0	0	1	0	1	1	0	1	0	1	0	0	0	0	Nominal range
0,2	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	
0,0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
-0,2	-1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	
-76	-380	1	1	1	1	0	1	0	0	0	0	1	0	0	0	0	0	
-76,2	-381	1	1	1	1	0	1	0	0	0	0	0	1	1	0	0	0	Underrange *
-157	-785	1	1	1	0	0	1	1	1	0	1	1	1	1	0	0	0	
< -157	-786	1	1	1	0	0	1	1	1	0	1	1	1	0	0	0	1	Underflow

* In the over-range and range, the existing slope of the characteristic curve is retained when the value leaves the linearized nominal range.

Measuring Range for Thermocouple: Type E

Table 14-49 SIMATIC S5 Format: Measuring Range Type E in °C

Meas. val. °C	Units (decimal)	Data Word																Range
		12	11	10	9	8	7	6	5	4	3	2	1	0	X	E	O	
> 1200	1201	0	0	1	0	0	1	0	1	1	0	0	0	1	0	0	1	Overflow
1200	1200	0	0	1	0	0	1	0	1	1	0	0	0	0	0	0	0	Over-range
1001	1001	0	0	0	1	1	1	1	1	0	1	0	0	1	0	0	0	
1000	1000	0	0	0	1	1	1	1	1	0	1	0	0	0	0	0	0	Nominal range
1	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
-1	-1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	
-270	-270	1	1	1	1	0	1	1	1	1	0	0	1	0	0	0	0	
< -270	-271	1	1	1	1	0	1	1	1	1	0	0	0	1	0	0	1	Underflow

Table 14-50 SIMATIC S5 Format: Measuring Range Type E in °F

Meas. val. in °F	Units (decimal)	Data Word																Range
		12	11	10	9	8	7	6	5	4	3	2	1	0	X	E	O	
> 2192	2193	0	1	0	0	0	1	0	0	1	0	0	0	1	0	0	1	Overflow
2192	2192	0	1	0	0	0	1	0	0	1	1	0	0	0	0	0	0	Over-range
1833	1833	0	0	1	1	1	0	0	1	0	1	0	0	1	0	0	0	
1832	1832	0	0	1	1	1	0	0	1	0	1	0	0	0	0	0	0	Nominal range
1	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
-1	-1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	
-454	-454	1	1	1	1	0	0	0	1	1	1	0	1	0	0	0	0	
< -454	-455	1	1	1	1	0	0	0	1	1	1	0	0	1	0	0	1	Underflow

Measuring Range for Thermocouple: Type N

Table 14-51 SIMATIC S5 Format: Measuring Range Type N in °C

Meas. val. in °C	Units (decimal)	Data Word																Range
		12	11	10	9	8	7	6	5	4	3	2	1	0	X	E	O	
> 1550	1551	0	0	1	1	0	0	0	0	0	1	1	1	1	0	0	1	Overflow
1550	1550	0	0	1	1	0	0	0	0	0	1	1	1	0	0	0	0	Over-range
1301	1301	0	0	1	0	1	0	0	0	1	0	1	0	1	0	0	0	
1300	1300	0	0	1	0	1	0	0	0	1	0	1	0	0	0	0	0	Nominal range
1	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
-1	-1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	
-270	-270	1	1	1	1	0	1	1	1	1	0	0	1	0	0	0	0	
< -270	-271	1	1	1	1	0	1	1	1	1	0	0	0	1	0	0	1	Underflow

Table 14-52 SIMATIC S5 Format: Measuring Range Type N in °F

Meas. val. in °F	Units (decimal)	Data Word																Range
		12	11	10	9	8	7	6	5	4	3	2	1	0	X	E	O	
> 2822	2823	0	1	0	1	1	0	0	0	0	0	1	1	1	0	0	1	Overflow
2822	2822	0	1	0	1	1	0	0	0	0	0	1	1	0	0	0	0	Over-range
2373	2373	0	1	0	0	1	0	1	0	0	0	1	0	1	0	0	0	
2372	2372	0	1	0	0	1	0	1	0	0	0	1	0	0	0	0	0	Nominal range
1	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
-1	-1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	
-454	-454	1	1	1	1	0	0	0	1	1	1	0	1	0	0	0	0	
< -454	-455	1	1	1	1	0	0	0	1	1	1	0	0	1	0	0	1	Underflow

Measuring Range for Thermocouple: Type J

Table 14-53 SIMATIC S5 Format: Measuring Range Type J in °C

Meas. val. in °C	Units (decimal)	Data Word																Range
		12	11	10	9	8	7	6	5	4	3	2	1	0	X	E	O	
> 1450	1451	0	0	1	0	1	1	0	1	0	1	0	1	1	0	0	1	Overflow
1450	1450	0	0	1	0	1	1	0	1	0	1	0	1	0	0	0	0	Over-range
1201	1201	0	0	1	0	0	1	0	1	1	0	0	0	1	0	0	0	
1200	1200	0	0	1	0	0	1	0	1	1	0	0	0	0	0	0	0	Nominal range
1	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
-1	-1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	
-210	-210	1	1	1	1	1	0	0	1	0	1	1	1	0	0	0	0	
< -210	-211	1	1	1	1	1	0	0	1	0	1	1	0	1	0	0	1	Underflow

Table 14-54 SIMATIC S5 Format: Measuring Range Type J in °F

Meas. val. in °F	Units (decimal)	Data Word																Range
		12	11	10	9	8	7	6	5	4	3	2	1	0	X	E	O	
> 2642	2643	0	1	0	1	0	0	1	0	1	0	0	1	1	0	0	1	Overflow
2642	2642	0	1	0	1	0	0	1	0	1	0	0	1	0	0	0	0	Over-range
2193	2193	0	1	0	0	0	1	0	0	1	0	0	0	1	0	0	0	
2192	2192	0	1	0	0	0	1	0	0	1	0	0	0	0	0	0	0	Nominal range
1	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
-1	-1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	
-346	-346	1	1	1	1	0	1	0	1	0	0	1	1	0	0	0	0	
< -346	-347	1	1	1	1	0	1	0	1	0	0	1	0	1	0	0	1	Underflow

Measuring Range for Thermocouple: Type K

Table 14-55 SIMATIC S5 Format: Measuring Range Type K in °C

Meas. val. in °C	Units (decimal)	Data Word																Range
		12	11	10	9	8	7	6	5	4	3	2	1	0	X	E	O	
> 1622	1623	0	0	1	1	0	0	1	0	1	0	1	1	1	0	0	1	Overflow
1622	1622	0	0	1	1	0	0	1	0	1	0	1	1	0	0	0	0	Over-range
1373	1373	0	0	1	0	1	0	1	0	1	1	1	0	1	0	0	0	
1372	1372	0	0	1	0	1	0	1	0	1	1	1	0	0	0	0	0	Nominal range
1	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
-1	-1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	
-270	-270	1	1	1	1	0	1	1	1	1	0	0	1	0	0	0	0	
< -270	-271	1	1	1	1	0	1	1	1	1	0	0	0	1	0	0	1	Underflow

Table 14-56 SIMATIC S5 Format: Measuring Range Type K in °F

Meas. val. in °F	Units (decimal)	Data Word																Range
		12	11	10	9	8	7	6	5	4	3	2	1	0	X	E	O	
> 2952	2953	0	1	0	1	1	1	0	0	0	1	0	0	1	0	0	1	Overflow
2952	2952	0	1	0	1	1	1	0	0	0	1	0	0	0	0	0	0	Over-range
2503	2503	0	1	0	0	1	1	1	0	0	0	1	1	1	0	0	0	
2502	2502	0	1	0	0	1	1	1	0	0	0	1	1	0	0	0	0	Nominal range
1	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
-1	-1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	
-454	-454	1	1	1	1	0	0	0	1	1	1	0	1	0	0	0	0	
< -454	-455	1	1	1	1	0	0	0	1	1	1	0	0	1	0	0	1	Underflow

Measuring Range for Thermocouple: Type L

Table 14-57 SIMATIC S5 Format: Measuring Range Type L in °C

Meas. val. in °C	Units (decimal)	Data Word																Range
		12	11	10	9	8	7	6	5	4	3	2	1	0	X	E	O	
> 1150	1151	0	0	1	0	0	0	1	1	1	1	1	1	1	0	0	1	Overflow
1150	1150	0	0	1	0	0	0	1	1	1	1	1	1	0	0	0	0	Over-range
901	901	0	0	0	1	1	1	0	0	0	0	1	0	1	0	0	0	
900	900	0	0	0	1	1	1	0	0	0	0	1	0	0	0	0	0	Nominal range
1	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
-1	-1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	
-200	-200	1	1	1	1	1	0	0	1	1	1	0	0	0	0	0	0	
< -200	-201	1	1	1	1	1	0	0	1	1	0	1	1	1	0	0	1	Underflow

Table 14-58 SIMATIC S5 Format: Measuring Range Type L in °F

Meas. val. in °F	Units (decimal)	Data Word																Range
		12	11	10	9	8	7	6	5	4	3	2	1	0	X	E	O	
> 2102	2103	0	1	0	0	0	0	0	1	1	0	1	1	1	0	0	1	Overflow
2102	2102	0	1	0	0	0	0	0	1	1	0	1	1	0	0	0	0	Over-range
1653	1653	0	0	1	1	0	0	1	1	1	0	1	0	1	0	0	0	
1652	1652	0	0	1	1	0	0	1	1	1	0	1	0	0	0	0	0	Nominal range
1	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
-1	-1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	
-328	-328	1	1	1	1	0	1	0	1	1	1	0	0	0	0	0	0	
< -328	-329	1	1	1	1	0	1	0	1	1	0	1	1	1	0	0	1	Underflow

Measuring Range for Thermocouple: Type R, S

Table 14-59 SIMATIC S5 Format: Measuring Range Type R, S in °C

Meas. val. in °C	Units (decimal)	Data Word																Range
		12	11	10	9	8	7	6	5	4	3	2	1	0	X	E	O	
> 2019	2020	0	0	1	1	1	1	1	1	0	0	1	0	0	0	0	1	Overflow
2019	2019	0	0	1	1	1	1	1	1	0	0	0	1	1	0	0	0	Over-range
1770	1770	0	0	1	1	0	1	1	1	0	1	0	1	0	0	0	0	
1769	1769	0	0	1	1	0	1	1	1	0	1	0	0	1	0	0	0	Nominal range
1	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
-1	-1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	
-50	-50	1	1	1	1	1	1	1	0	0	1	1	1	0	0	0	0	
-51	-51	1	1	1	1	1	1	1	0	0	1	1	0	1	0	0	0	Underrange
-170	-170	1	1	1	1	1	0	1	0	1	0	1	1	0	0	0	0	
< -170	-171	1	1	1	1	1	0	1	0	1	0	1	0	1	0	0	1	Underflow

Table 14-60 SIMATIC S5 Format: Measuring Range Type R, S in °F

Meas. val. in °F	Units (decimal)	Data Word																Range
		12	11	10	9	8	7	6	5	4	3	2	1	0	X	E	O	
> 3666	3667	0	1	1	1	0	0	1	0	1	0	0	1	1	0	0	1	Overflow
3666	3666	0	1	1	1	0	0	1	0	1	0	0	1	0	0	0	0	Over-range
3217	3217	0	1	1	0	0	1	0	0	1	0	0	0	1	0	0	0	
3216	3216	0	1	1	0	0	1	0	0	1	0	0	0	0	0	0	0	Nominal range
1	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
-1	-1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	
-58	-58	1	1	1	1	1	1	1	0	0	0	1	1	0	0	0	0	
-59	-59	1	1	1	1	1	1	1	0	0	0	1	0	1	0	0	0	Underrange
-274	-274	1	1	1	1	0	1	1	1	0	1	1	1	0	0	0	0	
< -274	-275	1	1	1	1	0	1	1	1	0	1	1	0	1	0	0	1	Underflow

Measuring Range for Thermocouple: Type B

Table 14-61 SIMATIC S5 Format: Measuring Range Type B in °C

Meas. val. in °C	Units (decimal)	Data Word																Range
		12	11	10	9	8	7	6	5	4	3	2	1	0	X	E	O	
> 2070	2071	0	1	0	0	0	0	0	0	1	0	1	1	1	0	0	1	Overflow
2070	2070	0	1	0	0	0	0	0	0	1	0	1	1	0	0	0	0	Over-range
1821	1821	0	0	1	1	1	0	0	0	1	1	1	0	1	0	0	0	
1820	1820	0	0	1	1	1	0	0	0	1	1	1	0	0	0	0	0	Nominal range
1	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
-1	-1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	Underrange
-120	-120	1	1	1	1	1	1	0	0	0	1	0	0	0	0	0	0	
< -120	-121	1	1	1	1	1	1	0	0	0	0	1	1	1	0	0	1	Underflow

Table 14-62 SIMATIC S5 Format: Measuring Range Type B in °F

Meas. val. in °F	Units (decimal)	Data Word																Range
		12	11	10	9	8	7	6	5	4	3	2	1	0	X	E	O	
> 3758	3759	0	1	1	1	0	1	0	1	0	1	1	1	1	0	0	1	Overflow
3758	3758	0	1	1	1	0	1	0	1	0	1	1	1	0	0	0	0	Over-range
3309	3309	0	1	1	0	0	1	1	1	0	1	1	0	1	0	0	0	
3308	3308	0	1	1	0	0	1	1	1	0	1	1	0	0	0	0	0	Nominal range
1	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
-1	-1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	Underrange
-184	-184	1	1	1	1	1	0	1	0	0	1	0	0	0	0	0	0	
< -184	-185	1	1	1	1	1	0	1	0	0	0	1	1	1	0	0	1	Underflow

Measuring Range for Thermocouple: Type T

Table 14-63 SIMATIC S5 Format: Measuring Range Type T in °C

Meas. val. in °C	Units (decimal)	Data Word																Range
		12	11	10	9	8	7	6	5	4	3	2	1	0	X	E	O	
> 540	541	0	0	0	1	0	0	0	0	1	1	1	0	1	0	0	1	Overflow
540	540	0	0	0	1	0	0	0	0	1	1	1	0	0	0	0	0	Over-range
401	401	0	0	0	0	1	1	0	0	1	0	0	0	1	0	0	0	
400	400	0	0	0	0	1	1	0	0	1	0	0	0	0	0	0	0	Nominal range
1	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
-1	-1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	
-270	-270	1	1	1	1	0	1	1	1	1	0	0	1	0	0	0	0	
< -270	-271	1	1	1	1	0	1	1	1	1	0	0	0	1	0	0	1	Underflow

Table 14-64 SIMATIC S5 Format: Measuring Range Type T in °F

Meas. val. in °F	Units (decimal)	Data Word																Range
		12	11	10	9	8	7	6	5	4	3	2	1	0	X	E	O	
> 1004	1005	0	0	0	1	1	1	1	1	0	1	1	0	1	0	0	1	Overflow
1004	1004	0	0	0	1	1	1	1	1	0	1	1	0	0	0	0	0	Over-range
753	753	0	0	0	1	0	1	1	1	1	0	0	0	1	0	0	0	
752	752	0	0	0	1	0	1	1	1	1	0	0	0	0	0	0	0	Nominal range
1	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
-1	-1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	
-454	-454	1	1	1	1	0	0	0	1	1	1	0	1	0	0	0	0	
< -454	-455	1	1	1	1	0	0	0	1	1	1	0	0	1	0	0	1	Underflow

Measuring Range for Thermocouple: Type U

Table 14-65 SIMATIC S5 Format: Measuring Range Type U in °C

Meas. val. in °C	Units (decimal)	Data Word																Range
		12	11	10	9	8	7	6	5	4	3	2	1	0	X	E	O	
> 850	851	0	0	0	1	1	0	1	0	1	0	0	1	1	0	0	1	Overflow
850	850	0	0	0	1	1	0	1	0	1	0	0	1	0	0	0	0	Over-range
601	601	0	0	0	1	0	0	1	0	1	1	0	0	1	0	0	0	
600	600	0	0	0	1	0	0	1	0	1	1	0	0	0	0	0	0	Nominal range
1	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
-1	-1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	
-200	-200	1	1	1	1	1	0	0	1	1	1	0	0	0	0	0	0	
< -200	-201	1	1	1	1	1	0	0	1	1	0	1	1	1	0	0	1	Underflow

Table 14-66 SIMATIC S5 Format: Measuring Range Type U in °F

Meas. val. in °F	Units (decimal)	Data Word																Range
		12	11	10	9	8	7	6	5	4	3	2	1	0	X	E	O	
> 1562	1563	0	0	1	1	0	0	0	0	1	1	0	1	1	0	0	1	Overflow
1562	1562	0	0	1	1	0	0	0	0	1	1	0	1	0	0	0	0	Over-range
1113	1113	0	0	1	0	0	0	1	0	1	1	0	0	1	0	0	0	
1112	1112	0	0	1	0	0	0	1	0	1	1	0	0	0	0	0	0	Nominal range
1	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
-1	-1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	
-328	-328	1	1	1	1	0	1	0	1	1	1	0	0	0	0	0	0	
< -328	-329	1	1	1	1	0	1	0	1	1	0	1	1	1	0	0	1	Underflow

14.1.7 Analog Value Representation for the Output Ranges of the Analog Output Modules in SIMATIC S5 Format

Introduction

The table in this section contains the digitized output ranges for the analog output modules.

Output Ranges for Current: 0 to 20 mA, 4 to 20 mA

Table 14-67 SIMATIC S5 Format: Measuring Ranges 0 to 20 mA, 4 to 20 mA

Measuring Range		Units (decimal)	Data Word																Range
0 to 20 mA	4 to 20 mA		11	10	9	8	7	6	5	4	3	2	1	0	x	x	x	x	
0	0	≥1205	0	1	0	0	1	0	1	1	0	1	0	1	x	x	x	x	Overflow
23,5178	22,8125	1204	0	1	0	0	1	0	1	1	0	1	0	0	x	x	x	x	Over-range
20,0180	20,0156	1025	0	1	0	0	0	0	0	0	0	0	0	1	x	x	x	x	
20,0000	20,0000	1024	0	1	0	0	0	0	0	0	0	0	0	0	x	x	x	x	Nominal range
:	4,0156	1	0	0	0	0	0	0	0	0	0	0	0	1	x	x	x	x	
0,0000	4,0000	0	0	0	0	0	0	0	0	0	0	0	0	0	x	x	x	x	
0,0000	3,9844	-1	1	1	1	1	1	1	1	1	1	1	1	1	x	x	x	x	Underrange
0,0000	0	-256	1	1	1	1	0	0	0	0	0	0	0	0	x	x	x	x	
0,0000	0	-257	1	1	1	0	1	1	1	1	1	1	1	1	x	x	x	x	Underflow
0,0000	0	≤-1205	1	0	1	1	0	1	0	0	1	0	1	1	x	x	x	x	

14.2 Basics of Analog Value Processing

14.2.1 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 14-68 Compensation of the Reference Junction Temperature

Options	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 lead to thermocouple lead) also influences the thermal e.m.f. The measured value is therefore inaccurate.	none
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 modules in the ET 200iS and used to correct the measured temperature value of the measurement junction. You can use 8 different reference junctions in the ET 200iS.	The parameter settings of the IM 151-2 and the 2AI TC must be matched: • 2AI RTD set to Pt100 climate range in the correct slot; • 2AI TC: Reference junction: RTD; Select the correct reference junction number; • IM 151-2: Assign the reference junction to a slot with 2AI RTD; Select a channel;

Extension to a Reference Junction

From their connection sides, the thermocouples can be extended by compensation cables as far as the reference junction (transition to copper wiring) or to the compensation box. The reference junction can also be an ET 200iS terminal module.

The compensation cables are made of the same material as the wires of the thermocouple. The connecting cables are copper. When connecting up, make sure that you do not reverse the polarity.

Compensation by Resistance Thermometer on the 2AI RTD

If thermocouples connected to the inputs of the 2AI TC have the same reference junction, compensate using a 2AI RTD.

For both channels of the 2AI TC module, you can select "RTD" or "none" as the reference junction. If you select "RTD", the same reference junction (RTD channel) is always used for both channels.

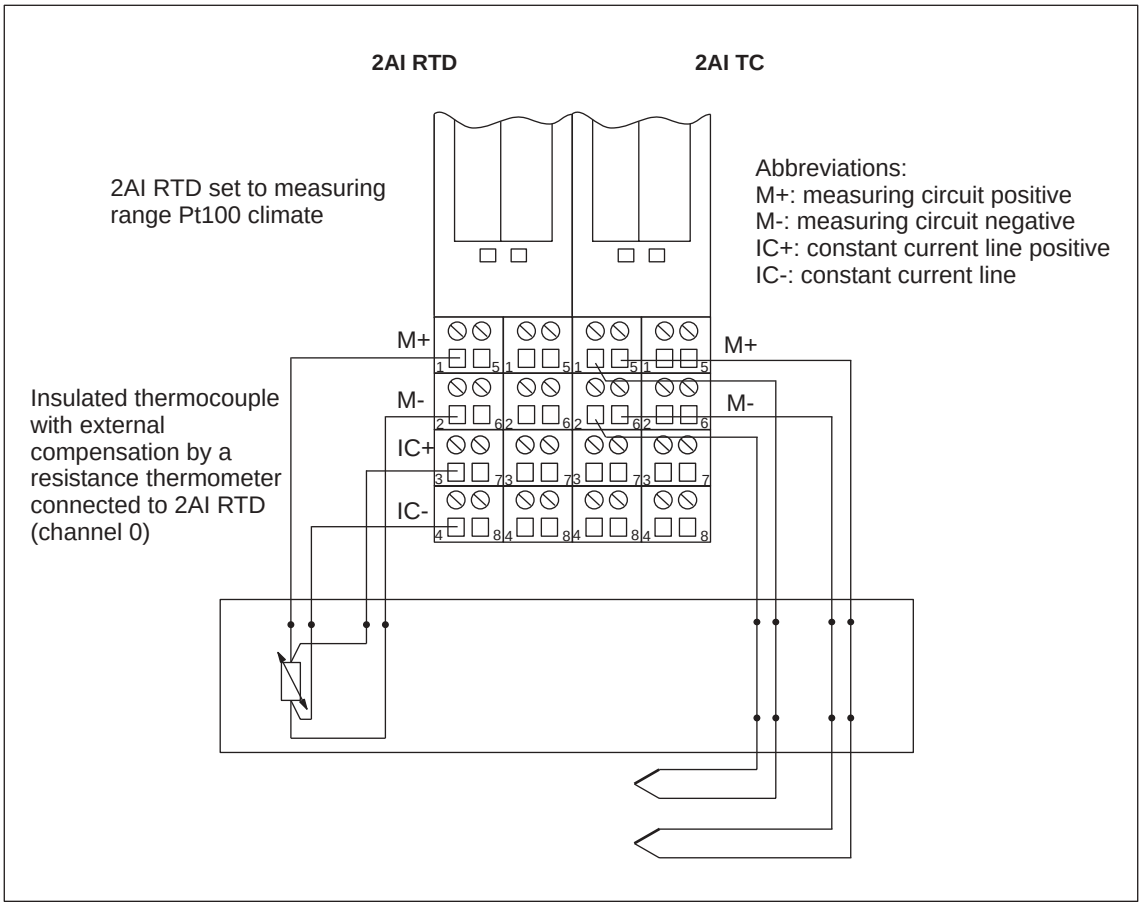


Figure 14-1 Compensation by 2AI RTD

Setting Parameters for the Reference Junction

You can set the reference junction for the 2AI TC electronics modules using the following parameters:

Table 14-69 Reference Junction Parameters

Parameter	Module	Range of Values	Explanation
Slot reference junction 1 to slot reference junction 8	IM 151-2	none, 4 to 35	With this parameter, you can assign up to 8 slots (none, 4 to 35), in which the channels for reference temperature measurement (calculating the compensation value).
Input reference junction 1 to input reference junction 8	IM 151-2	RTD on channel 0 RTD on channel 1	With this parameter you specify the channel for reference temperature measurement (calculating the compensation value) for the relevant slot.
Reference junction I0 and reference junction I1	2AI TC	none, RTD	With these parameters, you can enable the use of the reference junction.
Reference junction number	2AI TC	1 to 8	With this parameter, you assign the reference junction (1 to 8) containing the reference temperature (compensation value).

Example of Parameter Assignment for Reference Junctions

- Structure: To simplify the situation, the following schematic shows only RTD and TC modules:

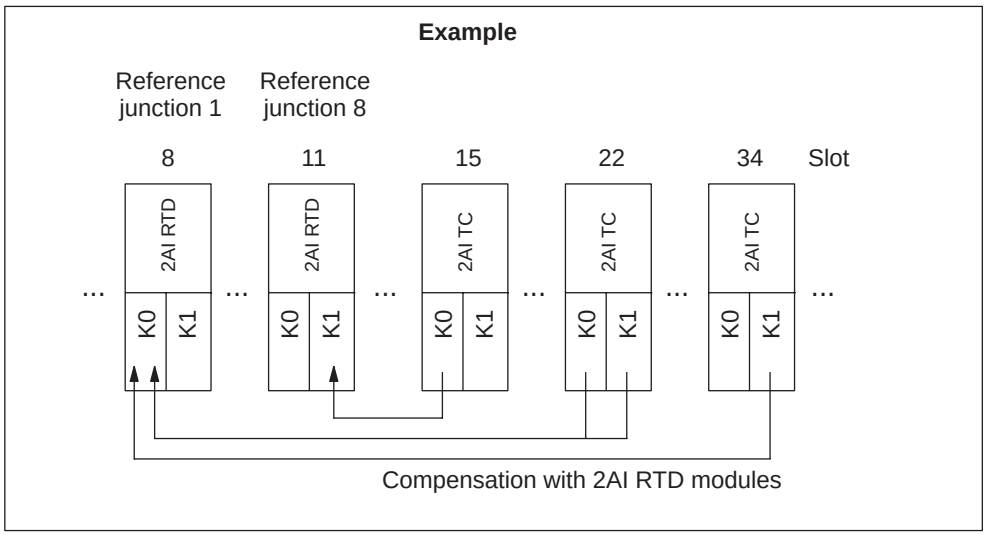


Figure 14-2 Example of Parameter Assignment for Reference Junctions

- Relevant Parameters for the Interface Module IM 151-2

Table 14-70 Relevant Parameters for the Interface Module IM 151-2

Parameter	Value
Slot reference junction 1	8
Input reference junction 1	RTD on channel 0
Slot reference junction 8	11
Input reference junction 8	RTD on channel 1

- Relevant Parameters for 2AI RTD and 2AI TC:

Table 14-71 Relevant Parameters for 2AI RTD and 2AI TC

Slot	Parameter	Value
8 (2AI RTD)	Measurement type / range I0	4-wire (temperature) / Pt 100 climate
11 (2AI RTD)	Measurement type / range I1	4-wire (temperature) / Pt 100 climate
15 (2AI TC)	Reference junction I0	RTD
	Reference junction I1	none
	Reference junction number	8
	Measuring range I0	Type...
	Measuring range I1	(any)
22 (2AI TC)	Reference junction I0	RTD
	Reference junction I1	RTD
	Reference junction number	1
	Measuring range I0	Type...
	Measuring range I1	Type...
34 (2AI TC)	Reference junction I0	none
	Reference junction I1	RTD
	Reference junction number	1
	Measuring range I0	(any)
	Measuring range I1	Type...

Uninsulated Thermocouples

If you use uninsulated thermocouples, make sure that you adhere to the permitted common mode voltage.

14.3 Response of the Analog Modules during Operation and if Faults Occur

Chapter Overview

This chapter describes the following:

- The dependence of the analog input and output values on the power supply of the electronics module and the operating states of the PLC.
- The response of the analog electronics modules depending on the location of the analog values in the relevant range.
- The influence of errors on the analog inputs/outputs.
- Use of the shield contact.

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 14-72 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)		Supply Voltage L+ on ET 200iS (Power Supply 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
			7FFFH until first change after startup or after assignment of parameters for the module is completed.	Until first value output: • After startup, a signal of 0 mA is output. • Dependent on the parameter "CPU/ master STOP"
POWER ON	STOP	L + present	Process value	Dependent on the parameter "CPU/ master STOP"

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 illustrates the relationship.

Table 14-73 Response of the Analog Modules Depending on the Location of the Analog Input Value in the Value Range

Measured Value is in	Input Value in the SIMATIC S7 Format	Input Value in the SIMATIC S5 Format
Nominal range	Measured value	Measured value
Over/under-range	Measured value	Measured value
Overflow	7_{FFFH}	End of the over-range +1 plus overflow bit
Underflow	8000_H	End of the under-range –1 plus overflow bit
Until valid measured values exist	7_{FFFH}	7_{FFFH}

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 14-74 Response of the Analog Modules Depending on the Location of the Analog Output Value in the Value Range

Output Value is in	Output Value in the SIMATIC S5/S7 Format
Nominal range	Value from DP master
Over/under-range	Value from DP master
Overflow	0 signal
Underflow	0 signal
Before parameter assignment	0 signal

14.4 Analog Electronics Module 2AI I 2WIRE

Order Number

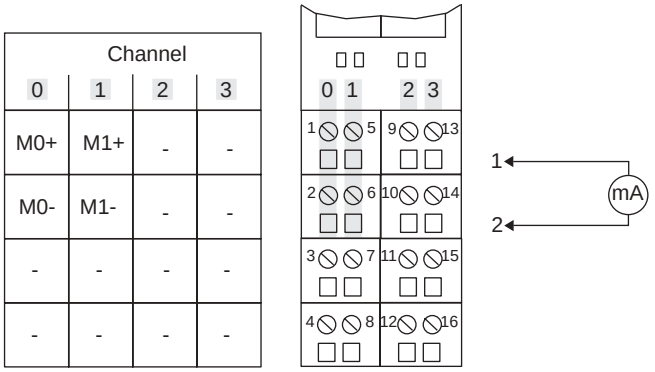
6ES7 134-5RB00-0AB0

Features

- 2 inputs for connecting 2-wire transducers
- Selectable input range: 4 to 20 mA
- Resolution 12 bits + sign

Terminal Assignment

Table 14-75 Terminal Assignment of the 2AI I 2WIRE

Terminal Assignment and View	Remarks
2DMU on Channel 0  	**2-wire transducer 1** Channel 0: Terminals 1 and 2 **2-wire transducer 2** Channel 1: Terminals 5 and 6 M +: Input signal "+" M -: Input signal "-" The 2-wire transducers are supplied over the measurement leads.

Block Diagram

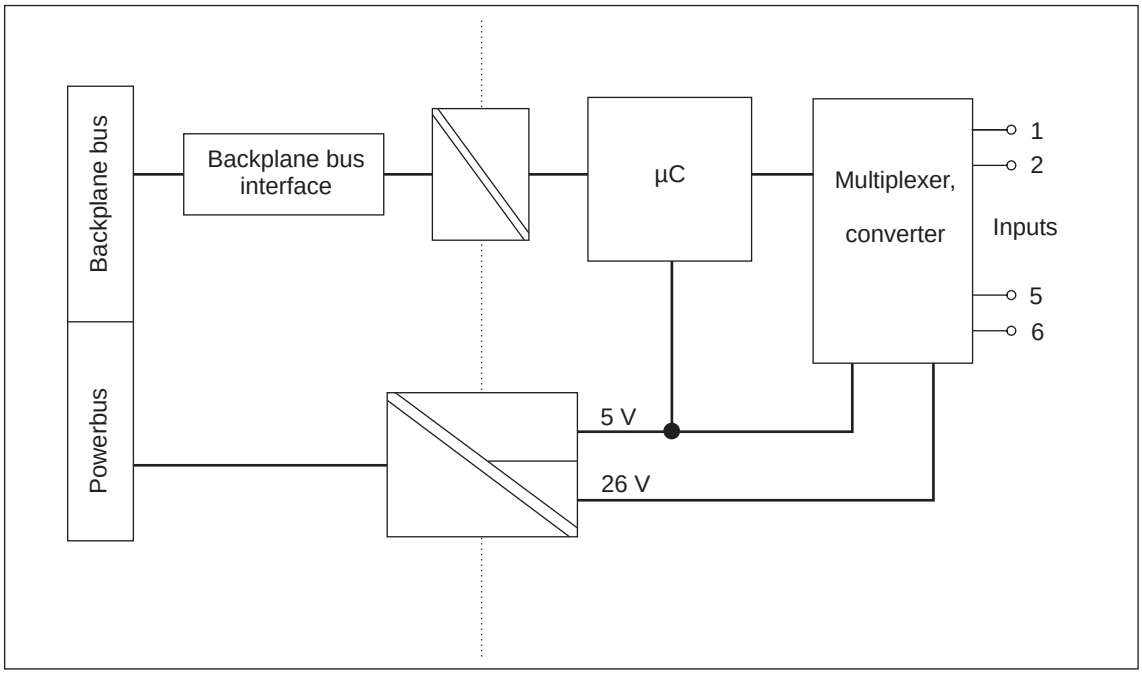


Figure 14-3 Block Diagram of the 2AI I 2WIRE

Technical Specifications

Table 14-76 Technical Specifications

Dimensions and Weight	
Dimensions W x H x D (mm)	30 x 81 x 76
Weight	approx. 120 g
Data Specific to the Module	
Number of inputs	2
Cable length	
• shielded	max. 200m

Data Specific to the Module		
Type of Protection		
• CENELEC	Ex II2(1)G EEx ib[ia] IIC T4 CE 0344	
• FM (applied for)	Class Number 3611: Class I, Division 2, Group A, B, C, D, Class I, Zone 2 Class Number 3610: Class I, Zone 1	
Voltages, Currents, Potentials		
Power supply of the transducers	yes	
• Supply current	max. 23mA (per channel)	
• Short-circuit proof	yes	
Electrical isolation		
• Between channels and backplane bus	yes	
• Between the channels	No	
• Between channels and load voltage (powerbus)	yes	
• Between load voltage (powerbus) and backplane bus	yes	
Insulation tested with	AC 500 V	
Current consumption		
• from load voltage L+ (powerbus)	max. 280 mA	
Power loss of the module	typ. 3.36 W	
Analog Value Formation		
Measurement principle	integrating (Sigma-Delta)	
Integration / conversion time / resolution (per channel)		
• Integration time selectable	No	
• Interference frequency suppression in Hz	60; 50	
• Basic conversion time including integration time (per channel) in ms	30	
• Cycle time in ms	Number of active channels per module x basic conversion time	
• Resolution (incl. over-range)	12 bits + sign	
Smoothing of measured values	yes, selectable in 4 levels:	
	Level	Time constant
	none	1 x cycle time
	weak	4 x cycle time
	medium	32 x cycle time
	strong	64 x cycle time

Interference Suppression, Error Limits	
Interference voltage suppression for f = n x (f1 ± 1 %), (f1 = interference frequency)	
• Normal-mode interference (peak value of the interference < nominal value of the input range)	min. 70 dB
Crosstalk between the inputs	min. -50 dB
Operational limits (in the entire temperature range, relative to the input range)	± 0.15 %
Basic error limit (operational limit at 25°C, related to the input range)	± 0.1 %
Temperature error (relative to the input range)	± 0.03 %
Linearity error (relative to the input range)	± 0.0015 %
Repeatability (in the settled state at 25°C, relative to the input range)	± 0.01 %
Status, Interrupts, Diagnostic Information	
Interrupts	
• Limit value interrupt	yes, selectable
• Diagnostic interrupt	yes, selectable
Diagnostic Functions	
• Group error display	red LED "SF"
• Diagnostic information readable	yes
Monitoring for	
• Short circuit	I < 23.8 mA*
• Wire break	I < 3.6 mA
Data Relevant to Safety	
See EU Prototype Test Certificate: KEMA 01 ATEX 1152 X	
Data for Selecting a Sensor	
Input ranges (nominal values) / input resistance	
• Current	4 to 20 mA
Permitted input current for current input (destruction limit)	90 mA
Connection of transducers	
• For current measurement	
As 2-wire transducer	possible
• Load impedance of the 2-wire transducer	max. 750 Ω

* I is in the current limitation. The current limitation cuts in at 27.2 mA. Short circuit at load impedance < 370 Ω.

14.5 Analog Electronics Module 2AI I 4WIRE

Order Number

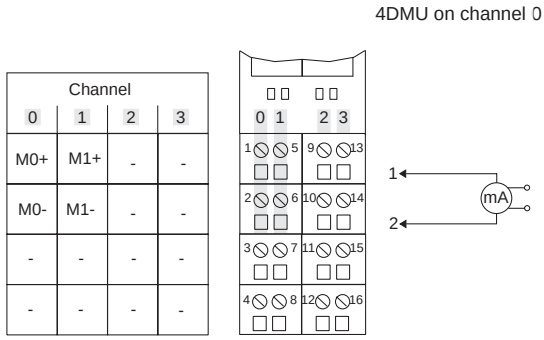
6ES7 134-5RB50-0AB0

Features

- 2 inputs for connecting 4-wire transducers
- Selectable input range: 0 to 20 mA / 4 to 20 mA
- Resolution 12 bits + sign

Terminal Assignment

Table 14-77 Terminal Assignment of the 2AI I 4WIRE

Terminal Assignment and View	Remarks
	**4-wire transducer 1** Channel 0: Terminals 1 and 2 **4-wire transducer 2** Channel 1: Terminals 5 and 6 M +: Input signal "+" M -: Input signal "-" The 4-wire transducers are supplied externally by a separate power supply.

Block Diagram

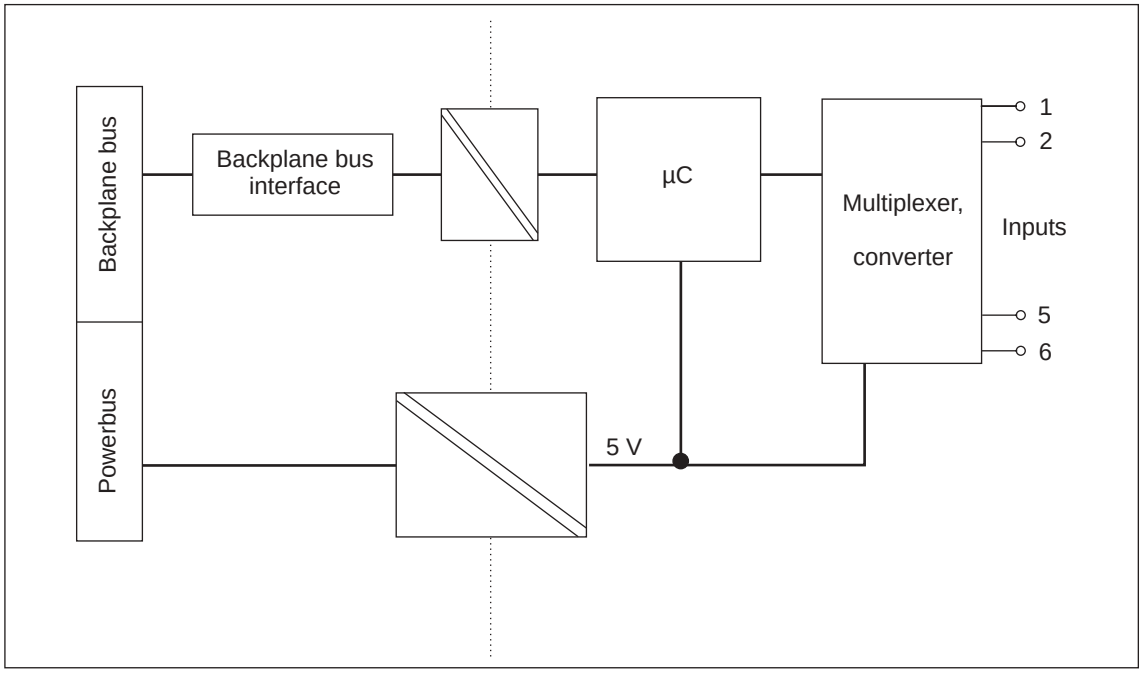


Figure 14-4 Block Diagram of the 2AI I 4WIRE

Technical Specifications

Table 14-78 Technical Specifications

Dimensions and Weight	
Dimensions W x H x D (mm)	30 x 81 x 76
Weight	approx. 120 g
Data for Specific Module	
Number of inputs	2
Cable length	
• shielded	max. 200m
Type of Protection	
• CENELEC	Ex II2(1)G EEx ib[ia] IIC T4 CE 0344

Data for Specific Module		
• FM (applied for)	Class Number 3611: Class I, Division 2, Group A, B, C, D, Class I, Zone 2 Class Number 3610: Class I, Zone 1	
Voltages, Currents, Potentials		
Power supply of the transducers	No	
Electrical isolation		
• Between channels and backplane bus	yes	
• Between the channels	No	
• Between channels and load voltage (powerbus)	yes	
• Between load voltage (powerbus) and backplane bus	yes	
Insulation tested with	AC 500 V	
Current consumption		
• from load voltage L+ (powerbus)	typ. 70 mA	
Power loss of the module	typ. 0.84 W	
Analog Value Formation		
Measurement principle	integrating (Sigma-Delta)	
Integration / conversion time / resolution (per channel)		
• Integration time selectable	yes	
• Interference frequency suppression in Hz	60, 50	
• Integration time	16.7 ms; 20 ms	
• Basic conversion time including integration time (per channel) in ms	30	
• Cycle time in ms	Number of active channels per module x basic conversion time	
• Resolution (incl. over-range)	12 bits + sign	
Smoothing of measured values	yes, selectable in 4 levels:	
	Level	Time constant
	none	1 x cycle time
	weak	4 x cycle time
	medium	32 x cycle time
	strong	64 x cycle time

Interference Suppression, Error Limits	
Interference voltage suppression for f = n x (f1 ± 1 %), (f1 = interference frequency)	
• Normal-mode interference (peak value of the interference < nominal value of the input range)	min. 70 dB
Crosstalk between the inputs	min. -50 dB
Operational limits (in the entire temperature range, relative to the input range)	± 0.15 %
Basic error limit (operational limit at 25°C, related to the input range)	± 0.1 %
Temperature error (relative to the input range)	± 0.03 %
Linearity error (relative to the input range)	± 0.015 %
Repeatability (in the settled state at 25°C, relative to the input range)	± 0.01 %
Status, Interrupts, Diagnostic Information	
Interrupts	
• Limit value interrupt	yes, selectable
• Diagnostic interrupt	yes, selectable
Diagnostic Functions	
• Group error display	red LED "SF"
• Diagnostic information readable	yes
Monitoring for	
• Wire break	I < 3.6 mA
Data Relevant to Safety	
Input 4DMU *	
See EU Prototype Test Certificate: KEMA 01 ATEX 1151 X	
Data for Selecting a Sensor	
Input ranges (nominal values) / input resistance	
• Current	0 to 20 mA/ min. 285 Ω 4 to 20 mA/ min. 285 Ω
Permitted input current for current input (destruction limit)	50 mA
Connection of transducers	
• For current measurement	
As 4-wire transducer	possible
Internal resistance of the output for 4DMU	min. 300 Ω

* Output parameters are negligibly small.

14.6 Analog Electronics Module 2AI RTD

Order Number

6ES7 134-5SB50-0AB0

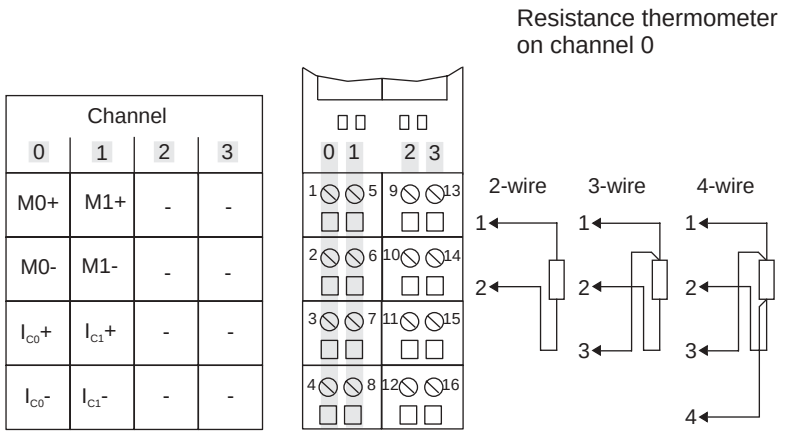
Features

- 2 inputs for resistance thermometer or resistance measurement
- Input ranges:
  - Resistance thermometer: Pt100; Ni100
  - Resistance measurement: 600 ohms
- Electrically isolated from load voltage L+
- Linearization of the sensor characteristic curves
- Resolution 15 bits + sign

Terminal Assignment

The following table shows the terminal assignments of the 2AI RTD on the terminal module.

Table 14-79 Terminal Assignment of the 2AI RTD

Terminal Assignment and View	Remarks
	**Resistance thermometer 1** Channel 0: Terminals 1 to 4 **Resistance thermometer 2** Channel 1: Terminals 5 to 8
	M+: Measuring cable positive M-: Measuring cable negative
	I_c+: Constant current cable positive I_c-: Constant current cable negative

Block Diagram

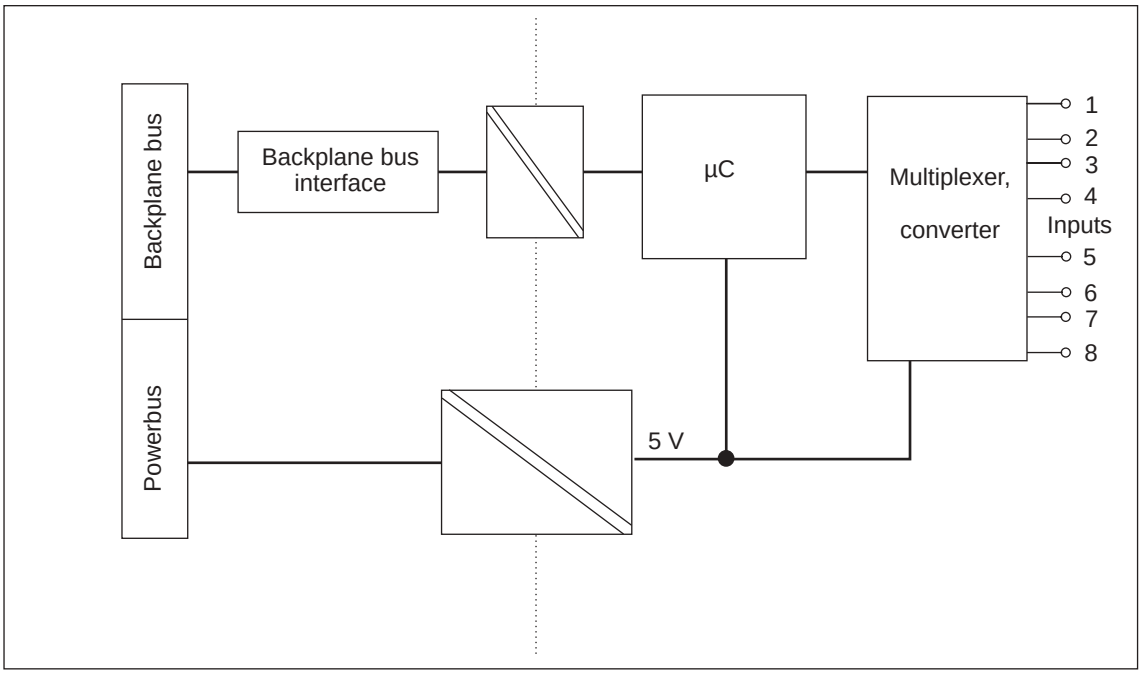


Figure 14-5 Block Diagram of the 2AI RTD

Technical Specifications

Table 14-80 Technical Specifications

Dimensions and Weight	
Dimensions W x H x D (mm)	30 x 81 x 52
Weight	approx. 120 g
Data Specific to the Module	
Number of inputs	2
• with resistance-type sensor	2
Cable length	
• shielded	max. 200m
Type of Protection	
• CENELEC	Ex II2(1)G EEx ib[ia] IIC T4 CE 0344

Data Specific to the Module		
• FM (applied for)	Class Number 3611: Class I, Division 2, Group A, B, C, D, Class I, Zone 2 Class Number 3610: Class I, Zone 1	
Voltages, Currents, Potentials		
Constant measurement current for resistance-type sensor	typ. 1 mA	
Electrical isolation		
• Between channels and backplane bus	yes	
• Between the channels	No	
• Between channels and load voltage (powerbus)	yes	
• Between load voltage (powerbus) and backplane bus	yes	
Insulation tested with	AC 500 V	
Current consumption		
• from load voltage L+ (powerbus)	typ. 70 mA	
Power loss of the module	typ. 0.84 W	
Analog Value Formation		
Measurement principle	integrating (Sigma-Delta)	
Integration / conversion time / resolution (per channel)		
• Integration time selectable	yes	
• Interference frequency suppression in Hz	60; 50	
• Integration time in ms	66; 80	
• Basic conversion time including integration time (per channel) in ms	66; 80	
• Additional conversion time for wire break check in ms	5	
• Cycle time in ms	Number of active channels per module x basic conversion time	
• Resolution (incl. over-range)	15 bits + sign	
Smoothing of measured values	yes, selectable in 4 levels:	
	Level	Time constant
	none	1 x cycle time
	weak	4 x cycle time
	medium	32 x cycle time
	strong	64 x cycle time

Interference Suppression, Error Limits	
Interference voltage suppression for f = n x (f1 ± 1 %), (f1 = interference frequency)	
• Common-mode interference (U_{CM} < 60 V)	min. 90 dB
• Normal-mode interference (peak value of the interference < nominal value of the input range)	min. 70 dB
Crosstalk between the inputs	min. -50 dB
Operational limits (in the entire temperature range, relative to the input range)	± 0.8 K standard range ± 0.3 K climatic range
Basic error limit (operational limit at 25°C, related to the input range)	± 0.5 K standard range ± 0.2 K climatic range
Temperature error (relative to the input range)	± 0.03 %
Linearity error (relative to the input range)	± 0.015 %
Repeatability (in the settled state at 25°C, relative to the input range)	± 0.01 %
Status, Interrupts, Diagnostic Information	
Interrupts	
• Limit value interrupt	yes, selectable
• Diagnostic interrupt	yes, selectable
Diagnostic Functions	
• Group error display	red LED "SF"
• Diagnostic information readable	yes
Data Relevant to Safety	
See EU Prototype Test Certificate: KEMA 01 ATEX 1153 X	
Data for Selecting a Sensor	
Input ranges (nominal values) / input resistance	
• Resistance	600 ohms / min. 2 Mohms
• Resistance thermometer	Pt100 / min. 2 Mohms Ni100 / min. 2 Mohms
Connection of transducers	
• For resistance measurement / RTD	
4-wire connection	possible
3-wire connection	possible
2-wire connection	**possible**
Characteristic curve linearization	yes
• For resistance	Nominal range linearized to 0 to 100% for resistance-type sensor (600 ohms), absolute

Interference Suppression, Error Limits	
• For passive resistance thermometer	Pt100; Ni100
Technical unit for data formats	Parameters can be assigned

* Line compensation possible with SIMATIC PDM

14.7 Analog Electronics Module 2AI TC

Order Number

6ES7 134-5SB00-0AB0

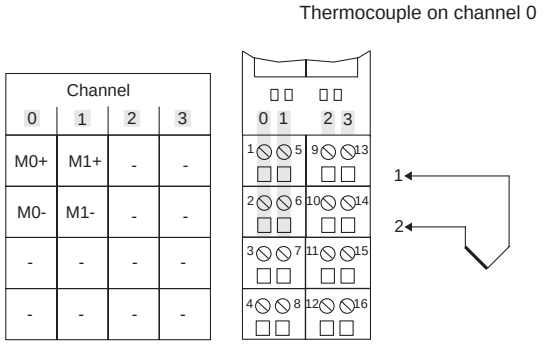
Features

- 2 inputs for thermocouple or voltage measurement
- Input ranges:
  - Thermal e.m.f. measurement: +/- 80 mV
  - Thermocouples: types E, N, J, K, L, S, R, B, T, U
  - Electrically isolated from load voltage L+
- Linearization of the sensor characteristic curves
- Permitted common-mode voltage DC 6.5 V, AC 30 V_{PP}
- Resolution 15 bits + sign

Terminal Assignment

The following table shows the terminal assignments of the 2AI TC on the terminal module.

Table 14-81 Terminal Assignment of the 2AI TC

Terminal Assignment and View	Remarks
	**Thermocouple 1** Channel 0: Terminals 1 and 2 **Thermocouple 2** Channel 1: Terminals 5 and 6
	M+: Measuring cable positive M-: Measuring cable negative

Block Diagram

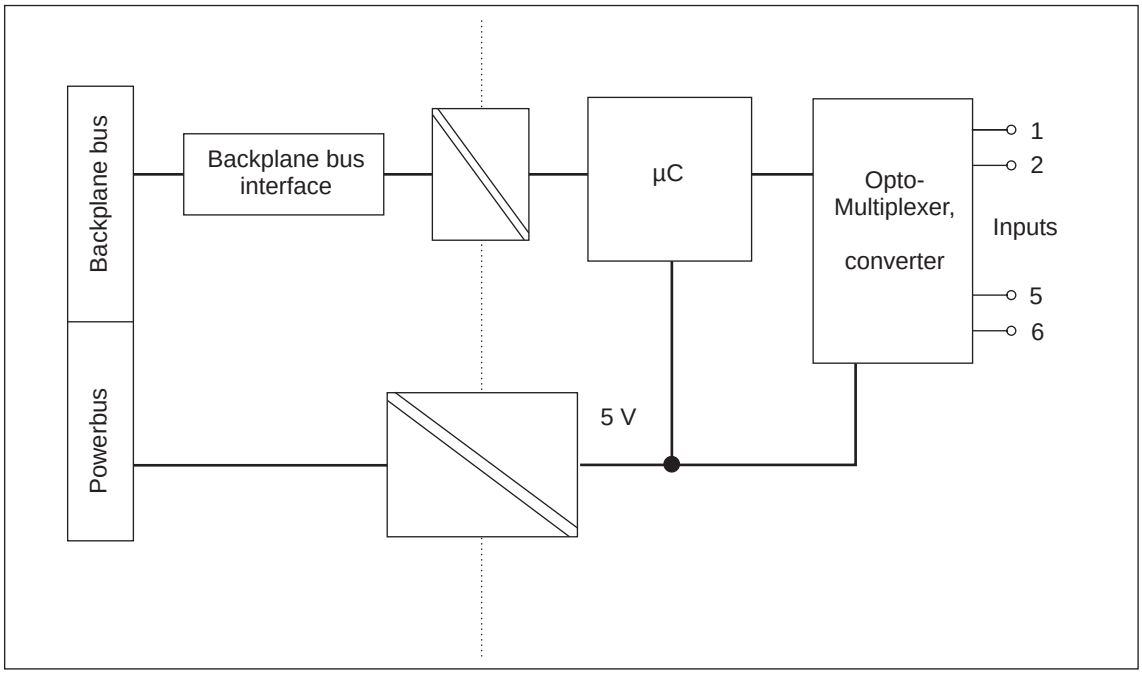


Figure 14-6 Block Diagram of the 2AI TC

Technical Specifications

Table 14-82 Technical Specifications

Dimensions and Weight	
Dimensions W x H x D (mm)	30 x 81 x 52
Weight	approx. 120 g
Data Specific to the Module	
Number of inputs	2
Cable length	
• shielded	max. 50m
Type of Protection	
• CENELEC	⟨Ex⟩ II2(1)G EEx ib[ia] IIC T4 CE 0344
• FM (applied for)	Class Number 3611: Class I, Division 2, Group A, B, C, D, Class I, Zone 2 Class Number 3610: Class I, Zone 1

Voltages, Currents, Potentials		
Electrical isolation		
• Between channels and backplane bus	yes	
• Between the channels	yes, functional	
• Between channels and load voltage (powerbus)	yes	
• Between load voltage (powerbus) and backplane bus	yes	
Permitted potential difference		
• between the inputs (U_{CM})	DC 6,5 V; AC 30 V	
Insulation tested with	AC 500 V	
Current consumption		
• from load voltage L+ (powerbus)	typ. 70 mA	
Power loss of the module	typ. 0.84 W	
Analog Value Formation		
Measurement principle	integrating (Sigma-Delta)	
Integration / conversion time / resolution (per channel)		
• Integration time selectable	yes	
• Interference frequency suppression in Hz	60; 50	
• Integration time in ms	66; 80	
• Basic conversion time including integration time (per channel) in ms	min. 66; min. 80	
• Additional conversion time for wire break monitoring in ms	5	
• Resolution (incl. over-range)	15 bits + sign	
Smoothing of measured values	yes, selectable in 4 levels:	
	Level	Time constant
	none	1 x cycle time
	weak	4 x cycle time
	medium	32 x cycle time
	strong	64 x cycle time
Interference Suppression, Error Limits		
Interference voltage suppression for f = n x (f1 ± 1 %), (f1 = interference frequency)		
• Common-mode interference (U_{CM} < 60 V)	min. 90 dB	
• Normal-mode interference (peak value of the interference < nominal value of the input range)	min. 70 dB	
Crosstalk between the inputs	min. -50 dB	
Operational limits (in the entire temperature range, relative to the input range)	± 1.5 K	

Voltages, Currents, Potentials	
Basic error limit (operational limit at 25°C, related to the input range)	± 1 K
Temperature error (relative to the input range)	± 0.03 %
Linearity error (relative to the input range)	± 0.015 %
Repeatability (in the settled state at 25°C, relative to the input range)	± 0.01 %
Status, Interrupts, Diagnostic Information	
Interrupts	
• Limit value interrupt	yes, selectable
• Diagnostic interrupt	yes, selectable
Diagnostic Functions	
• Group error	red LED "SF"
• Diagnostic information readable	yes
Data Relevant to Safety	
See EU Prototype Test Certificate: KEMA 01 ATEX 1154 X	
Data for Selecting a Sensor	
Input ranges (nominal values) / input resistance	
• Thermal e.m.f.	± 80 mV / min. 1 Mohms
• Thermocouple	Type E, N, J, K, L, S, R, B, T, U / min. 1 Mohm
Connection of transducers	
• for thermal e.m.f. measurement	possible
Characteristic curve linearization	yes
• for thermocouples	Type E, N, J, K, L, S, R, B, T, U
• for thermal e.m.f. measurement	Nominal range linear
Temperature compensation	
• Internal temperature compensation	Not possible
• External temperature compensation with compensation box	possible (one compensation box per channel, this must be intrinsically safe)
• External temperature compensation using temperature value acquired at an analog module of the same ET 200iS station	possible

14.8 Analog Electronics Module 2AO I

Order Number

6ES7 135-5RB00-0AB0

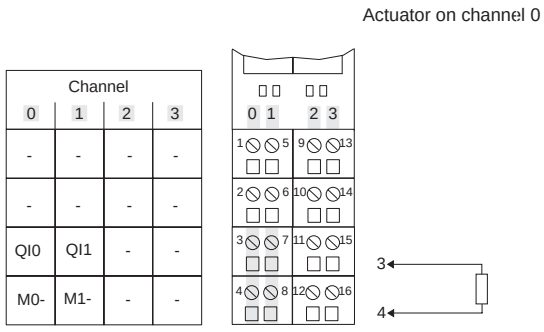
Features

- 2 outputs for current output
- Output range (selectable)
  - 4 to 20 mA
  - 0 to 20 mA
- Electrically isolated from load voltage L+
- Resolution 14 bits

Terminal Assignment

The following table shows the terminal assignments of the 2AO I on the terminal module.

Table 14-83 Terminal Assignment of the 2AO I

Terminal Assignment and View	Remarks
	**Actuator 1** Channel 0: Terminals 3 and 4 **Actuator 2** Channel 1: Terminals 7 and 8 QI: Positive output (analog output current) M: Chassis ground

Block Diagram

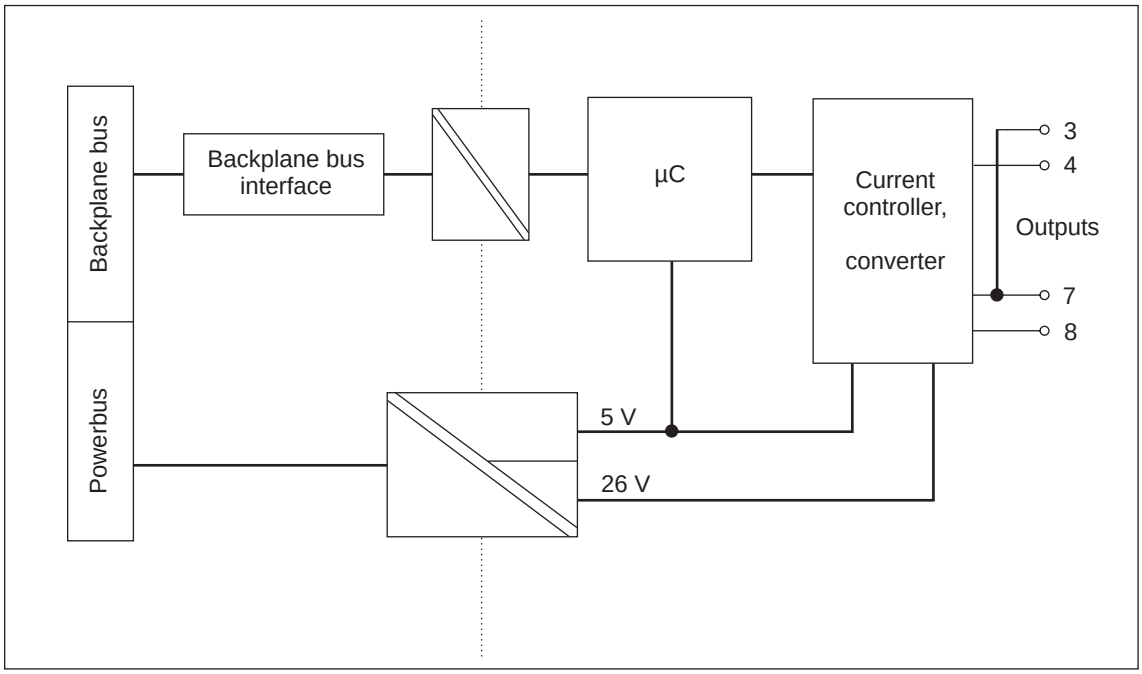


Figure 14-7 Block Diagram of the 2AO I

Technical Specifications

Table 14-84 Technical Specifications

Dimensions and Weight	
Dimensions W x H x D (mm)	30 x 81 x 76
Weight	approx. 120 g
Data Specific to the Module	
Number of outputs	2
Cable length	
• shielded	max. 200m
Type of Protection	
• CENELEC	Ex II2(1)G EEx ib[ia] IIC T4 CE 0344
• FM (applied for)	Class Number 3611: Class I, Division 2, Group A, B, C, D, Class I, Zone 2 Class Number 3610: Class I, Zone 1
Voltages, Currents, Potentials	
Electrical isolation	
• Between channels and backplane bus	yes
• Between the channels	No
• Between channels and load voltage (powerbus)	yes
• Between load voltage (powerbus) and backplane bus	yes
Insulation tested with	AC 500 V
Current consumption	max. 230 mA
• from load voltage L+ (powerbus)	typ. 280 mA
Power loss of the module	typ. 2.5 W
Analog Value Formation	
Resolution (incl. over-range)	14 bits
Cycle time	3.5 ms
Settling Time	
• for resistive load	max. 40 ms
• for capacitive load	max. 40 ms
• for inductive load	max. 40 ms
Substitute values connectable	yes

Interference Suppression, Error Limits	
Crosstalk between the outputs	min. - 50 dB
Operational limits (in the entire temperature range, relative to the output range)	± 0.2 %
Basic error limit (operational limit at 25°C, related to the output range)	± 0.1 %
Temperature error (relative to the output range)	± 0.01 % / K
Linearity error (relative to the output range)	± 0.02 %
Repeatability (in the settled state at 25°C, relative to the output range)	± 0.05 %
Output ripple; Bandwidth 0 to 50 kHz (relative to the output range)	± 0.05 %
Status, Interrupts, Diagnostic Information	
Interrupts	
• Diagnostic interrupt	yes, selectable
Diagnostic Functions	
• Group error display	red LED "SF"
• Diagnostic information readable	yes
Monitoring for	
• Short circuit	R* < 30 Ω
• Wire break	R* > 30 kΩ
Substitute values connectable	yes, selectable
Data Relevant to Safety	
See EU Prototype Test Certificate: KEMA 01 ATEX 1155 X	
Data for Selecting an Actuator	
Output ranges (nominal values)	
• Current	0 to 20 mA / 4 to 20 mA
Load impedance (in the nominal range of the output)	max. 750 Ω*
• No-load voltage	17 V
Connection of actuators	
• for current output	
2-wire connection	possible

* R = load impedance + cable resistance

14.9 Parameters of the Analog Electronics Modules

Parameters of 2AI I 2WIRE, 2AI I 4WIRE

All parameters are set with SIMATIC PDM.

Table 14-85 Parameters of 2AI I 2WIRE, 2AI I 4WIRE

Parameter		Range of Values	Default	Effective for
2AI I 2WIRE	**2AI I 4WIRE**			
Format of the analog values *		• SIMATIC S7 • SIMATIC S5	SIMATIC S7	ET 200iS
Interference frequency suppression *		• 50 Hz • 60 Hz	50 Hz	ET 200iS
Channel x (x = 0, 1)				
Measurement type	---	2DMU (current)	2DMU (current)	Channel
---	Measurement type	• 4DMU (current) • deactivated	4DMU (current)	Channel
Measuring Range	---	4 to 20 mA	4 to 20 mA	Channel
---	Measuring Range	• 4 to 20 mA • 0 to 20 mA	4 to 20 mA	Channel
Smoothing		• none • weak • medium • strong	none	Channel
Process alarm (when limit value exceeded)		• enabled • disabled	enabled	Channel
Upper limit value		Lower to upper value of the over-range	Upper nominal value	Channel
Lower limit value		Lower to upper value of the over-range	Lower nominal value	Channel
Group diagnostics		• enabled • disabled	enabled	Channel
Overflow/underflow diagnostics		• enabled • disabled	enabled	Channel
Wire break diagnostics		• enabled • disabled	enabled	Channel
Short circuit diagnostics	---	• enabled • disabled	enabled	Channel

* Entered automatically by SIMATIC PDM. See IM 151-2 parameters.

Parameters of 2AI RTD, 2AI TC

All parameters are set with SIMATIC PDM.

Table 14-86 Parameters of 2AI RTD, 2AI TC

Parameter		Range of Values	Default	Effective for
2AI RTD	**2AI TC**			
Format of the analog values *		• SIMATIC S7 • SIMATIC S5	SIMATIC S7	ET 200iS
Interference frequency suppression *		• 50 Hz • 60 Hz	50 Hz	ET 200iS
Temperature unit*		• Celsius • Fahrenheit	Celsius	ET 200iS
Reference junction number		1 to 8	1	Module
Channel x (x = 0, 1)				
Measurement type	---	• 4-wire (temperature) • 3-wire (temperature) • 2-wire (temperature) • 4-wire (resistance) • 3-wire (resistance) • 2-wire (resistance)	4-wire (temperature)	Channel
---	Measurement type	• Thermocouple • Thermal e.m.f. • deactivated	Thermocouple	Channel
Measuring Range	---	• Pt 100 standard range • Pt 100 climate range • Ni 100 standard range • Ni 100 climate range • 600 Ω (absolute)	Pt 100 standard range	Channel
---	Measuring Range	• Type B [PtRh-PtRh] • Type N [NiCrSi-NiSi] • Type E [NiCr-CuNi] • Type R [PtRh-Pt] • Type S [PtPh-Pt] • Type J [Fe-CuNi] • Type L [Fe-CuNi] • Type T [Cu-CuNi] • Type K [NiCr-Ni] • Type U [Cu-CuNi] • ± 80 mV	Type K [NiCr-Ni]	Channel

Parameter		Range of Values	Default	Effective for
2AI RTD	**2AI TC**			
Reference junction	---	• none • RTD	none	Channel
---	Reference junction	• none	none	Channel
Smoothing		• none • weak • medium • strong	none	Channel
Process alarm (when limit value exceeded)		• enabled • disabled	enabled	Channel
Upper limit value		Lower to upper limit value of the over-range	Upper limit value	Channel
Lower limit value		Lower to upper limit value of the over-range	Lower limit value	Channel
Group diagnostics		• enabled • disabled	enabled	Channel
Overflow/underflow diagnostics		• enabled • disabled	enabled	Channel
Wire break diagnostics		• enabled • disabled	enabled	Channel
Short circuit diagnostics	---	• enabled • disabled	enabled	Channel

* Entered automatically by SIMATIC PDM. See IM 151-2 parameters.
** Does not exist for Pt 100 climate range, Ni 100 climate range

Parameters of 2AO I

All parameters are set with SIMATIC PDM.

Table 14-87 Parameters of 2AO I

Parameters of 2AO I	Range of Values	Default	Effective for
Format of the analog values *	• SIMATIC S7 • SIMATIC S5	SIMATIC S7	ET 200iS
Channel x (x = 0, 1)			
Output type	• I (current) • deactivated	I (current)	Channel
Output range	• 4 to 20 mA • 0 to 20 mA	4 to 20 mA	Channel
Response to CPU/ master STOP	• Output no current/voltage • Apply substitute value • Hold last value	Output no current/voltage	Channel
Substitute value	Every value of the nominal range	4.0000 mA	Channel
Group diagnostics	• enabled • disabled	enabled	Channel
Wire break diagnostics	• enabled • disabled	enabled	Channel
Short circuit diagnostics	• enabled • disabled	enabled	Channel

* Entered automatically by SIMATIC PDM. See IM 151-2 parameters.

Identification Data

The identification data contain further information on the module and are read out with SIMATIC PDM. The identification data are resident on the module.

Table 14-88 Identification Data

Identification Data	Range of Values	Default	Effective for
Device			
Vendor	read	SIEMENS AG	Module
Device identification	read	Order Number	
Device serial number	read	depends on the product version	
Hardware revision	read		
Software revision	read		
Static revision no.	read	---	
Installation date	read/ write (max. 16 characters)	---	
Operating unit			
TAG	read/ write (max. 32 characters)	---	Module
Description	read/ write (max. 54 characters)	---	

14.10 Parameter Description

14.10.1 Reference Junction / Reference Junction Number

Parameter

See section *Connecting Thermocouples*

14.10.2 Smoothing

Using Smoothing

By smoothing analog values, a stable analog signal is available for further processing.

The smoothing of analog values is useful if the measured value changes are slow, for example in temperature changes.

Parameter

The measured values are smoothed using digital filters. Smoothing is achieved by the module forming a mean value from a specified number of converted (digitized) analog values.

The user can set the smoothing in a maximum of four stages (none, weak, medium, strong). The stage determines the number of analog signals used to form the mean value.

The stronger the smoothing, the more stable the smoothed analog value and the longer it takes until the smoothed analog signal is applied following a step response (refer to the following example).

Example

The following schematic illustrates the number of module cycles it takes for the smoothed analog value to be applied at approaching 100% following a step response depending on the selected smoothing. The schematic applies to every signal change at the analog input.

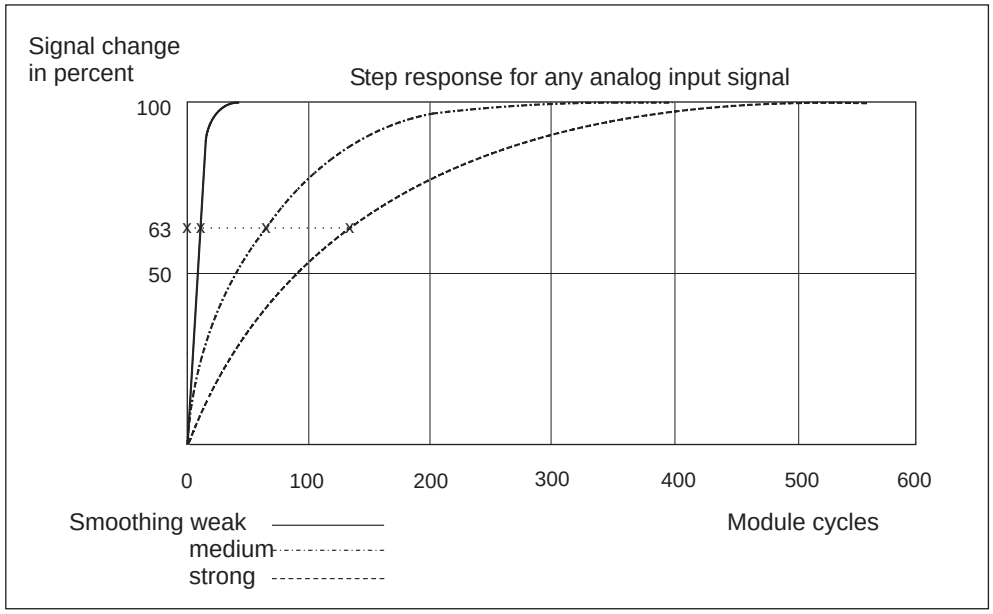


Figure 14-8 Example of the Influence of Smoothing on the Step Response

14.10.3 Identification Data

See also

Identification Data *[→ Page 12-8]*

Analog Electronics Modules with HART 15

15.1 Basics of HART

15.1.1 What is HART?

What is HART?

With the HART functionality, you can operate analog modules with additional digital communications options. The HART protocol has become established as the "de facto" standard protocol for communication with intelligent field devices: HART is a registered trademark of the "HART Communication Foundation" (HCF) that owns all the rights for the HART protocol.

Note

The HART analog modules are based on the HART protocol Version 5.2.

What Are the Advantages of HART

Using HART analog modules has the following advantages:

- Compatible connection with the analog modules: current loop 4 - 20 mA
- Additional digital communication using the HART protocol
- Low energy requirements of HART, important for use in the hazardous area
- Numerous field device with HART functions are in use

What Are the Typical Applications for HART?

The following applications are typical for HART:

- Commissioning of field devices (centralized parameter assignment)
- Online modification of field device parameters
- Information, maintenance and diagnostic displays for the field devices

15.1.2 How Does HART Work?

Introduction

The HART protocol describes the physical form of the transfer:

Transmission procedures, message structure, data formats and commands.

HART Signal

The following schematic shows the analog signal with the HART signal superimposed on it (FSK technique). The signal is composed of sine waves of 1200 Hz and 2200 Hz having an average value of zero. It can be filtered out using an input filter so that the original analog signal is available again.

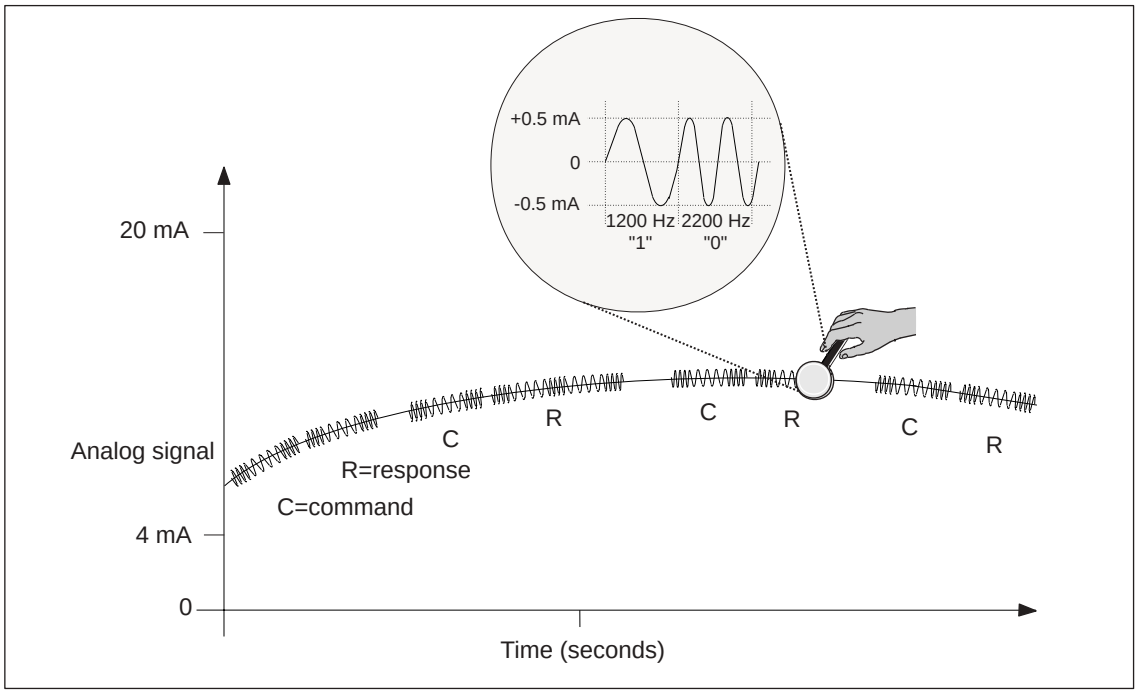


Figure 15-1 The HART Signal

HART Commands and Parameters

With SIMATIC PDM, you can set the parameters of the HART field devices using **HART commands** and read them out with the **HART response messages**. HART commands and their parameters are divided into three groups with the following properties:

- universal
- common practice
- device-specific

Universal commands must be supported by all manufacturers of HART field devices and common practice commands should be supported. There are also commands specific to the device that apply only to the particular device.

Examples of HART Parameters

The following table shows the HART parameters of the various groups:

Table 15-1 Examples of HART Parameters

Parameter Group	Parameters of the HART Field Device
universal	Measured value or manipulated variable (primary variable), manufacturer, tag, or identifier for actuator, other measured values or manipulated variables
common practice	Measuring range, filter time, alarm parameters (message, alarm and warning limits, output range
Device-specific	Special diagnostic information

15.1.3 How Are HART Field Devices Used with the ET 200iS

Use in the ET 200iS

With a HART analog module, you can connect a field device to each of the two channels: The module operates as the HART master, the field devices as HART slaves.

SIMATIC PDM sends and receives data via the HART analog module, comparable with a client served by the HART analog module.

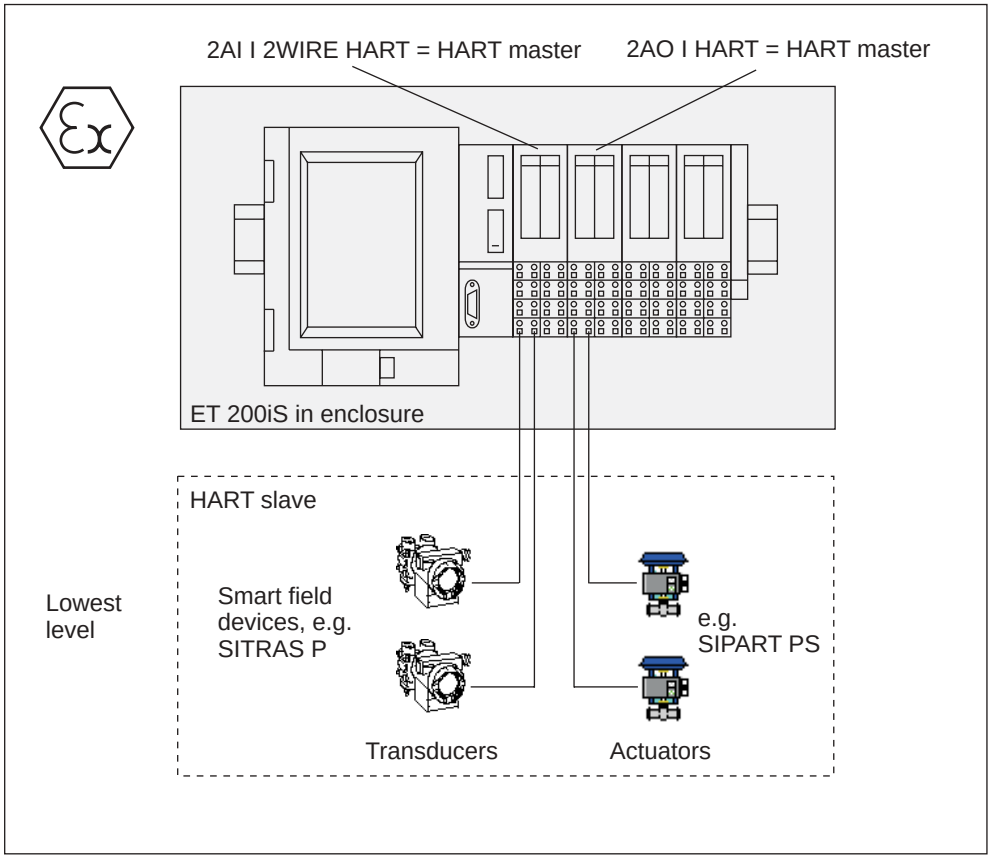


Figure 15-2 Location of the HART Analog Modules in the Distributed System

15.1.4 How Do You Use HART?

System Environment for Using HART

To operate an intelligent field device with HART functionality, you require the following system environment:

Current loop 4 – 20 mA via the analog electronics modules: 2AI I 2WIRE HART, 2AI I 4WIRE HART or 2AO I HART

The HART analog module takes over the function of a "master" by receiving the commands from the HART parameter assignment tool, passing them on to the smart field device and then returning the reply messages. The interface of the HART analog module is made up data records that are transferred over the I/O bus. These data records are generated and interpreted by the HART parameter assignment tool (SIMATIC PDM).

Only the primary variable of the measured value is entered in the process image input and output tables.

SIMATIC PDM, HART Handheld:

You can set the HART parameters either with an external HART handheld or with SIMATIC PDM. SIMATIC PDM accesses through the HART analog module while the HART handheld is connected directly parallel to the field device.

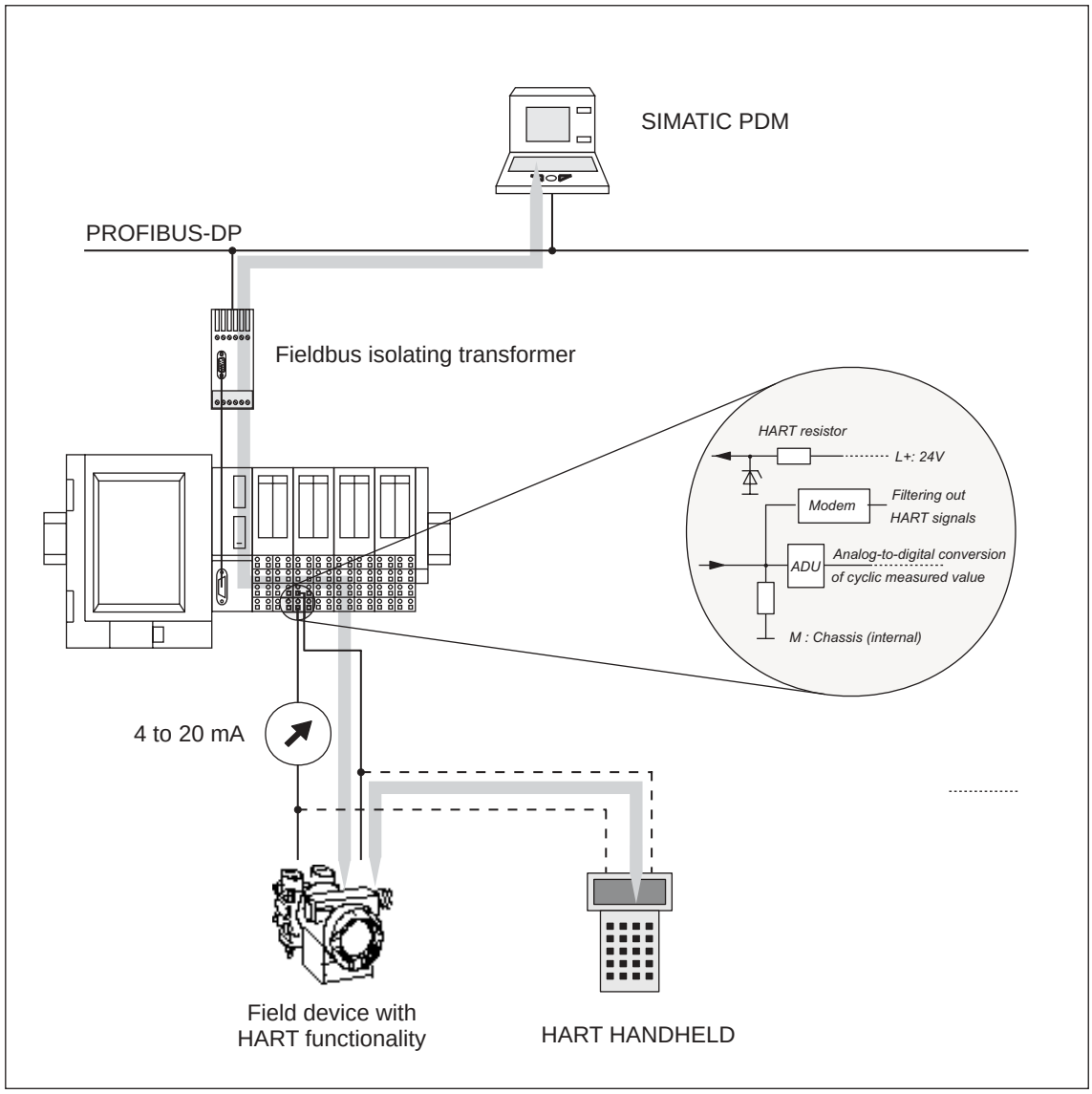


Figure 15-3 System Environment for Using HART

Transparent Message Data Format

The ET 200iS HART analog modules support the *transparent message data* format. With SIMATIC PDM, you therefore have direct access to the HART field devices for commands and response messages.

Every HART analog module is equipped with a common HART modem for the two channels. This means that you can only ever access one channel of the module directly with SIMATIC PDM (channel multiplexing). Simultaneous, direct access to the second channel of the same module is not possible.

If the channels are on different HART analog modules, you can access a maximum of 6 channels directly with SIMATIC PDM.

Further Properties of the ET 200iS HART Analog Modules

Table 15-2 Properties of the ET 200iS HART Analog Modules

Features	Explanation
Secondary master exclusion	no
Direct response with the validity of the data following a write request (application supported parameter check)	no
Several HART field devices supplied over one line (multi-drop mode)	No, analog value = 0
Type of communication in HART in which the master requests the HART field device to send permanent responses cyclically to a predefined HART command (for example reading the measured value) (burst mode)	no
HART master sends a predefined HART command to the connected HART field device (scan mode)	no
Use of the Compact HART Message Format	no
A HART client sends a sequence of HART commands. No other client can interrupt this sequence (successive HART commands mode)	no
Parameter stored non-volatile	no
Burst mode auto disable	no

Features	Explanation
Maximum PDU length	64 bytes (corresponds to 75 byte data record in the transparent message data format)
Client management	No, only 1 client per channel (2 "mailboxes" per module)

15.2 Analog Value Representation

See also

Overview *[→ Page 14-1]*

15.3 Basics of Analog Value Processing

See also

Connecting Thermocouples *[→ Page 14-33]*

15.4 Response of the Analog Modules with HART during Operation and if Problems Occur

See also

Response of the Analog Modules during Operation and if Faults Occur *[→ Page 14-43]*

15.5 Analog Electronics Module 2AI I 2WIRE HART

Order Number

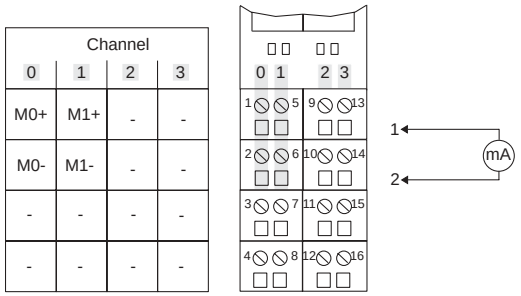
6ES7 134-5TB00-0AB0

Features

- 2 inputs for connecting HART field devices, 2-wire transducers
- Selectable input range: HART / 4 to 20 mA
- Resolution 12 bits + sign

Terminal Assignment

Table 15-3 Terminal Assignment of the 2AI I 2WIRE HART

Terminal Assignment and View	Remarks
	**2-wire transducer 1** Channel 0: Terminals 1 and 2 **2-wire transducer 2** Channel 1: Terminals 5 and 6 M +: Input signal "+" M -: Input signal "-" The 2-wire transducers are supplied over the measurement leads

Block Diagram

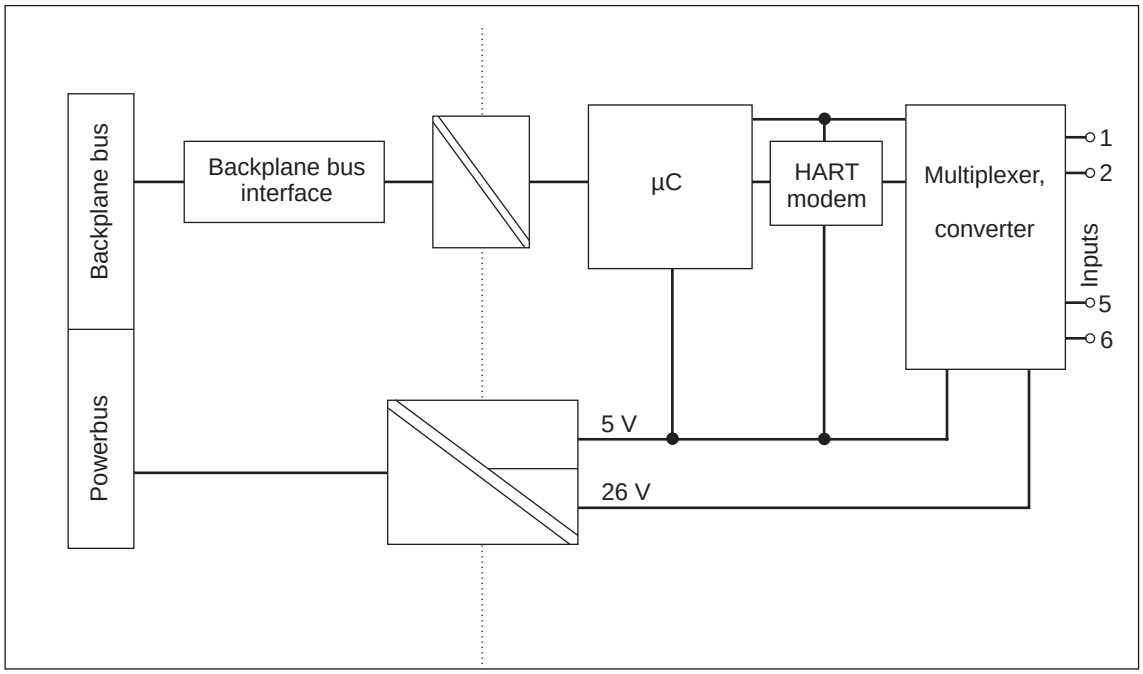


Figure 15-4 Block Diagram of the 2AI I 2WIRE HART

Technical Specifications

Table 15-4 Technical Specifications

Dimensions and Weight	
Dimensions W x H x D (mm)	30 x 81 x 76
Weight	approx. 120 g
Data Specific to the Module	
Number of inputs	2
Cable length	
• shielded	max. 200m
Type of Protection	
• CENELEC	Ⓔx II2(1)G EEx ib[ia] IIC T4 CE 0344
• FM (applied for)	Class Number 3611: Class I, Division 2, Group A, B, C, D, Class I, Zone 2 Class Number 3610: Class I, Zone 1
Voltages, Currents, Potentials	
Power supply of the transducers	yes
• Supply current	max. 23mA (per channel)
• Short-circuit proof	yes
Electrical isolation	
• Between channels and backplane bus	yes
• Between the channels	No
• Between channels and load voltage (powerbus)	yes
• Between load voltage (powerbus) and backplane bus	yes
Insulation tested with	AC 500 V
Current consumption	
• from load voltage L+ (powerbus)	typ. 280 mA
Power loss of the module	typ. 3.36 W

Analog Value Formation		
Measurement principle	integrating (Sigma-Delta)	
Integration / conversion time / resolution (per channel)		
• Integration time selectable	No	
• Interference frequency suppression in Hz	60; 50	
• Basic conversion time including integration time (per channel) in ms	30	
• Cycle time in ms	Number of active channels per module x basic conversion time	
• Resolution (incl. over-range)	12 bits + sign	
Smoothing of measured values	yes, selectable in 4 levels:	
	Level	Time constant
	none	1 x cycle time
	weak	4 x cycle time
	medium	32 x cycle time
	strong	64 x cycle time
Interference Suppression, Error Limits		
Interference voltage suppression for f = n x (f1 ± 1 %), (f1 = interference frequency)		
• Normal-mode interference (peak value of the interference < nominal value of the input range)	min. 70 dB	
Crosstalk between the inputs	min. -50 dB	
Operational limits (in the entire temperature range, relative to the input range)	± 0.15 %	
Basic error limit (operational limit at 25°C, related to the input range)	±0,1 %	
Temperature error (relative to the input range)	± 0.03 %	
Linearity error (relative to the input range)	± 0.0015 %	
Repeatability (in the settled state at 25°C, relative to the input range)	± 0.01 %	
Status, Interrupts, Diagnostic Information		
Interrupts		
• Limit value interrupt	yes, selectable	
• Diagnostic interrupt	yes, selectable	
Diagnostic Functions		
• Group error display	red LED "SF"	
• Diagnostic information readable	yes	
Monitoring for		
• Short circuit	I < 23.8 mA*	
• Wire break	I < 3.6 mA	

Data Relevant to Safety	
See EU Prototype Test Certificate: KEMA 01 ATEX 1152 X	
Data for Selecting a Sensor	
Input ranges (nominal values) / input resistance	
• Current	0 to 20 mA 4 to 20 mA
Permitted input current for current input (destruction limit)	90 mA
Connection of transducers	
• For current measurement	
As 2-wire transducer	possible
• Load impedance of the 2-wire transducer	max. 750 ohms

* I is in the current limitation. The current limitation cuts in at 27.2 mA. Short circuit at load impedance < 370 Ω.

15.6 Analog Electronics Module 2AI I 4WIRE HART

Order Number

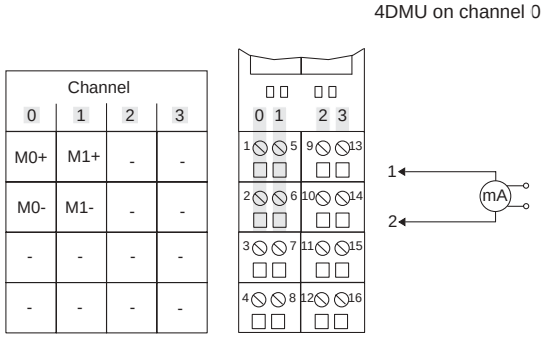
6ES7 134-5TB50-0AB0

Features

- 2 inputs for connecting HART field devices, 4-wire transducers
- Selectable input range: HART / 0 to 20 mA / 4 to 20 mA
- Resolution 12 bits + sign

Terminal Assignment

Table 15-5 Terminal Assignment of the 2AI I 4WIRE HART

Terminal Assignment and View	Remarks
	**4-wire transducer 1** Channel 0: Terminals 1 and 2 **4-wire transducer 2** Channel 1: Terminals 5 and 6 M +: Input signal "+" M -: Input signal "-" The 4-wire transducers are supplied externally by separate power supplies.

Block Diagram

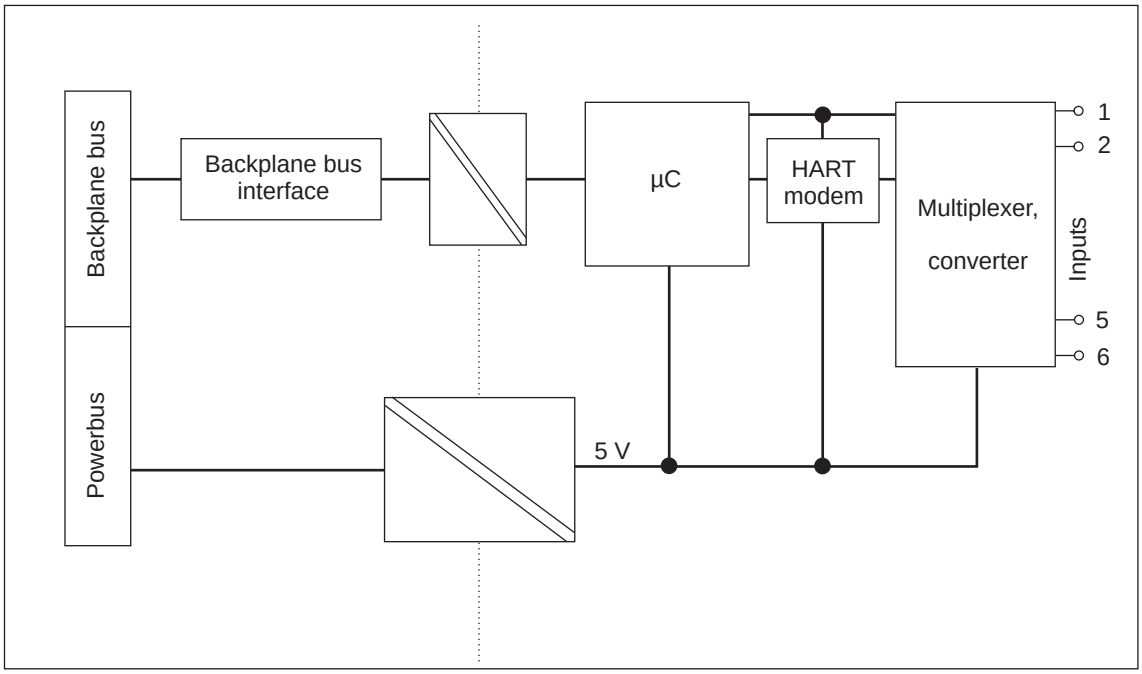


Figure 15-5 Block Diagram of the 2AI I 4WIRE HART

Technical Specifications

Table 15-6 Technical Specifications

Dimensions and Weight	
Dimensions W x H x D (mm)	30 x 81 x 76
Weight	approx. 120 g
Data for Specific Module	
Number of outputs	2
Cable length	
• shielded	max. 200m
Type of Protection	
• CENELEC	Ex II2(1)G EEx ib[ia] IIC T4 CE 0344
• FM (applied for)	Class Number 3611: Class I, Division 2, Group A, B, C, D, Class I, Zone 2 Class Number 3610: Class I, Zone 1
Voltages, Currents, Potentials	
Power supply of the transducers	No
Electrical isolation	
• Between channels and backplane bus	yes
• Between the channels	No
• Between channels and load voltage (powerbus)	yes
• Between load voltage (powerbus) and backplane bus	yes
Insulation tested with	AC 500 V
Current consumption	
• from load voltage L+ (powerbus)	typ. 70 mA
Power loss of the module	typ. 0.84 W

Analog Value Formation		
Measurement principle	integrating (Sigma-Delta)	
Integration / conversion time / resolution (per channel)		
• Integration time selectable	yes	
• Interference frequency suppression in Hz	60; 50	
• Basic conversion time including integration time (per channel) in ms	22; 25	
• Cycle time in ms	Number of active channels per module x basic conversion time	
• Resolution (incl. over-range)	12 bits + sign	
• Smoothing of measured values	yes, selectable in 4 levels:	
	Level	Time constant
	none	1 x cycle time
	weak	4 x cycle time
	medium	32 x cycle time
	strong	64 x cycle time
Interference Suppression, Error Limits		
Interference voltage suppression for f = n x (f1± 1 %), (f1 = interference frequency)		
• Normal-mode interference (peak value of the interference < nominal value of the input range)	min. 70 dB	
Crosstalk between the outputs	min. - 50dB	
Operational limits (in the entire temperature range, relative to the output range)	± 0.15 %	
Basic error limit (operational limit at 25°C, related to the input range)	± 0.1 %	
Temperature error (relative to the input range)	± 0.03 %	
Linearity error (relative to the input range)	± 0.015 %	
Repeatability (in the settled state at 25°C, relative to the input range)	± 0.01 %	

Status, Interrupts, Diagnostic Information	
Interrupts	
• Limit value interrupt	yes, selectable
• Diagnostic interrupt	yes, selectable
Diagnostic Functions	
• Group error display	red LED "SF"
• Diagnostic information readable	yes
Monitoring for	
• Wire break	I < 3.6 mA
Data Relevant to Safety	
Input 4DMU *	
See EU Prototype Test Certificate: KEMA 01 ATEX 1151 X	
Data for Selecting a Sensor	
Input ranges (nominal values) / input resistance	
• Current	0 to 20 mA/ min. 285 Ω 4 to 20 mA/ min. 285 Ω
Permitted input current for current input (destruction limit)	50 mA
Connection of transducers	
• For current measurement	
As 4-wire transducer	possible
Internal resistance of the output for 4DMU	min. 300 Ω

* Output parameters are negligibly small.

15.7 Analog Electronics Module 2AO I HART

Order Number

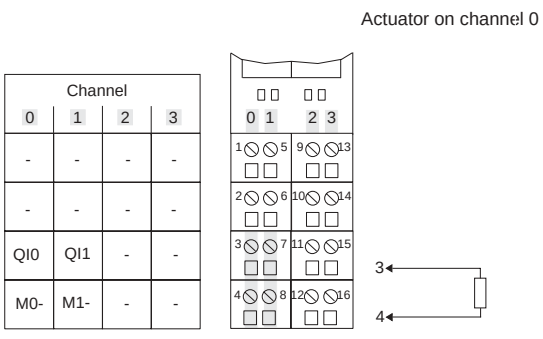
6ES7 135-5TB00-0AB0

Features

- 2 outputs for current output
- Output range (selectable)
  - HART
  - 4 to 20 mA
  - 0 to 20 mA
- Electrically isolated from load voltage L+
- Resolution 14 bits

Terminal Assignment

Table 15-7 Terminal Assignment of the 2AO I HART

Terminal Assignment and View	Remarks
	**Actuator 1** Channel 0: Terminals 3 and 4 **Actuator 2** Channel 1: Terminals 7 and 8 QI: Positive output (analog output current) M: Chassis ground

Block Diagram

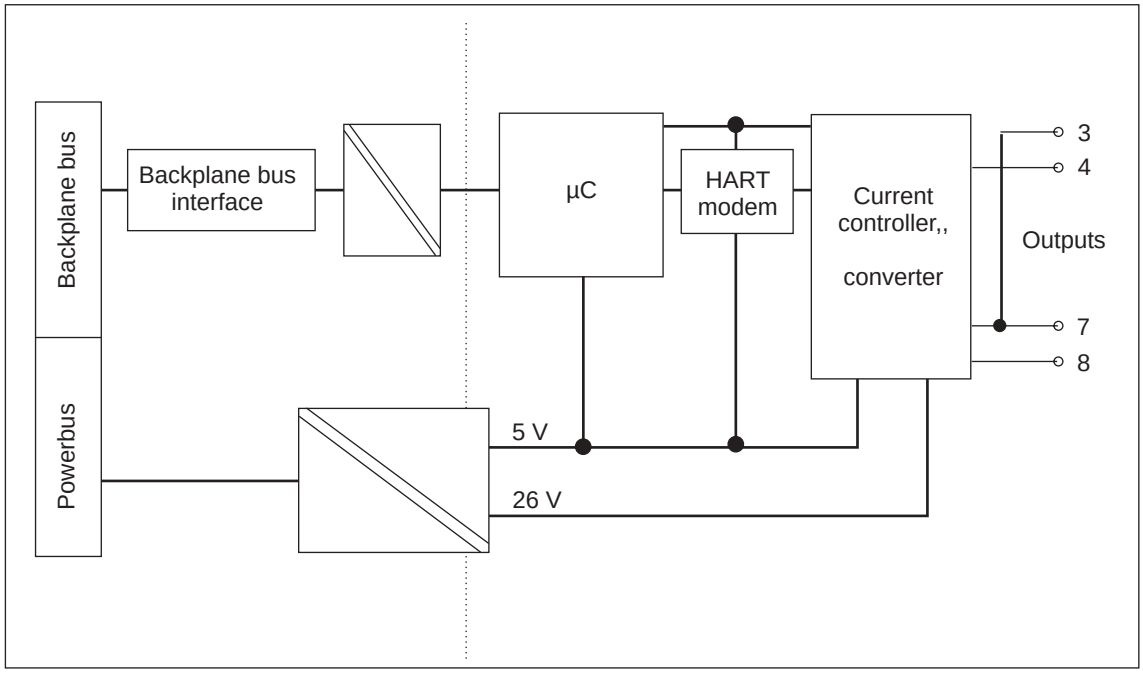


Figure 15-6 Block Diagram of the 2AO I HART

Technical Specifications

Table 15-8 Technical Specifications

Dimensions and Weight	
Dimensions W x H x D (mm)	30 x 81 x 76
Weight	approx. 120 g
Data Specific to the Module	
Number of outputs	2
Cable length	
• shielded	max. 200m
Type of Protection	
• CENELEC	Ex II2(1)G EEx ib[ia] IIC T4 CE 0344
• FM (applied for)	Class Number 3611: Class I, Division 2, Group A, B, C, D, Class I, Zone 2 Class Number 3610: Class I, Zone 1
Voltages, Currents, Potentials	
Electrical isolation	
• Between channels and backplane bus	yes
• Between the channels	No
• Between channels and load voltage (powerbus)	yes
• Between load voltage (powerbus) and backplane bus	yes
Insulation tested with	AC 500 V
Current consumption	
• from load voltage L+ (powerbus)	typ. 230 mA
Power loss of the module	typ. 2.5 W
Analog Value Formation	
Resolution (incl. over-range)	14 bits
Cycle time	3.6 ms
Settling Time	
• for resistive load	max. 40 ms
• for capacitive load	max. 40 ms
• for inductive load	max. 40 ms
Substitute values connectable	yes

Interference Suppression, Error Limits	
Crosstalk between the outputs	min. - 50 dB
Operational limits (in the entire temperature range, relative to the output range)	± 0.2 %
Basic error limit (operational limit at 25°C, related to the output range)	± 0.1 %
Temperature error (relative to the output range)	± 0.01 % / K
Linearity error (relative to the output range)	± 0.02 %
Repeatability (in the settled state at 25°C, relative to the output range)	± 0.05 %
Output ripple; Bandwidth 0 to 50 kHz (relative to the output range)	± 0.05 %
Status, Interrupts, Diagnostic Information	
Interrupts	
• Diagnostic interrupt	yes, selectable
Diagnostic Functions	
• Group error display	red LED "SF"
• Diagnostic information readable	yes
Monitoring for	
• Short circuit	R* < 30 Ω
• Wire break	R* > 30 kΩ
Substitute values connectable	yes, selectable
Data Relevant to Safety	
See EU Prototype Test Certificate: KEMA 01 ATEX 1155 X	
Data for Selecting an Actuator	
Output ranges (nominal values)	
• Current	0 to 20 mA / 4 to 20 mA
Load impedance (in the nominal range of the output)	max. 750 Ω*
• No-load voltage	17 V
Connection of actuators	
• for current output	
2-wire connection	possible

* R = load impedance + cable resistance

15.8 Parameters of the Analog Electronics Modules with HART

Parameters of 2AI I 2WIRE HART, 2AI I 4WIRE HART

All parameters are set with SIMATIC PDM.

Table 15-9 Parameter 2AI I 2WIRE HART; 2AI I 4WIRE HART

Parameter		Range of Values	Default	Effective for
2AI I 2WIRE HART	**2AI I 4WIRE HART**			
Format of the analog values *		• SIMATIC S7 • SIMATIC S5	SIMATIC S7	ET 200iS
Interference frequency suppression *		• 50 Hz • 60 Hz	50 Hz	ET 200iS
Channel x (x = 0, 1)				
Measurement type	---	• HART • 2DMU (current) • deactivated	HART	Channel
---	Measurement type	• HART • 4DMU (current) • deactivated	HART	Channel
Measuring Range	---	4 to 20 mA	4 to 20 mA	Channel
---	Measuring Range	• 4 to 20 mA • 0 to 20 mA	4 to 20 mA	Channel
Smoothing		• none • weak • medium • strong	none	Channel
Process alarm (when limit value exceeded)		• enabled • disabled	enabled	Channel
Upper limit value		Lower to upper limit value of the over-range	Upper limit value	Channel
Lower limit value		Lower to upper limit value of the over-range	Lower limit value	Channel
Group diagnostics		• enabled • disabled	enabled	Channel
Overflow/underflow diagnostics		• enabled • disabled	enabled	Channel
Wire break diagnostics		• enabled • disabled	enabled	Channel
Short circuit diagnostics enable	---	• enabled • disabled	enabled	Channel

* Entered automatically by SIMATIC PDM. See IM 151-2 parameters.

Parameters of 2AO I HART

All parameters are set with SIMATIC PDM.

Table 15-10 Parameters of 2AO I HART

Parameters of 2AO I HART	Range of Values	Default	Effective for
Format of the analog values *	• SIMATIC S7 • SIMATIC S5	SIMATIC S7	ET 200iS
Channel x (x = 0.1)			
Output type	• I HART (current HART) • I (current)	I (current)	Channel
Output range	• 4 to 20 mA • 0 to 20 mA	4 to 20 mA	Channel
Response to CPU/ master STOP	• Apply substitute value • Output no current/voltage • Hold last value	Apply substitute value (with I HART output type) Output no current / voltage (with I output type)	Channel
Substitute value	Every value of the nominal range	4.0000 mA	Channel
Group diagnostics	• enabled • disabled	enabled	Channel
Wire break diagnostics	• enabled • disabled	enabled	Channel
Short circuit diagnostics	• enabled • disabled	enabled	Channel

* Entered automatically by SIMATIC PDM. See IM 151-2 parameters.

Identification Data

The identification data contain further information on the module and are read out with SIMATIC PDM. The identification data are resident on the module.

Table 15-11 Identification Data

Identification Data	Range of Values	Default	Effective for
Device			
Vendor	read	SIEMENS AG	Module
Device identification	read	Order Number	
Device serial number	read	depends on the product version	
Hardware revision	read		
Software revision	read		
Static revision no.	read	---	
Installation date	read/ write (max. 16 characters)	---	
Operating unit			
TAG	read/ write (max. 32 characters)	---	Module
Description	read/ write (max. 54 characters)	---	

15.9 Parameter Description

15.9.1 Smoothing

See also

Smoothing *[→ Page 14-69]*

15.9.2 Identification Data

See also

Identification Data *[→ Page 12-8]*

15.10 HART Data Records

Introduction

This section contains information on assigning parameters, diagnostics, and communication with the HART analog modules. You require this information if you want to go beyond the standard applications of STEP 7 and PDM or want to use your own configuration tool for HART communication.

Data Record Interface

The analog modules with HART use data records as the input and output interface:

The mapping of HART commands and HART responses in PROFIBUS-DP data records is based on the *PROFIBUS Profile HART Version 1.0*. For more detailed information on the HART protocol, refer to *PROFIBUS DP HART Profile Application Guidelines*.

You can obtain this documentation from the PNO (PROFIBUS users organization) on the Internet http://www.profibus.com.

Table 15-12 HART Data Records

Record Number	Read / Write	Size in Bytes	Description
148	read	13	Directory process data
	DR information (data record directory): This data record contains the data record numbers (index) of all HART data records and information on numbers and revisions.		
149	read	3	HMD Feature Parameter Process Data
	HART Feature Flags: This data record describes which optional HART features are supported.		
129	Read / Write	6	HMD Parameter Process Data
	HART-Parameter: This data record contains the parameters for the HART master. When this data record is read, you can evaluated the status of the parameter assignment. There are no vendor-specific parameters for the analog modules with HART.		
80	write	75	HART Request Write Process Data
	Mailbox channel 0: This data record contains the transfer data for the command from the client to the HART field device (on channel 0).		
81	read	75	HART Response Read Process Data
	Mailbox channel 0: This data record contains the transfer data for the reply from the HART field device (on channel 0) to the client.		
82	write	75	HART Request Write Process Data
	Mailbox channel 1: This data record contains the transfer data for the command from the client to the HART field device (on channel 1).		
83	read	75	HART Response Read Process Data
	Mailbox channel 1: This data record contains the transfer data for the reply from the HART field device (on channel 1) to the client.		

Reading and Writing Data Records

To read and write data records, use the following SFCs:

- Read data record: SFC59 "RD_REC"
- Write data record: SFC58 "WR_REC"

For more detailed information on SFCs, refer to the manual *System Software for S7-300/400 System and Standard Functions*.

Order Numbers

16

16.1 Order Numbers

Introduction

You will find the order numbers for the ET 200iS distributed I/O station and the PROFIBUS accessories that you may need in conjunction with the ET 200iS below.

Interface Module

Table 16-1 Interface Module

Description	Number	Order Number
Interface module IM 151-2	1	6ES7 151-2AA00-0AB0

Terminal Modules

Table 16-2 Terminal Modules

Description	Number	Order Number
TM-PS	1	6ES7 193-5DA00-0AA0
TM-IM and bus termination module	1	6ES7 193-5DB00-0AA0
TM-E30S44-iS (screw terminals)	5	6ES7 193-5CB00-0AA0
TM-E30C44-iS (spring terminals)	5	6ES7 193-5CB10-0AA0

Power Supply Module

Table 16-3 Power Supply Module

Description	Number	Order Number
Power supply PS	1	6ES7 138-5EA00-0AA0

Digital Electronics Modules

Table 16-4 Digital Electronics Modules

Description	Number	Order Number
4DI NAMUR	1	6ES7 131-5RD00-0AB0
2DO DC25V/25mA	1	6ES7 132-5SB00-0AB0

Analog Electronics Modules

Table 16-5 Analog Electronics Modules

Description	Number	Order Number
2AI I 2WIRE	1	6ES7 134-5RB00-0AB0
2AI I 4WIRE	1	6ES7 134-5RB50-0AB0
2AI RTD	1	6ES7 134-5SB50-0AB0
2AI TC	1	6ES7 134-5SB00-0AB0
2 AO I	1	6ES7 135-5RB00-0AB0

Analog Electronics Modules with HART

Table 16-6 Analog Electronics Modules with HART

Description	Number	Order Number
2AI I 2WIRE HART	1	6ES7 134-5TB00-0AB0
2AI I 4WIRE HART	1	6ES7 134-5TB50-0AB0
2AO I HART	1	6ES7 135-5TB00-0AB0

ET 200iS Accessories

Table 16-7 ET 200iS Accessories

Description	Number	Order Number
Shield contact element	5	6ES7 193-4GA00-0AA0
Conductor bar, 3x10 mm, 1 m	10	8WA2 842
Shield clamp KLBÜ CO 1		1753311001*
Ground connection terminal ZB 16		031660*
EEx e terminal WPE 16/E (for DIN rail)		17522900*
Sheet of labels DIN A4, white	10	6ES7 193-4BA00-0AA0
Sheet of labels DIN A4, red	10	6ES7 193-4BD00-0AA0
Sheet of labels DIN A4, yellow	10	6ES7 193-4BB00-0AA0
Sheet of labels DIN A4, petrol	10	6ES7 193-4BH00-0AA0
Color identification labels, assorted:	10 strips à 20 labels per 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, 10 x (1 to 20)	200	8WA8 861-0AB
Slot number labels, 5 x (1 to 40)	200	8WA8 861-0AC
Enclosure for ET 200iS with degree of protection EEx e stainless steel, sheet steel		For information on ordering such enclosures, contact your Siemens representative

* Order numbers from Weidmüller GmbH, An der Talle 89, 33102 Paderborn, Tel: 05252-960-0, Fax: 05252-960-116

Network Components

The following table list all the network components you require to operate the ET 200iS.

Table 16-8 Network Components for the ET 200iS

Description	Order Number
Fieldbus isolating transformer 9373/21-12-10 and RS-485 terminating resistor	93 730 05 01 2 Can be ordered, for example from: R. STAHL Schaltgeräte GmbH Postfach 40 D-74636 Waldenburg, Germany Phone: +49–7942/9 43 – 0 Fax: +49–7942/9 43 – 43 33 Internet: http://www.stahl.de
PROFIBUS bus connector (1.5 Mbps)	6ES7 972-0BA30-0XA0
Bus cable for PROFIBUS • Normal	 6XV1 830-0EH10

Manuals on STEP 7 and SIMATIC S7

To program and commission the ET 200iS with *STEP 7*, you require one of the following manuals.

Table 16-9 Manuals on STEP 7 and SIMATIC S7

Description	Content
S7-300 Programmable Controller, Hardware and Installation	Includes • Description of the PROFIBUS-DP master interface of the CPU 315-2 DP • Structure of a PROFIBUS-DP network • RS-485 repeater
M7-300 Installation and Hardware	Includes • Description of the PROFIBUS-DP master interface in M7-300 • Structure of a PROFIBUS-DP network • RS-485 repeater
S7-400, M7-400 Hardware and Installation	Includes • 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/ Program Design programming manual	Includes 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 - wiring and cabling

Manual on the ET 200 in SIMATIC S5

To program and commission the ET 200iS with STEP 5 and COM PROFIBUS, you require the following manual.

Table 16-10 Manual on the ET 200 in SIMATIC S5

Description	Content
ET 200 Distributed I/O Station	Includes • Description of the master interface module IM 308-C for S5-115U/H, S5-135U and S5-155U/H • Description of the S5-95U with PROFIBUS-DP master interface • Description of the structure of a DP system and an FMS system with the CP 5412 (A2) as master • Manual on *COM PROFIBUS* • Working with FB IM 308C/FB 230

Book on PROFIBUS-DP with SIMATIC S7 and STEP 7

Table 16-11 Book on PROFIBUS-DP with SIMATIC S7 and STEP 7

Book	Order Numbers	Content
Decentralisation with PROFIBUS-DP - Structure, Configuration and Application of PROFIBUS-DP with SIMATIC S7 – Josef Weigmann, Gerhard Kilian, MCD Verlag, 1998	In bookstores: ISBN 3-89578-1444 From your Siemens office: A19100-L531-B714	Familiarizes you with the topics of PROFIBUS-DP and how to implement automation tasks with PROFIBUS-DP and SIMATIC S7. The use of PROFIBUS-DP is illustrated with numerous practical example based on SIMATIC S7.

Dimension Drawings

17

17.1 Dimension Drawings

Introduction

This chapter contains the dimension drawings of the most important components of the ET 200iS.

Terminal Module TM-PS with Power Supply Module PS Inserted

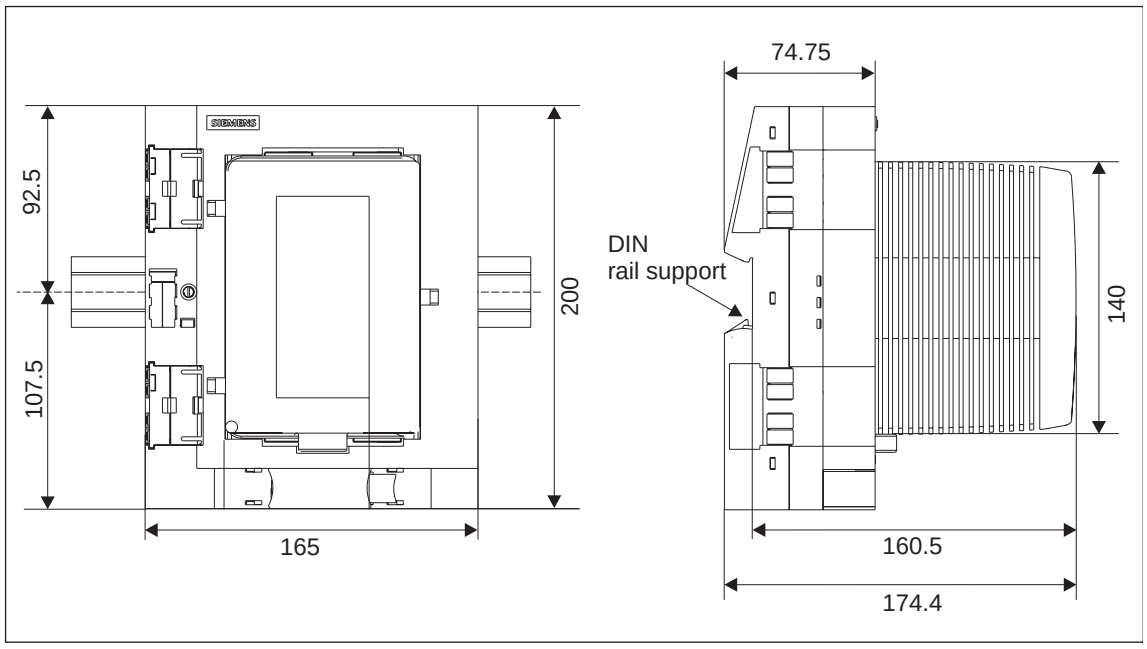


Figure 17-1 Terminal Module TM-PS with Power Supply Module PS Inserted

Terminal Module TM-IM with Interface Module IM 151-2 Inserted

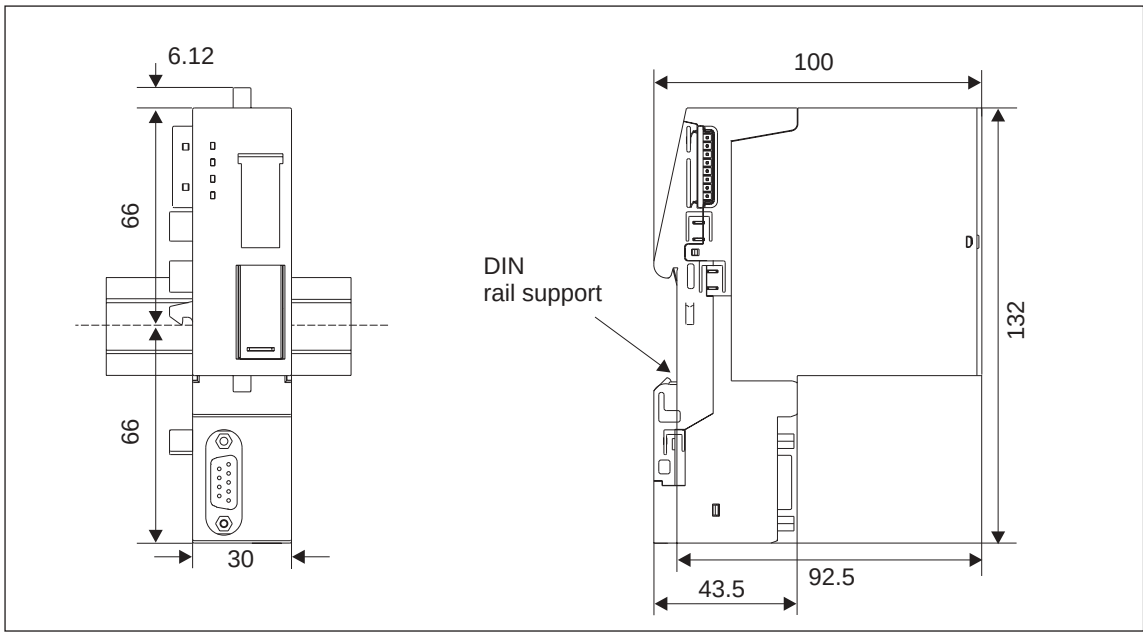


Figure 17-2 Terminal Module TM-IM with Interface Module IM 151-2 Inserted

Terminal Module TM-E with Electronics Module Inserted

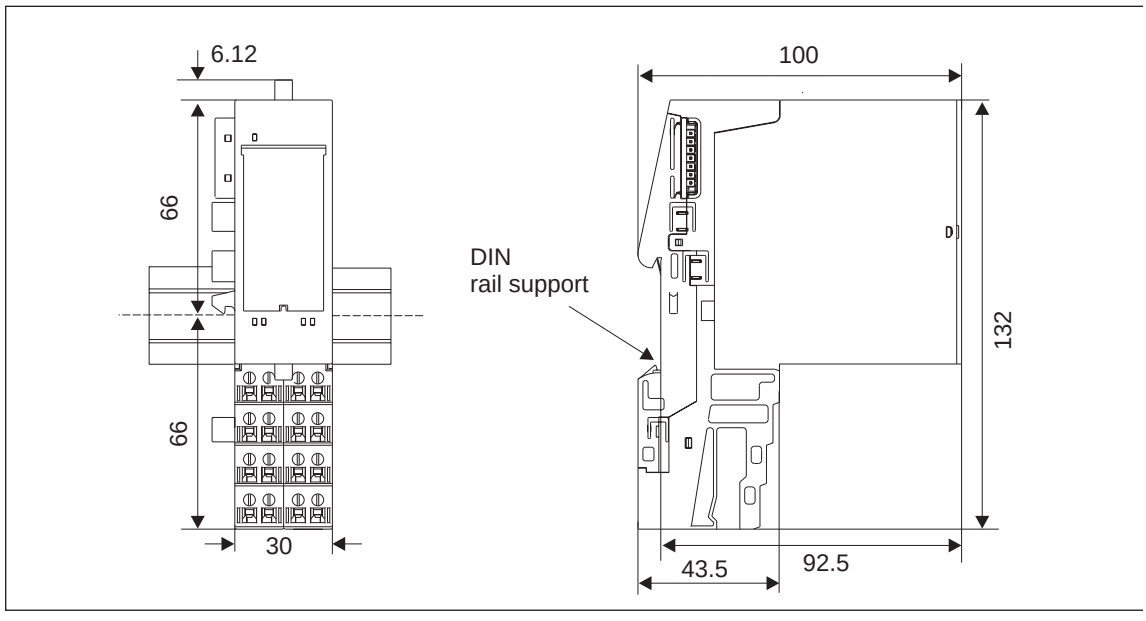


Figure 17-3 Terminal Module TM-E with Electronics Module Inserted

Bus Termination Module

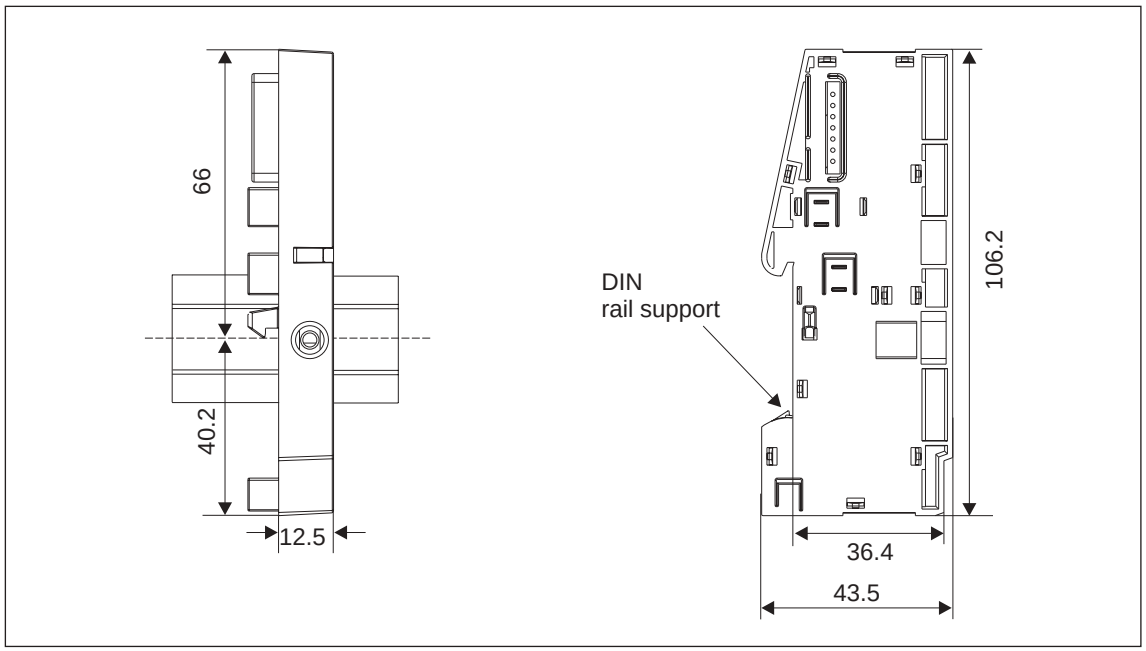


Figure 17-4 Bus Termination Module

Reaction Times

18

18.1 Introduction

The following schematic shows the different reaction times between the DP master and ET 200iS.

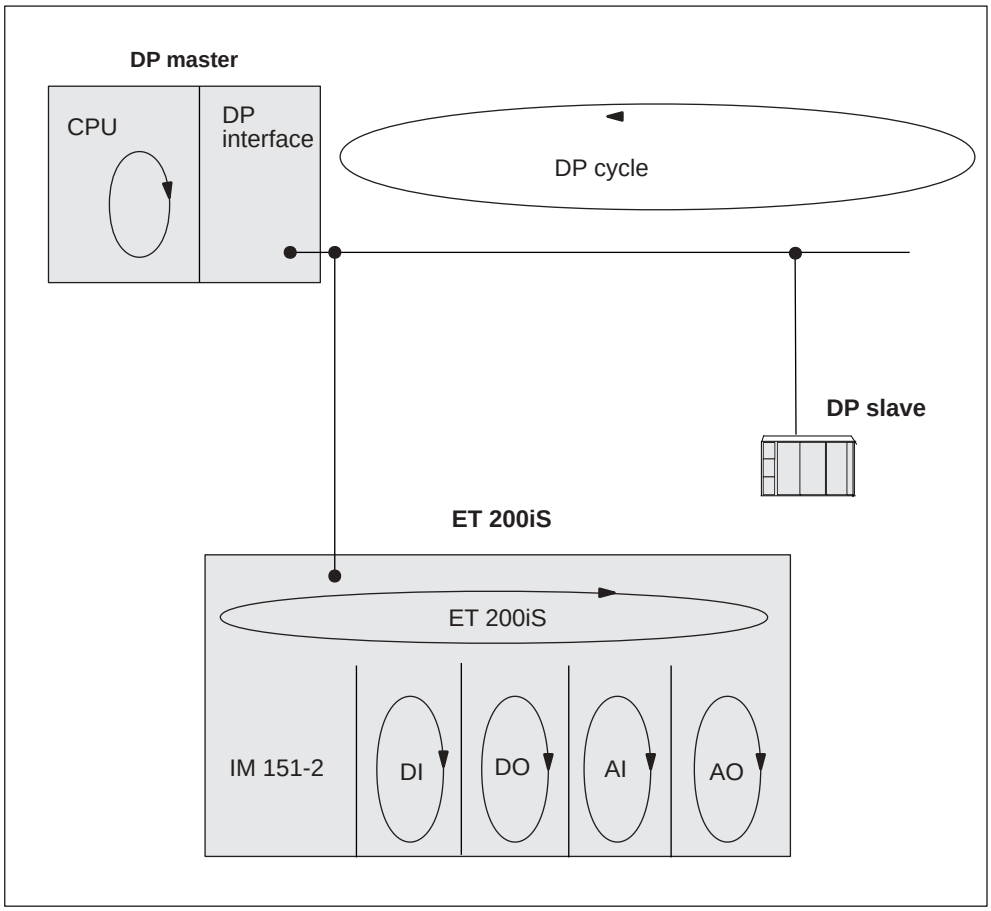


Figure 18-1 Reaction Times between the DP Master and ET 200iS

18.2 Reaction Times on the DP Master

You will find information on the reaction times in the manual of the DP master you are using.

18.3 Reaction Times on the ET 200iS

Reaction Time

The reaction time on the ET 200iS depends on:

- The number of modules
- The number of diagnostic messages
- Removing and inserting modules
- Interrupts

Calculating the Reaction Time

Using the formula below, you can calculate the approximate reaction time of the ET 200iS:

reaction time [µs] = 550 + 130 * m

Figure 18-2 Calculating the Reaction Time

Explanation of the Parameters:

- **m:** Total number of electronics modules

Example of Calculating the ET 200iS Reaction Time

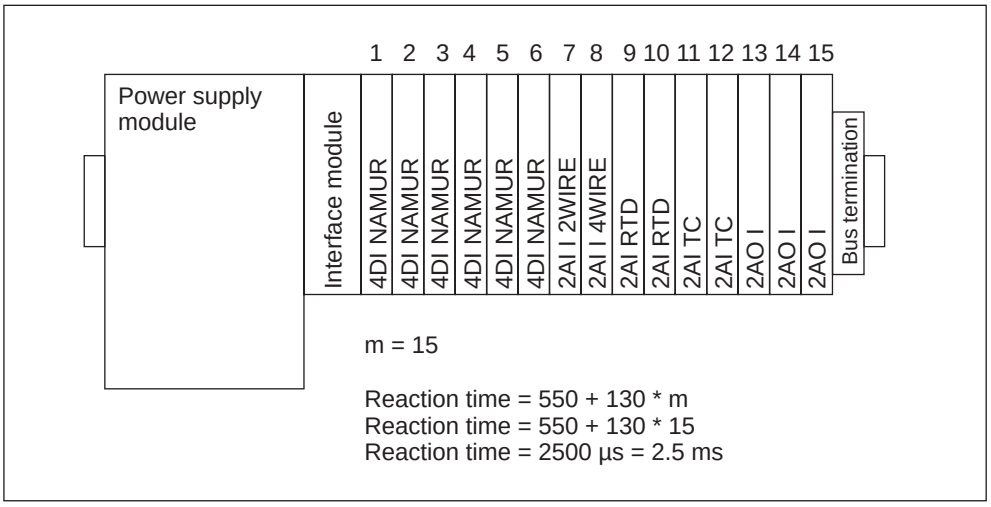


Figure 18-3 Example of Calculating the ET 200iS Reaction Time

18.4 Reaction Times with Digital Input Modules

Input delay

The reaction times of the digital input modules depend on the input delay. See technical specifications Section *Digital Electronics Modules.*

18.5 Reaction Times with Digital Output Modules

Output Delay

The reaction times correspond to the output delay. See technical specifications Section *Digital Electronics Modules*

18.6 Reaction Times of Analog Input Modules

Conversion Time

The conversion time is made up of the basic conversion time and the time for processing wire break monitoring diagnostics (see Technical Specifications 2AI TC and 2AI RTD, section *Analog Electronics Modules*).

With integrating conversion procedures, the integration time is included directly in the conversion time.

Cycle time

The analog-to-digital conversion and the transfer of the digitized measured values to memory or to the backplane bus is sequential; in other words, the analog input channels are converted one after the other. The cycle time; in other words, the time until an analog input value is converted again is the sum of the conversion times of all active analog input channels of the input modules. Unused analog input channels should be deactivated in the parameter settings to reduce the cycle time. The conversion and integration time for a deactivated channel is = 0.

The following schematic provides an overview of how the cycle time for an n-channel analog input module is made up.

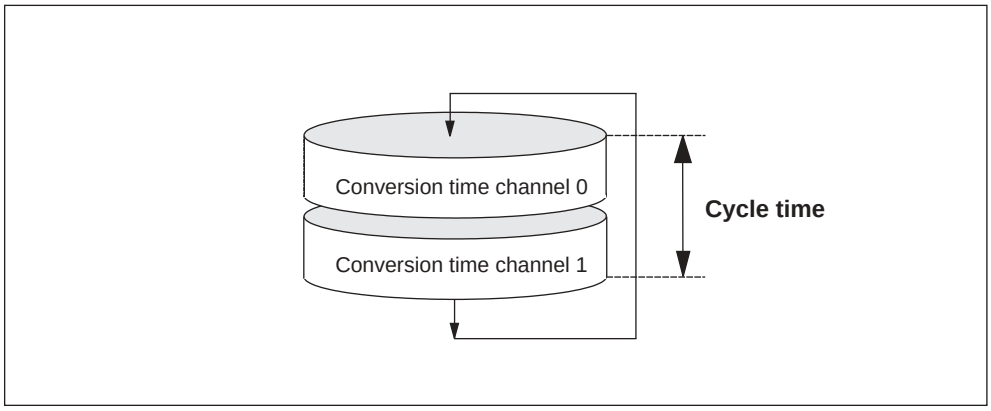


Figure 18-4 Cycle Times of the Analog Input Channel

18.7 Reaction Times of Analog Output Modules

Conversion Time

The conversion time of the analog output channels includes the time for taking the digitized output values from the internal memory and the digital-to-analog conversion.

Cycle time

The conversion of the analog output channels involves a processing time for the module and sequential conversion times for channels 0 and 1.

The cycle time, the other words, the time until an analog output value is converted again is the sum of the conversion times of all activated analog output channels and the processing time of the analog output module.

The following schematic provides an overview of how the cycle time for an analog output module is made up.

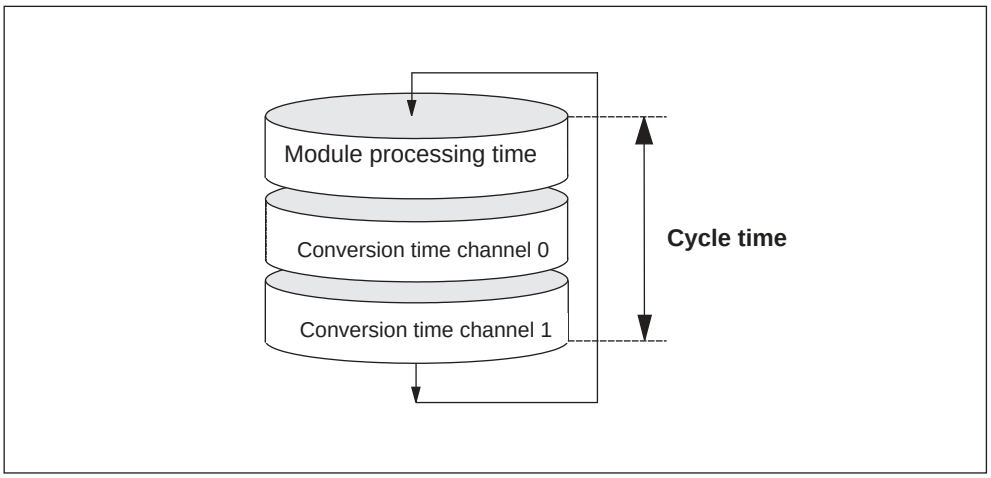


Figure 18-5 Cycle Time of the Analog Output Module

Settling Time

The settling time (t_1 to t_3), in other words, the time from applying the converted value to reaching the specified value at the analog output is load dependent. A distinction must be made between resistive, capacitive, and inductive load.

Response Time

The worst-case response time (t_1 to t_3), in other words, the time from the availability of the digital output values in the internal memory until the specified value is reached and the analog output is the sum of the cycle time and settling time. The worst case occurs when the analog channel was converted shortly before transferring a new output value and will only the converted again following the conversion of the other channels (cycle time).

The following schematic shows the response time of an analog output channel.

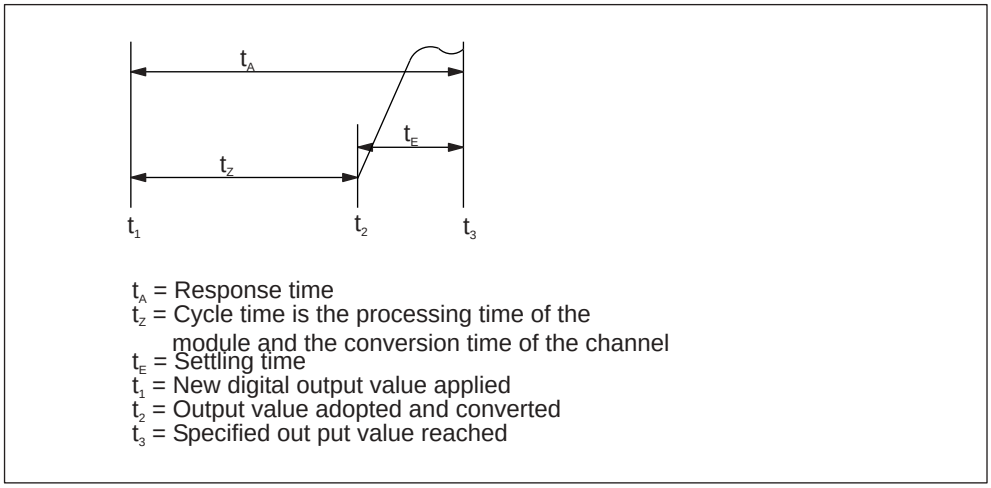


Figure 18-6 Response Time of an Analog Output Channel

Address Space of the Inputs and Outputs

19

19.1 Digital Electronics Modules

Digital Input Modules

Assignment of the process image input table PII per module:

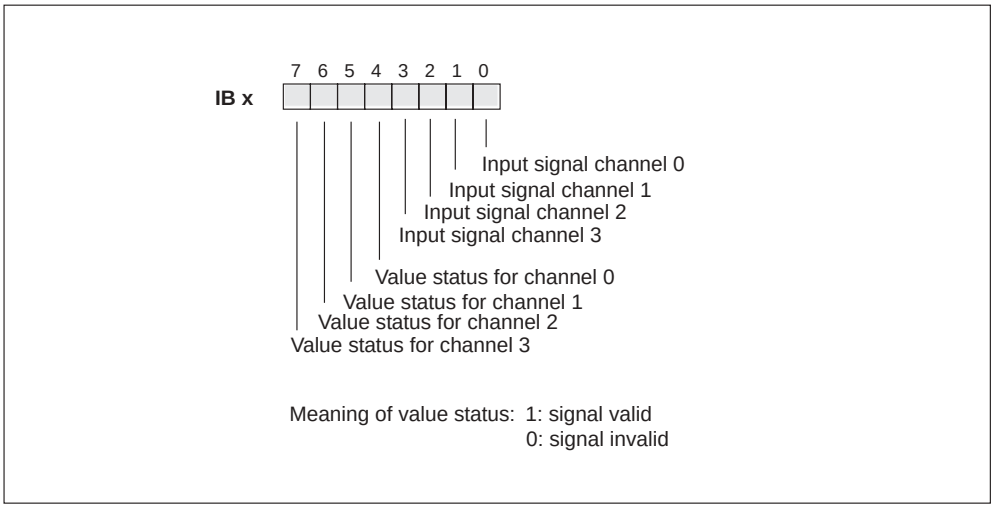


Figure 19-1 Address Space of Digital Input Modules

Digital Output Modules

Assignment of the process image output table PII per module:

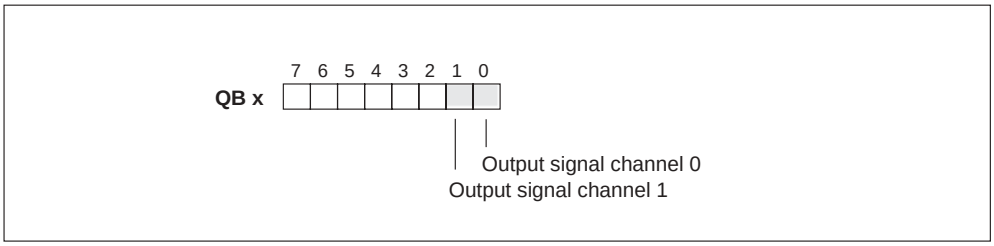


Figure 19-2 Address Space of Digital Output Modules

19.2 Analog Electronics Modules

Analog Input Modules

Process image input table PII per module:

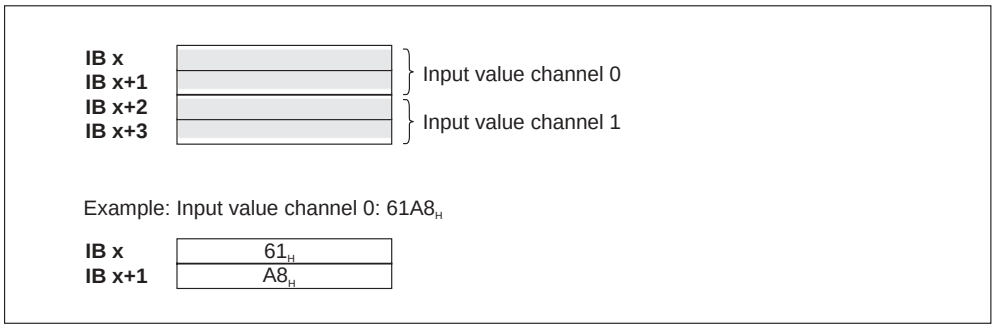


Figure 19-3 Address Space of Analog Input Modules

Analog Output Modules

Process image output table PIO per module:

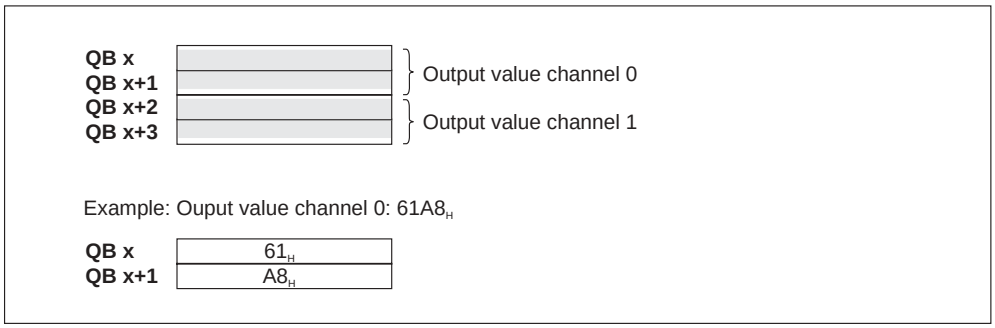


Figure 19-4 Address Space of Analog Output Modules

19.3 Analog Electronics Modules with HART

Analog Input Modules with HART

Process image input table PII per module:

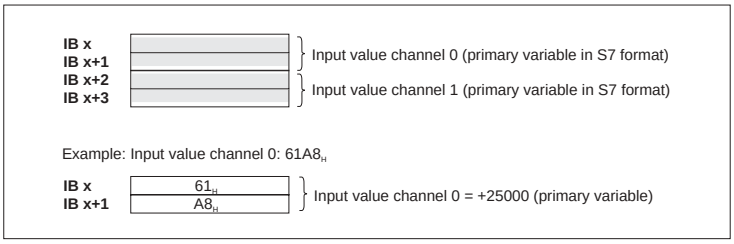


Figure 19-5 Address Space of Analog Input Modules with HART

Analog Output Modules with HART

Process image output table PIO per module:

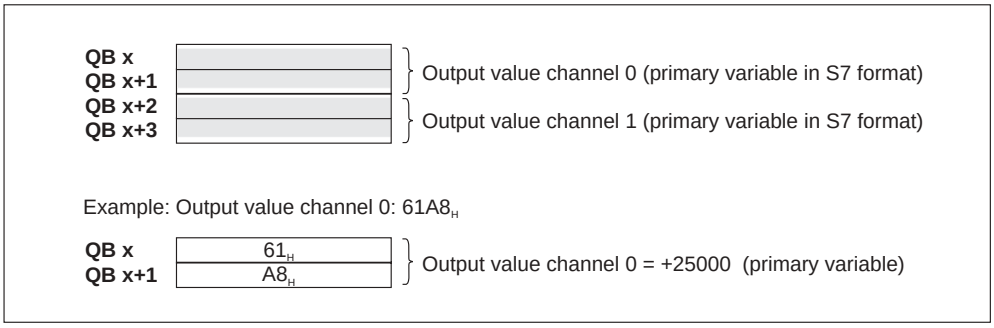


Figure 19-6 Address Space of Analog Output Modules with HART

Certifications

20

20.1 EU Prototype Test Certificates

20.1.1 ET 200iS Distributed I/O Station

Physikalisch-Technische Bundesanstalt

Braunschweig und Berlin

PTB

EG-Baumusterprüfbescheinigung

(1)

(2) Geräte und Schutzsysteme zur bestimmungsgemäßen Verwendung in explosionsgefährdeten Bereichen - **Richtlinie 94/9/EG**

(3) EG-Baumusterprüfbescheinigungsnummer

PTB 01 ATEX 2119

(4) Gerät: Basisaufbau des dezentralen Peripheriesystems Typ ET 200iS

(5) Hersteller: Siemens AG A&D AS

(6) Anschrift: 92224 Amberg, DEUTSCHLAND

(7) Die Bauart dieses Gerätes sowie die verschiedenen zulässigen Ausführungen sind in der Anlage und den darin aufgeführten Unterlagen zu dieser Baumusterprüfbescheinigung festgelegt.

(8) Die Physikalisch-Technische Bundesanstalt bescheinigt als benannte Stelle Nr. 0102 nach Artikel 9 der Richtlinie des Rates der Europäischen Gemeinschaften vom 23. März 1994 (94/9/EG) die Erfüllung der grundlegenden Sicherheits- und Gesundheitsanforderungen für die Konzeption und den Bau von Geräten und Schutzsystemen zur bestimmungsgemäßen Verwendung in explosionsgefährdeten Bereichen gemäß Anhang II der Richtlinie.

Die Ergebnisse der Prüfung sind in dem vertraulichen Prüfbericht PTB Ex 01-21303 festgehalten.

(9) Die grundlegenden Sicherheits- und Gesundheitsanforderungen werden erfüllt durch Übereinstimmung mit

EN 50 014:1997 + A1 + A2 **EN 50 018:1994** **EN 50 019:1994**
EN 50 020:1994 **EN 50 039:1980**

(10) Falls das Zeichen „X" hinter der Bescheinigungsnummer steht, wird auf besondere Bedingungen für die sichere Anwendung des Gerätes in der Anlage zu dieser Bescheinigung hingewiesen.

(11) Diese EG-Baumusterprüfbescheinigung bezieht sich nur auf Konzeption und Bau des festgelegten Gerätes gemäß Richtlinie 94/9/EG. Weitere Anforderungen dieser Richtlinie gelten für die Herstellung und das Inverkehrbringen dieses Gerätes.

(12) Die Kennzeichnung des Gerätes muß die folgenden Angaben enthalten:

Ex II 2 (1) G EEx d e [ib/ia] IIB/IIC T4

Zertifizierungsstelle Explosionsschutz
Im Auftrag

Dr.-Ing. U. Johannsmeyer
Regierungsdirektor

Braunschweig, 17. September 2001

Seite 1/5

Physikalisch-Technische Bundesanstalt

Braunschweig und Berlin

PTB

(13) **Anlage**

(14) **EG-Baumusterprüfbescheinigung PTB 01 ATEX 2119**

(15) Beschreibung des Gerätes

Das dezentrale Peripheriesystem Typ ET 200iS dient der Kommunikation zwischen eigensicheren Ein-Ausgabestromkreisen und einem externen eigensicheren RS 485 Feldbussystem.

Diese Bescheinigung des Basisaufbaus (Typ: TM-..; 6ES7 193-5..,-...) des dezentralen Peripheriesystems Typ ET 200iS umfasst auf einer Hutschiene elektrisch und mechanisch aneinanderzureihende Terminalmodule in Form von Sockeln für jeweils einen Stromversorgungs-Modul (TM-PS; 6ES7 193-5DA00-0AA0), einen Interface- und Busschnittstellenmodul (TM-IM; 6ES7 193-5DB00-0AA0) und bis zu 32 Elektronik-Module (TM-E; 6ES7 193-5CB00-0AA0 (Schraubklemme) + 6ES7 193-5CB10-0AA0 (Federklemme)) in einem System sowie einen Abschlussmodul. Der Basisaufbau dient im Wesentlichen der mechanischen und elektrischen Verbindung der die Funktion tragenden aufzusteckenden Module sowie dem Anschluss äußerer Stromkreise.

Durch Bezug werden hier die zu verwendenden Module Stromversorgung und Interface/Busschnittstelle konkret festgelegt. Für die Elektronik-Module sind die mechanischen Merkmale im Umfang dieser Bescheinigung umfasst sowie deren elektrische Schnittstelle zum Basisaufbau.

Das System insgesamt erfüllt bei bestimmungsgemäßer Errichtung die Anforderungen der Kategorie 2 (1) für einen Umgebungstemperaturbereich von –20 °C bis +60 °C.

Elektrische Daten

Systemexterne Stromkreise

Stromkreis Hilfsenergie-Eingang (Anschlussklemmen am Terminalmodul TM-PS)	U_o = 24 V DC (20 ... 30 V DC) I_o = 3.5 A sicherheitstechnische Maximalspannung U_m=250 V
Stromkreis Potentialausgleich (Anschlussklemmen am Terminalmodul TM-PS)	wird bestimmungsgemäß ausfallsicher mit dem Potentialausgleichsleitersystem des explosionsgefährdeten Bereiches verbunden
Stromkreis Power Bus (Anschlussklemmen am Terminalmodul TM-PS)	in Zündschutzart Eigensicherheit EEx [ib/ia] IIB/IIC, nur zum Anschluss von nach EN 50 020 nichtfunkengebenden passiven Stromkreisen Höchstwert bei Verwendung des Stromversorgungsmoduls Typ PS, 6ES7 138-5EA00-0AA0: U_o = 12,7 V der Stromkreis erfordert eine externe Strombegrenzung mindestens der Kategorie ib auf maximal 7 A

Seite 2/5

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Diese EG-Baumusterprüfbescheinigung darf nur unverändert weiterverbreitet werden.
Auszüge oder Änderungen bedürfen der Genehmigung der Physikalisch-Technischen Bundesanstalt.
Physikalisch-Technische Bundesanstalt • Bundesallee 100 • D-38116 Braunschweig

Physikalisch-Technische Bundesanstalt PTB

Braunschweig und Berlin

Anlage zur EG-Baumusterprüfbescheinigung PTB 01 ATEX 2119

RS 485 Feldbusanschluss (über D-SUB Anschlussbuchse am BSM)	in Zündschutzart Eigensicherheit EEx ib IIB/IIC	Stromkreis Versorgung S-Bus und Stromkreis S-Bus und Diagnose (Steckverbindung an den Terminalmodulen TM-E)	in Zündschutzart Eigensicherheit EEx ib IIB/IIC, nur zum Anschluss passiver Stromkreise
	Höchstwerte bei Verwendung des Interface-Moduls Typ IM 151-2, 6ES7 151-2AA00-0AB0, mit Bus-Schnittstellenmodul Typ BSM1:		Höchstwerte bei Verwendung des Stromversorgungsmoduls Typ PS, 6ES7 138-5EA00-0AA0:
	U_o = ± 4,2 V		U_o = 3,5 V
	I_o = ± 100 mA		I_o = 5 A (statisch 1,07 A)
	P_o = 106 mW		trapezförmige Kennlinie
	Kennlinie: linear		C_o = 38 µF für IIC bzw. 140 µF für IIB
	U_i = ±4,2 V		L_o = 5 µH für IIC bzw. 20 µH für IIB
Der eigensichere Feldbusanschluss ist galvanisch sicher von Erde und von allen anderen Stromkreisen des Systems getrennt.			bei Verwendung des Interface Moduls Typ IM 151-2, 6ES7 151-2AA00-0AB0, mit Bus-Schnittstellenmodul Typ BSM1 und des Stromversorgungsmoduls Typ PS, 6ES7 138-5EA00-0AA0, ist ein C_i von insgesamt 15,9 µF in Abzug zu bringen
Externes RS 485 Feldbussystem	in Zündschutzart Eigensicherheit SYST EEx ib IIB/IIC	Stromkreis Störspannungsableitung (Steckverbindung an den Terminalmodulen TM-E)	nur zum Anschluss eigensicherer Stromkreise
	Höchstwert jedes Klemmenpaares:		
	U_i = ±4,2 V	Ein-Ausgangsstromkreise (Anschlussklemmen an den Terminalmodulen TM-E)	siehe Bescheinigungen der Elektronik-Module
	Höchstwert der Summe der Klemmenpaare:		
	I_i = ± 3 A		
Leitungen	Kabeltyp A bzw. B nach EN 50039 mit folgenden Leitungsbelägen:	**Systeminterne Stromkreise**	
	L'/R' ≤ 22 µH / Ω (Schleifenwiderstand)	Stromkreis Hilfsenergie-Eingang und Stromkreis Potentialausgleich	durchverbunden zu den Anschlussklemmen Hilfsenergie-Eingang und Potentialausgleich (s.o.), nur zum Anschluss an den Stromversorgungsmodul Typ PS, 6ES7 138-5EA00-0AA0
	C' ≤ 250 nF / km		
	Litzendrahtdurchmesser ≥ 0,2 mm	Stromkreis Power Bus	in Zündschutzart Eigensicherheit EEx [ib/ia] IIB/IIC in der Ausprägung nichtfunkend, nur zum Anschluss passiver Stromkreise, mit Abzweig durch alle Module durchgeschleift
	konzentrierte Induktivitäten und Kapazitäten im Verlauf des externen RS 485 Feldbussystems sind nicht zulässig.		Höchstwert bei Verwendung des Stromversorgungsmoduls Typ PS, 6ES7 138-5EA00-0AA0:
Systemschnittstelle zu den Elektronik-Modulen			U_o = 12,7 V
Stromkreis Power Bus (Steckverbindung an den Terminalmodulen TM-E)	in Zündschutzart Eigensicherheit EEx [ib/ia] IIB/IIC, nur zum Anschluss passiver Stromkreise		der Stromkreis erfordert eine externe Strombegrenzung auf maximal 7 A , welche durch die angeschlossenen Module gewährleistet werden muss
	Höchstwert bei Verwendung des Stromversorgungsmoduls Typ PS, 6ES7 138-5EA00-0AA0:	Stromkreise Versorgung Feldbus und interne Stromkreise zwischen den Modulen Interface und Busschnittstelle	in Zündschutzart Eigensicherheit EEx ib IIB/IIC, nur zum Anschluss des Interface-Moduls Typ IM 151-2, 6ES7 151-2AA00-0AB0, mit Bus-Schnittstellenmodul Typ BSM1
	U_o = 12,7 V		
	der Stromkreis erfordert eine externe Strombegrenzung mindestens der Kategorie ib auf eigensichere Stromkreisparameter		

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Braunschweig und Berlin

Anlage zur EG-Baumusterprüfbescheinigung PTB 01 ATEX 2119

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Anlage zur EG-Baumusterprüfbescheinigung PTB 01 ATEX 2119

Stromkreis Versorgung S-Bus und Stromkreis S-Bus und Diagnose	in Zündschutzart Eigensicherheit EEx ib IIB/IIC, nur zum Anschluss passiver Stromkreise, mit Abzweig durch alle Module durchgeschleift Höchstwerte bei Verwendung des Stromversorgungsmoduls Typ PS, 6ES7 138-6EA00-0AA0: U_o = 3,5 V I_o = 5 A (statisch 1,07 A) trapezförmige Kennlinie
Stromkreis Störspannungsableitung (systeminterner Kontakt zur Hutschiene)	in Zündschutzart Eigensicherheit EEx ib IIB/IIC

Der Stromkreis Hilfsenergie ist im Basisaufbau bis zu einem Scheitelwert der Spannung von 375 V von allen anderen Stromkreisen und von Erde galvanisch sicher getrennt. Zusätzlich gilt bis hin zu 30 V entsprechendes für den Power Bus. Die Stromkreise Versorgung S-Bus und S-Bus und Diagnose sind galvanisch miteinander verbunden und bis zu einem Scheitelwert der Spannung von 10 V von Erde galvanisch sicher getrennt. Der Stromkreis Versorgung Feldbus ist bis zu einem Scheitelwert der Spannung von 10 V von Erde und von den Stromkreisen Versorgung S-Bus und S-Bus und Diagnose galvanisch sicher getrennt.

Der Stromkreis Potentialausgleich wird bestimmungsgemäß ausfallsicher mit dem Potentialausgleichsleitersystem des explosionsgefährdeten Bereiches verbunden.

Die Vermaschung der Module über die Stromkreise Power Bus, Versorgung S-Bus und S-Bus wird bei der Errichtung berücksichtigt.

(16) Prüfbericht PTB Ex 01-21303

(17) Besondere Bedingungen
nicht erforderlich

(18) Grundlegende Sicherheits- und Gesundheitsanforderungen
erfüllt durch Einhaltung der o.a. Normen

Zertifizierungsstelle Explosionsschutz
Im Auftrag

Braunschweig, 17. September 2001

Dr.-Ing. U. Johannsmeyer
Regierungsdirektor

Seite 5/5

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Auszüge oder Änderungen bedürfen der Genehmigung der Physikalisch-Technischen Bundesanstalt
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20.1.2 Interface module IM151-2

Physikalisch-Technische Bundesanstalt PTB

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EG-Baumusterprüfbescheinigung

(1) Geräte und Schutzsysteme zur bestimmungsgemäßen Verwendung in explosionsgefährdeten Bereichen - **Richtlinie 94/9/EG**

(2) EG-Baumusterprüfbescheinigungsnummer

PTB 01 ATEX 2122

(3) Gerät: Interfacemodul Typ IM 151-2, 6ES7-151-2AA00-0AB0, mit Bus-Schnittstellen-Modul Typ BSM1

(4) Hersteller: Siemens AG A&D AS

(5) Anschrift: 92224 Amberg, DEUTSCHLAND

(6) Die Bauart dieses Gerätes sowie die verschiedenen zulässigen Ausführungen sind in der Anlage und den darin aufgeführten Unterlagen zu dieser Baumusterprüfbescheinigung festgelegt.

(7) Die Physikalisch-Technische Bundesanstalt bescheinigt als benannte Stelle Nr. 0102 nach Artikel 9 der Richtlinie des Rates der Europäischen Gemeinschaften vom 23. März 1994 (94/9/EG) die Erfüllung der grundlegenden Sicherheits- und Gesundheitsanforderungen für die Konzeption und den Bau von Geräten und Schutzsystemen zur bestimmungsgemäßen Verwendung in explosionsgefährdeten Bereichen gemäß Anhang II der Richtlinie.

Die Ergebnisse der Prüfung sind in dem vertraulichen Prüfbericht PTB Ex 01-21305 festgehalten.

(9) Die grundlegenden Sicherheits- und Gesundheitsanforderungen werden erfüllt durch Übereinstimmung mit

EN 50 014:1997 + A1 + A2 **EN 50 020:1994**

(10) Falls das Zeichen „X" hinter der Bescheinigungsnummer steht, wird auf besondere Bedingungen für die sichere Anwendung des Gerätes in der Anlage zu dieser Bescheinigung hingewiesen.

(11) Diese EG-Baumusterprüfbescheinigung bezieht sich nur auf Konzeption und Bau des festgelegten Gerätes gemäß Richtlinie 94/9/EG. Weitere Anforderungen dieser Richtlinie gelten für die Herstellung und das Inverkehrbringen dieses Gerätes.

(12) Die Kennzeichnung des Gerätes muß die folgenden Angaben enthalten:

II 2 G EEx ib IIB/IIC T4

Zertifizierungsstelle Explosionsschutz Braunschweig, 17. September 2001
Im Auftrag

Dr.-Ing. U. Johannsmeyer
Regierungsdirektor

Seite 1/3

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Physikalisch-Technische Bundesanstalt PTB

Braunschweig und Berlin

Anlage

(13)

(14) **EG-Baumusterprüfbescheinigung PTB 01 ATEX 2122**

(15) Beschreibung des Gerätes

Der Interfacemodul Typ IM 151-2, 6ES7-151-2AA00-0AB0, mit Bus-Schnittstellen-Modul Typ BSM1 ist vorgesehen für die Errichtung bis hin zum Gefahrbereich der Zone 1. Er dient bestimmungsgemäß der externen Kommunikation des dezentralen Peripheriesystems Typ ET 200iS.

Der zulässige Umgebungstemperaturbereich lautet: $-20\ °C \le T_a \le 60\ °C$.

Elektrische Daten

systemexterner Stromkreis

RS 485 Feldbusanschluss (über D-SUB Anschlussbuchse am Bus-Schnittstellen-Modul)

in Zündschutzart Eigensicherheit EEx ib IIB/IIC

Höchstwerte bei Verwendung des Interfacemodul Typ IM 151-2, 6ES7-151-2AA00-0AB0, mit Bus-Schnittstellen-Modul Typ BSM1:

U_o = ± 4,2 V
I_o = ± 100 mA
P_o = 106 mW
Kennlinie: linear
U_i = ± 4,2 V

Der eigensichere Feldbusanschluss ist galvanisch sicher von Erde und von allen anderen Stromkreisen des Systems getrennt.

systeminterne Stromkreise

systemkonforme Elektrische Daten siehe PTB 01 ATEX 2119

Stromkreis Power Bus (systeminterne Steckverbindung)

in Zündschutzart Eigensicherheit EEx [ib/ia] IIB/IIC

Höchstwerte systemkonform

C_i ≈ 0
L_i ≈ 0

Stromkreis Versorgung S-Bus und Stromkreis S-Bus und Diagnose (U_{A2}) (systeminterne Steckverbindung)

die Stromaufnahme ist vernachlässigbar klein

in Zündschutzart Eigensicherheit EEx ib IIB/IIC

Höchstwerte:

U_i = 4 V
C_i = 9,2 µF
L_i ≈ 0

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Anlage zur EG-Baumusterprüfbescheinigung PTB 01 ATEX 2122

Stromkreis Versorgung Feldbus (U_{A1}) (systeminterne Steckverbindung)	in Zündschutzart Eigensicherheit EEx ib IIB/IIC Höchstwerte: U_i = 5,8 V P_i = 625 mW C_i ≈ 0 L_i ≈ 0
Stromkreis Störspannungsableitung (systeminterner Kontakt zur Hutschiene)	in Zündschutzart Eigensicherheit EEx ib IIB/IIC Höchstwert: energiebegrenzt auf ≤ 20 µJ

Die galvanischen Trennungen der eigensicheren Stromkreise untereinander und von Erde sind im Interfacemodul Typ IM 151-2, 6ES7-151-2AA00-0AB0, mit Bus-Schnittstellen-Modul Typ BSM1 systemkonform.

(16) Prüfbericht PTB Ex 01-21305

(17)

(17) Besondere Bedingungen

nicht erforderlich

(18) Grundlegende Sicherheits- und Gesundheitsanforderungen

erfüllt durch Einhaltung der o.a. Normen

Zertifizierungsstelle Explosionsschutz
Im Auftrag

Braunschweig, 17. September 2001

Dr.-Ing. U. Johannsmeyer
Regierungsdirektor

PHYSIKALISCH-TECHNISCHE BUNDESANSTALT

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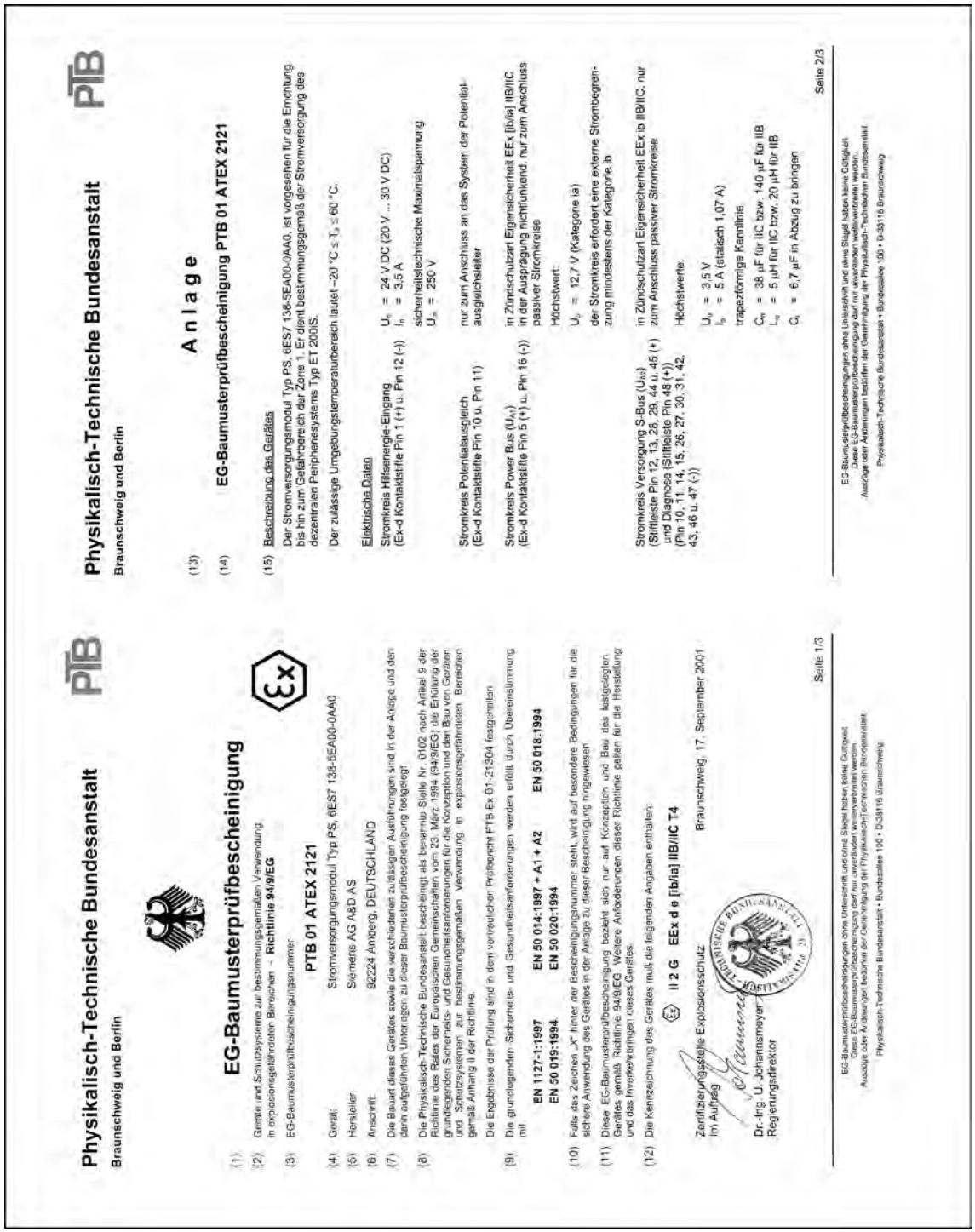
20.1.3 Power supply PS



Physikalisch-Technische Bundesanstalt
Braunschweig und Berlin

PTB

EG-Baumusterprüfbescheinigung

(1) Geräte und Schutzsysteme zur bestimmungsgemäßen Verwendung in explosionsgefährdeten Bereichen – Richtlinie 94/9/EG

(2) EG-Baumusterprüfbescheinigungsnummer
PTB 01 ATEX 2121

(3) Gerät: Stromversorgungsmodul Typ PS, 6ES7 138-5EA00-0AA0

(4) Hersteller: Siemens AG A&D AS

(5) Anschrift: 92224 Amberg, DEUTSCHLAND

(6) Die Bauart dieses Gerätes sowie die verschiedenen zulässigen Ausführungen sind in der Anlage und den darin aufgeführten Unterlagen zu dieser Baumusterprüfbescheinigung festgelegt.

(7) Die Physikalisch-Technische Bundesanstalt bescheinigt als benannte Stelle Nr. 0102 nach Artikel 9 der Richtlinie des Rates der Europäischen Gemeinschaften vom 23. März 1994 (94/9/EG) die Erfüllung der grundlegenden Sicherheits- und Gesundheitsanforderungen für die Konzeption und den Bau von Geräten und Schutzsystemen zur bestimmungsgemäßen Verwendung in explosionsgefährdeten Bereichen gemäß Anhang II der Richtlinie.

Die Ergebnisse der Prüfung sind in dem vertraulichen Prüfbericht PTB Ex 01-21304 festgehalten.

(8) Die grundlegenden Sicherheits- und Gesundheitsanforderungen werden erfüllt durch Übereinstimmung mit
EN 1127-1:1997 + A1 + A2 EN 50 014:1997 + A1 + A2 EN 50 018:1994
EN 50 019:1994 EN 50 020:1994

(9) Falls das Zeichen „X" hinter der Bescheinigungsnummer steht, wird auf besondere Bedingungen für die sichere Anwendung des Gerätes in der Anlage zu dieser Bescheinigung hingewiesen.

(10) Diese EG-Baumusterprüfbescheinigung bezieht sich nur auf Konzeption und Bau des festgelegten Gerätes, gemäß Richtlinie 94/9/EG. Weitere Anforderungen dieser Richtlinie gelten für die Herstellung und das Inverkehrbringen dieses Gerätes.

(11) Die Kennzeichnung des Gerätes muß die folgenden Angaben enthalten:
II 2 G EEx d e [ib/ia] IIB/IIC T4

(12) Zertifizierungsstelle Explosionsschutz
Im Auftrag
Braunschweig, 17. September 2001
Dr.-Ing. U. Johannsmeyer
Regierungsdirektor

Seite 1/3

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Braunschweig und Berlin

PTB

Anlage

(13)

(14) EG-Baumusterprüfbescheinigung PTB 01 ATEX 2121

(15) Beschreibung des Gerätes

Der Stromversorgungsmodul Typ PS, 6ES7 136-5EA00-0AA0, ist vorgesehen für die Einrichtung bis hin zum Gefahrbereich der Zone 1. Er dient bestimmungsgemäß der Stromversorgung des dezentralen Peripheriesystems Typ ET 200iS.

Der zulässige Umgebungstemperaturbereich lautet –20 °C ≤ T_a ≤ 60 °C.

Elektrische Daten

Stromkreis Hilfsenergie-Eingang (Ex-d Kontaktstifte Pin 1 (+) u. Pin 12 (-))
U_n = 24 V DC (20 V ... 30 V DC)
I_n = 3,5 A
sicherheitstechnische Maximalspannung
U_m = 250 V

Stromkreis Potentialausgleich (Ex-d Kontaktstifte Pin 10 u. Pin 11)
nur zum Anschluss an das System der Potentialausgleichsleiter

Stromkreis Power Bus (U_{PS}) (Ex-d Kontaktstifte Pin 5 (+) u. Pin 16 (-))
in Zündschutzart Eigensicherheit EEx [ib/ia] IIB/IIC in der Ausprägung nichtfunkend, nur zum Anschluss passiver Stromkreise
Höchstwert:
U_o = 12,7 V (Kategorie ia)
der Stromkreis erfordert eine externe Strombegrenzung mindestens der Kategorie ib

Stromkreis Versorgung S-Bus (U_{SB}) (Stiftleiste Pin 12, 13, 28, 29, 44 u. 45 (+) und Diagnose (Stiftleiste Pin 48 (+)) (Pin 10, 11, 14, 15, 26, 27, 30, 31, 42, 43, 46 u. 47 (-))
in Zündschutzart Eigensicherheit EEx ib IIB/IIC, nur zum Anschluss passiver Stromkreise
Höchstwerte:
U_o = 3,5 V
I_o = 5 A (statisch 1,07 A)
trapezförmige Kennlinie
C_o = 38 µF für IIC bzw. 140 µF für IIB
L_o = 5 µH für IIC bzw. 20 µH für IIB
C_i = 6,7 µF in Abzug zu bringen

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Anlage zur EG-Baumusterprüfbescheinigung PTB 01 ATEX 2121

Stromkreis Versorgung Feldbus ($U_{(-)}$) (Stiftleiste Pin 3, 4, 19, 20, 35 u. 36 (+) Pin 1, 2, 17, 18, 33, 34 (-))	in Zündschutzart Eigensicherheit EEx ib IIB/IIC, nur zum Anschluss passiver Stromkreise

Höchstwerte:

U_o = 5,7 V
I_o = 2,81 A (statisch 107 mA)
P_o = 0,61 W

trapezförmige Kennlinie

C_o = 14 µF für IIC bzw. 54 µF für IIB
L_o = 5 µH für IIC bzw. 20 µH für IIB

C_i = 1,2 µF in Abzug zu bringen

Der Stromkreis Hilfsenergie-Eingang ist im Stromversorgungsmodul bis zu einem Scheitelwert der Spannung von 375 V von allen anderen Stromkreisen und von Erde galvanisch sicher getrennt. Zusätzlich gilt bis hin zu 30 V entsprechendes für den Stromkreis Power Bus. Die Stromkreise Versorgung S-Bus und Versorgung Feldbus sind untereinander und von Erde bis zu einem Scheitelwert der Spannung von 10 V galvanisch sicher getrennt.

(16) Prüfbericht PTB Ex 01-21304

(17) Besondere Bedingungen

nicht erforderlich

(18) Grundlegende Sicherheits- und Gesundheitsanforderungen

erfüllt durch Einhaltung der o.a. Normen

Zertifizierungsstelle Explosionsschutz
Im Auftrag

Braunschweig, 17. September 2001

Dr.-Ing. U. Johannsmeyer
Regierungsdirektor

Seite 3/3

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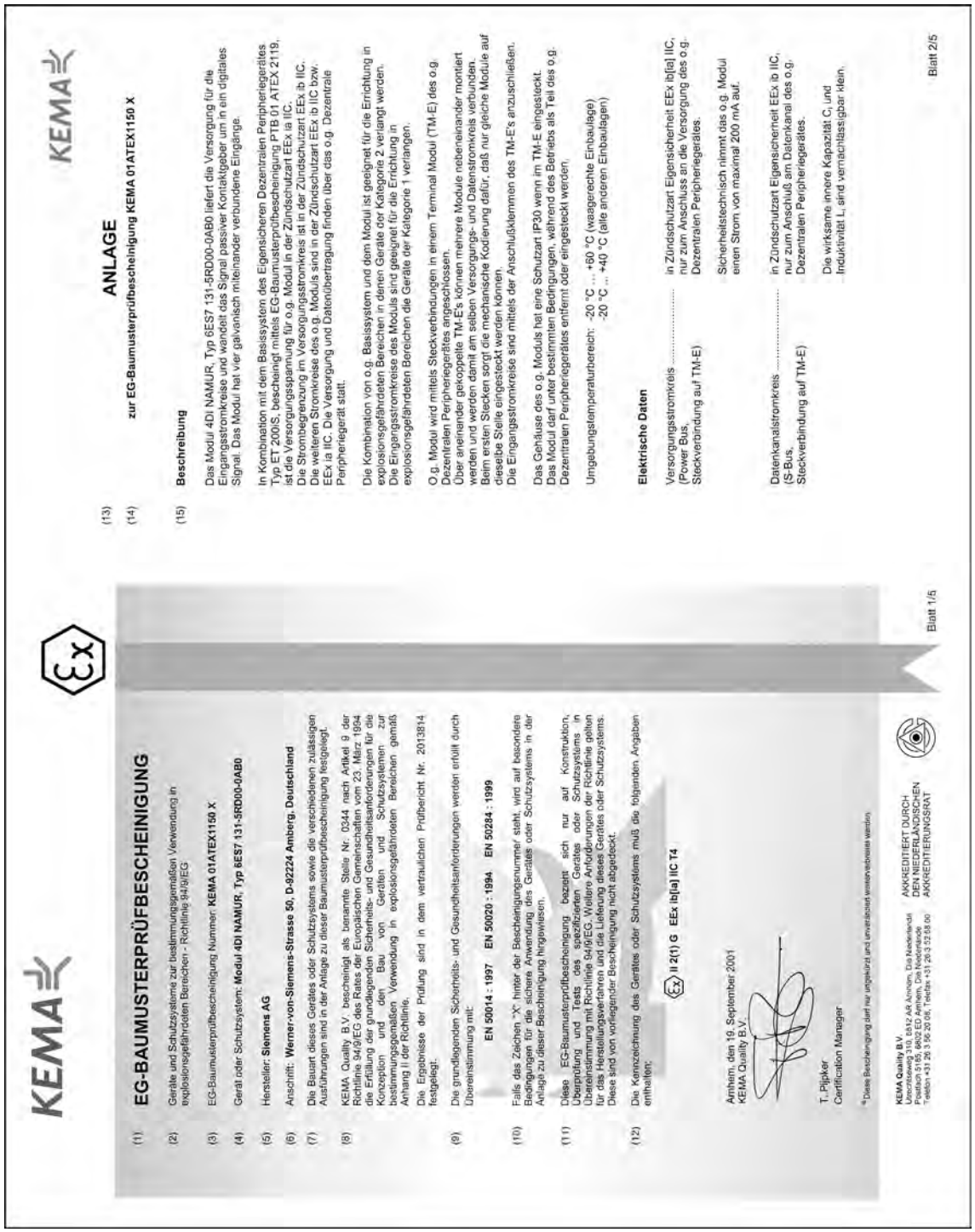
20.1.4 4DI NAMUR



KEMA

ANLAGE

zur EG-Baumusterprüfbescheinigung KEMA 01ATEX1150 X

(1) **EG-BAUMUSTERPRÜFBESCHEINIGUNG**

(2) Geräte und Schutzsysteme zur bestimmungsgemäßen Verwendung in explosionsgefährdeten Bereichen - Richtlinie 94/9/EG

(3) EG-Baumusterprüfbescheinigung Nummer **KEMA 01ATEX1150 X**

(4) Gerät oder Schutzsystem: **Modul 4DI NAMUR, Typ 6ES7 131-5RD00-0AB0**

(5) Hersteller: **Siemens AG**

(6) Anschrift: **Werner-von-Siemens-Strasse 50, D-92224 Amberg, Deutschland**

(7) Die Bauart dieses Gerätes oder Schutzsystems sowie die verschiedenen zulässigen Ausführungen sind in der Anlage zu dieser Baumusterprüfbescheinigung festgelegt.

(8) KEMA Quality B.V. bescheinigt als benannte Stelle Nr. 0344 nach Artikel 9 der Richtlinie 94/9/EG des Rates der Europäischen Gemeinschaften vom 23. März 1994 die Erfüllung der grundlegenden Sicherheits- und Gesundheitsanforderungen für die Konzeption und den Bau von Geräten und Schutzsystemen zur bestimmungsgemäßen Verwendung in explosionsgefährdeten Bereichen gemäß Anhang II der Richtlinie.

Die Ergebnisse der Prüfung sind in dem vertraulichen Prüfbericht Nr. 2013814 festgelegt.

(9) Die grundlegenden Sicherheits- und Gesundheitsanforderungen werden erfüllt durch Übereinstimmung mit:

EN 50014 : 1997 EN 50020 : 1994 EN 50284 : 1999

(10) Falls das Zeichen "X" hinter der Bescheinigungsnummer steht, wird auf besondere Bedingungen für die sichere Anwendung des Gerätes oder Schutzsystems in der Anlage zu dieser Bescheinigung hingewiesen.

(11) Diese EG-Baumusterprüfbescheinigung bezieht sich nur auf Konstruktion, Überprüfung und Tests des spezifizierten Gerätes oder Schutzsystems in Übereinstimmung mit Richtlinie 94/9/EG. Weitere Anforderungen der Richtlinie gelten für das Herstellungsverfahren und die Lieferung dieses Gerätes oder Schutzsystems. Diese sind von vorliegender Bescheinigung nicht abgedeckt.

(12) Die Kennzeichnung des Gerätes oder Schutzsystems muß die folgenden Angaben enthalten:

Ex II 2(1) G EEx ib[ia] IIC T4

Arnhem, den 19. September 2001
KEMA Quality B.V.

T. Pijpker
Certification Manager

*Diese Bescheinigung darf nur ungekürzt und unverändert weiterverbreitet werden.

KEMA Quality B.V.
Utrechtseweg 310, 6812 AR Arnhem, Das Niederlande
Postbus 5185, 6802 ED Arnhem, Das Niederlande
Telefon +31 26 3 56 91 00, Telefax +31 26 3 51 65 00

AKKREDITIERT DURCH DEN NIEDERLÄNDISCHEN AKKREDITIERUNGSRAT

Blatt 1/5

(13)

(14) zur EG-Baumusterprüfbescheinigung KEMA 01ATEX1150 X

(15) **Beschreibung**

Das Modul 4DI NAMUR, Typ 6ES7 131-5RD00-0AB0 liefert die Versorgung für die Eingangsstromkreise und wandelt das Signal passiver Kontaktgeber um in ein digitales Signal. Das Modul hat vier galvanisch miteinander verbundene Eingänge.

In Kombination mit dem Basissystem des Eigensicheren Dezentralen Peripheriegerätes Typ ET 200iS, bescheinigt mittels EG-Baumusterprüfbescheinigung PTB 01 ATEX 2119, ist die Versorgungsspannung für o.g. Modul in der Zündschutzart EEx ia IIC.
Die Strombegrenzung im Versorgungsstromkreis ist in der Zündschutzart EEx ib IIC.
Die weiteren Stromkreise des o.g. Moduls sind in der Zündschutzart EEx ib IIC bzw. EEx ia IIC. Die Versorgung und Datenübertragung finden über das o.g. Dezentrale Peripheriegerät statt.

Die Kombination von o.g. Basissystem und dem Modul ist geeignet für die Errichtung in explosionsgefährdeten Bereichen in denen Geräte der Kategorie 2 verlangt werden.
Die Eingangsstromkreise des Moduls sind geeignet für die Errichtung in explosionsgefährdeten Bereichen die Geräte der Kategorie 1 verlangen.

O.g. Modul wird mittels Steckverbindungen in einem Terminal Modul (TM-E) des o.g. Dezentralen Peripheriegerätes angeschlossen.
Über aneinander gekoppelte TM-E's können mehrere Module nebeneinander montiert werden und werden damit am selben Versorgungs- und Datenstromkreis verbunden.
Beim ersten Stecken sorgt die mechanische Kodierung dafür, daß nur gleiche Module auf dieselbe Stelle eingesteckt werden können.
Die Eingangsstromkreise sind mittels der Anschlußklemmen des TM-E's anzuschließen.

Das Gehäuse des o.g. Moduls hat eine Schutzart IP30 wenn im TM-E eingesteckt.
Das Modul darf unter bestimmten Bedingungen, während des Betriebs als Teil des o.g. Dezentralen Peripheriegerätes entfernt oder eingesteckt werden.

Umgebungstemperaturbereich: -20 °C ... +60 °C (waagerechte Einbaulage)
-20 °C ... +40 °C (alle anderen Einbaulagen)

Elektrische Daten

Versorgungsstromkreis ..... in Zündschutzart Eigensicherheit EEx ib[ia] IIC, nur zum Anschluss an die Versorgung des o.g. Dezentralen Peripheriegerätes.
(Power Bus,
Steckverbindung auf TM-E)

Sicherheitstechnisch nimmt das o.g. Modul einen Strom von maximal 200 mA auf.

Datenkanalstromkreis ..... in Zündschutzart Eigensicherheit EEx ib IIC, nur zum Anschluß am Datenkanal des o.g. Dezentralen Peripheriegerätes.
(S-Bus,
Steckverbindung auf TM-E)

Die wirksame innere Kapazität C_i und Induktivität L_i sind vernachlässigbar klein.

Blatt 2/5

KEMA

(13) **ANLAGE**

(14) **zur EG-Baumusterprüfbescheinigung KEMA 01ATEX1150 X**

(15) **Elektrische Daten** (Fortsetzung)

Eingangsstromkreise ..... (TM-E Anschlußklemmen 1/2, 5/6, 9/10 und 13/14)

in Zündschutzart Eigensicherheit EEx ia IIC, mit folgenden Höchstwerten:

Jeder Stromkreis einzeln angeschlossen:
U_o = 9,6 V
I_o = 11 mA
P_o = 26 mW
Höchstzulässige äußere Kapazität C_o und Induktivität L_o nach untenstehenden Tabelle.

	IIC	IIB
C_o	3,6 µF	26 µF
L_o	240 mH	1000 mH

Zwei Stromkreise parallel angeschlossen:
U_o = 9,6 V
I_o = 21 mA
P_o = 50 mW
Höchstzulässige äußere Kapazität C_o und Induktivität L_o nach untenstehenden Tabelle.

	IIC	IIB
C_o	3,6 µF	26 µF
L_o	80 mH	280 mH

Drei Stromkreise parallel angeschlossen:
U_o = 9,6 V
I_o = 32 mA
P_o = 77 mW
Höchstzulässige äußere Kapazität C_o und Induktivität L_o nach untenstehenden Tabelle.

	IIC	IIB
C_o	3,6 µF	26 µF
L_o	35 mH	110 mH

Vier Stromkreise parallel angeschlossen:
U_o = 9,6 V
I_o = 42 mA
P_o = 101 mW
Höchstzulässige äußere Kapazität C_o und Induktivität L_o nach untenstehenden Tabelle.

	IIC	IIB
C_o	3,6 µF	26 µF
L_o	19 mH	65 mH

Die Versorgungs-, Daten- und Eingangsstromkreise sind, bei Anwendung im o.g. Dezentralen Peripheriegerät sicher voneinander galvanisch getrennt.

KEMA

(13) **ANLAGE**

(14) **zur EG-Baumusterprüfbescheinigung KEMA 01ATEX1150 X**

(15) **Elektrische Daten** (Fortsetzung)

Stückprüfungen

Für den Transformator T200 sind die Spannungsprüfungen mit einem Höchstwert von 1500 Vac während einer Minute, gemäß Abschnitt 11.2 von EN 50020:1994 erforderlich.

(16) **Prüfbericht**

KEMA Nr. 2013814

(17) **Besondere Bedingungen**

1) Die Summe der sicherheitstechnisch vom Versorgungsstromkreis (Power Bus) aufgenommenen Ströme der Module, montiert auf einem Power Bus des o.g. Dezentralen Peripheriegerätes, darf den in der EG-Baumusterprüfbescheinigung PTB 01 ATEX 2119 erwähnten Wert nicht überschreiten.

2) Für das Stecken und Ziehen des o.g. Moduls während der Errichtung und des Betriebes sind die Errichtungs- und Betriebsanleitung des o.g. Dezentralen Peripheriegerätes zu beachten.
Beim Austausch der Module dürfen nur gleiche Typen verwendet werden.

3) Für den Umgebungstemperaturbereich und die elektrischen Daten, siehe (15)

(18) **Grundlegende Sicherheits- und Gesundheitsanforderungen**

Grundlegende Sicherheits- und Gesundheitsanforderungen, welche nicht abgedeckt sind von den unter (9) erwähnten Normen	
Abschnitt	Thema
1.0.5	Kennzeichnung
1.0.6 b) und d)	Betriebsanleitung

Diese Grundlegenden Sicherheits- und Gesundheitsanforderungen sind geprüft und positiv beurteilt worden. Die Prüfergebnisse sind in dem unter (16) erwähnten Prüfbericht festgelegt worden.

(19) **Prüfungsunterlagen**

1. Prüfbericht zur EG-Baumusterprüfbescheinigung PTB 01 ATEX 2119

		unterschrieben am
2.	Zeichnung Nr. A5E00031727K	26.07.2001
	4NEA9993747-09 (2 Blatt)	10.08.2001
	A5E00059027C	26.07.2001
	A5E00059028C	26.07.2001

KEMA

(15) ANLAGE

(14) zur EG-Baumusterprüfbescheinigung KEMA 01ATEX1150 X

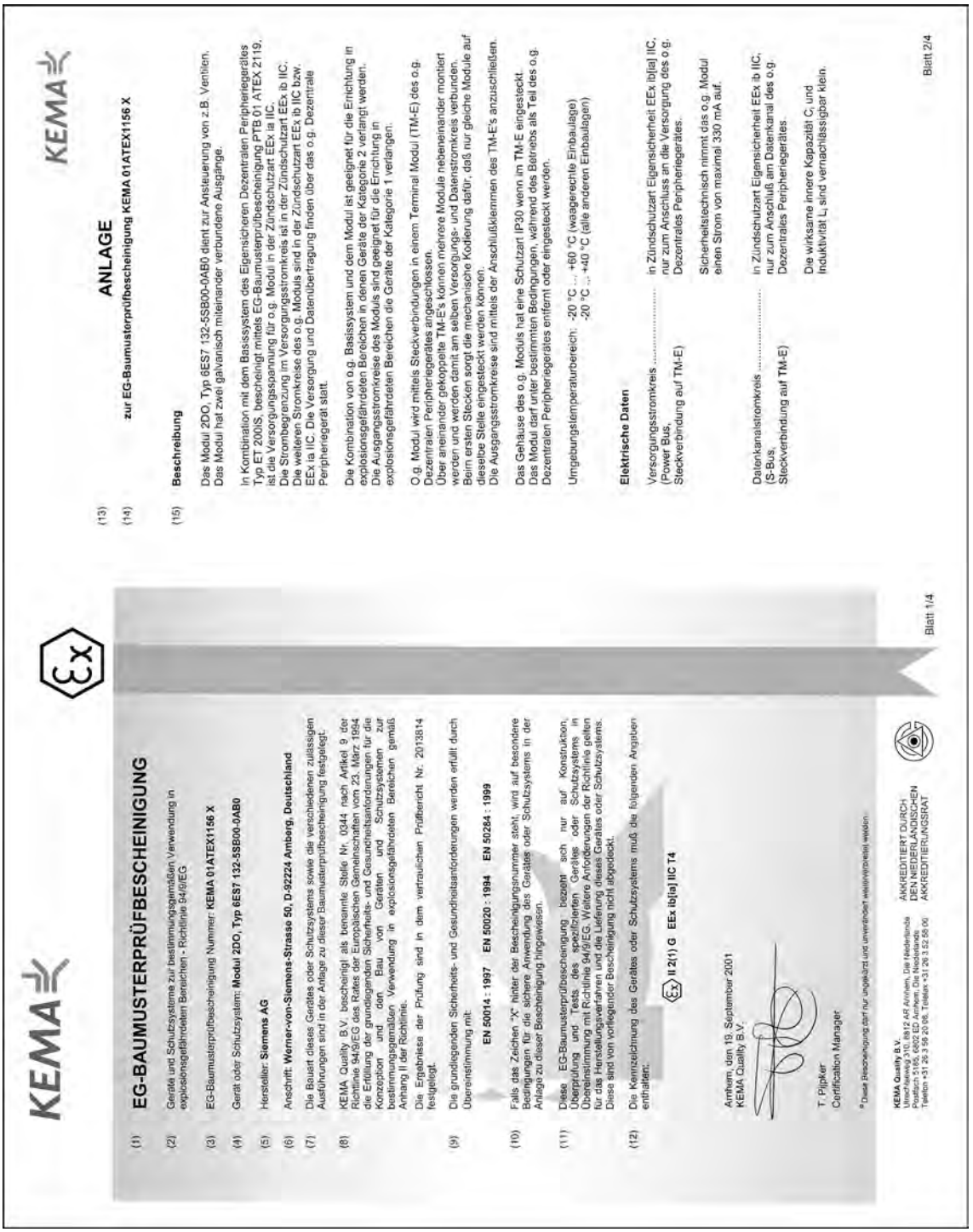
(15) **Prüfungsunterlagen** (Fortsetzung)

Zeichnung Nr.		unterschrieben am
A5E00113397E	(6 Blatt)	06.09.2001
A5E00056615B	(7 Blatt)	26.07.2001
A5E00060657B	(4 Blatt)	26.07.2001
A5E00110806	(6 Blatt)	13.08.2001
A5E00116807	(2 Blatt)	26.07.2001
A5E00113397C		26.07.2001
A5E00113397A	(46 Blatt)	26.07.2001
A5E00088854A	(6 Blatt)	26.07.2001
A5E00094449B		27.08.2001
A5E00088856B	(35 Blatt)	10.08.2001
A5E00075289A	(2 Blatt)	10.08.2001
A5E00088856N	(6 Blatt)	13.09.2001
A5E00088856P	(6 Blatt)	13.09.2001
A5E00094952B	(4 Blatt)	10.08.2001
A5E00094952	(2 Blatt)	10.08.2001
A5E00094909B	(5 Blatt)	10.08.2001
A5E00113255	(2 Blatt)	10.08.2001
A5E00111503A		14.09.2001

3 Prüfmuster

Blatt 5/6

20.1.5 2DO DC25V/25mA



KEMA

(Ex)

EG-BAUMUSTERPRÜFBESCHEINIGUNG

(1) (2) Geräte und Schutzsysteme zur bestimmungsgemäßen Verwendung in explosionsgefährdeten Bereichen - Richtlinie 94/9/EG

(3) EG-Baumusterprüfbescheinigung Nummer: **KEMA 01ATEX1156 X**

(4) Gerät oder Schutzsystem: **Modul 2DO, Typ 6ES7 132-5SB00-0AB0**

(5) Hersteller: **Siemens AG**

(6) Anschrift: **Werner-von-Siemens-Strasse 50, D-92224 Amberg, Deutschland**

(7) Die Bauart dieses Gerätes oder Schutzsystems sowie die verschiedenen zulässigen Ausführungen sind in der Anlage zu dieser Baumusterprüfbescheinigung festgelegt.

(8) KEMA Quality B.V. bescheinigt als benannte Stelle Nr. 0344 nach Artikel 9 der Richtlinie 94/9/EG des Rates der Europäischen Gemeinschaften vom 23. März 1994 die Erfüllung der grundlegenden Sicherheits- und Gesundheitsanforderungen für die Konzeption und den Bau von Geräten und Schutzsystemen zur bestimmungsgemäßen Verwendung in explosionsgefährdeten Bereichen gemäß Anhang II der Richtlinie.

Die Ergebnisse der Prüfung sind in dem vertraulichen Prüfbericht Nr. 2013814 festgelegt.

(9) Die grundlegenden Sicherheits- und Gesundheitsanforderungen werden erfüllt durch Übereinstimmung mit:

EN 50014 : 1997 EN 50020 : 1994 EN 50284 : 1999

(10) Falls das Zeichen "X" hinter der Bescheinigungsnummer steht, wird auf besondere Bedingungen für die sichere Anwendung des Gerätes oder Schutzsystems in der Anlage zu dieser Bescheinigung hingewiesen.

(11) Diese EG-Baumusterprüfbescheinigung bezieht sich nur auf Konstruktion, Überprüfung und Tests des spezifizierten Gerätes oder Schutzsystems in Übereinstimmung mit Richtlinie 94/9/EG. Weitere Anforderungen der Richtlinie gelten für das Herstellungsverfahren und die Lieferung dieses Gerätes oder Schutzsystems. Diese sind von vorliegender Bescheinigung nicht abgedeckt.

(12) Die Kennzeichnung des Gerätes oder Schutzsystems muß die folgenden Angaben enthalten:

(Ex) **II 2(1) G EEx ib[ia] IIC T4**

Arnhem, den 19. September 2001
KEMA Quality B.V.

T. Pijpker
Certification Manager

"Diese Bescheinigung darf nur ungekürzt und unverändert weiterverbreitet werden.

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AKKREDITIERT DURCH DEN NIEDERLÄNDISCHEN AKKREDITIERUNGSRAT

Blatt 1/4

(13)

(14) **ANLAGE**

zur EG-Baumusterprüfbescheinigung **KEMA 01ATEX1156 X**

(15) **Beschreibung**

Das Modul 2DO, Typ 6ES7 132-5SB00-0AB0 dient zur Ansteuerung von z.B. Ventilen. Das Modul hat zwei galvanisch miteinander verbundene Ausgänge.

In Kombination mit dem Basissystem des Eigensicheren Dezentralen Peripheriegerätes Typ ET 200iS, bescheinigt mittels EG-Baumusterprüfbescheinigung PTB 01 ATEX 2119, ist die Versorgungsspannung für o.g. Modul in der Zündschutzart EEx ia IIC. Die Strombegrenzung im Versorgungsstromkreis ist in der Zündschutzart EEx ib IIC. Die weiteren Stromkreise des o.g. Moduls sind in der Zündschutzart EEx ib IIC bzw. EEx ia IIC. Die Versorgung und Datenübertragung finden über das o.g. Dezentrale Peripheriegerät statt.

Die Kombination von o.g. Basissystem und dem Modul ist geeignet für die Errichtung in explosionsgefährdeten Bereichen in denen Geräte der Kategorie 2 verlangt werden. Die Ausgangsstromkreise des Moduls sind geeignet für die Errichtung in explosionsgefährdeten Bereichen die Geräte der Kategorie 1 verlangen.

O.g. Modul wird mittels Steckverbindungen in einem Terminal Modul (TM-E) des o.g. Dezentralen Peripheriegerätes angeschlossen.
Über aneinander gekoppelte TM-E's können mehrere Module nebeneinander montiert werden und werden damit am selben Versorgungs- und Datenstromkreis verbunden. Beim ersten Stecken sorgt die mechanische Kodierung dafür, daß nur gleiche Module auf dieselbe Stelle eingesteckt werden können.
Die Ausgangsstromkreise sind mittels der Anschlußklemmen des TM-E's anzuschließen.

Das Gehäuse des o.g. Moduls hat eine Schutzart IP30 wenn im TM-E eingesteckt.
Das Modul darf unter bestimmten Bedingungen, während des Betriebs als Teil des o.g. Dezentralen Peripheriegerätes entfernt oder eingesteckt werden.

Umgebungstemperaturbereich: -20 °C ... +60 °C (waagerechte Einbaulage)
-20 °C ... +40 °C (alle anderen Einbaulagen)

Elektrische Daten

Versorgungsstromkreis ..... in Zündschutzart Eigensicherheit EEx ib[ia] IIC, nur zum Anschluss an die Versorgung des o.g. Dezentrales Peripheriegerätes.
(Power Bus,
Steckverbindung auf TM-E)

Sicherheitstechnisch nimmt das o.g. Modul einen Strom von maximal 330 mA auf.

Datenkanalstromkreis ..... in Zündschutzart Eigensicherheit EEx ib IIC, nur zum Anschluß am Datenkanal des o.g. Dezentrales Peripheriegerätes.
(S-Bus,
Steckverbindung auf TM-E)

Die wirksame innere Kapazität C_i und Induktivität L_i sind vernachlässigbar Klein.

Blatt 2/4

KEMA

(13) **ANLAGE**

(14) **zur EG-Baumusterprüfbescheinigung KEMA 01ATEX1156 X**

(15) **Elektrische Daten** (Fortsetzung)

Ausgangsstromkreise ..... in Zündschutzart Eigensicherheit EEx ia IIC, mit (TM-E Anschlußklemmen 3/4 und 15/16) folgenden Höchstwerten.

Jeder Stromkreis einzeln angeschlossen:

U_o = 28 V
I_o = 49 mA
P_o = 345 mW

Höchstzulässige äußere Kapazität C_o und Induktivität L_o nach untenstehende Tabelle.

	IIC	IIB
C_o	80 nF	650 nF
L_o	15 mH	55 mH

Beide Stromkreise parallel angeschlossen:

U_o = 28 V
I_o = 98 mA
P_o = 685 mW

Höchstzulässige äußere Kapazität C_o und Induktivität L_o nach untenstehende Tabelle.

	IIC	IIB
C_o	80 nF	650 nF
L_o	3 mH	11 mH

Die Versorgungs-, Daten- und Ausgangsstromkreise sind, bei Anwendung im o.g. Dezentralen Peripheriegerät sicher voneinander galvanisch getrennt.

Stückprüfungen

Für den Transformator T200 sind die Spannungsprüfungen mit einem Höchstwert von 1500 Vac während einer Minute, gemäß Abschnitt 11.2 von EN 50020:1994 erforderlich

(16) **Prüfbericht**
KEMA Nr. 2013814

(17) **Besondere Bedingungen**

1) Die Summe der sicherheitstechnisch vom Versorgungsstromkreis (Power Bus) aufgenommenen Ströme der Module, montiert auf einem Power Bus des o.g. Dezentralen Peripheriegerätes, darf den in der EG-Baumusterprüfbescheinigung PTB 01 ATEX 2119 erwähnten Wert nicht überschreiten.

2) Für das Stecken und Ziehen des o.g. Moduls während der Errichtung und des Betriebes sind die Errichtungs- und Betriebsanleitung des o.g. Dezentralen Peripheriegerätes zu beachten.
Beim Austausch der Module dürfen nur gleiche Typen verwendet werden.

3) Für den Umgebungstemperaturbereich und die elektrischen Daten, siehe (15)

Blatt 3/4

KEMA

(13) **ANLAGE**

(14) **zur EG-Baumusterprüfbescheinigung KEMA 01ATEX1156 X**

(18) **Grundlegende Sicherheits- und Gesundheitsanforderungen**

Grundlegende Sicherheits- und Gesundheitsanforderungen, welche nicht abgedeckt sind von den unter (9) erwähnten Normen	
Abschnitt	Thema
1.0.5	Kennzeichnung
1.0.6 b) und d)	Betriebsanleitung

Diese Grundlegenden Sicherheits- und Gesundheitsanforderungen sind geprüft und positiv beurteilt worden. Die Prüfergebnisse sind in dem unter (16) erwähnten Prüfbericht festgelegt worden.

(19) **Prüfungsunterlagen**

1. EG-Baumusterprüfbescheinigung KEMA 01ATEX1163 X
   Prüfbericht zur EG-Baumusterprüfbescheinigung PTB 01 ATEX 2119

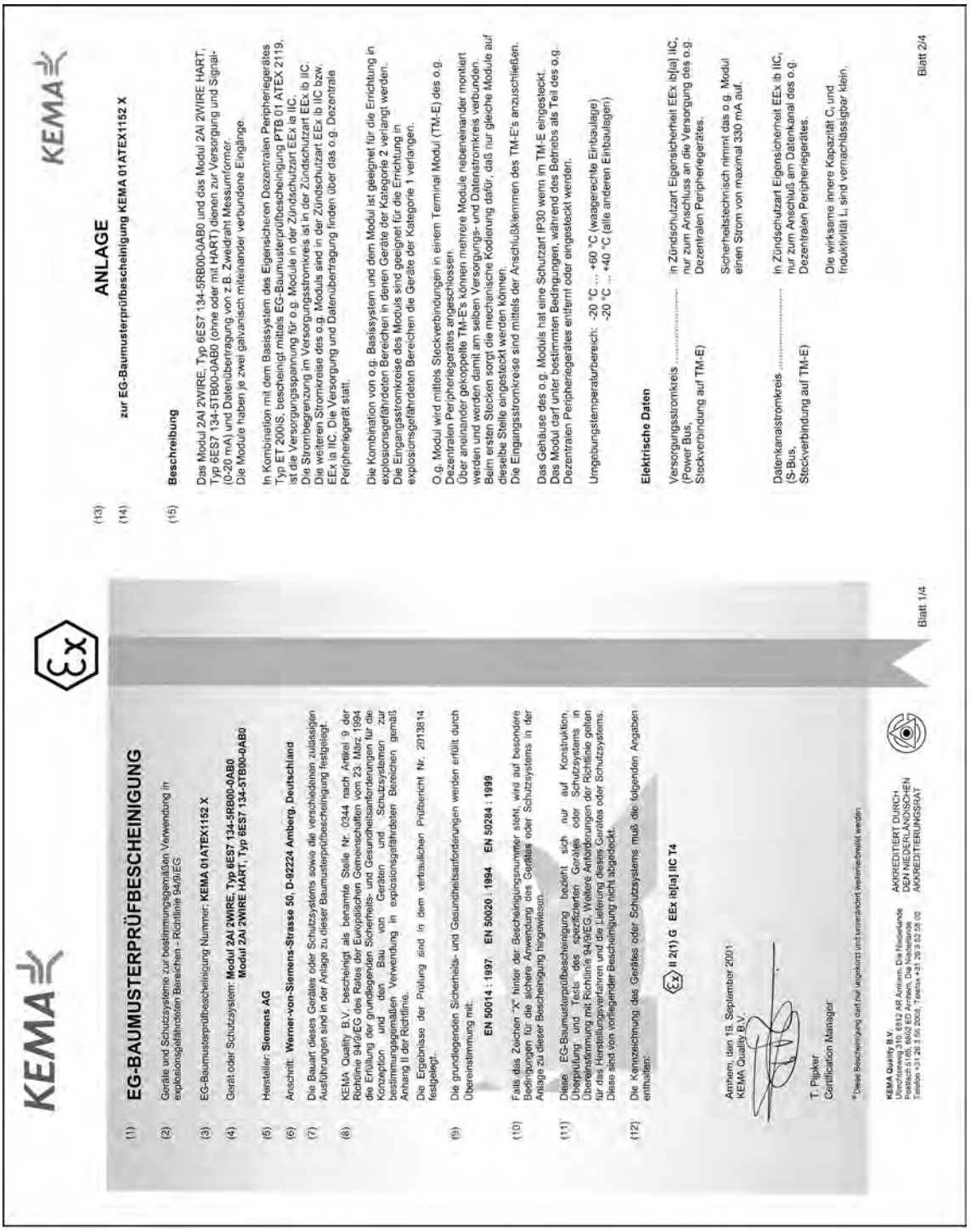
   unterschrieben am

2. Zeichnung Nr. A5E00101662A — 27.08.2001

3. Prüfmuster

Blatt 4/4

20.1.6 2AI I 2WIRE, 2AI I 2WIRE HART



KEMA

EG-BAUMUSTERPRÜFBESCHEINIGUNG

(1)

(2) Geräte und Schutzsysteme zur bestimmungsgemäßen Verwendung in explosionsgefährdeten Bereichen - Richtlinie 94/9/EG

(3) EG-Baumusterprüfbescheinigung Nummer: **KEMA 01ATEX1152 X**

(4) Gerät oder Schutzsystem: **Modul 2AI 2WIRE, Typ 6ES7 134-5RB00-0AB0**
Modul 2AI 2WIRE HART, Typ 6ES7 134-5TB00-0AB0

(5) Hersteller: **Siemens AG**

(6) Anschrift: **Werner-von-Siemens-Strasse 50, D-92224 Amberg, Deutschland**

(7) Die Bauart dieses Gerätes oder Schutzsystems sowie die verschiedenen zulässigen Ausführungen sind in der Anlage zu dieser Baumusterprüfbescheinigung festgelegt.

(8) KEMA Quality B.V. bescheinigt als benannte Stelle Nr. 0344 nach Artikel 9 der Richtlinie 94/9/EG des Rates der Europäischen Gemeinschaften vom 23. März 1994 die Erfüllung der grundlegenden Sicherheits- und Gesundheitsanforderungen für die Konzeption und den Bau von Geräten und Schutzsystemen zur bestimmungsgemäßen Verwendung in explosionsgefährdeten Bereichen gemäß Anhang II der Richtlinie.

Die Ergebnisse der Prüfung sind in dem vertraulichen Prüfbericht Nr. 2013814 festgelegt.

(9) Die grundlegenden Sicherheits- und Gesundheitsanforderungen werden erfüllt durch Übereinstimmung mit:

EN 50014 : 1997 EN 50020 : 1994 EN 50284 : 1999

(10) Falls das Zeichen "X" hinter der Bescheinigungsnummer steht, wird auf besondere Bedingungen für die sichere Anwendung des Gerätes oder Schutzsystems in der Anlage zu dieser Bescheinigung hingewiesen.

(11) Diese EG-Baumusterprüfbescheinigung bezieht sich nur auf Konstruktion, Überprüfung und Tests des spezifizierten Gerätes oder Schutzsystems in Übereinstimmung mit Richtlinie 94/9/EG. Weitere Anforderungen der Richtlinie gelten für das Herstellungsverfahren und die Lieferung dieses Gerätes oder Schutzsystems. Diese sind von vorliegender Bescheinigung nicht abgedeckt.

(12) Die Kennzeichnung des Gerätes oder Schutzsystems muß die folgenden Angaben enthalten:

II 2(1) G EEx ib[ia] IIC T4

Arnhem, den 13. September 2001
KEMA Quality B.V.

T. Pijpker
Certification Manager

*Diese Bescheinigung darf nur ungekürzt und unverändert weiterverbreitet werden

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AKKREDITIERT DURCH DEN NIEDERLÄNDISCHEN AKKREDITIERUNGSRAT

Blatt 1/4

(13)

(14) **ANLAGE**
zur EG-Baumusterprüfbescheinigung KEMA 01ATEX1152 X

(15) **Beschreibung**

Das Modul 2AI 2WIRE, Typ 6ES7 134-5RB00-0AB0 und das Modul 2AI 2WIRE HART, Typ 6ES7 134-5TB00-0AB0 (ohne oder mit HART) dienen zur Versorgung und Signal- (0-20 mA) und Datenübertragung von z.B. Zweidrant Messumformer.
Die Module haben je zwei galvanisch miteinander verbundene Eingänge.

In Kombination mit dem Basissystem des Eigensicheren Dezentralen Peripheriegerätes Typ ET 200iS, bescheinigt mittels EG-Baumusterprüfbescheinigung PTB 01 ATEX 2119, ist die Versorgungsspannung für o.g. Module in der Zündschutzart EEx ia IIC.
Die Strombegrenzung im Versorgungsstromkreis ist in der Zündschutzart EEx ib IIC.
Die weiteren Stromkreise des o.g. Moduls sind in der Zündschutzart EEx ib IIC bzw. EEx ia IIC. Die Versorgung und Datenübertragung finden über das o.g. Dezentrale Peripheriegerät statt.

Die Kombination von o.g. Basissystem und dem Modul ist geeignet für die Errichtung in explosionsgefährdeten Bereichen in denen Geräte der Kategorie 2 verlangt werden.
Die Eingangsstromkreise des Moduls sind geeignet für die Errichtung in explosionsgefährdeten Bereichen die Geräte der Kategorie 1 verlangen.

O.g. Modul wird mittels Steckverbindungen in einem Terminal Modul (TM-E) des o.g. Dezentralen Peripheriegerätes angeschlossen.
Über aneinander gekoppelte TM-E's können mehrere Module nebeneinander montiert werden und werden damit am selben Versorgungs- und Datenstromkreis verbunden.
Beim ersten Stecken sorgt die mechanische Kodierung dafür, daß nur gleiche Module auf dieselbe Stelle eingesteckt werden können.
Die Eingangsstromkreise sind mittels der Anschlußklemmen des TM-E's anzuschließen.

Das Gehäuse des o.g. Moduls hat eine Schutzart IP30 wenn im TM-E eingesteckt.
Das Modul darf unter bestimmten Bedingungen, während des Betriebs als Teil des o.g. Dezentralen Peripheriegerätes entfernt oder eingesteckt werden.

Umgebungstemperaturbereich: -20 °C ... +60 °C (waagerechte Einbaulage)
-20 °C ... +40 °C (alle anderen Einbaulagen)

Elektrische Daten

Versorgungsstromkreis ..... in Zündschutzart Eigensicherheit EEx ib[ia] IIC, nur zum Anschluss an die Versorgung des o.g. (Power Bus, Steckverbindung auf TM-E) Dezentralen Peripheriegerätes.

Sicherheitstechnisch nimmt das o.g. Modul einen Strom von maximal 330 mA auf.

Datenkanalstromkreis ..... in Zündschutzart Eigensicherheit EEx ib IIC, nur zum Anschluß am Datenkanal des o.g. (S-Bus, Steckverbindung auf TM-E) Dezentralen Peripheriegerätes.

Die wirksame innere Kapazität C_i und Induktivität L_i sind vernachlässigbar klein.

Blatt 2/4

KEMA

ANLAGE

zur EG-Baumusterprüfbescheinigung KEMA 01ATEX1152 X

(13)

(14)

(15) **Elektrische Daten** (Fortsetzung)

Eingangsstromkreise ..... in Zündschutzart Eigensicherheit EEx ia IIC, mit (TM-E Anschlußklemmen 1/2 und 5/6) folgenden Höchstwerten (pro Stromkreis):

U_o = 28 V
I_o = 85 mA
P_o = 595 mW

Höchstzulässige äußere Kapazität C_o und Induktivität L_o nach untenstehenden Tabelle.

	IIC	IIB
C_o	80 nF	650 nF
L_o	4 mH	15 mH

Die Versorgungs-, Daten- und Eingangsstromkreise sind, bei Anwendung im o.g. Dezentralen Peripheriegerät sicher voneinander galvanisch getrennt.

Stückprüfungen

Für den Transformator T200 sind die Spannungsprüfungen mit einem Höchstwert von 1500 Vac während einer Minute, gemäß Abschnitt 11.2 von EN 50020:1994 erforderlich.

(16) **Prüfbericht**

KEMA Nr. 2013814

(17) **Besondere Bedingungen**

1) Die Summe der sicherheitstechnisch vom Versorgungsstromkreis (Power Bus) aufgenommenen Ströme der Module, montiert auf einem Power Bus des o.g. Dezentralen Peripheriegerätes, darf den in der EG-Baumusterprüfbescheinigung PTB 01 ATEX 2119 erwähnten Wert nicht überschreiten.

2) Für das Stecken und Ziehen des o.g. Moduls während der Errichtung und des Betriebes sind die Errichtungs- und Betriebsanleitung des o.g. Dezentralen Peripheriegerätes zu beachten.
Beim Austausch der Module dürfen nur gleiche Typen verwendet werden.

3) Für den Umgebungstemperaturbereich und die elektrischen Daten, siehe (15)

Blatt 3/4

KEMA

ANLAGE

zur EG-Baumusterprüfbescheinigung KEMA 01ATEX1152 X

(13)

(14)

(18) **Grundlegende Sicherheits- und Gesundheitsanforderungen**

Grundlegende Sicherheits- und Gesundheitsanforderungen, welche nicht abgedeckt sind von den unter (9) erwähnten Normen	
Abschnitt	Thema
1.0.5	Kennzeichnung
1.0.6 b) und d)	Betriebsanleitung

Diese Grundlegenden Sicherheits- und Gesundheitsanforderungen sind geprüft und positiv beurteilt worden. Die Prüfergebnisse sind in dem unter (16) erwähnten Prüfbericht festgelegt worden.

(19) **Prüfungsunterlagen**

1. Prüfbericht zur EG-Baumusterprüfbescheinigung PTB 01 ATEX 2119

		unterschrieben am
2. Zeichnung Nr.	A5E00031727K	14.08.2001
	4NEA9993747-09 (2 Blatt)	14.08.2001
	A5E00059027C	14.08.2001
	A5E00059028C	14.08.2001
	A5E00113399F (10 Blatt)	14.08.2001
	A5E00113400E (10 Blatt)	14.08.2001
	A5E00060660B (11 Blatt)	14.08.2001
	A5E00057088B (6 Blatt)	27.08.2001
	A5E00067935 (7 Blatt)	14.08.2001
	A5E00086863 (3 Blatt)	27.08.2001
	A5E00119602 (3 Blatt)	14.08.2001
	A5E00113398C	27.08.2001
	A5E00113400C	27.08.2001
	A5E00113399A (58 Blatt)	27.08.2001
	A5E00088854A (6 Blatt)	14.08.2001
	A5E00113399E (3 Blatt)	27.08.2001
	A5E00087803B	27.08.2001
	A5E00087805B	27.08.2001
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	A5E00088858M (6 Blatt)	13.09.2001
	A5E00088859P (6 Blatt)	13.09.2001
	A5E00094951B (4 Blatt)	10.08.2001
	A5E00113256 (2 Blatt)	10.08.2001
	A5E00084908B (5 Blatt)	10.08.2001
	A5E00113254 (2 Blatt)	10.08.2001
	A5E00081503A	14.09.2001

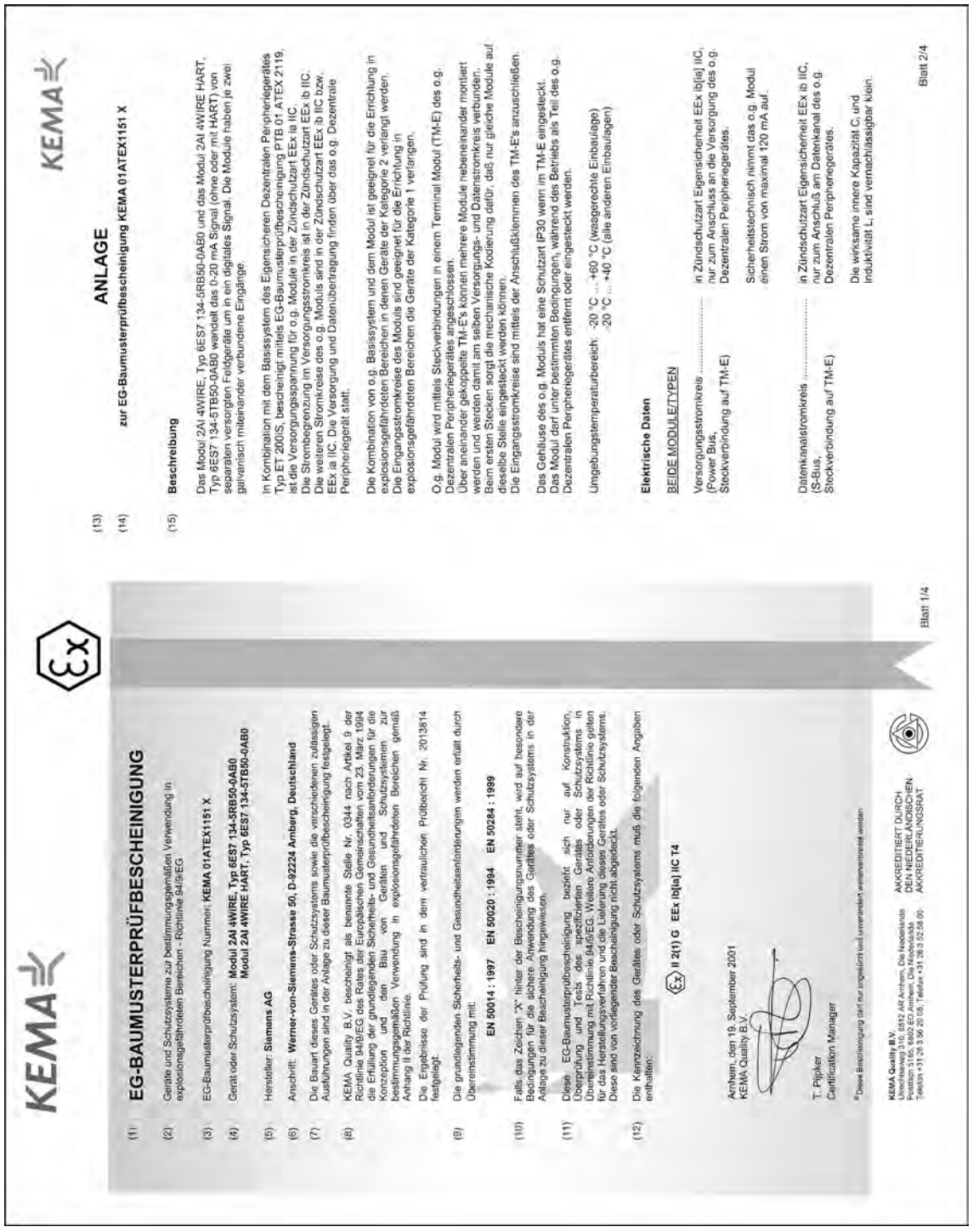
3. Prüfmuster

Blatt 4/4

1

Preface

20.1.7 2AI I 4WIRE, 2AI I 4WIRE HART



KEMA

EG-BAUMUSTERPRÜFBESCHEINIGUNG

(1)

(2) Geräte und Schutzsysteme zur bestimmungsgemäßen Verwendung in explosionsgefährdeten Bereichen - Richtlinie 94/9/EG

(3) EG-Baumusterprüfbescheinigung Nummer: **KEMA 01ATEX1151 X**

(4) Gerät oder Schutzsystem: **Modul 2AI 4WIRE, Typ 6ES7 134-5RB50-0AB0**
Modul 2AI 4WIRE HART, Typ 6ES7 134-5TB50-0AB0

(5) Hersteller: **Siemens AG**

(6) Anschrift: **Werner-von-Siemens-Strasse 50, D-92224 Amberg, Deutschland**

(7) Die Bauart dieses Gerätes oder Schutzsystems sowie die verschiedenen zulässigen Ausführungen sind in der Anlage zu dieser Baumusterprüfbescheinigung festgelegt.

(8) KEMA Quality B.V. bescheinigt als benannte Stelle Nr. 0344 nach Artikel 9 der Richtlinie 94/9/EG des Rates der Europäischen Gemeinschaften vom 23. März 1994 die Erfüllung der grundlegenden Sicherheits- und Gesundheitsanforderungen für die Konzeption und den Bau von Geräten und Schutzsystemen zur bestimmungsgemäßen Verwendung in explosionsgefährdeten Bereichen gemäß Anhang II der Richtlinie.

Die Ergebnisse der Prüfung sind in dem vertraulichen Prüfbericht Nr. 2013814 festgelegt.

(9) Die grundlegenden Sicherheits- und Gesundheitsanforderungen werden erfüllt durch Übereinstimmung mit:

EN 50014 : 1997 EN 50020 : 1994 EN 50284 : 1999

(10) Falls das Zeichen "X" hinter der Bescheinigungsnummer steht, wird auf besondere Bedingungen für die sichere Anwendung des Gerätes oder Schutzsystems in der Anlage zu dieser Bescheinigung hingewiesen.

(11) Diese EG-Baumusterprüfbescheinigung bezieht sich nur auf Konstruktion, Überprüfung und Tests des spezifizierten Gerätes oder Schutzsystems in Übereinstimmung mit Richtlinie 94/9/EG. Weitere Anforderungen der Richtlinie gelten für das Herstellungsverfahren und die Lieferung dieses Gerätes oder Schutzsystems. Diese sind von vorliegender Bescheinigung nicht abgedeckt.

(12) Die Kennzeichnung des Gerätes oder Schutzsystems muß die folgenden Angaben enthalten:

II 2(1) G EEx ib[ia] IIC T4

Arnhem, den 19. September 2001
KEMA Quality B.V.

T. Pijpker
Certification Manager

*Diese Bescheinigung darf nur ungekürzt und unverändert weiterverbreitet werden

KEMA Quality B.V.
Utrechtseweg 310, 6812 AR Arnhem, Die Niederlande
Postbox 5185, 6802 ED Arnhem, Die Niederlande
Telefon +31 26 356 20 00, Telefax +31 26 352 58 00

AKKREDITIERT DURCH DEN NIEDERLÄNDISCHEN AKKREDITIERUNGSRAT

Blatt 1/4

KEMA

ANLAGE

(13)

(14) zur EG-Baumusterprüfbescheinigung KEMA 01ATEX1151 X

(15) **Beschreibung**

Das Modul 2AI 4WIRE, Typ 6ES7 134-5RB50-0AB0 und das Modul 2AI 4WIRE HART, Typ 6ES7 134-5TB50-0AB0 wandelt das 0-20 mA Signal (ohne oder mit HART) von separaten versorgten Feldgeräte um in ein digitales Signal. Die Module haben je zwei galvanisch miteinander verbundene Eingänge.

In Kombination mit dem Basissystem des Eigensicheren Dezentralen Peripheriegerätes Typ ET 200iS, bescheinigt mittels EG-Baumusterprüfbescheinigung PTB 01 ATEX 2119, ist die Versorgungsspannung für o.g. Module in der Zündschutzart EEx ia IIC. Die Strombegrenzung im Versorgungsstromkreis ist in der Zündschutzart EEx ib IIC. Die weiteren Stromkreise des o.g. Moduls sind in der Zündschutzart EEx ib IIC bzw. EEx ia IIC. Die Versorgung und Datenübertragung finden über das o.g. Dezentrale Peripheriegerät statt.

Die Kombination von o.g. Basissystem und dem Modul ist geeignet für die Errichtung in explosionsgefährdeten Bereichen in denen Geräte der Kategorie 2 verlangt werden. Die Eingangsstromkreise des Moduls sind geeignet für die Errichtung in explosionsgefährdeten Bereichen die Geräte der Kategorie 1 verlangen.

O.g. Modul wird mittels Steckverbindungen in einem Terminal Modul (TM-E) des o.g. Dezentralen Peripheriegerätes angeschlossen.
Über aneinander gekoppelte TM-E's können mehrere Module nebeneinander montiert werden und werden damit am selben Versorgungs- und Datenstromkreis verbunden. Beim ersten Stecken sorgt die mechanische Kodierung dafür, daß nur gleiche Module auf dieselbe Stelle eingesteckt werden können.
Die Eingangsstromkreise sind mittels der Anschlußklemmen des TM-E's anzuschließen.

Das Gehäuse des o.g. Moduls hat eine Schutzart IP30 wenn im TM-E eingesteckt.
Das Modul darf unter bestimmten Bedingungen, während des Betriebs als Teil des o.g. Dezentralen Peripheriegerätes entfernt oder eingesteckt werden.

Umgebungstemperaturbereich: -20 °C ... +60 °C (waagerechte Einbaulage)
-20 °C ... +40 °C (alle anderen Einbaulagen)

Elektrische Daten

BEIDE MODULE/TYPEN

Versorgungsstromkreis ..... in Zündschutzart Eigensicherheit EEx ib[ia] IIC, nur zum Anschluss an die Versorgung des o.g. Dezentralen Peripheriegerätes.
(Power Bus,
Steckverbindung auf TM-E)

Sicherheitstechnisch nimmt das o.g. Modul einen Strom von maximal 120 mA auf.

Datenkanalstromkreis ..... in Zündschutzart Eigensicherheit EEx ib IIC, nur zum Anschluß am Datenkanal des o.g. Dezentralen Peripheriegerätes.
(S-Bus,
Steckverbindung auf TM-E)

Die wirksame innere Kapazität C_i und Induktivität L_i sind vernachlässigbar klein.

Blatt 2/4

KEMA

(13) **ANLAGE**

(14) **zur EG-Baumusterprüfbescheinigung KEMA 01ATEX1151 X**

(15) **Elektrische Daten** (Fortsetzung)

Modul 2AI 4WIRE
Typ 6ES7 134-5RB50-0AB0

Eingangsstromkreise ..... (TM-E Anschlußklemmen 1/2 und 5/6)

in Zündschutzart Eigensicherheit EEx ia IIC, mit folgenden Höchstwerten (pro Stromkreis):

U_o = 0,1 V
I_o = 0,4 mA
P_o = 0,1 mW

Höchstzulässige äußere Kapazität C_o und Induktivität L_o nach untenstehende Tabelle.

	IIC	IIB
C_o	100 µF	1000 µF
L_o	1000 mH	1000 mH

Modul 2AI 4WIRE HART
Typ 6ES7 134-5TB50-0AB0

Eingangsstromkreise ..... (TM-E Anschlußklemmen 1/2 und 5/6)

in Zündschutzart Eigensicherheit EEx ia IIC, mit folgenden Höchstwerten (pro Stromkreis):

U_o = 2,0 V
I_o = 7 mA
P_o = 4 mW

Höchstzulässige äußere Kapazität C_o und Induktivität L_o nach untenstehende Tabelle.

	IIC	IIB
C_o	100 µF	1000 µF
L_o	750 mH	1000 mH

BEIDE MODULE/TYPEN

Eingangsstromkreise ..... (TM-E Anschlußklemmen 1/2 und 5/6)

Nur zum Anschluß an einen bescheinigten eigensicheren Stromkreis mit folgenden Höchstwerten (pro Stromkreis):

U_i = 30 V
I_i = 150 mA
P_i = 1,2 W

Die wirksame innere Kapazität C_i = 2 nF, die wirksame Induktivität L_i ist vernachlässigbar klein.

Die Versorgungs-, Daten- und Eingangsstromkreise sind, bei Anwendung im o.g. Dezentralen Peripheriegerät sicher voneinander galvanisch getrennt.

Stückprüfungen

Für den Transformator T200 sind die Spannungsprüfungen mit einem Höchstwert von 1500 Vac während einer Minute, gemäß Abschnitt 11.2 von EN 50020:1994 erforderlich.

(16) **Prüfbericht**
KEMA Nr. 2013814

KEMA

(13) **ANLAGE**

(14) **zur EG-Baumusterprüfbescheinigung KEMA 01ATEX1151 X**

(17) **Besondere Bedingungen**

1) Die Summe der sicherheitstechnisch vom Versorgungsstromkreis (Power Bus) aufgenommenen Ströme der Module, montiert auf einem Power Bus des o.g. Dezentralen Peripheriegerätes, darf den in der EG-Baumusterprüfbescheinigung PTB 01 ATEX 2119 erwähnten Wert nicht überschreiten.
2) Für das Stecken und Ziehen des o.g. Moduls während der Errichtung und des Betriebes sind die Errichtungs- und Betriebsanleitung des o.g. Dezentralen Peripheriegerätes zu beachten.
   Beim Austausch der Module dürfen nur gleiche Typen verwendet werden.
3) Für den Umgebungstemperaturbereich und die elektrischen Daten, siehe (15)

(18) **Grundlegende Sicherheits- und Gesundheitsanforderungen**

Grundlegende Sicherheits- und Gesundheitsanforderungen, welche nicht abgedeckt sind von den unter (9) erwähnten Normen	
Abschnitt	Thema
1.0.5	Kennzeichnung
1.0.6 b) und d)	Betriebsanleitung

Diese Grundlegenden Sicherheits- und Gesundheitsanforderungen sind geprüft und positiv beurteilt worden. Die Prüfergebnisse sind in dem unter (16) erwähnten Prüfbericht festgelegt worden.

(19) **Prüfungsunterlagen**

1. Prüfbericht zur EG-Baumusterprüfbescheinigung PTB 01 ATEX 2119

		unterschrieben am
2. Zeichnung Nr.	A5E00031727K	10.08.2001
	4NEA9993747-09 (2 Blatt)	10.08.2001
	A5E00059027C	10.08.2001
	A5E00059028C	10.08.2001
	A5E00113401E (9 Blatt)	06.09.2001
	A5E00113402E (9 Blatt)	06.09.2001
	A5E00060671B (9 Blatt)	10.08.2001
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	A5E00067939 (6 Blatt)	22.08.2001
	A5E00067940 (5 Blatt)	22.08.2001
	A5E00122641	10.08.2001
	A5E00113401C	10.08.2001
	A5E00113401A (51 Blatt)	10.08.2001
	A5E00088854A (6 Blatt)	10.08.2001
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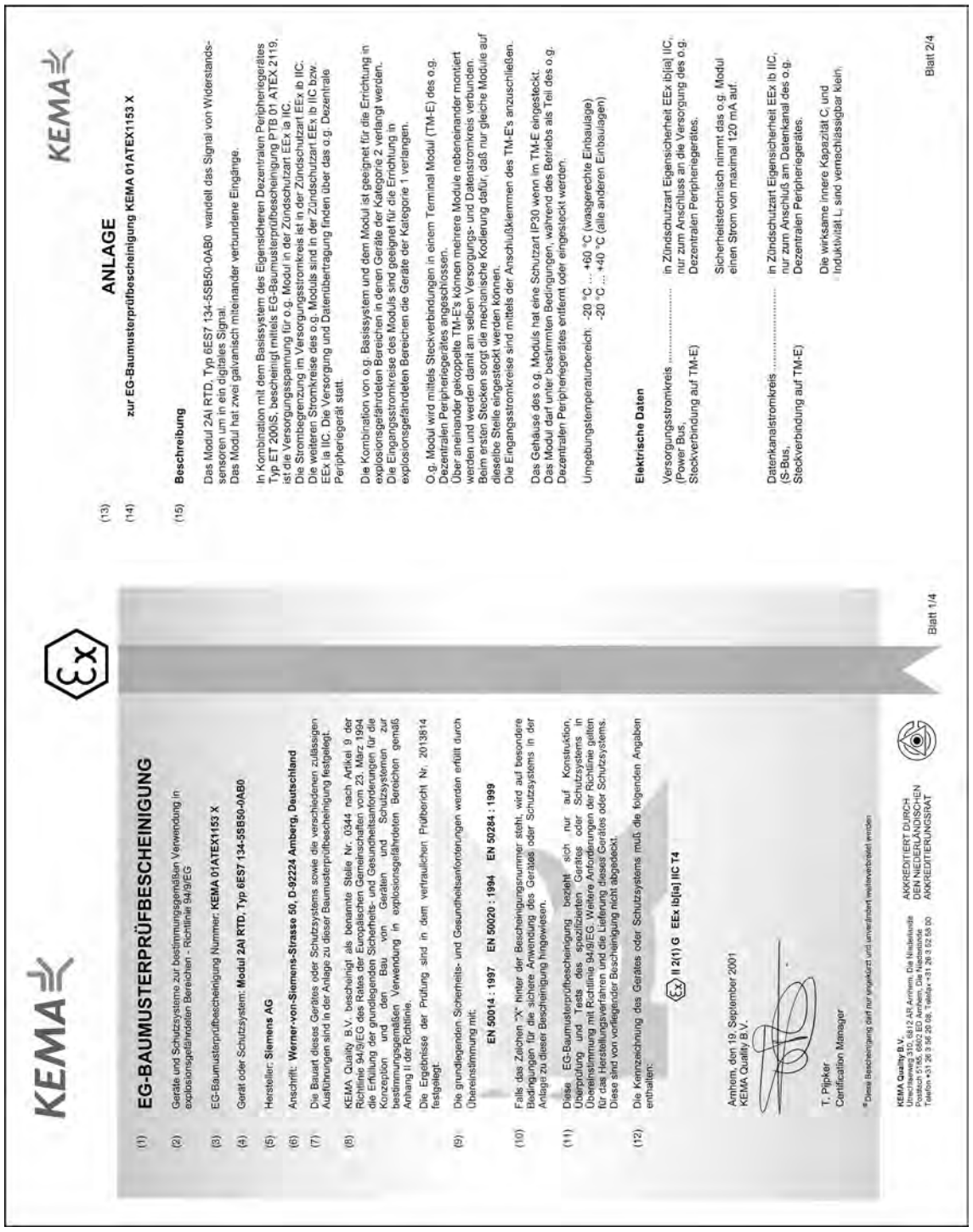
	A5E00090378A (2 Blatt)	10.08.2001
	A5E00088856N (6 Blatt)	13.09.2001
	A5E00088856P (6 Blatt)	13.09.2001
	A5E00094953B (4 Blatt)	10.08.2001
	A5E00094953 (2 Blatt)	10.08.2001
	A5E00094910B (5 Blatt)	10.08.2001
	A5E00094910 (2 Blatt)	10.08.2001
	A5E00081503A	14.09.2001

3. Prüfmuster

20.1.8 2AI RTD



KEMA

(1) **EG-BAUMUSTERPRÜFBESCHEINIGUNG**

(2) Geräte und Schutzsysteme zur bestimmungsgemäßen Verwendung in explosionsgefährdeten Bereichen - Richtlinie 94/9/EG

(3) EG-Baumusterprüfbescheinigung Nummer: **KEMA 01ATEX1153 X**

(4) Gerät oder Schutzsystem: **Modul 2AI RTD, Typ 6ES7 134-5SB50-0AB0**

(5) Hersteller: **Siemens AG**

(6) Anschrift: **Werner-von-Siemens-Strasse 50, D-92224 Amberg, Deutschland**

(7) Die Bauart dieses Gerätes oder Schutzsystems sowie die verschiedenen zulässigen Ausführungen sind in der Anlage zu dieser Baumusterprüfbescheinigung festgelegt.

(8) KEMA Quality B.V. bescheinigt als benannte Stelle Nr. 0344 nach Artikel 9 der Richtlinie 94/9/EG des Rates der Europäischen Gemeinschaften vom 23. März 1994 die Erfüllung der grundlegenden Sicherheits- und Gesundheitsanforderungen für die Konzeption und den Bau von Geräten und Schutzsystemen zur bestimmungsgemäßen Verwendung in explosionsgefährdeten Bereichen gemäß Anhang II der Richtlinie.

Die Ergebnisse der Prüfung sind in dem vertraulichen Prüfbericht Nr. 2013614 festgelegt.

(9) Die grundlegenden Sicherheits- und Gesundheitsanforderungen werden erfüllt durch Übereinstimmung mit:

EN 50014 : 1997 EN 50020 : 1994 EN 50284 : 1999

(10) Falls das Zeichen "X" hinter der Bescheinigungsnummer steht, wird auf besondere Bedingungen für die sichere Anwendung des Gerätes oder Schutzsystems in der Anlage zu dieser Bescheinigung hingewiesen.

(11) Diese EG-Baumusterprüfbescheinigung bezieht sich nur auf Konstruktion, Überprüfung und Tests des spezifizierten Gerätes oder Schutzsystems in Übereinstimmung mit Richtlinie 94/9/EG. Weitere Anforderungen der Richtlinie gelten für das Herstellungsverfahren und die Lieferung dieses Gerätes oder Schutzsystems. Diese sind von vorliegender Bescheinigung nicht abgedeckt.

(12) Die Kennzeichnung des Gerätes oder Schutzsystems muß die folgenden Angaben enthalten:

Ex II 2(1) G EEx ib[ia] IIC T4

Arnhem, den 19. September 2001
KEMA Quality B.V.

T. Pijpker
Certification Manager

*Diese Bescheinigung darf nur ungekürzt und unverändert weiterverbreitet werden

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Utrechtseweg 310, 6812 AR Arnhem, Die Niederlande
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Telefon +31 26 35 20 00, Telefax +31 26 3 52 58 00

AKKREDITIERT DURCH DEN NIEDERLÄNDISCHEN AKKREDITIERUNGSRAT

Blatt 1/4

(13)

(14) **ANLAGE**

zur EG-Baumusterprüfbescheinigung KEMA 01ATEX1153 X

(15) **Beschreibung**

Das Modul 2AI RTD, Typ 6ES7 134-5SB50-0AB0 wandelt das Signal von Widerstandssensoren um in ein digitales Signal.
Das Modul hat zwei galvanisch miteinander verbundene Eingänge.

In Kombination mit dem Basissystem des Eigensicheren Dezentralen Peripheriegerätes Typ ET 200iS, bescheinigt mittels EG-Baumusterprüfbescheinigung PTB 01 ATEX 2119, ist die Versorgungsspannung für o.g. Modul in der Zündschutzart EEx ia IIC.
Die Strombegrenzung im Versorgungsstromkreis ist in der Zündschutzart EEx ib IIC.
Die weiteren Stromkreise des o.g. Moduls sind in der Zündschutzart EEx ib IIC bzw. EEx ia IIC. Die Versorgung und Datenübertragung finden über das o.g. Dezentrale Peripheriegerät statt.

Die Kombination von o.g. Basissystem und dem Modul ist geeignet für die Errichtung in explosionsgefährdeten Bereichen in denen Geräte der Kategorie 2 verlangt werden.
Die Eingangsstromkreise des Moduls sind geeignet für die Errichtung in explosionsgefährdeten Bereichen die Geräte der Kategorie 1 verlangen.

O.g. Modul wird mittels Steckverbindungen in einem Terminal Modul (TM-E) des o.g. Dezentralen Peripheriegerätes angeschlossen.
Über aneinander gekoppelte TM-E's können mehrere Module nebeneinander montiert werden und werden damit am selben Versorgungs- und Datenstromkreis verbunden.
Beim ersten Stecken sorgt die mechanische Kodierung dafür, daß nur gleiche Module auf dieselbe Stelle eingesteckt werden können.
Die Eingangsstromkreise sind mittels der Anschlußklemmen des TM-E's anzuschließen.

Das Gehäuse des o.g. Moduls hat eine Schutzart IP30 wenn im TM-E eingesteckt.
Das Modul darf unter bestimmten Bedingungen, während des Betriebs als Teil des o.g. Dezentralen Peripheriegerätes entfernt oder eingesteckt werden.

Elektrische Daten

Versorgungsstromkreis ..... in Zündschutzart Eigensicherheit EEx ib[ia] IIC, nur zum Anschluss an die Versorgung des o.g. Dezentralen Peripheriegerätes.
(Power Bus, Steckverbindung auf TM-E)

Umgebungstemperaturbereich: -20 °C ... +60 °C (waagerechte Einbaulage)
-20 °C ... +40 °C (alle anderen Einbaulagen)

Sicherheitstechnisch nimmt das o.g. Modul einen Strom von maximal 120 mA auf.

Datenkanalstromkreis ..... in Zündschutzart Eigensicherheit EEx ib IIC, nur zum Anschluß an Datenkanal des o.g. Dezentralen Peripheriegerätes.
(S-Bus, Steckverbindung auf TM-E)

Die wirksame innere Kapazität C_i und Induktivität L_i sind vernachlässigbar klein.

Blatt 2/4

KEMA

(13) **ANLAGE**

(14) **zur EG-Baumusterprüfbescheinigung KEMA 01ATEX1153 X**

(15) **Elektrische Daten** (Fortsetzung)

Eingangsstromkreise ..... in Zündschutzart Eigensicherheit EEx ia IIC, mit
(TM-E Anschlußklemmen 1/2/3/4 folgenden Höchstwerten
und 5/6/78)

Jeder Stromkreis einzeln angeschlossen:

U_o = 6,0 V
I_o = 16 mA
P_o = 24 mW

Höchstzulässige äußere Kapazität C_o und Induktivität L_o nach untenstehende Tabelle.

	IIC	IIB
C_o	40 µF	1000 µF
L_o	120 mH	430 mH

Beide Stromkreise parallel angeschlossen:

U_o = 6,0 V
I_o = 28 mA
P_o = 42 mW

Höchstzulässige äußere Kapazität C_o und Induktivität L_o nach untenstehende Tabelle.

	IIC	IIB
C_o	40 µF	1000 µF
L_o	40 mH	160 mH

Die Versorgungs-, Daten- und Eingangsstromkreise sind, bei Anwendung im o.g. Dezentralen Peripheriegerät sicher voneinander galvanisch getrennt.

Stückprüfungen
Für den Transformator T200 sind die Spannungsprüfungen mit einem Höchstwert von 1500 Vac während einer Minute, gemäß Abschnitt 11.2 von EN 50020:1994 erforderlich.

(16) **Prüfbericht**
KEMA Nr. 2013814

(17) **Besondere Bedingungen**

1) Die Summe der sicherheitstechnisch vom Versorgungsstromkreis (Power Bus) aufgenommenen Ströme der Module, montiert auf einem Power Bus des o.g. Dezentralen Peripheriegerätes, darf den in der EG-Baumusterprüfbescheinigung PTB 01 ATEX 2119 erwähnten Wert nicht überschreiten.

2) Für das Stecken und Ziehen des o.g. Moduls während der Errichtung und des Betriebes sind die Errichtungs- und Betriebsanleitung des o.g. Dezentralen Peripheriegerätes zu beachten.
Beim Austausch der Module dürfen nur gleiche Typen verwendet werden.

3) Für den Umgebungstemperaturbereich und die elektrischen Daten, siehe (15)

Blatt 3/4

KEMA

(13) **ANLAGE**

(14) **zur EG-Baumusterprüfbescheinigung KEMA 01ATEX1153 X**

(18) **Grundlegende Sicherheits- und Gesundheitsanforderungen**

Grundlegende Sicherheits- und Gesundheitsanforderungen, welche nicht abgedeckt sind von den unter (9) erwähnten Normen	
Abschnitt	Thema
1.0.5	Kennzeichnung
1.0.6 b) und d)	Betriebsanleitung

Diese Grundlegenden Sicherheits- und Gesundheitsanforderungen sind geprüft und positiv beurteilt worden. Die Prüfergebnisse sind in dem unter (16) erwähnten Prüfbericht festgelegt worden.

(19) **Prüfungsunterlagen**

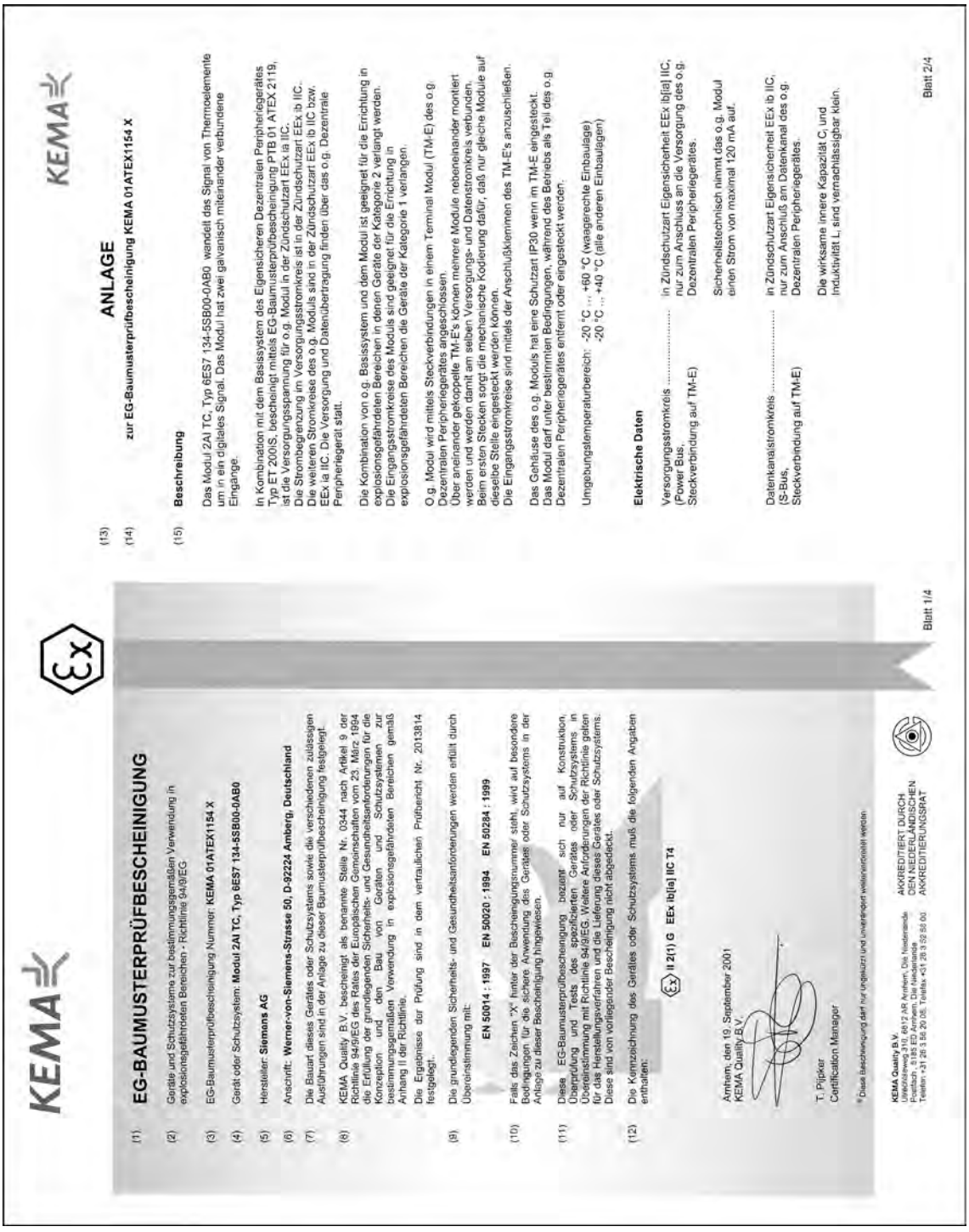
1. Prüfbericht zur EG-Baumusterprüfbescheinigung PTB 01 ATEX 2119

		unterschrieben am
2. Zeichnung Nr.	A5E00031727K	26.07.2001
	4NEA9993747-09 (2 Blatt)	26.07.2001
	A5E00059027C	26.07.2001
	A5E00059028C	26.07.2001
	A5E00113404C (9 Blatt)	06.09.2001
	A5E00074689B (8 Blatt)	26.07.2001
	A5E00101693B (5 Blatt)	26.07.2001
	A5E00101517 (5 Blatt)	26.07.2001
	A5E00101693	26.07.2001
	A5E00113404C	26.07.2001
	A5E00113404A (39 Blatt)	26.07.2001
	A5E00088854A (6 Blatt)	26.07.2001
	A5E00087811B	27.08.2001
	A5E00088856B (35 Blatt)	10.08.2001
	A5E00090378A (2 Blatt)	10.08.2001
	A5E00088856N (6 Blatt)	13.09.2001
	A5E00088856P (6 Blatt)	13.09.2001
	A5E00094953B (4 Blatt)	10.08.2001
	A5E00094953 (2 Blatt)	10.08.2001
	A5E00094910B (5 Blatt)	10.08.2001
	A5E00094910 (2 Blatt)	10.08.2001
	A5E00081503A	14.09.2001

3. Prüfmuster

Blatt 4/4

20.1.9 2AI TC



KEMA

(13)

(14) **ANLAGE**

zur EG-Baumusterprüfbescheinigung KEMA 01ATEX1154 X

KEMA

(1) **EG-BAUMUSTERPRÜFBESCHEINIGUNG**

(2) Geräte und Schutzsysteme zur bestimmungsgemäßen Verwendung in explosionsgefährdeten Bereichen - Richtlinie 94/9/EG

(3) EG-Baumusterprüfbescheinigung Nummer: **KEMA 01ATEX1154 X**

(4) Gerät oder Schutzsystem: **Modul 2AI TC, Typ 6ES7 134-5SB00-0AB0**

(5) Hersteller: **Siemens AG**

(6) Anschrift: **Werner-von-Siemens-Strasse 50, D-92224 Amberg, Deutschland**

(7) Die Bauart dieses Gerätes oder Schutzsystems sowie die verschiedenen zulässigen Ausführungen sind in der Anlage zu dieser Baumusterprüfbescheinigung festgelegt.

(8) KEMA Quality B.V. bescheinigt als benannte Stelle Nr. 0344 nach Artikel 9 der Richtlinie 94/9/EG des Rates der Europäischen Gemeinschaften vom 23. März 1994 die Erfüllung der grundlegenden Sicherheits- und Gesundheitsanforderungen für die Konzeption und den Bau von Geräten und Schutzsystemen zur bestimmungsgemäßen Verwendung in explosionsgefährdeten Bereichen gemäß Anhang II der Richtlinie.
Die Ergebnisse der Prüfung sind in dem vertraulichen Prüfbericht Nr. 2013814 festgelegt.

(9) Die grundlegenden Sicherheits- und Gesundheitsanforderungen werden erfüllt durch Übereinstimmung mit:
EN 50014 : 1997 EN 50020 : 1994 EN 50284 : 1999

(10) Falls das Zeichen "X" hinter der Bescheinigungsnummer steht, wird auf besondere Bedingungen für die sichere Anwendung des Gerätes oder Schutzsystems in der Anlage zu dieser Bescheinigung hingewiesen.

(11) Diese EG-Baumusterprüfbescheinigung bezieht sich nur auf Konstruktion, Überprüfung und Tests des spezifizierten Gerätes oder Schutzsystems in Übereinstimmung mit Richtlinie 94/9/EG. Weitere Anforderungen der Richtlinie gelten für das Herstellungsverfahren und die Lieferung dieses Gerätes oder Schutzsystems. Diese sind von vorliegender Bescheinigung nicht abgedeckt.

(12) Die Kennzeichnung des Gerätes oder Schutzsystems muß die folgenden Angaben enthalten:

II 2(1) G EEx ib[ia] IIC T4

Arnhem, den 19. September 2001
KEMA Quality B.V.

T. Pijpker
Certification Manager

* Diese Bescheinigung darf nur ungekürzt und unverändert weiterverbreitet werden

KEMA Quality B.V.
Utrechtseweg 310, 6812 AR Arnhem, Die Niederlande
Postbus 5185, 6802 ED Arnhem, Die Niederlande
Telefon: +31 26 3 56 20 05, Telefax: +31 26 3 52 58 00

AKKREDITIERT DURCH DEN NIEDERLÄNDISCHEN AKKREDITIERUNGSRAT

Blatt 1/4

Blatt 2/4

Beschreibung

Das Modul 2AI TC, Typ 6ES7 134-5SB00-0AB0 wandelt das Signal von Thermoelemente um in ein digitales Signal. Das Modul hat zwei galvanisch miteinander verbundene Eingänge.

In Kombination mit dem Basissystem des Eigensicheren Dezentralen Peripheriegerätes Typ ET 200iS, bescheinigt mittels EG-Baumusterprüfbescheinigung PTB 01 ATEX 2119, ist die Versorgungsspannung für o.g. Modul in der Zündschutzart EEx ia IIC.
Die Strombegrenzung im Versorgungsstromkreis ist in der Zündschutzart EEx ib IIC.
Die weiteren Stromkreise des o.g. Moduls sind in der Zündschutzart EEx ib IIC bzw. EEx ia IIC. Die Versorgung und Datenübertragung finden über das o.g. Dezentrale Peripheriegerät statt.

Die Kombination von o.g. Basissystem und dem Modul ist geeignet für die Errichtung in explosionsgefährdeten Bereichen in denen Geräte der Kategorie 2 verlangt werden.
Die Eingangsstromkreise des Moduls sind geeignet für die Errichtung in explosionsgefährdeten Bereichen die Geräte der Kategorie 1 verlangen.

O.g. Modul wird mittels Steckverbindungen in einem Terminal Modul (TM-E) des o.g. Dezentralen Peripheriegerätes angeschlossen.
Über aneinander gekoppelte TM-E's können mehrere Module nebeneinander montiert werden und werden damit am selben Versorgungs- und Datenstromkreis verbunden. Beim ersten Stecken sorgt die mechanische Kodierung dafür, daß nur gleiche Module auf dieselbe Stelle eingesteckt werden können.
Die Eingangsstromkreise sind mittels der Anschlußklemmen des TM-E's anzuschließen.

Das Gehäuse des o.g. Moduls hat eine Schutzart IP30 wenn im TM-E eingesteckt.
Das Modul darf unter bestimmten Bedingungen, während des Betriebs als Teil des o.g. Dezentralen Peripheriegerätes entfernt oder eingesteckt werden.

Umgebungstemperaturbereich: -20 °C ... +60 °C (waagerechte Einbaulage)
-20 °C ... +40 °C (alle anderen Einbaulagen)

Elektrische Daten

Versorgungsstromkreis ..... in Zündschutzart Eigensicherheit EEx ib[ia] IIC, (Power Bus, nur zum Anschluss an die Versorgung des o.g. Steckverbindung auf TM-E) Dezentralen Peripheriegerätes.

Sicherheitstechnisch nimmt das o.g. Modul einen Strom von maximal 120 mA auf.

Datenkanalstromkreis ..... in Zündschutzart Eigensicherheit EEx ib IIC, (S-Bus, nur zum Anschluß am Datenkanal des o.g. Steckverbindung auf TM-E) Dezentralen Peripheriegerätes.

Die wirksame innere Kapazität C_i und Induktivität L_i sind vernachlässigbar klein.

KEMA

(13) **ANLAGE**

(14) **zur EG-Baumusterprüfbescheinigung KEMA 01ATEX1154 X**

(15) **Elektrische Daten** (Fortsetzung)

Eingangsstromkreise ..... in Zündschutzart Eigensicherheit EEx ia IIC, mit
(TM-E Anschlußklemmen 1/2 und 5/6) folgenden Höchstwerten:

Jeder Stromkreis einzeln angeschlossen:
U_o = 6,0 V
I_o = 13 mA
P_o = 20 mW
Höchstzulässige äußere Kapazität C_o und Induktivität L_o nach untenstehende Tabelle.

	IIC	IIB
C_o	40 µF	1000 µF
L_o	200 mH	730 mH

Beide Stromkreise parallel angeschlossen:
U_o = 6,0 V
I_o = 26 mA
P_o = 40 mW
Höchstzulässige äußere Kapazität C_o und Induktivität L_o nach untenstehende Tabelle.

	IIC	IIB
C_o	40 µF	1000 µF
L_o	50 mH	170 mH

Die Versorgungs-, Daten- und Eingangsstromkreise sind, bei Anwendung im o.g. Dezentralen Peripheriegerät sicher voneinander galvanisch getrennt.

Stückprüfungen
Für den Transformator T200 sind die Spannungsprüfungen mit einem Höchstwert von 1500 Vac während einer Minute, gemäß Abschnitt 11.2 von EN 50020:1994 erforderlich.

(16) **Prüfbericht**
KEMA Nr. 2013814

(17) **Besondere Bedingungen**

1) Die Summe der sicherheitstechnisch vom Versorgungsstromkreis (Power Bus) aufgenommenen Ströme der Module, montiert auf einem Power Bus des o.g. Dezentralen Peripheriegerätes, darf den in der EG-Baumusterprüfbescheinigung PTB 01 ATEX 2119 erwähnten Wert nicht überschreiten.

2) Für das Stecken und Ziehen des o.g. Moduls während der Errichtung und des Betriebes sind die Errichtungs- und Betriebsanleitung des o.g. Dezentralen Peripheriegeräles zu beachten.
Beim Austausch der Module dürfen nur gleiche Typen verwendet werden.

3) Für den Umgebungstemperaturbereich und die elektrischen Daten, siehe (15)

Blatt 3/4

KEMA

(13) **ANLAGE**

(14) **zur EG-Baumusterprüfbescheinigung KEMA 01ATEX1154 X**

(18) **Grundlegende Sicherheits- und Gesundheitsanforderungen**

Grundlegende Sicherheits- und Gesundheitsanforderungen, welche nicht abgedeckt sind von den unter (9) erwähnten Normen	
Abschnitt	Thema
1.0.5	Kennzeichnung
1.0.6 b) und d)	Betriebsanleitung

Diese Grundlegenden Sicherheits- und Gesundheitsanforderungen sind geprüft und positiv beurteilt worden. Die Prüfergebnisse sind in dem unter (16) erwähnten Prüfbericht festgelegt worden.

(19) **Prüfungsunterlagen**

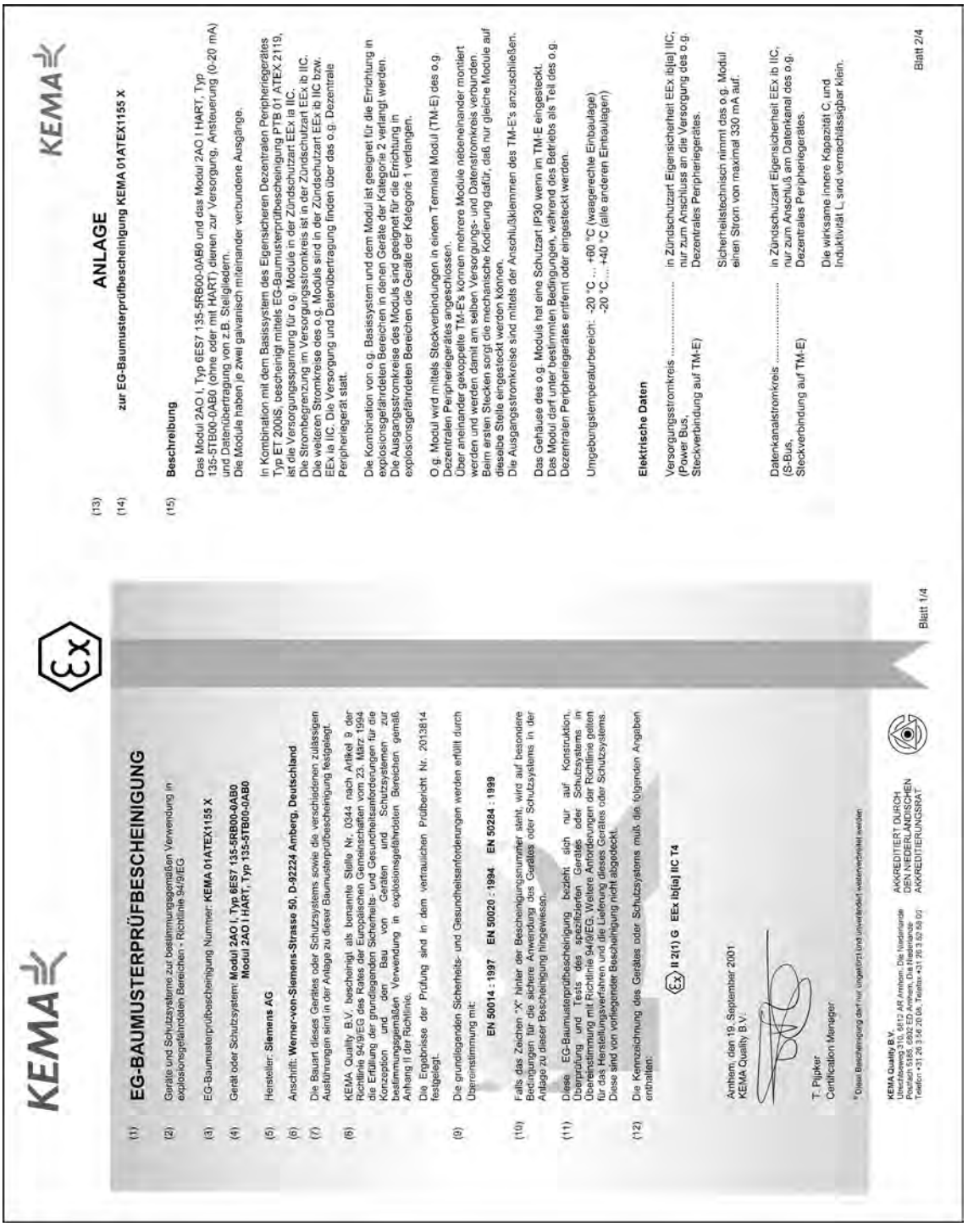
1. Prüfbericht zur EG-Baumusterprüfbescheinigung PTB 01 ATEX 2119

		unterschrieben am
2. Zeichnung Nr.	A5E00031727K	26.07.2001
	4NEA9993747-09 (2 Blatt)	26.07.2001
	A5E00059027C	26.07.2001
	A5E00059028C	26.07.2001
	A5E00113405D (9 Blatt)	06.09.2001
	A5E00074680B (8 Blatt)	26.07.2001
	A5E00101693B (5 Blatt)	26.07.2001
	A5E00101486 (4 Blatt)	26.07.2001
	A5E00101693	26.07.2001
	A5E00113405C	26.07.2001
	A5E00113405A (43 Blatt)	26.07.2001
	A5E00088854A (6 Blatt)	26.07.2001
	A5E00087809B	27.08.2001
	A5E00088856B (35 Blatt)	10.08.2001
	A5E00090378A (2 Blatt)	10.08.2001
	A5E00088856N (6 Blatt)	13.09.2001
	A5E00088856P (6 Blatt)	13.09.2001
	A5E00094953B (4 Blatt)	10.08.2001
	A5E00094953 (2 Blatt)	10.08.2001
	A5E00094910B (5 Blatt)	10.08.2001
	A5E00094910 (2 Blatt)	10.08.2001
	A5E00081503A	14.09.2001

3. Prüfmuster

Blatt 4/4

20.1.10 2AO I, 2AO I HART



KEMA

(Ex)

KEMA

(1) **EG-BAUMUSTERPRÜFBESCHEINIGUNG**

(13)

(14) **ANLAGE**

zur EG-Baumusterprüfbescheinigung KEMA 01ATEX1155 X

(2) Geräte und Schutzsysteme zur bestimmungsgemäßen Verwendung in explosionsgefährdeten Bereichen - Richtlinie 94/9/EG

(15) **Beschreibung**

(3) EG-Baumusterprüfbescheinigung Nummer: **KEMA 01ATEX1155 X**

Das Modul 2AO I, Typ 6ES7 135-5RB00-0AB0 und das Modul 2AO I HART, Typ 135-5TB00-0AB0 (ohne oder mit HART) dienen zur Versorgung, Ansteuerung (0-20 mA) und Datenübertragung von z.B. Stellgliedern.
Die Module haben je zwei galvanisch miteinander verbundene Ausgänge.

(4) Gerät oder Schutzsystem: **Modul 2AO I, Typ 6ES7 135-5RB00-0AB0**
Modul 2AO I HART, Typ 135-5TB00-0AB0

In Kombination mit dem Basissystem des Eigensicheren Dezentralen Peripheriegerätes Typ ET 200iS, bescheinigt mittels EG-Baumusterprüfbescheinigung PTB 01 ATEX 2119, ist die Versorgungsspannung für o.g. Module in der Zündschutzart EEx ia IIC.
Die Strombegrenzung im Versorgungsstromkreis ist in der Zündschutzart EEx ib IIC.
Die weiteren Stromkreise des o.g. Moduls sind in der Zündschutzart EEx ib IIC bzw. EEx ia IIC. Die Versorgung und Datenübertragung finden über das o.g. Dezentrale Peripheriegerät statt.

(5) Hersteller: **Siemens AG**

(6) Anschrift: **Werner-von-Siemens-Strasse 50, D-92224 Amberg, Deutschland**

(7) Die Bauart dieses Gerätes oder Schutzsystems sowie die verschiedenen zulässigen Ausführungen sind in der Anlage zu dieser Baumusterprüfbescheinigung festgelegt.

(6) KEMA Quality B.V. bescheinigt als benannte Stelle Nr. 0344 nach Artikel 9 der Richtlinie 94/9/EG des Rates der Europäischen Gemeinschaften vom 23. März 1994 die Erfüllung der grundlegenden Sicherheits- und Gesundheitsanforderungen für die Konzeption und den Bau von Geräten und Schutzsystemen zur bestimmungsgemäßen Verwendung in explosionsgefährdeten Bereichen gemäß Anhang II der Richtlinie.

Die Ergebnisse der Prüfung sind in dem vertraulichen Prüfbericht Nr. 2013814 festgelegt.

(9) Die grundlegenden Sicherheits- und Gesundheitsanforderungen werden erfüllt durch Übereinstimmung mit:

EN 50014 : 1997 EN 50020 : 1994 EN 50284 : 1999

(10) Falls das Zeichen "X" hinter der Bescheinigungsnummer steht, wird auf besondere Bedingungen für die sichere Anwendung des Gerätes oder Schutzsystems in der Anlage zu dieser Bescheinigung hingewiesen.

(11) Diese EG-Baumusterprüfbescheinigung bezieht sich nur auf Konstruktion, Überprüfung und Tests des spezifizierten Gerätes oder Schutzsystems in Übereinstimmung mit Richtlinie 94/9/EG. Weitere Anforderungen der Richtlinie gelten für das Herstellungsverfahren und die Lieferung dieses Gerätes oder Schutzsystems. Diese sind von vorliegender Bescheinigung nicht abgedeckt.

(12) Die Kennzeichnung des Gerätes oder Schutzsystems muß die folgenden Angaben enthalten:

(Ex) **II 2(1) G EEx ib[ia] IIC T4**

Arnhem, den 19. September 2001
KEMA Quality B.V.

T. Pijpker
Certification Manager

Elektrische Daten

Versorgungsstromkreis ..... in Zündschutzart Eigensicherheit EEx ib[ia] IIC; (Power Bus, nur zum Anschluss an die Versorgung des o.g. Steckverbindung auf TM-E) Dezentrales Peripheriegerätes.

Sicherheitstechnisch nimmt das o.g. Modul einen Strom von maximal 330 mA auf.

Datenkanalstromkreis ..... in Zündschutzart Eigensicherheit EEx ib IIC; (S-Bus, nur zum Anschluß am Datenkanal des o.g. Steckverbindung auf TM-E) Dezentrales Peripheriegerätes.

Die wirksame innere Kapazität C_i und Induktivität L_i sind vernachlässigbar klein.

Umgebungstemperaturbereich: -20 °C ... +80 °C (waagerechte Einbaulage)
-20 °C ... +40 °C (alle anderen Einbaulagen)

*) Diese Bescheinigung darf nur ungekürzt und unverändert weiterverbreitet werden

Blatt 1/4

Blatt 2/4

KEMA Quality B.V.
Utrechtseweg 310, 6812 AR Arnhem, Die Niederlande
Postfach 5186, 6802 ED Arnhem, Die Niederlande
Telefon +31 26 3 56 20 66, Telefax +31 26 3 52 58 00

AKKREDITIERT DURCH DEN NIEDERLÄNDISCHEN AKKREDITIERUNGSRAT

KEMA

(13) **ANLAGE**

(14) **zur EG-Baumusterprüfbescheinigung KEMA 01ATEX1155 X**

(15) **Elektrische Daten** (Fortsetzung)

Ausgangsstromkreise ..... in Zündschutzart Eigensicherheit EEx ia IIC, mit
(TM-E Anschlußklemmen 3/4 und 7/8) folgenden Höchstwerten (pro Stromkreis):

U_o = 28 V
I_o = 80 mA
P_o = 560 mW

Höchstzulässige äußere Kapazität C_o und Induktivität L_o nach untenstehenden Tabelle.

	IIC	IIB
C_o	80 nF	650 nF
L_o	5 mH	20 mH

Die Versorgungs-, Daten- und Ausgangsstromkreise sind, bei Anwendung im o.g. Dezentralen Peripheriegerät sicher voneinander galvanisch getrennt.

Stückprüfungen

Für den Transformator T200 sind die Spannungsprüfungen mit einem Höchstwert von 1500 Vac während einer Minute, gemäß Abschnitt 11.2 von EN 50020:1994 erforderlich.

(16) **Prüfbericht**
KEMA Nr. 2013814

(17) **Besondere Bedingungen**

1) Die Summe der sicherheitstechnisch vom Versorgungsstromkreis (Power Bus) aufgenommenen Ströme der Module, montiert auf einem Power Bus des o.g. Dezentralen Peripheriegerätes, darf den in der EG-Baumusterprüfbescheinigung PTB 01 ATEX 2119 erwähnten Wert nicht überschreiten.

2) Für das Stecken und Ziehen des o.g. Moduls während der Errichtung und des Betriebes sind die Errichtungs- und Betriebsanleitung des o.g. Dezentralen Peripheriegerätes zu beachten.
Beim Austausch der Module dürfen nur gleiche Typen verwendet werden.

3) Für den Umgebungstemperaturbereich und die elektrischen Daten, siehe (15)

(18) **Grundlegende Sicherheits- und Gesundheitsanforderungen**

Grundlegende Sicherheits- und Gesundheitsanforderungen, welche nicht abgedeckt sind von den unter (9) erwähnten Normen	
Abschnitt	Thema
1.0.5	Kennzeichnung
1.0.6 b) und d)	Betriebsanleitung

Diese Grundlegenden Sicherheits- und Gesundheitsanforderungen sind geprüft und positiv beurteilt worden. Die Prüfergebnisse sind in dem unter (16) erwähnten Prüfbericht festgelegt worden.

KEMA

(13) **ANLAGE**

(14) **zur EG-Baumusterprüfbescheinigung KEMA 01ATEX1155 X**

(19) **Prüfungsunterlagen**

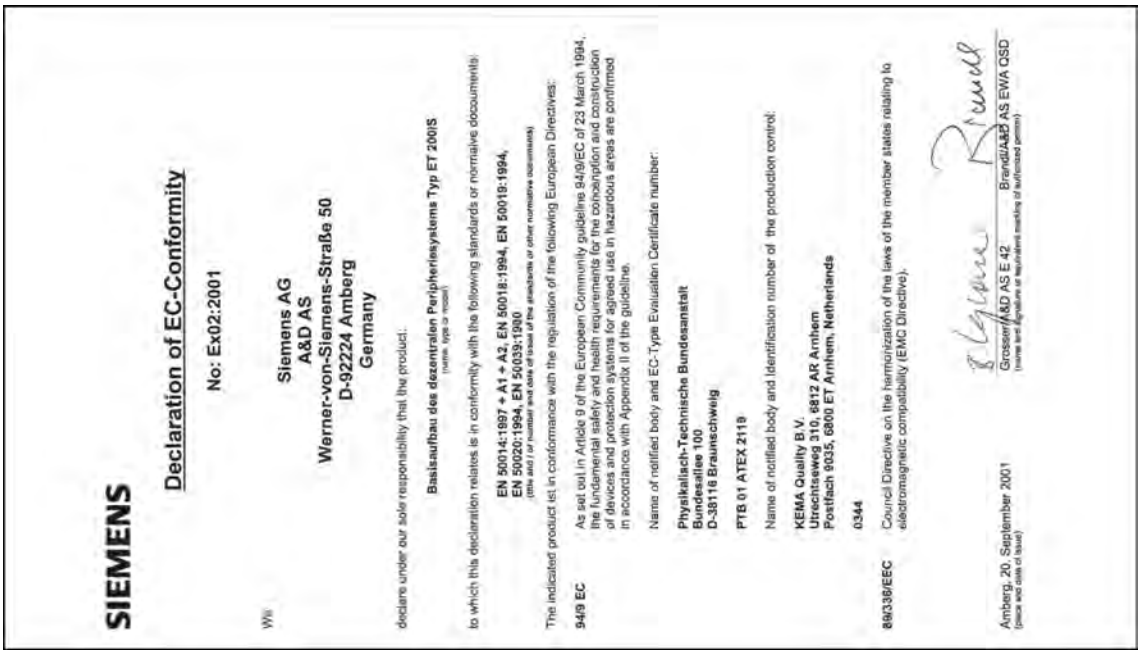
1. EG-Baumusterprüfbescheinigung KEMA 01ATEX1162 X
   Prüfbericht zur EG-Baumusterprüfbescheinigung PTB 01 ATEX 2119

		unterschrieben am
2. Zeichnung Nr:	A5E00087813A	27.08.2001
	A5E00087814A	27.08.2001

3. Prüfmuster

20.2 EU Declarations of Conformity

20.2.1 ET 200iS Distributed I/O Station



SIEMENS

Declaration of EC-Conformity

No: Ex02:2001

We

Siemens AG
A&D AS
Werner-von-Siemens-Straße 50
D-92224 Amberg
Germany

declare under our sole responsibility that the product:

Basisaufbau des dezentralen Peripheriesystems Typ ET 200iS
(name, type or model)

to which this declaration relates is in conformity with the following standards or normative documents:

EN 50014:1997 + A1 + A2, EN 50018:1994, EN 50019:1994,
EN 50020:1994, EN 50039:1980
(title and / or number and date of issue of the standards or other normative documents)

The indicated product is in conformance with the regulation of the following European Directives:

94/9 EC — As set out in Article 9 of the European Community guideline 94/9/EC of 23 March 1994, the fundamental safety and health requirements for the conception and construction of devices and protection systems for agreed use in hazardous areas are confirmed in accordance with Appendix II of the guideline.

Name of notified body and EC-Type Evaluation Certificate number:

Physikalisch-Technische Bundesanstalt
Bundesallee 100
D-38116 Braunschweig

PTB 01 ATEX 2119

Name of notified body and Identification number of the production control:

KEMA Quality B.V.
Utrechtseweg 310, 6812 AR Arnhem
Postfach 9035, 6800 ET Arnhem, Netherlands

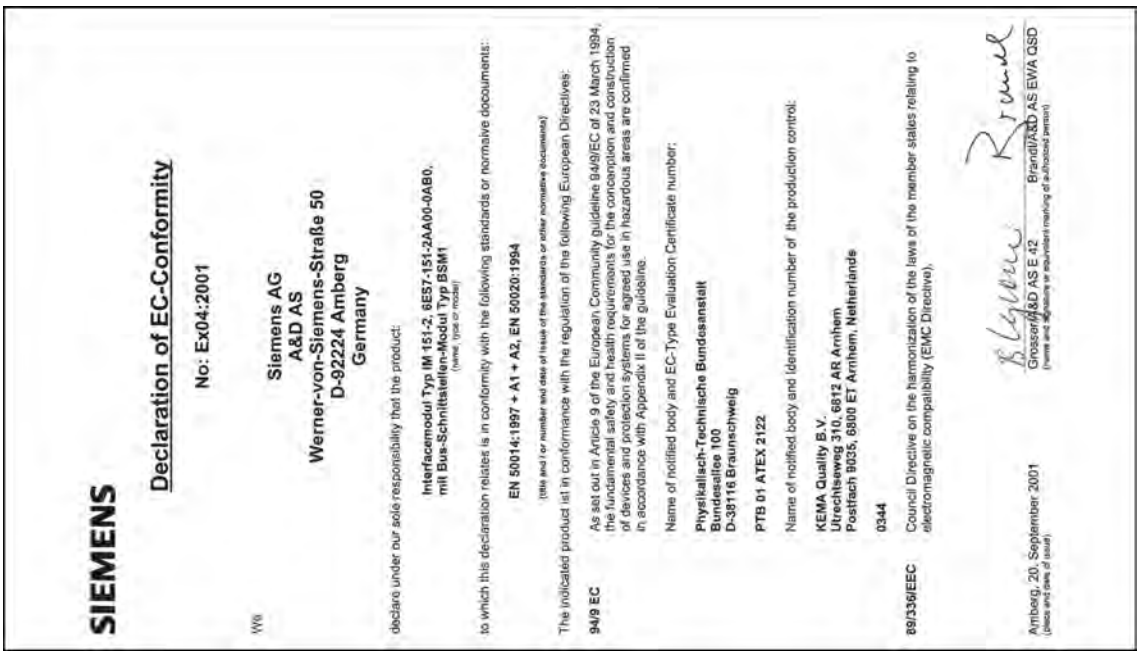
0344

89/336/EEC — Council Directive on the harmonization of the laws of the member states relating to electromagnetic compatibility (EMC Directive).

Amberg, 20. September 2001
(place and date of issue)

Grosser/A&D AS E 42 Brandl/A&D AS EWA QSD
(name and signature or equivalent marking of authorized person)

20.2.2 Interface module IM 151-2



SIEMENS

Declaration of EC-Conformity

No: Ex04:2001

We

Siemens AG
A&D AS
Werner-von-Siemens-Straße 50
D-92224 Amberg
Germany

declare under our sole responsibility that the product:

Interfacemodul Typ IM 151-2, 6ES7-151-2AA00-0AB0,
mit Bus-Schnittstellen-Modul Typ BSM1
(name, type or model)

to which this declaration relates is in conformity with the following standards or normative documents:

EN 50014:1997 + A1 + A2, EN 50020:1994
(title and / or number and date of issue of the standards or other normative documents)

The indicated product is in conformance with the regulation of the following European Directives:

94/9 EC — As set out in Article 9 of the European Community guideline 94/9/EC of 23 March 1994, the fundamental safety and health requirements for the conception and construction of devices and protection systems for agreed use in hazardous areas are confirmed in accordance with Appendix II of the guideline.

Name of notified body and EC-Type Evaluation Certificate number:

Physikalisch-Technische Bundesanstalt
Bundesallee 100
D-38116 Braunschweig

PTB 01 ATEX 2122

Name of notified body and Identification number of the production control:

KEMA Quality B.V.
Utrechtseweg 310, 6812 AR Arnhem
Postfach 9035, 6800 ET Arnhem, Netherlands

0344

89/336/EEC — Council Directive on the harmonization of the laws of the member states relating to electromagnetic compatibility (EMC Directive).

Amberg, 20. September 2001
(place and date of issue)

Grosser/A&D AS E 42 Brandl/A&D AS EWA QSD
(name and signature or equivalent marking of authorized person)

20.2.3 Power supply PS

SIEMENS

Declaration of EC-Conformity

No: Ex03:2001

We

Siemens AG
A&D AS
Werner-von-Siemens-Straße 50
D-92224 Amberg
Germany

declare under our sole responsibility that the product:

Power Supply, 6ES7 138-5EA00-0AA0
(name, type or model)

to which this declaration relates is in conformity with the following standards or normative documents:

EN 1127-1:1997, EN 50014:1997 + A1 + A2, EN 50018:1994, EN 50019:1994, EN 50020:1994
(title and / or number and date of issue of the standards or other normative documents)

The indicated product ist in conformance with the regulation of the following European Directives:

94/9 EC — As set out in Article 9 of the European Community guideline 94/9/EC of 23 March 1994, the fundamental safety and health requirements for the conception and construction of devices and protection systems for agreed use in hazardous areas are confirmed in accordance with Appendix II of the guideline.

Name of notified body and Identification number of the production control:

Physikalisch-Technische Bundesanstalt
Bundesallee 100
D-38116 Braunschweig

PTB 01 ATEX 2121

Name of notified body and Identification number of the production control:

KEMA Quality B.V.
Utrechtseweg 310, 6812 AR Arnhem
Postfach 9035, 6800 ET Arnhem, Netherlands

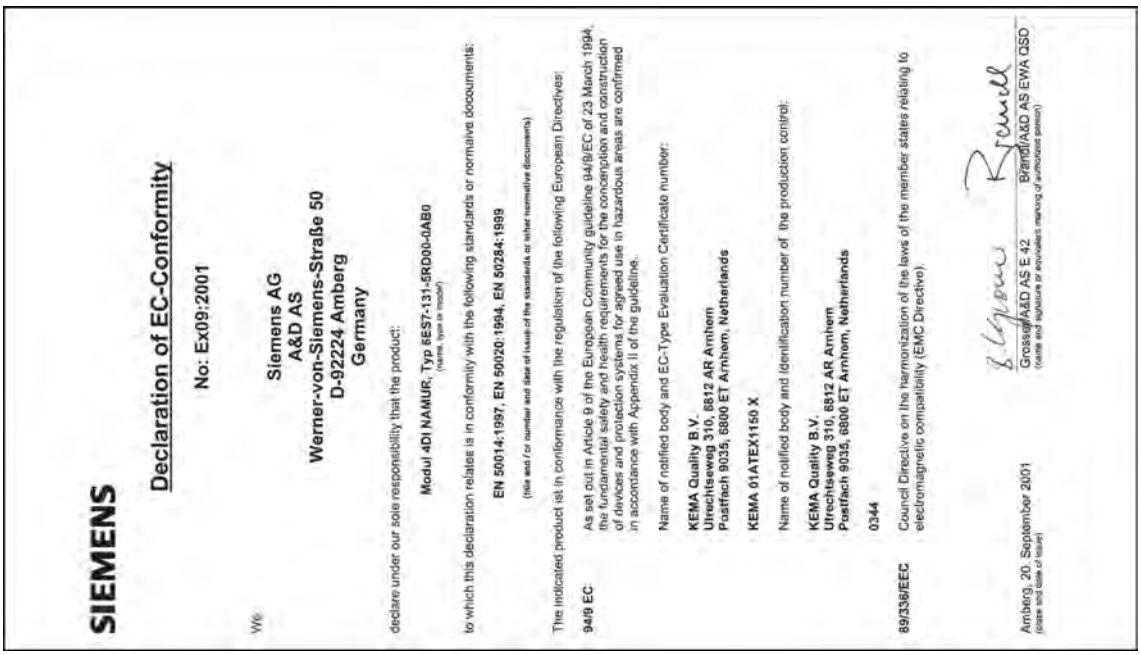
0344

89/336/EEC — Council Directive on the harmonization of the laws of the member states relating to electromagnetic compatibility (EMC Directive).

Amberg, 20. September 2001
(place and date of issue)

Grosser/A&D AS E 42 Brandl/A&D AS EWA QSD
(name and signature or equivalent marking of authorized person)

20.2.4 4DI NAMUR



SIEMENS

Declaration of EC-Conformity

No: Ex09:2001

We

Siemens AG
A&D AS
Werner-von-Siemens-Straße 50
D-92224 Amberg
Germany

declare under our sole responsibility that the product:

Modul 4DI NAMUR, Typ 6ES7-131-5RD00-0AB0
(name, type or model)

to which this declaration relates is in conformity with the following standards or normative documents:

EN 50014:1997, EN 50020:1994, EN 50284:1999
(title and / or number and date of issue of the standards or other normative documents)

The indicated product ist in conformance with the regulation of the following European Directives:

94/9 EC — As set out in Article 9 of the European Community guideline 94/9/EC of 23 March 1994, the fundamental safety and health requirements for the conception and construction of devices and protection systems for agreed use in hazardous areas are confirmed in accordance with Appendix II of the guideline.

Name of notified body and EC-Type Evaluation Certificate number:

KEMA Quality B.V.
Utrechtseweg 310, 6812 AR Arnhem
Postfach 9035, 6800 ET Arnhem, Netherlands

KEMA 01ATEX1150 X

Name of notified body and Identification number of the production control:

KEMA Quality B.V.
Utrechtseweg 310, 6812 AR Arnhem
Postfach 9035, 6800 ET Arnhem, Netherlands

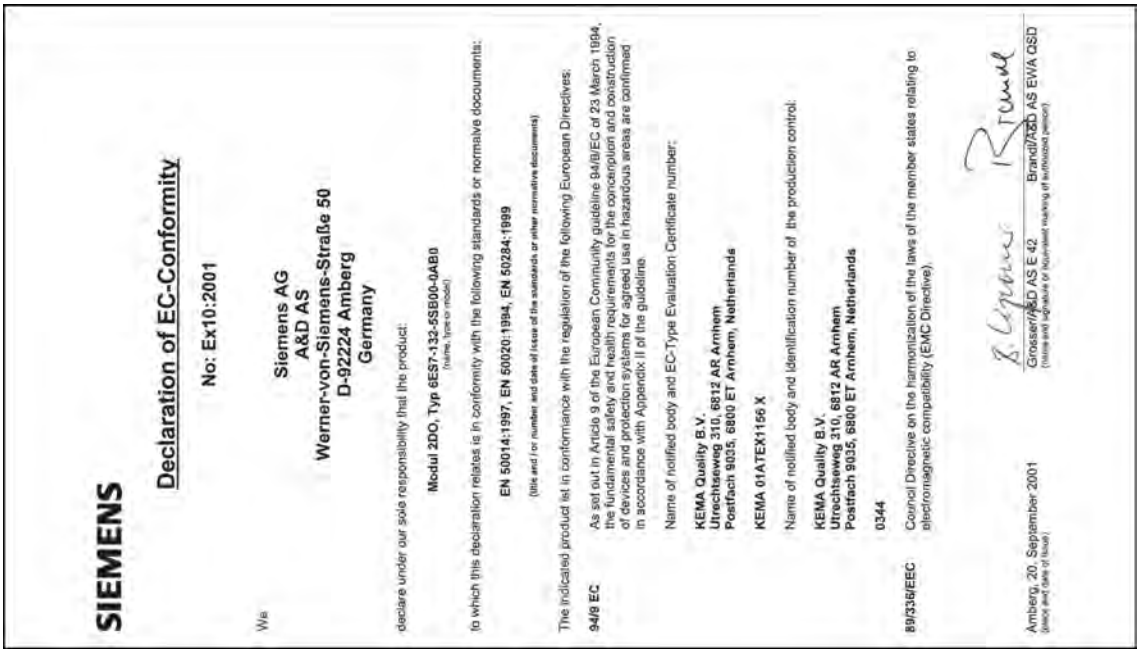
0344

89/336/EEC — Council Directive on the harmonization of the laws of the member states relating to electromagnetic compatibility (EMC Directive).

Amberg, 20. September 2001
(place and date of issue)

Grosser/A&D AS E 42 Brandl/A&D AS EWA QSD
(name and signature or equivalent marking of authorized person)

20.2.5 2DO DC25V/25mA



SIEMENS

Declaration of EC-Conformity

No: Ex10:2001

We

Siemens AG
A&D AS
Werner-von-Siemens-Straße 50
D-92224 Amberg
Germany

declare under our sole responsibility that the product:

Modul 2DO, Typ 6ES7-132-5SB00-0AB0
(name, type or model)

to which this declaration relates is in conformity with the following standards or normative documents:

EN 50014:1997, EN 50020:1994, EN 50284:1999
(title and / or number and date of issue of the standards or other normative documents)

The indicated product let in conformance with the regulation of the following European Directives:

94/9 EC — As set out in Article 9 of the European Community guideline 94/9/EC of 23 March 1994, the fundamental safety and health requirements for the conception and construction of devices and protection systems for agreed use in hazardous areas are confirmed in accordance with Appendix II of the guideline.

Name of notified body and EC-Type Evaluation Certificate number:

KEMA Quality B.V.
Utrechtseweg 310, 6812 AR Arnhem
Postfach 9035, 6800 ET Arnhem, Netherlands

KEMA 01ATEX1156 X

Name of notified body and Identification number of the production control:

KEMA Quality B.V.
Utrechtseweg 310, 6812 AR Arnhem
Postfach 9035, 6800 ET Arnhem, Netherlands

0344

89/336/EEC — Council Directive on the harmonization of the laws of the member states relating to electromagnetic compatibility (EMC Directive).

Amberg, 20. September 2001
(place and date of issue)

Grosser/A&D AS E 42 Brandl/A&D AS EWA QSD
(name and signature or equivalent marking of authorized person)

20.2.6 2AI I 2WIRE, 2AI I 2WIRE HART

SIEMENS

Declaration of EC-Conformity

No: Ex05:2001

We

Siemens AG
A&D AS
Werner-von-Siemens-Straße 50
D-92224 Amberg
Germany

declare under our sole responsibility that the product:

Modul 2AI 2WIRE, Typ 6ES7-134-5RB00-0AB0
Modul 2AI 2WIRE HART, Typ 6ES7-134-5TB00-0AB0
(name, type or model)

to which this declaration relates is in conformity with the following standards or normative documents:

EN 50014:1997, EN 50020:1994, EN 50284:1999
(title and / or number and date of issue of the standards or other normative documents)

The indicated product let in conformance with the regulation of the following European Directives:

94/9 EC — As set out in Article 9 of the European Community guideline 94/9/EC of 23 March 1994, the fundamental safety and health requirements for the conception and construction of devices and protection systems for agreed use in hazardous areas are confirmed in accordance with Appendix II of the guideline.

Name of notified body and EC-Type Evaluation Certificate number:

KEMA Quality B.V.
Utrechtseweg 310, 6812 AR Arnhem
Postfach 9035, 6800 ET Arnhem, Netherlands

KEMA 01ATEX1162 X

Name of notified body and Identification number of the production control:

KEMA Quality B.V.
Utrechtseweg 310, 6812 AR Arnhem
Postfach 9035, 6800 ET Arnhem, Netherlands

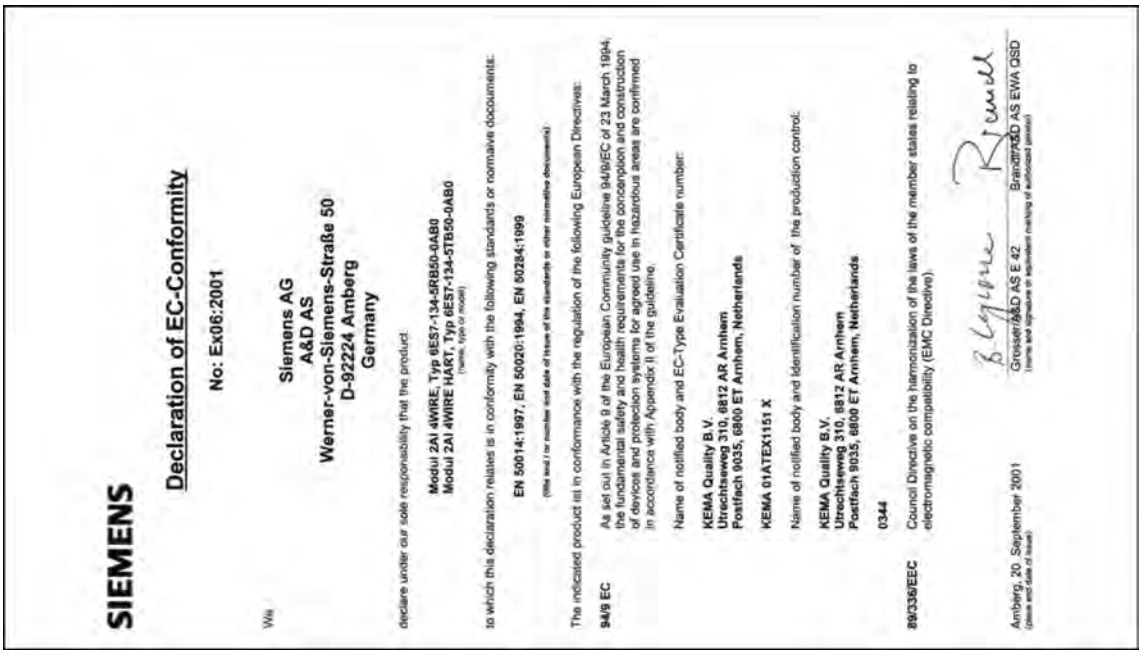
0344

89/336/EEC — Council Directive on the harmonization of the laws of the member states relating to electromagnetic compatibility (EMC Directive).

Amberg, 20. September 2001
(place and date of issue)

Grosser/A&D AS E 42 Brandl/A&D AS EWA QSD
(name and signature or equivalent marking of authorized person)

20.2.7 2AI I 4WIRE, 2AI I 4WIRE HART



SIEMENS

Declaration of EC-Conformity

No: Ex06:2001

We

Siemens AG
A&D AS
Werner-von-Siemens-Straße 50
D-92224 Amberg
Germany

declare under our sole responsibility that the product:

Modul 2AI 4WIRE, Typ 6ES7-134-5RB50-0AB0
Modul 2AI 4WIRE HART, Typ 6ES7-134-5TB50-0AB0
(name, type or model)

to which this declaration relates is in conformity with the following standards or normative documents:

EN 50014:1997, EN 50020:1994, EN 50284:1999
(title and / or number and date of issue of the standards or other normative documents)

The indicated product ist in conformance with the regulation of the following European Directives:

94/9 EC — As set out in Article 9 of the European Community guideline 94/9/EC of 23 March 1994, the fundamental safety and health requirements for the conception and construction of devices and protection systems for agreed use in hazardous areas are confirmed in accordance with Appendix II of the guideline.

Name of notified body and EC-Type Evaluation Certificate number:

KEMA Quality B.V.
Utrechtseweg 310, 6812 AR Arnhem
Postfach 9035, 6800 ET Arnhem, Netherlands

KEMA 01ATEX1151 X

Name of notified body and identification number of the production control:

KEMA Quality B.V.
Utrechtseweg 310, 6812 AR Arnhem
Postfach 9035, 6800 ET Arnhem, Netherlands

0344

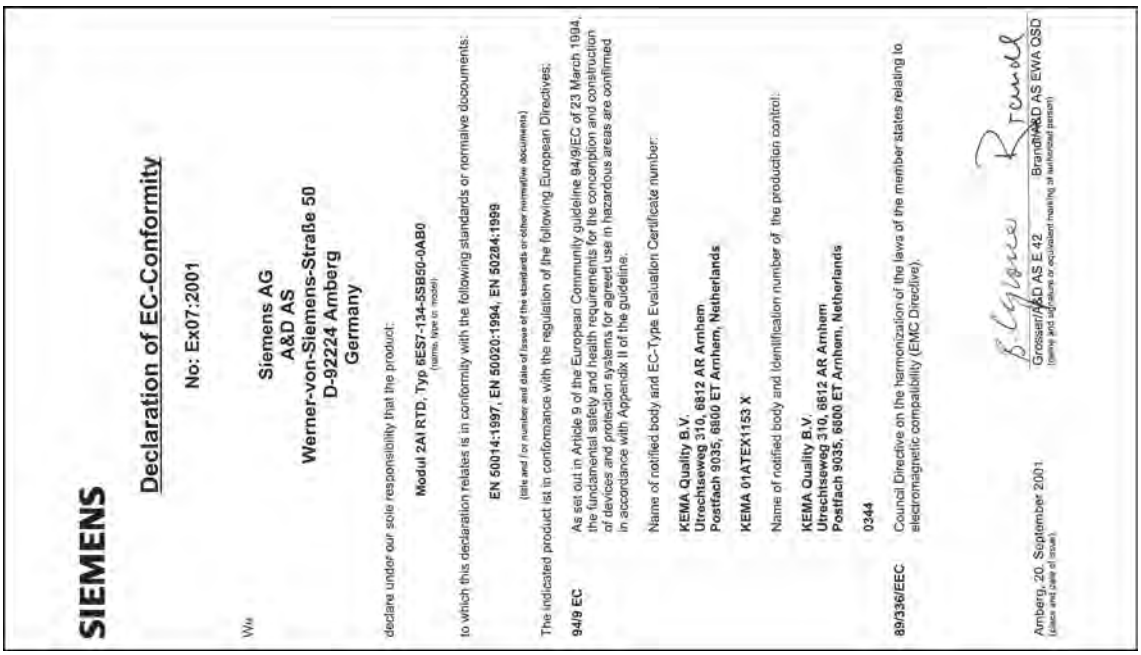
89/336/EEC — Council Directive on the harmonization of the laws of the member states relating to electromagnetic compability (EMC Directive).

Amberg, 20. September 2001
(place and date of issue)

Grosser/A&D AS E 42
(name and signature or equivalent marking of authorized person)

Brandhard AS EWA QSD

20.2.8 2AI RTD



SIEMENS

Declaration of EC-Conformity

No: Ex07:2001

We

Siemens AG
A&D AS
Werner-von-Siemens-Straße 50
D-92224 Amberg
Germany

declare under our sole responsibility that the product:

Modul 2AI RTD, Typ 6ES7-134-5SB50-0AB0
(name, type or model)

to which this declaration relates is in conformity with the following standards or normative documents:

EN 50014:1997, EN 50020:1994, EN 50284:1999
(title and / or number and date of issue of the standards or other normative documents)

The indicated product ist in conformance with the regulation of the following European Directives:

94/9 EC — As set out in Article 9 of the European Community guideline 94/9/EC of 23 March 1994, the fundamental safety and health requirements for the conception and construction of devices and protection systems for agreed use in hazardous areas are confirmed in accordance with Appendix II of the guideline.

Name of notified body and EC-Type Evaluation Certificate number:

KEMA Quality B.V.
Utrechtseweg 310, 6812 AR Arnhem
Postfach 9035, 6800 ET Arnhem, Netherlands

KEMA 01ATEX1153 X

Name of notified body and identification number of the production control:

KEMA Quality B.V.
Utrechtseweg 310, 6812 AR Arnhem
Postfach 9035, 6800 ET Arnhem, Netherlands

0344

89/336/EEC — Council Directive on the harmonization of the laws of the member states relating to electromagnetic compability (EMC Directive).

Amberg, 20. September 2001
(place and date of issue)

Grosser/A&D AS E 42
(name and signature or equivalent marking of authorized person)

Brandhard AS EWA QSD

20.2.9 2AI TC

SIEMENS

Declaration of EC-Conformity

No: Ex08:2001

We

Siemens AG
A&D AS
Werner-von-Siemens-Straße 50
D-92224 Amberg
Germany

declare under our sole responsibility that the product:

Modul 2AI TC, Typ 6ES7-134-5SB00-0AB0
(name, type or model)

to which this declaration relates is in conformity with the following standards or normative documents:

EN 50014:1997, EN 50020:1994, EN 50284:1999
(title and / or number and date of issue of the standards or other normative documents)

The indicated product list in conformance with the regulation of the following European Directives:

94/9 EC — As set out in Article 9 of the European Community guideline 94/9/EC of 23 March 1994, the fundamental safety and health requirements for the conception and construction of devices and protection systems for agreed use in hazardous areas are confirmed in accordance with Appendix II of the guideline.

Name of notified body and EC-Type Evaluation Certificate number:

KEMA Quality B.V.
Utrechtseweg 310, 6812 AR Arnhem
Postfach 9035, 6800 ET Arnhem, Netherlands

KEMA 01ATEX1154 X

Name of notified body and Identification number of the production control:

KEMA Quality B.V.
Utrechtseweg 310, 6812 AR Arnhem
Postfach 9035, 6800 ET Arnhem, Netherlands

0344

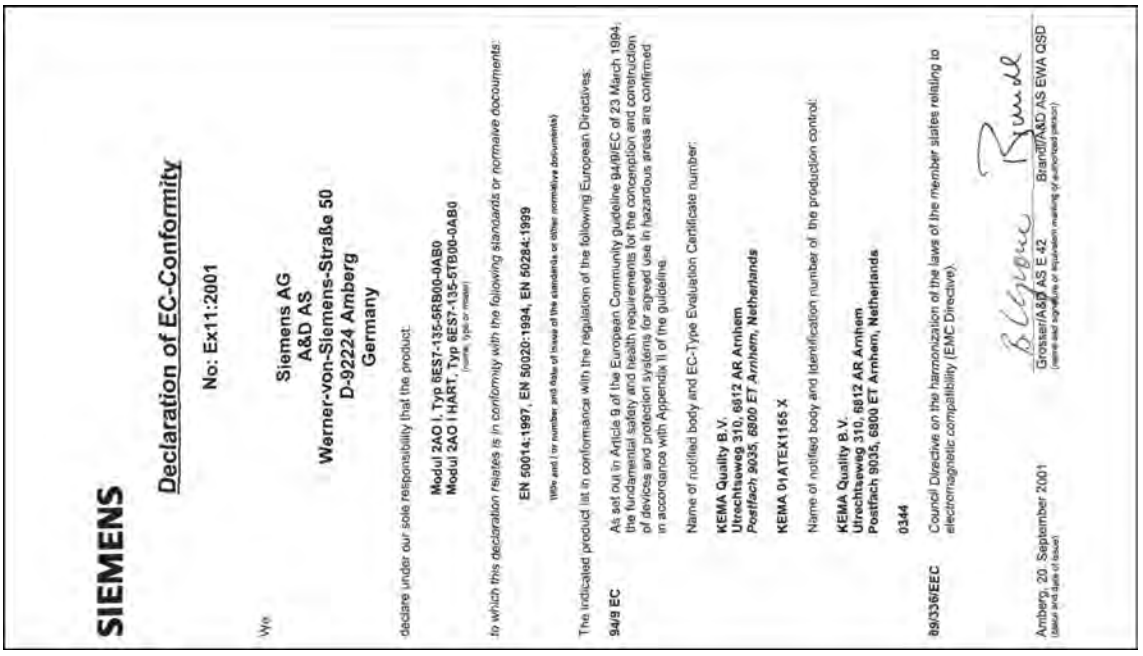
89/336/EEC — Council Directive on the harmonization of the laws of the member states relating to electromagnetic compatibility (EMC Directive).

Amberg, 20. September 2001
(place and date of issue)

Grosser/A&D AS E 42
(name and signature or equivalent marking of authorized person)

Brandl/A&D AS EWA QSD
(name and signature or equivalent marking of authorized person)

20.2.10 2AO I, 2AO I HART



SIEMENS

Declaration of EC-Conformity

No: Ex11:2001

We

Siemens AG
A&D AS
Werner-von-Siemens-Straße 50
D-92224 Amberg
Germany

declare under our sole responsibility that the product:

Modul 2AO I, Typ 6ES7-135-6RB00-0AB0
Modul 2AO I HART, Typ 6ES7-135-6TB00-0AB0
(name, type or model)

to which this declaration relates is in conformity with the following standards or normative documents:

EN 50014:1997, EN 50020:1994, EN 50284:1999
(title and / or number and date of issue of the standards or other normative documents)

The indicated product list in conformance with the regulation of the following European Directives:

94/9 EC — As set out in Article 9 of the European Community guideline 94/9/EC of 23 March 1994, the fundamental safety and health requirements for the conception and construction of devices and protection systems for agreed use in hazardous areas are confirmed in accordance with Appendix II of the guideline.

Name of notified body and EC-Type Evaluation Certificate number:

KEMA Quality B.V.
Utrechtseweg 310, 6812 AR Arnhem
Postfach 9035, 6800 ET Arnhem, Netherlands

KEMA 01ATEX1155 X

Name of notified body and Identification number of the production control:

KEMA Quality B.V.
Utrechtseweg 310, 6812 AR Arnhem
Postfach 9035, 6800 ET Arnhem, Netherlands

0344

89/336/EEC — Council Directive on the harmonization of the laws of the member states relating to electromagnetic compatibility (EMC Directive).

Amberg, 20. September 2001
(place and date of issue)

Grosser/A&D AS E 42
(name and signature or equivalent marking of authorized person)

Brandl/A&D AS EWA QSD
(name and signature or equivalent marking of authorized person)

Marking

21

21.1 Marking According to Divisions

Overview

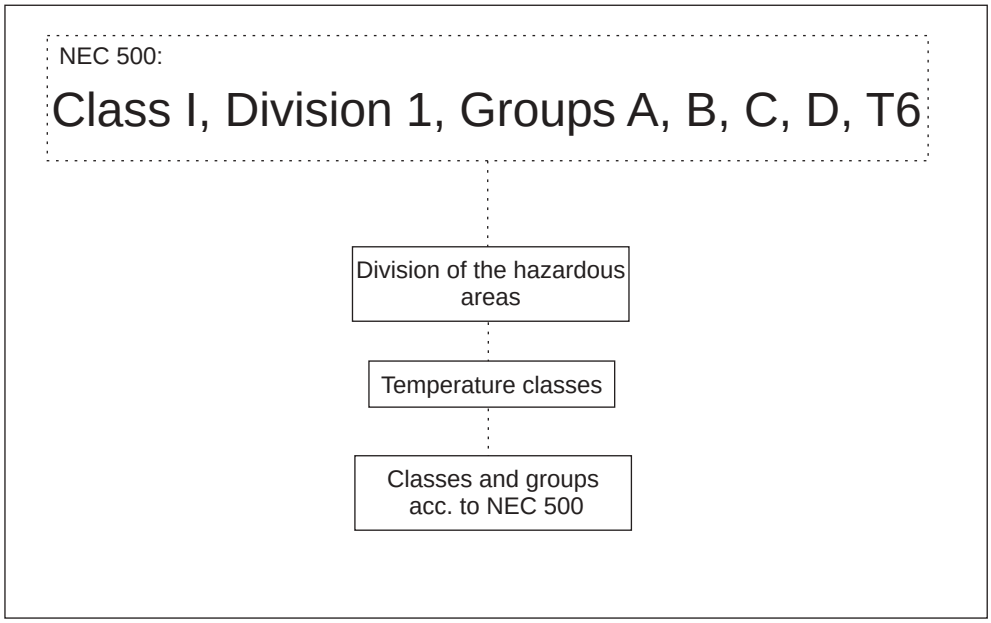


Figure 21-1 Overview

Division of the Hazardous Areas

Division of the Hazardous Areas			
		Danger continuously or intermittently	Danger seldom and for a short time
USA	**NEC 500** Class I (gas) Class II (dust) Class III (fibers)	Division 1	Division 2

Temperature Classes

Temperature Classes	
Highest Permitted Surface Temperature	USA (NEC 500)
450°C	T1
300°C	T2
280°C	T2A
260°C	T2B
230°C	T2C
215°C	T2D
200°C	T3
180°C	T3A
165°C	T3B
160°C	T3C
135°C	T4
120°C	T4A
100°C	T5
85°C	T6

Classes and Groups According to NEC 500

Classes and Groups According to NEC 500		
Typical Gases / Dusts / Flyings / Fibers	Group	
Acetylene	Class I	Group A
Hydrogen	Class I	Group B
Ethylene	Class I	Group C
Propane	Class I	Group D
Methane	Mining	
Metal dust	Class II	Group E
Carbon dust	Class II	Group F
Grain dust	Class II	Group G
Fibers / flyings	Class III	

21.2 Marking According to Zones

Overview

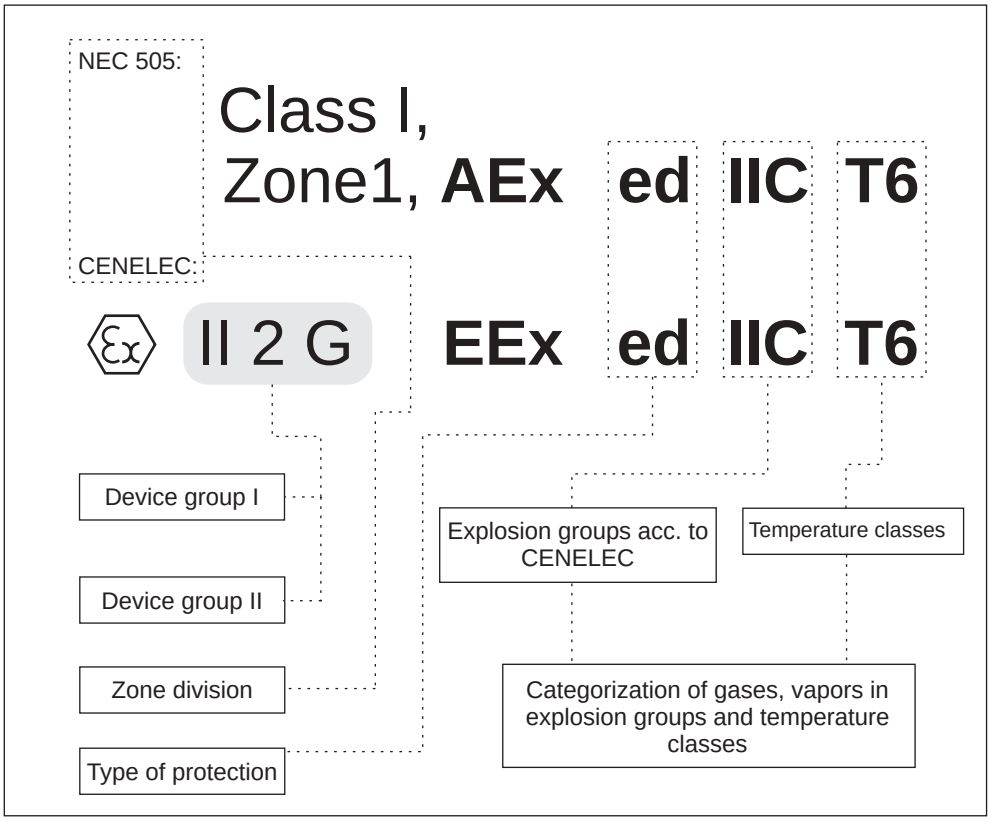


Figure 21-2 Overview

Device group I

Table 21-1 Device group I

Device group I (Mining)		
	Category M1 Extremely high degree of safety	**Category M2** High degree of safety
Adequate safety	with 2 protective measures/ if two faults occur	must be turned off if an explosive atmosphere occurs

Device group II

Table 21-2 Device group II

Device group II (Other Hazardous Areas)						
	Category 1* Extremely high degree of safety		**Category 2*** High degree of safety		**Category 3*** Normal degree of safety	
Adequate safety	with 2 protective measures/ if two faults occur		if device problems occur often/ if 1 fault occurs		in problem-free operation	
Use in	Zone 0	Zone 20	Zone 1	Zone 21	Zone 2	Zone 22
Atmosphere G = Gas, D = Dust	**G**	**D**	**G**	**D**	**G**	**D**

* II (1) G = relevant electrical equipment – Installation in safe area

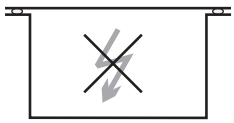
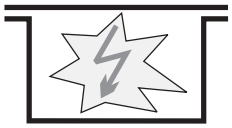
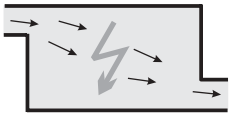
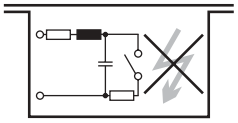
Classification of Zones

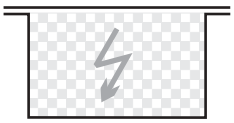
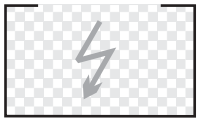
Table 21-3 Classification of Zones

Classification of Zones				
		Danger continuously, over long periods or often	Danger intermittently	Danger seldom and for a short time
IEC		Zone 0 (Zone 20 - dust)	Zone 1 (Zone 21 - dust)	Zone 2 (Zone 22 - dust)
USA	**NEC 505** Class I (gas)	Zone 0	Zone 1	Zone 0

Types of Protection

Table 21-4 Types of Protection

Types of Protection				
Type of Protection		Schematic Representation	Main Application	Standard
Increased safety	**e**		Terminals and terminal boxes, control boxes for installation of components (with a different type of explosion protection), cage motors, lamps	EN 50 019 IEC 60 079-7 FM 3600 UL 2279
Explosion-proof enclosure	**d**		Switching device and switchgear, control and display devices, controllers, motors, transformers, heaters, lamps	EN 50 018 IEC 60 079-1 FM 3600 UL 2279
Pressurized enclosure	**p**		Switch gear and control cubicles, analytic devices, large motors	EN 50 016 IEC 60 079-2 FM 3620 NFPA 496
Intrinsic safety	**i***		Instrumentation and control engineering, communications engineering, sensors, actuators	EN 50 020 IEC 60 079-11 FM 3610 UL 2279
Oil immersion	**o**		Transformers, starting resistors	EN 50 015 IEC 60 079-6 FM 3600 UL 2279

Types of Protection				
Sand filling	**q**		Transformers, capacitors, heating conductor terminal box	EN 50 017 IEC 60 079-5 FM 3600 UL 2279
Encapsulation	**m**		Switching devices for small loads, command and signaling devices, display devices, sensors	EN 50 028 IEC 60 079-18 FM 3600 UL 2279
Type of Protection	**n**	Zone 2 Several methods of ignition protection methods are included in this type of protection	All electrical equipment for zone 2, less suitable for switching devices and switchgear	EN 50 021 IEC 60 079-15

* ia = use in zone 0, 1, 2; ib = use in zone 1,2; [EEx ib] = corresponding electrical equipment – installation in safe area

Explosion Groups

Table 21-5 Explosion Groups

Explosion Groups according to CENELEC / NEC 505	
Explosion group	Typical gas
I	Methane
II A	Propane
II B	Ethylene
II C	Hydrogen

Temperature Classes

Table 21-6 Temperature Classes

Temperature Classes	
Highest Permitted Surface Temperature	CENELEC / USA (NEC 505)
450 °C	T1
300 °C	T2
200 °C	T3
135 °C	T4
100 °C	T5
85 °C	T6

Classification of Gases and Vapors in Explosion Groups and Temperature Classes

Table 21-7 Classification of Gases and Vapors in Explosion Groups and Temperature Classes

Classification of Gases and Vapors in Explosion Groups and Temperature Classes						
	T1	**T2**	**T3**	**T4**	**T5**	**T6**
I	Methane					
II A	Acetone Ethane Ethyl acetate Ammonia Benzol (pure) Acetic acid Carbon oxide Methane Methanol Propane Toluol	Ethyl alcohol i-amyl acetate n-butane n-butyl alcohol	Gasoline Diesel fuel Aircraft fuel Fuel oils n-hexane	Acet aldehyde Ethylester		
II B	Town gas (lighting gas)	Ethylene				
II C	Hydrogen	Acetylene				Hydrogen sulphide

Glossary

22

22.1 Glossary

ACCU

The accumulators are registers on the CPU and serve as buffers for load, transfer, compare, calculation and conversion operations.

Backplane bus

The backplane bus is a serial data bus over which the interface module IM 151-2 communicates with the electronics modules and supplies them with the required voltage. The connection between the individual modules is established using the terminal modules.

Bus

Common transmission path to which all nodes are connected. It has two defined ends.

With the ET 200, the bus is a twisted-pair cable or a fibre-optic cable.

Bus connector

Physical connection between the nodes and LAN cable.

Bus termination module

The ET 200iS distributed I/O station is terminated by the bus termination module. If you do not insert a bus termination module, the ET 200iS cannot be operated.

Chassis ground

Chassis ground includes all the interconnected inactive parts of equipment that must not carry a hazardous voltage even in the event of a fault.

Diagnostics

Diagnostics is the detection, localization, classification, indication and further evaluation of errors, faults and messages.

Diagnostics provides monitoring functions that run automatically when the plant is operational. This increases plant availability by reducing commissioning and down times.

Distributed I/O devices

These are input/output units that are not installed in the central rack but are distributed and a distance from the CPU, for example:

- ET 200M, ET 200B, ET 200X, ET 200L, ET 200S, ET 200iS
- DP/AS-I Link
- For the DP slaves from Siemens or other vendors.

The distributed I/O devices are connected to the DP master over PROFIBUS DP.

DP master

A master complying with the standard IEC 61158/EN 50170, Volume 2, PROFIBUS is known as a DP master.

DP standard

The DP standard is the bus protocol of the ET 200 distributed I/O station complying with the standard IEC 61158/EN 50170, Volume 2, PROFIBUS.

DP slave

A slave operated on PROFIBUS with the PROFIBUS-DP protocol and complying with the standard IEC 61158/EN 50170, Volume 2, PROFIBUS is known as a DP slave.

DPV1

Expansion of DPV0.

Equipotential bonding

Electrical connection (equipotential bonding conductor) that keeps electrical equipment and extraneous conductive objects to the same or almost the same potential to prevent disturbing or dangerous voltages between these objects.

ET 200

The ET 200 distributed I/O station with the PROFIBUS-DP protocol allows connection of the distributed I/O to a CPU or adequate DP master. One of the main features of the ET 200 is it is fast reaction times since only a few data (bytes) is transferred.

The ET 200 is based on the standard IEC 61158/ EN 50170, Volume 2, PROFIBUS.

The ET 200 operates according to the master-slave principle. The DP master can, for example, be the master interface module IM 308-C or the CPU 315-2 DP.

DP slaves can be the distributed I/O stations ET 200B, ET 200M, ET 200X, ET 200L, ET 200S, ET 200iS or DP slaves from Siemens or other vendors.

Floating

With floating input/output modules, the reference potentials of the control and load circuit are electrically isolated, for example, by optocouplers, relay contacts or transformers.

Flutter monitoring

Flutter monitoring is a process control function for digital input signals. Flutter monitoring detects and reports untypical series of signal changes.

- Detection: If a selectable number of signal changes occurs in a monitoring window.
- Report: Entry of diagnostic information and triggering of a diagnostic interrupt; Evaluation and processing of the value status and the diagnostic information.

Freeze

This is a control command that the DP master can send to a group of DP slaves.

After receiving the FREEZE control command, the DP slave freezes the current state of the inputs and transfers this cyclically to the DP master.

With every new FREEZE control command, the DP slave freezes the state of the inputs again.

The input data are only sent cyclically by the DP slave to the DP master again after the DP master has sent the UNFREEZE control command.

Ground

Ground is the conductive ground area whose electrical potential at any point can be taken as zero. In the vicinity of grounding elements, the ground may have a potential other than zero. For this reason, the term "reference ground" is often used.

Grounding

Grounding means connecting a conductive part to ground via a grounding system.

Grounding conductor PA

Term for electrical equipment used in the hazardous area to which the equipotential bonding is connected.

GSD file

A GSD file (device database file) contains all the properties specific to a DP slave. The format of the GSD file is specified in the standard IEC 61158/EN 50170, Volume 2, PROFIBUS.

HART

Highway **A**dressable **R**emote **T**ransducer

Hot swapping

Removing and inserting modules while the ET 200iS is operational.

Identification data

The identification data allow you to read out module information (vendor, type, product version etc.) using SIMATIC PDM. The module information is resident in the module memory.

Line compensation

Resistance and RTD measurements with 2/3-wire connection without measuring circuits result in additional measuring inaccuracies. These are compensated by line compensation.

Master

When a master is in possession of the token, it can send data to other nodes and request data from other nodes (= active node). The DP master can, for example, be the master interface module IM 308 C or the CPU 315-2 DP.

Node

Device that sends, receives, or amplifies data over the network, for example, DP master, DP slave, RS-485 repeater.

Non-floating

With non-floating input/output modules, the reference potentials of the control and load circuit are electrically connected.

Output characteristics curve

This is the graphic representation of the voltage-current characteristic curve of a digital output module.

Parameter Assignment

Parameter assignment is a transfer of slave parameters from the DP master to the DP slave.

PCS 7 OS

Operator station (operator control and monitoring system) for the process control system SIMATIC PCS 7.

Permanent wiring

All the elements carrying wiring (terminal modules) are installed on a DIN rail. The electronics modules are inserted in the terminal modules.

Prewiring

Wiring the terminal modules before the electronics modules are inserted.

Process image

The process image contains the cyclically updated signal state of the inputs and outputs. The process image is part of the system memory of the DP master. At the start of the cyclic program, the signal states of the input modules are transferred to the process image input table. And the end of the cyclic program, the process image output table is transferred to the DP slave as the signal state.

PROFIBUS

PROcess FIeld BUS specified in the standard EN 50170, Volume 2, PROFIBUS. This specifies the functional, electrical and mechanical characteristics of a bit-serial fieldbus system.

PROFIBUS is available with the protocols DP (= Distributed Peripheral I/O), FMS (= Fieldbus Message Specification), PA (= Process Automation) or TF (= Technological Functions).

PROFIBUS address

To allow it to be identified uniquely on PROFIBUS, every node must have a PROFIBUS address.

PCs/PGs have the PROFIBUS address "0".

For the ET 200iS distributed I/O station, the PROFIBUS addresses 1 to 125 are permitted.

Programmable controller

A programmable controller is a controller with programmable memory consisting of at least one CPU, various input and output modules and operator control and monitoring devices.

Pulse extension

Pulse extension is a function with which the length of a digital input signal can be extended. A pulse at a digital input is extended by a selected length.

Reference potential

The voltages of circuits are considered and/or measured relative to this potential.

RTD

Measuring temperatures with resistance thermometers (resistance temperature detection).

Segment

The LAN cable between two terminating resistors forms a segment. A segment can contain 0 to 32 nodes. Segments can be connected using RS-485 repeaters.

SIMATIC PCS 7

PCS 7 is a powerful process control system with integrated "programming, operator control and monitoring". Through PCS 7, you have a direct attachment to the control system. For more detailed information, refer to the *St 70 catalog* and the integrated *PCS 7 online help*.

SIMATIC PDM

SIMATIC PDM (Process Device Manager) is a versatile tool for configuring, setting parameters, commissioning, and diagnostics of intelligent process devices (not only from Siemens). SIMATIC PDM allows you to configure a wide range of process devices with a uniform user interface.

Slave

A slave can only exchange data with a master after it has been requested to send data by the master. Slaves include all DP slaves such as the ET 200B, ET 200X, ET 200M, ET 200S, ET 200iS etc.

SYNC

This is a control command that the DP master can send to a group of DP slaves.

With the SYNC control command, the DP master instructs the DP slave to hold the states of the outputs at the current value. The output data of the next frames are stored by the DP slave, however, the state of the outputs remains unchanged.

After the next SYNC control command, the DP slave sets the outputs that is stored as output data. The outputs are only updated cyclically again when the DP master sends the UNSYNC control command.

TC

Measuring temperatures with thermocouples.

Time-of-day synchronization

Time-of-day synchronization ensures that all the clocks in a system are set to the same time. A master clock distributes the time to all other components in the system that have a clock in a configurable cycle. The components use this time to set their own clocks.

Time stamp

Information on the date and time of messages.

Time stamping

When time stamping is used, binary input signals are given a time stamp when they change. All the binary input signals selected for time stamping must be time stamped with a specified accuracy throughout the system when they change. This means that when 2 transducers on different stations in different PROFIBUS-DP master systems respond at the same time, the time stamps of these signal changes must not differ by more than this selected accuracy.

Total current

Total current of all output channels of a digital output module.

Transmission rate

The transmission rate is the speed at which data is transmitted and is specified as the number of the bits transferred per second (= bit rate).

With the ET 200iS, transmission rates of 9.6 Kbps to 1.5 Mbps are possible.

Value status

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

- Wire break check
- Flutter monitoring
- Pulse extension

WinCC

Basic package of PCS 7.

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Product Information to the manual

Distributed I/O device ET 200iS, Version 10/2001

Introduction

This product information contains fixes and additional information relevant to the user manual ”Distributed I/O device ET 200iS”, versions 10/2001, order no. 6ES7 151-2AA00-8BA0.

1 Configuration options in zones: *see Chapter 4.4 in the ET 200iS Manual*

Rules for the configuration of ET 200iS in Zone 1, Zone 2 and in the safety area

Note

- Connect the fieldbus isolation transformer to the start of the PROFIBUS-DP segment. The fieldbus transformer is always required and must be installed in the safety area!
- Enable the terminating resistor on the fieldbus isolation transformer.

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2 Using ET 200iS in a redundant DP standard master system: *see Chapter 4.7 of the ET 200iS manual*

Restrictions

Since SIMATIC PDM can not access ET 200iS via the Y link, it must be connected to the PROFIBUS-DP segment downstream of the Y link (secondary side).

3 Limitation of the number of connectible electronic modules/maximum configuration: *see Chapter 4.8 of the ET 200iS manual*

Number of electronic modules

Each ET 200iS station consists of a maximum of 32 electronic modules, including digital and analog electronic modules.

The actual number of electronic modules is often limited by

- the safety–relevant maximum current for which the system is designed (Limit value: < 7000 mA).
- the current of the power supply module PS. This limit (maximum permitted) current depends on ambient temperature at the PS power supply module and may not be exceeded.

Unrestricted use and combination of modules in an ET 200iS is possible with the configurations shown below:

- **ET 200iS up to 20 electronic modules, at an ambient temperature of 40 °C** (Limit value: < 5000 mA)
- **ET 200iS up to 19 electronic modules, at an ambient temperature of 50 °C** (Limit value: < 4650 mA)
- **ET 200iS up to 17 electronic modules, at an ambient temperature of 60 °C** (Limit value: < 4300 mA)

For operation with a **higher number** of electronic modules (maximum 32) you must check you configuration according to the **calculation table (see Table 1).**

Calculation table

Use the calculation table to check the safety–relevant and typical current consumption of ET 200iS.

These typical current values represent those of an average plant configuration. The following simultaneity factors apply to the ET 200iS station:

- with DI of 65 %
- with DO of 80 %
- with AI of 80 %
- with AO of 80 %

If the specified simultaneity factors are too low for your application, you must base the calculated current consumption on maximum values (see Chapter 5 in this product info).

Procedure

You must **check the safety–relevant and typical current consumption of your** ET200iS configuration!The limit values specified in the table columns =*safety–relevant current consumption in mA* and = *typical current consumption in mA* must **not be exceeded**.

1. Multiply the safety–relevant current value of each module by the number of modules and then enter the result in the column *x Number of modules* and = *and safety–relevant current consumption in mA* .
2. Multiply the typical current value of each module by the number of modules and then enter the result in the column = *typical current consumption in mA* .
3. Add all modules and enter the value in the field *Total number of modules* (max. 32 electronic modules).
4. Add the safety–relevant current consumption and enter the sum in the field *Accumulative current consumption*.
5. Add the typical current consumption and enter the sum in the field *Accumulative current consumption*.
6. Compare the calculated sum totals with the specified limit values.

Table 1 Current consumption calculation table

Electronic modules	**x number of modules**	**safety–relevant current per module in mA**	**= safety–relevant current consumption in mA .**	**typical current per module in mA**	**= typical current consumption in mA**
4DI NAMUR	x	200 mA	=	80 mA	=
2DO 25VDC/25mA[1]	x	330 mA	=	240 mA	=
2DO 25VDC/25mA[2]	x	330 mA	=	160 mA	=
2AI I 2WIRE	x	330 mA	=	200 mA	=
2AI I 4WIRE	x	120 mA	=	50 mA	=
2AI RTD	x	120 mA	=	50 mA	=
2AI TC	x	120 mA	=	50 mA	=
2AO I	x	330 mA	=	200 mA	=
2AI I 2WIRE HART	x	330 mA	=	200 mA	=
2AI I 4WIRE HART	x	120 mA	=	50 mA	=
2AO I HART	x	330 mA	=	200 mA	=
	Total number of modules =		Total current consumption =	Simultaneity factors with typ. current DI: 65%, DO: 80%, AI: 80%, AO: 80%	Accumulative current consumption =
	max. 32		**< 7000 mA**		**< 5000 mA at 40 °C**
					< 4650 mA at 50 °C
					< 4300 mA at 60 °C

1 The maximum current consumption of the connected valves is 25 mA.
2 The maximum current consumption of the connected valves is 12 mA.

Example

An ET 200iS is operated at an ambient temperature of 50 °C . It consists of the following electronic modules:

- 5 modules 4DI NAMUR,
- 5 modules 2DO 25VDC/25mA with 25–mA valves
- 2 modules 2DO 25VDC/12mA with 25–mA valves
- 3 modules 2AI I 2WIRE

- 5 modules 2AI I 4WIRE
- 5 modules 2AI RTD
- 4 modules 2AI TC
- 3 modules 2AO I

When operating with 32 electronic modules at an ambient temperature of 50 °C, the current consumption needs to be checked (< 4650 mA and < 7000 mA):

Table 2 Current consumption calculation table

Electronic modules	**x number of modules**	**safety–relevant current per module in mA**	**= safety–relevant current consumption in mA .**	**typical current per module in mA**	**= typical current consumption in mA**
4DI NAMUR	x ***5***	200 mA	= ***1000 mA***	80 mA	= ***400 mA***
2DO 25VDC/25mA[1]	x ***5***	330 mA	= ***1650 mA***	240 mA	= ***1200 mA***
2DO 25VDC/25mA[2]	x ***2***	330 mA	= ***660 mA***	160 mA	= ***320 mA***
2AI I 2WIRE	x ***3***	330 mA	= ***990 mA***	200 mA	= ***600 mA***
2AI I 4WIRE	x ***5***	120 mA	= ***600 mA***	50 mA	= ***250 mA***
2AI RTD	x ***5***	120 mA	= ***600 mA***	50 mA	= ***250 mA***
2AI TC	x ***4***	120 mA	= ***480 mA***	50 mA	= ***200 mA***
2AO I	x ***3***	330 mA	= ***990 mA***	200 mA	= ***600 mA***
2AI I 2WIRE HART	x	330 mA	=	200 mA	=
2AI I 4WIRE HART	x	120 mA	=	50 mA	=
2AO I HART	x	330 mA	=	200 mA	=
	Total number of modules = ***32 modules***		Total current consumption = ***6970 mA result is OK!***	Simultaneity factors with typ. current DI: 65%, DO: 80%, AI: 80%, AO: 80%	Total current consumption = ***3820 mA result is OK!***
	max. 32		**< 7000 mA**		< 5000 mA at 40 °C
					< 4650 mA at 50 °C
					< 4300 mA at 60 °C

1 The maximum current consumption of the connected valves is 25 mA.
2 The maximum current consumption of the connected valves is 12 mA.

Note

The limit values were complied with under both conditions (safety–relevant and typical current consumption). The ET 200iS can therefore be operated with this configuration.

It must be ensured that the maximum ambient temperature of 50 °C at the power supply module PS is not exceeded.

4 Installation rules: *see Chapter 5.1 of the ET 200iS manual*

Cubicle for ET 200iS in Zone 1

The ET 200iS must be installed in a metal cubicle (stainless steel or steel sheet) of the protection class EEx e (Increased safety).

Cubicle for ET 200iS in Zone 2

The ET 200iS must be installed in a metal cubicle (stainless steel or steel sheet) of the minimum protection class IP 54. A manufacturer's declaration of compatibility has to be available for operation of the cubicle in Zone 2 (according to EN 50021).

5 Technical data of the electronic modules: *see Chapters 13, 14 and 15 of the ET 200iS manual*

Maximum current consumption of the electronic modules

Valid for the maximum current consumption is a simultaneity factor of 100 %, that is, all channels of the ET 200iS station are active simultaneously under maximum power consumption.

Table 3 Maximum current consumption of the electronic modules

Electronic module	Maximum current consumption in mA
4DI NAMUR	90 mA
2DO 25VDC/25mA1	270 mA
2DO 25VDC/25mA[2]	170 mA
2AI I 2WIRE	250 mA
2AI I 4WIRE	50 mA
2AI RTD	50 mA
2AI TC	50 mA
2AO I	250 mA
2AI I 2WIRE HART	250 mA
2AI I 4WIRE HART	50 mA
2AO I HART	250 mA

1 The maximum current consumption of the connected valves is 25 mA.
2 The maximum current consumption of the connected valves is 12 mA.

6 Standards and certifications for the power supply module

The power supply module itemised in Table 4 fulfills the following standards and certifications.

Table 4 Power supply module

Power supply module	Order no.
Power supply module	6ES7138-5EA00-0AA0

ATEX certification

PTB 01 ATEX 2121
according to EN 1127-1:1997, EN 50014:1997+A1+A2, EN 50018:1994, EN 50019:1994 and EN 50020:1994

II 2 G EEx de [ib/ia] IIC/IIB T4

The EC declarations of conformity are kept on file at the following address for the authorities in charge:

Siemens Aktiengesellschaft
Automation and Drives Division
A&D AS RD ST Type Test
Postfach 1963
D-92209 Amberg

UL/CSA certification

HAZ. LOC.

See ***Control Drawing*** **A5E00158421-01**

FM certification

APPROVED

See ***Control Drawing*** **A5E00158421-01**

7 Standards and certifications for the interface module

The interface module itemised in Table 5 fulfills the following standards and certifications.

Table 5 Interface module

Interface module	Order no.
Interface module	6ES7151-2AA00-0AB0

ATEX certification

PTB 01 ATEX 2122
according to EN 50014:1997+A1+A2 and EN 50020:1994
II 2 G EEx ib IIB/IIC T4

The EC declarations of conformity are kept on file at the following address for the authorities in charge:

Siemens Aktiengesellschaft
Automation and Drives Division
A&D AS RD ST Type Test
Postfach 1963
D-92209 Amberg

UL/CSA certification

See ***Control Drawing*** **A5E00158421-01**

HAZ. LOC.

FM certification

See ***Control Drawing*** **A5E00158421-01**

8 Standards and certifications of the electronics modules

The electronics modules itemised in Table 6 fulfill the following standards and certifications.

Table 6 Electronics modules

Electronics modules	Order no.
4DI NAMUR	6ES7131-5RD00-0AB0
2DO DC25V/25mA	6ES7132-5SB00-0AB0
2AI I 2WIRE	6ES7134-5RB00-0AB0
2AI I 4WIRE	6ES7134-5RB50-0AB0
2AI RTD	6ES7134-5SB50-0AB0
2AI TC	6ES7134-5SB00-0AB0
2AI I 2WIRE HART	6ES7134-5TB00-0AB0
2AI I 4WIRE HART	6ES7134-5TB50-0AB0
2AO I	6ES7135-5RB00-0AB0
2AO I HART	6ES7135-5TB00-0AB0

ATEX certification

KEMA 01 ATEX 1150, 1151, 1152, 1153, 1154, 1155, 1156 X
according to EN 50014:1997, EN 50020:1994 and EN 50284:1999


II 2 G (1) GD EEx ib [ia] IIC T4

The EC declarations of conformity are kept on file at the following address for the authorities in charge:

Siemens Aktiengesellschaft
Automation and Drives Division
A&D AS RD ST Type Test
Postfach 1963
D-92209 Amberg

Note

Electronics modules of device category 2G may be used in zone 1 hazardous areas. Sensors of device categories 1G, 2G and 3G may be connected to the intrinsically safe inputs of the electronics modules for zones 0, 1 and 2; sensors of device categories 1D, 2D and 3D may be used for zones 20, 21 and 22.

UL/CSA certification

HAZ. LOC.

See ***Control Drawing*** **A5E00158421-01**

FM certification

See ***Control Drawing*** **A5E00158421-01**

SIEMENS

Product Information

Release 02.2004

RS 485-IS Coupler (6ES7 972-0AC80-0XA0)

This Product Information contains important information concerning the *"ET 200iS Distribute I/O Station"* Manual, order no. 6ES7 151-2AA00-8BA0. Its is to be understood as separate part of the documentation, and in case of any uncertainty overrides all other information in manuals and catalogs.

Special information

This product information refers to PROFIBUS RS 485-IS, and includes a description of PROFIBUS DP Ex i.

Differences between PROFIBUS RS 485-IS and PROFIBUS DP Ex i are documented separately.

Chapter overview

Chapter	Topic	Page
1	Function	2
2	Features	4
3	Installation / Removal	6
4	Wiring	8
5	Commissioning	18
6	Diagnostics	18
7	Maximum configuration	19
8	Technical Specifications	20
9	Order Numbers	25
10	Certifications	25

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1 Function

The RS 485-IS Coupler converts PROFIBUS-DP to PROFIBUS RS 485-IS with intrinsic safety (intrinsic safety ignition type i). The RS 485-IS coupler operates here as a safety barrier. IS stands for “Intrinsically Safe”.

Fields of application

The RS 485-IS Coupler is used to isolate the intrinsically safe PROFIBUS RS 485-IS from PROFIBUS-DP which is not intrinsically safe.

Note

You may connect to the RS 485-IS Coupler:

- Up to 31 stations (Field Devices RS 485-IS) with PROFIBUS RS 485-IS interface,

or

- Up to 16 stations (ET 200iS stations) with PROFIBUS DP Ex i interface.

Mixed mode within the same segment is not permitted!

Structure

- You need an RS 485-IS Coupler in order to be able to operate RS 485-IS field devices or an ET 200iS in potentially explosive atmospheres (see 1 and 2).
- You need two RS 485-IS Couplers to amplify data signals on the bus and couple bus segments (see 3).

  The repeater function by means of two RS 485-IS Couplers is required:

  – When the number of stations operated in the Ex area exceeds the approved number

  – When the maximum cable length is exceeded at a segment in the Ex area

  – To couple a PROFIBUS RS 485-IS segment to a PROFIBUS DP Ex i segment
- The RS 485-IS Coupler also allows you to connect devices to PROFIBUS RS 485-IS which can be operated only in Zone 2, e.g. operating panels (see 4).

Note

The internal bus terminator of the RS 485 IS Coupler must be switched on for operation on PROFIBUS DP Ex i. Looping of the PROFIBUS DP Ex i is not permitted (see 2)!

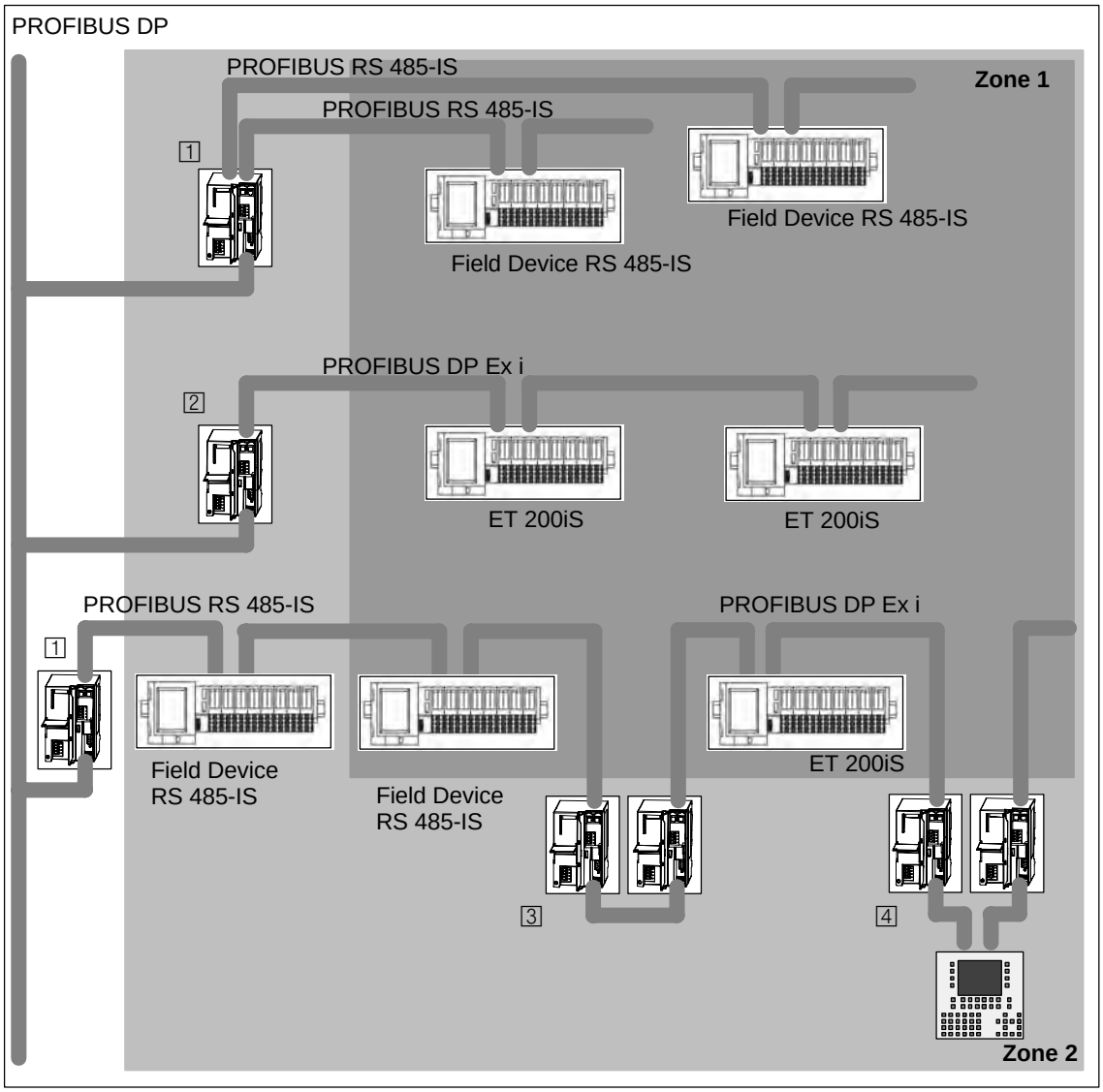


Figure 1 RS 485-IS Coupler Fields of Application

2 Features

Structure

View of the RS 485-IS Coupler:

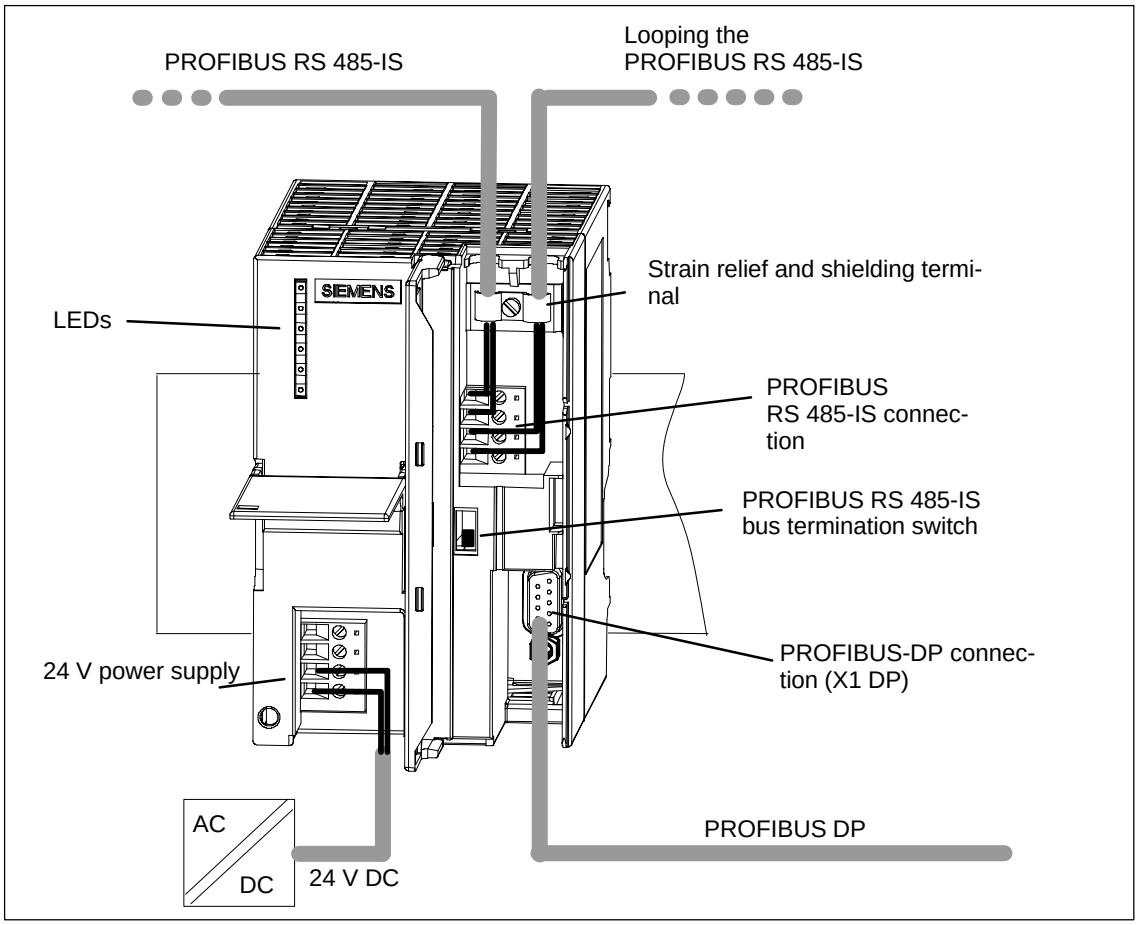


Figure 2 View of the RS 485-IS Coupler

Features

Characteristics of the RS 485-IS Coupler:

- Transmission speed between 9.6 kbps and 1.5 Mbps
- Diagnostics by means of LED indicators
- Integrated bus termination for PROFIBUS RS 485-IS
- Up to 31 / 16 stations can be operated on any RS 485-IS Coupler (see Chapter 8.3 Technical data).
- Repeater function for the Ex area by means two RS 485-IS Couplers (same response as RS 485 Repeater)
- Certification to ATEX 100a
- Corresponding equipment for use in potentially explosive areas Zone 1, 2
- Intrinsic safety for PROFIBUS RS 485-IS subnet

Operation of the RS 485-IS Coupler as RS 485 Repeater

In order to be able to increase the lengths of your PROFIBUS RS 485-IS segments in the Ex area, you may operate two RS 485-IS Couplers in RS 485 repeater mode. Please note:

- You may operate a maximum of five segments in series.
- The segment cable length specified in the technical data in Chapter 8.3 must be adhered to.

3 Installation / Removal

Installation Position

The RS 485-IS Coupler can be mounted vertically or horizontally. The maximum ambient temperature in vertical mounting position is 40° C.

Open Equipment

The RS 485-IS Coupler is an of the open equipment class, i.e. it may only be installed in lockable or mechanically secured enclosures, cabinets or electrical switch rooms. Access to these enclosures, cabinets or electrical switch rooms is only permitted to instructed or authorized personnel.

Installation technique

The RS 485-IS Coupler is mounted on a DIN rail for S7 installation technology. Make allowances for trouble–free installation by maintaining a clearance of 40 mm at the bottom and the top of the module.

For further information relating to the S7 installation technique for modules, refer to the *S7-300 Automation System, Installation* Installation Manual.

Note

The RS 485-IS Coupler does not transfer signals on the S7 backplane bus.

Installation location

The RS 485-IS Coupler may be operated in potentially explosive atmospheres of Zone 2, provided it is mounted in suitable enclosures. The PROFIBUS RS 485-IS bus cable may be routed from the potentially explosive area to Zone 1.

Enclosures for Zone 2

The RS 485-IS Coupler must be installed in an enclosure with minimum IP 54. For operation of the enclosure and cable glands in Zone 2 a declaration of conformity to EN 50021 must be provided by the manufacturer.

Danger

Installation procedures may cause ignition by sparking or impermissible surface temperatures.

Never install the equipment under potentially explosive conditions !

Components Required

- Profile rail for S7 installation technology
- RS 485-IS Coupler

The order numbers are found in Chapter 9.

Installation

1. Mount the S7 profile rail onto a solid carrier.
2. Suspend the RS 485-IS Coupler onto the S7 profile rail, and then swivel it downwards.
3. Screw-tighten the RS 485-IS Coupler.

Removal

You remove the RS 485-IS Couplers in reverse sequence.

Before you remove an RS 485-IS Coupler that is in operation, switch off the 24 V DC power supply to the coupler.

4 Wiring

Note

Before you start wiring the system, please note the information in “General rules and regulations for wiring” in Chapter 6 of the *Distributed i/O device ET 200iS* Manual.

Chapter overview

Chapter	Topic	Page
4.1	Potential Isolation and Grounding	8
4.2	Operation on a grounded power supply	9
4.3	Operation with ungrounded reference potential	11
4.4	Terminals of the RS 485-IS Coupler	12
4.5	Connecting the power supply	13
4.6	Connecting PROFIBUS-DP	14
4.7	Connecting PROFIBUS RS 485-IS	15

4.1 Potential Isolation and Grounding

You may wire up a grounded or ungrounded 24 V power supply system, depending on the requirements of your assembly.

Characteristics of the RS 485-IS Coupler

- PROFIBUS-DP and the internal logic are galvanically interconnected
- PROFIBUS-DP and PROFIBUS RS 485-IS are galvanically isolated from the 24 V power supply
- PROFIBUS-DP is galvanically isolated from PROFIBUS RS 485-IS

4.2 Operation on a grounded power supply

Definition: Grounded–Neutral Supply

In a grounded power supply system, the neutral conductor of the mains is bonded to earth. A short of the live conductor to ground or to chassis ground of the system trips the protective devices.

Components and Protective Measures

Regulations prescribe various system components and compulsory protective measures for the installation of a plant. The type of components and compulsory protective measures depends on which DIN VDE regulation applies to your system installation.

- Master switch (see Figure 3, 1): DIN VDE 0100 Part 460
- Isolating link (see Figure 3, 1): DIN VDE 0113 part 1

RS 485-IS Coupler on Grounded–Neutral Power Supply

Figure 3 shows the position of the RS 485-IS Coupler in a system connected to a TN-S power network. When the RS 485-IS Coupler is connected to grounded reference potential, all parasitic currents are discharged to ground via the grounding conductor.

Note

To operate the RS 485-IS in grounded mode, you need to bridge its M and functional ground terminals!

Note: The displayed setup of the power supply connections does not actually correspond with the live arrangement, but was selected for reasons of clarity.

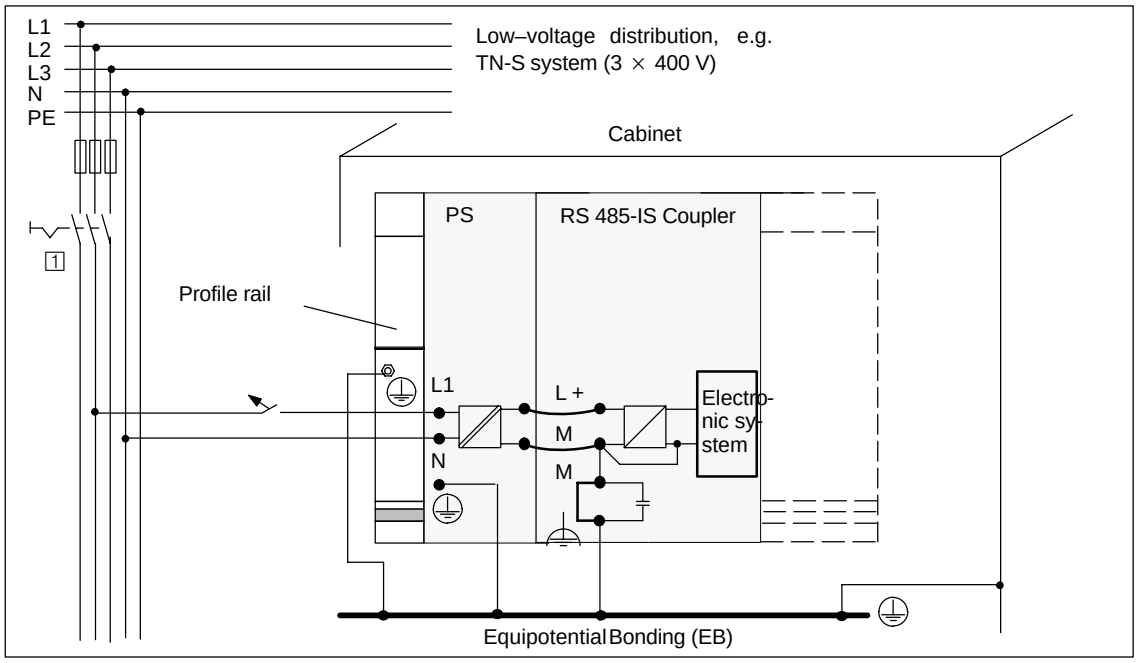


Figure 3 Operating the RS 485-IS Coupler on Grounded–Neutral Power Supply

4.3 Operation with ungrounded reference potential

Application

In large–scale systems you may have to install the RS 485-IS Coupler with ungrounded reference potential, for example, for monitoring short–circuit to ground. This applies in particular to systems operated in the chemical industry or in power plants, for example.

Discharging Parasitic Currents

In RS 485-IS Coupler installations with ungrounded reference potential, developing parasitic currents are discharged to protective ground via an integral capacitor (see Figure 4).

Wiring Diagram

Figure 4 shows an installation of the RS 485-IS Coupler with ungrounded reference potential. If you choose not to ground the reference potential of the 24 V power of your RS 485-IS Coupler, you need to **remove the jumper between the M terminals and system ground**. As long as this jumper is removed, the reference potential of the RS 485-IS Coupler is connected internally to the profile rail and the grounding conductor via a capacitor.

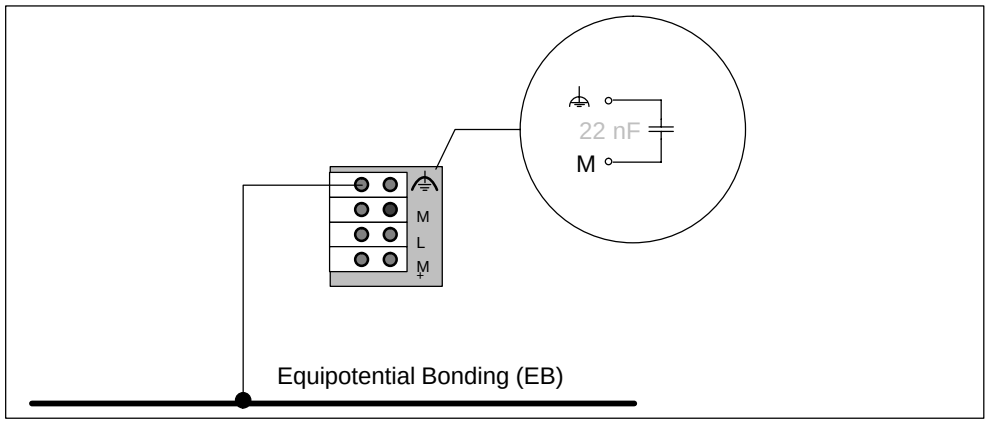


Figure 4 Installing the RS 485-IS Coupler with Ungrounded Reference Potential

4.4 Terminals of the RS 485-IS Coupler

Terminals for coupler mode

The figure below shows you the connections you need to wire up in order to operate the RS 485-IS Coupler:

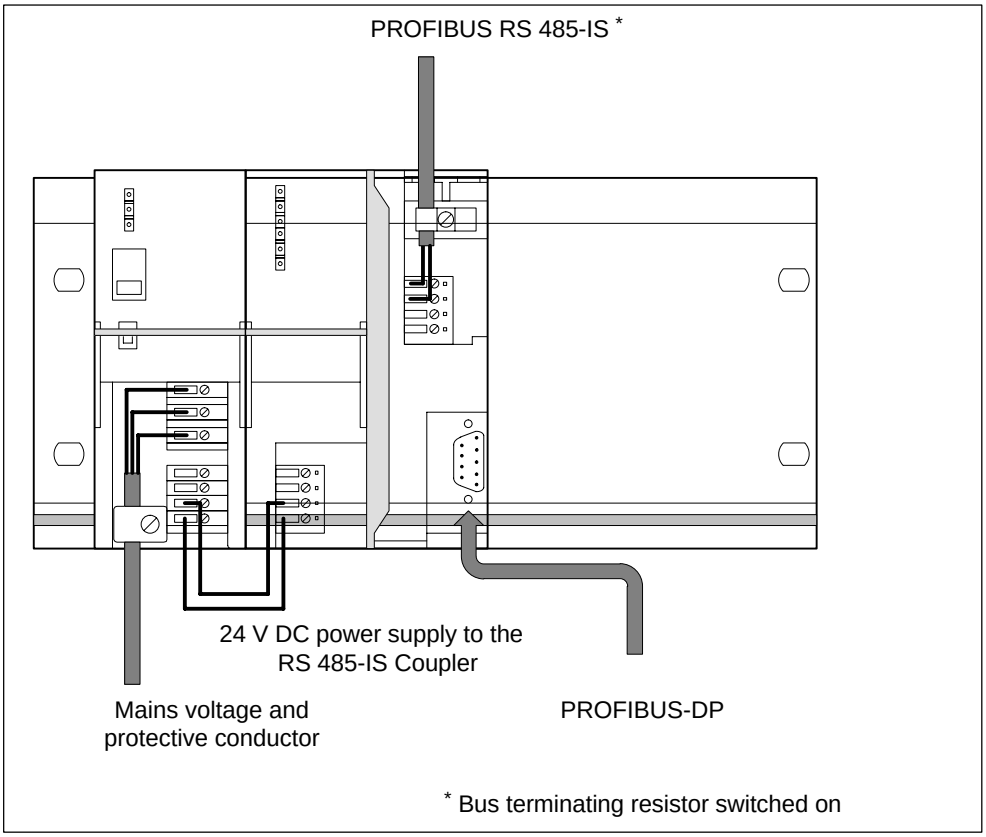


Figure 5 Terminals for coupler mode

Terminals for RS 485 Repeatermode

You need two RS 485-IS Couplers for operation in RS 485 Repeater mode. The figure below shows you the connections required for operation in RS 485-Repeater mode in Ex areas:

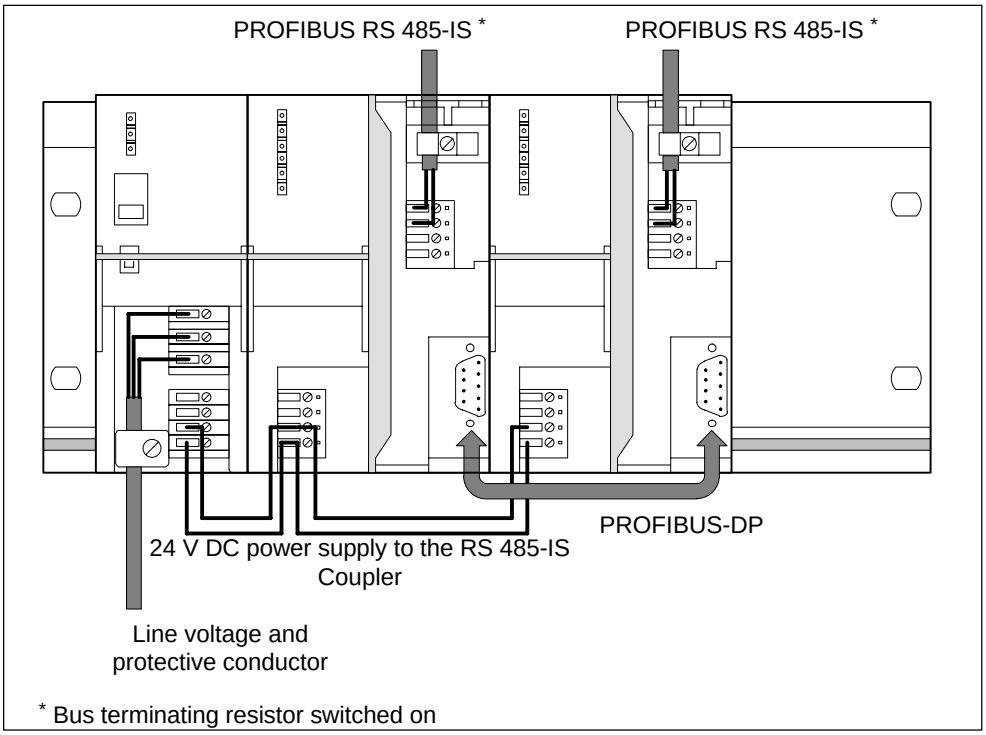


Figure 6 Terminals for RS 485 Repeatermode

4.5 Connecting the power supply

Tools required

You need a screwdriver with a 3 mm blade to terminate the power supply cables.

Power supply terminals

Pin assignment of the 4-pole screw terminals for the 24 V power supply:

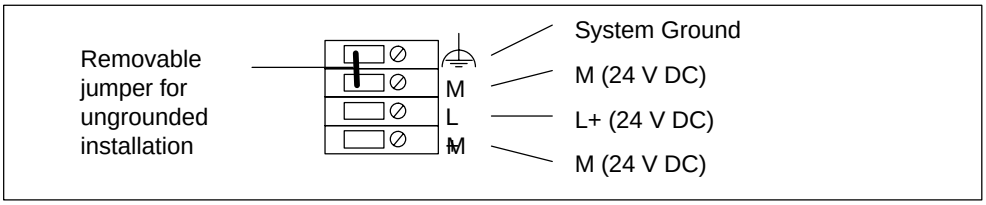


Figure 7 Power supply for the RS 485-IS Coupler

The maximum conductor cross-section is 2.5 mm^2. A strain relief is not provided.

4.6 Connecting PROFIBUS-DP

Tools required

You need a screwdriver with a 3 mm blade to terminate the power supply cables.

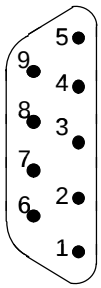
Bus cables and connectors

Always use the accessories specified in Chapter 4.7 for PROFIBUS-DP.

PROFIBUS-DP Connector

The 9-pin PROFIBUS-DP connector is located behind the bottom of the right-hand front-panel door of your RS 485-IS Coupler. Designation of the terminals:

Table 1 Pin-assignment of the PROFIBUS-DP connector

View	Pin	Signal	Description
	1	–	–
	2	–	–
	3	RxD / TxD–P	Data line B (suggested: red)
	4	RTS	Request To Send
	5	M5V	Data reference potential (from station)
	6	P5V	Power supply + (from station)
	7	–	–
	8	RxD / TxD–N	Data line A (suggested: green)
	9	–	–

Procedure

To connect your PROFIBUS-DP:

1. Insert the bus connector into the PROFIBUS socket.
2. Screw–tighten the bus connector.
3. When you install the RS 485-IS Coupler at the end of the PROFIBUS-DP segment, you need to switch on the terminating resistor on the bus connector.

4.7 Connecting PROFIBUS RS 485-IS

The following contents are mandatory for the installation of PROFIBUS RS 485-IS:

- PNO guideline “PROFIBUS RS 485-IS User and Installation Guide, Version 1.0, May 2003
  PROFIBUS-Nutzerorganisation e. V.,
  Haid-und-Neu-Straße 7, D-76131 Karlsruhe, Germany

  Further information is found on the Internet:

  http://www.profibus.com.
- Installation regulations to IEC 60079-14 (Installation of Electrical Systems in Potentially Explosive Atmospheres)

Warning

Always bond the RS 485-IS Coupler to equipotential ground before you connect the PROFIBUS RS 485-IS at its terminals!

Tools required

You need a screwdriver with a 3 mm blade to terminate the PROFIBUS RS 485-IS cables.

PROFIBUS RS 485-IS connector

The 4-pole screw terminals for the PROFIBUS RS 485-IS are located below the right–hand side of the front door of the RS 485-IS Coupler. Designation of the terminals:

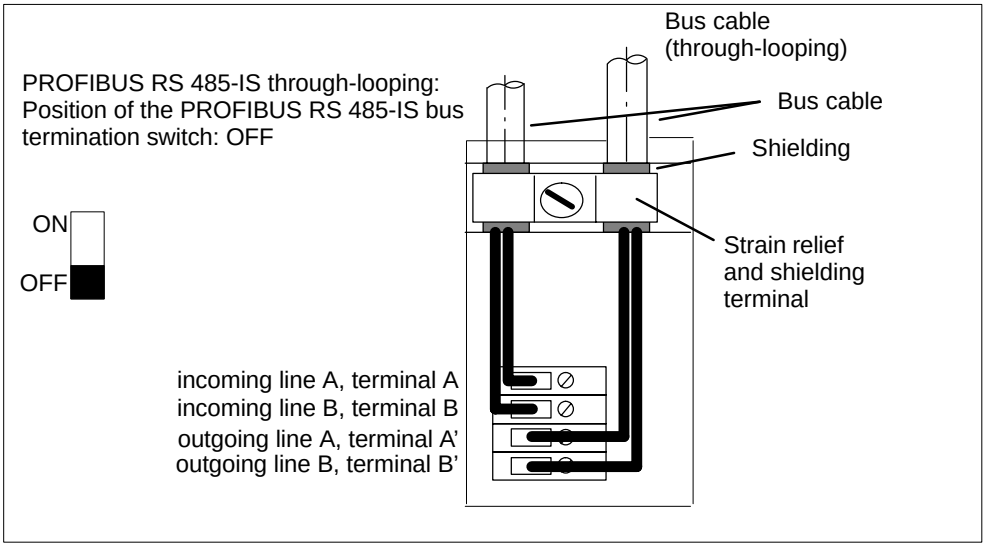


Figure 8 PROFIBUS RS 485-IS connection

Note

The signal is not amplified between the two screw terminals of the PROFIBUS RS 485-IS cable!

PROFIBUS RS 485-IS bus termination switch

The RS 485-IS Coupler is equipped with a PROFIBUS RS 485-IS bus termination switch:

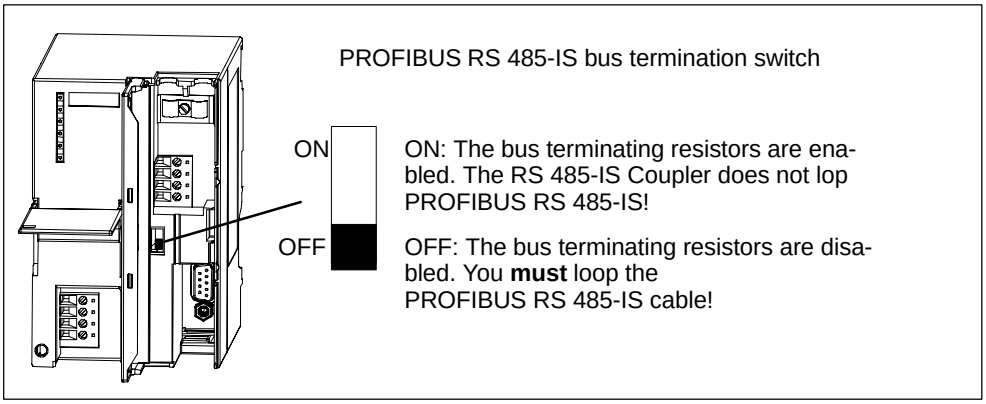


Figure 9 PROFIBUS RS 485-IS bus termination switch

Procedure

How to wire the PROFIBUS RS 485-IS cable:

1. Strip the bus cable as shown in Fig 10 and fold the shielding braid back over the insulation.

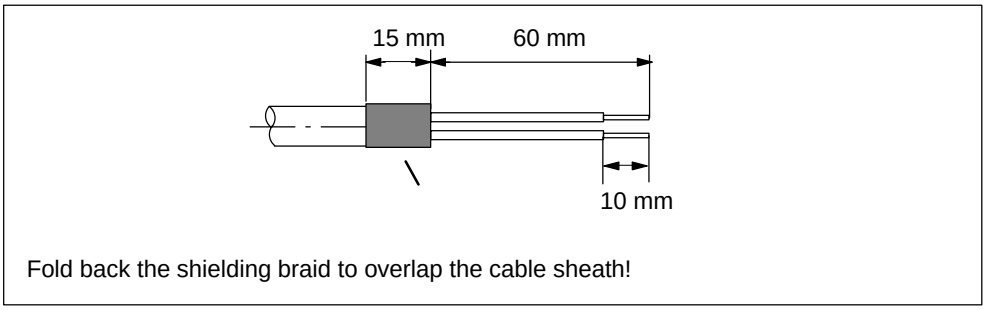


Figure 10 Stripping lengths

2. Place the shielding of the bus cable underneath the strain relief, and then screw–tighten this.
3. Terminate your bus cable at the screw terminals A and B. Make sure of the correct polarity (e.g. green wire to terminal A, red wire to terminal B).

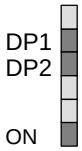
5 Commissioning

Requirements

After you have completed the assembly and wiring of the RS 485-IS Coupler and after you have switched on the power supply, the device is ready for operation.

6 Diagnostics

Table 2 Status and error messages of the RS 485-IS Coupler



DP1: LED for PROFIBUS DP (yellow)
DP2: LED for PROFIBUS RS 485-IS (yellow)

ON: 24 V power supply to the RS 485-IS Coupler (green)

LEDs			Meaning	Remedy
DP1	**DP2**	**ON**		
*	*	on	Power to the RS 485-IS is switched on. The RS 485-IS Coupler is ready for operation.	–
off	off	off	Power to the RS 485-IS is not switched on, or the RS 485-IS Coupler is in error state.	Check the 24 V power supply to your RS 485-IS Coupler, or contact your Siemens partner.
flashes	*	on	PROFIBUS-DP message frames are received.	–
off	*	on	PROFIBUS-DP message frames are not received. Causes: • The DP Master is offline. • The bus cable is damaged.	• Check the proper seating of the bus connector. • Check the bus cable connection to the DP master. • Switch the 24 V DC power module off and on again.
*	flashes	on	Receiving PROFIBUS RS 485-IS datagrams.	–
*	off	on	No datagrams from PROFIBUS RS 485-IS, e.g. • a station does not respond. The station may not be addressed. • The bus cable is damaged.	• Check the stations which are connected to PROFIBUS RS 485-IS. • Check the bus cable connection to the DP master.

* Irrelevant

7 Maximum configuration

Introduction

In order to be able to use distributed i/O devices in Ex area Zone 1, the PROFIBUS DP must be installed intrinsically safe. You can separate the intrinsically safe PROFIBUS RS 485 IS from PROFIBUS DP with the help of the RS 485-IS Coupler.

Safety Data

At the RS 485-IS Coupler, you may only connect field devices which are certified for operation on a PROFIBUS RS 485-IS interface or ET 200iS with PROFIBUS DP Ex i interface:

- Up to 31 stations (Field Devices RS 485-IS) with PROFIBUS RS 485-IS interface,
- Up to 16 stations (ET 200iS stations) with PROFIBUS DP Ex i interface.

Mixed mode within the same segment is not permitted!

8 Technical Specifications

Chapter overview

Chapter	Topic	Page
8.1	General Technical Specifications	20
8.2	Standards, Certificates and Approvals	21
8.3	Technical Specifications	24

8.1 General Technical Specifications

General technical data of the RS 485-IS Coupler are found in Chapter 9 of the *Distributed I/O Device ET 200iS* Manual. Standards and approvals for the RS 485-IS Coupler are found in the following chapter 8.2.

Climatic Ambient Conditions

The following specification concerning the ambient climatic conditions for operation the of RS 485-IS Coupler overrides the general technical data in the *Distributed I/O Devices ET 200iS* Manual:

Table 3 Climatic Ambient Conditions

Ambient Conditions	Permissible Range
Temperature	
• Horizontal mounting position	– 25 to 60 °C
• Vertical mounting position	– 25 to 40 °C

8.2 Standards, Certificates and Approvals

The RS 485-IS Coupler is compliant with the following standards and approvals.

CE Certification

The RS 485-IS Coupler meets the requirements and safety objectives of the following EC directives, and it is compliant with the harmonized European standards (EN) which are published in the official documentation of the European Union:

- 89/336/EC ”Electromagnetic Compatibility” (EMC Guideline)
- 73/23/EC ”Electrical Equipment for Operation Within Specific Voltage Limits” (low-voltage guideline)

The EC Declarations of Conformity are available to the relevant authorities at:

Siemens Aktiengesellschaft
Automation and Drives
A&D AS RD ST PLC
PO-Box 1963
D-92209 Amberg

UL and CSA certification

Underwriters Laboratories Inc. to

- UL 508 (Industrial Control Equipment)
- CAN/CSA C22.2 No. 14-M91 (Process Control Equipment)
- UL 1604, Third Edition (Hazardous Location)
- UL 913, Sixth Edition (Hazardous Location)
- UL 2279, First Edition (Hazardous Location)
- CAN/CSA C22.2 No. 213-M1987
- CAN/CSA C22.2 No. 157-92
- E79-11 und E79-15

APPROVED for use in
Class I, Division 2, Group A, B, C, D T4;
Class I, Zone 2, Group IIC T4
AIS Class I, Division 1, Group A, B, C, D
[AExib] IIC, Class I, Zone 1, 2, Group IIC

FM certification (in preparation)

Factory Mutual Research (FM) to Approval Standard Class Numbers 3600 (1998), 3610 (1999), 3611 (1999), 3810 (1989),
Class I, Division 2, Group A, B, C, D T4
Class I, Zone 2, Group IIC T4
AIS Class I, Division 1, Group A, B, C, D
[AExib] IIC, Class I, Zone 1, 2, Group IIC

ATEX certification

KEMA 03 ATEX 1183 X to EN 50014:1997, EN 50020:2002, EN 50021:1999 and EN 50284:1999


II 3 (2) G EEx nA [ib] IIC T4

The EC Declarations of Conformity are available to the responsible authorities at:

Siemens Aktiengesellschaft
Automation and Drives
A&D AS RD ST PLC
PO-Box 1963
D-92209 Amberg

IEC 61131

The RS 485-IS Coupler meets the requirements and criteria of the Standard IEC 61131-2 (Programmable Logic Controllers, Part 2: Equipment Requirements and Testing).

PROFIBUS Standard

The RS 485-IS Coupler is based on the Standard *IEC 61784-1:2002 Ed1 CP 3/1.*

Shipbuilding certification (in preparation)

Classification Societies:

- 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)

Industrial Use

SIMATIC products are designed for industrial applications.

Table 4 Industrial Use

Fields of application	Requirements on	
	Noise emission	Interference-proofing
Industry	EN 61000-6-4: 2001	EN 61000-6-2: 2001

Operation in Residential Areas

To operate the RS 485-IS Coupler in residential areas, the degree of radio interference must comply with limit class B to EN 55011.

Suitable measures for ensuring radio interference limit class B are:

- Installation of the RS 485-IS Coupler in grounded switch cabinets/cubicles
- Installation of noise filters in the supply lines

Warning

There is a risk of harm to persons and material damage.

In potentially explosive locations there is a risk of harm to persons and material damage, if you disconnect a connector while the RS 485-IS Coupler is in operation.

In potentially explosive locations, always switch off power before you disconnect any one of the RS 485 Coupler connectors.

8.3 Technical data RS 485-IS Coupler (6ES7 972-0AC80-0XA0)

Dimensions and Weight	
Dimensions W × H × D (mm)	80 × 125 × 130
Weight	approx. 500 g
Module–specific Data	
Transmission rate on PROFIBUS-DP, PROFIBUS RS 485-IS	9.6; 19.2; 45.45; 93.75; 187.5; 500 kbps; 1.5 Mbps
Bus protocol	PROFIBUS-DP
Voltages, Currents, Potentials	
Power supply voltage to the RS 485-IS Coupler	24 V DC (20.4 V to 28.8 V)
• Polarity reversal protection	yes
• Power failure buffering	min. 5 ms
Potential isolation of the 24 V power supply	
• to PROFIBUS-DP	yes
Tested with	DC 500 V
• to PROFIBUS RS 485-IS	yes
Tested with	AC 1500 V
Current consumption of the RS 485-IS Coupler (24 V DC)	max. 150 mA
Power loss of the module	typically 3 W
Status, Interrupts, Diagnostics	
Status display	No
Interrupts	none
Diagnostic Functions	yes
• PROFIBUS-DP (primary) bus monitoring	yellow LED ”DP1”
• PROFIBUS RS 485-IS (secondary) bus monitoring	yellow LED ”DP2”
• 24 V power supply monitoring	green LED ”ON”

Notes on safety		
• U_0 =	V_{DC} =	4.2 V
• I_0 =	I_{SC} =	93 mA
• P_0 =	0.1 W	
• Ui	$V_{max.}$=	± 4.2 V
• Li, Ci	≈ 0 (can be neglected)	
• Am =	250 VAC	
• T_a =	-25 to +60 °C	
RS 485-IS segment		
permissible cable length for one segment	RS 485-IS	DP Ex i
• 9.6 to 187.5 kbps	1000 m	200 m
• 500 kbps	400 m	200 m
• 1.5 Mbps	200 m	200 m
Maximum number of stations on PROFIBUS DP	max. 31	max. 16
PROFIBUS RS 485-IS bus termination switch	integral, switched	

9 Order numbers

Table 5 RS 485-IS Coupler Order Number

Component	Order Number
RS 485-IS Coupler	6ES7 972-0AC80-0XA0
Profile rail for S7 installation technology	
• 480 mm	6ES7 390-1AE80-0AA0
• 530 mm	6ES7 390-1AF30-0AA0
• 620 mm	6ES7 390-1AJ30-0AA0
• 2000 mm	6ES7 390-1BC00-0AA0
PROFIBUS-DPbus connector	
• for PROFIBUS-DP through–loop (without PG socket)	6ES7 972-0BA30-0XA0
PROFIBUS-DP bus cable	
• standard (flexible)	6XV1 830-0EH10

10 Certifications

Chapter overview

Topic
EC-TYPE EXAMINATION CERTIFICATE
Declaration of EC-Conformity

translation

Original language: German

(1) EC-TYPE EXAMINATION CERTIFICATE

(2) Equipment or protective system intended for use in potentially explosive atmospheres - Directive 94/9/EC

(3) EC-Type Examination Certificate Number: **KEMA 03ATEX1183 X**

(4) Equipment or protective system: **Coupler RS 485-IS Model 6ES7 972 – 0AC80 – 0XA0**

(5) Manufacturer: **SIEMENS AG**

(6) Address: **Werner-von-Siemens-Strasse 50, 92224 Amberg, Germany**

(7) This equipment or protective system and any acceptable variation thereto is specified in the schedule to this certificate and the documents therein referred to.

(8) KEMA Quality B.V., notified body number 0344 in accordance with Article 9 of the Council Directive 94/9/EC of 23 March 1994, certifies that this equipment or protective system has been found to comply with the Essential Health and Safety Requirements relating to the design and construction of equipment and protective systems intended for use in potentially explosive atmospheres given in Annex II to the directive.

The examination and test results are recorded in confidential report no. 2026281.

(9) Compliance with the Essential Health and Safety Requirements has been assured by compliance with:

EN 50014 : 1997 **EN 50020 : 2002** **EN 50021 : 1999**

(10) If the sign "X" is placed after the certificate number, it indicates that the equipment or protective system is subject to special conditions for safe use specified in the schedule to this certificate.

(11) This EC-Type Examination Certificate relates only to the design, examination and tests of the specified equipment or protective system according to the Directive 94/9/EC. Further requirements of the directive apply to the manufacturing process and supply of this equipment or protective system. These are not covered by this certificate.

(12) The marking of the equipment or protective system shall include the following:

II 3(2) G EEx nA [ib] IIC T4

Arnhem, 15 September 2003
KEMA Quality B.V.

C.G. van Es
Certification Manager

KEMA Quality B.V.
Utrechtseweg 310, 6812 AR Arnhem, The Netherlands
P.O. Box 5185, 6802 ED Arnhem, The Netherlands
Telephone +31 26 3 56 20 08 Telefax +31 26 3 52 58 00

ACCREDITED BY THE DUTCH COUNCIL FOR ACCREDITATION

KEMA

(13) # SCHEDULE

(14) **to EC-Type Examination Certificate KEMA 03ATEX1183 X**

(15) **Description**

The Coupler RS 485-IS Model 6ES7 972 – 0AC80 – 0XA0 is used for safe separation between intrinsically safe and non-intrinsically safe PROFIBUS-DP segments.
The intrinsically safe circuits at terminal block X3 are suitable for connection to a fieldbus system.

Ambient temperature range -25 °C ... +60 °C.

Electrical data

Supply circuit..... U_n = 20,4...28,8 Vdc
Terminal block X1 (L+ und M) I_{max} = 120 mA
U_m = 250 Vac

Input/Output RS 485-IS ..... in type of protection intrinsic safety EEx ib IIC, with
Terminal block X3 (A, B, A', B') the following maximum values:

U_o = 4,2 V
I_o = 93 mA (linear)
P_o = 0,1 W

The cable connected to the Input/Output shall not exceed the values of L/R = 30 µH/Ohm and C = 500 nF/km.
The effective internal capacitance C_i and inductance L_i of the other equipment connected to this circuit shall be negligibly small.

And only for connection to a certified intrinsically safe circuit (for instance a fieldbus system), with the following maximum values:

U_i = 4,2 V

I_i and P_i are determined by U_i. The effective internal capacitance C_i and inductance L_i are negligibly small.

All intrinsically safe circuits are infallibly galvanically isolated from all other circuits up to a peak voltage of 375 V.

Routine tests

The transformer T1400 shall be subjected to a routine test, as laid down in drawing No. 4NEA 999 3945 01.

(16) **Report**

KEMA No. 2026281.

KEMA

(13) # SCHEDULE

(14) **to EC-Type Examination Certificate KEMA 03ATEX1183 X**

(17) **Special conditions for safe use**

The Coupler RS 485-IS Model 6ES7 972 – 0AC80 – 0XA0 shall be installed in a metal enclosed panel or rack providing a degree of ingress protection of at least IP54 according to EN 60529, taking into account the environmental conditions under which the equipment will be used.

When at any cable or cable entry point of this panel or rack the temperature under rated conditions is higher than 70 °C or the temperature under rated conditions at the branching point of the conductors is higher than 80 °C, the temperature specifications of the selected cables should be higher than the actual measured temperature values.

These conditions apply only for applications which require category 3 equipment.

(18) **Essential Health and Safety Requirements**

Covered by the standards listed at (9).

(19) **Test documentation**

			dated
1.	Com_Types_Reassurance.doc		04.07.2003
2.	Drawing No.	A5E00187495B (8 sheets))	
		A5E00187455A (9 sheets))	
		A5E00187455 (5 sheets))	
		A5E00187455B (4 sheets))	
		A5E00149490B (2 sheets))	
		A5E00187455A (9 sheets))	11.07.2003
		A5E00219050A)	
		A5E00187492A (7 sheets))	
		A5E00187492 (3 sheets))	
		A5E00187492B (3 sheets))	
		A5E00219051A)	
		4NEA 999 3945 01	19.08.2003

SIEMENS

Declaration of EC-Conformity

We

Siemens AG,
A&D AS

Werner-von-Siemens-Straße 50,
92224 Amberg

declare under our sole responsibility that the product:

Coupler RS 485-IS Model 6ES7 972-0AC80-0XA0
(name, type or model)

to which this declaration relates is in conformity with the following standards or normative documents:

EN 50014: 1997, EN 50020: 2002, EN 50021: 1999,
EN 61000-6-2: 2001, EN 61000-6-4: 2001
(title and / or number and date of issue of the standards or other normative documents)

The indicated product is in conformance with the regulation of the following European Directives:

94/9 EC As set out in Article 9 of the European Community guideline 94/9/EC of 23 March 1994, the fundamental safety and health requirements for the conception and construction of devices and protection systems for agreed use in hazardous areas are confirmed in accordance with Appendix II of the guideline.

Name of notified body - EC type evaluation certificate No.:

KEMA 03 ATEX 1183 X
N.V. KEMA
Utrechtseweg 310
6812 AR Arnhem
Postfach 9035, 6800 ET Arnhem, Niederlande

Identification No. of notified body "Production control"

0344

89/336/EEC Council Directive on the harmonization of the laws of the member states relating to electromagnetic compatibility (EMC Directive).

Amberg, 2003-09-15
(place and date of issue)

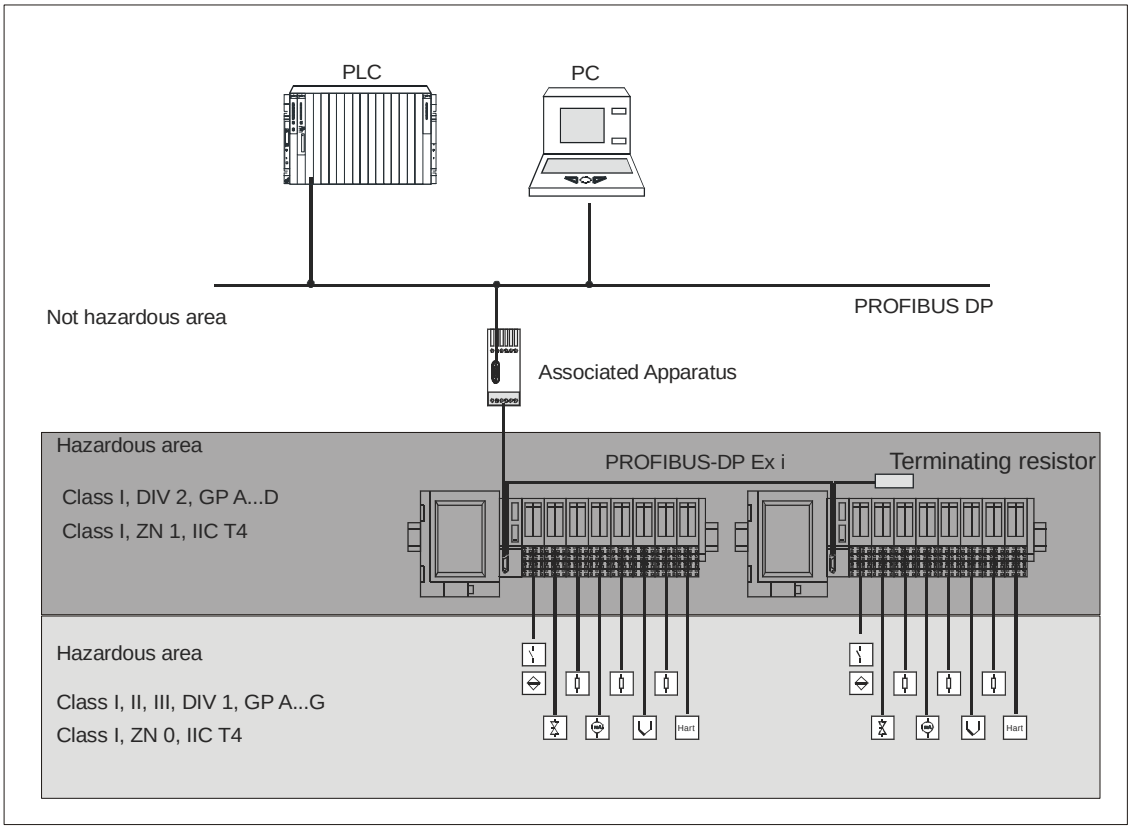
Grosser/A&D AS RD 4 Rappl/A&D AS EWA QSD
(name and signature or equivalent marking of authorized person)

SIEMENS

Intrinsic Safety Control Drawing

A5E00158421-01

ET 200iS **system in total**



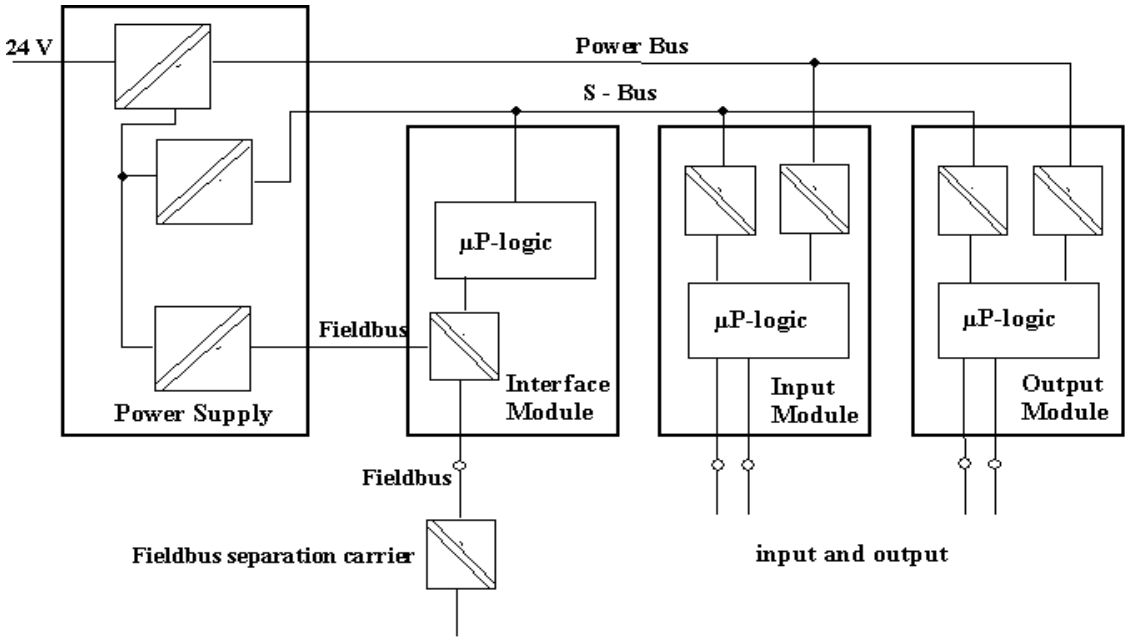
The complete interface system ET 200iS with its components is represented in the Control Drawing.

You can find the pin configuration in the manual “SIMATIC ET 200iS Distributed I/O Station“.

Intrinsic Safety Control Drawing A5E00158421-01

ET 200iS system in total

The supply (of electrical energy) of the components is represented in the following drawing.



Notes

1. POWER SUPPLY
   The power supply supplies the Interface Module, the I/O electronic modules and the field circuit. The power supply provides the following supplies:
   - Power Bus for the I/O modules and the field circuit
   - Electrical circuit for S-Bus and Interface Module
   - Electrical circuit for external field bus system

   The power supply is specified in the following.
2. INTERFACE MODULE
   The Interface Module is the connector between the fieldbus and the internal Bus of the ET 200iS with the I/O modules. The input and output data are processed.
3. I / O MODULES
   There are as many as 32 I/O modules arranged in the internal bus system (taking into account a maximum supply current of 7 A total). You can find the rule to determine the maximum number of modules in the manual “SIMATIC ET 200iS Distributed I/O Station“. Respective to the module type they enable the activation of the process interface.
   This applies to the complete system installed within the hazardous (classified) area. The maximum current drawn by each module is shown as I_{supply} on the following pages.

ET 200iS **system in total**

4. The above mentioned power supply, the IM and the I/O modules may be inserted and removed within the (classified) hazardous area while powered.
5. Third party approved associated apparatus must be installed in accordance with manufacturer instructions.
6. The maximum voltage U_M used or generated by the equipment installed outside the hazardous area may not exceed 250 Vac.
7. The installation must be in accordance with NEC ANSI / NFPA 70 Article 504 or 505, ANSI / ISA-RP 12.6 and CEC section 18.
8. For installation in Class II, Division 1 or 2 and Class III, Divison 1 or 2 Hazardous (Classified) Locations, the system must be installed in an NRTL listed dust-ignition-proof enclosure suitable for such locations.
9. The entity concept allows connection between intrinsically safe apparatus and intrinsically safe and associated apparatus when the following rules are followed:
   U_o, $V_{oc} \leq U_i$, V_{max}

   I_o, $I_{sc} \leq I_i$, I_{max}

   $P_o \leq P_i$, P_{max}

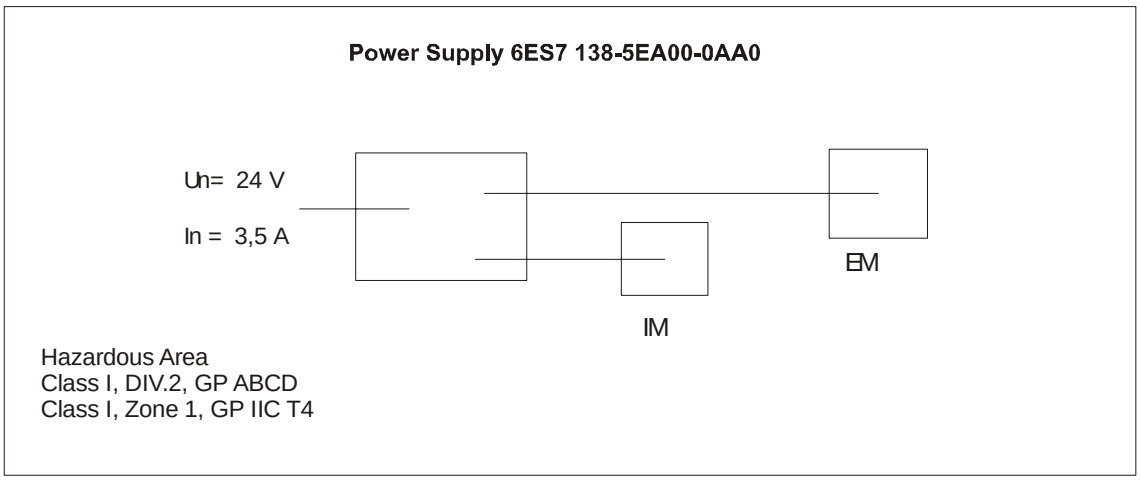
   C_o, $C_a \geq C_i + C_{cable}$

   L_o, $L_a \geq L_i + L_{cable}$

10. WARNING: SUBSTITUTION OF COMPONENTS MAY IMPAIR THE INTRINSIC SAFETY OR SUITABILITY FOR DIVISION 2

Intrinsic Safety Control Drawing A5E00158421-01

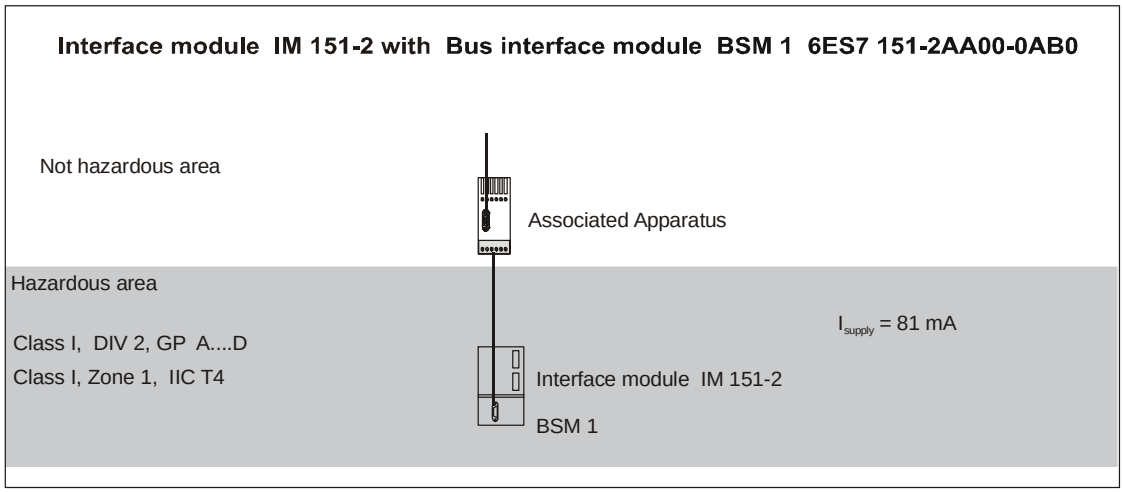
ET 200iS **6ES7 138-5EA00-0AA0**



Use with TM-PS part No. 6ES7 193-5DA00-0AA0.

Intrinsic Safety Control Drawing A5E00158421-01

ET 200iS **6ES7 151-2AA00-0AB0**



You can find the pin configuration in the manual „SIMATIC ET 200iS Distributed I/O Station“, chapter 12.

Use with TM-IM/BSM P/N 6ES7 193-5DB00-0AA0.

The following parameters for the RS 485 fieldbus connection apply to the interface module:

	Fieldbus
U_o, V_{oc} [V_{dc}]	4,2
I_{sc}, I_o [mA]	100
P_o, [mW]	106
U_i, V_{max} [V_{dc}]	4,2 (*)

(*) I_i, I_{max}, P_i can be any value

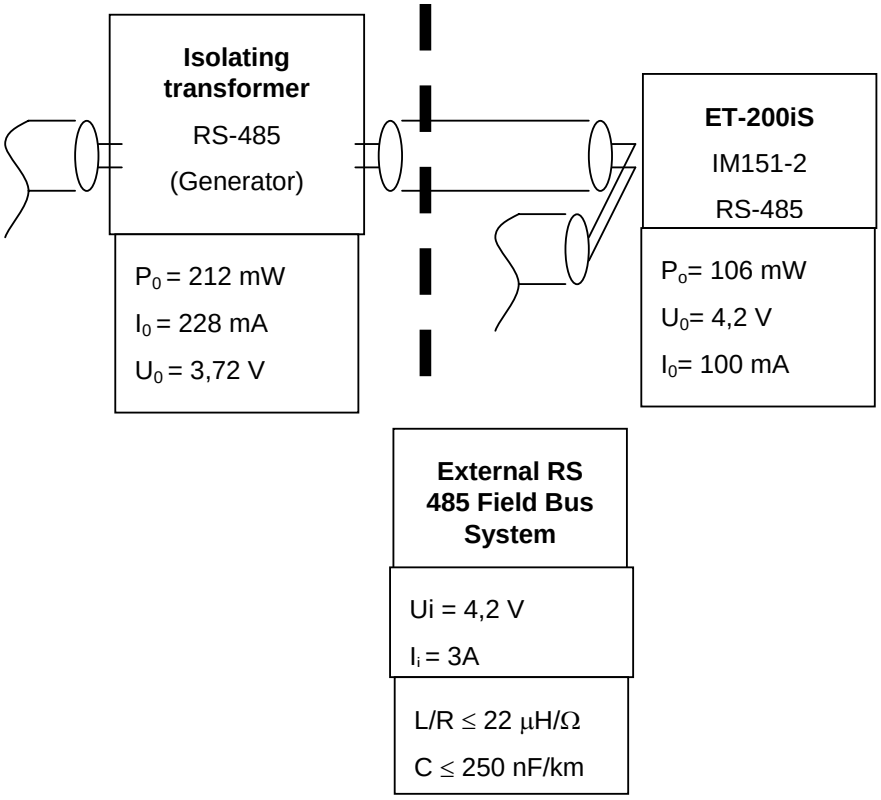
The following merits apply to the fieldbus line:

Must be in accordance with NEC 504.30B:

- L‘ / R‘ ≤ 22 µH / Ω (loopresistance)
- C‘ ≤ 250 nF / km
- Litz wire diameter ≤ 0,2 mm
- Concentrated inductance and capacitance are not allowed in the running of the external RS 485 fieldbus system.
- In applications where concentrated inductance and capacitance are considered the following values apply: C_o, $C_a \leq$ 100 µF (A, B/IIC) or $\leq$ 1000 µF (C, D/IIB)
  and L_o, $L_a \leq$ 3mH (A, B/IIC) or $\leq$ 15 mH (C, D/IIB)

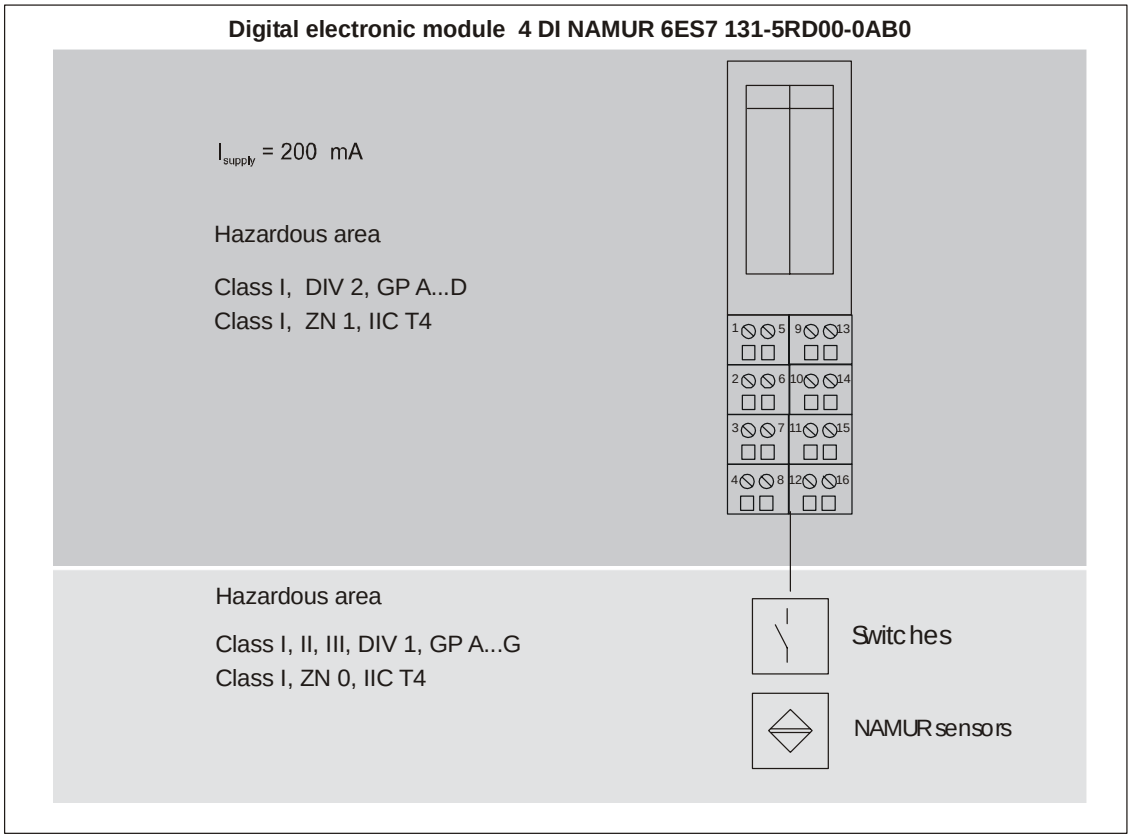
Intrinsic Safety Control Drawing A5E00158421-01

ET 200iS **6ES7 151-2AA00-0AB0**



Intrinsic Safety Control Drawing A5E00158421-01

ET 200iS **6ES7 131-5RD00-0AB0**



You can find the pin configuration in the manual “SIMATIC ET 200iS Distributed I/O Station”, chapter 13.1. Also see notes under “system in total”.

Use with TM-E P/N 6ES7 193-5CB*0-0AA0.

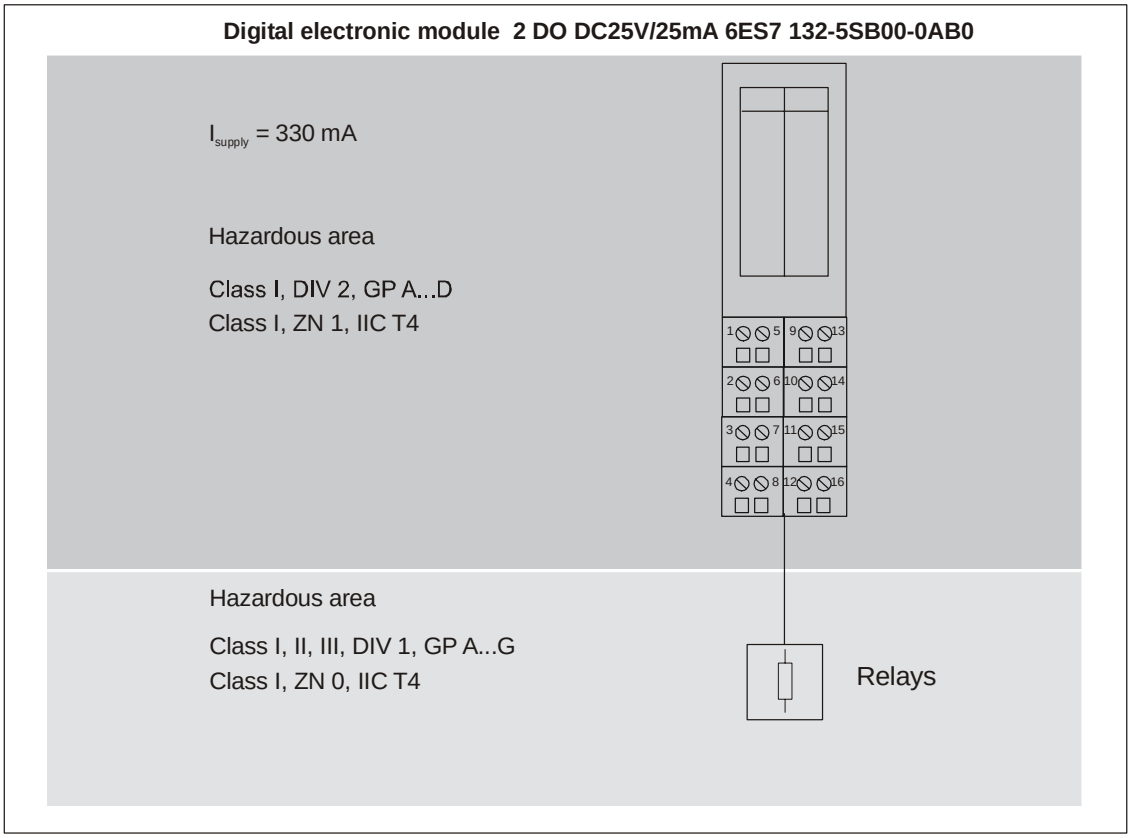
The following parameters for the input circuits are applicable for the electronic module:

	1 input		2 inputs //		3 inputs //		4 inputs //	
U_o, V_{oc} [V_{dc}]	9,6		9,6		9,6		9,6	
I_o, I_{sc} [mA]	11		21		32		42	
P_o [mW]	26		50		77		101	
	A,B/IIC	C-G/IIB	A,B/IIC	C-G/IIB	A,B/IIC	C-G/IIB	A,B/IIC	C-G/IIB
C_o, C_a [µF]	3,6	26	3,6	26	3,6	26	3,6	26
L_o, L_a [mH]	240	1000	80	280	35	110	19	65

Intrinsic Safety Control Drawing A5E00158421-01

ET 200iS **6ES7 132-5SB00-0AB0**

Digital electronic module 2 DO DC25V/25mA 6ES7 132-5SB00-0AB0



You can find the pin configuration in the manual “SIMATIC 200iS Distributed I/O Station“, chapter 13.2 . Also see notes under “system in total”.

Use with TM-E P/N 6ES7 193-5CB*0-0AA0.

The following parameters for the output circuits are applicable for the electronic module:

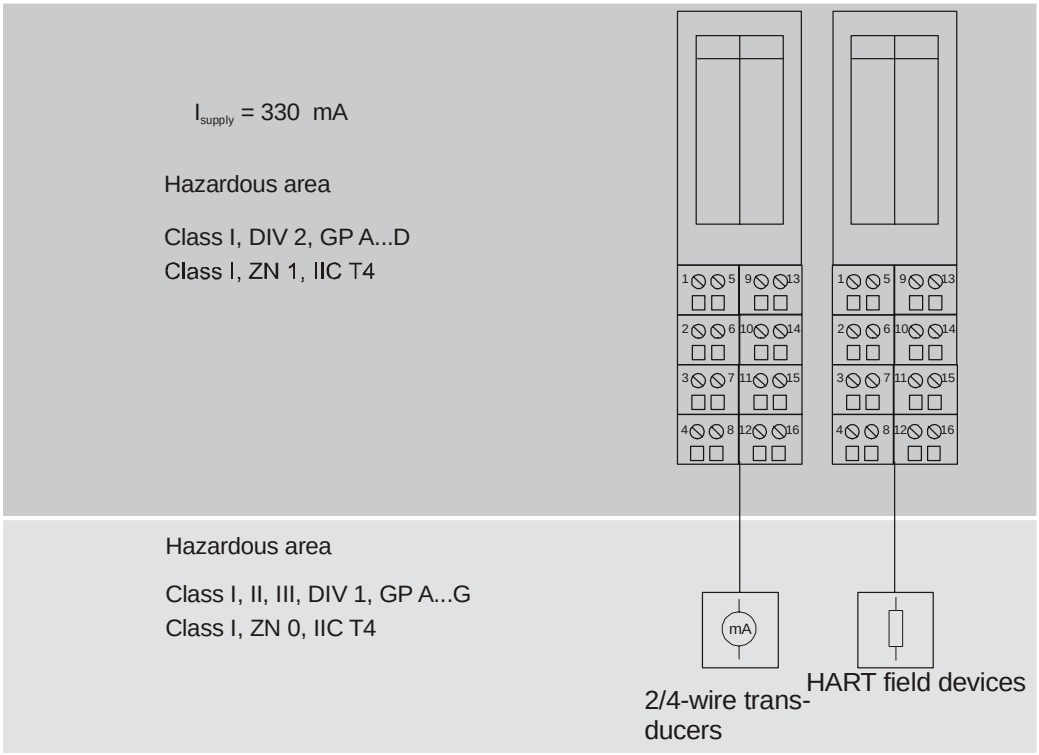
	1 output		2 outputs //	
U_o, V_{oc} [V_{dc}]	28		28	
I_o, I_{sc} [mA]	49		98	
P_o [mW]	345		685	
	A,B/IIC	C-G/IIB	A,B/IIC	C-G/IIB
C_o, C_a [nF]	80	650	80	650
L_o, L_a [mH]	15	55	3	11

Intrinsic Safety Control Drawing A5E00158421-01

ET 200iS

6ES7 134-5RB00-0AB0
6ES7 134-5TB00-0AB0

Analog electronic modules 2AI I 2WIRE 6ES7 134-5RB00-0AB0, HART 6ES7 134-5TB00-0AB0



You can find the pin configuration in the manual „SIMATIC ET 200iS Distributed I/O Station“, chapter 14.4 and 15.5 . Also see notes under „system in total“.

Use with TM-E P/N 6ES7 193-5CB*0-0AA0.

The following parameters for the input circuit are applicable for the electronic modules:

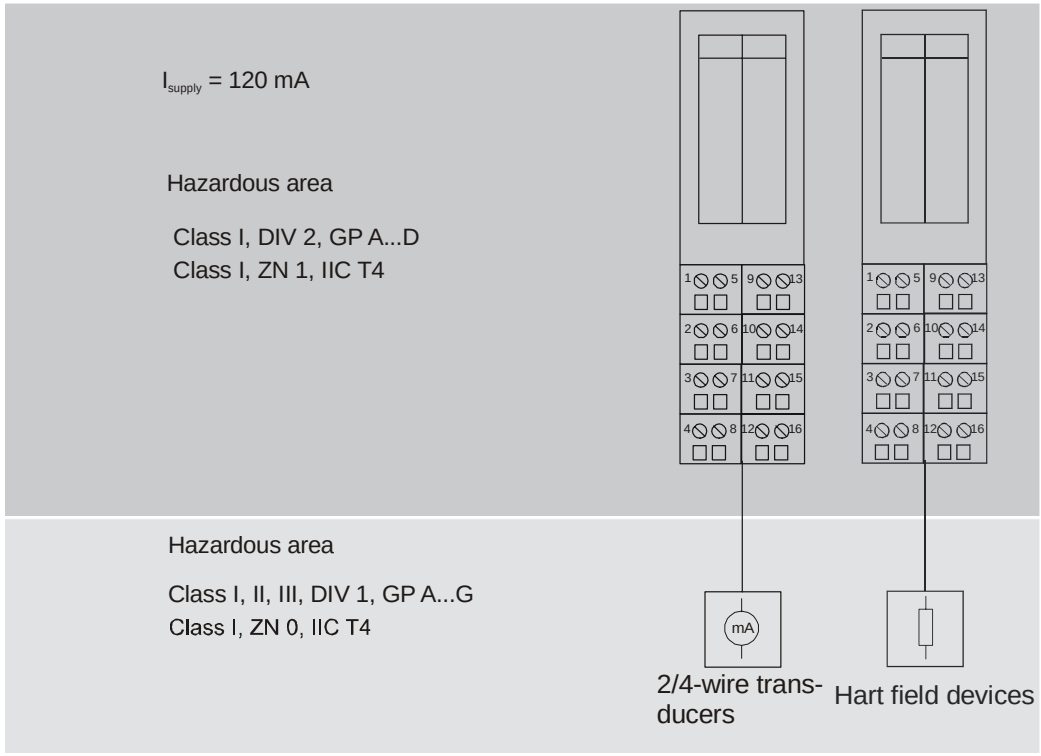
	input	
U_o, V_{oc} [V_{dc}]	28	
I_o, I_{sc} [mA]	85	
P_o [mW]	595	
	A,B/IIC	C-G/IIB
C_o, C_a [nF]	80	650
L_o, L_a [mH]	4	15

Intrinsic Safety Control Drawing A5E00158421-01

ET 200iS

6ES7 134-5RB50-0AB0
6ES7 134-5TB50-0AB0

Analog electronic module 2 AI I 4WIRE 6ES7 134-5RB50-0AB0, HART 6ES7 134-5TB50-0AB0



You can find the pin configuration in the manual „SIMATIC ET 200iS Distributed I/O Station“, chapter 14.5 and 15.6. Also see notes under „system in total“.

Use with TM-E P/N 6ES7 193-5CB*0-0AA0.

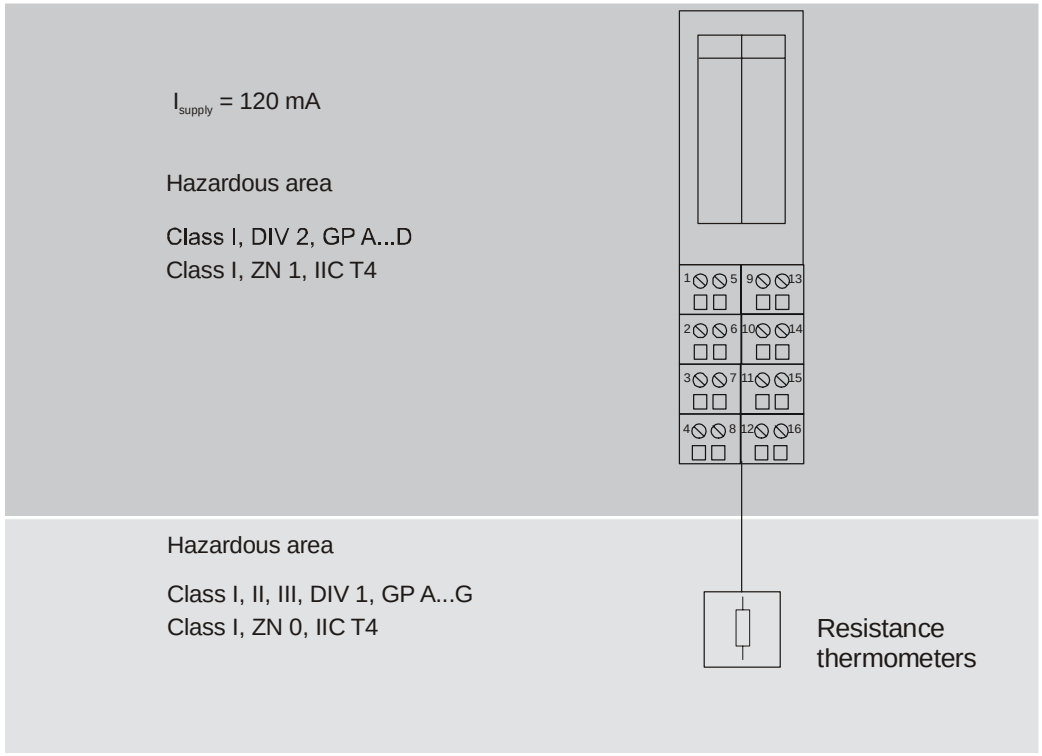
The following parameters for the input circuits are applicable for the electronic modules:

	input
U_i, V_{max} [V_{dc}]	30
I_i, I_{max} [mA]	150
P_i [W]	1,2
Ci [nF]	2
Li [mH]	0

Intrinsic Safety Control Drawing A5E00158421-01

ET 200iS **6ES7 134-5SB50-0AB0**

Analog electronic module 2 AI RTD 6ES7 134-5SB50-0AB0



You can find the pin configuration in the manual „SIMATIC ET 200iS Distributed I/O Station“, chapter 14.6 . Also see notes under „system in total“.

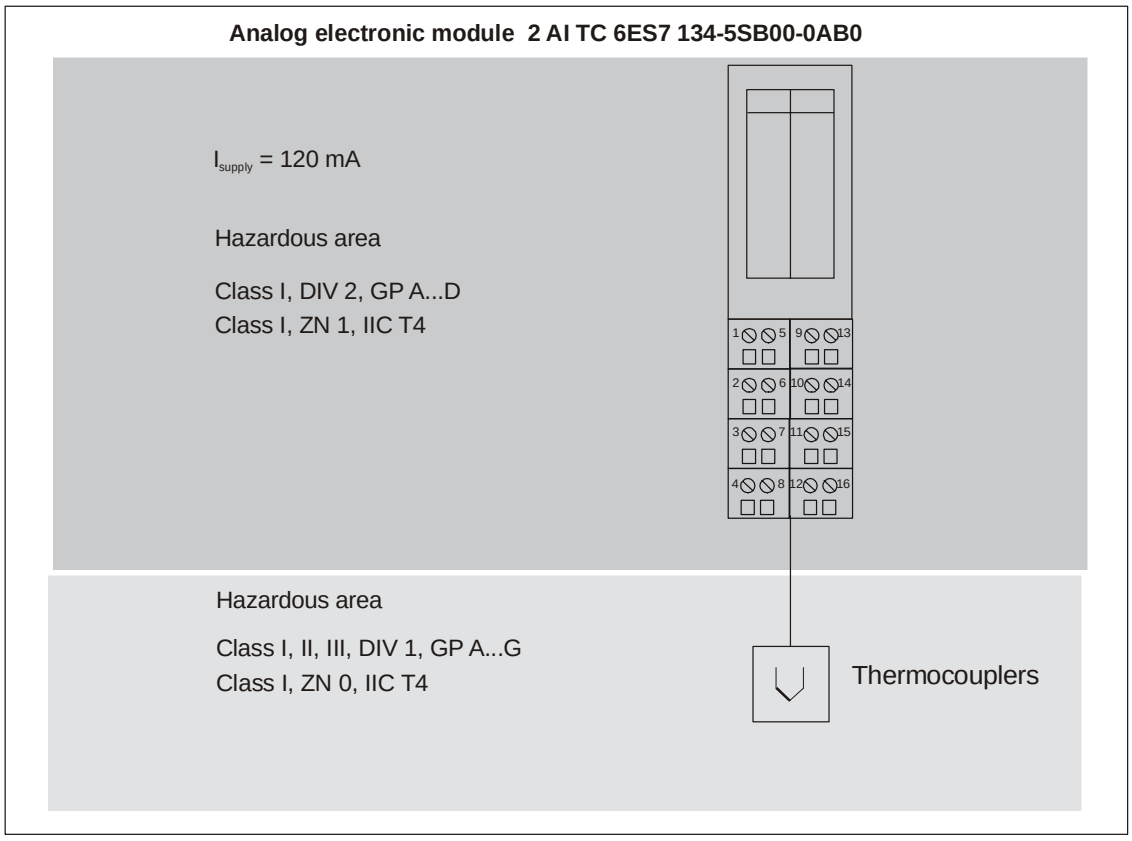
Use with TM-E P/N 6ES7 193-5CB*0-0AA0.

The following parameters for the input circuits are applicable for the electronic module:

	1 input		2 inputs //	
U_o, V_{oc} [V_{dc}]	6,0		6,0	
I_o, I_{sc} [mA]	16		28	
P_o [mW]	24		42	
	A,B/IIC	C-G/IIB	A,B/IIC	C-G/IIB
C_o, C_a [µF]	40	1000	40	1000
L_o, L_a [mH]	120	430	40	160

Intrinsic Safety Control Drawing A5E00158421-01

ET 200iS **6ES7 134-5SB00-0AB0**



You can find the pin configuration in the manual „SIMATIC ET 200iS Distributed I/O Station“, chapter 14.7 . Also see notes under „system in total“.

Use with TM-E P/N 6ES7 193-5CB*0-0AA0.

The following parameters for the input circuits are applicable for the electronic module:

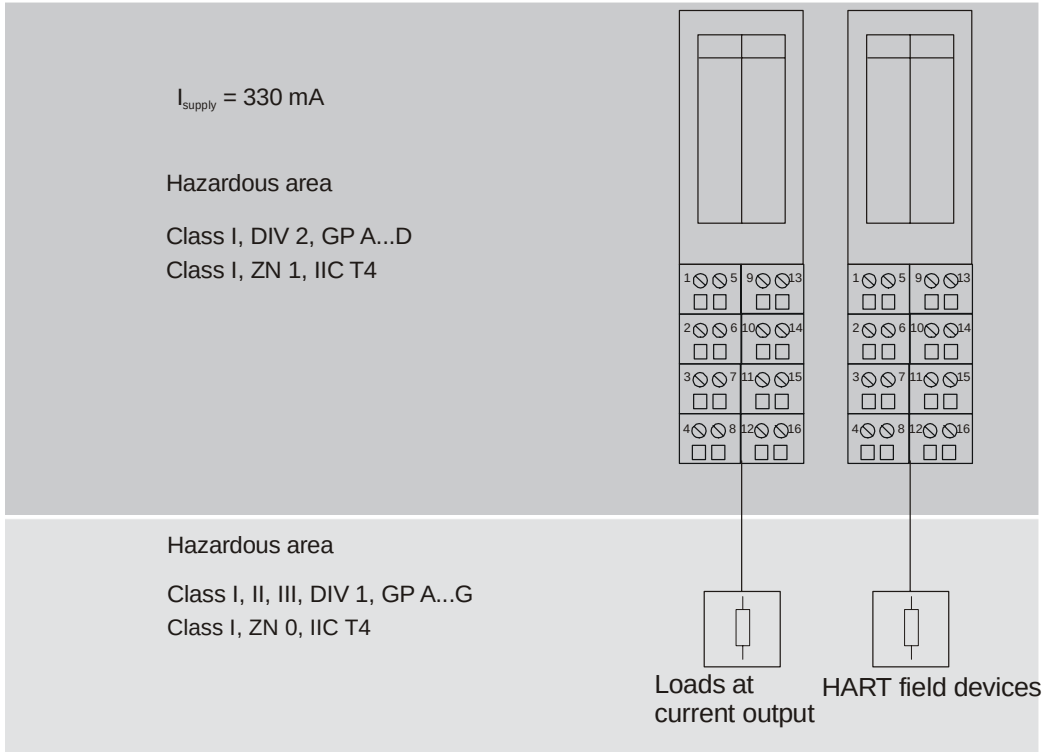
	1 input		2 inputs //	
U_o, V_{oc} [V_{dc}]	6,0		6,0	
I_o, I_{sc} [mA]	13		26	
P_o [mW]	20		40	
	A,B/IIC	C-G/IIB	A,B/IIC	C-G/IIB
C_o, C_a [µF]	40	1000	40	1000
L_o, L_a [mH]	200	730	50	170

Intrinsic Safety Control Drawing A5E00158421-01

ET 200iS

6ES7 135-5RB00-0AB0
6ES7 135-5TB00-0AB0

Analog electronic module 2 AO I 6ES7 135-5RB00-0AB0, HART 6ES7 135-5TB00-0AB0



You can find the pin configuration in the manual „SIMATIC ET 200iS Distributed I/O Station“, chapter 14.8. Also see notes under “system in total”.

Use with TM-E P/N 6ES7 193-5CB*0-0AA0.

The following parameters for the output circuits are applicable for the electronic modules:

	output	
U_o, V_{oc} [V_{dc}]	28	
I_o, I_{sc} [mA]	80	
P_o [mW]	560	
	A,B/IIC	C-G/IIB
C_o, C_a [nF]	80	650
L_o, L_a [mH]	5	20

Intrinsic Safety Control Drawing A5E00158421-01