SIEMENS

SIMATIC

ET 200C
Distributed I/O Station

Manual

Edition 03

EWA 4NEB 812 6119-02b

Safety Guidelines

This manual contains notices which you should observe to ensure your own personal safety, as well as to protect the product and connected equipment. These notices are highlighted in the manual by a warning triangle and are marked as follows according to the level of danger:

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 or property damage can result if proper precautions are not taken.

Note

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.

The device/system may only be set up and operated in conjunction with this manual.

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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Exclusion 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 is reviewed regularly and any necessary corrections included in subsequent editions. Suggestions for improvement are welcomed.

Technical data subject to change.

Preface

Purpose of the Manual

The information in this manual will enable you to:

- install, connect and operate the ET 200C distributed I/O station,
- look up the module characteristics and technical data.

Contents of the Manual

This section shows you how the manual is structured.

What is ET 200C?	Chap. 1
What configuration options do I have with ET 200C?	Chap. 2
What are the components of ET 200C?	Chap. 3
What is involved in mechanical and electrical installation?	Chap. 4
How do I set the address and parameters with COM ET 200?	Chap. 5
How do I perform startup and testing with COM ET 200?	Chap. 6
Errors?	Chap. 7, 8
How do I connect the ET 200 handheld?	Chap. 9
Technical data?	Chap. 10, 11, 12, 13
Pin assignment, type files?	Appendix A, B

Scope of the Manual

This manual covers all the ET 200C modules that can be addressed with the **DP standard** bus protocol. Each of these ET 200C modules has an order number beginning with 6ES7 (See Chapter 10.1).

This manual is applicable to operation of ET 200C in conjunction with

- IM 308-B master interface and COM ET 200
- IM 308-C master interface and COM ET 200 Windows.

Operation with the IM 308-B master interface and COM ET 200 is described in detail in this manual.

Scope of the Manual (Continued)

As regards operation of ET 200C with the IM 308-C master interface and COM ET 200 Windows, this manual describes only parameterization with COM ET 200 Windows. See the manual entitled *ET 200 Distributed I/O System* (order number 6ES5 998-3ES12) for detailed information on how to use COM ET 200 Windows and on working with the FB IM 308C standard function block.

COM ET 200 Windows has an online Help system that provides valuable assistance for starting up and operating the ET 200C modules.

Other Important Manuals

This manual follows on from the manual entitled *ET 200 Distributed I/O System*, which is the master description for the series.

You must read and understand the manual *ET 200 Distributed I/O System* in order to use this manual.

Quick Access

A number of features in this manual will help you to obtain quick access to the information you require:

- At the start of the manual you will find a general table of contents, plus a list of all the illustrations and a list of all the tables in the manual.
- On each page throughout the manual, the bold-face headings on the left summarize the contents of the individual passages.
- The Appendices are followed by a Glossary containing definitions of the important terms used in this manual.
- The manual closes with a detailed index that you can use to find information on the topic of your choice.

Standards

The ET 200C modules function as DP standard slaves in accordance with the definitions of DIN E 19245, Parts 1 and 3.

Questions

Please address all questions about the ET 200C distributed I/O station to:

Hotline SIMATIC
Erlangen
Phone (+ 49 for Germany) 9131/7-43344

Suggestions

You will find suggestion sheets at the end of the manual. Please note any suggestions or proposals you may have on these sheets and return them to use. Your suggestions will help us improve the next edition of the manual.

Contents

Figures

Tables

Configuration

1

In this Chapter

This chapter ”Configuration” provides you with information on

- the position of the ET 200C distributed I/O station in the distributed I/O system and
- the components of the ET 200C.

1.1 What is the ET 200?

Definition

The distributed I/O system ET 200 is based on the PROFIBUS standard (DIN 19245, Part 1) and the PROFIBUS-DP draft standard (DIN 19245, Part 3).

At SIEMENS, the PROFIBUS is called SINEC L2.

The field bus on which the ET 200 distributed I/O system is based, is a variant of SINEC L2 called SINEC L2-DP. This version is designed for communication with the distributed I/O at extremely short response times.

Stations Described in this Manual

The distributed I/O system comprises active and passive stations, the SINEC L2-DP field bus and the SINEC L2 network components. The distributed I/O station is a slave station.

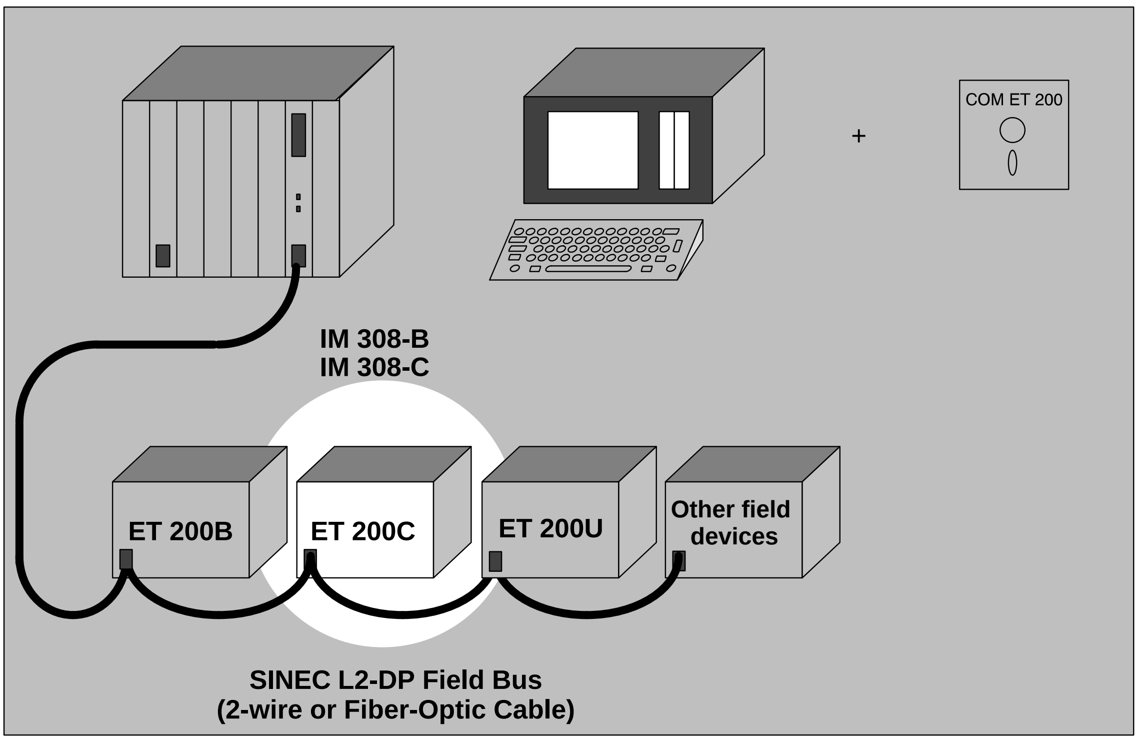

Figure 1-1 ET 200 Bus Users Described in this Manual

1.2 What is the ET 200C?

Range of Modules

The ET 200C Distributed I/O Station is part of the ET 200 Distributed I/O System.

The ET 200C digital and analog modules each form a slave station.

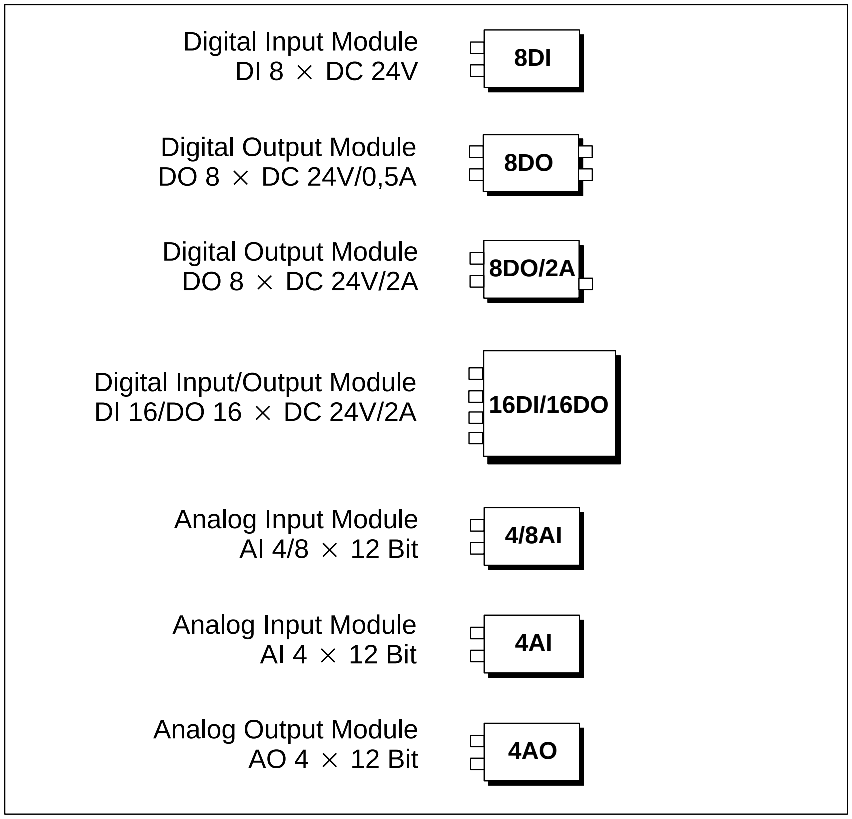

Figure 1-2 ET 200C Digital and Analog Modules

What is the ET 200C?, Continued

Other Components

ET 200C also includes other components. Not all components may be necessary for operation:

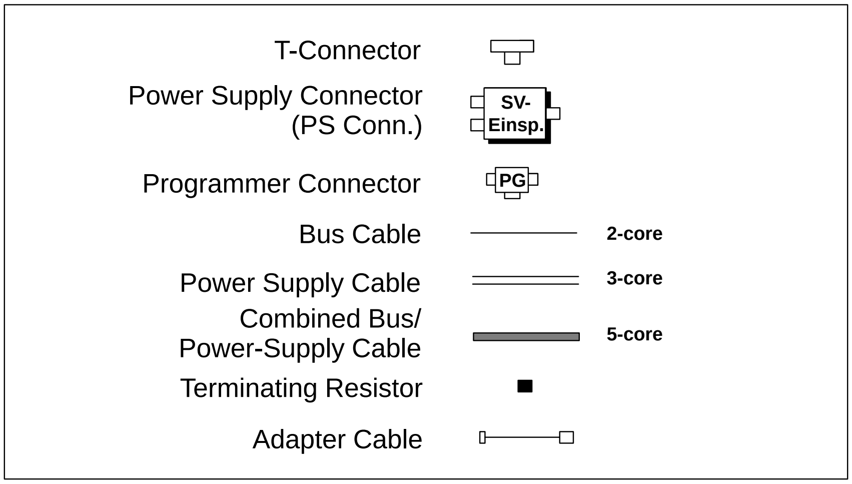

Figure 1-3 Other ET 200C Components

Operating ET 200C

All ET 200C components can be addressed under the DP standard bus protocol.

Note

ET 200C can be operated with the following master interface modules and versions of COM ET 200:

- IM 308-B (revision level 5 or higher) and COM ET 200 (V4.0 or later, see Chapters 5 and 6), only in conjunction with ET 200C digital modules
- IM 308-C (revision level 1 or higher) and COM ET 200 Windows

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Characteristics of the ET 200C

The ET 200C Distributed I/O Station has the following characteristics:

- Degree of protection IP 66/IP 67

  All components of the ET 200C (excluding adapter cables) are designed with degree of protection IP 66 and 67. However, IP 66 and IP 67 are only ensured if the installation rules in Section 4.1 are observed.

- Compact design

  ET 200C is ideal for applications where space is at a premium. A digital input module **with** T connector, for example, measures only 289 × 129 × 57 mm. An analog module **with** T connector measures a mere 289 × 101 × 57 mm.

- Connections

  – Digital inputs and/or digital outputs, analog inputs or analog outputs

  – Protective conductor connection for each input/output (digital modules only)

  – 2-wire and 3-wire proximity switches can be connected

- Electrical isolation between the SINEC L2-DP field bus and the process side of the ET 200C modules.

- Direct connection of programmer or ET 200 handheld possible (with adapter cable and programmer with programmer interface module CP5410-S5DOS/ST)

  – For setting the station number (digital modules require ET 200 handheld; analog modules by means of internal DIL switches or the ET 200 handheld)

  – For testing and startup

  – Diagnostics

- Diagnostics of the inputs/outputs for the following types of fault (can be switched off with COM ET 200)

  – Short-circuit/overload of the sensor supply or outputs

  – Wire break in sensor supply (except in DI 16/DO 16 × DC 24V/2A) or at the outputs

  – Load voltage of the outputs (digital modules only)

  A diagnostic report on defective inputs/outputs can also be output via the IM 308-B master interface module.

Characteristics of the ET 200C (Continued)

- The digital modules have the following LEDs
  - RUN
  - BF (bus fault)
  - DIA (diagnostics of the inputs/outputs or undervoltage of the outputs)
  - U_L in DO 8 × DC 24V/0.5A and DO 8 × DC 24V/2A or U_{L1}, U_{L2} in DI 16/DO 16 × DC 24V/2A (load voltage supply of the outputs)
  - Status of the inputs/outputs or individual diagnostics
- The analog modules have the following LEDs
  - RUN
  - BF (bus fault)
  - DIA (diagnostics of the inputs/outputs)
- High data throughput:

  The bus accommodates, for example, the IM 308-C master interface and ten ET 200C; DI 16/DO 16 × DC 24V/2A distributed I/O stations each with 2-byte inputs/outputs. The baud rate is 12 Mbaud. The reaction time for a complete data cycle is thus 0.45 ms.

  The reaction time t_{DP} for a data cycle is calculated as follows:

$$
\begin{aligned}
t_{DP} = {} & A \\
& + (B + (\text{number of I/O bytes} \times T_{byte})) && \text{[slave 1]} \\
& + (B + (\text{number of I/O bytes} \times T_{byte})) && \text{[slave 2]} \\
& + \ldots \\
& + (B + (\text{number of I/O bytes} \times T_{byte})) && \text{[slave n]}
\end{aligned}
$$

  A, B, T_{byte} = master-dependent constants

Table 1-1 Maximum baud rates with components of ET 200C

With master interface	ET 200C components	Maximum baud rate
IM 308-B	All digital modules	1.500 kbaud
IM 308-C	All digital modules	12.000 kbaud
IM 308-C	All digital modules	1.500 kbaud

- Length of the SINEC L2 bus cable

  The following values apply for the SINEC L2 bus cable in accordance with the baud rate on the bus when configuring the ET 200C.

Table 1-2 Length of the SINEC L2 Bus Cable in Accordance with the Baud Rate on the SINEC L2-DP Bus

Baud rate	Max. length of bus cable
< 500 kbaud	500 m/segment
500 kbaud	400 m/segment
1500 kbaud	200 m/segment
> 1500 kbaud	100 m/segment

ET 200C Configuration Options 2

In this Chapter This chapter describes the configuration options offered to you by ET 200C.

2.1 Overview of the ET 200C Configuration Options

Configuration Options

The table below contains the various configuration options made available by ET 200C.

Table 2-1 ET 200C Configuration Options

PS connector	Configuration	Described in
Configuration with power supply connector	Configuration with power supply connector and **without** T connector	Section 2.1.1
	Configuration with power supply connector and **with** T connector	Section 2.1.2
	Configuration with **several** power supply connectors (the level of expansion with one power supply connector is limited)	Section 2.1.3
	Configuration with **programmer connector**	Section 2.1.5
Configuration without power supply connector (each module has a separate power supply)	Configuration **without** power supply connector	Section 2.1.4
	Configuration with **programmer connector**	Section 2.1.5

Legend for the Following Sections

The ET 200C configuration options are described in the following sections by means of diagrams which are based on the following legend:

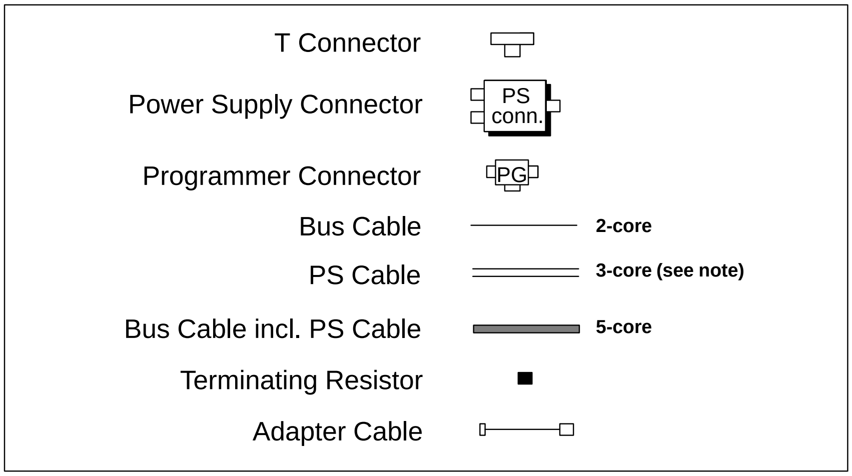


Figure 2-1 Legend

Note

You will require a 3-core cable for the load voltage supply and the separate power supply connectors of the digital modules. You can, however, also use the prefabricated, 5-core cable from Siemens for the load voltage. Two of the conductors will then not be used in this case (see Section 3.11).

2.1.1 Configuration with Power Supply Connector without T Connector

Definition

In a configuration with looped field bus and power supply, the individual modules are connected directly to the field bus.

The power supply is combined with the field bus in a single cable via the power supply connector.

Advantage

You do not need a T connector.

The power supply is run over the bus cable, i.e. no external power supply is required for the slave station.

Constraint

If a slave station is disconnected from the bus, the “Bus traffic” is interrupted for slave stations located further down the line.

Since there is then no terminating resistor available, bus traffic might be disturbed for slave stations still connected to the bus.

The level of expansion using one power supply connector is limited (see Section 2.1.3).

Cables

Different types of cable can be used for the various configurations:

- Read Section 3.11 if you wish to use prefabricated cables from Siemens.
- Read Section 4.3 if you wish to prepare the cables yourself.

Configuration

A possible configuration with power supply connector and without T connector can be seen in Fig. 2-2:

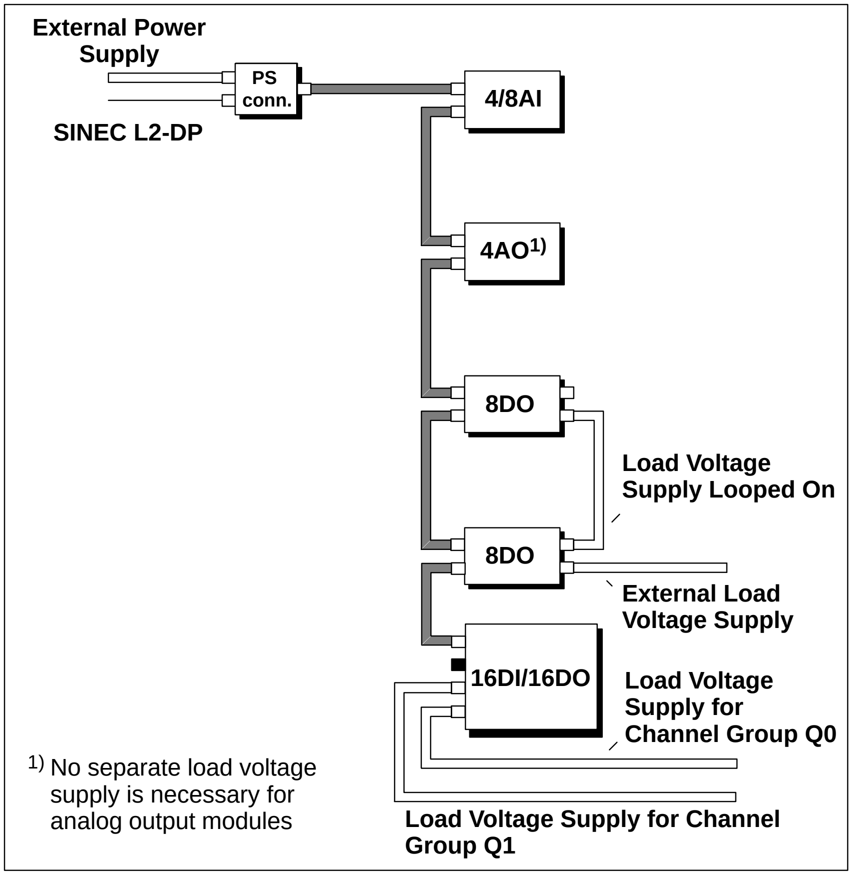


Figure 2-2 SINEC L2-DP Field Bus and Power Supply Looped Through at ET 200C Slave Station

Configuration with Power Supply Connector without T Connector, Continued

Rules for the External Load Voltage Supply

The maximum permissible current for the external load voltage supply is limited:

Table 2-2 Permissible Current Load for Load Voltage Supply

Digital module	Total permissible current load
ET 200C; DO 8 × DC 24V/0.5A	max. 4 A
ET 200C; DO 8 × DC 24V/2A	Ambient temperature: –25 ... +25 °C max. 10 A +26 ... +40 °C max. 8 A +41 ... +60 °C max. 4 A
ET 200C; DI 16/DO 16 × DC 24V/2A (outputs in groups of 4)	Ambient temperature: –25 ... +25 °C max. 3.5 A per group of 4 +26 ... +40 °C max. 2.5 A per group of 4 +41 ... +60 °C max. 1.5 A per group of 4

Note

An external load voltage supply can only be looped via the digital output module DO 8 × DC 24V/0.5A until the maximum current of 4 A is reached. The maximum current load of 4 A is not protected by means of a fuse in the module.

2.1.2 Configuration with Power Supply Connector and with T Connectors

Definition

In a configuration with power supply connector and T connectors, the individual modules are connected to the field bus by T connectors.

The power supply is combined with the field bus in a single cable via the power supply connector.

Advantage

A slave station can be disconnected at any time from the bus without interrupting the “Bus traffic” for the remaining slave stations.

The power supply is fed over the bus cable, i.e. no external power supply is required for the slave stations.

Constraint

The level of expansion with one power supply connector is limited (see Section 2.1.3).

Cables

Different types of cable can be used for the various configurations:

- Read Section 3.11 if you wish to use prefabricated cables from Siemens.
- Read Section 4.3 if you wish to prepare the cables yourself.

Configuration with Power Supply Connector and with T Connectors, Continued

Configuration

A possible configuration with power supply connector and with T connector can be seen in Fig. 2-3:

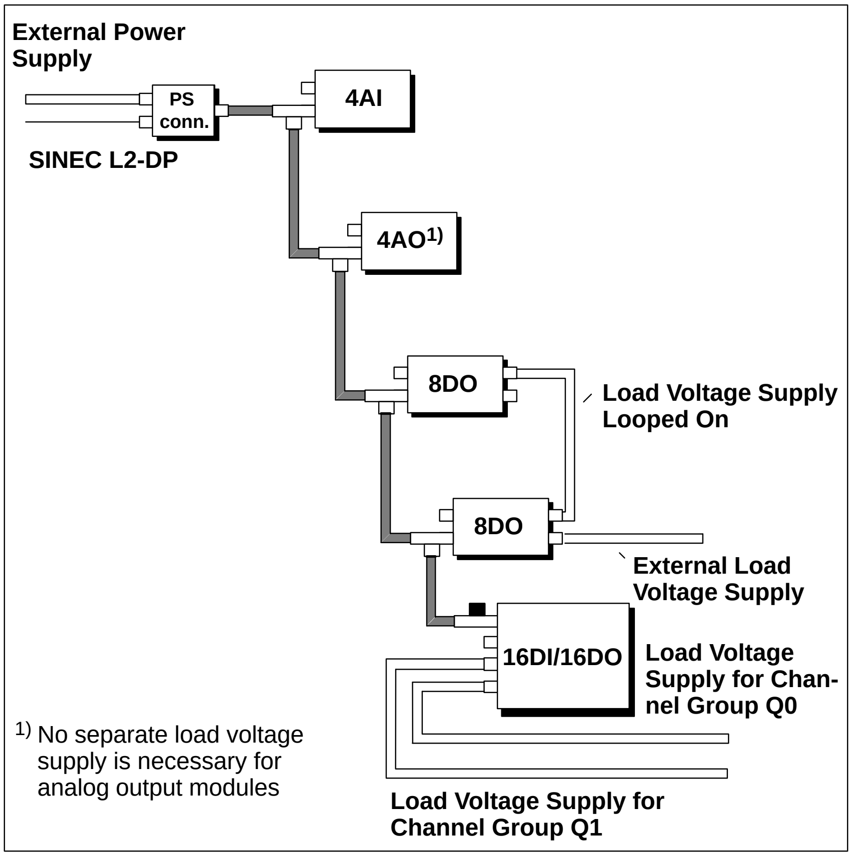


Figure 2-3 SINEC L2-DP Field Bus and Power Supply Looped Through with T Connectors

Rules for the External Load Voltage Supply

The maximum permissible current for the external load voltage supply is limited:

Table 2-3 Permissible Current Load for Load Voltage Supply

Digital module	Total permissible current load
ET 200C; DO 8 × DC 24V/0.5A	max. 4 A
ET 200C; DO 8 × DC 24V/2A	Ambient temperature: –25 ... +25 °C max. 10 A +26 ... +40 °C max. 8 A +41 ... +60 °C max. 4 A
ET 200C; DI 16/DO 16 × DC 24V/2A (outputs in groups of 4)	Ambient temperature: –25 ... +25 °C max. 3.5 A per group of 4 +26 ... +40 °C max. 2.5 A per group of 4 +41 ... +60 °C max. 1.5 A per group of 4

Note

An external load voltage supply can only be looped via the digital output module DO 8 × DC 24V/0.5A until the maximum current of 4 A is reached. The maximum current load of 4 A is not protected by means of a fuse in the module.

Rules for the T Connector

Spur lines are not permitted on the ET 200C except for the programmer or the ET 200 handheld. This means that the **12-pin plug** of the T connector is always secured directly to the bus connection of a module.

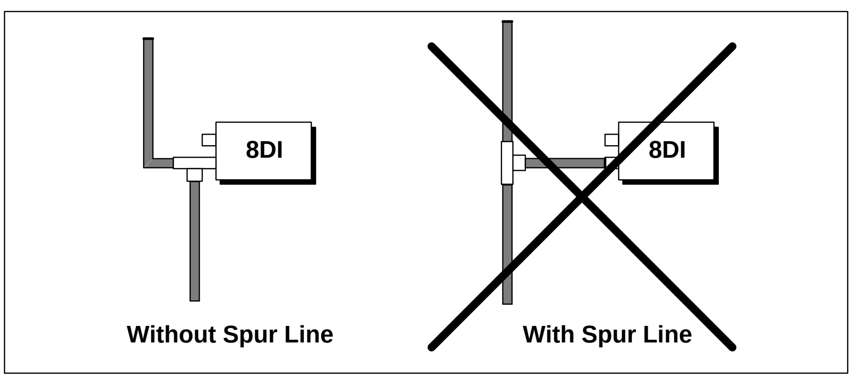


Figure 2-4 Rule for Use of a T Connector

2.1.3 Configuration using Several Power Supply Connectors

Constraint when Using One Power Supply Connector

In the configurations using a power supply connector (see Sections 2.1.2 and 2.1.1), the power supply is fed over the bus cable.

This design is limited by the following factors:

- If the power supply and the SINEC L2-DP field bus are combined in one cable, the following values apply for the length of the bus cable between the power supply connector and the last slave station connected:

Table 2-4 Length of the Bus Cable, if SINEC L2-DP Field Bus and Power Supply are Combined in One Cable

Current load	Max. cable length
< 1 A	80 m
< 2 A	40 m
< 4 A	20 m

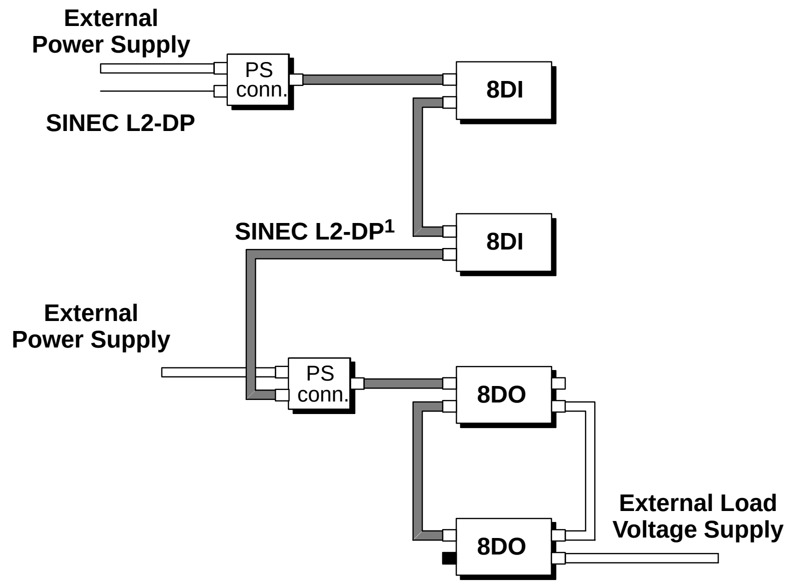
- A maximum of 4 A can be looped via the power supply connector. The current consumption of the digital modules limits the number of digital modules that can be connected.

Table 2-5 Current Consumption of the Digital Modules of ET 200C

Digital module	Current consumption comprises	Current consumption
ET 200C; DI 8 × DC 24V	• Power supply for internal logic and • Sensor supply	typ. 135 mA application-specific (see Section 4.3.2)
ET 200C; DO 8 × DC 24V/0.5A	• Power supply for internal logic	typ. 90 mA
ET 200C; DO 8 × DC 24V/2A	• Power supply for internal logic	typ. 90 mA
ET 200C; DI16/DO16 × DC 24V/2A	• Power supply for internal logic and • Sensor supply	typ. 90 mA application-specific (see Section 4.3.2)
ET 200C; AI 4/8 × 12 Bit	• Power supply for internal logic	typ. 80 mA
ET 200C; AI 4 × 12 Bit	• Power supply for internal logic	typ. 130 mA/ 24 V
ET 200C; AI 4 × 12 Bit	• Power supply for internal logic	typ. 120 mA

Remedy

You are planning several power supply connectors per segment. A possible configuration with several power supply connectors can be seen in Fig. 2-5.



[1] In this case, you can use a 2 or 5-core cable. The 2 “left” connections for “External power supply” and “SINEC L2-DP” are not jumpered!

Figure 2-5 Configuration using Several Power Supply Connectors

2.1.4 Configuration without Power Supply Connector

Definition

In a configuration with a separate power supply each slave station is supplied individually with current. This current supply may **not** be fed over the bus cable.

The T connector for connecting SINEC L2-DP is essential for being able to loop the SINEC L2-DP field bus.

Advantage

The power supply is not run over the bus (2-core instead of 5-core cable).

A slave station can be disconnected at any time from the bus without the “Bus traffic” being interrupted for slave stations further down the line, since the field bus is looped via the T connectors.

Cables

Different types of cable can be used for the various configurations:

- Read Section 3.11 if you wish to use prefabricated cables from Siemens.
- Read Section 4.3 if you wish to prepare the cables yourself.

Note

You must prepare the cables yourself for the load voltage supply of ET 200C; DO 8 × DC 24V/2A or ET 200C; DI 16/DO 16 × DC 24V/2A and for separate power supplies (see Section 4.3).

Configuration

A possible configuration without power supply connector can be seen in Fig. 2-6.

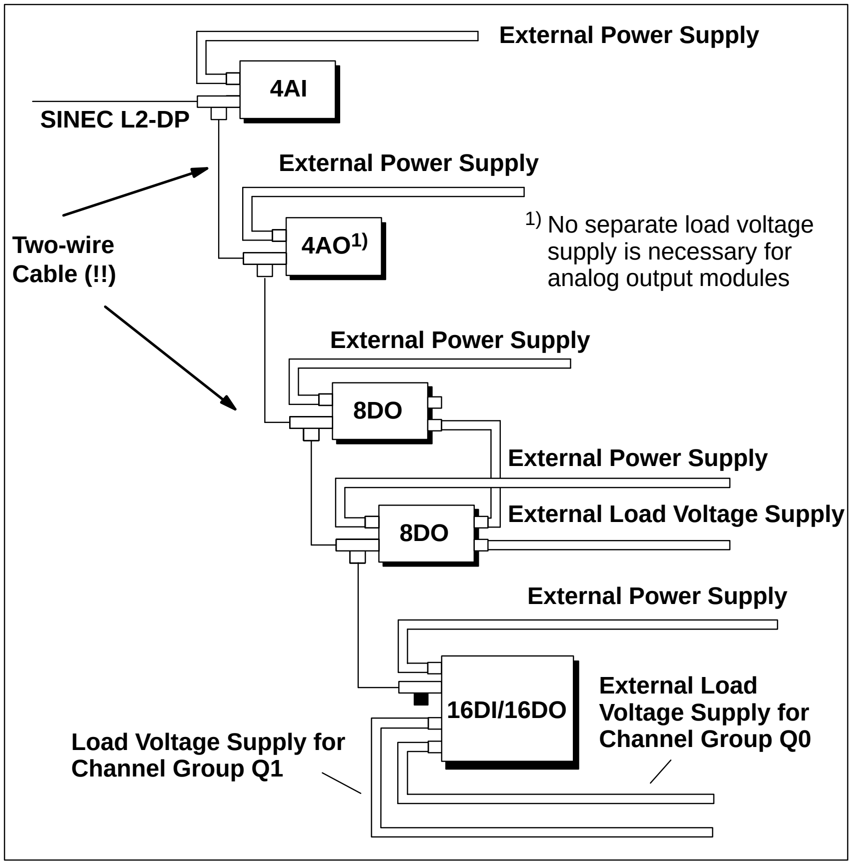


Figure 2-6 SINEC L2-DP Field Bus Looped Through with T Connectors – Individual External Power Supply to Each Slave Station

Configuration without Power Supply Connector, Continued

Rules for the External Load Voltage Supply

The maximum permissible current for the external load voltage supply is limited:

Table 2-6 Permissible Current Load for Load Voltage Supply

Digital module	Total permissible current load
ET 200C; DO 8 × DC 24V/0.5A	Max. 4 A
ET 200C; DO 8 × DC 24V/2A	Ambient temperature: –25 ... +25 °C max. 10 A +26 ... +40 °C max. 8 A +41 ... +60 °C max. 4 A
ET 200C; DI 16/DO 16 × DC 24V/2A (outputs in groups of 4)	Ambient temperature: –25 ... +25 °C max. 3.5 A per group of 4 +26 ... +40 °C max. 2.5 A per group of 4 +41 ... +60 °C max. 1.5 A per group of 4

Note

An external load voltage supply can only be looped via the digital output module DO 8 × DC 24V/0.5A until the maximum current of 4 A is reached. The maximum current load of 4 A is not protected by means of a fuse in the module.

Rules for the T Connector

Spur lines are not permitted on the ET 200C except for the programmer or the ET 200 handheld. This means that the **12-pin plug** of the T connector is always secured directly to the bus connection of a module.

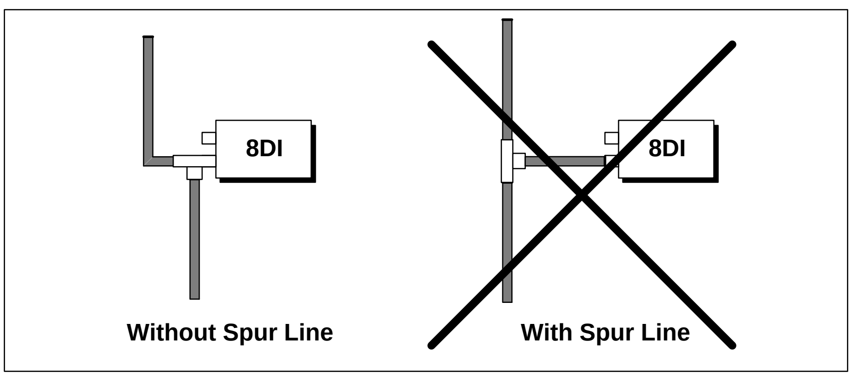


Figure 2-7 Rules for Use of a T Connector

Rules for Current Connection

Note the following rules for the external power supply:

Caution

Risk of destroying the ET 200C modules.

Do not run the SINEC L2-DP bus and the external power supply together through an ET 200C module. If you did, the external power supply would be looped though the field bus to other ET 200C modules. This could cause the gradual destruction of the ET 200C modules.

If you connect an external power supply to an ET 200C module, it is imperative to use only the 2-core bus cable for connecting the SINEC L2-DP.

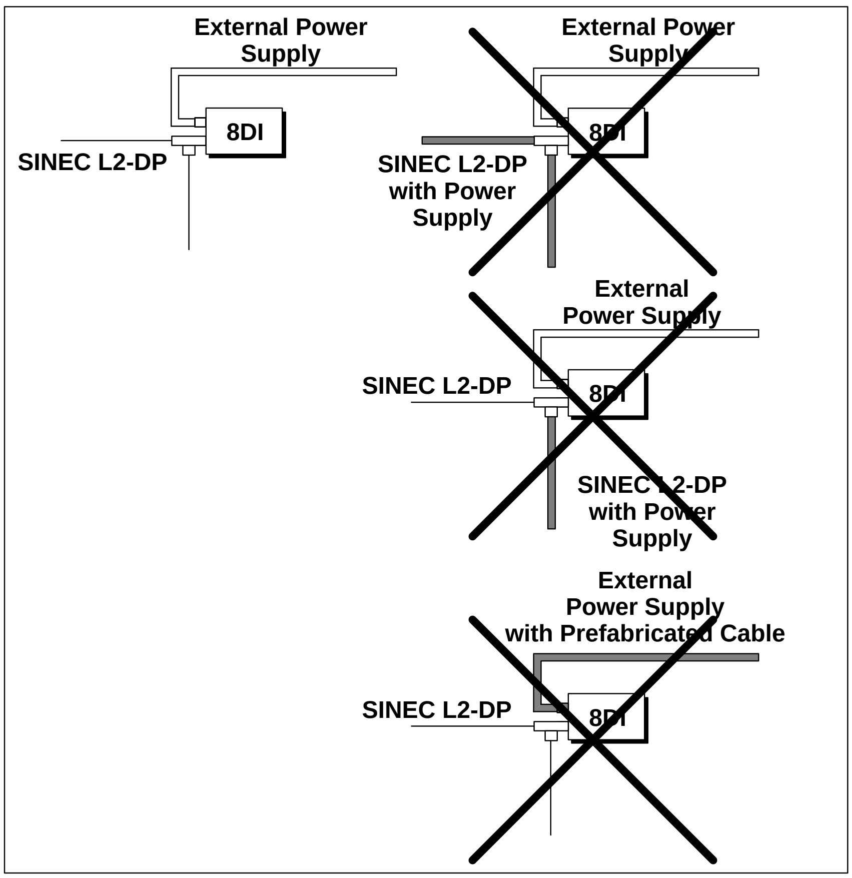


Figure 2-8 Rules for Current Connection

2.1.5 Configuration with Programmer Connector

Definition

If you want to connect the programmer to the SINEC L2-DP field bus within the IP 66/IP 67 landscape, you will need a programmer (PG) connector.

Connection of the Programmer

In order to connect the programmer to the programmer connector, you will require two connecting cables:

- Adapter cable (see Section 3.13) and
- Programmer connecting cable (Order No. 6XV1 830-1AH...)

An ET 200 handheld cannot be connected to the programmer connector. It can only be plugged into the bus connection of a slave station (via the adapter cable). Connection of the ET 200 handheld is described in detail in Chapter 9.1.

Configuration

A possible configuration with a programmer connector can be seen in Fig. 2-9.

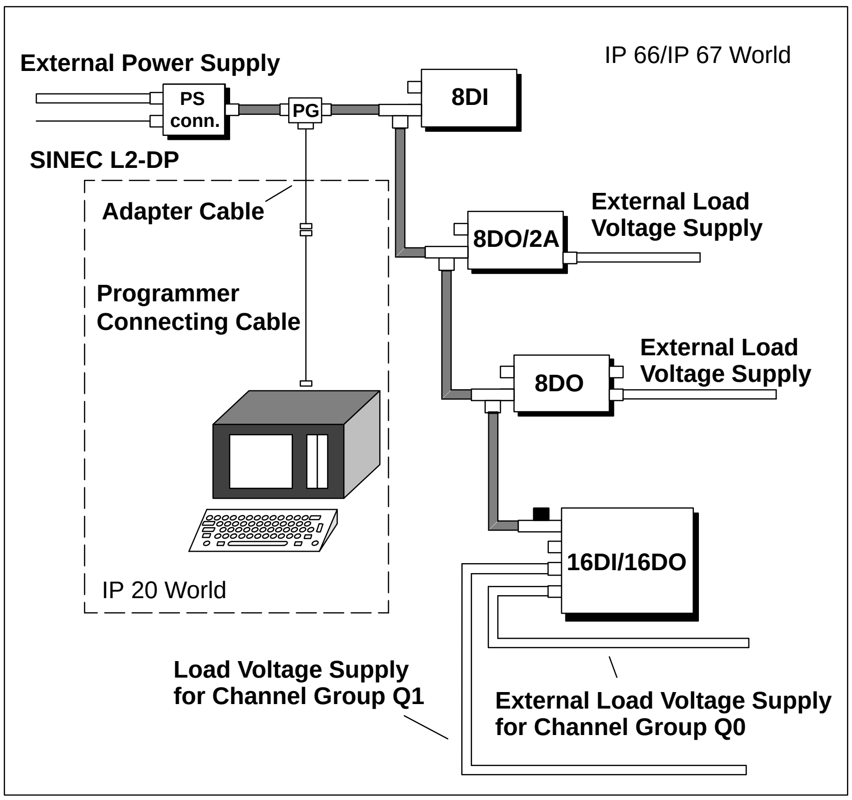


Figure 2-9 Configuration with Programmer Connector

Rules for Connecting the Programmer Connector

Both the 2-core and the 5-core cable can be connected to the programmer connector.

A programmer connector can be placed anywhere on the SINEC L2-DP field bus. The following should be noted here:

- The programmer connector should not be located at the end of the bus cable, otherwise a terminating resistor cannot be fitted.
- You can place several programmer connectors on a bus. You can, however, only connect **one** programmer to one of the programmer connectors on the bus since the programmer is a station with the number 0.
- The following values apply for the length of the spur line in accordance with the baud rate on the SINEC L2-DP bus when connecting a programmer:

Table 2-7 Length of the Spur Line of the Programmer Connection in Accordance with the Baud Rate on the SINEC L2-DP Bus

Baud rate	Max. length of the spur line
< 500 kbaud	Max. 32 × 3 m Max. 10 × 5 m Max. 1 × 10 m
1500 kbaud	Max. 5 × 2 m (clearance of 3 m) or SINEC L2 bus terminal

ET 200C Components

3

In this Chapter

All components of the ET 200C with their performance data and characteristics are described in this chapter.

3.1 Digital Input Module ET 200C; DI 8 $\times$ DC 24V (6ES7 141-0BF00-0XB0)

Characteristics

The digital input module ET 200C; DI 8 $\times$ DC 24V has the following characteristics:

- Degree of protection IP 66/IP 67 (see Installation rules, Section 4.1)
- Choice of six different baud rates:
  9.6; 19.2; 93.75; 187.5; 500; 1500; 3000; 6000 or 12000 kbaud

  The baud rates 3000, 6000 and 12000 kbaud are only possible when the module is operated with the IM 308-C (see Section 1.2).
- Channel-by-channel diagnostics of the inputs for wire breaks and short-circuit/overload of the sensor supply (can be switched off with COM ET 200, see Section 5.1.4).

  The diagnostics can be output via the IM 308-B master interface module. In addition, each diagnostic message causes the LED ”DIA” or the respective individual diagnostics LED to light up.
- LEDs for
  - RUN
  - BF (bus fault)
  - DIA (diagnostics of the module)
  - Status of the inputs or individual diagnostics
- Attachment of the module without opening the cover (drill-hole template at the back of the manual)

Connections

The digital input module ET 200C; DI 8 × DC 24V has the following connections:

- 8 input channels (4-conductor connection)
- 2 bus connections (12-pin socket)

  The 12-pin sockets can be used for several purposes:

  – To connect the SINEC L2-DP field bus

  – To connect the power supply

  – To connect the field bus and incorporated power supply

  The bus connections are interconnected internally.

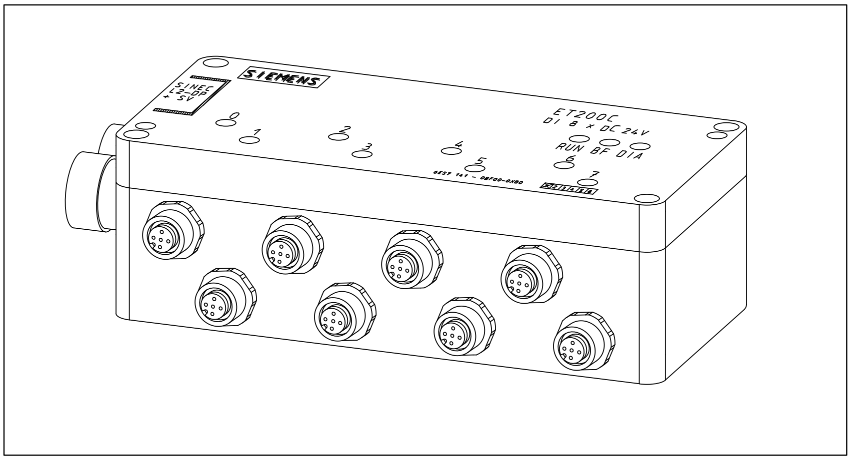


Figure 3-1 Digital Input Module ET 200C; DI 8 × DC 24V (6ES7 141-0BF00-0XB0)

3.2 Digital Output Module ET 200C; DO 8 × DC 24V/0.5A (6ES7 142-0BF00-0XB0)

Characteristics

The digital output module ET 200C; DO 8 × DC 24V/0.5A has the following characteristics:

- Degree of protection IP 66/IP 67 (see Installation rules, Section 4.1)
- Output current per channel: 0.5 A
- Choice of nine different baud rates:
  9.6, 19.2; 93.75; 187.5; 500; 1500; 3000; 6000 and 12000 kbaud

  The baud rates 3000, 6000 and 12000 kbaud can only be used if the module is operated with the IM 308-C (see Section 1.2).
- Channel-by-channel diagnostics of the outputs for wire break and short-circuit/overload and load voltage of the outputs (can be switched off with COM ET 200, see Section 5.1.4).

  The diagnostics can be output via the IM 308-B master interface module. In addition, each diagnostic message causes the LED ”DIA” or the respective individual diagnostics LED to light up.
- LEDs for
  - RUN
  - BF (bus fault)
  - DIA (diagnostics of the outputs)
  - U_L (load voltage supply of the outputs)
  - Status of the outputs or individual diagnostics
- Attachment of the module without opening the cover (drill-hole template at the back of the manual)

Connections

The digital output module ET 200C; DO 8 × DC 24V/0.5A has the following connections:

- 8 output channels (three-conductor connection)
- 2 bus connections (12-pin socket)

  The 12-pin sockets can be used for several purposes:

  – to connect the SINEC L2-DP field bus

  – to connect the power supply

  – to connect the field bus and incorporated power supply

  The bus connections are interconnected internally.
- 2 connections for external load voltage supply:

  – 6-pin male connector for feeding load voltage supply

  – 6-pin socket for looping the load voltage supply

  The load voltage connections are interconnected internally, i.e. the load voltage supply can be looped via the digital output module provided a total current of 4 A is not exceeded.

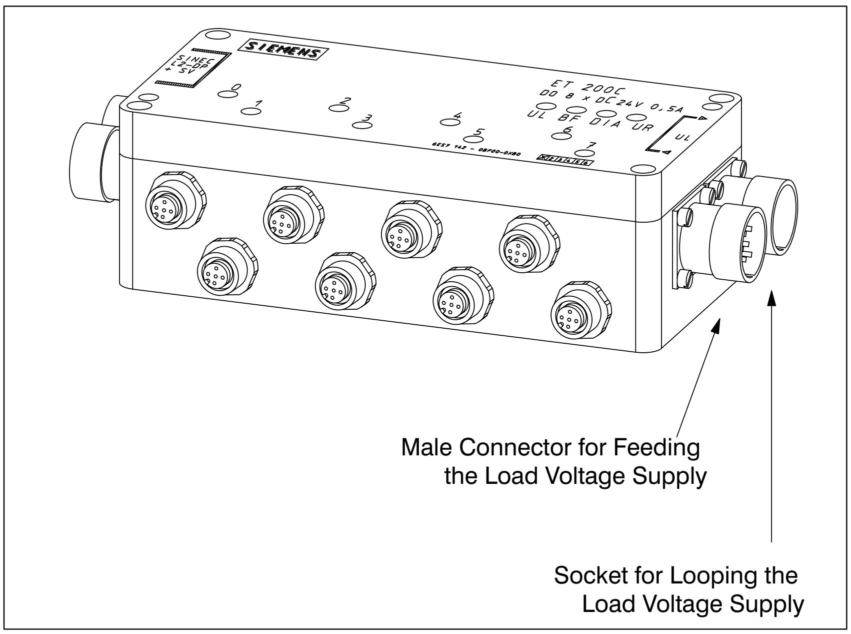


Figure 3-2 Digital Output Module ET 200C; DO 8 × DC 24V/0.5A (6ES7 142-0BF00-0XB0)

3.3 Digital Output Module ET 200C; DO 8 × DC 24V/2A (6ES7 142-0BF10-0XB0)

Characteristics

The digital output module ET 200C; DO 8 × DC 24V/2A has the following characteristics:

- Degree of protection IP 66/IP 67 (see Installation rules, Section 4.1)
- Output current per channel: 2 A
- Choice of nine different baud rates:
  9.6, 19.2; 93.75; 187.5; 500; 1500; 3000; 6000 and 12000 kbaud

  The baud rates 3000, 6000 and 12000 kbaud can only be used if the module is operated with the IM 308-C (see Section 1.2).
- Channel-by-channel diagnostics of the outputs for wire break and short-circuit/overload and load voltage of the outputs (can be switched off with COM ET 200, see Section 5.1.4).

  The diagnostics can be output via the IM 308-B master interface module. In addition, each diagnostic message causes the LED ”DIA” or the respective individual diagnostics LED to light up.
- LEDs for
  - RUN
  - BF (bus fault)
  - DIA (diagnostics of the outputs)
  - U_L (load voltage supply of the outputs)
  - Status of the outputs or individual diagnostics
- Attachment of the module without opening the cover (drill-hole template at the back of the manual)

Connections

The digital output module ET 200C; DO 8 × DC 24V/2A has the following connections:

- 8 output channels (three-conductor connection)
- 2 bus connections (12-pin socket)

  The 12-pin sockets can be used for several purposes:

  – to connect the SINEC L2-DP field bus

  – to connect the power supply

  – to connect the field bus and incorporated power supply

  The bus connections are interconnected internally.

- 1 connection for external load voltage supply (6-pin male connector)

  The load voltage supply cannot be looped if the ET 200C;
  DO 8 × DC 24V/2A is used.

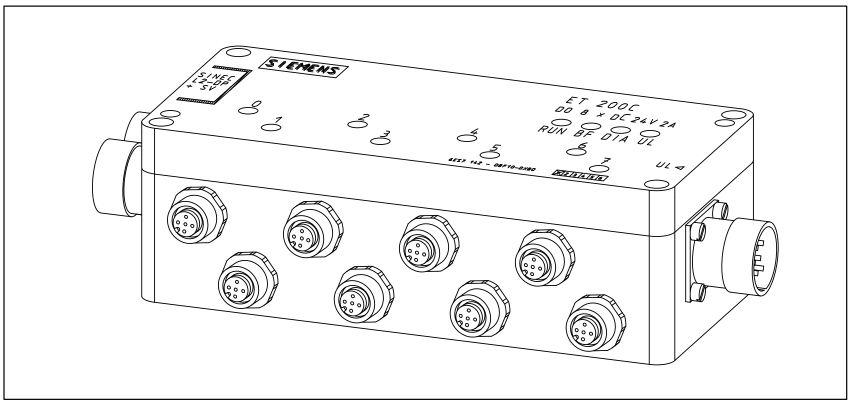


Figure 3-3 Digital Output Module ET 200C; DO 8 × DC 24V/2A (6ES7 142-0BF10-0XB0)

3.4 Digital Input/Output Module ET 200C; DI 16/DO 16 × DC 24V (6ES 143-0BL00-0XB0 and 6ES7 143-0BL10-0XB0)

Characteristics

The digital input/output module ET 200C; DI 16/DO 16 × DC 24V has the following characteristics:

- Degree of protection IP 66/IP 67 (see Installation rules, Section 4.1)
- Two versions of the module are available with different connection systems for the input/output channels:

  with circular connectors → 6ES7 143-0BL00-0XB0

  with cable gland and conduit thread → 6ES7 143-0BL10-0XB0
- Output current per channel: 2 A
- Choice of nine different baud rates:
  9.6, 19.2; 93.75; 187.5; 500; 1500; 3000; 6000 and 12000 kbaud

  The baud rates 3000, 6000 and 12000 kbaud can only be used if the module is operated with the IM 308-C (see Section 1.2).
- Diagnostics for 4 outputs of a channel group for wire break, short-circuit/overload and load voltage of the outputs (LED ”DIA” for output x.0 to x.3, LED ”DIA” for output x.4 to x.7; x = 0.1).

  Diagnostics for 4 inputs of a channel group for wire break, short-circuit/overload of the sensor supply (LED ”DIA” for input x.0 to x.3, LED ”DIA” for input x.4 to x.7; x = 0.1).

  The diagnostics can be output via the IM 308-B master interface module. Diagnostics can be switched off with COM ET 200 by means of the parameterization telegram (see Section 5.1.2).
- LEDs for
  - RUN
  - BF (bus fault)
  - DIA (group diagnostics for 4 inputs and 4 outputs)
  - Load voltage monitoring (U_{L1}, U_{L2})
  - Status of the inputs/outputs
- Attachment of the module without opening the cover (drill-hole template at the back of the manual)
- Replaceable labelling strips (order no. 6ES7 790-2CA11, 5 labelling strips on one DIN A4 sheet)

Connections

The digital output module ET 200C; DI 16/DO 16 × DC 24V has the following connections:

- 16 input channels, non-floating (four-conductor connection)
- 16 output channel, floating in groups of 8 channels
- 2 bus connections (12-pin socket)

  The 12-pin sockets can be used for several purposes:

  – to connect the SINEC L2-DP field bus

  – to connect the power supply

  – to connect the field bus and incorporated power supply

  The bus connections are interconnected internally.

- 2 connections for external load voltage supply (6-pin male connector)

  There is a separate load voltage connection for each channel group (Q0, Q1). The load voltage **cannot** be looped via the digital input/output module.

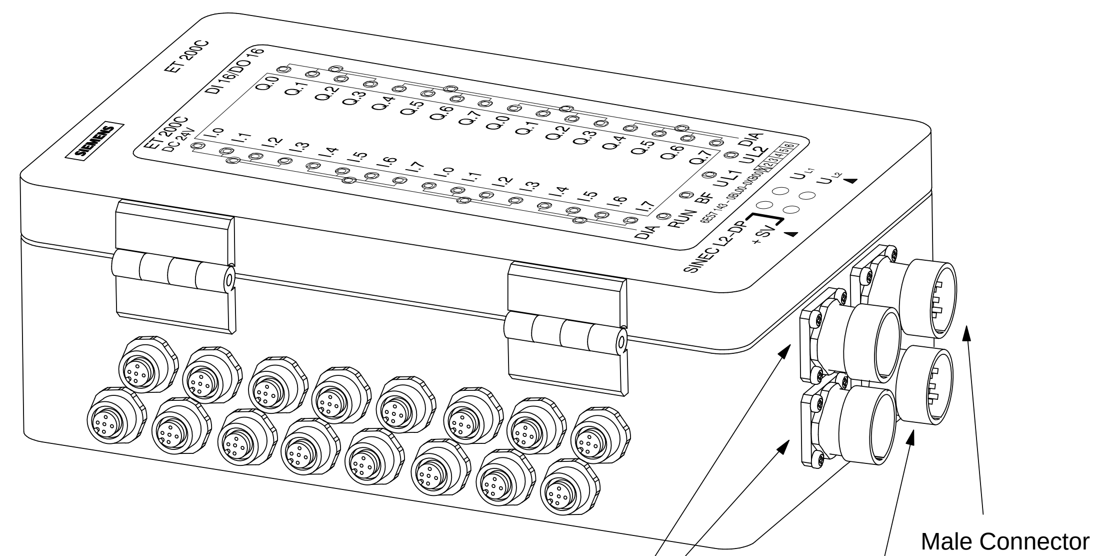


Figure 3-4 Digital Input/Output Module ET 200C; DI 16/DO 16 × DC 24V with Circular Connector (6ES7 143-0BL00-0XB0)

Digital Input/Output Module ET 200C; DI 16/DO 16 × DC 24V (6ES 143-0BL00-0XB0 and 6ES7 143-0BL10-0XB0), Continued

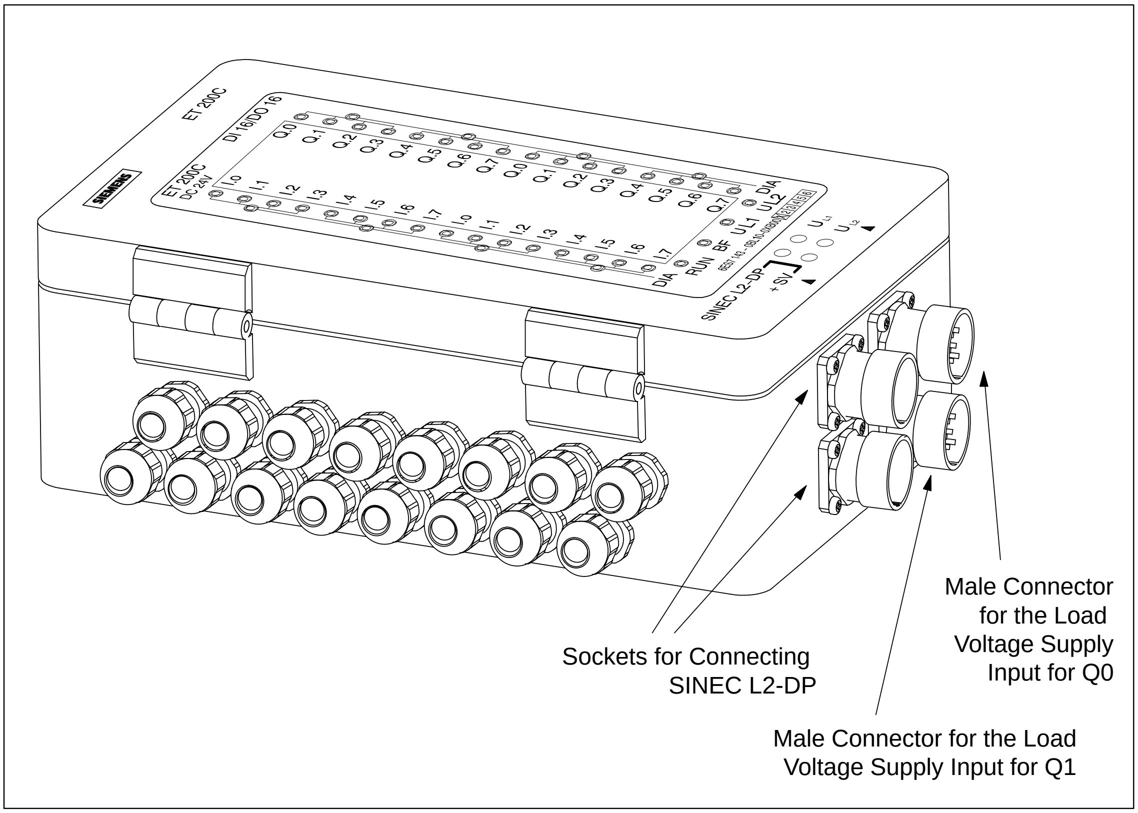


Figure 3-5 Digital I/O Module ET 200C; DI 16/DO 16 × DC 24 V with Conduit Thread Glands (6ES7 143-0BL10-0XB0)

3.5 Analog Input Module ET 200C; AI 4/8 × 12 Bit (6ES7 144-0KH00-0XB0)

Characteristics

The analog input module ET 200C; AI 4/8 × 12 bit has the following characteristics:

- Degree of protection IP 66/IP 67 (see Installation Rules, Section 4.1)
- Choice of the following baud rates: 9.6; 19.2; 93.75; 187.5; 500 and 1500 kbaud
- Measuring principle: voltage-frequency conversion (integrating)
- Measuring range selectable separately for each channel group
  - ± 80 mV
  - ± 250 mV
  - ± 500 mV
  - ± 1000 mV
  - thermocouples (types N, K, T, U, J, L, E)
  - Resistance thermometers (Pt100/Ni100)

The analog input module ET 200C; AI 4/8 × 12 bit is suitable for either two-wire or four-wire connection. This means that the measuring range can be set only on the basis of channel groups.

- Channel diagnostics of inputs for wire break, range overshoot, common-mode voltage overshoot, short-circuit and parameterization error (can be switched off with COM ET 200, see Section 5.1.4).

  Channel diagnostics can be evaluated only via the IM 308-C master interface. Each diagnostics message causes the ”DIA” LED to light up.
- LEDs for
  - RUN
  - BF (bus fault)
  - DIA (module diagnostics)
- No need to open the cover to secure the module (see drill-hole templates at the back of the manual).

Analog Input Module ET 200C; AI 4/8 × 12 Bit (6ES7 144-0KH00-0XB0), Continued

Connections

The analog input module ET200C; AI 4/8 × 12 bit has the following connections:

- 8 input channels for thermocouples and voltage sensors (2-wire)

  or 4 input channels (4-wire)

- 2 bus connectors (12-pin socket)

  The 12-pin sockets can be used for:

  – connecting to the SINEC L2-DP field bus

  – connecting to the power supply

  – connecting to the combined field bus and power supply cable

  The bus connectors are linked internally.

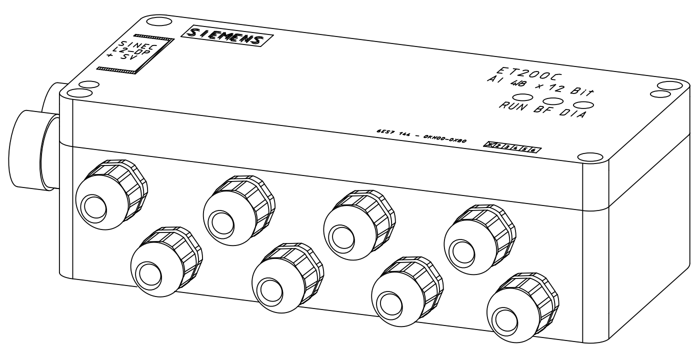


Figure 3-6 Analog Input Module ET 200C; AI 4/8 × 12 Bit (6ES7 144-0KH00-0XB0)

3.6 Analog Input Module ET 200C; AI 4 × 12 Bit (6ES7 144-0HF00-0XB0)

Characteristics

The analog input module ET 200C; AI 4 × 12 bit has the following characteristics:

- Degree of protection IP 66/IP 67 (see Installation Rules, Section 4.1)
- Choice of the following baud rates: 9.6; 19.2; 93.75; 187.5; 500 and 1500 kbaud
- Measuring principle: momentary value encryption (successive approximation)
- Measuring range selectable separately for each channel group
  - ± 1.25 V
  - ± 2.5 V
  - ± 5V
  - ± 10 V
  - ± 20 mA
  - 0 ... 20 mA
  - 4 ... 20 mA
- Channel diagnostics of inputs for range overshoot and parameterization error (can be switched off with COM ET 200, see Section 5.1.4).
- Channel diagnostics can be evaluated only via the IM 308-C master interface. Each diagnostics message causes the ”DIA” LED to light up.
- LEDs for
  - RUN
  - BF (bus fault)
  - DIA (module diagnostics)
- No need to open the cover to secure the module (see drill-hole templates at the back of the manual).

Analog Input Module ET 200C; AI 4 × 12 Bit (6ES7 144-0HF00-0XB0), Continued

Connections

The analog input module ET200C; AI 4 × 12 bit has the following connections:

- 4 input channels (2-wire)
- 2 bus connectors (12-pin socket)

  The 12-pin sockets can be used for:

  – connecting to the SINEC L2-DP field bus

  – connecting to the power supply

  – connecting to the combined field bus and power supply cable

  The bus connectors are linked internally.

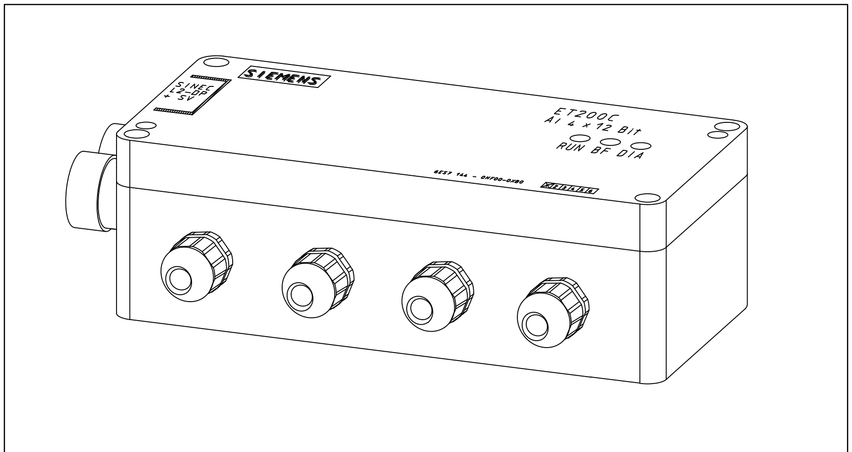


Figure 3-7 Analog Input Module ET 200C; AI 4 × 12 Bit (6ES7 144-0HF00-0XB0)

3.7 Analog Output Module ET 200C; AO 4 × 12 Bit (6ES7 145-0HF00-0XB0)

Characteristics

The analog output module ET 200C; AO 4 × 12 bit has the following characteristics:

- Degree of protection IP 66/IP 67 (see Installation Rules, Section 4.1)
- Choice of the following baud rates: 9.6; 19.2; 93.75; 187.5; 500 and 1500 kbaud
- Output ranges selectable separately for each channel group
  - ± 10 V
  - 0 ... 10 V
  - ± 20 mA
  - 0 ... 20 mA
  - 4 ... 20 mA
- Channel diagnostics of outputs for wire break, range overshoot, common-mode voltage overshoot, short-circuit and parameterization error (can be switched off with COM ET 200, see Section 5.1.4).

  Channel diagnostics can be evaluated only via the IM 308-C master interface. Each diagnostics message causes the ”DIA” LED to light up.
- LEDs for
  - RUN
  - BF (bus fault)
  - DIA (module diagnostics)
- No need to open the cover to secure the module (see drill-hole templates at the back of the manual).

Analog Output Module ET 200C; AO 4 × 12 Bit (6ES7 145-0HF00-0XB0), Continued

Connections

The analog output module ET200C; AO 4 × 12 bit has the following connections:

- 4 output channels
- 2 bus connectors (12-pin socket)

  The 12-pin sockets can be used for:

  – connecting to the SINEC L2-DP field bus

  – connecting to the power supply

  – connecting to the combined field bus and power supply cable

  The bus connectors are linked internally.

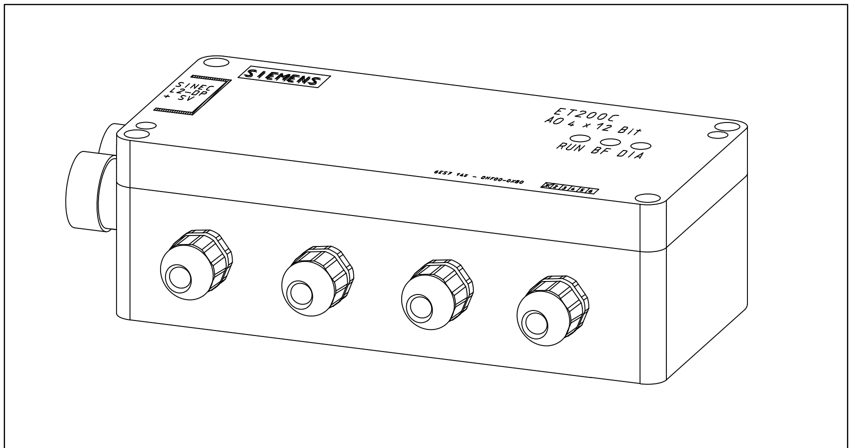


Figure 3-8 Analog Output Module ET 200C; AO 4 × 12 Bit (6ES7 145-0HF00-0XB0)

3.8 T Connector (6ES5 762-2CT11)

Application

You need a T connector for the following configurations:

- Configuration with power supply connector and with T connectors (see Section 2.1.2)
- Configuration with external current supply (see Section 2.1.4)

This means that the SINEC L2-DP field bus can also continue operating if a slave station connected via a T connector is disconnected.

Characteristics

The T connector has the following characteristics:

- Degree of protection IP 66/IP 67 (see Installation rules, Section 4.1)
- Choice of following baud rates:
  9.6; 19.2; 93.75; 187.5; 500; 1500; 3000; 6000 or 12000 kbaud

  The baud rates 3000, 6000 and 12000 kbaud are only possible when the module is operated with the IM 308-C (see Section 1.2).

Connections

A T connector has 3 bus connections:

- Two 12-pin sockets
- One 12-pin male connector

The T connector is attached to the bus connection of an ET 200C module via the 12-pin male connector. Both bus connections of the ET 200C module can be used.

The bus connection can be used for several purposes (see digital modules).

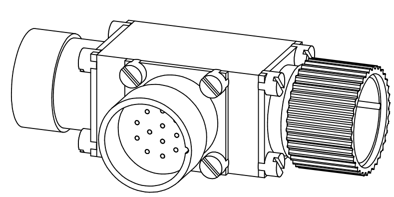


Figure 3-9 T Connector

3.9 Power Supply Connector (6ES5 762-2CS11)

Application

The power supply connector is used to combine the SINEC L2-DP field bus and the external power supply.

Characteristics

The power supply connector has the following characteristics:

- Degree of protection IP 66/IP 67 (see Installation rules, Section 4.1);
- Choice of following baud rates:
  9.6; 19.2; 93.75; 187.5; 500; 1500; 3000; 6000 or 12000 kbaud

  Baud rates 3000, 6000 and 12000 kbaud are possible only for operation with the IM 308-C and the digital modules (see Section 1.2).
- Loadable with a maximum of 4 A input current. This limits the number of digital input modules that can be connected (see Section 2.1.3).
- Does not represent a bus node with station number
- Attachment without opening the cover (drill-hole template at the back of the manual).

Connections

The power supply connector has the following connections:

- Connection for “Incoming” SINEC L2-DP field bus (12-pin socket)
- Connection for “Incoming” external power supply (6-pin male connector)
- Connection for “Outgoing” SINEC L2-DP field bus with power supply (12-pin socket)
- Grounding screw for connection of PE

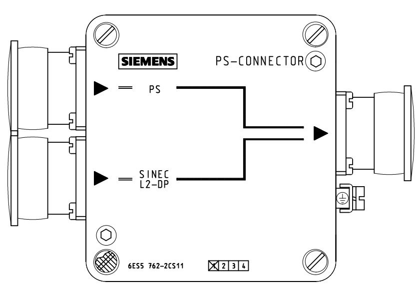


Figure 3-10 Power Supply Connector

3.10 Programmer Connector (6ES5 762-2CA12)

Application

A programmer connector is used to connect the programmer within the IP 66/IP 67 environment to the SINEC L2-DP bus.

Characteristics

The programmer connector has the following characteristics:

- Degree of protection IP 66/IP 67 (see Installation rules, Section 4.1)
- Choice of following baud rates:
  9.6; 19.2; 93.75; 187.5; 500; 1500; 3000; 6000 or 12000 kbaud

  Baud rates 3000, 6000 and 12000 kbaud are possible only for operation with the IM 308-C and the digital modules (see Section 1.2).
- Can be placed anywhere on the bus (exception: the programmer connector may not be attached to the ends of the bus cable, since there is then no space for the terminating resistor).
- Does not represent a bus node with station number
- Attachment without opening the cover (drill-hole template at the back of the manual).

Connections

A programmer connector has three bus connections:

- Connection for “Incoming” SINEC L2-DP field bus (possibly with power supply) (12-pin socket)
- Connection for “Outgoing” SINEC L2-DP field bus (possibly with power supply) (12-pin socket)
- Connection for adapter cable (see Section 3.13) to the programmer (12-pin socket)

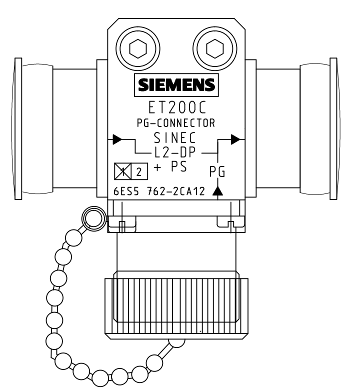


Figure 3-11 Programmer Connector

3.11 Cables

Types of Cables

The ET 200C can be used in various configurations for which you require the correct cables. The following types of cable are available.

Table 3-1 ET 200C Cables

Number of Cores	Application
2	SINEC L2-DP field bus, power supply is not incorporated
5	• For SINEC L2-DP field bus and power supply in one cable or • For feeding the power supply to the power connector or • For external load voltage supply.

Versions

Various different cables are available from SIEMENS for the ET 200C.

All of the cables are available precut and terminated at both ends, one end or not at all

- with 12-pin male connector for SINEC L2-DP bus connection and/or power supply

  and/or

- with 6-pin connection for load voltage supply.

You can, however, also prepare the cables yourself. The necessary information can be found in Section 4.3.

Note

All prefabricated cables have a core cross-sectional area of 0.75 mm^2 for a maximum current load of 4 A.

You will require cables with a minimum core cross-sectional area of 2.5 mm^2 for the load voltage supply of ET 200C; DO 8 $\times$ DC 24V/2A and ET 200C; DI 16/DO 16 $\times$ DC 24V/2A. You must prepare these cables yourself.

You must also prepare the cable for feeding separate power supplies yourself.

Order numbers The following table contains the order numbers for standard cable lengths:

Table 3-2 Order Numbers for Standard Cable Lengths (Core Cross-Sectional Area 0.75 mm^2/Max. Current Load 4 A)

Description	Cable (standard sheath)	Cable (non-welding sheath)
5-core cable (not prefabricated)	6ES5 717-1□□□1	6ES5 718-1□□□1
5-core cable, prefabricated at one end (6-pin circular socket)	6ES5 717-2□□□1	6ES5 718-2□□□1
5-core cable, prefabricated at both ends (6-pin circular socket/6-pin circular connector)	6ES5 717-3□□□1	6ES5 718-3□□□1
5-core cable, prefabricated at one end (12-pin circular connector)[1]	6ES5 717-6□□□1	6ES5 718-6□□□1
5-core cable, prefabricated at both ends (12-pin circular connector)	6ES5 717-7□□□1 ↑↑↑	6ES5 718-7□□□1 ↑↑↑
Length		
0.5 m	A B 4	A B 4
1 m	B B 0	B B 0
2 m	B C 0	B C 0
5 m	B F 0	B F 0
10 m	C B 0	C B 0

1 Do not use for feeding the power supply separately (as bus cable is connected → may cause interference on the bus)

If you require cables of a different length, you can order these using Z numbers.

Specify the order number and the desired length, e.g. 6ES5 717-1AA01-Z 3.50 m.

Table 3-3 Order Numbers for Standard Cable Lengths (Core Cross-Sectional Area 0.75 mm^2/Max. Current Load 4 A)

Description	Cable (standard sheath)	Cable (non-welding sheath)
5-core cable (not prefabricated)	6ES5 717-1AA01-Z	6ES5 718-1AA01-Z
5-core cable, prefabricated at one end (6-pin circular socket)	6ES5 717-2AA01-Z	6ES5 718-2AA01-Z
5-core cable, prefabricated at both ends (6-pin circular socket/6-pin circular connector)	6ES5 717-3AA01-Z	6ES5 718-3AA01-Z
5-core cable, prefabricated at one end (12-pin circular connector)[1]	6ES5 717-6AA01-Z	6ES5 718-6AA01-Z
5-core cable, prefabricated at both ends (12-pin circular connector)	6ES5 717-7AA01-Z	6ES5 718-7AA01-Z

1 Do not use for feeding the power supply separately (as bus cable is connected → may cause interference on the bus)

3.12 Terminating Resistor (6ES5 755-2CA11)

Application

A bus cable must always be terminated at both ends with a terminating resistor.

On the ET 200C, the terminating resistor is screwed onto a 12-pin socket. The terminating resistor can be screwed onto the bus connection of:

- Digital and analog modules, or
- T connector

Characteristics

The terminating resistor has

- Degree of protection IP 66/IP 67 (see Installation rules, Section 4.1)

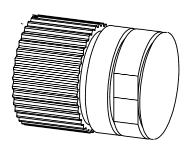


Figure 3-12 Terminating Resistor

3.13 Adapter Cable (6ES5 755-8CA11)

Application

The adapter cable is required for connecting the programmer (with programmer interface module CP5410-S5DOS/ST) or the ET 200 handheld to the ET 200C.

The programmer or the ET 200 handheld are required for

- Setting the station number (digital modules only with ET 200 handheld, anlog modules optionally with ET200 handheld)
- Test and startup
- Diagnostics functions

Characteristics

The adapter cable has the following characteristics:

- Degree of protection IP 66/IP 67 (see Installation rules, Section 4.1) only at the end with the IP 66/IP 67 bus connector
- Choice of following baud rates:
  9.6; 19.2; 93.75; 187.5; 500; 1500; 3000; 6000 or 12000 kbaud

  The baud rates 3000, 6000 and 12000 kbaud are only possible when operating with the IM 308-C and digital modules (see Section 1.2).

Connections

The adapter cable has the following connections:

- Bus connector in IP 20 (9-pin connector)
- Bus connector in IP 66/IP 67 (12-pin connector)

In order to connect the programmer, you also require the programmer connecting cable.

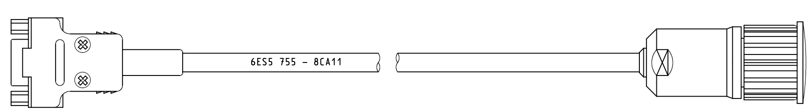


Figure 3-13 Adapter Cable

4 Mechanical and Electrical Installation

In this Chapter

This chapter describes the mechanical and electrical installation of the ET 200C.

4.1 Installation of ET 200C

Rules

Degree of protection IP 66/IP 67 can be guaranteed for the ET 200C modules only under the following conditions:

- The surfaces on which the ET 200C modules are mounted must be flat (no tensions)
- All unused connections must **always** be sealed with the plastic caps supplied (inputs/outputs only) or metal caps.

IP 66/IP 67 is **not** guaranteed if the transparent caps for transport are used.

Degree of protection IP 66/IP 67

Bear the following in mind with regard to degree of protection IP 66/IP 67:

Before startup, check the security of all metal and plastic seals on the ET 200C distributed I/O station.

Installation

The ET 200C modules can be installed in any position and inclined at any angle.

Note the minimum distances between ET 200C modules and cable ducts:

Table 4-1 Distances between ET 200C Modules and Cable Ducts

Between ET 200C module and cable duct ...	Distance
.... **no** T connector is installed	10 cm
... a T connector is installed	5 cm

Captive M4 securing screws are used. You will require a 3.0 mm wrench for socket-head screws to DIN 911 for installation and removal.

Use the drill-hole templates at the back of this manual to install the ET 200C modules. Secure each module to a flat surface or carrier using two M4 screws.

4.2 Electrical Wiring of the ET 200C Distributed I/O Station

Introduction

Both **grounded** and **ungrounded** configurations are possible.

The following two sections include a circuit example for

- Grounded configuration and
- Ungrounded configuration.

The text contains code numbers, which are references to the respective diagram.

Note

We recommend the grounded configuration for analog modules. This configuration provides additional protection against electromagnetic interference.

4.2.1 Grounded Configuration

Definition

In a grounded configuration, the ground and PE potentials are connected.

Rules

For the grounded configuration, the following must be taken into account:

- You must provide a main switch **(1)** according to VDE 0100 for the ET 200C modules, the sensors and the actuators.
- You need a fuse **(2)** for the mains connection of the load power supply unit.
- Use a Siemens load power supply unit of the 6EV1 series (see Catalog ET 1) for power supply and load voltage supply.

  If you use any other load power supply (24 V DC), note that the voltage must be in the range of 20 V DC to 30 V DC (including ripple). The load power supply must generate a functional extra-low voltage with protective separation in accordance with VDE 0106, Part 101. If you use a switched-mode power supply, you will need a back-up capacitor (with a rating of 200 μF per 1 A load current) **(3)**.
- You should provide in secondary circuit a connection **(4)** to the protective conductor on the load power supply (terminal M).
- You need a main power fuse to protect the supply voltage **(5)**.
- For both grounded and ungrounded configurations, use a low-resistance conductor to connect the protective ground (PE) terminal of the ET 200C modules (digital and analog modules, power supply connector, programmer connector) to the protective ground conductor or the chassis ground (machine ground) (**6**).

  The right-hand side of the power supply connector features a screw for connecting the protective ground conductor. PE is looped in via the power supply connector.

  In addition, the protective ground conductor must be connected to the PE pin in the 12-pin round connector or 6-pin round connector. PE pin and housing are linked internally.
- All machine parts must be grounded.
- Use a minimum cross-section of 10 mm^2 for equipotential bonding and ground connections!

Configuration

The grounded configuration for the ET 200C is shown below.

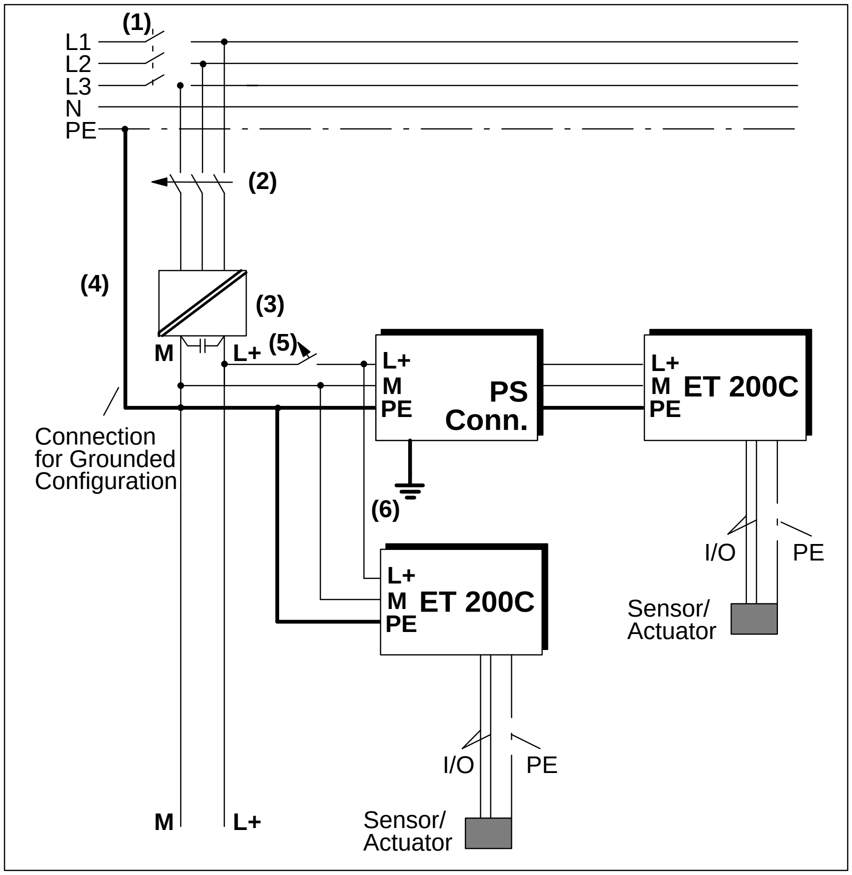


Figure 4-1 Grounded Configuration for ET 200C with 24 V DC Current/Load Voltage Supply

4.2.2 Ungrounded Configuration

Definition

In an ungrounded configuration, there is no connection between the load power supply (M terminal) and the protective ground conductor (PE). The protective ground conductor loses its protective function.

The internal design of the digital and analog modules is such that the supply voltage is connected to the protective ground conductor through a capacitor, in order to dissipate high-frequency interference.

Rules

For the ungrounded configuration, the following must be taken into account:

- You must provide a main switch **(1)** according to VDE 0100 for the ET 200C modules, the sensors and the actuators.
- You need a fuse **(2)** for the mains connection of the load power supply unit.
- Use a Siemens load power supply unit of the 6EV1 series (see Catalog ET 1) for power supply and load voltage supply.

  If you use any other load power supply (24 V DC), note that the voltage must be in the range of 20 V DC to 30 V DC (including ripple). The load power supply must generate a functional extra-low voltage with protective separation in accordance with VDE 0106, Part 101. If you use a switched-mode power supply, you will need a back-up capacitor (with a rating of 200 μF per 1 A load current) **(3)**.
- You need a main power fuse to protect the supply voltage **(5)**.
- For both grounded and ungrounded configurations, use a low-resistance conductor to connect the protective ground (PE) terminal of the ET 200C modules (digital modules, power supply connector, programmer connector) to the protective ground conductor or the chassis ground (mache ground) **(6)**.

  The right-hand side of the power supply connector features a screw for connecting the protective ground conductor. PE is looped in via the power supply connector.

  In addition, the protective ground conductor must be connected to the PE pin in the 12-pin round connector or 6-pin round connector. PE pin and housing are linked internally.
- You must provide insulation monitoring to ground with voltage clamping **(7)**.

⚠

Warning

The ungrounded configuration can be neutralized by grounded machine parts and grounded electrical devices.

Example: A grounded sensor or actuator links the PE protective ground to the M potential of the control system.

Configuration

The ungrounded configuration for the ET 200C is shown below.

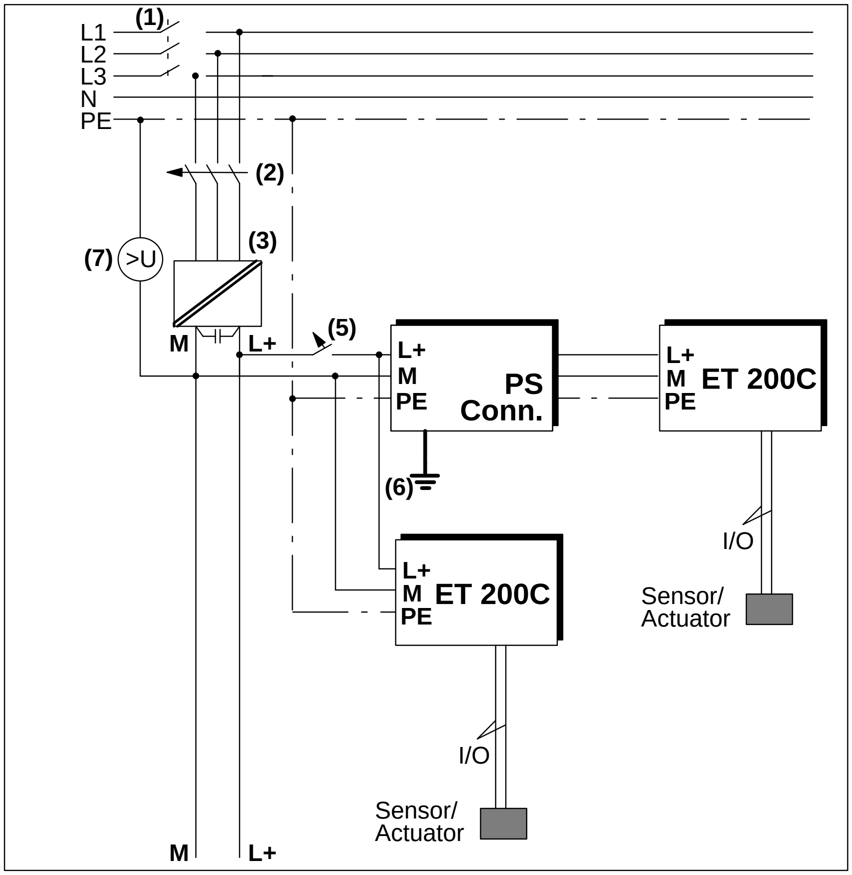


Figure 4-2 Ungrounded Configuration for ET 200C

4.3 Wiring of the ET 200C

Introduction

Prefabricated cables are available from Siemens for the bus connection and the power/load voltage supply (see section 3.10). If you use prefabricated cables, you do not have to read the following section.

Note

All prefabricated cables have a core cross-sectional area of 0.75 mm^2 for a maximum current load of 4 A.

You will require cables with a minimum core cross-sectional area of 2.5 mm^2 for the load voltage supply of ET 200C; DO 8 × DC 24V/2A and ET 200C; DI 16/DO 16 × DC 24V/2A. You must prepare these cables yourself.

You must also prepare the cable for feeding separate power supplies yourself.

Read the following instructions if you wish to prepare the cables yourself.

Circular Connectors/ Sockets

You will require 6-pin and 12-pin circular connectors/sockets for connecting the bus, power supply and the load voltage supply.

The following table contains the order numbers for 6-pin and 12-pin circular connectors:

Table 4-2 Order Numbers for Circular Connectors

Round connector/socket	Order number
6-pin connector with a socket insert (not prefabricated)	6ES5 760-2CA11
6-pin connector with pin insert (not prefabricated)	6ES5 760-2CA21
12-pin connector with pin insert (not prefabricated)	6ES5 760-2CB11

You will require 5-pin circular connectors with pin inserts and M12 external thread to connect the inputs/outputs of the following modules:

- ET 200C; DI 8 × DC 24V
- ET 200C; DO 8 × DC 24V/0.5A
- ET 200C; DO 8 × DC 24V/2A
- ET 200C; DI 16/DO 16 × DC 24V/2A (6ES7 143-0BL00-0XB0)

The corresponding 5-pin circular connectors with pin inserts are available from companies such as Kostal or Lumberg.

Rules: Circular Connectors/ Sockets

The following applies for all connections to circular connectors:

- Remove the cable insulation so that the screw is tightly held by the clamping ring in the circular connector.
- Always use the same core color for the same signal.

  For the green/red SINEC L2 cable, for example, always connect the green wire to terminal A and the red wire to terminal B.

Conduit-Thread Glands

The inputs/outputs of the

- ET 200C; DI 16/DO 16 × DC 24V/2A (6ES7 143-0BL10-0XB0)
- ET 200C; AI 4/8 × 12 bit (6ES7 144-0KH00-0XB0)
- ET 200C; AI 4 × 12 bit (6ES7 144-0HF00-0XB0)
- ET 200C; AO 4 × 12 bit (6ES7 145-0HF00-0XB0)

are connected by means of cable glands which carry the cable through the housing and into the module. Connect the cables as indicated by the labels on the terminals (see Section 4.3.4).

The inputs/outputs have conduit threads in order to secure the signal lines and to ensure that the appropriate degree of protection is provided in accordance with IP 66/IP 67.

Rules: Conduit-Thread Glands

The cables for ET 200C modules with conduit thread glands must comply with the following specifications:

- Digital modules: ∅ 8 mm cable (PG 9 conduit thread)
- Analog modules: ∅ 4.5 ... 6 mm cable
  (e.g. 4 × 0.25 mm^2 or 2 × 0.34 mm^2)

4.3.1 Wiring of the Bus Connection

Note

The bus connection is a 12-pin socket of the ET 200C module.

Introduction

The following ET 200C modules have a bus connection:

- Digital modules (2 bus connections)
- Analog modules (2 bus connections)
- T connector (2 bus connections – a 3rd bus connection is screwed directly onto the ET 200C module)
- Power supply connector (2 bus connections, 1 × SINEC L2-DP, 1 × power supply and SINEC L2-DP together)
- Programmer connector (3 bus connections)

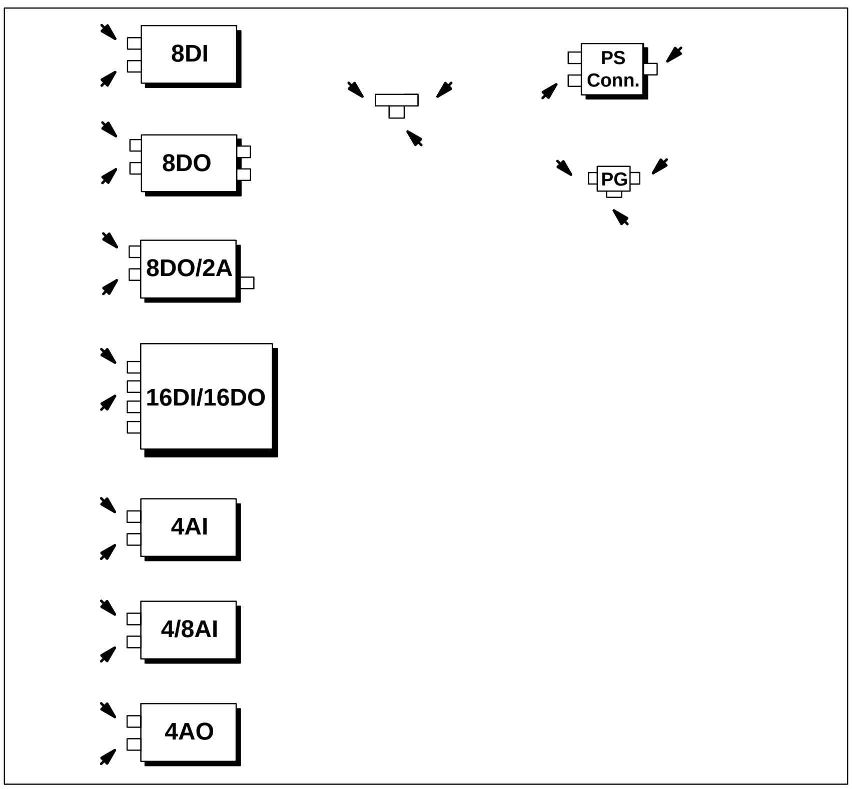


Figure 4-3 Bus Connections of the ET 200C Modules

All ET 200C modules have a socket as bus connection, i.e. a plug connector must be used for all cables as connector.

Connection Options

The SINEC L2-DP and power supply can be connected in one of three ways:

- SINEC L2-DP only connected to the bus connection
- Power supply only connected to the bus connection
- SINEC L2-DP and power supply connected to a bus connection.

⚠

Warning

If you connect an external power supply to a bus connection,

- It is only permissible to connect the 2-core (!) SINEC L2 bus cable to the second bus connection.
- It is only permissible to connect the 2-core (!) SINEC L2 bus cable where a T connector is used.

Connecting only SINEC L2-DP

If you only wish to connect the SINEC L2-DP bus, you will require

- 12-pin circular connectors
- SINEC L2 2-core cable

Connect the circular connectors in accordance with the following table:

Table 4-3 Pin Assignment of the Bus Connection where only the SINEC L2-DP is Connected

Pin	Assignment	Pin	Assignment
1	reserved	7	reserved
2	A (green)	8	reserved
3	reserved	9	reserved
4	B (red)	10	reserved
5	reserved	11	reserved
6	reserved	12	reserved

Wiring of the Bus Connection, Continued

Connecting only power supply

If you only wish to connect the power supply, you require

- 12-pin circular connectors
- 3-core cable with a diameter of 6 to 10 mm.

Connect the circular connectors in accordance with the following table:

Table 4-4 Pin Assignment of the Bus Connection where only the Power Supply is Connected

Pin	Assignment	Pin	Assignment
1	reserved	7	P 24 V
2	reserved	8	M 24 V
3	reserved	9	PE
4	reserved	10	reserved
5	reserved	11	reserved
6	reserved	12	reserved

Connecting SINEC L2-DP and Power Supply

If you combine the SINEC L2-DP bus and the power supply in a single cable, you will require

- 12-pin circular plugs
- 5-core cable with a diameter of 6 to 10 mm.

Table 4-5 Pin Assignment of the Bus Connection if SINEC L2-DP and Power Supply are Connected

Pin	Assignment	Pin	Assignment
1	reserved	7	P 24 V
2	A (green)	8	M 24 V
3	reserved	9	PE
4	B (red)	10	reserved
5	reserved	11	reserved
6	reserved	12	reserved

Sealing of Unused Connections

Connections which are not required must be sealed using the enclosed metal caps.

4.3.2 Wiring of ET 200C; DI 8 × DC 24V (6ES7 141-0BF00-0XB0)

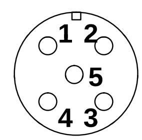
Connecting Inputs

To wire the inputs you will require

- 5-pin circular plugs
- Flexible 4-core Cu cables with a minimum core cross-section of 0.75 mm^2.

Connect the inputs in accordance with the pin assignment in the following table.

Table 4-6 Pin Assignment of the Inputs of ET 200C; DI 8 × DC 24V (6ES7 141-0BF00-0XB0)

Pin	Input	View
1	24 V DC[1]	
2	Free	
3	Ground	
4	Signal	View: Mating Side
5	PE	

[1] The module supplies this 24 V DC at pin 1 as the voltage supply for the connected sensors.

Sealing of Unused Inputs

Inputs which are not required must be sealed using the enclosed twist caps.

Wiring of ET 200C; DI 8 × DC 24V (6ES7 141-0BF00-0XB0), Continued

Return Sensor Supply to Inputs

The following must be noted if you feed the sensor supply of an input directly to an input ("Read back output" function):

- If no load is connected,
  - the diagnostics for the sensor supply must be disconnected in the COM ET 200 (see Section 5.1.4) **or**
  - a resistor (2.4 kΩ) must be connected to ground at the input for wire-break recognition.

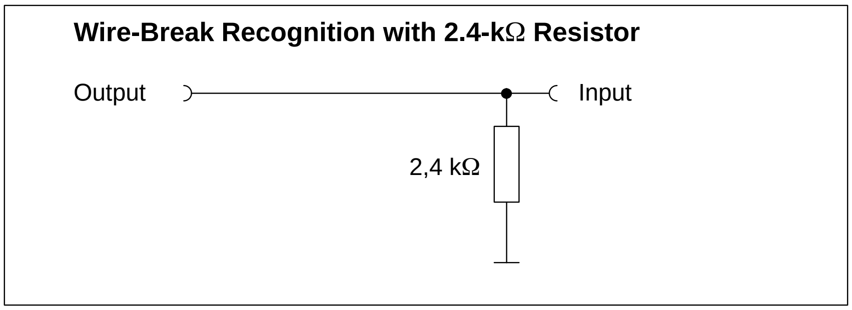


Figure 4-4 Sensor Supply Returned to Input without Load

- If a load is connected, only a wire break on the connection to the load will be recognized. The connection between the sensor supply and the input **cannot** be monitored for wire breaks.

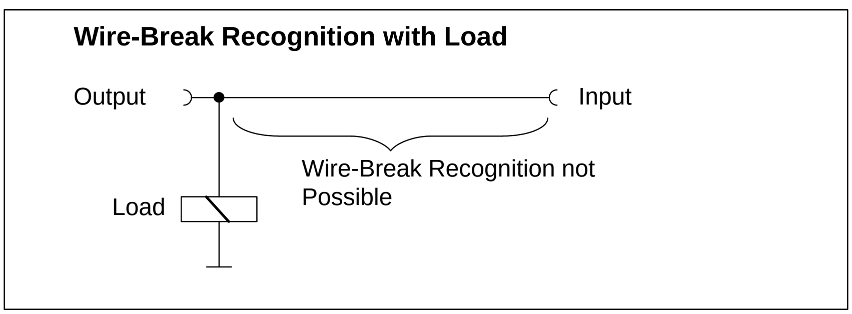


Figure 4-5 Sensor Supply Returned to Input with Load

4.3.3 Wiring of ET 200C; DO 8 × DC 24V/0.5A (6ES7 142-0BF00-0XB0) and ET 200C; DO 8 × DC 24V/2A (6ES7 142-0BF10-0XB0)

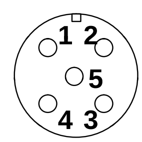
Connecting Outputs

To wire the outputs you will require

- 5-pin circular plugs
- Flexible 3-core Cu cables with a minimum core cross-section of 0.75 mm^2.

Connect the outputs in accordance with the pin assignments in the table below.

Table 4-7 Pin Assignments of the Outputs of ET 200C; DO 8 × DC 24V/0.5A (6ES7 142-0BF00-0XB0) and ET 200C; DO 8 × DC 24V/2A (6ES7 142-0BF10-0XB0)

Pin	Output	View
1	Free	
2	Free	
3	Ground	
4	Signal	View: Mating Side
5	PE	

Sealing of Unused Outputs

Outputs which are not required must be sealed using the enclosed twist caps.

Wiring of ET 200C; DO 8 × DC 24V/0.5A (6ES7 142-0BF00-0XB0) and ET 200C; DO 8 × DC 24V/2A (6ES7 142-0BF10-0XB0), Continued

Return Outputs to Inputs

If you run an output or sensor supply input directly to an input ("Read back output" function), you must take the following into account:

- If no load is connected,
  - the diagnostics for the output or sensor supply must be disconnected in the COM ET 200 (see section 5.1.4) **or**
  - a resistor (2.4 kΩ) must be connected to ground at the input for wire-break recognition.

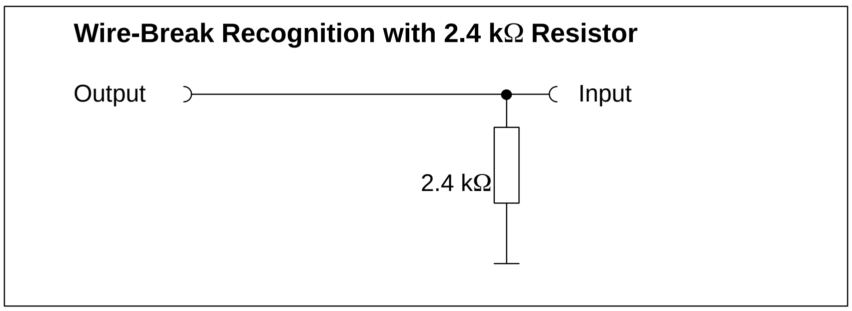


Figure 4-6 Output Returned to Input without Load

- If a load is connected, a wire break is only recognized on the connection to the load. The output → input connection can **not** be monitored for wire-break.

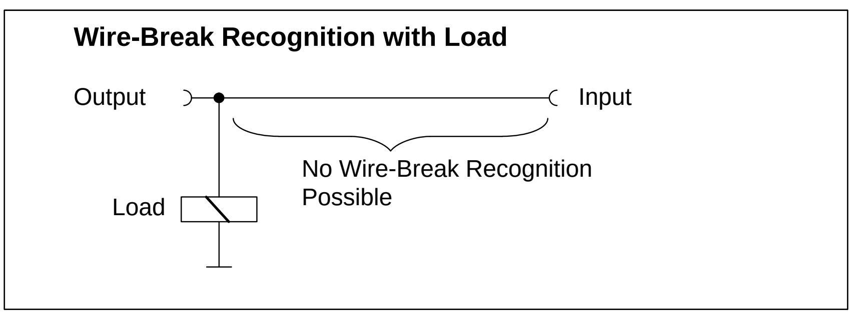


Figure 4-7 Output Returned to Input with Load

4.3.4 Wiring of ET 200C; DI 16/DO 16 × DC 24V/2A (6ES7 143-0BL00-0XB0)

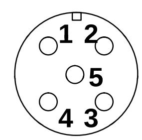
Connecting Inputs/Outputs

To wire the inputs/outputs you will require

- 5-pin circular plugs
- Flexible 3-core Cu cables with a minimum core cross-section of 0.75 mm^2.

Connect the inputs in accordance with the pin assignments in the following table.

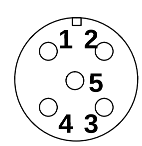
Table 4-8 Pin Assignments of the Inputs of ET 200C; DI 16/DO 16 × DC 24V/2A (6ES7 143-0BL00-0XB0)

Pin	Input	View
1	24 V DC[1]	
2	Free	
3	Ground	
4	Signal	View: Mating Side
5	PE	

1 The module supplies this 24 V DC at pin 1 as the voltage supply for the connected sensors.

Connect the outputs in accordance with the pin assignments in the following table.

Table 4-9 Pin Assignments of the Outputs of ET 200C; DI 16/DO 16 × DC 24V/2A (6ES7 143-0BL00-0XB0)

Pin	Input	View
1	Free	
2	Free	
3	Ground	
4	Signal	
5	PE	View: Mating Side

Sealing of Unused Inputs/Outputs

Seal all unused inputs/outputs with the screw caps supplied.

Wiring of ET 200C; DI 16/DO 16 × DC 24V/2A (6ES7 143-0BL00-0XB0), Continued

Return Outputs to Inputs

If you run an output or sensor supply input directly to an input ("Read back output" function), you must take the following into account:

- If no load is connected,
  - the diagnostics for the output or sensor supply must be disconnected in the COM ET 200 (see section 5.1.4) **or**
  - a resistor (2.4 kΩ) must be connected to ground at the input for wire-break recognition.

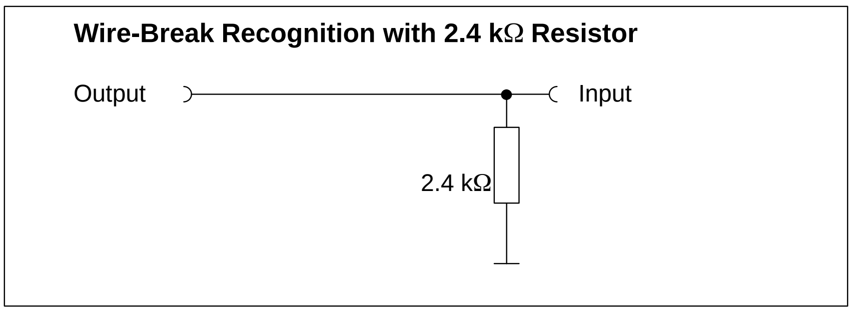


Figure 4-8 Output Returned to Input without Load

- If a load is connected, a wire break is only recognized on the connection to the load. The output → input connection can **not** be monitored for wire-break.

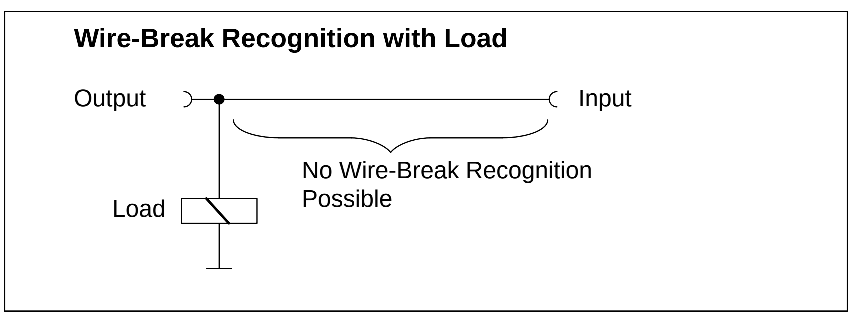


Figure 4-9 Output Returned to Input with Load

4.3.5 Wiring of ET 200C; DI 16/DO 16 × DC 24V/2A (6ES7 143-0BL10-0XB0)

Connecting Inputs and Outputs

Connect the signal lines to the screw terminals in the module.

Proceed as follows:

1. Open the module using a screwdriver.
2. Unscrew the conduit thread slightly, remove the seal and pull the signal lines through the threaded joint.
3. Strip the signal lines and crimp the ends with wire end ferrules.
4. Connect the lines to the labelled, numbered terminals.
5. Pull the lines taught and tighten the conduit thread.
6. Fill in the labelling strips on the front of the module.
7. Close the module using a screwdriver.

Terminal Assignments

Connect the signal lines in accordance with the terminal assignments in the following table.

Table 4-10 Connection Assignments of ET 200C; DI 16/DO 16 × DC 24V/2A (6ES7 143-0BL10-0XB0)

Terminal	Assignment
I0.0 ... I0.7	I0: Input .0 7
I1.0 ... I1.7	I1: Input .0 7
Q0.0 ... Q0.7	Q0: Output .0 7
Q1.0 ... Q1.7	Q1: Output .0 7
24V	24 V DC (sensor supply)
0V	Ground (sensor supply)
PE	PE
M1	Ground (U_{L1})
M2	Ground (U_{L2})

Sealing of Unused Inputs/Outputs

Inputs/outputs which are not required must be sealed using the screw-type seals.

Wiring of ET 200C; DI 16/DO 16 × DC 24V/2A (6ES7 143-0BL10-0XB0), Continued

Arrangement of the screw terminals

Figure 4-10 shows the arrangement of the screw terminals of ET 200C; DI 16/DO 16 × DC 24V/2A (6ES7 143-0BL10-0XB0)

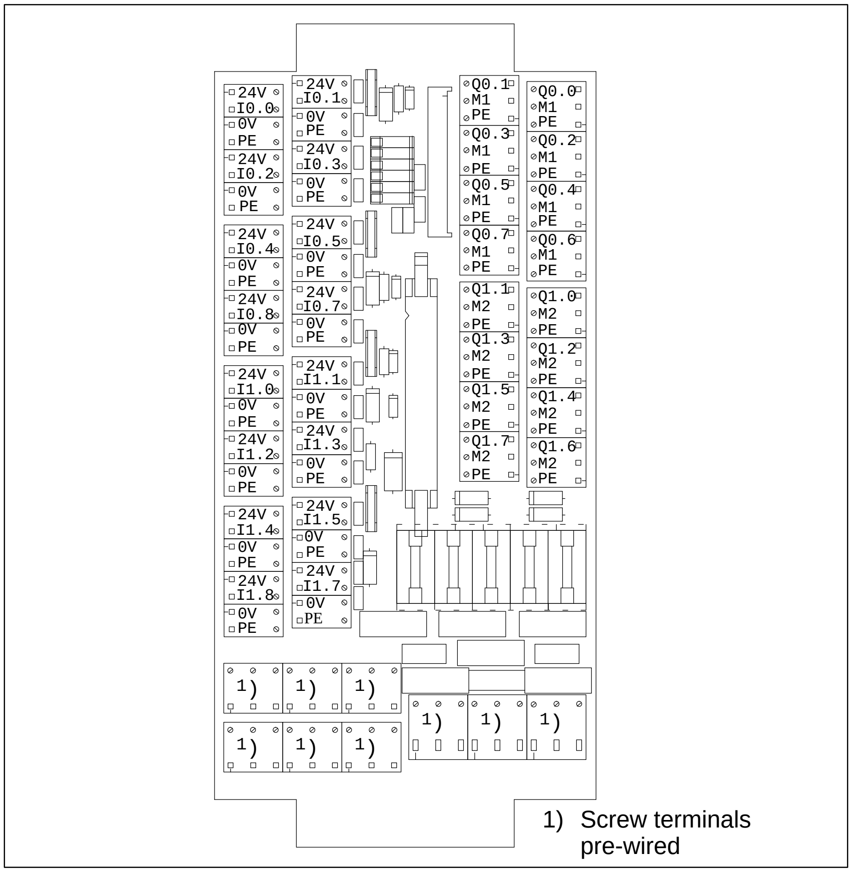


Figure 4-10 Arrangement of Screw Terminals of ET 200C; DI 16/DO 16 × DC 24V/2A (6ES7 143-0BL10-0XB0)

4.3.6 Wiring of ET 200C; AI 4/8 × 12 Bit (6ES7 144-0KH00-0KB0)

Connecting Inputs

Connect the signal cables to the screw terminals on the lower printed-circuit board in the module.

Proceed as follows:

1. Open the module using a screwdriver.
2. Unscrew the cap of the conduit thread gland for the grounding cable and remove the seal with the sleeve.
3. Push first the gland cap and then the seal onto the cable.
4. Cut back an appropriate length of the outer cable sheath.
5. Bend the braided shield at the end of the outer sheath up through 90°. Push the sleeve with a twisting action over the foil until it is under the braided shield in the outer sheath.
6. Trim off the braided shield flush with the outer edge of the sleeve.
7. Pull the ends of the signal cables though the glands with the foil and cut off the foil.
8. Strip the ends of the signal lines and crimp the conductors with wire ferrules.
9. Connect the lines to the corresponding terminals.
10. Pull the lines taut and tighten the gland.
11. Repeat steps 2 through 10 with other signal lines or close the module using a screwdriver. When closing the module, make sure that the cover is correctly seated as damage may occur if the cover is not aligned with the casing.

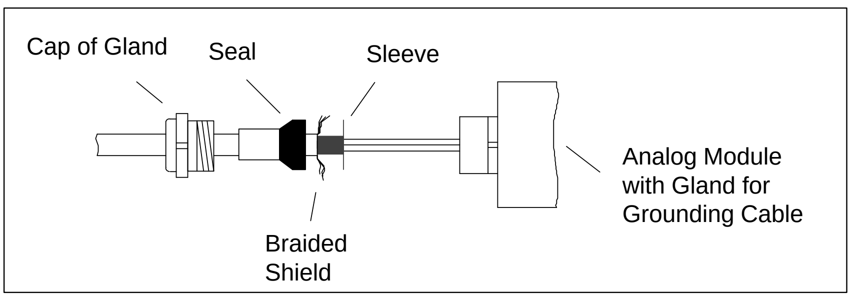


Figure 4-11 Components of the Cable Gland for the Grounding Cable

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Note

When you connect the signal lines, check that the DIL switches on the printed circuit board (see Figure 4-12) remain easily accessible.

Wiring of ET 200C; AI 4/8 × 12 Bit (6ES7 144-0KH00-0KB0), Continued

Terminal Assignment

Connect the signal lines to the terminals in accordance with the table below.

Table 4-11 Connection Assignment of the Inputs of ET 200C; AI 4/8 × 12 Bit (6ES7 144-0KH00-0KB0)

Terminal	Assignment for connection of ...				
	channel	**resistance sensor**	**channel**	**thermocouple**	**voltage sensor**
1		not used		Compensator (+)	not used
2		not used		Compensator (–)	not used
3	CH0	Measuring line (+)	CH0	Measuring line (+)	Measuring line (+)
4		Measuring line (–)		Measuring line (–)	Measuring line (–)
5		Constant current line I_{C+}	CH1	Measuring line (+)	Measuring line (+)
6		Constant current line I_{C-}		Measuring line (–)	Measuring line (–)
7	CH1	Measuring line (+)	CH2	Measuring line (+)	Measuring line (+)
8		Measuring line (–)		Measuring line (–)	Measuring line (–)
9		Constant current line I_{C+}	CH3	Measuring line (+)	Measuring line (+)
10		Constant current line I_{C-}		Measuring line (–)	Measuring line (–)
11	CH2	Measuring line (+)	CH4	Measuring line (+)	Measuring line (+)
12		Measuring line (–)		Measuring line (–)	Measuring line (–)
13		Constant current line I_{C+}	CH5	Measuring line (+)	Measuring line (+)
14		Constant current line I_{C-}		Measuring line (–)	Measuring line (–)
15	CH3	Measuring line (+)	CH6	Measuring line (+)	Measuring line (+)
16		Measuring line (–)		Measuring line (–)	Measuring line (–)
17		Constant current line I_{C+}	CH7	Measuring line (+)	Measuring line (+)
18		Constant current line I_{C-}		Measuring line (–)	Measuring line (–)
19		Analog ground (M_{ANA})		Analog ground (M_{ANA})	
20		Analog ground (M_{ANA})		Analog ground (M_{ANA})	

Sealing of Unused Inputs

Seal all unused inputs with the screw caps supplied (module is supplied with all inputs sealed).

Arrangement of Screw Terminals and DIL Switches

Figure 4-12 shows the arrangement of screw terminals and DIL switches in the ET 200C; AI 4/8 × 12 Bit.

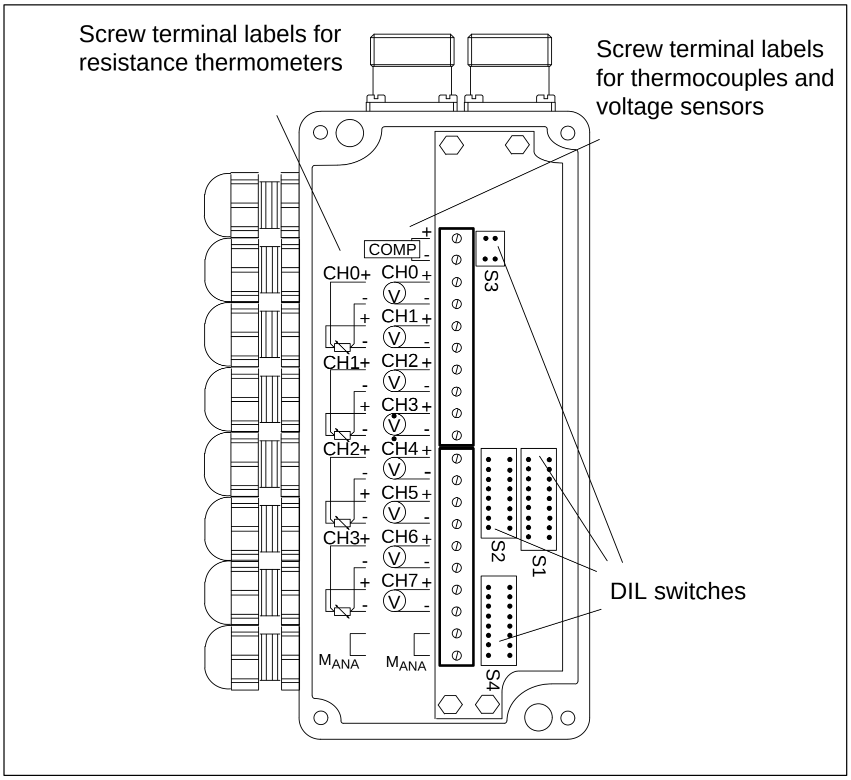

Figure 4-12 Arrangement of Screw Terminals and DIL Switches in ET 200C; AI 4/8 × 12 Bit

Table 4-12 DIL-Switch Blocks in the ET 200C; AI 4/8 × 12 Bit

DIL switch block	Function	Described in
S1	Manually set the station number	Section 4.4.1
S2	Select 2-wire or 4-wire connection for Pt100 resistance thermometers	Section 4.4.2
S3	Select external/internal and floating/non-floating compensation for thermocouples	Section 4.4.2
S4	Select floating or non-floating measurement	Section 4.4.2

Wiring of ET 200C; AI 4/8 × 12 Bit (6ES7 144-0KH00-0KB0), Continued

Thermocouple: Floating Measurement and Floating External Compensation

The illustration on this page shows how thermocouples are connected for floating measurement and external floating compensation:

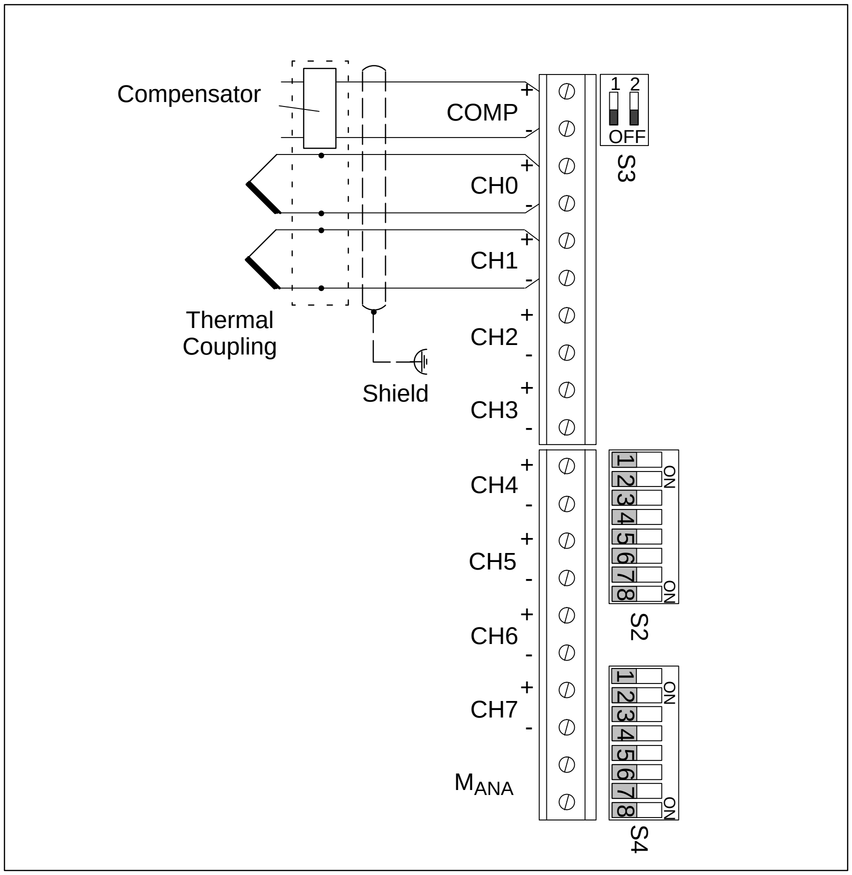

Figure 4-13 Connection to ET 200C; AI 4/8 × 12 Bit of Thermocouples for Floating Measurement and External Floating Compensation

Thermocouple: Non-Floating Measurement and Non-Floating External Compensation

The illustration on this page shows how thermocouples are connected for non-floating measurement and external non-floating compensation:

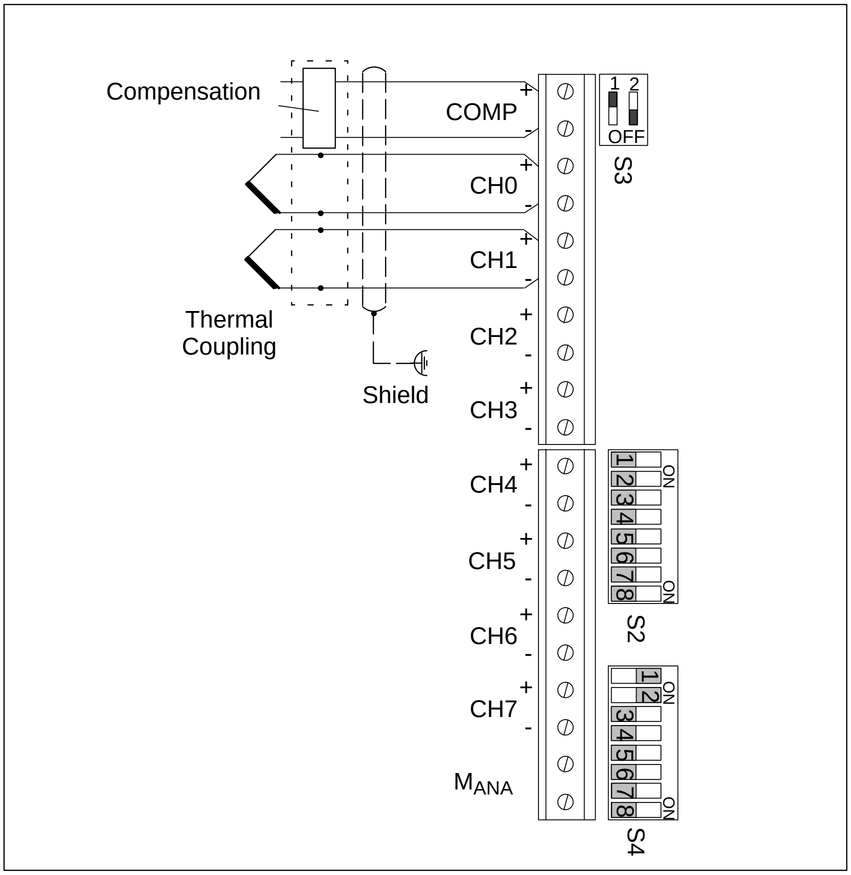

Figure 4-14 Connection to ET 200C; AI 4/8 × 12 Bit of Thermocouples for Non-Floating Measurement and External Non-Floating Compensation

Wiring of ET 200C; AI 4/8 × 12 Bit (6ES7 144-0KH00-0KB0), Continued

Thermocouple: Non-Floating Measurement and Internal Compensation

The illustration on this page shows how thermocouples are connected for non-floating measurement and internal compensation:

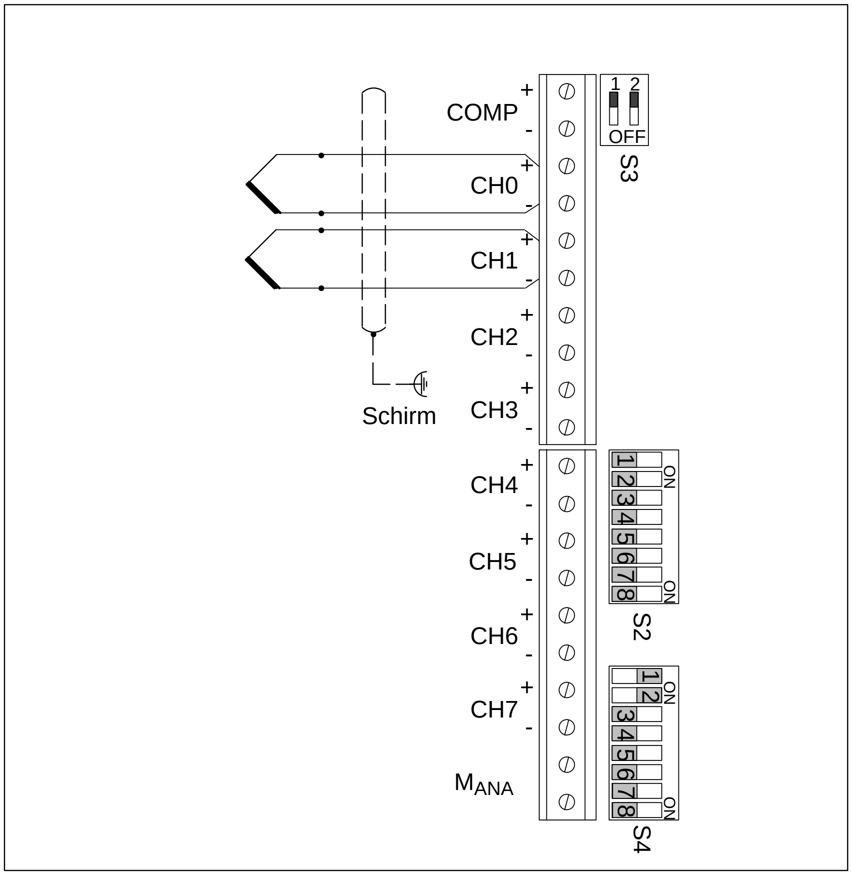

Figure 4-15 Connection to ET 200C; AI 4/8 × 12 Bit of Thermocouples for Non-Floating Measurement and Internal Compensation

Resistance Thermometer, 2-Wire Circuit

The resistance of the resistance thermometer (Pt 100) is measured with the aid of a 2-wire circuit. A maximum of four Pt 100 thermometers can be connected (1 resistance thermometer per channel group).

The resistance thermometer receives a constant current supply via terminals $CH0_+$ / $CH2_+$ and $CH0_-$ / $CH2_-$. Voltage drops on the measuring lines can falsify the results of measurement. This type of measurement is of practical value if the precision requirements are low.

The settings of the switches in DIL switch block S4 determine whether measurement is floating or non-floating (see Section 4.4.2).

Note

If a resistance thermometer (Pt100) is used for floating measurement, the maximum permissible common-mode voltage is $U_{CM} \leq \pm 1V$ and must not be overshot relative to M_{ANA} at any differential input.

The illustration below shows how resistance thermometers (Pt100) are connected to channel 0 and channel 2 in a 2-wire circuit for floating measurement:

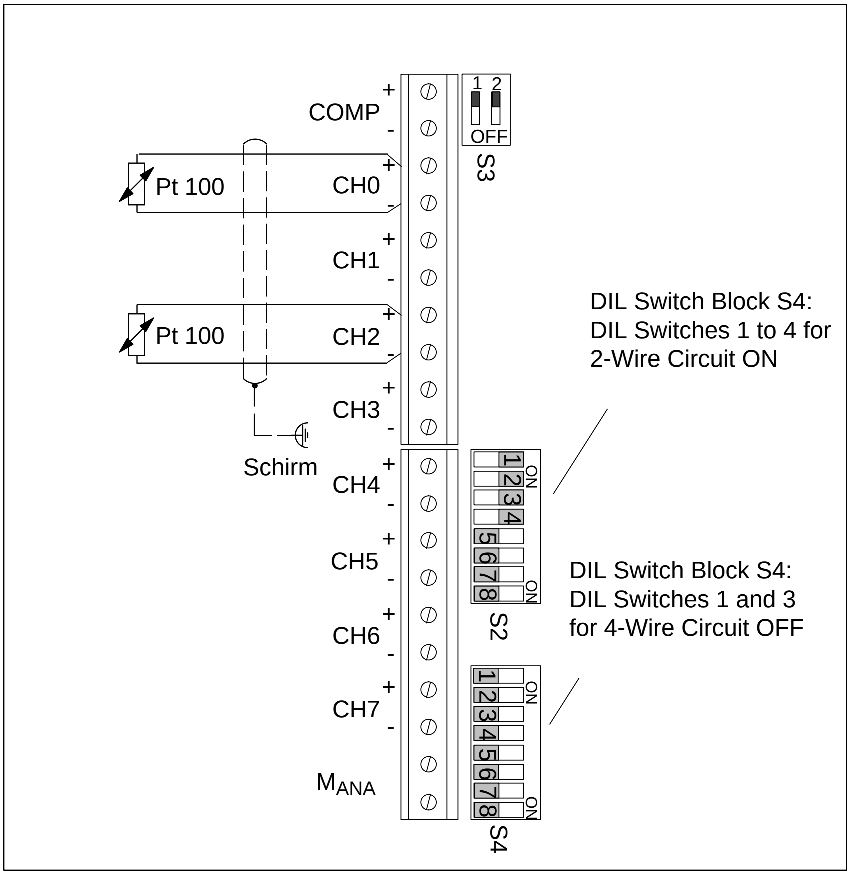

Figure 4-16 Connection to ET 200C; AI 4/8 × 12 Bit of Resistance Thermometers (Pt 100) in 2-Wire Circuit for Floating Measurement

Wiring of ET 200C; AI 4/8 × 12 Bit (6ES7 144-0KH00-0KB0), Continued

Resistance Thermometer, 4-Wire Circuit

The resistance of the resistance thermometer (Pt 100) is measured with the aid of a 4-wire circuit.

The resistance thermometer receives a constant current Ic via terminals $CH0_+$ / $CH2_+$ and $CH0_-$ / $CH2_-$. The voltage generated at the resistance thermometer is measured via $CH1_+$ / $CH3_+$ and $CH1_-$ / $CH3_-$. In this configuration, voltage fluctuations on the constant-current lines do not falsify the results of measurement. The measuring inputs are high-ohmic, so the voltage drop on the measuring lines is negligible.

Note

If a resistance thermometer (Pt100) is used for floating measurement, the maximum permissible common-mode voltage is $U_{CM} \leq \pm 1V$ and must not be overshot relative to M_{ANA} at any differential input.

The illustration below shows how resistance thermometers (Pt 100) are connected in a 4-wire circuit for floating measurement:

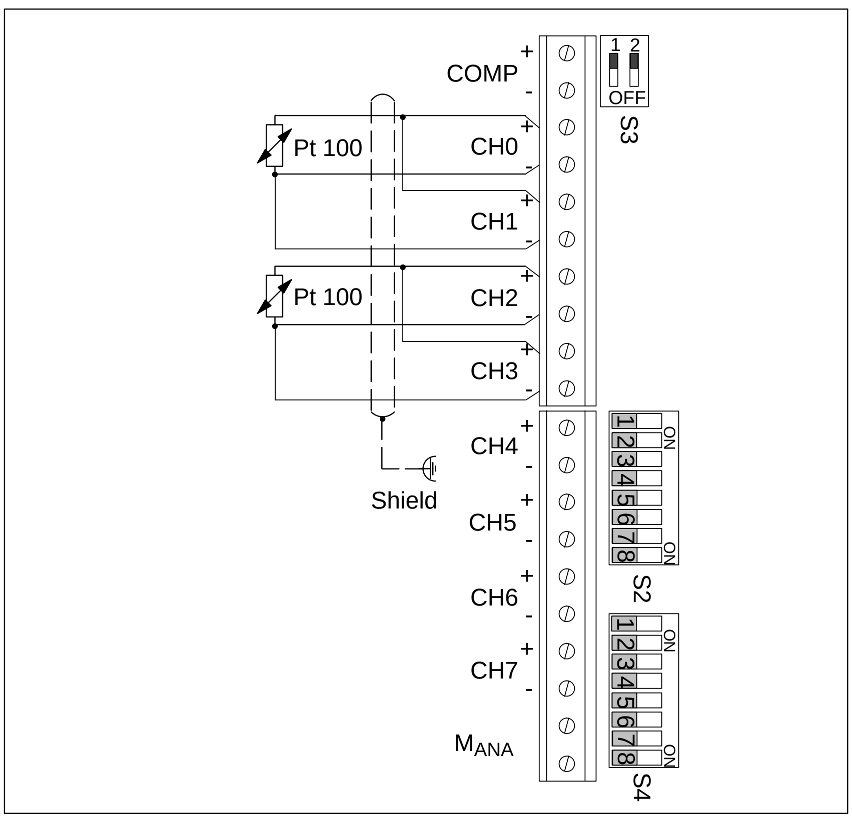

Figure 4-17 Connection to ET 200C; AI 4/8 × 12 Bit of Resistance Thermometers (Pt 100) in 4-Wire Circuit for Floating Measurement

Voltage Sensors

Free channels can be used to connect voltage sensors (±80 mV, ±250 mV, ±500 mV, ±1000 mV).

The settings of the switches in DIL switch block S4 determine whether measurement is floating or non-floating (see Section 4.4.2).

Note

If a voltage sensor is used for floating measurement, the maximum permissible common-mode voltage is $U_{CM} \leq \pm 1V$ and must not be overshot relative to M_{ANA} at any differential input.

The illustration below shows how voltage sensors are connected in a 2-wire circuit for non-floating measurement:

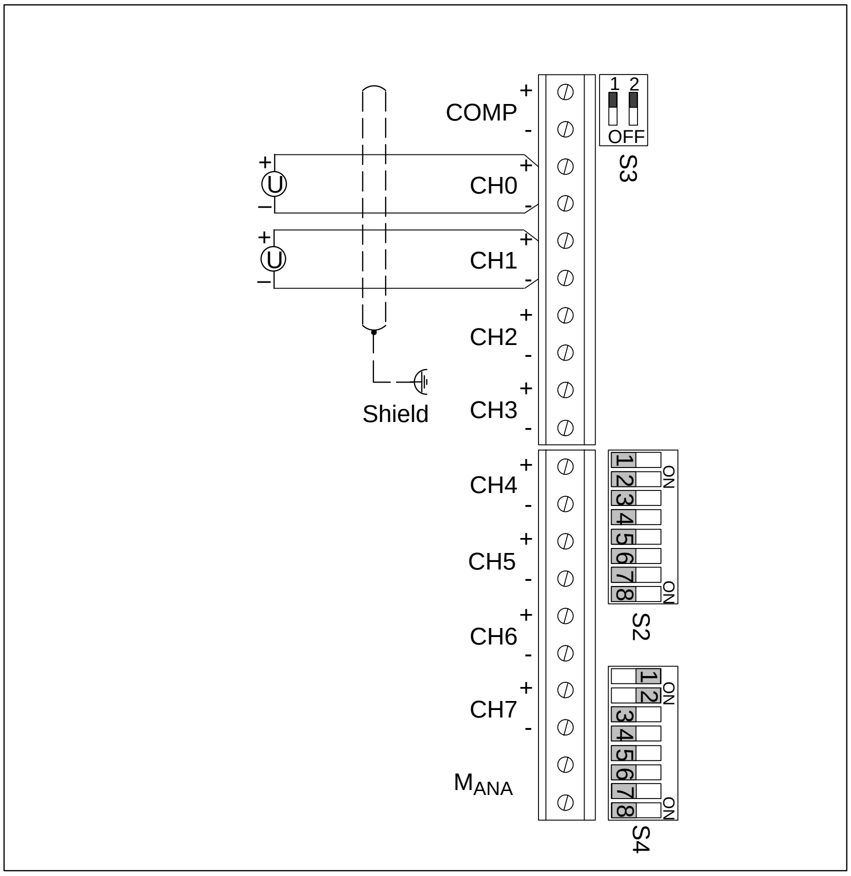

Figure 4-18 Connection to ET 200C; AI 4/8 × 12 Bit of Voltage Sensors in 2-Wire Circuit for Non-Floating Measurement

4.3.7 Wiring of ET 200C; AI 4 × 12 Bit (6ES7 144-0HF00-0KB0)

Connecting Inputs

Connect the signal cables to the screw terminals on the lower printed-circuit board in the module.

Proceed as follows:

1. Open the module using a screwdriver.
2. Unscrew the cap of the conduit thread gland for the grounding cable and remove the seal with the sleeve.
3. Push first the gland cap and then the seal onto the cable.
4. Cut back an appropriate length of the outer cable sheath.
5. Bend the braided shield at the end of the outer sheath up through 90°. Push the sleeve with a twisting action over the foil until it is under the braided shield in the outer sheath.
6. Trim off the braided shield flush with the outer edge of the sleeve.
7. Pull the ends of the signal cables though the glands with the foil and cut off the foil.
8. Strip the ends of the signal lines and crimp the conductors with wire ferrules.
9. Connect the lines to the corresponding terminals.
10. Pull the lines taut and tighten the gland.
11. Repeat steps 2 through 10 with other signal lines or close the module using a screwdriver. When closing the module, make sure that the cover is correctly seated as damage may occur if the cover is not aligned with the casing.

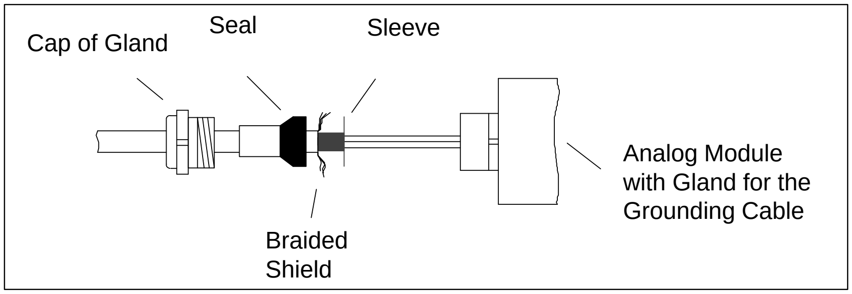

Figure 4-19 Components of the Cable Gland for the Grounding Cable

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Note

When you connect the signal lines, check that the DIL switches on the printed circuit board (see Figure 4-20) remain easily accessible.

Terminal Assignment

Connect the signal lines to the terminals in accordance with the table below.

Table 4-13 Connection Assignment of the Inputs of ET 200C; AI 4 $\times$ 12 Bit (6ES7 144-0HF00-0KB0)

Channel	Terminal	Assignment
CH0	1	Measuring line (+)
	2	Measuring line (–)
CH1	3	Measuring line (+)
	4	Measuring line (–)
CH2	5	Measuring line (+)
	6	Measuring line (–)
CH3	7	Measuring line (+)
	8	Measuring line (–)
	9	Analog ground (M_{ANA})
	10	Analog ground (M_{ANA})

Sealing of Unused Inputs

Seal all unused inputs with the screw caps supplied (module is supplied with all inputs sealed).

Wiring of ET 200C; AI 4 × 12 Bit (6ES7 144-0HF00-0KB0), Continued

Arrangement of Screw Terminals and DIL Switches

Figure 4-20 shows the arrangement of screw terminals and DIL switches in the ET 200C; AI 4 × 12 bit

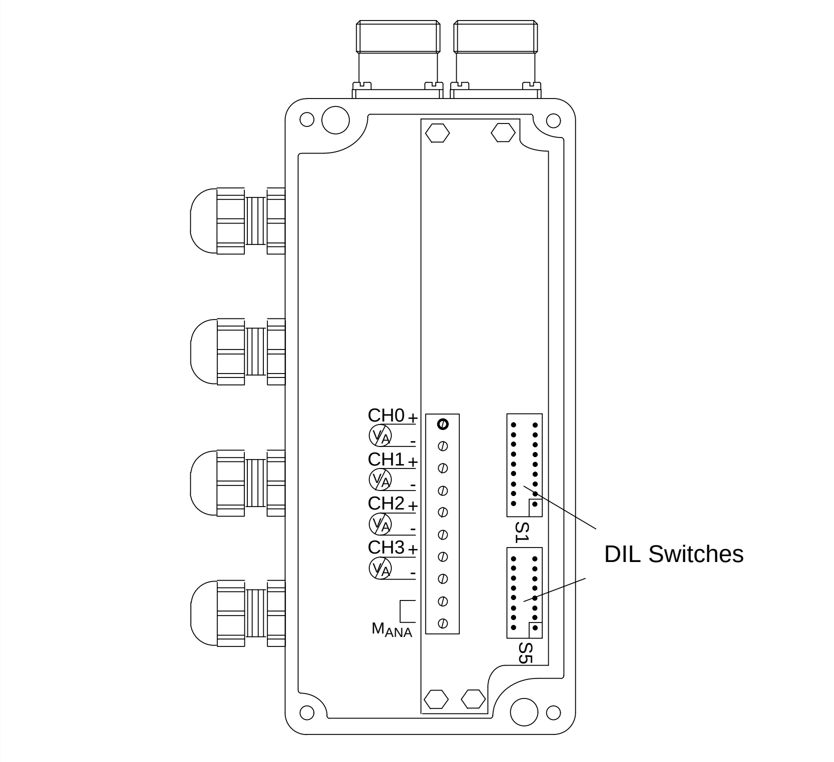

Figure 4-20 Arrangement of Screw Terminals and DIL Switches in ET 200C; AI 4 × 12 Bit

Table 4-14 DIL Switch Blocks in ET 200C; AI 4 × 12 Bit

DIL switch block	Function	Described in
S1	Manually set the station number	Section 4.4.1
S5	Select voltage or current measurement	Section 4.4.3
	Select floating/non-floating measurement	

Voltage Sensors

Voltage sensors can be connected for the measured-value ranges ± 1.25 V, ± 2.5 V, ± 5 V, ± 10 V.

The settings of the switches in DIL switch block S4 determine whether measurement is floating or non-floating (see Section 4.4.1).

Note

If a voltage sensor is used for floating measurement, the maximum permissible common-mode voltage is $U_{CM} \leq \pm 1$ V and must not be overshot relative to M_{ANA} at any differential input.

The illustration below shows how voltage sensors are connected in a 2-wire circuit for floating measurement:

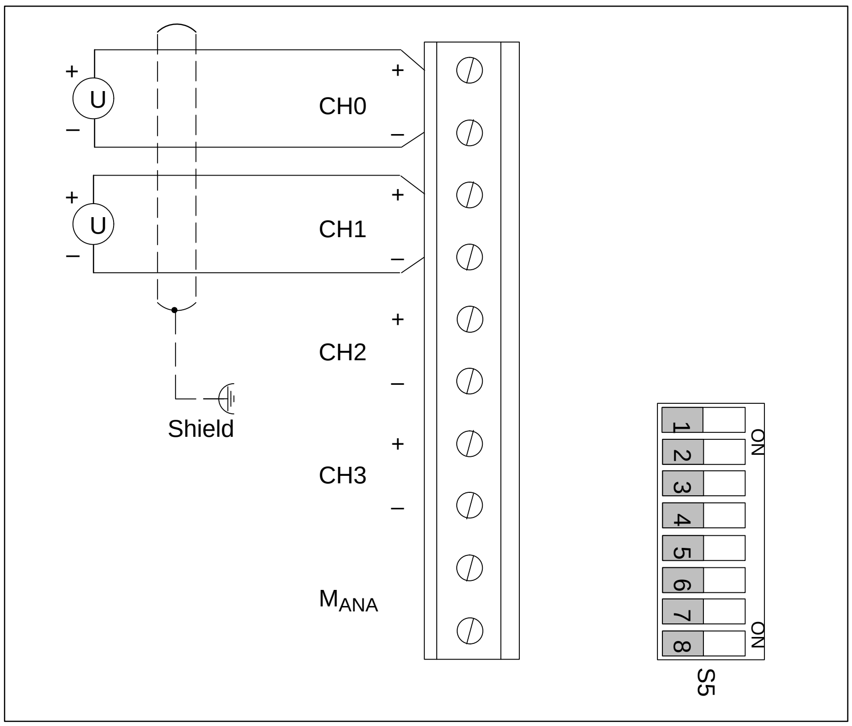

Figure 4-21 Connection to ET 200C; AI 4 × 12 Bit of Voltage Sensors in 2-Wire Circuit for Floating Measurement

Wiring of ET 200C; AI 4 × 12 Bit (6ES7 144-0HF00-0KB0), Continued

Current Sensors

Current sensors can be connected for the measured-value ranges 0 ... 20 mA, 4 ... 20 mA, ± 20 mA.

The parallel shunt resistor must be activated before a channel can be used for measuring currents.

The settings of the switches in DIL switch block S5 determine whether measurement is floating or non-floating (see Section 4.4.1).

Note

If a current sensor is used for floating measurement, the maximum permissible common-mode voltage is $U_{CM} \leq \pm 1$ V and must not be overshot relative to M_{ANA} at any differential input.

The illustration below shows how current sensors are connected in a 2-wire circuit for floating measurement:

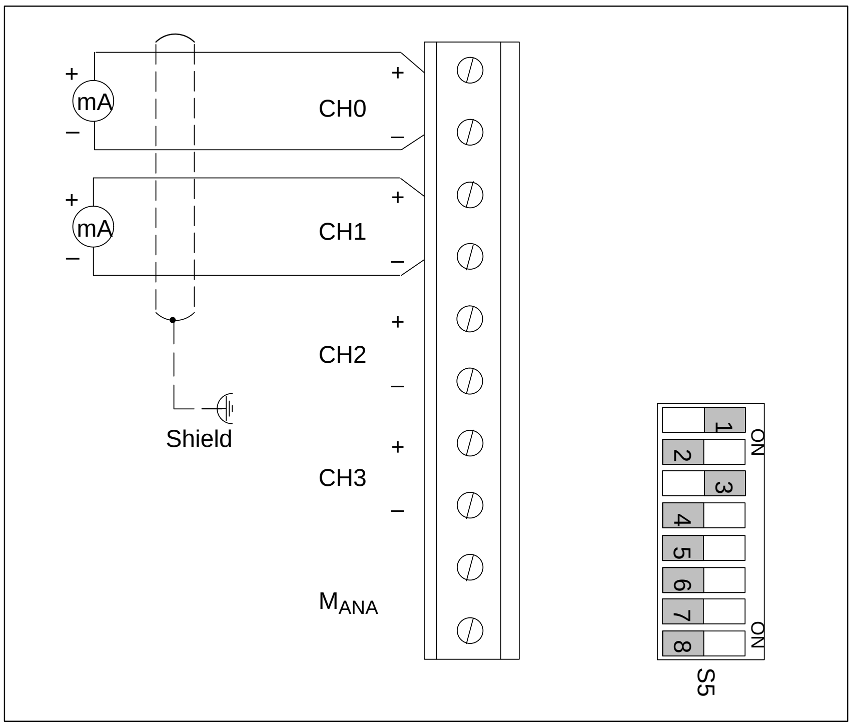

Figure 4-22 Connection to ET 200C; AI 4 × 12 Bit of Current Sensors in 2-Wire Circuit for Floating Measurement

4.3.8 Wiring of ET 200C; AO 4 × 12 Bit (6ES7 145-0HF00-0KB0)

Connecting Outputs

Connect the signal cables to the screw terminals on the lower printed-circuit board in the module.

Proceed as follows:

1. Open the module using a screwdriver.
2. Unscrew the cap of the conduit thread gland for the grounding cable and remove the seal with the sleeve.
3. Push first the gland cap and then the seal onto the cable.
4. Cut back an appropriate length of the outer cable sheath.
5. Bend the braided shield at the end of the outer sheath up through 90°. Push the sleeve with a twisting action over the foil until it is under the braided shield in the outer sheath.
6. Trim off the braided shield flush with the outer edge of the sleeve.
7. Pull the ends of the signal cables though the glands with the foil and cut off the foil.
8. Strip the ends of the signal lines and crimp the conductors with wire ferrules.
9. Connect the lines to the corresponding terminals.
10. Pull the lines taut and tighten the gland.
11. Repeat steps 2 through 10 with other signal lines or close the module using a screwdriver. When closing the module, make sure that the cover is correctly seated as damage may occur if the cover is not aligned with the casing.

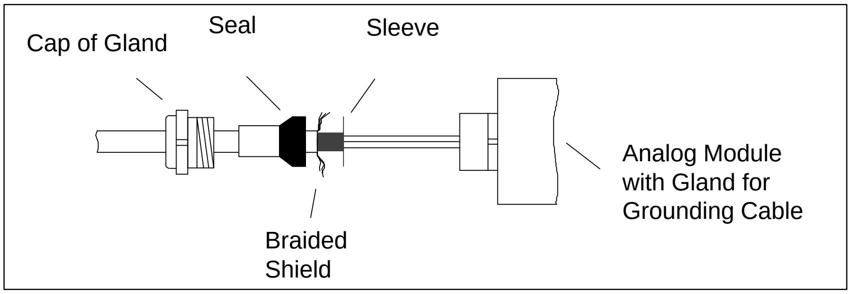

Figure 4-23 Components of the Cable Gland for the Grounding Cable

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Note

When you connect the signal lines, check that the DIL switches on the printed circuit board (see Figure 4-24) remain easily accessible.

Wiring of ET 200C; AO 4 × 12 Bit (6ES7 145-0HF00-0KB0), Continued

Terminal Assignment

Connect the signal lines to the terminals in accordance with the table below.

Table 4-15 Pin Assignment, Outputs of ET 200C; AO 4 × 12 Bit (6ES7 145-0HF00-0XB0)

Channel	Terminal	4-wire layout	2-wire layout
	1	not used	
	2	not used	
CH0	3	Analog output ”Voltage” (+)	Analog output ”Current or Voltage” (+)
	4	Analog output ”Voltage” (–)	Analog output ”Current or Voltage” (–)
	5	Sensor line (S+)	not used
	6	Sensor line (S–)	not used
CH1	7	Analog output ”Voltage” (+)	Analog output ”Current or Voltage” (+)
	8	Analog output ”Voltage” (–)	Analog output ”Current or Voltage” (–)
	9	Sensor line (S+)	not used
	10	Sensor line (S–)	not used
CH2	11	Analog output ”Voltage” (+)	Analog output ”Current or Voltage” (+)
	12	Analog output ”Voltage” (–)	Analog output ”Current or Voltage” (–)
	13	Sensor line (S+)	not used
	14	Sensor line (S–)	not used
CH3	15	Analog output ”Voltage” (+)	Analog output ”Current or Voltage” (+)
	16	Analog output ”Voltage” (–)	Analog output ”Current or Voltage” (–)
	17	Sensor line (S+)	not used
	18	Sensor line (S–)	not used
	19	not used	
	20	not used	

Sealing of Unused Outputs

Seal all unused outputs with the screw caps supplied (module is supplied with all outputs sealed).

Arrangement of Screw Terminals and DIL Switches

Figure 4-24 shows the arrangement of screw terminals and DIL switches in the ET 200C; AO 4 × 12 Bit.

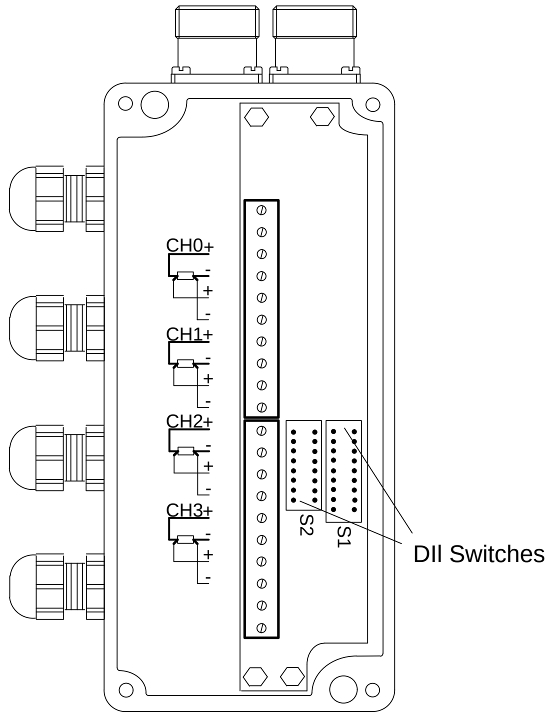


Figure 4-24 Arrangement of Screw Terminals and DIL Switches in ET 200C; AO 4 × 12 Bit

Table 4-16 DIL Switch Blocks in ET 200C; AO 4 × 12 Bit

DIL switch block	Function	Described
S1	Manually set the station number	Section 4.4.1
S2	Select 2-wire or 4-wire connection	Section 4.4.4

Connection Options

You have two options for connecting loads to the ET 200C; AO 4 × 12 Bit:

- Connect load in 4-wire circuit
- Connect load in 2-wire circuit

Wiring of ET 200C; AO 4 × 12 Bit (6ES7 145-0HF00-0KB0), Continued

Load in 4-Wire Circuit (Voltage Output)

The voltage is connected for the load via two high-resistance sensor lines (S+, S– at terminals $_+$ and $_-$) for each channel. In this way it is possible to correct voltage drops of up to 3 V per line.

It is important to ensure that the sensor lines are connected directly to the load.

The illustration below shows how to connect loads in a 4-wire circuit for voltage output.

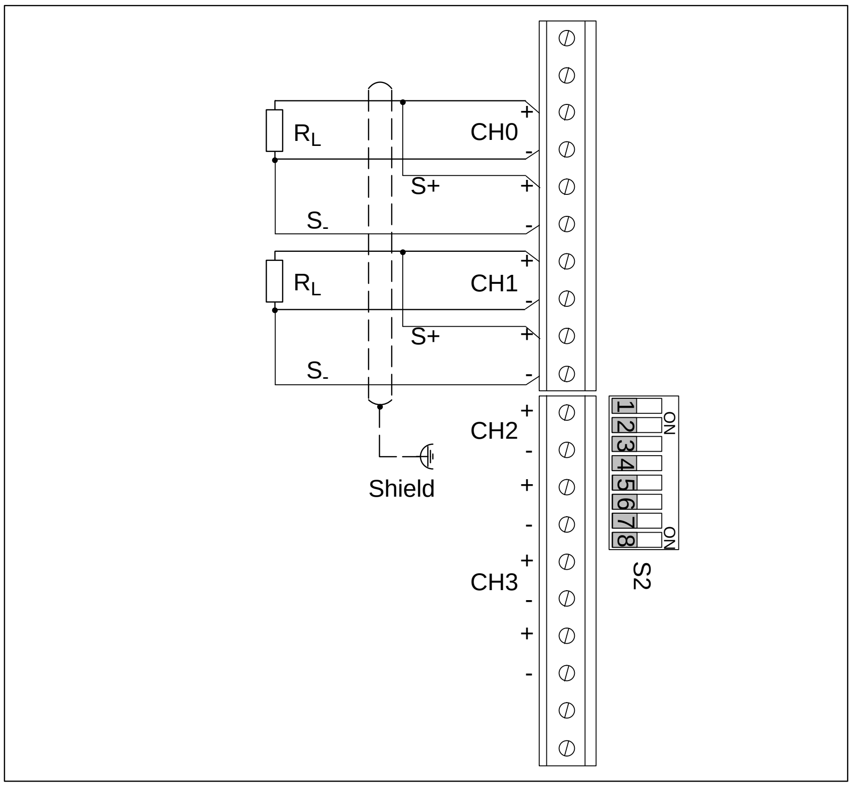


Figure 4-25 Connection of Loads to ET 200C; AO 4 × 12 Bit, 4-Wire Circuit for Voltage Output

Load in 2-Wire Circuit (Voltage Output)

In a 2-wire circuit there are no sensor lines. A 2-wire circuit for voltage output is possible if the line resistance of the signal lines is negligible with respect to the load resistance.

Close the DIL switches in DIL switch block S2 in order to obtain a precise output voltage in the 2-wire circuit. This creates a low-ohmic link between the sensor input and the associated output, thus preventing a circuit-related error due to the output-voltage feedback.

The illustration below shows how to connect loads in a 2-wire circuit for voltage output.

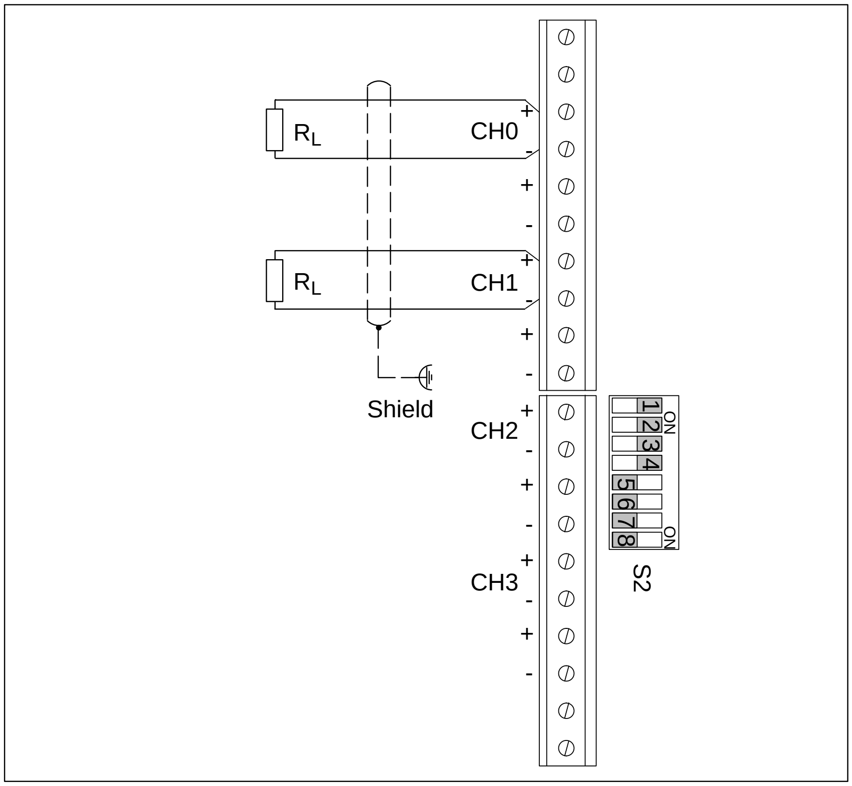


Figure 4-26 Connection of Loads to ET 200C; AO 4 × 12 Bit, 2-Wire Circuit for Voltage Output

Wiring of ET 200C; AO 4 × 12 Bit (6ES7 145-0HF00-0KB0), Continued

Load in 2-Wire Circuit (Current Output)

The illustration below shows how to connect loads in a 2-wire circuit for current output.

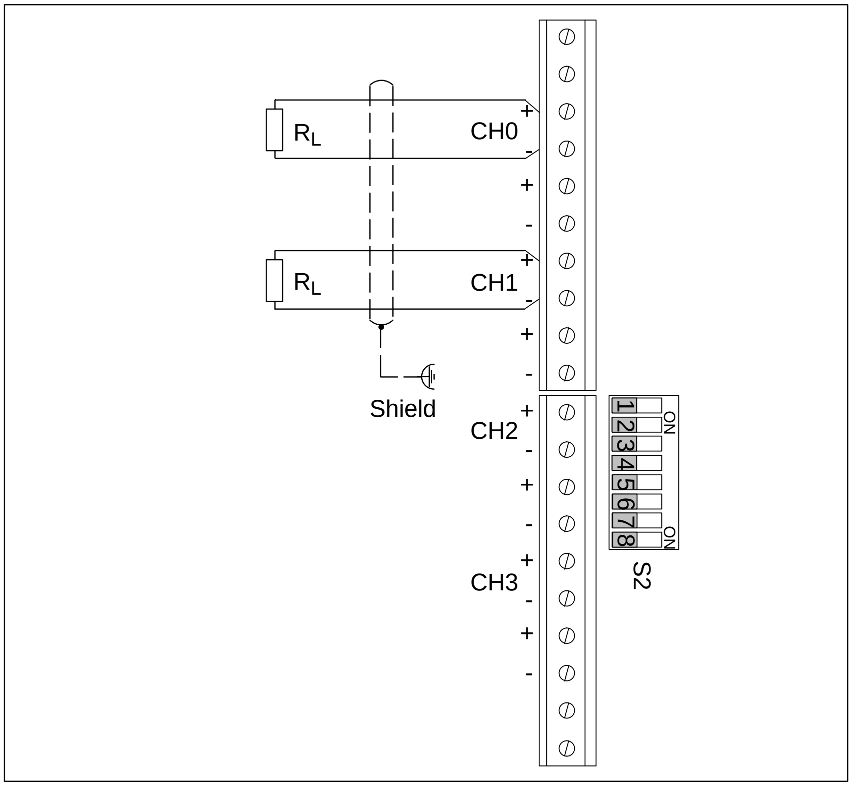


Figure 4-27 Connection of Loads to ET 200C; AO 4 × 12 Bit, 2-Wire Circuit for Current Output

4.3.9 Wiring of the Load Voltage Supply

Introduction

The digital output module ET 200C; DO 8 × DC 24V/0.5A and ET 200C; DO 8 × DC 24V/2A are each equipped with a connection for the load supply voltage. The load supply voltage can be also be routed from an ET 200C; DO 8 × DC 24V/0.5A module via a second connection to a further digital module with outputs.

The digital input/output module ET 200C; DI 16/DO 16 × DC 24V/2A is equipped with a connection for the load voltage supply for each channel group (Q0, Q1). The load voltage supply cannot be looped onto other modules.

Connecting Load Voltage Supply

To connect the load voltage supply you will require

- 6-pin circular socket for “incoming” load voltage

  or

- 6-pin circular connector for ”outgoing” load voltage (only with ET 200C; DO 8 × DC 24V/0.5A)

  Flexible 3-core Cu cables:

  – for ET 200C; DO 8 × DC 24V/0.5A with a minimum core cross-sectional area of 0.75 mm^2 (AWG 18) and a diameter of between 6 and 10 mm.

  – for ET 200C; DO 8 × DC 24V/2A and ET 200C; DI 16/DO 16 × DC 24V/2A with a minimum core cross-sectional area of 2.5 mm^2 (AWG 13).

Connect the circular socket/circular connector in accordance with the following pin assignment:

Table 4-17 Pin Assignment of the Load Voltage Supply

Pin	Load voltage supply
1	PE
2	P 24 V
3	M 24 V
4	free
5	free
6	free

Sealing of Unused Connections

Connections which are not required must be sealed using the enclosed metal caps.

4.3.10 Wiring of the External Power Supply to the PS Connector

Introduction

An external power supply must be connected to the power supply connector.

Connecting External Power Supply

To connect the external power supply you will require

- 6-pin circular socket

  and

- Flexible 3-core Cu cables:
  - with a minimum core cross-section of 0.75 mm^2 (AWG 18) and a diameter of 6 to 10 mm.

Connect the circular socket in accordance with the following pin assignment:

Table 4-18 Pin Assignment of the External Power Supply

Pin	Power supply
1	PE
2	P 24 V
3	M 24 V
4	free
5	free
6	free

Sealing of Unused Connections

Connections which are not required must be sealed using the enclosed metal caps.

4.4 Setting DIL Switches on Analog Modules of ET 200C

Introduction

In the following analog modules, the lower printed-circuit board accommodates the terminal block plus a number of DIL switch blocks:

- ET200C; AI 4/8 × 12 bit
- ET200C; AI 4 × 12 bit
- ET200C; AO 4 × 12 bit

These DIL switch blocks can be used to set the station number of the ET 200C module (optional), the measurement type for the input modules, and the wiring configuration (2-wire or 4-wire) for the output module.

Every analog module has a DIL switch block for setting the station number (block S1). The other DIL switch blocks are module-specific.

Note

The settings performed electronically with COM ET 200 Windows as described in the manual *ET 200 Distributed I/O System* (Order No. 6ES5 998-3ES12) must always match the settings of the internal DIL switches of the analog modules.

4.4.1 Setting the Station Number of Analog Modules by Means of DIL Switch Block S1

Basic Requirement

DIL switch block S1 is in the default position (as delivered). In the default position the single DIL switch is set to E (for **E**lectronic parameterization via the bus) and the seven DIL switches in the array for setting the station number are set to 1 (see Figure 4-28).

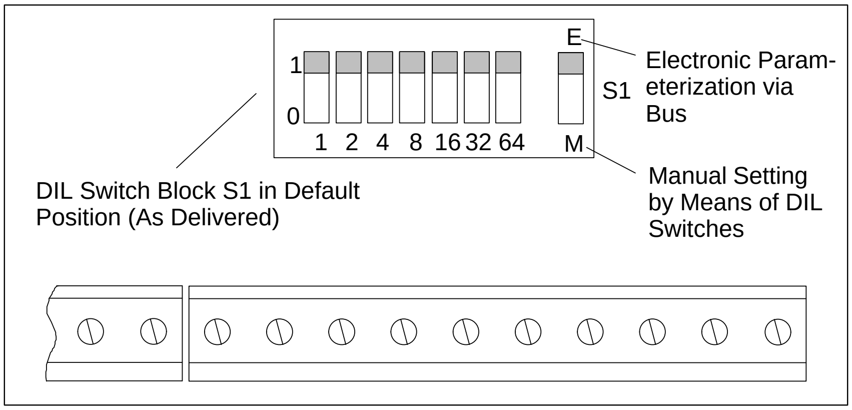


Figure 4-28 DIL Switch Block in Default Position (As Delivered)

If you leave the switches in their default positions, all you have to do is set the station number when parameterizing via the bus (see Chapter 5).

If you set the single DIL switch to M (for **M**anual setting by DIL switches) you must use the seven DIL switches in the array to set the station number (see Figure 4-29).

Rules

The rules which apply to setting the station number by means of the DIL switches in DIL switch block S1 are as follows:

- The single DIL switch of DIL switch block S1 must be set to M (for **M**anual setting via DIL switch). The default setting of this switch is E (for **E**lectronic setting via the bus).
- An ET 200C analog module must be assigned a station number in the range:
  - IM 308-B master interface: 3 ... 124
  - IM 308-C master interface: 1 ... 123
- You must also enter the same station number when parameterizing with COM ET 200.

Example You want to assign station number 6 to an analog module

6 = 2 + 4

DIL switch block S1 set to station number 6

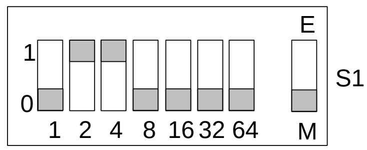


Figure 4-29 Example of How to Set a Station Number at DIL Switch Block S1

Setting a Station Number by Means of DIL Switches

To set a station number by means of the DIL switches in DIL switch block S1, proceed as follows:

1. Open the analog module.
2. On the lower printed-circuit board, set the single switch of DIL switch block S1 to M (for **M**anual).
3. Set the station number by means of the block of seven DIL switches (see Figure 4-29).
4. Close the module, making sure that the cover is correctly seated as damage may occur if the cover is not aligned with the casing.

4.4.2 Setting the Measurement Type for Analog Module ET 200C; AI 4/8 × 12 Bit

Basic Requirement

The lower printed-circuit board in the analog module ET 200C; AI 4/8 × 12 Bit accommodates the following module-specific DIL switch blocks:

Table 4-19 Module-Specific DIL Switch Blocks in ET 200C; AI 4/8 × 12 Bit

DIL switch block	Function	Default setting (as delivered)
S2	Select 2-wire or 4-wire connection for Pt 100 resistance thermometers	OFF 4-wire connection for Pt 100
S3	Select external/internal and floating/non-floating compensation for thermocouples	ON internal and non-floating compensation for thermocouples
S4	Select floating or non-floating measurement	OFF floating measurement

Rules

The rules for setting the measurement type for the analog module ET 200C; AI 4/8 × 12 Bit by means of the DIL switches are as follows:

- High-precision measurement with Pt 100 resistance thermometers is ensured only if you use 4-wire connection.
- The usual setting for thermocouple measurements is internal with non-floating compensation. Use external compensation only if the reference point has to be outside the analog module ET 200C; AI 4/8 × 12 Bit. Spurious voltages can occur, caused for example by crosstalk at the compensator input.

  Non-floating compensation prevents voltage shift in the event of a common-mode disruption at the compensator.
- You should always use non-floating measurement by preference, as this will suppress the effect of severe common-mode disruptions, for example.
- When you close the module, make sure that the cover is correctly seated as damage may occur if the cover is not aligned with the casing.

Setting DIL Switch Block S2

DIL switch block S2 on the AI 4/8 module enables you to select 2-wire or 4-wire connection for Pt 100 resistance thermometers.

Set DIL switch block S2 as follows:

Table 4-20 DIL Switches in DIL Switch Block S2

DIL switch block S2	Default	Switch ON
1	OFF	Channels (CH) 0 and 1, measuring line (positive) connected to constant current line (positive) (2-wire connection for Pt 100)
2	OFF	Channels (CH) 0 and 1, measuring line (negative) connected to constant current line (negative) (2-wire connection for Pt 100)
3	OFF	Channel (CH) 2 and 3, measuring line (positive) connected to constant current line (positive) (2-wire connection for Pt 100)
4	OFF	Channels (CH) 2 and 3, measuring line (negative) connected to constant current line (negative) (2-wire connection for Pt 100)
5	OFF	Channels (CH) 4 and 5, measuring line (positive) connected to constant current line (positive) (2-wire connection for Pt 100)
6	OFF	Channels (CH) 4 and 5, measuring line (negative) connected to constant current line (negative) (2-wire connection for Pt 100)
7	OFF	Channels (CH) 6 and 7, measuring line (positive) connected to constant current line (positive) (2-wire connection for Pt 100)
8	OFF	Channel (CH) 6 and 7, measuring line (negative) connected to constant current line (negative) (2-wire connection for Pt 100)

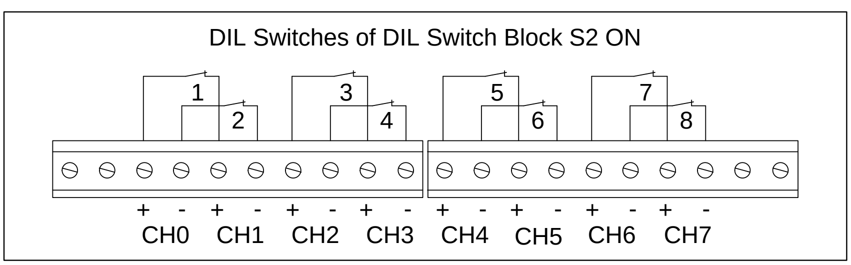


Figure 4-30 Block Diagram of DIL Switches in DIL Switch Block S2

Setting Measurement Type for Analog Module ET 200C; AI 4/8 × 12 Bit, Continued

Note

If you use a 2-wire circuit for measuring with thermocouples or for voltage measurement, make sure that the corresponding DIL switch in DIL switch block S2 is ON.

Setting DIL Switch Block S3

DIL switch block S3 on the AI 4/8 module enables you to select external/internal and floating/non-floating compensation for thermocouples.

Set DIL switch block S3 as follows:

Table 4-21 DIL Switches in DIL Switch Block S3

DIL switch block S3	Default	Switch ON
1	ON	Negative input connected to ground (non-floating compensation)
2	ON	External compensation inputs short-circuited (necessary for internal compensation)

Setting DIL Switch Block S4

DIL switch block S4 on the AI 4/8 module enables you to select floating/non-floating measurement.

Set DIL switch block S4 as follows:

Table 4-22 DIL Switches in DIL Switch Block S4

DIL switch block S4	Default	Switch ON
1	OFF	Channel (CH) 0, measuring line (negative) connected to analog ground (non-floating measurement)
2	OFF	Channel (CH) 1, measuring line (negative) connected to analog ground (non-floating measurement)
3	OFF	Channel (CH) 2, measuring line (negative) connected to analog ground (non-floating measurement)
4	OFF	Channel (CH) 3, measuring line (negative) connected to analog ground (non-floating measurement)
5	OFF	Channel (CH) 4, measuring line (negative) connected to analog ground (non-floating measurement)
6	OFF	Channel (CH) 5, measuring line (negative) connected to analog ground (non-floating measurement)
7	OFF	Channel (CH) 6, measuring line (negative) connected to analog ground (non-floating measurement)
8	OFF	Channel (CH) 7, measuring line (negative) connected to analog ground (non-floating measurement)

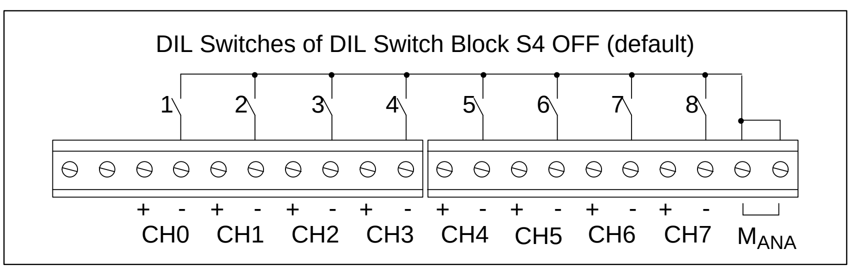


Figure 4-31 Block Diagram of DIL Switches in DIL Switch Block S4

4.4.3 Setting Measurement Type for Analog Module ET 200C; AI 4 × 12 Bit

Basic Requirement

The lower printed-circuit board in the analog module ET 200C; AI 4 × 12 Bit accommodates the following module-specific DIL switch block:

Table 4-23 Module-Specific DIL Switch Block in ET 200C; AI 4 × 12 Bit

DIL switch block	Function	Default setting (as delivered)
S5	Select voltage or current measurement	OFF voltage measurement
	Select floating or non-floating measurement	OFF floating measurement

If you close a DIL switch for current measurement, a shunt resistor (125 ohms) parallel to the input is activated.

Caution

Make sure that this shunt resistor is not in circuit for voltage measurements, as otherwise the sensor would be overloaded.

Rules

The rules for setting the measurement type for the analog module ET 200C; AI 4 × 12 bit by means of the DIL switches are as follows:

- The shunt resistor parallel to the input of the channel in question must be activated for measuring currents.
- You should always use non-floating measurement by preference, as this will suppress the effect of severe common-mode disruptions, for example.
- When you close the module, make sure that the cover is correctly seated as damage may occur if the cover is not aligned with the casing.

Setting DIL Switch Block S5

DIL switch block S5 on the AI 4 module enables you to select voltage or current measurement and floating or non-floating measurement.

Set DIL switch block S5 as follows:

Table 4-24 DIL Switches in DIL Switch Block S5

DIL switch block S5	Default	Switch ON
1	OFF	Channel (CH) 0, shunt resistor activated (voltage measurement)
2	OFF	Channel (CH) 0 measuring line (negative) connected to analog ground (floating measurement)
3	OFF	Channel (CH) 1, shunt resistor activated (voltage measurement)
4	OFF	Channel (CH) 1 measuring line (negative) connected to analog ground (floating measurement)
5	OFF	Channel (CH) 2, shunt resistor activated (voltage measurement)
6	OFF	Channel (CH) 2 measuring line (negative) connected to analog ground (floating measurement)
7	OFF	Channel (CH) 3, shunt resistor activated (voltage measurement)
8	OFF	Channel (CH) 3 measuring line (negative) connected to analog ground (floating measurement)

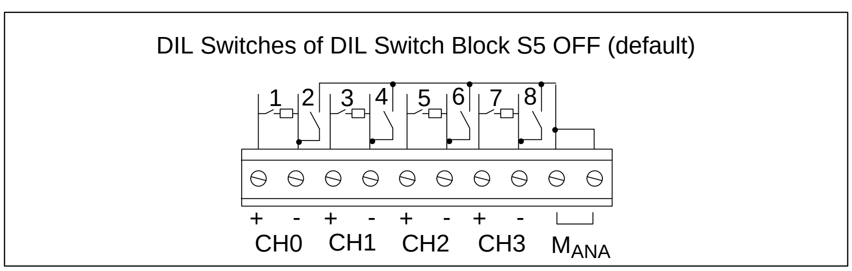


Figure 4-32 Block Diagram of DIL Switches in DIL Switch Block S5

4.4.4 Setting Connection Mode for Analog Module ET 200C; AO 4 $\times$ 12 Bit

Basic Requirement

The lower printed-circuit board in the analog module ET 200C; AO 4 $\times$ 12 Bit accommodates the following module-specific DIL switch block:

Table 4-25 Module-specific DIL-switch block in ET 200C; AO 4 $\times$ 12 Bit

DIL switch block	Function	Default setting (as delivered)
S2	Select 2-wire or 4-wire connection mode	OFF 4-wire connection mode

---

Note

The DIL switch of DIL switch block S2 must be set to ON for 2-wire connection mode, as otherwise an error of + 2 % would occur at the output.

Rules

The rules for setting the connection mode for the analog module ET 200C; AO 4 $\times$ 12 Bit by means of the DIL switches are as follows:

- The analog module ET 200C; AO 4 $\times$ 12 Bit is intended primarily for high-end control functions with 4-wire configurations. You should use the 2-wire option only in exceptional cases.

  If you have to use 2-wire connection, set the DIL switches of DIL switch block S2 in the analog module ET 200C; AO 4 $\times$ 12 Bit accordingly
- When you close the module, make sure that the cover is correctly seated as damage may occur if the cover is not aligned with the casing.

Setting DIL Switch Block S2

DIL switch block S2 on the AO 4 module enables you to select 2-wire or 4-wire connection.

Set DIL switch block S2 as follows:

Table 4-26 DIL Switches in DIL Switch Block S2

DIL switch block S2	Default	Switch ON
1	OFF	Channel (CH) 0, output line (positive) connected to sensor line (positive) (2-wire connection)
2	OFF	Channel (CH) 0, output line (negative) connected to sensor line (negative) (2-wire connection)
3	OFF	Channel (CH) 1, output line (positive) connected to sensor line (positive) (2-wire connection)
4	OFF	Channel (CH) 1, output line (negative) connected to sensor line (negative) (2-wire connection)
5	OFF	Channel (CH) 2, output line (positive) connected to sensor line (positive) (2-wire connection)
6	OFF	Channel (CH) 2, output line (negative) connected to sensor line (negative) (2-wire connection)
7	OFF	Channel (CH) 3, output line (positive) connected to sensor line (positive) (2-wire connection)
8	OFF	Channel (CH) 3, output line (negative) connected to sensor line (negative) (2-wire connection)

Address Assignment and Parameterization with COM ET 200

5

Introduction

This chapter is based on the *ET 200 Distributed I/O System* manual. The *ET 200 Distributed I/O System* manual contains basic information on COM ET 200.

Address assignment is an important aspect of COM ET 200. In the *ET 200 Distributed I/O System* manual, you will find information on the type of address assignment (linear addressing or dual-port RAM addressing).

In this Chapter

Typical address assignment for ET 200C is described in this chapter.

This chapter also explains how to fill out the “CONFIGURING” screen form of the **COM ET 200 V4.x** parameterization software for configuring the ET 200C distributed I/O station.

Using this screen form you specify the following information for each ET 200C slave station:

- The station number (see Section 5.1.1),
- The address area and the station type of the station (see Section 5.1.2),
- The addresses of the inputs and outputs (see Section 5.1.3) and
- The inputs and outputs that will generate a diagnostics signal in the event of a fault (see Section 5.1.4).

COM ET 200 Windows

You can skip this chapter if you use ET 200C with **COM ET 200 Windows**.

COM ET 200 Windows supports standardized, simple configuration and parameterization for all ET 200 slaves. Its use is not described in this manual. See the manual entitled *ET 200 Distributed I/O System* (Order No. 6ES5 998-3ES12) for details on working with COM ET 200 Windows. The program also has an integral online help system which provides all the support you need to configure and parameterize the ET 200C modules.

The parameters of the ET 200C analog modules that you can set with COM ET 200 Windows are listed in Chapter 12 of this manual.

Note

The Import Memory Card function in COM ET 200 Windows V1.0 works correctly only in configurations that do not include ET 200C analog modules.

5.1 Address Assignment with COM ET 200 V4.x

Type Files

In order to put an ET 200C into operation with COM ET 200, make sure that the type file of the ET 200C module in question is available in the COM ET 200 directory.

The designations of the type files are as follows:

Table 5-1 Type File Designations for ET 200C

Station type	Order number	Type file
C-8DI DP	6ES7 141-0BF00-0XB0	SN8010TD.200
C-8DO DP	6ES7 142-0BF00-0XB0	SN8011TD.200
C-8DO/2A DP	6ES7 142-0BF10-0XB0	SI8012TD.200
C-16DI/16DO/2A DP	6ES7 143-0BL00-0XB0, 6ES7 143-0BL10-0XB0	SI8013TD.200

How to Obtain the Type Files

The type files of the ET 200C modules are part of COM ET 200 (as of Version 4.1). If you are currently working with COM ET 200 V4.0, you can obtain Version 4.1 of COM ET 200 free of charge from your contact at Siemens.

Alternatively, you can download the appropriate type file from the interface centre via modem under the following mailbox number:

Tel.: +49 911/73-7972

All type files are made available centrally in the interface centre.

Appendix B of the manual includes a section which contains the contents of the types files. If necessary, you can use these to generate any missing type files yourself using an ASCII editor.

5.1.1 Enter Station Number

Basic Requirement

You have processed the ET 200 system parameters in the COM ET 200 form ”ET 200 SYSTEM PARAMETERS” (see the manual *ET 200 Distributed I/O System*).

Rules

Please note the following when editing the station number:

- An ET 200C station must have a station number between 3 and 124.
- The station number of a “further active station” (if specified in the “ET 200 SYSTEM PARAMETERS” form) may **not** be entered for the ET 200C station!

Procedure: Enter Station Number

The station number is entered as follows:

1. From the “FUNCTION SELECTION” screen, press <F2> to go to the “CONFIGURING” screen.
2. If necessary, correct the station number that appears on the screen.

   Entry options:

   Possible station numbers for ET 200C: 3 to 124

   Help:

   Press <F7> (HELP). A window appears with all previously assigned station numbers and station types. You can select a station and display its configuration. If no station number has been assigned, the message “`No stations configured`” appears.
3. Confirm the entry with <F6> (ENTER).

Result

If the station whose number you entered has already been configured, its configuration appears on the screen after you complete your entry.

If the station whose number you entered has not already been configured, two additional entry fields appear in the “CONFIGURING” screen: “Area” and “Station type” (see Section 5.1.2).

Enter Station Number, Continued

Example

In our example the station is being assigned the station number “3”.

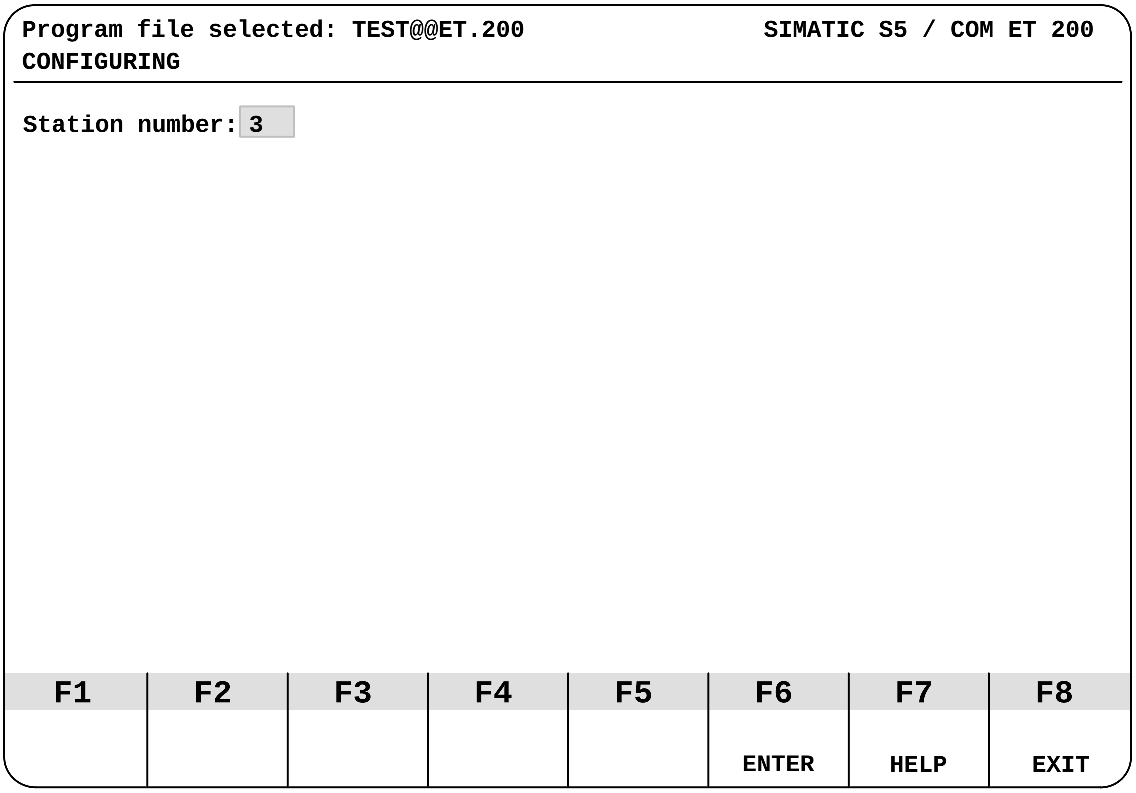


Figure 5-1 “CONFIGURING” Screen (1)

5.1.2 Enter Address Area and Station Type

Basic Requirement

If the station has not already been configured, two additional entry fields “Area” and “Station type” appear in the “CONFIGURING” screen after entry of the station number (see Section 5.1.1).

Procedure: Enter Address Area and Station Type

Address area and station type of the ET 200C are defined as follows:

1. Enter the address area of the station in the “Area” entry field.

   Entry options:

   If you entered “Y” for the ET 200 system parameter “Dual-port RAM ADDR”, you must enter the abbreviation of the peripheral area (example: “P3” for dual-port RAM page number 3 in the P peripheral area).

   If you entered “N” for the ET 200 system parameter “Dual-port RAM ADDR”, you must select one of the permissible areas for linear addressing (P or Q).

Note

The *ET 200 Distributed I/O System* manual describes the basic principles of address assignment for ET 200 (linear addressing or dual-port RAM addressing).

---

2. Enter the corresponding name for your ET 200C station in the “Station type” entry field. (see Table 5-1)

   Help:

   Press <F7> to make a window appear with all station types that can be entered in the entry field.

3. Confirm your entries by pressing <F6> (ENTER).

Result

On completion of the entries, additional entry fields and a table for configuring the inputs or outputs appear in the CONFIGURING screen (see Section 5.1.3).

Enter Address Area and Station Type, Continued

Example

In our example, a digital input module (6ES7 141-0BF00-0XB0) is to be configured. The inputs of the module are addressed linearly in the P peripheral area.

```
Program file selected: TEST@@ET.200              SIMATIC S5 / COM ET 200
CONFIGURING

Station number: 3     Area:    P     Station type: C-8DI DP
```

F1	F2	F3	F4	F5	F6	F7	F8
					ENTER	HELP	EXIT

Figure 5-2 “CONFIGURING” Screen (2)

5.1.3 Enter Station Name, Addresses and Address Identifier

Basic Requirement

After the station type has been entered (see Section 5.1.2), additional entry fields for configuring the inputs and outputs appear in the “CONFIGURING” screen.

“Station Name”

If required, you can assign a name to the ET 200C distributed I/O station in the “Station name” entry field (all keyboard characters are permitted).

“Next Available Address”

COM ET 200 automatically displays the next available address for the digital inputs (DI), digital outputs (DQ), analog inputs (AI) and analog outputs (AQ).

When selecting the “CONFIGURING” screen for the first time in the selected program file, the next available addresses are set to “0”.

Procedure: Enter Addresses and Address Identifiers

The addresses of the inputs/outputs of the ET 200C station are defined as follows:

1. If required, enter in the “Next free address” entry fields another **free** address that you wish to use for the inputs or outputs of the ET 200C station.

   Entry options:

   For linear addressing: 0 to 255

   For Q dual-port RAM addressing: 0 to 254

   For P dual-port RAM addressing: 192 to 254

2. Enter the address identifiers of the ET 200C in the entry fields of the ”Configuration” area (Fig. 5-3: $\boxed{1}$).

   Requirement:

   The cursor must be positioned at the entry field for the address identifier (slot).

Note

All output ports are assigned the slot ”0.” in the case of digital ET 200C modules. All input ports are assigned the slot ”1.”.

   Entry option:

   Enter the address identifiers as decimal numbers (see table 5-2).

Enter Station Name, Addresses and Address Identifier, Continued

3. Confirm the entries with <F6> (ENTER).

Result

COM ET 200 automatically displays the initial module address in the output field ”Module address: I: Q:”:

- in field ”I:” the initial module address for the inputs
- in field ”Q:” the initial module address for the outputs

The input and output area are addressed separately from ”Next available address” (per address identifier).

Address identifiers

The following address identifiers are used for ET 200C:

Table 5-2 Address Identifiers for ET 200C (DP Standard)

Module	Order number	Address identifier		Consis-tency	Address range (byte)	Address area
		Slot 0:	Slot 1:			
ET 200C; DI 8 × DC 24V	6ES7 141-0BF00-0XB0	000	016	Byte	1	digital
ET 200C; DO 8 × DC 24V/0.5A	6ES7 142-0BF00-0XB0	032	000	Byte	1	digital
ET 200C; DO 8 × DC 24V/2A	6ES7 142-0BF10-0XB0	032	000	Byte	1	digital
ET 200C; DI 16/DO 16 × DC 24V/2A	6ES7 143-0BL00-0XB0 6ES7 143-0BL10-0XB0	033	017	Byte	2[1]	digital

1 per input and output area

Example

In our example, ET 200C; DI 16/DO 16 × DC 24V/2A is to be used for ”Press control”.

Addresses:

16 digital inputs: I 0.0 ... 0.7, I 1.0 ... 1.7,

16 digital outputs: Q 0.0 ... 0.7, Q 1.0 ... 1.7,

Address identifier:

16 digital inputs: 017

16 digital outputs: 033

```
Program file selected: TEST@@ET.200                 SIMATIC S5 / COM ET 200
CONFIGURING

Station number: 5      Area:     P    Station type: C-16DI/16DO/2A DP
Station name:          Press control
Next available address: DI:  2   DQ:  2    AI:  0   AQ:  0

    Configuration:                      Module address      I:      Q:
    (Shift F6: DP slave parameterization frame)
      0.      1.      2.      3.      4.      5.      6.      7.
     033     017
      8.      9.     10.     11.     12.     13.     14.     15.

     16.     17.     18.     19.     20.     21.     22.     23.

     24.     25.     26.     27.     28.     29.     30.     31.

1

   F1        F2        F3        F4        F5        F6        F7        F8
STATION   STATION    DELETE     NEW      ADRESS
   +         –      STATION   STATION   ASSIGN.    ENTER     HELP      EXIT
```

Figure 5-3 ”CONFIGURING” Screen (3)

Enter Station Name, Addresses and Address Identifier, Continued

Procedure: Enter Address Identifiers Individually

Table 5-2 contains all of the address identifiers you require for ET 200C.

If the address identifiers are not available, you can have them created by COM ET 200. The window ”DP identifier” must be filled in for this purpose.

1. Position the cursor at the input field for the address identifier.

   Example:

   Move the cursor to the input field for slot ”1.” in order to enter the address identifier for the 16 DI of the ET 200C-16DI/16DO.

2. Press <F7> (HELP).

   The ”DP identifier” window will then appear:

```
DP-IDENTIFIER
I/Q: #  Length: ## Format: # Consistency: #
Help:
I/Q:         I: Input,        Q: Output,
             X: Input/Output,
Length:      1 - 16
Format:      B: Byte,         W: Word,
Consistency:0: Byte/Word      1: Total
             (depending on format)
```

3. Make the appropriate entries in the 4 fields with the aid of the legend.

   Example:

   ”DP IDENTIFIER” for the 16 inputs of the ET 200C-16DI/16DO (slot ”1.”):

```
DP-IDENTIFIER
I/Q: I  Length: 2 Format: B Consistency: 0
Help:
I/Q:         I: Input,        Q: Output,
             X: Input/Output,
Length:      1 - 16
Format:      B: Byte,         W: Word,
Consistency:0: Byte/Word      1: Total
             (depending on format)
```

4. Confirm the entries with <F6> (ENTER).

Result

The input field for the address identifier contains the correct address identifier (”017”) for the 16 inputs of the ET 200C-16DI/16DO.

Special Points of Interest with Regard to Addressing

The process image is created one word at a time by the CPUs 941, 942, 943 and 944 (AG S5-115U/H series). In the case of ET 200C, this means that two slave stations can be addressed within one word:

Address 0:	8DI (1)	Address 0:	8DO (1)
1:	8DI (2)	1:	8DO (2)
2:	...	2:	...
3:	...	3:	...
4:	...	4:	...

The following can occur if an input/output value is read in via the **process image**:

Case 1

Assumption: failure occurs in 8DI (1) or 8DO (1).

Since the CPUs 941 ... 944 read/write the process image one word at a time, they recognize that a failure has occurred in 8DI (1) or 8DO (1). As a result, **no** read/write operations are performed by the CPUs on the process image of 8DI (2) or 8DO (2) either, although these are present.

The CPU is set to STOP with NAK (if ”NAK = yes” in COM ET 200). The CPU is reset to RUN after a STOP-RUN transition although 8DI (1) and 8DI (2) (or 8DO (1) and 8DO (2)) are not entered in the process image.

Case 2

8DO (2) behaves in the same way as in case 1.

Case 3

Assumption: failure occurs in 8DI (2).

Since the above-mentioned CPUs read the process image one word at a time, they recognize that a failure has occurred in 8DI (2).

The CPU is set to STOP with NAK (if ”NAK = yes” in COM ET 200). The CPU remains set to STOP even after a STOP-RUN transition.

Note

The following rules must be noted when addressing the CPUs 941 ... 944:

1. Only use load and transfer commands. These commands recognize, one byte at a time, whether or not a byte is present or missing or
2. Assign each ET 200C module to an even address (e.g. 2, 4, ...) and leave the odd addresses free. You can then also access the process image.

5.1.4 Enter Parameterization Frame with COM ET 200 V4.x

Introduction

The diagnostic behavior of each individual input or output or the entire module (16 DI/16 DO) is defined for the digital ET 200C modules using the parameterization frame.

Note

The diagnostics function must always be switched off for an input/output,

- if the output is not used or
- if an output is returned directly to an input or
- if the sensor supply of an input is returned directly to the input (see Section 4.3.2/4.3.3).

Procedure: Define Diagnostic behavior

Perform the following steps in order to enter the diagnostic behavior in the parameterization frame of the ET 200C:

1. Press (shift) F6 (DP slave parameterization frame).

   The ”DP slave parameterization frame” window for the ET 200C station will then appear. 5 bytes of the parameterization frame are preassigned with ”00_H” the first time this is selected:

```
DP SLAVE - PARAMETERIZATION FRAME

Byte| (entry in format KH)
----------------------------------------------
 0  | [00] [00] 00  00  00
10  |
20  |
```

2. Then enter the diagnostic behavior of the ET 200C station in the format ”KH”.

Note

Only bytes 0 and 1 (marked with ”□” in the diagram) are relevant for parameterizing the diagnostic behavior of the ET 200C station . The entry options and their meaning are described in Fig. 5-5 and 5-4.

Bytes 2, 3 and 4 contain ”00_H” which cannot be overwritten!

---

3. Terminate the entry with <F6> (ENTER).
4. Confirm the configuration with <F6> (ENTER).

Result

The defined diagnostic behavior is stored in the preselected program file.

Structure of the Parameterization Frame, Byte 0

The diagnostic behavior of the ET 200C; DI 16/DO 16 × DC 24V/2A is defined in byte 0 of the parameterization frame. Byte 0 contains ”00_H” in the case of all other ET 200C modules:

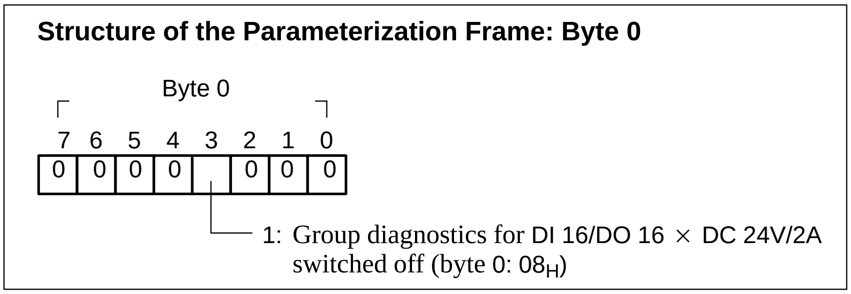


Figure 5-4 Structure of the Parameterization Frame for ET 200C: Byte 0

Structure of the Parameterization Frame, Byte 1

The diagnostic response for inputs/outputs 0 to 7 of the ET 200C modules DI 8 × DC 24V, DO 8 × DC 24V/0.5A and DO 8 × DC 24V/2A is defined in byte 1 of the parameterization frame:

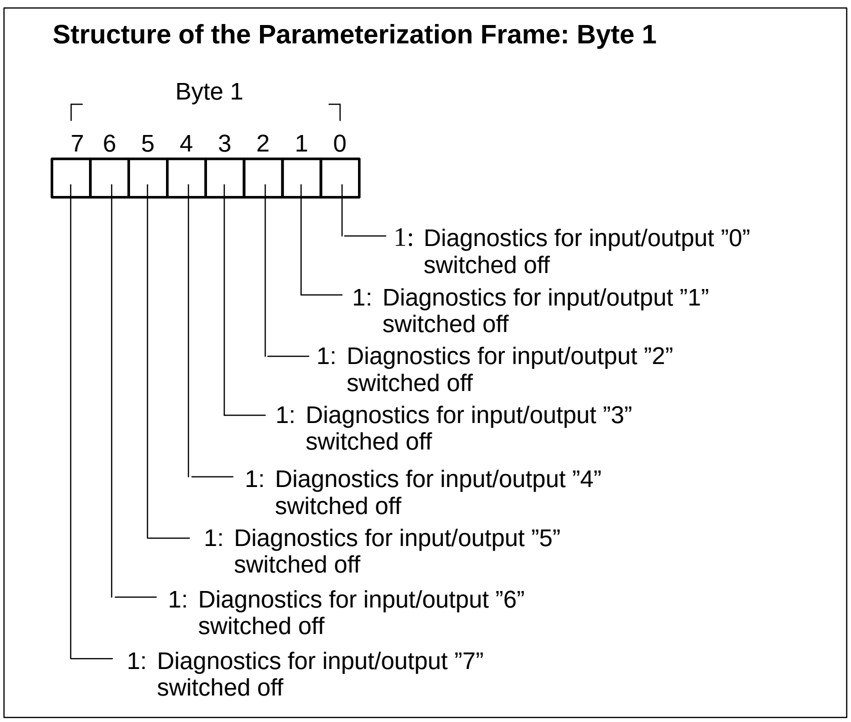


Figure 5-5 Structure of the Parameterization Frame for ET 200C: Byte 1

Startup and Test with COM ET 200 6

Startup Options

There are 2 options available for starting and testing the ET 200C distributed I/O station:

- Using the ET 200 handheld
- Using COM ET 200 and programmer (with interface module CP5410-S5DOS/ST)

Handheld

Start-up and testing of ET 200C using the ET 200 handheld is described in the *ET 200 Handheld* manual.

In chapter 8 of this manual you will learn how to

- Connect the handheld and which rules you need to observe to do this (see Section 9.1).

In this Chapter

This chapter describes how to start up and test ET 200C with a programmer and **COM ET 200 V4.x**.

You will learn in this chapter how to

- Connect the programmer and the rules you need to observe to do this (see Section 6.1)
- Select the station and transfer the configuration data to the station (see Section 6.2)
- Test the station (see Section 6.3).

COM ET 200 Windows

You can skip this chapter if you use ET 200C with **COM ET 200 Windows**.

COM ET 200 Windows supports standardized, simple startup for all ET 200 slaves. Its use is not described in this manual. See the manual entitled *ET 200 Distributed I/O System* (Order No. 6ES5 998-3ES12) for details on which versions of COM ET 200 Windows incorporate test and startup functions.

The program also has an integral online help system which provides all the support you need for starting up the ET 200C modules.

6.1 Connecting the Programmer

Introduction

There are two options for starting up the ET 200C station with a programmer and COM ET 200:

- The ET 200C module is disconnected from the bus. You connect the programmer **to the ET 200C module**.
- You can also start up the ET 200C slave station “bus” while it is in operation. For this purpose, connect the programmer **to the SINEC L2-DP field bus** via the programmer connector.

Requirements for Connecting the Programmer to ET 200C

You will need two cable sets to connect the programmer to the ET 200C module:

- An adapter cable (see Section 3.13)

  and

- The programmer connecting cable (Order No. 6XV1 830-1AH..).

Rules for Connecting the Programmer to ET 200C

Please observe the following rules when connecting the programmer to ET 200C modules:

- The programmer is plugged into the bus connection of the digital modules via the **adapter cable** and the programmer connecting cable.
- The digital module is run over an external power supply.

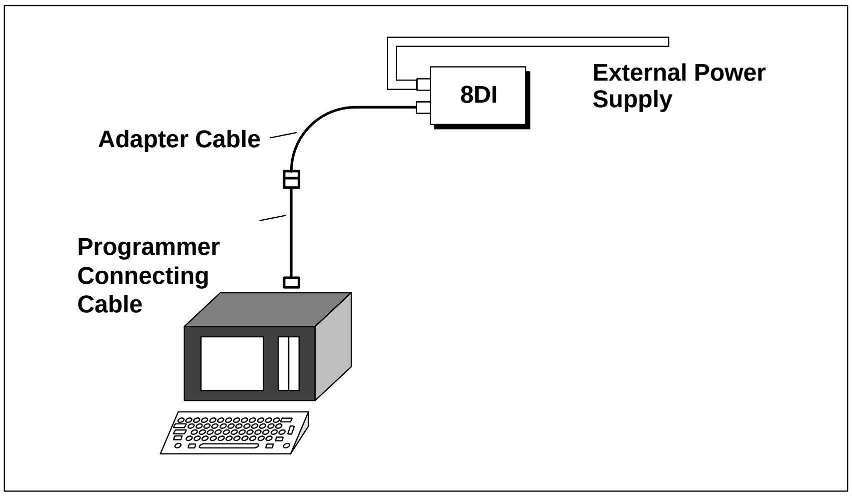


Figure 6-1 Connecting the Programmer to the ET 200C

Requirements for Connecting the Programmer to the Field Bus

In order to connect the programmer to the SINEC L2-DP field bus, you will require

- A programmer connector (see Section 3.10),
- An adapter cable (see Section 3.13) and
- The programmer connecting cable (Order No. 6XV1 830-1AH..).

Rules for Connecting the Programmer to the Field Bus

Please note the following rules when connecting the programmer to the SINEC L2-DP field bus:

- The programmer must be connected to the SINEC L2-DP via the programmer connector.
- The programmer is plugged into the programmer connector via the **adapter cable** and the programmer connecting cable.

Caution

If you start up an ET 200C station while the bus is in operation using the programmer connected to the bus, you must note the following: The station cannot be controlled by the master station while the programmer has access to the station!

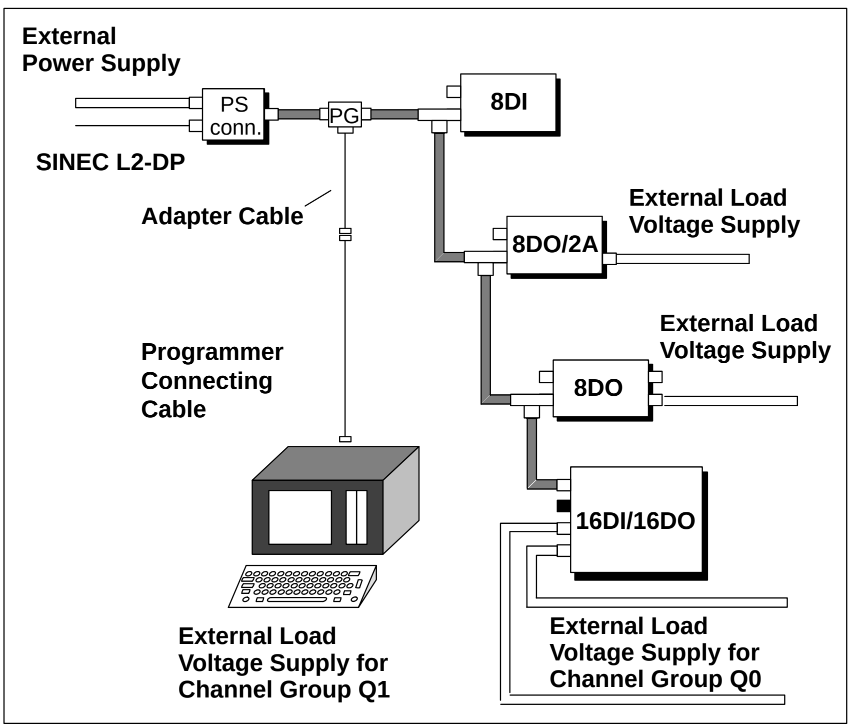


Figure 6-2 Connecting the Programmer to the SINEC L2-DP Field Bus

6.2 Starting Up and Testing the ET 200C Distributed I/O Station

Assumption

The ET 200C distributed I/O station has been assigned a station number with the ET 200 handheld (see Chapter 9). It is now time to start the station with the programmer and COM ET 200 V4.x.

Procedure: Select Station

The ET 200C station is parameterized as follows:

1. Connect your ET 200C module via an adapter cable and programmer connecting cable to the programmer (using interface module CP5410-S5DOS/ST) (see Section 6.1).
2. Open the ”STARTUP/TEST” form of the COM ET 200 V.4x software package (press <F5> in the ”FUNCTION SELECTION” form).
3. Enter the station number of the ET 200C station.
4. Confirm the entry with <F6> (ENTER).

   Result:

   COM ET 200 V4.x now tries to establish a connection to the station.

Result

After the connection has been established, the station is assigned the configuration data.

Rules

The station should now be coded with the current station number.

The station number can be changed using the **ET 200 handheld**.

Changing the Baud Rate

Note on changing the baud rate:

Note

It is possible that the ET 200C station will not be admitted to the SINEC L2-DP bus when an incorrect configuration is redefined and the baud rate is changed at the same time.

Example In our example, the ET 200C station is to be assigned the station number “3”.

```
Program file selected: TEST@@ET.200                SIMATIC S5 / COM ET 200
SYSTEM START-UP/TEST: STATION SELECTED

Station number:  3
```

F1	F2	F3	F4	F5	F6	F7	F8
					ENTER	HELP	EXIT

Figure 6-3 “SYSTEM START-UP/TEST: STATION SELECTED” Screen

6.3 Testing the ET 200C Distributed I/O Station

Basic Requirement

Once you have parameterized your ET 200C station (see Section 6.2), COM ET 200 V4.x automatically goes to the ”STARTUP/TEST: STATUS/ CONTROL” form.

Procedure: Select Slot

The slot of the input/output port is selected as follows:

1. Position the cursor at the slot of the ET 200C, the input status of which you wish to evaluate or the outputs of which you wish to control.
2. Press <F5> (SELECT.).

   Result:

   The selected slot is marked with a ”*”. The slot will be deselected if <F5> (SELECT.) is pressed again.
3. Confirm the selection with <F6> (ENTER).

Result

The ”SYSTEM START-UP/TEST: STATUS/CONTROL” screen for the selected station appears with the following contents:

- Diagnostics messages for the entire station appear in plain text in the output field ”Station status”.
- The digital inputs/outputs are displayed in ”KH” format in two tables.

Changing the Baud Rate

Note on changing the baud rate:

Note

It is possible that the ET 200C station will not be admitted to the SINEC L2-DP bus when an incorrect configuration is redefined and the baud rate is changed at the same time.

Example

The digital module ET 200C; DO 8 × DC 24V/0.5A is tested in our example.

```
Program file selected: TEST@@ET.200                SIMATIC S5 / COM ET 200
START-UP / TEST: STATUS/CONTROL
--------------------------------------------------------------------------
Station number: 6                                Station type: C-8DO  DP
Station name: PRESS
Station status:


Slot: 0     Identifier: 032

Force     |
----------|  -------------------------------------------------------------
Outputs   |     KH = 13
          |
Status    |
----------|  -------------------------------------------------------------
Inputs    |

Status of outputs is retained

  F1   |  F2   |  F3   |  F4   |  F5   |  F6   |  F7   |  F8
       |       |       |       |       | ENTER | HELP  | EXIT
```

Figure 6-4 ”SYSTEM START-UP/TEST: STATUS/CONTROL” Screen

Testing the ET 200C Distributed I/O Station, Continued

Procedure: Test Inputs

Inputs are tested as follows:

1. Preselect the input signals (sensor signals) for the module.
2. Press <F6> (ENTER).

   Result:

   The input data for the selected module and (station) diagnostic data is requested. The diagnosis appears in plain text in the field ”Station status”.

   The function key assignments on the screen change.
3. Press <F6> (STOP) to freeze the screen, i.e. to stop the output fields in the line ”Inputs” from being updated.

Procedure: Test Outputs

Outputs are tested as follows:

1. Enter the output signals in the line ”Outputs”.
2. Press <F6> (ENTER).

   Result:

   The output data is transferred cyclically to the selected module.

   The function key assignments on the screen change.
3. Press <F6> (STOP) to freeze the screen.

Example

Set outputs for ET 200C; DO 8 × DC 24V/0.5A:

KH = 13

Output	0	1	2	3	4	5	6	7
Signal	1	1	0	0	1	0	0	0

Fault Diagnostics with the IM 308-B

7

In this Chapter

This chapter contains information on diagnosing faults on the ET 200C distributed I/O station.

This chapter describes fault detection:

- via LEDs on the front panel of the module (see Section 7.1)
- with **COM ET 200 V4.x** and the programmer (see Section 7.2)
- via STEP 5 (see Section 7.3)

Fault detection via STEP 5 (station diagnostics) is included here for situations where the ”diagnostics” master of the ET 200C is an IM 308-B.

7.1 Using LEDs to Diagnose Problems

Introduction

The LEDs on the front of the ET 200C modules provide you with initial information on that type of fault.

Fault Display

The tables below describe the meanings of the LED signals on the ET 200C modules.

Table 7-1 Fault Messages through LEDs on the ET 200C; DI 8 × DC 24V

<table>
<tr><th>LED</th><th>Optical Signal</th><th>Explanation</th></tr>
<tr><td>RUN</td><td>Lit (green)</td><td>ET 200C; DI 8 × DC 24V is in the RUN mode (power supply switched on)</td></tr>
<tr><td>BF</td><td>Lit (red)</td><td>Either
• The monitoring time has elapsed without the ET 200C; DI 8 × DC 24V being addressed (because the connection to the IM 308-B is lost or IM 308-B is set to STOP)
or
• The ET 200C; DI 8 × DC 24V was not parameterized during startup or a restart.</td></tr>
<tr><td>DIA</td><td>Lit (red)</td><td>Group diagnostics of the inputs:
• Wire breakage, short-circuit/overload at the sensor supply</td></tr>
<tr><td rowspan="5">0, 1, 2, 3, 4, 5, 6, 7
(Status LEDs of the inputs)</td><td>Lit (green)</td><td>Input active</td></tr>
<tr><td>Flashing (red)</td><td>Short-circuit at the sensor supply of the input</td></tr>
<tr><td>Lit (red)</td><td>Wire breakage at the sensor supply</td></tr>
<tr><td>4 LEDs lit (red)</td><td>Internal blowing of fuse[1]</td></tr>
<tr><td>8 LEDs lit (red)</td><td>Either
• Undervoltage of the module supply
or
• Internal blowing of fuse[1]</td></tr>
</table>

1 Ask your SIEMENS contact partner

Table 7-2 Fault Messages through LEDs of the ET 200C; DO 8 × DC 24V/0.5A and ET 200C; DO 8 × DC 24V/2A

LED	Optical Signal	Explanation
RUN	Lit (green)	ET 200C; DO 8 × DC 24V/0.5A or ET 200C; DO 8 × DC 24V/2A is in the RUN mode (power supply switched on)
U_L	Lit (green)	Load voltage for outputs present
BF	Lit (red)	Either • The monitoring time has elapsed without the ET 200C; DO 8 × DC 24V or the ET 200C; DO 8 × DC24V/2A being addressed (because the connection to the IM 308-B is lost or IM 308-B is in STOP mode) or • ET 200C; DO 8 × DC 24V/0.5A or ET 200C; DO 8 × DC 24V/2A was not parameterized during startup or a restart
DIA	Lit (red)	**Group diagnostics** of the outputs: • Wire break, short-circuit[1]/overload or undervoltage at the outputs
0, 1, 2, 3, 4, 5, 6, 7 (Status LEDs of the outputs)	Lit (green)	Output active
	Flashes (red)	Short-circuit at the output
	Lit (red)	Wire break at the output
	4 LEDs lit (red)[2]	Internal blowing of fuse[3]
	8 LEDs lit (red)[2]	Either • Undervoltage of the load voltage supply or • Internal blowing of fuse[3]

1 The diagnostics message remains for a further 20 s (approx.) in the case of ET 200C; DO 8 × DC 24V/2A after the short-circuit has been eliminated (e.g. when an output is reset).
2 Not with ET 200C; DO 8 × DC 24V/2A
3 Ask your SIEMENS contact person

Using LEDs to Diagnose Problems, Continued

Table 7-3 Fault Messages through LEDs of the ET 200C; DI 16/DO 16 × DC 24V/2A

LED	Optical Signal	Explanation
RUN	Lit (green)	ET 200C; DI 16/DO 16 × DC 24V/2A is in the RUN mode (power supply switched on)
U_{L1}	Lit (green)	Load voltage for channel group Q0 present
U_{L2}	Lit (green)	Load voltage for channel group Q1 present
BF	Lit (red)	Either • The monitoring time has elapsed without the ET 200C; DI 16/DO 16 × DC 24V/2A being addressed (because the connection to the IM 308-B is lost or IM 308-B is in STOP mode) or • ET 200C; DI 16/DO 16 × DC 24V/2A was not parameterized during startup or a restart
DIA	Lit (red)	**Group diagnostics** for groups of 4 inputs or 4 outputs: • Inputs: wire break, short-circuit[1]/overload of the sensor supply • Outputs: wire break, short-circuit[2]/overload or undervoltage at the outputs
0, 1, 2, 3, 4, 5, 6, 7, 8, 9,10,11,12,13,14,15 (Status LEDs of the inputs/outputs)	Lit (green)	Input or output active

1 The sensor supply for all of the inputs in the group of 4 is interrupted in the event of a short-circuit in the sensor supply.
2 The diagnostics message remains for a further 20 s (approx.) after the short-circuit has been eliminated (e.g. when an output is reset).

7.2 Using COM ET 200 V4.x to Diagnose Problems

Introduction

The COM ET 200 V4.x software package provides the ”DIAGNOSTICS” form for diagnostics functions.

Requirement

The following are prerequisites for using the diagnostics functions:

- You have a programmer with a CP5410-S5DOS/ST programmer bus interface connected to the SINEC L2-DP bus.
- You indicated “Programmer connected to the bus: Y” in the ET 200-SYSTEM PARAMETERS” screen.
- The preset program file is identical to the program file on the E(E)PROM.

Procedure: Request Station Diagnosis

A station diagnosis is requested as follows:

1. Press <F6> in the “FUNCTION SELECTION” screen to call up the “DIAGNOSTICS: OVERVIEW” screen.

   Result:

   The numbers of the station for which diagnostics data is available are listed under “Station number” in the screen.
2. Press <F1> (INDIVIDUAL DIAGNOSTICS).

   Result:

   COM ET 200 asks for a “Station number”.
3. In the “Station number” entry field, enter the number of the faulty station that you want to investigate further.
4. Press <F6> (ENTER) to be able to evaluate the diagnostics messages of this station.

Result

After <F6> (ENTER) is pressed, COM ET 200 branches to the “INDIVIDUAL DIAGNOSTICS” screen with the following contents:

The diagnostics messages for the entire station are displayed in plain text in the output field ”Station status” (see Fig. 7-1).

”Device-related diagnostics” provides information on channel-by-channel diagnostics in ”KH” format. More detailed information on device-related diagnostics of the ET 200C can be found in Fig. 7-7/7-8.

Using COM ET 200 V4.x to Diagnose Problems, Continued

Example

One or several signaling transmitter lines of the ET 200C; DI 8 × DC 24V are interrupted or short-circuited in our example. The device-related diagnostics have a length of 7 bytes (incl. header).

```
Program file selected: TEST@@ET.200                SIMATIC S5 / COM ET 200
INDIVIDUAL DIAGNOSTICS

Station number:  3       Area:   P        Station type:  C-8DI         DP
Station name:   Press control
Station status: Device-related diagnostics

              Byte 0                   Byte 5
Device-related diagnostics

          KH =    00 00 BE 00 00 00

Identifier-specific diagnostics:
          Slot:

Active
  F1    F2    F3    F4    F5    F6    F7    F8
                                      HELP  EXIT
```

Figure 7-1 ”INDIVIDUAL DIAGNOSTICS” Screen

7.3 Using STEP 5 to Diagnose Problems (Station Diagnosis)

Introduction

You can use STEP 5 with the IM 308-B master interface for the systematic pinpointing and diagnosis of faults.

STEP 5 Diagnostics Facilities

The table below lists the STEP 5 diagnostics facilities:

Table 7-4 STEP 5 Diagnostics Facilities

Diagnostics	Content
Diagnostics “Overview”	Enables you to determine which stations have diagnostics data pending.
Diagnostics for “Parameter assignment and adressibility	Enables you to determine which stations have been parameterized and which stations can be contacted.
Station diagnostics	Provides messages on the status of the slave station and locates the defective input or output.

Diagnostics ”Overview” and ”Parameter Assignment and Addressability”

The Diagnostics ”Overview” and ”Parameter Assignment and Addressability” each require 2 bytes which are organized in words.

Using STEP 5 to Diagnose Problems (Continued)

Station Diagnostics

16 bytes per slave station are reserved for the station diagnostics. The 16 bytes are organized into 8 words.

To avoid confusion, the 2 diagnostics bytes of the diagnostics words are referred to below as “Diagnostics address” and “Diagnostics address +1”.

Table 7-5 Structure of the Station Diagnostics for ET 200C

Code	Diagnostics address	Diagnostics address + 1
0	Station status 1	Station status 2
1	Station status 3	Master address
2	Manufacturer ID	
3	Header (device-related diagnostics)	Device-related diagnostics (byte 0) **16DI/16DO**: group diagnostics **8DI, 8DO, 8DO/2A**: free
4	Reserved (byte 1)	Device-related diagnostics (byte 2) **16DI/16DO**: free **8DI, 8DO, 8DO/2A**: individual diagnostics
5	Free (byte 3)	Free (byte 4)
6	Free (byte 5)	Free (byte 6)
7	Free	Free

Request Diagnostics

The diagnostics are loaded word by word and transferred to the diagnostics word. (The load and transfer operations in this section refer to the default diagnostics address 252).

When you use dual-port RAM addressing, the diagnostics word is located in the basic dual-port RAM page. Before you request diagnostics for dual-port RAM page addressing, you must select the dual-port RAM page.

A typical STEP 5 station diagnostics listing is given below:

STL	Explanation
L KY (basic dual-port RAM page number) T PY 255	Page selection (Basic dual-port RAM page number: nx16, n=0,1,..)
L KY (station number),(code) T PW 252	Load diagnostics (station number: 3...124, code: see Table 7-5) and transfer to the diagnostics word (diagnostics word: in this case PW 252).
L PW 252 L KH (hex-code: no fault) !=F BEB	Evaluate diagnostics word (hex-code: see Section 7.3.1 to 7.3.5) Fault?
SFB FBx	Evaluate fault in FBx.

7.3.1 “Overview” Diagnostics

Introduction

The diagnostics ”Overview” includes all stations for which diagnostics data is available.

Request diagnostics ”Overview”

The STEP 5 program is programmed as follows:

STL	Explanation
L KY 127,n T PW 252	Store the value 127 (code for diagnostics ”Overview” request) in the ”diagnostics address” byte; store the code for the numbers of the stations, from which the diagnostics ”Overview” is to be requested, in the ”diagnostics address + 1” byte (the diagnostics ”Overview” ranges from station (n $\times$ 16) ... station (n $\times$ 16 + 15)
L PW 252	Load diagnostics word
L KH 0000	
!=F	No station with faults?
BEB	
SPB FBx	Evaluate fault in FBx.

Structure: Diagnostics Word ”Overview”

The structure of the diagnostics word is as follows after the diagnostics ”Overview” has been requested:

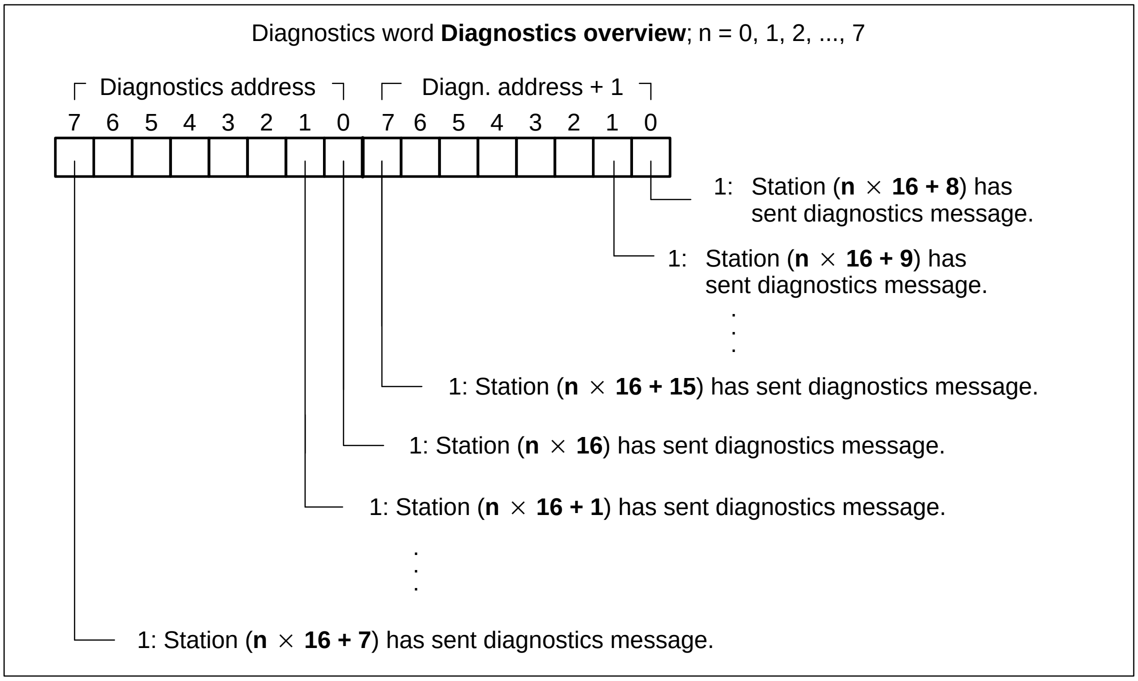


Figure 7-2 Structure of the Diagnostics Word after Requesting the Diagnostics ”Overview”

7.3.2 ”Parameter Assignment and Addressability” Diagnostics

Introduction

The diagnostics for ”parameter assignment and addressability” cover all stations which can be parameterized and addressed.

Request Diagnostics for ”Parameter Assignment and Addressability”

The STEP 5 program is programmed as follows:

STL	Explanation
L KY 126,n T PW 252	Store the value 126 (code for diagnostics for ”Parameter assignment and addressability” request) in the ”diagnostics address” byte; store the code for the numbers of the stations, from which the diagnostics ”Parameter assignment and addressability” are to be requested, in the ”diagnostics address + 1” byte (the diagnostics range from station (n × 16) ... station (n × 16 + 15)
L PW 252	Load diagnostics word
L KH FFFF	(all stations (n×16)...(n×16+15) parameterized with COM ET 200)
!=F	No station with faults ?
BEB	
SPB FBx	Evaluate fault in FBx.

Structure: Diagnostics Word ”Parameter Assignment and Addressability”

The structure of the diagnostics word is as follows after the diagnostics for ”Parameter assignment and addressability” have been requested:

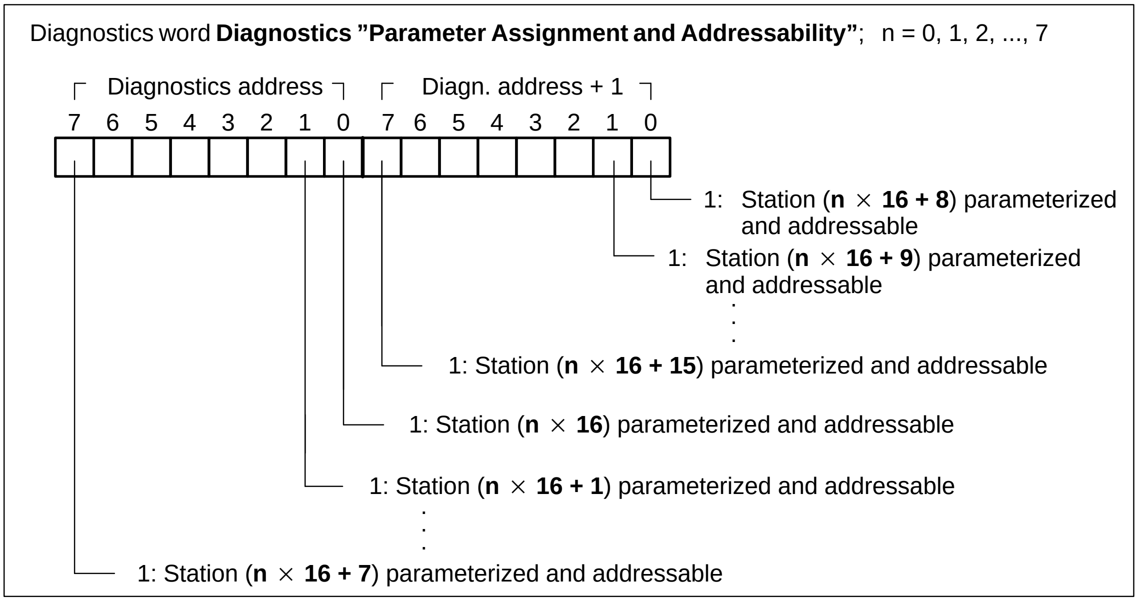


Figure 7-3 Structure of the Diagnostics Word after Requesting the Diagnostics for ”Parameter Assignment and Addressability”

Diagnostics ”Overview” and Diagnostics for ”Parameter Assignment and Addressability”

The following diagnostics messages can be formed by combining the diagnostics ”Overview” and diagnostics ”Parameter assignment and addressability”:

Table 7-6 Combination of the Diagnostics ”Overview” and Diagnostics for ”Parameter Assignment and Addressability”

Overview	Parameter assignment and addressability	Explanation: Station is ...
0	0	... not parameterized and not addressable
0	1	... without faults and addressable
1	0	... parameterized and not addressable
1	1	... with faults but addressable

7.3.3 Station Status Diagnostics

Introduction

The ”Station status 1 to 3” bytes provide information on the station. The ”Master address” byte contains the address of the master station which parameterized the slave station.

Request Station Status 1 and 2

The STEP 5 program is programmed as follows:

STL	Explanation
L KY n,0 T PW 252	Store the number of the slave station (n = slave station), of which the station status is to be requested, in the ”Diagnostics address” byte; store the code for ”Station status 1 and station status 2” (code = 0) in the ”Diagnostics address + 1” byte.
L PW 252	Load diagnostics word
L KH 000C	Monitoring is activated.
!=F	No fault?
BEB	
SPB FBx	Evaluate fault in FBx.

Structure: Diagnostics Word "Station Status 1 and 2"

Following request of the station status 1 and 2 (code = 0), the diagnostics word has the following structure:

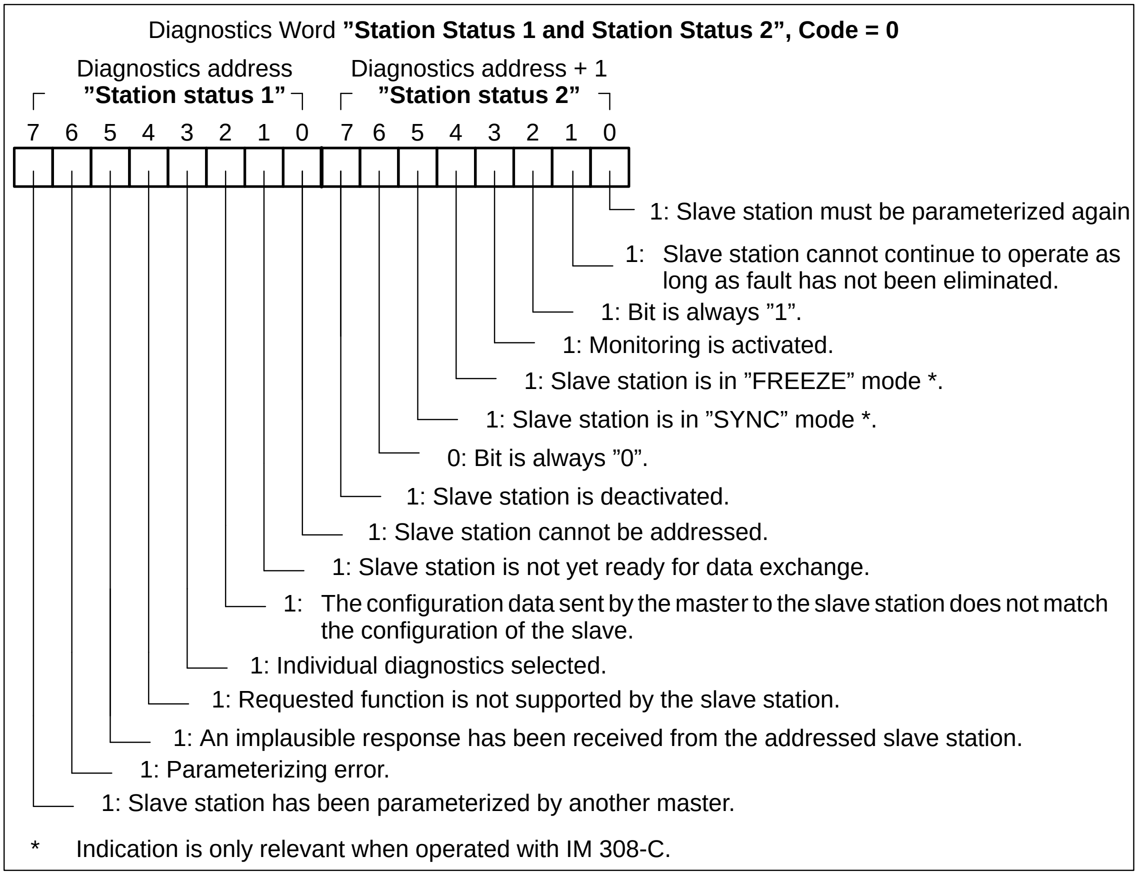


Figure 7-4 Structure of the Diagnostics Word after Requesting the Station Status (Station Status 1 and Station Status 2)

Note

If the slave station was not configured with COM ET 200 (V4.0) when operated with IM 308-B, the structure of the diagnostics word "Station status 1 and station status 2" (KH format) is as follows:

Station status: 01_H

Station status: 44_H

Station Status Diagnostics, Continued

Request Station Status 3 and Master Address

The STEP 5 program is programmed as follows:

STL	Explanation
L KY n,1 T PW 252	In the ”Diagnostics address” byte, the number of the slave station (n = station nuumber) which requests the master address is to be stored; in the ”Diagnostics address + 1” byte, the code for the ”Station status 3 and master address” (code = 1) is to be stored.
L PW 252	Load diagnostics word
L KH 0001	Station number of the master = 1?
!=F	No fault?
BEB	
SPB FBx	Evaluate fault in FBx.

Structure: Diagnostics Word “Station Status 3 and Master Address”

Following request of station status 3 and the master address (code = 1), the diagnostics word has the following structure:

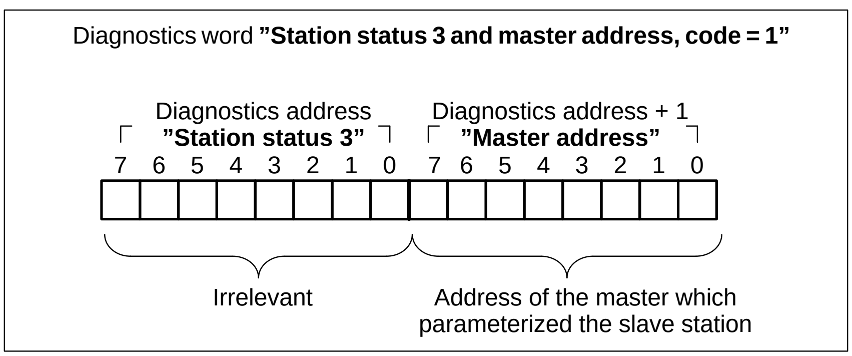


Figure 7-5 Structure of the Diagnostics Word after Requesting the Station Status (Station Status 3 and Master Address)

7.3.4 Manufacturer Identification Diagnostics

Introduction

The “Manufacturer identification” byte describes the type of slave station.

Request Manufacturer Identification

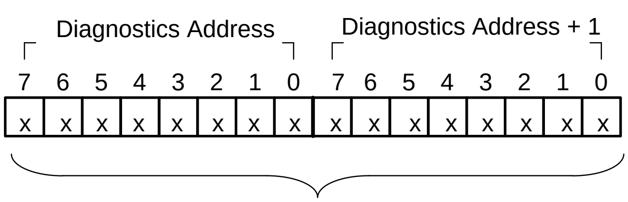
The STEP 5 program is programmed as follows:

STL	Explanation
L KY n,2 T PW 252	Store the number of the slave station (n = station number), from which the manufacturer identification is to be requested, in the ”Diagnostics address” byte; store the code for ”manufacturer identification” (code = 2) in the ”Diagnostics address + 1” byte.

Structure: Diagnostics Word “Manufacturer Identification”

Following request of the manufacturer identification (code = 2), the diagnostics word has the following structure:

Diagnostics Word **”Manufacturer Identification”, Code = 2**



8010_H:	ET 200C; DI 8 × DC 24V	(6ES7 141-0BF00-0XB0)
8011_H:	ET 200C; DO 8 × DC 24V/0.5A	(6ES7 142-0BF00-0XB0)
8012_H:	ET 200C; DO 8 × DC 24V/2A	(6ES7 142-0BF10-0XB0)
8013_H:	ET 200C; DI 16/DO 16 × DC 24V/2A	(6ES7 143-0BL00-0XB0) (6ES7 143-0BL10-0XB0)

Figure 7-6 Structure of the Diagnostics Word after Request for Manufacturer Identification

7.3.5 Device-related Diagnostics – Digital ET 200C

Introduction

The device-related diagnostics indicate which inputs or outputs are defective. The header provides information on the length of the device-related diagnostics.

Request Header and Device-related Diagnostics for 16 DI/16 DO

The STEP 5 program is programmed as follows:

STL	Explanation
L KY n,3 T PW 252	Store the number of the slave station (n = station number), for which the device-related diagnostics are to be requested, in the ”Diagnostics address” byte; store the code for ”header” or ”device-related diagnostics” (group diagnostics) for 16 DI/16 DO (code = 3) in the ”Diagnostics address + 1” byte.
L PW 252	Load diagnostics word
L KH 0700	
!=F	Fault?
BEB	
SPB FBx	Evaluate fault in FBx.

Structure: Diagnostics Word ”Header” and Device-related Diagnostics for 16 DI/16 DO

The structure of the diagnostics word is as follows after requesting the header and the device-related diagnostics for ET 200C; DI 16/DO 16 × DC 24V/DC (code 3):

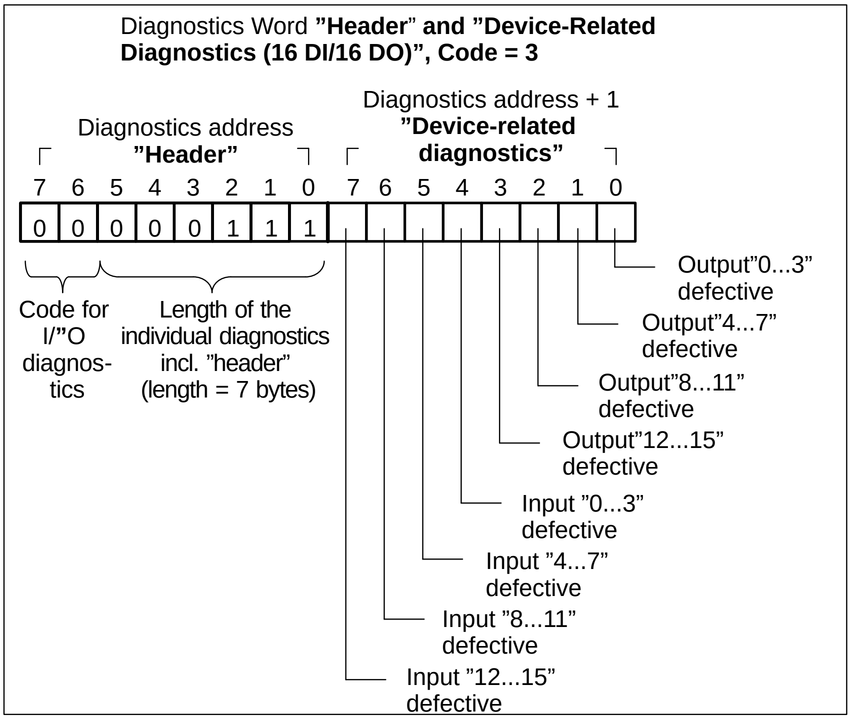


Figure 7-7 Structure of the Diagnostics Word after Requesting the Header and the Device-related Diagnostics of ET 200C; DI 16/DO 16 × DC 24V/2A

Device-related Diagnostics – Digital ET 200C, Continued

Request Device-related Diagnostics for 8 DI, 8 DO and 8DO/2A

The STEP 5 program is programmed as follows:

STL	Explanation
L KY n,4 T PW 252	Store the number of the slave station (n = station number), for which the device-related diagnostics are to be requested, in the ”Diagnostics address” byte; store the code for ”device-related diagnostics” (individual diagnostics) for 8DI, 8DO and 8DO/2A” (code = 4) in the ”Diagnostics address + 1” byte.
L KH 0000	Load diagnostics word
L PW 252	
!=F	Fault?
BEB	
SPB FBx	Evaluate fault in FBx.

Structure: Diagnostics Word ”Device-related Diagnostics” for 8DI, 8DO and 8DO/2A

The structure of the diagnostics word is as follows after requesting the device-related diagnostics of ET 200C; DI 8 × DC 24V, ET 200C; DO 8 × DC 24V/0.5A and ET 200C; DO 8 × DC 24V/2A (code = 4):

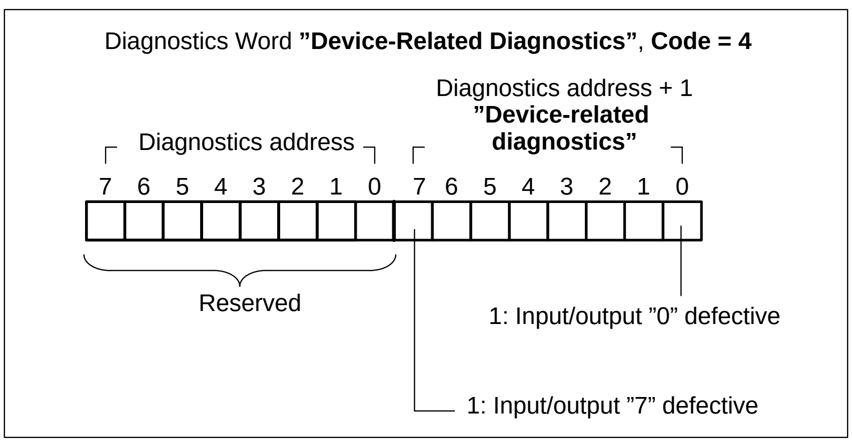


Figure 7-8 Structure of the Diagnostics Word after Requesting the Device-related Diagnostics of ET 200C; DI 8 × DC 24V, ET 200C; DO 8 × DC 24V/0.5A and ET 200C; DO 8 × DC 24V/2A

Fault Diagnostics with the IM 308-C

8

In this Chapter

This chapter contains information on diagnosing faults on the ET 200C distributed I/O station.

This chapter describes fault detection

- via LEDs on the front panel of the module (see Section 8.1)
- via STEP 5 (see Section 8.2).

Fault detection with STEP 5 (station diagnostics) is included here for situations where the ”diagnostics” master of the ET 200C is an IM 308-C and an analog module is connected.

8.1 Using LEDs to Diagnose Problems

Introduction

The LEDs on the front of the ET 200C modules provide you with initial information on that type of fault.

Fault Display

The tables below describe the meanings of the LED signals on the ET 200C modules.

Table 8-1 Fault Messages through LEDs on the ET 200C; DI 8 × DC 24V

LED	Optical signal	Explanation
RUN	Lit (green)	ET 200C; DI 8 × DC 24V is in the RUN mode (power supply switched on)
BF	Lit (red)	Either • The monitoring time has elapsed without the ET 200C; DI 8 × DC 24V being addressed (because the connection to the IM 308-B is lost or IM 308-B is set to STOP) or • The ET 200C; DI 8 × DC 24V was not parameterized during startup or a restart.
DIA	Lit (red)	**Group diagnostics** of the inputs: • Wire breakage, short-circuit/overload at the sensor supply
0, 1, 2, 3, 4, 5, 6, 7 (Status LEDs of the inputs)	Lit (green)	Input active
	Flashing (red)	Short-circuit at the sensor supply of the input
	Lit (red)	Wire breakage at the sensor supply
	4 LEDs lit (red)	Internal blowing of fuse[1]
	8 LEDs lit (red)	Either • Undervoltage of the module supply or • Internal blowing of fuse[1]

1 Ask your SIEMENS contact partner

Table 8-2 Fault Messages through LEDs of the ET 200C; DO 8 × DC 24V/0.5A and ET 200C; DO 8 × DC 24V/2A

LED	Optical signal	Explanation
RUN	Lit (green)	ET 200C; DO 8 × DC 24V/0.5A or ET 200C; DO 8 × DC 24V/2A is in the RUN mode (power supply switched on)
U_L	Lit (green)	Load voltage for outputs present
BF	Lit (red)	Either • The monitoring time has elapsed without the ET 200C; DO 8 × DC 24V or the ET 200C; DO 8 × DC24V/2A being addressed (because the connection to the IM 308-B is lost or IM 308-B is in STOP mode) or • ET 200C; DO 8 × DC 24V/0.5A or ET 200C; DO 8 × DC 24V/2A was not parameterized during startup or a restart
DIA	Lit (red)	**Group diagnostics** of the outputs: • Wire break, short-circuit[1]/overload or undervoltage at the outputs
0, 1, 2, 3, 4, 5, 6, 7	Lit (green)	Output active
(Status LEDs of the outputs)	Flashes (red)	Short-circuit at the output
	Lit (red)	Wire break at the output
	4 LEDs lit (red)[2]	Internal blowing of fuse[3]
	8 LEDs lit (red)[2]	Either • Undervoltage of the load voltage supply or • Internal blowing of fuse[3]

1 The diagnostics message remains for a further 20 s (approx.) in the case of ET 200C; DO 8 × DC 24V/2A after the short-circuit has been eliminated (e.g. when an output is reset).
2 Not with ET 200C; DO 8 × DC 24V/2A
3 Ask your SIEMENS contact person

Using LEDs to Diagnose Problems, Continued

Table 8-3 Fault Messages through LEDs of the ET 200C; DI 16/DO 16 × DC 24V/2A

LED	Optical signal	Explanation
RUN	Lit (green)	ET 200C; DI 16/DO 16 × DC 24V/2A is in the RUN mode (power supply switched on)
U_{L1}	Lit (green)	Load voltage for channel group Q0 present
U_{L2}	Lit (green)	Load voltage for channel group Q1 present
BF	Lit (red)	Either • The monitoring time has elapsed without the ET 200C; DI 16/DO 16 × DC 24V/2A being addressed (because the connection to the IM 308-B is lost or IM 308-B is in STOP mode) or • ET 200C; DI 16/DO 16 × DC 24V/2A was not parameterized during startup or a restart
DIA	Lit (red)	**Group diagnostics** for groups of 4 inputs or 4 outputs: • Inputs: wire break, short-circuit[1]/overload of the sensor supply • Outputs: wire break, short-circuit[2]/overload or undervoltage at the outputs
0, 1, 2, 3, 4, 5, 6, 7, 8, 9,10,11,12,13,14,15 (Status LEDs of the inputs/outputs)	Lit (green)	Input or output active

1 The sensor supply for all of the inputs in the group of 4 is interrupted in the event of a short-circuit in the sensor supply.
2 The diagnostics message remains for a further 20 s (approx.) after the short-circuit has been eliminated (e.g. when an output is reset).

Table 8-4 Fault Messages through LEDs of the ET 200C; AI 4/8 × 12 Bit, AI 4 × 12 Bit and AO 4 × 12 Bit

LED	Optical signal	Explanation
RUN	Lit (green)	ET 200C; analog modules are in the RUN mode (power supply switched on)
BF	Lit (red)	Fault on the SINEC L2-DP bus • Data lines short-circuited • Module not parameterized • Bus interruption or • memory module was reimported with COM ET 200 Windows V1.0[1].
DIA	Flashes (red)	Hardware fault, if BF is also lit[2].
	Lit (red)	Fault at inputs/outputs of the analog modules: • Configuration/parameterization error (4/8 AI, 4AI, 4AO) • Common-mode error (4/8 AI) • Short-circuit to ground (4/8 AI, 4 AO) • Wire breakage (4/8 AI, 4 AI, 4 AO) • Measuring range undershot (4/8 AI, 4 AI) • Measuring range overshot (4/8 AI, 4 AI)

1 Remedy: Delete configuration of the ET 200C analog module and reconfigure.
2 Ask your SIEMENS contact person.

8.2 Using STEP 5 to Diagnose Problems (Station Diagnostics)

Introduction

You can use STEP 5 for the systematic pinpointing and diagnosis of faults.

STEP 5 Diagnostics Facilities

The table below lists the STEP 5 diagnostics facilities for operation with IM 308-C:

Table 8-5 STEP 5 Diagnostics Facilities, Operation with IM 308-C

Diagnostics	Content
Master diagnostics	• Registers all slaves for which diagnostics messages are pending. • Registers all slaves with which data transfer has taken place within a certain time window • Provides information on the operating mode of the DP master
Station diagnostics	Provides information on status of the slave and outputs diagnostics for channel groups (modules with diagnostics capability only)

In this Section

Master diagnostics with IM 308-C is dependent on the station type of the slaves. It is described in detail in the manual entitled *ET200 Distributed I/O System* (Order No. 6ES5 998-3ES12).

This section describes **station diagnostics with ET 200C**.

Structure: Station Diagnostics

A certain number of bytes is reserved for station diagnostics of each slave station. The precise number depends on the station type.

The tables below illustrate the structure of station diagnostics for ET 200C:

Table 8-6 Structure of Station Diagnostics for Digital ET 200C Modules

Byte	Content
Diagnostics byte 0	Station status 1 – PROFIBUS DP standard
Diagnostics byte 1	Station status 2 – PROFIBUS DP standard
Diagnostics byte 2	Station status 3 – PROFIBUS DP standard
Diagnostics byte 3	Master station number – PROFIBUS DP standard
Diagnostics byte 4	Manufacturer identification (high) – PROFIBUS DP standard
Diagnostics byte 5	Manufacturer identification (low) – PROFIBUS DP standard
Diagnostics byte 6	Header (device-related diagnostics)
Diagnostics byte 7	Device-related diagnostics 16 DI/16DO: group diagnostics 8 DI, 8DO, 8DO/2A: free
Diagnostics byte 8	Reserved
Diagnostics byte 9	Device-related diagnostics 16 DI/16DO: free 8 DI, 8DO, 8DO/2A: individual diagnostics
Diagnostics bytes 10 to 12	free

Using STEP 5 to Diagnose Problems (Station Diagnostics), Continued

Table 8-7 Structure of Station Diagnostics for ET 200C; AI 4/8 × 12 Bit

<table>
<tr><th>Byte</th><th colspan="2">Content</th></tr>
<tr><td>Diagnostics byte 0</td><td colspan="2">Station status 1 – PROFIBUS DP standard</td></tr>
<tr><td>Diagnostics byte 1</td><td colspan="2">Station status 2 – PROFIBUS DP standard</td></tr>
<tr><td>Diagnostics byte 2</td><td colspan="2">Station status 3 – PROFIBUS DP standard</td></tr>
<tr><td>Diagnostics byte 3</td><td colspan="2">Master station number – PROFIBUS DP standard</td></tr>
<tr><td>Diagnostics byte 4</td><td colspan="2">Manufacturer identification (high) – PROFIBUS DP standard</td></tr>
<tr><td>Diagnostics byte 5</td><td colspan="2">Manufacturer identification (low) – PROFIBUS DP standard</td></tr>
<tr><td>Diagnostics byte 6</td><td colspan="2">Header (identification-related diagnostics)</td></tr>
<tr><td>Diagnostics byte 7</td><td colspan="2">Module fault vector</td></tr>
<tr><td>Diagnostics byte 8</td><td colspan="2">Header (device-related diagnostics)</td></tr>
<tr><td>Diagnostics byte 9</td><td colspan="2">S7 header (S7 alarm): limit value alarm 02_H
diagnostics alarm 01_H</td></tr>
<tr><td>Diagnostics byte 10</td><td colspan="2">Slot number</td></tr>
<tr><td>Diagnostics byte 11</td><td colspan="2">Reserved</td></tr>
<tr><td></td><td>Diagnostics alarm</td><td>Limit value alarm</td></tr>
<tr><td>Diagnostics byte 12</td><td>System-specific diagnostics</td><td>Limit value overshoot</td></tr>
<tr><td>Diagnostics byte 13</td><td>System-specific diagnostics</td><td>Limit value undershoot</td></tr>
<tr><td>Diagnostics byte 14</td><td>Free</td><td>Free</td></tr>
<tr><td>Diagnostics byte 15</td><td>System-specific diagnostics</td><td>Free</td></tr>
<tr><td>Diagnostics byte 16</td><td>Channel type</td><td rowspan="5"></td></tr>
<tr><td>Diagnostics byte 17</td><td>Length of diagnostics per channel</td></tr>
<tr><td>Diagnostics byte 18</td><td>Number of channels</td></tr>
<tr><td>Diagnostics byte 19</td><td>Channel error vector</td></tr>
<tr><td>Diagnostics bytes 20 to 27</td><td>Channel-specific diagnostics</td></tr>
</table>

: Device-related diagnostics

Table 8-8 Structure of Station Diagnostics for ET 200C; AI 4 × 12 Bit

Byte	Content	
Diagnostics byte 0	Station status 1 – PROFIBUS DP standard	
Diagnostics byte 1	Station status 2 – PROFIBUS DP standard	
Diagnostics byte 2	Station status 3 – PROFIBUS DP standard	
Diagnostics byte 3	Master station number – PROFIBUS DP standard	
Diagnostics byte 4	Manufacturer identification (high) – PROFIBUS DP standard	
Diagnostics byte 5	Manufacturer identification (low) – PROFIBUS DP standard	
Diagnostics byte 6	Header (identification-related diagnostics)	
Diagnostics byte 7	Module fault vector	
Diagnostics byte 8	Header (device-related diagnostics)	
Diagnostics byte 9	S7 header (S7 alarm): limit value alarm 02_H diagnostics alarm 01_H	
Diagnostics byte 10	Slot number	
Diagnostics byte 11	Reserved	
	Diagnostics alarm	**Limit value alarm**
Diagnostics byte 12	System-specific diagnostics	Limit value overshoot
Diagnostics byte 13	System-specific diagnostics	Limit value undershoot
Diagnostics byte 14	Free	Free
Diagnostics byte 15	System-specific diagnostics	Free
Diagnostics byte 16	Channel type	
Diagnostics byte 17	Length of diagnostics per channel	
Diagnostics byte 18	Number of channels	
Diagnostics byte 19	Channel error vector	
Diagnostics bytes 20 to 23	Channel-specific diagnostics	

: Device-related diagnostics

Using STEP 5 to Diagnose Problems (Station Diagnostics), Continued

Table 8-9 Structure of Station Diagnostics for ET 200C; AO 4 × 12 Bit

Byte	Content
Diagnostics byte 0	Station status 1 – PROFIBUS DP standard
Diagnostics byte 1	Station status 2 – PROFIBUS DP standard
Diagnostics byte 2	Station status 3 – PROFIBUS DP standard
Diagnostics byte 3	Master station number – PROFIBUS DP standard
Diagnostics byte 4	Manufacturer identification (high) – PROFIBUS DP standard
Diagnostics byte 5	Manufacturer identification (low) – PROFIBUS DP standard
Diagnostics byte 6	Header (identification-related diagnostics)
Diagnostics byte 7	Module fault vector
Diagnostics byte 8	Header (device-related diagnostics)
Diagnostics byte 9	S7 header (S7 alarm): diagnostics alarm 01_H
Diagnostics byte 10	Slot number
Diagnostics byte 11	Reserved
	Diagnostics alarm
Diagnostics byte 12	System-specific diagnostics
Diagnostics byte 13	System-specific diagnostics
Diagnostics byte 14	Free
Diagnostics byte 15	System-specific diagnostics
Diagnostics byte 16	Channel type
Diagnostics byte 17	Length of diagnostics per channel
Diagnostics byte 18	Number of channels
Diagnostics byte 19	Channel error vector
Diagnostics bytes 20 to 23	Channel-specific diagnostics

: Device-related diagnostics

Request Station Diagnostics

In order to request station diagnostics for an ET 200C station, you must call the FB IM308C function block (FB 192) with the function FCT = SD.

The FB IM308C places the station diagnostics in the S5 data block of the CPU opened with the FM IM308C call (data block or marker area). It is important to define two memory areas of equal size, in order to ensure that limit-value alarms and diagnostics alarms do not overwrite each other (see Figure 8-1).

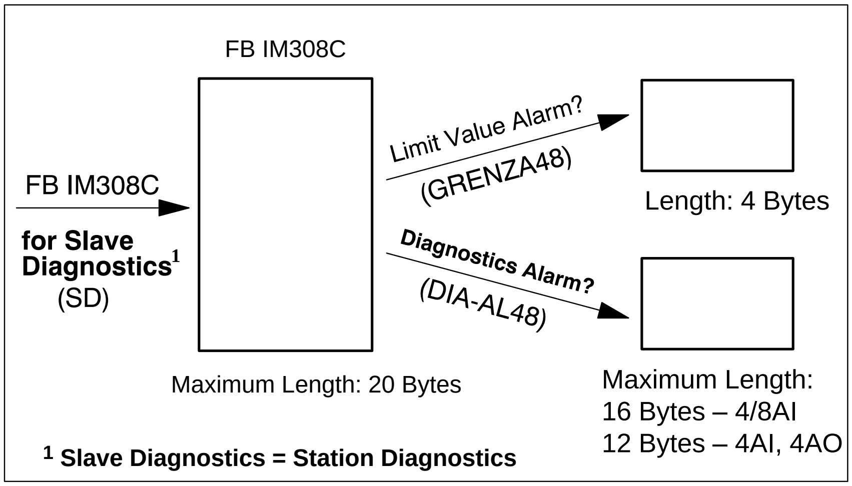


Figure 8-1 Diagram Illustrating How Station Diagnostics is Requested with FB IM308C

Description

FB IM308C and its use relate to general access to diagnostics data of the IM 308-C and are described in detail in the manual *ET 200 Distributed I/O System* (Order No. 6ES5 998-3ES12).

The example below illustrates how to call station diagnostics with the aid of the FB IM308C and store the information in a data block.

The example is followed by a description of how station diagnostics is evaluated. This description is based on the assumption that the diagnostics data is stored in a data block.

Using STEP 5 to Diagnose Problems (Station Diagnostics), Continued

Example: Request Diagnostics with FB IM308C

In this example, the FB IM308C (FB 192) is used to request station diagnostics for a slave having station number 3. The diagnostics data will be written to data block DB 10, starting at data word DW 0.

Basic structure of the STEP 5 listing (e.g. in OB 1):

STL	Explanation
:A DB 10	
:	
:SPA FB 192	Call the FB IM308C
Name :IM308C	
DPAD : KH F800	DP window: F800
IMST : KY 0,3	Number of IM 308-C: 0, station number of the slave: 3
FCT : KC SD	SD = read slave diagnostics
GCGR : KM 00000000 00000000	irrelevant
TYP : KY 0,10	Memory area: 0, block: DB 10
STAD : KF +0	No. of first data word: DW0 Bytes to
LENG : KF -1	be transferred: –1 (joker length)
ERR : MW 134	fault word: MW 134
:	
:L DR 4	Check: Limit value alarm?
:L KB 2	
:!=F	
:SPB FB 60	Store limit value alarm
Name :LIMITA48	
:	
:	
:	
:L DR 4	Check: Diagnostics alarm?
:L KB 1	
:!=F	
:SPB FB 61	Store diagnostics alarm
Name :DIA-AL48	
:	
:BE	

STL: FB 60	Explanation
Name :LIMITA48	
:A DB 10	
:	
:L DW 6	Move information for limit value
:T DW 60	alarm to prevent overwriting by
:L DW 8	subsequent limit value alarms
:T DW 61	
:	
:BE	

STL: FB 61	Explanation
Name :DIA-AL48	
:A DB 10	
:	
:L DW 6	Move information for diagnostics alarm to prevent overwriting by subsequent diagnostics alarms
:T DW 62	
:L DW 7	
:T DW 63	
:L DW 8	
:T DW 64	
:L DW 9	
:T DW 65	
:L DW 10	
:T DW 66	
:L DW 11	
:T DW 67	
:L DW 12	
:T DW 68	
:L DW 13	
:T DW 69	
:	
:BE	

8.2.1 Diagnosing the station status

Introduction

The ”Station Status 1 ... 3” diagnostics bytes provide information on the station. The ”Master station number” diagnostics byte contains the number of the station which parameterized the slave station.

Assumption

Station diagnostics of an ET 200C module has been requested by the CPU and is stored in a data block (DB), starting at data word DW n.

The table below shows the position of the diagnostics data in a data block:

Table 8-10 Position of the Diagnostics Data in the Data Block

Data word	DL	DR
DW n	Station status 1	Station status 2
DW n + 1	Station status 3	Master station number
DW n + 2	Manufacturer identification	
...	...	...

n = starting word address of the diagnostics data in the DB

Read Station Status 1 and 2

The STEP 5 program is programmed as follows:

STL	Explanation
A DB 10	Call data block (here: DB 10)
L DW 0	Load diagnostics word ”station
L KH FFC3	status 1 and station status 2”
UW	(here: n = 0)
L KH 0000	
!=F	No fault?
BEB	
SPB FBx	Evaluate fault in FBx.

Structure: Station Status 1 and 2

The structure of the diagnostics word for station status 1 and 2 (in our example DW 0) is as follows:

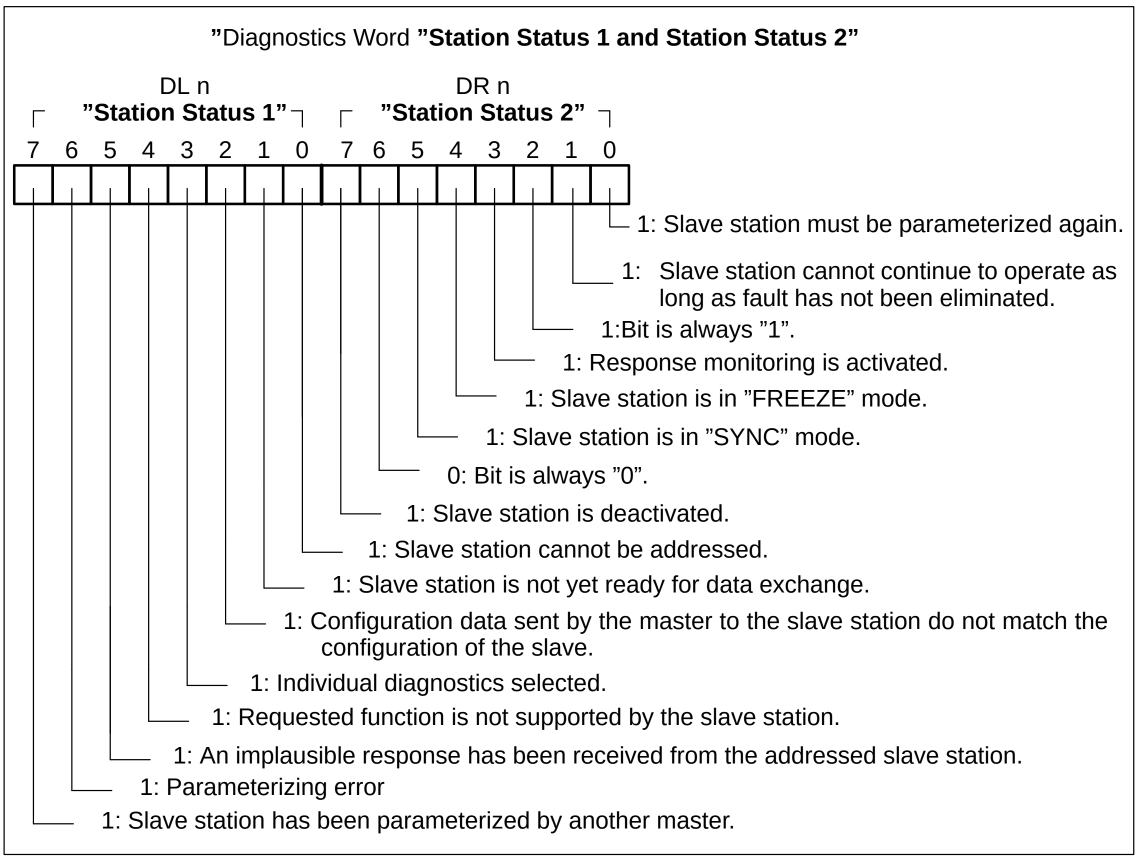


Figure 8-2 Structure of the Diagnostics Word (Station Status 1 and Station Status 2)

Diagnosing the Station Status, Continued

Read Station Status 3 and Master Station Number

The STEP 5 program is programmed as follows:

STL	Explanation
A DB 10	Call data block (here: DB 10),
L DR 1	Load diagnostics word ”station
L KB 1	status 3 and master station number
	(here = 1)”
!=F	No fault?
BEB	
SPA FBx	Evaluate fault in FBx.

Structure: Station Status 3 and Master Station Number

The structure of the diagnostics word for station status 3 and master station number (in our example: DW 1) is as follows:

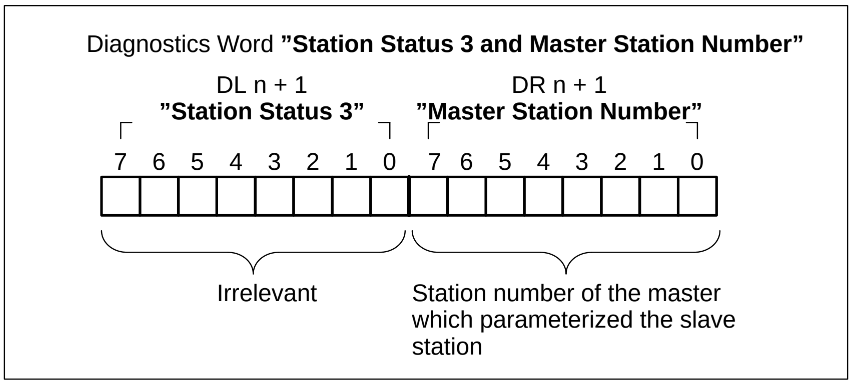


Figure 8-3 Structure of the Diagnostics Word ”Station Status 3 and Master Station Number”

8.2.2 Diagnosing the Manufacturer Identification

Introduction

The ”manufacturer identification” diagnostics word describes the type of slave station.

Assumption

Station diagnostics has been requested by the CPU and is stored in a data block DB 10, starting at data word DW n (n = 0). See Table 8-10.

Read Manufacturer Identification

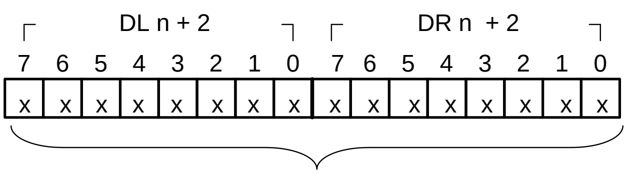
The STEP 5 program is programmed as follows:

STL	Explanation
A DB 10	Call data block (here: DB 10)
L DW 2	Load diagnostics word ”manufacturer
L KH 800E	identification” (e.g. ”800EH” for ET200C-4AI)
!=F	No fault?
BEB	
SPA FBx	Evaluate fault in FBx.

Structure: Manufacturer Identification

The structure of the diagnostics word for manufacturer identification (in our example DW 2) is as follows:

Diagnostics Word **”Manufacturer Identification”**



8010_H:	ET 200C; DI 8 × DC 24 V	(6ES7 141-0BF00-0XB0)
8011_H:	ET 200C; DO 8 × DC 24 V/0,5A	(6ES7 142-0BF00-0XB0)
8012_H:	ET 200C; DO 8 × DC 24 V/2A	(6ES7 142-0BF10-0XB0)
8013_H:	ET 200C; DI 16/DO 16 × DC 24 V	(6ES7 143-0BL00-0XB0)
8013_H:	ET 200C; DI 16/DO 16 × DC 24 V	(6ES7 143-0BL10-0XB0)
$800F_H$:	ET 200C; AI 4/8 × 12 Bit	(6ES7 144-0KH00-0XB0)
$800E_H$:	ET 200C; AI 4 × 12 Bit	(6ES7 144-0HF00-0XB0)
$800D_H$:	ET 200C; AO 4 × 12 Bit	(6ES7 145-0HF00-0XB0)

Figure 8-4 Structure of the ”Manufacturer Identification” Diagnostics Word

8.2.3 Device-related Diagnostics – Digital ET 200C

Introduction

Device-related diagnostics indicates which inputs or outputs are defective. The header provides information on the length of the device-related diagnostics.

Note

Device-related diagnostics is possible only with ET 200C stations which have diagnostics capability.

ET 200C stations which **do not** have diagnostics capability have the value ”07_H” in the header. The remaining bytes are reserved.

Assumption

Station diagnostics of a digital ET 200C module has been requested by the CPU and is stored in a data block DB 10, starting at data word DW 0. The length of this device-related diagnostics data is 7 bytes.

Position of Diagnostics Data in Data Block

The table below shows the position of the diagnostics data in the data block:

Table 8-11 Position of Diagnostics Data in the Data Block for ET 200C

Data word	DL	DR
DW 0	Station status 1	Station status 2
DW 1	Station status 3	Master station nummer
DW 2	Manufacturer identification	
DW 3	Header (device-related diagnostics)	Device-related diagnostics 16DI/16DO: group diagnostics; 8DI, 8DO, 8DO/2A: free
DW 4	Reserved	Device-related diagnostics 16DI/16DO: free; 8DI, 8DO, 8DO/2A: individual diagnostics
DW 5	Free	Free
DW 6	Free	Free

n = starting word address of the diagnostics data in the DB

Read Device-related Diagnostics

The STEP 5 program is programmed as follows:

STL	Explanation
A DB 10	Call data block (here: DB 10)
L DW 3	Load diagnostics word ”header and
L KH 0700	device-related diagnostics”
!=F	No fault?
BEB	
SPA FBx	Evaluate fault in FBx.

Structure: Header and Device-related Diagnostics for 16 DI/16DO

The structure of the diagnostics word for header and device-related diagnostics (in our example DW 3) for the ET 200C; DI 16/DO 16 $\times$ DC 24V is as follows:

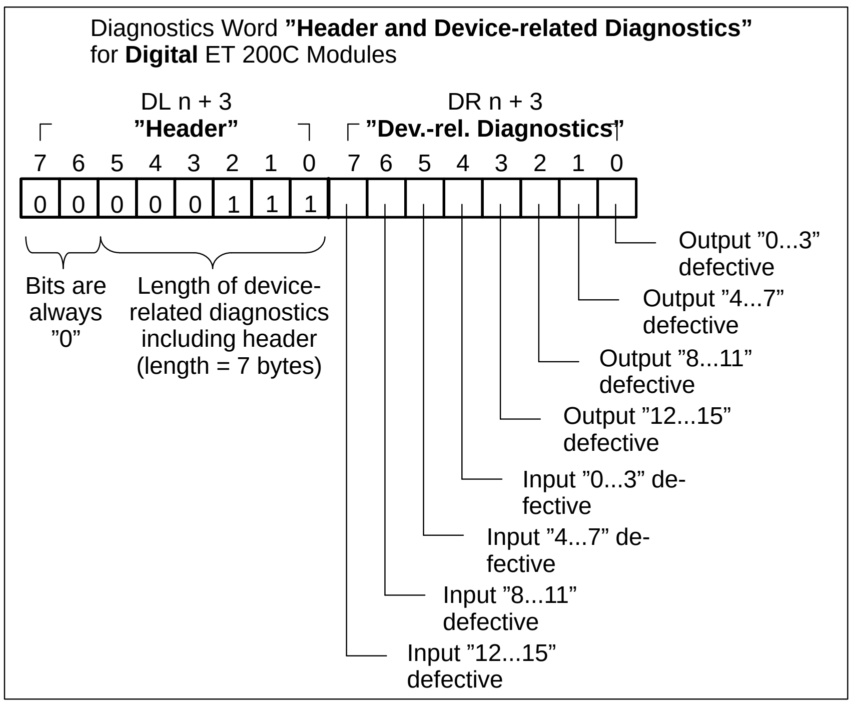


Figure 8-5 Structure of the Diagnostics Word ”Header and Device-related Diagnostics” of ET 200C; DI 16/DO 16 $\times$ DC 24V

Device-related Diagnostics – Digital ET 200C, Continued

Structure: Device-related Diagnostics for 8DI, 8DO and 8DO/2A

The structure of the diagnostics word for device-related diagnostics (in our example: DW 4) for ET 200C; DI 8 × DC 24V; ET 200C; DO 8 × DC 24V/0.5A and ET 200C; DO 8 × DC 24V/2A is as follows:

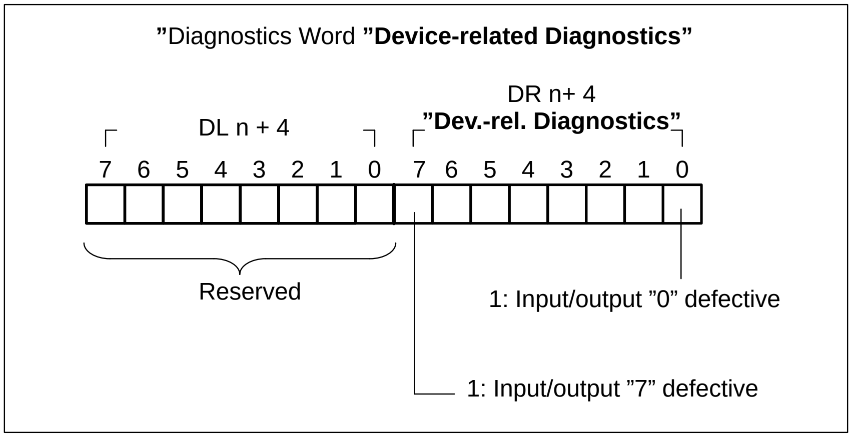


Figure 8-6 Structure of the Diagnostics Word for ”Device-related Diagnostics” for ET 200C; DI 8 × DC 24V; ET 200C; DO 8 × DC 24V/0.5A and ET 200C; DO 8 × DC 24V/2A

8.2.4 Identification- and Device-related Diagnostics – Analog ET 200C

Introduction

The device-related diagnostics for an analog ET 200C module indicate which faults are reported by the module. The header provides information on the length of the device-related diagnostics.

Assumption

Station diagnostics of analog ET 200C modules has been requested by the CPU and is stored in a data block DB 10, starting at data word DW n.

Position of Diagnostics Data in Data Block

The table below shows the position of the diagnostics data in the data block:

Table 8-12 Position of Diagnostics Data in Data Block for ET 200C; AI 4/8 × 12 Bit

Data word	DL		DR	
DW n	Station status 1		Station status 2	
DW n + 1	Stationsstatus 3		Master stations number	
DW n + 2	Manufacturer identification			
DW n + 3	Header – identification-related diagnostics		Module fault vector	
DW n + 4	Header – device-related diagnostics		S7-Header – Diagnosealarm: limit value alarm: 02_H diagnostics alarm: 01_H	
DW n + 5	Slotnummer		Reserved	
	Diagnostics alarm	**Limit value alarm**	**Diagnostics alarm**	**Limit value alarm**
DW n + 6	System-specific diagnostics	Limit value overshoot	System-specific diagnostics	Limit value undershoot
DW n + 7	Free	Free	System-specific diagnostics	Free
DW n + 8	Channel type – AI 4/8, AI 4, AO 4		Length of diagnostics per channel	
DW n + 9	Number of channels		Channel fault vector – one bit per channel	
DW n + 10 to n + 13	Channel-specific diagnostics		Channel-specific diagnostics	

n = starting word address of the diagnostics data in the DB

: Device-specific diagnostics

Identification- and Device-related Diagnostics – Analog ET 200C, Continued

Table 8-13 Position of the Diagnostics Data in the Data Block for ET 200C; AI 4 × 12 Bit

<table>
<tr><th>Data word</th><th colspan="2">DL</th><th colspan="2">DR</th></tr>
<tr><td>DW n</td><td colspan="2">Station status 1</td><td colspan="2">Station status 2</td></tr>
<tr><td>DW n + 1</td><td colspan="2">Station status 3</td><td colspan="2">Master station number</td></tr>
<tr><td>DW n + 2</td><td colspan="4">Manufacturer identification</td></tr>
<tr><td>DW n + 3</td><td colspan="2">Header – identification-related diagnostics</td><td colspan="2">Module fault vector</td></tr>
<tr><td>DW n + 4</td><td colspan="2">Header – device-related diagnostics</td><td colspan="2">S7-header – diagnostics alarm:
limit value alarm: 02_H
diagnostics alarm: 01_H</td></tr>
<tr><td>DW n + 5</td><td colspan="2">Slot number</td><td colspan="2">Reserved</td></tr>
<tr><td></td><td>Diagnostics alarm</td><td>Limit value alarm</td><td>Diagnostics alarm</td><td>Limit value alarm</td></tr>
<tr><td>DW n + 6</td><td>System-specific diagnostics</td><td>Limit value overshoot</td><td>System-specific diagnostics</td><td>Limit value undershoot</td></tr>
<tr><td>DW n + 7</td><td>Free</td><td>Free</td><td>System-specific diagnostics</td><td>Free</td></tr>
<tr><td>DW n + 8</td><td>Channel type – AI 4/8, AI 4, AO 4</td><td rowspan="3"></td><td>Length of diagnostics per channel</td><td rowspan="3"></td></tr>
<tr><td>DW n + 9</td><td>Number of channels</td><td>Channel fault vector – one bit per channel</td></tr>
<tr><td>DW n + 10
to n + 11</td><td>Channel-specific diagnostics</td><td>Channel-specific diagnostics</td></tr>
</table>

n = starting word address of the diagnostics data in the DB

: Device-specific diagnostics

Table 8-14 Position of the Diagnostics Data in the Data Block for ET 200C; AO 4 × 12 Bit

Data word	DL	DR
DW n	Station status 1	Station status 2
DW n + 1	Station status 3	Master station number
DW n + 2	Manufacturer identification	
DW n + 3	Header – identification-related diagnostics	Module fault vector
DW n + 4	Header – device-related diagnostics	S7-Header – diagnostics alarm: diagnostics alarm: 01_H
DW n + 5	Slot number	Reserved
	Diagnostics alarm	**Diagnostics alarm**
DW n + 6	System-specific diagnostics	System-specific diagnostics
DW n + 7	Free	System-specific diagnostics
DW n + 8	Channel type – AI 4/8, AI 4, AO 4	Length of diagnostics per channel
DW n + 9	Number of channels	Channel fault vector – one bit per channel
DW n + 10 to n + 11	Channel-specific diagnostics	Channel-specific diagnostics

n = starting word address of the diagnostics data in the DB

: Device-specific diagnostics

Identification- and Device-related Diagnostics – Analog ET 200C, Continued

Structure: Header – Identification-related Diagnostics (DW n + 3)

The structure of diagnostics word DW n + 3 for identification-related diagnostics of analog ET 200C modules is as follows:

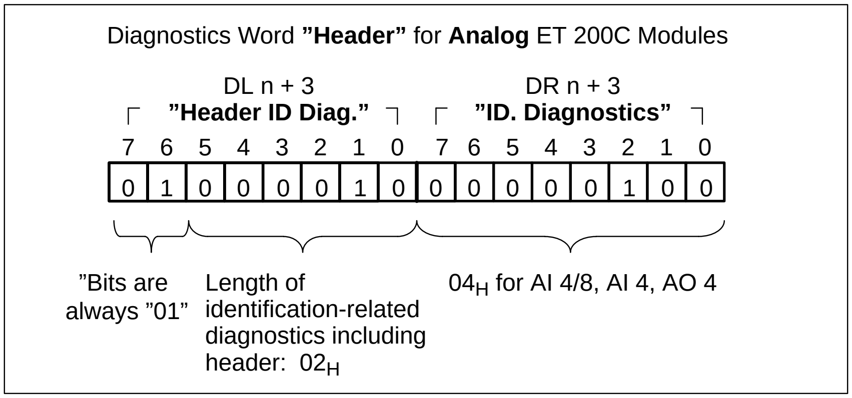


Figure 8-7 Structure of Diagnostics Word for Identification-related Diagnostics (DW n + 3) for Analog ET 200C Modules

Read Device-related Diagnostics

The STEP 5 program is programmed as follows:

AWL	Explanation
A DB 10	Call data block (here: DB 10)
L DL 4	Load diagnostics word ”device-re-
L KH 0008	lated diagnostics (DW n +4)”
!=F	No fault?
BEB	
SPA FBx	Evaluate fault in FBx.

Call other device-related diagnostics by entering the appropriate data words of the DB instead of DWn + 4 (see Tables 8-12, 8-13 and 8-14).

Structure: Header – Device-related Diagnostics (DW n + 4)

The structure of diagnostics word DW n + 4 for header – device-related diagnostics of analog ET 200C modules is as follows:

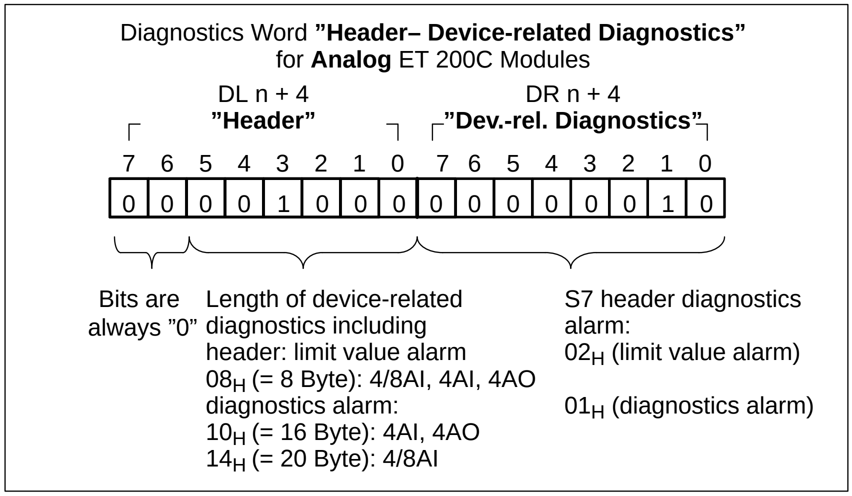


Figure 8-8 Structure of Diagnostics Word ”Header – Device-related Diagnostics” (DW n + 4) for Analog ET 200C Modules

Structure: Device-related Diagnostics (DW n + 5)

The structure of diagnostics word DW n + 5 for analog ET 200C modules is as follows:

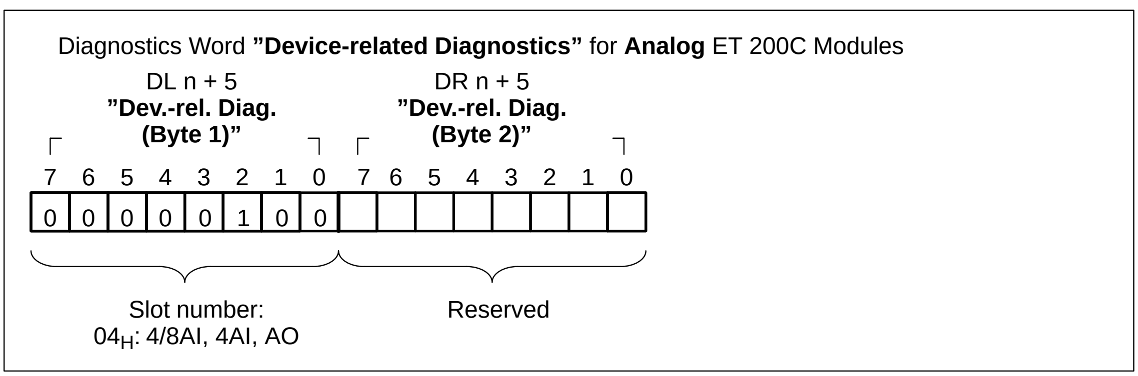


Figure 8-9 Structure of Diagnostics Word ”Device-related Diagnostics – Diagnostics Alarm” (DW n + 5) for Analog ET 200C Modules

Identification- and Device-related Diagnostics – Analog ET 200C, Continued

Structure: Device-related Diagnostics for Diagnostics Alarm (DW n + 6)

The structure of diagnostics word DW n + 6 for analog ET 200C modules is as follows:

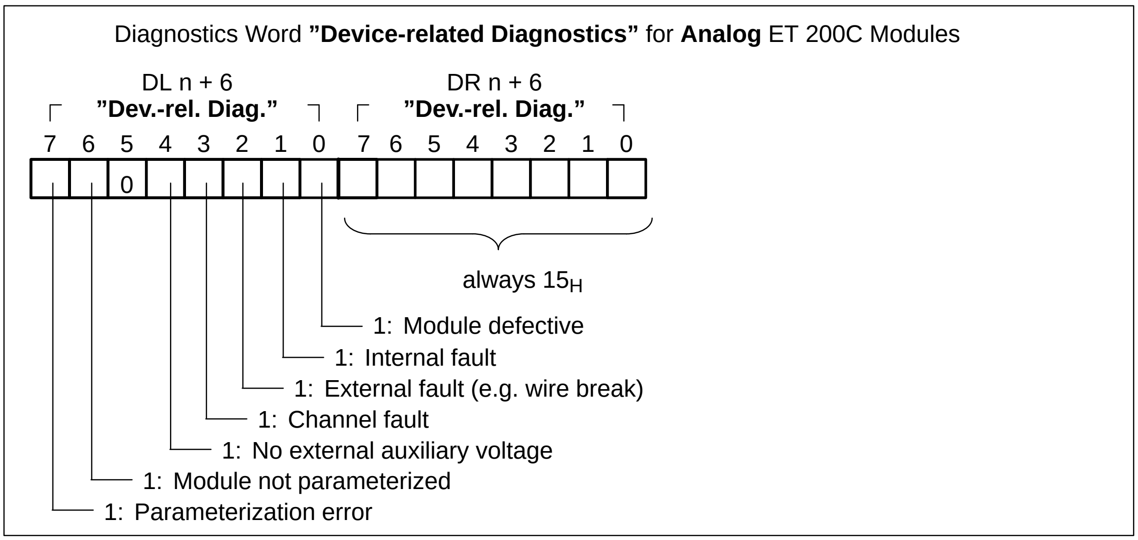


Figure 8-10 Structure of Diagnostics Word "Device-related Diagnostics – Diagnostics Alarm" (DW n + 6) for Analog ET 200C Modules

Structure: Device-related Diagnostics for Diagnostics Alarm (DW n + 7)

The structure of diagnostics word DW n + 7 for analog ET 200C modules is as follows:

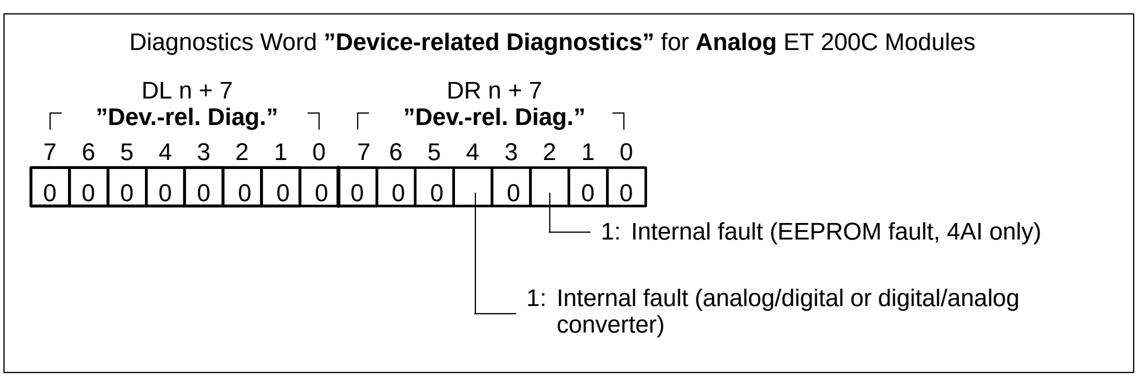


Figure 8-11 Structure of Diagnostics Word "Device-related Diagnostics – Diagnostics Alarm" (DW n + 7) for Analog ET 200C Modules

Structure: Device-related Diagnostics for Diagnostics Alarm (DW n + 8)

The structure of diagnostics word DW n + 8 for analog ET 200C modules is as follows:

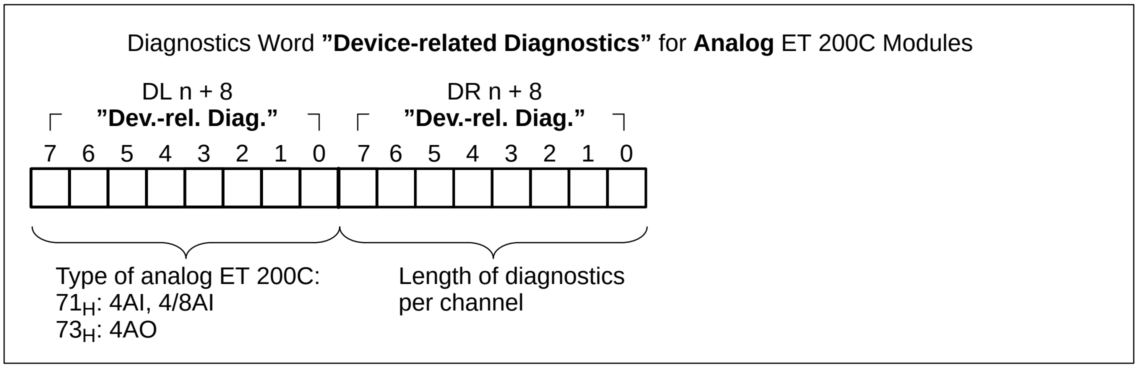


Figure 8-12 Structure of Diagnostics Word "Device-related Diagnostics – Diagnostics Alarm" (DW n + 8) for Analog ET 200C Modules

Structure: Device-related Diagnostics for Diagnostics Alarm (DW n + 9)

The structure of diagnostics word DW n + 9 for analog ET 200C modules is as follows:

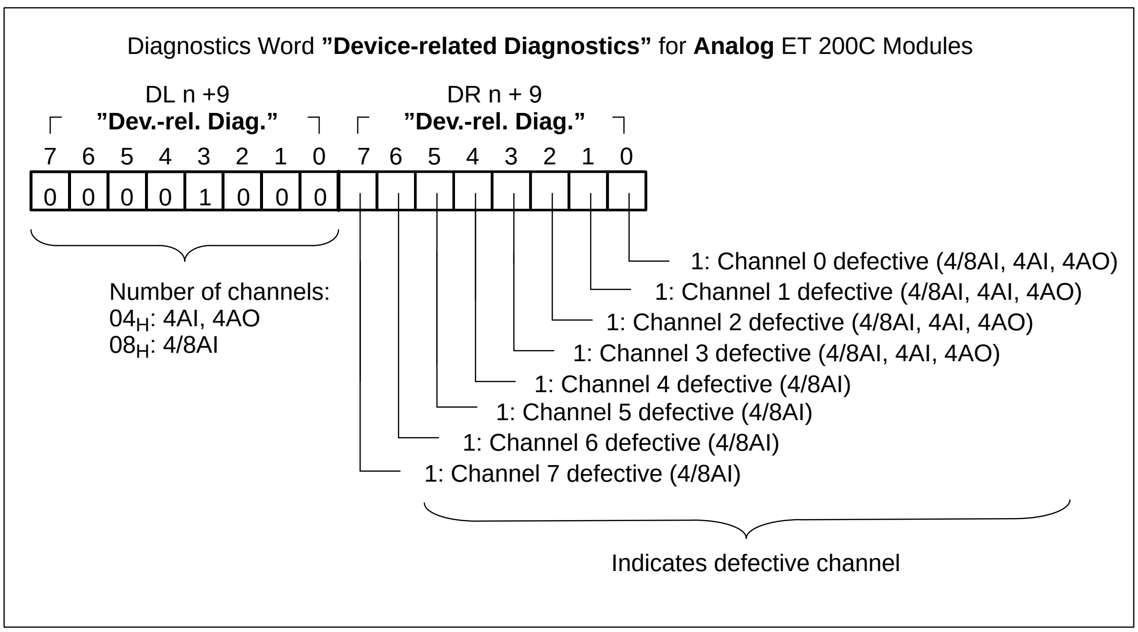


Figure 8-13 Structure of Diagnostics Word "Device-related Diagnostics – Diagnostics Alarm" (DW n + 9) for Analog ET 200C Modules

Identification- and Device-related Diagnostics – Analog ET 200C, Continued

Structure: Device-related Diagnostics for Diagnostics Alarm (DW n + 10)

The structure of diagnostics word DW n + 10 for analog ET 200C modules is as follows:

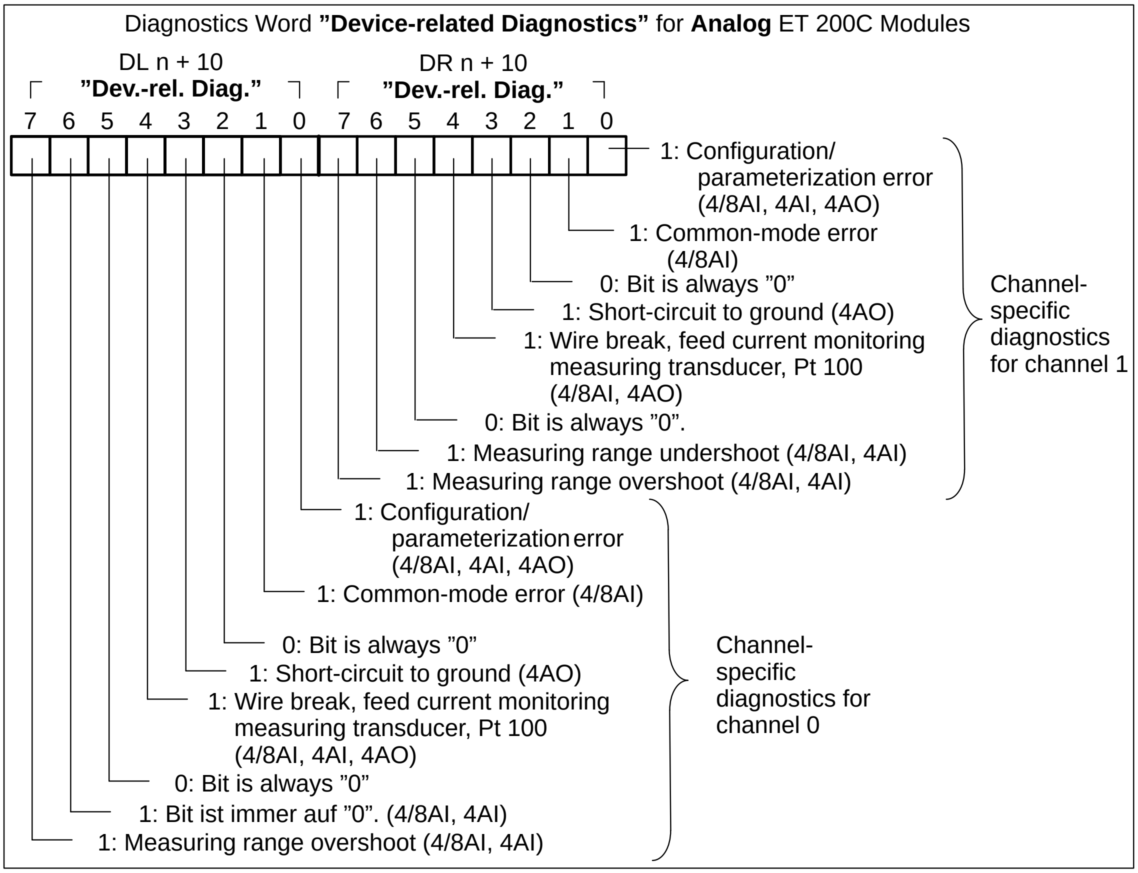


Figure 8-14 Structure of Diagnostics Word ”Header and Device-related Diagnostics – Diagnostics Alarm” (DW n + 10) for Analog ET 200C Modules

Structure: Device-related Diagnostics for Diagnostics Alarm (DW n + 11)

The structure of diagnostics word DW n + 11 for analog ET 200C modules is the same as that of DW n + 10. This diagnostics word describes the channel-specific diagnostics for channels 2 and 3.

Structure: Device-related Diagnostics for Diagnostics Alarm (DW n + 12)

The structure of diagnostics word DW n + 12 for analog ET 200C modules is as follows:

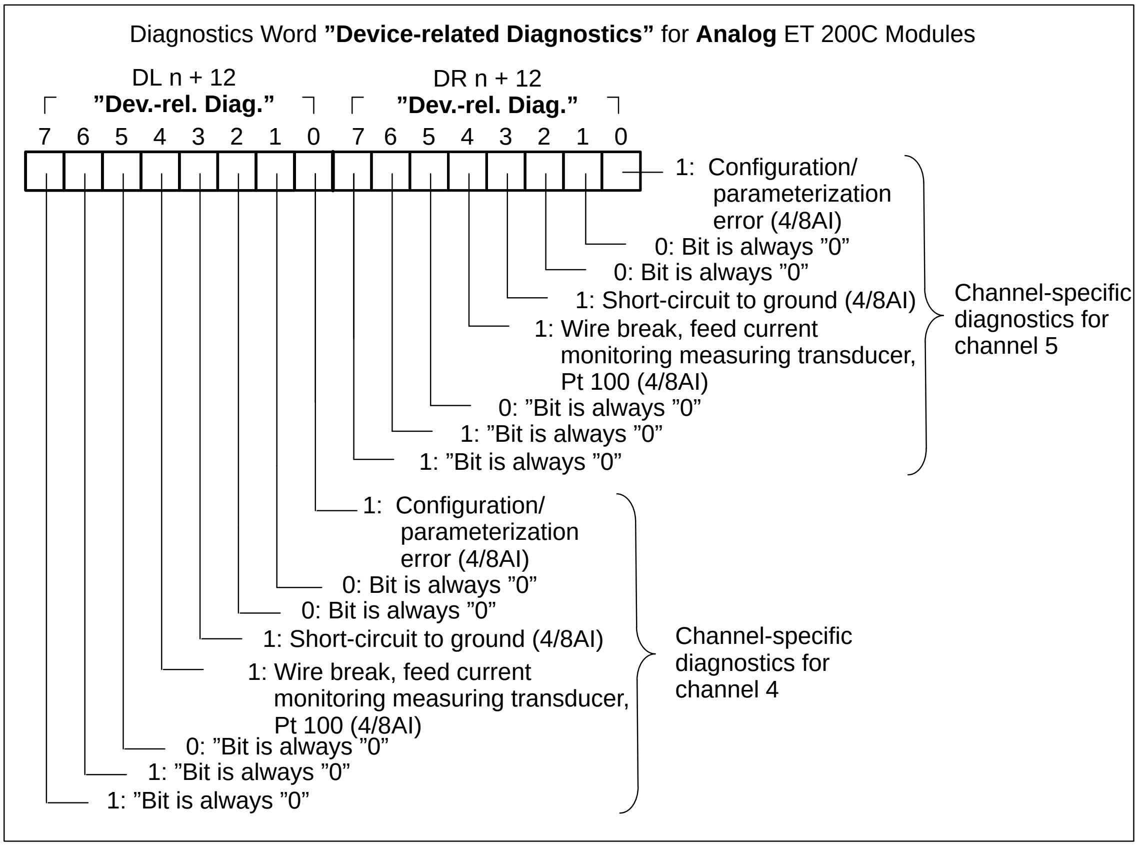


Figure 8-15 Structure of Diagnostics Word "Header and Device-related Diagnostics – Diagnostics Alarm" (DW n + 12) for Analog ET 200C Modules

Structure: Device-related Diagnostics for Diagnostics Alarm (DW n + 13)

The structure of diagnostics word DW n + 13 for analog ET 200C modules is the same as that of DW n + 12. This diagnostics word describes the channel-specific diagnostics for channels 6 and 7 of ET 200C 4/8 AI.

Identification- and Device-related Diagnostics – Analog ET 200C, Continued

Structure: Device-related Diagnostics for Limit Value Alarm (DW n + 6)

The structure of diagnostics word DW n + 6 for analog ET 200C modules is as follows:

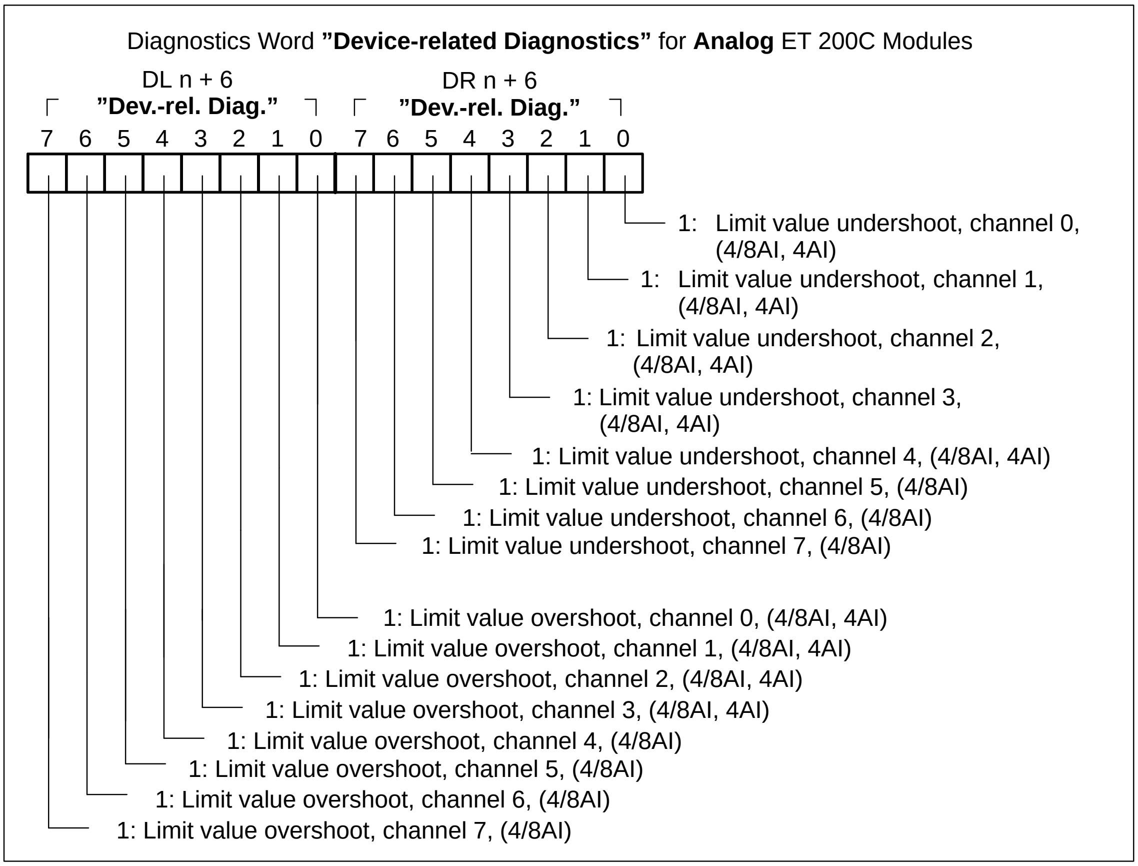


Figure 8-16 Structure of Diagnostics Word ”Device-related Diagnostics – Limit Value Alarm” (DW n + 6) for Analog ET 200C Modules

Connection of the ET 200 Handheld 9

In this Chapter

This chapter describes the connection of the ET 200 handheld for startup and testing of the ET 200C distributed I/O station.

In this chapter you will learn

- which connections are possible for the ET 200 handheld and which rules must be observed.

Startup and testing of the ET 200C with the ET 200 handheld are described in the *ET 200 Handheld* manual.

9.1 Connection of the ET 200 Handheld

Introduction

When connecting the ET 200 handheld to the ET 200C distributed I/O station, the following rules must be observed.

Requirement

In order to connect the ET 200 handheld to the ET 200C station, you require the

- adapter cable (see Section 3.13)
- an ET 200 handheld (from version 4.0)

Rules

The following rules must be observed when connecting the ET 200 handheld:

- The ET 200 handheld is plugged – via the **adapter cable** – onto the bus connector of the digital modules.
- The ET 200 handheld is either
  - connected to an **unassigned** bus connector of the digital module

    or
  - the SINEC L2 bus connector must be removed from the ET 200C station and the ET 200 handheld is then plugged onto this bus connector.

Note

The ET 200 handheld must always be connected in such a way that the power supply for the digital module is not interrupted.

- The ET 200 handheld must not be plugged onto the programmer connector.

Behaviour of the Station

Connection of the ET 200 handheld automatically disconnects the ET 200C distributed I/O station from the SINEC L2-DP field bus.

A **general reset** is performed on an ET 200C station if an ET 200 handheld is connected. The ”general reset” function enables the station number to be changed.

After disconnection of the ET 200 handheld from the station and restoration of the SINEC L2 bus connection (if interrupted) the master takes the ET 200C station back into the bus cycle.

Connection Options

Depending on the configuration of the ET 200C (see Chapter 2 “ET 200C Configuration Options”), the following connections are possible for the ET 200 handheld:

- Configuration **with** power supply connector and **without** T connector:

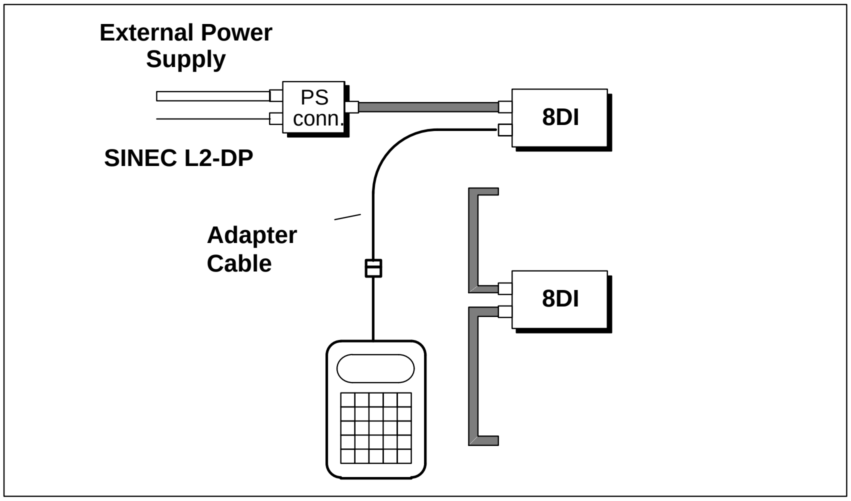


Figure 9-1 Connection of ET 200 Handheld for Configuration with Power Supply Connector and without T Connector

- Configuration with external power supply:

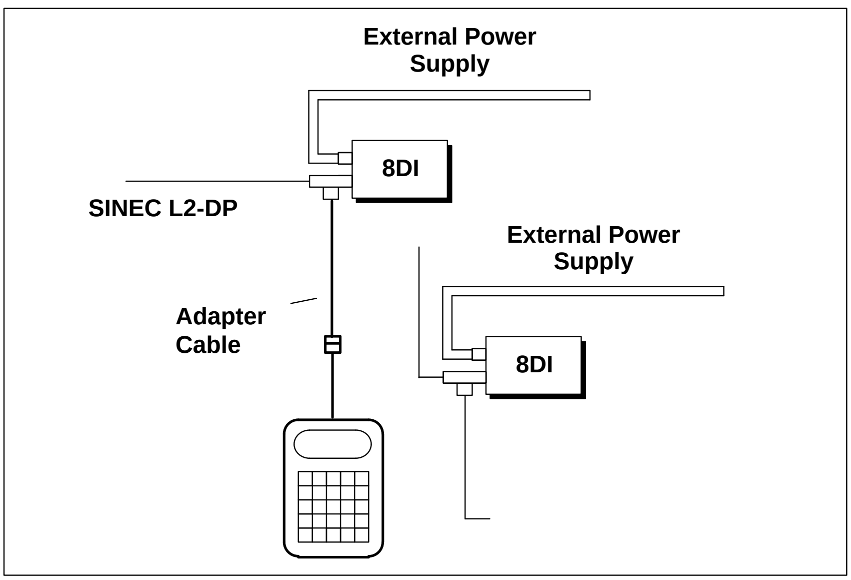


Figure 9-2 Connection of ET 200 Handheld for Configuration with External Power Supply

Connection of the ET 200 Handheld, Continued

Connection Options (Continued)

- The handheld can be connected in two different ways for the configuration **with** power supply connector **and** T connector:
  - – Plug the ET 200 handheld into the unassigned bus connector of the ET 200C station:

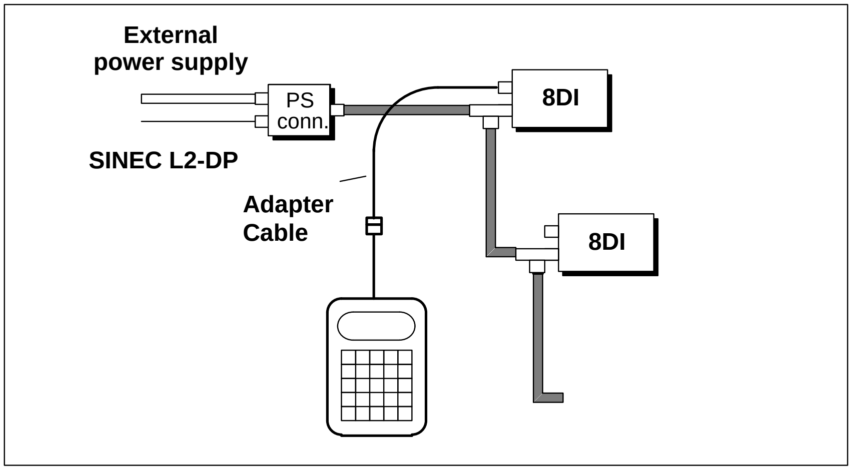


Figure 9-3 Connection of the Handheld to the Unassigned Bus Connection of the ET 200C Station for Configuration with Power Supply Connector and T Connector

or

  - – Connect the ET 200 handheld to the T connector:

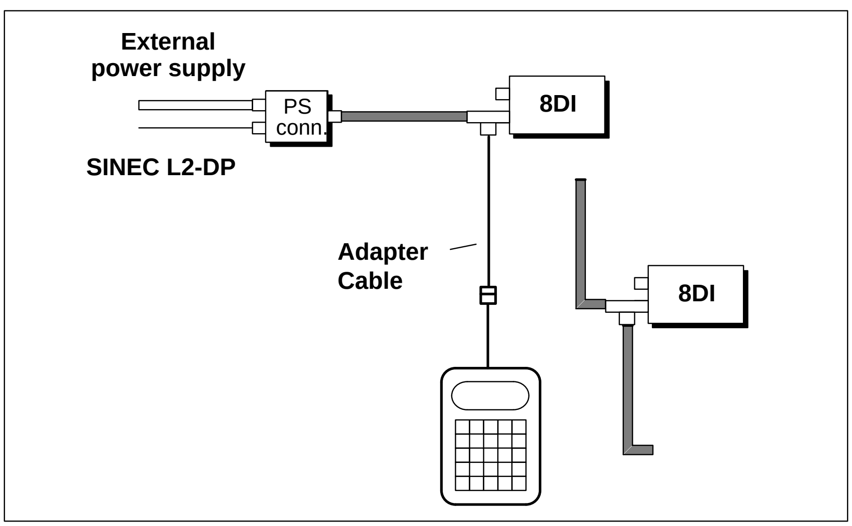


Figure 9-4 Connection of the Handheld to the T Connector for Configuration with Power Supply Connector and T Connector

General Technical Specifications 10

In this Chapter

This chapter contains the general technical data.

The general technical data comprises

- a list of all ET 200C modules
- the standards and specified values which are satisfied by all modules of ET 200C and the criteria applied in testing the modules.

10.1 Overview of Digital and Analog Modules for the ET 200C

ET 200C Module	Order number	Description
Digital modules:		
ET 200C; DI 8 × DC 24 V	6ES7 141-0BF00-0XB0	8 inputs with circular socket connectors
ET 200C; DO 8 × DC 24 V/0.5A	6ES7 142-0BF00-0XB0	8 outputs with circular socket connectors
ET 200C; DO 8 × DC 24 V/2A	6ES7 142-0BF10-0XB0	8 outputs with circular socket connectors
ET 200C; DI 16/DO 16 × DC 24 V	6ES7 143-0BL00-0XB0	16 inputs with circular socket connectors 16 outputs with circular socket connectors
ET 200C; DI 16/DO 16 × DC 24 V	6ES7 143-0BL10-0XB0	16 inputs with cable glands and conduit threads 16 outputs with cable glands and conduit threads
Analog modules:		
ET 200C; AI 4/8 × 12 Bit	6ES7 144-0KH00-0XB0	8 inputs with cable glands and conduit threads measuring principle: integrating
ET 200C; AI 4 × 12 Bit	6ES7 144-0HF00-0XB0	4 inputs with cable glands and conduit threads measuring principle: successive approximation
ET 200C; AO 4 × 12 Bit	6ES7 145-0HF00-0XB0	4 outputs with cable glands and conduit threads

10.2 General Technical Specifications

Climatic Environmental Conditions to IEC 1131-2	
Temperature, operation	– 25 ... + 60 °C
Temperature, storage/transport	– 40 ... + 70 °C
Temperature change	
• Operation	max. 10 °C/h
• Storage/transport	max. 20 °C/h
Relative humidity	10 ... 100 %
Atmospheric pressure	
• Operation	860 ... 1060 hPa
• Storage/transport	660 ... 1060 hPa
Degree of protection IP to IEC 529	IP 66 / IP 67 (DI16/DO16 not tested)
Operating conditions with chemically active pollutants to IEC 654-4	Class 2
Mechanically Conditions	
Operating conditions to IEC 654-3	
• 10 Hz ≤ f < 57 Hz	Constant amplitude 0,35 mm
• 57 Hz ≤ f < 150 Hz	Constant acceleration 5 g
• Mode of vibration	Frequency sweeps with sweep rate of 1 octave/min.
• Vibration period	10 frequency sweeps per axis in each of the 3 axes vertical to each other
• Operating conditions to IEC 654-3	U.T.1 (corresponds to 100 % frequency)
Shock-tested to IEC 68-2-27	
• Type of shock	Half sine
• Shock intensity	30 g peak value, 18 ms duration
• Direction of shock	6 shocks in each of the 3 axes vertical to each other
Bump test to IEC 68-2-29	
• Type of shock	Half sine
• Shock intensity	25 g peak value, 6 ms duration
• Direction of shock	1000 shocks in each of the 3 axes vertical to each other

Drop and topple to IEC 68-2-31	
• Tested with	Height of fall 100 mm
Electromagnetic Compatibility (EMC)/ Noise Immunity	
Electrostatic discharge test to IEC 801-2	Discharge on all parts that are accessible to the operator in normal operation
• Test voltage	8 kV air discharge 4 kV relay discharge (relative humidity 30 to 95 %)
Electromagnetic field test to IEC 801-3	Field strength 10V/m
Fast transient burst to IEC 801-4	
• Digital input/output module	2 kV
• Analog input/output	2 kV
• DC voltage supply	2 kV
• Communications interface	2 kV
Safety Information	
Insulation rating	
• Between electrically independent circuits and circuits connected to central earthing point	to DIN VDE 0160 (05.1988)
• Between all circuits and central earthing point	to DIN VDE 0160 (05.1988)
Radio interference suppression	to EN 50081-2 for industrial applications

11 Digital Modules

In this Chapter This chapter contains technical details of the digital ET 200C modules.

11.1 Digital Input Module ET 200C; DI 8 $\times$ DC 24V (6ES7 141-0BF00-0BX0)

Technical Specifications	
Baud rates	9.6/19.2/93.75/187.5/500/ 1500/3000[1]/6000[1]/ 12000[1] kbaud
Mains buffering (without sensor supply)	typ. 20 ms
Insulation rating	to VDE 0160
Nominal insulation voltage (L+ against PE)	60 V AC
Test voltage	500 V AC
Electrical isolation to SINEC L2-DP	500 V
Power loss	typ. 3.6 W
Weight	approx. 900 g
Dimensions (W × H × D)	200 × 100 × 57
Diagnostic Functions	
Voltage monitoring	green LED “RUN”
SINEC L2-DP bus monitoring	red LED “BF”
Group diagnostics for short-circuit, overload or wire break of sensor supply	red LED “DIA”
Status of inputs	red LED for individual diagnostics 8 red LEDs for supply undervoltage or internal fuse 4 red LEDs for internal fuse green LED for status of inputs

1 This baud rate is only relevant in conjunction with the IM 308-C.

Supply Voltage for Inputs, Sensor Supply and Internal Logic	
Nominal value (L+)	24 V DC
Permissible range (incl. ripple = max. 3.6 V)	20 to 30 V
Value at t < 0.5 s	35 V
Short-circuit capability	Yes
Current consumption	
• Logic	typ. 35 mA
• Sensor	application-specific
Short-circuit current	max. 4 A
Inputs	
Number of inputs	8
Connection	via 5-pin circular connectors 5-wire connection per channel
Electrical isolation	No
Supply voltage for sensors	(L+) – 0.8 V
Permissible total current	max. 4 A
• per channel	max. 450 mA
Input voltage	
• Nominal value	24 V DC
• for “0” signal	– 30 ... 5 V
• for “1” signal	13 to 30 V
Input current for “1” signal	typ. 4.5 mA at 24 V
Wire-break recognition	typ. $I \leq 1$ mA
No wire-break recognition	typ. $I \geq 10$ mA
Short-circuit current limitation	typ. 1 A per channel
Delay of inputs	typ. 1.8 ms (0 → 1) typ. 1 ms (1 → 0)
Connection of 2-wire BERO	Possible
• Quiescent input current	≤ 1.5 mA
Cable length of the inputs	max. 50 m

Block Diagram

Simplified representation of the potentials of the digital input module ET 200C; DI 8 × DC 24V:

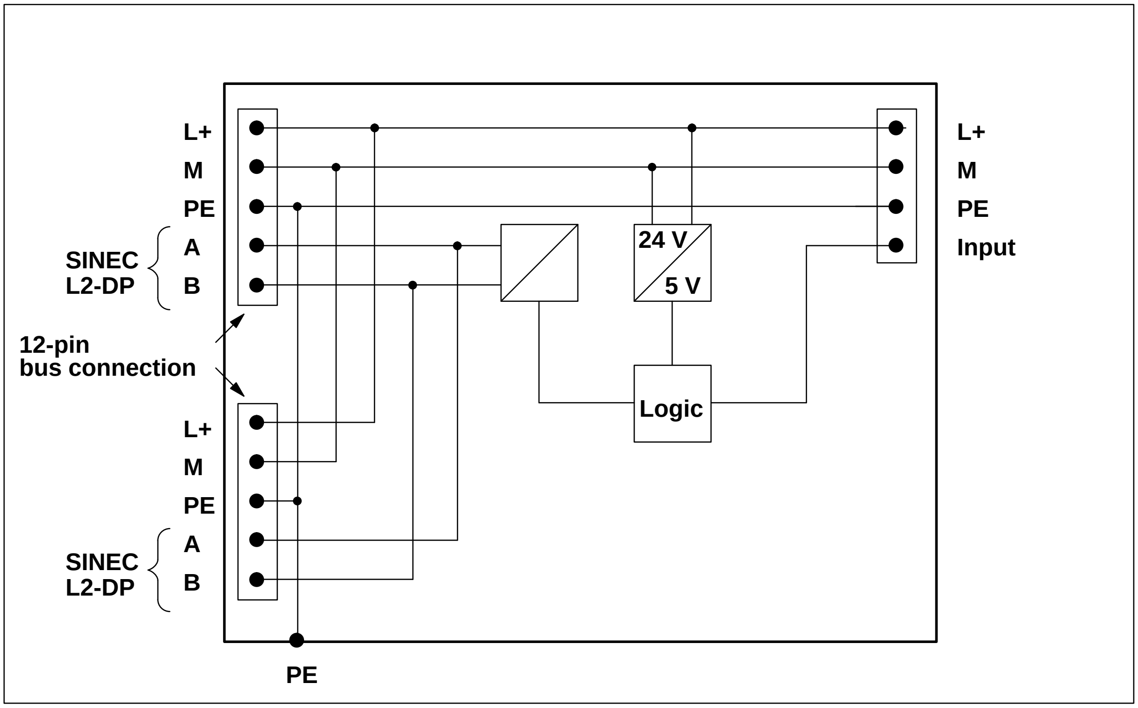


Figure 11-1 Digital Input Module ET 200C; DI 8 × DC 24V: Block Diagram

Parameterization

You define the diagnostics behavior of the ET 200C; DI 8 × DC 24 V with the COM ET 200 parameterization software.

The table below lists the diagnostics parameters for the ET 200C; DI 8 × DC 24 V:

Table 11-1 Parameters for Digital Input Module ET 200C; DI 8 × DC 24 V

Byte[1]	Bit	Parameter	Explanation	Value range
1	0	Enable diagnostics for channel 0	Enable diagnostics messages channel by channel	disable enable
	1	Enable diagnostics for channel 1		
	2	Enable diagnostics for channel 2		
	3	Enable diagnostics for channel 3		
	4	Enable diagnostics for channel 4		
	5	Enable diagnostics for channel 5		
	6	Enable diagnostics for channel 6		
	7	Enable diagnostics for channel 7		

: Default setting in parameterization telegram

1 Byte address in parameterization telegram of slave

Digital Input Module ET 200C; DI 8 × DC 24V (6ES7 141-0BF00-0XB0), Continued

Dimension Drawing

Dimension drawing for digital input module ET 200C; DI 8 × DC 24 V:

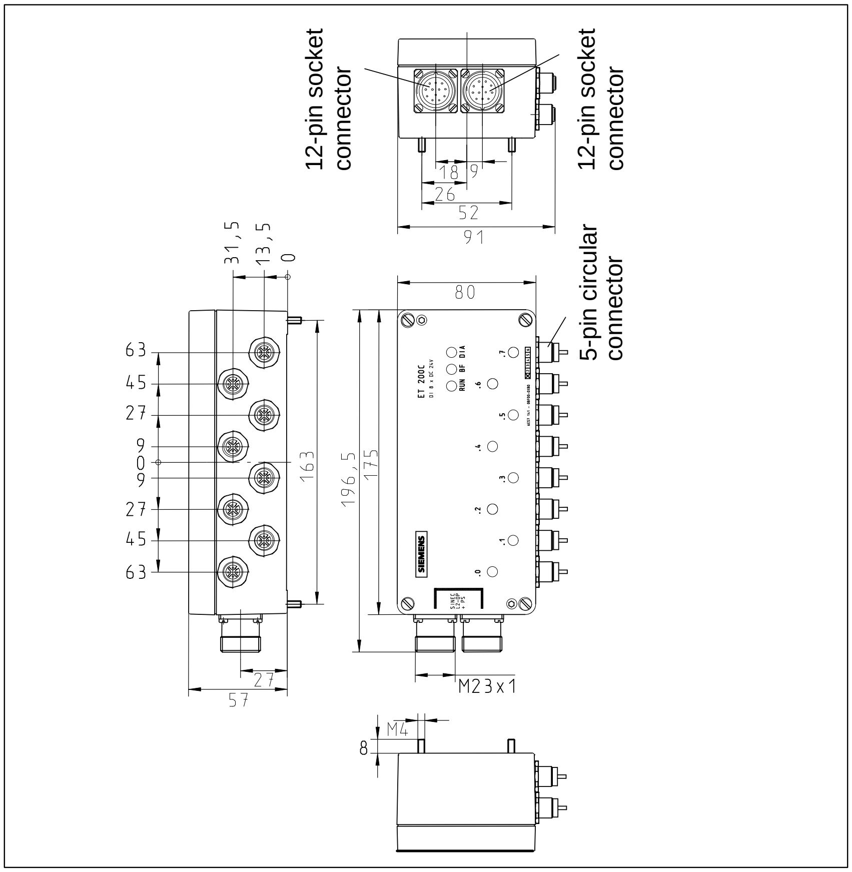
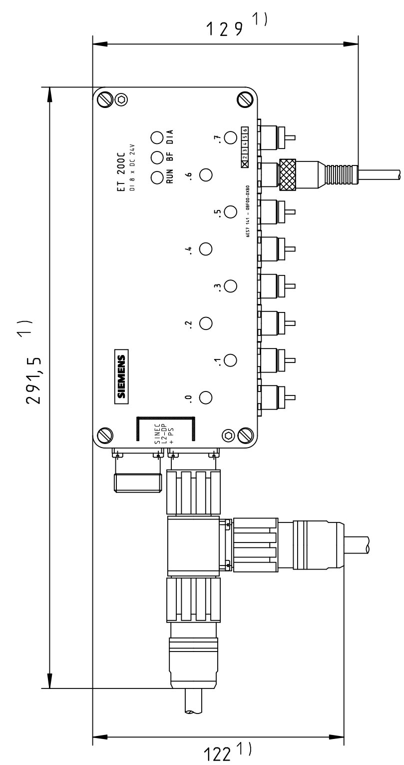


Figure 11-2 Digital Input Module ET 200C; DI 8 × DC 24 V; Dimension Drawing

Dimension Drawing

Dimension drawing for the digital input module ET 200C; DI 8 × DC 24V with T connector and plug connectors (with pin/socket inserts):



1: Observe the bending radii of the cable when installing the module.

Figure 11-3 Digital Input Module ET 200C; DI 8 × DC 24 V; Dimension Drawing with T Connector and Plug Connectors (with Pin/Socket Inserts)

11.2 Digital Output Module ET 200C; DO 8 × DC 24V/0.5A (6ES7 142-0BF00-0XB0)

Technical Specifications	
Baud rates	9.6/19.2/93.75/187.5/500/ 1500/3000[1]/6000[1]/ 12000[1] kbaud
Mains buffering (without sensor and load voltage supply)	typ. 20 ms
Insulation rating	to VDE 0160
Nominal insulation voltage (L+ against PE)	60 V AC (75 V DC)
Test voltage	500 V DC
Electrical isolation to SINEC L2-DP bus	500 V
Power loss	typ. 4.1 W
Weight	approx. 1000 g
Dimensions (W × H × D)	223 × 100 × 57
Diagnostic Functions	
Voltage monitoring	green LED “RUN”
SINEC L2-DP bus monitoring	red LED “BF”
Group diagnostics for shortcircuit, overload or wire break	red LED “DIA”
Status of outputs	red LED for individual diagnostics (short-circuit or wire break of outputs) 8 red LEDs for supply undervoltage or internal fuse 4 red LEDs for internal fuse green LED for status of outputs
Voltage supply of outputs	green LED “U_L” supply of outputs

[1] This baud rate is only relevant in conjunction with the IM 308-C.

Supply Voltage for Outputs, Load Voltage Supply and Internal Logic	
Nominal value (L+)	24 V DC
Permissible range (incl. ripple = max. 3.6 V)	20 to 30 V
Value at t < 0.5 s	35 V
Short-circuit capability	Yes
Current consumption	
• Logic	typ. 90 mA
• Load	typ. 80 mA
Short-circuit current	max. 4 A
Outputs	
Number of outputs	8
Connection	via 5-pin circular connectors 3-wire connection per channel
Electrical isolation between internal logic and outputs	Yes, 500 V
Load voltage supply	
• Nominal value (L1)	24 V DC
• Permissible range (incl. ripple = max. 3.6 V)	20 to 30 V
Output current for “1” signal	
• Nominal value	500 mA per channel
• Permissible range	0 to 500 mA per channel
• Lamp load	max. 5 W
Permissible total current	4 A
Residual current for “0” signal	max. 0.3 mA
Wire break recognition	typ. I ≤ 1 mA
No wire break recognition	typ. I ≥ 10 mA
Short-circuit diagnostics signal	typ. 1 A
Switching frequency	
• at resistive load	100 Hz
• at inductive load	0.5 Hz
Limitation of voltage induced on circuit interruption	typ. (L+) – 50 V
Cable length of outputs	max. 50 m

Block Diagram

Simplified representation of the potentials of the digital output module ET 200C; DO 8 × DC 24V/0.5A:

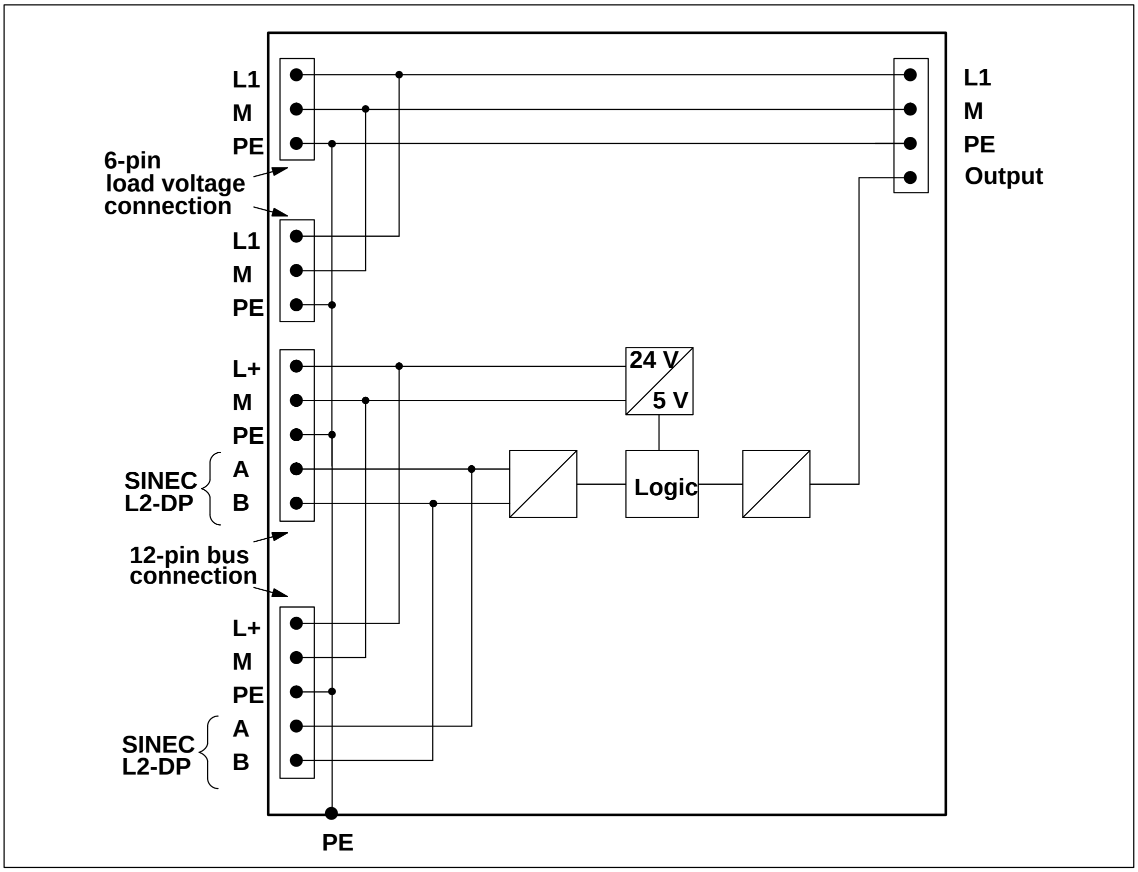


Figure 11-4 Digital Output Module ET 200C; DO 8 × DC 24V/0.5A: Block Diagram

Digital Output Module ET 200C; DO 8 × DC 24V/0.5A (6ES7 142-0BF00-0XB0), Continued

Parameterization

You define the diagnostics behavior of the ET 200C; DO 8 × DC 24 V/0.5A with the COM ET 200 parameterization software.

The table below lists the diagnostics parameters for the ET 200C; DO 8 × DC 24 V/0.5A:

Table 11-2 Parameters for Digital Output Module ET 200C; DO 8 × DC 24 V/0.5A

Byte[1]	Bit	Parameter	Explanation	Value range
1	0	Enable diagnostics for channel 0	Enable diagnostics messages channel by channel	disable enable
	1	Enable diagnostics for channel 1		
	2	Enable diagnostics for channel 2		
	3	Enable diagnostics for channel 3		
	4	Enable diagnostics for channel 4		
	5	Enable diagnostics for channel 5		
	6	Enable diagnostics for channel 6		
	7	Enable diagnostics for channel 7		

[shaded] : Default setting in parameterization telegram

[1] Byte address in parameterization telegram of slave

Dimension Drawing

Dimension drawing for digital output module ET 200C;
DO 8 × DC 24 V/0.5A

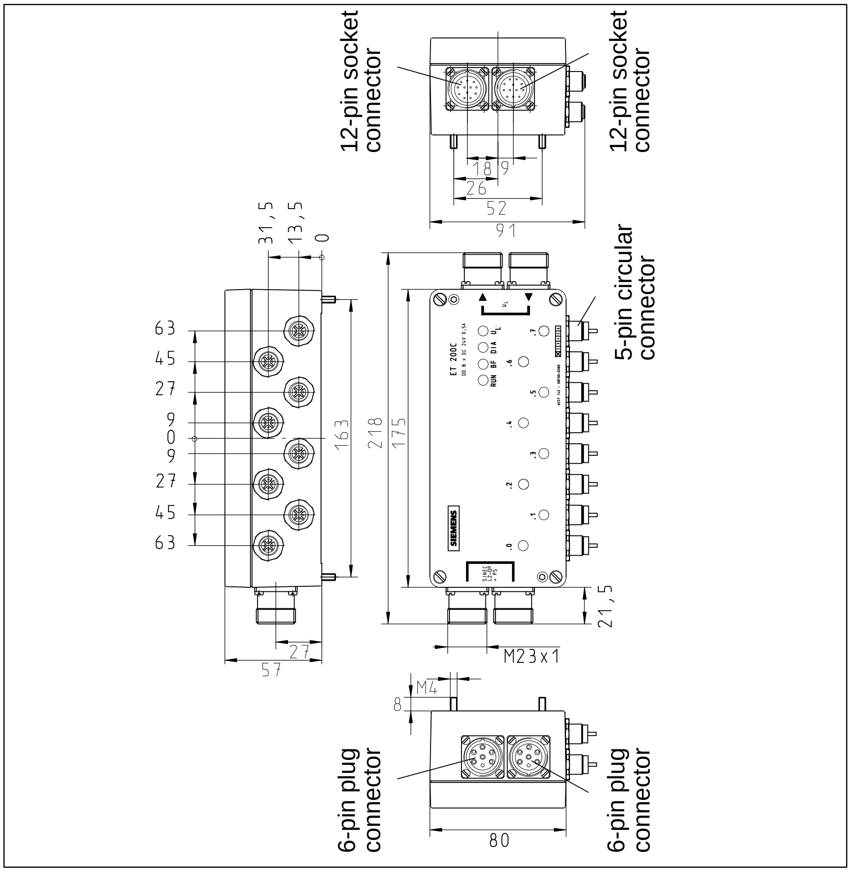
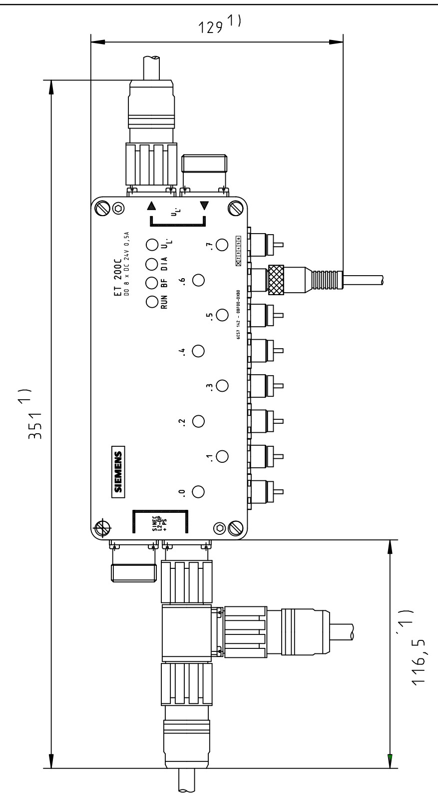


Figure 11-5 Digital Output Module ET 200C; DO 8 × DC 24 V/0.5A; Dimension Drawing

Digital Output Module ET 200C; DO 8 × DC 24V/0.5A (6ES7 142-0BF00-0XB0), Continued

Dimension Drawing

Dimension drawing for the digital output module ET 200C; DO 8 × DC 24V/0.5A with T connectors and plug connectors (with pin/socket inserts):



1: Observe the bending radii of the cable when installing the module.

Figure 11-6 Digital Output Module ET 200C; DO 8 × DC 24 V/0.5A; Dimension Drawing with T Connector and Plug Connectors (with Pin/Socket Inserts)

11.3 Digital Output Module ET 200C; DO 8 × DC 24V/2A (6ES7 142-0BF10-0XB0)

Technical Specifications	
Baud rates	9.6/19.2/93.75/187.5/500/ 1500/3000[1]/6000[1]/ 12000[1] kBaud
Mains buffering (without sensor and load voltage supply)	typ. 20 ms
Insulation rating	to VDE 0160
Nominal insulation voltage (L+ against PE)	60 V AC (75 V DC)
Test voltage	500 V DC
Electrical isolation to SINEC L2-DP bus	500 V
Power loss	typ. 4.1 W
Weight	approx. 1000 g
Dimensions (W × H × D)	223 × 100 × 57
Diagnostic Functions	
Voltage monitoring	green LED ”RUN”
SINEC L2-DP bus monitoring	red LED ”BF”
Group diagnostics for short-circuit/overload or wire break	red LED ”DIA”
Status of outputs	red LED for individual diagnostics (short-circuit or wire break of outputs)[2] green LED for status of outputs
Supply voltage for outputs	green LED ”U_L” for load voltage supply of the outputs
Supply Voltage for Outputs, Load Voltage Supply and Internal Logic	
Nominal value (L+)	24 V DC
Permissible range	20 ... 30 V
(incl. ripple = max. 3.6 V)	
Value at t < 0.5 s	35 V
Short-circuit capability	Yes
Current consumption	
• Logic	typ. 90 mA
• Load	typ. 80 mA
Short-circuit current	max. 4 A

Outputs	
Number of outputs	8
Connection	via 5-pin circular connector 3-wire connection per channel
Electrical isolation between internal logic and outputs	Yes, 500 V
Load voltage supply	
• Nominal value (L1)	24 V DC
• Permissible range (incl. ripple = max. 3.6 V)	20 ... 30 V
Output current for ”1” signal	
• Nominal value	2 A per channel
• Permissible range	10 mA ... 2 A per channel
• Lamp load	max. 5 W
Permissible total current Ambient temperature:	
– 25 ... +25 °C	max. 10 A
+26 ... +40 °C	max. 8 A
+41 ... +60 °C	max. 4 A
Residual current for ”0” signal	max. 0.5 mA
Wire-break recognition	typ. I ≤ 1 mA
No wire-break recognition	typ. I ≥ 20 mA
Short-circuit diagnostics signal	typ. 3.5 A
Switching frequency	
• at resistive load	100 Hz
• at inductive load	0.5 Hz
Limitation of voltage induced on circuit interruption	typ. (L+) – 50 V
Cable length of outputs	max. 30 m

1 This baud rate is only relevant in conjunction with the IM 308-C.

2 The diagnostics signal remains for a further 20 s (approx.) after a short-circuit has been eliminated (e.g. when an output is reset).

Digital Output Module ET 200C; DO 8 × DC 24V/2A (6ES7 142-0BF10-0XB0), Continued

Block Diagram

Simplified representation of the potentials of the digital output module ET 200C; DO 8 × DC 24V/2A:

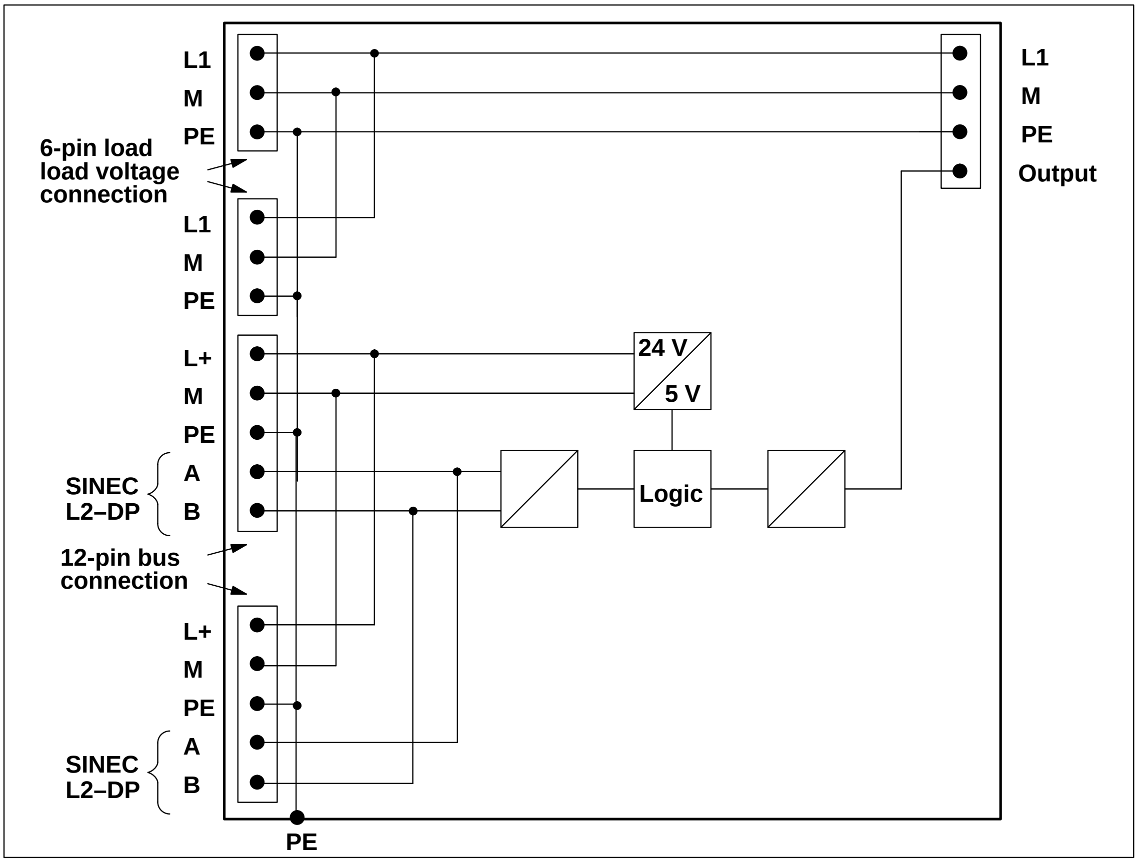


Figure 11-7 Digital Output Module ET 200C; DO 8 × DC 24V/2A: Block Diagram

Parameterization

You define the diagnostics behavior of the ET 200C; DO 8 × DC 24 V/2A with the COM ET 200 parameterization software.

The table below lists the diagnostics parameters for the ET 200C; DO 8 × DC 24 V/2A:

Table 11-3 Parameters for Digital Output Module ET 200C; DO 8 × DC 24 V/2A

Byte[1]	Bit	Parameter	Explanation	Value range
1	0	Enable diagnostics for channel 0	Enable diagnostics messages channel by channel	disable enable
	1	Enable diagnostics for channel 1		
	2	Enable diagnostics for channel 2		
	3	Enable diagnostics for channel 3		
	4	Enable diagnostics for channel 4		
	5	Enable diagnostics for channel 5		
	6	Enable diagnostics for channel 6		
	7	Enable diagnostics for channel 7		

: Default setting in parameterization telegram

[1] Byte address in parameterization telegram of slave

Digital Output Module ET 200C; DO 8 × DC 24V/2A (6ES7 142-0BF10-0XB0), Continued

Dimension Drawing

Dimension drawing for digital output module ET 200C; DO 8 × DC 24 V/2A

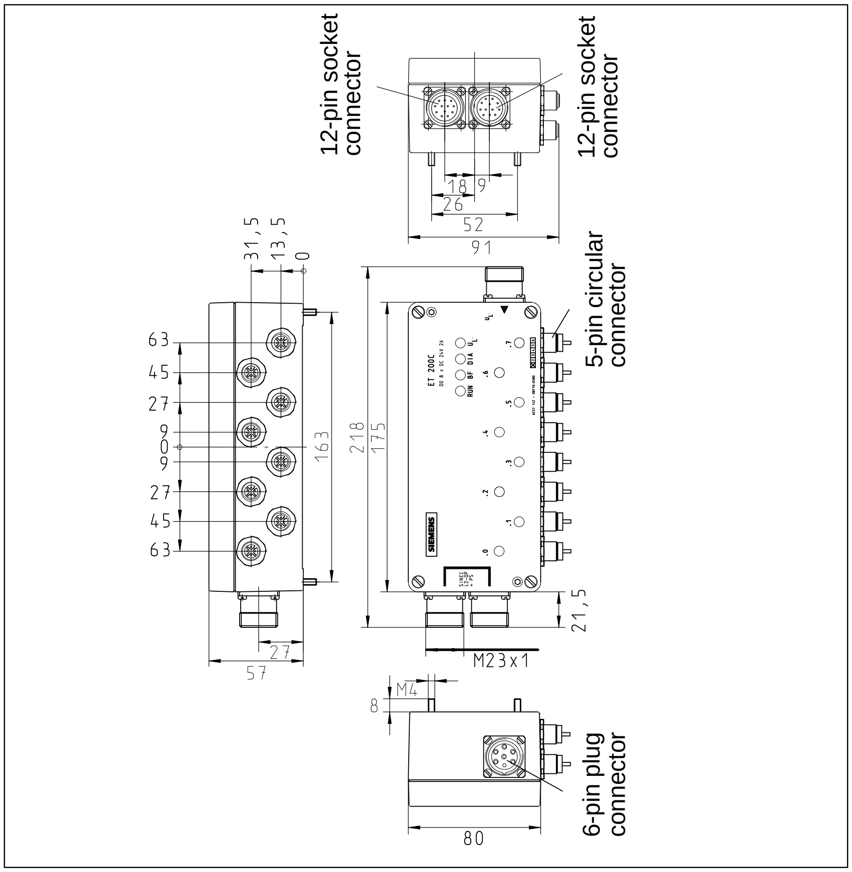
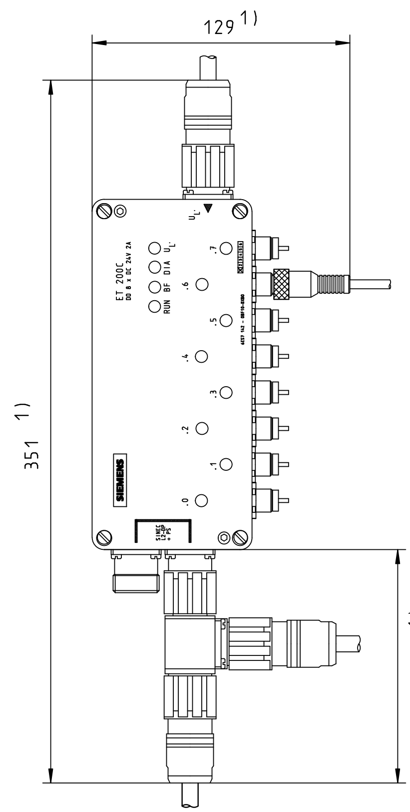


Figure 11-8 Digital Output Module ET 200C; DO 8 × DC 24 V/2A; Dimension Drawing

Dimension Drawing

Dimension drawing for the digital output module ET 200C; DO 8 × DC 24V/2A with T connectors and plug connectors (with pin/socket inserts):



1: Observe the bending radii of the cable when installing the module.

Figure 11-9 Digital Output Module ET 200C; DO 8 × DC 24 V/2A; Dimension Drawing with T Connector and Plug Connectors (with Pin/Socket Inserts)

11.4 Digital Input/Output Module ET 200C; DI 16/DO 16 × DC 24V/2A (6ES7 143-0BL00-0XB0 and 6ES7 143-0BL10-0XB0)

Technical Specifications	
Baud rates	9.6/19.2/93.75/187.5/500/ 1500/3000[1]/6000[1]/ 12000[1] kbaud
Mains buffering (without sensor and load voltage supply)	typ. 20 ms
Insulation rating	to VDE 0160
Nominal insulation voltage (L+ against PE)	60 V AC (75 V DC)
Test voltage	500 V DC
Electrical isolation to SINEC L2-DP bus	500 V
Power loss	typ. 4.1 W
Weight	approx. 3700 g
Dimensions (W × H × D)	260 × 167 × 83
Diagnostic Functions	
Voltage monitoring	green LED ”RUN”
SINEC L2-DP bus monitoring	red LED ”BF”
Status of inputs or outputs	red LED ”DIA” for diagnosing groups of 4 inputs/outputs[2] green LED for status of inputs
Supply Voltage for Outputs, Load Voltage Supply and Internal Logic	
Nominal value (L+)	24 V DC
Permissible range	20.4 ... 30.2 V
(incl. ripple = max. 3.6 V)	
Value at t < 0,5 s	35 V
Short-circuit capability	Yes
Current consumption	
• Logic	typ. 90 mA
• Load	typ. 40 mA
Short-circuit current	max. 6.3 A

1 This baud rate is only relevant in conjunction with the IM 308-C.

2 If a short-circuit occurs in the sensor supply of an input, the sensor supply for all of the inputs in the group of 4 will be interrupted.

Inputs	
Number of inputs	16
Connection	
6ES7 143-0BL00-0XB0	via 5-pin circular connector (4-wire connection)
6ES7 143-0BL10-0XB0	via cable gland and conduit thread (4-wire connection)
Electrical isolation	No
Supply voltage for sensors	(L+) – 0.8 V
Permissible total current	max. 4 A
• per channel	max. 250 mA
Input voltage	
• Nominal value	24 V DC
• for “0” signal	–30 ... 5 V
• for “1” signal	13 ... 30 V
Input current for “1” signal	typ. 4.5 mA at 24 V
Short-circuit current limitation	2.3 A for each group of 4
Delay of inputs	typ. 1.8 ms (0 → 1) typ. 1 ms (1 → 0)
Connection of 2-wire BERO	Possible
• Quiescent input current	≤ 1.5 mA
Cable length of the inputs	max. 50 m
Outputs	
Number of outputs	16
• in groups of	8
Connection with	
6ES7 143-0BL00-0XB0	via 5-pin circular connector (3-wire connection)
6ES7 143-0BL10-0XB0	via cable gland and conduit thread (3-wire connection)

Outputs (continued)	
Electrical isolation between internal logic and outputs	Yes, 500 V
Load voltage supply	
• Nominal value (L1)	24 V DC
• Permissible range (incl. ripple = max. 3.6 V)	20 ... 30 V
Output current for ”1” signal	
• Nominal value	2 A per channel
• Permissible range	20 mA ... 2 A per channel
• Lamp load	max. 5 W
Permissible total current Ambient temperature: – 25 ... +25 °C +26 ... +40 °C +41 ... +60 °C	 max. 3.5 A per group of 4 max. 2.5 A per group of 4 max. 1.5 A per group of 4
Residual current for ”0” signal	max. 0.5 mA
Wire-break recognition	typ. I ≤ 1 mA
No wire-break recognition	typ. I ≥ 20 mA
Short-circuit diagnostics signal	typ. 3.5 A per channel
Switching frequency	
• at resistive load	100 Hz
• at inductive load	0.5 Hz
Limitation of voltage induced on circuit interruption	typ. (L+) – 50 V
Cable length of outputs	max. 30 m

Digital Input/Output Module ET 200C; DI 16/DO 16 × DC 24V/2A (6ES7 143-0BL00-0XB0 and 6ES7 143-0BL10-0XB0), Continued

Block Diagram

Simplified representation of the potentials of the digital input/output module ET 200C; DI 16/DO 16 × DC 24V/2A:

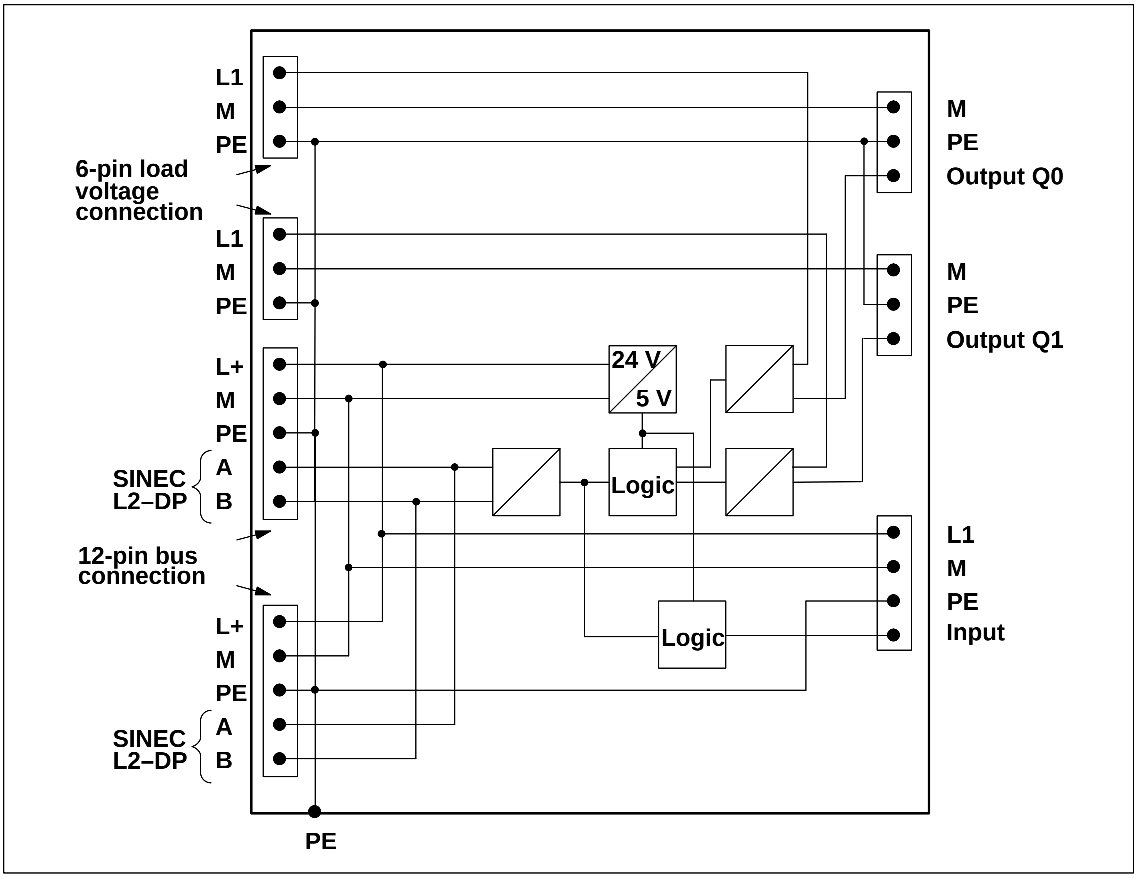


Figure 11-10 Digital Input/Output Module ET 200C; DI 16/DO 16 × DC 24V/2A: Block Diagram

Parameterization

You define the diagnostics behavior of the ET 200C; DI 16/DO 16 × DC 24 V/2A with the COM ET 200 parameterization software.

The table below lists the diagnostics parameters for the ET 200C; DI 16/DO 16 × DC 24 V/2A:

Table 11-4 Parameters for Digital Input/Output Module ET 200C; DI 16/DO 16 × DC 24 V/2A

Byte[1]	Parameter	Explanation	Value range
0	Enable group diagnostics for DI 16/DO 16	Enable diagnostics messages for entire module	disable enable

: Default setting in parameterization telegram

1 Byte address in parameterization telegram of slave

Digital Input/Output Module ET 200C; DI 16/DO 16 × DC 24V/2A (6ES7 143-0BL00-0XB0 and 6ES7 143-0BL10-0XB0), Continued

Dimension Drawing

Dimension drawing for the digital input/output module ET 200C; DI 16/DO 16 × DC 24V/2A (6ES7 143-0BL00-0XB0):

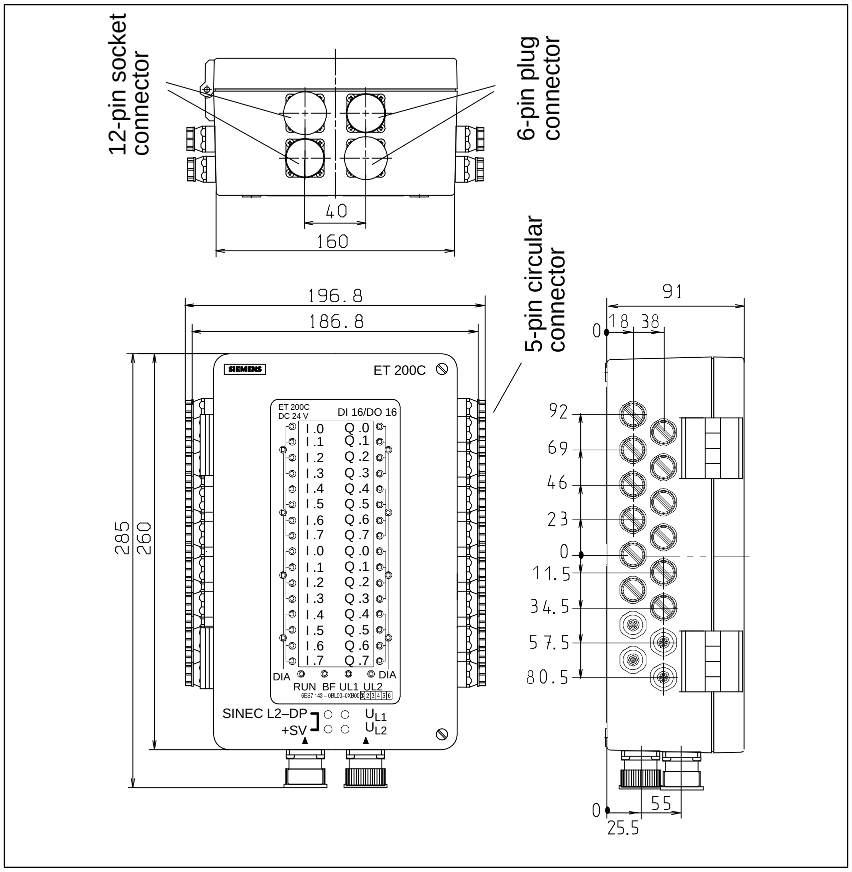


Figure 11-11 Digital Input/Output Module ET 200C; DI 16/DO 16 × DC 24 V/2A (6ES7 143-0BL00-0XB0); Dimension Drawing

Dimension Drawing

Dimension drawing for the digital input/output module ET 200C;
DI 16/DO 16 × DC 24V/2A (6ES7 143-0BL00-0XB0):

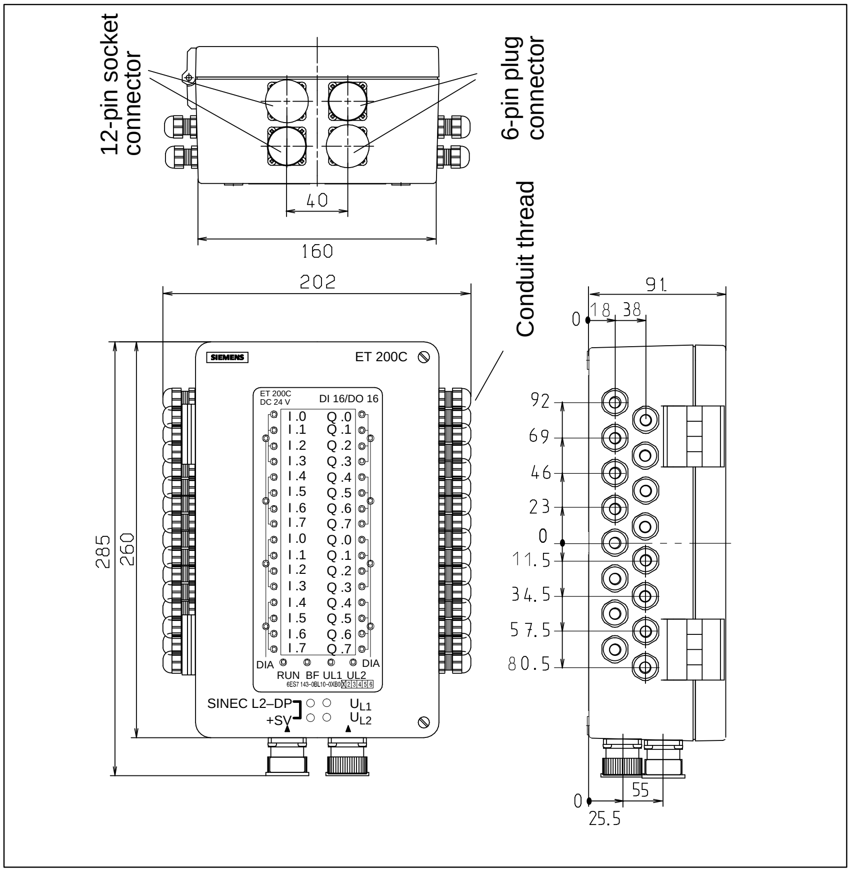
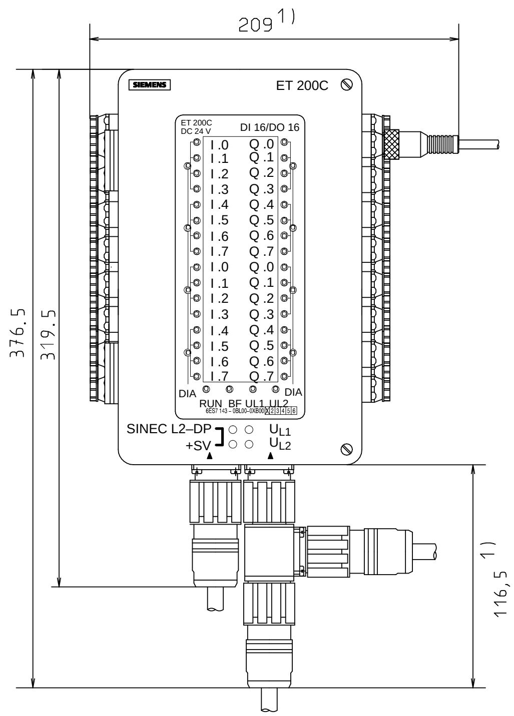


Figure 11-12 Digital Input/Output Module ET 200C; DI 16/DO 16 × DC 24 V/2A (6ES7 143-0BL10-0XB0); Dimension Drawing

Digital Input/Output Module ET 200C; DI 16/DO 16 × DC 24V/2A (6ES7 143-0BL00-0XB0 and 6ES7 143-0BL10-0XB0), Continued

Dimension Drawing

Dimension drawing for the digital input/output module ET 200C; DI 16/DO 16 × DC 24V/2A (6ES7 143-0BL00-0XB0):

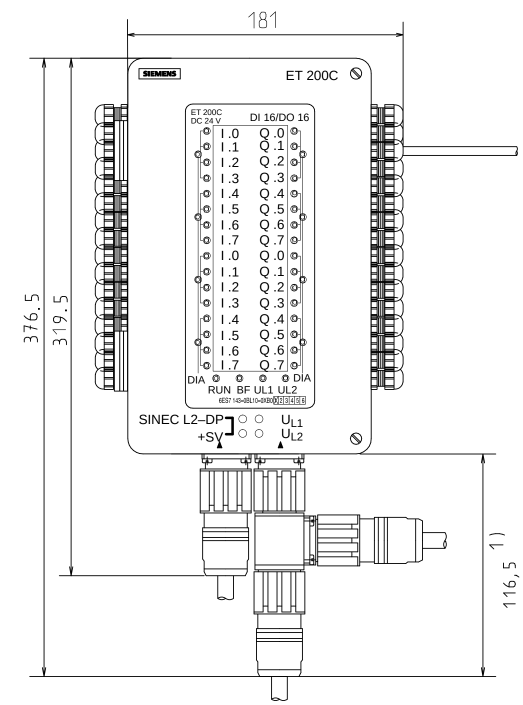


1) Observe the bending radii of the cable when installing the module.

Figure 11-13 Digital Input/Output Module ET 200C; DI 16/DO 16 × DC 24 V/2A (6ES7 143-0BL00-0XB0); Dimension Drawing with T Connector and Plug Connectors (with Pin/Socket Inserts)

Dimension Drawing

Dimension drawing for the digital input/output module ET 200C; DI 16/DO 16 × DC 24V/2A (6ES7 143-0BL00-0XB0):



1 Observe the bending radii of the cable when installing the module.

Figure 11-14 Digital Input/Output Module ET 200C; DI16/DO 16 × DC 24 V/2A (6ES7 143-0BL10-0XB0); Dimension Drawing with T Connector and Plug Connectors (with Pin/Socket Inserts)

Analog Modules 12

In this Chapter

This chapter contains technical data for the analog modules of ET 200C.

In addition to the technical data, this chapter also describes the measurement types and the measured-value presentation of the analog modules.

12.1 Analog Input Module ET 200C; AI 4/8 × 12 Bit (6ES7 144-0KH00-0XB0)

Technical Data	
Transfer rates	9.6/19.2/93.75/187.5/ 500/1500 kbaud
Bus protocol	DP standard
FREEZEable	yes
Galvanically isolated from SINEC L2-DP bus	yes
Power loss	typ. 2 W
Weight	approx. 1050 g
Dimensions (W × H × D)	200 × 100 × 57
Diagnostics Functions	
Voltage monitoring	green LED “RUN”
SINEC L2-DP bus monitoring	red LED “BF”
Group diagnostics	red LED “DIA, parameterizable
Supply Voltage Inputs and Internal Logic	
Supply voltage (L+)	
• Nominal	24 V DC
• Permissible range	20.4 ... 30.2 V
• Value for t < 0.5 s	35 V
Current consumption from L+	
• Logic	80 mA
Inputs	
Number of inputs	8 voltage inputs or 4 inputs for PT 100 or 8 inputs for thermocouples
Galvanic isolation between voltage supply and internal logic	yes
Test voltage	500 V DC
Measured value ranges	
• Voltage sensor	± 80 mV, ± 250 mV, ± 500 mV, ± 1000 mV
• Resistance sensor	0 ... 400 Ω
Permissible input voltage for voltage input	max. 32 V

Inputs (Continued)	
Characteristic linearization for the following thermocouples	
• Types N, K, T, U, J, E	to IEC 584
• Type L	to DIN 43710
Linearization accuracy in nominal range	± 1°C
Signal generator connection	two-wire; four-wire for Pt 100
Input resistance	>1 MΩ
Measured value presentation	S5: 12 bit + sign S7: 15 bit + sign
Overload range	approx. 17.5 %
Limit value alarm	yes, parameterizable for channels 0 and 2
Diagnostics alarm	yes, parameterizable
Diagnostics information accessible	yes
Temperature compensation	yes, parameterizable
Characteristic linearization	yes, parameterizable

Inputs (Continued)				
Measuring principle	integrating voltage-frequency conversion			
Integration/conversion time/resolution (per channel)				
• parameterizable	yes			
• Integration time in ms	2.5	$16^2/_3$	20	100
• Basic conversion time incl. integration time in ms	5	19	22	102
Additional conversion time for resistance-measurement in ms	1	1	1	1
or				
Additional conversion time for wire-breakage monitoring in ms	10	10	10	10
or				
Additional conversion time for resistance measurement **and** wire-breakage monitoring in ms	16	16	16	16
• Resolution in bits + DT (incl. overload range)	9	12	12	14
• Interference voltage suppression for interference frequency f1 in Hz	400	60	50	10
Permissible potential differential				
• Input to input	max. ± 1 V			
• Inputs to M_A (U_{CM})	max. ± 1 V			
• M_A to PE or M	max. 75 V DC/60 V AC			
Error message for				
• Range overshoot	yes			
• Wire break on sensor line	yes, for Pt 100, ± 80 mV, thermocouples types N, K, T, U, J, L, E (parameterizable with COM ET 200)			
Interference voltage suppression for f = n × (f1 ± 1 %), (f1 = interference frequency)				
• Common-mode interference (U_{pp} < 2.5 V)	> 70 dB			
• Series-mode interference (peak interference < nominal value of input range)	> 40 dB			
Crosstalk between inputs				
• at 50 Hz	50 dB			
• at 60 Hz	50 dB			

Inputs (Continued)	
Operational limit (for entire temperature range, referenced to input range)	
• 80 mV	± 1 %
• from 250 to 1000 mV	± 0.6 %
• Thermocouples	± 10 K
• Resistance	± 5 K
Basic error (operational limit at 25 °C, referenced to input range)	
• 80 mV	± 0.6 %
• from 250 to 1000 mV	± 0.4 %
• Thermocouples	± 7 K
• Resistance	± 3 K
Temperature error (referenced to input range)	± 0.005 %/K
Linearity error (referenced to input range)	± 0.05 %
Repeat accuracy (in steady state at 25 °C, referenced to input range)	± 0.05 %
Cable length	
• shielded	max. 30 m

ET 200C Analog Input Module; AI 4/8 × 12 Bit (6ES7 144-0KH00-0XB0), Continued

Block Diagram

Simplified representation of the potentials of the ET 200C analog input module; AI 4/8 × 12 bit:

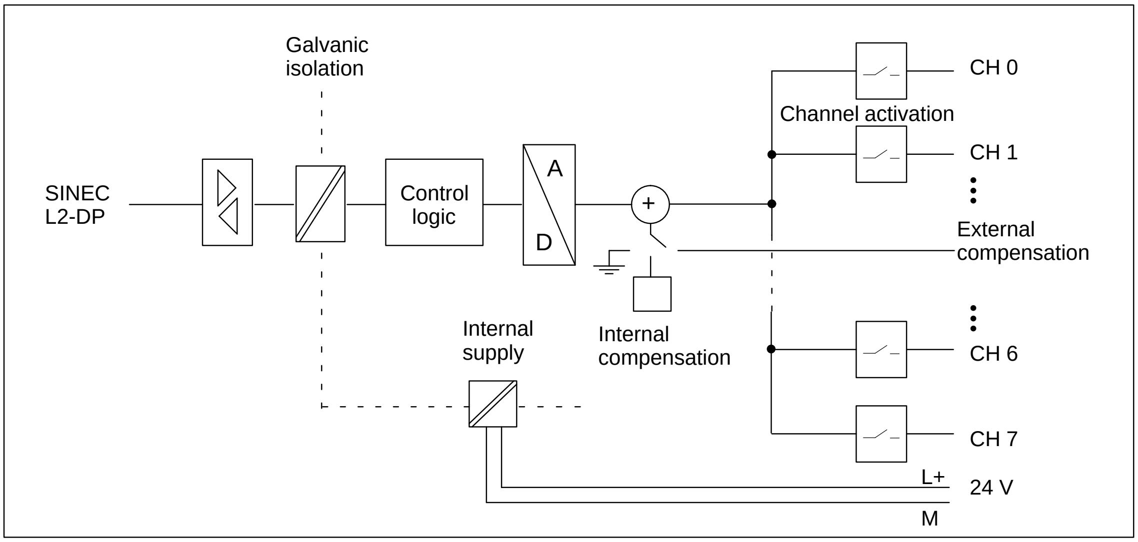


Figure 12-1 ET200C Analog Input Module; AI 4/8 × 12 Bit: Block Diagram

Screw Terminals

Fig. 12-2 shows the screw terminals and their assignments in the ET 200C; AI 4/8 × 12 Bit:

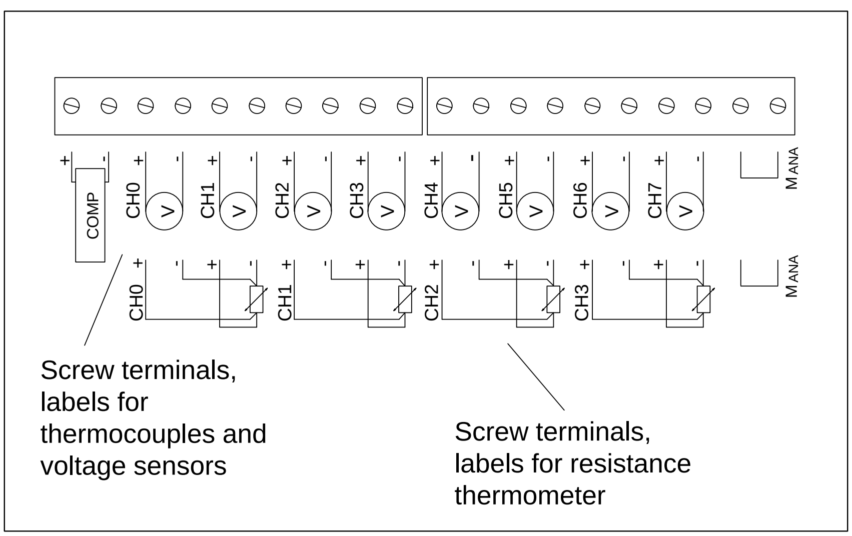


Figure 12-2 Screw Terminals and Their Assignments in the ET 200C; AI 4/8 × 12 Bit

Parameterization

You parameterize the ET 200C; AI 4/8 × 12 bit with the aid of the COM ET 200 Windows parameterization software.

Where to Look

Parameterization of the ET 200C; AI 4/8 × 12 bit with COM ET 200 Windows is described in detail in the Help system integrated in the COM ET 200 Windows program.

The manual entitled *ET 200 Distributed I/O System* (Order No. 6ES5 998-3ES12) contains detailed descriptions of how to use COM ET 200 Windows.

All the parameters for the ET 200C; AI 4/8 × 12 bit are described in the table below:

Table 12-1 Parameters for ET 200C Analog Input Module; AI 4/8 × 12 Bit

Byte[1]	Bit	Parameter	Explanation	Range of values
08	0	Enable diagnostics CH 0/1	Enable diagnostics messages by channel groups	disable enable
	1	Enable diagnostics CH 2/3		
	2	Enable diagnostics CH 4/5		
	3	Enable diagnostics CH 6/7		
09	0	Enable wire-breakage message CH 0/1	Enable wire-breakage detect. by channel groups	disable enable
	1	Enable wire-breakage message CH 2/3		
	2	Enable wire-breakage message CH 4/5		
	3	Enable wire-breakage message CH 6/7		
15	6	Enable diagnostics alarm	Enable diagnostics alarm of module	disable enable
	7	Enable limit value alarm	Enable limit value alarm of module	
16	0 ... 1	Integration time CH 0/1	Set integration time by channel groups	2.5 ms 16.7 ms 20 ms 100 ms
	2 ... 3	Integration time CH 2/3		
	4 ... 5	Integration time CH 4/5		
	6 ... 7	Integration time CH 6/7		

ET 200C Analog Input Module; AI 4/8 × 12 Bit (6ES7 144-0KH00-0XB0), Continued

Table 12-1 Parameters for ET 200C Analog Input Module; AI 4/8 × 12 Bit, Continued

Byte[1]	Bit	Parameter	Explanation	Range of values
17	0 ... 7	Measurement type / measuring range CH 0/1	Set measurement type and measuring range for channel group CH 0/1	Channel not activated Range of values for measurement type / measuring range: see Table 12-2
18	0 ... 7	Measurement type / measuring range CH 2/3	Set measurement type and measuring range for channel group CH 2/3	
19	0 ... 7	Measurement type / measuring range CH 4/5	Set measurement type and measuring range for channel group CH 4/5	
20	0 ... 7	Measurement type / measuring range CH 6/7	Set measurement type and measuring range for channel group CH 6/7	
21	0 ... 7	Upper limit value CH 0	Set upper limit value for channel 0	0 –32768 ... 32767
22	0 ... 7	Lower limit value CH 0	Set lower limit value for channel 0	0 –32768 ... 32767
23	0 ... 7	Upper limit value CH 2	Set upper limit value for channel 2	0 –32768 ... 32767
24	0 ... 7	Lower limit value CH 2	Set lower limit value for channel 2	0 –32768 ... 32767
34	2	Measured value presentation	Present measured value for master system S5 or S7	S5 S7

: Default setting in parameterization telegram

1 Byte address in parameterization telegram of slave

Table 12-2 Parameters for ET 200C Analog Input Module; AI 4/8 × 12 Bit: Range of Values, Bytes 25 to 28

Range of values for bytes 17 to 20	Explanation
Channel not activated	No measurement on this channel
Measurement type ± 80 mV	Measuring range ± 80 mV
Measurement type ± 0.25 V	Measuring range ± 0.25 V
Measurement type ± 0.5 V	Measuring range ± 0.5 V
Measurement type ± 1 V	Measuring range ± 1 V
Measurement type 48 ohms resistance	Measurement with 48 ohms resistance
Measurement type 150 ohms resistance	Measurement with 150 ohms resistance
Measurement type 300 ohms resistance	Measurement with 300 ohms resistance
Measurement type 600 ohms resistance	Measurement with 600 ohms resistance

Table 12-2 Parameters for ET 200C Analog Input Module; AI 4/8 × 12 Bit: Range of Values, Bytes 25 to 28, Continued

Range of values for bytes 17 to 20	**Explanation**
Measurement type Pt100 climatic	Measurement with Pt100 resistance thermometer (climatic)
Measurement type Ni100 climatic	Measurement with Ni100 resistance thermometer (climatic)
Measurement type Pt100 standard	Measurement with Pt100 resistance thermometer (standard)
Measurement type Ni100 standard	Measurement with Ni100 resistance thermometer (standard)
Measurement type th.cpl., type N int.	Thermocouple measurement type N with internal compensation
Measurement type th.cpl., type E int.	Thermocouple measurement type E with internal compensation
Measurement type th.cpl., type J int.	Thermocouple measurement type J with internal compensation
Measurement type th.cpl., type L int.	Thermocouple measurement type L with internal compensation
Measurement type th.cpl., type T int.	Thermocouple measurement type T with internal compensation
Measurement type th.cpl., type K int.	Thermocouple measurement type K with internal compensation
Measurement type th.cpl., type U int.	Thermocouple measurement type U with internal compensation
Measurement type th.cpl., type N int./lin.	Thermocouple measurement type N with internal compensation and linearization
Measurement type th.cpl., type E int./lin.	Thermocouple measurement type E with internal compensation and linearization
Measurement type th.cpl., type J int./lin.	Thermocouple measurement type J with internal compensation and linearization
Measurement type th.cpl., type L int./lin.	Thermocouple measurement type L with internal compensation and linearization
Measurement type th.cpl., type T int./lin.	Thermocouple measurement type T with internal compensation and linearization
Measurement type th.cpl., type K int./lin.	Thermocouple measurement type K with internal compensation and linearization
Measurement type th.cpl., type U int./lin.	Thermocouple measurement type U with internal compensation and linearization
Measurement type th.cpl., type N ext.	Thermocouple measurement type N with external compensation
Measurement type th.cpl., type E ext.	Thermocouple measurement type E with external compensation
Measurement type th.cpl., type J ext.	Thermocouple measurement type J with external compensation
Measurement type th.cpl., type L ext.	Thermocouple measurement type L with external compensation
Measurement type th.cpl., type T ext.	Thermocouple measurement type T with external compensation
Measurement type th.cpl., type K ext.	Thermocouple measurement type K with external compensation
Measurement type th.cpl., type U ext.	Thermocouple measurement type U with external compensation
Measurement type th.cpl., type N ext./lin.	Thermocouple measurement type N with external compensation and linearization
Measurement type th.cpl., type E ext./lin.	Thermocouple measurement type E with external compensation and linearization
Measurement type th.cpl., type J ext./lin.	Thermocouple measurement type J with external compensation and linearization
Measurement type th.cpl., type L ext./lin.	Thermocouple measurement type L with external compensation and linearization
Measurement type th.cpl., type T ext./lin.	Thermocouple measurement type T with external compensation and linearization
Measurement type th.cpl., type K ext./lin.	Thermocouple measurement type K with external compensation and linearization
Measurement type th.cpl., type U ext./lin.	Thermocouple measurement type U with external compensation and linearization

ET 200C Analog Input Module; AI 4/8 × 12 Bit (6ES7 144-0KH00-0XB0), Continued

Analog Value Presentation, SIMATIC S5

The analog values of ET 200C; AI 4/8 × 12 Bit for SIMATIC S5 are presented as complements of twos (range: – 2048 ... + 2047 units).

The table below shows the analog value presentation for ET 200C; AI 4/8 × 12 bit:

Table 12-3 Presentation of an Analog Input Value as Bit Pattern for SIMATIC S5 with ET 200C; AI 4/8 × 12 Bit

	High byte								Low byte							
Bit number	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Analog value presentation	DT	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	F	O

Bits 0 ... 2 and 15 are without significance for the amount of the measured value. These bits are described in detail in Table 12-4.

Supplementary Bits

Bits 0 ... 2 and 15 in the bit pattern of the analog input value have the following significance:

Table 12-4 Description of Bits for ET 200C; AI 4/8 × 12 Bit

Bit	Significance	Signal state	Significance of the signal state
O	Overflow bit	1	Range overshoot[1]
F	Error bit	1	Wire break; the value read is invalid
DT	Sign	0	Sign “+”
		1	Sign “–”
X	Irrelevant	–	–

1 An overflow at one measuring point has no effect on the overflow bits of the other channels; i.e. the values of the other channels are correct and can be evaluated.

Table of Measured Values

The table below shows the relationship between analog and digitized measured values for the measuring ranges: ± 80 mV, ± 250 mV, ± 500 mV and ± 1000 mV.

Table 12-5 Digitized Measured Values for ET 200C; AI 4/8 × 12 Bit (Measuring Ranges: ± 80 mV, ± 250 mV, ± 500 mV and ± 1000 mV)

Units	**Measured value in mV**				**Digitized measured value**													**X**	**F**	**O**	**Range**
	± 80 mV	**± 250 mV**	**± 500 mV**	**± 1000 mV**	**15**	**14**	**13**	**12**	**11**	**10**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**	
> 2409	94.10	294.07	588.13	1176.26	0	1	0	0	1	0	1	1	0	1	0	0	1	0	0	1	Overflow
2408	94.06	293.95	587.89	1175.78	0	1	0	0	1	0	1	1	0	1	0	0	0	0	0	0	Overload range
:	:	:	:	:								:									
2049	80.04	250.12	500.24	1000.48	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	
2048	80.00	250.0	500.0	1000.0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Nominal range
1024	40.00	125.00	250.00	500.00	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	
1	0.039	0.12	0.24	0.48	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	
0	0.00	0.00	0.00	0.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
–1	–0.039	–0.12	–0.24	–0.48	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	
–1024	–40.00	–125.00	–250.00	–500.00	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	
–2048	–80.00	–250.0	–500.0	–1000.0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
–2049	–80.04	–250.12	–500.24	–1000.48	1	0	1	1	1	1	1	1	1	1	1	1	1	0	0	0	Overload range
:	:	:	:	:								:									
–2408	–94.06	–293.95	587.89	–1175.78	1	0	1	1	0	1	0	0	1	1	0	0	0	0	0	0	
< –2409	–94.10	–294.07	–588.13	–1176.26	1	0	1	1	0	1	0	0	1	0	1	1	1	0	0	1	Overflow

ET 200C Analog Input Module; AI 4/8 × 12 Bit (6ES7 144-0KH00-0XB0), Continued

Table of Measured Values

The table below shows the relationship between analog and digitized measured values for resistance sensors (Pt 100):

Table 12-6 Digitized Measured Values for ET 200C; AI 4/8 × 12 Bit with Resistance Sensors

Units	Resistance in Ω	Temperature in ° C	Digitized measured value													X	F	O	Range
			15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	
> 1766	> 400	> 883	0	0	1	1	0	1	1	1	0	0	1	1	0	0	0	1	Overflow
1766		883	0	0	1	1	0	1	1	1	0	0	1	1	0	0	0	0	Overload range[1]
:		:								:									
1702		851	0	0	1	1	0	1	0	1	0	0	1	1	0	0	0	0	
1700	390.26	850	0	0	1	1	0	1	0	1	0	0	1	0	0	0	0	0	Nominal range
1400	345.13	700	0	0	1	0	1	0	1	1	1	1	0	0	0	0	0	0	
1000	280.90	500	0	0	0	1	1	1	1	1	0	1	0	0	0	0	0	0	
600	212.02	300	0	0	0	1	0	0	1	0	1	1	0	0	0	0	0	0	
300	157.31	150	0	0	0	0	1	0	0	1	0	1	1	0	0	0	0	0	
200	138.50	100	0	0	0	0	0	1	1	0	0	1	0	0	0	0	0	0	
2	100.39	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	
–0	100.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
–40	92.16	–20	1	1	1	1	1	1	1	0	1	1	0	0	0	0	0	0	
–80	84.27	–40	1	1	1	1	1	1	0	1	1	0	0	0	0	0	0	0	
–200	60.25	–100	1	1	1	1	1	0	0	1	1	1	0	0	0	0	0	0	
–202		–101	1	1	1	1	1	0	0	1	1	0	1	1	0	0	0	0	Overload range[1]
:		:								:									
–494		–247	1	1	1	1	0	0	0	0	1	0	0	1	0	0	0	0	
< –494		< –247	1	1	1	1	0	0	0	0	1	0	0	1	0	0	0	1	Overflow

1 In the overload range, the characteristic retains the angle adopted on leaving the linearized nominal range.

Table of Measured Values

The three tables below contain the relationships between analog and digitized measured values for thermocouples of types K, J and L.

Table 12-7 Digitized Measured Values for ET 200C; AI 4/8 × 12 Bit with Linearization; Type K Thermocouple (Nickel-Chromium/Nickel-Aluminum, to IEC 584)

Units	Thermal e.m.f. in mV[1]	Temperature in °C	Digitized measured value													X	F	O	Range
			15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	
> 2359			0	1	0	0	1	0	0	1	1	0	1	1	1	0	0	1	Overflow
1370		1370	0	0	1	0	1	0	1	0	1	1	0	1	0	0	0	0	Overload range[2]
1369	54.773	1369	0	0	1	0	1	0	1	0	1	1	0	0	1	0	0	0	
1000	41.269	1000	0	0	0	1	1	1	1	1	0	1	0	0	0	0	0	0	
500	20.640	500	0	0	0	0	1	1	1	1	1	0	1	0	0	0	0	0	
150	6.137	150	0	0	0	0	0	1	0	0	1	0	1	1	0	0	0	0	Nominal range
100	4.095	100	0	0	0	0	0	0	1	1	0	0	1	0	0	0	0	0	
1	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	
–1	–0.039	–1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	
–100	–3.553	–100	1	1	1	1	1	1	0	0	1	1	1	0	0	0	0	0	
–101	–3.584	–101	1	1	1	1	1	1	0	0	1	1	0	1	1	0	0	0	Precision
–150	–4.912	–150	1	1	1	1	1	0	1	1	0	1	0	1	0	0	0	0	≤ 2 K
–200	–5.891	–200	1	1	1	1	1	0	0	1	1	1	0	0	0	0	0	0	
–201		–201	1	1	1	1	1	0	0	1	1	0	1	1	1	0	0	0	Overload range[2]
–273			1	1	1	1	0	0	0	0	1	0	0	1	0	0	0	1	Overflow
X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	0	1	0	Wire break

1 For a reference temperature 0 °C
2 In the overload range, the characteristic retains the angle adopted on leaving the linearized nominal range.

ET 200C Analog Input Module; AI 4/8 × 12 Bit (6ES7 144-0KH00-0XB0), Continued

Table 12-8 Digitized Measured Values for ET 200C; AI 4/8 × 12 Bit with Linearization; Type J Thermocouple (Iron/Copper-Nickel (Constantan), to IEC 584)

Units	Thermal e.m.f. in mV[1]	Temperature in °C	Digitized measured value													X	F	O	Range
			15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	
1485			0	0	1	0	1	1	1	0	0	1	1	0	1	0	0	1	Overflow
1201		1201	0	0	1	0	0	1	0	1	1	0	0	0	1	0	0	0	Overload range[2]
1200	69.536	1200	0	0	1	0	0	1	0	1	1	0	0	0	0	0	0	0	
1000	57.942	1000	0	0	0	1	1	1	1	1	0	1	0	0	0	0	0	0	
500	27.388	500	0	0	0	0	1	1	1	1	1	0	1	0	0	0	0	0	
100	5.268	100	0	0	0	0	0	0	1	1	0	0	1	0	0	0	0	0	
1	0.05	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	Nominal range
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
–1	–0.05	–1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	
–100	–4.632	–100	1	1	1	1	1	1	0	0	1	1	1	0	0	0	0	0	
–150	–6.499	–150	1	1	1	1	1	0	1	1	0	1	0	1	0	0	0	0	
–199	–7.868	–199	1	1	1	1	1	0	0	1	1	1	0	0	1	0	0	0	
–200	–7.890	–200	1	1	1	1	1	0	0	1	1	1	0	0	0	0	0	0	
–201		–201	1	1	1	1	1	0	0	1	1	0	1	1	1	0	0	0	Overload range[2]
–273			1	1	1	1	0	1	1	1	0	1	1	1	1	0	0	1	Overflow
X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	0	1	0	Wire break

1 For a reference temperature 0 °C
2 In the overload range, the characteristic retains the angle adopted on leaving the linearized nominal range.

Table 12-9 Digitized Measured Values for ET 200C; AI 4/8 × 12 Bit with Linearization; Type L Thermocouple (Iron/Copper-Nickel (Constantan), to DIN 43710)

Units	**Thermal e.m.f. in mV**[1]	**Temperature in °C**	**Digitized measured value**													**X**	**F**	**O**	**Range**
			15	**14**	**13**	**12**	**11**	**10**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**	
1361			0	0	1	0	1	0	1	0	1	0	0	0	1	0	0	1	Overflow
901		901	0	0	0	1	1	1	0	0	0	0	1	0	1	0	0	0	Overload range[2]
900	53.14	900	0	0	0	1	1	1	0	0	0	0	1	0	0	0	0	0	Nominal range
500	27.85	500	0	0	0	0	1	1	1	1	1	0	1	0	0	0	0	0	
250	13.75	250	0	0	0	0	0	1	1	1	1	1	0	1	0	0	0	0	
100	+5.37	100	0	0	0	0	0	0	1	1	0	0	1	0	0	0	0	0	
1	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	
–1	–0.05	–1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	
–100	–4.75	–100	1	1	1	1	1	1	0	0	1	1	1	0	0	0	0	0	
–150	–6.60	–150	1	1	1	1	1	0	1	1	0	1	0	1	0	0	0	0	
–190	–7.86	–190	1	1	1	1	1	0	1	0	0	0	0	1	0	0	0	0	
–199	–8.12	–199	1	1	1	1	1	0	0	1	1	1	0	0	1	0	0	0	
–200		–200	1	1	1	1	1	0	0	1	1	1	0	0	0	0	0	0	Overload range[2]
–273			1	1	1	1	0	1	1	1	0	1	1	1	1	0	0	1	Overflow
X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	0	1	0	Wire break

1 For a reference temperature 0 °C
2 In the overload range, the characteristic retains the angle adopted on leaving the linearized nominal range.

ET 200C Analog Input Module; AI 4/8 × 12 Bit (6ES7 144-0KH00-0XB0), Continued

Analog Value Presentation, SIMATIC S7

The analog values of ET 200C; AI 4/8 × 12 Bit for SIMATIC S7 are presented as complements of twos.

The table below shows the analog value presentation for ET 200C; AI 4/8 × 12 Bit:

Table 12-10 Presentation of an Analog Input Value as Bit Pattern for SIMATIC S7 with ET 200C; AI 4/8 × 12 Bit

	High byte								Low byte							
Bit number	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Analog value presentation	DT	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}

Bit 15 is without significance for the amount of the measured value. It merely represents the sign.

Table of Measured Values

The table below shows the digitized measured values of the ET 200C; AI 4/8 × 12 for the measuring ranges: ± 80 mV, ± 250 mV, ± 500 mV and ± 1000 mV.

Table 12-11 Digitized Measured Values for ET 200C; AI 4/8 × 12 Bit (Measuring Ranges: ± 80 mV, ± 250 mV, ± 500 mV and ± 1000 mV)

Measuring range ± 80 mV	Measuring range ± 250 mV	Measuring range ± 500 mV	Measuring range ± 1 V	Units decimal	Units hexa-decimal	Range
≥ 94.074	≥ 293.98	≥ 587.96	≥ 1.176	32767	$7FFF_H$	Overflow
94.071	293.97	587.94	1.175	32511	$7EFF_H$	Overload range
:	:	:	:	:	:	
80.003	250.01	500.02	1.00004	27649	$6C01_H$	
80.000	250.00	500.00	1.000	27648	$6C00_H$	Nominal range
60.000	187.50	375.00	0.750	20736	5100_H	
:	:	:	:	:	:	
– 60.000	– 187.50	– 375.00	– 0.750	–20736	$AF00_H$	
– 80.000	– 250.00	– 500.00	–1.000	–27648	9400_H	
– 80.003	– 250.01	– 500.02	– 1.00004	–27649	$93FF_H$	Underdrive range
:	:	:	:	:	:	
– 94.074	– 293.98	– 587.96	– 1.175	–32512	8100_H	
≤ – 94.077	≤ – 293.99	≤ – 588.98	≤ – 1.176	–32768	8000_H	Underrun

Table of Measured Values

The table below shows the digitized measured values for the ET 200C; AI 4/8 × 12 Bit for resistance sensors (Pt 100):

Table 12-12 Digitized Measured Values for ET 200C; AI 4/8 × 12 Bit for Pt 100 Resistance Sensors

Temperature range standard Pt 100 850 °C	**Decimal**	**Hexadecimal**	**Range**
≥ 1000.1	32767	$7FFF_H$	Overflow
1000.0 : 850.1	10000 : 8501	2710_H : 2135_H	Overload range
850.0 : –200.0	8500 : –2000	2134_H : $F830_H$	Nominal range
–200.1 : –243.0	–2001 : –2430	$F82F_H$: $F682_H$	Underdrive range
≤ – 243.1	–32768	8000_H	Underrun

Table of Measured Values

The four tables below show the digitized measured values for thermocouples of types K, N, J and E.

Table 12-13 Digitized Measured Values for ET 200C; AI 4/8 × 12 Bit for Type K Thermocouple

Temperature range in °C Type K	**Decimal**	**Hexadecimal**	**Range**
≥ 1623	32767	$7FFF_H$	Overflow
1622 : 1373	16220 : 13730	$3FSC_H$: $35A2_H$	Overload range
1372 : –270	13720 : –2700	3598_H : $F574_H$	Nominal range
≤ –271	–2710	$F573_H$	Underdrive range
If wiring is incorrect or an error occurs in the sensor in the negative, the analog input module reports underrun if $F0C5_H$ is undershot and outputs 8000_H.			

ET 200C Analog Input Module; AI 4/8 × 12 Bit (6ES7 144-0KH00-0XB0), Continued

Table 12-14 Digitized Measured Values for ET 200C; AI 4/8 × 12 Bit for Type N Thermocouple

Temperature range in °C Type N	Decimal	Hexadecimal	Range
≥ 1551	32767	$7C8C_H$	Overflow
1550 : 1301	15500 : 13010	$3C8C_H$: $32D2_H$	Overload range
1300 : –270	13000 : –2700	$32C8_H$: $F574_H$	Nominal range
≤ –271	–2710	$F573_H$	Underdrive range
If wiring is incorrect or an error occurs in the sensor in the negative, the analog input module reports underrun if $F0C5_H$ is undershot and outputs 8000_H.			

Table 12-15 Digitized Measured Values for ET 200C; AI 4/8 × 12 Bit for Type J Thermocouple

Temperature range in °C Type J	Decimal	Hexadecimal	Range
≥ 1451	32767	$7FFF_H$	Overflow
1450 : 1201	14500 : 12010	$38A4_H$: $2EEA_H$	Overload range
1200 : –210.0	12000 : –2100	$2EE0_H$: $F7CC_H$	Nominal range
≤ –211	–2110	$F7C2_H$	Underdrive range
If wiring is incorrect or an error occurs in the sensor in the negative, the analog input module reports underrun if $F0C5_H$ is undershot and outputs 8000_H.			

Table 12-16 Digitized Measured Values for ET 200C; AI 4/8 × 12 Bit for Type E Thermocouple

Temperature range in °C Type E	**Decimal**	**Hexadecimal**	**Range**
≥ 1201	32767	$7FFF_H$	Overflow
1200 : 1001	12000 : 10010	$2EE0_H$: $271A_H$	Overload range
1000 : –270	10000 : –2700	2710_H : $F574_H$	Nominal range
≤ –271	–2710	$F573_H$	Underdrive range
If wiring is incorrect or an error occurs in the sensor in the negative, the analog input module reports underrun if $F0C5_H$ is undershot and outputs 8000_H.			

ET 200C Analog Input Module; AI 4/8 × 12 Bit (6ES7 144-0KH00-0XB0), Continued

Dimensional Drawing

Dimensional drawing for ET 200C analog input module; AI 4/8 × 12 Bit:

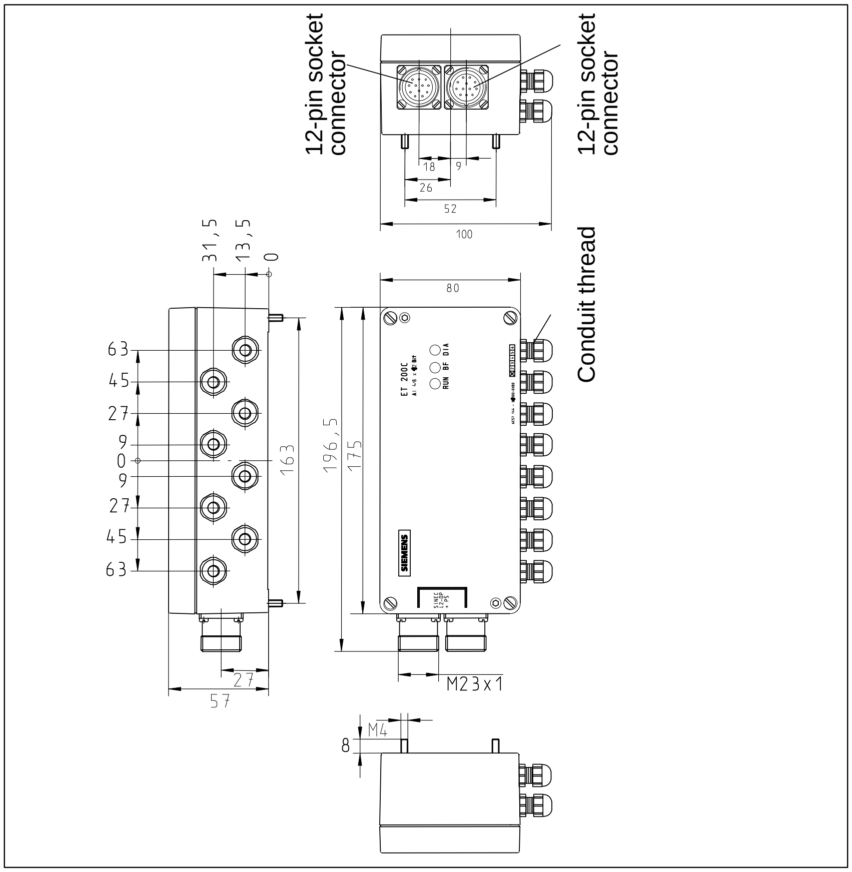
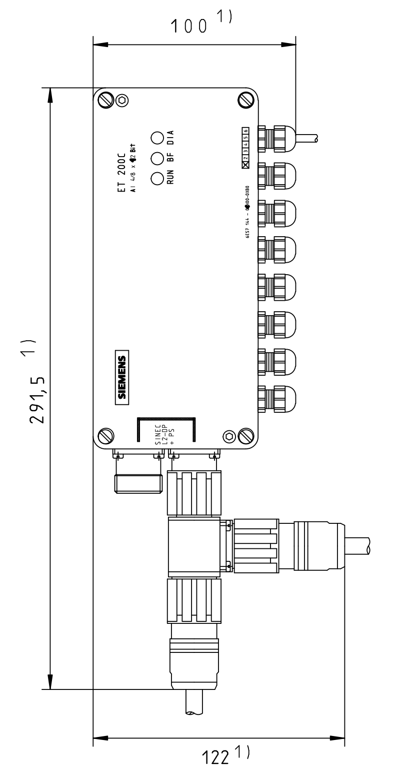


Figure 12-3 ET 200C Analog Input Module; AI 4/8 × 12 Bit: Dimensional Drawing

Dimensional Drawing

Dimensional drawing for ET 200C analog input module; AI 4/8 × 12 Bit with T connector:



1: The bending radii of the cable must be taken into account for installation.

Figure 12-4 ET 200C Analog Input Module; AI 4/8 × 12 Bit: Dimensional Drawing with T connector

12.2 ET 200C Analog Input Module; AI 4 × 12 Bit (6ES7 144-0HF00-0XB0)

Technical Data	
Transfer rates	9.6/19.2/93.75/187.5/ 500/1500 kbaud
Bus protocol	DP standard
Galvanically isolated from SINEC L2-DP bus	yes
Power loss	typ. 3.0 W
Weight	approx. 950 g
Dimensions (W x H x D)	200 × 100 × 57
Diagnostics Functions	
Voltage monitoring	green LED “RUN”
SINEC L2-DP bus monitoring	red LED “BF”
Group diagnostics	red LED “DIA”, parameterizable
Supply Voltage Inputs and Internal Logic	
Supply voltage (L+)	
• Nominal	24 V DC
• Permissible range	20.4 ... 30.2 V
• Value for t < 0.5 s	35 V
Current consumption from L+	
• Logic	130 mA/24V
Inputs	
Number of inputs	4
Galvanic isolation between voltage supply and internal logic	yes
Test voltage	500 V DC
Measured value ranges	
• Voltage sensor	± 1.25 V, ± 2.5 V, ± 5 V, ± 10 V
• Current sensor	± 20 mA, 0 – 20 mA, 4 – 20 mA
Signal generator connection	two-wire
Input resistance	
• Voltage sensor	> 1 MΩ
• Current sensor	125 Ω
Measured value presentation	12 Bit + sign
Measuring principle	momentary value encryption (successive approximation)
Encryption time	250 µs per input
Cycle time of the module	approx. 2 ms (without system reaction time)

Inputs (Continued)	
Permissible potential differential	
• Input to input	max. ±10 V
• Inputs to M_A (U_{CM})	max. ±1 V
• M_A to PE or M	max. 75 V DC/60 V AC
Error message for	
• Range overshoot	yes
Interference voltage suppression for f = n × (50/60 Hz ± 1%) n = 1, 2, ...	
• Common-mode interference (U_{pp} < 1 V)	min. 60 dB
Basic error	
• Voltage ranges	0.15 %
• Current ranges	0.25 %
Operational limit (0 ... 60 °C)	
• Voltage ranges	0.30 %
• Current ranges	0.45 %
Permissible input voltage	max. ± 25 V-1 channel, ± 16 V-4 channels **or** ± 75 V (pulse for max. 1 ms and sampling ratio of 1:20)
Permissible input current	max. 31 mA
Cable length	
• shielded	max. 30 m
Limit value alarm	yes, parameterizable for channels 0 and 2
Diagnostics alarm	yes, parameterizable
Diagnostics information accessible	yes

Block Diagram

Simplified representation of the potentials of the ET 200C analog input module; AI 4 × 12 Bit:

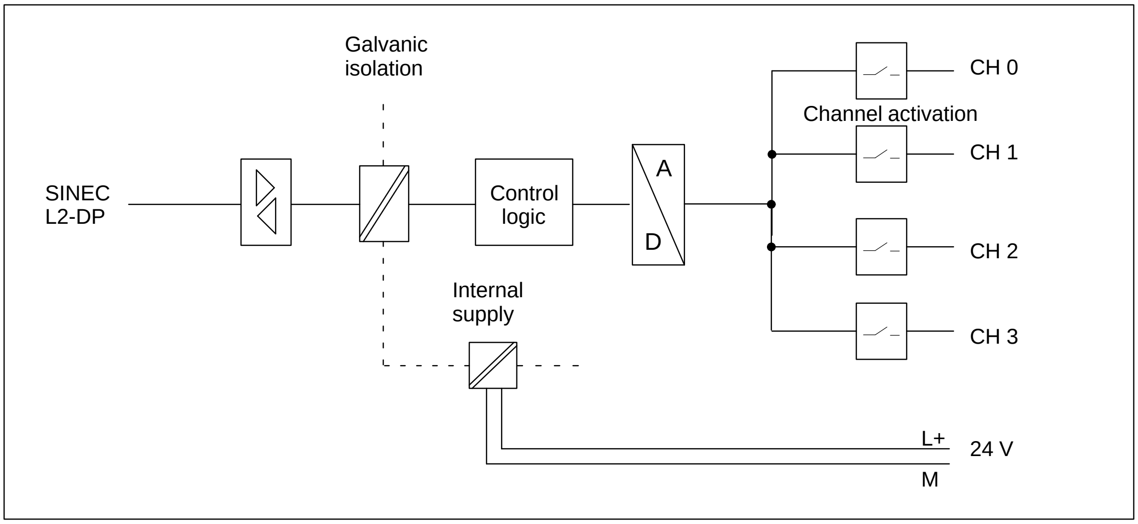


Figure 12-5 ET200C Analog Input Module; AI 4 × 12 Bit: Block Diagram

Screw Terminals

Fig. 12-6 shows the screw terminals and their assignments in the ET 200C; AI 4 × 12 Bit:

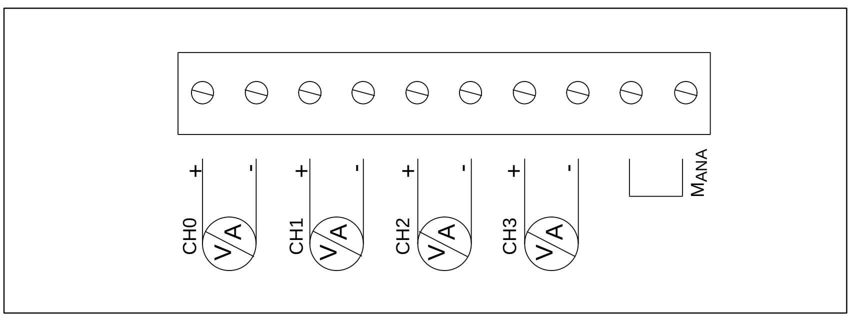


Figure 12-6 Screw Terminals with Assignments in the ET 200C; AI 4 × 12 Bit

ET 200C Analog Input Module; AI 4 × 12 Bit (6ES7 144-0HF00-0XB0), Continued

Parameterization

You parameterize the ET 200C; AI 4 × 12 bit with the aid of the COM ET 200 Windows parameterization software.

Where to Look

Parameterization of the ET 200C; AI 4 × 12 bit with COM ET 200 Windows is described in detail in the Help system integrated in the COM ET 200 Windows program.

The manual entitled *ET 200 Distributed I/O System* (Order No. 6ES5 998-3ES12) contains detailed descriptions of how to use COM ET 200 Windows.

All the parameters for the ET 200C; AI 4 × 12 Bit are described in the table below:

Table 12-17 Parameters for ET 200C Analog Input Module; AI 4 × 12 Bit

Byte[1]	Bit	Parameter	Explanation	Range of values
08	0	Enable diagnostics CH 0	Enable diagnostics messages by channel groups	disable enable
	1	Enable diagnostics CH 1		
	2	Enable diagnostics CH 2		
	3	Enable diagnostics CH 3		
09	6	Enable diagnostics alarm	Enable diagnostics alarm of module	disable enable
	7	Enable limit value alarm	Enable limit value alarm of module	
17	0 ... 7	Measurement type / measuring range CH 0	Set measurement type and measuring range for channel CH 0	Channel not activated Measurement type ± 1.25 V Measurement type ± 2.5 V Measurement type ± 5 V Measurement type ± 10 V Measurement type ± 20 mA Measurement type 0 ... 20 mA Measurement type 4 ... 20 mA
18	0 ... 7	Measurement type / measuring range CH 1	Set measurement type and measuring range for channel CH 1	
19	0 ... 7	Measurement type / measuring range CH 2	Set measurement type and measuring range for channel CH 2	
20	0 ... 7	Measurement type / measuring range CH 3	Set measurement type and measuring range for channel CH 3	
21	0 ... 7	Upper limit value CH 0	Set upper limit value for channel CH 0	0 –32768 ... 32767
23	0 ... 7	Lower limit value CH 0	Set lower limit value for channel CH 0	0 –32768 ... 32767

Table 12-17 Parameters for ET 200C Analog Input Module; AI 4 × 12 Bit, Continued

Byte[1]	Bit	Parameter	Explanation	Range of values
25	0 ... 7	Upper limit value CH 2	Set upper limit value for channel CH 2	0 –32768 ... 32767
27	0 ... 7	Lower limit value CH 2	Set lower limit value for channel CH 2	0 –32768 ... 32767
34	2	Measured value presentation	Present measured value for master system S5 or S7	S5 S7

: Default setting in parameterization telegram

1 Byte address in parameterization telegram of slave

ET 200C Analog Input Module; AI 4 × 12 Bit (6ES7 144-0HF00-0XB0), Continued

Analog Value Presentation, SIMATIC S5

The analog values of ET 200C; AI 4 × 12 Bit for SIMATIC S5 are presented as complements of twos (range: – 2048 ... + 2047 units).

The table below shows the analog value presentation for ET 200C; AI 4 × 12 Bit:

Table 12-18 Presentation of an Analog Input Value as Bit Pattern for ET 200C; AI 4 × 12 Bit

	High byte								Low byte							
Bit number	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Analog value presentation	DT	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	F	O

Bits 0 ... 2 and 15 are without significance for the amount of the measured value. These bits are described in detail in Table 12-19.

Supplementary Bits

Bits 0 ... 2 and 15 in the bit pattern of the analog input value have the following significance:

Table 12-19 Description of bits for ET 200C; AI 4 × 12 Bit

Bit	Significance	Signal state	Significance of the signal state
O	Overflow bit	1	Range overshoot[1]
F	Error bit	1	Wire break; the value read is invalid
DT	Sign	0	Sign “+”
		1	Sign “–”
X	Irrelevant	–	–

1 An overflow at one measuring point has no effect on the overflow bits of the other channels; i.e. the values of the other channels are correct and can be evaluated.

Table of Measured Values

The table below shows the relationship between analog and digitized measured values for the measuring ranges: ± 1.25 V, ± 2.5 V, ± 5 V, ± 10 V.

Table 12-20 Digitized Measured Values for ET 200C; AI 4 × 12 Bit (Measuring Ranges: ± 1.25 V, ± 2.5 V, ± 5 V, ± 10 V)

Units	Measured value in V				Digitized measured value													X	F	O	Range
	±1.25V	±2.5V	±5V	±10V	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	
2407	1.4695	2.9389	5.8778	11.7558								:								1	Overflow
2406	1.4689	2.9377	5.8754	11.7509								:								0	
:	:	:	:	:								:								0	Overload range
2049	1.2506	2.5012	5.0024	10.0049	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	
2048	1.2500	2.5000	5.0000	10.0000	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
2047	1.2494	2.4988	4.9976	9.9951	0	0	1	1	1	1	1	1	1	1	1	1	1	0	0	0	
2046	1.2488	2.4975	4.9951	9.9902	0	0	1	1	1	1	1	1	1	1	1	1	0	0	0	0	
:	:	:	:	:								:									
1	0.0006	0.0012	0.0024	0.0049	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	Nominal range
0	0.0000	0.0000	0.0000	0.0000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
–1	–0.0006	–0.0012	–0.0024	–0.0049	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	
:	:	:	:	:								:							:		
–2047	–1.2494	–2.4988	–4.9976	–9.9951	1	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	
–2048	–1.2500	–2.5000	–5.0000	–10.0000	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
–2049	–1.2506	–2.5012	–5.0024	–10.0049	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	
–2050	–1.2512	–2.5024	–5.0048	–10.0098	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
:	:	:	:	:								:								0	Underdrive range
–2406	–1.4689	2.9377	–5.8754	–11.7509								:								0	
–2407	–1.4695	–2.9389	–5.8778	–11.7558								:								1	Underrun

ET 200C Analog Input Module; AI 4 × 12 Bit (6ES7 144-0HF00-0XB0), Continued

Table of Measured Values

The tables below show the relationship between analog and digitized measured values for the measuring ranges: 0 ... 20 mA, 4 ... 20 mA, ± 20 mA.

Table 12-21 Digitized Measured Values for ET 200C; AI 4 × 12 Bit (Measuring Range: ± 20 mA)

Units	Measured value in mA	Digitized measured value													X	F	O	Range
	± 20 mA	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	
:	:								:									Overload range
:	:								:									
2048	20.0000	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
2047	19.9902	0	0	1	1	1	1	1	1	1	1	1	1	1	0	0	1	Nominal range
2046	19.9804	0	0	1	1	1	1	1	1	1	1	1	1	0	0	0	0	
:	:								:									
1	0.00976	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	
0	0.0000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
–1	–0.00976	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	
:	:								:									
–2047	–19.9902	1	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	
–2048	–20.0000	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	
–2049	–20.00976	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	Underdrive range
:	:								:									
:	:								:									

Table 12-22 Digitized Measured Values for ET 200C; AI 4 × 12 Bit (Measuring Range: 0 ... 20 mA)

Units	Measured value in mA	Digitized measured value													X	X	O	Range
	0 ... 20 mA	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	
4095	19.9951	0	1	1	1	1	1	1	1	1	1	1	1	1	0	0	1	Nominal range
4094	19.9902	0	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	
:	:								:									
1	0.00488	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	
0	0.00000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	

Table 12-23 Digitized Measured Values for ET 200C; AI 4 × 12 Bit (Measuring Range: 4 ... 20 mA)

Units	Measured value in mA	Digitized measured value[1]													X	F	O	Range
	4 ... 20 mA	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	
3009	23.500								:								1	Overflow
3008	23.462								:								0	Overload range
:	:								:								0	
2561	20.008	0	1	0	1	0	0	0	0	0	0	0	0	1	0	0	0	
2560	20.000	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	Nominal range
2048	16.000	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
512	4.000	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	
511	3.992	0	0	0	0	1	1	1	1	1	1	1	1	1	0	0	0	Underdrive range
384	3.000	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	
383	2.992	0	0	0	0	1	0	1	1	1	1	1	1	1	0	0	0	
0	0.000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Wire break

Note

The 4 ... 20 mA measuring range is resolved as 2048 units with the interval 512 ... 2560. Presentation in the 0 ... 2048 range requires the subtraction of 512 units by the software.

ET 200C Analog Input Module; AI 4 × 12 Bit (6ES7 144-0HF00-0XB0), Continued

Analog Value Presentation, SIMATIC S7

The analog values of ET 200C; AI 4 × 12 Bit for SIMATIC S7 are presented as complements of twos.

The table below shows the analog value presentation for ET 200C; AI 4 × 12 Bit:

Table 12-24 Presentation of an Analog Input Value as Bit Pattern for SIMATIC S7 with ET 200C; AI 4 × 12 Bit

	High byte								Low byte							
Bit number	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Analog value presentation	DT	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}

Bit 15 is without significance for the amount of the measured value. It merely represents the sign.

Table of Measured Values

The table below shows the digitized measured values of the ET 200C; AI 4 × 12 for the measuring ranges: ± 1.25 V, ± 2.5 V, ± 5 V and ± 10 V.

Table 12-25 Digitized Measured Values for ET 200C; AI 4 × 12 bit (Measuring Ranges: ± 1.25 V, ± 2.5 V, ± 5 V and ± 10 V)

Measuring range ± 1.25 V	Measuring range ± 2.5 V	Measuring range ± 5 V	Measuring range ± 10 V	Units decimal	Units hexa-decimal	Range
≥ 1.4699	≥ 2.9398	≥ 5.8796	≥ 11.759	32767	$7FFF_H$	Overflow
1.46985	2.9397	5.8794	11.7589	32511	$7EFF_H$	Overload range
:	:	:	:	:	:	
1.25005	2.5001	5.0002	10.0004	27649	$6C01_H$	
1.25	2.50	5.00	10.00	27648	$6C00_H$	Nominal range
0.9375	1.875	3.75	7.50	20736	5100_H	
:	:	:	:	:	:	
– 0.9375	– 1.875	– 3.75	– 7.50	–20736	$AF00_H$	
– 1.25	– 2.50	– 5.00	– 10.00	–27648	9400_H	
– 1.25005	– 2.5001	– 5.0002	– 10.0004	–27649	$93FF_H$	Underdrive range
:	:	:	:	:	:	
– 1.4699	– 2.9398	– 5.8796	– 11.759	–32512	8100_H	
≤ – 1.47	≤ – 2.94	≤ – 5.88	≤ – 11.76	–32768	8000_H	Underrun

Table of Measured Values

The table below shows the digitized measured values of the ET 200C; AI 4 × 12 for the measuring range: ± 20 mA.

Table 12-26 Digitized Measured Values for ET 200C; AI 4 × 12 Bit (Measuring Range: ± 20 mA)

Measuring range ± 20 mA	Units		Range
	decimal	hexadecimal	
≥ 23.516	32767	$7FFF_H$	Overflow
23.515 : 20.0007	32511 : 27649	$7EFF_H$: $6C01_H$	Overload range
20.000 14.998 : – 14.998 – 20.000	27648 20736 : –20736 –27648	$6C00_H$ 5100_H : $AF00_H$ 9400_H	Nominal range
– 20.0007 : – 23.516	–27649 : –32512	$93FF_H$: 8100_H	Underdrive range
≤ – 23.517	–32768	8000_H	Underrun

ET 200C Analog Input Module; AI 4 × 12 Bit (6ES7 144-0HF00-0XB0), Continued

Table of Measured Values

The table below shows the digitized measured values of the ET 200C; AI 4 × 12 for the measuring ranges: 0 to 20 mA and 4 to 20 mA.

Table 12-27 Digitized Measured Values for ET 200C; AI 4 × 12 Bit (Measuring Ranges: 0 to 20 mA and 4 to 20 mA)

Measuring range from 0 to 20 mA	Measuring range from 4 to 20 mA	Units		Range
		decimal	hexadecimal	
≥ 23.516	≥ 22.815	32767	$7FFF_H$	Overflow
23.515	22.810	32511	$7EFF_H$	Overload range
:	:	:	:	
20.0007	20.0005	27649	$6C01_H$	
20.000	20.000	27648	$6C00_H$	Nominal range
14.998	16.000	20736	5100_H	
:	:	:	:	
0.000	4.000	0	0_H	
-0.0007	3.9995	–1	$FFFF_H$	Underdrive range
:	:	:	:	
–3.5185	1.1852	–4864	$ED00_H$	
≤–3.5193	≤1.1845	–32768	8000_H	Underrun

Dimensional Drawing

Dimensional drawing for ET 200C analog input module; AI 4 × 12 Bit:

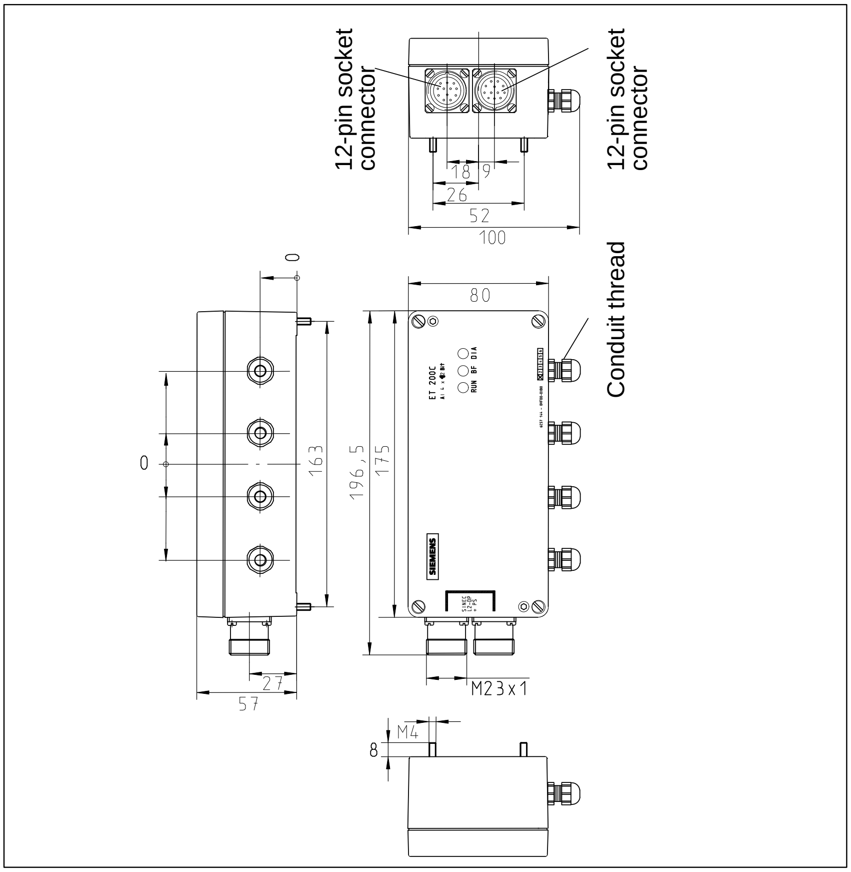
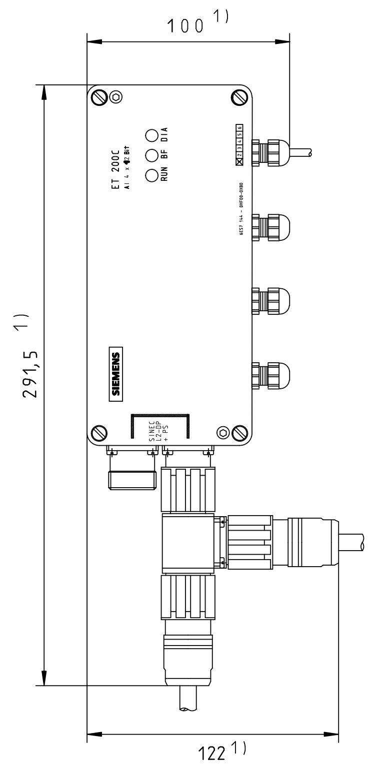


Figure 12-7 ET 200C Analog Input Module; AI 4 × 12 Bit: Dimensional Drawing

ET 200C Analog Input Module; AI 4 × 12 Bit (6ES7 144-0HF00-0XB0), Continued

Dimensional Drawing

Dimensional drawing for ET 200C analog input module; AI 4 × 12 Bit with T connector:



1: The bending radii of the cable must be taken into account for installation.

Figure 12-8 ET 200C Analog Input Module; AI 4 × 12 Bit: Dimensional Drawing with T connector

12.3 ET 200C Analog Output Module; AO 4 × 12 Bit (6ES7 145-0HF00-0XB0)

Technical Data	
Transfer rates	9.6/19.2/93.75/187.5/ 500/1500 kbaud
Bus protocol	DP standard
Galvanically isolated from SINEC L2-DP bus	yes
Power loss	typ. 3.0 W
Weight	approx. 950 g
Dimensions (W × H × D)	200 × 100 × 57
Diagnostics Functions	
Voltage monitoring	green LED “RUN”
SINEC L2-DP bus monitoring	red LED “BF”
Group diagnostics	red LED “DIA”, parameterizable
Supply Voltage Outputs and Internal Logic	
Supply voltage (L+)	
• Nominal	24 V DC
• Permissible range	20.4 ... 30.2 V
• Value for t < 0.5 s	35 V
Current consumption from L+	
• Logic	120 mA
Outputs	
Number of outputs	4
Galvanic isolation between voltage supply and internal logic	yes
Test voltage	500 V DC
Measured value ranges	
• Voltage range	± 10 V, 0– 10 V, 1 – 5 V
• Current range	± 20 mA, 0 – 20 mA, 4 – 20 mA
Connection	four- or two-wire
Load resistance	
• Voltage output	min. 1 kΩ
• Load impedance for voltage output	max. 500 Ω
• Capacitive load	max. 1 µF
• Inductive load	max. 1 mH
Measured value presentation	12 bit + sign
Overload range	approx. 17.5 %
Conversion time	S5: max. 2 ms per output

Outputs (Continued)	
Conversion time	S7: max. 1 ms per output
Settling time	
• for ohmic load	0.15 ms
• for capacitive load	2.5 ms
• for inductive load	0.2 ms
Permissible potential differential	
• M_A to PE or M	max. 75 V DC/60 V AC
Crosstalk between outputs	40 dB
Operational limit (for entire temperature range, referenced to output range)	
• Voltage	± 0.5 %
• Current	± 0.6 %
Basic error (operational limit at 25 ˚C, referenced to output range)	
• Voltage	± 0.3 %
• Current	± 0.4 %
Temperature error (referenced to output range)	± 0.02 %/K
Linearity error (referenced to output range)	± 0.05 %
Repeat accuracy (in steady state at 25 ˚C, referenced to output range)	± 0.05 %
Output ripple (referenced to output range)	± 0.10 %
Voltage output	
• Short-circuit protection	yes, max. 1 output simultaneously
• Short-circuit current	max. 25 mA
Current output	
• No-load voltage	max. 18 V
Cable length	
• shielded	max. 30 m
Substitute values	yes, parameterizable
Diagnostics alarm	yes, parameterizable
Diagnostics information accessible	yes

ET 200C Analog Output Module; AO 4 × 12 Bit (6ES7 145-0HF00-0XB0), Continued

Block Diagram

Simplified representation of the potentials of the ET 200C analog output module; AO 4 × 12 Bit:

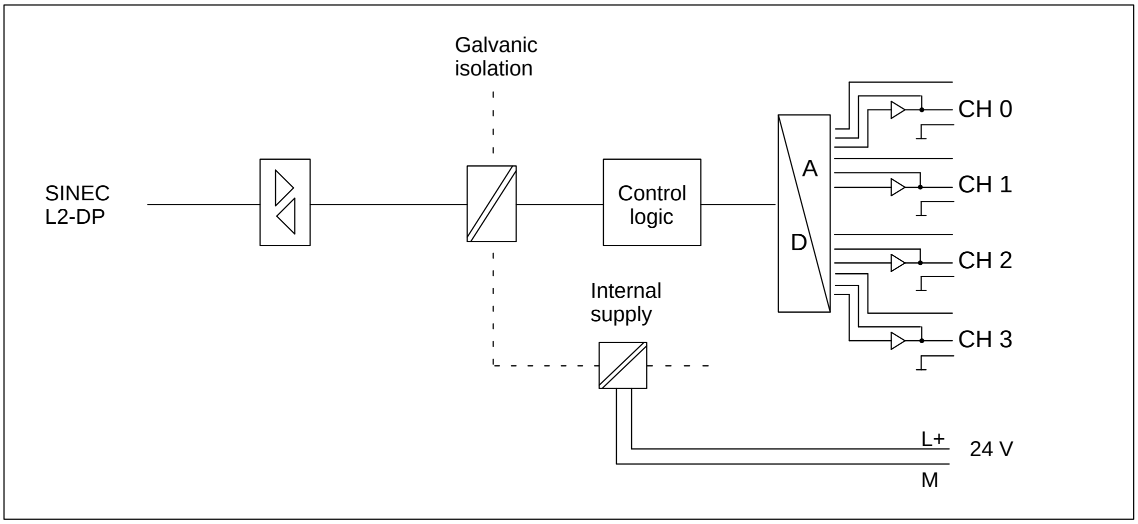


Figure 12-9 ET 200C Analog Output Module; AO 4 × 12 Bit: Block Diagram

Screw Terminals

Fig. 12-10 shows the screw terminals and their assignments in the ET 200C; AO 4 × 12 Bit:

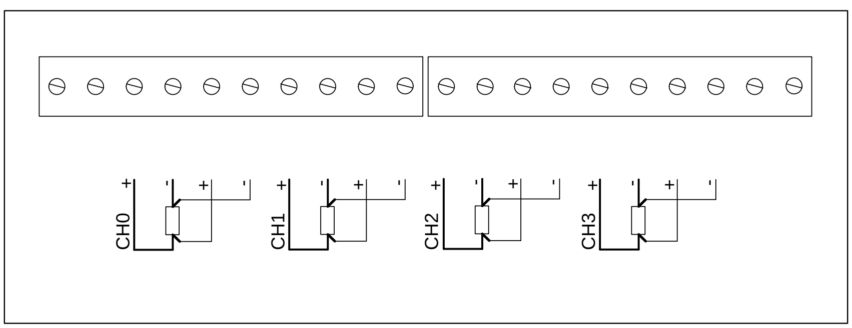


Figure 12-10 Screw Terminals with Assignments in the ET 200C; AO 4 × 12 Bit

Parameterization

You parameterize the ET 200C; AO 4 × 12 Bit with the aid of the COM ET 200 Windows parameterization software.

Where to Look

Parameterization of the ET 200C; AO 4 × 12 Bit with COM ET 200 Windows is described in detail in the Help system integrated in the COM ET 200 Windows program.

The manual entitled *ET 200 Distributed I/O System* (Order No. 6ES5 998-3ES12) contains detailed descriptions of how to use COM ET 200 Windows.

All the parameters for the ET 200C; AO 4 × 12 Bit are described in the table below:

Table 12-28 Parameters for ET 200C Analog Output Module; AO 4 × 12 Bit

Byte[1]	Bit	Parameter	Explanation	Range of values
08	0	Enable diagnostics CH 0	Enable diagnostics messages by channel groups	disable enable
	1	Enable diagnostics CH 1		
	2	Enable diagnostics CH 2		
	3	Enable diagnostics CH 3		
15	6	Enable diagnostics alarm	Enable diagnostics alarm of module	disable enable
16	0	Type of substitute value, CH 0	Channel by channel definition of substitute value output on error	Substitute value last value
	1	Type of substitute value, CH 1		
	2	Type of substitute value, CH 2		
	3	Type of substitute value, CH 3		
17	0 ... 7	Output type / output range CH 0	Channel by channel selection of output range	Output range ± 10 V Output range 0 ... 10 V Output range 0 ... 20 mA Output range 4 ... 20 mA Output range ± 20 mA
18	0 ... 7	Output type / output range CH 1		
19	0 ... 7	Output type / output range CH 2		
20	0 ... 7	Output type / output range CH 3		
21	0 ... 7	Substitute value CH 0	Channel by channel input of substitute value (if communication is interrupted, value input is output as substitute value – see Table 12-29)	0 –32768 ... 32767
23	0 ... 7	Substitute value CH 1		
25	0 ... 7	Substitute value CH 2		
27	0 ... 7	Substitute value CH 3		
34	2	Measured value presentation	Present measured value for master system S5 or S7	S5 S7

: Default setting in parameterization telegram

1 Byte address in parameterization telegram of slave

ET 200C Analog Output Module; AO 4 × 12 Bit (6ES7 145-0HF00-0XB0), Continued

Substitute Value Output – Communication Interrupted

The substitute value output of the ET 200C; AO 4 × 12 Bit in the event of an interruption in communication is described in the table below:

Table 12-29 Substitute Value Output of ET 200C; AO 4 × 12 Bit on Interruption in Communication

Cause of interruption in communication between I/O controller and 4AO output module	**Response of 4AO output module to interruption in communication**			
	Response monitoring active		Response monitoring not active	
	Substitute value: configurable	Substitute value: last value	Substitute value: configurable	Substitute value: last value
“POWER OFF” at controller (CPU and DP master)	CV ⇒ SV	CV ⇒ LV	CV ⇒ SV	CV ⇒ LV
CPU stopped	CV ⇒ SV	CV ⇒ LV	CV ⇒ SV	CV ⇒ LV
DP master stopped	CV ⇒ SV	CV ⇒ LV	CV ⇒ SV	CV ⇒ LV
Interruption on bus	CV ⇒ SV	CV ⇒ LV	CV ⇒ LV	CV ⇒ LV
	Response of 4AO output module to end of interruption in communication			
	Response monitoring active		Response monitoring not active	
	Substitute value: configurable	Substitute value: last value	Substitute value: configurable	Substitute value: last value
“POWER OFF” at controller (CPU and DP master)	SV⇒0⇒SV	LV⇒0⇒CV	SV ⇒ CV	LV ⇒ CV
CPU stopped	SV ⇒ CV	LV ⇒ CV	SV ⇒ CV	LV ⇒ CV
DP master stopped	SV ⇒ CV	LV ⇒ CV	SV ⇒ CV	LV ⇒ CV
Interruption on bus	SV ⇒ CV	LV⇒0⇒CV	LV ⇒ CV	LV ⇒ CV

CV – current value from CPU; LV – last value; SV – configured substitute value

Analog Value Presentation, SIMATIC S5

The analog values of ET 200C; AO 4 × 12 Bit for SIMATIC S5 are presented as complements of twos.

The table below shows the analog value presentation for ET 200C; AO 4 × 12 Bit:

Table 12-30 Presentation of an Analog Input Value as Bit Pattern for ET 200C; AO 4 × 12 Bit

	High byte								**Low byte**							
Bit number	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Analog value presentation	DT	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	X	X

Bits 0 ... 3 and 15 are without significance for the amount of the measured value. These bits are described in detail in Table 12-31.

Supplementary Bits

Bits 0 ... 2 and 15 in the bit pattern of the analog input value have the following significance:

Table 12-31 Description of bits for ET 200C; AO 4 × 12 Bit

Bit	Significance	Signal state	Significance of the signal state
DT	Sign	0	Sign “+”
		1	Sign “–”
X	Irrelevant	–	–

ET 200C Analog Output Module; AO 4 × 12 Bit (6ES7 145-0HF00-0XB0), Continued

Table of Measured Values

The table below shows the relationship between analog and digitized output signals for the ranges of values: ± 10 V, 0 ... 10 V, ± 20 mA, 0 ... 20 mA, 4 ... 20 mA.

Table 12-32 Analog Output Signals of ET 200C; AO 4 × 12 Bit (Ranges of Values: ± 10 V, 0 ... 10 V, ± 20 mA, 0 ... 20 mA, 4 ... 20 mA)

Units	Measured value in mV						Digitized measured value													Range
	0 ... 20 mA	4 ... 20 mA	± 20 mA	0 ... 10 V	1 ... 5 V	± 10V	15	14	13	12	11	10	9	8	7	6	5	4	3	
1249		23.52			5.88		0	1	0	0	1	1	1	0	0	0	0	1	0	Over-load range
1204	23.52	:	23.52	11.758	:	11.758	0	1	0	0	1	0	1	1	0	1	0	0	0	
:	:	:	:	:	:	:									:					
1025	20.0195	20.016	20.2	10.0098	5.004	10.0098	0	1	0	0	0	0	0	0	0	0	0	1	0	
1024	20.0	20.0	20.0	10.00	5.0	10.00	0	1	0	0	0	0	0	0	0	0	0	0	0	
1023	19.98	19.98	19.98	9.99	4.995	9.990	0	0	1	1	1	1	1	1	1	1	1	1	1	
512	10.0	12.0	10.0	5.00	3	5.000	0	0	1	0	0	0	0	0	0	0	0	0	0	
256	5.0	8.00	5.0	2.50	2	2.500	0	0	0	1	0	0	0	0	0	0	0	0	0	
1	0.0195	4.015	0.02	0.0098	1.00375	0.0098	0	0	0	0	0	0	0	0	0	0	0	0	1	Nom. range
0	0.0	4.0	0.0	0.0	1.0	0.000	0	0	0	0	0	0	0	0	0	0	0	0	0	
–1	0.0	3.984	–0.02	0.0	0.996	–0.0098	1	1	1	1	1	1	1	1	1	1	1	1	1	
–256	0.0	0.0	–05.0	0.0	0.0	–2.500	1	1	1	1	0	0	0	0	0	0	0	0	0	
–512	0.0	0.0	–10.0	0.0	0.0	–5.000	1	1	1	0	0	0	0	0	0	0	0	0	0	
–1024	0.0	0.0	–20.00	0.0	0.0	–10.000	1	1	0	0	0	0	0	0	0	0	0	0	0	
–1025	0.0	0.0	–20.02	0.0	0.0	–10.009	1	0	1	1	1	1	1	1	1	1	1	1	1	Over-load range
:	:	:	:	:	:	:									:					
–1204	0.0	0.0	–23.52	0.0	0.0	–11.758	1	0	1	1	0	1	0	0	1	1	1	0	0	

Analog Value Presentation, SIMATIC S7

The analog values of ET 200C; AO 4 × 12 Bit for SIMATIC S7 are presented as complements of twos.

The table below shows the analog value presentation for ET 200C; AO 4 × 12 Bit:

Table 12-33 Presentation of an Analog Input Value as Bit Pattern for SIMATIC S7 with ET 200C; AO 4 × 12 Bit

	High byte								**Low byte**							
Bit number	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Analog value presentation	DT	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}

Bit 15 is without significance for the amount of the measured value. It merely represents the sign.

ET 200C Analog Output Module; AO 4 $\times$ 12 Bit (6ES7 145-0HF00-0XB0), Continued

Table of Measured Values

The table below shows the digitized output values of the ET 200C; AO 4 $\times$ 12 for the output ranges: $\pm$ 20 mA, 0 to 20 mA and 4 to 20 mA.

Table 12-34 Digitized Measured Values for ET 200C; AO 4 $\times$ 12 Bit (Output Ranges: $\pm$ 20 mA, 0 to 20 mA and 4 to 20 mA)

Output range $\pm$ 20 mA	Output range 0 to 20 mA	Output range 4 to 20 mA	Units		Range
			decimal	hexa-decimal	
0	0	0	$\geq$ 32512	$\geq$ $7F00_H$	Overflow
23.515	23.515	22.81	32511	$7EFF_H$	Overload range
:	:	:	:	:	
20.0007	20.0007	20.005	27649	$6C01_H$	
20.000	20.000	20.000	27648	$6C00_H$	Nominal range
	:	:	:	:	
0	0	4.000	0	0_H	
	0	:	:	:	
:		0	– 6912	$E500_H$	
		0	– 6913	$E4FF_H$	
			:	:	
– 20.000			– 27648	9400_H	
			– 27649	$93FF_H$	Underdrive range
:			:	:	
– 23.515			– 32512	8100_H	
0			$\leq$ – 32513	$\leq$ $80FF_H$	Underrun

Table of Measured Values

The table below shows the digitized output values of the ET 200C; AO 4 × 12 for the output ranges: 0 to 10 V and ± 10 V.

Table 12-35 Digitized Measured Values for ET 200C; AO 4 × 12 Bit (Output Ranges: 0 to 10 V and ± 10 V)

Output range 0 to 10 V	Output range ± 10 V	Units		Range
		decimal	hexa-decimal	
0	0	≥ 32512	≥ $7F00_H$	Overflow
11.7589	11.7589	32511	$7EFF_H$	Overload range
:	:	:	:	
10.0004	10.0004	27649	$6C01_H$	
10.0000	10.0000	27648	$6C00_H$	Nominal range
:	:	:	:	
0	0	0	0_H	
0		:	:	
	:	– 6912	$E500_H$	
		– 6913	$E4FF_H$	
		:	:	
	– 10.0000	– 27648	9400_H	
	10.0004	– 27649	$93FF_H$	Underdrive range
	:	:	:	
	– 11.7589	– 32512	8100_H	
	0	≤ – 32513	≤ $80FF_H$	Underrun

ET 200C Analog Output Module; AO 4 $\times$ 12 Bit (6ES7 144-0HF00-0XB0), Continued

Dimensional Drawing

Dimensional drawing for ET 200C analog output module; AO 4 $\times$ 12 Bit:

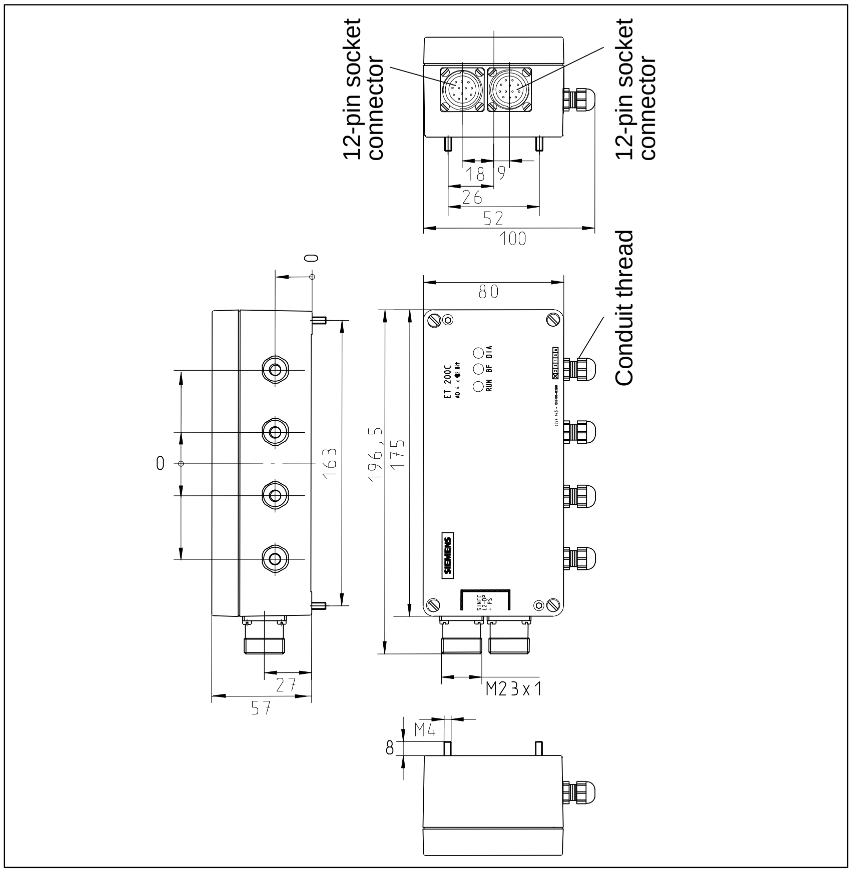
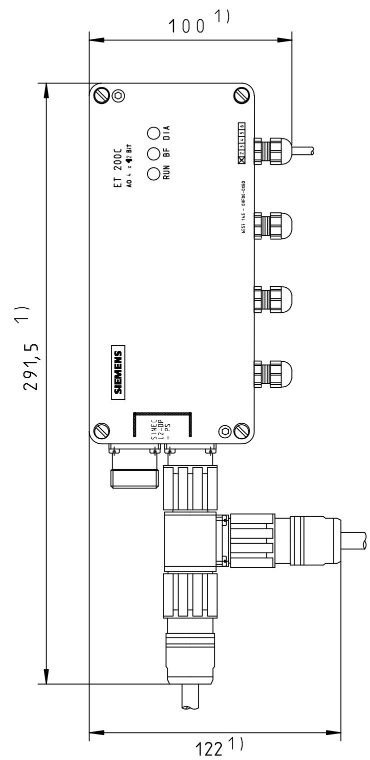


Figure 12-11 ET 200C Analog Output Module; AO 4 $\times$ 12 Bit: Dimensional Drawing

Dimensional Drawing

Dimensional drawing for ET 200C analog output module; AO 4 × 12 Bit with T connector:



1: The bending radii of the cable must be taken into account for installation.

Figure 12-12 ET 200C Analog Output Module; AO 4 × 12 Bit: Dimensional Drawing with T connector

Other ET 200C Components 13

In this Chapter

This chapter contains technical data on the following ET 200C components:

- T connector
- Power supply connector
- Programmer connector
- Cable
- Terminating resistor
- Adapter cable

13.1 T Connector (6ES5 762-2CT11)

Technical Specifications	
Connections	• 2 × 12- pin socket connector • 1 × 12-pin connector
Weight	approx. 160 g
Dimensions (W × H × L)	46 × 26 × 70 mm

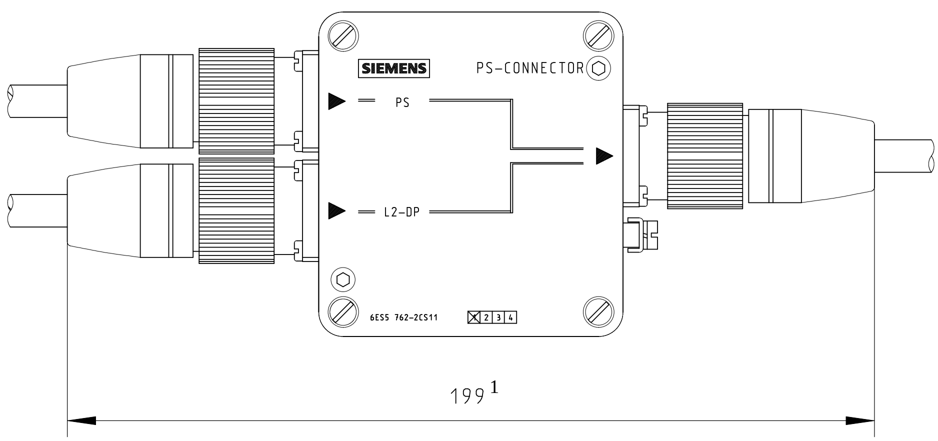
13.2 Power Supply Connector (6ES5 762-2CS11)

Technical Specifications	
Input voltage	
• Nominal value	24 V DC
• Permissible range	20.4 to 30.2 V DC
Output voltage	
• Nominal value	24 V DC
• Permissible range	20.4 to 30.2 V DC
Output current	
• Nominal value	4 A

Short-circuit protection	No
Electrical isolation	No
Insulation rating	to VDE 0160
Internal resistance R_I	typ. 10 mΩ
Connections	• 2 × 12-pin socket connector • 1 × 6-pin plug • Earthing screw
Weight	approx. 500 g
Dimensions (W × H × L)	80 × 57 × 125 mm

Dimension Drawing

Dimension drawing for the power supply connector with plug connectors (with pin/socket insert):



1 Observe the bending radii of the cable when installing the connector

Figure 13-1 Power Supply Connector: Dimension Drawing with Plug Connectors (with Pin/Socket Insert)

Power Supply Connector (6ES5 762-2CS11), Continued

Dimension Drawing

Dimension drawing for power supply connector:

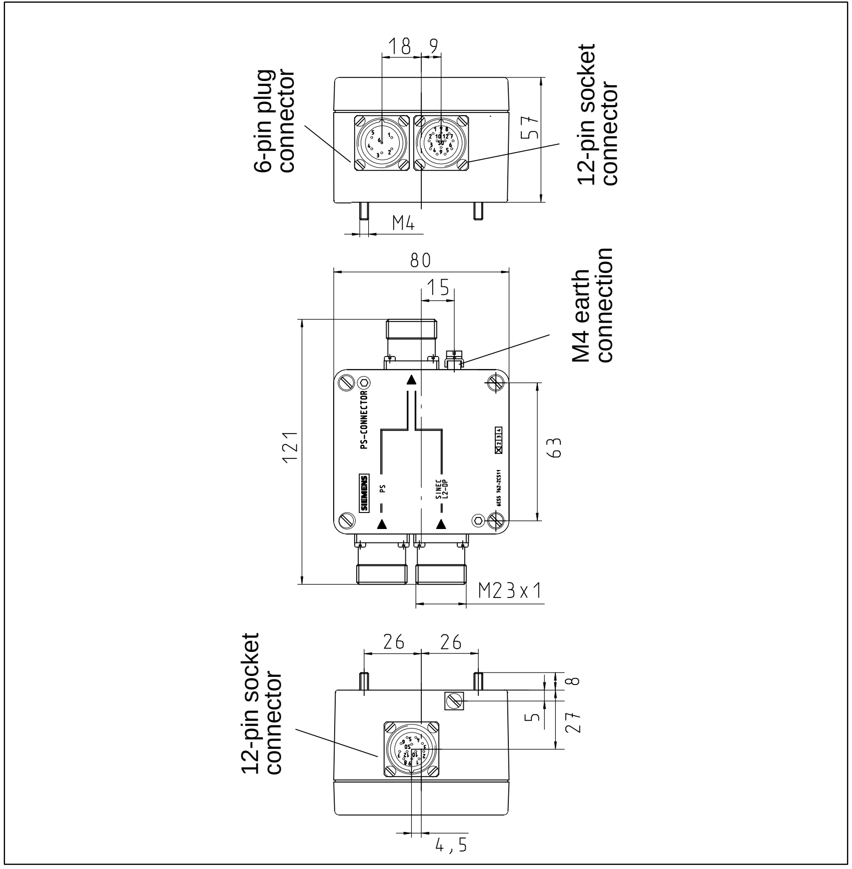


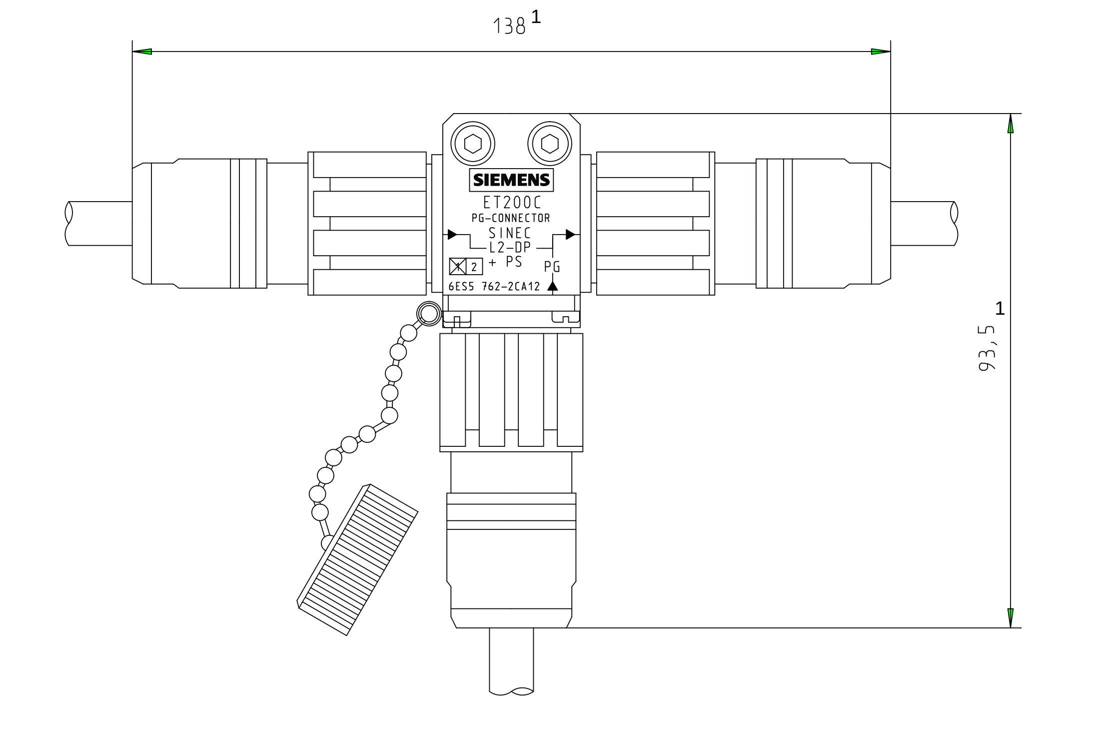
Figure 13-2 Power Supply Connector: Dimension Drawing

13.3 Programmer Connector (6ES5 762-2CA12)

Technical Specifications	
Connections	• 1 × 12-pin socket without metal cap • 1 × 12- pin socket with metal cap • 1 × 12-pin male connector
Weight	approx. 220 g
Dimensions (W × H × L)	55 × 30 × 63 mm

Dimension Drawing

Dimension drawing for programmer connector with plug connectors (with pin/socket insert):



1 Observe the bending radii of the cable when installing the module.

Figure 13-3 Programmer Connector: Dimension Drawing with Plug Connectors (with Pin/Socket Insert)

Programmer Connector (6ES5 762-2CA12), Continued

Dimension Drawing

Dimension drawing for Programmer Connector:

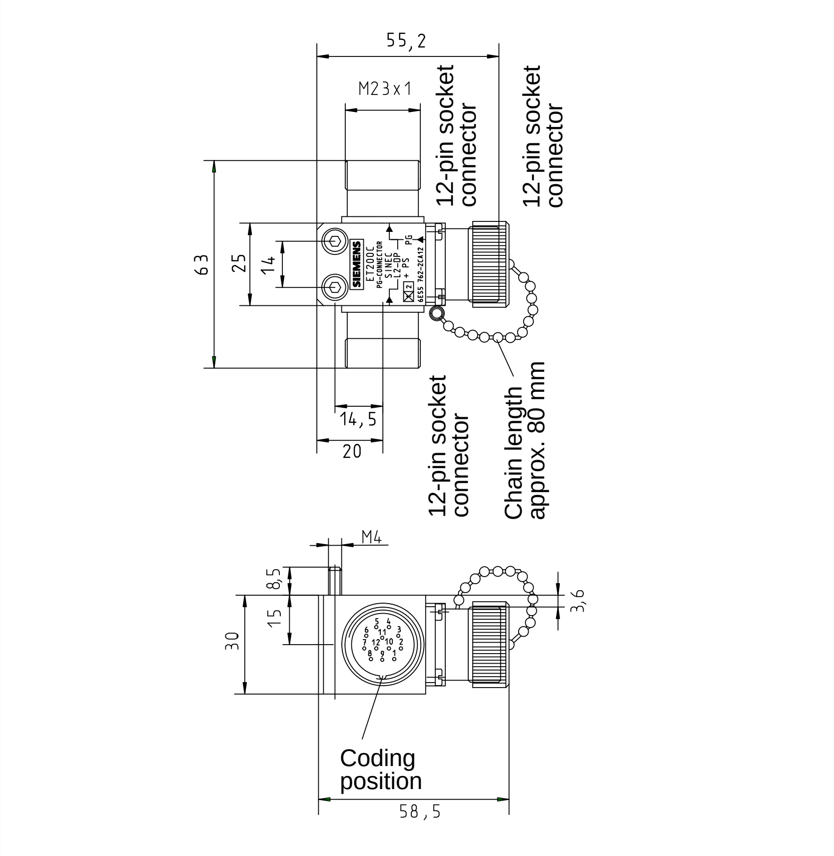


Figure 13-4 Programmer Connector: Dimension Drawing

13.4 Cables

Cables for SINEC L2-DP and Power Supply (5-core)[1]	
Surge impedance	approx. 135 to 160 Ω (f = 3 to 20 MHz)
Loop impedance	≤ 115 Ω/km
Effective capacity	30 nF/km
Attenuation	0.9 dB / 100 m (f = 200 kHz)
Permissible core cross-sectional area	
• for SINEC L2-DP	0.3 mm^2 to 0.5 mm^2
• for PS connector	min. 0.75 mm^2
Outer diameter of the 5-core bus cable	8 mm
Version	Single-pair bus cable and 3 supply lines with common screen

1 You can also use this cable for feeding the power supply to the power supply connector or for feeding the external load voltage.

Cables for SINEC L2-DP (2-core)	
Surge impedance	approx. 135 to 160 Ω (f = 3 to 20 MHz)
Loop impedance	≤ 115 Ω/km
Effective capacity	30 nF/km
Attenuation	0.9 dB / 100 m (f = 200 kHz)
Permissible core cross-sectional area	
• for SINEC L2-DP	0.3 mm^2 to 0.5 mm^2
Outer diameter of the 2-core bus cable	8 mm
Version	Single-pair bus cable

13.5 Terminating Resistor (6ES5 755-2CA11)

Technical Specifications	
Connection	1 × 12-pin socket in metal cap
Weight	approx. 70 g
Dimensions (diameter × H)	∅26 × 40 mm

13.6 Adapter Cable (6ES5 755-8CA11)

Technical Specifications	
Connections	• 1×9-pin D sub connector • 1×12-pin connector
Cable length (without plug-in connector)	20 cm
Smallest permissible bending radius	$7.5 \times D_{Max}$

Pin Assignments of the ET 200C Modules A

In this Chapter

This chapter describes the pin assignments of the analog and digital modules in ET 200C.

A.1 Pin Assignments of ET 200C Digital Modules

Pin Assignments

The pin assignments for the ports of all digital modules are summarized below. See section 4.3 for more information on ET 200C wiring.

Table A-1 Pin Assignment of Bus Connector for ET 200 C Digital Modules, only SINEC L2-DP Connected

Pin	Assignment	Pin	Assignment
1	reserved	7	reserved
2	A (green)	8	reserved
3	reserved	9	reserved
4	B (red)	10	reserved
5	reserved	11	reserved
6	reserved	12	reserved

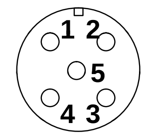
Table A-2 Pin Assignment of Bus Connector for ET 200C Digital Modules, only Separate Power Supply Connected

Pin	Assignment	Pin	Assignment
1	reserved	7	P 24 V
2	reserved	8	M 24 V
3	reserved	9	PE
4	reserved	10	reserved
5	reserved	11	reserved
6	reserved	12	reserved

Table A-3 Pin Assignment of Bus Connector for ET 200C Digital Modules, SINEC L2-DP and Power Supply Combined in a Common Cable

Pin	Assignment	Pin	Assignment
1	reserved	7	P 24 V
2	A (green)	8	M 24 V
3	reserved	9	PE
4	B (red)	10	reserved
5	reserved	11	reserved
6	reserved	12	reserved

Table A-4 Pin Assignment, Inputs of ET 200C; DI 8 × DC 24V and ET 200C; DI 16/DO 16 × DC 24V/2A (6ES7 143-0BL00-0BX0)

Pin	Input	View
1	24 V DC[1]	
2	not used	
3	Ground	
4	Signal	View: mating side
5	PE	

1 The 24 V DC at pin 1 is the power supply provided by the module for the sensor.

Table A-5 Pin Assignment, Outputs of ET 200C; DO 8 × DC 24V/0.5A, ET 200C; DO 8 × DC 24V/2A and ET 200C; DI 16/DO 16 × DC 24V/2A (6ES7 143-0BL00-0XB0)

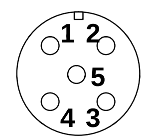
Pin	Output	View
1	not used	
2	not used	
3	Ground	
4	Signal	View: mating side
5	PE	

Table A-6 Pin Assignment, Inputs and Outputs of ET 200C; DI 16/DO 16 × DC 24V/2A (6ES7 143-0BL10-0XB0)

Terminal	Assignment
I0.0 ... I0.7	I0: input .0 7
I1.0 ... I1.7	I1: input .0 7
Q0.0 ... Q0.7	Q0: output .0 7
Q1.0 ... Q1.7	Q1: output .0 7
24V	24 V DC (sensor supply)
0V	Ground (sensor supply)
PE	PE
M1	Ground (UL_1)
M2	Ground (UL_2)

Pin Assignments of ET 200C Digital Modules, Continued

Table A-7 Pin Assignment for Load Voltage Supply, ET 200C Modules with Outputs

Pin	Load voltage supply
1	PE
2	P 24 V
3	M 24 V
4	not used
5	not used
6	not used

Table A-8 Pin Assignment, External Power Supply at PSU Feed

Pin	Power supply
1	PE
2	P 24 V
3	M 24 V
4	not used
5	not used
6	not used

A.2 Pin Assignments of ET 200C Analog Modules

Pin Assignments

The pin and terminal assignments for the ports of all analog modules are summarized below. See section 4.3 for more information on ET 200C wiring.

Table A-9 Pin Assignment of Bus Connector for ET 200C Analog Modules, only SINEC L2-DP Connected

Pin	Assignment	Pin	Assignment
1	reserved	7	reserved
2	A (green)	8	reserved
3	reserved	9	reserved
4	B (red)	10	reserved
5	reserved	11	reserved
6	reserved	12	reserved

Table A-10 Pin Assignment of Bus Connector for ET 200C Analog Modules, only Separate Power Supply Connected

Pin	Assignment	Pin	Assignment
1	reserved	7	P 24 V
2	reserved	8	M 24 V
3	reserved	9	PE
4	reserved	10	reserved
5	reserved	11	reserved
6	reserved	12	reserved

Table A-11 Pin Assignment of Bus Connector for ET 200C Analog Modules, SINEC L2-DP and Power Supply Combined in a Common Cable

Pin	Assignment	Pin	Assignment
1	reserved	7	P 24 V
2	A (green)	8	M 24 V
3	reserved	9	PE
4	B (red)	10	reserved
5	reserved	11	reserved
6	reserved	12	reserved

Pin Assignments of ET 200C Analog Modules, Continued

Table A-12 Pin Assignment, Inputs of ET 200C; AI 4/8 × 12 Bit (6ES7 144-0KH00-0XB0)

Terminal	Assignment for connection of ...				
	channel	**resistance sensor**	**channel**	**thermocouple**	**voltage sensor**
1		not used		Compensator (+)	not used
2		not used		Compensator (–)	not used
3	CH0	Measuring line (+)	CH0	Measuring line (+)	Measuring line (+)
4		Measuring line (–)		Measuring line (–)	Measuring line (–)
5		Constant current line I_{C+}	CH1	Measuring line (+)	Measuring line (+)
6		Constant current line I_{C-}		Measuring line (–)	Measuring line (–)
7	CH1	Measuring line (+)	CH2	Measuring line (+)	Measuring line (+)
8		Measuring line (–)		Measuring line (–)	Measuring line (–)
9		Constant current line I_{C+}	CH3	Measuring line (+)	Measuring line (+)
10		Constant current line I_{C-}		Measuring line (–)	Measuring line (–)
11	CH2	Measuring line (+)	CH4	Measuring line (+)	Measuring line (+)
12		Measuring line (–)		Measuring line (–)	Measuring line (–)
13		Constant current line I_{C+}	CH5	Measuring line (+)	Measuring line (+)
14		Constant current line I_{C-}		Measuring line (–)	Measuring line (–)
15	CH3	Measuring line (+)	CH6	Measuring line (+)	Measuring line (+)
16		Measuring line (–)		Measuring line (–)	Measuring line (–)
17		Constant current line I_{C+}	CH7	Measuring line (+)	Measuring line (+)
18		Constant current line I_{C-}		Measuring line (–)	Measuring line (–)
19		Analog ground (M_{ANA})		Analog ground (M_{ANA})	
20		Analog ground (M_{ANA})		Analog ground (M_{ANA})	

Table A-13 Pin Assignment, Inputs of ET 200C; AI 4 × 12 Bit (6ES7 144-0HF00-0XB0)

Channel	Terminal	Assignment
CH0	1	Measuring line (+)
	2	Measuring line (–)
CH1	3	Measuring line (+)
	4	Measuring line (–)
CH2	5	Measuring line (+)
	6	Measuring line (–)
CH3	7	Measuring line (+)
	8	Measuring line (–)
	9	Analog ground (M_{ANA})
	10	Analog ground (M_{ANA})

Pin Assignments of ET 200C Analog Modules, Continued

Table A-14 Pin Assignment, Outputs of ET 200C; AO 4 × 12 Bit (6ES7 145-0HF00-0XB0)

Channel	Terminal	4-wire layout	2-wire layout
	1	not used	
	2	not used	
CH0	3	Analog output “Voltage” (+)	Analog output “Current or Voltage” (+)
	4	Analog output “Voltage” (–)	Analog output “Current or Voltage” (–)
	5	Sensor line (S+)	not used
	6	Sensor line (S–)	not used
CH1	7	Analog output “Voltage” (+)	Analog output “Current or Voltage” (+)
	8	Analog output “Voltage” (–)	Analog output “Current or Voltage” (–)
	9	Sensor line (S+)	not used
	10	Sensor line (S–)	not used
CH2	11	Analog output “Voltage” (+)	Analog output “Current or Voltage” (+)
	12	Analog output “Voltage” (–)	Analog output “Current or Voltage” (–)
	13	Sensor line (S+)	not used
	14	Sensor line (S–)	not used
CH3	15	Analog output “Voltage” (+)	Analog output “Current or Voltage” (+)
	16	Analog output “Voltage” (–)	Analog output “Current or Voltage” (–)
	17	Sensor line (S+)	not used
	18	Sensor line (S–)	not used
	19	not used	
	20	not used	

Type Files

B

Provision of Type Files

All type files needed for the purposes of configuring ET 200 C with COM ET 200 V4.x and COM ET 200 Windows are available from the Interface Center. You can fetch the type files you need by modem by dialing the following mailbox number:

Phone: (+ 49 for Germany) 911/73-7972

Provision of GSD Files

If you want to connect ET 200C modules to DP masters which are not capable of processing the type files (e.g. other-vendor DP masters), you need a device master file (or GSD file as it is also known) to DIN E 19245, Part 3. All device master data for ET 200U/B/C is available on a diskette which you can order under the following order number:

Diskette with device master data: 6ES7 190-1AA00-0AA0

Alternatively, you can fetch the device master data by modem from the Interface Center by dialing the following mailbox number:

Phone: (+ 49 for Germany) 911/73-7972

In this Chapter

This chapter contains the listings of all type files for configuring your system with COM ET 200 V4.x (ET 200C digital modules) and COM ET 200 Windows (ET 200C analog modules). If the need arises, you can use these listings to generate a missing type file for this version of COM ET 200 with the aid of an ASCII editor.

For more information on installing type files for COM ET 200 V4.x, see section 5.1, For more information on installing type files for COM ET 200 Windows, see the manual entitled *ET 200 Distributed I/O System* (Order No. 6ES5 998-3ES12), section 7.3.

The type files for configuring the digital modules of ET 200C with COM ET 200 Windows are supplied with COM ET 200 Windows and do not have to be subsequently installed.

B.1 Type Files, ET 200C Digital Modules for COM ET 200 V4.x

Type Files

In order to configure an ET 200C with COM ET 200 V4.x, you must make sure that the type file of the ET 200C module is installed in the directory of COM ET 200 V4.x.

The designations of the type files for ET 200C digital modules with COM ET 200 V4.x are as follows:

Table B-1 Designations of Type Files for ET 200C Digital Modules

Station type	Order number	Type file
C-8DI DP	6ES7 141-0BF00-0XB0	SN8010TD.200
C-8DO DP	6ES7 142-0BF00-0XB0	SN8011TD.200
C-8DO/2A DP	6ES7 142-0BF10-0XB0	SI8012TD.200
C-16DI/16DO/2A DP	6ES7 143-0BL00-0XB0, 6ES7 143-0BL10-0XB0	SI8013TD.200

B.1.1 Type File SN8010TD.200: COM ET 200 V4.x - C-8DI DP

Type file SN8010TD.200: COM ET 200 V4.x - C-8DI DP	[char.]
ET200C 8DE DC 24V with LSPM 2 MLFB<6ES7 141-0BF00-0XB0> Ident 0x8010H	[69 char.]
V4.0;	[5 char.]
C-8DI DP;	[18 char.]
SIEMENS ;	[11 char.]
SIMATIC_S7;	[11 char.]
ET200 ;	[11 char.]
ET200C/24V/DP ;	[16 char.]
32784;	[6 char.]
Y;	[2 char.]
Y;	[2 char.]
Y;	[2 char.]
Y;	[2 char.]
Y;	[2 char.]
Y;	[2 char.]
N;	[2 char.]
N;	[2 char.]
N;	[2 char.]
N;	[2 char.]
N;	[2 char.]
N;	[2 char.]
N;	[2 char.]
N;	[2 char.]
00000;	[6 char.]
1111011111;	[11 char.]
032;	[4 char.]
032;	[4 char.]
032;	[4 char.]
015;	[4 char.]
012;	[4 char.]
PV005;	[6 char.]
00;	[3 char.]
00;	[3 char.]
00;	[3 char.]
00;	[3 char.]
00;	[3 char.]
PSL000;	[7 char.]
KV000;	[6 char.]
SY;	[3 char.]
DKM000;	[7 char.]

B.1.2 Type File SN8011TD.200: COM ET 200 V4.x - C-8DO DP

Type file SN8011TD.200: COM ET 200 V4.x - C-8DO DP	[char.]
ET200C 8DA DC 24V / 0.5A with LSPM 2 MLFB<6ES7 142-0BF00-0XB0> Ident 0x8011 H	[76 char.]
V4.0;	[5 char.]
C-8DO DP;	[18 char.]
SIEMENS ;	[11 char.]
SIMATIC_S7;	[11 char.]
ET200 ;	[11 char.]
ET200C/24V/DP ;	[16 char.]
32785;	[6 char.]
Y;	[2 char.]
Y;	[2 char.]
Y;	[2 char.]
Y;	[2 char.]
Y;	[2 char.]
Y;	[2 char.]
N;	[2 char.]
N;	[2 char.]
N;	[2 char.]
N;	[2 char.]
N;	[2 char.]
N;	[2 char.]
N;	[2 char.]
N;	[2 char.]
00000;	[6 char.]
1111011111;	[11 char.]
032;	[4 char.]
032;	[4 char.]
032;	[4 char.]
015;	[4 char.]
012;	[4 char.]
PV005;	[6 char.]
00;	[3 char.]
00;	[3 char.]
00;	[3 char.]
00;	[3 char.]
00;	[3 char.]
PSL000;	[7 char.]
KV000;	[6 char.]
SY;	[3 char.]
DKM000;	[7 char.]

B.1.3 Type File SN8012TD.200: COM ET 200 V4.x - C-8DO/2A DP

Type file SN8012TD.200: COM ET 200 V4.x - C-8DO/2A DP	[char.]
ET200C 8DA DC 24V / 2A with LSPM 2 MLFB<6ES7 142-0BF10-0XB0> Ident 0x8012 H	[74 char.]
V4.0;	[5 char.]
C-8DO/2A DP;	[18 char.]
SIEMENS ;	[11 char.]
SIMATIC_S7;	[11 char.]
ET200 ;	[11 char.]
ET200C/24V/DP ;	[16 char.]
32786;	[6 char.]
Y;	[2 char.]
Y;	[2 char.]
Y;	[2 char.]
Y;	[2 char.]
Y;	[2 char.]
Y;	[2 char.]
N;	[2 char.]
N;	[2 char.]
N;	[2 char.]
N;	[2 char.]
N;	[2 char.]
N;	[2 char.]
N;	[2 char.]
N;	[2 char.]
00000;	[6 char.]
1111011111;	[11 char.]
032;	[4 char.]
032;	[4 char.]
032;	[4 char.]
015;	[4 char.]
012;	[4 char.]
PV005;	[6 char.]
00;	[3 char.]
00;	[3 char.]
00;	[3 char.]
00;	[3 char.]
00;	[3 char.]
PSL000;	[7 char.]
KV000;	[6 char.]
SY;	[3 char.]
DKM000;	[7 char.]

B.1.4 Type File SN8013TD.200: COM ET 200 V4.x - C-16DI/16DO/2A DP

Type file SN8013TD.200: COM ET 200 V4.x - C-16DI/16DO/2A DP	[char.]
ET200C 16DE / 16DA DC 24V / 0.5A MLFB<6ES7 143-0BL.0-0XB0> Ident 0x8013 H	[73 char.]
V4.0;	[5 char.]
C-16DI/16DO/2A DP;	[18 char.]
SIEMENS ;	[11 char.]
SIMATIC_S7;	[11 char.]
ET200 ;	[11 char.]
ET200C/24V/DP ;	[16 char.]
32787;	[6 char.]
Y;	[2 char.]
Y;	[2 char.]
Y;	[2 char.]
Y;	[2 char.]
Y;	[2 char.]
Y;	[2 char.]
N;	[2 char.]
N;	[2 char.]
N;	[2 char.]
N;	[2 char.]
N;	[2 char.]
N;	[2 char.]
N;	[2 char.]
N;	[2 char.]
00000;	[6 char.]
1111011111;	[11 char.]
032;	[4 char.]
032;	[4 char.]
032;	[4 char.]
015;	[4 char.]
012;	[4 char.]
PV005;	[6 char.]
00;	[3 char.]
00;	[3 char.]
00;	[3 char.]
00;	[3 char.]
00;	[3 char.]
PSL000;	[7 char.]
KV000;	[6 char.]
SY;	[3 char.]
DKM000;	[7 char.]

B.2 Type Files of ET 200C Analog Modules for COM ET 200 Windows

Type Files

In order to configure an ET 200C with COM ET 200 Windows, you must make sure that the type file of the ET 200C module is installed in the directory of COM ET 200 Windows.

The designations of the type files for ET 200C analog modules with COM ET 200 Windows are as follows:

Table B-2 Designations of Type Files for ET 200C Analog Modules

Station type	Order number	Type file
C-4/8AI DP	6ES7 144-0KH00-0XB0	SI800FAD.200
C-4AI DP	6ES7 144-0HF00-0XB0	SI800EAD.200
C-4AO DP	6ES7 145-0HF00-0XB0	SI800DAD.200

B.2.1 Type File SI800FAD.200: COM ET 200 Windows - C-4/8AI DP

Type file SI800FAD.200: COM ET 200 Windows - C-4/8AI DP	[char.]
ET 200C AI4/8 x 12 Bit, MLFB<6ES7 144-0KH00-0XB0>, Siemens-Slave, V 1.0	[71 char.]
V5.x;	[5 char.]
C-4/8AI DP;	[18 char.]
SIEMENS ;	[11 char.]
ET 200C ;	[11 char.]
ET 200 ;	[11 char.]
ET200C/ANALOG ;	[16 char.]
32783;	[6 char.]
Y;	[2 char.]
Y;	[2 char.]
Y;	[2 char.]
N;	[2 char.]
Y;	[2 char.]
N;	[2 char.]
N;	[2 char.]
N;	[2 char.]
N;	[2 char.]
N;	[2 char.]
N;	[2 char.]
N;	[2 char.]
N;	[2 char.]
N;	[2 char.]
00030;	[6 char.]
0001011111;	[11 char.]
016;	[4 char.]
000;	[4 char.]
004;	[4 char.]
028;	[4 char.]
043;	[4 char.]
PV036;	[6 char.]
00;	[3 char.]
00;	[3 char.]
00;	[3 char.]
07;	[3 char.]
81;	[3 char.]
04;	[3 char.]
00;	[3 char.]
00;	[3 char.]
00;	[3 char.]
00;	[3 char.]
13;	[3 char.]
81;	[3 char.]
04;	[3 char.]
01;	[3 char.]
00;	[3 char.]
00;	[3 char.]
00;	[3 char.]
00;	[3 char.]
00;	[3 char.]
00;	[3 char.]
00;	[3 char.]
00;	[3 char.]

Type file SI800FAD.200: COM ET 200 Windows - C-4/8AI DP	[char.]
00;	[3 char.]
00;	[3 char.]
00;	[3 char.]
00;	[3 char.]
00;	[3 char.]
00;	[3 char.]
00;	[3 char.]
07;	[3 char.]
81;	[3 char.]
02;	[3 char.]
00;	[3 char.]
00;	[3 char.]
08;	[3 char.]
00;	[3 char.]
PSL023;	[7 char.]
PS015”Enable diagnostics CH 0/1 ”BIT0 ”0”0”1”HI001”;	[56 char.]
PS015”Enable diagnostics CH 2/3 ”BIT1 ”0”0”1”HI001”;	[56 char.]
PS015”Enable diagnostics CH 4/5 ”BIT2 ”0”0”1”HI001”;	[56 char.]
PS015”Enable diagnostics CH 6/7 ”BIT3 ”0”0”1”HI001”;	[56 char.]
PS016”Enable wire breakage msg. CH0/1”BIT0 ”0”0”1”HI005”;	[56 char.]
PS016”Enable wire breakage msg. CH2/3”BIT1 ”0”0”1”HI005”;	[56 char.]
PS016”Enable wire breakage msg. CH4/5”BIT2 ”0”0”1”HI005”;	[56 char.]
PS016”Enable wire breakage msg. CH6/7”BIT3 ”0”0”1”HI005”;	[56 char.]
PS022”Enable diagnostics alarm ”BIT6 ”0”0”1”HI005”;	[56 char.]
PS022”Enable limit value alarm ”BIT7 ”0”0”1”HI006”;	[56 char.]
PS023”Integration time CH 0/1 ”BGR02”10”0”3”HI002”;	[57 char.]
PS023”Integration time CH 2/3 ”BGR22”10”0”3”HI002”;	[57 char.]
PS023”Integration time CH 4/5 ”BGR42”10”0”3”HI002”;	[57 char.]
PS023”Integration time CH 6/7 ”BGR62”10”0”3”HI002”;	[57 char.]
PS024”Measurement type/measuring range CH0/1”BYTE”0”0”231”HI003”;	[58 char.]
PS025”Measurement type/measuring range CH2/3”BYTE”0”0”231”HI003”;	[58 char.]
PS026”Measurement type/measuring range CH4/5”BYTE”0”0”231”HI003”;	[58 char.]
PS027”Measurement type/measuring range CH6/7”BYTE”0”0”231”HI003”;	[58 char.]
PS028”Upper limit value CH 0 ”INT ”0”–32768”32767”HI000”;	[65 char.]
PS030”Lower limit value CH 0 ”INT ”0”–32768”32767”HI000”;	[66 char.]
PS032”Upper limit value CH 2 ”INT ”0”–32768”32767”HI000”;	[65 char.]
PS034”Lower limit value CH 2 ”INT ”0”–32768”32767”HI000”;	[66 char.]
PS041”Measured value presentation ”BIT2 ”0”0”1”HI004”;	[56 char.]
HTT006;	[7 char.]
HI001;	[6 char.]
L2;	[3 char.]
”disable ”00000”;	[39 char.]
”enable (enable diag. alarm)”00001”;	[39 char.]
HI002;	[6 char.]
L4;	[3 char.]
”Integration time 2.5 ms ”00000”;	[39 char.]
”Integration time 16.7 ms ”00001”;	[40 char.]
”Integration time 20 ms ”00002”;	[39 char.]
”Integration time 100 ms ”00003”;	[39 char.]
HI003;	[6 char.]
L41;	[4 char.]
”Channel not activated ”00000”;	[39 char.]
”Measurement type +/– 80 mV ”00017”;	[39 char.]
”Measurement type +/– 0.25 V ”00018”;	[39 char.]
”Measurement type +/– 0.5 V ”00019”;	[39 char.]
”Measurement type +/– 1 V ”00020”;	[39 char.]

Type file SI800FAD.200: COM ET 200 Windows - C-4/8AI DP	[char.]
”Measurement type 48 ohms resistance ”00065”;	[39 char.]
”Measurement type 150 ohms resistance ”00066”;	[39 char.]
”Measurement type 300 ohms resistance ”00068”;	[39 char.]
”Measurement type 600 ohms resistance ”00070”;	[39 char.]
”Measurement type Pt100 climatic ”00128”;	[39 char.]
”Measurement type Ni100 climatic ”00129”;	[39 char.]
”Measurement type Pt100 standard ”00130”;	[39 char.]
”Measurement type Ni100 standard ”00131”;	[39 char.]
”Measurement type th.cpl, type N int. ”00161”;	[39 char.]
”Measurement type th.cpl, type E int. ”00162”;	[39 char.]
”Measurement type th.cpl, type J int. ”00165”;	[39 char.]
”Measurement type th.cpl, type L int. ”00166”;	[39 char.]
”Measurement type th.cpl, type T int. ”00167”;	[39 char.]
”Measurement type th.cpl, type K int. ”00168”;	[39 char.]
”Measurement type th.cpl, type U int. ”00169”;	[39 char.]
”Measurement type th.cpl, type N int./lin. ”00209”;	[39 char.]
”Measurement type th.cpl, type E int./lin. ”00210”;	[39 char.]
”Measurement type th.cpl, type J int./lin. ”00213”;	[39 char.]
”Measurement type th.cpl, type L int./lin. ”00214”;	[39 char.]
”Measurement type th.cpl, type T int./lin. ”00215”;	[39 char.]
”Measurement type th.cpl, type K int./lin. ”00216”;	[39 char.]
”Measurement type th.cpl, type U int./lin. ”00217”;	[39 char.]
”Measurement type th.cpl, type N ext. ”00177”;	[39 char.]
”Measurement type th.cpl, type E ext. ”00178”;	[39 char.]
”Measurement type th.cpl, type J ext. ”00181”;	[39 char.]
”Measurement type th.cpl, type L ext. ”00182”;	[39 char.]
”Measurement type th.cpl, type T ext. ”00183”;	[39 char.]
”Measurement type th.cpl, type K ext. ”00184”;	[39 char.]
”Measurement type th.cpl, type U ext. ”00185”;	[39 char.]
”Measurement type th.cpl, type N ext./lin. ”00225”;	[39 char.]
”Measurement type th.cpl, type E ext./lin. ”00226”;	[39 char.]
”Measurement type th.cpl, type J ext./lin. ”00229”;	[39 char.]
”Measurement type th.cpl, type L ext./lin. ”00230”;	[39 char.]
”Measurement type th.cpl, type T ext./lin. ”00231”;	[39 char.]
”Measurement type th.cpl, type K ext./lin. ”00232”;	[39 char.]
”Measurement type th.cpl, type U ext./lin. ”00233”;	[39 char.]
HI004;	[6 char.]
L2;	[3 char.]
”Measured value presentation, SIMATIC S5”00000”;	[39 char.]
”Measured value presentation, SIMATIC S7”00001”;	[39 char.]
HI005;	[6 char.]
L2;	[3 char.]
”disable ”00000”;	[39 char.]
”enable ”00001”;	[39 char.]
HI006;	[6 char.]
L2;	[3 char.]
”disable ”00000”;	[39 char.]
”enable (specify limit value) ”00001”;	[39 char.]
KV004;	[6 char.]
004”000”000”143”192”;	[21 char.]
004”000”000”155”064”;	[21 char.]
004”000”000”143”192”;	[21 char.]
067”071”000”021”197”;	[21 char.]
SY;	[3 char.]
DKM056;	[7 char.]
DBO004”0”Module fault ”1”;	[43 char.]
DBO004”1”Internal error ”1”;	[43?char.]

Type file SI800FAD.200: COM ET 200 Windows - C-4/8AI DP		[char.]
DBO004”2”External error (wire break)	”1”;	[43 char.]
DBO004”3”Channel is errored	”1”;	[43 char.]
DBO004”6”Module not parameterized	”1”;	[43 char.]
DBO004”7”Module parameterization error	”1”;	[43 char.]
DBO005”4”Channel information waiting	”1”;	[43 char.]
DBO007”4”ADU error	”1”;	[43 char.]
DBO012”0”Parameterization error CH 0	”1”;	[43 char.]
DBO012”1”Common-mode error CH 0	”1”;	[43 char.]
DBO012”3”Short circuit to M CH 0	”1”;	[43 char.]
DBO012”4”Wire break CH 0	”1”;	[43 char.]
DBO012”6”Measuring range undershot	CH0”1”;	[43 char.]
DBO012”7”Measuring range overshot	CH0”1”;	[43 char.]
DBO013”0”Parameterization error CH 1	”1”;	[43 char.]
DBO013”1”Common-mode error CH 1	”1”;	[43 char.]
DBO013”3”Short circuit to M CH 1	”1”;	[43 char.]
DBO013”4”Wire break CH 1	”1”;	[43 char.]
DBO013”6”Measuring range undershot	CH1”1”;	[43 char.]
DBO013”7”Measuring range overshot	CH1”1”;	[43 char.]
DBO014”0”Parameterization error CH 2	”1”;	[43 char.]
DBO014”1”Common-mode error CH 2	”1”;	[43 char.]
DBO014”3”Short circuit to M CH 2	”1”;	[43 char.]
DBO014”4”Wire break CH 2	”1”;	[43 char.]
DBO014”6”Measuring range undershot	CH2”1”;	[43 char.]
DBO014”7”Measuring range overshot	CH2”1”;	[43 char.]
DBO015”0”Parameterization error CH 3	”1”;	[43 char.]
DBO015”1”Common-mode error CH 3	”1”;	[43 char.]
DBO015”3”Short circuit to M CH 3	”1”;	[43 char.]
DBO015”4”Wire break CH 3	”1”;	[43 char.]
DBO015”6”Measuring range undershot	CH3”1”;	[43 char.]
DBO015”7”Measuring range overshot	CH3”1”;	[43 char.]
DBO016”0”Parameterization error CH 4	”1”;	[43 char.]
DBO016”1”Common-mode error CH 4	”1”;	[43 char.]
DBO016”3”Short circuit to M CH 4	”1”;	[43 char.]
DBO016”4”Wire break CH 4	”1”;	[43 char.]
DBO016”6”Measuring range undershot	CH4”1”;	[43 char.]
DBO016”7”Measuring range overshot	CH4”1”;	[43 char.]
DBO017”0”Parameterization error CH 5	”1”;	[43 char.]
DBO017”1”Common-mode error CH 5	”1”;	[43 char.]
DBO017”3”Short circuit to M CH 5	”1”;	[43 char.]
DBO017”4”Wire break CH 5	”1”;	[43 char.]
DBO017”6”Measuring range undershot	CH5”1”;	[43 char.]
DBO017”7”Measuring range overshot	CH5”1”;	[43 char.]
DBO018”0”Parameterization error CH 6	”1”;	[43 char.]
DBO018”1”Common-mode error CH 6	”1”;	[43 char.]
DBO018”3”Short circuit to M CH 6	”1”;	[43 char.]
DBO018”4”Wire break CH 6	”1”;	[43 char.]
DBO018”6”Measuring range undershot	CH6”1”;	[43 char.]
DBO018”7”Measuring range overshot	CH6”1”;	[43 char.]
DBO019”0”Parameterization error CH 7	”1”;	[43 char.]
DBO019”1”Common-mode error CH 7	”1”;	[43 char.]
DBO019”3”Short circuit to M CH 7	”1”;	[43 char.]
DBO019”4”Wire break CH 7	”1”;	[43 char.]
DBO019”6”Measuring range undershot	CH7”1”;	[43 char.]
DBO019”7”Measuring range overshot	CH7”1”;	[43 char.]
DKK000;		[7 char.]
ET_200C;		[8 char.]
ISNONAME;		[9 char.]

Type file SI800FAD.200: COM ET 200 Windows - C-4/8AI DP	[char.]
SO000;	[6 char.]
016;	[4 char.]
MLFB000;	[8 char.]
LSK000;	[7 char.]
000;	[4 char.]
SPT000;	[7 char.]
HTT000;	[7 char.]

B.2.2 Type File SI800EAD.200: COM ET 200 Windows - C-4AI DP

Type file SI800EAD.200: COM ET 200 Windows - C-4AI DP	[char.]
ET 200C AI 4 x 12 Bit, MLFB<6ES7 144-0HF00-0XB0>, Siemens-Slave, V 1.0	[70 char.]
V5.x;	[5 char.]
C-4AI DP;	[18 char.]
SIEMENS ;	[11 char.]
ET 200C ;	[11 char.]
ET 200 ;	[11 char.]
ET200C/ANALOG ;	[16 char.]
32782;	[6 char.]
Y;	[2 char.]
Y;	[2 char.]
Y;	[2 char.]
N;	[2 char.]
Y;	[2 char.]
N;	[2 char.]
N;	[2 char.]
N;	[2 char.]
N;	[2 char.]
N;	[2 char.]
N;	[2 char.]
N;	[2 char.]
N;	[2 char.]
N;	[2 char.]
00020;	[6 char.]
0001011111;	[11 char.]
008;	[4 char.]
000;	[4 char.]
004;	[4 char.]
028;	[4 char.]
043;	[4 char.]
PV036;	[6 char.]
00;	[3 char.]
00;	[3 char.]
00;	[3 char.]
07;	[3 char.]
81;	[3 char.]
04;	[3 char.]
00;	[3 char.]
00;	[3 char.]
00;	[3 char.]
00;	[3 char.]
13;	[3 char.]
81;	[3 char.]
04;	[3 char.]
01;	[3 char.]
00;	[3 char.]
00;	[3 char.]
00;	[3 char.]
00;	[3 char.]
00;	[3 char.]
00;	[3 char.]
00;	[3 char.]
00;	[3 char.]

Type file SI800EAD.200: COM ET 200 Windows - C-4AI DP	[char.]
00;	[3 char.]
00;	[3 char.]
00;	[3 char.]
00;	[3 char.]
00;	[3 char.]
00;	[3 char.]
00;	[3 char.]
07;	[3 char.]
81;	[3 char.]
02;	[3 char.]
00;	[3 char.]
00;	[3 char.]
08;	[3 char.]
00;	[3 char.]
PSL015;	[7 char.]
PS015”Enable diagnostics CH 0 ”BIT0 ”0”0”1”HI001”;	[56 char.]
PS015”Enable diagnostics CH 1 ”BIT1 ”0”0”1”HI001”;	[56 char.]
PS015”Enable diagnostics CH 2 ”BIT2 ”0”0”1”HI001”;	[56 char.]
PS015”Enable diagnostics CH 3 ”BIT3 ”0”0”1”HI001”;	[56 char.]
PS022”Enable diagnostics alarm ”BIT6 ”0”0”1”HI004”;	[56 char.]
PS022”Enable limit value alarm ”BIT7 ”0”0”1”HI005”;	[56 char.]
PS024”Measurement type/measuring range CH 0 ”BYTE ”0”0”35”HI002”;	[57 char.]
PS025”Measurement type/measuring range CH 1 ”BYTE ”0”0”35”HI002”;	[57 char.]
PS026”Measurement type/measuring range CH 2 ”BYTE ”0”0”35”HI002”;	[57 char.]
PS027”Measurement type/measuring range CH 3 ”BYTE ”0”0”35”HI002”;	[57 char.]
PS028”Upper limit value CH 0 ”INT ”0”–32768”32767”HI000”;	[69 char.]
PS030”Lower limit value CH 0 ”INT ”0”–32768”32767”HI000”;	[70 char.]
PS032”Upper limit value CH 2 ”INT ”0”–32768”32767”HI000”;	[69 char.]
PS034”Lower limit value CH 2 ”INT ”0”–32768”32767”HI000”;	[70 char.]
PS041”Measured value presentation ”BIT2 ”0”0”1”HI003”;	[56 char.]
HTT005;	[7 char.]
HI001;	[6 char.]
L2;	[3 char.]
”disable ”00000”;	[39 char.]
”enable (enable diag. alarm) ”00001”;	[39 char.]
HI002;	[6 char.]
L8;	[3 char.]
”Channel not activated ”00000”;	[39 char.]
”Measurement type +/– 1.25 V ”00020”;	[39 char.]
”Measurement type +/– 2.5 V ”00021”;	[39 char.]
”Measurement type +/– 5.0 V ”00022”;	[39 char.]
”Measurement type +/– 10 V ”00025”;	[39 char.]
”Measurement type +/– 20 mA ”00036”;	[39 char.]
”Measurement type 0 – 20 mA ”00034”;	[39 char.]
”Measurement type 4 – 20 mA ”00035”;	[39 char.]
HI003;	[6 char.]
L2;	[3 char.]
”Measured value presentation, SIMATIC S5”00000”;	[39 char.]
”Measured value presentation, SIMATIC S7”00001”;	[39 char.]
HI004;	[6 char.]
L2;	[3 char.]
”disable ”00000”;	[39 char.]
”enable ”00001”;	[39 char.]
HI005;	[6 char.]
L2;	[3 char.]
”disable ”00000”;	[39 char.]

Type file SI800EAD.200: COM ET 200 Windows - C-4AI DP		[char.]
”enable (specify limit value) ”00001”;		[39 char.]
KV004;		[6 char.]
004”000”000”143”192”;		[21 char.]
004”000”000”155”064”;		[21 char.]
004”000”000”143”192”;		[21 char.]
067”067”000”021”196”;		[21 char.]
SY;		[3 char.]
DKM020;		[7 char.]
DBO004”0”Module malfunction	”1”;	[43 char.]
DBO004”1”Internal error	”1”;	[43 char.]
DBO004”3”Channel is errored	”1”;	[43 char.]
DBO004”6”Module not parameterized	”1”;	[43 char.]
DBO004”7”Module parameterization error	”1”;	[43 char.]
DBO005”4”Channel information waiting	”1”;	[43 char.]
DBO007”2”EEPROM error	”1”;	[43 char.]
DBO007”4”ADU error	”1”;	[43 char.]
DBO012”0”Parameterization error CH 0	”1”;	[43 char.]
DBO012”6”Measuring range undershot	CH0”1”;	[43 char.]
DBO012”7”Measuring range overshot	CH0”1”;	[43 char.]
DBO013”0”Parameterization error CH 1	”1”;	[43 char.]
DBO013”6”Measuring range undershot	CH1”1”;	[43 char.]
DBO013”7”Measuring range overshot	CH1”1”;	[43 char.]
DBO014”0”Parameterization error CH 2	”1”;	[43 char.]
DBO014”6”Measuring range undershot	CH2”1”;	[43 char.]
DBO014”7”Measuring range overshot	CH2”1”;	[43 char.]
DBO015”0”Parameterization error CH 3	”1”;	[43 char.]
DBO015”6”Measuring range undershot	CH3”1”;	[43 char.]
DBO015”7”Measuring range overshot	CH3”1”;	[43 char.]
DKK000;		[7 char.]
ET_200C;		[8 char.]
ISNONAME;		[9 char.]
SO000;		[6 char.]
008;		[4 char.]
MLFB000;		[8 char.]
LSK000;		[7 char.]
000;		[4 char.]
SPT000;		[7 char.]
HTT000;		[7 char.]

B.2.3 Type File SI800DAD.200: COM ET 200 Windows - C-4AO DP

Type file SI800DAD.200: COM ET 200 Windows - C-4AO DP	[char.]
ET 200C AO4 x 12 Bit, MLFB<6ES7 145-0HF00-0XB0>, Siemens-Slave, V 1.0	[69 char.]
V5.x;	[5 char.]
C-4AO DP;	[18 char.]
SIEMENS ;	[11 char.]
ET 200C ;	[11 char.]
ET 200 ;	[11 char.]
ET200C/ANALOG ;	[16 char.]
32781;	[6 char.]
Y;	[2 char.]
Y;	[2 char.]
Y;	[2 char.]
Y;	[2 char.]
N;	[2 char.]
N;	[2 char.]
N;	[2 char.]
N;	[2 char.]
N;	[2 char.]
N;	[2 char.]
N;	[2 char.]
N;	[2 char.]
N;	[2 char.]
N;	[2 char.]
00020;	[6 char.]
0001011111;	[11 char.]
000;	[4 char.]
008;	[4 char.]
004;	[4 char.]
028;	[4 char.]
043;	[4 char.]
PV036;	[6 char.]
00;	[3 char.]
00;	[3 char.]
00;	[3 char.]
07;	[3 char.]
81;	[3 char.]
04;	[3 char.]
00;	[3 char.]
00;	[3 char.]
00;	[3 char.]
00;	[3 char.]
13;	[3 char.]
81;	[3 char.]
04;	[3 char.]
01;	[3 char.]
00;	[3 char.]
00;	[3 char.]
00;	[3 char.]
25;	[3 char.]
25;	[3 char.]
25;	[3 char.]
25;	[3 char.]
00;	[3 char.]

```
Type file SI800DAD.200: COM ET 200 Windows - C-4AO DP                 [char.]
00;                                                                 [3 char.]
00;                                                                 [3 char.]
00;                                                                 [3 char.]
00;                                                                 [3 char.]
00;                                                                 [3 char.]
00;                                                                 [3 char.]
00;                                                                 [3 char.]
07;                                                                 [3 char.]
81;                                                                 [3 char.]
02;                                                                 [3 char.]
00;                                                                 [3 char.]
00;                                                                 [3 char.]
08;                                                                 [3 char.]
00;                                                                 [3 char.]
PSL018;                                                             [7 char.]
PS015”Enable diagnostics CH 0       ”BIT0 ”0”0”1”HI005”;           [56 char.]
PS015”Enable diagnostics CH 1       ”BIT1 ”0”0”1”HI005”;           [56 char.]
PS015”Enable diagnostics CH 2       ”BIT2 ”0”0”1”HI005”;           [56 char.]
PS015”Enable diagnostics CH 3       ”BIT3 ”0”0”1”HI005”;           [56 char.]
PS022”Enable diagnostics alarm      ”BIT6 ”0”0”1”HI001”;           [56 char.]
PS023”Type substitute value CH 0    ”BIT0 ”0”0”1”HI002”;           [56 char.]
PS023”Type substitute value CH 1    ”BIT1 ”0”0”1”HI002”;           [56 char.]
PS023”Type substitute value CH 2    ”BIT2 ”0”0”1”HI002”;           [56 char.]
PS023”Type substitute value CH 3    ”BIT3 ”0”0”1”HI002”;           [56 char.]
PS024”Output type / range CH 0   ”BYTE ”25”23”36”HI003”;           [59 char.]
PS025”Output type / range CH 1   ”BYTE ”25”23”36”HI003”;           [59 char.]
PS026”Output type / range CH 2   ”BYTE ”25”23”36”HI003”;           [59 char.]
PS027”Output type / range CH 3   ”BYTE ”25”23”36”HI003”;           [59 char.]
PS028”Substitute value CH 0  ”INT ”0”–32768”32767”HI000”;          [65 char.]
PS030”Substitute value CH 1  ”INT ”0”–32768”32767”HI000”;          [65 char.]
PS032”Substitute value CH 2  ”INT ”0”–32768”32767”HI000”;          [65 char.]
PS034”Substitute value CH 3  ”INT ”0”–32768”32767”HI000”;          [65 char.]
PS041”Measured value presentation   ”BIT2 ”0”0”1”HI004”;           [56 char.]
HTT005;                                                             [7 char.]
HI001;                                                              [6 char.]
L2;                                                                 [3 char.]
”disable                            ”00000”;                       [39 char.]
”enable                             ”00001”;                       [39 char.]
HI002;                                                              [6 char.]
L2;                                                                 [3 char.]
”Substitute value : parameterizable ”00000”;                       [39 char.]
”Substitute value : last value      ”00001”;                       [39 char.]
HI003;                                                              [6 char.]
L6;                                                                 [3 char.]
”Output range 1 – 5 V               ”00023”;                       [39 char.]
”Output range 0 – 10 V              ”00024”;                       [39 char.]
”Output range +/– 10 V              ”00025”;                       [39 char.]
”Output range 0 – 20 mA             ”00034”;                       [39 char.]
”Output range 4 – 20 mA             ”00035”;                       [39 char.]
”Output range +/– 20 mA             ”00036”;                       [39 char.]
HI004;                                                              [6 char.]
L2;                                                                 [3 char.]
”Measured value presentation, SIMATIC S5”00000”;                   [39 char.]
”Measured value presentation, SIMATIC S7”00001”;                   [39 char.]
HI005;                                                              [6 char.]
L2;                                                                 [3 char.]
”disable                      ”00000”;                             [39 char.]
```

Type file SI800DAD.200: COM ET 200 Windows - C-4AO DP	[char.]
”enable (specify limit value) ”00001”;	[39 char.]
KV004;	[6 char.]
004”000”000”143”192”;	[21 char.]
004”000”000”155”064”;	[21 char.]
004”000”000”143”192”;	[21 char.]
131”067”000”037”224”;	[21 char.]
SY;	[3 char.]
DKM031;	[7 char.]
DBO004”1”Internal error ”1”;	[43 char.]
DBO004”2”External error (wire break) ”1”;	[43 char.]
DBO004”3”Channel is errored ”1”;	[43 char.]
DBO004”6”Module not parameterized ”1”;	[43 char.]
DBO004”7”Module parameterization error ”1”;	[43 char.]
DBO004”0”Module error ”1”;	[43 char.]
DBO007”4”DAU error ”1”;	[43 char.]
DBO012”0”Parameterization error CH 0 ”1”;	[43 char.]
DBO012”1”Common-mode error CH 0 ”1”;	[43 char.]
DBO012”2”Short circuit to P CH 0 ”1”;	[43 char.]
DBO012”3”Short circuit to M CH 0 ”1”;	[43 char.]
DBO012”4”Wire break CH 0 ”1”;	[43 char.]
DBO012”6”No load voltage CH 0 ”1”;	[43 char.]
DBO013”0”Parameterization error CH 1 ”1”;	[43 char.]
DBO013”1”Common-mode error CH 1 ”1”;	[43 char.]
DBO013”2”Short circuit to P CH 1 ”1”;	[43 char.]
DBO013”3”Short circuit to M CH 1 ”1”;	[43 char.]
DBO013”4”Wire break CH 1 ”1”;	[43 char.]
DBO013”6”No load voltage CH 1 ”1”;	[43 char.]
DBO014”0”Parameterization error CH 2 ”1”;	[43 char.]
DBO014”1”Common-mode error CH 2 ”1”;	[43 char.]
DBO014”2”Short circuit to P CH 2 ”1”;	[43 char.]
DBO014”3”Short circuit to M CH 2 ”1”;	[43 char.]
DBO014”4”Wire break CH 2 ”1”;	[43 char.]
DBO014”6”No load voltage CH 2 ”1”;	[43 char.]
DBO015”0”Parameterization error CH 3 ”1”;	[43 char.]
DBO015”1”Common-mode error CH 3 ”1”;	[43 char.]
DBO015”2”Short circuit to P CH 3 ”1”;	[43 char.]
DBO015”3”Short circuit to M CH 3 ”1”;	[43 char.]
DBO015”4”Wire break CH 3 ”1”;	[43 char.]
DBO015”6”No load voltage CH 3 ”1”;	[43 char.]
DKK000;	[7 char.]
ET_200C;	[8 char.]
ISNONAME;	[9 char.]
SO000;	[6 char.]
008;	[4 char.]
MLFB000;	[8 char.]
LSK000;	[7 char.]
000;	[4 char.]
SPT000;	[7 char.]
HTT000;	[7 char.]

C Safety-Related Guidelines

In this Chapter

The following guidelines are intended to ensure personal safety as well as to protect the products and equipment connected against damage.

C.1 Active and Passive Faults in Automation Equipment

Active and Passive Faults

Depending on the particular task for which the electronic automation equipment is used, both **active** as well as **passive** faults can result in a **dangerous** situation. For example, in drive control, an active fault is generally dangerous because it can result in an unauthorized startup of the drive. On the other hand, a passive fault in a signalling function can result in a dangerous operating state not being reported to the operator.

The differentiation of the possible faults and their classification into dangerous and non-dangerous faults, depending on the particular task, is important for all safety considerations in respect to the product supplied.

Warning

In all cases where a fault in automation equipment can result in severe personal injury or substantial property damage, i.e., where a dangerous fault can occur, additional external measures must be taken or equipment provided to ensure or force safe operating conditions even in the event of a fault (e.g., by means of independent limit monitors, mechanical interlocks, etc.).

Procedures for Maintenance and Repair

If you are carrying out measurement or testing work on the **ET 200C distributed I/O station**, you must adhere to the rules and regulations contained in the VBG 4.0 Accident Prevention Regulations of the German employers liability assurance association (“Berufsgenossenschaften”). Pay particular attention to paragraph 8, “Permissible exceptions when working on live parts”.

Repairs may only be carried out by **Siemens service personnel** or **Siemens-authorized repair shops**.

C.2 Suggestions for Configuring and Installing a Distributed I/O Station

Warnings

A distributed I/O station is often used as a component in a larger system. The suggestions contained in the following warning are intended to help you install your distributed I/O system safely.

Warning

- Adhere to any safety and accident-prevention regulations applicable to your situation and system.
- If your system has a permanent power connection (stationary equipment) that is not equipped with an isolating switch and/or fuses that disconnect all poles, install either a suitable isolating switch or fuses in the building wiring system. Connect your system to a ground conductor.
- Before startup, if you have units that operate using the main power supply, make sure that the voltage range setting of the equipment matches the local main power voltage.
- When using a 24 V supply, make sure to provide proper electric isolation between the main supply and the 24 V supply. Use only power supplies manufactured according to IEC 364-4-41 or HD 384.04.41 (VDE 0100, Part 410).
- Fluctuations or deviations of the supply voltage from the rated value may not exceed the tolerance limit specified in the technical specifications. If they do, functional failures or dangerous conditions can occur in the electronic modules or equipment.
- Take suitable measures to make sure that programs that are interrupted by a voltage dip or power failure resume proper operation when the power is restored. Make sure that dangerous operating conditions do not occur even momentarily. If necessary, force an EMERGENCY OFF.
- EMERGENCY OFF devices must be in accordance with EN 60204/ IEC 204 (VDE 0113) and be effective in all operating modes of the equipment. Make certain to prevent any uncontrolled or undefined restart when the EMERGENCY OFF devices are released.
- Install power supply and signal cables so that inductive and capacitive interference cannot affect the automation functions.
- Install your automation system and its operative components so as to prevent unintentional operation.
- Automation equipment can assume an undefined state in the case of a wire break in the signal lines. To prevent this, take the proper hardware and software safety measures when linking the inputs and outputs of the automation equipment.

Glossary

A

Active nodes

Can transmit data to other nodes or request data from other nodes when they have a permission to send (= master station).

An active node is, for example, the IM 308-B master interface module.

B

Baud rate

Data transmission speed: specifies the number of bits transmitted per second (baud rate = bit rate).

Binary file

You must created a binary file if you also wish to save the data you exported to the memory card on the PG/PC. Like the memory card, the binary file contains all of the bus, slave and master parameters created with COM ET 200.

The binary file is formatted in such a way that it can be read by different versions of COM ET 200.

Bus

Common transmission path for all nodes connected; with defined termination points.

Bus connection

All ET 200C modules have a bus connection (12-pin socket). This bus connection has several functions:

- Connection to the SINEC L2-DP field bus
- Connection to the power supply
- Connection to the field bus and power supply at a single socket

Busnode

Device that can send, receive or amplify data via the bus, e.g. master station, slave station, repeater, active star hub, etc.

In the ET 200C, only the digital modules are nodes. All other devices cannot send or receive data. They also have no station number (e.g. PS connector, programmer connector, etc.).

Bussegment

→ Segment

C

Control command

A DP master can send commands for synchronizing the slave stations to one slave, a group of slaves or all slaves simultaneously.

Event-controlled synchronization is possible via the control commands → FREEZE and → SYNC.

CP5410-S5DOS/ST

Programmer interface module for connection to SINEC L2 and SINEC L2-DP. The CP5410-S5DOS/ST can only be plugged into the PG 730, 750 and 770 programmers.

Cyclical processing

The slave station is addressed at regular intervals by the master.

The master (e.g. the IM 308-B) reads the input data from the slaves and passes output data on to the slaves.

D

Device-related diagnostics

The upper-most level of the slave-specific diagnostics. The device-related diagnostics refer to the entire slave.

Diagnostics

Detection, location, classification, display, additional evaluation of errors, faults and messages.

Diagnostics includes monitoring functions that are automatically executed during normal operation.

Application: Increasing the availability of a system/plant by cutting start-up and idle times.

Distributed I/O

Comprises the input/output units connected in a distributed configuration, i.e. at a distance from the CPU:

- ET 200B,
- ET 200C,
- ET 200U or
- third-party systems.

DP master

→ Master system which communicates with the slave stations in accordance with a defined algorithm and supplies the user with data.

DP Siemens

Bus protocol developed by Siemens.

DP slave → DP standard slave

DP standard Short name for draft standard DIN 19245, part 3

DP standard slave → Slave station which behaves in accordance with draft standard DIN 19245, part 3

E

Earth The conductive soil where the potential at all points can be assumed equal to zero.

Earthing Connecting an electrically conductive part to the earthing electrode via the earthing system.

Earthing electrode One or more conductive part(s) that make good contact with the earth.

Earthing measures All measures taken to establish a chassis connection.

ET 200 Distributed I/O system from Siemens for connecting distributed I/O stations to the programmable controllers S5-115U ... S5155U or any other adequate master.

The ET 200 is characterized by fast response times as only small volumes of data (bytes) are transferred. ET 200 is based on the PROFIBUS standard (DIN 19245, part 1) and the draft standard PROFIBUS-DP (DIN 19245, part 3).

ET 200 operates in accordance with the master/slave principle. The IM 308-B or any host incorporating the CP 5480-DP can be master.

The distributed I/O stations ET 200B, ET 200C or ET 200U or other devices not supplied by Siemens can be configured as slaves.

F

FREEZE is a control command which is sent from the master to the slave.

The master uses this command to freeze the current states of the inputs. The input data is then only updated again when the control command UNFREEZE is sent by the master.

G

GSD file

Device master data file. File in which the slave-specific characteristics such as number of inputs and outputs, number of diagnostics bytes, SYNC capability etc. are defined. One GSD file is available for each Siemens DP standard slave.

This file is only necessary if you wish to connect DP standard slaves to a non-Siemens DP master. No GSD file is required if you use a Siemens DP master. The device master data for Siemens DP masters is defined in the → type file (COM ET 200-specific format).

Group

The DP slaves must be arranged in groups to which the control commands SYNC or FREEZE are to be output.

Several slaves can be combined to form a group. A DP slave can belong to several groups but to only one → master system.

Group affiliation

Affiliation of a bus station with a → group.

H

Host

A host is a system or device which incorporates at least one DP master, e.g.:

- The programmable controller with the CPU is the host and the IM 308-C the DP master.
- The PC is the host and the CP 5480 the DP master.

I

IP 66

Degree of protection to DIN 40050; full protection against contact with live or moving parts, contamination, dust and the harmful ingression of heavy sea water or harsh water jets.

IP 67

Degree of protection to DIN 40050; full protection against contact with live or moving parts, contamination and dust and protection against the harmful effects of immersion in water under pressure.

Isolated

In isolated I/O modules, the reference potentials of the control and load circuits are electrically isolated. The input and output circuits are not “grouped”, i.e. the input and output circuits are not connected to a common potential (so-called group of one).

M

Master interface module

Module for distributed configurations. The IM 308-B master interface module is used for “connecting” the distributed I/O to the programmable controller.

Master-slave access method

Bus access method providing for only one → active node while all other nodes are → passive.

Master system

All slave stations which are assigned to a master, together with the master, form a master system.

Monitoring time

is a slave parameter in COM ET 200. If a slave station is not addressed within the monitoring time, all outputs will be set to ”0” (safe condition).

N

Non-floating

In non-floating I/O modules, the reference potentials of the control and load circuits are electrically interconnected.

O

”Overview” diagnostics

indicates the slave station for which a diagnostics message is present.

P

Passive nodes

They may exchange data with an active node only after being requested to do so by the active node (= slave station).

Parameterization master

This is the master which is authorized to parameterize a slave station.

PROFIBUS

PROcess **FI**eld **BUS**, German process and field bus standard defined in the PROFIBUS standard (DIN 19245).

It specifies functional, electrical and mechanical characteristics for a bit-serial field bus system.

PROFIBUS-DP

PROFIBUS-DP draft standard (DIN 19245, Part 3) on which the ET 200 distributed I/O system is based.

Protective conductor A conductor required for protective measures against shock currents. It is symbolized by PE.

R

Reference potential Potential to which the voltages of the circuits concerned are referred and/or with respect to which they are measured.

Response time Period between an edge at the input and the programmed output signal change.

The response time of an ET 200C can be ignored when estimating the response times in the distributed I/O system. The response times of the distributed I/O system are described in the manual ”ET 200 Distributed I/O System”.

S

Screen impedance AC impedance of the cable screen. The screen impedance is a characteristic of the cable used and is usually specified by the manufacturer.

Segment The bus line between two terminating resistors constitutes a segment. A segment includes 0 to 32 → nodes. Segments can be linked via repeaters.

Short-circuit Caused by a fault; it conductively connects conductors that are energized in normal operation if no resistance is inserted in the faulty circuit.

SINEC L2 LAN that interfaces PROFIBUS-compatible programmable controllers and field devices both at the cell and field levels.

SINEC L2-DP SINEC L2 LAN with DP protocol. DP denotes the distributed I/O. ET 200 corresponds to SINEC L2-DP.

Station number Each ET 200 node must be assigned a station number. The programmer or ET 200 handheld unit are addressed by means of station number “0”;

Master and slave have the same station number in the range 1 ... 125.

Exception: ET 200B has a station number from the range 1 ... 99.

STOP This is a master mode. No data is exchanged between the master and slaves in this mode.

SYNC

This is a → control command which is sent from the master to the slave.

The master uses this control command to freeze the current states of the outputs. The output data is stored with the frames that follow; the output states, however, remain unchanged. The outputs are then only updated again when the control command UNSYNC is sent by the master.

T

Terminating resistor

Resistance for matching to the impedance of a bus cable; terminating resistors are generally required for terminating cables or segments.

In the ET 200C, the terminating resistor screws onto the bus connection of an ET 200C module or onto a T connector.

Type file

File which is required by the COM ET 200 in order to configure a slave station. The type file contains slave-specific characteristics such as number of inputs and outputs, number of diagnostics bytes, SYNC capability etc. are defined.

One type file, which is generated by Siemens and is part of COM ET 200 (from version 4.1), is available for each ET 200C station type.

U

UNFREEZE

→ FREEZE

Ungrounded configuration

Configuration without any electrical connection to ground. In most cases, the fault currents are discharged via an RC element. (See Manual *Guidelines on Fault-Free Installation of Programmable Controllers*.)

UNSYNC

→ SYNC

W

Wire break

This means that there is an interruption in the supply leads to the sensor or in the sensor itself.

Index

D

E

F

G

R

S

T

U

V

W

Siemens AG
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D–92209 Amberg
Federal Republic of Germany

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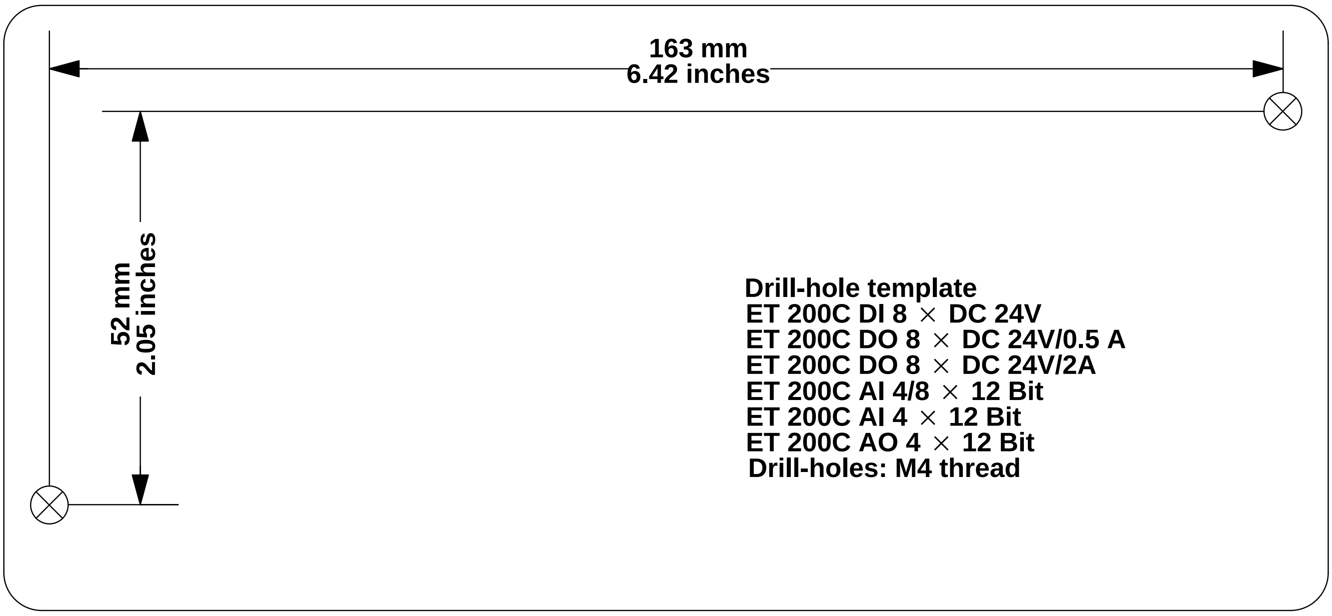
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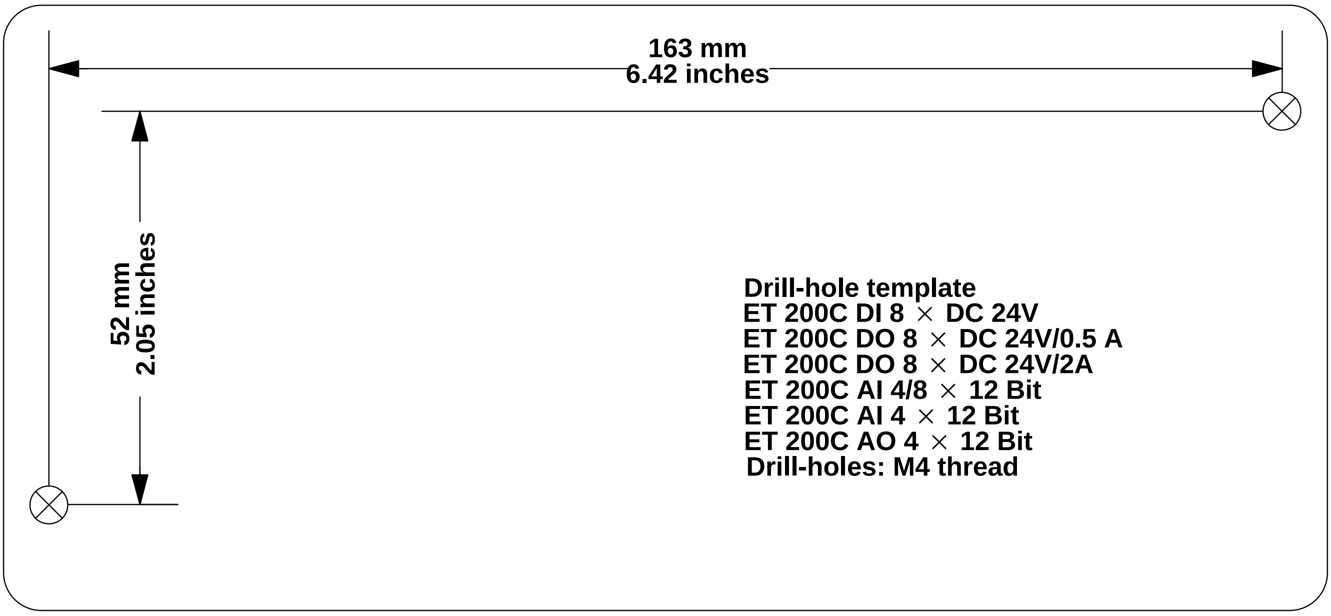
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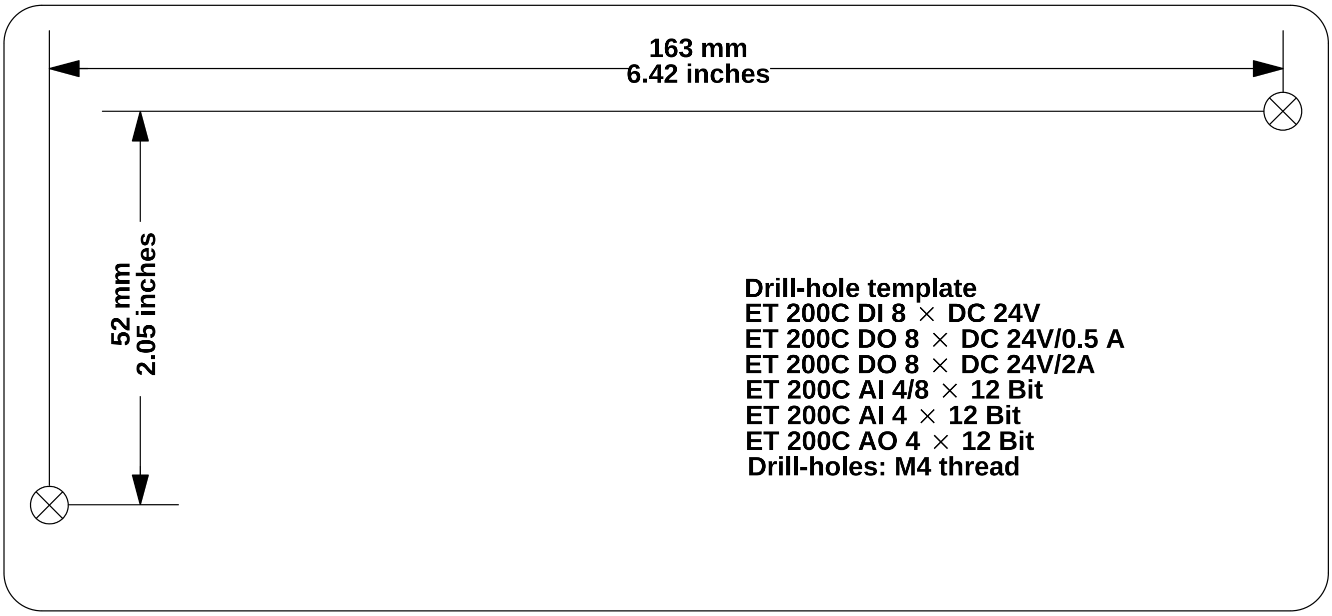
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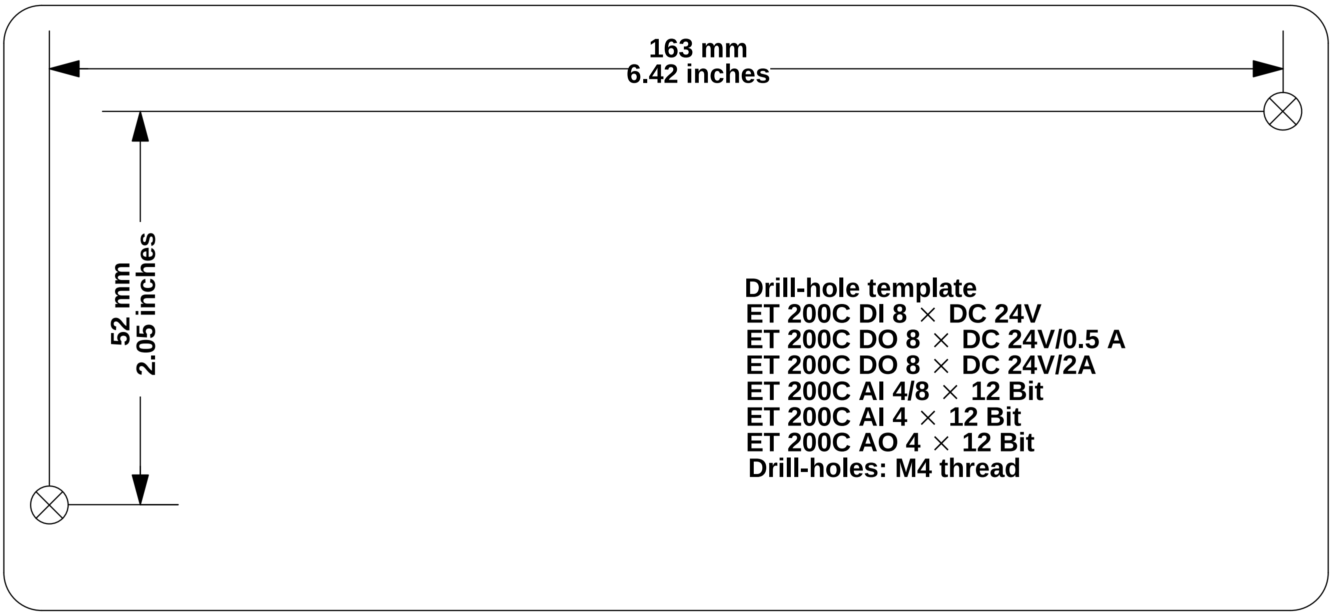
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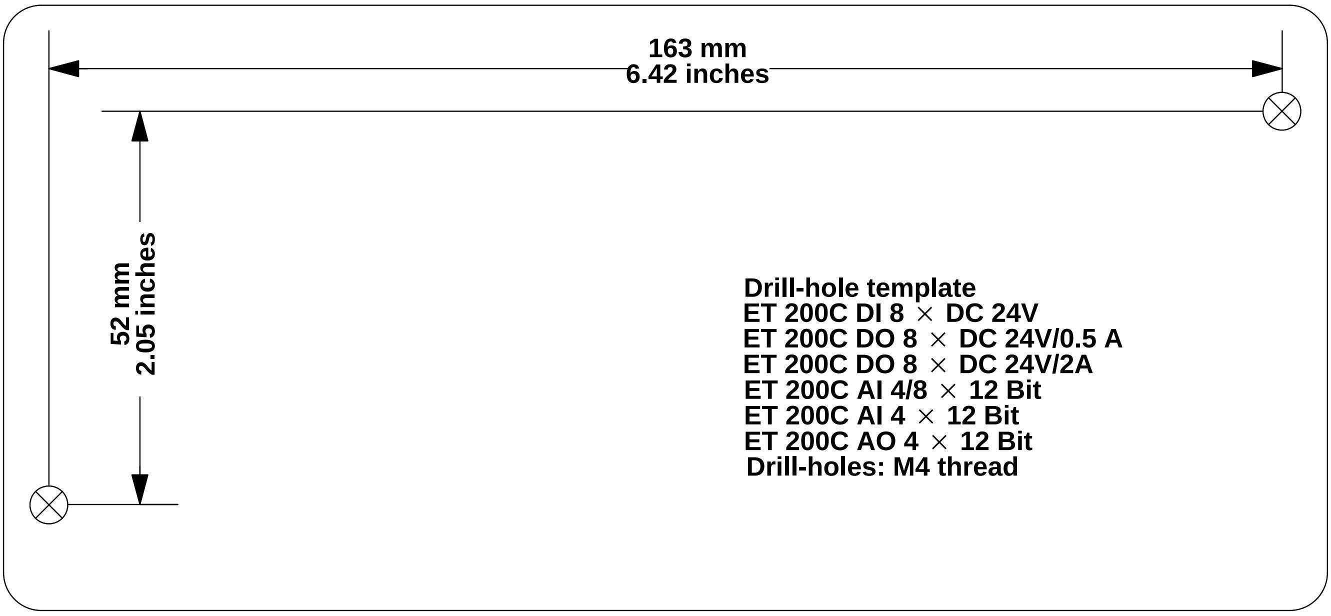
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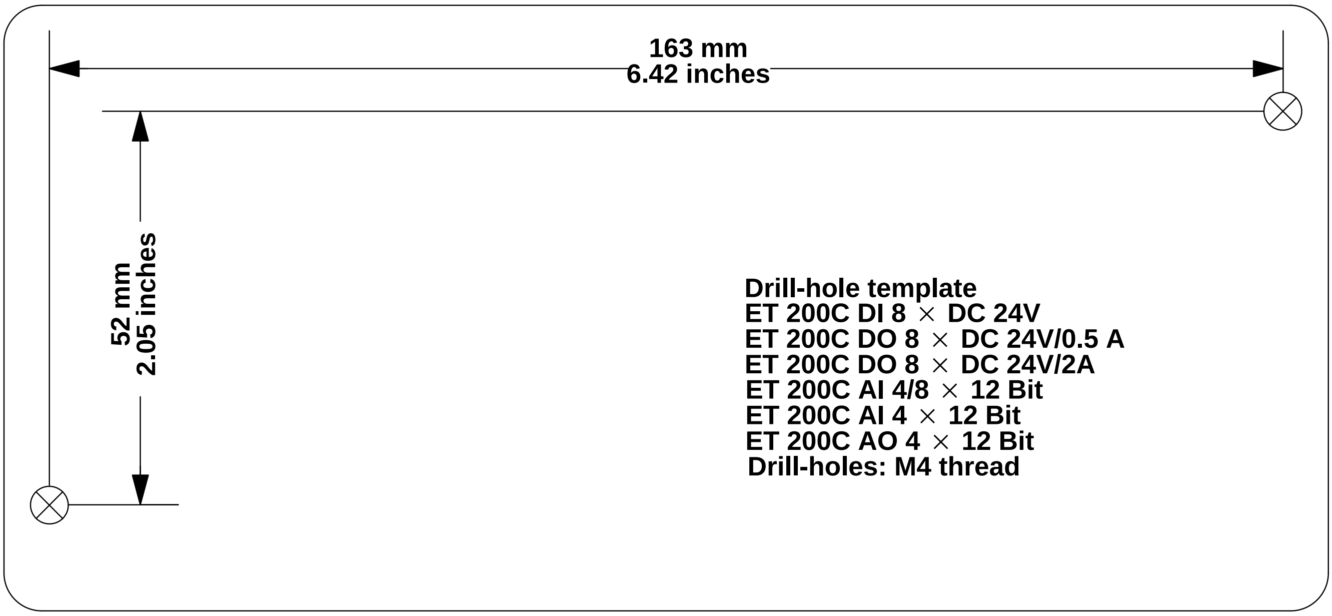
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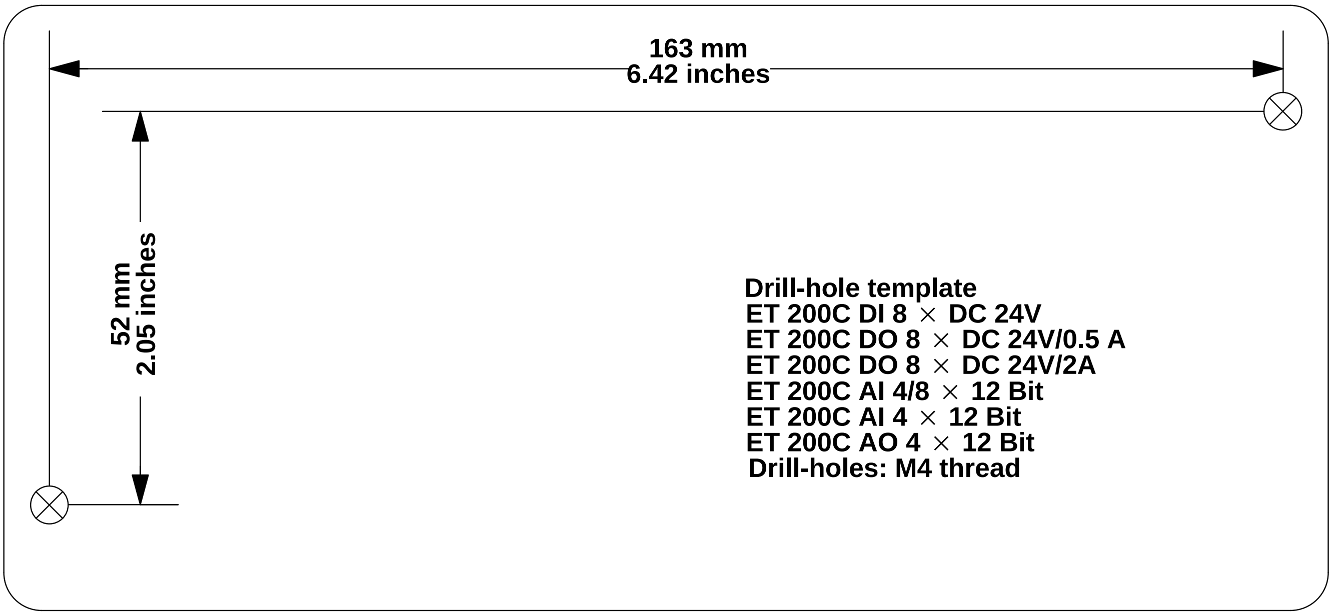
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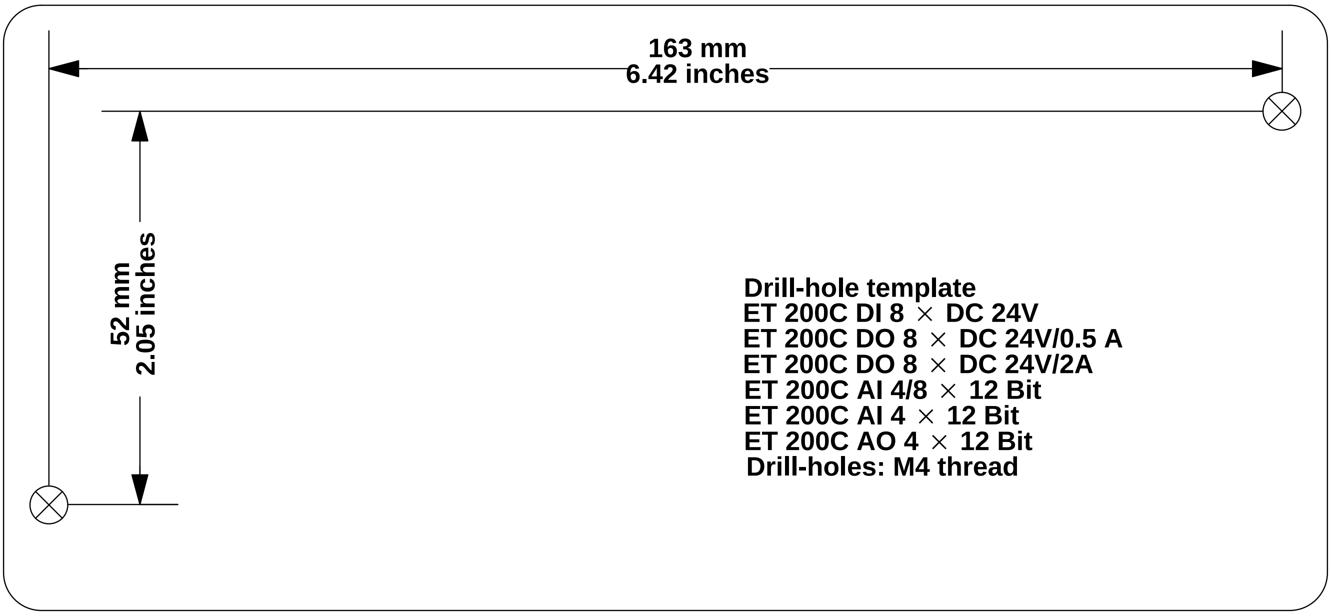
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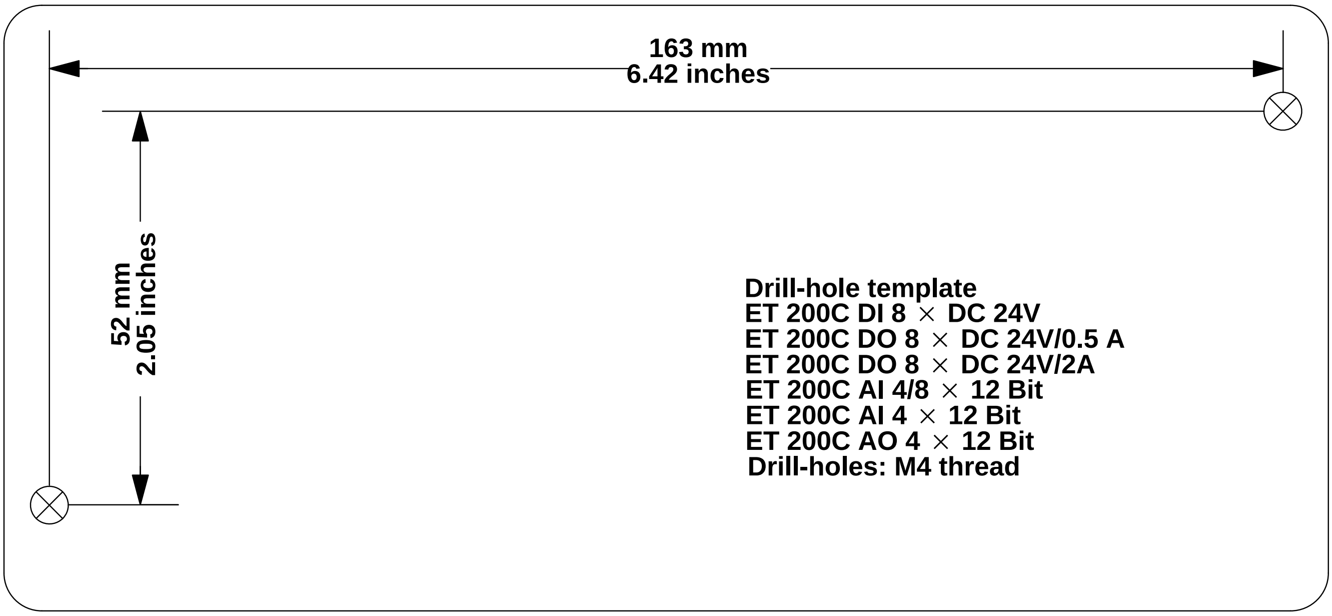
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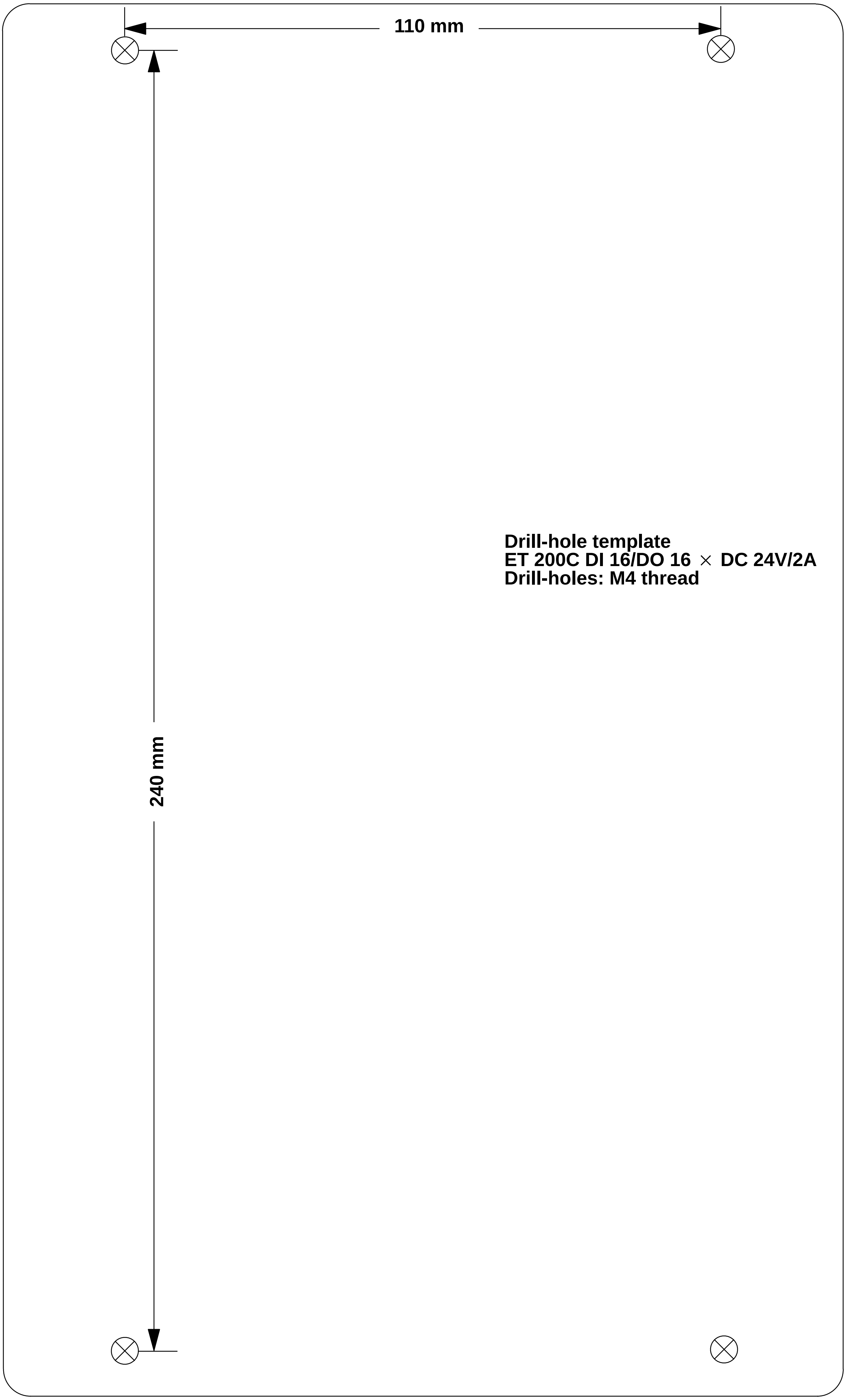
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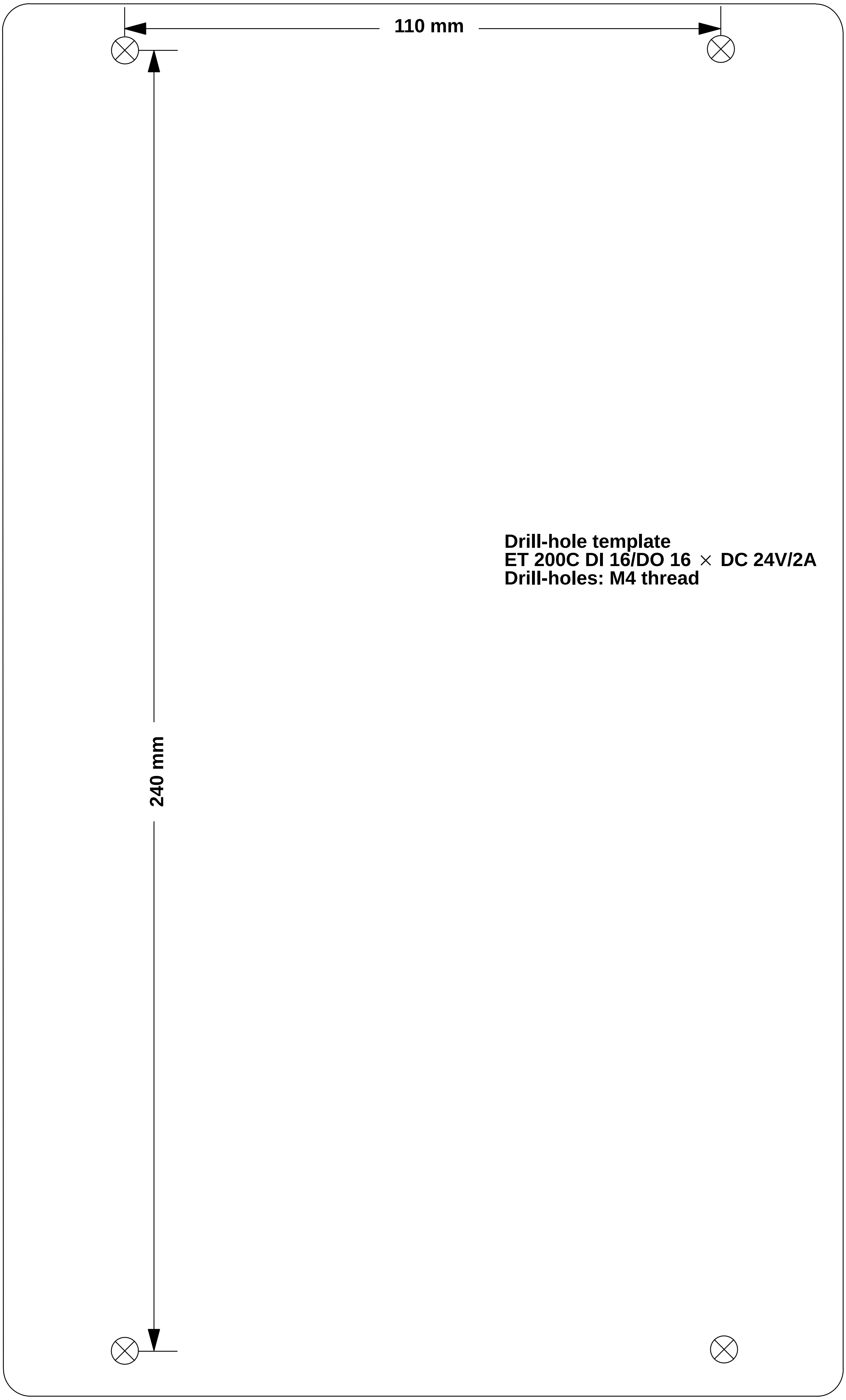
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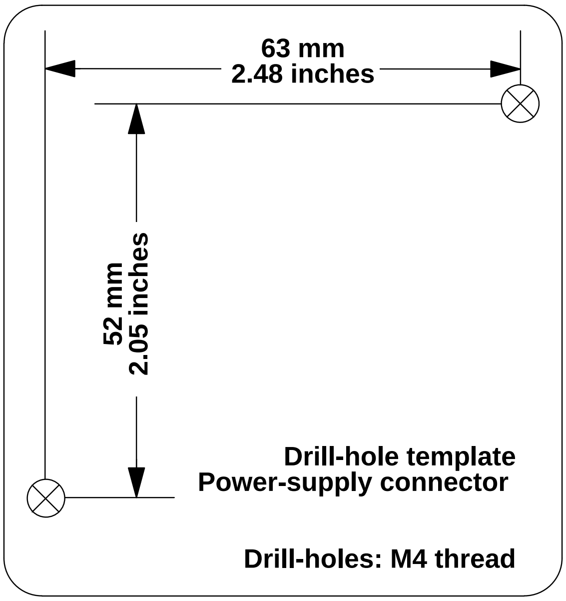
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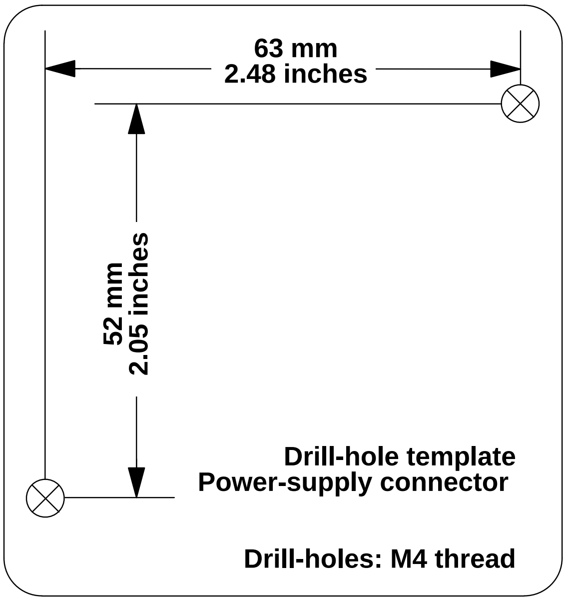
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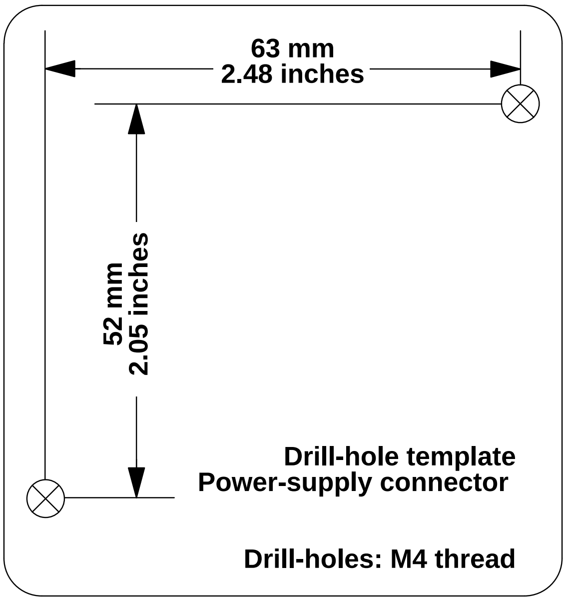
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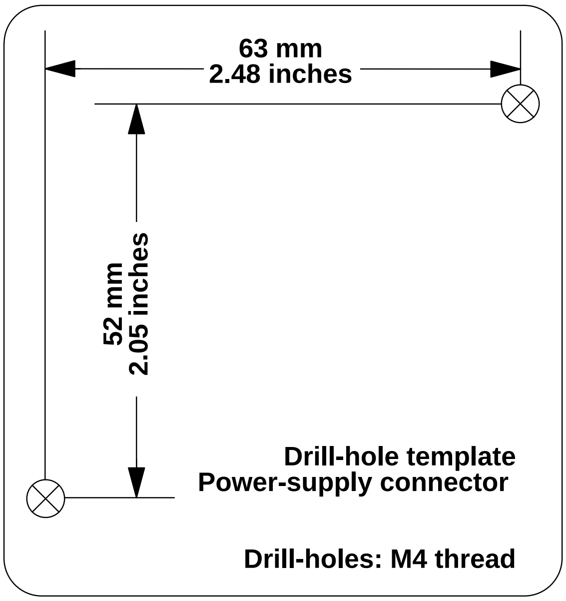
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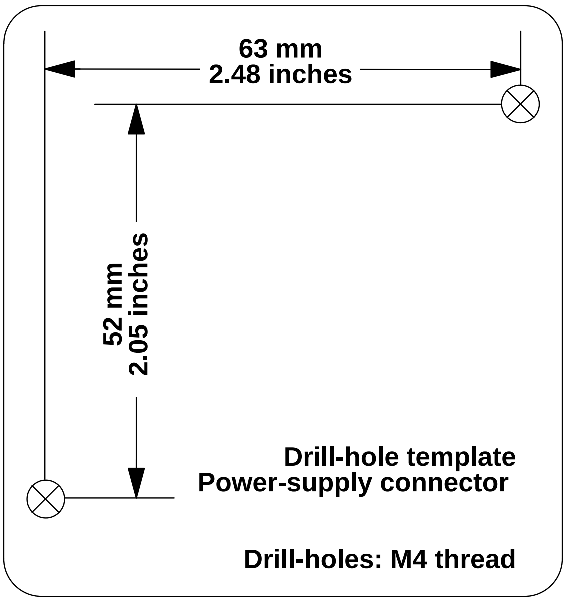
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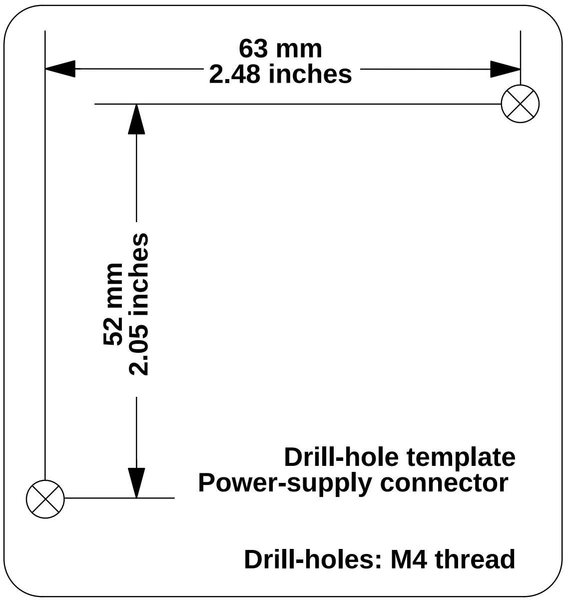
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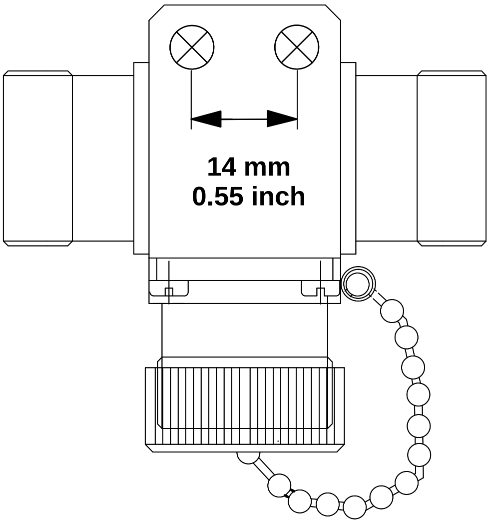
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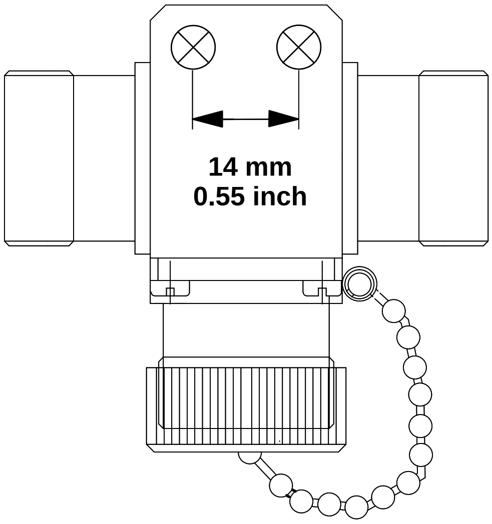
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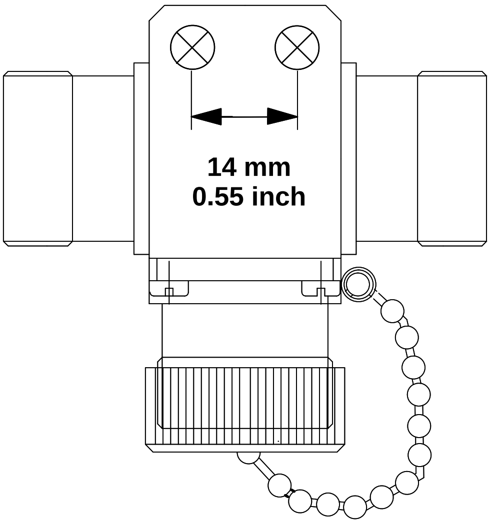
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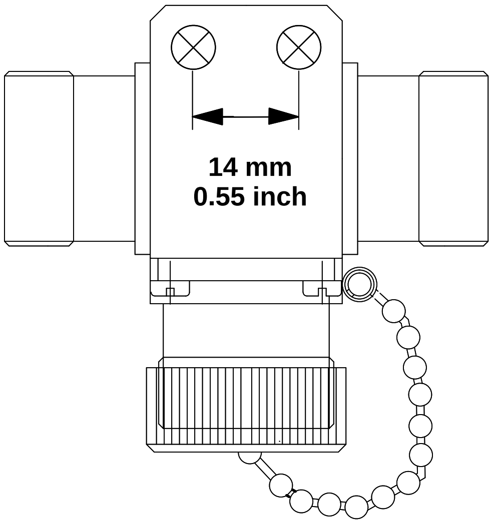
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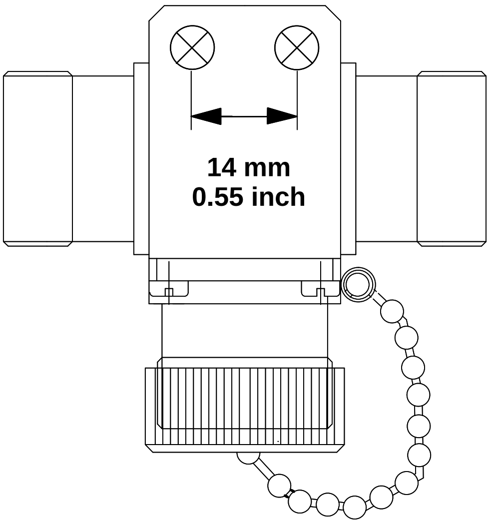
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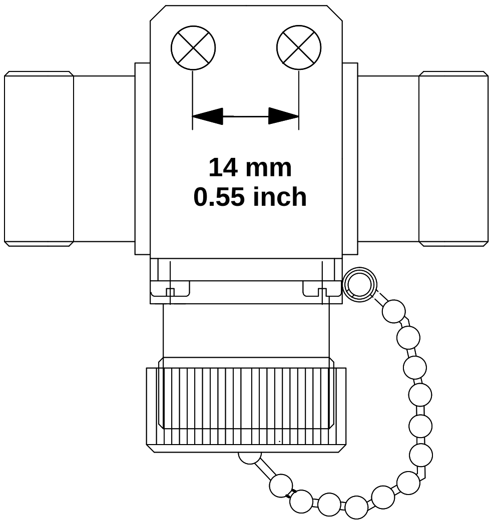
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