

# SIEMENS

## SIMATIC

### ET 200B Distributed I/O Station

#### Manual

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EWA 4NEB 812 6089-02c

Edition 04

## 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

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

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

## Correct Usage

Note the following:



### Warning

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

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

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

Technical data subject to change.  
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# Preface

## Purpose of the Manual

The information contained in this manual will allow you:

- To install, wire and start up the ET 200B distributed I/O station.
- To find module characteristics and technical specifications quickly and easily.

## Contents of the Manual

The following explains the structure of the contents of the manual:

|  |        |               |
|--|--------|---------------|
| What is the ET 200B?   | —————▶ | Chap. 1       |
| Which control and display elements does the ET 200B have?        | —————▶ | Chap. 2       |
| How is the ET 200B installed?                                    | —————▶ | Chap. 3       |
| How do I configure and parameterize the ET 200B?                 | —————▶ | Chap. 4       |
| Faults?  | —————▶ | Chap. 5       |
| Technical Specifications?  | —————▶ | Chap. 6, 7, 8 |
| Which type files do I need?                                      | —————▶ | Appendix A    |
| How are configuration and parameterization telegrams structured? | —————▶ | Appendix B, C |

## Scope of the Manual

This manual describes all the ET 200B modules which can be accessed with the **PROFIBUS-DP** bus protocol. These ET 200B modules all have order numbers starting with 6ES7 (see Section F.1).

This manual is valid for operation of the ET 200B with:

- IM 308-B master interface module and COM ET 200 V4.x
- IM 308-C master interface module and COM ET 200 WINDOWS
- S7/M7-DP master with PROFIBUS-DP interface and STEP 7
- other PROFIBUS-DP masters from Siemens and other vendors.

## Electronic Manuals

You can also order the documentation for the ET 200B distributed I/O station as an electronic manual on CD-ROM.

## Other Requisite Manuals

In addition to this manual, you will also need the manual for the DP master used (see Appendix F.2).

**Organizational Conventions**

The following organizational conventions are used in this manual to make it easier for you to find specific information:

- At the front of the manual is a complete table of contents, together with a list of all the figures and tables contained in the manual.
- The left-hand column of each page in the individual chapters has headings to help you find information more quickly.
- The Appendix is followed by a glossary containing definitions of the most important technical terms used in the manual.
- At the end of the manual is a detailed index which you can use to refer to specific sections.

**Standards**

The ET200B distributed I/O station is based on the PROFIBUS standard (EN 50170, Part 1) and the PROFIBUS-DP standard (EN 50170, Part 3).

**Courses**

Our "KO-ET 200" workshop is the ideal way to get to know the ET 200 distributed I/O system.

If you would like more information, please contact your regional Training Center or the following address:

Product Marketing for SIMATIC, SINEC and COROS  
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Fax: +49 (911) 895-5021

**Queries**

Please direct all technical queries to your Siemens contact partner in the office responsible for your area. You can look up the addresses in the manuals for the CPUs, for example in the "Siemens Worldwide" appendix of the manual *S7-300 Programmable Controller Hardware and Installation*, in catalogs and in CompuServe (go autforum).

You may prefer to use our hotline support; the number to dial is +49 (911) 895-7000 (fax 7001).

If you need type files or GSD files, the modem number to dial is +49 (911) 737972.

If you have any questions or comments on this manual, please complete the suggestions form and return it to us. You will find this form at the back of the manual.

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# System Overview

# 1

## In this Chapter

The System Overview gives you information on the following:

| <b>In Section</b> | <b>you will find</b>                       | <b>on Page</b> |
|-------------------|--|----------------|
| 1.1               | What is the ET 200 distributed I/O system? | 1-2            |
| 1.2               | What is ET 200B?                           | 1-3            |

## 1.1 What is the ET 200 Distributed I/O System?

### Definition

The ET 200 distributed I/O system is based on the PROFIBUS standard (EN 50170, Part 1) and the PROFIBUS-DP standard (EN 50170, Part 3).

The field bus on which the ET 200 distributed I/O system is based is a version of PROFIBUS known as PROFIBUS-DP (DP = Dezentrale Peripherie, or distributed I/O). This version is designed for minimum reaction times in communication with the distributed inputs and outputs.

### The Components of ET 200

The distributed input/output system consists of active stations (DP masters) and passive stations (DP slaves) interconnected by the PROFIBUS-DP field bus.

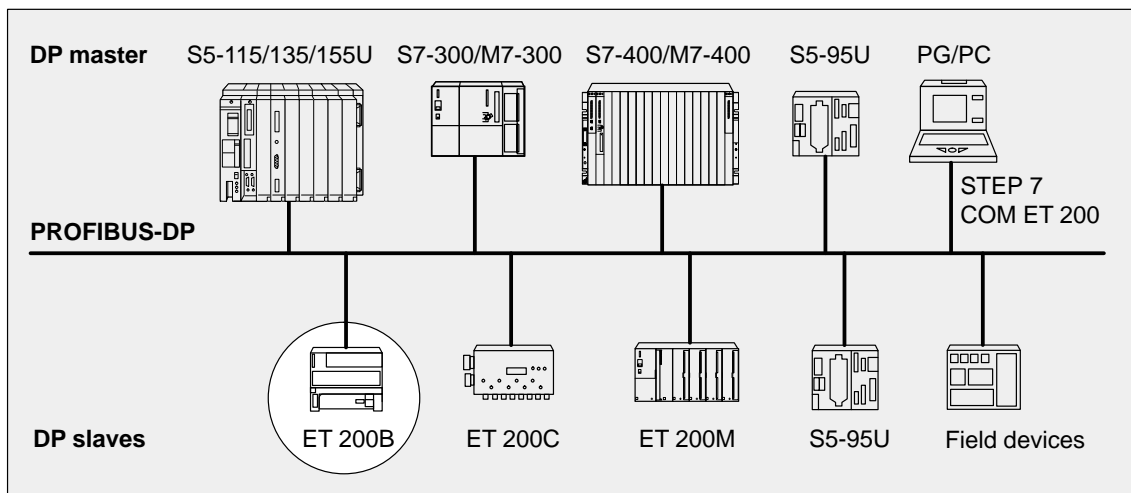


Figure 1-1 Typical PROFIBUS-DP Configuration with SIMATIC S5/S7/M7

### SINEC L2-DP = PROFIBUS-DP

SINEC L2-DP is the PROFIBUS-DP from Siemens.

## 1.2 What is the ET 200B?

### Definition

The ET 200B (B stands for "block I/O") belongs to the ET 200 distributed I/O system with the PROFIBUS-DP field bus. ET 200B is a DP slave having IP 20 protection.

The ET 200B distributed I/O station incorporates an integral port for connection to the PROFIBUS-DP bus and digital or analog inputs/outputs.

### Range of Modules

The range of modules for the ET 200B includes:

- 24 V DC digital modules
- 120/230 V AC digital modules
- Analog modules

### Application

Thanks to its compact and flat design, the ET 200B distributed I/O station is primarily suited to applications where space is a priority.

The ET 200B distributed I/O station can be mounted either on a standard sectional rail or directly onto the wall. Vertical and horizontal installation are both possible.

### Components

The ET 200B consists of 2 parts: the terminal block and the electronics block.

The terminal block (TB) incorporates the permanent wiring and does not contain any function-related electrical components. The electronics block is attached to the terminal block. The electronics block (EB) contains the logic circuits.

The terminal block and the electronics block have matching mechanical coding elements to prevent destruction of the electronics block.

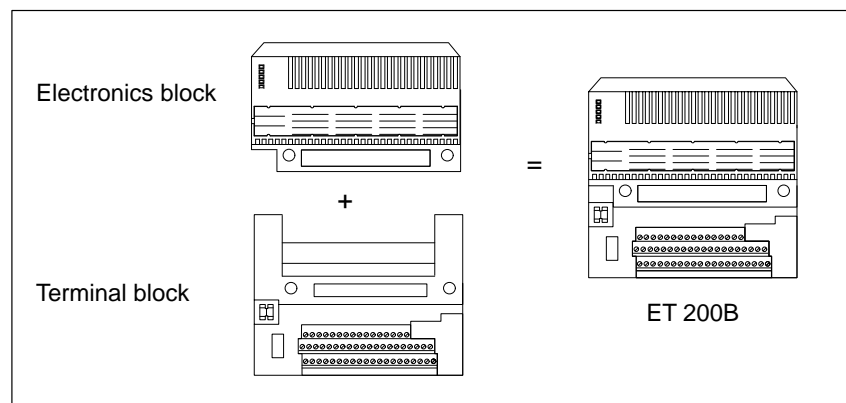


Figure 1-2 Components of ET 200B

**Compatible with**

All ET 200B modules can be addressed with the **PROFIBUS-DP** bus protocol.

ET 200B can be operated with the following systems:

Table 1-1 ET 200B: Range of Applications

| In system     | Operating with                                      | Configurable with   |
|---------------|---|---|
| SIMATIC S5    | IM 308-B master interface (release 5 and higher)    | COM ET 200 V4.x <ul style="list-style-type: none"> <li>• version 4.0 and higher: digital modules</li> <li>• version 4.1 and higher: analog modules</li> </ul> |
|               | IM 308-C master interface (release 1 and higher)    | COM ET 200 Windows (version 1.0 and higher)   |
| SIMATIC S7/M7 | S7/M7 DP master with integral PROFIBUS-DP interface | STEP 7 <ul style="list-style-type: none"> <li>• version 2.0 and higher: digital modules</li> <li>• version 3.0 and higher: analog modules</li> </ul>          |

**S7 Slave**

The analog modules of ET200B can be operated as S7 slaves in conjunction with SIMATIC S7/ M7 and STEP 7 (V3.0 and higher). This means that all the functions of the central S7 I/O modules are also at your disposal for the ET 200B analog modules.

**The Next Sections**

The next sections of this chapter contain an overview of the components of ET 200B.

| In Section | you will find     | on Page |
|------------|-------------------|---------|
| 1.2.1      | Terminal Block    | 1-5     |
| 1.2.2      | Electronics Block | 1-6     |

## 1.2.1 Terminal Block

**Definition** The terminal block incorporates the permanent wiring.

**Characteristics** The terminal block has the following characteristics:

- The supply voltage for the electronics block (logic) can be switched on/off (except for the TB6/AC terminal block).
- The terminal block can be mounted both on standard sectional rails and on smooth surfaces, so direct wall mounting is possible.
- The PROFIBUS-DP bus is interfaced via a SINEC L2 bus connector.
- Station numbers between 00 and 99 can be set with the aid of a tool such as a screwdriver:
  - When operating with an IM 308-B master interface, station numbers 3 to 99 are permissible.
  - When operating with an IM 308-C master interface or with an S7/M7 DP master, station numbers 1 to 99 are permissible.

## 1.2.2 Electronics Block

**Definition** The electronics block contains the logic circuits and is plugged onto the terminal block.

**Characteristics** The electronics block has the following characteristics:

- There is galvanic isolation between the PROFIBUS-DP bus and the internal electronics.
- The block has LEDs for indicating the following:
  - Voltage supply to the logic circuits (RUN)
  - Bus fault (BF)
  - Group diagnostics: short-circuit, wire break or load voltage failure (DIA, only for electronics blocks which can be diagnosed)
  - Load voltage monitoring (L1+, L2+, L3+, L4+, only for digital electronics blocks (24 V DC) with output channels)
  - Status of the inputs or outputs (for digital electronics blocks only)
- Labeling strips are inserted in the electronics block. Fill in the labeling strips to ensure unambiguous assignment of name, channel and LED.

# Technical Description

# 2

## In this Chapter

This chapter contains information on:

| In Section | you will find                   | on Page |
|------------|---------------------------------|---------|
| 2.1        | Design of the Terminal Block    | 2-2     |
| 2.2        | Design of the Electronics Block | 2-4     |

## 2.1 Design of the Terminal Block

### Design Principle of the Digital TBs

All digital terminal blocks are built on the same design principle explained below using the TB1/DC terminal block as a typical example:

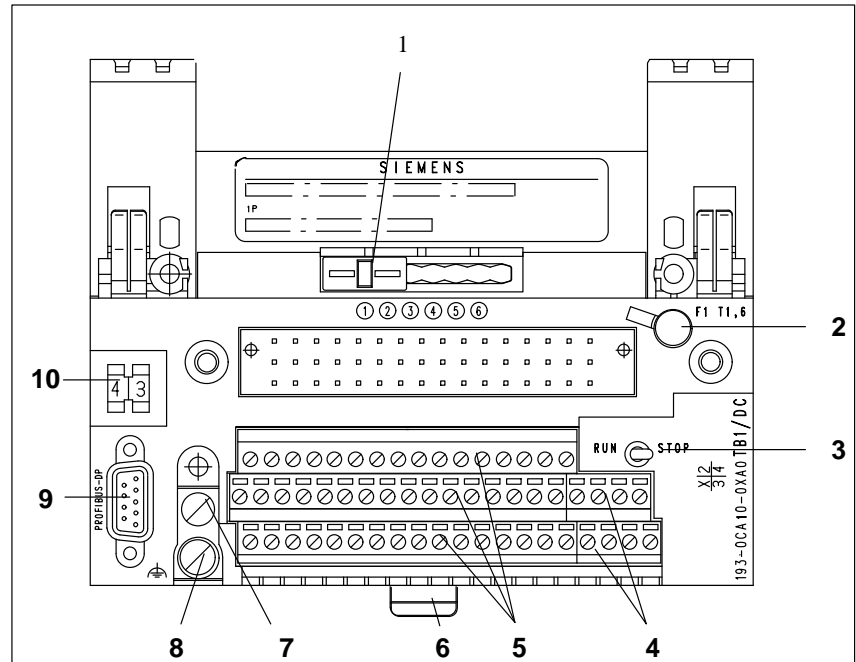


Figure 2-1 The TB1/DC

- 1 Coding slide switch
- 2 Fuse
- 3 STOP/RUN switch (not TB6/AC). The power supply for logic circuits in the electronics block can be switched on or off with the STOP/RUN switch. It can also be used to switch the ET 200B distributed I/O station on and off.
- 4 Terminals for power supplies
- 5 Terminals for inputs/outputs
- 6 Slide for removing the terminal block from the standard sectional rail
- 7 M4 screw (connects chassis to PE)
- 8 M5 screw for connecting PE
- 9 PROFIBUS-DP interface
- 10 Switch for setting the station number (the station number is valid only after operation of the STOP/RUN switch (STOP → RUN)).



**Design Principle of the TB8 Analog Block**

On the front of the TB8 analog terminal block, there are an additional 5 coding switches:

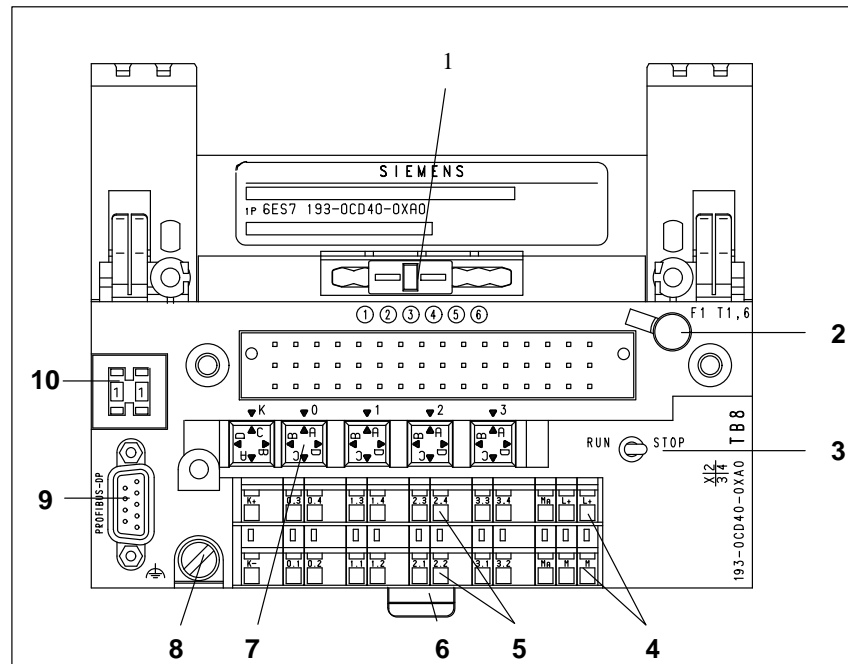


Figure 2-2 The TB8

- 1 Coding slide switch
- 2 Fuse
- 3 STOP/RUN switch. The power supply for logic circuits in the electronics block can be switched on or off with the STOP/RUN switch. It can also be used to switch the ET 200B distributed I/O station on and off.
- 4 Terminals for power supplies
- 5 Terminals for inputs/outputs
- 6 Slide for removing the terminal block from the standard sectional rail
- 7 Coding connectors. You use the coding connectors to set the wiring of the TB8 for analog value processing.
- 8 M5 screw for connecting PE
- 9 PROFIBUS-DP interface
- 10 Switch for setting the station number (the station number is valid only after operation of the STOP/RUN switch (STOP → RUN)).

## 2.2 Design of the Electronics Block

### Design Principle

All types of electronics block are built on the same design principle which is explained below using the ET 200B-16DI electronics block as a typical example:

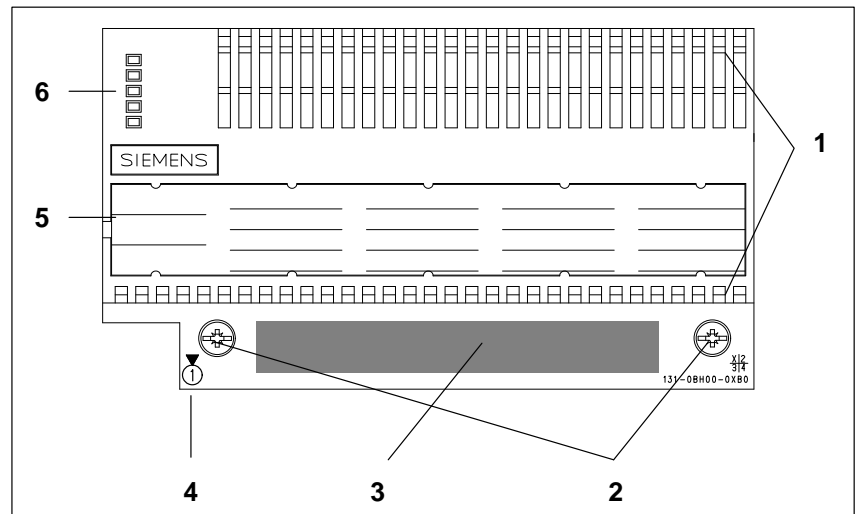


Figure 2-3 ET 200B-16DI Electronics Block

- 1 Ventilation slots
- 2 Screws for mounting the electronics block on the terminal block
- 3 Printed schematic diagram
- 4 Indication of the coding slide switch setting on the top of the terminal block
- 5 Labeling strip; for indicating the status of the inputs or outputs in the case of digital electronics blocks with LEDs
- 6 LEDs for
  - Voltage supply to the logic circuits (RUN)
  - Bus fault (BF)
  - Group diagnostics; short-circuit, wire break or load voltage failure (DIA, only for electronics blocks which can be diagnosed)
  - Load voltage monitor (L1+, L2+, L3+, L4+, depending on the electronics block: see Section 5.2)

### Coding

The electronics blocks are coded by the manufacturer.

Some types of electronics blocks have a recess at the bottom. This recess ensures that the terminal block is assigned safely to the correct electronics block.

# Mechanical and Electrical Installation

# 3

## In the Chapter

This chapter contains information on:

| In Section | you will find  | on Page |
|------------|--|---------|
| 3.1        | Installing and Setting the Terminal Block            | 3-2     |
| 3.2        | Installing the Electronics Block                     | 3-12    |
| 3.3        | Dismantling the Terminal Block and Electronics Block | 3-14    |
| 3.4        | Electrical Installation                              | 3-16    |
| 3.5        | Wiring the Terminal Block                            | 3-22    |
| 3.6        | Wiring the Bus Interface                             | 3-26    |

## Technical Data

You will find a detailed description of the technical data of the ET 200B modules in Sections 6, 7 and 8.

### 3.1 Installing and Setting the Terminal Block

#### Two Methods

You can install the terminal block either

- on a standard sectional rail (35 × 15 mm or 35 × 7.5 mm to DIN EN 50022)
- or
- on smooth surfaces, i.e. direct wall mounting (for dimensions of the mounting holes see Dimensional Drawings in Sections 7 and 8).

#### Small Electronics Block, Digital

Figure 3-1 shows the clearances required for installation of the 16DI, 16DO, 8DI/8DO, 8DI/8DO HWA, 8RO and 4/8AI, 4AI, 4AO electronics blocks (without shield connecting element):

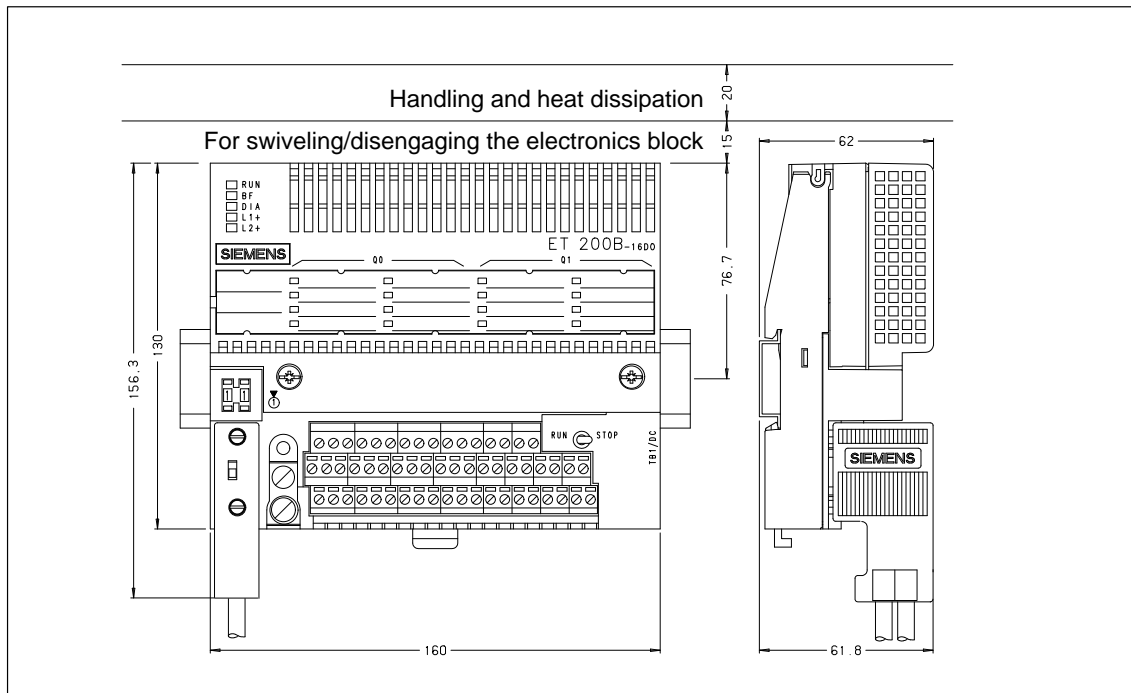


Figure 3-1 Clearances Required for Installation of the 16DI, 16DO, 8DI/8DO, 8DI/8DO HWA, 8RO and 4/8AI, 4AI, 4AO Electronics Blocks (without Shield Connecting Element)

**Large Electronics Block**

Figure 3-2 shows the clearances required for installation of the 16DI-AC, 16DO-AC, 32DI, 16DO/2A, 32DO, 16DI/16DO, 24DI/8DO, 16RO-AC and 8DI/8RO-AC electronics blocks:

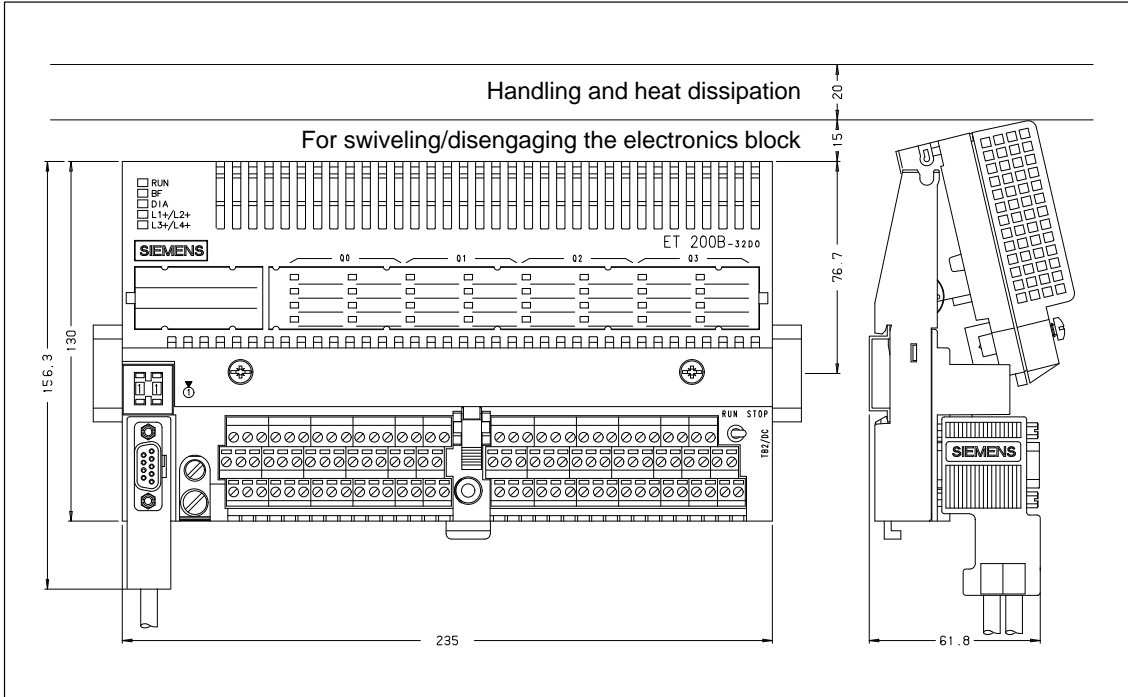


Figure 3-2 Clearances Required for Installation of the 16DI-AC, 16DO-AC, 32DI, 16DO/2A, 32DO, 16DI/16DO, 24DI/8DO, 16RO-AC and 8DI/8RO-AC Electronics Blocks

**Small Electronics Block, Analog**

Figure 3-3 shows the clearances required for installation of the 4/8AI, 4AI, 4AO electronics blocks (with shield connecting element):

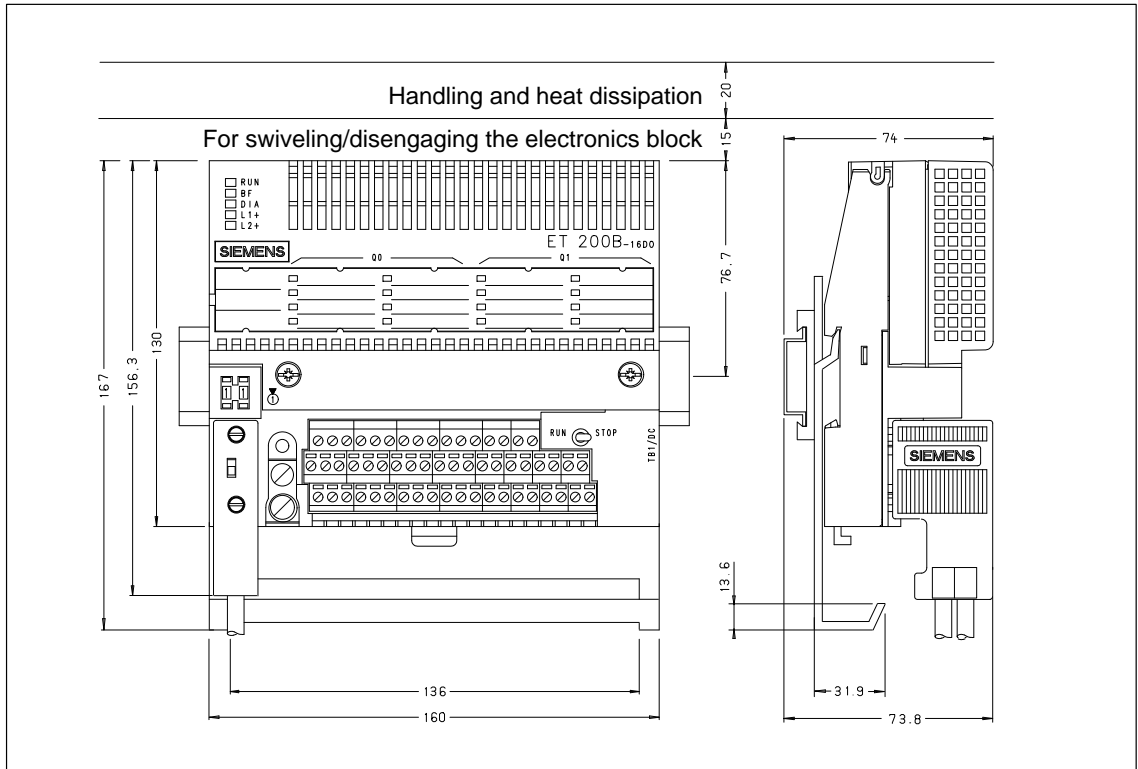


Figure 3-3 Clearances Required for Installation of the 4/8AI, 4AI and 4AO Electronics Blocks (with Shield Connecting Element)

**Shield Connecting Element for TB8**

In the case of analog value processing, we recommend that the cable shielding of the signal lines be connected directly at terminal block TB8.

For this application, you can hang the TB8 onto a shield connecting element after first mounting the shield connecting element on a standard sectional rail ( $35 \times 15$  or  $35 \times 7.5$  mm to DIN EN 50022) or a smooth surface.

To secure the shield braiding, install metal terminal elements on the shield connecting element.

You can order the shield connecting element and the terminal elements under the following numbers:

- Shield connecting element → Order No. 6ES7 193-0CD40-7XA0
- Terminal elements (set of two):
  - Single version → Order No. 6ES7 390-5BA00-0AA0  
(one shield cable per terminal element with a diameter of 3 to 8 mm to be clamped)
  - Double version → Order No. 6ES7 390-5AB00-0AA0  
(two shield cables per terminal element with a diameter of 2 to 6 mm to be clamped)

---

**Note**

If you mount the TB8 with shield connecting element on a standard sectional rail, you must install the ET 200B horizontally.

---

**Mounting on a  
Standard Sectional  
Rail**

To mount the terminal block on a standard sectional rail...

1. Hang the terminal block on the standard sectional rail (1) and
2. Swing it back until the slide on the module snaps into place (2).

**Note:**

The meanings of the coding switch settings are explained in Table 3-1.

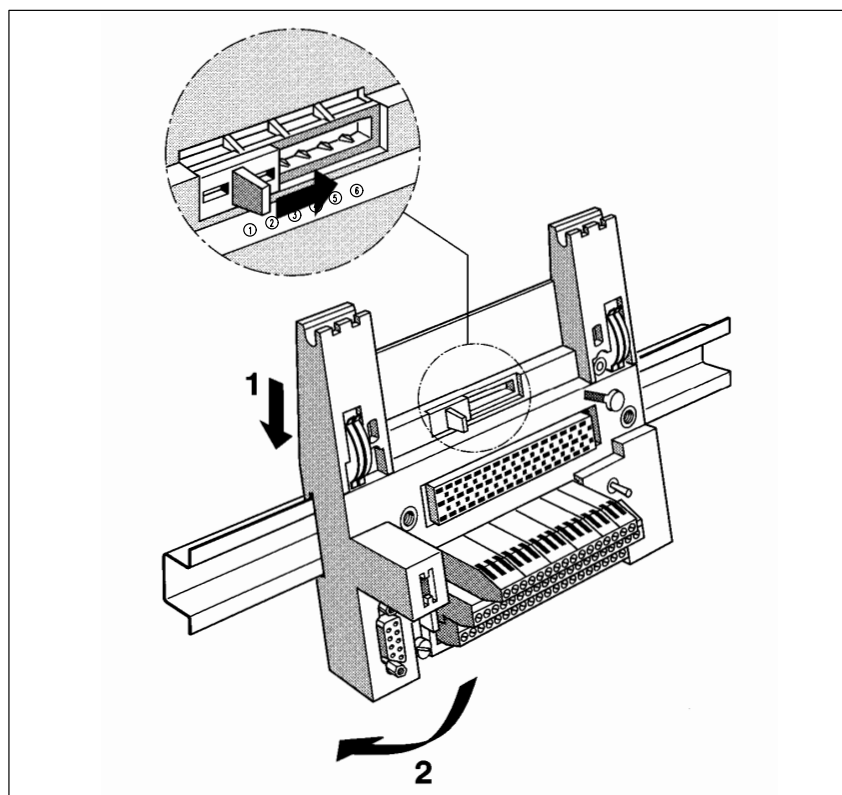


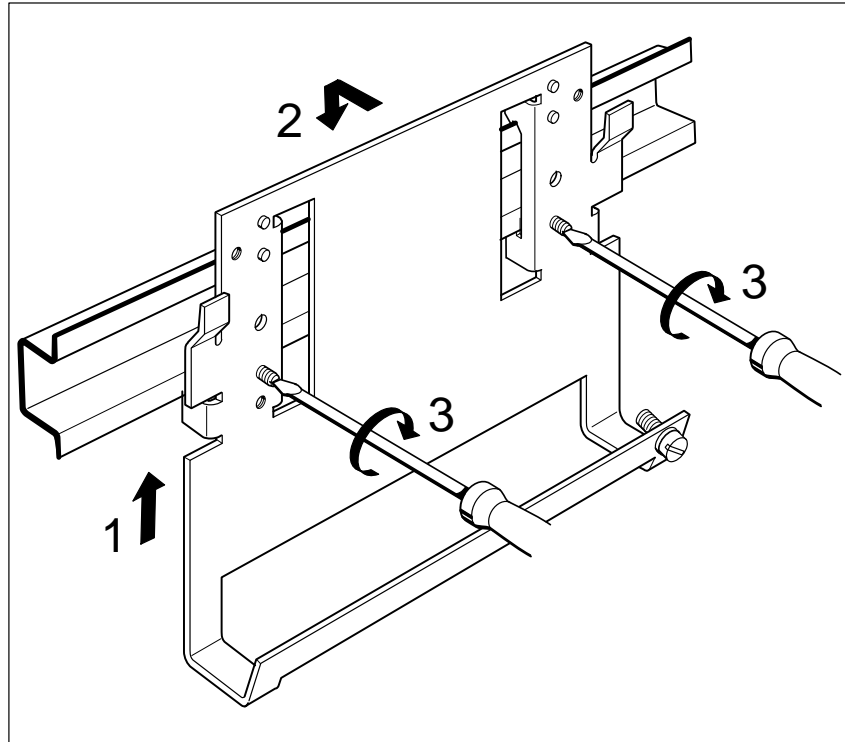
Figure 3-4 Hanging the Terminal Block on the Standard Sectional Rail and Setting the Coding Slide Switch



**Mounting the  
Shield Connecting  
Element on a Stan-  
dard Sectional Rail**

To mount the shield connecting element on a standard sectional rail...

1. Hang the shield connecting element on the standard sectional rail from below (1) and swing it back (2).
2. Secure the shield connecting element on the standard sectional rail by tightening the screws (3).



**3**

Figure 3-5 Mounting the Shield Connecting Element on the Standard Sectional Rail

### Mounting the Terminal Block on the Shield Connecting Element

To mount the terminal block on the shield connecting element ...

1. Engage the terminal block in the brackets of the terminal connecting element (1).
2. Tighten the screws to secure the terminal block to the shield connecting element (2).

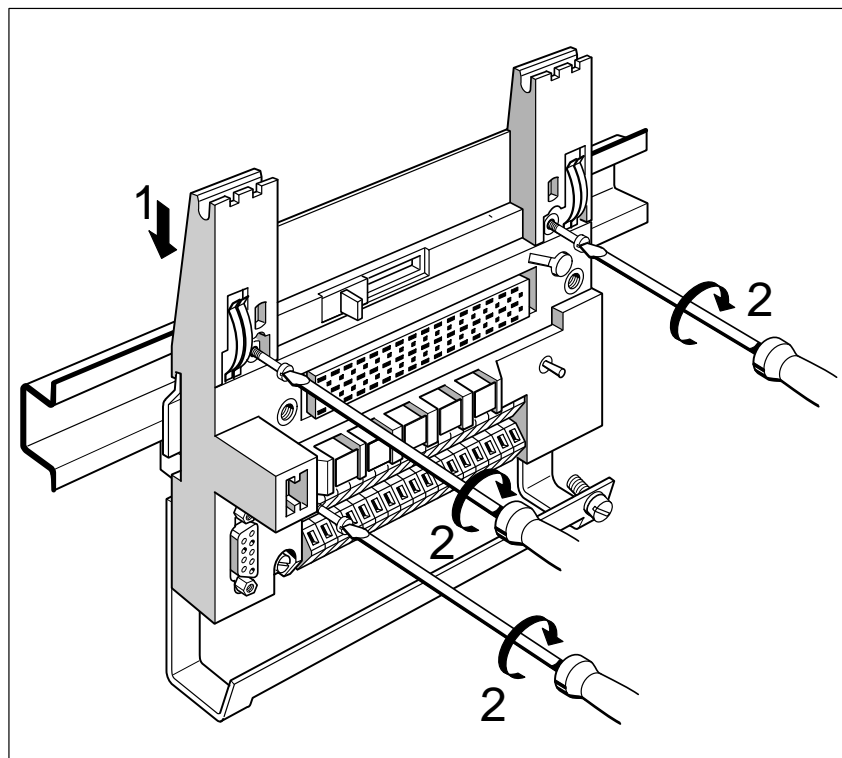


Figure 3-6 Mounting the Terminal Block on the Shield Connecting Element

**Setting the Coding Slide Switch**

In order to prevent the wrong electronics block being plugged in, the terminal block has a coding slide switch (see Section 2.1, Figure 2-1, **1**).

The coding switch can be engaged in 6 settings. Each setting is assigned to a module class of the ET 200B distributed I/O station:

Table 3-1 Assignment of the Electronics Blocks to the Coding Slide Switch

| Setting | Module Class          |
|---------|-----------------------|
| 1       | 24 V digital modules  |
| 2       | 24 V special modules  |
| 3       | Analog modules        |
| 4       | Reserved              |
| 5       | Reserved              |
| 6       | 230 V digital modules |

**Setting the Station Number**

Any station number from 00 to 99 can be set with the aid of a tool such as a screwdriver (see Section 2.1, Figure 2-1, **10**):

- Station numbers 3 to 99 are permissible when operating with the IM308-B master interface.
- Station numbers 1 to 99 are permissible when operating with the IM 308-C master interface or with the S7/M7 DP master.

The station number becomes valid only after a STOP/RUN transition of the ET 200B slave station.

**Setting the Coding Plug**

The coding plus of the TB8 provide the means of setting the defaults for analog value measurement and analog value output for each channel in the case of analog modules (see Section 2-1, Figure 2-2, **7**).

The coding plugs enable you to set the input or output circuitry of the TB8 to suit the measured value sensor or load connected and the desired measuring or output method.

The possible settings for the coding plugs are: "A", "B", "C" and "D".

The relationships between the various settings of the coding plugs and the measurement/output method and the measured value sensors and loads are detailed in the sections dealing with the individual electronics blocks (see Sections 8.4 through 8.6). The procedure for changing the settings of the coding plugs is described below.

### Changing the Coding Plug Setting

The procedure for changing the setting of a coding plug is as follows:

1. Pull the coding plug above the channel group from its socket in the TB8 (1).

**Tip:**

It is easiest to reset the coding plugs before installing the electronics block.

2. Turn the coding plug to the appropriate position (2) and reinsert the coding plug in its socket (3).

**Correct setting:**

The pointer "Δ" beside the letter "A", "B", "C" or "D" must point toward the electronics block.

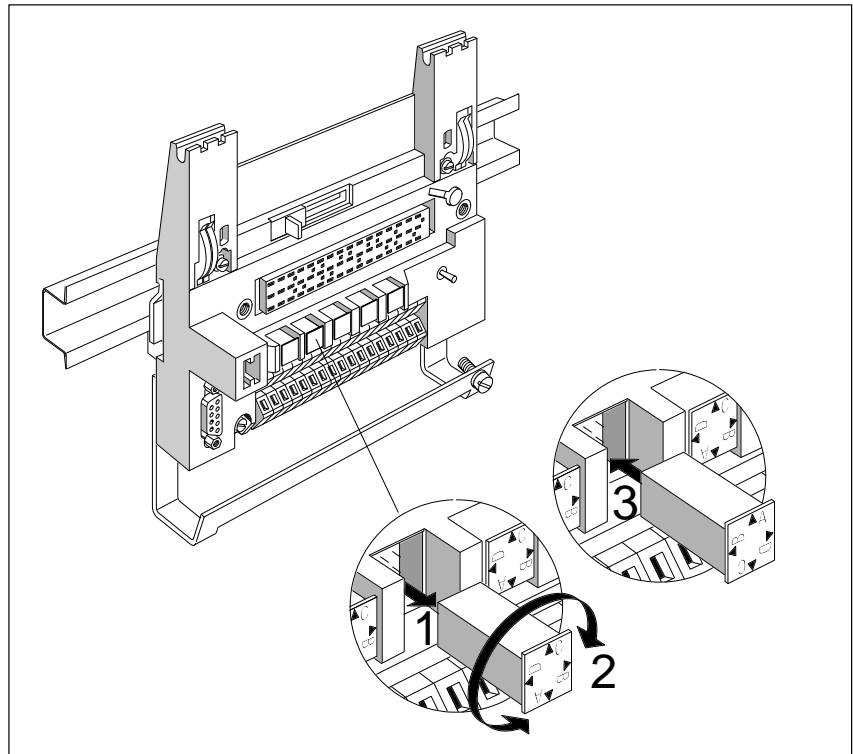


Figure 3-7 Changing the Setting of the Coding Plug

**Terminal Block Fuses**

The fuse (F1) in the terminal block protects against:

- short-circuit in the sensor supply
- reversed polarity of the voltage supply to the internal logic
- voltage spikes in the voltage supply to the internal logic

If the fuse trips the module's internal logic is deenergized.

**Changing the Fuse**

Proceed as follows when changing the fuse:

1. Switch the STOP/RUN switch to the "STOP" position.
2. Pull the electronics block off the terminal block.
3. Pry the fuse out of its base using a screwdriver.
4. Insert the new fuse.
5. Reinstall the electronics block on the terminal block.
6. Switch the RUN/STOP switch to "RUN".

**Note**

The TB6/AC terminal block has no STOP/RUN switch. Make sure that the external power supply is switched off before removing the electronics block and changing the fuse.

**Approved Fuses**

Install only the fuses listed in Table 3-2. The fuses can be ordered in packs of ten.

Table 3-2 Approved Fuses for Terminal Blocks

| Terminal Block | Fuse                               | Order No.<br>(pack of 10) |
|----------------|------------------------------------|---------------------------|
| TB6/AC         | Miniature fuse TR5-T 1.0; 250 V AC | 6ES7 193-0DC00-0XA0       |
| TB1/DC         | Miniature fuse TR5-T 1.6; 250 V    | 6ES7 193-0DA00-0XA0       |
| TB1-4/DC       | Miniature fuse TR5-T 1.6; 250 V    |                           |
| TB3/DC         | Miniature fuse TR5-T 1.6; 250 V    |                           |
| TB8-analog     | Miniature fuse TR5-T 1.6; 250 V    |                           |
| TB2/DC         | Miniature fuse TR5-T 2.5; 250 V    | 6ES7 193-0DB00-0XA0       |
| TB2-4/DC       | Miniature fuse TR5-T 2.5; 250 V    |                           |
| TB4/DC         | Miniature fuse TR5-T 2.5; 250 V    |                           |
| TB4M/DC        | Miniature fuse TR5-T 2.5; 250 V    |                           |

## 3.2 Installing the Electronics Block

### Engaging the Electronics Block on the Terminal Block

After coding the terminal block via the coding slide switch, you can engage the electronics block on the terminal block:



#### Warning

Avoid electrical destruction of the electronics block.

Always set the STOP/RUN switch of the terminal block to the “STOP” position before engaging the electronics block on the terminal block!

The TB6/DC terminal block has no STOP/RUN switch. Always switch off the external power supply before attempting to engage an electronics block (120/230 V AC) onto the TB6/DC.

1. Engage the electronics block on the terminal block (1).
2. Press the electronics block onto the terminal block (2).
3. Secure the electronics block by tightening the screws (3).

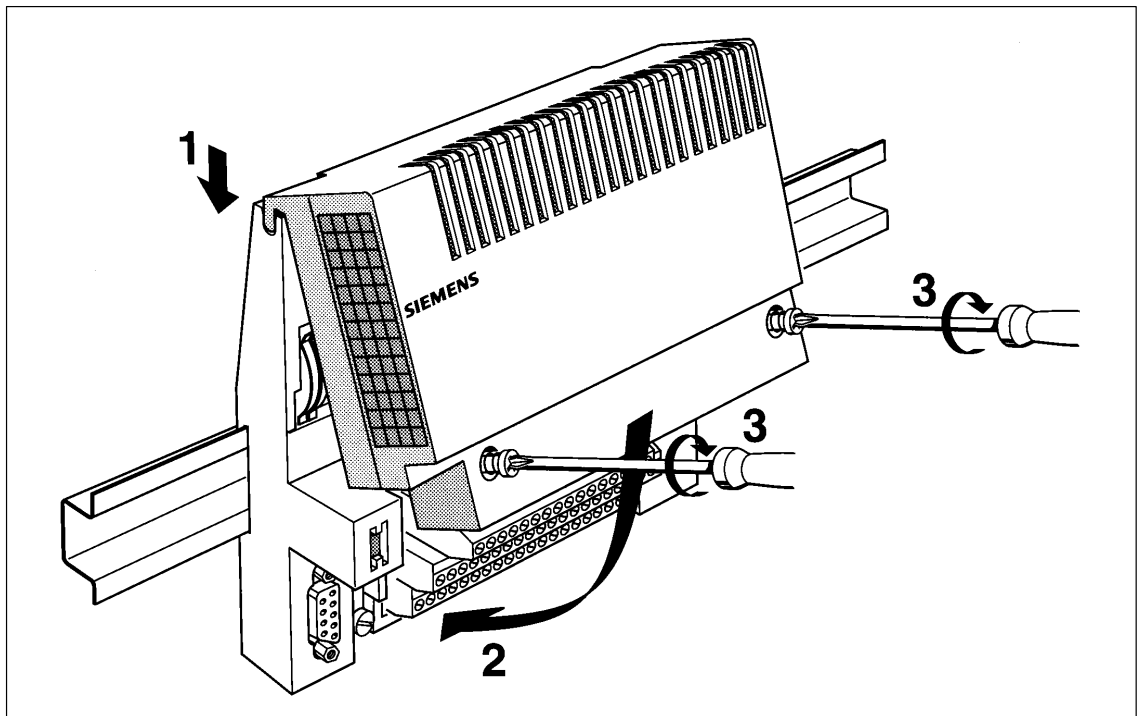


Figure 3-8 Engaging the Electronics Block on the Terminal Block

## Labeling the Electronics Block

A labeling strip is inserted in the electronics block.

Individual DIN A4 sheets consisting of several labeling strips can be ordered separately. Please refer to Appendix F for order numbers.

### Versions

- For electronics blocks with 16DI, 16DO, 8DI/8DO, 8DI/8DO HWA, 8RO, 4/8AI, 4AI, 4AO:

10 labeling strips on one DIN A4 sheet

- For electronics blocks with 16DI-AC, 16DO-AC, 32DI, 16DO/2A, 32DO, 16DI/16DO, 24DI/8DO, 16RO-AC, 8DI/8RO-AC:

7 large labeling strips and 9 small labeling strips on one DIN A4 sheet.

### 3.3 Dismantling the Terminal Block and the Electronics Block

#### Dismantling (from the Standard Sectional Rail)

Proceed according to the following steps:

1. Remove the electronics block in the reverse sequence to that described in Figure 3-8.



#### Warning

Avoid electrical destruction of the electronics block.

Always set the STOP/RUN switch of the terminal block to the “STOP” position before disengaging the electronics block from the terminal block or installing a replacement electronics block!

The TB6/DC terminal block has no STOP/RUN switch. Always switch off the external power supply before attempting to disengage an electronics block (120/230 V AC) from the TB6/DC or installing a replacement electronics block.

2. Press the slide (1) on the bottom of the terminal block down using a screwdriver and
3. Swing the terminal block out of the standard sectional rail (2).

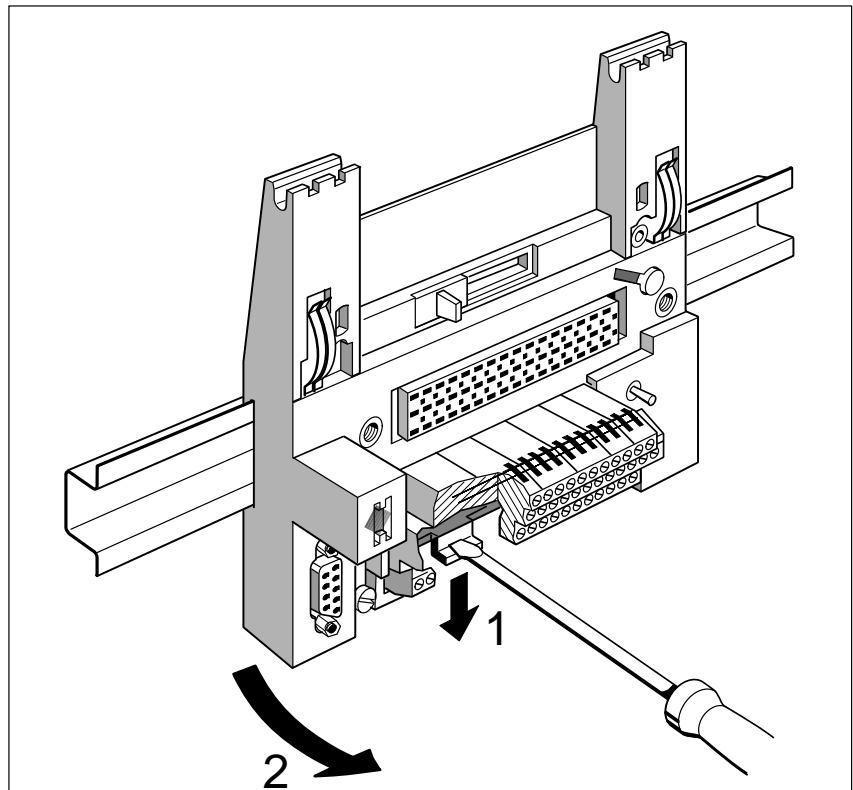


Figure 3-9 Dismantling the ET 200B



**Dismantling  
(from the Shield  
Connecting Ele-  
ment)**



Proceed according to the following steps:

1. Remove the electronics block in the reverse sequence to that described in Figure 3-8.

---

**Warning**

Avoid electrical destruction of the electronics block.

Always set the STOP/RUN switch of the terminal block to the “STOP” position before disengaging the electronics block from the terminal block or installing a replacement electronics block!

The TB6/DC terminal block has no STOP/RUN switch. Always switch off the external power supply before attempting to disengage an electronics block (120/230 V AC) from the TB6/DC or installing a replacement electronics block.

---

2. Remove the terminal block and the shield connecting element in the reverse sequence to that described in Figures 3-5 and 3-6.

## 3.4 Electrical Installation

**Introduction** The ET 200B distributed I/O station allows both **grounded** and **ungrounded** configurations.

**Next Sections** The following two sections explain the configuration rules and give circuit examples for

| In Section | you will find            | on Page |
|------------|--------------------------|---------|
| 3.4.1      | Grounded Configuration   | 3-17    |
| 3.4.2      | Ungrounded Configuration | 3-20    |

The numbers in the text cross-reference the components shown in the figures.


### 3.4.1 Grounded Configuration

**Definition** In a grounded configuration, the reference potential of the ET 200B logic circuits and the protective ground conductor (PE) are galvanically interconnected.

**Rules** You must note the following points for a grounded configuration:

- You must provide a main switch **(1)** in accordance with DIN VDE 0100 for the ET 200B modules, the signal sensors and the actuators.
- If the spur lines are a maximum of 3 m long and are ground-fault-resistant and short-circuit-proof, the supply connection for the ET 200B and the load circuit requires no additional fuse **(2)**.
- Use a Siemens load power supply unit **(3)** in the 6EV1 series (**Catalog ET 1**) for supplying the 24 V DC to the ET 200B.

If you connect another load power supply unit (24 V DC), please note that the voltage must be in the range 20 to 30 V (including ripple). The load power supply unit must generate a functional low voltage with safe electrical isolation in accordance with DIN VDE 0106. In the case of non-stabilized load power supply units, you require a back-up capacitor (rating 200  $\mu\text{F}$  per 1 A load current).

- Provide a detachable connection to the protective ground conductor **(4)** in the secondary circuit of the load power supply unit (M terminal).
- A fuse **(5)** is required for fusing the supply voltage.
- For both grounded and ungrounded configurations, the PE terminal  of the ET 200B must have a low-impedance connection to the protective ground conductor or the cabinet ground (machine parts) **(6)**.
- Use a minimum cross-section of 4 mm<sup>2</sup> and a maximum of 10 mm<sup>2</sup> for equipotential bonding and ground connections.
- All machine parts must be grounded.
- The PROFIBUS-DP interface of terminal blocks release 2 and later is ungrounded.

**Connecting the Reference Potential of the Logic Circuits to PE**

For a grounded configuration, you must also do the following at the digital terminal blocks:

1. Connect the PE terminal to the lower screw.
2. Tighten the upper screw. The upper screw connects the ground potential to PE.

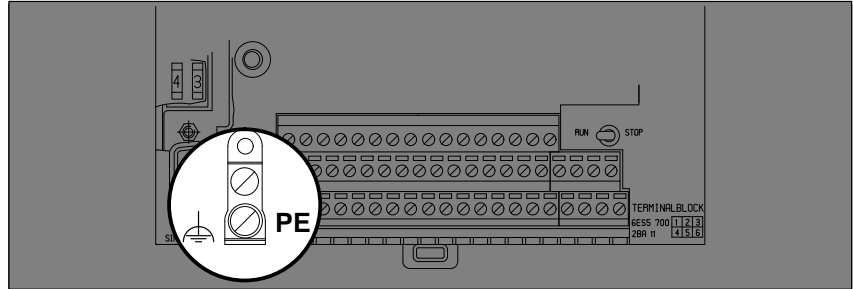


Figure 3-10 Both Screws Tightened in a Grounded Configuration

**Electrical Configuration**

The following figure shows the grounded configuration for 24 V DC digital modules of the ET 200B:

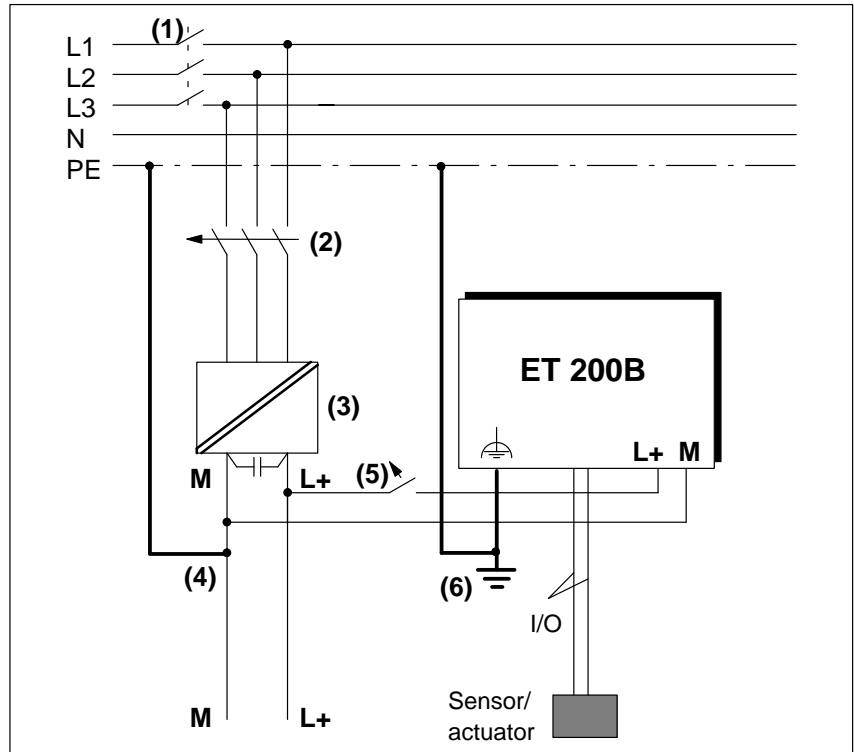


Figure 3-11 Grounded Configuration for 24 V DC Digital Modules of the ET 200B

**Electrical Configuration**

The following figure shows the grounded configuration for 120/230 V AC digital modules of the ET 200B:

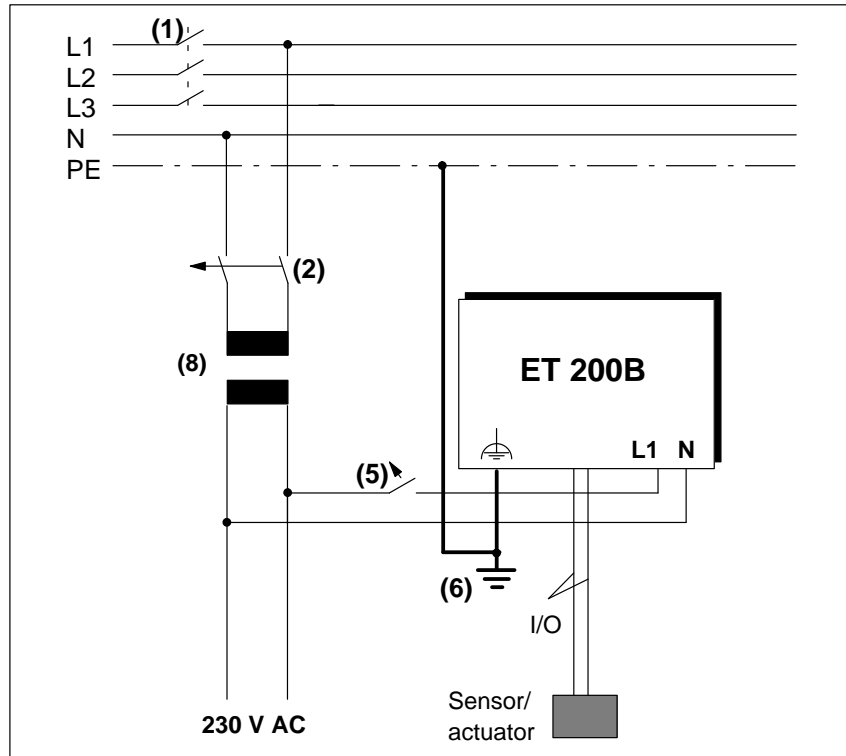


Figure 3-12 Grounded Configuration for 120/230 V AC Digital Modules of the ET 200B


### 3.4.2 Ungrounded Configuration

**Definition** In an ungrounded configuration, there is no galvanic connection between the reference potential of the ET 200B logic circuits and the protective ground conductor (PE).

**Rules** You must note the following points for an ungrounded configuration:

- You must provide a main switch (1) in accordance with DIN VDE 0100 for the ET 200B modules, the signal sensors and the actuators.
- If the spur lines are a maximum of 3 m long and are ground-fault-resistant and short-circuit-proof, the supply connection for the ET 200B and the load circuit requires no additional fuse (2).
- Use a Siemens load power supply unit (3) in the 6EV1 series (**Catalog ET 1**) for supplying the 24 V DC to the ET 200B.

If you connect another load power supply unit (24 V DC), please note that the voltage must be in the range 20 to 30 V (including ripple). The load power supply unit must generate a functional low voltage with safe electrical isolation in accordance with DIN VDE 0106. In the case of non-stabilized load power supply units, you require a back-up capacitor (rating 200 µF per 1 A load current).

- A fuse (5) is required for fusing the supply voltage.
- For both grounded and ungrounded configurations, the PE terminal  of the ET 200B must have a low-impedance connection to the protective ground conductor or the cabinet ground (machine parts) (core cross-section of PE min. 4 mm<sup>2</sup> and max. 10 mm<sup>2</sup>) (6).
- Provide an insulation monitoring circuit against ground with voltage limitation in accordance with the regulations applying to the system, for example DIN VDE 0160 (7).
- The PROFIBUS-DP interface of terminal blocks release 2 and later is ungrounded.



#### Warning

The ungrounded configuration can be canceled out by grounded machine parts and grounded electrical equipment.

**Example:** A grounded sensor or a grounded actuator connects the PE to the reference potential (M terminal) of the controller.

---

**Disconnecting the Reference Potential of the Logic Circuits from PE**

For an ungrounded configuration, you must also do the following at the digital terminal blocks:

1. Connect the PE terminal to the lower screw.
2. Remove the upper screw for an ungrounded configuration.

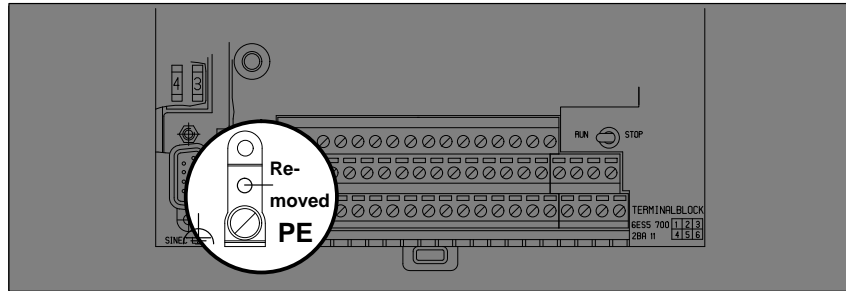


Figure 3-13 Upper Screw Removed in an Ungrounded Configuration

**Electrical Configuration**

Figure 3-14 shows the ungrounded configuration for 24 V DC digital modules of the ET 200B:

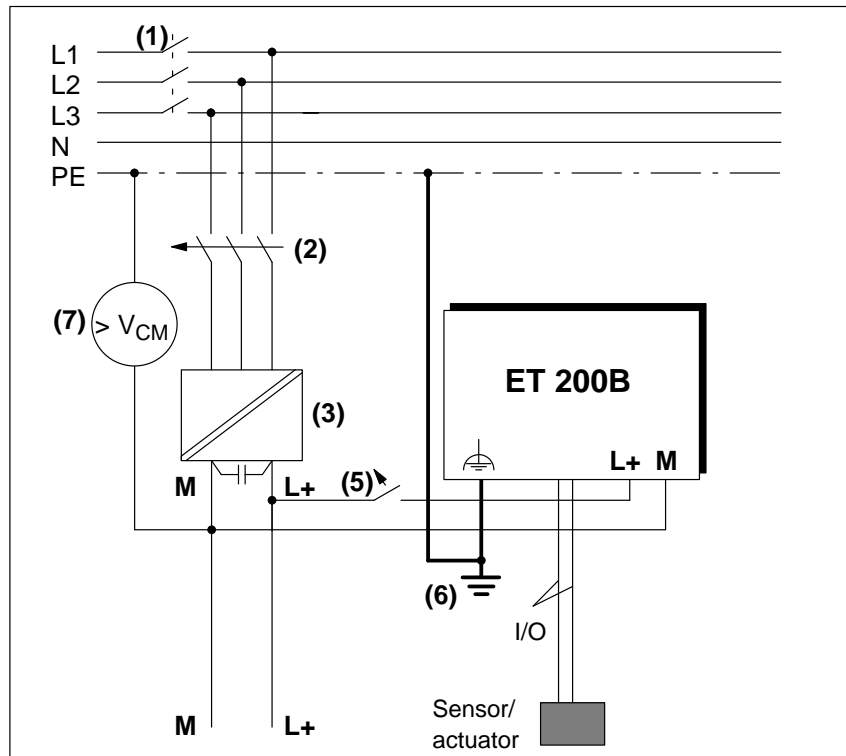


Figure 3-14 Ungrounded Configuration for 24 V DC Digital Modules of the ET 200B

## 3.5 Wiring the Terminal Block

### Introduction

Connect the following to the terminal block:

- Supply voltage for internal logic circuits
- Sensor supply for input channels
- Load voltage supply for output channels
- Sensors/loads

### Wiring

The wiring of the terminal block is dependent on the electronics block used. A distinction is made between **floating** and **non-floating** electronics blocks.

### Floating Electronics Block

In a floating electronics block

- **either** the circuit for the internal electronics and the load circuit are galvanically isolated from each other:

All 120/230 V AC electronics blocks and floating 24 V DC electronics blocks belong to this category.

- **or** the voltage supply of the internal logic and the analog circuits are galvanically isolated from each other:

All analog electronics blocks belong to this category.

---

### Note

You can use floating electronics blocks regardless of whether the reference potential of the supply voltage for the internal logic circuits is grounded or not.

---

### Non-Floating Electronics Blocks

In non-floating electronics blocks, the internal logic circuits and the load current circuit share a common reference potential (M ground).

Non-floating electronics blocks include: non-floating 24 V DC electronics blocks.



**Conductor Cross-sections**

The approved conductor cross-sections for all voltage-supply and signal lines are as follows:

Table 3-3 Approved Conductor Cross-sections

| Line                                     | Conductor Ferrules | Conductor Cross-section  |
|--|--------------------|--|
| Supply-voltage and signal lines          | with ferrules      | max. 1.5 mm <sup>2</sup>   |
|  | w/o ferrules       | max. 2.5 mm <sup>2</sup><br>(min. 0.08 mm <sup>2</sup> for TB3, TB4, TB4M, TB8 and min. 0.14 mm <sup>2</sup> for TB1, TB1-4, TB2, TB2-4) |
| Protective earth (PE) to terminal block* | with ferrule       | max. 2.5 mm <sup>2</sup>   |

\* for TB1-4/DC or TB2-4/DC only

**Connections**

Some terminal blocks are fitted with screw terminals while others have spring-latch terminals (see Figure 3-15) for securing the cable conductors.

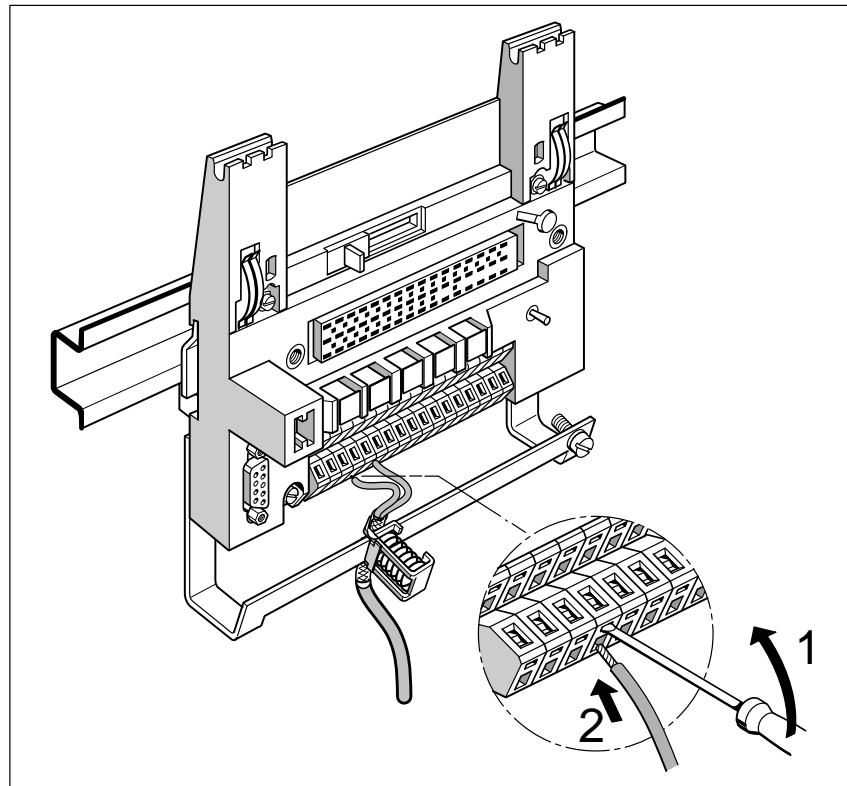


Figure 3-15 Connecting Cables to Spring-Latch Terminals

**Pin Assignments**

In Chapter 7 “Range of Modules”, you will find the pin assignments of each electronics block. The following table will help you.

Table 3-4 Pin Assignments of the Terminal Blocks

| Assignment of ...                    | For Electronics Block ...                | See ...    |
|--------------------------------------|--|------------|
| TB1/DC, TB1-4/DC and TB3/DC          | ET 200B-16DI                             | Table 7-3  |
|                                      | ET 200B-16DO                             | Table 7-5  |
|                                      | ET 200B-8DI/8DO                          | Table 7-9  |
|                                      | ET 200B-8DI/8DO HWA                      | Table 7-10 |
|                                      | ET 200B-8RO                              | Table 7-8  |
| TB2/DC, TB2-4/DC, TB4/DC and TB4M/DC | ET 200B-16DO/2A                          | Table 7-6  |
|                                      | ET 200B-32DI, ET 200B-32DI 0.2ms         | Table 7-4  |
|                                      | ET 200B-32DO                             | Table 7-7  |
|                                      | ET 200B-16DI/16DO                        | Table 7-12 |
|                                      | ET 200B-24DI/8DO, ET 200B-24DI/8DO 0.2ms | Table 7-13 |
| TB6/AC                               | ET 200B-16DI-AC                          | Table 7-14 |
|                                      | ET 200B-16DO-AC                          | Table 7-15 |
|                                      | ET 200B-16RO-AC                          | Table 7-16 |
|                                      | ET 200B-8DI/8RO-AC                       | Table 7-17 |
| TB8-analog                           | ET 200B-4/8AI                            | Table 8-37 |
|                                      | ET 200B-4AI                              | Table 8-55 |
|                                      | ET 200B-4AO                              | Table 8-65 |

### Shielding for Analog Value Processing

For analog value processing, connect the cable shields of the signal lines directly at the TB8 to the shield connecting element (Order No.: 6ES7 193-0CD40-7XA0).

### Procedure for Connecting the Shielding

Follow the steps listed below:

1. Engage the TB8 terminal block on the shield connecting element after first mounting the shield connecting element on the standard sectional rail or a smooth surface (wall) (see Section 3.1).
2. Mount the metallic terminal elements (see Section 3.1) on the bottom edge of the shield connecting element (**1** and **2**).
3. Strip the ends of the signal lines.
4. Secure the bare cable ends to the terminal elements (**3** and **4**).
5. Connect the shield connecting element to the protective ground conductor (PE). The cross-section of PE must be a minimum of 4 mm<sup>2</sup> and a maximum of 10 mm<sup>2</sup>.
6. Connect the shield of the bus cable in such a way that the maximum bend radius when bent once ( $10 \times d_0$ ;  $d_0$  = outer diameter of the cable) is not exceeded.

3

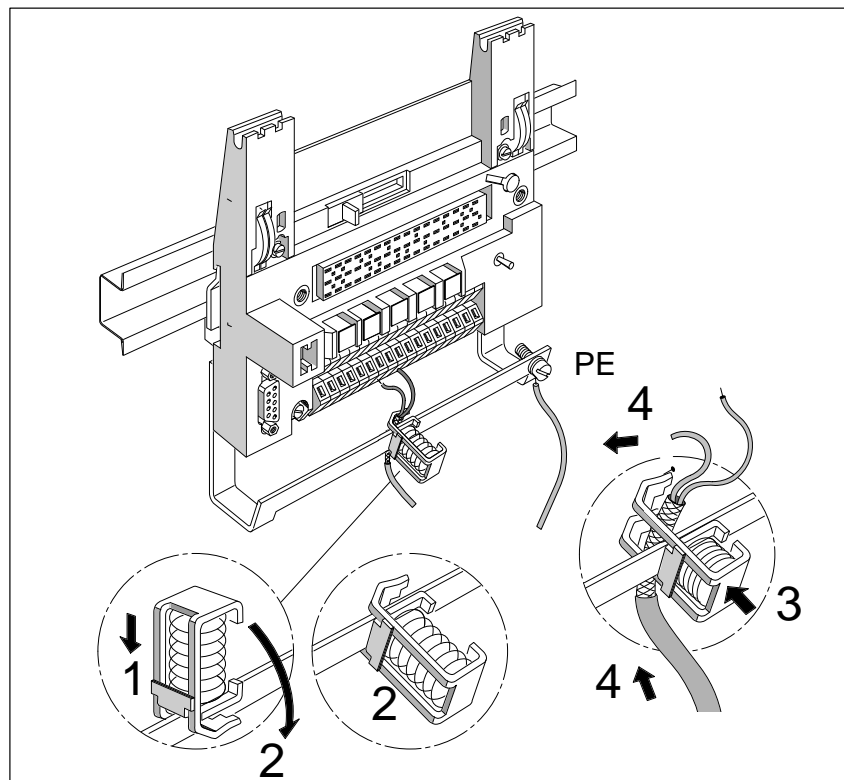


Figure 3-16 Shield Connecting Element on Terminal Block TB8

### 3.6 Wiring the Bus Interface

**Bus Interface** The PROFIBUS-DP bus connects to the terminal block by means of a bus connector.

**Bus Connector** There are a number of bus connectors for ET 200B.

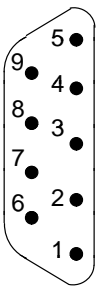
Table 3-5 Bus Connectors

| Design  |                           | Order Number                     |
|---|---------------------------|----------------------------------|
| max. 12 Mbaud                                 | without programmer socket | 6ES7 972-0BA10-0XA0 <sup>1</sup> |
|   | with programmer socket    | 6ES7 972-0BB10-0XA0 <sup>1</sup> |
| max. 1.5 Mbaud (without terminating resistor) | without programmer socket | 6ES7 972-0BA30-0XA0              |

<sup>1</sup> When inserted, the installation height for the ET 200B module is not exceeded with this bus connector.

**PROFIBUS-DP Interface** The pin assignment of the 9-pin PROFIBUS-DP interface of the terminal block is described below.

Table 3-6 Pin Assignment of the PROFIBUS-DP Interface

| View <sup>2</sup>   | Pin No. | Signal Name | Designation                             |
|---|---------|-------------|---|
|  | 1       | –           | –                                       |
|   | 2       | –           | –                                       |
|   | 3       | RxD/TxD-P   | Data line B                             |
|   | 4       | RTS         | Request To Send                         |
|   | 5       | M5V2        | Data reference potential (from station) |
|   | 6       | P5V2        | Supply plus (from station)              |
|   | 7       | –           | –                                       |
|   | 8       | RxD/TxD-N   | Data line A                             |
|   | 9       | –           | –                                       |

<sup>2</sup> Terminal block as viewed from in front

**Connecting the Bus Cable**

The procedure for connecting the bus cable to the bus connector is described in detail in the following manuals:

- Manual *ET 200 Distributed I/O System*
- Manual *S7-300 Programmable Controller Hardware and Installation*
- Manual *M7-300 Programmable Controller Hardware and Installation*
- Manual *S7-400/M7-400 Programmable Controller Hardware and Installation*

**Dimensional Drawings with Bus Connectors**

Chapters 7 and 8 contain dimensional drawings of ET 200B modules with bus connectors installed.



# Configuration and Parameterization

# 4

## In this Chapter

Before startup, you must configure and parameterize the modules of the ET 200B distributed I/O station.

This chapter contains information on:

| In Section | you will find                            | on Page |
|------------|--|---------|
| 4.1        | Configuration Options                    | 4-2     |
| 4.2        | Requirements for Configuration           | 4-3     |
| 4.3        | Where to Find the Requisite Information? | 4-5     |

## 4.1 Configuration Options

### Options

You can configure and parameterize the ET 200B modules described in this manual as DP slaves:

- with COM ET 200 version 4.x or higher
  - version 4.0 or higher: digital modules
  - version 4.1 or higher: analog modules
- with COM ET 200 Windows version 1.0 or higher
- with STEP 7 version x.0 or higher
  - version 2.0 or higher: digital modules
  - version 3.0 or higher: analog modules
- directly by means of configuration and parameterization telegrams (for DP masters from Siemens that do not belong to the SIMATIC S5/S7/M7 automation system and other-vendor DP masters).

### S7 Slave

The analog modules of ET200B can be operated as S7 slaves in conjunction with SIMATIC S7/ M7 and STEP 7 (V3.0 and higher). This means that all the functions of the central S7 I/O modules are also at your disposal for the ET 200B analog modules.



## 4.2 Requirements for Configuration

### Type File

COM ET 200 V4.x, COM ET 200 Windows and STEP 7 require a type file for each ET 200B module (DP slave). The type file is a record of all the properties of the module concerned.

You do not need a type file to operate ET 200B analog modules as S7 slaves.

Before you start working with the software, check that the type file of the ET 200B module is installed in a type-file directory recognized by the software. The names of the type files are listed in Appendix A.1.

If you do not have a type file for ET 200B, you can fetch the type file you need via modem. The number to dial is +49 (911) 737972.

### GSD File

You do not need a device master data file (GSD file) unless you are going to use ET 200B with a DP master that cannot process the type file. The GSD file contains all the slave-specific properties.

The format of the GSD file is defined in EN 50170, Part 3. The contents of the GSD files are described in Appendix A.2.

You can order the GSD file on diskette (Order No. 6ES7 190-1AA00-0AA0) or fetch it via modem. The modem number to dial is +49 (911) 737972.

**Which Type File?**

There are a number of type file versions for the ET 200B modules; the version you need depends on the parameterization software and the master.

The type file version is indicated by the seventh character in the type file name (example: SIxxxxAD.200), "xxxx" is the module's manufacturer ID.

The 8th character in the type file name indicates the language:  
 D = German, E = English, F = French, I = Italian, S = Spanish,  
 X = non-language-specific (example: SIxxxxAE.200 for an English type file).

The type file versions and their applications are listed in the table below.

Table 4-1 Type File Versions and Applications

| Parameterization software      | COM ET 200 V4.x      | COM ET 200 Windows (V1.0 and higher) |  | STEP 7 <sup>1</sup> (as DP slave)                  |
|--------------------------------|----------------------|--------------------------------------|--|--|
| Master                         | IM 308-B             | IM 308-C                             |  | S7/M7 DP master                                    |
| <b>ET 200B digital modules</b> |                      |                                      |  |  |
| Type file <sup>2</sup>         | SIxxxxTE.200         | SIxxxxAE.200 or SIxxxxAX.200         |  | SIxxxxAE.200 or SIxxxxAX.200                       |
| Parameterization               | no settings possible |                                      |  |  |
| Configuration                  | DP ID                | DP ID                                |  | DP ID  |
| Diagnostics                    | 13 bytes             | 13 bytes                             |  | 13 bytes   |
| <b>ET 200B analog modules</b>  |                      |                                      |  |  |
| Type file <sup>2</sup>         | SIxxxxTE.200         | SIxxxxAE.200                         | SIxxxxBE.200                                       | SIxxxxBE.200                                       |
| Parameterization               | 32 bytes (KH format) | 32 bytes (plain text with pick list) | 36 bytes <sup>3</sup> (plain text with pick list)  | 36 bytes <sup>3</sup> (plain text with pick list)  |
| Configuration                  | DP ID                | DP ID                                | extended DP ID, single-channel addressing possible | extended DP ID, single-channel addressing possible |
| Diagnostics                    | 16 bytes             | 21/25 bytes                          | 25/29 bytes  | 25/29 bytes  |

These applications are taken into account in Chapters 5 through 8; important information on the other applications is contained in the Appendix.

<sup>1</sup> STEP 7 version 2.0 and higher for digital modules, STEP 7 version 3.0 and higher for analog modules

<sup>2</sup> xxxx = manufacturer ID of the ET 200B module (see Section A.1)

<sup>3</sup> Analog modules with additional functions: limit-value alarm, diagnostics alarm, 4AO supporting dummy-value output, other measuring ranges

### 4.3 Where to Find the Requisite Information?

**COM ET 200 Windows and STEP 7**

Chapters 5 through 8 contain information on configuration, parameterization and diagnostics that you will need if you are working with the latest type files under COM ET 200 Windows or STEP 7 (see Table 4-1: gray fields).

If you use COM ET 200 Windows or STEP 7 to configure and parameterize ET 200B modules, the graphical user interfaces and the integral online help systems of these programs provide additional support.

The manual *ET200 Distributed I/O System* (Order No. 6ES5 998-3ES12) contains general information on working with COM ET 200 Windows.

Basic information on configuring and parameterizing distributed I/O with STEP 7 is contained in the user manual entitled *Standard Software for S7 and M7, STEP 7*.

**COM ET 200 Windows (Old Type File)**

If you configure and parameterize ET 200B analog modules with COM ET 200 Windows and the type file SIxxxxAE.200, you will find the requisite supplementary information in Appendix E of this manual.

**COM ET 200 Version 4.x**

If you configure and parameterize ET 200B modules with COM ET 200 version 4.x, you will find the information you need in Appendix D of this manual.

**Configuration and Parameterization Telegram**

If you use configuration and parameterization telegrams to operate ET 200B, e.g. CP 5431 as DP master, you need the details of the layout of the configuration and parameterization telegram, which is module-specific (see Appendix B and C).



# 5

## Status and Error Diagnostics

### In this Chapter

This chapter describes the diagnostics options for the ET 200B distributed I/O station.

The information is applicable if you are using the latest applicable type file under COM ET 200 Windows or STEP 7 (see Table 4-1: gray fields).

| In Section | you will find                       | on Page |
|------------|-------------------------------------|---------|
| 5.1        | Possible response on startup        | 5-2     |
| 5.2        | Status and error indication by LEDs | 5-3     |
| 5.3        | Slave diagnostics                   | 5-5     |

### Diagnostics with IM 308-B

Diagnostics with the IM 308-B master interface and COM ET 200 V4.x is not discussed in this chapter. You will find all the information you need on diagnostics with the IM 308-B in Appendix D.

### Diagnostics with IM 308-C (Old Type Files)

If you configure the analog modules of ET 200B with COM ET 200 Windows and the type file SIxxxxAE.200, you will find the information you need on diagnostics in Appendix E.

## 5.1 Possible Response on Startup

### **Response to Power Off/Power On**

If power is switched on and off repeatedly, it is possible in exceptional cases that an ET 200B digital module will not be accepted by the PROFIBUS-DP bus.

#### **Remedy:**

Set the STOP/RUN switch to STOP and then back to RUN.

### **Baud Rate Change**

With the ET 200B digital modules, it is not possible to correct a wrong configuration and simultaneously change the baud rate. If this is attempted, the station will not be accepted by the PROFIBUS-DP bus.

#### **Remedy:**

Set the STOP/RUN switch to STOP and then back to RUN.

## 5.2 Status and Error Indication by LEDs

**Introduction** The indicators on the front panels of the ET 200B provide initial indication of the type of error.

**Error Indication, Digital ET 200B** The meanings of the signals provided by the LEDs on digital ET 200B modules are listed in the table below.

Table 5-1 LEDs on Digital ET 200B Modules and their Meanings

| LED     | State       | Meaning   |
|---------|-------------|---|
| RUN     | Lit (green) | ET 200B in operation (power supply switched on; STOP/RUN switch in "RUN" position <sup>1</sup> )  |
| BF      | Lit (red)   | Either <ul style="list-style-type: none"> <li>Response monitoring time has elapsed without the ET 200B station being addressed (because connection to the IM 308-C or to the S7/M7 DP master has failed or the IM 308-C is set to STOP)</li> </ul> or <ul style="list-style-type: none"> <li>The ET 200B station was not parameterized on startup/restart.</li> </ul> |
| DIA     | Lit (red)   | For digital 24 V DC output modules: <ul style="list-style-type: none"> <li>one output at least: short-circuit or load voltage failure (L1+, L2+, L3+, L4+)</li> </ul> For analog modules: <ul style="list-style-type: none"> <li>diagnostics for at least one input or output</li> </ul>  |
| L1+     | Lit (green) | For ET 200B-16DO, -8DI/8DO, -8DI/8DO HWA, -16DI/16DO, -24DI/8DO and -24DI/8DO 0.2ms: <ul style="list-style-type: none"> <li>Voltage is applied for channel group Q0: .0 ... .7.<sup>2</sup></li> </ul>  |
| L2+     | Lit (green) | For ET 200B-16DO, -16DI/16DO: <ul style="list-style-type: none"> <li>Voltage is applied for channel group Q1: .0 ... .7.<sup>2</sup></li> </ul>   |
| L1+/L2+ | Lit (green) | For ET 200B-32DO: <ul style="list-style-type: none"> <li>Voltage is applied for channel groups Q0: .0 ... .7 and Q1: .0 ... .7.<sup>2</sup></li> </ul> For ET 200B-16DO/2A: <ul style="list-style-type: none"> <li>Voltage is applied for channel groups Q0: .0 ... .3 and Q0: .4 ... .7.<sup>2</sup></li> </ul>  |
| L3+/L4+ | Lit (green) | For ET 200B-32DO: <ul style="list-style-type: none"> <li>Voltage is applied for channel groups Q2: .0 ... .7 and Q3: .0 ... .7.<sup>2</sup></li> </ul> For ET 200B-16DO/2A: <ul style="list-style-type: none"> <li>Voltage is applied for channel group Q1: .0 ... .3 and Q1: .4 ... .7.<sup>2</sup></li> </ul>   |

<sup>1</sup> Not applicable to AC 120/230 V AC digital modules. These modules do not have a STOP/RUN switch.

<sup>2</sup> LED goes out if fuse blows or voltage drops below a certain limit (typically 15.5 V).

**Error Indication,  
Analog ET 200B**

The meanings of the signals provided by the LEDs on analog ET 200B modules are listed in the table below.

Table 5-2 LEDs on Analog ET 200B Modules and their Meanings

| LED RUN     | LED BF             | LED DIA         | Meaning  | Remedy   |
|-------------|--------------------|-----------------|--|--|
| Off         | Off                | Off             | Voltage not applied to module.   | <ul style="list-style-type: none"> <li>Check the power supply.</li> <li>Check that the electronics block is correctly mounted on the terminal block.</li> </ul>  |
| Lit (green) | Off                | Off             | Module is on the PROFIBUS-DP and is exchanging data.   | -  |
| Lit (green) | Lit (red) or off   | Lit (red)       | An error has occurred on the module (e.g. parameterization incorrect, wire break, measuring range overshoot)   | <ul style="list-style-type: none"> <li>Read the diagnostics buffer to identify the error, see Section 5.3 "Slave Diagnostics"</li> <li>If there is no diagnostics information in the buffer, check parameterization to ascertain whether the diagnostics alarm and corresponding channel diagnostics have been enabled.</li> </ul> |
| Lit (green) | Flashing (red)     | Off             | Either <ul style="list-style-type: none"> <li>Module has not received a parameterization telegram, or telegram is incorrect.</li> </ul> or <ul style="list-style-type: none"> <li>Incorrect bus protocol.</li> </ul> | Check the configuration in the DP master (station number, station type).   |
| Lit (green) | Flashing (red)     | Lit (red)       | Error in configuration telegram  | This error cannot occur if the correct type files are used.  |
| Lit (green) | Flashes once (red) | Off             | Module is powering up.   | -  |
| Lit (green) | Lit (red)          | No significance | Baud rate matching in progress.  | <ul style="list-style-type: none"> <li>Check the PROFIBUS-DP connection.</li> <li>Check the DP master.</li> </ul>  |



## 5.3 Slave Diagnostics

### Definition

Diagnostics means the detection and pinpointing of errors. The layout of slave diagnostics is defined in standard EN 50170, Part 3. Slave diagnostics of the ET 200B are in compliance with this standard.

### In this Section

This section describes the structure of slave diagnostics for ET 200B.

| In Section | you will find   | on Page |
|------------|---|---------|
| 5.3.1      | General information on slave diagnostics, operation with IM 308-C   | 5-6     |
| 5.3.2      | General information on slave diagnostics, operation with S7/M7 DP masters (STEP 7) or other PROFIBUS-DP masters | 5-8     |
| 5.3.3      | Structure of slave diagnostics  | 5-9     |
| 5.3.4      | Structure of station status 1 to 3  | 5-11    |
| 5.3.5      | Structure of the master station number and the manufacturer ID  | 5-13    |
| 5.3.6      | Structure of device-related diagnostics (digital ET 200B)   | 5-14    |
| 5.3.7      | Structure of ID-related diagnostics (analog ET 200B)  | 5-16    |
| 5.3.8      | Structure of device-related diagnostics (analog ET 200B)  | 5-18    |

### Further Information

Section 5.3.3 describes the basic structure of slave diagnostics for digital and analog ET 200B modules. Sections 5.3.4 to 5.3.8 describe the contents of the individual diagnostics bytes.

### 5.3.1 General Information on Slave Diagnostics, Operation with IM 308-C

#### Requesting Slave Diagnostics

To request slave diagnostics for an ET 200B station in operation with IM 308-C, you must call the FB IM308C function block (FB 192) with the function FCT = SD.

The FB IM308C places the slave diagnostics in the S5 data area of the CPU (data block or bit memory address area) opened when the FB IM308C was called.

#### FM IM308C

FB IM308C handling conforms to general access to diagnostics data of the IM 308-C and is described in detail in the manual *ET200 Distributed I/O System* (Order No. 6ES5 998-3ES.2).

The example below shows how to request slave diagnostics with the aid of the FB IM308C and place the information in a data block.

This is followed by an example illustrating how to evaluate slave diagnostics. This second example assumes that the diagnostics information has been placed in a data block.

---

#### Note

The module parameters of the FB IM308C and the error codes in the ERR parameter of the FB IM308C are described in detail in the manual *ET 200 Distributed I/O System* (Order No. 6ES5 998-3ES.2).

---

#### Example: Request Diagnostics with FB IM308C

In this example, the FB IM308C (FB 192) is employed to request slave diagnostics of a slave having the station number 3. The diagnostics data will be placed in data block DB 10 as of data word DW 0.

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

| STL                         | Explanation   |
|-----------------------------|---|
| :                           |   |
| :JU FB 192                  | Invoke FB IM308C  |
| Name :IM308C                | DP frame: F800  |
| DPAD : KH F800              | Number of the IM 308-C: 0, station number of the slave: 3 |
| IMST : KY 0,3               |   |
| FCT : KC SD                 | SD = Read slave diagnostics                               |
| GCGR : KM 00000000 00000000 | irrelevant  |
| TYP : KY 0,10               | Memory area: 0, block: DB10                               |
| STAD : KF +0                | Number of the first data word: DW0                        |
| LENG : KF -1                | Bytes to be transferred: -1 (joker length)                |
| ERR : FW 134                | Error word: MW 134  |
| :                           |   |
| :***                        |   |

**Example:  
Evaluating Diagnostics**

The slave diagnostics of a digital ET 200B module have been requested from the CPU and placed in a data block DB 10 starting at data word DW 0. You want to evaluate station status 1 and 2.

In the STEP 5 program, you program the following:

| STL       | Explanation  |
|-----------|--|
| A DB 10   | Invoke data block (here: DB 10) Load diagnostics word "Station status 1 and station status 2" (response monitoring active) |
| L DW 0    |  |
| L KH 000C |  |
| !=F       | no error?  |
| BE C      |  |
| JC FBx    | Evaluate error in FBx.   |

**Diagnostics Alarm and Process Alarm**

The analog modules of ET 200B support the following alarms:

- Diagnostics alarm
- Process alarm

In order to evaluate diagnostics alarms and process alarms via the device-related diagnostics with the IM 308-C, it is important to bear the following in mind:

**Note**

In your STEP5 application program you must regularly query the corresponding bits in the device-related diagnostics in order to ensure that alarms are not overwritten by subsequent alarms.

With regard to the bus runtime for the PROFIBUS-DP you must allow for the fact that the bits are queried at least once parallel to the bus runtime.

**Structure of Slave Diagnostics**

The structure of slave diagnostics for operation with IM 308-C is described in Sections 5.3.3 to 5.3.8.

### 5.3.2 General Information on Slave Diagnostics, Operation with S7/M7 DP Masters (STEP 7) or Other PROFIBUS-DP Masters

#### Diagnostics with S7/M7 DP Masters

If you operate the ET 200B as a DP slave with a **SIMATIC S7/M7** DP master, the ET 200B modules function like central S7-300 I/O modules.

You read out diagnostics (data records 0 and 1) with SFC 13 "DPNRM\_DG". For information on requesting diagnostics data, see the manual *STEP 7 Standard and System Functions*.

#### Diagnostics with Other PROFIBUS-DP Masters

If you operate ET 200B as DP slave with DP masters from Siemens that do not belong to the SIMATIC S5/S7/M7 automation system or with other-vendor DP masters, see the documentation on the DP master for information on how to request slave diagnostics.

#### Diagnostic Alarm and Process Alarm

The analog modules of ET 200B support the following alarms:

- Diagnostics alarm
- Process alarm

You can evaluate these alarms with an S7/M7 DP master. In the event of an alarm, alarm OBs are automatically run in the CPU (see the programming manual *System Software for S7-300/S7-400, Program Design*).

---

#### Note

If you want to evaluate diagnostics alarms and process alarms via the device-related diagnostics with other than PROFIBUS-DP masters, you must bear the following in mind:

- The DP master should be able to store the diagnostics messages, i.e. the diagnostics messages should be placed in a ring buffer in the DP master. If the DP master cannot store diagnostics messages, only the most recently received diagnostics message will be available.
  - In your application program you must regularly query the corresponding bits in the device-related diagnostics. With regard to the bus runtime for the PROFIBUS-DP you must allow for the fact that the bits are queried at least once parallel to the bus runtime.
- 

#### Structure of Slave Diagnostics

The structure of slave diagnostics for operation with S7/M7 DP masters (STEP 7) or other PROFIBUS-DP masters is described in Sections 5.3.3 to 5.3.8.

### 5.3.3 Structure of Slave Diagnostics

**Introduction**

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

Diagnostics of the ET 200B distributed I/O station is in compliance with EN 50170, Part 3. The basic structure of slave diagnostics is described below.

**Digital ET 200B**

The figure below shows the structure of slave diagnostics for digital ET 200B modules:

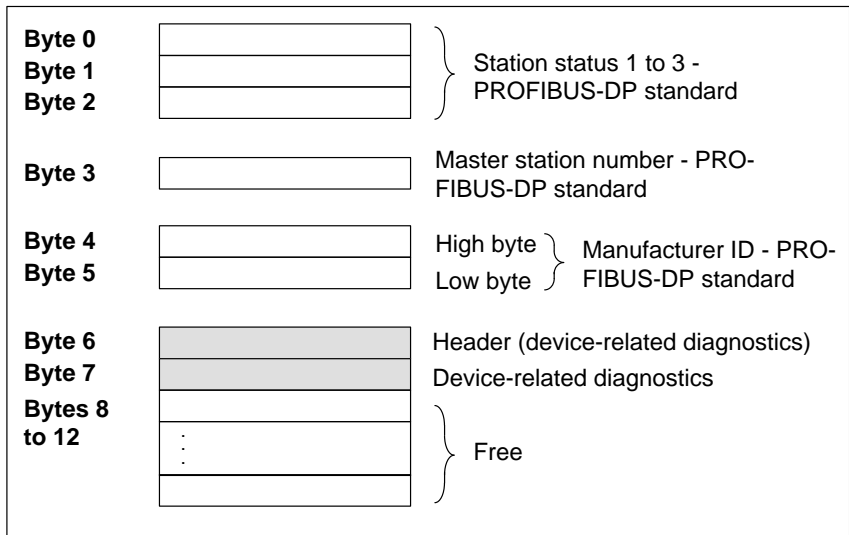


Figure 5-1 Structure of Slave Diagnostics for Digital ET 200B

**Analog ET 200B**

The figure below shows the structure of slave diagnostics for for analog ET 200B modules:

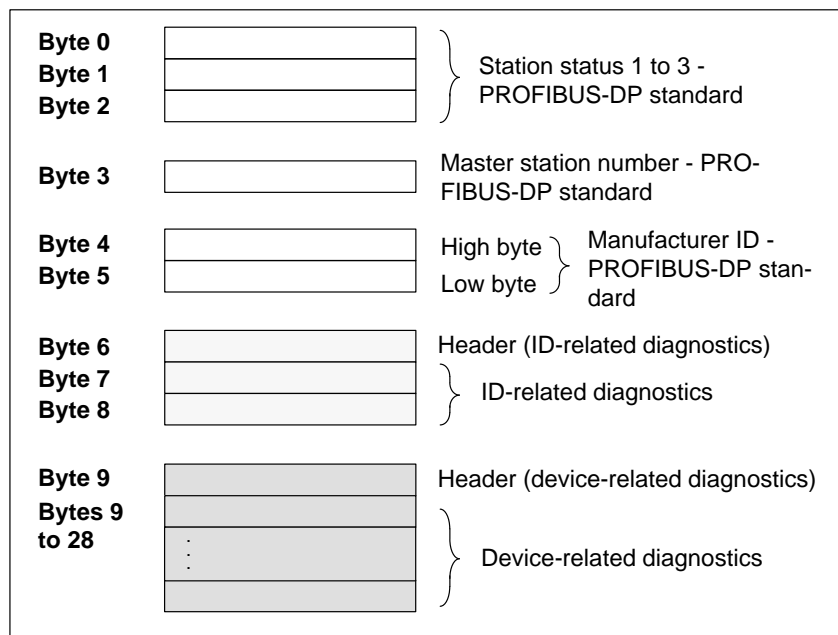


Figure 5-2 Structure of Slave Diagnostics for Analog ET 200B

**Requesting Slave Diagnostics**

You can request slave diagnostics with the following function blocks:

Table 5-3 Function Blocks for Slave Diagnostics

| PLC Family               | Number | Name           |
|--------------------------|--------|----------------|
| SIMATIC S5 with IM 308-C | FB 192 | FB IM308C      |
| SIMATIC S7/M7            | SFC 13 | SFC "DPNRM_DG" |

### 5.3.4 Structure of Station Status 1 to 3

#### Introduction

Station status 1 ... 3 provides an overview of the status of the ET 200B (see Figures 5-1 and 5-2, bytes 0 to 2).

#### Station Status 1 (Byte 0)

The table below shows the structure of station status 1:

Table 5-4 Structure of Station Status 1 (Byte 0)

| Bit | Meaning  |
|-----|--|
| 0   | 1: DP slave cannot be addressed by DP master.  |
| 1   | 1: DP slave not yet ready for data exchange.   |
| 2   | 1: Configuration data sent by DP master to DP slave does not match the structure of the DP slave.          |
| 3   | 1: Device-related diagnostics data is waiting.   |
| 4   | 1: Requested function is not supported by DP slave.  |
| 5   | 1: Implausible answer received from DP slave.  |
| 6   | 1: parameterization telegram is errored.   |
| 7   | 1: DP slave was parameterized by a DP master not the DP master which currently has access to the DP slave. |

#### Station Status 2 (Byte 1)

The table below shows the structure of station status 2:

Table 5-5 Structure of Station Status 2 (Byte 1)

| Bit | Meaning  |
|-----|--|
| 0   | 1: DP slave must be reparameterized.   |
| 1   | 1: A diagnostics message is waiting. The DP slave cannot resume operation until the error has been rectified (static diagnostics message). |
| 2   | 1: Bit is always "1" if DP slave having this station number exists.  |
| 3   | 1: Response monitoring is activated for this slave.  |
| 4   | 1: DP slave has received a "FREEZE" control command. <sup>1</sup>  |
| 5   | 1: DP slave has received a "SYNC" control command. <sup>1</sup>  |
| 6   | 0: Bit is always "0".  |

Table 5-5 Structure of Station Status 2 (Byte 1), continued

| <b>Bit</b> | <b>Meaning</b>   |
|------------|--|
| 7          | 1: DP slave is deactivated, i.e. slave has been removed from current processing. |

<sup>1</sup> Bit is not updated unless an extra diagnostics message changes.

**Station Status 3  
(Byte 2)**

Station status 3 is reserved and is not relevant as regards diagnostics of the DP slave. Its value is always 00<sub>H</sub>.



### 5.3.5 Structure of the Master Station Number and the Manufacturer ID

#### Introduction

The "Master station number" diagnostics byte contains the station number of the DP master which parameterized the ET 200B. The "Manufacturer ID" diagnostics byte describes the type of the ET 200B.

#### Master Station Number (Byte 3)

The master station number consists of one byte (see Figures 5-1 and 5-2):

Table 5-6 Structure of the Master Station Number (Byte 3)

| Bit    | Meaning   |
|--------|---|
| 0 to 7 | Station number of the DP master which parameterized the DP slave and which has read and write access to the DP slave. |

#### Manufacturer ID (Bytes 4, 5)

The manufacturer ID consists of two bytes (see Figures 5-1 and 5-2):

Table 5-7 Structure of the Manufacturer ID (Bytes 4, 5)

| Byte 4          | Byte 5          | Manufacturer ID for    |                     |
|-----------------|-----------------|------------------------|---------------------|
| 00 <sub>H</sub> | 01 <sub>H</sub> | ET 200B-16DI           | 6ES7 131-0BH00-0XB0 |
| 00 <sub>H</sub> | 02 <sub>H</sub> | ET 200B-16DO           | 6ES7 132-0BH01-0XB0 |
| 00 <sub>H</sub> | 03 <sub>H</sub> | ET 200B-8RO            | 6ES7 132-0GF00-0XB0 |
| 00 <sub>H</sub> | 04 <sub>H</sub> | ET 200B-32DI           | 6ES7 131-0BL00-0XB0 |
| 00 <sub>H</sub> | 05 <sub>H</sub> | ET 200B-16DO/2A        | 6ES7 131-0BH11-0XB0 |
| 00 <sub>H</sub> | 0A <sub>H</sub> | ET 200B-16DI/16DO      | 6ES7 133-0BL00-0XB0 |
| 00 <sub>H</sub> | 0B <sub>H</sub> | ET 200B-8DI/8DO        | 6ES7 133-0BH01-0XB0 |
| 00 <sub>H</sub> | 0C <sub>H</sub> | ET 200B-32DI 0.2ms     | 6ES7 131-0BL10-0XB0 |
| 00 <sub>H</sub> | 0D <sub>H</sub> | ET 200B-32DO           | 6ES7 132-0BL01-0XB0 |
| 00 <sub>H</sub> | 0E <sub>H</sub> | ET 200B-24DI/8DO 0.2ms | 6ES7 133-0BN11-0XB0 |
| 00 <sub>H</sub> | 0F <sub>H</sub> | ET 200B-24DI/8DO       | 6ES7 133-0BN01-0XB0 |
| 00 <sub>H</sub> | 10 <sub>H</sub> | ET 200B-8DI/8DO HWA    | 6ES7 133-0BH10-0XB0 |
| 00 <sub>H</sub> | 19 <sub>H</sub> | ET 200B-16DI-AC        | 6ES7 131-0HF00-0XB0 |
| 00 <sub>H</sub> | 1A <sub>H</sub> | ET 200B-16DO-AC        | 6ES7 132-0HF00-0XB0 |
| 00 <sub>H</sub> | 1C <sub>H</sub> | ET 200B-16RO-AC        | 6ES7 132-0HH00-0XB0 |
| 00 <sub>H</sub> | 1D <sub>H</sub> | ET 200B-8DI/8RO-AC     | 6ES7 133-0HH00-0XB0 |
| 80 <sub>H</sub> | 18 <sub>H</sub> | ET 200B-4AO            | 6ES7 135-0HF01-0XB0 |
| 80 <sub>H</sub> | 19 <sub>H</sub> | ET 200B-4AI            | 6ES7 134-0HF01-0XB0 |
| 80 <sub>H</sub> | 1A <sub>H</sub> | ET 200B-4/8AI          | 6ES7 134-0KH01-0XB0 |

### 5.3.6 Structure of Device-Related Diagnostics (Digital ET 200B)

#### Introduction

The device-related diagnostics for digital ET 200B modules indicate whether inputs or outputs are defective. The header indicates the length of the device-related diagnostics. (see Figure 5-1, bytes 6 and 7)

#### Note

Device-related diagnostics requires an ET 200B station with diagnostics capability.

ET 200B stations which do **not** have diagnostics capability have the value "07<sub>H</sub>" in the header and the remaining bytes are reserved.

#### Header (Byte 6)

Digital ET 200B modules have the value 07<sub>H</sub> in the "Header (device-related diagnostics)" byte.

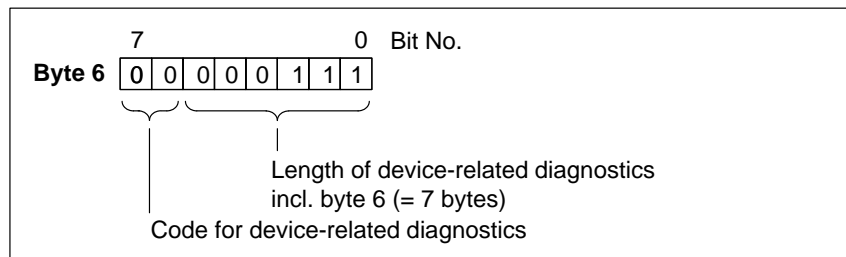


Figure 5-3 Structure of the Header (Device-Related Diagnostics) for Digital ET200B (Byte 6)

#### Device-Related Diagnostics (Byte 7)

The device-related diagnostics of digital ET 200B modules with diagnostics capability consists of one byte (see Figure 5-1):

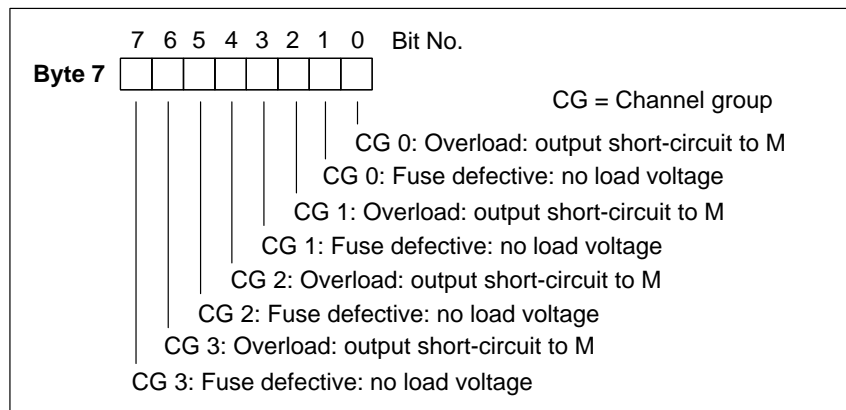


Figure 5-4 Structure of Device-Related Diagnostics for Digital ET 200B (Byte 7)

## Channel Group

Note the following as regards evaluation of device-related diagnostics:

---

### Note

The channel group of an ET 200B digital module always takes up one byte in the S5 address space of the CPU (corresponding to 8 inputs or 8 outputs), irrespective of the galvanic isolation of the module (grouping).

**Example:** ET 200B-16DO/2A (galvanic isolation in groups of 4)

Channel group 0 corresponds to Q0: outputs .0 ... .7.

Potential group 0 corresponds to Q0: outputs .0 ... .3.

---

### 5.3.7 Structure of ID-related Diagnostics (Analog ET 200B)

**Introduction** ID-related diagnostics shows which module in which slot is defective. The header indicate the length of ID-related diagnostics. (see Figure 5-2, bytes 6 to 8)

**Header (Byte 6)** Analog ET 200B modules have the value 43H in the "Header (ID-related diagnostics)" byte.

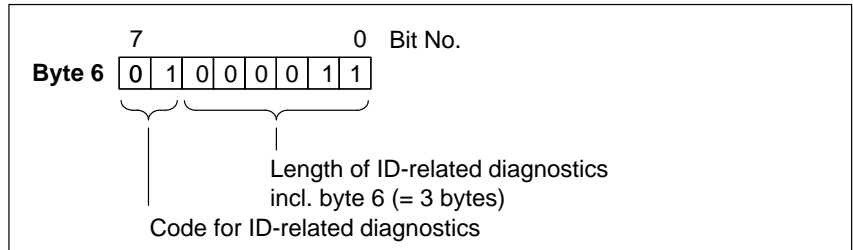


Figure 5-5 Structure of the Header (ID-related Diagnostics) for Analog ET 200B (Byte 6)

**ID-related Diagnostics (Bytes 7, 8)** The ID-related diagnostics of analog ET 200B modules consists of two bytes (see Figure 5-2):

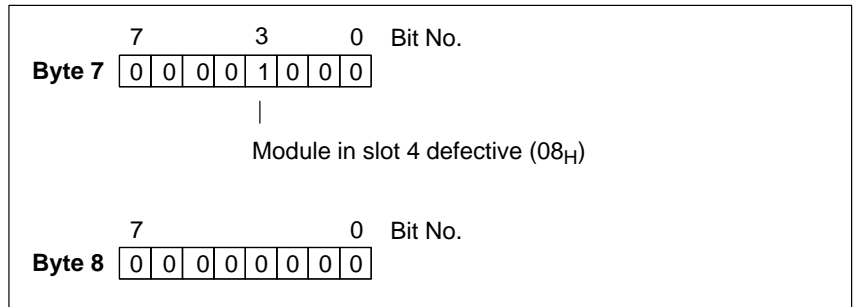


Figure 5-6 Structure of ID-related Diagnostics for Analog ET 200B (Bytes 7, 8)

---

**Note**

Irrespective of the configuration of the analog ET 200B module (slots 4 to 11), slot 4 is always flagged as defective in a diagnostics message!

---

**Configuration Error**

If a configuration telegram contains an error, only the 3-byte ID-related diagnostics (bytes 6, 7, 8) is returned and **no** device-related diagnostics.

If the configuration telegram contains an error, the structure of ID-related diagnostics is as follows:

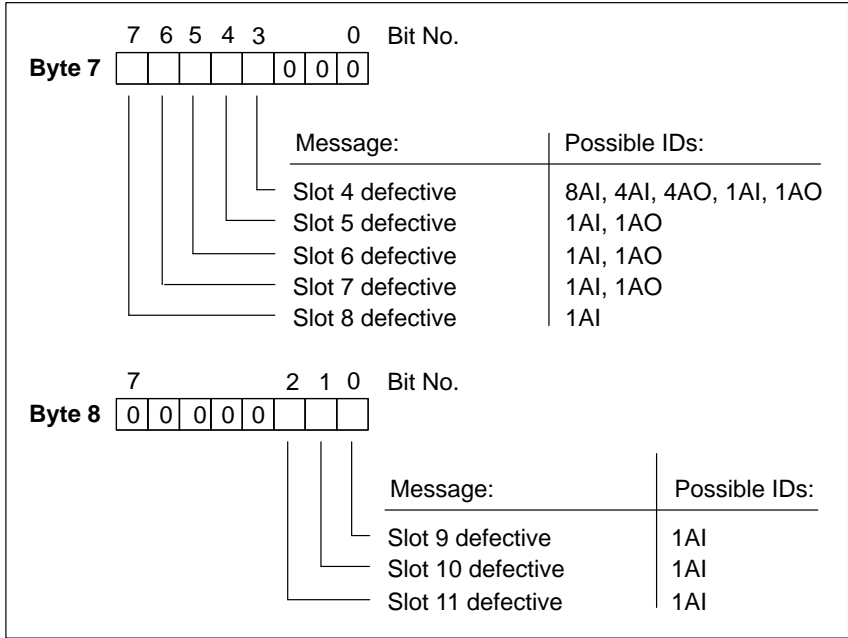


Figure 5-7 Structure of ID-related Diagnostics for Analog ET 200B (Bytes 7, 8) in the Event of an Error in the Configuration Telegram

**Note**

If there is an error in the configuration telegram, the configured slots of the analog ET 200B module the configurations of which are errored are shown.

If the error in the configuration telegram is general (e.g. wrong length), the value FF<sub>H</sub> is returned for bytes 7 and 8.

### 5.3.8 Structure of Device-Related Diagnostics (Analog ET 200B)

#### Introduction

The device-related diagnostics for an analog ET 200B shows you the error reported by the ET 200B. The header indicates the length of device-related diagnostics. (see Figure 5-2, bytes 9 to 28)

#### Note

Chapter 8 contains a discussion of "Supplementary Bits" in the section dealing with analog value representation: these bits contain additional diagnostics information.

The structure of the device-related diagnostics for configuration of analog modules with the latest type file version **SIxxxxBE.200** is described below. If you configure with the type file SIxxxxAE.200, please turn to Appendix E.2.

#### Header (Byte 9)

The analog ET 200B modules contain the following information in the "Header (device-related diagnostics)" byte:

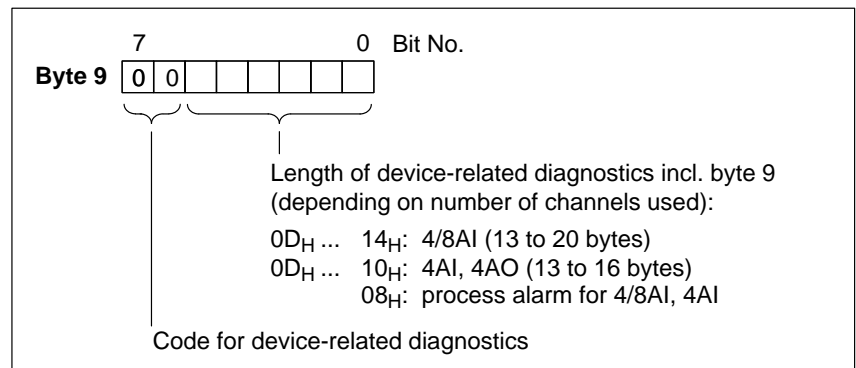


Figure 5-8 Structure of the Header (Device-Related Diagnostics) for Analog ET200B (Byte 9)

**Device-Related Diagnostics**

Device-related diagnostics of the analog ET 200B modules comprises a maximum of 19 bytes:

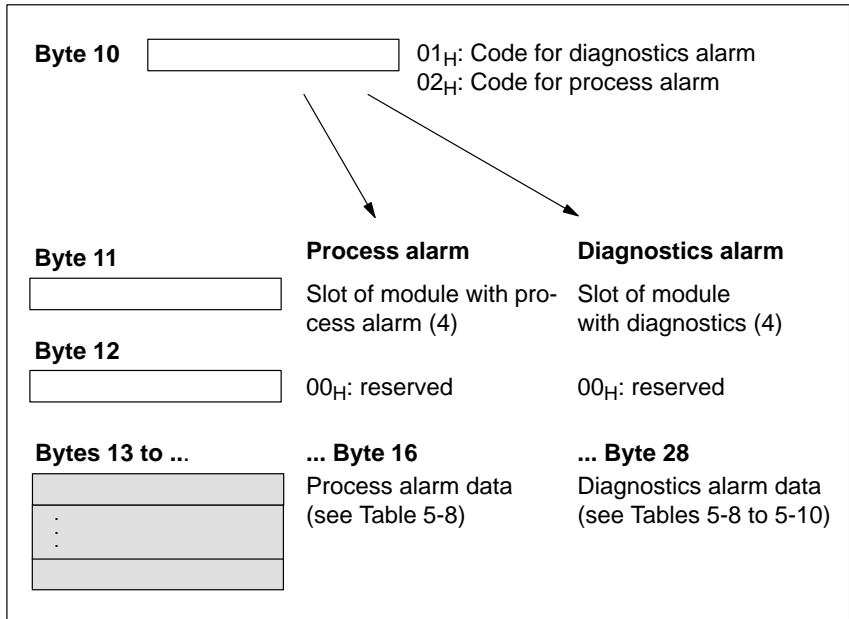


Figure 5-9 Structure of Device-Related Diagnostics for Analog ET 200B (Bytes 10 to 28)

**Bytes 13 to 16**

Table 5-8 shows the structure and contents of bytes 13 to 16.

Table 5-8 Bytes 13 to 16 for Diagnostics and Process Alarms

| Byte                     | Bit | Byte 10 = 01 <sub>H</sub> (Diagnostics Alarm) | Byte 10 = 02 <sub>H</sub> (Process Alarm) |  |  |
|--------------------------|-----|---|---|--|--|
| 13<br>(→<br>Tab.<br>5-9) | 0   | Module defect                                 | Channel 0                                 | Upper limit value overshoot (4/8AI, 4AI)               | FF <sub>H</sub> : End-of-cycle alarm (4/8AI) |
|                          | 1   | Internal error                                | Channel 1                                 | Upper limit value overshoot (4/8AI <sup>1</sup> )      |  |
|                          | 2   | External error                                | Channel 2                                 | Upper limit value overshoot (4/8AI <sup>1</sup> , 4AI) |  |
|                          | 3   | Channel error                                 | Channel 3                                 | Reserved   |  |
|                          | 4   | Reserved                                      | Channel 4                                 | Reserved   |  |
|                          | 5   | Reserved                                      | Channel 5                                 | Reserved   |  |
|                          | 6   | Parameterization missing                      | Channel 6                                 | Reserved   |  |
|                          | 7   | Incorrect parameters in module                | Channel 7                                 | Reserved   |  |

<sup>1</sup> For the ET 200B-4/8AI, only the combination of single channel addressing **and** parameterization of channel group 0 for resistance measurement (Pt 100, Ni 100, R) entails display of "Upper/lower limit value overshoot" for channel 1. In all other cases (i.e. module addressing and single channel addressing **and** parameterization of channel group 0 for other than resistance measurement (Pt 100, Ni 100, R), "Upper/lower limit value overshoot" is displayed for channel 2.

Table 5-8 Bytes 13 to 16 for Diagnostics and Process Alarms, continued

| Byte | Bit    | Byte 10 = 01 <sub>H</sub> (Diagnostics Alarm) |      |               | Byte 10 = 02 <sub>H</sub> (Process Alarm) |  |                            |
|------|--------|---|------|---------------|---|--|----------------------------|
| 14   | 0 to 3 | Module class                                  | 0101 | Analog module | Channel 0                                 | Lower limit value overshoot (4/8AI, 4AI)               | 00 <sub>H</sub> : Reserved |
|      |        |   |      |               | Channel 1                                 | Lower limit value overshoot (4/8AI <sup>1</sup> )      |                            |
|      |        |   |      |               | Channel 2                                 | Lower limit value overshoot (4/8AI <sup>1</sup> , 4AI) |                            |
|      |        |   |      |               | Channel 3                                 | Reserved   |                            |
|      | 4      | Channel information available                 |      |               | Channel 4                                 | Reserved   |                            |
|      | 5      | Reserved                                      |      |               | Channel 5                                 | Reserved   |                            |
|      | 6      | Reserved                                      |      |               | Channel 6                                 | Reserved   |                            |
|      | 7      | Reserved                                      |      |               | Channel 7                                 | Reserved   |                            |
| 15   | 0      | Wrong ET 200B station type                    |      |               | 00 <sub>H</sub> : Reserved                |  | 00 <sub>H</sub> : Reserved |
|      | 1      | Reserved                                      |      |               |   |  |                            |
|      | 2      | Reserved                                      |      |               |   |  |                            |
|      | 3      | Reserved                                      |      |               |   |  |                            |
|      | 4      | Reserved                                      |      |               |   |  |                            |
|      | 5      | Reserved                                      |      |               |   |  |                            |
|      | 6      | Reserved                                      |      |               |   |  |                            |
|      | 7      | Reserved                                      |      |               |   |  |                            |
| 16   | 0      | Reserved                                      |      |               | 00 <sub>H</sub> : Reserved                |  | 00 <sub>H</sub> : Reserved |
|      | 1      | Reserved                                      |      |               |   |  |                            |
|      | 2      | EPROM error (4AI)                             |      |               |   |  |                            |
|      | 3      | Reserved                                      |      |               |   |  |                            |
|      | 4      | ADC/DAC error (4AO)                           |      |               |   |  |                            |
|      | 5      | Reserved                                      |      |               |   |  |                            |
|      | 6      | Process alarm lost (4/8AI, 4AI)               |      |               |   |  |                            |
|      | 7      | Reserved                                      |      |               |   |  |                            |

**Possible Values, Byte 13** In a diagnostics alarm the possible values of byte 13 are as follows:

Table 5-9 Possible Values for Byte 13 in Diagnostics Alarm

| Value                              | Bit 3 | Bit 2 | Bit 1 | Bit 0 | Meaning   |
|------------------------------------|-------|-------|-------|-------|---|
| 00 <sub>H</sub>                    | 0     | 0     | 0     | 0     | No error  |
| 03 <sub>H</sub> (83 <sub>H</sub> ) | 0     | 0     | 1     | 1     | Internal error, no channel error; (incorrect parameters in the module)    |
| 0B <sub>H</sub> (8B <sub>H</sub> ) | 1     | 0     | 1     | 1     | Internal error, channel error; (incorrect parameters in the module)       |
| 0D <sub>H</sub>                    | 1     | 1     | 0     | 1     | External error, channel error   |
| 0F <sub>H</sub> (8F <sub>H</sub> ) | 1     | 1     | 1     | 1     | Summation error of all above errors; (incorrect parameters in the module) |



**Bytes 17 to 28  
(Diagnostics  
Alarm)**

Table 5-10 shows the structure and contents of bytes 17 to 28 (for diagnostics alarm only).

Table 5-10 Bytes 17 to 28 for Diagnostics Alarm

| Byte                  | Bit                          | Meaning  | Remark   |                   |
|-----------------------|------------------------------|--|--|-------------------|
| 17                    | 0 to 7                       | Channel type   | 71 <sub>H</sub><br>73 <sub>H</sub>                                       | 4/8AI, 4AI<br>4AO |
| 18                    | 0 to 7                       | Number of diagnostics bits output per channel by a module. | 08 <sub>H</sub>  | 4/8AI, 4AI, 4AO   |
| 19                    | 0 to 7                       | Number of channels of a module.                            | 01 <sub>H</sub> to 04 <sub>H</sub><br>01 <sub>H</sub> to 08 <sub>H</sub> | 4AI, 4AO<br>4/8AI |
| 20                    | <b>Channel error vector:</b> |  |  |                   |
|                       | 0                            | Channel error, channel 0                                   | 4/8AI, 4AI, 4AO  |                   |
|                       | 1                            | Channel error, channel 1                                   | 4/8AI, 4AI, 4AO  |                   |
|                       | 2                            | Channel error, channel 2                                   | 4/8AI, 4AI, 4AO  |                   |
|                       | 3                            | Channel error, channel 3                                   | 4/8AI, 4AI, 4AO  |                   |
|                       | 4                            | Channel error, channel 4                                   | 4/8AI  |                   |
|                       | 5                            | Channel error, channel 5                                   | 4/8AI  |                   |
|                       | 6                            | Channel error, channel 6                                   | 4/8AI  |                   |
| 7                     | Channel error, channel 7     | 4/8AI  |  |                   |
| 21 to 28 <sup>1</sup> | -                            | Channel-specific errors                                    | See Table 5-11   |                   |

<sup>1</sup> The number of bytes depends on the number of channels in the module.

**Analog Channel**

Table 5-11 shows the assignment of the diagnostics byte for an analog input or analog output channel.

Table 5-11 Diagnostics Byte for an Analog Input/Analog Output Channel

| Byte | Bit | Analog Input Channel (4/8AI, 4AI)   | Analog Output Channel (4AO) |
|------|-----|---|-----------------------------|
| ≅ 21 | 0   | Configuration/parameterization error  |                             |
|      | 1   | Common-mode error (4/8AI only)  | "0" (reserved)              |
|      | 2   | "0" (reserved)  |                             |
|      | 3   | "0" (reserved)  | Ground short-circuit        |
|      | 4   | Wire-break/feed-current monitoring: meas. transducer/Pt 100/Ni 100/R <sup>1</sup> |                             |
|      | 5   | "0" (reserved)  | "0" (reserved)              |
|      | 6   | Measuring range overshoot   | "0" (reserved)              |
|      | 7   | Measuring range overshoot   | "0" (reserved)              |

<sup>1</sup> In the case of the ET 200B-4/8AI, a "wire break" error is superimposed on common-mode and measuring-range errors occurring at the same time (common-mode and measuring-range errors are not signaled).



## General Technical Specifications

### What are General Technical Specifications?

The general technical specifications comprise the standards that all ET 200B modules satisfy, the test values they comply with and the criteria used to test all modules.

### General Technical Specifications

The table below contains the general technical specifications of the ET 200B modules.

| Climatic environ. conditions acc. to IEC 1131-2  | Mechanical environmental conditions   |
|--|---|
| Operating temperature <ul style="list-style-type: none"> <li>Preferred installation (= horizontal installation on a vertical wall: see Figure 3-8) 0 to +60 °C (32 to 140 °F)</li> <li>Other installation positions 0 to +40 °C (32 to 104 °F) (Air intake temperature, measured at the bottom of the module)</li> </ul> | Vibration <sup>1</sup> tested to IEC 68-2-6 <ul style="list-style-type: none"> <li>10 Hz ≤ f &lt; 57 Hz Const. amplitude 0.075 mm</li> <li>57 Hz ≤ f &lt; 150 Hz Const. acceleration 1g</li> <li>Mode of vibration Frequency sweeps with a rate of change of 1 octave/min.</li> <li>Period of oscillation 10 frequency sweeps per axis in each of the 3 perpendicular axes</li> <li>Operating conditions In accordance with IEC 1131-2</li> </ul> |
| Storage/transport temperature -40 to +70 °C (-40 to 158 °F)  | Shock <sup>1</sup> tested to IEC 68-2-27 <ul style="list-style-type: none"> <li>Type of shock Semi-sinusoidal</li> <li>Strength of shock 15 g peak value, 11 ms duration</li> <li>Direction of shock 2 shocks in each of the 3 perpendicular axes</li> </ul>  |
| Relative humidity to DIN 40040 15 to 95 % (indoor), no condensation  | Drop and topple to IEC 68-2-31 <ul style="list-style-type: none"> <li>Tested with Height of fall 100 mm (3.90 in.)</li> </ul>   |
| Atmospheric pressure <ul style="list-style-type: none"> <li>Operating 795 to 1080 hPa</li> <li>Storage/transport 660 to 1080 hPa</li> </ul>  |   |
| Pollutants <ul style="list-style-type: none"> <li>SO<sub>2</sub> ≤ 0.5 ppm (rel. humidity ≤ 60 %, no condensation)</li> <li>H<sub>2</sub>S ≤ 0.1 ppm (rel. humidity ≤ 60 %, no condensation)</li> </ul>  |   |

<sup>1</sup> Vibrations and shocks permanently reaching the specified values as well as bumps must be prevented by adequate measures.

| Electromagnetic compatibility (EMC)/noise immunity   |  | IEC/VDE safety information  |  |
|--|--|---|--|
| Static electricity to IEC 801-2  | Discharge to all parts that are accessible to the operator during normal operation | Degree of protection to IEC 529   |  |
| <ul style="list-style-type: none"> <li>Test voltage</li> </ul>   | 8 kV air discharge<br>4 kV contact discharge (relative humidity 30 to 95%)         | <ul style="list-style-type: none"> <li>Type</li> <li>Class</li> </ul>   | IP 20<br>I to IEC 536  |
| Electromagnetic fields to IEC 801-3  | Field strength 10 V/m  | Insulation rating   |  |
| Fast transient burst to IEC 801-4, Class III   |  | <ul style="list-style-type: none"> <li>Between electrically independent circuits and circuits connected to a central grounding point</li> <li>Between all circuits and central grounding point (standard sectional rail)</li> </ul> | to DIN VDE 0160 (05.1988) and IEC 1131-2<br>to DIN VDE 0160 (05.1988) and IEC 1131-2 |
| <ul style="list-style-type: none"> <li>Digital input/output module</li> <li>for V = 24 V</li> <li>for V &gt; 24 V</li> <li>Analog input/output module</li> <li>Communications interface</li> </ul> | 2 kV<br>2 kV<br>2 kV   | Test voltage for a nominal voltage $V_{input}$ of the circuits (AC/DC)  | to DIN VDE 0160 and IEC 1131-2   |
|  |  | $V_{input} = 0$ to 50 V<br>$V_{input} = 50$ to 125 V<br>$V_{input} = 125$ to 250 V  | 500 V DC<br>1250 V AC<br>1500 V AC   |
|  |  | Radio interference suppression  | to VDE 0871  |
|  |  | <ul style="list-style-type: none"> <li>Limit class</li> </ul>   | A  |

**UL/CSA Certification**

ET 200B is certified as follows:  
UL Recognition Mark  
Underwriters Laboratories (UL) to  
Standard UL 508, Report 116536  
CSA Certification Mark  
Canadian Standard Association (CSA) to  
Standard C 22.2 No. 142, Report LR 48323

**FM Certification**

The AC 120/230 V digital modules of ET 200B are FM-certified as follows:  
FM Certification to Factory Mutual Approval Standard Class Number 3611,  
Class I, Division 2, Group A, B, C, D.



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**Warning**

Risk of injury and damage to property.

In hazardous locations injury and damage to property can occur if you disconnect connections while an ET 200 is in operation.

In hazardous locations, always deenergize the ET 200 before disconnecting connections.

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**Warning**

WARNING - DO NOT DISCONNECT WHILE CIRCUIT IS LIVE  
UNLESS LOCATION IS KNOWN TO BE NONHAZARDOUS

---

**CE certification**

Our products satisfy the requirements of EU Directive 89/336/EC "Electromagnetic Compatibility" and the harmonized European standards (EN standards) cited therein.



In accordance with Article 10 of the above-mentioned EU Directive, the EU declarations of conformity are available for scrutiny by the authorities responsible by:

Siemens Aktiengesellschaft  
Bereich Automatisierungstechnik  
AUT E 148  
Postfach 1963  
D-92209 Amberg

**Area of Application**

SIMATIC products are designed for use in an industrial environment.

With a special permit, SIMATIC products can also be used in a residential environment (residential, office and trade environments, small businesses). You must obtain the special permit from the appropriate authority or testing agency. In Germany, these special permits are issued by the Bundesamt für Post und Telekommunikation and its regional offices.

| Area of Application | Requirement for       |                       |
|---------------------|-----------------------|-----------------------|
|                     | Interference Emission | Interference Immunity |
| Industry            | EN 50081-2 : 1993     | EN 50082-2 : 1995     |
| Residential         | Special permit        | EN 50082-1 : 1992     |

**Compliance with Installation Guidelines**

SIMATIC products satisfy the requirements if you comply with the guidelines for installation and operation as laid down in the manuals.

**Recycling and Disposal**

The ET 200B distributed I/O station is an environmentally compatible product.

The following are some of the characteristics of ET 200B:

- The plastic used for the housing has high fire resistance deriving from halogen-free flame resistance
- Laser labeling (i.e. no externally applied labels)
- Plastics bear identification markings to DIN 54840
- Compact design so materials outlay is low, number of components is minimized by integration in ASICs

On account of the low pollutant make-up, ET 200B is suitable for recycling.

For environmentally compatible recycling and disposal of your old SIMATIC equipment, please contact:

Siemens Aktiengesellschaft  
Technische Dienstleistungen  
ANL A 44 Kreislaufwirtschaft  
Postfach 32 40  
D-D-91052 Erlangen

Phone: + 49 91 31/7-3 33 19

Fax: + 49 91 31/7-2 66 43

This Siemens office offers comprehensive and flexible disposal backed by individual consulting at fixed prices. Once the equipment has been disposed of you receive disassembly records stating the material fractions and the corresponding identification records for the materials.

# Digital Modules

# 7

## Introduction

There are a number of digital modules for connecting sensors/transducers or actuators/loads.

## In this Chapter

This chapter contains the technical data, the dimensional drawings and the block diagrams for the ET 200B digital modules.

| In Section | you will find      | on Page |
|------------|--------------------|---------|
| 7.1        | Digital Modules    | 7-2     |
| 7.2        | Terminal Blocks    | 7-4     |
| 7.3        | Electronics Blocks | 7-14    |

## 7.1 Digital Modules

### Introduction

The tables below provide an overview of the digital modules of ET 200B.

### List of Electronics Blocks

The following types of digital electronics block are available:

Table 7-1 ET 200B Digital Electronics Blocks

| Electronics block     | Description  |
|-----------------------|--|
| ET 200B-16DI          | Inputs: 16 × DC 24 V (3 ms)  |
| ET 200B-32DI          | Inputs: 32 × DC 24 V (3 ms)  |
| ET 200B-32DI 0.2ms    | Inputs: 32 × DC 24 V (0.2 ms)  |
| ET 200B-16DO          | Outputs: 16 × DC 24 V (0.5 A/2 A)                                      |
| ET 200B-16DO/2A       | Outputs: 16 × DC 24 V (2 A)  |
| ET 200B-32DO          | Outputs: 32 × DC 24 V (0.5 A)  |
| ET 200B-8DI/8DO       | Inputs: 8 × DC 24 V (3 ms)<br>Outputs: 8 × DC 24 V (0.5 A)             |
| ET 200B-8DI/8DO HWA   | Inputs: 8 × DC 24 V (3 ms)<br>Outputs: 8 × DC 24 V (0.5 A)/HW shutdown |
| ET 200B-16DI/16DO     | Inputs: 16 × DC 24 V (3 ms)<br>Outputs: 16 × DC 24 V (0.5 A)           |
| ET200B-24DI/8DO       | Inputs: 24 × DC 24 V (3 ms)<br>Outputs: 8 × DC 24 V (0.5 A)            |
| ET200B-24DI/8DO 0.2ms | Inputs: 24 × DC 24 V (0.2 ms)<br>Outputs: 8 × DC 24 V (0.5 A)          |
| ET 200B-8RO           | Outputs: 8 × REL. DC 24 ... 60 V                                       |
| ET 200B-16DI-AC       | Inputs: 16 × AC 120/230 V  |
| ET 200B-16DO-AC       | Outputs: 16 × AC 120/230 V (0.5 A)                                     |
| ET 200B-16RO-AC       | Outputs: 16 × REL. AC 120 V/DC 24 ... 150 V                            |
| ET 200B-8DI/8RO-AC    | Inputs: 8 × AC 120/230 V<br>Outputs: 8 × REL. AC 120 V/DC 24 ... 150 V |



## List of Terminal Blocks

The following types of digital terminal blocks are available:

Table 7-2 ET 200B Digital Terminal Blocks

| Terminal block | Description  |
|----------------|--|
| TB1/DC         | 16-channel, screw-type terminal, 3-tier  |
| TB1-4/DC       | 16-channel, screw-type terminal, 4-tier  |
| TB2/DC         | 32-channel, screw-type terminal, 3-tier  |
| TB2-4/DC       | 32-channel, screw-type terminal, 4-tier  |
| TB3/DC         | 16-channel, spring-latch terminal  |
| TB4/DC         | 32-channel, spring-latch terminal  |
| TB4M/DC        | 32-channel, spring-latch terminal with extra row of terminals for additional grounds |
| TB6/AC         | 16-channel, screw-type terminal, 3-tier  |

## 7.2 Terminal Blocks

**Introduction** This section contains the dimensional drawings and the terminal numbering of the ET 200B terminal blocks

The last subsection shows the dimensions of an ET 200B station with bus connector inserted.

**Pin Assignment** The pin assignment of the terminal blocks depends on which electronics block is installed and is therefore described in the section dealing with electronics blocks, Section 7.3.

**In this Section**

| In Section | you will find                                 | on Page |
|------------|---|---------|
| 7.2.1      | Terminal block TB1/DC (6ES7 193-0CA10-0XA0)   | 7-5     |
| 7.2.2      | Terminal block TB1-4/DC (6ES7 193-0CA20-0XA0) | 7-6     |
| 7.2.3      | Terminal block TB3/DC (6ES7 193-0CA30-0XA0)   | 7-7     |
| 7.2.4      | Terminal block TB2/DC (6ES7 193-0CB10-0XA0)   | 7-8     |
| 7.2.5      | Terminal block TB2-4/DC (6ES7 193-0CB20-0XA0) | 7-9     |
| 7.2.6      | Terminal block TB4/DC (6ES7 193-0CB30-0XA0)   | 7-10    |
| 7.2.7      | Terminal block TB4M/DC (6ES7 193-0CE30-0XA0)  | 7-11    |
| 7.2.8      | Terminal block TB6/AC (6ES7 193-0CC10-0XA0)   | 7-12    |
| 7.2.9      | Terminal block and bus connector              | 7-13    |

### 7.2.1 Terminal Block TB1/DC (6ES7 193-0CA10-0XA0)

**Dimensional Drawing**

Figure 7-1 is a dimensional drawing of the TB1/DC (screw-type terminal, 3-tier).

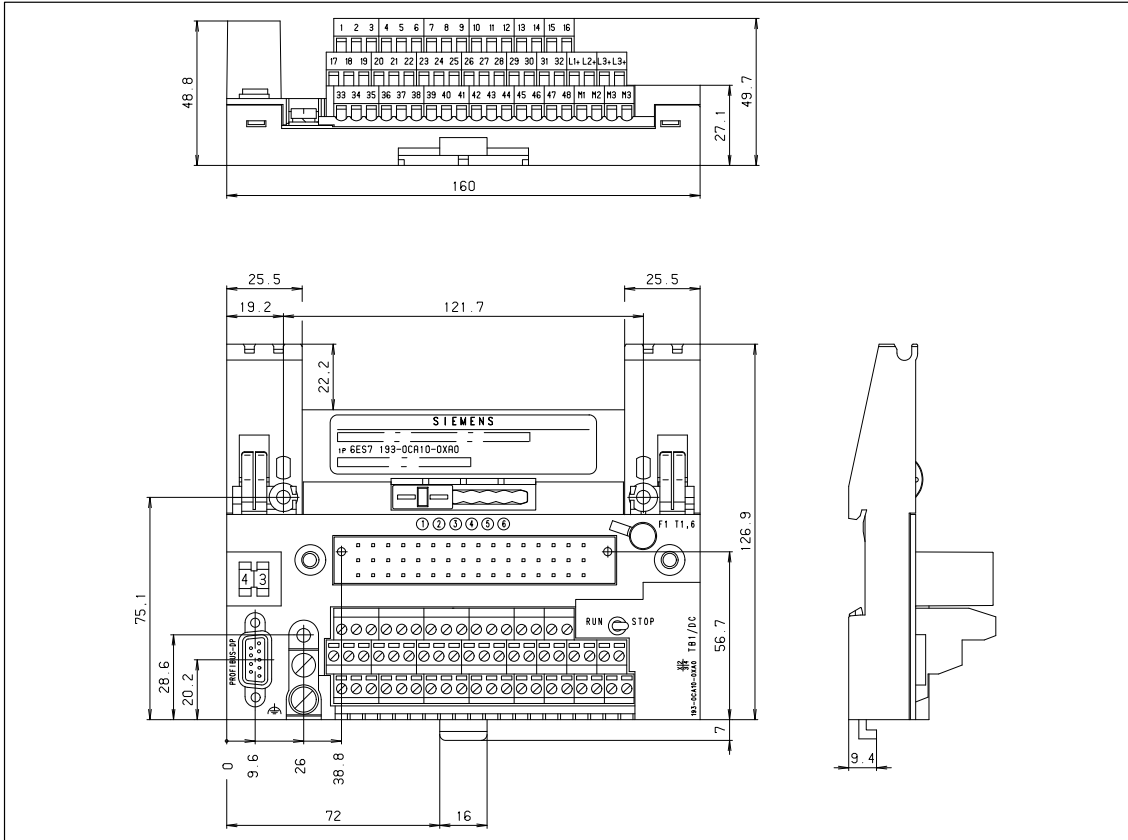


Figure 7-1 Dimensional Drawing: Terminal Block TB1/DC (Screw-Type Terminal, 3-Tier)

**Terminal Numbering**

Figure 7-2 is an enlargement of the terminal numbering printed on the TB1/DC (screw-type terminal, 3-tier).

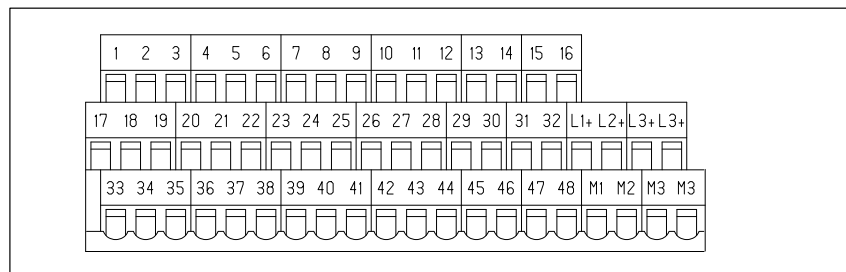


Figure 7-2 Terminal Numbering: Terminal Block TB1/DC (Screw-Type Terminal, 3-Tier)

## 7.2.2 Terminal Block TB1-4/DC (6ES7 193-0CA20-0XA0)

### Dimensional Drawing

Figure 7-3 is a dimensional drawing of the TB1-4/DC (screw-type terminal, 4-tier).

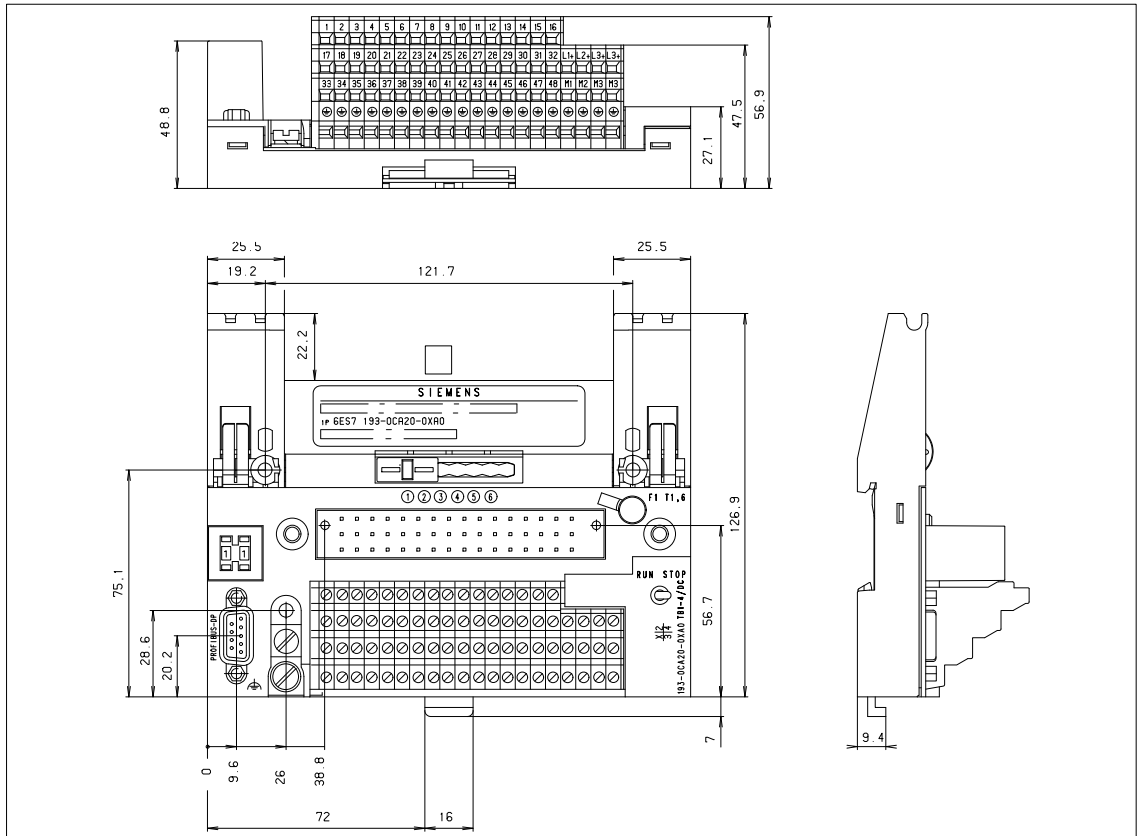


Figure 7-3 Dimensional Drawing: Terminal Block TB1-4/DC (Screw-Type Terminal, 4-Tier)

### Terminal Numbering

Figure 7-4 is an enlargement of the terminal numbering printed on the TB1-4/DC (screw-type terminal, 4-tier).

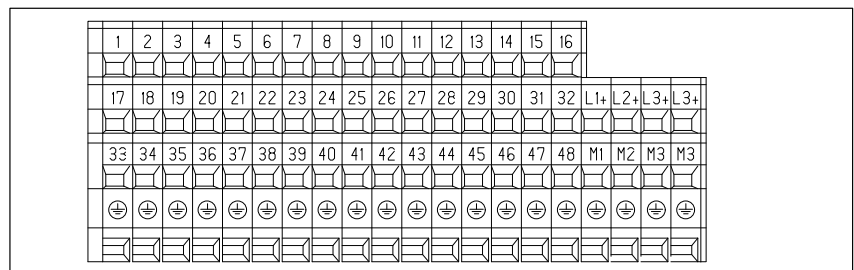


Figure 7-4 Terminal Numbering: Terminal Block TB1-4/DC (Screw-Type Terminal, 4-Tier)



### 7.2.4 Terminal Block TB2/DC (6ES7 193-0CB10-0XA0)

**Dimensional Drawing**

Figure 7-7 is a dimensional drawing of the TB2/DC (screw-type terminal, 3-tier).

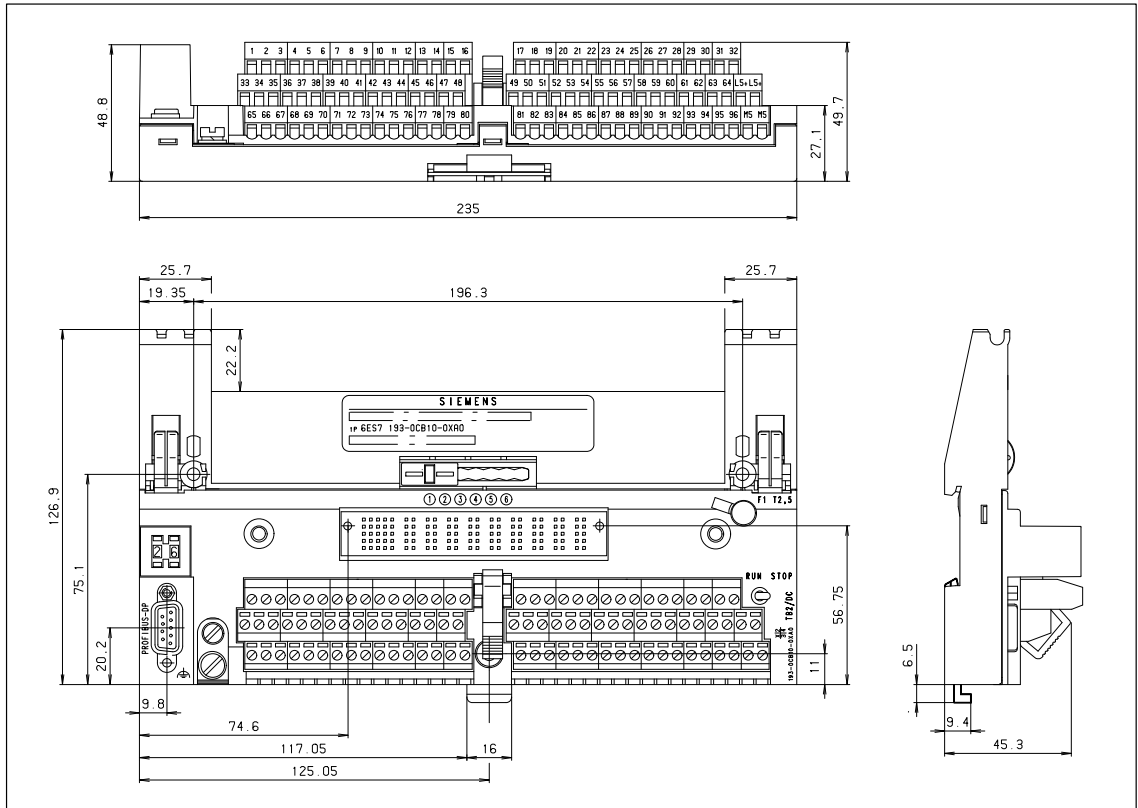


Figure 7-7 Dimensional Drawing: Terminal Block TB2/DC (Screw-Type Terminal, 3-Tier)

**Terminal Numbering**

Figure 7-8 is an enlargement of the terminal numbering printed on the TB2/DC (screw-type terminal, 3-tier).

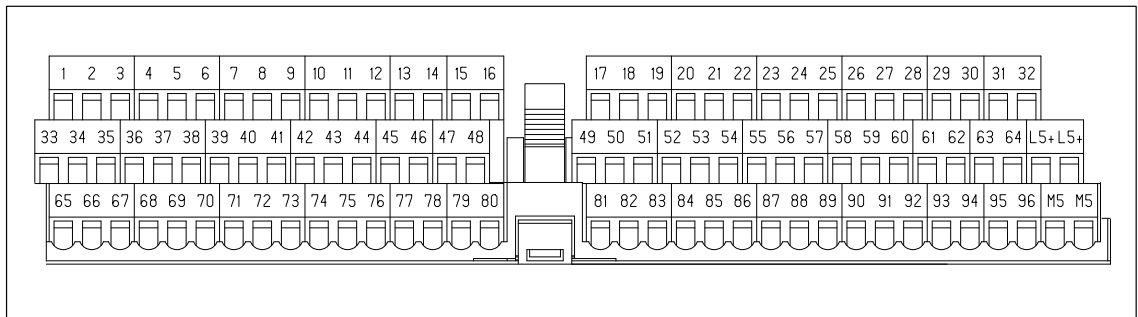


Figure 7-8 Terminal Numbering: Terminal Block TB2/DC (Screw-Type Terminal, 3-Tier)

### 7.2.5 Terminal Block TB2-4/DC (6ES7 193-0CB20-0XA0)

**Dimensional Drawing**

Figure 7-9 is a dimensional drawing of the TB2-4/DC (screw-type terminal, 4-tier).

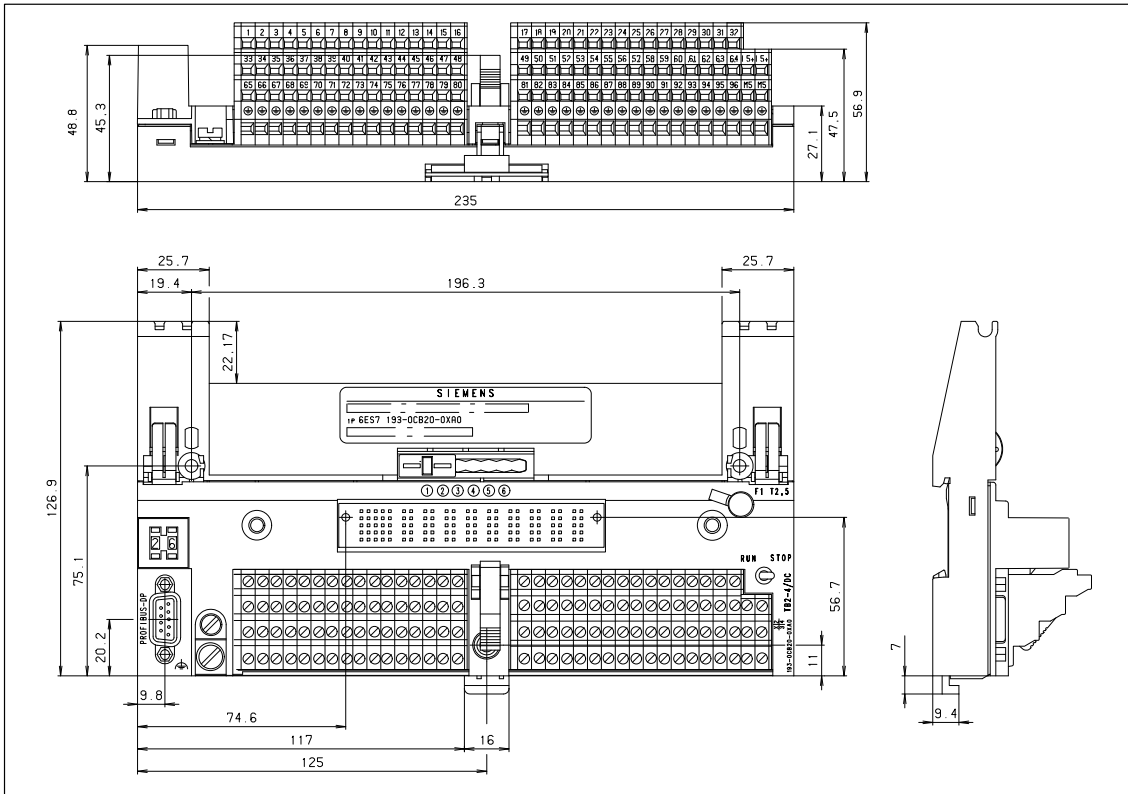


Figure 7-9 Dimensional Drawing: Terminal Block TB2-4/DC (Screw-Type Terminal, 4-Tier)

**Terminal Numbering**

Figure 7-10 is an enlargement of the terminal numbering printed on the TB2-4/DC (screw-type terminal, 4-tier).

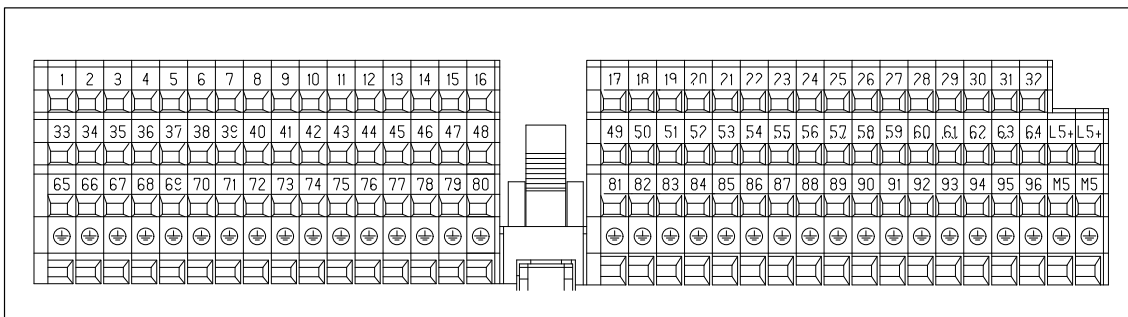


Figure 7-10 Terminal Numbering: Terminal Block TB2-4/DC (Screw-Type Terminal, 4-Tier)

### 7.2.6 Terminal Block TB4/DC (6ES7 193-0CB30-0XA0)

**Dimensional Drawing** Figure 7-11 is a dimensional drawing of the TB4/DC (spring-latch terminal).

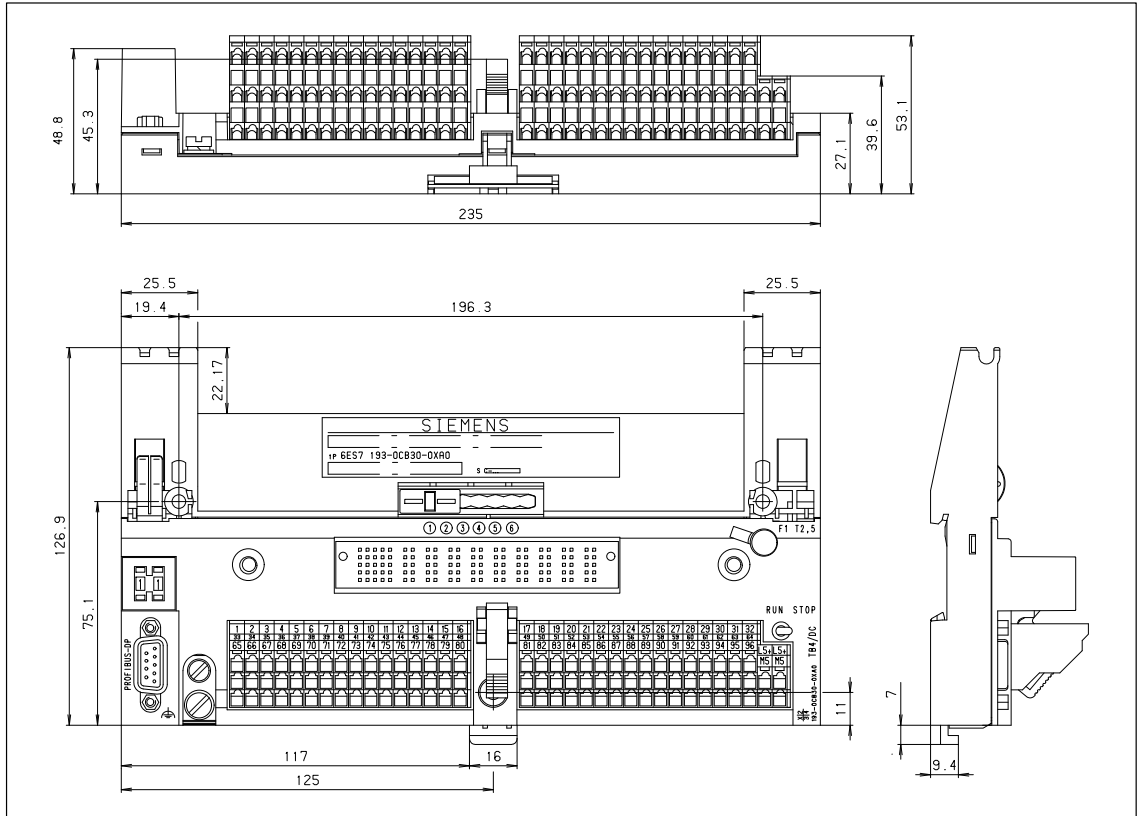


Figure 7-11 Dimensional Drawing: Terminal Block TB4/DC (Spring-Latch Terminal)

**Terminal Numbering** Figure 7-12 is an enlargement of the terminal numbering printed on the TB4/DC (spring-latch terminal).

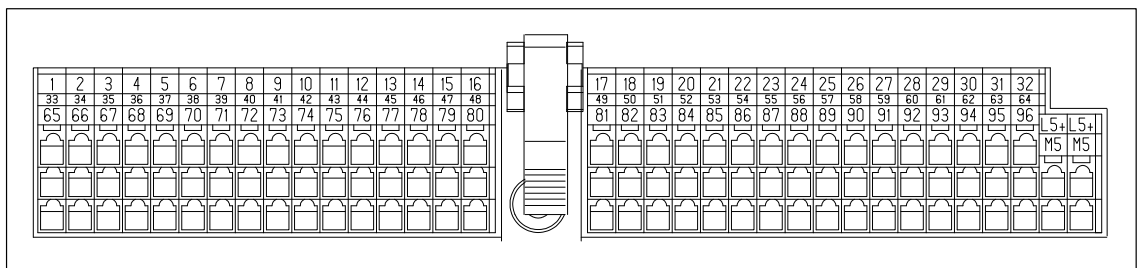


Figure 7-12 Terminal Numbering: Terminal Block TB4/DC (Spring-Latch Terminal)





## 7.2.8 Terminal Block TB6/AC (6ES7 193-0CC10-0XA0)

**Dimensional Drawing** Figure 7-15 is a dimensional drawing of the TB6/AC (screw-type terminal, 3-tier)

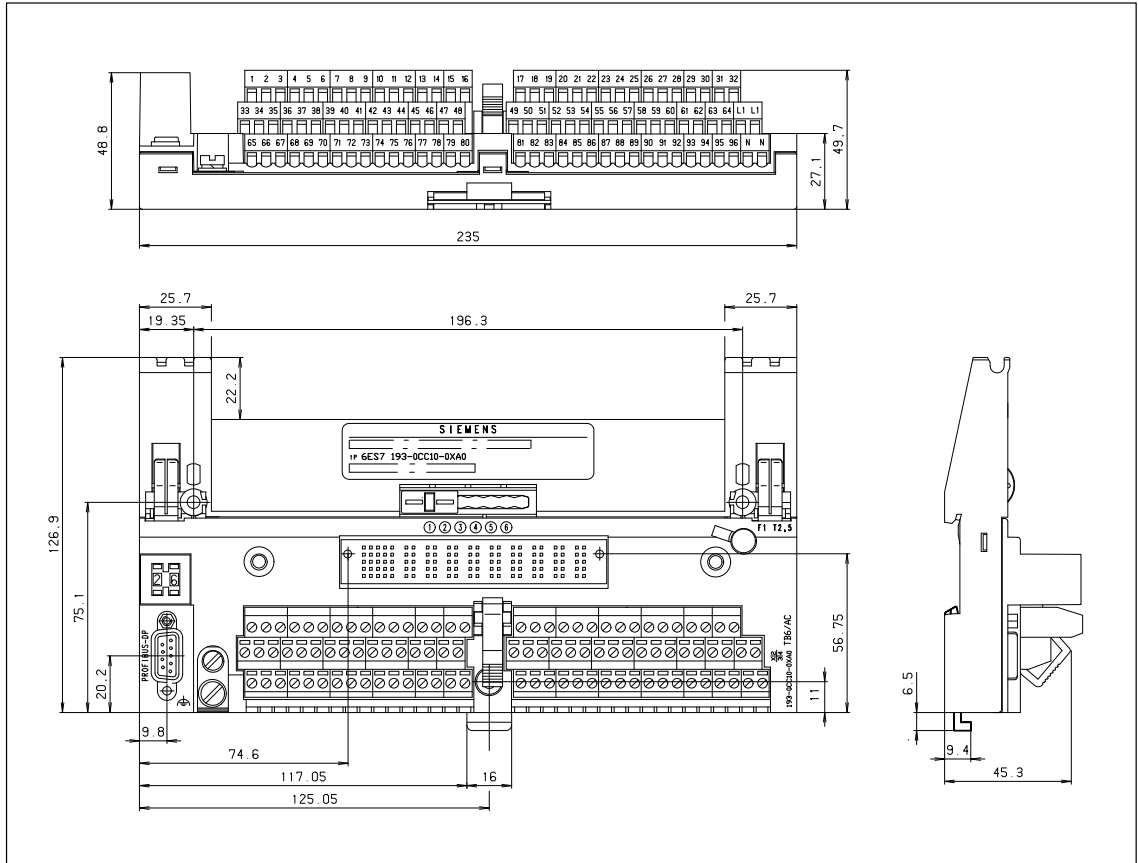


Figure 7-15 Dimensional Drawing: Terminal Block TB6/AC (Screw-Type Terminal, 3-Tier)

**Terminal Numbering** Figure 7-16 is an enlargement of the terminal numbering printed on the TB6/AC (screw-type terminal, 3-tier).

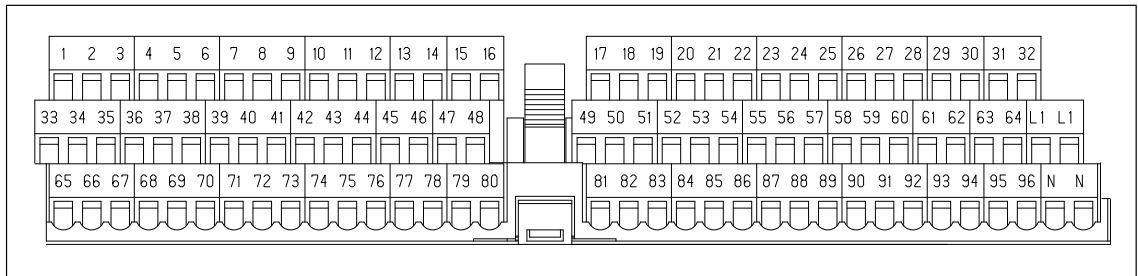


Figure 7-16 Terminal Numbering: Terminal Block TB6/AC (Screw-Type Terminal, 3-Tier)

## 7.2.9 Terminal Block and Bus Connector

**Dimensional Drawing** Figure 7-17 shows the dimensional drawings (side elevation) of any terminal block with electronics block inserted and a variety of bus connectors.

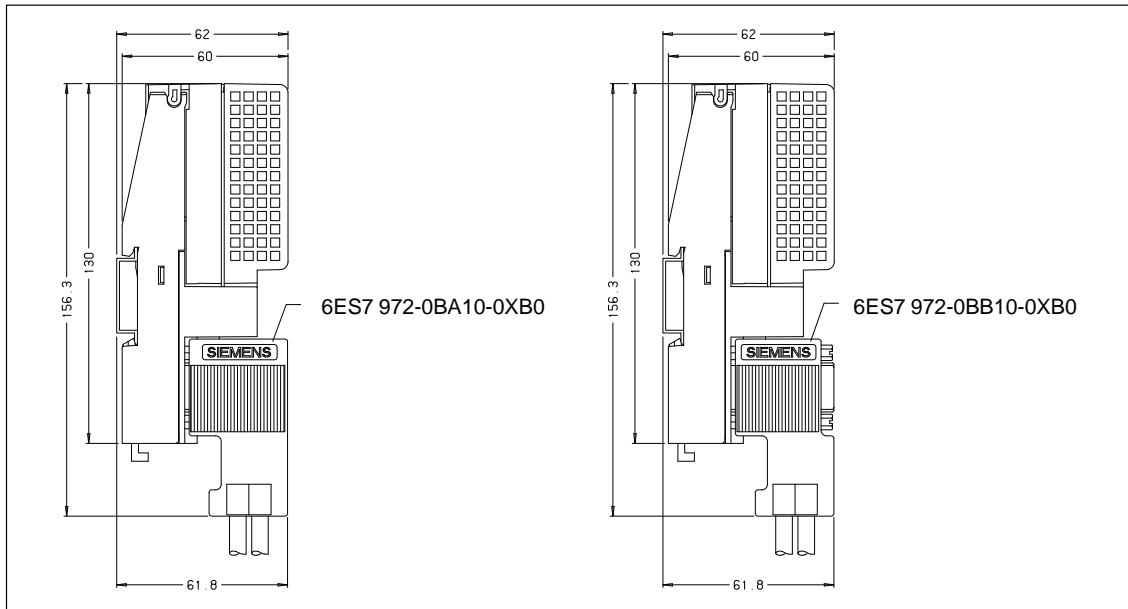


Figure 7-17 Dimensional Drawing: Side Elevation with Bus Connector (6ES7 972-0BA10-0XA0 and 6ES7 972-0BB10-0XA0)

## 7.3 Electronics Blocks

### Introduction

This section contains the technical data of the electronics blocks of ET 200B.

The technical data for each electronics block is accompanied by

- an outline of the characteristics,
- the block diagram and
- the pin assignments for the various permissible terminal blocks.

### In this Section

| In Section | you will find  | on Page |
|------------|--|---------|
| 7.3.1      | ET 200B-16DI (6ES7 131-0BH00-0XB0)   | 7-15    |
| 7.3.2      | ET 200B-32DI (6ES7 131-0BL00-0XB0) and<br>ET 200B-32DI 0.2ms (6ES7 131-0BL10-0XB0)         | 7-20    |
| 7.3.3      | ET 200B-16DO (6ES7 132-0BH01-0XB0)   | 7-26    |
| 7.3.4      | ET 200B-16DO/2A (6ES7 132-0BH11-0XB0)  | 7-32    |
| 7.3.5      | ET 200B-32DO (6ES7 132-0BL01-0XB0)   | 7-38    |
| 7.3.6      | ET 200B-8RO (6ES7 132-0GF00-0XB0)  | 7-44    |
| 7.3.7      | ET 200B-8DI/8DO (6ES7 133-0BH01-0XB0)  | 7-49    |
| 7.3.8      | ET 200B-8DI/8DO HWA (6ES7 133-0BH10-0XB0)  | 7-55    |
| 7.3.9      | ET 200B-16DI/16DO (6ES7 133-0BL00-0XB0)  | 7-62    |
| 7.3.10     | ET 200B-24DI/8DO (6ES7 133-0BN01-0XB0) and<br>ET 200B-24DI/8DO 0.2ms (6ES7 133-0BN11-0XB0) | 7-68    |
| 7.3.11     | ET 200B-16DI-AC (6ES7 131-0HF00-0XB0)  | 7-74    |
| 7.3.12     | ET 200B-16DO-AC (6ES7 132-0HF00-0XB0)  | 7-79    |
| 7.3.13     | ET 200B-16RO-AC (6ES7 132-0HH00-0XB0)  | 7-84    |
| 7.3.14     | ET 200B-8DI/8RO-AC (6ES7 133-0HH00-0XB0)   | 7-89    |

### 7.3.1 Electronics Block ET 200B-16DI (6ES7 131-0BH00-0XB0)

**Characteristics**

The ET 200B 16DI electronics block has the following characteristics

- 16 inputs, non-floating
- Input voltage: 24 V DC
- Suitable for switches and 2/3-wire proximity switches (BEROs).
- Possible terminal blocks: TB1/DC, TB1-4/DC, TB3/DC

**Dimensional Drawing**

Dimensional drawing for ET 200B-16DI:

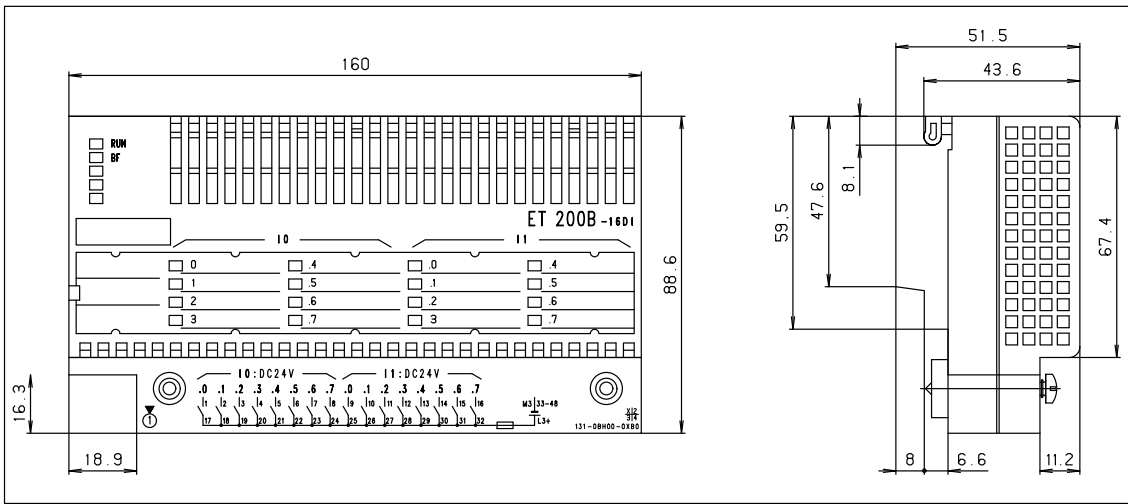


Figure 7-18 Dimensional Drawing: ET 200B-16DI (6ES7 131-0BH00-0XB0)

**Terminal Numbering**

Figure 7-19 is an enlargement of the terminal numbering printed on the ET 200B-16DI.

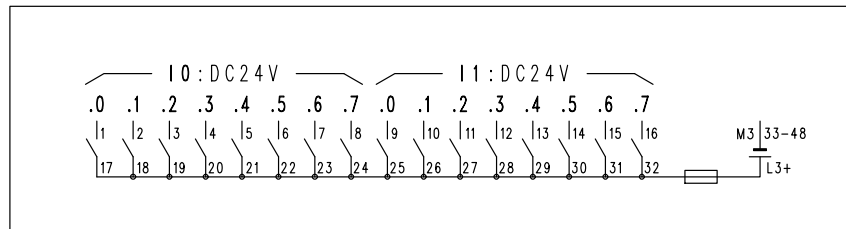


Figure 7-19 Connection Diagram: ET 200B-16DI (6ES7 131 0BH00-0XB0)

**Block Diagram** Simplified diagram of potential for the ET 200B-16DI and TB1/DC or TB3/DC:

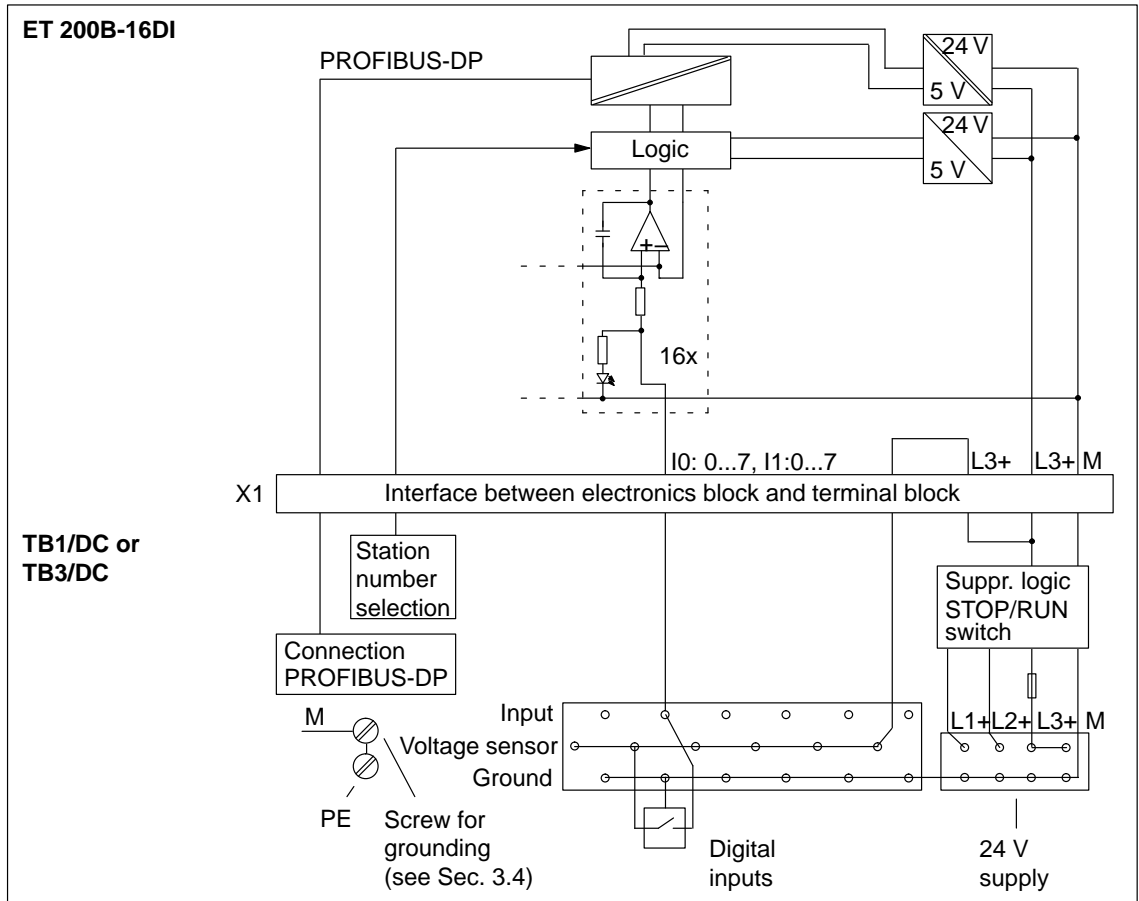


Figure 7-20 Block Diagram: ET 200B-16DI (6ES7 131-0BH0-0XB0) and TB1/DC or TB3/DC

**Block Diagram**

Simplified diagram of the potential for the ET 200B-16DI and TB1-4/DC:

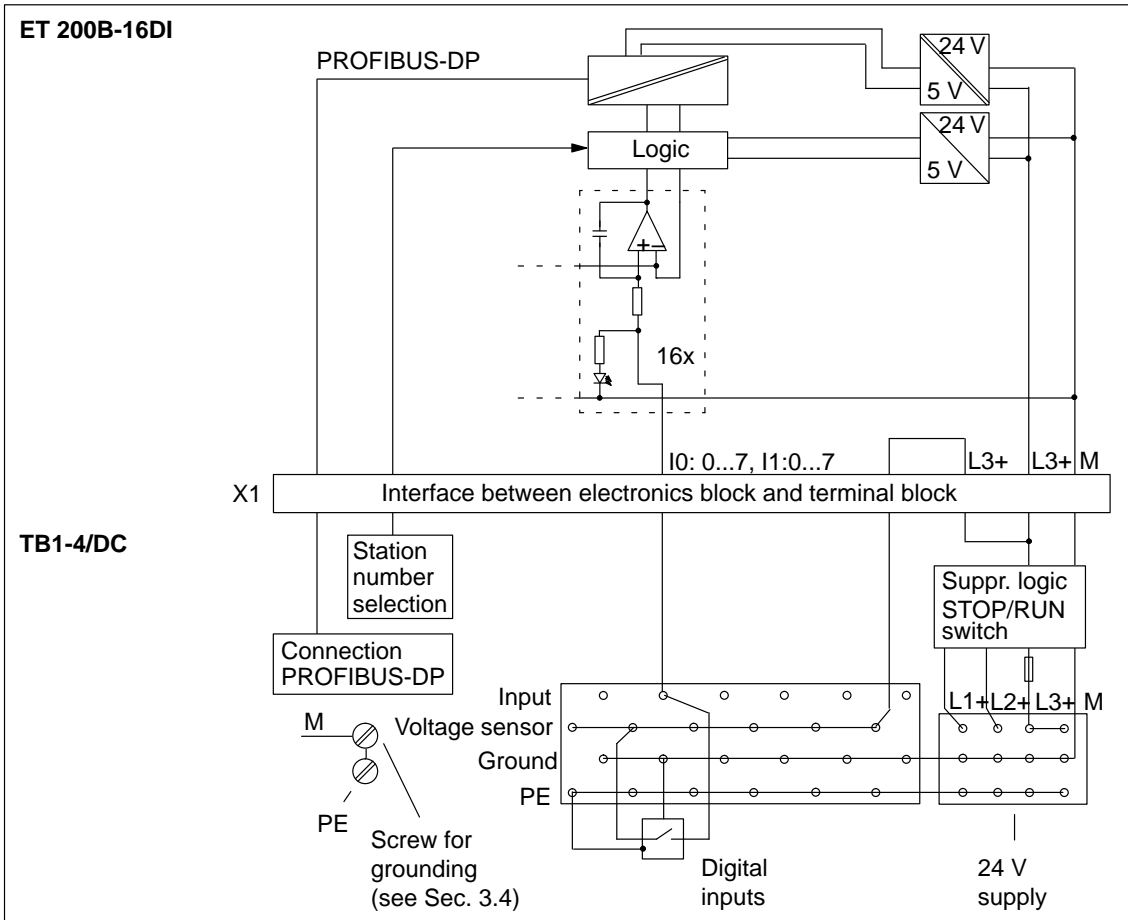


Figure 7-21 Block Diagram: ET 200B-16DI (6ES7 131-0BH00-0XB0) and TB1-4/DC

**Pin Assignment**

The table below shows the pin assignment of the terminal blocks for ET 200B-16DI. For the sake of clarity, the table also shows the terminal numbering of the terminal blocks, taking the TB1-4/DC by way of example.

Table 7-3 Pin Assignment of Terminal Blocks TB1/DC; TB1-4/DC and TB3/DC for ET 200B-16DI (6ES7 131-0BH00-0XB0)

| Terminal tier 1 |              | Terminal tier 2 |   | Terminal tier 3 |   | Terminal tier 4 <sup>1</sup> |   |
|-----------------|--------------|-----------------|---|-----------------|---|------------------------------|---|
| 1               | I0: Input .0 | 17              | 24 V (sensor voltage, internally jumpered, connected to L3+)  | 33              | Ground (sensor voltage, internally jumpered, connected to M1, M2, M3) | ⊕                            | PE (internally jumpered, but not connected to PE screw) |
| 2               | I0: Input .1 | 18              |   | 34              |   | ⊕                            |   |
| 3               | I0: Input .2 | 19              |   | 35              |   | ⊕                            |   |
| 4               | I0: Input .3 | 20              |   | 36              |   | ⊕                            |   |
| 5               | I0: Input .4 | 21              |   | 37              |   | ⊕                            |   |
| 6               | I0: Input .5 | 22              |   | 38              |   | ⊕                            |   |
| 7               | I0: Input .6 | 23              |   | 39              |   | ⊕                            |   |
| 8               | I0: Input .7 | 24              |   | 40              |   | ⊕                            |   |
| 9               | I1: Input .0 | 25              |   | 41              |   | ⊕                            |   |
| 10              | I1: Input .1 | 26              |   | 42              |   | ⊕                            |   |
| 11              | I1: Input .2 | 27              |   | 43              |   | ⊕                            |   |
| 12              | I1: Input .3 | 28              |   | 44              |   | ⊕                            |   |
| 13              | I1: Input .4 | 29              |   | 45              |   | ⊕                            |   |
| 14              | I1: Input .5 | 30              |   | 46              |   | ⊕                            |   |
| 15              | I1: Input .6 | 31              |   | 47              |   | ⊕                            |   |
| 16              | I1: Input .7 | 32              |   | 48              |   | ⊕                            |   |
| -               |              | L1+             | not used  | M1              | not used  | ⊕                            | PE (internally jumpered, but not connected to PE screw) |
| -               |              | L2+             | not used  | M2              | not used  | ⊕                            |   |
| -               |              | L3+             | Voltage supply, internal logic <b>and</b> sensor voltage 24 V | M3              | Ground connection, internal logic <b>and</b> sensor voltage           | ⊕                            |   |
| -               |              | L3+             | Voltage supply, internal logic <b>and</b> sensor voltage 24 V | M3              | Ground connection, internal logic <b>and</b> sensor voltage           | ⊕                            |   |

1 TB1-4/DC only



**Important Note on Wiring**

The following notes are important as regards the wiring of the ET 200B-16DI:

- The terminals for PE on the 4-tier terminal block are not connected to the PE connection of terminal block TB1-4/DC.
- L3+ and terminals 17 ... 32 are interconnected, as are M1, M2, M3 and terminals 33 ... 48.
- The two L3+ terminals are also interconnected.

**Fuse**

The 24 V sensor supply is protected by fuse F1 (1.6 A) in the terminal blocks. Nevertheless, make sure that the current does not exceed the specifications in the technical data for the electronics block.

**Technical Data**

The technical data of electronics block ET 200B-16DI is listed in the tables below.

| Technical specifications   |   | Inputs   |                                |
|--|---|--|--------------------------------|
| Baud rates*  | 9.6/19.2/93.75/187.5/500/1500/3000/6000/12000 kbaud | Number of inputs   | 16                             |
| Bus protocol   | PROFIBUS-DP   | Galvanic isolation to internal electronic circuits                     | No                             |
| FREEZE capability  | Yes   | Input voltage  |                                |
| Galvanic isolation to SI-NEC L2-DP                                 | Yes   | • Rated value  | 24 V DC                        |
| Power losses   | Typ. 2.5 W  | • For "0" signal   | - 30 V to 5 V                  |
| Weight (EB and TB)   | Approx. 600 g (21 oz.)                              | • For "1" signal   | 13 V to 30 V                   |
| Dimensions (EB and TB: W × H × D)                                  | 160 × 130 × 60 mm (6.24 x 5.07 x 2.34 in.)          | Input current for "1" signal   | Typ. 4 mA at 24 V<br>Min. 2 mA |
| <b>Diagnostics functions</b>                                       |   | Delay of inputs  | 2.0 to 3.5 ms                  |
| Voltage monitoring   | Green "RUN" LED                                     | Connection of 2-wire BERO  | Possible                       |
| Bus monitoring SI-NEC L2-DP  | Red "BF" LED  | • Quiescent current  | ≤ 1.5 mA                       |
| Status of inputs   | Green LEDs  | Connection of mechanical switches                                      | Possible                       |
| <b>Supply voltage for inputs, sensor supply and internal logic</b> |   | Wire lengths of the sensors  |                                |
| Supply voltage (L3+)   |   | • Unshielded   | Max. 100 m (328 ft.)           |
| • Rated value  | 24 V DC   | * In operation with the IM 308-B, the maximum baud rate is 1500 kbaud. |                                |
| • Permissible range  | 18.5 to 30.2 V                                      |  |                                |
| • Value for t < 0.5 s  | 35 V  |  |                                |
| Current consumption from L3+                                       |   |  |                                |
| • Logic  | Typ. 70 mA  |  |                                |
| • Sensors  | Max. 500 mA   |  |                                |
| I <sup>2</sup> t (for inrush current)                              | ≤ 0.05 A <sup>2</sup> s                             |  |                                |

### 7.3.2 Electronics Blocks ET 200B-32DI (6ES7 131-0BL00-0XB0) and ET 200B-32DI 0.2ms (6ES7 131-0BL10-0XB0)

#### Characteristics

The ET 200B-32DI and ET 200B-32DI 0.2ms electronics blocks have the following characteristics:

- 32 inputs, non-floating
- Input voltage: 24 V DC
- Input delay:
  - 6ES7 131-0BL00-0XB0 → 3 ms
  - 6ES7 131-0BL10-0XB0 → 0.2 ms
- Suitable for switches and 2/3-wire proximity switches (BEROs).
- Possible terminal blocks: TB2/DC, TB2-4/DC, TB4/DC, TB4M/DC

#### Dimensional Drawing

Dimensional drawing for ET 200B-32DI (6ES7 131-0BL00-0XB0) and ET 200B-32DI 0.2ms (6ES7 131-0BL10-0XB0):

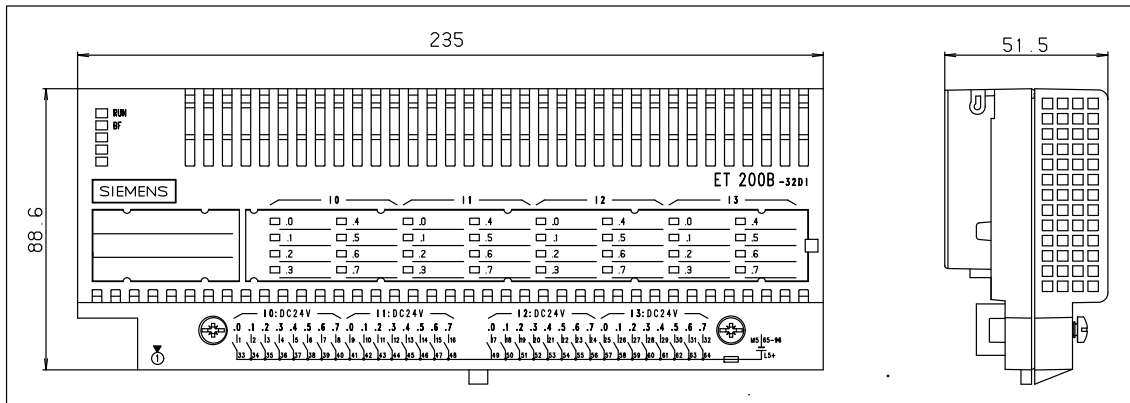


Figure 7-22 Dimensional Drawing: ET 200B-32DI (6ES7 131-0BL00-0XB0) and ET 200B-32DI 0.2ms (6ES7 131-0BL10-0XB0)

#### Terminal Numbering

Figure 7-23 is an enlargement of the terminal numbering printed on the ET 200B-32DI.

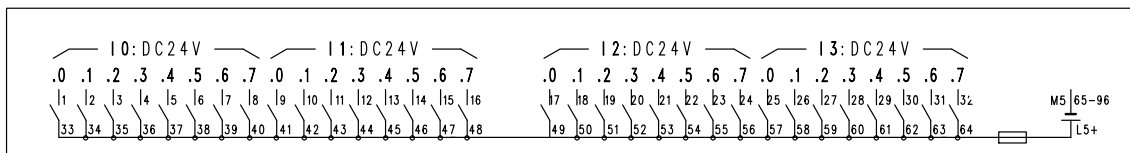


Figure 7-23 Connection Diagram: ET 200B-32DI (6ES7 131-0BL00-0XB0) and ET 200B-32DI 0.2ms (6ES7 131-0BL10-0XB0)

**Block Diagram**

Simplified diagram of potential for the ET 200B-32DI or ET 200B-32DI 0.2 ms and TB2/DC or TB4/DC:

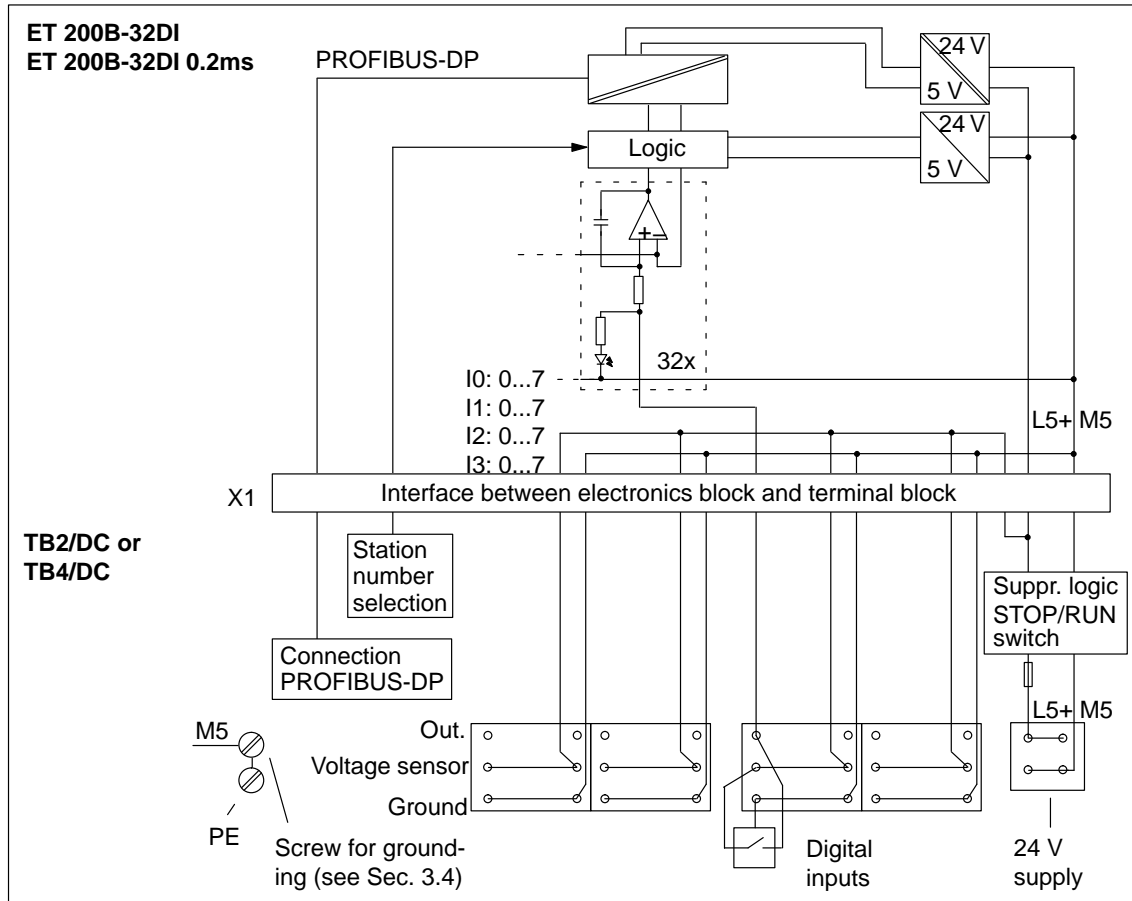


Figure 7-24 Block Diagram: ET 200B-32DI (6ES7 131-0BL00-0XB0) or ET 200B-32DI 0.2ms (6ES7 131-0BL10-0XB0) and TB2/DC or TB4/DC

**Block Diagram**

Simplified diagram of the potential for the ET 200B-32DI or ET 200B-32DI 0.2 ms and TB2-4/DC:

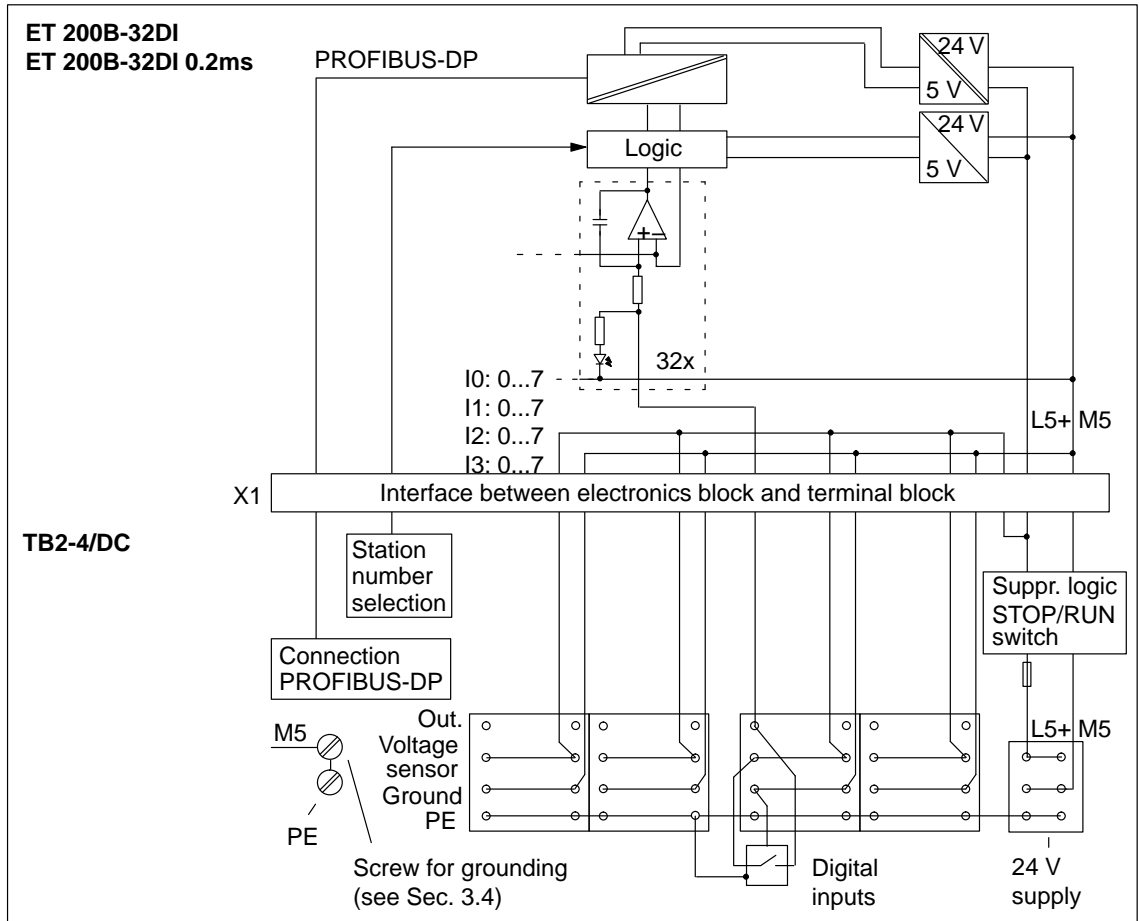


Figure 7-25 Block Diagram: ET 200B-32DI (6ES7 131-0BL00-0XB0) or ET 200B-32DI 0.2ms (6ES7 131-0BL10-0XB0) and TB2-4/DC

**Pin Assignment**

The table below shows the pin assignment of the terminal blocks for ET 200B-32DI and ET 200B-32DI 0.2 ms. For the sake of clarity, the table also shows the terminal numbering of the terminal blocks, taking the TB2-4/DC by way of example.

Table 7-4 Pin Assignment of Terminal Blocks TB2/DC, TB2-4/DC, TB4/DC and TB4M/DC for ET 200B-32DI (6ES7 131-0BL00-0XB0) and ET 200B-32DI 0.2ms (6ES7 131-0BL10-0XB0)

| Terminal tier 1 |              | Terminal tier 2 |  | Terminal tier 3 |   | Terminal tier 4 <sup>1</sup> |   |
|-----------------|--------------|-----------------|--|-----------------|---|------------------------------|---|
| 1               | I0: Input .0 | 33              | 24 V (sensor voltage, internally jumpered, connected to L5+) | 65              | Ground (sensor voltage, internally jumpered, connected to M5) | ⊕                            | PE (internally jumpered, but not connected to PE screw) |
| 2               | I0: Input .1 | 34              |  | 66              |   | ⊕                            |   |
| 3               | I0: Input .2 | 35              |  | 67              |   | ⊕                            |   |
| 4               | I0: Input .3 | 36              |  | 68              |   | ⊕                            |   |
| 5               | I0: Input .4 | 37              |  | 69              |   | ⊕                            |   |
| 6               | I0: Input .5 | 38              |  | 70              |   | ⊕                            |   |
| 7               | I0: Input .6 | 39              |  | 71              |   | ⊕                            |   |
| 8               | I0: Input .7 | 40              |  | 72              |   | ⊕                            |   |
| 9               | I1: Input .0 | 41              |  | 73              |   | ⊕                            |   |
| 10              | I1: Input .1 | 42              |  | 74              |   | ⊕                            |   |
| 11              | I1: Input .2 | 43              |  | 75              |   | ⊕                            |   |
| 12              | I1: Input .3 | 44              |  | 76              |   | ⊕                            |   |
| 13              | I1: Input .4 | 45              |  | 77              |   | ⊕                            |   |
| 14              | I1: Input .5 | 46              |  | 78              |   | ⊕                            |   |
| 15              | I1: Input .6 | 47              |  | 79              |   | ⊕                            |   |
| 16              | I1: Input .7 | 48              |  | 80              |   | ⊕                            |   |
| 17              | I2: Input .0 | 49              |  | 81              |   | ⊕                            |   |
| 18              | I2: Input .1 | 50              |  | 82              |   | ⊕                            |   |
| 19              | I2: Input .2 | 51              |  | 83              |   | ⊕                            |   |
| 20              | I2: Input .3 | 52              |  | 84              |   | ⊕                            |   |
| 21              | I2: Input .4 | 53              |  | 85              |   | ⊕                            |   |
| 22              | I2: Input .5 | 54              |  | 86              |   | ⊕                            |   |
| 23              | I2: Input .6 | 55              |  | 87              |   | ⊕                            |   |

Table 7-4 Pin Assignment of Terminal Blocks TB2/DC, TB2-4/DC, TB4/DC and TB4M/DC for ET 200B-32DI (6ES7 131-0BL00-0XB0) and ET 200B-32DI 0.2ms (6ES7 131-0BL10-0XB0), continued

| Terminal tier 1 |              | Terminal tier 2 |   | Terminal tier 3 |   | Terminal tier 4 <sup>1</sup> |   |
|-----------------|--------------|-----------------|---|-----------------|---|------------------------------|---|
| 24              | I2: Input .7 | 56              | 24 V (sensor voltage, internally jumpered, connected to L5+)  | 88              | Ground (sensor voltage, internally jumpered, connected to M5) | ⊕                            | PE (internally jumpered, but not connected to PE screw) |
| 25              | I3: Input .0 | 57              |   | 89              |   | ⊕                            |   |
| 26              | I3: Input .1 | 58              |   | 90              |   | ⊕                            |   |
| 27              | I3: Input .2 | 59              |   | 91              |   | ⊕                            |   |
| 28              | I3: Input .3 | 60              |   | 92              |   | ⊕                            |   |
| 29              | I3: Input .4 | 61              |   | 93              |   | ⊕                            |   |
| 30              | I3: Input .5 | 62              |   | 94              |   | ⊕                            |   |
| 31              | I3: Input .6 | 63              |   | 95              |   | ⊕                            |   |
| 32              | I3: Input .7 | 64              |   | 96              |   | ⊕                            |   |
| –               |              | L5+             | Voltage supply, internal logic <b>and</b> sensor voltage 24 V | M5              | Ground connection, internal logic <b>and</b> sensor voltage   | ⊕                            | PE (internally jumpered, but not connected to PE screw) |
| –               |              | L5+             | Voltage supply, internal logic <b>and</b> sensor voltage 24 V | M5              | Ground connection, internal logic <b>and</b> sensor voltage   | ⊕                            |   |

<sup>1</sup> TB2-4/DC only; in the TB4M/DC tier 4 is available for additional ground connections (see Section 7.2.7)

**Important Note on Wiring**

The following notes are important as regards the wiring of the ET 200B-32DI and ET 200B-32DI 0.2 ms:

- The terminals for PE on the 4-tier terminal block are not connected to the PE connection of terminal block TB2-4/DC.
- L5+ and terminals 33 ... 64 are interconnected, as are M5 and terminals 65 ... 96.
- The two L5+ terminals are also internally interconnected.

**Fuse**

The 24 V sensor supply is protected by fuse F1 (2.5 A) in the terminal blocks. Nevertheless, make sure that the current does not exceed the specifications in the technical data for the electronics block.

**Technical Data**

The technical data of electronics blocks ET 200B-32DI and ET 200B-32DI 0.2 ms is listed in the tables below.

| Technical specifications   |   | Inputs   |                                 |
|--|---|--|---------------------------------|
| Baud rates*<br>for<br>6ES7 131-0BL10-0XB0<br>and<br>6ES7 131-0BL00-0BL0          | 9.6/19.2/93.75/187.5/500/<br>1500/3000/6000/<br>12000 kbaud | Number of inputs   | 32                              |
| Bus protocol<br>for<br>6ES7 131-0BL10-0XB0<br>and<br>6ES7 131-0BL00-0XB0         | PROFIBUS-DP   | Galvanic isolation to inter-<br>nal electronic circuits                | No                              |
| FREEZE<br>capability<br>for<br>6ES7 131-0BL10-0XB0<br>and<br>6ES7 131-0BL00-0XB0 | Yes   | Input voltage  |                                 |
| Galvanic isolation to SI-<br>NEC L2-DP   | Yes   | • Rated value  | 24 V DC                         |
| Power losses   | Typ. 4.8 W  | • For "0" signal   | - 30 V to 5 V                   |
| Weight (EB and TB)   | Approx. 800 g (28 oz.)                                      | • For "1" signal   | 13 V to 30 V                    |
| Dimensions (EB and TB):<br>W x H x D)  | 235 x 130 x 60 mm<br>(9.17 x 5.07 x 2.34 in.)               | Input current for<br>"1" signal  | Typ. 4 mA for 24 V<br>Min. 2 mA |
| <b>Diagnostics functions</b>   |   | Delay of inputs for<br>6ES7 131-0BL00-0XB0                             | 3 ms                            |
| Voltage monitoring   | Green "RUN" LED   | Delay of inputs for<br>6ES7 131-0BL10-0XB0                             | 0.2 ms                          |
| Bus monitoring SI-<br>NEC L2-DP  | Red "BF" LED  | Connection of 2-wire<br>BERO   | Possible                        |
| Status of inputs   | Green LEDs  | • Quiescent current  | ≤ 1.5 mA                        |
| <b>Supply voltage for inputs, sensor supply and internal logic</b>               |   | Connection of mechanical<br>switches                                   | Possible                        |
| Supply logic (L5+)   |   | Cable length of sensors  |                                 |
| • Rated value  | 24 V DC   | • Unshielded   | Max. 100 m (328 ft.)            |
| • Permissible range  | 18.5 to 30.2 V  | * In operation with the IM 308-B, the maximum baud rate is 1500 kbaud. |                                 |
| • Value for t < 0.5 s  | 35 V  |  |                                 |
| Current consumption from<br>L5+  |   |  |                                 |
| • Logic  | Typ. 70 mA  |  |                                 |
| • Sensors  | Max. 1 A  |  |                                 |
| I <sup>2</sup> t<br>(for inrush current)   | ≤ 0.05 A <sup>2</sup> s                                     |  |                                 |

### 7.3.3 Electronics Block ET 200B-16DO (6ES7 132-0BH01-0XB0)

**Characteristics** The ET 200B-16DO electronics block has the following characteristics:

- 16 outputs, non-floating
- Load voltage: 24 V DC
- Output current:  $12 \times 0.5 \text{ A}$ ,  $4 \times 2 \text{ A}$
- Suitable for solenoid valves and DC contactors.
- Possible terminal blocks: TB1/DC, TB1-4/DC, TB3/DC

**Dimensional Drawing** See Figure 7-18 for the precise dimensions.

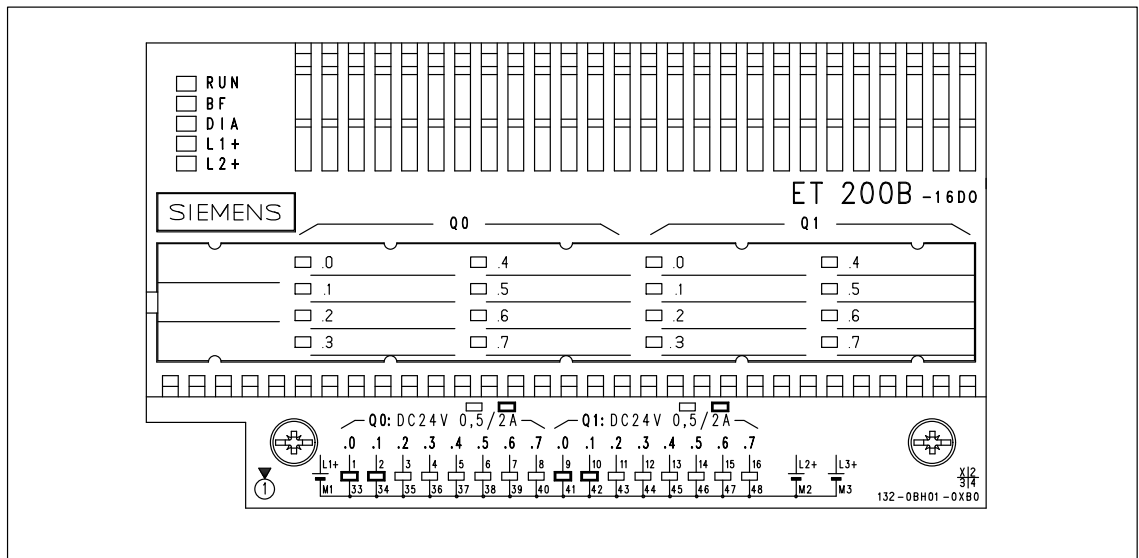


Figure 7-26 Front Elevation: ET 200B-16DO (6ES7 132-0BH01-0XB0)



**Block Diagram**

Simplified diagram of potential for the ET 200B-16DO and TB1/DC or TB3/DC:

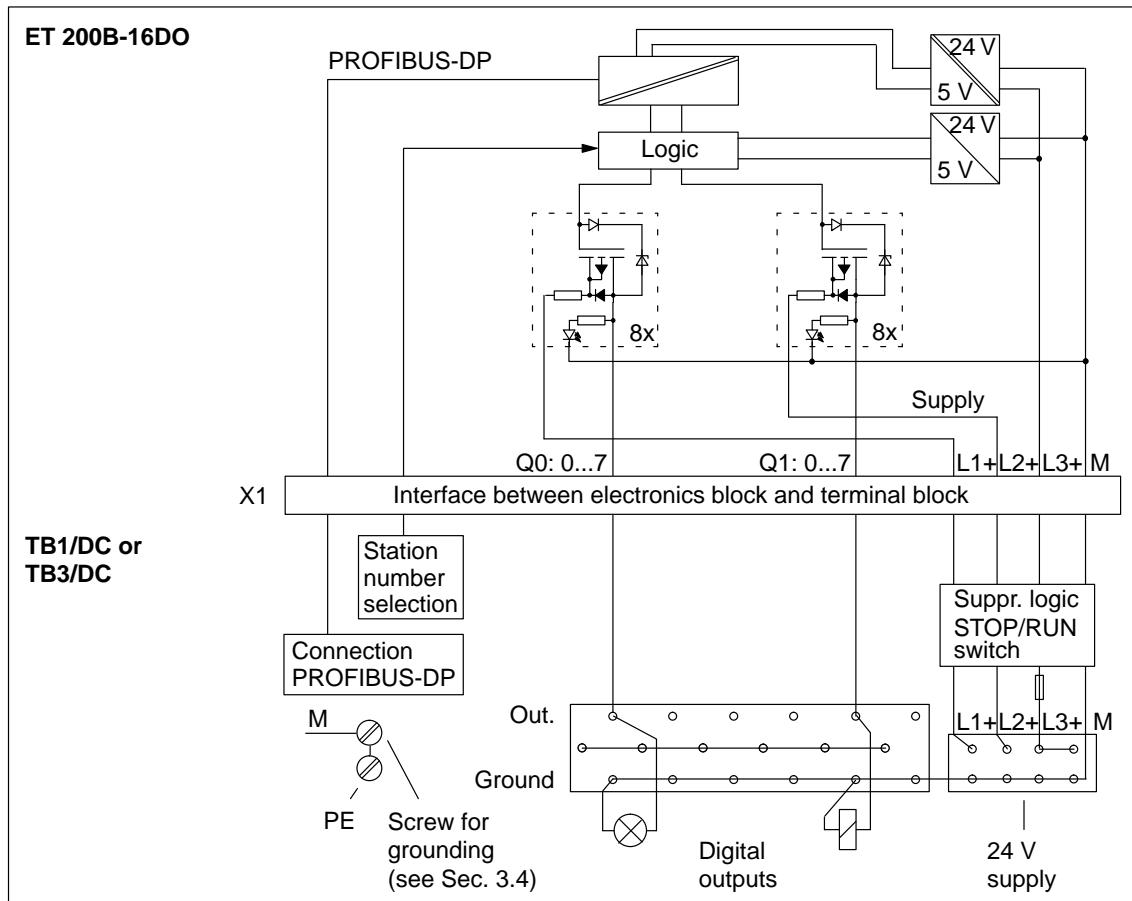


Figure 7-27 Block Diagram: ET 200B-16DO (6ES7 132-0BH01-0XB0) and TB1/DC or TB3/DC

**Block Diagram** Simplified diagram of the potential for the ET 200B-16DO and TB1-4/DC:

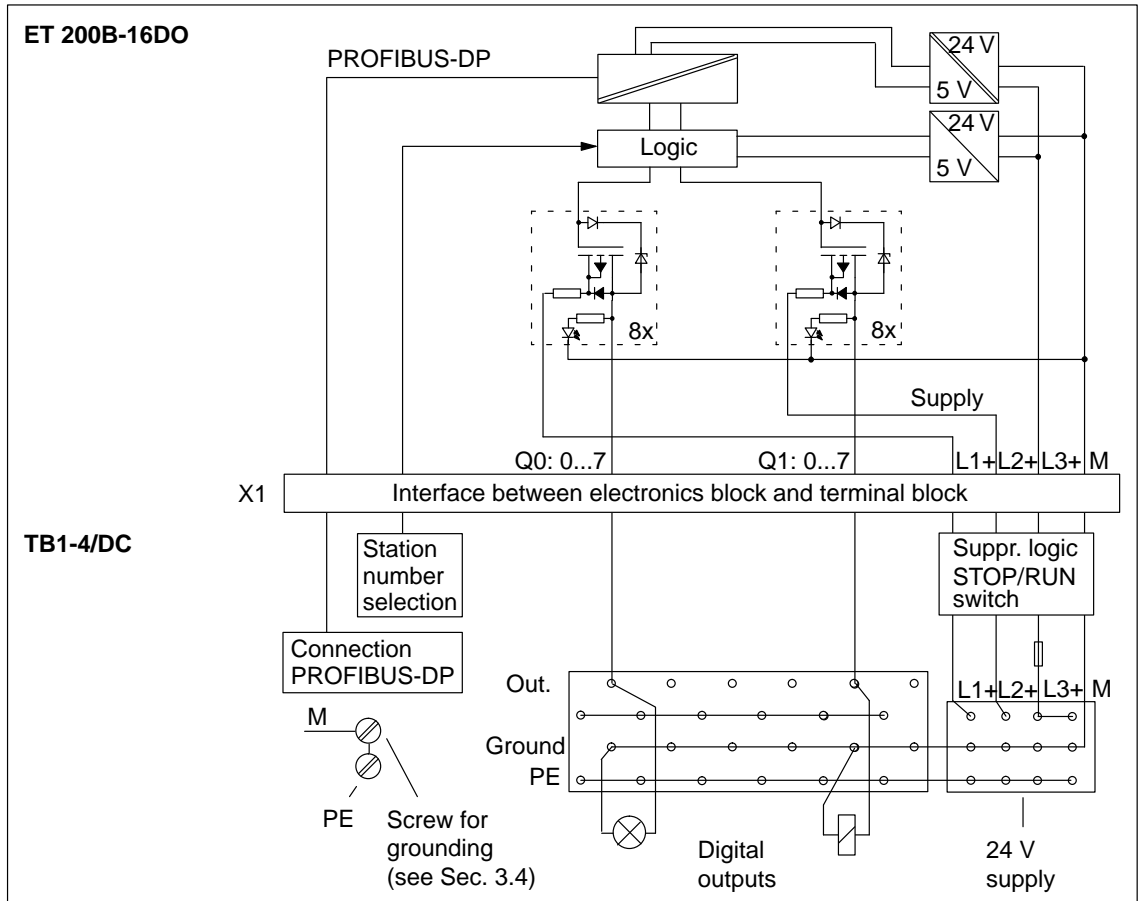
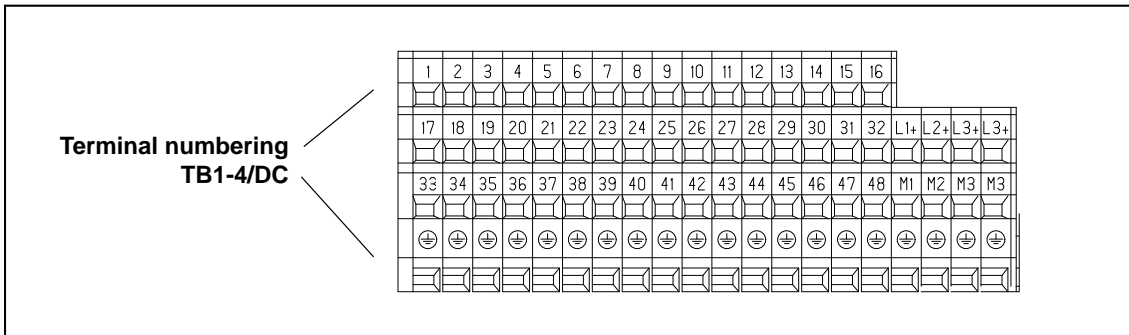


Figure 7-28 Block Diagram: ET 200B-16DO (6ES7 132-0BH01-0XB0) and TB1-4/DC

**Pin Assignment**

The table below shows the pin assignment of the terminal blocks for ET 200B-16DO. For the sake of clarity, the table also shows the terminal numbering of the terminal blocks, taking the TB1-4/DC by way of example.

Table 7-5 Pin Assignment of Terminal Blocks TB1/DC, TB1-4/DC and TB3/DC for ET 200B-16DO (6ES7 132-0BH01-0XB0)



| Terminal tier 1 |                | Terminal tier 2 |  | Terminal tier 3 |  | Terminal tier 4 <sup>1</sup> |   |
|-----------------|----------------|-----------------|--|-----------------|--|------------------------------|---|
| 1               | Q0: Output .0* | 17              | not used (internally jumpered)                           | 33              | Ground (internally jumpered, connected to M1, M2, M3)  | ⊕                            | PE (internally jumpered, but not connected to PE screw) |
| 2               | Q0: Output .1* | 18              |  | 34              |  | ⊕                            |   |
| 3               | Q0: Output .2  | 19              |  | 35              |  | ⊕                            |   |
| 4               | Q0: Output .3  | 20              |  | 36              |  | ⊕                            |   |
| 5               | Q0: Output .4  | 21              |  | 37              |  | ⊕                            |   |
| 6               | Q0: Output .5  | 22              |  | 38              |  | ⊕                            |   |
| 7               | Q0: Output .6  | 23              |  | 39              |  | ⊕                            |   |
| 8               | Q0: Output .7  | 24              |  | 40              |  | ⊕                            |   |
| 9               | Q1: Output .0* | 25              |  | 41              |  | ⊕                            |   |
| 10              | Q1: Output .1* | 26              |  | 42              |  | ⊕                            |   |
| 11              | Q1: Output .2  | 27              |  | 43              |  | ⊕                            |   |
| 12              | Q1: Output .3  | 28              |  | 44              |  | ⊕                            |   |
| 13              | Q1: Output .4  | 29              |  | 45              |  | ⊕                            |   |
| 14              | Q1: Output .5  | 30              |  | 46              |  | ⊕                            |   |
| 15              | Q1: Output .6  | 31              |  | 47              |  | ⊕                            |   |
| 16              | Q1: Output .7  | 32              |  | 48              |  | ⊕                            |   |
| -               |                | L1+             | Voltage supply <b>L1+</b> for channel group Q0: .0 to .7 | M1              | Ground supply <b>M1</b> for channel group Q0: .0 to .7 | ⊕                            | PE (internally jumpered, but not connected to PE screw) |
| -               |                | L2+             | Voltage supply <b>L2+</b> for channel group Q1: .0 to .7 | M2              | Ground supply <b>M2</b> for channel group Q1: .0 to .7 | ⊕                            |   |

\* The maximum load for these outputs is 2A, the maximum load for all other outputs is 0.5 A.

Table 7-5 Pin Assignment of Terminal Blocks TB1/DC, TB1-4/DC and TB3/DC for ET 200B-16DO (6ES7 132-0BH01-0XB0), continued

| Terminal tier 1 |  | Terminal tier 2 |                                | Terminal tier 3 |                                   | Terminal tier 4 <sup>1</sup> |  |
|-----------------|--|-----------------|--------------------------------|-----------------|-----------------------------------|------------------------------|--|
| -               |  | L3+             | Voltage supply, internal logic | M3              | Ground connection, internal logic | ⊕                            | PE (internally jumped but not connected to PE screw) |
| -               |  | L3+             | Voltage supply, internal logic | M3              | Ground connection, internal logic | ⊕                            |  |

1 TB1-4/DC only

**Important Note on Wiring**

The following notes are important as regards the wiring of the ET 200B-16DO:

- The terminals for PE on the 4-tier terminal block are not connected to the PE connection of terminal block TB1-4/DC.
- L1+, L2+ and L3+ are **not** interconnected.
- M1, M2, M3 and terminals 33 ... 48 are internally interconnected.
- The two L3+ terminals are internally interconnected.

**Technical Data**

The technical data of electronics block ET 200B-16DO is listed in the tables below.

| <b>Technical specifications</b>  |   | <b>Outputs</b>  |   |
|--|---|---|---|
| Baud rates*  | 9.6/19.2/93.75/187.5/500/<br>1500/3000/6000/<br>12000 kbaud | Number of outputs   | 16  |
| Bus protocol   | PROFIBUS-DP   | Galvanic isolation  | No  |
| SYNC capability  | Yes   | • In groups of  | 8   |
| Galvanic isolation to SI-<br>NEC L2-DP bus   | Yes   | Output voltage  |   |
| Power losses   | Max. 5 W  | • For "0" signal  | Max. 2 V (idle)   |
| Weight (EB and TB)   | Approx. 600 g (21 oz.)                                      | • For "1" signal  | Min. (supply voltage<br>– 3 V)  |
| Dimensions (EB and TB:<br>W x H x D)   | 160 x 130 x 60 mm<br>(6.24 x 5.07 x 2.34 in.)               | Output voltage  |   |
| <b>Diagnostics functions</b>   |   | • For "0" signal  | Max. 1 mA   |
| Voltage monitoring   | Green "RUN" LED   | • For "1" signal  | Max. 2 A (2 outputs per<br>group; .0 and .1)<br>Max. 0.5 A (6 outputs per<br>group; .2 to .7) |
| Bus monitoring SI-<br>NEC L2-DP  | Red "BF" LED  | Delay of outputs  | Max. 1 ms   |
| Group diagnostics for<br>short-circuit, load voltage<br>failure                              | Red "DIA" LED   | • At max. lamp load   | Max. 80 ms  |
| Load voltage monitoring,<br>by group   | Green "L1+", "L2+" LEDs                                     | Switching frequency   |   |
| Status of outputs  | Green LEDs  | • Resistive load  | Max. 100 Hz   |
| <b>Supply voltage for outputs, load voltage supply and<br/>internal logic</b>                |   | • Inductive load  | Max. 0.5 Hz   |
| Supply voltages<br>(L1+,L2+,L3+)   |   | • Lamp load   | Max. 8 Hz   |
| • Rated value  | 24 V DC   | Load current per group  |   |
| • Permissible range  | 18.5 to 30.2 V  | • Total current   | Max. 4 A  |
| • Value for $t < 0.5$ s  | 35 V  | • In case of short-circuit                                      | Max. 6.5 A  |
| Current consumption from<br>L3+  |   | Lamp load   |   |
| • Logic  | 80 mA   | • At $I = 0.5$ A  | Max. 5 W  |
| $I^2t$ (for inrush current)  | $\leq 0.05$ A <sup>2</sup> s                                | • At $I = 2$ A  | Max. 10 W   |
| Short-circuit protection in<br>case of polarity reversal<br>(L1+ and L2+) of load<br>voltage | No  | Setting a digital input   | Possible  |
|  |   | Limitation of voltage in-<br>duced on current interrup-<br>tion | Typ. (L1+, L2+) –55 V   |
|  |   | Cable length  | Max. 100 m (328 ft.)  |

\* In operation with the IM 308-B, the maximum baud rate is 1500 kbaud.

### 7.3.4 Electronics Block ET 200B-16DO/2A (6ES7 132-0BH11-0XB0)

**Characteristics** The ET 200B-16DO/2A electronics block has the following characteristics:

- 16 outputs, floating in groups of 4
- Load voltage: 24 V DC
- Output current: 2 A
- Possible terminal blocks: TB2/DC, TB2-4/DC, TB4/DC, TB4M/DC

**Dimensional Drawing** See Figure 7-22 for the precise dimensions.

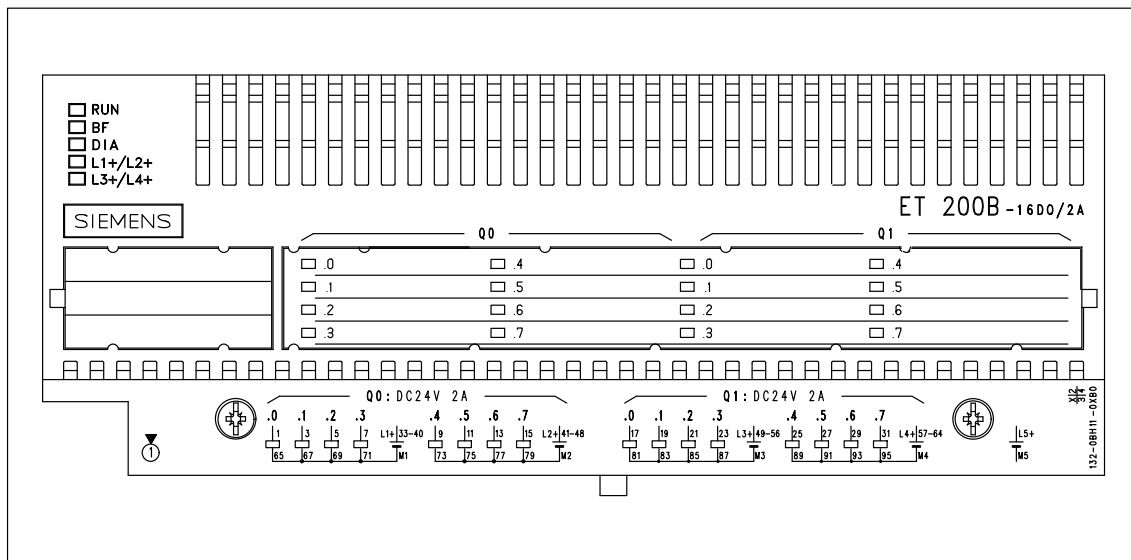


Figure 7-29 Front Elevation: ET 200B-16DO/2A (6ES7 132-0BH11-0XB0)

**Block Diagram**

Simplified diagram of potential for the ET 200B-16DO/2A and TB2/DC or TB4/DC:

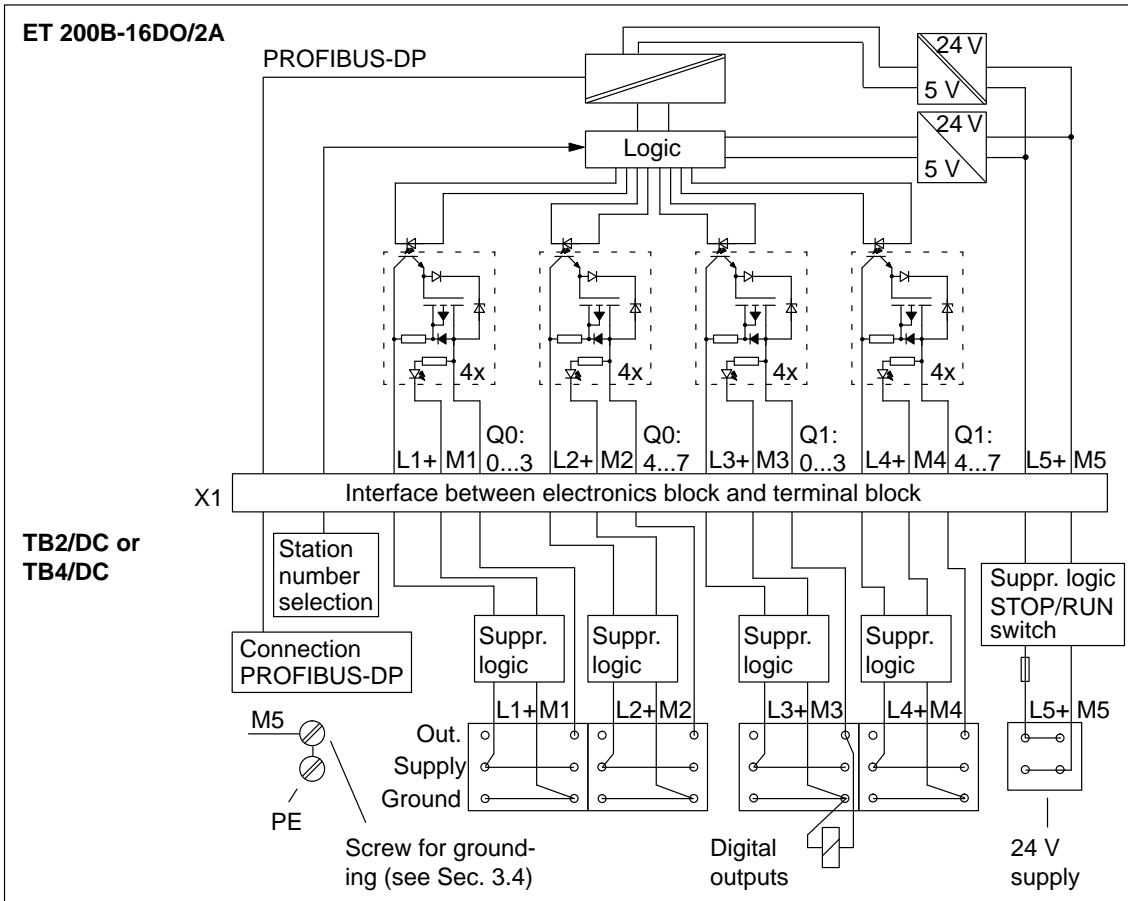


Figure 7-30 Block Diagram: ET 200B-16DO/2A (6ES7 132-0BH11-0XB0) and TB2/DC or TB4/DC

**Block Diagram**

Simplified diagram of the potential for the ET 200B-16DO/2A and TB2/DC or TB4/DC:

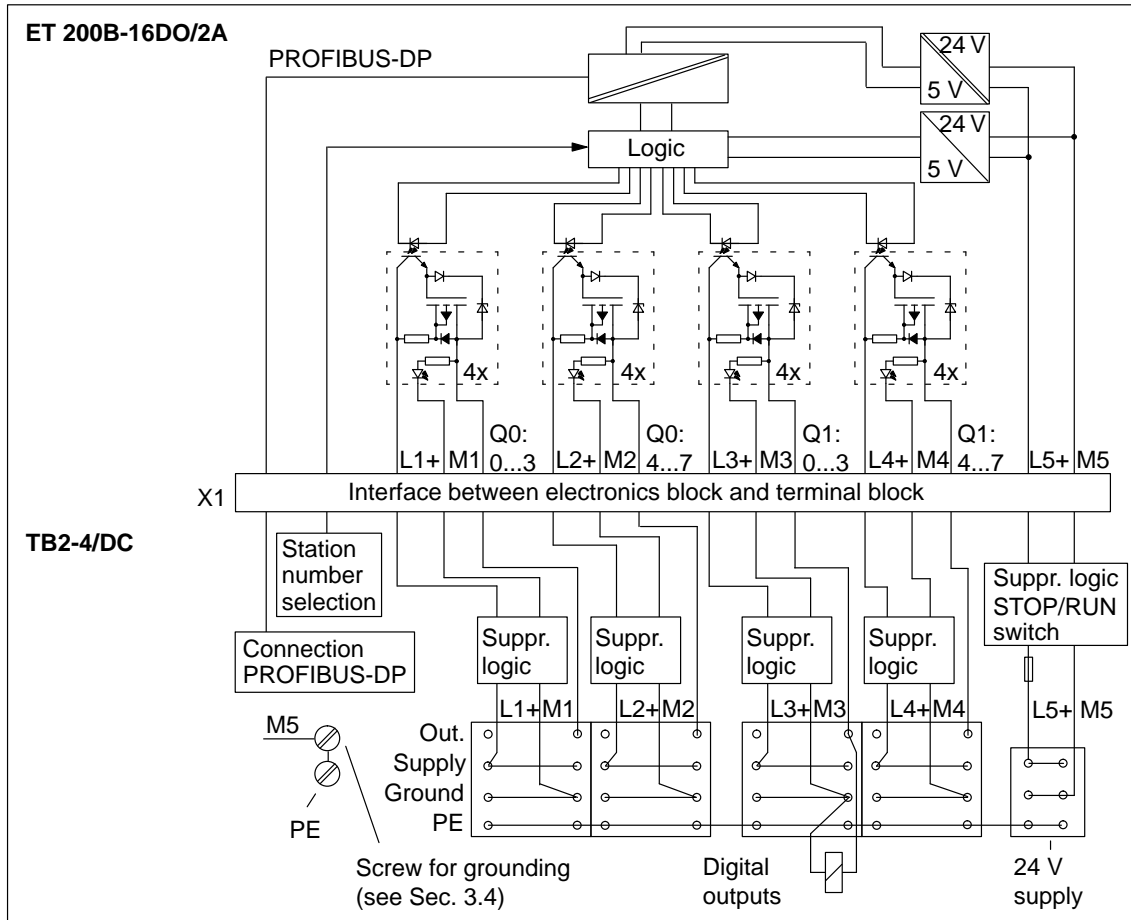


Figure 7-31 Block Diagram: ET 200B-16DO/2A (6ES7 132-0BH11-0XB0) and TB2-4/DC



**Pin Assignment**

The table below shows the pin assignment of the terminal blocks for ET 200B-16DO/2A. For the sake of clarity, the table also shows the terminal numbering of the terminal blocks, taking the TB2-4/DC by way of example.

Table 7-6 Pin Assignment of Terminal Blocks TB2/DC; TB2-4/DC, TB4/DC and TB4M/DC for ET 200B-16DO/2A (6ES7 132-0BH11-0XB0)

| Terminal numbering TB2-4/DC  |                 |                 |  |    |   |    |   |    |    |    |    |    |    |    |    |                 |                 |                 |                              |    |               |    |  |    |   |    |   |    |          |    |    |     |    |               |    |    |   |   |          |    |    |   |   |               |    |    |   |   |          |    |    |   |   |               |    |    |   |   |          |    |    |   |   |               |    |  |    |   |   |  |    |          |    |    |   |    |               |    |    |   |    |          |    |    |   |    |               |    |    |   |    |          |    |    |   |    |               |    |    |   |    |          |    |    |   |    |               |    |  |    |   |   |  |    |          |    |    |   |    |               |    |    |   |    |          |    |    |   |    |               |    |    |   |    |          |    |    |   |    |               |    |    |   |    |          |    |    |   |
|--|-----------------|-----------------|--|----|---|----|---|----|----|----|----|----|----|----|----|-----------------|-----------------|-----------------|------------------------------|----|---------------|----|--|----|---|----|---|----|----------|----|----|-----|----|---------------|----|----|---|---|----------|----|----|---|---|---------------|----|----|---|---|----------|----|----|---|---|---------------|----|----|---|---|----------|----|----|---|---|---------------|----|--|----|---|---|--|----|----------|----|----|---|----|---------------|----|----|---|----|----------|----|----|---|----|---------------|----|----|---|----|----------|----|----|---|----|---------------|----|----|---|----|----------|----|----|---|----|---------------|----|--|----|---|---|--|----|----------|----|----|---|----|---------------|----|----|---|----|----------|----|----|---|----|---------------|----|----|---|----|----------|----|----|---|----|---------------|----|----|---|----|----------|----|----|---|
| 1  | 2               | 3               | 4  | 5  | 6   | 7  | 8   | 9  | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17              | 18              | 19              | 20                           | 21 | 22            | 23 | 24   | 25 | 26  | 27 | 28  | 29 | 30       | 31 | 32 |     |    |               |    |    |   |   |          |    |    |   |   |               |    |    |   |   |          |    |    |   |   |               |    |    |   |   |          |    |    |   |   |               |    |  |    |   |   |  |    |          |    |    |   |    |               |    |    |   |    |          |    |    |   |    |               |    |    |   |    |          |    |    |   |    |               |    |    |   |    |          |    |    |   |    |               |    |  |    |   |   |  |    |          |    |    |   |    |               |    |    |   |    |          |    |    |   |    |               |    |    |   |    |          |    |    |   |    |               |    |    |   |    |          |    |    |   |
| 33   | 34              | 35              | 36   | 37 | 38  | 39 | 40  | 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49              | 50              | 51              | 52                           | 53 | 54            | 55 | 56   | 57 | 58  | 59 | 60  | 61 | 62       | 63 | 64 | L5+ |    |               |    |    |   |   |          |    |    |   |   |               |    |    |   |   |          |    |    |   |   |               |    |    |   |   |          |    |    |   |   |               |    |  |    |   |   |  |    |          |    |    |   |    |               |    |    |   |    |          |    |    |   |    |               |    |    |   |    |          |    |    |   |    |               |    |    |   |    |          |    |    |   |    |               |    |  |    |   |   |  |    |          |    |    |   |    |               |    |    |   |    |          |    |    |   |    |               |    |    |   |    |          |    |    |   |    |               |    |    |   |    |          |    |    |   |
| 65   | 66              | 67              | 68   | 69 | 70  | 71 | 72  | 73 | 74 | 75 | 76 | 77 | 78 | 79 | 80 | 81              | 82              | 83              | 84                           | 85 | 86            | 87 | 88   | 89 | 90  | 91 | 92  | 93 | 94       | 95 | 96 | M5  | M5 |               |    |    |   |   |          |    |    |   |   |               |    |    |   |   |          |    |    |   |   |               |    |    |   |   |          |    |    |   |   |               |    |  |    |   |   |  |    |          |    |    |   |    |               |    |    |   |    |          |    |    |   |    |               |    |    |   |    |          |    |    |   |    |               |    |    |   |    |          |    |    |   |    |               |    |  |    |   |   |  |    |          |    |    |   |    |               |    |    |   |    |          |    |    |   |    |               |    |    |   |    |          |    |    |   |    |               |    |    |   |    |          |    |    |   |
| <table border="1"> <thead> <tr> <th>Terminal tier 1</th> <th>Terminal tier 2</th> <th>Terminal tier 3</th> <th>Terminal tier 4<sup>1</sup></th> </tr> </thead> <tbody> <tr> <td>1</td><td>Q0: Output .0</td><td>33</td><td rowspan="8">Voltage supply <b>L1+</b> for channel group Q0: .0 to .3 (internally jumpered)</td><td>65</td><td rowspan="8">Ground <b>M1</b> for channel group Q0: .0 to .3 (internally jumpered)</td><td>⊕</td><td rowspan="8">PE (internally jumpered, but not connected to PE screw)</td> </tr> <tr> <td>2</td><td>not used</td><td>34</td><td>66</td><td>⊕</td> </tr> <tr> <td>3</td><td>Q0: Output .1</td><td>35</td><td>67</td><td>⊕</td> </tr> <tr> <td>4</td><td>not used</td><td>36</td><td>68</td><td>⊕</td> </tr> <tr> <td>5</td><td>Q0: Output .2</td><td>37</td><td>69</td><td>⊕</td> </tr> <tr> <td>6</td><td>not used</td><td>38</td><td>70</td><td>⊕</td> </tr> <tr> <td>7</td><td>Q0: Output .3</td><td>39</td><td>71</td><td>⊕</td> </tr> <tr> <td>8</td><td>not used</td><td>40</td><td>72</td><td>⊕</td> </tr> <tr> <td>9</td><td>Q0: Output .4</td><td>41</td><td rowspan="8">Voltage supply <b>L2+</b> for channel group Q0: .4 to .7 (internally jumpered)</td><td>73</td><td rowspan="8">Ground <b>M2</b> for channel group Q0: .4 to .7 (internally jumpered)</td><td>⊕</td><td rowspan="8"></td> </tr> <tr> <td>10</td><td>not used</td><td>42</td><td>74</td><td>⊕</td> </tr> <tr> <td>11</td><td>Q0: Output .5</td><td>43</td><td>75</td><td>⊕</td> </tr> <tr> <td>12</td><td>not used</td><td>44</td><td>76</td><td>⊕</td> </tr> <tr> <td>13</td><td>Q0: Output .6</td><td>45</td><td>77</td><td>⊕</td> </tr> <tr> <td>14</td><td>not used</td><td>46</td><td>78</td><td>⊕</td> </tr> <tr> <td>15</td><td>Q0: Output .7</td><td>47</td><td>79</td><td>⊕</td> </tr> <tr> <td>16</td><td>not used</td><td>48</td><td>80</td><td>⊕</td> </tr> <tr> <td>17</td><td>Q1: Output .0</td><td>49</td><td rowspan="8">Voltage supply <b>L3+</b> for channel group Q1: .0 to .3 (internally jumpered)</td><td>81</td><td rowspan="8">Ground <b>M3</b> for channel group Q1: .0 to .3 (internally jumpered)</td><td>⊕</td><td rowspan="8"></td> </tr> <tr> <td>18</td><td>not used</td><td>50</td><td>82</td><td>⊕</td> </tr> <tr> <td>19</td><td>Q1: Output .1</td><td>51</td><td>83</td><td>⊕</td> </tr> <tr> <td>20</td><td>not used</td><td>52</td><td>84</td><td>⊕</td> </tr> <tr> <td>21</td><td>Q1: Output .2</td><td>53</td><td>85</td><td>⊕</td> </tr> <tr> <td>22</td><td>not used</td><td>54</td><td>86</td><td>⊕</td> </tr> <tr> <td>23</td><td>Q1: Output .3</td><td>55</td><td>87</td><td>⊕</td> </tr> <tr> <td>24</td><td>not used</td><td>56</td><td>88</td><td>⊕</td> </tr> </tbody> </table> |                 |                 |  |    |   |    |   |    |    |    |    |    |    |    |    | Terminal tier 1 | Terminal tier 2 | Terminal tier 3 | Terminal tier 4 <sup>1</sup> | 1  | Q0: Output .0 | 33 | Voltage supply <b>L1+</b> for channel group Q0: .0 to .3 (internally jumpered) | 65 | Ground <b>M1</b> for channel group Q0: .0 to .3 (internally jumpered) | ⊕  | PE (internally jumpered, but not connected to PE screw) | 2  | not used | 34 | 66 | ⊕   | 3  | Q0: Output .1 | 35 | 67 | ⊕ | 4 | not used | 36 | 68 | ⊕ | 5 | Q0: Output .2 | 37 | 69 | ⊕ | 6 | not used | 38 | 70 | ⊕ | 7 | Q0: Output .3 | 39 | 71 | ⊕ | 8 | not used | 40 | 72 | ⊕ | 9 | Q0: Output .4 | 41 | Voltage supply <b>L2+</b> for channel group Q0: .4 to .7 (internally jumpered) | 73 | Ground <b>M2</b> for channel group Q0: .4 to .7 (internally jumpered) | ⊕ |  | 10 | not used | 42 | 74 | ⊕ | 11 | Q0: Output .5 | 43 | 75 | ⊕ | 12 | not used | 44 | 76 | ⊕ | 13 | Q0: Output .6 | 45 | 77 | ⊕ | 14 | not used | 46 | 78 | ⊕ | 15 | Q0: Output .7 | 47 | 79 | ⊕ | 16 | not used | 48 | 80 | ⊕ | 17 | Q1: Output .0 | 49 | Voltage supply <b>L3+</b> for channel group Q1: .0 to .3 (internally jumpered) | 81 | Ground <b>M3</b> for channel group Q1: .0 to .3 (internally jumpered) | ⊕ |  | 18 | not used | 50 | 82 | ⊕ | 19 | Q1: Output .1 | 51 | 83 | ⊕ | 20 | not used | 52 | 84 | ⊕ | 21 | Q1: Output .2 | 53 | 85 | ⊕ | 22 | not used | 54 | 86 | ⊕ | 23 | Q1: Output .3 | 55 | 87 | ⊕ | 24 | not used | 56 | 88 | ⊕ |
| Terminal tier 1  | Terminal tier 2 | Terminal tier 3 | Terminal tier 4 <sup>1</sup>   |    |   |    |   |    |    |    |    |    |    |    |    |                 |                 |                 |                              |    |               |    |  |    |   |    |   |    |          |    |    |     |    |               |    |    |   |   |          |    |    |   |   |               |    |    |   |   |          |    |    |   |   |               |    |    |   |   |          |    |    |   |   |               |    |  |    |   |   |  |    |          |    |    |   |    |               |    |    |   |    |          |    |    |   |    |               |    |    |   |    |          |    |    |   |    |               |    |    |   |    |          |    |    |   |    |               |    |  |    |   |   |  |    |          |    |    |   |    |               |    |    |   |    |          |    |    |   |    |               |    |    |   |    |          |    |    |   |    |               |    |    |   |    |          |    |    |   |
| 1  | Q0: Output .0   | 33              | Voltage supply <b>L1+</b> for channel group Q0: .0 to .3 (internally jumpered) | 65 | Ground <b>M1</b> for channel group Q0: .0 to .3 (internally jumpered) | ⊕  | PE (internally jumpered, but not connected to PE screw) |    |    |    |    |    |    |    |    |                 |                 |                 |                              |    |               |    |  |    |   |    |   |    |          |    |    |     |    |               |    |    |   |   |          |    |    |   |   |               |    |    |   |   |          |    |    |   |   |               |    |    |   |   |          |    |    |   |   |               |    |  |    |   |   |  |    |          |    |    |   |    |               |    |    |   |    |          |    |    |   |    |               |    |    |   |    |          |    |    |   |    |               |    |    |   |    |          |    |    |   |    |               |    |  |    |   |   |  |    |          |    |    |   |    |               |    |    |   |    |          |    |    |   |    |               |    |    |   |    |          |    |    |   |    |               |    |    |   |    |          |    |    |   |
| 2  | not used        | 34              |  | 66 |   | ⊕  |   |    |    |    |    |    |    |    |    |                 |                 |                 |                              |    |               |    |  |    |   |    |   |    |          |    |    |     |    |               |    |    |   |   |          |    |    |   |   |               |    |    |   |   |          |    |    |   |   |               |    |    |   |   |          |    |    |   |   |               |    |  |    |   |   |  |    |          |    |    |   |    |               |    |    |   |    |          |    |    |   |    |               |    |    |   |    |          |    |    |   |    |               |    |    |   |    |          |    |    |   |    |               |    |  |    |   |   |  |    |          |    |    |   |    |               |    |    |   |    |          |    |    |   |    |               |    |    |   |    |          |    |    |   |    |               |    |    |   |    |          |    |    |   |
| 3  | Q0: Output .1   | 35              |  | 67 |   | ⊕  |   |    |    |    |    |    |    |    |    |                 |                 |                 |                              |    |               |    |  |    |   |    |   |    |          |    |    |     |    |               |    |    |   |   |          |    |    |   |   |               |    |    |   |   |          |    |    |   |   |               |    |    |   |   |          |    |    |   |   |               |    |  |    |   |   |  |    |          |    |    |   |    |               |    |    |   |    |          |    |    |   |    |               |    |    |   |    |          |    |    |   |    |               |    |    |   |    |          |    |    |   |    |               |    |  |    |   |   |  |    |          |    |    |   |    |               |    |    |   |    |          |    |    |   |    |               |    |    |   |    |          |    |    |   |    |               |    |    |   |    |          |    |    |   |
| 4  | not used        | 36              |  | 68 |   | ⊕  |   |    |    |    |    |    |    |    |    |                 |                 |                 |                              |    |               |    |  |    |   |    |   |    |          |    |    |     |    |               |    |    |   |   |          |    |    |   |   |               |    |    |   |   |          |    |    |   |   |               |    |    |   |   |          |    |    |   |   |               |    |  |    |   |   |  |    |          |    |    |   |    |               |    |    |   |    |          |    |    |   |    |               |    |    |   |    |          |    |    |   |    |               |    |    |   |    |          |    |    |   |    |               |    |  |    |   |   |  |    |          |    |    |   |    |               |    |    |   |    |          |    |    |   |    |               |    |    |   |    |          |    |    |   |    |               |    |    |   |    |          |    |    |   |
| 5  | Q0: Output .2   | 37              |  | 69 |   | ⊕  |   |    |    |    |    |    |    |    |    |                 |                 |                 |                              |    |               |    |  |    |   |    |   |    |          |    |    |     |    |               |    |    |   |   |          |    |    |   |   |               |    |    |   |   |          |    |    |   |   |               |    |    |   |   |          |    |    |   |   |               |    |  |    |   |   |  |    |          |    |    |   |    |               |    |    |   |    |          |    |    |   |    |               |    |    |   |    |          |    |    |   |    |               |    |    |   |    |          |    |    |   |    |               |    |  |    |   |   |  |    |          |    |    |   |    |               |    |    |   |    |          |    |    |   |    |               |    |    |   |    |          |    |    |   |    |               |    |    |   |    |          |    |    |   |
| 6  | not used        | 38              |  | 70 |   | ⊕  |   |    |    |    |    |    |    |    |    |                 |                 |                 |                              |    |               |    |  |    |   |    |   |    |          |    |    |     |    |               |    |    |   |   |          |    |    |   |   |               |    |    |   |   |          |    |    |   |   |               |    |    |   |   |          |    |    |   |   |               |    |  |    |   |   |  |    |          |    |    |   |    |               |    |    |   |    |          |    |    |   |    |               |    |    |   |    |          |    |    |   |    |               |    |    |   |    |          |    |    |   |    |               |    |  |    |   |   |  |    |          |    |    |   |    |               |    |    |   |    |          |    |    |   |    |               |    |    |   |    |          |    |    |   |    |               |    |    |   |    |          |    |    |   |
| 7  | Q0: Output .3   | 39              |  | 71 |   | ⊕  |   |    |    |    |    |    |    |    |    |                 |                 |                 |                              |    |               |    |  |    |   |    |   |    |          |    |    |     |    |               |    |    |   |   |          |    |    |   |   |               |    |    |   |   |          |    |    |   |   |               |    |    |   |   |          |    |    |   |   |               |    |  |    |   |   |  |    |          |    |    |   |    |               |    |    |   |    |          |    |    |   |    |               |    |    |   |    |          |    |    |   |    |               |    |    |   |    |          |    |    |   |    |               |    |  |    |   |   |  |    |          |    |    |   |    |               |    |    |   |    |          |    |    |   |    |               |    |    |   |    |          |    |    |   |    |               |    |    |   |    |          |    |    |   |
| 8  | not used        | 40              |  | 72 |   | ⊕  |   |    |    |    |    |    |    |    |    |                 |                 |                 |                              |    |               |    |  |    |   |    |   |    |          |    |    |     |    |               |    |    |   |   |          |    |    |   |   |               |    |    |   |   |          |    |    |   |   |               |    |    |   |   |          |    |    |   |   |               |    |  |    |   |   |  |    |          |    |    |   |    |               |    |    |   |    |          |    |    |   |    |               |    |    |   |    |          |    |    |   |    |               |    |    |   |    |          |    |    |   |    |               |    |  |    |   |   |  |    |          |    |    |   |    |               |    |    |   |    |          |    |    |   |    |               |    |    |   |    |          |    |    |   |    |               |    |    |   |    |          |    |    |   |
| 9  | Q0: Output .4   | 41              | Voltage supply <b>L2+</b> for channel group Q0: .4 to .7 (internally jumpered) | 73 | Ground <b>M2</b> for channel group Q0: .4 to .7 (internally jumpered) | ⊕  |   |    |    |    |    |    |    |    |    |                 |                 |                 |                              |    |               |    |  |    |   |    |   |    |          |    |    |     |    |               |    |    |   |   |          |    |    |   |   |               |    |    |   |   |          |    |    |   |   |               |    |    |   |   |          |    |    |   |   |               |    |  |    |   |   |  |    |          |    |    |   |    |               |    |    |   |    |          |    |    |   |    |               |    |    |   |    |          |    |    |   |    |               |    |    |   |    |          |    |    |   |    |               |    |  |    |   |   |  |    |          |    |    |   |    |               |    |    |   |    |          |    |    |   |    |               |    |    |   |    |          |    |    |   |    |               |    |    |   |    |          |    |    |   |
| 10   | not used        | 42              |  | 74 |   | ⊕  |   |    |    |    |    |    |    |    |    |                 |                 |                 |                              |    |               |    |  |    |   |    |   |    |          |    |    |     |    |               |    |    |   |   |          |    |    |   |   |               |    |    |   |   |          |    |    |   |   |               |    |    |   |   |          |    |    |   |   |               |    |  |    |   |   |  |    |          |    |    |   |    |               |    |    |   |    |          |    |    |   |    |               |    |    |   |    |          |    |    |   |    |               |    |    |   |    |          |    |    |   |    |               |    |  |    |   |   |  |    |          |    |    |   |    |               |    |    |   |    |          |    |    |   |    |               |    |    |   |    |          |    |    |   |    |               |    |    |   |    |          |    |    |   |
| 11   | Q0: Output .5   | 43              |  | 75 |   | ⊕  |   |    |    |    |    |    |    |    |    |                 |                 |                 |                              |    |               |    |  |    |   |    |   |    |          |    |    |     |    |               |    |    |   |   |          |    |    |   |   |               |    |    |   |   |          |    |    |   |   |               |    |    |   |   |          |    |    |   |   |               |    |  |    |   |   |  |    |          |    |    |   |    |               |    |    |   |    |          |    |    |   |    |               |    |    |   |    |          |    |    |   |    |               |    |    |   |    |          |    |    |   |    |               |    |  |    |   |   |  |    |          |    |    |   |    |               |    |    |   |    |          |    |    |   |    |               |    |    |   |    |          |    |    |   |    |               |    |    |   |    |          |    |    |   |
| 12   | not used        | 44              |  | 76 |   | ⊕  |   |    |    |    |    |    |    |    |    |                 |                 |                 |                              |    |               |    |  |    |   |    |   |    |          |    |    |     |    |               |    |    |   |   |          |    |    |   |   |               |    |    |   |   |          |    |    |   |   |               |    |    |   |   |          |    |    |   |   |               |    |  |    |   |   |  |    |          |    |    |   |    |               |    |    |   |    |          |    |    |   |    |               |    |    |   |    |          |    |    |   |    |               |    |    |   |    |          |    |    |   |    |               |    |  |    |   |   |  |    |          |    |    |   |    |               |    |    |   |    |          |    |    |   |    |               |    |    |   |    |          |    |    |   |    |               |    |    |   |    |          |    |    |   |
| 13   | Q0: Output .6   | 45              |  | 77 |   | ⊕  |   |    |    |    |    |    |    |    |    |                 |                 |                 |                              |    |               |    |  |    |   |    |   |    |          |    |    |     |    |               |    |    |   |   |          |    |    |   |   |               |    |    |   |   |          |    |    |   |   |               |    |    |   |   |          |    |    |   |   |               |    |  |    |   |   |  |    |          |    |    |   |    |               |    |    |   |    |          |    |    |   |    |               |    |    |   |    |          |    |    |   |    |               |    |    |   |    |          |    |    |   |    |               |    |  |    |   |   |  |    |          |    |    |   |    |               |    |    |   |    |          |    |    |   |    |               |    |    |   |    |          |    |    |   |    |               |    |    |   |    |          |    |    |   |
| 14   | not used        | 46              |  | 78 |   | ⊕  |   |    |    |    |    |    |    |    |    |                 |                 |                 |                              |    |               |    |  |    |   |    |   |    |          |    |    |     |    |               |    |    |   |   |          |    |    |   |   |               |    |    |   |   |          |    |    |   |   |               |    |    |   |   |          |    |    |   |   |               |    |  |    |   |   |  |    |          |    |    |   |    |               |    |    |   |    |          |    |    |   |    |               |    |    |   |    |          |    |    |   |    |               |    |    |   |    |          |    |    |   |    |               |    |  |    |   |   |  |    |          |    |    |   |    |               |    |    |   |    |          |    |    |   |    |               |    |    |   |    |          |    |    |   |    |               |    |    |   |    |          |    |    |   |
| 15   | Q0: Output .7   | 47              |  | 79 |   | ⊕  |   |    |    |    |    |    |    |    |    |                 |                 |                 |                              |    |               |    |  |    |   |    |   |    |          |    |    |     |    |               |    |    |   |   |          |    |    |   |   |               |    |    |   |   |          |    |    |   |   |               |    |    |   |   |          |    |    |   |   |               |    |  |    |   |   |  |    |          |    |    |   |    |               |    |    |   |    |          |    |    |   |    |               |    |    |   |    |          |    |    |   |    |               |    |    |   |    |          |    |    |   |    |               |    |  |    |   |   |  |    |          |    |    |   |    |               |    |    |   |    |          |    |    |   |    |               |    |    |   |    |          |    |    |   |    |               |    |    |   |    |          |    |    |   |
| 16   | not used        | 48              |  | 80 |   | ⊕  |   |    |    |    |    |    |    |    |    |                 |                 |                 |                              |    |               |    |  |    |   |    |   |    |          |    |    |     |    |               |    |    |   |   |          |    |    |   |   |               |    |    |   |   |          |    |    |   |   |               |    |    |   |   |          |    |    |   |   |               |    |  |    |   |   |  |    |          |    |    |   |    |               |    |    |   |    |          |    |    |   |    |               |    |    |   |    |          |    |    |   |    |               |    |    |   |    |          |    |    |   |    |               |    |  |    |   |   |  |    |          |    |    |   |    |               |    |    |   |    |          |    |    |   |    |               |    |    |   |    |          |    |    |   |    |               |    |    |   |    |          |    |    |   |
| 17   | Q1: Output .0   | 49              | Voltage supply <b>L3+</b> for channel group Q1: .0 to .3 (internally jumpered) | 81 | Ground <b>M3</b> for channel group Q1: .0 to .3 (internally jumpered) | ⊕  |   |    |    |    |    |    |    |    |    |                 |                 |                 |                              |    |               |    |  |    |   |    |   |    |          |    |    |     |    |               |    |    |   |   |          |    |    |   |   |               |    |    |   |   |          |    |    |   |   |               |    |    |   |   |          |    |    |   |   |               |    |  |    |   |   |  |    |          |    |    |   |    |               |    |    |   |    |          |    |    |   |    |               |    |    |   |    |          |    |    |   |    |               |    |    |   |    |          |    |    |   |    |               |    |  |    |   |   |  |    |          |    |    |   |    |               |    |    |   |    |          |    |    |   |    |               |    |    |   |    |          |    |    |   |    |               |    |    |   |    |          |    |    |   |
| 18   | not used        | 50              |  | 82 |   | ⊕  |   |    |    |    |    |    |    |    |    |                 |                 |                 |                              |    |               |    |  |    |   |    |   |    |          |    |    |     |    |               |    |    |   |   |          |    |    |   |   |               |    |    |   |   |          |    |    |   |   |               |    |    |   |   |          |    |    |   |   |               |    |  |    |   |   |  |    |          |    |    |   |    |               |    |    |   |    |          |    |    |   |    |               |    |    |   |    |          |    |    |   |    |               |    |    |   |    |          |    |    |   |    |               |    |  |    |   |   |  |    |          |    |    |   |    |               |    |    |   |    |          |    |    |   |    |               |    |    |   |    |          |    |    |   |    |               |    |    |   |    |          |    |    |   |
| 19   | Q1: Output .1   | 51              |  | 83 |   | ⊕  |   |    |    |    |    |    |    |    |    |                 |                 |                 |                              |    |               |    |  |    |   |    |   |    |          |    |    |     |    |               |    |    |   |   |          |    |    |   |   |               |    |    |   |   |          |    |    |   |   |               |    |    |   |   |          |    |    |   |   |               |    |  |    |   |   |  |    |          |    |    |   |    |               |    |    |   |    |          |    |    |   |    |               |    |    |   |    |          |    |    |   |    |               |    |    |   |    |          |    |    |   |    |               |    |  |    |   |   |  |    |          |    |    |   |    |               |    |    |   |    |          |    |    |   |    |               |    |    |   |    |          |    |    |   |    |               |    |    |   |    |          |    |    |   |
| 20   | not used        | 52              |  | 84 |   | ⊕  |   |    |    |    |    |    |    |    |    |                 |                 |                 |                              |    |               |    |  |    |   |    |   |    |          |    |    |     |    |               |    |    |   |   |          |    |    |   |   |               |    |    |   |   |          |    |    |   |   |               |    |    |   |   |          |    |    |   |   |               |    |  |    |   |   |  |    |          |    |    |   |    |               |    |    |   |    |          |    |    |   |    |               |    |    |   |    |          |    |    |   |    |               |    |    |   |    |          |    |    |   |    |               |    |  |    |   |   |  |    |          |    |    |   |    |               |    |    |   |    |          |    |    |   |    |               |    |    |   |    |          |    |    |   |    |               |    |    |   |    |          |    |    |   |
| 21   | Q1: Output .2   | 53              |  | 85 |   | ⊕  |   |    |    |    |    |    |    |    |    |                 |                 |                 |                              |    |               |    |  |    |   |    |   |    |          |    |    |     |    |               |    |    |   |   |          |    |    |   |   |               |    |    |   |   |          |    |    |   |   |               |    |    |   |   |          |    |    |   |   |               |    |  |    |   |   |  |    |          |    |    |   |    |               |    |    |   |    |          |    |    |   |    |               |    |    |   |    |          |    |    |   |    |               |    |    |   |    |          |    |    |   |    |               |    |  |    |   |   |  |    |          |    |    |   |    |               |    |    |   |    |          |    |    |   |    |               |    |    |   |    |          |    |    |   |    |               |    |    |   |    |          |    |    |   |
| 22   | not used        | 54              |  | 86 |   | ⊕  |   |    |    |    |    |    |    |    |    |                 |                 |                 |                              |    |               |    |  |    |   |    |   |    |          |    |    |     |    |               |    |    |   |   |          |    |    |   |   |               |    |    |   |   |          |    |    |   |   |               |    |    |   |   |          |    |    |   |   |               |    |  |    |   |   |  |    |          |    |    |   |    |               |    |    |   |    |          |    |    |   |    |               |    |    |   |    |          |    |    |   |    |               |    |    |   |    |          |    |    |   |    |               |    |  |    |   |   |  |    |          |    |    |   |    |               |    |    |   |    |          |    |    |   |    |               |    |    |   |    |          |    |    |   |    |               |    |    |   |    |          |    |    |   |
| 23   | Q1: Output .3   | 55              |  | 87 |   | ⊕  |   |    |    |    |    |    |    |    |    |                 |                 |                 |                              |    |               |    |  |    |   |    |   |    |          |    |    |     |    |               |    |    |   |   |          |    |    |   |   |               |    |    |   |   |          |    |    |   |   |               |    |    |   |   |          |    |    |   |   |               |    |  |    |   |   |  |    |          |    |    |   |    |               |    |    |   |    |          |    |    |   |    |               |    |    |   |    |          |    |    |   |    |               |    |    |   |    |          |    |    |   |    |               |    |  |    |   |   |  |    |          |    |    |   |    |               |    |    |   |    |          |    |    |   |    |               |    |    |   |    |          |    |    |   |    |               |    |    |   |    |          |    |    |   |
| 24   | not used        | 56              |  | 88 |   | ⊕  |   |    |    |    |    |    |    |    |    |                 |                 |                 |                              |    |               |    |  |    |   |    |   |    |          |    |    |     |    |               |    |    |   |   |          |    |    |   |   |               |    |    |   |   |          |    |    |   |   |               |    |    |   |   |          |    |    |   |   |               |    |  |    |   |   |  |    |          |    |    |   |    |               |    |    |   |    |          |    |    |   |    |               |    |    |   |    |          |    |    |   |    |               |    |    |   |    |          |    |    |   |    |               |    |  |    |   |   |  |    |          |    |    |   |    |               |    |    |   |    |          |    |    |   |    |               |    |    |   |    |          |    |    |   |    |               |    |    |   |    |          |    |    |   |

Table 7-6 Pin Assignment of Terminal Blocks TB2/DC; TB2-4/DC, TB4/DC and TB4M/DC for ET 200B-16DO/2A (6ES7 132-0BH11-0XB0), continued

| Terminal tier 1 |               | Terminal tier 2 |   | Terminal tier 3 |  | Terminal tier 4 <sup>1</sup> |   |
|-----------------|---------------|-----------------|---|-----------------|--|------------------------------|---|
| 25              | Q1: Output .4 | 57              | Voltage supply L4+ for channel group Q1: .4 to .7 (internally jumpered) | 89              | Ground M4 for channel group Q1: .4 to .7 (internally jumpered) | ⊕                            | PE (internally jumpered, but not connected to PE screw) |
| 26              | not used      | 58              |   | 90              |  | ⊕                            |   |
| 27              | Q1: Output .5 | 59              |   | 91              |  | ⊕                            |   |
| 28              | not used      | 60              |   | 92              |  | ⊕                            |   |
| 29              | Q1: Output .6 | 61              |   | 93              |  | ⊕                            |   |
| 30              | not used      | 62              |   | 94              |  | ⊕                            |   |
| 31              | Q1: Output .7 | 63              |   | 95              |  | ⊕                            |   |
| 32              | not used      | 64              |   | 96              |  | ⊕                            |   |
| –               |               | L5+             | Voltage supply, internal logic  | M5              | Ground connection, internal logic                              | ⊕                            | PE (internally jumpered, but not connected to PE screw) |
| –               |               | L5+             | Voltage supply, internal logic  | M5              | Ground connection, internal logic                              | ⊕                            |   |

<sup>1</sup> TB2-4/DC only; in the TB4M/DC tier 4 is available for additional ground connections (see Section 7.2.7)

**Important Note on Wiring**

The following notes are important as regards the wiring of the ET 200B-16DO/2A:

- The terminals for PE on the 4-tier terminal block are not connected to the PE connection of terminal block TB2-4/DC.
- L1+ ... L5+ and M1 ... M5 are **not** internally interconnected.
- The two L5+ terminals are internally interconnected.

**Technical Data**

The technical data of electronics block ET 200B-16DO/2A is listed in the tables below.

| Technical specifications   |  | Outputs                              |                                |
|--|--|--------------------------------------|--------------------------------|
| Baud rates*  | 9.6/19.2/93.75/187.5/500/<br>1500/3000/6000/<br>12000 kbaud        | Number of outputs                    | 16                             |
| Bus protocol   | PROFIBUS-DP  | Galvanic isolation                   | Yes                            |
| SYNC capability  | Yes  | • In groups of                       | 4                              |
| Galvanic isolation to SI-<br>NEC L2-DP bus   | Yes  | Output voltage                       |                                |
| Power losses   | Max. 7 W   | • For "0" signal                     | Max. 2 V (idle)                |
| Weight (EB and TB)   | Approx. 900 g (31.5 oz.)   | • For "1" signal                     | Min. (supply voltage<br>– 3 V) |
| Dimensions (EB and TB:<br>W x H x D)   | 235 x 130 x 60 mm<br>(9.17 x 5.07 x 2.34 in.)                      | Output                               |                                |
| <b>Diagnostics functions</b>   |  | • For "0" signal                     | Max. 1 mA                      |
| Voltage monitoring   | Green "RUN" LED  | • For "1" signal                     | Max. 2 A                       |
| Bus monitoring SINEC<br>L2-DP  | Red "BF" LED   | Delay of outputs                     | Max. 1 ms                      |
| Group diagnostics for<br>short-circuit, load voltage<br>failure                                  | Red "DIA" LED  | • At max. lamp load                  | Max. 80 ms                     |
| Load voltage monitoring,<br>by channel group<br>(Q0, Q1)   | Green LEDs<br>"L1+/"L2+" (Q0: .0 to 7)<br>"L3+/"L4+" (Q1: .0 to 7) | Switching frequency                  |                                |
| Status of outputs  | Green LEDs   | • Resistive load                     | Max. 100 Hz                    |
| <b>Supply voltage for outputs, load voltage supply and<br/>internal logic</b>                    |  | • Inductive load                     | Max. 0.5 Hz                    |
| Supply voltage<br>(L1+,L2+,L3+,L4+,L5+)  |  | • Lamp load                          | Max. 8 Hz                      |
| • Rated value  | 24 V DC  | Load current per group               |                                |
| • Permissible range  | 18.5 to 30.2 V   | • Total current                      | Max. 4 A                       |
| • Value at $t < 0.5$ s   | 35 V   | • In case of short-circuit           | Max. 6.5 A                     |
| Current consumption from<br>L5+  |  | Lamp load                            | Max. 10 W                      |
| • Logic  | 100 mA   | Setting a digital input              | Possible                       |
| $I^2t$<br>(for inrush current)   | $\leq 0.05$ A <sup>2</sup> s                                       | Limit of inductive cutoff<br>voltage | Typ. (L1+ ... L4+) – 50 V      |
| Short-circuit protection in<br>case of polarity reversal<br>(L1+,L2+,L3+,L4+) of<br>load voltage | No   | Cable length                         | Max. 100 m (328 ft.)           |

\* In operation with the IM 308-B, the maximum baud rate is 1500 kbaud.

### 7.3.5 Electronics Block ET 200B-32DO (6ES7 132-0BL01-0XB0)

**Characteristics** The ET 200B-32DO electronics block has the following characteristics:

- 32 outputs, floating in groups of 8
- Load voltage: 24 V DC
- Output voltage: 0.5 A
- Suitable for solenoid valves and DC contactors
- Possible terminal blocks: TB2/DC, TB2-4/DC, TB4/DC, TB4M/DC

**Dimensional Drawing** See Figure 7-22 for the precise dimensions.

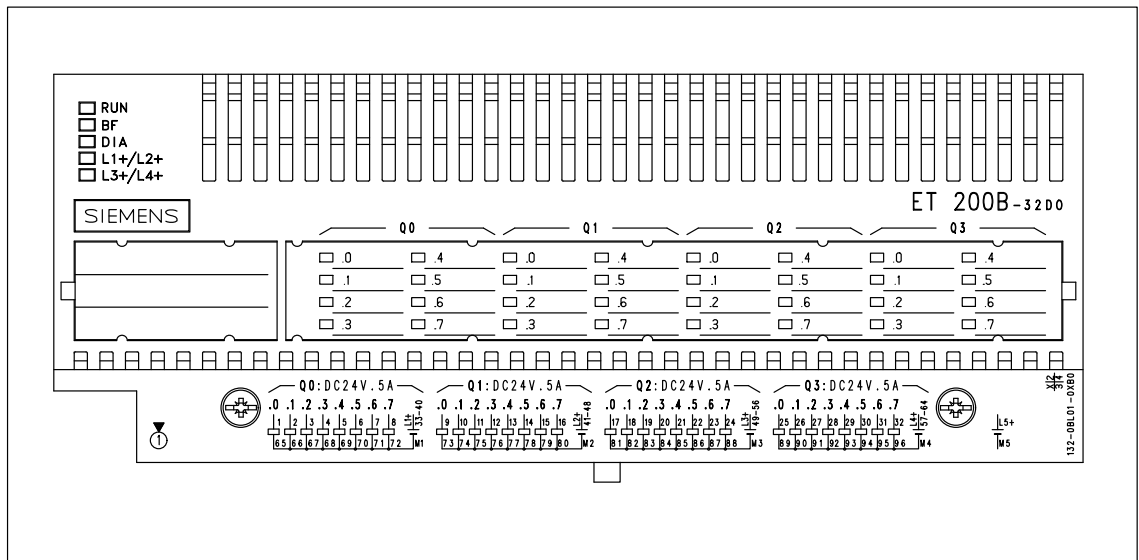


Figure 7-32 Front Elevation: ET 200B-32DO (6ES7 132-0BL01-0XB0)

**Block Diagram**

Simplified diagram of potential for the ET 200B-32DO and TB2/DC or TB4/DC:

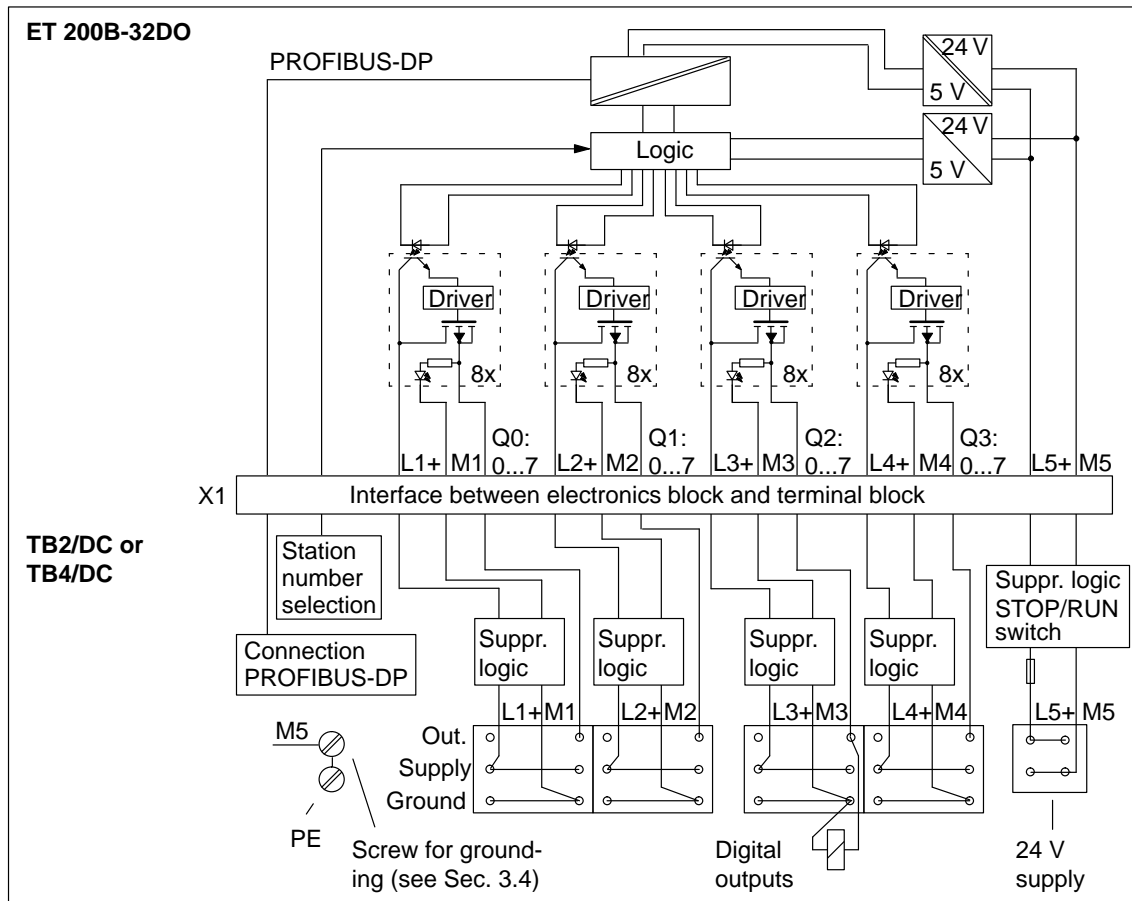


Figure 7-33 Block Diagram: ET 200B-32DO (6ES7 132-0BL01-0XB0) and TB2/DC or TB4/DC

**Block Diagram** Simplified diagram of the potential for the ET 200B-32DO and TB2-4/DC:

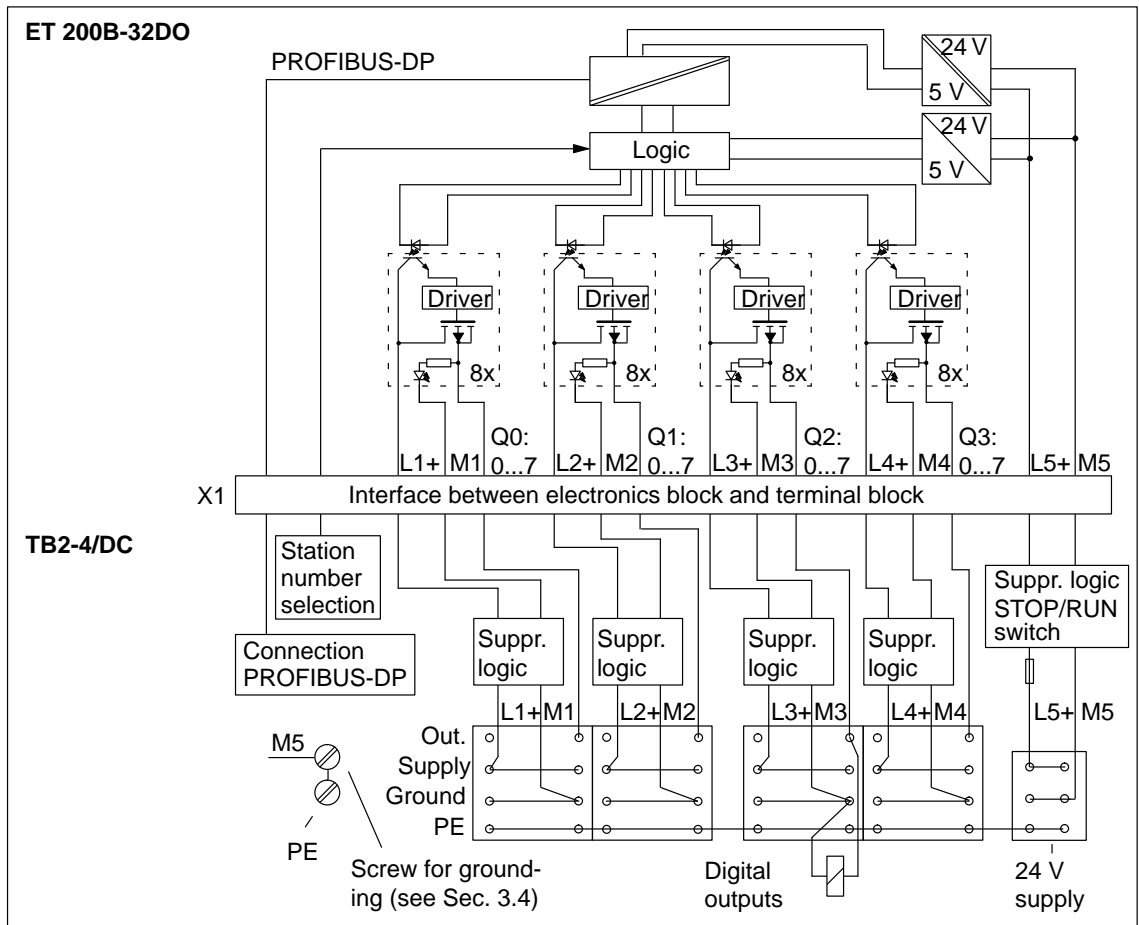


Figure 7-34 Block Diagram: ET 200B-32DO (6ES7 132-0BL01-0XB0) and TB2-4/DC

**Pin Assignment**

The table below shows the pin assignment of the terminal blocks for ET 200B-32DO. For the sake of clarity, the table also shows the terminal numbering of the terminal blocks, taking the TB2-4/DC by way of example.

Table 7-7 Pin Assignment of Terminal Blocks TB2/DC, TB2-4/DC, TB4/DC and TB4M/DC for ET 200B-32DO (6ES7 132-0BL01-0XB0)

| Terminal numbering TB2-4/DC   |                 |                 |  |    |  |    |   |    |    |    |    |    |    |    |    |                 |                 |                 |                              |    |               |    |  |    |   |    |   |    |               |    |    |     |     |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |               |    |  |    |  |   |  |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |  |    |   |   |  |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |
|---|-----------------|-----------------|--|----|--|----|---|----|----|----|----|----|----|----|----|-----------------|-----------------|-----------------|------------------------------|----|---------------|----|--|----|---|----|---|----|---------------|----|----|-----|-----|---------------|----|----|---|---|---------------|----|----|---|---|---------------|----|----|---|---|---------------|----|----|---|---|---------------|----|----|---|---|---------------|----|----|---|---|---------------|----|--|----|--|---|--|----|---------------|----|----|---|----|---------------|----|----|---|----|---------------|----|----|---|----|---------------|----|----|---|----|---------------|----|----|---|----|---------------|----|----|---|----|---------------|----|----|---|----|---------------|----|--|----|---|---|--|----|---------------|----|----|---|----|---------------|----|----|---|----|---------------|----|----|---|----|---------------|----|----|---|----|---------------|----|----|---|----|---------------|----|----|---|----|---------------|----|----|---|
| 1   | 2               | 3               | 4  | 5  | 6  | 7  | 8   | 9  | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17              | 18              | 19              | 20                           | 21 | 22            | 23 | 24   | 25 | 26  | 27 | 28  | 29 | 30            | 31 | 32 |     |     |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |               |    |  |    |  |   |  |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |  |    |   |   |  |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |
| 33  | 34              | 35              | 36   | 37 | 38   | 39 | 40  | 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49              | 50              | 51              | 52                           | 53 | 54            | 55 | 56   | 57 | 58  | 59 | 60  | 61 | 62            | 63 | 64 | L5+ | L5+ |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |               |    |  |    |  |   |  |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |  |    |   |   |  |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |
| 65  | 66              | 67              | 68   | 69 | 70   | 71 | 72  | 73 | 74 | 75 | 76 | 77 | 78 | 79 | 80 | 81              | 82              | 83              | 84                           | 85 | 86            | 87 | 88   | 89 | 90  | 91 | 92  | 93 | 94            | 95 | 96 | M5  | M5  |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |               |    |  |    |  |   |  |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |  |    |   |   |  |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |
| <table border="1"> <thead> <tr> <th>Terminal tier 1</th> <th>Terminal tier 2</th> <th>Terminal tier 3</th> <th>Terminal tier 4<sup>1</sup></th> </tr> </thead> <tbody> <tr> <td>1</td><td>Q0: Output .0</td><td>33</td><td rowspan="8">Voltage supply <b>L1+</b> for channel group Q0: .0 to .7 (internally jumpered)</td> <td>65</td><td rowspan="8">Ground <b>M1</b> for channel group Q0: .0 to .7 (internally jumpered)</td> <td>⊕</td><td rowspan="8">PE (internally jumpered, but not connected to PE screw)</td> </tr> <tr> <td>2</td><td>Q0: Output .1</td><td>34</td> <td>66</td> <td>⊕</td> </tr> <tr> <td>3</td><td>Q0: Output .2</td><td>35</td> <td>67</td> <td>⊕</td> </tr> <tr> <td>4</td><td>Q0: Output .3</td><td>36</td> <td>68</td> <td>⊕</td> </tr> <tr> <td>5</td><td>Q0: Output .4</td><td>37</td> <td>69</td> <td>⊕</td> </tr> <tr> <td>6</td><td>Q0: Output .5</td><td>38</td> <td>70</td> <td>⊕</td> </tr> <tr> <td>7</td><td>Q0: Output .6</td><td>39</td> <td>71</td> <td>⊕</td> </tr> <tr> <td>8</td><td>Q0: Output .7</td><td>40</td> <td>72</td> <td>⊕</td> </tr> <tr> <td>9</td><td>Q1: Output .0</td><td>41</td><td rowspan="8">Voltage supply <b>L2+</b> for channel group Q1: .4 to .7 (internally jumpered)</td> <td>73</td><td rowspan="8">Ground <b>M2</b> for channel group Q01: .0 to .7 (internally jumpered)</td> <td>⊕</td> <td rowspan="8"></td> </tr> <tr> <td>10</td><td>Q1: Output .1</td><td>42</td> <td>74</td> <td>⊕</td> </tr> <tr> <td>11</td><td>Q1: Output .2</td><td>43</td> <td>75</td> <td>⊕</td> </tr> <tr> <td>12</td><td>Q1: Output .3</td><td>44</td> <td>76</td> <td>⊕</td> </tr> <tr> <td>13</td><td>Q1: Output .4</td><td>45</td> <td>77</td> <td>⊕</td> </tr> <tr> <td>14</td><td>Q1: Output .5</td><td>46</td> <td>78</td> <td>⊕</td> </tr> <tr> <td>15</td><td>Q1: Output .6</td><td>47</td> <td>79</td> <td>⊕</td> </tr> <tr> <td>16</td><td>Q1: Output .7</td><td>48</td> <td>80</td> <td>⊕</td> </tr> <tr> <td>17</td><td>Q2: Output .0</td><td>49</td><td rowspan="8">Voltage supply <b>L3+</b> for channel group Q2: .0 to .7 (internally jumpered)</td> <td>81</td><td rowspan="8">Ground <b>M3</b> for channel group Q2: .0 to .7 (internally jumpered)</td> <td>⊕</td> <td rowspan="8"></td> </tr> <tr> <td>18</td><td>Q2: Output .1</td><td>50</td> <td>82</td> <td>⊕</td> </tr> <tr> <td>19</td><td>Q2: Output .2</td><td>51</td> <td>83</td> <td>⊕</td> </tr> <tr> <td>20</td><td>Q2: Output .3</td><td>52</td> <td>84</td> <td>⊕</td> </tr> <tr> <td>21</td><td>Q2: Output .4</td><td>53</td> <td>85</td> <td>⊕</td> </tr> <tr> <td>22</td><td>Q2: Output .5</td><td>54</td> <td>86</td> <td>⊕</td> </tr> <tr> <td>23</td><td>Q2: Output .6</td><td>55</td> <td>87</td> <td>⊕</td> </tr> <tr> <td>24</td><td>Q2: Output .7</td><td>56</td> <td>88</td> <td>⊕</td> </tr> </tbody> </table> |                 |                 |  |    |  |    |   |    |    |    |    |    |    |    |    | Terminal tier 1 | Terminal tier 2 | Terminal tier 3 | Terminal tier 4 <sup>1</sup> | 1  | Q0: Output .0 | 33 | Voltage supply <b>L1+</b> for channel group Q0: .0 to .7 (internally jumpered) | 65 | Ground <b>M1</b> for channel group Q0: .0 to .7 (internally jumpered) | ⊕  | PE (internally jumpered, but not connected to PE screw) | 2  | Q0: Output .1 | 34 | 66 | ⊕   | 3   | Q0: Output .2 | 35 | 67 | ⊕ | 4 | Q0: Output .3 | 36 | 68 | ⊕ | 5 | Q0: Output .4 | 37 | 69 | ⊕ | 6 | Q0: Output .5 | 38 | 70 | ⊕ | 7 | Q0: Output .6 | 39 | 71 | ⊕ | 8 | Q0: Output .7 | 40 | 72 | ⊕ | 9 | Q1: Output .0 | 41 | Voltage supply <b>L2+</b> for channel group Q1: .4 to .7 (internally jumpered) | 73 | Ground <b>M2</b> for channel group Q01: .0 to .7 (internally jumpered) | ⊕ |  | 10 | Q1: Output .1 | 42 | 74 | ⊕ | 11 | Q1: Output .2 | 43 | 75 | ⊕ | 12 | Q1: Output .3 | 44 | 76 | ⊕ | 13 | Q1: Output .4 | 45 | 77 | ⊕ | 14 | Q1: Output .5 | 46 | 78 | ⊕ | 15 | Q1: Output .6 | 47 | 79 | ⊕ | 16 | Q1: Output .7 | 48 | 80 | ⊕ | 17 | Q2: Output .0 | 49 | Voltage supply <b>L3+</b> for channel group Q2: .0 to .7 (internally jumpered) | 81 | Ground <b>M3</b> for channel group Q2: .0 to .7 (internally jumpered) | ⊕ |  | 18 | Q2: Output .1 | 50 | 82 | ⊕ | 19 | Q2: Output .2 | 51 | 83 | ⊕ | 20 | Q2: Output .3 | 52 | 84 | ⊕ | 21 | Q2: Output .4 | 53 | 85 | ⊕ | 22 | Q2: Output .5 | 54 | 86 | ⊕ | 23 | Q2: Output .6 | 55 | 87 | ⊕ | 24 | Q2: Output .7 | 56 | 88 | ⊕ |
| Terminal tier 1   | Terminal tier 2 | Terminal tier 3 | Terminal tier 4 <sup>1</sup>   |    |  |    |   |    |    |    |    |    |    |    |    |                 |                 |                 |                              |    |               |    |  |    |   |    |   |    |               |    |    |     |     |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |               |    |  |    |  |   |  |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |  |    |   |   |  |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |
| 1   | Q0: Output .0   | 33              | Voltage supply <b>L1+</b> for channel group Q0: .0 to .7 (internally jumpered) | 65 | Ground <b>M1</b> for channel group Q0: .0 to .7 (internally jumpered)  | ⊕  | PE (internally jumpered, but not connected to PE screw) |    |    |    |    |    |    |    |    |                 |                 |                 |                              |    |               |    |  |    |   |    |   |    |               |    |    |     |     |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |               |    |  |    |  |   |  |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |  |    |   |   |  |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |
| 2   | Q0: Output .1   | 34              |  | 66 |  | ⊕  |   |    |    |    |    |    |    |    |    |                 |                 |                 |                              |    |               |    |  |    |   |    |   |    |               |    |    |     |     |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |               |    |  |    |  |   |  |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |  |    |   |   |  |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |
| 3   | Q0: Output .2   | 35              |  | 67 |  | ⊕  |   |    |    |    |    |    |    |    |    |                 |                 |                 |                              |    |               |    |  |    |   |    |   |    |               |    |    |     |     |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |               |    |  |    |  |   |  |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |  |    |   |   |  |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |
| 4   | Q0: Output .3   | 36              |  | 68 |  | ⊕  |   |    |    |    |    |    |    |    |    |                 |                 |                 |                              |    |               |    |  |    |   |    |   |    |               |    |    |     |     |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |               |    |  |    |  |   |  |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |  |    |   |   |  |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |
| 5   | Q0: Output .4   | 37              |  | 69 |  | ⊕  |   |    |    |    |    |    |    |    |    |                 |                 |                 |                              |    |               |    |  |    |   |    |   |    |               |    |    |     |     |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |               |    |  |    |  |   |  |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |  |    |   |   |  |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |
| 6   | Q0: Output .5   | 38              |  | 70 |  | ⊕  |   |    |    |    |    |    |    |    |    |                 |                 |                 |                              |    |               |    |  |    |   |    |   |    |               |    |    |     |     |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |               |    |  |    |  |   |  |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |  |    |   |   |  |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |
| 7   | Q0: Output .6   | 39              |  | 71 |  | ⊕  |   |    |    |    |    |    |    |    |    |                 |                 |                 |                              |    |               |    |  |    |   |    |   |    |               |    |    |     |     |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |               |    |  |    |  |   |  |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |  |    |   |   |  |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |
| 8   | Q0: Output .7   | 40              |  | 72 |  | ⊕  |   |    |    |    |    |    |    |    |    |                 |                 |                 |                              |    |               |    |  |    |   |    |   |    |               |    |    |     |     |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |               |    |  |    |  |   |  |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |  |    |   |   |  |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |
| 9   | Q1: Output .0   | 41              | Voltage supply <b>L2+</b> for channel group Q1: .4 to .7 (internally jumpered) | 73 | Ground <b>M2</b> for channel group Q01: .0 to .7 (internally jumpered) | ⊕  |   |    |    |    |    |    |    |    |    |                 |                 |                 |                              |    |               |    |  |    |   |    |   |    |               |    |    |     |     |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |               |    |  |    |  |   |  |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |  |    |   |   |  |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |
| 10  | Q1: Output .1   | 42              |  | 74 |  | ⊕  |   |    |    |    |    |    |    |    |    |                 |                 |                 |                              |    |               |    |  |    |   |    |   |    |               |    |    |     |     |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |               |    |  |    |  |   |  |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |  |    |   |   |  |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |
| 11  | Q1: Output .2   | 43              |  | 75 |  | ⊕  |   |    |    |    |    |    |    |    |    |                 |                 |                 |                              |    |               |    |  |    |   |    |   |    |               |    |    |     |     |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |               |    |  |    |  |   |  |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |  |    |   |   |  |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |
| 12  | Q1: Output .3   | 44              |  | 76 |  | ⊕  |   |    |    |    |    |    |    |    |    |                 |                 |                 |                              |    |               |    |  |    |   |    |   |    |               |    |    |     |     |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |               |    |  |    |  |   |  |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |  |    |   |   |  |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |
| 13  | Q1: Output .4   | 45              |  | 77 |  | ⊕  |   |    |    |    |    |    |    |    |    |                 |                 |                 |                              |    |               |    |  |    |   |    |   |    |               |    |    |     |     |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |               |    |  |    |  |   |  |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |  |    |   |   |  |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |
| 14  | Q1: Output .5   | 46              |  | 78 |  | ⊕  |   |    |    |    |    |    |    |    |    |                 |                 |                 |                              |    |               |    |  |    |   |    |   |    |               |    |    |     |     |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |               |    |  |    |  |   |  |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |  |    |   |   |  |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |
| 15  | Q1: Output .6   | 47              |  | 79 |  | ⊕  |   |    |    |    |    |    |    |    |    |                 |                 |                 |                              |    |               |    |  |    |   |    |   |    |               |    |    |     |     |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |               |    |  |    |  |   |  |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |  |    |   |   |  |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |
| 16  | Q1: Output .7   | 48              |  | 80 |  | ⊕  |   |    |    |    |    |    |    |    |    |                 |                 |                 |                              |    |               |    |  |    |   |    |   |    |               |    |    |     |     |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |               |    |  |    |  |   |  |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |  |    |   |   |  |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |
| 17  | Q2: Output .0   | 49              | Voltage supply <b>L3+</b> for channel group Q2: .0 to .7 (internally jumpered) | 81 | Ground <b>M3</b> for channel group Q2: .0 to .7 (internally jumpered)  | ⊕  |   |    |    |    |    |    |    |    |    |                 |                 |                 |                              |    |               |    |  |    |   |    |   |    |               |    |    |     |     |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |               |    |  |    |  |   |  |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |  |    |   |   |  |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |
| 18  | Q2: Output .1   | 50              |  | 82 |  | ⊕  |   |    |    |    |    |    |    |    |    |                 |                 |                 |                              |    |               |    |  |    |   |    |   |    |               |    |    |     |     |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |               |    |  |    |  |   |  |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |  |    |   |   |  |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |
| 19  | Q2: Output .2   | 51              |  | 83 |  | ⊕  |   |    |    |    |    |    |    |    |    |                 |                 |                 |                              |    |               |    |  |    |   |    |   |    |               |    |    |     |     |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |               |    |  |    |  |   |  |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |  |    |   |   |  |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |
| 20  | Q2: Output .3   | 52              |  | 84 |  | ⊕  |   |    |    |    |    |    |    |    |    |                 |                 |                 |                              |    |               |    |  |    |   |    |   |    |               |    |    |     |     |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |               |    |  |    |  |   |  |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |  |    |   |   |  |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |
| 21  | Q2: Output .4   | 53              |  | 85 |  | ⊕  |   |    |    |    |    |    |    |    |    |                 |                 |                 |                              |    |               |    |  |    |   |    |   |    |               |    |    |     |     |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |               |    |  |    |  |   |  |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |  |    |   |   |  |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |
| 22  | Q2: Output .5   | 54              |  | 86 |  | ⊕  |   |    |    |    |    |    |    |    |    |                 |                 |                 |                              |    |               |    |  |    |   |    |   |    |               |    |    |     |     |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |               |    |  |    |  |   |  |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |  |    |   |   |  |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |
| 23  | Q2: Output .6   | 55              |  | 87 |  | ⊕  |   |    |    |    |    |    |    |    |    |                 |                 |                 |                              |    |               |    |  |    |   |    |   |    |               |    |    |     |     |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |               |    |  |    |  |   |  |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |  |    |   |   |  |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |
| 24  | Q2: Output .7   | 56              |  | 88 |  | ⊕  |   |    |    |    |    |    |    |    |    |                 |                 |                 |                              |    |               |    |  |    |   |    |   |    |               |    |    |     |     |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |               |    |  |    |  |   |  |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |  |    |   |   |  |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |    |               |    |    |   |

Table 7-7 Pin Assignment of Terminal Blocks TB2/DC, TB2-4/DC, TB4/DC and TB4M/DC for ET 200B-32DO (6ES7 132-0BL01-0XB0), continued

| Terminal tier 1 |               | Terminal tier 2 |   | Terminal tier 3 |  | Terminal tier 4 <sup>1</sup> |   |
|-----------------|---------------|-----------------|---|-----------------|--|------------------------------|---|
| 25              | Q3: Output .0 | 57              | Voltage supply L4+ for channel group Q3: .0 to .7 (internally jumpered) | 89              | Ground M4 for channel group Q3: .0 to .7 (internally jumpered) | ⊕                            | PE (internally jumpered, but not connected to PE screw) |
| 26              | Q3: Output .1 | 58              |   | 90              |  | ⊕                            |   |
| 27              | Q3: Output .2 | 59              |   | 91              |  | ⊕                            |   |
| 28              | Q3: Output .3 | 60              |   | 92              |  | ⊕                            |   |
| 29              | Q3: Output .4 | 61              |   | 93              |  | ⊕                            |   |
| 30              | Q3: Output .5 | 62              |   | 94              |  | ⊕                            |   |
| 31              | Q3: Output .6 | 63              |   | 95              |  | ⊕                            |   |
| 32              | Q3: Output .7 | 64              |   | 96              |  | ⊕                            |   |
| –               |               | L5+             | Voltage supply, internal logic  | M5              | Ground connection, internal logic                              | ⊕                            | PE (internally jumpered, but not connected to PE screw) |
| –               |               | L5+             | Voltage supply, internal logic  | M5              | Ground connection, internal logic                              | ⊕                            |   |

<sup>1</sup> TB2-4/DC only; in the TB4M/DC tier 4 is available for additional ground connections (see Section 7.2.7)

**Important Note on Wiring**

The following notes are important as regards the wiring of the ET 200B-32DO:

- The terminals for PE on the 4-tier terminal block are not connected to the PE connection of terminal block TB2-4/DC.
- If all actuators are connected by two-wire cables to the TB2/DC, TB4/DC or TB2-4/DC, connect the ground of an actuator and the supply for the reference potential per group by means of a DIN 46231 cable cleat.
- L1+ ... L5+ and M1 ... M5 are **not** internally interconnected.
- The two L5+ terminals are internally interconnected.



**Technical Data**

The technical data of electronics block ET 200B-32DO is listed in the tables below.

| Technical specifications  |   | Outputs   |                                |
|---|---|---|--------------------------------|
| Baud rates*   | 9.6/19.2/93.75/187.5/500/<br>1500/3000/6000/<br>12000 kbaud | Number of outputs   | 32                             |
| Bus protocol  | PROFIBUS-DP   | Galvanic isolation  | Yes                            |
| SYNC capability   | Yes   | • In groups of  | 8                              |
| Galvanic isolation to SI-<br>NEC L2-DP bus                                    | Yes   | Output voltage  |                                |
| Power losses  | Max. 7.9 W  | • For "0" signal  | Max. 2 V (idle)                |
| Weight (EB and TB)  | Approx. 800 g (28 oz.)                                      | • For "1" signal  | Min. (supply voltage<br>– 3 V) |
| Dimensions (EB and TB:<br>W x H x D)  | 235 x 130 x 60 mm<br>(9.17 x 5.07 x 2.34 in.)               | Output current  |                                |
| <b>Diagnostics functions</b>  |   | • For "0" signal  | Max. 1 mA                      |
| Voltage monitoring  | Green "RUN" LED   | • For "1" signal  | Max. 0.5 A                     |
| Bus monitoring SINEC<br>L2-DP   | Red "BF" LED  | Delay of outputs  |                                |
| Group diagnostics for<br>short-circuit, load voltage<br>failure               | Red "DIA" LED   | • From "0" to "1"   | Approx. 20 µs                  |
| Load voltage monitoring   | Green "L1+/L2+",<br>"L3+/L4+" LEDs                          | • From "1" to "0"   | Max. 0.5 ms                    |
| Status of outputs   | Green LEDs  | Switching frequency   |                                |
| <b>Supply voltage for outputs, load voltage supply and<br/>internal logic</b> |   | • Resistive load  | Max. 1000 Hz                   |
| Supply voltage<br>(L1+,L2+,L3+,L4+,L5+)                                       |   | • Inductive load  | Max. 0.5 Hz                    |
| • Rated value   | 24 V DC   | • Lamp load   | Max. 8 Hz                      |
| • Permissible range   | 18.5 to 30.2 V  | Short-circuit protection  | Yes                            |
| • Value for $t < 0.5$ s   | 35 V  | Load current per group  |                                |
| $I^2t$<br>(for inrush current)  | $\leq 0.05$ A <sup>2</sup> s                                | • Total current   | Max. 2 A                       |
| Current consumption from<br>L5+   |   | Lamp load   | Max. 5 W                       |
| • Logic   | Typ. 75 mA  | Setting a digital input   | Possible                       |
|   |   | Limitation of voltage in-<br>duced on current interrup-<br>tion | Typ. (L1+ ... L4+) – 55 V      |
|   |   | Cable length  | Max. 100 m (328 ft.)           |

\* In operation with the IM 308-B, the maximum baud rate is 1500 kbaud.

### 7.3.6 Electronics block ET 200B-8RO (6ES7 132-0GF00-0XB0)

**Characteristics** The ET 200B-8RO electronics block has the following characteristics:

- 8 relay outputs, floating in groups of 1
- Switching voltage: 24 to 60 V DC
- Possible terminal blocks: TB1/DC, TB1-4/DC or TB3/DC

**Dimensional Drawing** See Figure 7-18 for the precise dimensions.

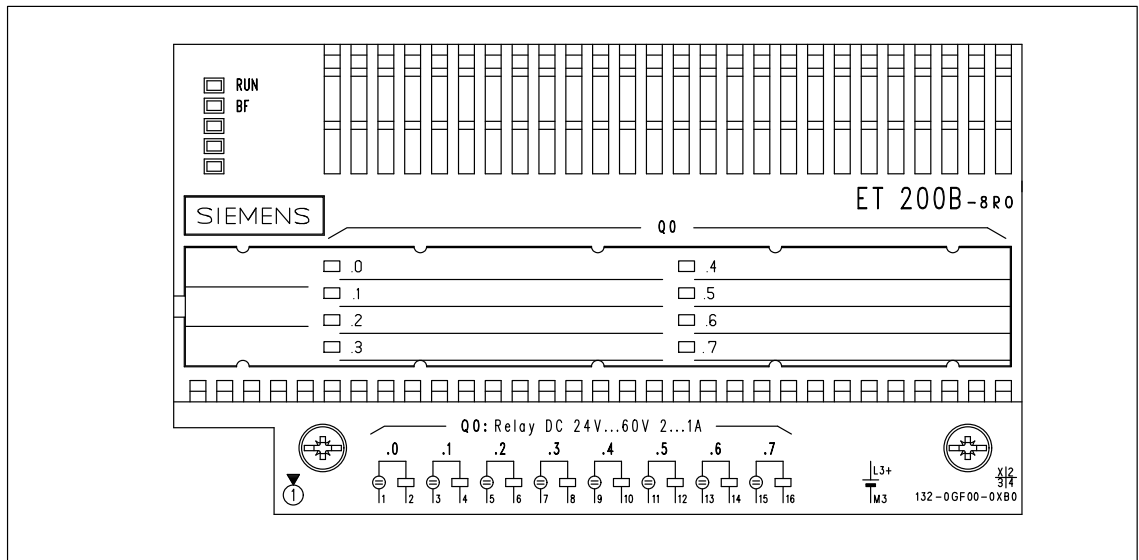


Figure 7-35 Front Elevation: ET 200B-8RO (6ES7 132-0GF00-0XB0)

**Block Diagram**

Simplified diagram of the potential for the ET 200B-8RO and TB1/DC or TB3/DC:

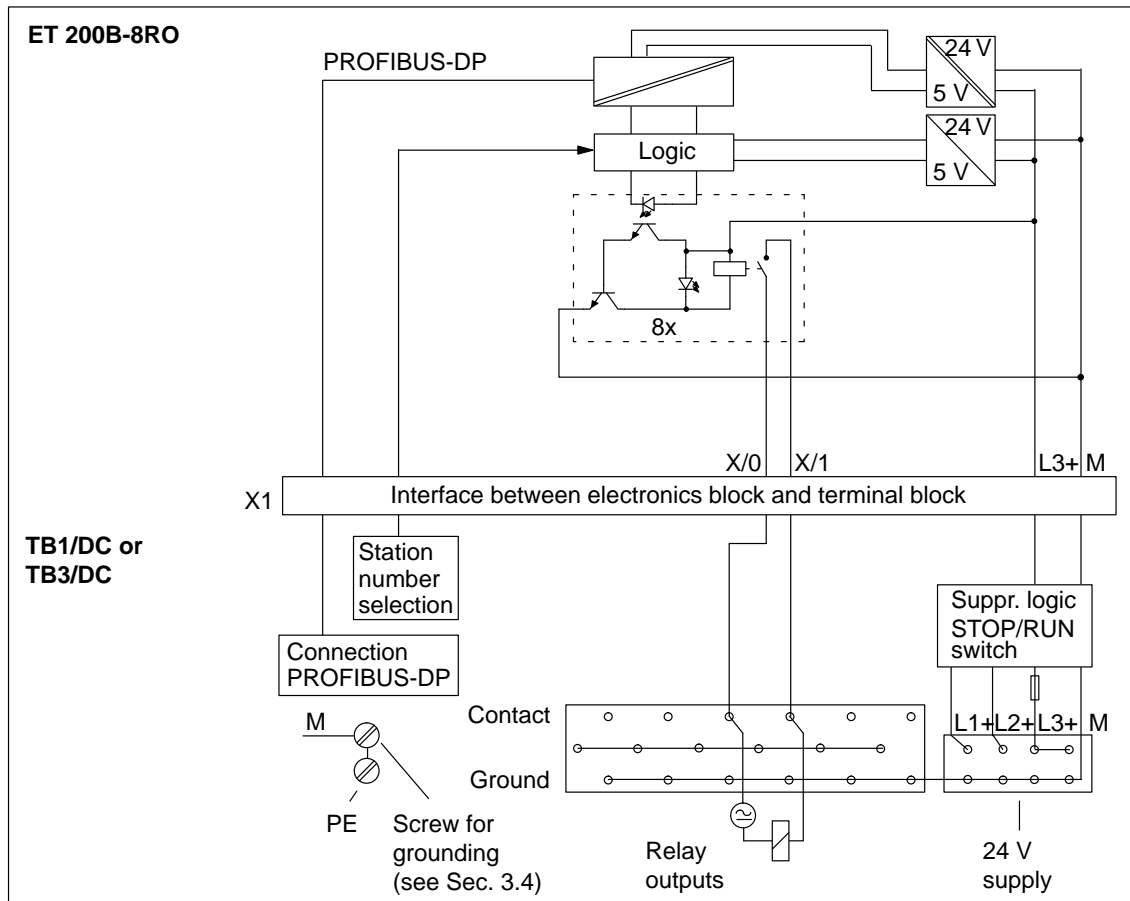


Figure 7-36 Block Diagram: ET 200B-8RO (6ES7 132-0GF00-0XB0) and TB1/DC or TB3/DC

**Block Diagram** Simplified diagram of the potential for the ET 200B-8RO and TB1-4/DC:

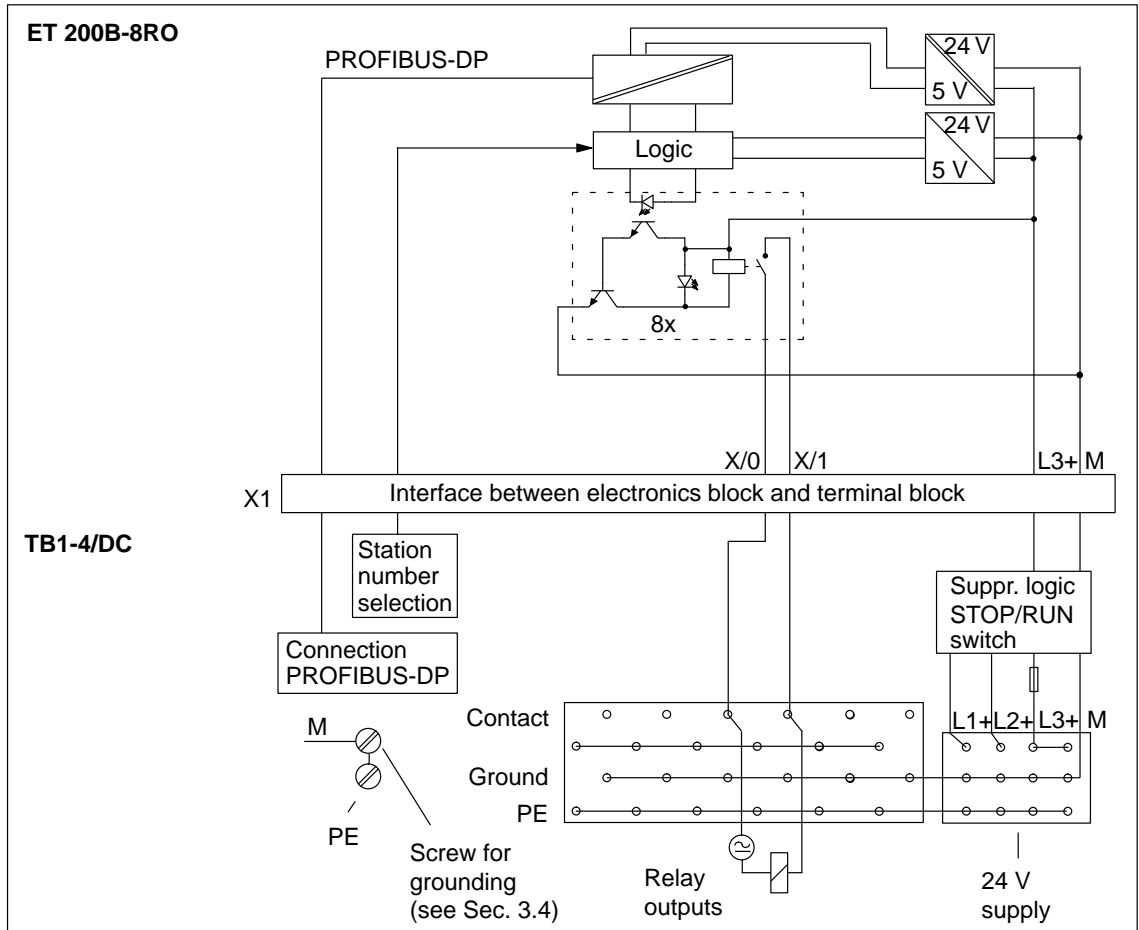
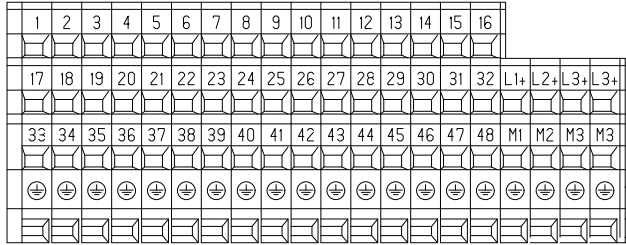


Figure 7-37 Block Diagram: ET 200B-8RO (6ES7 132-0GF00-0XB0) and TB1-4/DC

**Pin Assignment**

The table below shows the pin assignment of the terminal blocks for ET 200B-8RO. For the sake of clarity, the table also shows the terminal numbering of the terminal blocks, taking the TB1-4/DC by way of example.

Table 7-8 Pin Assignment of Terminal Blocks TB1/DC; TB1-4/DC and TB3/DC for ET 200B-8RO (6ES7 132-0GF00-0XB0)



**Terminal numbering TB1-4/DC**

| Terminal tier 1       | Terminal tier 2                    | Terminal tier 3  | Terminal tier 4 <sup>1</sup>                              |
|-----------------------|------------------------------------|--|---|
| 1 Q0: Connection 0/0  | 17 not used (internally jumpered)  | 33 Ground (internally jumpered, connected to M1, M2, M3) | ⊕ PE (internally jumpered, but not connected to PE screw) |
| 2 Q0: Connection 0/1  | 18                                 | 34   | ⊕   |
| 3 Q0: Connection 1/0  | 19                                 | 35   | ⊕   |
| 4 Q0: Connection 1/1  | 20                                 | 36   | ⊕   |
| 5 Q0: Connection 2/0  | 21                                 | 37   | ⊕   |
| 6 Q0: Connection 2/1  | 22                                 | 38   | ⊕   |
| 7 Q0: Connection 3/0  | 23                                 | 39   | ⊕   |
| 8 Q0: Connection 3/1  | 24                                 | 40   | ⊕   |
| 9 Q0: Connection 4/0  | 25                                 | 41   | ⊕   |
| 10 Q0: Connection 4/1 | 26                                 | 42   | ⊕   |
| 11 Q0: Connection 5/0 | 27                                 | 43   | ⊕   |
| 12 Q0: Connection 5/1 | 28                                 | 44   | ⊕   |
| 13 Q0: Connection 6/0 | 29                                 | 45   | ⊕   |
| 14 Q0: Connection 6/1 | 30                                 | 46   | ⊕   |
| 15 Q0: Connection 7/0 | 31                                 | 47   | ⊕   |
| 16 Q0: Connection 7/1 | 32                                 | 48   | ⊕   |
| -                     | L1+ not used                       | M1 not used  | ⊕ PE (internally jumpered, but not connected to PE screw) |
| -                     | L2+ not used                       | M2 not used  | ⊕   |
| -                     | L3+ Voltage supply, internal logic | M3 Ground connection, internal logic                     | ⊕   |
| -                     | L3+ Voltage supply, internal logic | M3 Ground connection, internal logic                     | ⊕   |

<sup>1</sup> TB1-4/DC only

**Important Note on Wiring**

The following notes are important as regards the wiring of the ET 200B-8RO:

- The terminals for PE on the 4-tier terminal block are not connected to the PE connection of terminal block TB1-4/DC.
- M1, M2, M3 and terminals 33 ... 48 are interconnected.
- The two L3+ terminals are internally interconnected.

**Technical Data**

The technical data of electronics block ET 200B-8RO is listed in the tables below.

| Technical specifications                            |   | Relay outputs                      |   |
|---|---|------------------------------------|---|
| Baud rates*   | 9.6/19.2/93.75/187.5/500/1500/3000/6000/12000 kbaud | Number of outputs                  | 8   |
| Bus protocol  | PROFIBUS-DP   | Galvanic isolation                 | Yes   |
| SYNC capability                                     | Yes   | • In groups of                     | 1   |
| Galvanic isolation to the SINEC L2-DP bus           | Yes   | Short-circuit protection           | No  |
| Power losses  | Typ. 2 W  | Continuous current I <sub>th</sub> | Max. 5 A  |
| Weight (EB and TB)                                  | Approx. 650 g (22.75 oz.)                           | Relay type                         | Dold OW 5699  |
| Dimensions (EB and TB: W x H x D)                   | 160 x 130 x 60 mm (6.24 x 5.07 x 2.34 in.)          | Cycling capacity of contacts       |   |
| Diagnostics functions                               |   | • Resistive load                   | Max. 2 A at 24 V DC<br>Max. 1.5 A at 48 V DC<br>Max. 1 A at 60 V DC |
| Voltage monitoring                                  | Green "RUN" LED                                     | • Inductive load                   | Max. 0.5 A at 30 V DC   |
| Bus monitoring SINEC L2-DP                          | Red "BF" LED  | Mechanical service life            | > 10 <sup>8</sup> switching operations                              |
| Status of outputs                                   | Green LEDs  | Switching rate                     | Max. 20/s   |
| Supply voltage for relay outputs and internal logic |   | Cable length                       |   |
| Supply voltage (L3+)                                |   | • Unshielded                       | Max. 100 m (328 ft.)  |
| • Rated value                                       | 24 V DC   | Setting of a digital input         | Possible  |
| • Permissible range                                 | 18.5 to 30.2 V                                      |                                    |   |
| • Value for t < 0.5 s                               | 35 V  |                                    |   |
| Current consumption from L3+                        |   |                                    |   |
| • Logic   | Typ. 130 mA   |                                    |   |
| I <sup>2</sup> t (for inrush current)               | ≤ 0.05 A <sup>2</sup> s                             |                                    |   |

\* In operation with the IM 308-B, the maximum baud rate is 1500 kbaud.

### 7.3.7 Electronics Block ET 200B-8DI/8DO (6ES7 133-0BH01-0XB0)

**Characteristics** The ET 200B-8DI/8DO electronics block has the following characteristics:

- 8 inputs, non-floating
- 8 outputs, non-floating
- Input voltage: 24 V DC
- Input delay: 3 ms
- Load voltage: 24 V DC
- Possible terminal blocks: TB1/DC, TB1-4/DC or TB3/DC

**Dimensional Drawing** See Figure 7-18 for the precise dimensions.

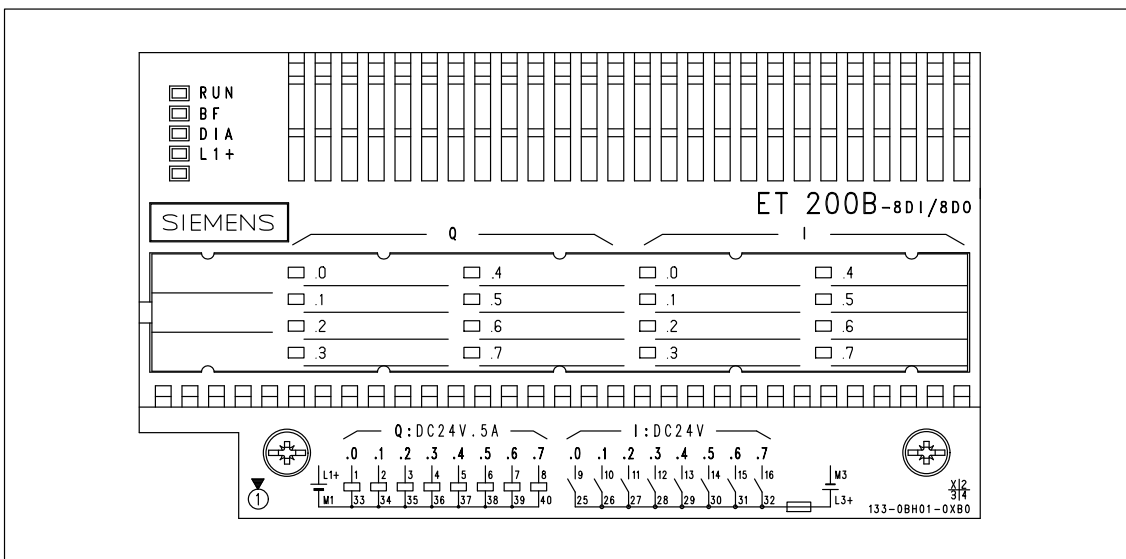


Figure 7-38 Front Elevation: ET 200B-8DI/8DO (6ES7 133-0BH01-0XB0)

**Block Diagram**

Simplified diagram of potential for the ET 200B-8DI/8DO and TB1/DC or TB3/DC:

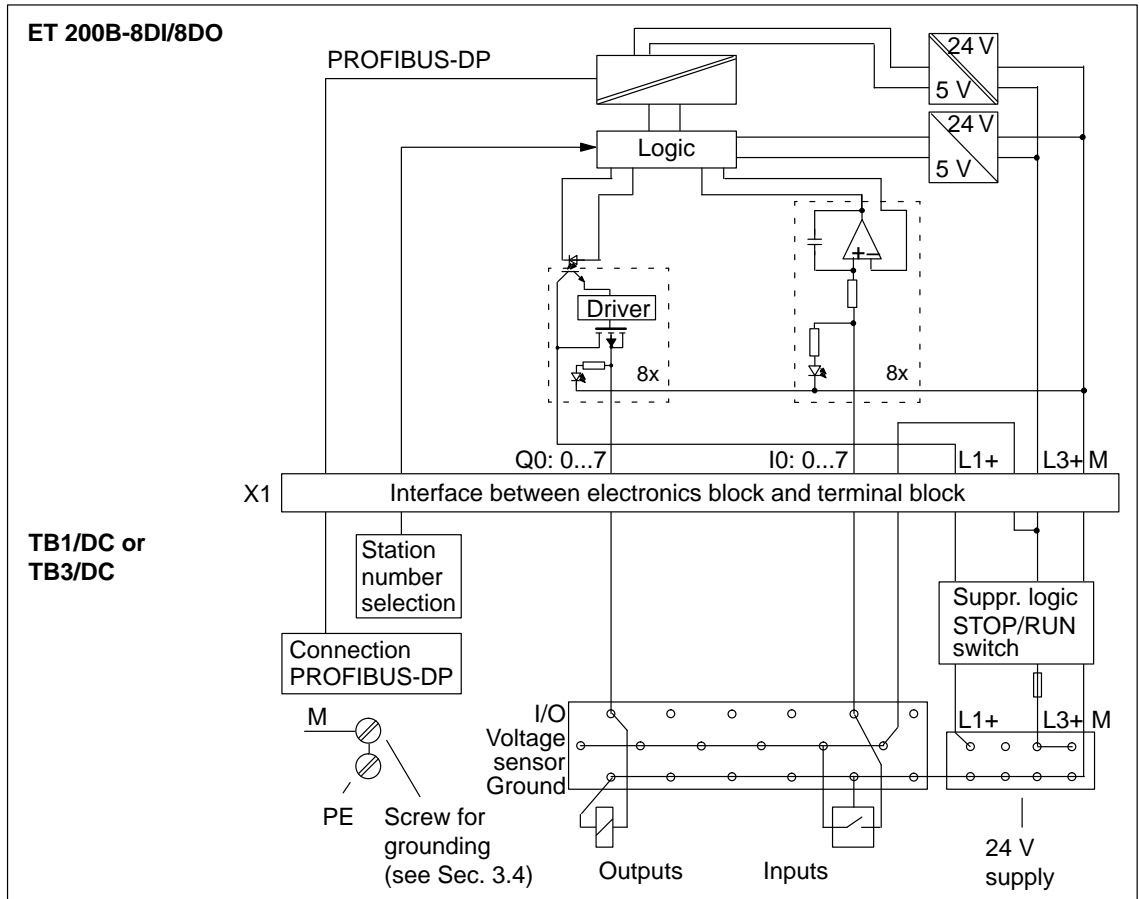


Figure 7-39 Block Diagram: ET 200B-8DI/8DO (6ES7 133-0BH01-0XB0) and TB1/DC or TB3/DC

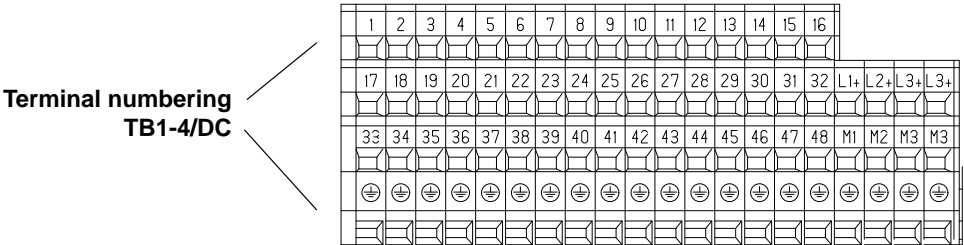




**Pin Assignment**

The table below shows the pin assignment of the terminal blocks for ET 200B-8DI/8DO. For the sake of clarity, the table also shows the terminal numbering of the terminal blocks, taking the TB1-4/DC by way of example.

Table 7-9 Pin Assignment of Terminal Blocks TB1/DC; TB1-4/DC and TB3/DC for ET 200B-8DI/8DO (6ES7 133-0BH01-0XB0)



**Terminal numbering TB1-4/DC**

| Terminal tier 1 | Terminal tier 2   | Terminal tier 3   | Terminal tier 4 <sup>1</sup>                              |
|-----------------|---|---|---|
| 1 Q0: Output .0 | 17 24 V (sensor voltage, internally jumpered, connected to L3+) | 33 Ground (outputs) (internally jumpered, connected to M1, M2, M3)        | ⊕ PE (internally jumpered, but not connected to PE screw) |
| 2 Q0: Output .1 | 18  | 34  | ⊕   |
| 3 Q0: Output .2 | 19  | 35  | ⊕   |
| 4 Q0: Output .3 | 20  | 36  | ⊕   |
| 5 Q0: Output .4 | 21  | 37  | ⊕   |
| 6 Q0: Output .5 | 22  | 38  | ⊕   |
| 7 Q0: Output .6 | 23  | 39  | ⊕   |
| 8 Q0: Output .7 | 24  | 40  | ⊕   |
| 9 I0: Input .0  | 25  | 41 Ground (sensor voltage) (internally jumpered, connected to M1, M2, M3) | ⊕   |
| 10 I0: Input .1 | 26  | 42  | ⊕   |
| 11 I0: Input .2 | 27  | 43  | ⊕   |
| 12 I0: Input .3 | 28  | 44  | ⊕   |
| 13 I0: Input .4 | 29  | 45  | ⊕   |
| 14 I0: Input .5 | 30  | 46  | ⊕   |
| 15 I0: Input .6 | 31  | 47  | ⊕   |
| 16 I0: Input .7 | 32  | 48  | ⊕   |
| -               | L1+ Voltage supply L1+ for channel group Q0: .0 to .7           | M1 Ground supply M1 for channel group Q0: .0 to .7                        | ⊕ PE (internally jumpered, but not connected to PE screw) |
| -               | L2+ not used  | M2 not used   | ⊕   |
| -               | L3+ Voltage supply, internal logic and sensor voltage 24 V      | M3 Ground connection, internal logic and sensor voltage                   | ⊕   |
| -               | L3+ Voltage supply, internal logic and sensor voltage 24 V      | M3 Ground connection, internal logic and sensor voltage                   | ⊕   |

<sup>1</sup> TB1-4/DC only

**Important Note on Wiring**

The following notes are important as regards the wiring of the ET 200B-8DI/8DO:

- The terminals for PE on the 4-tier terminal block are not connected to the PE connection of terminal block TB1-4/DC.
- L1+ and L3+ are **not** internally interconnected.
- L3+ and terminals 25 ... 32 are interconnected, as are M1, M2, M3 and terminals 33 ... 48.
- The two L3+ terminals are also interconnected.

**Fuse**

The 24 V sensor supply is protected by fuse F1 (1.6 A) in the terminal blocks. Nevertheless, make sure that the current does not exceed the specifications in the technical data for the electronics block.

**Technical Data**

The technical data of electronics block ET 200B-8DI/8DO is listed in the tables below.

|   |   |                                   |                                |
|---|---|-----------------------------------|--------------------------------|
| <b>Technical specifications</b>   |   | <b>Inputs, continued</b>          |                                |
| Baud rates*   | 9.6/19.2/93.75/187.5/500/<br>1500/3000/6000/<br>12000 kbaud | Input current for "1" signal      | Typ. 4 mA at 24 V<br>Min. 2 mA |
| Bus protocol  | PROFIBUS-DP   | Delay of inputs                   | 3 ms                           |
| FREEZE and SYNC capability  | Yes   | Connection of 2-wire BERO         | Possible                       |
| Galvanic isolation to SI-NEC L2-DP bus  | Yes   | • Quiescent current               | ≤ 1.5 mA                       |
| Power losses  | Max. 3.8 W  | Connection of mechanical switches | Possible                       |
| Weight (EB and TB)  | Approx. 650 g (22.75 oz.)                                   | Cable length of sensors           |                                |
| Dimensions (EB and TB: W x H x D)   | 160 x 130 x 60 mm<br>(6.24 x 5.07 x 2.34 in.)               | • Unshielded                      | Max. 100 m (328 ft.)           |
| <b>Diagnostics functions</b>  |   | <b>Outputs</b>                    |                                |
| Voltage monitoring  | Green "RUN" LED   | Number of outputs                 | 8                              |
| Bus monitoring SINEC L2-DP  | Red "BF" LED  | Galvanic isolation                | No                             |
| Group diagnostics for short-circuit, load voltage failure                       | Red "DIA" LED   | • In groups of                    | 8                              |
| Load voltage monitoring   | Green "L1+" LED   | Output voltage                    |                                |
| Status of inputs and outputs  | Green LEDs  | • For "0" signal                  | Max. 2 V (idle)                |
|   |   | • For "1" signal                  | Min. (supply voltage – 3 V)    |
|   |   | Output current                    |                                |
|   |   | • For "0" signal                  | Max. 1 mA                      |
|   |   | • For "1" signal                  | Max. 0.5 A                     |
|   |   | Delay of outputs                  |                                |
|   |   | • From "0" to "1"                 | Approx. 20 μs                  |
|   |   | • From "1" to "0"                 | Max. 0.5 ms                    |
| <b>Supply voltage for sensor supply, load voltage supply and internal logic</b> |   | Switching frequency               |                                |
| Supply voltage (L1+,L3+)  |   | • Resistive load                  | Max. 100 Hz                    |
| • Rated value   | 24 V DC   | • Inductive load                  | Max. 0.5 Hz                    |
| • Permissible range   | 18.5 to 30.2 V  | • Lamp load                       | Max. 8 Hz                      |
| • Value for t < 0.5 s   | 35 V  | Short-circuit protection          | Yes                            |
| Current consumption from L3+  |   | Load current                      |                                |
| • Logic   | Typ. 70 mA  | • Total current                   | Max. 2 A                       |
| • Sensors   | Max. 500 mA   | Lamp load                         | Max. 5 W                       |
| I <sup>2</sup> t (for inrush current)   | ≤ 0.05 A <sup>2</sup> s                                     | Setting a digital input           | Possible                       |
| <b>Inputs</b>   |   | Limit of inductive cutoff voltage | Typ. (L1+) – 55 V              |
| Number of inputs  | 8   | Cable length                      | Max. 100 m (328 ft.)           |
| Galvanic isolation to internal electronic circuits                              | No  |                                   |                                |
| Input voltage   |   |                                   |                                |
| • Rated value   | 24 V DC   |                                   |                                |
| • For "0" signal  | – 30 V to 5 V   |                                   |                                |
| • For "1" signal  | 13 V to 30 V  |                                   |                                |

\* In operation with the IM 308-B, the maximum baud rate is 1500 kbaud.

### 7.3.8 Electronics Block ET 200B-8DI/8DO HWA (6ES7 133-0BH10-0XB0)

**characteristics** The ET 200B-8DI/8DO HWA electronics block has the following characteristics:

- 8 inputs, non-floating
- 8 outputs, non-floating
- The outputs can be deactivated by a programmed deactivation level applied to the input.
- Input voltage: 24 V DC
- Input delay: 3 ms
- Load voltage: 24 V DC
- Possible terminal blocks: TB1/DC, TB1-4/DC or TB3/DC

**Dimensional Drawing** See Figure 7-18 for the precise dimensions.

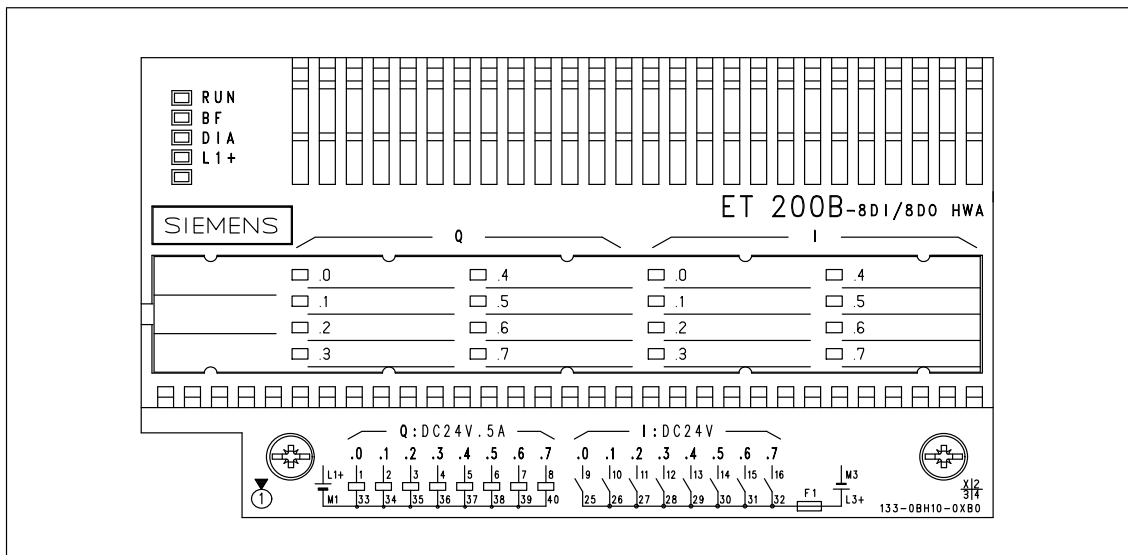


Figure 7-41 Front Elevation: ET 200B-8DI/8DO HWA (6ES7 133-0BH10-0XB0)

**Block Diagram**

Simplified diagram of potential for the ET 200B-8DI/8DO HWA and TB1/DC or TB3/DC:

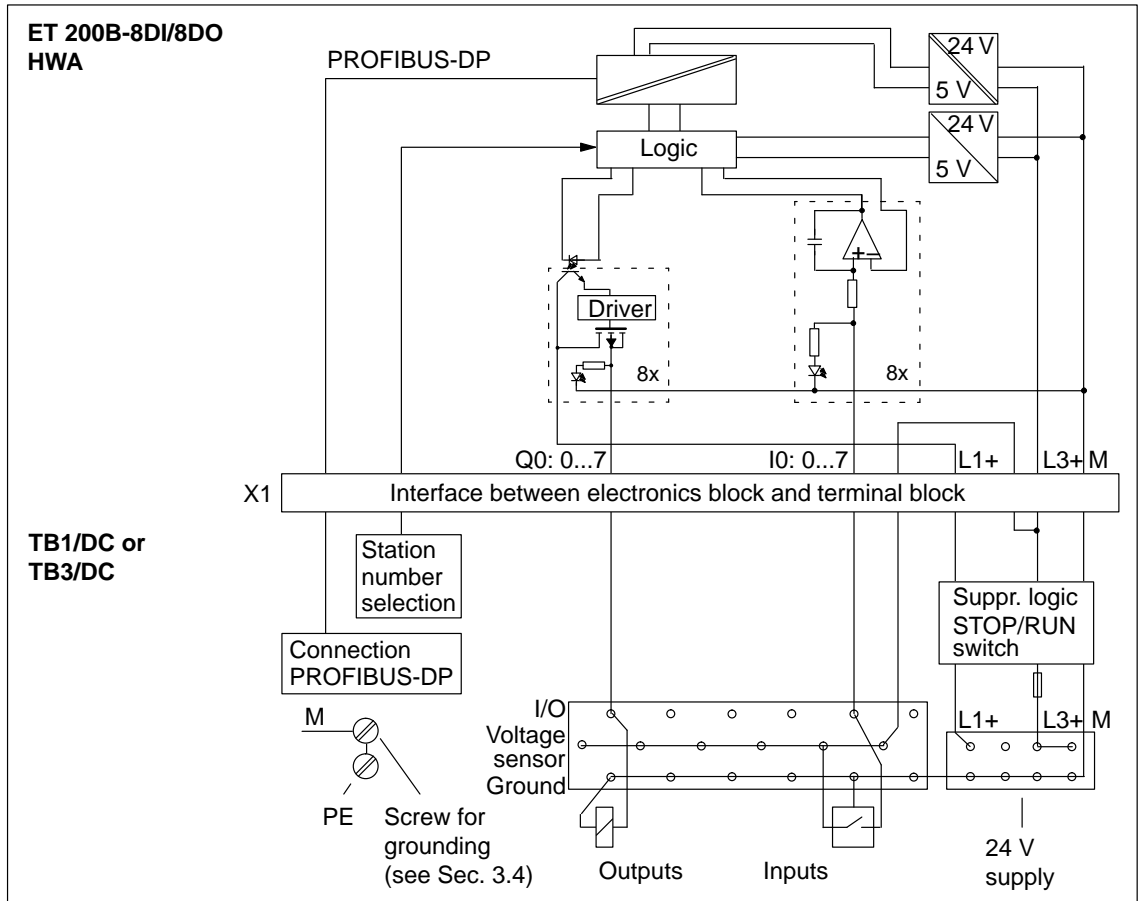


Figure 7-42 Block Diagram: ET 200B-8DI/8DO HWA (6ES7 133-0BH10-0XB0) and TB1/DC or TB3/DC

**Block Diagram**

Simplified diagram of potential for the ET 200B-8DI/8DO HWA and TB1-4/DC:

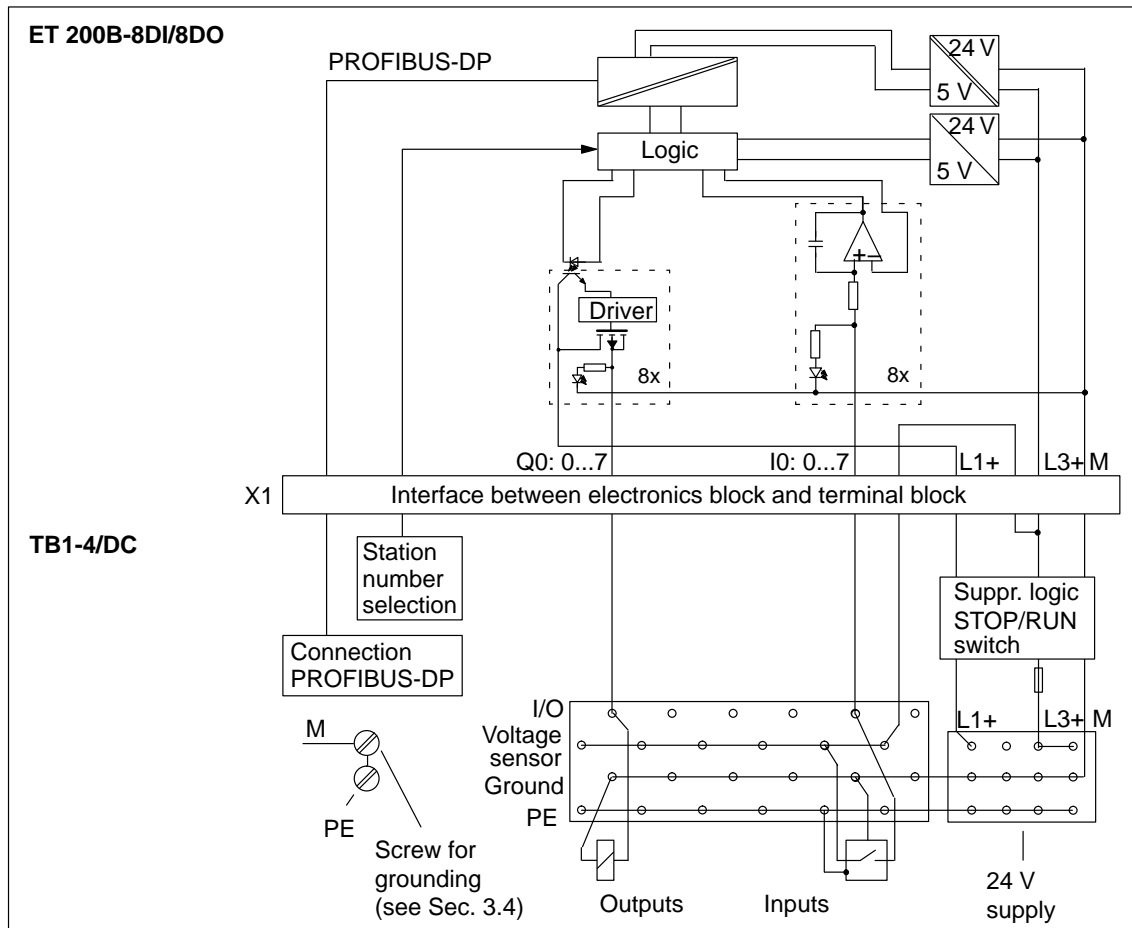


Figure 7-43 Block Diagram: ET 200B-8DI/8DO HWA (6ES7 133-0BH10-0XB0) and TB1-4/DC

**Pin Assignment**

The table below shows the pin assignment of the terminal blocks for ET 200B-8DI/8DO HWA. For the sake of clarity, the table also shows the terminal numbering of the terminal blocks, taking the TB1-4/DC by way of example.

Table 7-10 Pin Assignment of Terminal Blocks TB1/DC; TB1-4/DC and TB3/DC for ET 200B-8DI/8DO HWA (6ES7 133-0BH10-0XB0)

| Terminal tier 1 | Terminal tier 2  | Terminal tier 3 | Terminal tier 4 <sup>1</sup>                            |  |
|-----------------|--|-----------------|---|--|
| 1 Q0: Output .0 | 24 V (sensor voltage, internally jumpered, connected to L3+) | 33              | PE (internally jumpered, but not connected to PE screw) |  |
| 2 Q0: Output .1 |  | 34              |   |  |
| 3 Q0: Output .2 |  | 35              |   |  |
| 4 Q0: Output .3 |  | 36              |   |  |
| 5 Q0: Output .4 |  | 37              |   |  |
| 6 Q0: Output .5 |  | 38              |   |  |
| 7 Q0: Output .6 |  | 39              |   |  |
| 8 Q0: Output .7 |  | 40              |   |  |
| 9 I0: Input .0  |  | 41              |   | Ground (sensor voltage) (internally jumpered, connected to M1, M2, M3) |
| 10 I0: Input .1 |  | 42              |   |  |
| 11 I0: Input .2 |  | 43              |   |  |
| 12 I0: Input .3 |  | 44              |   |  |
| 13 I0: Input .4 |  | 45              |   |  |
| 14 I0: Input .5 |  | 46              |   |  |
| 15 I0: Input .6 |  | 47              |   |  |
| 16 I0: Input .7 |  | 48              |   |  |
| -               | L1+ Voltage supply L1+ for channel group Q0: .0 to .7        | M1              | PE (internally jumpered, but not connected to PE screw) |  |
| -               | L2+ not used   | M2              |   |  |
| -               | L3+ Voltage supply, internal logic and sensor voltage 24 V   | M3              |   |  |
| -               | L3+ Voltage supply, internal logic and sensor voltage 24 V   | M3              |   |  |

<sup>1</sup> TB1-4/DC only



**HW Cutoff**

Outputs .0 to .7 are deactivated as soon as the programmed cutoff level is applied to the corresponding input .0 to .7. The relationship between inputs and outputs is permanent (I .0 → O .0, I .1 → O .1, ...).

Address assignment:

|          |                                 |   |
|----------|---------------------------------|---|
| EB x     | Inputs .0 to .7                 | } 2 consecutive bytes in the address space of the CPU |
| AB y     | Outputs .0 to .7                |   |
| AB y + 1 | Cutoff level .0 to .7 (negated) |   |

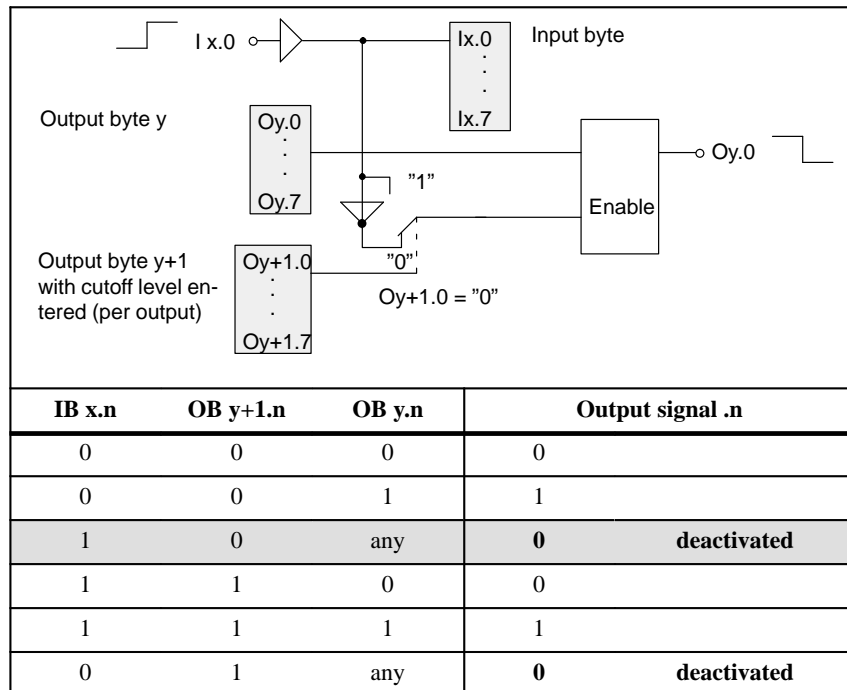
**Bit Assignment in the "Cutoff Level" Byte**

The "cutoff level" byte defaults to "0", i.e. output y.n is deactivated (set to "0"), if signal "1" is present at input x.n.

0: Output is deactivated by signal "1" at corresponding input.

1: Output is deactivated by signal "1" at corresponding input

Table 7-11 Truth Table for Hardware Cutoff of ET 200B-8DI/8DO HWA



**Note**

The following notes are important as regards the wiring and hardware cutoff of ET 200B-8DI/8DO HWA:

- The terminals for PE on the 4-tier terminal block are not connected to the PE connection of terminal block TB1-4/DC.
- L1+ and L3+ are **not** internally interconnected.
- L3+ and terminals 17 ... 32 are interconnected, as are M1, M2, M3 and terminals 33 ... 48.
- The two L3+ terminals are also interconnected.
- Outputs can switch through temporarily:



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**Warning**

The configuration described below is such that POWER OFF, STOP or transient voltage collapse at the terminal block cause the outputs of the ET 200B-8DI/8DO HWA to switch through briefly.

Case 3 in Table 7-11 "Truth Table" (gray background):  
"cutoff level" byte OB y+1" programmed to "0", outputs set to "1" by S5/S7 application program. → signal "1" at input I x.n activates the hardware cut-off.

**Cause:** POWER OFF, STOP or transient voltage collapse shuts off the sensor voltage, but the logic continues to function for at least another 20 ms (bridging power failure). The lack of the sensor voltage means that signal "0" is detected at the inputs and the outputs are enabled if the configuration is as described above.

---

**Fuse**

The 24 V sensor supply is protected by fuse F1 (1.6 A) in the terminal blocks. Nevertheless, make sure that the current does not exceed the specifications in the technical data for the electronics block.

**Technical Data**

The technical data of electronics block ET 200B-8DI/8DO HWA is listed in the tables below.

| Technical Data  |   | Inputs (continued)                   |                                |
|---|---|--------------------------------------|--------------------------------|
| Baud rates*   | 9.6/19.2/93.75/187.5/500/<br>1500/3000/6000/<br>12000 kbaud | Input current for<br>"1" signal      | Typ. 4 mA at 24 V<br>Min. 2 mA |
| Bus protocol  | PROFIBUS-DP   | Delay of inputs                      | 3 ms                           |
| FREEZE and SYNC capability  | Yes   | Connection of 2-wire<br>BERO         | Possible                       |
| Galvanic isolation to SI-<br>NEC L2-DP bus                                  | Yes   | • Quiescent current                  | ≤ 1.5 mA                       |
| Power losses  | Max. 3.8 W  | Connection of mechanical<br>switches | Possible                       |
| Weight (EB and TB)  | Approx. 650 g   | Cable length of sensors              |                                |
| Dimensions (EB and TB:<br>W x H x D)  | 160 x 130 x 60  | • Unshielded                         | Max. 100 m (328 ft.)           |
| Diagnostics functions   |   | Outputs                              |                                |
| Voltage monitoring  | Green "RUN" LED   | Number of outputs                    | 8                              |
| Bus monitoring SINEC<br>L2-DP   | Red "BF" LED  | Galvanic isolation                   | No                             |
| Group diagnostics for<br>short-circuit, load voltage<br>failure             | Red "DIA" LED   | • In groups of                       | 8                              |
| Load voltage monitoring   | Green "L1+" LED   | Output voltage                       |                                |
| Status of inputs and out-<br>puts   | Green LEDs  | • For "0" signal                     | Max. 2 V (idle)                |
|   |   | • For "1" signal                     | Min. (supply voltage<br>– 3 V) |
| Supply voltage for sensor supply, load voltage supply<br>and internal logic |   | Output current                       |                                |
| Supply voltage (L1+,L3+)  |   | • For "0" signal                     | Max. 1 mA                      |
| • Rated value   | 24 V DC   | • For "1" signal                     | Max. 0.5 A                     |
| • Permissible range   | 18.5 ... 30.2 V   | Delay of outputs                     |                                |
| • Value for t < 0.5 s   | 35 V  | • From "0" to "1"                    | Typ. 50 µs                     |
| Current consumption from<br>L3+   |   | • From "1" to "0"                    | Typ. 100 µs                    |
| • Logic   | Typ. 70 mA  | • By hardware cutoff                 | 3 ms                           |
| • Sensors   | Max. 500 mA   | Switching frequency                  |                                |
| I <sup>2</sup> t (for the inrush current)                                   | ≤ 0.05 A <sup>2</sup> s                                     | • Resistive load                     | Max. 100 Hz                    |
|   |   | • Inductive load                     | Max. 0.5 Hz                    |
|   |   | • Lamp load                          | Max. 8 Hz                      |
|   |   | Short-circuit protection             | Yes                            |
|   |   | Load current                         |                                |
|   |   | • Total current                      | Max. 2 A                       |
|   |   | Lamp load                            | Max. 5 W                       |
|   |   | Setting a digital input              | Possible                       |
|   |   | Limit of inductive cutoff<br>voltage | Typ. (L1+) – 55 V              |
|   |   | Cable length                         | Max. 100 m (328 ft.)           |
| Inputs  |   |                                      |                                |
| Number of inputs  | 8   |                                      |                                |
| Galvanic isolation to inter-<br>nal electronic circuits                     | No  |                                      |                                |
| Input voltage   |   |                                      |                                |
| • Rated value   | 24 V DC   |                                      |                                |
| • For "0" signal  | – 30 V ... 5 V  |                                      |                                |
| • For "1" signal  | 13 V ... 30 V   |                                      |                                |

\* In operation with the IM 308-B, the maximum baud rate is 1500 kbaud.

### 7.3.9 Electronics Block ET 200B-16DI/16DO (6ES7 133 0BL00-0XB0)

**Characteristics**

The ET 200B-16DI/16DO has the following characteristics:

- 16 inputs, non-floating
- 16 outputs, floating in groups of 8
- Input voltage: 24 V DC
- Input delay: 3 ms
- Load voltage: 24 V DC
- Possible terminal blocks: TB2/DC, TB2-4/DC, TB4/DC, TB4M/DC

**Dimensional Drawing**

See Figure 7-22 for the precise dimensions.

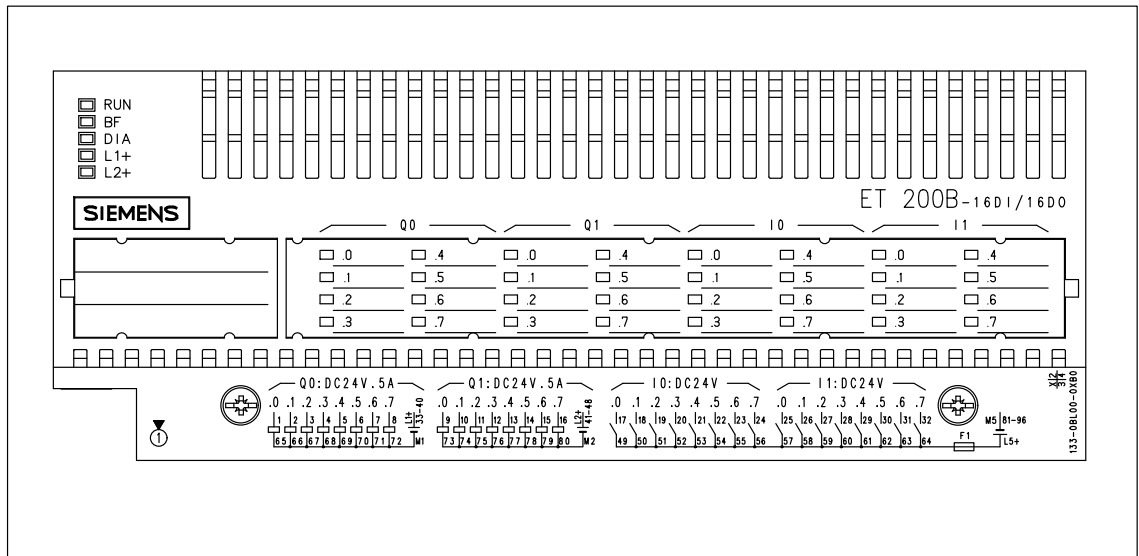


Figure 7-44 Front Elevation: ET 200B-16DI/16DO (6ES7 133-0BL00-0XB0)

**Block Diagram**

Simplified diagram of the potential for the ET 200B-16DI/16DO and TB2/DC or TB4/DC:

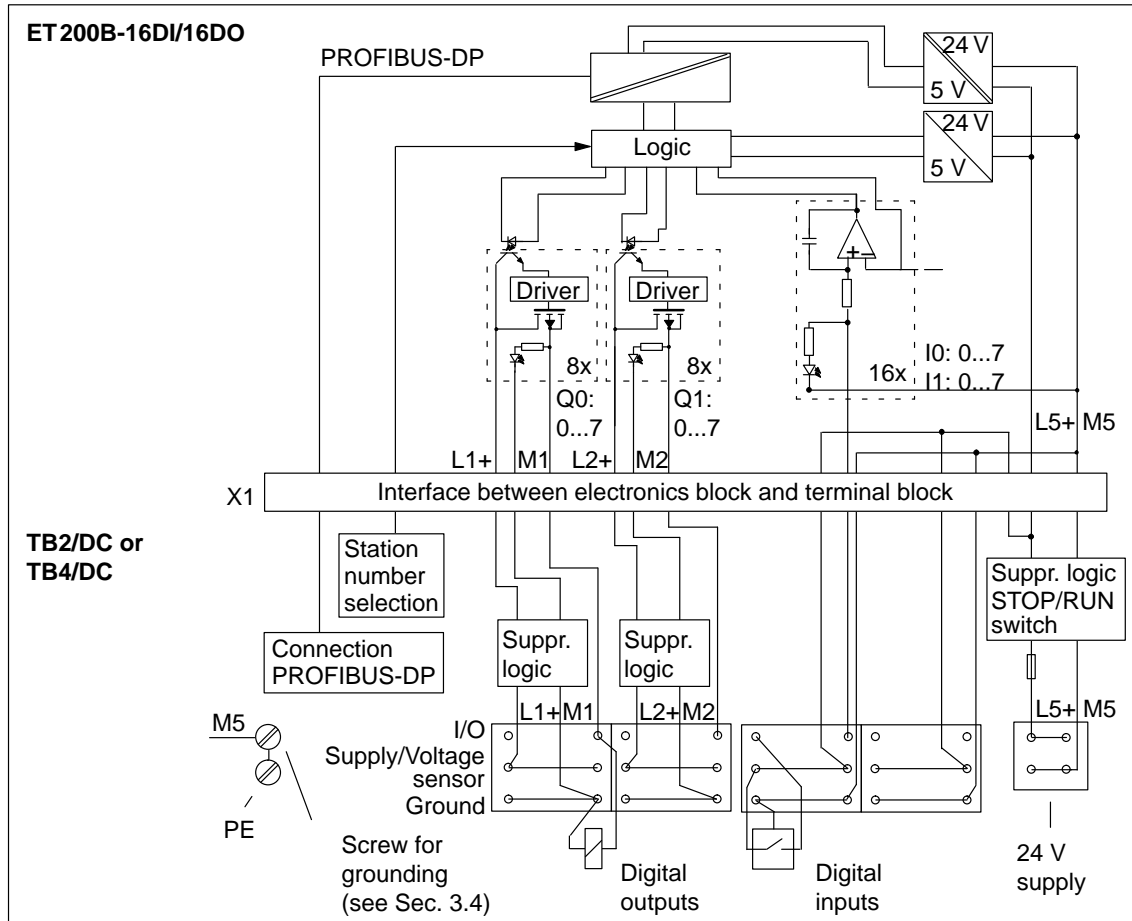


Figure 7-45 Block Diagram: ET 200B-16DI/16DO (6ES7 133-0BL00-0XB0) and TB2/DC or TB4/DC

**Block Diagram** Simplified diagram of the potential for the ET 200B-16DI/16DO and TB2-4/DC:

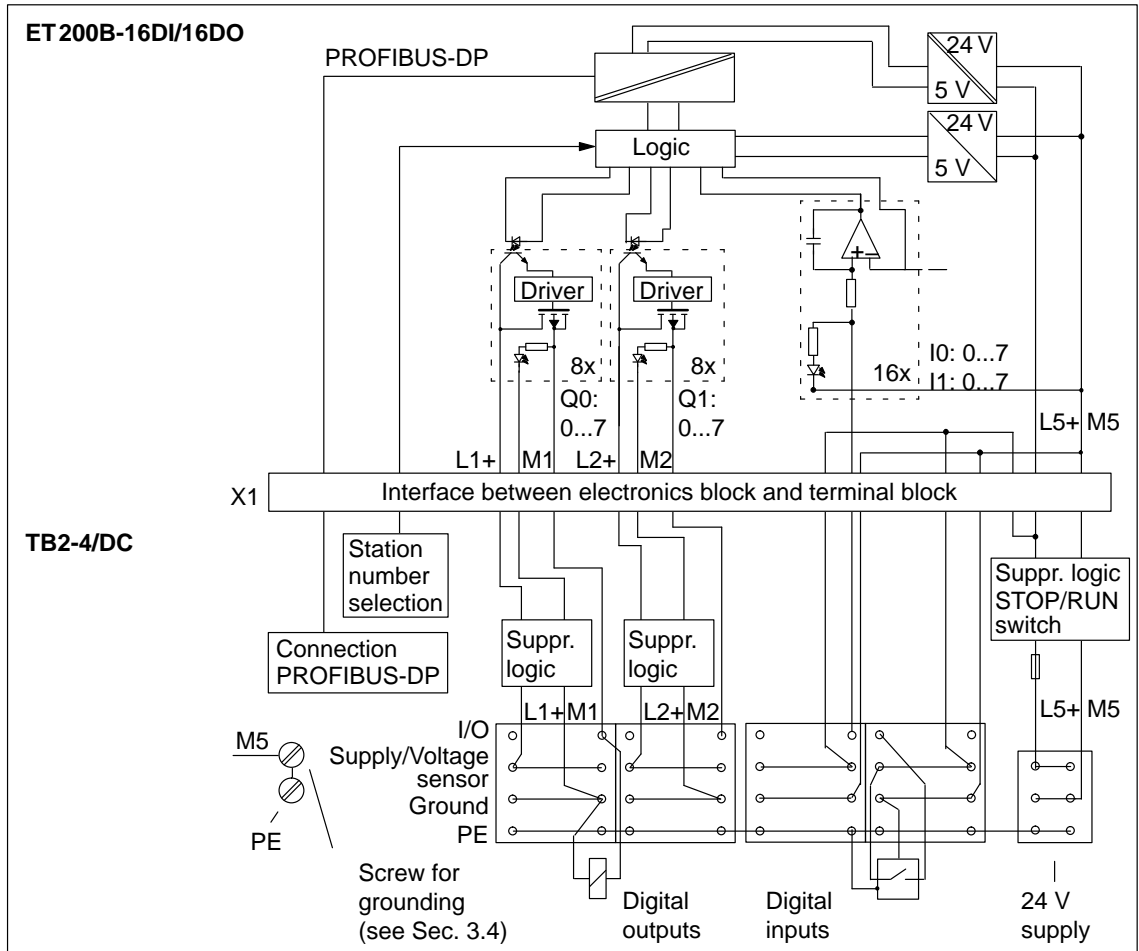


Figure 7-46 Block Diagram: ET 200B-16DI/16DO (6ES7 133-0BL00-0XB0) and TB2-4/DC

**Pin Assignment**

The table below shows the pin assignment of the terminal blocks for ET 200B-16DI/16DO. For the sake of clarity, the table also shows the terminal numbering of the terminal blocks, taking the TB2-4/DC by way of example.

Table 7-12 Pin Assignment of Terminal Blocks TB2/DC, TB2-4/DC, TB4/DC and TB4M/DC for ET 200B-16DI/16DO (6ES7 133-0BL00-0XB0)

| Terminal numbering TB2-4/DC   |                 |                 |                              |    |    |    |    |    |    |    |    |    |    |    |    |                 |                 |                 |                              |                 |    |    |    |                 |    |    |    |                 |    |    |    |                 |     |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                  |    |    |   |                  |    |    |   |                  |    |    |   |                  |    |    |   |                  |    |    |   |                  |    |    |   |                  |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |
|---|-----------------|-----------------|------------------------------|----|----|----|----|----|----|----|----|----|----|----|----|-----------------|-----------------|-----------------|------------------------------|-----------------|----|----|----|-----------------|----|----|----|-----------------|----|----|----|-----------------|-----|----|---|-----------------|----|----|---|-----------------|----|----|---|-----------------|----|----|---|-----------------|----|----|---|-----------------|----|----|---|------------------|----|----|---|------------------|----|----|---|------------------|----|----|---|------------------|----|----|---|------------------|----|----|---|------------------|----|----|---|------------------|----|----|---|-----------------|----|----|---|-----------------|----|----|---|-----------------|----|----|---|-----------------|----|----|---|-----------------|----|----|---|-----------------|----|----|---|-----------------|----|----|---|-----------------|----|----|---|-----------------|----|----|---|-----------------|----|----|---|-----------------|----|----|---|-----------------|----|----|---|
| 1   | 2               | 3               | 4                            | 5  | 6  | 7  | 8  | 9  | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17              | 18              | 19              | 20                           | 21              | 22 | 23 | 24 | 25              | 26 | 27 | 28 | 29              | 30 | 31 | 32 |                 |     |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                  |    |    |   |                  |    |    |   |                  |    |    |   |                  |    |    |   |                  |    |    |   |                  |    |    |   |                  |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |
| 33  | 34              | 35              | 36                           | 37 | 38 | 39 | 40 | 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49              | 50              | 51              | 52                           | 53              | 54 | 55 | 56 | 57              | 58 | 59 | 60 | 61              | 62 | 63 | 64 | L5+             | L5+ |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                  |    |    |   |                  |    |    |   |                  |    |    |   |                  |    |    |   |                  |    |    |   |                  |    |    |   |                  |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |
| 65  | 66              | 67              | 68                           | 69 | 70 | 71 | 72 | 73 | 74 | 75 | 76 | 77 | 78 | 79 | 80 | 81              | 82              | 83              | 84                           | 85              | 86 | 87 | 88 | 89              | 90 | 91 | 92 | 93              | 94 | 95 | 96 | M5              | M5  |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                  |    |    |   |                  |    |    |   |                  |    |    |   |                  |    |    |   |                  |    |    |   |                  |    |    |   |                  |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |
| <table border="1"> <thead> <tr> <th>Terminal tier 1</th> <th>Terminal tier 1</th> <th>Terminal tier 3</th> <th>Terminal tier 4<sup>1</sup></th> </tr> </thead> <tbody> <tr> <td>1 Q0: Output .0</td> <td>33</td> <td>65</td> <td>⊕</td> </tr> <tr> <td>2 Q0: Output .1</td> <td>34</td> <td>66</td> <td>⊕</td> </tr> <tr> <td>3 Q0: Output .2</td> <td>35</td> <td>67</td> <td>⊕</td> </tr> <tr> <td>4 Q0: Output .3</td> <td>36</td> <td>68</td> <td>⊕</td> </tr> <tr> <td>5 Q0: Output .4</td> <td>37</td> <td>69</td> <td>⊕</td> </tr> <tr> <td>6 Q0: Output .5</td> <td>38</td> <td>70</td> <td>⊕</td> </tr> <tr> <td>7 Q0: Output .6</td> <td>39</td> <td>71</td> <td>⊕</td> </tr> <tr> <td>8 Q0: Output .7</td> <td>40</td> <td>72</td> <td>⊕</td> </tr> <tr> <td>9 Q1: Output .0</td> <td>41</td> <td>73</td> <td>⊕</td> </tr> <tr> <td>10 Q1: Output .1</td> <td>42</td> <td>74</td> <td>⊕</td> </tr> <tr> <td>11 Q1: Output .2</td> <td>43</td> <td>75</td> <td>⊕</td> </tr> <tr> <td>12 Q1: Output .3</td> <td>44</td> <td>76</td> <td>⊕</td> </tr> <tr> <td>13 Q1: Output .4</td> <td>45</td> <td>77</td> <td>⊕</td> </tr> <tr> <td>14 Q1: Output .5</td> <td>46</td> <td>78</td> <td>⊕</td> </tr> <tr> <td>15 Q1: Output .6</td> <td>47</td> <td>79</td> <td>⊕</td> </tr> <tr> <td>16 Q1: Output .7</td> <td>48</td> <td>80</td> <td>⊕</td> </tr> <tr> <td>17 I0: Input .0</td> <td>49</td> <td>81</td> <td>⊕</td> </tr> <tr> <td>18 I0: Input .1</td> <td>50</td> <td>82</td> <td>⊕</td> </tr> <tr> <td>19 I0: Input .2</td> <td>51</td> <td>83</td> <td>⊕</td> </tr> <tr> <td>20 I0: Input .3</td> <td>52</td> <td>84</td> <td>⊕</td> </tr> <tr> <td>21 I0: Input .4</td> <td>53</td> <td>85</td> <td>⊕</td> </tr> <tr> <td>22 I0: Input .5</td> <td>54</td> <td>86</td> <td>⊕</td> </tr> <tr> <td>23 I0: Input .6</td> <td>55</td> <td>87</td> <td>⊕</td> </tr> <tr> <td>24 I0: Input .7</td> <td>56</td> <td>88</td> <td>⊕</td> </tr> <tr> <td>25 I1: Input .0</td> <td>57</td> <td>89</td> <td>⊕</td> </tr> <tr> <td>26 I1: Input .1</td> <td>58</td> <td>90</td> <td>⊕</td> </tr> <tr> <td>27 I1: Input .2</td> <td>59</td> <td>91</td> <td>⊕</td> </tr> <tr> <td>28 I1: Input .3</td> <td>60</td> <td>92</td> <td>⊕</td> </tr> </tbody> </table> |                 |                 |                              |    |    |    |    |    |    |    |    |    |    |    |    | Terminal tier 1 | Terminal tier 1 | Terminal tier 3 | Terminal tier 4 <sup>1</sup> | 1 Q0: Output .0 | 33 | 65 | ⊕  | 2 Q0: Output .1 | 34 | 66 | ⊕  | 3 Q0: Output .2 | 35 | 67 | ⊕  | 4 Q0: Output .3 | 36  | 68 | ⊕ | 5 Q0: Output .4 | 37 | 69 | ⊕ | 6 Q0: Output .5 | 38 | 70 | ⊕ | 7 Q0: Output .6 | 39 | 71 | ⊕ | 8 Q0: Output .7 | 40 | 72 | ⊕ | 9 Q1: Output .0 | 41 | 73 | ⊕ | 10 Q1: Output .1 | 42 | 74 | ⊕ | 11 Q1: Output .2 | 43 | 75 | ⊕ | 12 Q1: Output .3 | 44 | 76 | ⊕ | 13 Q1: Output .4 | 45 | 77 | ⊕ | 14 Q1: Output .5 | 46 | 78 | ⊕ | 15 Q1: Output .6 | 47 | 79 | ⊕ | 16 Q1: Output .7 | 48 | 80 | ⊕ | 17 I0: Input .0 | 49 | 81 | ⊕ | 18 I0: Input .1 | 50 | 82 | ⊕ | 19 I0: Input .2 | 51 | 83 | ⊕ | 20 I0: Input .3 | 52 | 84 | ⊕ | 21 I0: Input .4 | 53 | 85 | ⊕ | 22 I0: Input .5 | 54 | 86 | ⊕ | 23 I0: Input .6 | 55 | 87 | ⊕ | 24 I0: Input .7 | 56 | 88 | ⊕ | 25 I1: Input .0 | 57 | 89 | ⊕ | 26 I1: Input .1 | 58 | 90 | ⊕ | 27 I1: Input .2 | 59 | 91 | ⊕ | 28 I1: Input .3 | 60 | 92 | ⊕ |
| Terminal tier 1   | Terminal tier 1 | Terminal tier 3 | Terminal tier 4 <sup>1</sup> |    |    |    |    |    |    |    |    |    |    |    |    |                 |                 |                 |                              |                 |    |    |    |                 |    |    |    |                 |    |    |    |                 |     |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                  |    |    |   |                  |    |    |   |                  |    |    |   |                  |    |    |   |                  |    |    |   |                  |    |    |   |                  |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |
| 1 Q0: Output .0   | 33              | 65              | ⊕                            |    |    |    |    |    |    |    |    |    |    |    |    |                 |                 |                 |                              |                 |    |    |    |                 |    |    |    |                 |    |    |    |                 |     |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                  |    |    |   |                  |    |    |   |                  |    |    |   |                  |    |    |   |                  |    |    |   |                  |    |    |   |                  |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |
| 2 Q0: Output .1   | 34              | 66              | ⊕                            |    |    |    |    |    |    |    |    |    |    |    |    |                 |                 |                 |                              |                 |    |    |    |                 |    |    |    |                 |    |    |    |                 |     |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                  |    |    |   |                  |    |    |   |                  |    |    |   |                  |    |    |   |                  |    |    |   |                  |    |    |   |                  |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |
| 3 Q0: Output .2   | 35              | 67              | ⊕                            |    |    |    |    |    |    |    |    |    |    |    |    |                 |                 |                 |                              |                 |    |    |    |                 |    |    |    |                 |    |    |    |                 |     |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                  |    |    |   |                  |    |    |   |                  |    |    |   |                  |    |    |   |                  |    |    |   |                  |    |    |   |                  |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |
| 4 Q0: Output .3   | 36              | 68              | ⊕                            |    |    |    |    |    |    |    |    |    |    |    |    |                 |                 |                 |                              |                 |    |    |    |                 |    |    |    |                 |    |    |    |                 |     |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                  |    |    |   |                  |    |    |   |                  |    |    |   |                  |    |    |   |                  |    |    |   |                  |    |    |   |                  |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |
| 5 Q0: Output .4   | 37              | 69              | ⊕                            |    |    |    |    |    |    |    |    |    |    |    |    |                 |                 |                 |                              |                 |    |    |    |                 |    |    |    |                 |    |    |    |                 |     |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                  |    |    |   |                  |    |    |   |                  |    |    |   |                  |    |    |   |                  |    |    |   |                  |    |    |   |                  |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |
| 6 Q0: Output .5   | 38              | 70              | ⊕                            |    |    |    |    |    |    |    |    |    |    |    |    |                 |                 |                 |                              |                 |    |    |    |                 |    |    |    |                 |    |    |    |                 |     |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                  |    |    |   |                  |    |    |   |                  |    |    |   |                  |    |    |   |                  |    |    |   |                  |    |    |   |                  |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |
| 7 Q0: Output .6   | 39              | 71              | ⊕                            |    |    |    |    |    |    |    |    |    |    |    |    |                 |                 |                 |                              |                 |    |    |    |                 |    |    |    |                 |    |    |    |                 |     |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                  |    |    |   |                  |    |    |   |                  |    |    |   |                  |    |    |   |                  |    |    |   |                  |    |    |   |                  |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |
| 8 Q0: Output .7   | 40              | 72              | ⊕                            |    |    |    |    |    |    |    |    |    |    |    |    |                 |                 |                 |                              |                 |    |    |    |                 |    |    |    |                 |    |    |    |                 |     |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                  |    |    |   |                  |    |    |   |                  |    |    |   |                  |    |    |   |                  |    |    |   |                  |    |    |   |                  |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |
| 9 Q1: Output .0   | 41              | 73              | ⊕                            |    |    |    |    |    |    |    |    |    |    |    |    |                 |                 |                 |                              |                 |    |    |    |                 |    |    |    |                 |    |    |    |                 |     |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                  |    |    |   |                  |    |    |   |                  |    |    |   |                  |    |    |   |                  |    |    |   |                  |    |    |   |                  |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |
| 10 Q1: Output .1  | 42              | 74              | ⊕                            |    |    |    |    |    |    |    |    |    |    |    |    |                 |                 |                 |                              |                 |    |    |    |                 |    |    |    |                 |    |    |    |                 |     |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                  |    |    |   |                  |    |    |   |                  |    |    |   |                  |    |    |   |                  |    |    |   |                  |    |    |   |                  |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |
| 11 Q1: Output .2  | 43              | 75              | ⊕                            |    |    |    |    |    |    |    |    |    |    |    |    |                 |                 |                 |                              |                 |    |    |    |                 |    |    |    |                 |    |    |    |                 |     |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                  |    |    |   |                  |    |    |   |                  |    |    |   |                  |    |    |   |                  |    |    |   |                  |    |    |   |                  |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |
| 12 Q1: Output .3  | 44              | 76              | ⊕                            |    |    |    |    |    |    |    |    |    |    |    |    |                 |                 |                 |                              |                 |    |    |    |                 |    |    |    |                 |    |    |    |                 |     |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                  |    |    |   |                  |    |    |   |                  |    |    |   |                  |    |    |   |                  |    |    |   |                  |    |    |   |                  |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |
| 13 Q1: Output .4  | 45              | 77              | ⊕                            |    |    |    |    |    |    |    |    |    |    |    |    |                 |                 |                 |                              |                 |    |    |    |                 |    |    |    |                 |    |    |    |                 |     |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                  |    |    |   |                  |    |    |   |                  |    |    |   |                  |    |    |   |                  |    |    |   |                  |    |    |   |                  |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |
| 14 Q1: Output .5  | 46              | 78              | ⊕                            |    |    |    |    |    |    |    |    |    |    |    |    |                 |                 |                 |                              |                 |    |    |    |                 |    |    |    |                 |    |    |    |                 |     |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                  |    |    |   |                  |    |    |   |                  |    |    |   |                  |    |    |   |                  |    |    |   |                  |    |    |   |                  |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |
| 15 Q1: Output .6  | 47              | 79              | ⊕                            |    |    |    |    |    |    |    |    |    |    |    |    |                 |                 |                 |                              |                 |    |    |    |                 |    |    |    |                 |    |    |    |                 |     |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                  |    |    |   |                  |    |    |   |                  |    |    |   |                  |    |    |   |                  |    |    |   |                  |    |    |   |                  |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |
| 16 Q1: Output .7  | 48              | 80              | ⊕                            |    |    |    |    |    |    |    |    |    |    |    |    |                 |                 |                 |                              |                 |    |    |    |                 |    |    |    |                 |    |    |    |                 |     |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                  |    |    |   |                  |    |    |   |                  |    |    |   |                  |    |    |   |                  |    |    |   |                  |    |    |   |                  |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |
| 17 I0: Input .0   | 49              | 81              | ⊕                            |    |    |    |    |    |    |    |    |    |    |    |    |                 |                 |                 |                              |                 |    |    |    |                 |    |    |    |                 |    |    |    |                 |     |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                  |    |    |   |                  |    |    |   |                  |    |    |   |                  |    |    |   |                  |    |    |   |                  |    |    |   |                  |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |
| 18 I0: Input .1   | 50              | 82              | ⊕                            |    |    |    |    |    |    |    |    |    |    |    |    |                 |                 |                 |                              |                 |    |    |    |                 |    |    |    |                 |    |    |    |                 |     |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                  |    |    |   |                  |    |    |   |                  |    |    |   |                  |    |    |   |                  |    |    |   |                  |    |    |   |                  |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |
| 19 I0: Input .2   | 51              | 83              | ⊕                            |    |    |    |    |    |    |    |    |    |    |    |    |                 |                 |                 |                              |                 |    |    |    |                 |    |    |    |                 |    |    |    |                 |     |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                  |    |    |   |                  |    |    |   |                  |    |    |   |                  |    |    |   |                  |    |    |   |                  |    |    |   |                  |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |
| 20 I0: Input .3   | 52              | 84              | ⊕                            |    |    |    |    |    |    |    |    |    |    |    |    |                 |                 |                 |                              |                 |    |    |    |                 |    |    |    |                 |    |    |    |                 |     |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                  |    |    |   |                  |    |    |   |                  |    |    |   |                  |    |    |   |                  |    |    |   |                  |    |    |   |                  |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |
| 21 I0: Input .4   | 53              | 85              | ⊕                            |    |    |    |    |    |    |    |    |    |    |    |    |                 |                 |                 |                              |                 |    |    |    |                 |    |    |    |                 |    |    |    |                 |     |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                  |    |    |   |                  |    |    |   |                  |    |    |   |                  |    |    |   |                  |    |    |   |                  |    |    |   |                  |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |
| 22 I0: Input .5   | 54              | 86              | ⊕                            |    |    |    |    |    |    |    |    |    |    |    |    |                 |                 |                 |                              |                 |    |    |    |                 |    |    |    |                 |    |    |    |                 |     |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                  |    |    |   |                  |    |    |   |                  |    |    |   |                  |    |    |   |                  |    |    |   |                  |    |    |   |                  |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |
| 23 I0: Input .6   | 55              | 87              | ⊕                            |    |    |    |    |    |    |    |    |    |    |    |    |                 |                 |                 |                              |                 |    |    |    |                 |    |    |    |                 |    |    |    |                 |     |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                  |    |    |   |                  |    |    |   |                  |    |    |   |                  |    |    |   |                  |    |    |   |                  |    |    |   |                  |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |
| 24 I0: Input .7   | 56              | 88              | ⊕                            |    |    |    |    |    |    |    |    |    |    |    |    |                 |                 |                 |                              |                 |    |    |    |                 |    |    |    |                 |    |    |    |                 |     |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                  |    |    |   |                  |    |    |   |                  |    |    |   |                  |    |    |   |                  |    |    |   |                  |    |    |   |                  |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |
| 25 I1: Input .0   | 57              | 89              | ⊕                            |    |    |    |    |    |    |    |    |    |    |    |    |                 |                 |                 |                              |                 |    |    |    |                 |    |    |    |                 |    |    |    |                 |     |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                  |    |    |   |                  |    |    |   |                  |    |    |   |                  |    |    |   |                  |    |    |   |                  |    |    |   |                  |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |
| 26 I1: Input .1   | 58              | 90              | ⊕                            |    |    |    |    |    |    |    |    |    |    |    |    |                 |                 |                 |                              |                 |    |    |    |                 |    |    |    |                 |    |    |    |                 |     |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                  |    |    |   |                  |    |    |   |                  |    |    |   |                  |    |    |   |                  |    |    |   |                  |    |    |   |                  |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |
| 27 I1: Input .2   | 59              | 91              | ⊕                            |    |    |    |    |    |    |    |    |    |    |    |    |                 |                 |                 |                              |                 |    |    |    |                 |    |    |    |                 |    |    |    |                 |     |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                  |    |    |   |                  |    |    |   |                  |    |    |   |                  |    |    |   |                  |    |    |   |                  |    |    |   |                  |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |
| 28 I1: Input .3   | 60              | 92              | ⊕                            |    |    |    |    |    |    |    |    |    |    |    |    |                 |                 |                 |                              |                 |    |    |    |                 |    |    |    |                 |    |    |    |                 |     |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                  |    |    |   |                  |    |    |   |                  |    |    |   |                  |    |    |   |                  |    |    |   |                  |    |    |   |                  |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |                 |    |    |   |

Table 7-12 Pin Assignment of Terminal Blocks TB2/DC, TB2-4/DC, TB4/DC and TB4M/DC for ET 200B-16DI/16DO (6ES7 133-0BL00-0XB0), continued

| Terminal tier 1 |              | Terminal tier 1 |   | Terminal tier 3 |  | Terminal tier 4 <sup>1</sup> |   |
|-----------------|--------------|-----------------|---|-----------------|--|------------------------------|---|
| 29              | II: Input .4 | 61              | 24 V (sensor voltage) (internally jumpered, connected to L5+) | 93              | Ground (sensor voltage) (internally jumpered, connected to M5) | ⊕                            | PE (internally jumpered, but not connected to PE screw) |
| 30              | II: Input .5 | 62              |   | 94              |  | ⊕                            |   |
| 31              | II: Input .6 | 63              |   | 95              |  | ⊕                            |   |
| 32              | II: Input .7 | 64              |   | 96              |  | ⊕                            |   |
| -               |              | L5+             | Voltage supply, internal logic <b>and</b> sensor voltage 24 V | M5              | Ground connection, internal logic <b>and</b> sensor voltage    | ⊕                            | PE (internally jumpered, but not connected to PE screw) |
| -               |              | L5+             | Voltage supply, internal logic <b>and</b> sensor voltage 24 V | M5              | Ground connection, internal logic <b>and</b> sensor voltage    | ⊕                            |   |

<sup>1</sup> TB2-4/DC only; in the TB4M/DC tier 4 is available for additional ground connections (see Section 7.2.7)

**Important Note on Wiring**

The following notes are important as regards the wiring of the ET 200B-16DI/16DO:

- The terminals for PE on the 4-tier terminal block are not connected to the PE connection of terminal block TB2-4/DC.
- If all actuators are connected by two-wire cables to the TB2/DC, TB4/DC or TB2-4/DC, connect the ground of an actuator and the supply for the reference potential per group by means of a DIN 46231 cable cleat.
- L1+, L2+ and L5+ or M1, M2 and M5 are **not** interconnected.
- L5+ and terminals 49 ... 64 are interconnected, as are M5 and terminals 81 ... 96.
- The two L5+ terminals are also internally interconnected.

**Fuse**

The 24 V sensor supply is protected by fuse F1 (2.5 A) in the terminal blocks. Nevertheless, make sure that the current does not exceed the specifications in the technical data for the electronics block.



**Technical Data**

The technical data of electronics block ET 200B-16DI/16DO is listed in the tables below.

| <b>Technical Data</b>   |   | <b>Inputs (continued)</b>  |                                |
|---|---|--|--------------------------------|
| Baud rates*   | 9.6/19.2/93.75/187.5/500/<br>1500/3000/6000/<br>12000 kbaud | Input current<br>For "1" signal  | Typ. 4 mA at 24 V<br>Min. 2 mA |
| Bus protocol  | PROFIBUS-DP   | Delay of inputs  | 3 ms                           |
| FREEZE and SYNC capability  | Yes   | Connection of 2-wire<br>BERO   | Possible                       |
| Galvanic isolation to SI-<br>NEC L2-DP bus                                | Yes   | • Quiescent current  | ≤ 1.5 mA                       |
| Power losses  | Max. 5.5 W  | Connection of mechanical<br>switches                                   | Possible                       |
| Weight (EB and TB)  | Approx. 800 g (28 oz.)                                      | Cable length of sensors  |                                |
| Dimensions (EB and TB:<br>W x H x D)                                      | 235 x 130 x 60  | • Unshielded   | Max. 100 m (328 ft.)           |
| <b>Diagnostics functions</b>  |   | <b>Outputs</b>   |                                |
| Voltage monitoring  | Green "RUN" LED   | Number of outputs  | 16                             |
| Bus monitoring SINEC<br>L2-DP   | Red "BF" LED  | Galvanic isolation   | Yes                            |
| Group diagnostics for<br>short-circuit, load voltage<br>failure           | Red "DIA" LED   | • In groups of   | 8                              |
| Load voltage monitoring   | Green "L1+/L2+" LEDs  | Output voltage   |                                |
| Status of inputs and out-<br>puts   | Green LEDs  | • For "0" signal   | Max. 2 V (idle)                |
|   |   | • For "1" signal   | Min. (supply voltage<br>– 3 V) |
|   |   | Output current   |                                |
|   |   | • For "0" signal   | Max. 1 mA                      |
|   |   | • For "1" signal   | Max. 0.5 A                     |
|   |   | Delay of outputs   |                                |
|   |   | • From "0" to "1"  | Approx. 20 μs                  |
|   |   | • From "1" to "0"  | Max. 0.5 ms                    |
|   |   | Switching frequency  |                                |
|   |   | • Resistive load   | Max. 1000 Hz                   |
|   |   | • Inductive load   | Max. 0.5 Hz                    |
|   |   | • Lamp load  | Max. 8 Hz                      |
|   |   | Short-circuit protection   | Yes                            |
|   |   | Load current per group   |                                |
|   |   | • Total current  | Max. 2 A                       |
|   |   | Lamp load  | Max. 5 W                       |
|   |   | Setting a digital input  | Possible                       |
|   |   | Limit of inductive cutoff<br>voltage                                   | Typ. (L1+/L2+) – 55 V          |
|   |   | Cable length   | Max. 100 m (328 ft.)           |
| <b>Supply voltage for outputs, load voltage supply and internal logic</b> |   | * In operation with the IM 308-B, the maximum baud rate is 1500 kbaud. |                                |
| Supply voltages (L1+,<br>L2+, L5+)  |   |  |                                |
| • Rated value   | 24 V DC   |  |                                |
| • Permissible range   | 18.5 ... 30.2 V   |  |                                |
| • Value for t < 0.5 s   | 35 V  |  |                                |
| Current consumption from<br>L5+   |   |  |                                |
| • Logic   | Typ. 85 mA  |  |                                |
| • Sensors   | Max. 1 A  |  |                                |
| I <sup>2</sup> t (for inrush current)                                     | ≤ 0.05 A <sup>2</sup> s                                     |  |                                |
| <b>Inputs</b>   |   |  |                                |
| Number of inputs  | 16  |  |                                |
| Galvanic isolation to inter-<br>nal electronic circuits                   | No  |  |                                |
| Input voltage   |   |  |                                |
| • Rated value   | 24 V DC   |  |                                |
| • For "0" signal  | – 30 V ... 5 V  |  |                                |
| • For "1" signal  | 13 V ... 30 V   |  |                                |

### 7.3.10 Electronics Blocks ET 200B-24DI/8DO (6ES7 133-0BN01-0XB0) and ET 200B-24DI/8DO 0.2ms (6ES7 133-0BN11-0XB0)

**Characteristics** The ET 200B-24DI/8DO and ET 200B-24DI/8DO 0.2ms electronics blocks have the following characteristics:

- 24 inputs, non-floating
- 8 outputs, floating in groups of 8
- Input voltage: 24 V DC
- Input delay:
  - 6ES7 133-0BN01-0XB0 → 3 ms
  - 6ES7 133-0BN11-0XB0 → 0.2 ms
- Load voltage: 24 V DC
- Possible terminal blocks: TB2/DC, TB2-4/DC, TB4/DC, TB4M/DC

**Dimensional Drawing** See Figure 7-22 for the precise dimensions.

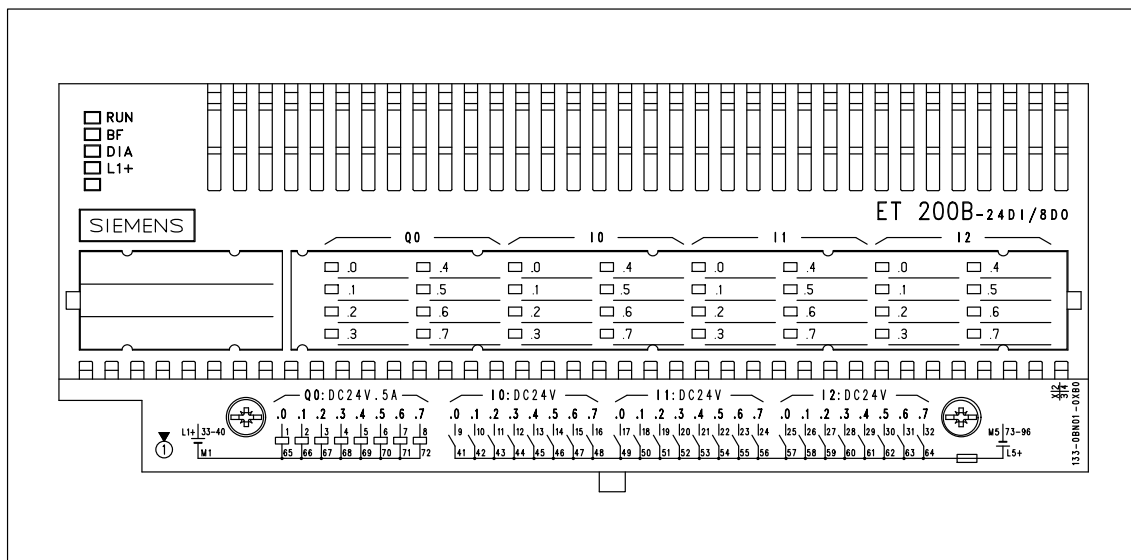


Figure 7-47 Front Elevation: ET 200B-24DI/8DO (6ES7 133-0BN01-0XB0) and ET 200B-24DI/8DO 0.2ms (6ES7 133-0BN11-0XB0)

**Block Diagram**

Simplified diagram of the potential for the ET 200B-24DI/8DO or ET 200B-24DI/8DO 0.2 ms and TB2/DC or TB4/DC:

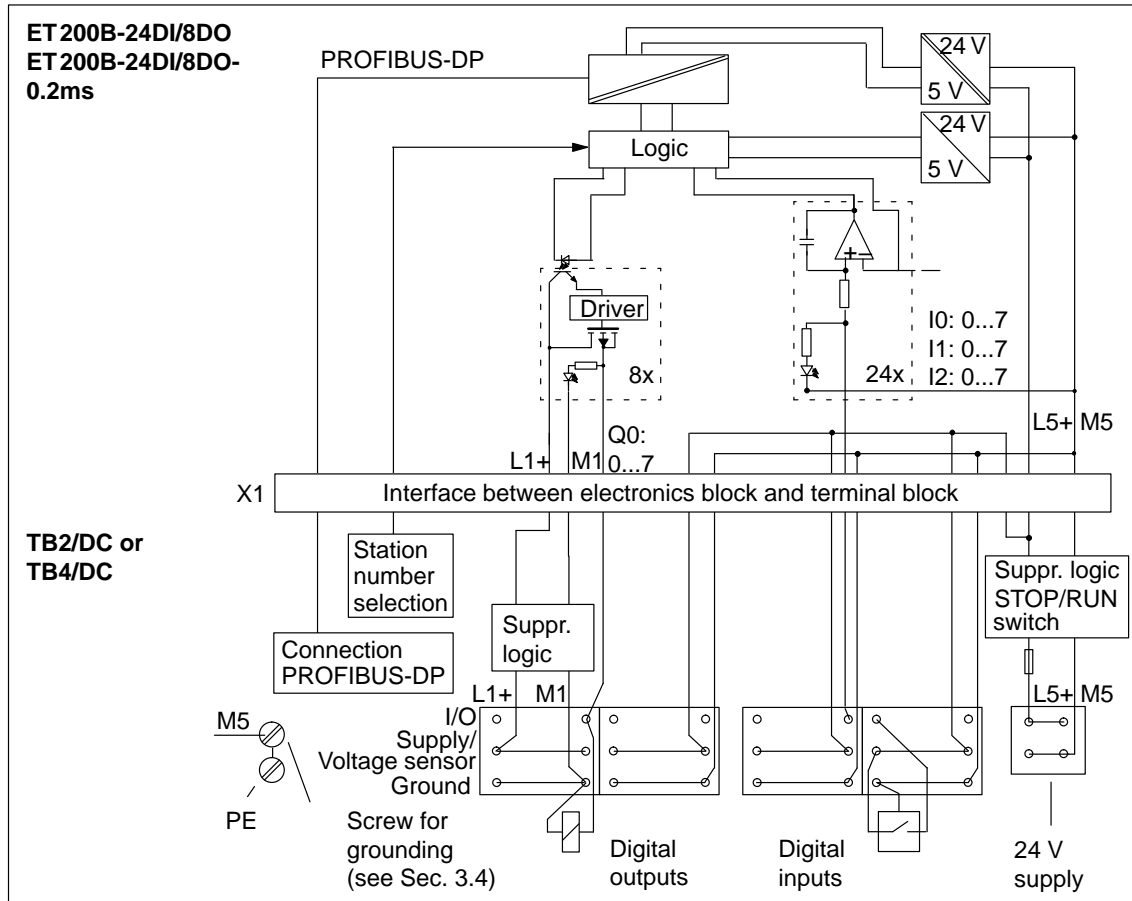


Figure 7-48 Block Diagram: ET 200B-24DI/8DO (6ES7 133-0BN01-0XB0) or ET 200B-24DI/8DO 0.2ms (6ES7 133-0BN11-0XB0) and TB2/DC or TB4/DC

**Block Diagram**

Simplified diagram of the potential for the ET 200B-24DI/8DO or ET 200B-24DI/8DO 0.2 ms and TB2-4/DC:

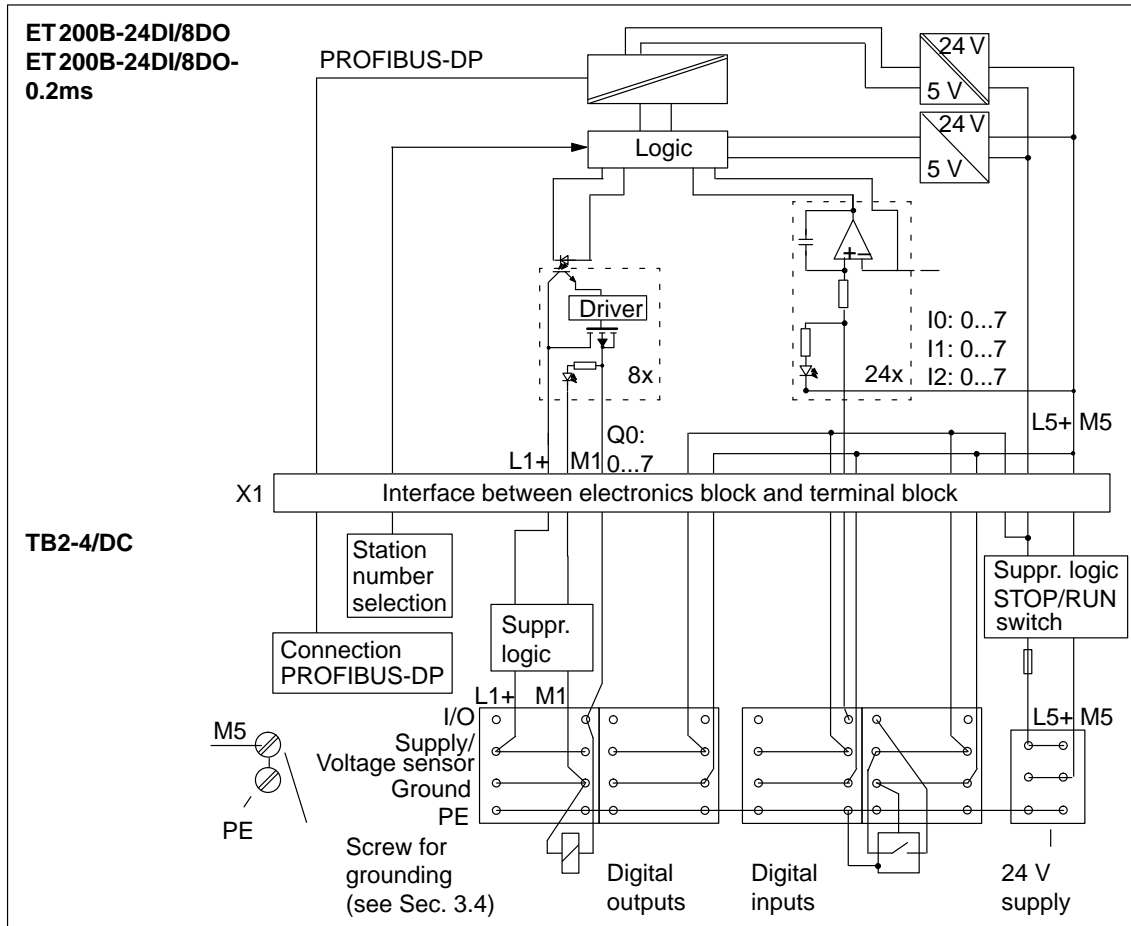


Figure 7-49 Block Diagram: ET 200B-24DI/8DO (6ES7 133-0BN01-0XB0) or ET 200B-24DI/8DO 0.2ms (6ES7 133-0BN11-0XB0) and TB2-4/DC

**Pin Assignment**

The table below shows the pin assignment of the terminal blocks for ET 200B-24DI/8DO and ET 200B-24DI/8DO 0.2 ms. For the sake of clarity, the table also shows the terminal numbering of the terminal blocks, taking the TB2-4/DC by way of example.

Table 7-13 Pin Assignment of Terminal Blocks TB2/DC; TB2-4/DC and TB4/DC for ET 200B-24DI/8DO (6ES7 133-0BN01-0XB0) and ET 200B-24DI/8DO 0.2ms (6ES7 133-0BN11-0XB0)

| Terminal numbering TB2-4/DC  |                 |                 |   |    |  |    |   |    |    |    |    |    |    |    |    |                 |                 |                 |                              |    |               |    |   |    |  |    |   |    |               |    |    |     |     |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |              |    |   |    |  |   |  |    |              |    |    |   |    |              |    |    |   |    |              |    |    |   |    |              |    |    |   |    |              |    |    |   |    |              |    |    |   |    |              |    |    |   |    |              |    |  |    |   |  |    |              |    |  |    |   |    |              |    |  |    |   |    |              |    |  |    |   |    |              |    |  |    |   |    |              |    |  |    |   |    |              |    |  |    |   |    |              |    |  |    |   |    |              |    |  |    |   |  |    |              |    |  |    |   |
|--|-----------------|-----------------|---|----|--|----|---|----|----|----|----|----|----|----|----|-----------------|-----------------|-----------------|------------------------------|----|---------------|----|---|----|--|----|---|----|---------------|----|----|-----|-----|---------------|----|----|---|---|---------------|----|----|---|---|---------------|----|----|---|---|---------------|----|----|---|---|---------------|----|----|---|---|---------------|----|----|---|---|--------------|----|---|----|--|---|--|----|--------------|----|----|---|----|--------------|----|----|---|----|--------------|----|----|---|----|--------------|----|----|---|----|--------------|----|----|---|----|--------------|----|----|---|----|--------------|----|----|---|----|--------------|----|--|----|---|--|----|--------------|----|--|----|---|----|--------------|----|--|----|---|----|--------------|----|--|----|---|----|--------------|----|--|----|---|----|--------------|----|--|----|---|----|--------------|----|--|----|---|----|--------------|----|--|----|---|----|--------------|----|--|----|---|--|----|--------------|----|--|----|---|
| 1  | 2               | 3               | 4   | 5  | 6  | 7  | 8   | 9  | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17              | 18              | 19              | 20                           | 21 | 22            | 23 | 24  | 25 | 26                                       | 27 | 28  | 29 | 30            | 31 | 32 |     |     |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |              |    |   |    |  |   |  |    |              |    |    |   |    |              |    |    |   |    |              |    |    |   |    |              |    |    |   |    |              |    |    |   |    |              |    |    |   |    |              |    |    |   |    |              |    |  |    |   |  |    |              |    |  |    |   |    |              |    |  |    |   |    |              |    |  |    |   |    |              |    |  |    |   |    |              |    |  |    |   |    |              |    |  |    |   |    |              |    |  |    |   |    |              |    |  |    |   |  |    |              |    |  |    |   |
| 33   | 34              | 35              | 36  | 37 | 38                                       | 39 | 40  | 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49              | 50              | 51              | 52                           | 53 | 54            | 55 | 56  | 57 | 58                                       | 59 | 60  | 61 | 62            | 63 | 64 | L5+ | L5+ |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |              |    |   |    |  |   |  |    |              |    |    |   |    |              |    |    |   |    |              |    |    |   |    |              |    |    |   |    |              |    |    |   |    |              |    |    |   |    |              |    |    |   |    |              |    |  |    |   |  |    |              |    |  |    |   |    |              |    |  |    |   |    |              |    |  |    |   |    |              |    |  |    |   |    |              |    |  |    |   |    |              |    |  |    |   |    |              |    |  |    |   |    |              |    |  |    |   |  |    |              |    |  |    |   |
| 65   | 66              | 67              | 68  | 69 | 70                                       | 71 | 72  | 73 | 74 | 75 | 76 | 77 | 78 | 79 | 80 | 81              | 82              | 83              | 84                           | 85 | 86            | 87 | 88  | 89 | 90                                       | 91 | 92  | 93 | 94            | 95 | 96 | M5  | M5  |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |              |    |   |    |  |   |  |    |              |    |    |   |    |              |    |    |   |    |              |    |    |   |    |              |    |    |   |    |              |    |    |   |    |              |    |    |   |    |              |    |    |   |    |              |    |  |    |   |  |    |              |    |  |    |   |    |              |    |  |    |   |    |              |    |  |    |   |    |              |    |  |    |   |    |              |    |  |    |   |    |              |    |  |    |   |    |              |    |  |    |   |    |              |    |  |    |   |  |    |              |    |  |    |   |
| <table border="1"> <thead> <tr> <th>Terminal tier 1</th> <th>Terminal tier 2</th> <th>Terminal tier 3</th> <th>Terminal tier 4<sup>1</sup></th> </tr> </thead> <tbody> <tr> <td>1</td> <td>Q0: Output .0</td> <td>33</td> <td rowspan="8">Voltage supply L1+ for channel group Q0: .0 to .7</td> <td>65</td> <td rowspan="8">Ground M1 for channel group Q0: .0 to .7</td> <td>⊕</td> <td rowspan="8">PE (internally jumped, but not connected to PE screw)</td> </tr> <tr> <td>2</td> <td>Q0: Output .1</td> <td>34</td> <td>66</td> <td>⊕</td> </tr> <tr> <td>3</td> <td>Q0: Output .2</td> <td>35</td> <td>67</td> <td>⊕</td> </tr> <tr> <td>4</td> <td>Q0: Output .3</td> <td>36</td> <td>68</td> <td>⊕</td> </tr> <tr> <td>5</td> <td>Q0: Output .4</td> <td>37</td> <td>69</td> <td>⊕</td> </tr> <tr> <td>6</td> <td>Q0: Output .5</td> <td>38</td> <td>70</td> <td>⊕</td> </tr> <tr> <td>7</td> <td>Q0: Output .6</td> <td>39</td> <td>71</td> <td>⊕</td> </tr> <tr> <td>8</td> <td>Q0: Output .7</td> <td>40</td> <td>72</td> <td>⊕</td> </tr> <tr> <td>9</td> <td>I0: Input .0</td> <td>41</td> <td rowspan="8">24 V (sensor voltage, connected to L5+)</td> <td>73</td> <td rowspan="8">Ground (sensor voltage, connected to M5)</td> <td>⊕</td> <td rowspan="8"></td> </tr> <tr> <td>10</td> <td>I0: Input .1</td> <td>42</td> <td>74</td> <td>⊕</td> </tr> <tr> <td>11</td> <td>I0: Input .2</td> <td>43</td> <td>75</td> <td>⊕</td> </tr> <tr> <td>12</td> <td>I0: Input .3</td> <td>44</td> <td>76</td> <td>⊕</td> </tr> <tr> <td>13</td> <td>I0: Input .4</td> <td>45</td> <td>77</td> <td>⊕</td> </tr> <tr> <td>14</td> <td>I0: Input .5</td> <td>46</td> <td>78</td> <td>⊕</td> </tr> <tr> <td>15</td> <td>I0: Input .6</td> <td>47</td> <td>79</td> <td>⊕</td> </tr> <tr> <td>16</td> <td>I0: Input .7</td> <td>48</td> <td>80</td> <td>⊕</td> </tr> <tr> <td>17</td> <td>I1: Input .0</td> <td>49</td> <td></td> <td>81</td> <td>⊕</td> <td rowspan="8"></td> </tr> <tr> <td>18</td> <td>I1: Input .1</td> <td>50</td> <td></td> <td>82</td> <td>⊕</td> </tr> <tr> <td>19</td> <td>I1: Input .2</td> <td>51</td> <td></td> <td>83</td> <td>⊕</td> </tr> <tr> <td>20</td> <td>I1: Input .3</td> <td>52</td> <td></td> <td>84</td> <td>⊕</td> </tr> <tr> <td>21</td> <td>I1: Input .4</td> <td>53</td> <td></td> <td>85</td> <td>⊕</td> </tr> <tr> <td>22</td> <td>I1: Input .5</td> <td>54</td> <td></td> <td>86</td> <td>⊕</td> </tr> <tr> <td>23</td> <td>I1: Input .6</td> <td>55</td> <td></td> <td>87</td> <td>⊕</td> </tr> <tr> <td>24</td> <td>I1: Input .7</td> <td>56</td> <td></td> <td>88</td> <td>⊕</td> </tr> <tr> <td>25</td> <td>I2: Input .0</td> <td>57</td> <td></td> <td>89</td> <td>⊕</td> <td rowspan="2"></td> </tr> <tr> <td>26</td> <td>I2: Input .1</td> <td>58</td> <td></td> <td>90</td> <td>⊕</td> </tr> </tbody> </table> |                 |                 |   |    |  |    |   |    |    |    |    |    |    |    |    | Terminal tier 1 | Terminal tier 2 | Terminal tier 3 | Terminal tier 4 <sup>1</sup> | 1  | Q0: Output .0 | 33 | Voltage supply L1+ for channel group Q0: .0 to .7 | 65 | Ground M1 for channel group Q0: .0 to .7 | ⊕  | PE (internally jumped, but not connected to PE screw) | 2  | Q0: Output .1 | 34 | 66 | ⊕   | 3   | Q0: Output .2 | 35 | 67 | ⊕ | 4 | Q0: Output .3 | 36 | 68 | ⊕ | 5 | Q0: Output .4 | 37 | 69 | ⊕ | 6 | Q0: Output .5 | 38 | 70 | ⊕ | 7 | Q0: Output .6 | 39 | 71 | ⊕ | 8 | Q0: Output .7 | 40 | 72 | ⊕ | 9 | I0: Input .0 | 41 | 24 V (sensor voltage, connected to L5+) | 73 | Ground (sensor voltage, connected to M5) | ⊕ |  | 10 | I0: Input .1 | 42 | 74 | ⊕ | 11 | I0: Input .2 | 43 | 75 | ⊕ | 12 | I0: Input .3 | 44 | 76 | ⊕ | 13 | I0: Input .4 | 45 | 77 | ⊕ | 14 | I0: Input .5 | 46 | 78 | ⊕ | 15 | I0: Input .6 | 47 | 79 | ⊕ | 16 | I0: Input .7 | 48 | 80 | ⊕ | 17 | I1: Input .0 | 49 |  | 81 | ⊕ |  | 18 | I1: Input .1 | 50 |  | 82 | ⊕ | 19 | I1: Input .2 | 51 |  | 83 | ⊕ | 20 | I1: Input .3 | 52 |  | 84 | ⊕ | 21 | I1: Input .4 | 53 |  | 85 | ⊕ | 22 | I1: Input .5 | 54 |  | 86 | ⊕ | 23 | I1: Input .6 | 55 |  | 87 | ⊕ | 24 | I1: Input .7 | 56 |  | 88 | ⊕ | 25 | I2: Input .0 | 57 |  | 89 | ⊕ |  | 26 | I2: Input .1 | 58 |  | 90 | ⊕ |
| Terminal tier 1  | Terminal tier 2 | Terminal tier 3 | Terminal tier 4 <sup>1</sup>                      |    |  |    |   |    |    |    |    |    |    |    |    |                 |                 |                 |                              |    |               |    |   |    |  |    |   |    |               |    |    |     |     |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |              |    |   |    |  |   |  |    |              |    |    |   |    |              |    |    |   |    |              |    |    |   |    |              |    |    |   |    |              |    |    |   |    |              |    |    |   |    |              |    |    |   |    |              |    |  |    |   |  |    |              |    |  |    |   |    |              |    |  |    |   |    |              |    |  |    |   |    |              |    |  |    |   |    |              |    |  |    |   |    |              |    |  |    |   |    |              |    |  |    |   |    |              |    |  |    |   |  |    |              |    |  |    |   |
| 1  | Q0: Output .0   | 33              | Voltage supply L1+ for channel group Q0: .0 to .7 | 65 | Ground M1 for channel group Q0: .0 to .7 | ⊕  | PE (internally jumped, but not connected to PE screw) |    |    |    |    |    |    |    |    |                 |                 |                 |                              |    |               |    |   |    |  |    |   |    |               |    |    |     |     |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |              |    |   |    |  |   |  |    |              |    |    |   |    |              |    |    |   |    |              |    |    |   |    |              |    |    |   |    |              |    |    |   |    |              |    |    |   |    |              |    |    |   |    |              |    |  |    |   |  |    |              |    |  |    |   |    |              |    |  |    |   |    |              |    |  |    |   |    |              |    |  |    |   |    |              |    |  |    |   |    |              |    |  |    |   |    |              |    |  |    |   |    |              |    |  |    |   |  |    |              |    |  |    |   |
| 2  | Q0: Output .1   | 34              |   | 66 |  | ⊕  |   |    |    |    |    |    |    |    |    |                 |                 |                 |                              |    |               |    |   |    |  |    |   |    |               |    |    |     |     |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |              |    |   |    |  |   |  |    |              |    |    |   |    |              |    |    |   |    |              |    |    |   |    |              |    |    |   |    |              |    |    |   |    |              |    |    |   |    |              |    |    |   |    |              |    |  |    |   |  |    |              |    |  |    |   |    |              |    |  |    |   |    |              |    |  |    |   |    |              |    |  |    |   |    |              |    |  |    |   |    |              |    |  |    |   |    |              |    |  |    |   |    |              |    |  |    |   |  |    |              |    |  |    |   |
| 3  | Q0: Output .2   | 35              |   | 67 |  | ⊕  |   |    |    |    |    |    |    |    |    |                 |                 |                 |                              |    |               |    |   |    |  |    |   |    |               |    |    |     |     |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |              |    |   |    |  |   |  |    |              |    |    |   |    |              |    |    |   |    |              |    |    |   |    |              |    |    |   |    |              |    |    |   |    |              |    |    |   |    |              |    |    |   |    |              |    |  |    |   |  |    |              |    |  |    |   |    |              |    |  |    |   |    |              |    |  |    |   |    |              |    |  |    |   |    |              |    |  |    |   |    |              |    |  |    |   |    |              |    |  |    |   |    |              |    |  |    |   |  |    |              |    |  |    |   |
| 4  | Q0: Output .3   | 36              |   | 68 |  | ⊕  |   |    |    |    |    |    |    |    |    |                 |                 |                 |                              |    |               |    |   |    |  |    |   |    |               |    |    |     |     |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |              |    |   |    |  |   |  |    |              |    |    |   |    |              |    |    |   |    |              |    |    |   |    |              |    |    |   |    |              |    |    |   |    |              |    |    |   |    |              |    |    |   |    |              |    |  |    |   |  |    |              |    |  |    |   |    |              |    |  |    |   |    |              |    |  |    |   |    |              |    |  |    |   |    |              |    |  |    |   |    |              |    |  |    |   |    |              |    |  |    |   |    |              |    |  |    |   |  |    |              |    |  |    |   |
| 5  | Q0: Output .4   | 37              |   | 69 |  | ⊕  |   |    |    |    |    |    |    |    |    |                 |                 |                 |                              |    |               |    |   |    |  |    |   |    |               |    |    |     |     |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |              |    |   |    |  |   |  |    |              |    |    |   |    |              |    |    |   |    |              |    |    |   |    |              |    |    |   |    |              |    |    |   |    |              |    |    |   |    |              |    |    |   |    |              |    |  |    |   |  |    |              |    |  |    |   |    |              |    |  |    |   |    |              |    |  |    |   |    |              |    |  |    |   |    |              |    |  |    |   |    |              |    |  |    |   |    |              |    |  |    |   |    |              |    |  |    |   |  |    |              |    |  |    |   |
| 6  | Q0: Output .5   | 38              |   | 70 |  | ⊕  |   |    |    |    |    |    |    |    |    |                 |                 |                 |                              |    |               |    |   |    |  |    |   |    |               |    |    |     |     |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |              |    |   |    |  |   |  |    |              |    |    |   |    |              |    |    |   |    |              |    |    |   |    |              |    |    |   |    |              |    |    |   |    |              |    |    |   |    |              |    |    |   |    |              |    |  |    |   |  |    |              |    |  |    |   |    |              |    |  |    |   |    |              |    |  |    |   |    |              |    |  |    |   |    |              |    |  |    |   |    |              |    |  |    |   |    |              |    |  |    |   |    |              |    |  |    |   |  |    |              |    |  |    |   |
| 7  | Q0: Output .6   | 39              |   | 71 |  | ⊕  |   |    |    |    |    |    |    |    |    |                 |                 |                 |                              |    |               |    |   |    |  |    |   |    |               |    |    |     |     |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |              |    |   |    |  |   |  |    |              |    |    |   |    |              |    |    |   |    |              |    |    |   |    |              |    |    |   |    |              |    |    |   |    |              |    |    |   |    |              |    |    |   |    |              |    |  |    |   |  |    |              |    |  |    |   |    |              |    |  |    |   |    |              |    |  |    |   |    |              |    |  |    |   |    |              |    |  |    |   |    |              |    |  |    |   |    |              |    |  |    |   |    |              |    |  |    |   |  |    |              |    |  |    |   |
| 8  | Q0: Output .7   | 40              |   | 72 |  | ⊕  |   |    |    |    |    |    |    |    |    |                 |                 |                 |                              |    |               |    |   |    |  |    |   |    |               |    |    |     |     |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |              |    |   |    |  |   |  |    |              |    |    |   |    |              |    |    |   |    |              |    |    |   |    |              |    |    |   |    |              |    |    |   |    |              |    |    |   |    |              |    |    |   |    |              |    |  |    |   |  |    |              |    |  |    |   |    |              |    |  |    |   |    |              |    |  |    |   |    |              |    |  |    |   |    |              |    |  |    |   |    |              |    |  |    |   |    |              |    |  |    |   |    |              |    |  |    |   |  |    |              |    |  |    |   |
| 9  | I0: Input .0    | 41              | 24 V (sensor voltage, connected to L5+)           | 73 | Ground (sensor voltage, connected to M5) | ⊕  |   |    |    |    |    |    |    |    |    |                 |                 |                 |                              |    |               |    |   |    |  |    |   |    |               |    |    |     |     |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |              |    |   |    |  |   |  |    |              |    |    |   |    |              |    |    |   |    |              |    |    |   |    |              |    |    |   |    |              |    |    |   |    |              |    |    |   |    |              |    |    |   |    |              |    |  |    |   |  |    |              |    |  |    |   |    |              |    |  |    |   |    |              |    |  |    |   |    |              |    |  |    |   |    |              |    |  |    |   |    |              |    |  |    |   |    |              |    |  |    |   |    |              |    |  |    |   |  |    |              |    |  |    |   |
| 10   | I0: Input .1    | 42              |   | 74 |  | ⊕  |   |    |    |    |    |    |    |    |    |                 |                 |                 |                              |    |               |    |   |    |  |    |   |    |               |    |    |     |     |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |              |    |   |    |  |   |  |    |              |    |    |   |    |              |    |    |   |    |              |    |    |   |    |              |    |    |   |    |              |    |    |   |    |              |    |    |   |    |              |    |    |   |    |              |    |  |    |   |  |    |              |    |  |    |   |    |              |    |  |    |   |    |              |    |  |    |   |    |              |    |  |    |   |    |              |    |  |    |   |    |              |    |  |    |   |    |              |    |  |    |   |    |              |    |  |    |   |  |    |              |    |  |    |   |
| 11   | I0: Input .2    | 43              |   | 75 |  | ⊕  |   |    |    |    |    |    |    |    |    |                 |                 |                 |                              |    |               |    |   |    |  |    |   |    |               |    |    |     |     |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |              |    |   |    |  |   |  |    |              |    |    |   |    |              |    |    |   |    |              |    |    |   |    |              |    |    |   |    |              |    |    |   |    |              |    |    |   |    |              |    |    |   |    |              |    |  |    |   |  |    |              |    |  |    |   |    |              |    |  |    |   |    |              |    |  |    |   |    |              |    |  |    |   |    |              |    |  |    |   |    |              |    |  |    |   |    |              |    |  |    |   |    |              |    |  |    |   |  |    |              |    |  |    |   |
| 12   | I0: Input .3    | 44              |   | 76 |  | ⊕  |   |    |    |    |    |    |    |    |    |                 |                 |                 |                              |    |               |    |   |    |  |    |   |    |               |    |    |     |     |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |              |    |   |    |  |   |  |    |              |    |    |   |    |              |    |    |   |    |              |    |    |   |    |              |    |    |   |    |              |    |    |   |    |              |    |    |   |    |              |    |    |   |    |              |    |  |    |   |  |    |              |    |  |    |   |    |              |    |  |    |   |    |              |    |  |    |   |    |              |    |  |    |   |    |              |    |  |    |   |    |              |    |  |    |   |    |              |    |  |    |   |    |              |    |  |    |   |  |    |              |    |  |    |   |
| 13   | I0: Input .4    | 45              |   | 77 |  | ⊕  |   |    |    |    |    |    |    |    |    |                 |                 |                 |                              |    |               |    |   |    |  |    |   |    |               |    |    |     |     |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |              |    |   |    |  |   |  |    |              |    |    |   |    |              |    |    |   |    |              |    |    |   |    |              |    |    |   |    |              |    |    |   |    |              |    |    |   |    |              |    |    |   |    |              |    |  |    |   |  |    |              |    |  |    |   |    |              |    |  |    |   |    |              |    |  |    |   |    |              |    |  |    |   |    |              |    |  |    |   |    |              |    |  |    |   |    |              |    |  |    |   |    |              |    |  |    |   |  |    |              |    |  |    |   |
| 14   | I0: Input .5    | 46              |   | 78 |  | ⊕  |   |    |    |    |    |    |    |    |    |                 |                 |                 |                              |    |               |    |   |    |  |    |   |    |               |    |    |     |     |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |              |    |   |    |  |   |  |    |              |    |    |   |    |              |    |    |   |    |              |    |    |   |    |              |    |    |   |    |              |    |    |   |    |              |    |    |   |    |              |    |    |   |    |              |    |  |    |   |  |    |              |    |  |    |   |    |              |    |  |    |   |    |              |    |  |    |   |    |              |    |  |    |   |    |              |    |  |    |   |    |              |    |  |    |   |    |              |    |  |    |   |    |              |    |  |    |   |  |    |              |    |  |    |   |
| 15   | I0: Input .6    | 47              |   | 79 |  | ⊕  |   |    |    |    |    |    |    |    |    |                 |                 |                 |                              |    |               |    |   |    |  |    |   |    |               |    |    |     |     |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |              |    |   |    |  |   |  |    |              |    |    |   |    |              |    |    |   |    |              |    |    |   |    |              |    |    |   |    |              |    |    |   |    |              |    |    |   |    |              |    |    |   |    |              |    |  |    |   |  |    |              |    |  |    |   |    |              |    |  |    |   |    |              |    |  |    |   |    |              |    |  |    |   |    |              |    |  |    |   |    |              |    |  |    |   |    |              |    |  |    |   |    |              |    |  |    |   |  |    |              |    |  |    |   |
| 16   | I0: Input .7    | 48              |   | 80 |  | ⊕  |   |    |    |    |    |    |    |    |    |                 |                 |                 |                              |    |               |    |   |    |  |    |   |    |               |    |    |     |     |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |              |    |   |    |  |   |  |    |              |    |    |   |    |              |    |    |   |    |              |    |    |   |    |              |    |    |   |    |              |    |    |   |    |              |    |    |   |    |              |    |    |   |    |              |    |  |    |   |  |    |              |    |  |    |   |    |              |    |  |    |   |    |              |    |  |    |   |    |              |    |  |    |   |    |              |    |  |    |   |    |              |    |  |    |   |    |              |    |  |    |   |    |              |    |  |    |   |  |    |              |    |  |    |   |
| 17   | I1: Input .0    | 49              |   | 81 | ⊕  |    |   |    |    |    |    |    |    |    |    |                 |                 |                 |                              |    |               |    |   |    |  |    |   |    |               |    |    |     |     |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |              |    |   |    |  |   |  |    |              |    |    |   |    |              |    |    |   |    |              |    |    |   |    |              |    |    |   |    |              |    |    |   |    |              |    |    |   |    |              |    |    |   |    |              |    |  |    |   |  |    |              |    |  |    |   |    |              |    |  |    |   |    |              |    |  |    |   |    |              |    |  |    |   |    |              |    |  |    |   |    |              |    |  |    |   |    |              |    |  |    |   |    |              |    |  |    |   |  |    |              |    |  |    |   |
| 18   | I1: Input .1    | 50              |   | 82 | ⊕  |    |   |    |    |    |    |    |    |    |    |                 |                 |                 |                              |    |               |    |   |    |  |    |   |    |               |    |    |     |     |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |              |    |   |    |  |   |  |    |              |    |    |   |    |              |    |    |   |    |              |    |    |   |    |              |    |    |   |    |              |    |    |   |    |              |    |    |   |    |              |    |    |   |    |              |    |  |    |   |  |    |              |    |  |    |   |    |              |    |  |    |   |    |              |    |  |    |   |    |              |    |  |    |   |    |              |    |  |    |   |    |              |    |  |    |   |    |              |    |  |    |   |    |              |    |  |    |   |  |    |              |    |  |    |   |
| 19   | I1: Input .2    | 51              |   | 83 | ⊕  |    |   |    |    |    |    |    |    |    |    |                 |                 |                 |                              |    |               |    |   |    |  |    |   |    |               |    |    |     |     |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |              |    |   |    |  |   |  |    |              |    |    |   |    |              |    |    |   |    |              |    |    |   |    |              |    |    |   |    |              |    |    |   |    |              |    |    |   |    |              |    |    |   |    |              |    |  |    |   |  |    |              |    |  |    |   |    |              |    |  |    |   |    |              |    |  |    |   |    |              |    |  |    |   |    |              |    |  |    |   |    |              |    |  |    |   |    |              |    |  |    |   |    |              |    |  |    |   |  |    |              |    |  |    |   |
| 20   | I1: Input .3    | 52              |   | 84 | ⊕  |    |   |    |    |    |    |    |    |    |    |                 |                 |                 |                              |    |               |    |   |    |  |    |   |    |               |    |    |     |     |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |              |    |   |    |  |   |  |    |              |    |    |   |    |              |    |    |   |    |              |    |    |   |    |              |    |    |   |    |              |    |    |   |    |              |    |    |   |    |              |    |    |   |    |              |    |  |    |   |  |    |              |    |  |    |   |    |              |    |  |    |   |    |              |    |  |    |   |    |              |    |  |    |   |    |              |    |  |    |   |    |              |    |  |    |   |    |              |    |  |    |   |    |              |    |  |    |   |  |    |              |    |  |    |   |
| 21   | I1: Input .4    | 53              |   | 85 | ⊕  |    |   |    |    |    |    |    |    |    |    |                 |                 |                 |                              |    |               |    |   |    |  |    |   |    |               |    |    |     |     |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |              |    |   |    |  |   |  |    |              |    |    |   |    |              |    |    |   |    |              |    |    |   |    |              |    |    |   |    |              |    |    |   |    |              |    |    |   |    |              |    |    |   |    |              |    |  |    |   |  |    |              |    |  |    |   |    |              |    |  |    |   |    |              |    |  |    |   |    |              |    |  |    |   |    |              |    |  |    |   |    |              |    |  |    |   |    |              |    |  |    |   |    |              |    |  |    |   |  |    |              |    |  |    |   |
| 22   | I1: Input .5    | 54              |   | 86 | ⊕  |    |   |    |    |    |    |    |    |    |    |                 |                 |                 |                              |    |               |    |   |    |  |    |   |    |               |    |    |     |     |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |              |    |   |    |  |   |  |    |              |    |    |   |    |              |    |    |   |    |              |    |    |   |    |              |    |    |   |    |              |    |    |   |    |              |    |    |   |    |              |    |    |   |    |              |    |  |    |   |  |    |              |    |  |    |   |    |              |    |  |    |   |    |              |    |  |    |   |    |              |    |  |    |   |    |              |    |  |    |   |    |              |    |  |    |   |    |              |    |  |    |   |    |              |    |  |    |   |  |    |              |    |  |    |   |
| 23   | I1: Input .6    | 55              |   | 87 | ⊕  |    |   |    |    |    |    |    |    |    |    |                 |                 |                 |                              |    |               |    |   |    |  |    |   |    |               |    |    |     |     |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |              |    |   |    |  |   |  |    |              |    |    |   |    |              |    |    |   |    |              |    |    |   |    |              |    |    |   |    |              |    |    |   |    |              |    |    |   |    |              |    |    |   |    |              |    |  |    |   |  |    |              |    |  |    |   |    |              |    |  |    |   |    |              |    |  |    |   |    |              |    |  |    |   |    |              |    |  |    |   |    |              |    |  |    |   |    |              |    |  |    |   |    |              |    |  |    |   |  |    |              |    |  |    |   |
| 24   | I1: Input .7    | 56              |   | 88 | ⊕  |    |   |    |    |    |    |    |    |    |    |                 |                 |                 |                              |    |               |    |   |    |  |    |   |    |               |    |    |     |     |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |              |    |   |    |  |   |  |    |              |    |    |   |    |              |    |    |   |    |              |    |    |   |    |              |    |    |   |    |              |    |    |   |    |              |    |    |   |    |              |    |    |   |    |              |    |  |    |   |  |    |              |    |  |    |   |    |              |    |  |    |   |    |              |    |  |    |   |    |              |    |  |    |   |    |              |    |  |    |   |    |              |    |  |    |   |    |              |    |  |    |   |    |              |    |  |    |   |  |    |              |    |  |    |   |
| 25   | I2: Input .0    | 57              |   | 89 | ⊕  |    |   |    |    |    |    |    |    |    |    |                 |                 |                 |                              |    |               |    |   |    |  |    |   |    |               |    |    |     |     |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |              |    |   |    |  |   |  |    |              |    |    |   |    |              |    |    |   |    |              |    |    |   |    |              |    |    |   |    |              |    |    |   |    |              |    |    |   |    |              |    |    |   |    |              |    |  |    |   |  |    |              |    |  |    |   |    |              |    |  |    |   |    |              |    |  |    |   |    |              |    |  |    |   |    |              |    |  |    |   |    |              |    |  |    |   |    |              |    |  |    |   |    |              |    |  |    |   |  |    |              |    |  |    |   |
| 26   | I2: Input .1    | 58              |   | 90 | ⊕  |    |   |    |    |    |    |    |    |    |    |                 |                 |                 |                              |    |               |    |   |    |  |    |   |    |               |    |    |     |     |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |               |    |    |   |   |              |    |   |    |  |   |  |    |              |    |    |   |    |              |    |    |   |    |              |    |    |   |    |              |    |    |   |    |              |    |    |   |    |              |    |    |   |    |              |    |    |   |    |              |    |  |    |   |  |    |              |    |  |    |   |    |              |    |  |    |   |    |              |    |  |    |   |    |              |    |  |    |   |    |              |    |  |    |   |    |              |    |  |    |   |    |              |    |  |    |   |    |              |    |  |    |   |  |    |              |    |  |    |   |

Table 7-13 Pin Assignment of Terminal Blocks TB2/DC; TB2-4/DC and TB4/DC for ET 200B-24DI/8DO (6ES7 133-0BN01-0XB0) and ET 200B-24DI/8DO 0.2ms (6ES7 133-0BN11-0XB0), continued

| Terminal tier 1 |              | Terminal tier 2 |   | Terminal tier 3 |   | Terminal tier 4 <sup>1</sup> |   |
|-----------------|--------------|-----------------|---|-----------------|---|------------------------------|---|
| 27              | I2: Input .2 | 59              | 24 V (sensor voltage, connected to L5+)                       | 91              | Ground (sensor voltage, connected to M5)                    | ⊕                            | PE (internally jumpered, but not connected to PE screw) |
| 28              | I2: Input .3 | 60              |   | 92              |   | ⊕                            |   |
| 29              | I2: Input .4 | 61              |   | 93              |   | ⊕                            |   |
| 30              | I2: Input .5 | 62              |   | 94              |   | ⊕                            |   |
| 31              | I2: Input .6 | 63              |   | 95              |   | ⊕                            |   |
| 32              | I2: Input .7 | 64              |   | 96              |   | ⊕                            |   |
| –               |              | L5+             | Voltage supply, internal logic <b>and</b> sensor voltage 24 V | M5              | Ground connection, internal logic <b>and</b> sensor voltage | ⊕                            | PE (internally jumpered, but not connected to PE screw) |
| –               |              | L5+             | Voltage supply, internal logic <b>and</b> sensor voltage 24 V | M5              | Ground connection, internal logic <b>and</b> sensor voltage | ⊕                            |   |

<sup>1</sup> TB2-4/DC only; in the TB4M/DC tier 4 is available for additional ground connections (see Section 7.2.7)

**Important Note on Wiring**

The following notes are important as regards the wiring of the ET 200B-24DI/8DO and ET 200B-24DI/8DO 0.2 ms:

- The terminals for PE on the 4-tier terminal block are not connected to the PE connection of terminal block TB2-4/DC.
- If all actuators are connected by two-wire cables to the TB2/DC, TB4/DC or TB2-4/DC, connect the ground of an actuator and the supply for the reference potential per group by means of a DIN 46231 cable cleat.
- L1+ and L5+ and M1 and M5 are **not** interconnected.
- L5+ and terminals 41 ... 64 are interconnected, as are M5 and terminals 73 ... 96.
- The two L5+ terminals are also interconnected.

**Fuse**

The 24 V sensor supply is protected by fuse F1 (2.5 A) in the terminal blocks. Nevertheless, make sure that the current does not exceed the specifications in the technical data for the electronics block.

**Technical Data**

The technical data of electronics blocks ET 200B-24DI/8DO and ET 200B-24DI/8DO 0.2 ms is listed in the tables below.

| Technical specifications  |   | Inputs, continued   |                                |
|---|---|---|--------------------------------|
| Baud rates*   | 9.6/19.2/93.75/187.5/500/<br>1500/3000/6000/<br>12000 kbaud | Delay of inputs for<br>6ES7 133-0BN00-0XB0                      | 3 ms                           |
| Bus protocol  | PROFIBUS-DP   | Delay of inputs for<br>6ES7 133-0BN10-0XB0                      | 0.2 ms                         |
| FREEZE and SYNC capability  | Yes*  | Connection of 2-wire<br>BERO                                    | Possible                       |
| Galvanic isolation to SINEC L2-DP bus                                       | Yes   | • Quiescent current   | ≤ 1.5 mA                       |
| Power losses  | Max. 5.5 W  | Connection of mechanical<br>switches                            | Possible                       |
| Weight (EB and TB)  | Approx. 800 g (28 oz.)                                      | Cable length of sensors   |                                |
| Dimensions (EB and TB:<br>W x H x D)  | 235 x 130 x 60 mm<br>(9.17 x 5.07 x 2.34 in.)               | • Unshielded  | Max. 100 m (328 ft.)           |
| Diagnostics functions   |   | Outputs   |                                |
| Voltage monitoring  | Green "RUN" LED   | Number of outputs   | 8                              |
| Bus monitoring SINEC<br>L2-DP   | Red "BF" LED  | Galvanic isolation  | Yes                            |
| Group diagnostics for<br>short-circuit, load voltage<br>failure             | Red "DIA" LED   | • In groups of  | 8                              |
| Load voltage monitoring   | Green "L1+" LED   | Output voltage  |                                |
| Status of inputs and out-<br>puts   | Green LEDs  | • For "0" signal  | Max. 2 V (idle)                |
|   |   | • For "1" signal  | Min. (supply voltage<br>– 3 V) |
| Supply voltage for sensor supply, load voltage supply<br>and internal logic |   | Output current  |                                |
| Supply voltage (L1+,L5+)  |   | • For "0" signal  | Max. 1 mA                      |
| • Rated value   | 24 V DC   | • For "1" signal  | Max. 0.5 A                     |
| • Permissible range   | 18.5 to 30.2 V  | Delay of outputs  |                                |
| • Value for t < 0.5 s   | 35 V  | • From "0" to "1"   | Approx. 20 μs                  |
| Current consumption from<br>L5+   |   | • From "1" to "0"   | Max. 0.5 ms                    |
| • Logic   | Typ. 85 mA  | Switching frequency   |                                |
| • Sensors   | Max. 1 A  | • Resistive load  | Max. 1000 Hz                   |
| I <sup>2</sup> t (for the inrush current)                                   | ≤ 0.05 A <sup>2</sup> s                                     | • Inductive load  | Max. 0.5 Hz                    |
|   |   | • Lamp load   | Max. 8 Hz                      |
| Inputs  |   | Short-circuit protection  | Yes                            |
| Number of inputs  | 24  | Load current  |                                |
| Galvanic isolation to inter-<br>nal electronic circuits                     | No  | • Total current   | Max. 2 A                       |
| Input voltage   |   | Lamp load   | Max. 5 W                       |
| • Rated value   | 24 V DC   | Setting a digital input   | Possible                       |
| • For "0" signal  | – 30 V to 5 V   | Limitation of voltage in-<br>duced on current interrup-<br>tion | Typ. (L5+) – 55 V              |
| • For "1" signal  | 13 V to 30 V  | Cable length  | Max. 100 m (328 ft.)           |
| Input current for<br>"1" signal   | Typ. 4 mA at 24 V<br>Min. 2 mA                              |   |                                |

\* In operation with the IM 308-B, the maximum baud rate is 1500 kbaud.

### 7.3.11 Electronics Block ET 200B-16DI-AC (6ES7 131-0HF00-0XB0)

**Characteristics** The ET 200B-16DI-AC electronics block has the following characteristics:

- 16 inputs, floating in groups of 4
- Input voltage: 120/230 V AC
- Suitable for switches and 2-wire proximity switches acc. to IEC 1131, type 1
- Possible terminal block: TB6/AC

**Dimensional Drawing** See Figure 7-22 for the precise dimensions.

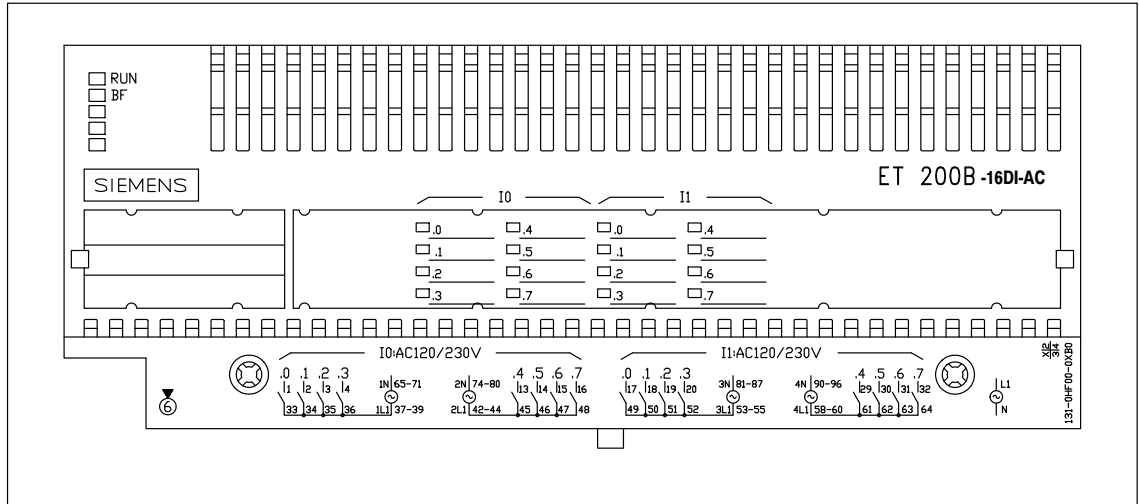


Figure 7-50 Front Elevation: ET 200B-16DI-AC (6ES7 131-0HF00-0XB0)



**Block Diagram**

Simplified diagram of the potential for the ET 200B-16DI-AC and TB6/AC:

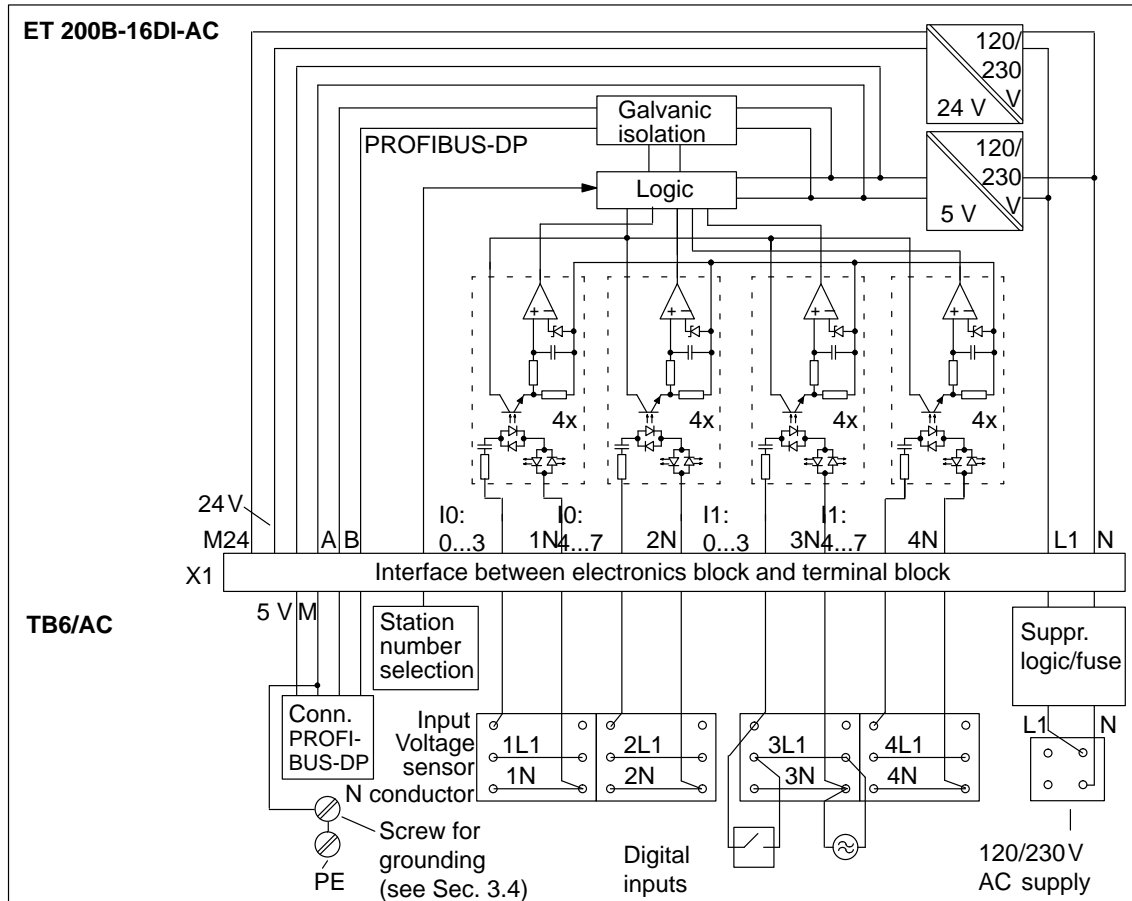


Figure 7-51 Block Diagram: ET 200B-16DI-AC (6ES7 131-0HF00-0XB0) and TB6/AC

**Pin Assignment**

The table below shows the pin assignment of the terminal blocks for ET 200B-16DI-AC. For the sake of clarity, the table also shows the terminal numbering of the terminal block, taking the TB6/AC by way of example.

Table 7-14 Pin Assignment of Terminal Block TB6/AC for ET 200B-16DI-AC (6ES7 131-0HF00-0XB0)

| Terminal numbering TB6/AC |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
|---------------------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| 1                         | 2  | 3  | 4  | 5  | 6  | 7  | 8  | 9  | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 |    |    |
| 33                        | 34 | 35 | 36 | 37 | 38 | 39 | 40 | 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49 | 50 | 51 | 52 | 53 | 54 | 55 | 56 | 57 | 58 | 59 | 60 | 61 | 62 | 63 | 64 | L1 | L1 |
| 65                        | 66 | 67 | 68 | 69 | 70 | 71 | 72 | 73 | 74 | 75 | 76 | 77 | 78 | 79 | 80 | 81 | 82 | 83 | 84 | 85 | 86 | 87 | 88 | 89 | 90 | 91 | 92 | 93 | 94 | 95 | 96 | N  | N  |

| Terminal tier 1 |              | Terminal tier 2 |   | Terminal tier 3 |  |
|-----------------|--------------|-----------------|---|-----------------|--|
| 1               | I0: Input .0 | 33              | Sensor voltage 1L1 for channel I0: .0 to .3 | 65              | Sensor voltage 1N for channel I0: .0 to .3 |
| 2               | I0: Input .1 | 34              |   | 66              |  |
| 3               | I0: Input .2 | 35              |   | 67              |  |
| 4               | I0: Input .3 | 36              |   | 68              |  |
| 5               | not used     | 37              |   | 69              |  |
| 6               | not used     | 38              |   | 70              |  |
| 7               | not used     | 39              |   | 71              |  |
| 8               | not used     | 40              | not used                                    | 72              | not used                                   |
| 9               | not used     | 41              | not used                                    | 73              | not used                                   |
| 10              | not used     | 42              | Sensor voltage 2L1 for channel I0: .4 to .7 | 74              | Sensor voltage 2N for channel I0: .4 to .7 |
| 11              | not used     | 43              |   | 75              |  |
| 12              | not used     | 44              |   | 76              |  |
| 13              | I0: Input .4 | 45              |   | 77              |  |
| 14              | I0: Input .5 | 46              |   | 78              |  |
| 15              | I0: Input .6 | 47              |   | 79              |  |
| 16              | I0: Input .7 | 48              |   | 80              |  |
| 17              | I1: Input .0 | 49              | Sensor voltage 3L1 for channel I1: .0 to .3 | 81              | Sensor voltage 3N for channel I1: .0 to .3 |
| 18              | I1: Input .1 | 50              |   | 82              |  |
| 19              | I1: Input .2 | 51              |   | 83              |  |
| 20              | I1: Input .3 | 52              |   | 84              |  |
| 21              | not used     | 53              |   | 85              |  |
| 22              | not used     | 54              |   | 86              |  |
| 23              | not used     | 55              |   | 87              |  |
| 24              | not used     | 56              | not used                                    | 88              | not used                                   |
| 25              | not used     | 57              | not used                                    | 89              | not used                                   |
| 26              | not used     | 58              | Sensor voltage 4L1 for channel I1: .4 to .7 | 90              | Sensor voltage 4N for channel I1: .4 to .7 |

Table 7-14 Pin Assignment of Terminal Block TB6/AC for ET 200B-16DI-AC (6ES7 131-0HF00-0XB0), continued

| Terminal tier 1 |              | Terminal tier 2 |  | Terminal tier 3 |   |
|-----------------|--------------|-----------------|--|-----------------|---|
| 27              | not used     | 59              | Sensor voltage <b>4L1</b> for channel I1: .4 to .7 | 91              | Sensor voltage <b>4N</b> for channel I1: .4 to .7 |
| 28              | not used     | 60              |  | 92              |   |
| 29              | I1: Input .4 | 61              |  | 93              |   |
| 30              | I1: Input .5 | 62              |  | 94              |   |
| 31              | I1: Input .6 | 63              |  | 95              |   |
| 32              | I1: Input .7 | 64              |  | 96              |   |
| -               |              | L1              | Voltage supply, internal logic                     | N               | Voltage supply, internal logic                    |
| -               |              | L1              | Voltage supply, internal logic                     | N               | Voltage supply, internal logic                    |

### Important Note on Wiring

The following notes are important as regards the wiring of the ET 200B-16DI-AC:

- If installed in an 230 V AC system, the following must always be connected to the same outer conductor (same phase):
  - 1L1/1N and 2L1/2N (same phase)
  - 3L1/3N and 4L1/4N (same phase)
- If installed in an 230 V AC system with ambient temperatures in excess of 40 °C only 12 inputs can be used and rated input current must not exceed 240 V AC.

**Technical Data**

The technical data of electronics block ET 200B-16DI-AC is listed in the tables below.

| Technical specifications                 |   | Inputs                            |                      |
|--|---|-----------------------------------|----------------------|
| Baud rates*                              | 9.6/19.2/93.75/187.5/500/1500/3000/6000/12000 kbaud       | Number of inputs                  | 16                   |
| Bus protocol                             | PROFIBUS-DP   | Galvanic isolation                | Yes (optocouplers)   |
| Galvanic isolation to SINEC L2-DP        | Yes, 500 V DC to logic, 1500 V AC to connection terminals | • In groups of                    | 4                    |
| Power losses                             |   | Input voltage                     |                      |
| • at 230 V                               | Typ. 6 W  | • Rated value                     | 120/230 V AC         |
| • at 120 V                               | Typ. 4.5 W  | • For "0" signal                  | 0 to 40 V AC         |
| Weight (EB and TB)                       | 811 g (29 oz.)  | • For "1" signal                  | 79 to 264 V AC       |
| Dimensions (EB and TB: W x H x D)        | 235 x 130 x 60 mm (9.17 x 5.07 x 2.34 in.)                | Input current for "1" signal      | 3 to 16 mA           |
| <b>Diagnostics functions</b>             |   | • At 120 V, 60 Hz                 | Typ. 6.5 mA          |
| Voltage monitoring                       | Green "RUN" LED   | • At 230 V, 50 Hz                 | Typ. 10.5 mA         |
| Bus monitoring SINEC L2-DP               | Red "BF" LED  | Type of input acc. to IEC 1131    | Type 1               |
| Status of inputs                         | Green LEDs  | Delay of inputs                   | 0 to 25 ms           |
| <b>Supply voltage for internal logic</b> |   | Connection of 2-wire BERO         | No                   |
| Supply voltage L1                        |   | • Permissible quiescent current   | 2 mA                 |
| • Rated value                            | 120/230 V AC  | Connection of mechanical switches | Yes                  |
| • Permissible range                      | 85 to 264 V AC  | Cable length                      | Max. 600 m (1968 ft) |
| • Frequency                              | 47 to 63 Hz   |                                   |                      |
| • Current consumption from L1            | Typ. 60 mA  |                                   |                      |

\* In operation with the IM 308-B, the maximum baud rate is 1500 kbaud.

### 7.3.12 Electronics Block ET 200B-16DO-AC (6ES7 132-0HF00-0XB0)

**Characteristics** The ET 200B-16DO-AC electronics block has the following characteristics:

- 16 outputs, floating in groups of 4
- Output current: 0.5 A
- Load voltage: 120/230 V AC
- Possible terminal block: TB6/AC

**Dimensional Drawing** See Figure 7-22 for the precise dimensions.

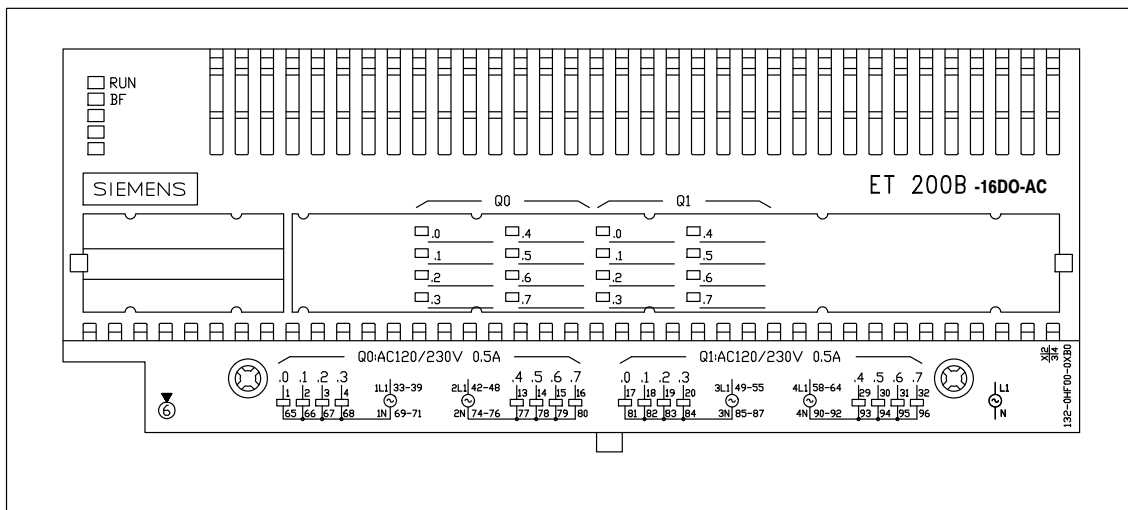


Figure 7-52 Front Elevation: ET 200B-16DO-AC (6ES7 132-0HF00-0XB0)

**Block Diagram** Simplified diagram of the potential for the ET 200B-16DO-AC and TB6/AC:

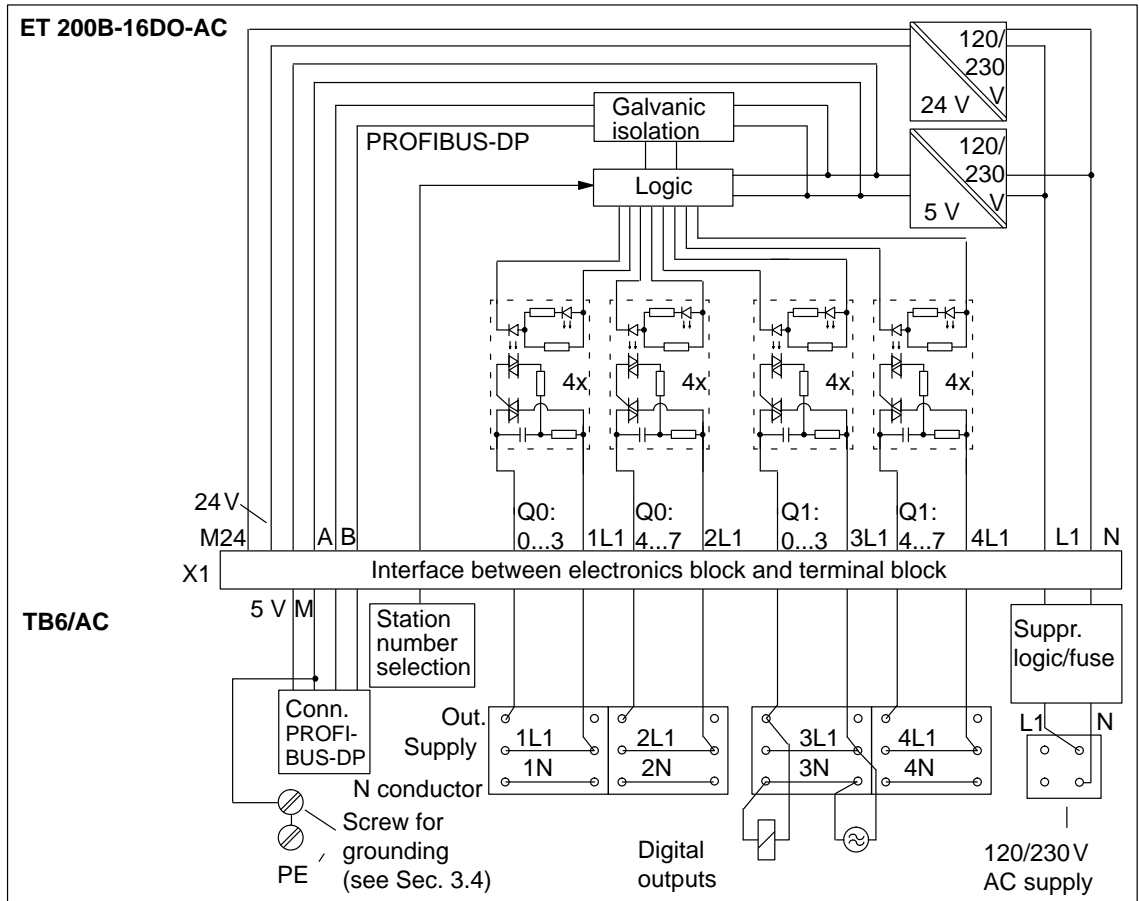


Figure 7-53 Block Diagram: ET 200B-16DO-AC (6ES7 132-0HF00-0XB0) and TB6/AC

**Pin Assignment**

The table below shows the pin assignment of the terminal blocks for ET 200B-16DO-AC. For the sake of clarity, the table also shows the terminal numbering of the terminal blocks, taking the TB6/AC by way of example.

Table 7-15 Pin Assignment of Terminal Block TB6/AC for ET 200B-16DO-AC (6ES7 132-0HF00-0XB0)

| Terminal numbering TB6/AC |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
|---------------------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| 1                         | 2  | 3  | 4  | 5  | 6  | 7  | 8  | 9  | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 |    |    |
| 33                        | 34 | 35 | 36 | 37 | 38 | 39 | 40 | 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49 | 50 | 51 | 52 | 53 | 54 | 55 | 56 | 57 | 58 | 59 | 60 | 61 | 62 | 63 | 64 | L1 | L1 |
| 65                        | 66 | 67 | 68 | 69 | 70 | 71 | 72 | 73 | 74 | 75 | 76 | 77 | 78 | 79 | 80 | 81 | 82 | 83 | 84 | 85 | 86 | 87 | 88 | 89 | 90 | 91 | 92 | 93 | 94 | 95 | 96 | N  | N  |

| Terminal tier 1 |               | Terminal tier 2 |  | Terminal tier 3 |   |
|-----------------|---------------|-----------------|--|-----------------|---|
| 1               | Q0: Output .0 | 33              | Voltage supply <b>1L1</b> for channel Q0: .0 to .3 | 65              | Voltage supply <b>1N</b> for channel Q0: .0 to .3 |
| 2               | Q0: Output .1 | 34              |  | 66              |   |
| 3               | Q0: Output .2 | 35              |  | 67              |   |
| 4               | Q0: Output .3 | 36              |  | 68              |   |
| 5               | not used      | 37              |  | 69              |   |
| 6               | not used      | 38              |  | 70              |   |
| 7               | not used      | 39              |  | 71              |   |
| 8               | not used      | 40              | not used   | 72              | not used  |
| 9               | not used      | 41              | not used   | 73              | not used  |
| 10              | not used      | 42              | Voltage supply <b>2L1</b> for channel Q0: .4 to .7 | 74              | Voltage supply <b>2N</b> for channel Q0: .4 to .7 |
| 11              | not used      | 43              |  | 75              |   |
| 12              | not used      | 44              |  | 76              |   |
| 13              | Q0: Output .4 | 45              |  | 77              |   |
| 14              | Q0: Output .5 | 46              |  | 78              |   |
| 15              | Q0: Output .6 | 47              |  | 79              |   |
| 16              | Q0: Output .7 | 48              |  | 80              |   |
| 17              | Q1: Output .0 | 49              | Voltage supply <b>3L1</b> for channel Q1: .0 to .3 | 81              | Voltage supply <b>3N</b> for channel Q1: .0 to .3 |
| 18              | Q1: Output .1 | 50              |  | 82              |   |
| 19              | Q1: Output .2 | 51              |  | 83              |   |
| 20              | Q1: Output .3 | 52              |  | 84              |   |
| 21              | not used      | 53              |  | 85              |   |
| 22              | not used      | 54              |  | 86              |   |
| 23              | not used      | 55              |  | 87              |   |
| 24              | not used      | 56              | not used   | 88              | not used  |
| 25              | not used      | 57              | not used   | 89              | not used  |
| 26              | not used      | 58              | Voltage supply <b>4L1</b> for channel Q1: .4 to .7 | 90              | Voltage supply <b>4N</b> for channel Q1: .4 to .7 |

Table 7-15 Pin Assignment of Terminal Block TB6/AC for ET 200B-16DO-AC (6ES7 132-0HF00-0XB0), continued

| Terminal tier 1 |               | Terminal tier 2 |  | Terminal tier 3 |   |
|-----------------|---------------|-----------------|--|-----------------|---|
| 27              | not used      | 59              | Voltage supply <b>4L1</b> for channel Q1: .4 to .7 | 91              | Voltage supply <b>4N</b> for channel Q1: .4 to .7 |
| 28              | not used      | 60              |  | 92              |   |
| 29              | Q1: Output .4 | 61              |  | 93              |   |
| 30              | Q1: Output .5 | 62              |  | 94              |   |
| 31              | Q1: Output .6 | 63              |  | 95              |   |
| 32              | Q1: Output .7 | 64              |  | 96              |   |
| -               |               | L1              | Voltage supply, internal logic                     | N               | Voltage supply, internal logic                    |
| -               |               | L1              | Voltage supply, internal logic                     | N               | Voltage supply, internal logic                    |

**Important Note on Wiring**

The following notes are important as regards the wiring of the ET 200B-16DO-AC:

- If installed in an AC 230 V system, the following must always be connected to the same outer conductor (same phase):
  - 1L1/1N and 2L1/2N (same phase)
  - 3L1/3N and 4L1/4N (same phase)



**Technical Data**

The technical data of electronics block ET 200B-16DO-AC is listed in the tables below.

| Technical specifications  |   | Outputs  |  |
|---|---|--|--|
| Baud rates*   | 9.6/19.2/93.75/187.5/500/<br>1500/3000/6000/<br>12000 kbaud     | Number of outputs  | 16   |
| Bus protocol  | PROFIBUS-DP   | Galvanic isolation   | Yes (optocouplers)                                     |
| Galvanic isolation to SI-<br>NEC L2-DP bus                      | Yes, 500 V DC to logic,<br>1500 V AC to connection<br>terminals | • In groups of   | 4  |
| Power losses  | Max. 11 W   | • Signal voltage   | 79 to 264 V AC   |
| Weight (EB and TB)  | Approx. 805 g (29 oz)   | Output voltage   |  |
| Dimensions (EB and TB:<br>W x H x D)                            | 235 x 130 x 60 mm<br>(9.17 x 5.07 x 2.34 in.)                   | • For "1" signal<br>(≥ 50 mA)                                | Max. L1 – 1.5 V  |
|   |   | • For "1" signal<br>(≤ 50 mA)                                | Max. L1 – 8.5 V  |
|   |   | Output current   |  |
|   |   | • For "0" signal   | Max. 1.3 mA  |
|   |   | Delay of outputs   | Max. 20 ms   |
|   |   | Short-circuit protection                                     | No   |
|   |   | Switching frequency  |  |
|   |   | • Resistive load   | 10 Hz  |
|   |   | • Inductive load   | 0.5 Hz   |
|   |   | • Lamp load  | 1 Hz   |
|   |   | Load current per output in<br>preferred mounting<br>position |  |
|   |   | • 0 °C to 40 °C<br>(32 ° F to 104 ° F)                       | 0.5 A  |
|   |   | • 40 °C to 60 °C<br>(32 ° F to 140 ° F)                      | 0.35 A   |
|   |   | Load current per output in<br>other mounting positions       |  |
|   |   | • 0 °C to 40 °C<br>(32 ° F to 104 ° F)                       | 0.35 A   |
|   |   | Lamp load  | Max. 25 W  |
|   |   | Size of motor starter  | Max. size 3 acc. to NEMA                               |
|   |   | Parallel connection of 2<br>outputs                          | Possible<br>(though not in order to<br>increase power) |
|   |   | Setting a digital input                                      | Possible   |
|   |   | Cable length   | Max. 600 m (1968 ft)                                   |
| <b>Diagnostics functions</b>                                    |   |  |  |
| Voltage monitoring  | Green "RUN" LED   |  |  |
| Bus monitoring<br>SINEC L2-DP                                   | Red "BF" LED  |  |  |
| Group diagnostics for<br>short-circuit, load voltage<br>failure | No  |  |  |
| Load voltage monitoring   | No  |  |  |
| Status of outputs   | Green LEDs  |  |  |
| <b>Supply voltage for internal logic</b>                        |   |  |  |
| Supply voltage L1   |   |  |  |
| • Rated value   | 120/230 V AC  |  |  |
| • Permissible range   | 85 to 264 V AC  |  |  |
| • Frequency   | 47 to 63 Hz   |  |  |
| • Current consumption<br>from L1                                | Typ. 150 mA   |  |  |

\* In operation with the IM 308-B, the maximum baud rate is 1500 kbaud.

### 7.3.13 Electronics Block ET 200B-16RO-AC (6ES7 132-0HH00-0XB0)

**Characteristics** The ET 200B-16RO-AC electronics block has the following characteristics:

- 16 relay outputs, floating in groups of 1
- Load voltage: 120 V AC  
24 ... 150 V DC
- Output current: 4A for outputs 0.0, 0.7, 1.0 and 1.7  
12 A for outputs 0.1 to 0.6 and 1.1 to 1.6
- Suitable for AC/DC solenoid valves, switches, motor starters, small-power motors, motors and lamps.
- Possible terminal block: TB6/AC

**Dimensional Drawing** See Figure 7-22 for the precise dimensions.

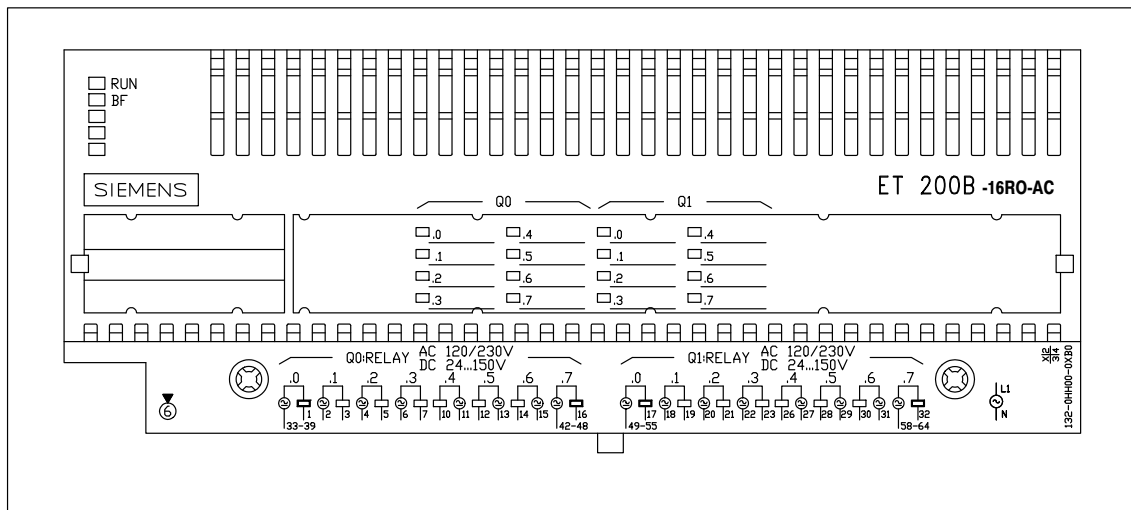


Figure 7-54 Front Elevation: ET 200B-16RO-AC (6ES7 132-0HH00-0XB0)

**Block Diagram**

Simplified diagram of the potential for the ET 200B-16RO-AC and TB6/DC:

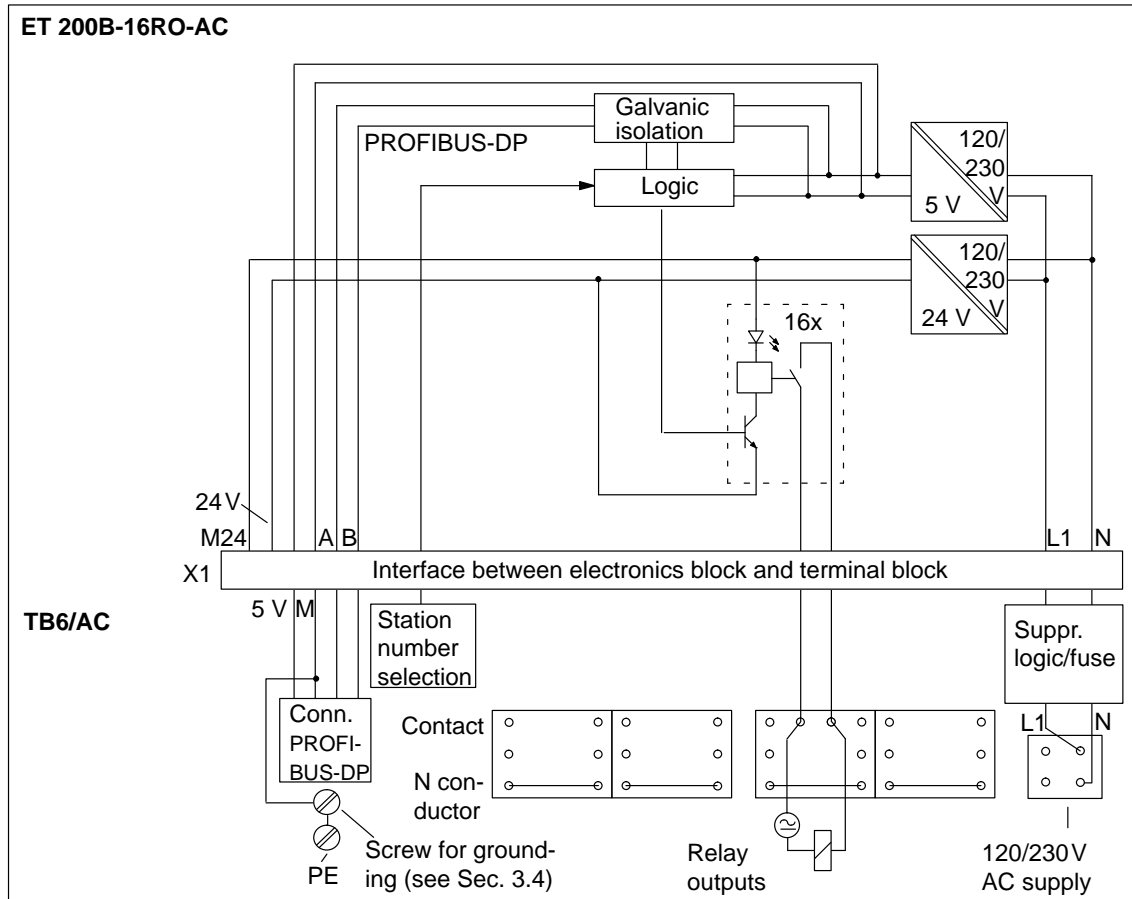


Figure 7-55 Block Diagram: ET 200B-16RO-AC (6ES7 132-0HH00-0XB0) and TB6/AC

**Pin Assignment**

The table below shows the pin assignment of the terminal blocks for ET 200B-16RO-AC. For the sake of clarity, the table also shows the terminal numbering of the terminal blocks, taking the TB6/AC by way of example.

Table 7-16 Pin Assignment of Terminal Block TB6/AC for ET 200B-16RO-AC (6ES7 132-0HH00-0XB0)

| Terminal numbering TB6/AC |                    |    |                    |   |   |   |                 |          |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |   |   |
|---------------------------|--------------------|----|--------------------|---|---|---|-----------------|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|
| 1                         | 2                  | 3  | 4                  | 5 | 6 | 7 | 8               | 9        | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40 | 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49 | 50 | 51 | 52 | 53 | 54 | 55 | 56 | 57 | 58 | 59 | 60 | 61 | 62 | 63 | 64 | L1 | L1 | 65 | 66 | 67 | 68 | 69 | 70 | 71 | 72 | 73 | 74 | 75 | 76 | 77 | 78 | 79 | 80 | 81 | 82 | 83 | 84 | 85 | 86 | 87 | 88 | 89 | 90 | 91 | 92 | 93 | 94 | 95 | 96 | N | N |
| Terminal tier 1           |                    |    | Terminal tier 2    |   |   |   | Terminal tier 3 |          |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |   |   |
| 1                         | Q0: Connection 0/1 | 33 | Q0: Connection 0/0 |   |   |   | 65              | not used |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |   |   |
| 2                         | Q0: Connection 1/0 | 34 |                    |   |   |   | 66              | not used |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |   |   |
| 3                         | Q0: Connection 1/1 | 35 |                    |   |   |   | 67              | not used |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |   |   |
| 4                         | Q0: Connection 2/0 | 36 |                    |   |   |   | 68              | not used |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |   |   |
| 5                         | Q0: Connection 2/1 | 37 |                    |   |   |   | 69              | not used |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |   |   |
| 6                         | Q0: Connection 3/0 | 38 |                    |   |   |   | 70              | not used |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |   |   |
| 7                         | Q0: Connection 3/1 | 39 |                    |   |   |   | 71              | not used |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |   |   |
| 8                         | not used           | 40 | not used           |   |   |   | 71              | not used |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |   |   |
| 9                         | not used           | 41 | not used           |   |   |   | 73              | not used |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |   |   |
| 10                        | Q0: Connection 4/1 | 42 | Q0: Connection 7/0 |   |   |   | 74              | not used |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |   |   |
| 11                        | Q0: Connection 4/0 | 43 |                    |   |   |   | 75              | not used |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |   |   |
| 12                        | Q0: Connection 5/1 | 44 |                    |   |   |   | 76              | not used |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |   |   |
| 13                        | Q0: Connection 5/0 | 45 |                    |   |   |   | 77              | not used |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |   |   |
| 14                        | Q0: Connection 6/1 | 46 |                    |   |   |   | 78              | not used |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |   |   |
| 15                        | Q0: Connection 6/0 | 47 |                    |   |   |   | 79              | not used |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |   |   |
| 16                        | Q0: Connection 7/1 | 48 |                    |   |   |   | 80              | not used |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |   |   |
| 17                        | Q1: Connection 0/0 | 49 | Q1: Connection 0/0 |   |   |   | 81              | not used |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |   |   |
| 18                        | Q1: Connection 1/0 | 50 |                    |   |   |   | 82              | not used |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |   |   |
| 19                        | Q1: Connection 1/1 | 51 |                    |   |   |   | 83              | not used |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |   |   |
| 20                        | Q1: Connection 2/0 | 52 |                    |   |   |   | 84              | not used |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |   |   |
| 21                        | Q1: Connection 2/1 | 53 |                    |   |   |   | 85              | not used |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |   |   |
| 22                        | Q1: Connection 3/0 | 54 |                    |   |   |   | 86              | not used |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |   |   |
| 23                        | Q1: Connection 3/1 | 55 |                    |   |   |   | 87              | not used |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |   |   |
| 24                        | not used           | 56 | not used           |   |   |   | 88              | not used |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |   |   |
| 25                        | not used           | 57 | not used           |   |   |   | 89              | not used |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |   |   |
| 26                        | Q1: Connection 4/1 | 58 | Q1: Connection 7/0 |   |   |   | 90              | not used |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |   |   |

Table 7-16 Pin Assignment of Terminal Block TB6/AC for ET 200B-16RO-AC  
(6ES7 132-0HH00-0XB0), continued

| Terminal tier 1 |                    | Terminal tier 2 |                                | Terminal tier 3 |                                |
|-----------------|--------------------|-----------------|--------------------------------|-----------------|--------------------------------|
| 27              | Q1: Connection 4/0 | 59              | Q1: Connection 7/0             | 91              | not used                       |
| 28              | Q1: Connection 5/1 | 60              |                                | 92              | not used                       |
| 29              | Q1: Connection 5/0 | 61              |                                | 93              | not used                       |
| 30              | Q1: Connection 6/1 | 62              |                                | 94              | not used                       |
| 31              | Q1: Connection 6/0 | 63              |                                | 95              | not used                       |
| 32              | Q1: Connection 7/1 | 64              |                                | 96              | not used                       |
| -               |                    | L1              | Voltage supply, internal logic | N               | Voltage supply, internal logic |
| -               |                    | L1              | Voltage supply, internal logic | N               | Voltage supply, internal logic |

### Important Note on Wiring

The following notes are important as regards the wiring of the ET 200B-16RO-AC:

- Protect the module against inductive voltage surges at the relay contacts. Suitable surge protectors are RC elements or varistors connected across the relay contact or across the load. The size and ratings of the protective elements must be dimensioned to suit the size and type of load.
- Voltage surge protectors of this kind extend the service life of the relay contacts.

**Technical Data**

The technical data of electronics block ET 200B-16RO-AC is listed in the tables below.

| Technical specifications  |   | Relay outputs   |   |
|---|---|---|---|
| Baud rates*   | 9.6/19.2/93.75/187.5/500/<br>1500/3000/6000/<br>12000 kbaud     | Number of outputs   |   |
| Bus protocol  | PROFIBUS-DP   | • High current  | 4 (0.0, 0.7, 1.0 and 1.7)   |
| Galvanic isolation to SI-<br>NEC L2-DP bus                      | Yes, 500 V DC to logic,<br>1500 V AC to connection<br>terminals | • Low current   | 12 (0.1 to 0.6, 1.1 to 1.6)   |
| Power losses  | 20 W  | Galvanic isolation  | Yes (relays)  |
| Weight (EB and TB)  | 814 g (29 oz)   | • In groups of  | 1   |
| Dimensions<br>(EB and TB: W x H x D)                            | 235 x 130 x 60 mm<br>(9.17 x 5.09 x 2.34 in.)                   | Short-circuit protection  | No  |
| <b>Diagnostics functions</b>                                    |   | Relay type  | Takamisawa NY 24 W-K  |
| Voltage monitoring  | Green "RUN" LED   | Output voltage  |   |
| Bus monitoring SINEC<br>L2-DP                                   | Red "BF" LED  | • Rated value   | 24 to 150 V DC<br>120 V AC  |
| Group diagnostics for<br>short-circuit, load voltage<br>failure | No  | • Permissible range   | 0,1 to 150 V DC<br>79 to 150 V AC   |
| Load voltage monitoring   | No  | Continuous current I <sub>th</sub>                              | Max. 4 A<br>(for high current points)<br>Max. 2 A<br>(for low current points) |
| Status of outputs   | Green LEDs  | Switching capacity of con-<br>tacts                             |   |
| <b>Supply voltage for internal logic</b>                        |   | • High current points   |   |
| Supply voltage L1   |   | Resistive load  | 0 to 40 °C      60 °C<br>(32 to 104 ° F)      (140° F)                        |
| • Rated value   | 120/230 V AC  | 24 V DC/120 V AC  | 4 A      2 A  |
| • Permissible range   | 85 to 264 V AC  | 120 V DC  | 0.2 A      0.2 A  |
| • Frequency   | 47 to 63 Hz   | Inductive load  |   |
| • Current consumption<br>from L1                                | Typ. 210 mA   | 24 V DC/120 V AC  | 2 A      2 A  |
|   |   | 120 V DC  | 0.2 A      0.2 A  |
|   |   | • Low current points  |   |
|   |   | Resistive and<br>inductive loads                                | 0 to 40 °C      60 °C<br>(32 to 104 ° F)      (140° F)                        |
|   |   | 24 V DC/120 V AC  | 2 A      1 A  |
|   |   | 120 V DC  | 0.2 A      0.2 A  |
|   |   | Switching cycles of con-<br>tacts acc. to VDE 0660,<br>Part 200 |   |
|   |   | • DC-11   | > 100 x 10 <sup>6</sup>   |
|   |   | • AC-15   | > 300 x 10 <sup>5</sup>   |
|   |   | Switching frequency   |   |
|   |   | • Resistive load  | Max. 10 Hz  |
|   |   | • Inductive load  | Max. 2 Hz   |
|   |   | Cable length  | Max. 600 m (1968 ft.)   |
|   |   | Setting a digital input   | Possible  |

\* In operation with the IM 308-B, the maximum baud rate is 1500 kbaud.

### 7.3.14 Electronics Block ET 200B-8DI/8RO-AC (6ES7 133-0HH00-0XB0)

#### Characteristics

The ET 200B-8DI/8RO-AC electronics block has the following characteristics:

- 8 inputs, floating in groups of 4
- 8 relay outputs, floating in groups of 1
- Input voltage: 120/230 V AC
- Inputs suitable for switches and 2-wire proximity switches acc. to IEC 1131, type 1
- 8 relay outputs, floating in groups of 1
- Output load voltage: 120 V AC  
24 ... 150 V DC
- Output current: 4 A for outputs 0.0 and 0.7  
2 A for outputs 0.1 to 0.6
- Outputs suitable for AC/DC solenoid valves, switches, motor starters, small-power motors, motors and lamps.
- Possible terminal block: TB6/AC

#### Dimensional Drawing

See Figure 7-22 for the precise dimensions.

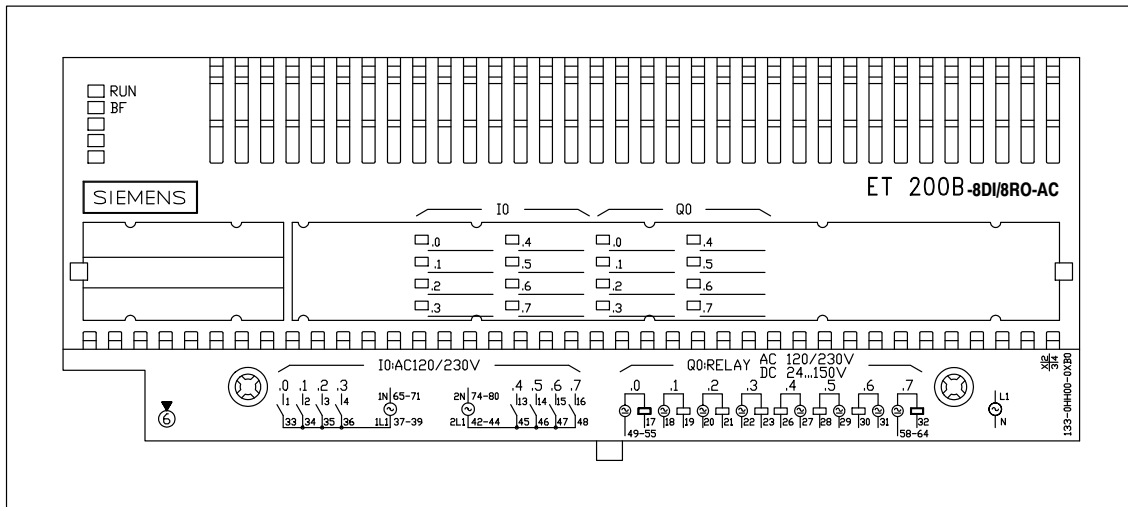


Figure 7-56 Front Elevation: ET 200B-8DI/8RO-AC (6ES7 133-0HH00-0XB0)

**Block Diagram** Simplified diagram of the potential for the ET 200B-8DI/8RO-AC and TB6/DC:

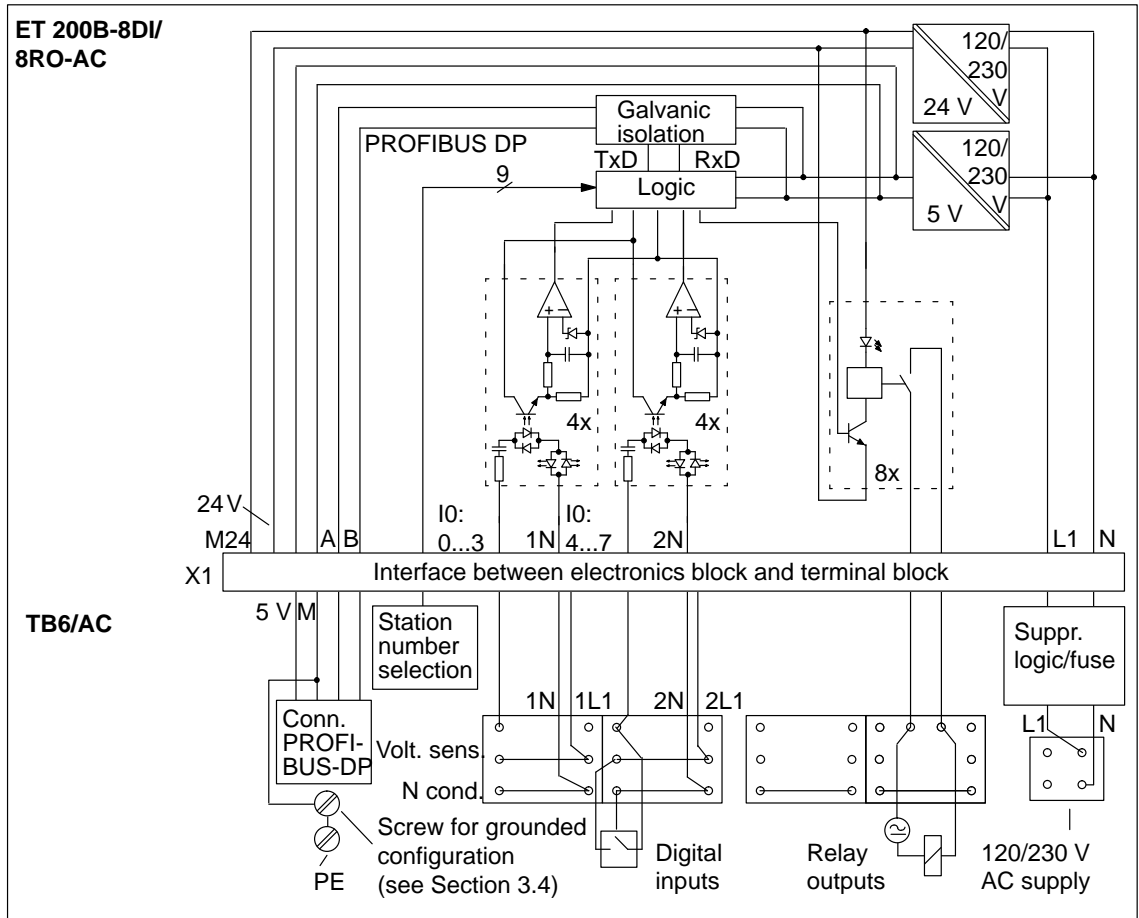


Figure 7-57 Block Diagram: ET 200B-8DI/8RO-AC (6ES7 133-0HH00-0XB0) and TB6/AC



**Pin Assignment**

The table below shows the pin assignment of the terminal blocks for ET 200B-8DI/8RO-AC. For the sake of clarity, the table also shows the terminal numbering of the terminal blocks, taking the TB6/AC by way of example.

Table 7-17 Pin Assignment of Terminal Block TB6/AC for ET 200B-8DI/8RO-AC (6ES7 133-0HH00-0XB0)

| Terminal numbering TB6/AC |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
|---------------------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| 1                         | 2  | 3  | 4  | 5  | 6  | 7  | 8  | 9  | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 |    |    |
| 33                        | 34 | 35 | 36 | 37 | 38 | 39 | 40 | 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49 | 50 | 51 | 52 | 53 | 54 | 55 | 56 | 57 | 58 | 59 | 60 | 61 | 62 | 63 | 64 | L1 | L1 |
| 65                        | 66 | 67 | 68 | 69 | 70 | 71 | 72 | 73 | 74 | 75 | 76 | 77 | 78 | 79 | 80 | 81 | 82 | 83 | 84 | 85 | 86 | 87 | 88 | 89 | 90 | 91 | 92 | 93 | 94 | 95 | 96 | N  | N  |

| Terminal tier 1 |                | Terminal tier 2 |  | Terminal tier 3 |   |
|-----------------|----------------|-----------------|--|-----------------|---|
| 1               | I0: Input .0   | 33              | Sensor voltage <b>1L1</b> for channel I0: .0 to .3 | 65              | Sensor voltage <b>1N</b> for channel I0: .0 to .3 |
| 2               | I0: Input .1   | 34              |  | 66              |   |
| 3               | I0: Input .2   | 35              |  | 67              |   |
| 4               | I0: Input .3   | 36              |  | 68              |   |
| 5               | not used       | 37              |  | 69              |   |
| 6               | not used       | 38              |  | 70              |   |
| 7               | not used       | 39              |  | 71              |   |
| 8               | not used       | 40              | not used   | 72              | not used  |
| 9               | not used       | 41              | not used   | 73              | not used  |
| 10              | not used       | 42              | Sensor voltage <b>2L1</b> for channel I0: .4 to .7 | 74              | Sensor voltage <b>2N</b> for channel I0: .4 to .7 |
| 11              | not used       | 43              |  | 75              |   |
| 12              | not used       | 44              |  | 76              |   |
| 13              | I0: Input .4   | 45              |  | 77              |   |
| 14              | I0: Input .5   | 46              |  | 78              |   |
| 15              | I0: Input .6   | 47              |  | 79              |   |
| 16              | I0: Input .7   | 48              |  | 80              |   |
| 17              | Q0: Output 0/1 | 49              | Q0: Output 0/0                                     | 81              | not used  |
| 18              | Q0: Output 1/0 | 50              |  | 82              | not used  |
| 19              | Q0: Output 1/1 | 51              |  | 83              | not used  |
| 20              | Q0: Output 2/0 | 52              |  | 84              | not used  |
| 21              | Q0: Output 2/1 | 53              |  | 85              | not used  |
| 22              | Q0: Output 3/0 | 54              |  | 86              | not used  |
| 23              | Q0: Output 3/1 | 55              |  | 87              | not used  |
| 24              | not used       | 56              | not used   | 88              | not used  |
| 25              | not used       | 57              | not used   | 89              | not used  |

Table 7-17 Pin Assignment of Terminal Block TB6/AC for ET 200B-8DI/8RO-AC (6ES7 133-0HH00-0XB0), continued

| Terminal tier 1 |                | Terminal tier 2 |                                | Terminal tier 3 |                                |
|-----------------|----------------|-----------------|--------------------------------|-----------------|--------------------------------|
| 26              | Q0: Output 4/1 | 58              | Q0: Output 7/0                 | 90              | not used                       |
| 27              | Q0: Output 4/0 | 59              |                                | 91              | not used                       |
| 28              | Q0: Output 5/1 | 60              |                                | 92              | not used                       |
| 29              | Q0: Output 5/0 | 61              |                                | 93              | not used                       |
| 30              | Q0: Output 6/1 | 62              |                                | 94              | not used                       |
| 31              | Q0: Output 6/0 | 63              |                                | 95              | not used                       |
| 32              | Q0: Output 7/1 | 64              |                                | 96              | not used                       |
| -               |                | L1              | Voltage supply, internal logic | N               | Voltage supply, internal logic |
| -               |                | L1              | Voltage supply, internal logic | N               | Voltage supply, internal logic |

**Important Note on Wiring**

The following notes are important as regards the wiring of the ET 200B-8DI/8RO-AC:

- If installed in an 230 V AC system with ambient temperatures in excess of 40 °C only 6 inputs can be used and rated input current must not exceed AC 240 V.
- If installed in an 230 V AC system, the following must always be connected to the same outer conductor (same phase):
  - 1L1/1N and 2L1/2N (same phase)
  - 3L1/3N and 4L1/4N (same phase)
- Protect the module against inductive voltage surges at the relay contacts. Suitable surge protectors are RC elements or varistors connected across the relay contact or across the load. The size and ratings of the protective elements must be dimensioned to suit the size and type of load.
- Voltage surge protectors of this kind extend the service life of the relay contacts.

**Technical Data**

The technical data of electronics block ET 200B-8DI/8RO-AC is listed in the tables below.

| <b>Technical specifications</b>   |   | <b>Inputs</b>                        |   |
|---|---|--------------------------------------|---|
| Baud rates*   | 9.6/19.2/93.75/187.5/500/<br>1500/3000/6000/<br>12000 kbaud     | Number of inputs                     | 8   |
| Bus protocol  | PROFIBUS-DP   | Galvanic isolation                   | Yes (optocouplers)  |
| Galvanic isolation to SI-<br>NEC L2-DP bus                                | Yes, 500 V DC to logic,<br>1500 V AC to connection<br>terminals | • In groups of                       | 4   |
| Power losses  | 13 W  | Input voltage                        |   |
| Weight (EB and TB)  | 811 g (29 oz)   | • Rated value                        | 120/230 V AC  |
| Dimensions (EB and TB:<br>W x H x D)                                      | 235 x 130 x 60 mm<br>(9.17 x 5.07 x 2.34 in.)                   | • For "0" signal                     | 0 to 40 V AC  |
| <b>Diagnostics functions</b>  |   | • For "1" signal                     | 79 to 264 V AC  |
| Voltage monitoring  | Green LED "RUN"   | Input current for "1" sig-<br>nal    | 3 to 16 mA  |
| Bus monitoring SINEC<br>L2-DP   | Red LED "BF"  | • at 120, 60 Hz                      | Typ. 6.5 mA   |
| Group diagnostics for<br>short-circuit, load voltage<br>failure           | No  | • at 230 V, 50 Hz                    | Typ. 10.5 mA  |
| Load voltage monitoring   | No  | Type of input acc. to<br>IEC 1131    | Type 1  |
| Status of outputs   | Green LEDs  | Delay of inputs                      | 0 to 25 ms  |
| <b>Supply voltage for internal logic</b>                                  |   | Connection of 2-wire<br>BERO         | No  |
| Supply voltage L1   |   | • Permissible quiescent<br>current   | 2 mA  |
| • Rated value   | 120/230 V AC,   | Connection of mechanical<br>switches | Yes   |
| • Permissible range   | 85 to 264 V AC  | Cable length of sensors              |   |
| • Frequency   | 47 to 63 Hz   | Cable length                         | Max. 600 m (1968 ft.)   |
| • Current consumption<br>from L1  | Typ. 165 mA   | <b>Relay outputs</b>                 |   |
| * In operation with the IM 308-B, the maximum baud rate<br>is 1500 kbaud. |   | Number of outputs                    |   |
|   |   | • High current                       | 2 (0.0, 0.7)  |
|   |   | • Low current                        | 6 (0.1 to 0.6)  |
|   |   | Galvanic isolation                   | Yes (relays)  |
|   |   | • In groups of                       | 1   |
|   |   | Short-circuit protection             | No  |
|   |   | Relay type                           | Takamisawa NY 24W-K   |
|   |   | Output voltage                       |   |
|   |   | • Rated value                        | 24 to 150 V DC<br>120 V AC  |
|   |   | • Permissible range                  | 0.1 to 150 V DC<br>79 to 150 V AC   |
|   |   | Continuous current $I_{th}$          | Max. 4 A<br>(for high current points)<br>Max. 2 A<br>(for low current points) |

| <b>Relay outputs, continued</b>                         |                               |                   |
|---|-------------------------------|-------------------|
| Switching capacity of contacts                          |                               |                   |
| • High current points                                   |                               |                   |
| Resistive load  | 0 to 40 °C<br>(32 to 104 ° F) | 60 °C<br>(140° F) |
| 24 V DC/<br>120/230 V AC                                | 4 A                           | 2 A               |
| 120 V DC  | 0.2 A                         | 0.2 A             |
| Inductive load  |                               |                   |
| 24 V DC/<br>120/230 V AC                                | 2A                            | 2A                |
| 120 V DC  | 0.2 A                         | 0.2 A             |
| • Low current points                                    |                               |                   |
| Resistive and inductive loads                           |                               |                   |
|   | 0 to 40 °C<br>(32 to 104 ° F) | 60 °C<br>(140° F) |
| 24 V DC/<br>120/230 V AC                                | 2A                            | 1 A               |
| 120 V DC  | 0.2 A                         | 0.2 A             |
| Switching cycles of contacts acc. to VDE 0660, Part 200 |                               |                   |
| • DC-11   | > 100 x 10 <sup>6</sup>       |                   |
| • AC-15   | > 300 x 10 <sup>5</sup>       |                   |
| Switching frequency                                     |                               |                   |
| • Resistive load  | Max. 10 Hz                    |                   |
| • Inductive load  | Max. 2 Hz                     |                   |
| Cable length  | Max. 600 m (1968 ft.)         |                   |
| Setting a digital input                                 | Possible                      |                   |

# Analog Modules

# 8

## Introduction

There are a number of analog modules for connecting measured-value sensors and loads/actuators.

## In this Chapter

This chapter contains the technical data for the analog modules.

The technical data for each analog module is accompanied by

- details of the measured-value sensors and loads that can be connected,
- information on analog-value display for operation with SIMATIC S5 and S7,
- a list of permissible address IDs, and
- the parameters of the analog modules.

| In Section | you will find   | on Page |
|------------|---|---------|
| 8.1        | Analog modules  | 8-2     |
| 8.2        | Terminal block TB8 (6ES7 193-0CD40-0XA0)              | 8-3     |
| 8.3        | Terminal block TB8 and bus connector                  | 8-4     |
| 8.4        | Electronics block ET 200B-4/8AI (6ES7 134-0KH01-0XB0) | 8-5     |
| 8.5        | Electronics block ET 200B-4AI (6ES7 134-0HF01-0XB0)   | 8-51    |
| 8.6        | Electronics block ET 200B-4AO (6ES7 135-0HF01-0XB0)   | 8-76    |

## 8.1 Analog Modules

**Introduction** The tables below give an overview of the ET 200B analog modules.

**List of Electronics Blocks** The following types of electronics block are available:

Table 8-1 Analog Electronics Blocks of ET 200B

| Electronics block | Description   |
|-------------------|---|
| ET 200B-4/8AI     | 8 analog differential inputs <b>or</b><br>8 × thermocouples, 4 × resistance measurement, 4 × resistance thermometer (PT 100, Ni 100) (measuring principle: integrating) |
| ET 200B-4AI       | 4 analog differential inputs<br>(measuring principle: successive approximation)   |
| ET 200B-4AO       | 4 analog outputs  |

**List of Terminal Blocks** A single terminal block is available for all analog electronics blocks:

Table 8-2 Analog Terminal Block of ET 200B

| Terminal block | Description                         |
|----------------|-------------------------------------|
| TB8            | 4/8-channel, spring-latch terminals |

## 8.2 Terminal Block TB8 (6ES7 193-0CD40-0XA0)

**Dimensional Drawing, TB8** Dimensional drawing: terminal block TB8 (spring-latch terminals)

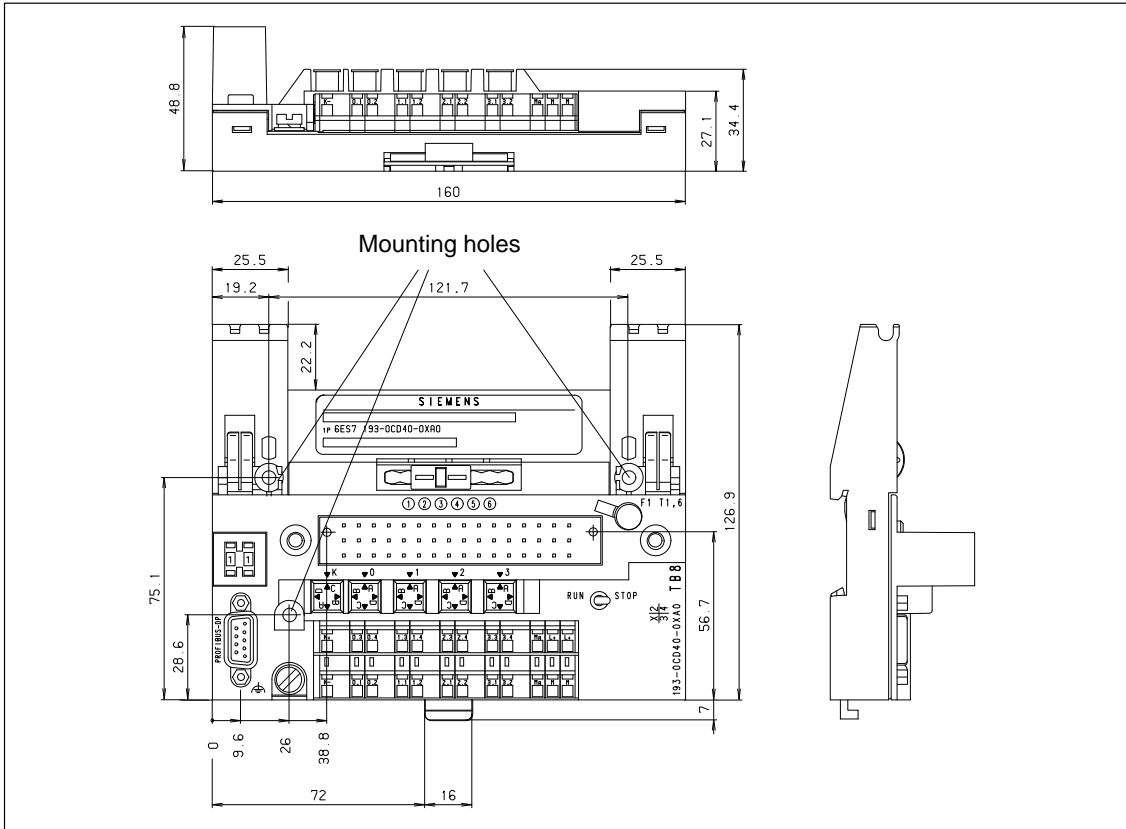


Figure 8-1 Dimensional Drawing: Terminal Block TB8 (Spring-Latch Terminals)

**Terminal Numbering** Figure 8-2 is an enlargement of the terminal numbering printed on the TB8 (spring-latch terminals).

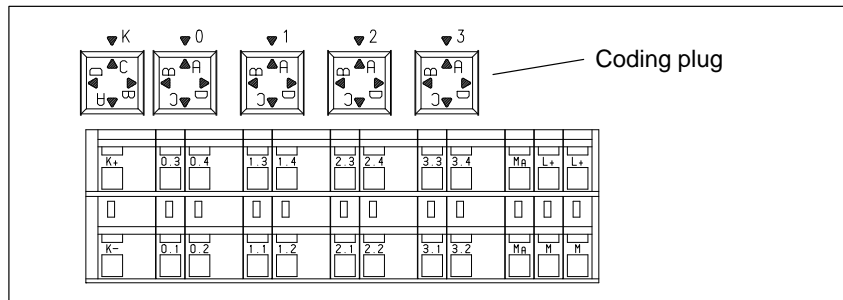


Figure 8-2 Terminal Numbering: Terminal Block TB8 (Spring-Latch Terminals)

### 8.3 Terminal Block TB8 and Bus Connector

**Dimensional Drawing**

Figure 8-3 contains the dimensional drawings (side elevation) of the terminal block TB8 with electronics block installed and two different bus connectors.

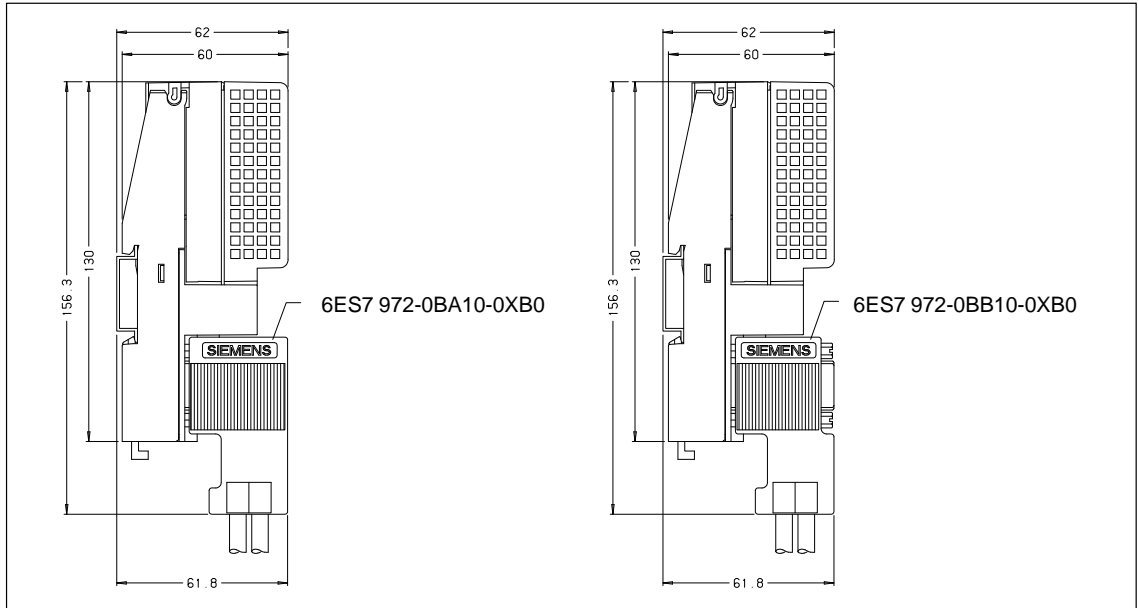


Figure 8-3 Dimensional Drawing: Side Elevation with Bus Connectors (6ES7 972-0BA10-0XA0 and 6ES7 972-0BB10-0XA0)



## 8.4 Electronics Block ET 200B-4/8AI (6ES7 134-0KH01-0XB0)

### Characteristics

The ET 200B-4/8AI electronics block has the following characteristics:

- 8 inputs in 4 channel groups, galvanically isolated from voltage supply to the internal logic
- Transducers supported:
  - Thermocouples: types E, J, K, L, N, T, U
  - Resistance thermometers: Pt 100, Ni 100
  - Resistors: 48  $\Omega$ , 150  $\Omega$ , 300  $\Omega$ , 600  $\Omega$
  - Voltage sensors:  $\pm 80$  mV,  $\pm 250$  mV,  $\pm 500$  mV,  $\pm 1000$  mV (2-wire connection)
- Measuring principle: integrating
- Integration times: 2.5 ms, 16.7 ms, 20 ms, 100 ms
- Supply voltage: 24 V DC
- Measured-value range selection via COM ET 200 or STEP 7 or directly via parameterization telegram (see Chapter 4)

### Dimensional Drawing

Dimensional drawing of the ET 200B-4/8AI:

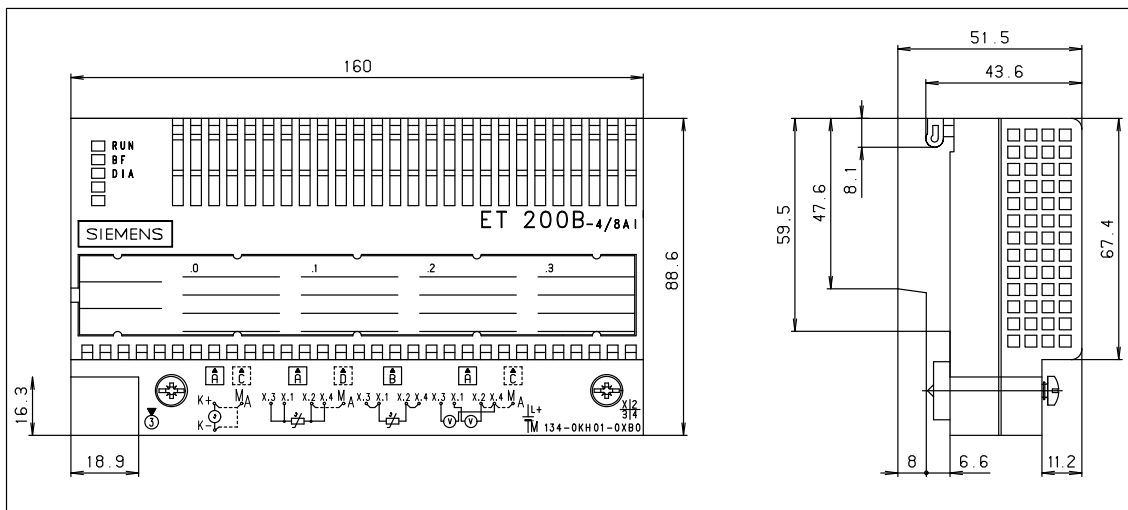


Figure 8-4 Dimensional Drawing: ET 200B-4/8AI (6ES7 134-0KH01-0XB0)

**Terminal Numbering**

Figure 8-5 is an enlargement of the terminal numbering printed on the ET 200B-4/8AI.

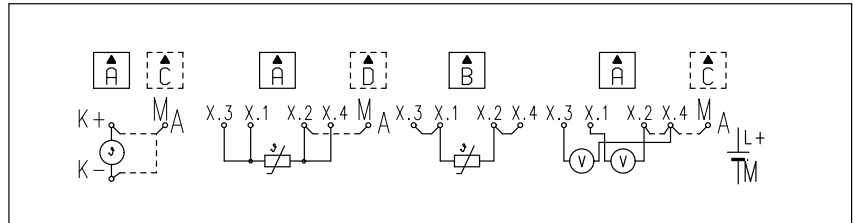


Figure 8-5 Connection Diagram: ET 200B-4/8AI (6ES7 134-0KH01-0XB0)

**List of Subsections**

The following aspects of the ET 200B-4/8AI are described below:

| In Section | you will find   | on Page |
|------------|---|---------|
| 8.4.1      | Connecting transducers  | 8-7     |
| 8.4.2      | Configuration options   | 8-20    |
| 8.4.3      | Setting the operating mode  | 8-23    |
| 8.4.4      | Analog-value representation, operation with SIMATIC S5            | 8-26    |
| 8.4.5      | Analog-value representation, operation with SIMATIC S7            | 8-39    |
| 8.4.6      | Schematic circuit diagram, terminal assignment and technical data | 8-47    |

## 8.4.1 Connecting Transducers

### Possible Connections

You can connect the following to the ET 200B-4/8AI electronics block:

- Up to 8 thermocouples with compensating box
- Up to 4 resistance thermometers in 2-wire or 4-wire connection
- Up to 4 resistors in 2-wire or 4-wire connection
- Up to 8 voltage sensors (2-wire connection)

Mixed configurations with different types of sensor are possible.

### Channel Group

A channel group consists of two channels set with the parameterization software COM ET 200 or STEP 7 (diagnostics enable, measurement type, measuring range, etc.) and with the coding plug on the TB8 (input circuit).

The settings of a channel group apply to all the channels in the group in question.

### Input Circuit

There are two ways of measuring analog signals from thermocouples, resistance thermometers, resistors and voltage transducers:

- Floating-ground measurement
- Ground-referenced measurement

You set the input circuit for floating-ground or ground-referenced measurement by means of the coding plugs on the TB8 (one coding plug per channel group)

### Floating-Ground Measurement

In the case of floating-ground measurement (differential measurement), each signal line has its own signal reference conductor.

Differential measurement is required in the following cases:

- If the sensors are connected to different potentials and
- If the different signal sources are physically apart.

---

#### Note

The maximum permissible common mode voltage ( $V_{CM}$ ) of the differential inputs to analog ground ( $M_A$ ) is  $\pm 1V$ .

The maximum permissible voltage difference between  $M_A$  and PE must not exceed 75 V DC/60 V AC.

Avoid ground loops!

---


### Ground-Referenced Measurement

In the case of ground-referenced measurement, all signal reference conductors in the TB8 are connected to a common reference point (analog ground  $M_A$ ).

To avoid ground loops, galvanically isolated and ungrounded signal sources (thermocouples, Pt 100, voltage sources) are required.

---

#### Note

Connect  $M_A$  to PE () to enhance noise immunity in the case of ground-referenced measurement.

---

### Connecting Thermocouples with Compensating Boxes

The ET 200B-4/8AI does not have an internal compensating box. The influence of temperature on the reference junction can be countered with a compensating box.

Please note the following rules when connecting a compensating box:

- In a configuration with external compensation you need only one compensating box for all the thermocouples of a single type (E, J, K, L, N, T, U) in a module.

Connect the compensating box to terminals K+ and K- (see for example Figure 8-6).

- In a configuration with external compensation you can connect a maximum of 4 different thermocouples (a different type of thermocouple for each channel group) if you use a separate compensating box for each connection.

In this case the unused K+ and K- terminals must be connected to  $M_A$ . (see Figure 8-7)

- In a configuration with external compensation and one compensating box per channel the same thermocouple type must be used per channel group.
- The compensating box requires a floating power supply. The power supply unit of the compensating box must have a grounded braided shield.

Figures 8-6 to 8-8 illustrate the connection options for thermocouples. A maximum of 8 thermocouples can be connected.

### Valid Compensating Boxes

We recommend the following compensating boxes for connection to the ET 200B-4/8AI:

- Compensating box type U with current stabilizer.
- Reference junction with built-in power supply unit.

**Order Numbers**

The order numbers of the compensating boxes and the associated components can be found in the tables below.

Table 8-3 Compensating Box Type U with Current Stabilizer.

| Accessories   | Weight                                   | Order Number                     |
|---|--|----------------------------------|
| <b>Type U compensating box</b><br>Reference temp. 20 °C (68 °F)→ 0 mV<br>0 °C (32 °F)→ 0 mV   | 0.22 kg (7.7 oz.)<br>0.22 kg (7.7 oz.)   | C70153-A502-A1<br>C70153-A502-A5 |
| <b>Insert for type U compensating box</b><br>(as spare part and for installation in distribution boxes or similar)<br>Reference temp. 20 °C (68 °F)→ 0 mV<br>0 °C (32 °F)→ 0 mV | 0.09 kg (3.15 oz.)<br>0.09 kg (3.15 oz.) | C70153-A502-B7<br>C70153-A502-B9 |
| <b>Current stabilizer</b> for feeding a compensating box for thermocouple Fe/Cu Ni, Ni Cr/Ni<br>Reference temp. 20 °C (68 °F)→ 0 mV<br>0 °C (32 °F)→ 0 mV                       | 0.25 kg (8.75 oz.)<br>0.25 kg (8.75 oz.) | M55232-A1<br>M55232-A2           |

Table 8-4 Reference Junction with Built-in Power Supply Unit


| Accessories  | Order Number          |
|--|-----------------------|
| <b>Reference junction</b> with built-in power supply unit for busbar installation  | M72166-□□□□□<br>      |
| Auxiliary energy            220 V AC<br>110 V AC<br>24 V AC<br>24 V DC   | B1<br>B2<br>B3<br>B4  |
| Connection to thermocouple    Fe-CuNi    Type L<br>Fe/Cu Ni    Type J<br>Ni Cr/Ni    Type K<br>Cu-CuNi    Type U<br>Cu/Cu Ni    Type T | 1<br>2<br>3<br>6<br>7 |
| Reference temperature            0 °C<br>20 °C   | 00<br>20              |

**On the Following Pages**

The following pages contain a connection example for every connection possibility and measuring principle. Please note the following rules.

**Rules**

Please note the following rules when connecting measured-value sensors to the ET 200B-4/8AI:

- The permissible potential difference at the differential input (x.1 ↔ x.2 or x.3 ↔ x.4, x = 0 to 3) must not exceed  $\pm 1$  V.
- The maximum permissible common mode voltage ( $V_{CM}$ ) between the differential inputs (x.1 ↔ x.2, x.3 ↔ x.4, x = 0 to 3) and analog ground  $M_A$  is  $\pm 1$  V.
- The maximum permissible isolation voltage between analog ground ( $M_A$ ) and PE () or between the reference potential of the supply voltage (M) is 75 V DC/60 V AC.
- You must short-circuit the connection terminals of unused voltage inputs and connect them to  $M_A$ .

If the coding plug is in the C position, the connection to  $M_A$  is not required (already jumpered internally).

- If you connect only one voltage sensor (2-wire connection) to one channel, you must also short-circuit the remaining free differential input of the channel group and connect it to  $M_A$ .

If the coding plug is in the C position, the connection to  $M_A$  is not required (already jumpered internally).

- If you connect a compensating box, you must short-circuit terminals “K+” and “K-”. For this purpose, set the coding plug to the “C” position.

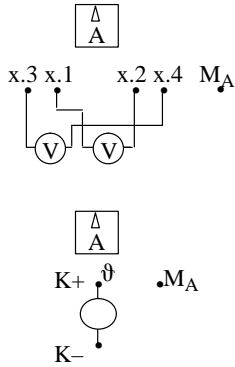
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**Note**

Please note the explanation of shielding of analog lines in Sections 3.1 and 3.5.

---

**Floating-Ground Measurement**



The figure below illustrates the connection of thermocouples of the same type with **one** compensating box **for the entire module** (floating-ground measurement):

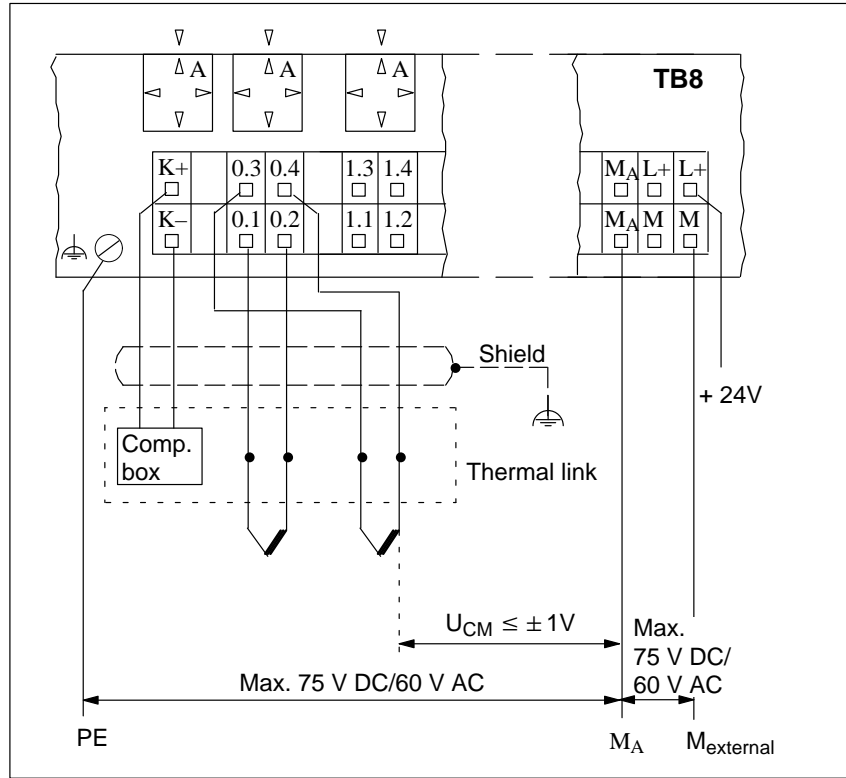
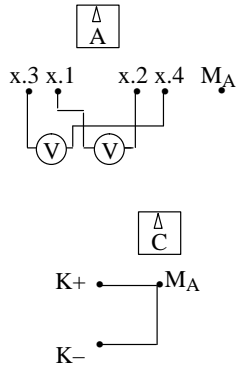


Figure 8-6 Connection of Thermocouples with one Compensating Box (Floating-Ground Measurement)

**Note**

The maximum permissible common mode voltage ( $V_{CM} \leq \pm 1V$ ) must not be exceeded at any of the differential inputs with reference to  $M_A$ .

**Floating-Ground Measurement**



The figure below illustrates the connection of thermocouples of different types with **one** compensating box **per channel** (floating-ground measurement):

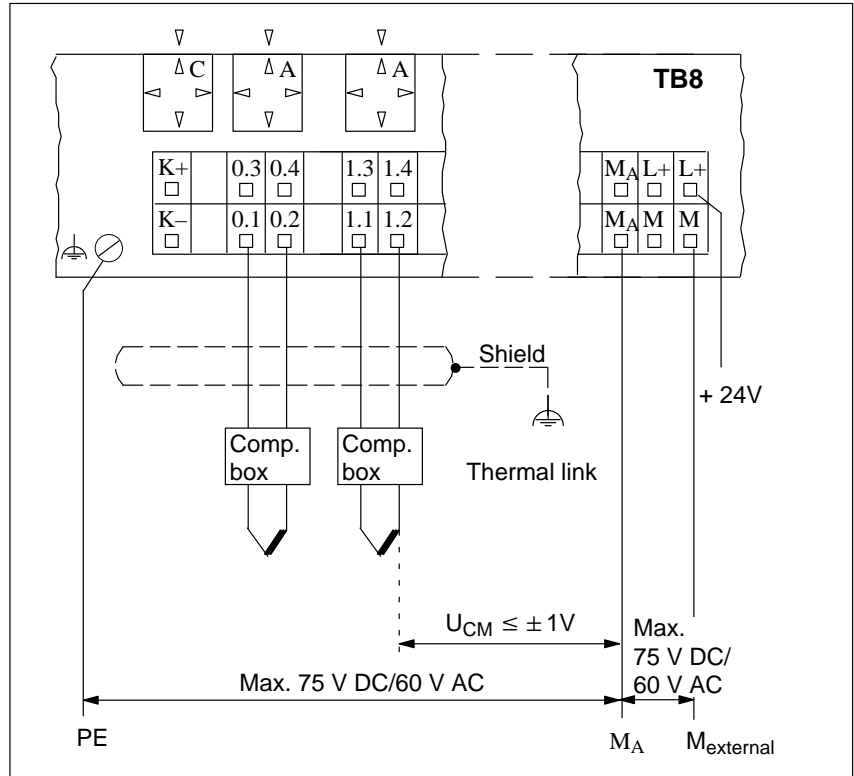


Figure 8-7 Connection of Thermocouples with one Compensating Box per Channel (Floating-Ground Measurement)

**Note**

The maximum permissible common mode voltage ( $V_{CM} \leq \pm 1V$ ) must not be exceeded at any of the differential inputs with reference to  $M_A$



**Ground-Referenced Measurement**

The figure below illustrates the connection of thermocouples of the same type with **one** compensating box **for the entire module** (ground-referenced measurement):

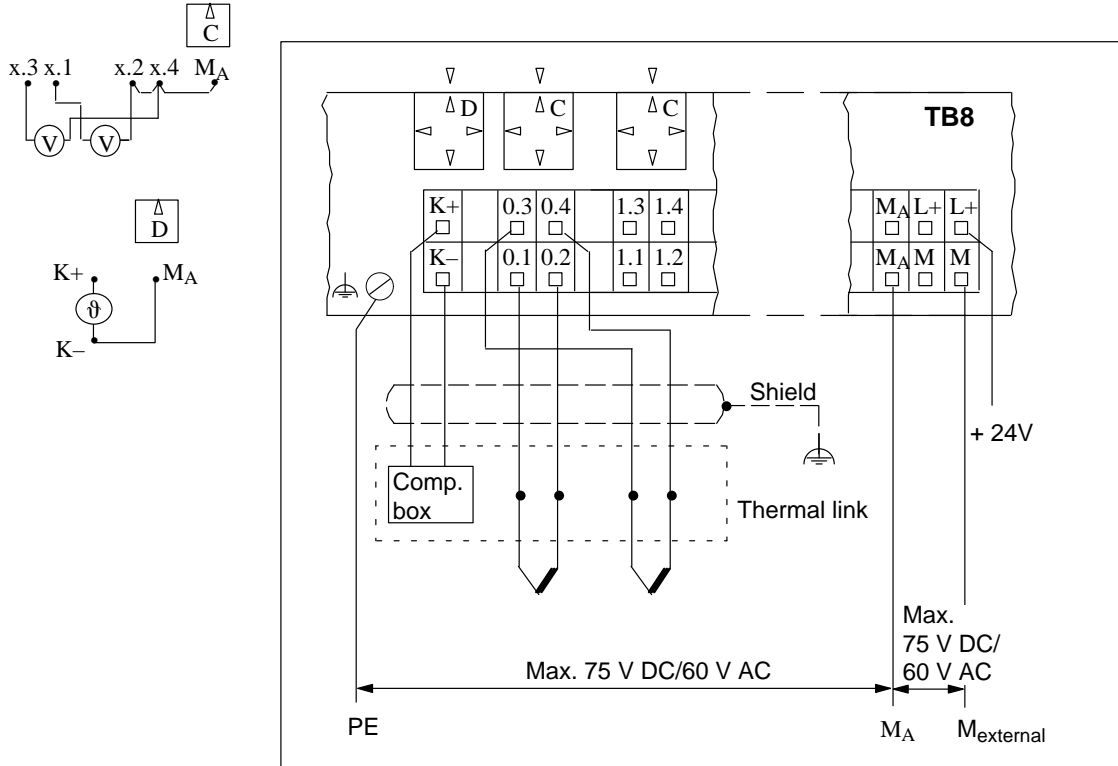


Figure 8-8 Connection of Thermocouples with one Compensating Box (Ground-Referenced Measurement)

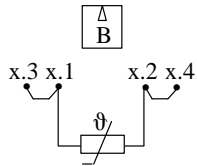
**Connection of Resistance Thermometers/Resistors (2-Wire Connection)**

If resistance thermometers or resistors are connected, resistance can be measured by means of a 2-wire connection.

The resistance thermometer/resistor receives a constant current supply via terminals x.1 and x.2. Voltage drops on the measuring lines may falsify the results. This type of measurement is useful if the measuring lines are short and thick or when the requirements for measuring accuracy are low.

Figures 8-9 and 8-10 show the two methods of connecting resistance thermometers and resistors in a 2-wire connection, taking a Pt 100 by way of example. A maximum of 4 resistance thermometers (Pt 100, Ni 100) or resistors can be connected.

**Floating-Ground Measurement**



The connection of resistance thermometers (Pt 100) with 2-wire connections (floating-ground measurement) is shown below:

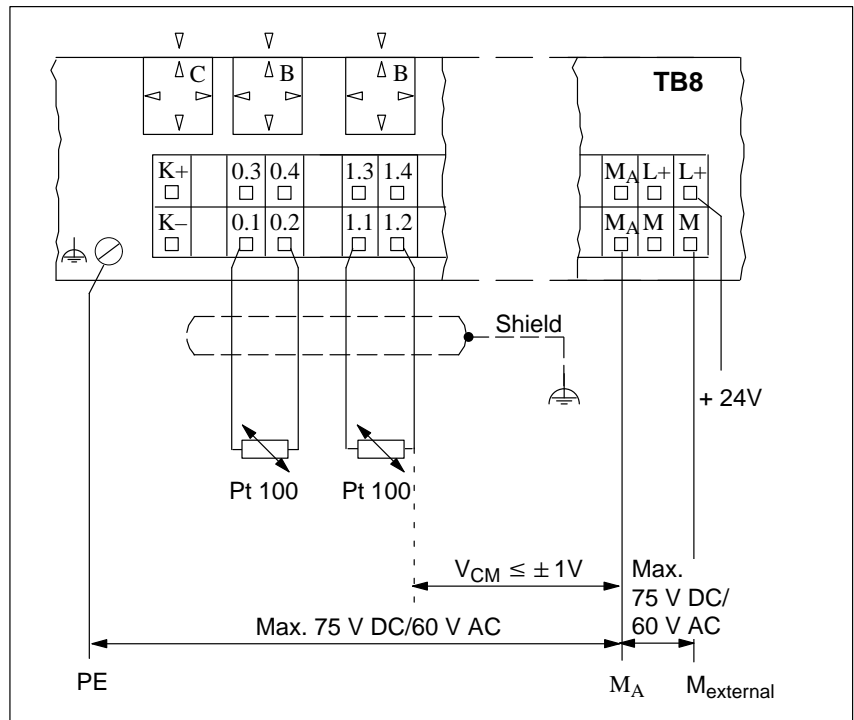
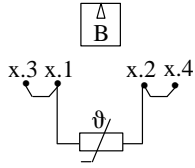


Figure 8-9 Connection of Resistance Thermometers (Pt 100) with 2-Wire Connections (Floating-Ground Measurement)

**Note**

The maximum permissible common mode voltage ( $V_{CM} \leq \pm 1V$ ) must not be exceeded at any of the differential inputs with reference to  $M_A$ .

**Ground-Referenced Measurement**



In the case of ground-referenced measurement, you must connect terminal x.4 externally with analog ground ( $M_A$ ).

The connection of resistance thermometers (Pt 100) with 2-wire connections (ground-referenced measurement) is shown below:

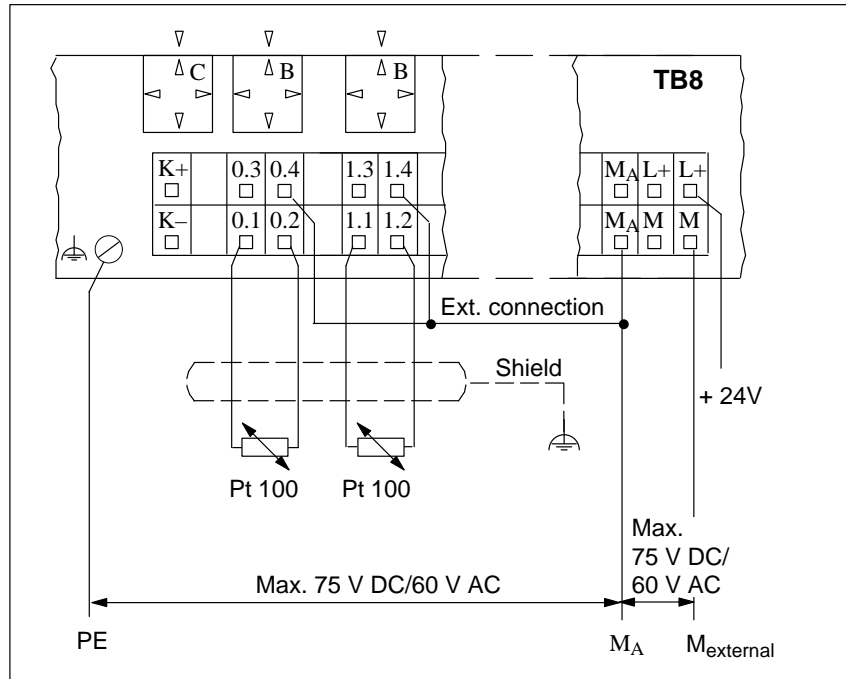


Figure 8-10 Connection of Resistance Thermometers (Pt 100) with 2-Wire Connections (Ground-Referenced Measurement)

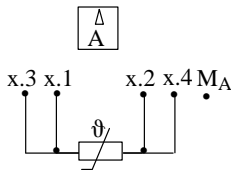
**Connection of Resistance Thermometers (4-Wire Connection)**

If resistance thermometers or resistors are connected, resistance can be measured by means of a 4-wire connection.

A constant current  $I_c$  is fed to the resistance thermometer via terminals x.1 and x.2. The voltage generated at the resistance thermometer is measured via x.3/x.4. This means that voltage drops on the “constant current lines” do not corrupt the result of the measurement. The measurement inputs have a high resistance so that only a negligible voltage drop occurs on the measuring lines.

Figures 8-11 and 8-12 show the two methods of connecting resistance thermometers and resistors in a 4-wire connection, taking a Pt 100 by way of example.

**Floating-Ground Measurement**



The connection of resistance thermometers (Pt 100) with 4-wire connections (floating-ground measurement) is shown below:

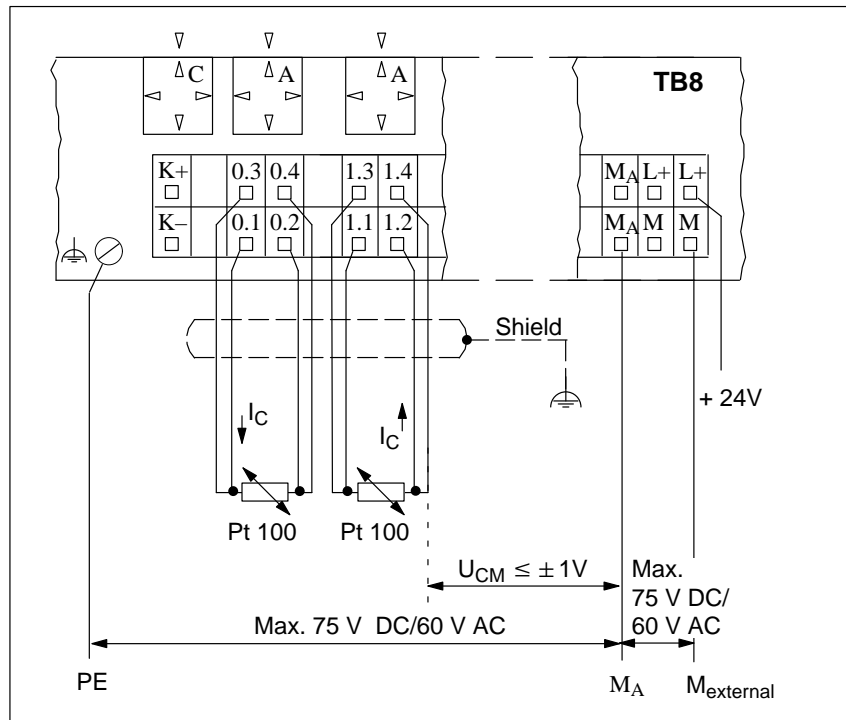


Figure 8-11 Connection of Resistance Thermometers (Pt 100) with 4-Wire Connections (Floating-Ground Measurement)

**Note**

The maximum permissible common mode voltage ( $V_{CM} \leq \pm 1V$ ) must not be exceeded at any of the differential inputs with reference to  $M_A$ .

**Ground-Referenced Measurement**

The connection of resistance thermometers (Pt 100) with 4-wire connections (ground-referenced measurement) is shown below:

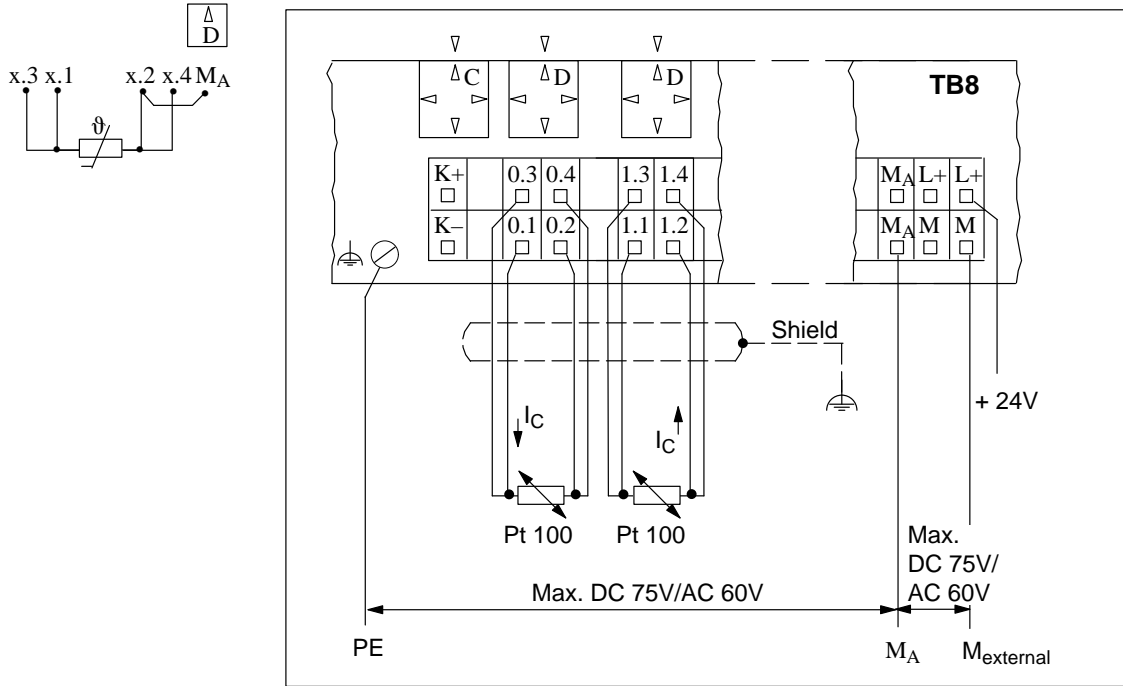


Figure 8-12 Connection of Resistance Thermometers (Pt 100) with 4-Wire Connections (Ground-Referenced Measurement)

**Connection of Voltage Sensors**

The channels can also be used to connect voltage sensors ( $\pm 80 \text{ mV}$ ,  $\pm 250 \text{ mV}$ ,  $\pm 500 \text{ mV}$ ,  $\pm 1000 \text{ mV}$ ).

Two voltage sensors per channel group can be connected.

Figures 8-13 and 8-14 show the two methods of connecting voltage sensors.

**Floating-Ground Measurement**

Two-wire connection of voltage sensors (floating-ground measurement) is shown below:

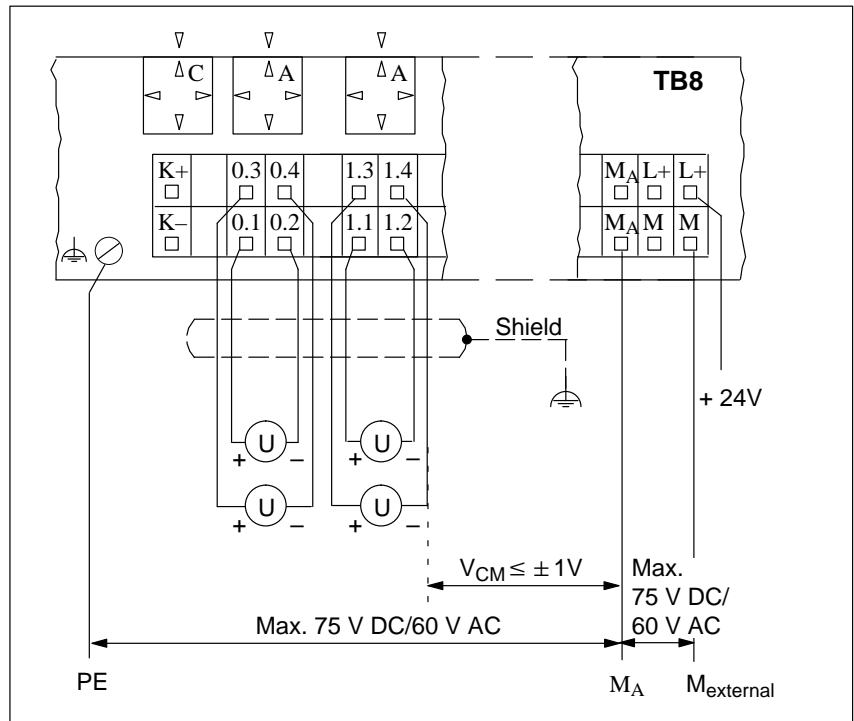
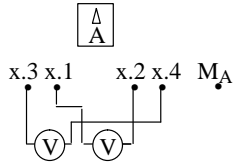
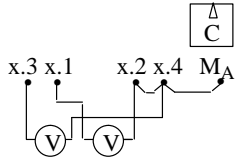


Figure 8-13 2-Wire Connection of Voltage Sensors to ET 200B-4/8AI (Floating-Ground Measurement)

**Note**

The maximum permissible common mode voltage ( $V_{CM} \leq \pm 1V$ ) must not be exceeded at any of the differential inputs with reference to  $M_A$ .

**Ground-Referenced Measurement**



Two-wire connection of voltage sensors (ground-referenced measurement) is shown below:

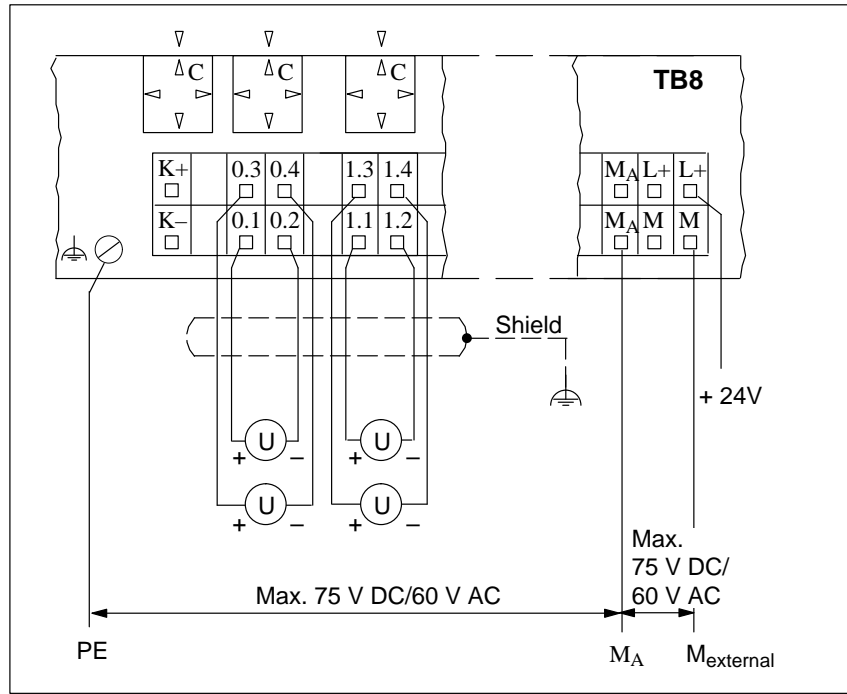


Figure 8-14 2-Wire Connection of Voltage Sensors to ET 200B-4/8AI (Ground-Referenced Measurement)

## 8.4.2 Configuration Options

**Type File** The information in this section applies to the type file **SI801ABE.200**.  
The type file contains the possible configurations. The configuration you choose depends on the wiring of the module.

**Configuration for Voltage Sensors, Thermocouples** Table 8-5 shows the possible configurations of the ET 200B-4/8AI with COM ET 200 Windows or STEP 7 for connecting voltage sensors and thermocouples.  
Table 8-5 lists only the slots for configuring the input areas (slots 4 to 11). Slots 1 to 3 have the default value "004".

Table 8-5 Possible Configurations for the Input Areas of ET 200B-4/8AI, with only Voltage Sensors and Thermocouples Connected

| Confi-<br>gura-<br>tion | Terminals used  |                |                 |                |                 |                |                 |                | Length <sup>1</sup><br>(in<br>words) | Meaning   |
|-------------------------|-----------------|----------------|-----------------|----------------|-----------------|----------------|-----------------|----------------|--------------------------------------|---|
|                         | Channel group 0 |                | Channel group 1 |                | Channel group 2 |                | Channel group 3 |                |                                      |   |
|                         | Chan-<br>nel 0  | Chan-<br>nel 1 | Chan-<br>nel 2  | Chan-<br>nel 3 | Chan-<br>nel 4  | Chan-<br>nel 5 | Chan-<br>nel 6  | Chan-<br>nel 7 |                                      |   |
|                         | 0.1/0.2         | 0.3/0.4        | 1.1/1.2         | 1.3/1.4        | 2.1/2.2         | 2.3/2.4        | 3.0/3.1         | 3.3/3.4        |                                      |   |
| 8AI                     | ×               | ×              | ×               | ×              | ×               | ×              | ×               | ×              | 8                                    | A start address is assigned for the entire module, addresses for 8 words are reserved.<br>(= module addressing) |
| 8 x 1AI                 | ×               | ×              | ×               | ×              | ×               | ×              | ×               | ×              | 8                                    |   |
| 7 x 1AI                 | ×               | ×              | ×               | ×              | ×               | ×              | ×               |                | 7                                    |   |
| 6 x 1AI                 | ×               | ×              | ×               | ×              | ×               | ×              |                 |                | 6                                    |   |
| 5 x 1AI                 | ×               | ×              | ×               | ×              | ×               |                |                 |                | 5                                    |   |
| 4 x 1AI                 | ×               | ×              | ×               | ×              |                 |                |                 |                | 4                                    |   |
| 3 x 1AI                 | ×               | ×              | ×               |                |                 |                |                 |                | 3                                    |   |
| 2 x 1AI                 | ×               | ×              |                 |                |                 |                |                 |                | 2                                    |   |
| 1 x 1AI                 | ×               |                |                 |                |                 |                |                 |                | 1                                    |   |

<sup>1</sup> Length of user data; × = Connection of measuring lines

### Note

If you connect voltage sensors/thermocouples and resistors/thermal resistors to the same module, you have a mixed configuration as shown in Tables 8-5 and 8-6 (see example below).



**Configuration for Resistors/Thermal Resistors**

Table 8-6 shows the possible configurations of the ET 200B-4/8AI with COM ET 200 Windows or STEP 7 for connecting thermal resistors and for resistance measurement.

Table 8-6 lists only the slots for configuring the input areas (slots 4 to 7). Slots 1 to 3 have the default value "004".

Table 8-6 Possible IDs for Configuring the Input Areas of ET 200B-4/8AI, with only Thermal resistors and Resistors Connected

| Config-uration | Terminals used  |            |                 |            |                 |            |                 |            | Length <sup>1</sup><br>(in words) | Meaning   |
|----------------|-----------------|------------|-----------------|------------|-----------------|------------|-----------------|------------|-----------------------------------|---|
|                | Channel group 0 |            | Channel group 1 |            | Channel group 2 |            | Channel group 3 |            |                                   |   |
|                | Chan-nel 0      | Chan-nel 1 | Chan-nel 2      | Chan-nel 3 | Chan-nel 4      | Chan-nel 5 | Chan-nel 6      | Chan-nel 7 |                                   |   |
|                | 0.1/0.2         | 0.3/0.4    | 1.1/1.2         | 1.3/1.4    | 2.1/2.2         | 2.3/2.4    | 3.0/3.1         | 3.3/3.4    |                                   |   |
| 8AI            | o               | ×          | o               | ×          | o               | ×          | o               | ×          | 8                                 | A start address is assigned for the entire module, addresses for 8 words are reserved. Input data only in the words for channels 0, 2, 4 and 6. (= module addressing) |
| 5 to 8 x 1AI   |                 |            |                 |            |                 |            |                 |            |                                   | This configuration is rejected as errored.  |
|                | Channel group 0 |            | Channel group 1 |            | Channel group 2 |            | Channel group 3 |            |                                   |   |
|                | Channel 0       |            | Channel 1       |            | Channel 2       |            | Channel 3       |            |                                   |   |
|                | 0.1/0.2         | 0.3/0.4    | 1.1/1.2         | 1.3/1.4    | 2.1/2.2         | 2.3/2.4    | 3.0/3.1         | 3.3/3.4    |                                   |   |
| 4 x 1AI        | o               | ×          | o               | ×          | o               | ×          | o               | ×          | 4                                 | A separate start address can be assigned for each channel. Addresses are reserved for a maximum of 4 words. (= single-channel addressing)                             |
| 3 x 1AI        | o               | ×          | o               | ×          | o               | ×          |                 |            | 3                                 |   |
| 2 x 1AI        | o               | ×          | o               | ×          |                 |            |                 |            | 2                                 |   |
| 1 x 1AI        | o               | ×          |                 |            |                 |            |                 |            | 1                                 |   |

<sup>1</sup> Length of user data  
 × = Connection of measuring lines  
 o = Connection of constant-current lines

**Example** In this example voltage sensors and thermal resistors (Pt 100) are connected.

Table 8-7 Example for Configuring the Input Areas of ET 200B-4/8AI

| Config-uration | Terminals used             |                            |                            |                            |                            |                            |                            |                            | Length <sup>1</sup><br>(in words) | Meaning  |
|----------------|----------------------------|----------------------------|----------------------------|----------------------------|----------------------------|----------------------------|----------------------------|----------------------------|-----------------------------------|--|
|                | Chan. group 0              |                            | Chan. group 1              |                            | Chan. group 2              |                            | Chan. group 3              |                            |                                   |  |
|                | Chan-nel 0                 | Chan-nel 1                 | Channel 2                  |                            | Chan-nel 3                 | Chan-nel 4                 | Chan-nel 5                 | Chan-nel 6                 |                                   |  |
| 0.1/<br>0.2    | 0.3/<br>0.4                | 1.1/<br>1.2                | 1.3/<br>1.4                | 2.1/<br>2.2                | 2.3/<br>2.4                | 3.0/<br>3.1                | 3.3/<br>3.4                |                            |                                   |  |
|                | U<br>mea-<br>sure-<br>ment | U<br>mea-<br>sure-<br>ment | Pt 100                     |                            | U<br>mea-<br>sure-<br>ment | U<br>mea-<br>sure-<br>ment | U<br>mea-<br>sure-<br>ment | U<br>mea-<br>sure-<br>ment |                                   | 6 voltage sensors and one Pt 100 thermal resistor  |
| 7 × 1AI        | ×                          | ×                          | o                          | ×                          | ×                          | ×                          | ×                          | ×                          | 7                                 |  |
|                | Chan. group 0              |                            | Chan. group 1              |                            | Chan. group 2              |                            | Chan. group 3              |                            |                                   |  |
|                | Channel 0                  |                            | Ch. 1                      | Ch. 2                      | Channel 3                  |                            | Ch. 4                      | Ch. 5                      |                                   |  |
|                | 0.1/<br>0.2                | 0.3/<br>0.4                | 1.1/<br>1.2                | 1.3/<br>1.4                | 2.1/<br>2.2                | 2.3/<br>2.4                | 3.0/<br>3.1                | 3.3/<br>3.4                |                                   |  |
|                | Pt 100                     |                            | U<br>mea-<br>sure-<br>ment | U<br>mea-<br>sure-<br>ment | Pt 100                     |                            |                            |                            |                                   | 2 voltage sensors and two Pt 100 thermal resistors |
| 4 × 1AI        | o                          | ×                          | ×                          | ×                          | o                          | ×                          |                            |                            | 4                                 |  |

<sup>1</sup> Length of user data  
 × = Connection of measuring lines  
 o = Connection of constant-current lines

**Notes on Configuring**

Bear the following in mind when configuring the modules:

- If you connect resistance thermometers/resistors, the assignment defined in the configuration and the parameterization must match.
- If you connect 4 resistance thermometers/resistors, the only possible configuration options are 8AI or 4 × 1AI.
- If you use single-channel addressing and configure more channels than is possible for parameterization with resistance thermometers/resistors, an error message is displayed for the module.
- If you connect resistance thermometers/resistors and configure with the 8AI ID, the channels not used by the resistance inputs you configure (channels 1, 3, 5 and 7) are also transmitted to the DP master. In the input area addresses that cannot be used for these channels are assigned.
- If you connect resistance thermometers/resistors and use single-channel addressing, addresses are assigned only for the resistance inputs.
- Diagnostics messages and diagnostics data (slave diagnostics) are returned only for the configured channels.

### 8.4.3 Setting the Operating Mode

#### Setting the Operating Mode

You set the operating mode of the ET 200B-4/8AI electronics block

- by means of the coding plugs on the TB8 terminal block and
- by means of the COM ET 200 or STEP7 parameterization software.

#### Coding Plugs

The coding plugs of the TB8 enable you to set the input circuit of the TB8 for analog value measurement of each individual channel group of the ET 200B-4/8AI in accordance with the measured-value sensor connected and the desired mode of measurement.

The possible settings of the coding plugs are: "A", "B", "C" and "D".

For details of the relationships between the settings of the coding plugs and the mode of measurement and the measured-value sensors, see Section 8.4.1. Section 3.1 describes how to change the settings of the coding plugs.

#### Channel Group

Some parameters of the ET 200B-4/8AI listed on the following pages apply only to individual channel groups. Table 8-8 lists the assignment of TB8 terminals to channel groups.

Table 8-8 Assignment of Terminals to Channel Groups

| Channel Group   | Terminals         |
|-----------------|-------------------|
| Channel group 0 | Terminals 0.1/0.2 |
|                 | Terminals 0.3/0.4 |
| Channel group 1 | Terminals 1.1/1.2 |
|                 | Terminals 1.3/1.4 |
| Channel group 2 | Terminals 2.1/2.2 |
|                 | Terminals 2.3/2.4 |
| Channel group 3 | Terminals 3.1/3.2 |
|                 | Terminals 3.3/3.4 |

**Parameters**

Table 8-9 shows all the parameters for parameterizing the ET 200B-4/8AI with COM ET 200 Windows or STEP 7.

You can set these parameters for the ET 200B-4/8AI if you use the type file **SI801ABE.200**.

Table 8-9 Parameters for ET 200B-4/8AI (6ES7 134-0KH01-0XB0)

| Parameter  | Explanation   | Value Range                          |
|--|---|--------------------------------------|
| Diagnostics alarm                                | Diagnostics-alarm enable for module   | Disable<br>Enable                    |
| End-of-cycle alarm                               | End-of-cycle alarm enable for module  | Disable<br>Enable                    |
| Limit-value alarm                                | Limit-value alarm enable for module   | Disable<br>Enable                    |
| Diagnostics enable for channel group 0           | Diagnostics messages enabled separately for each channel group  | Disable<br>Enable                    |
| Diagnostics enable for channel group 1           |   |                                      |
| Diagnostics enable for channel group 2           |   |                                      |
| Diagnostics enable for channel group 3           |   |                                      |
| Wire break monitoring enable for channel group 0 | Wire break monitoring enabled separately for each channel group: <b>only</b> for resistance thermometers (Pt 100, Ni 100), thermocouples, resistors and voltage sensors $\pm 80$ mV | Disable<br>Enable                    |
| Wire break monitoring enable for channel group 1 |   |                                      |
| Wire break monitoring enable for channel group 2 |   |                                      |
| Wire break monitoring enable for channel group 3 |   |                                      |
| Integration time for channel group 0             | Enter an optimum integration time for the A/D converter to help suppress noise voltage.   | 2.5 ms<br>16.7 ms<br>20 ms<br>100 ms |
| Integration time for channel group 1             |   |                                      |
| Integration time for channel group 2             |   |                                      |
| Integration time for channel group 3             |   |                                      |

Table 8-9 Parameters for ET 200B-4/8AI (6ES7 134-0KH01-0XB0), continued

| Parameter                                      | Explanation   | Value Range   |
|--|---|---|
| Measurement type and range for channel group 0 | You can set the measurement type and range separately for each channel group<br>For voltage measurement:<br><br>For resistance thermometer with linearization:<br><br>For thermocouple with external reference junction:<br><br>For resistance measurement: | Channel not activated   |
| Measurement type and range for channel group 1 |   | $\pm 1 \text{ V}$<br>$\pm 0.5 \text{ V}$<br>$\pm 0.25 \text{ V}$<br>$\pm 80 \text{ mV}$   |
| Measurement type and range for channel group 2 |   | Pt 100 standard range<br>Ni 100 standard range  |
| Measurement type and range for channel group 3 |   | Type N with linearization<br>Type E with linearization<br>Type J with linearization<br>Type L with linearization<br>Type T with linearization<br>Type K with linearization<br>Type U with linearization |
| Representation of measured values              | Sets representation of the measured values for module   | SIMATIC S5<br>SIMATIC S7  |
| Measured value representation: S5              | Sets data format for analog value representation, SIMATIC S5  | Complement of twos<br>Amount with sign  |
| Upper limit value for channel 0                | Upper and lower limit values for each channel   | 0<br>- 32768 ... 32767  |
| Lower limit value for channel 0                |   | 0<br>- 32768 ... 32767  |
| Upper limit value for channel 2 (channel 1*)   |   | 0<br>- 32768 ... 32767  |
| Lower limit value for channel 2 (channel 1*)   |   | 0<br>- 32768 ... 32767  |

■ : Default

- \* For the ET 200B-4/8AI, only the combination of single channel addressing **and** parameterization of channel group 0 for resistance measurement (Pt 100, Ni 100, R) requires parameterization of the "Upper/lower limit values" for channel 1. In all other cases (i.e. module addressing and single channel addressing **and** parameterization of channel group 0 for other than resistance measurement (Pt 100, Ni 100, R), you parameterize "Upper/lower limit values" for channel 2.

### 8.4.4 Analog Value Representation, Operation with SIMATIC S5

#### Analog Value Representation, SIMATIC S7

If you operate the ET 200B-4/8AI with SIMATIC S5, you can utilize the analog value representation of SIMATIC S7 (higher measured-value resolution: max. 14 bits + sign). See Section 8.4.5 for the measured-value tables for analog value representation in SIMATIC S7.

#### Analog Value Representation, SIMATIC S5

Analog values can be represented in two data formats with the ET 200B-4/8AI for SIMATIC S5:

- 12-bit complement of twos representation (range: -2048 to +2047 units)
- 11-bit amount and 1-bit sign (range: -2048 to +2047 units)

The Table below shows the analog value representation of the ET 200B-4AI:

Table 8-10 Representation of an Analog Input Value as a Bit Pattern (6ES7 134-0KH01-0XB0)

|                             | High Byte |          |          |       |       |       |       |       | Low Byte |       |       |       |       |   |   |   |
|-----------------------------|-----------|----------|----------|-------|-------|-------|-------|-------|----------|-------|-------|-------|-------|---|---|---|
| Bit number                  | 15        | 14       | 13       | 12    | 11    | 10    | 9     | 8     | 7        | 6     | 5     | 4     | 3     | 2 | 1 | 0 |
| Analog value representation | SI        | $2^{11}$ | $2^{10}$ | $2^9$ | $2^8$ | $2^7$ | $2^6$ | $2^5$ | $2^4$    | $2^3$ | $2^2$ | $2^1$ | $2^0$ | X | F | s |

Bits 0 to 2 and bit 15 have no significance for the amount of the measured value. See Table 8-11 for a detailed description of these bits.

#### Supplementary Bits

Bits 0 to 2 and bit 15 have the following meaning in the bit pattern of the analog input value:

Table 8-11 Description of the Bits (6ES7 134-0KH01-0XB0)

| Bit | Meaning      | Signal Status | Meaning of the Signal Status                                     |
|-----|--------------|---------------|--|
| OV  | Overflow bit | 1             | Overrange <sup>1</sup>   |
| F   | Fault bit    | 1             | Wire break; the measured value read in is not valid <sup>2</sup> |
| SI  | Sign         | 0             | “+” sign   |
|     |              | 1             | “-” sign   |
| X   | Irrelevant   | -             | -  |

<sup>1</sup> In the event of an overflow at one measuring point, the overflow bits of the other channels remain unaffected; this means that the values of the other channels are correct and can be evaluated.

<sup>2</sup> When the ET 200B-4/8AI signals a wire break (fault bit F = 1), the overflow bit OV is also set.

**Voltage Measuring Ranges** The two tables below show the assignments of analog to digitized measured values for the measuring ranges:  $\pm 80$  mV,  $\pm 250$  mV,  $\pm 500$  mV and  $\pm 1000$  mV.

Table 8-12 Representation of Digitized Measured Values of the ET 200B-4/8AI (6ES7 134-0KH01-0XB0; Measuring Ranges:  $\pm 80$  mV,  $\pm 250$  mV,  $\pm 500$  mV and  $\pm 1000$  mV; **Complement of Twos**)

| Units   | Measured Value in mV |                 |                 |                  | Digitized Measured Value |    |    |    |    |    |   |   |   |   |   |   |   |   |   | X | F                | O | V | Range |
|---------|----------------------|-----------------|-----------------|------------------|--------------------------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|------------------|---|---|-------|
|         | $\pm 80$<br>mV       | $\pm 250$<br>mV | $\pm 500$<br>mV | $\pm 1000$<br>mV | 15                       | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 |   |                  |   |   |       |
| > 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 | Overrange        |   |   |       |
| :       | :                    | :               | :               | :                | :                        |    |    |    |    |    |   |   |   |   |   |   |   |   |   |   |                  |   |   |       |
| 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<br>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 | 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 | Overrange        |   |   |       |
| :       | :                    | :               | :               | :                | :                        |    |    |    |    |    |   |   |   |   |   |   |   |   |   |   |                  |   |   |       |
| -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         |   |   |       |

Table 8-13 Representation of Digitized Measured Values of the ET 200B-4/8AI (6ES7 134-0KH01-0XB0; Measuring Ranges:  $\pm 80$  mV,  $\pm 250$  mV,  $\pm 500$  mV and  $\pm 1000$  mV; **Amount and Sign**)

| Units   | Measured Value in mV |                 |                 |                  | SI | Digitized Measured Value |    |    |    |    |    |   |   |   |   | X | F | OV | Range |   |               |
|---------|----------------------|-----------------|-----------------|------------------|----|--------------------------|----|----|----|----|----|---|---|---|---|---|---|----|-------|---|---------------|
|         | $\pm 80$<br>mV       | $\pm 250$<br>mV | $\pm 500$<br>mV | $\pm 1000$<br>mV |    | 15                       | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 |   |   |    |       | 5 | 4             |
| > 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 | Over-range    |
| :       | :                    | :               | :               | :                |    |                          |    |    |    |    |    | : |   |   |   |   |   |    |       |   |               |
| 2049    | 80.04                | 250.12          | 500.24          | 1000.48          | 0  | 1                        | 0  | 0  | 0  | 0  | 0  | 0 | 0 | 0 | 0 | 0 | 0 | 1  | 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 | 0 | 1  | 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  | 0                        | 0  | 0  | 0  | 0  | 0  | 0 | 0 | 0 | 0 | 0 | 0 | 1  | 0     | 0 |               |
| -1024   | -40.00               | -125.00         | -250.00         | -500.00          | 1  | 0                        | 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  | 1                        | 0  | 0  | 0  | 0  | 0  | 0 | 0 | 0 | 0 | 0 | 1 | 0  | 0     | 0 | Over-range    |
| :       | :                    | :               | :               | :                |    |                          |    |    |    |    |    | : |   |   |   |   |   |    |       |   |               |
| -2408   | -94.06               | -293.95         | 587.89          | -1175.78         | 1  | 1                        | 0  | 0  | 1  | 0  | 1  | 1 | 0 | 1 | 0 | 0 | 0 | 0  | 0     | 0 |               |
| < -2409 | -94.10               | -294.07         | -588.13         | -1176.26         | 1  | 1                        | 0  | 0  | 1  | 0  | 1  | 1 | 0 | 1 | 0 | 0 | 1 | 0  | 0     | 1 | Overflow      |

**Note**

Bit 15 of the digitized measured value indicates the sign.

The following applies: SI = 0  $\rightarrow$  positive value; SI = 1  $\rightarrow$  negative value.



**Measuring Ranges: Resistance Measurement**

The table below shows the assignments of analog to digitized measured values for the resistance measuring ranges: 48 Ω, 150 Ω, 300 Ω and 600 Ω.

Table 8-14 Representation of Digitized Measured Values of the ET 200B-4/8AI for Resistance Measurement (Complement of Twos)

| Units  | Resistance in Ω                         |        |        |        | Digitized Measured Value |    |    |    |    |    |   |   |   |   |   |   |   | X | F | OV | Range         |
|--------|---|--------|--------|--------|--------------------------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|----|---------------|
|        | 48                                      | 150    | 300    | 600    | 15                       | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 |   |   |    |               |
| ≥ 2409 | 56.46                                   | 176.44 | 352.88 | 705.76 | 0                        | 1  | 0  | 0  | 1  | 0  | 1 | 1 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 1  | Overflow      |
| 2408   | 56.44                                   | 176.37 | 352.73 | 705.47 | 0                        | 1  | 0  | 0  | 1  | 0  | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0  | Over-range    |
| :      | :                                       | :      | :      | :      | :                        |    |    |    |    |    |   |   |   |   |   |   |   |   |   |    |               |
| 2049   | 48.02                                   | 150.07 | 300.14 | 600.29 | 0                        | 1  | 0  | 0  | 0  | 0  | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0  |               |
| 2048   | 48                                      | 150    | 300    | 600    | 0                        | 1  | 0  | 0  | 0  | 0  | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0  | Nominal range |
| 1536   | 36                                      | 112.5  | 225    | 450    | 0                        | 0  | 1  | 1  | 0  | 0  | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0  |               |
| 1024   | 24                                      | 75     | 150    | 300    | 0                        | 0  | 1  | 0  | 0  | 0  | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0  |               |
| 512    | 12                                      | 37.5   | 75     | 150    | 0                        | 0  | 0  | 1  | 0  | 0  | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0  |               |
| 1      | 0.023                                   | 0.072  | 0.144  | 0.288  | 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 | 1  | Overflow      |
| :      | (Negative values physically impossible) |        |        |        | :                        |    |    |    |    |    |   |   |   |   |   |   |   |   |   |    |               |
| X      |   |        |        |        | X                        | X  | X  | X  | X  | X  | X | X | X | X | X | X | X | 0 | 1 | 0  | Wire break    |

**Measuring Range,  
Pt 100 Resistance  
Thermometers**

The table below shows the assignments of analog to digitized measured values for resistance thermometers (Pt 100):

Table 8-15 Representation of Digitized Measured Values of the ET 200B-4/8AI for Resistance Thermometers (Complement of Twos)

| Units  | Resistance in $\Omega$ | Temperature in $^{\circ}\text{C}$ | Digitized Measured Value |    |    |    |    |    |   |   |   |   |   | X | F | OV | Range |   |                        |
|--------|------------------------|-----------------------------------|--------------------------|----|----|----|----|----|---|---|---|---|---|---|---|----|-------|---|------------------------|
|        |                        |                                   | 15                       | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 |   |   |    |       | 4 | 3                      |
| > 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     | 1 | Overrange <sup>1</sup> |
| :      |                        | :                                 |                          |    |    |    |    |    | : |   |   |   |   |   |   |    |       |   |                        |
| 1702   |                        | 851                               | 0                        | 0  | 1  | 1  | 0  | 1  | 0 | 1 | 0 | 0 | 1 | 1 | 0 | 0  | 0     | 1 |                        |
| 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     | 1 | Overrange <sup>1</sup> |
| :      |                        | :                                 |                          |    |    |    |    |    | : |   |   |   |   |   |   |    |       |   |                        |
| -494   |                        | -247                              | 1                        | 1  | 1  | 1  | 0  | 0  | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0  | 0     | 1 |                        |
| < -494 |                        | < -247                            | 1                        | 1  | 1  | 1  | 0  | 0  | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0  | 0     | 1 | Overflow               |

<sup>1</sup> In the overrange, any rise in the characteristic curve is retained when the linearized nominal range is exited.

**Measuring Range,  
Ni 100 Resistance  
Sensors**

The table below shows the assignments of analog to digitized measured values for resistance sensors (Ni 100):

Table 8-16 Representation of Digitized Measured Values of the ET 200B-4/8AI for Ni 100 Resistance Sensors (Complement of Twos)

| Units  | Resistance in Ω | Temperature in °C | Digitized Measured Value |    |    |    |    |    |   |   |   |   |   | X | F | OV | Range |   |                        |
|--------|-----------------|-------------------|--------------------------|----|----|----|----|----|---|---|---|---|---|---|---|----|-------|---|------------------------|
|        |                 |                   | 15                       | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 |   |   |    |       | 4 | 3                      |
| > 590  |                 | > 295             | 0                        | 0  | 0  | 1  | 0  | 0  | 1 | 0 | 0 | 1 | 1 | 1 | 0 | 0  | 0     | 1 | Overflow               |
| 590    |                 | 295               | 0                        | 0  | 0  | 1  | 0  | 0  | 1 | 0 | 0 | 1 | 1 | 1 | 0 | 0  | 0     | 1 | Overrange <sup>1</sup> |
| :      |                 | :                 |                          |    |    |    |    |    | : |   |   |   |   |   |   |    |       |   |                        |
| 502    |                 | 251               | 0                        | 0  | 0  | 0  | 1  | 1  | 1 | 1 | 1 | 0 | 1 | 1 | 0 | 0  | 0     | 1 |                        |
| 500    | 289.2           | 250               | 0                        | 0  | 0  | 0  | 1  | 1  | 1 | 1 | 1 | 0 | 1 | 0 | 0 | 0  | 0     | 0 | Nominal range          |
| 498    | 288.1           | 249               | 0                        | 0  | 0  | 0  | 1  | 1  | 1 | 1 | 1 | 0 | 0 | 1 | 0 | 0  | 0     | 0 |                        |
| 400    | 240.7           | 200               | 0                        | 0  | 0  | 0  | 1  | 1  | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0  | 0     | 0 |                        |
| 200    | 161.8           | 100               | 0                        | 0  | 0  | 0  | 0  | 1  | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0  | 0     | 0 |                        |
| 2      | 100.5           | 1                 | 0                        | 0  | 0  | 0  | 0  | 0  | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0  | 0     | 0 |                        |
| 0      | 100             | 0                 | 0                        | 0  | 0  | 0  | 0  | 0  | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0  | 0     | 0 |                        |
| -2     | 99.5            | -1                | 1                        | 1  | 1  | 1  | 1  | 1  | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0  | 0     | 0 |                        |
| -20    | 94.6            | -10               | 1                        | 1  | 1  | 1  | 1  | 1  | 1 | 1 | 0 | 1 | 1 | 0 | 0 | 0  | 0     | 0 |                        |
| -80    | 79.1            | -40               | 1                        | 1  | 1  | 1  | 1  | 1  | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0  | 0     | 0 |                        |
| -118   | 70              | -59               | 1                        | 1  | 1  | 1  | 1  | 1  | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0  | 0     | 0 |                        |
| -120   | 69.5            | -60               | 1                        | 1  | 1  | 1  | 1  | 1  | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0  | 0     | 0 |                        |
| -122   |                 | -61               | 1                        | 1  | 1  | 1  | 1  | 1  | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0  | 0     | 1 | Overrange <sup>1</sup> |
| :      |                 | :                 |                          |    |    |    |    |    | : |   |   |   |   |   |   |    |       |   |                        |
| -210   |                 | -105              | 1                        | 1  | 1  | 1  | 1  | 0  | 0 | 1 | 0 | 1 | 1 | 1 | 0 | 0  | 0     | 1 |                        |
| < -210 |                 | < -105            | 1                        | 1  | 1  | 1  | 1  | 0  | 0 | 1 | 0 | 1 | 1 | 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             |

<sup>1</sup> In the overrange, any rise in the characteristic curve is retained when the linearized nominal range is exited.

**Measuring Range, Type E Thermocouples**

The table below shows the assignments of analog to digitized measured values for Type E thermocouples.

Table 8-17 Representation of Digitized Measured Values of the ET 200B-4/8AI with Linearization; Type E Thermocouples (Nickel-Chrome/Copper-Nickel, to IEC 548, Part 1; **Complement of Twos**)

| Units  | Thermal e. m. f. in mV <sup>1</sup> | Temperature in °C | Digitized Measured Value |    |    |    |    |    |   |   |   |   |   |   | X | F | OV | Range |                        |
|--------|-------------------------------------|-------------------|--------------------------|----|----|----|----|----|---|---|---|---|---|---|---|---|----|-------|------------------------|
|        |                                     |                   | 15                       | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 |   |   |    |       | 2                      |
| > 1200 |                                     |                   | 0                        | 0  | 1  | 0  | 0  | 1  | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0  | 1     | Overflow               |
| 1001   |                                     | 1001              | 0                        | 0  | 0  | 1  | 1  | 1  | 1 | 1 | 0 | 1 | 0 | 0 | 1 | 0 | 0  | 1     | Overrange <sup>2</sup> |
| 1000   | 76.358                              | 1000              | 0                        | 0  | 0  | 1  | 1  | 1  | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0  | 0     | Nominal range          |
| 800    | 61.022                              | 800               | 0                        | 0  | 0  | 1  | 1  | 0  | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0  | 0     |                        |
| 400    | 28.943                              | 400               | 0                        | 0  | 0  | 0  | 1  | 1  | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0  | 0     |                        |
| 100    | 6.317                               | 100               | 0                        | 0  | 0  | 0  | 0  | 0  | 1 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0  | 0     |                        |
| 1      | 0.059                               | 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     | -0.059                              | -1                | 1                        | 1  | 1  | 1  | 1  | 1  | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0  | 0     |                        |
| -100   | -5.237                              | -100              | 1                        | 1  | 1  | 1  | 1  | 1  | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 0  | 0     |                        |
| -200   | -8.824                              | -200              | 1                        | 1  | 1  | 1  | 1  | 0  | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0  | 0     |                        |
| -269   | -9.833                              | -269              | 1                        | 1  | 1  | 1  | 0  | 1  | 1 | 1 | 1 | 0 | 0 | 1 | 1 | 0 | 0  | 0     |                        |
| -270   | -9.835                              | -270              | 1                        | 1  | 1  | 1  | 0  | 1  | 1 | 1 | 1 | 0 | 0 | 1 | 0 | 0 | 0  | 0     |                        |
| -271   |                                     | -271              | 1                        | 1  | 1  | 1  | 0  | 1  | 1 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 0  | 1     | Overrange <sup>2</sup> |
| -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             |

<sup>1</sup> for a reference temperature 0 °C

<sup>2</sup> In the overrange, any rise in the characteristic curve is retained when the linearized nominal range is exited.

**Measuring Range, Type J Thermocouples**

The table below shows the assignments of analog to digitized measured values for Type J thermocouples.

Table 8-18 Representation of Digitized Measured Values of the ET 200B-4/8AI with Linearization: Type J Thermocouple (Iron/Copper-Nickel (Constantan), to IEC 584) (**Complement of Twos**)

| Units | Thermal e. m. f. in mV <sup>1</sup> | Temperature in °C | Digitized Measured Value |    |    |    |    |    |   |   |   |   |   | X | F | OV | Range |   |                        |
|-------|-------------------------------------|-------------------|--------------------------|----|----|----|----|----|---|---|---|---|---|---|---|----|-------|---|------------------------|
|       |                                     |                   | 15                       | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 |   |   |    |       | 4 | 3                      |
| 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     | 1 | Overrange <sup>2</sup> |
| 1200  | 69.536                              | 1200              | 0                        | 0  | 1  | 0  | 0  | 1  | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0  | 0     | 0 | Nominal range          |
| 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 |                        |
| 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     | 1 | Overrange <sup>2</sup> |
| -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             |

<sup>1</sup> For a reference temperature of 0 °C (32 °F)

<sup>2</sup> In the overrange, any rise in the characteristic curve is retained when the linearized nominal range is exited.

**Measuring Range, Type K Thermocouples**

The table below shows the assignments of analog to digitized measured values for Type K thermocouples.

Table 8-19 Representation of Digitized Measured Values of the ET 200B-4/8AI with Linearization: Type K Thermocouples (Nickel-Chrome/Nickel-Aluminum, to IEC 584) (**Complement of Twos**)

| Units  | Thermal e. m. f. in mV <sup>1</sup> | Temperature in °C | Digitized Measured Value |    |    |    |    |    |   |   |   |   |   | X | F | OV | Range |   |                        |                        |
|--------|-------------------------------------|-------------------|--------------------------|----|----|----|----|----|---|---|---|---|---|---|---|----|-------|---|------------------------|------------------------|
|        |                                     |                   | 15                       | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 |   |   |    |       | 4 | 3                      | 2                      |
| > 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     | 1 | Overrange <sup>2</sup> |                        |
| 1369   | 54.773                              | 1369              | 0                        | 0  | 1  | 0  | 1  | 0  | 1 | 0 | 1 | 1 | 0 | 0 | 1 | 0  | 0     | 0 | Nominal range          |                        |
| 1000   | 41.269                              | 1000              | 0                        | 0  | 0  | 1  | 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 |                        | 0                      |
| 150    | 6.137                               | 150               | 0                        | 0  | 0  | 0  | 0  | 1  | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 0  | 0     | 0 |                        | 0                      |
| 100    | 4.095                               | 100               | 0                        | 0  | 0  | 0  | 0  | 0  | 1 | 1 | 0 | 0 | 1 | 0 | 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     | 0 |                        | 0                      |
| -1     | -0.039                              | -1                | 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 | 0                      | Accuracy<br>≤ 2 K      |
| -101   | -3.584                              | -101              | 1                        | 1  | 1  | 1  | 1  | 1  | 0 | 0 | 1 | 1 | 0 | 1 | 1 | 0  | 0     | 0 | 0                      |                        |
| -150   | -4.912                              | -150              | 1                        | 1  | 1  | 1  | 1  | 0  | 1 | 1 | 0 | 1 | 0 | 1 | 0 | 0  | 0     | 0 | 0                      |                        |
| -200   | -5.891                              | -200              | 1                        | 1  | 1  | 1  | 1  | 0  | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 0  | 0     | 0 | 0                      |                        |
| -201   |                                     | -201              | 1                        | 1  | 1  | 1  | 1  | 0  | 0 | 1 | 1 | 0 | 1 | 1 | 1 | 1  | 0     | 0 | 1                      | Overrange <sup>2</sup> |
| -273   |                                     |                   | 1                        | 1  | 1  | 1  | 0  | 1  | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 1  | 0     | 0 | 1                      | Overflow               |
| X      |                                     | X                 | X                        | X  | X  | X  | X  | X  | X | X | X | X | X | X | X | X  | 0     | 1 | 0                      | Wire break             |

<sup>1</sup> For a reference temperature of 0 °C (32 °F)

<sup>2</sup> In the overrange, any rise in the characteristic curve is retained when the linearized nominal range is exited.

**Measuring Range,  
Type L Thermo-  
couples**

The table below shows the assignments of analog to digitized measured values for Type L thermocouples.

Table 8-20 Representation of Digitized Measured Values of the ET 200B-4/8AI with Linearization: Type L Thermocouples (Iron/Copper-Nickel (Constantan), to DIN 43710) (**Complement of Twos**)

| Units | Thermal e. m. f. in mV <sup>1</sup> | Temperature in °C | Digitized Measured Value |    |    |    |    |    |   |   |   |   | X | F | OV | Range |   |   |                        |
|-------|-------------------------------------|-------------------|--------------------------|----|----|----|----|----|---|---|---|---|---|---|----|-------|---|---|------------------------|
|       |                                     |                   | 15                       | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 |   |   |    |       | 5 | 4 | 3                      |
| 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 | 1 | Overrange <sup>2</sup> |
| 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 | 1 | Overrange <sup>2</sup> |
| -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             |

<sup>1</sup> For a reference temperature of 0 °C (32 °F)

<sup>2</sup> In the overrange, any rise in the characteristic curve is retained when the linearized nominal range is exited.

**Measuring Range,  
Type N Thermo-  
couples**

The table below shows the assignments of analog to digitized measured values for Type N thermocouples.

Table 8-21 Representation of Digitized Measured Values of the ET 200B-4/8AI with Linearization; Type N Thermocouples (Nickel-Chrome-Silicium/Nickel-Silicium, to IEC 548-1; **Complement of Twos**)

| Units  | Thermal e. m. f. in mV <sup>1</sup> | Temperature in °C | Digitized Measured Value |    |    |    |    |    |   |   |   |   |   |   | X | F | OV | Range |                        |
|--------|-------------------------------------|-------------------|--------------------------|----|----|----|----|----|---|---|---|---|---|---|---|---|----|-------|------------------------|
|        |                                     |                   | 15                       | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 |   |   |    |       |                        |
| > 1550 |                                     |                   | 0                        | 0  | 1  | 1  | 0  | 0  | 0 | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 0  | 1     | Overflow               |
| 1301   |                                     | 1301              | 0                        | 0  | 1  | 0  | 1  | 0  | 0 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 0  | 1     | Overrange <sup>2</sup> |
| 1300   | 47.502                              | 1300              | 0                        | 0  | 1  | 0  | 1  | 0  | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0  | 0     | Nominal range          |
| 1000   | 36.248                              | 1000              | 0                        | 0  | 0  | 1  | 1  | 1  | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0  | 0     |                        |
| 500    | 16.744                              | 500               | 0                        | 0  | 0  | 0  | 1  | 1  | 1 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 0  | 0     |                        |
| 100    | 2.774                               | 100               | 0                        | 0  | 0  | 0  | 0  | 0  | 1 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0  | 0     |                        |
| 1      | 0.026                               | 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     | -0.026                              | -1                | 1                        | 1  | 1  | 1  | 1  | 1  | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0  | 0     |                        |
| -100   | -2.407                              | -100              | 1                        | 1  | 1  | 1  | 1  | 1  | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 0  | 0     |                        |
| -250   | -4.313                              | -250              | 1                        | 1  | 1  | 1  | 1  | 0  | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0  | 0     |                        |
| -269   | -4.345                              | -269              | 1                        | 1  | 1  | 1  | 0  | 1  | 1 | 1 | 1 | 0 | 0 | 1 | 1 | 0 | 0  | 0     |                        |
| -270   | -4.345                              | -270              | 1                        | 1  | 1  | 1  | 0  | 1  | 1 | 1 | 1 | 0 | 0 | 1 | 0 | 0 | 0  | 0     |                        |
| -271   |                                     | -271              | 1                        | 1  | 1  | 1  | 0  | 1  | 1 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 0  | 1     | Overrange <sup>2</sup> |
| -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             |

<sup>1</sup> for a reference temperature 0 °C

<sup>2</sup> In the overrange, any rise in the characteristic curve is retained when the linearized nominal range is exited.



**Measuring Range,  
Type T Thermo-  
couples**

The table below shows the assignments of analog to digitized measured values for Type T thermocouples.

Table 8-22 Representation of Digitized Measured Values of the ET 200B-4/8AI with Linearization; Type T Thermocouples (Copper/Copper-Nickel, to IEC 548, Part 1; **Complement of Twos**)

| Units | Thermal e. m. f. in mV <sup>1</sup> | Temperature in °C | Digitized Measured Value |    |    |    |    |    |   |   |   |   |   | X | F | OV | Range |   |                        |
|-------|-------------------------------------|-------------------|--------------------------|----|----|----|----|----|---|---|---|---|---|---|---|----|-------|---|------------------------|
|       |                                     |                   | 15                       | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 |   |   |    |       | 4 | 3                      |
| > 540 |                                     |                   | 0                        | 0  | 0  | 1  | 0  | 0  | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 0  | 0     | 1 | Overflow               |
| 401   |                                     | 401               | 0                        | 0  | 0  | 0  | 1  | 1  | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0  | 0     | 1 | Overrange <sup>2</sup> |
| 400   | 20.869                              | 400               | 0                        | 0  | 0  | 0  | 1  | 1  | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0  | 0     | 0 | Nominal range          |
| 399   | 20.807                              | 399               | 0                        | 0  | 0  | 0  | 1  | 1  | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 0  | 0     | 0 |                        |
| 200   | 9.286                               | 200               | 0                        | 0  | 0  | 0  | 0  | 1  | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0  | 0     | 0 |                        |
| 100   | 4.277                               | 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  | -3.378                              | -100              | 1                        | 1  | 1  | 1  | 1  | 1  | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 0  | 0     | 0 |                        |
| -200  | -5.603                              | -200              | 1                        | 1  | 1  | 1  | 1  | 0  | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 0  | 0     | 0 |                        |
| -269  | -6.256                              | -269              | 1                        | 1  | 1  | 1  | 0  | 1  | 1 | 1 | 1 | 0 | 0 | 1 | 1 | 0  | 0     | 0 |                        |
| -270  | -6.258                              | -270              | 1                        | 1  | 1  | 1  | 0  | 1  | 1 | 1 | 1 | 0 | 0 | 1 | 0 | 0  | 0     | 0 |                        |
| -271  |                                     | -271              | 1                        | 1  | 1  | 1  | 0  | 1  | 1 | 1 | 1 | 0 | 0 | 0 | 1 | 0  | 0     | 1 | Overrange <sup>2</sup> |
| -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             |

<sup>1</sup> for a reference temperature 0 °C

<sup>2</sup> In the overrange, any rise in the characteristic curve is retained when the linearized nominal range is exited.

**Measuring Range,  
Type U Thermo-  
couples**

The table below shows the assignments of analog to digitized measured values for Type U thermocouples.

Table 8-23 Representation of Digitized Measured Values of the ET 200B-4/8AI with Linearization; Type U Thermocouples (Copper/Copper-Nickel, to DIN 43710; **Complement of Twos**)

| Units | Thermal e. m. f. in mV <sup>1</sup> | Temperature in °C | Digitized Measured Value |    |    |    |    |    |   |   |   |   |   |   | X | F | OV | Range |                        |
|-------|-------------------------------------|-------------------|--------------------------|----|----|----|----|----|---|---|---|---|---|---|---|---|----|-------|------------------------|
|       |                                     |                   | 15                       | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 |   |   |    |       | 3                      |
| > 850 |                                     |                   | 0                        | 0  | 0  | 1  | 1  | 0  | 1 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0  | 1     | Overflow               |
| 601   |                                     | 601               | 0                        | 0  | 0  | 1  | 0  | 0  | 1 | 0 | 1 | 1 | 0 | 0 | 1 | 0 | 0  | 1     | Overrange <sup>2</sup> |
| 600   | 34.31                               | 600               | 0                        | 0  | 0  | 1  | 0  | 0  | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0  | 0     | Nominal range          |
| 599   | 34.24                               | 599               | 0                        | 0  | 0  | 1  | 0  | 0  | 1 | 0 | 1 | 0 | 1 | 1 | 1 | 0 | 0  | 0     |                        |
| 300   | 14.90                               | 300               | 0                        | 0  | 0  | 0  | 1  | 0  | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 0  | 0     |                        |
| 100   | 4.25                                | 100               | 0                        | 0  | 0  | 0  | 0  | 0  | 1 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0  | 0     |                        |
| 1     | 0.04                                | 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    | -0.04                               | -1                | 1                        | 1  | 1  | 1  | 1  | 1  | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0  | 0     |                        |
| -100  | -3.4                                | -100              | 1                        | 1  | 1  | 1  | 1  | 1  | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 0  | 0     |                        |
| -150  | -4.69                               | -150              | 1                        | 1  | 1  | 1  | 1  | 0  | 1 | 1 | 0 | 1 | 0 | 1 | 0 | 0 | 0  | 0     |                        |
| -199  | -5.68                               | -199              | 1                        | 1  | 1  | 1  | 1  | 0  | 0 | 1 | 1 | 1 | 0 | 0 | 1 | 0 | 0  | 0     |                        |
| -200  | -5.70                               | -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  | 1     | Overrange <sup>2</sup> |
| -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             |

<sup>1</sup> for a reference temperature 0 °C

<sup>2</sup> In the overrange, any rise in the characteristic curve is retained when the linearized nominal range is exited.

### 8.4.5 Analog Value Representation, Operation with SIMATIC S7

**Analog Value Representation, SIMATIC S7**

If you operate the ET 200B-4/8AI with SIMATIC S7 the analog values are represented in complements of twos.

The table below shows the analog value representation of the ET 200B-4/8AI:

Table 8-24 Representation of an Analog Input Value as a Bit Pattern for SIMATIC S7 and ET 200B-4/8AI

|                             | High Byte |                 |                 |                 |                 |                 |                |                | Low Byte       |                |                |                |                |                |                |                |
|-----------------------------|-----------|-----------------|-----------------|-----------------|-----------------|-----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|
| Bit Number                  | 15        | 14              | 13              | 12              | 11              | 10              | 9              | 8              | 7              | 6              | 5              | 4              | 3              | 2              | 1              | 0              |
| Analog Value Representation | SI        | 2 <sup>14</sup> | 2 <sup>13</sup> | 2 <sup>12</sup> | 2 <sup>11</sup> | 2 <sup>10</sup> | 2 <sup>9</sup> | 2 <sup>8</sup> | 2 <sup>7</sup> | 2 <sup>6</sup> | 2 <sup>5</sup> | 2 <sup>4</sup> | 2 <sup>3</sup> | 2 <sup>2</sup> | 2 <sup>1</sup> | 2 <sup>0</sup> |

Bit 15 has no significance for the amount of the measured value. It merely represents the sign.

**Resolution**

The resolution for the measured value depends directly on the integration time selected for the ET 200B-4/8A. In other words, the longer the integration time for an analog input channel, the higher is the resolution of the measured value.

If the resolution of an analog module is less than 15 bits, the analog value entry is left-aligned. The unused lower-value places are padded with "0".

Table 8-25 lists the possible resolutions of the ET 200B-4/8AI as a function of integration time. The "x" characters indicate the bits that are of no significance for the measured value.

Table 8-25 Possible Resolutions of Analog Values: ET 200B-4/8AI

| Integration Time | Resolution in Bits | Analog Value |   |   |   |   |   |   |   |          |   |   |   |   |   |   |   |
|------------------|--------------------|--------------|---|---|---|---|---|---|---|----------|---|---|---|---|---|---|---|
|                  |                    | High Byte    |   |   |   |   |   |   |   | Low Byte |   |   |   |   |   |   |   |
| 2.5 ms           | 9 (+SI)            | SI           | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0        | 1 | x | x | x | x | x | x |
| 16.7 ms, 20 ms   | 12 (+SI)           | SI           | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0        | 0 | 0 | 0 | 1 | x | x | x |
| 100 ms           | 14 (+SI)           | SI           | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0        | 0 | 0 | 0 | 0 | 0 | 1 | x |

**Voltage Measuring Ranges**

The table below shows the representation of the digitized measuring values of the ET 200B-4/8AI for the measuring ranges:  $\pm 80$  mV,  $\pm 250$  mV,  $\pm 500$  mV and  $\pm 1000$  mV.

Table 8-26 Representation of Digitized Measured Values of the ET 200B-4/8AI (Measuring Ranges:  $\pm 80$  mV,  $\pm 250$  mV,  $\pm 500$  mV and  $\pm 1000$  mV)

| Measuring Range<br>$\pm 80$ mV | Measuring Range<br>$\pm 250$ mV | Measuring Range<br>$\pm 500$ mV | Measuring Range $\pm 1$ V | Units   |                   | Range         |
|--------------------------------|---------------------------------|---------------------------------|---------------------------|---------|-------------------|---------------|
|                                |                                 |                                 |                           | Decimal | Hexadecimal       |               |
| $\geq 94.074$                  | $\geq 293.98$                   | $\geq 587.96$                   | $\geq 1.17592$            | 32767   | 7FFF <sub>H</sub> | Overflow      |
| 94.071                         | 293.97                          | 587.94                          | 1.17588                   | 32511   | 7EFF <sub>H</sub> | Overrange     |
| :                              | :                               | :                               | :                         | :       | :                 |               |
| 80.003                         | 250.01                          | 500.02                          | 1.00004                   | 27649   | 6C01 <sub>H</sub> | Nominal range |
| 80.000                         | 250.00                          | 500.00                          | 1.000                     | 27648   | 6C00 <sub>H</sub> |               |
| 60.000                         | 187.50                          | 375.00                          | 0.750                     | 20736   | 5100 <sub>H</sub> | Nominal range |
| :                              | :                               | :                               | :                         | :       | :                 |               |
| - 60.000                       | - 187.50                        | - 375.00                        | - 0.750                   | -20736  | AF00 <sub>H</sub> | Nominal range |
| - 80.000                       | - 250.00                        | - 500.00                        | -1.000                    | -27648  | 9400 <sub>H</sub> |               |
| - 80.003                       | - 250.01                        | - 500.02                        | - 1.00004                 | -27649  | 93FF <sub>H</sub> | Underrange    |
| :                              | :                               | :                               | :                         | :       | :                 |               |
| - 94.074                       | - 293.98                        | - 587.96                        | - 1.17592                 | -32512  | 8100 <sub>H</sub> | Underrange    |
| $\leq - 94.077$                | $\leq - 293.99$                 | $\leq - 587.98$                 | $\leq - 1.17596$          | -32768  | 8000 <sub>H</sub> |               |

**Measuring Range, Resistance Measurement**

The table below shows the assignments of analog to digitized measured values for the resistance measuring ranges: 48  $\Omega$ , 150  $\Omega$ , 300  $\Omega$  and 600  $\Omega$ .

Table 8-27 Representation of Digitized Measured Values of the ET 200B-4/8AI for Resistance Measurement

| Measuring Range 48 $\Omega$             | Measuring Range 150 $\Omega$ | Measuring Range 300 $\Omega$ | Measuring Range 600 $\Omega$ | Units   |                   | Range         |
|---|------------------------------|------------------------------|------------------------------|---------|-------------------|---------------|
|   |                              |                              |                              | Decimal | Hexadecimal       |               |
| > 56.4427                               | > 176.3835                   | > 352.767                    | > 705.5339                   | 32767   | 7FFF <sub>H</sub> | Overflow      |
| 56.4427                                 | 176.3835                     | 352.767                      | 705.5339                     | 32511   | 7EFF <sub>H</sub> | Overrange     |
| :                                       | :                            | :                            | :                            | :       | :                 |               |
| 48.0174                                 | 150.0054                     | 300.0109                     | 600.0217                     | 27649   | 6C01 <sub>H</sub> | Nominal range |
| 48.000                                  | 150.000                      | 300.000                      | 600.000                      | 27648   | 6C00 <sub>H</sub> |               |
| 36.000                                  | 112.500                      | 225.000                      | 450.000                      | 20736   | 5100 <sub>H</sub> | Nominal range |
| :                                       | :                            | :                            | :                            | :       | :                 |               |
| 0.000                                   | 0.000                        | 0.000                        | 0.000                        | 0       | 0 <sub>H</sub>    | Underrun      |
| (Negative values physically impossible) |                              |                              |                              | -32768  | 8000 <sub>H</sub> |               |

**Measuring Range,  
Pt 100 Resistance  
Sensors**

The table below shows the assignments of analog to digitized measured values for resistance sensors (Pt 100).

Table 8-28 Representation of Digitized Measured Values of the ET 200B-4/8AI for Pt 100 Resistance Sensors

| Temperature Range Standard<br>Pt 100<br>850 °C | Decimal             | Hexadecimal                                 | Range         |
|--|---------------------|---|---------------|
| ≥ 1000.1                                       | 32767               | 7FFF <sub>H</sub>                           | Overflow      |
| 1000.0<br>:<br>850.1                           | 10000<br>:<br>8501  | 2710 <sub>H</sub><br>:<br>2135 <sub>H</sub> | Overrange     |
| 850.0<br>:<br>-200.0                           | 8500<br>:<br>-2000  | 2134 <sub>H</sub><br>:<br>F830 <sub>H</sub> | Nominal range |
| -200.1<br>:<br>-243.0                          | -2001<br>:<br>-2430 | F82F <sub>H</sub><br>:<br>F682 <sub>H</sub> | Underrange    |
| ≤ - 243.1                                      | -32768              | 8000 <sub>H</sub>                           | Underrun      |

**Measuring Range,  
Ni 100 Resistance  
Sensors**

The table below shows the assignments of analog to digitized measured values for resistance sensors (Ni 100).

Table 8-29 Representation of Digitized Measured Values of the ET 200B-4/8AI for Ni 100 Resistance Sensors

| Temperature Range Standard<br>Ni 100<br>250 °C | Decimal            | Hexadecimal                                 | Range         |
|--|--------------------|---|---------------|
| ≥ 295.1  | 32767              | 7FFF <sub>H</sub>                           | Overflow      |
| 295.0<br>:<br>250.1                            | 2950<br>:<br>2501  | 0B86 <sub>H</sub><br>:<br>09C5 <sub>H</sub> | Overrange     |
| 250.0<br>:<br>-60.0                            | 2500<br>:<br>-600  | 09C4 <sub>H</sub><br>:<br>FDA8 <sub>H</sub> | Nominal range |
| -60.1<br>:<br>-105.0                           | -601<br>:<br>-1050 | FDA7 <sub>H</sub><br>:<br>FBE6 <sub>H</sub> | Underrange    |
| ≤ - 105.1                                      | -32768             | 8000 <sub>H</sub>                           | Underrun      |

**Measuring Range,  
Type E Thermo-  
couples**

The table below shows the assignments of analog to digitized measured values for Type E thermocouples.

Table 8-30 Representation of Digitized Measured Values of the ET 200B-4/8AI with Linearization; Type E Thermocouples

| Temperature Range in °C<br>Type E | Decimal             | Hexadecimal                                 | Range         |
|-----------------------------------|---------------------|---|---------------|
| ≥ 1200.1                          | 32767               | 7FFF <sub>H</sub>                           | Overflow      |
| 1200.0<br>:<br>1000.1             | 12000<br>:<br>10001 | 2EE0 <sub>H</sub><br>:<br>2711 <sub>H</sub> | Overrange     |
| 1000.0<br>:<br>-270.0             | 10000<br>:<br>-2700 | 2710 <sub>H</sub><br>:<br>F574 <sub>H</sub> | Nominal range |
| ≤ -270.1                          | -2701               | F573 <sub>H</sub>                           | Underrange    |

If wiring is incorrect or a sensor error in the negative range occurs, the analog-input module signals underrun when F0C4<sub>H</sub> is undershot and outputs 8000<sub>H</sub>.

**Measuring Range,  
Type J Thermo-  
couples**

The table below shows the assignments of analog to digitized measured values for Type J thermocouples.

Table 8-31 Representation of Digitized Measured Values of the ET 200B-4/8AI with Linearization; Type J Thermocouples

| Temperature Range in °C<br>Type J | Decimal             | Hexadecimal                                 | Range         |
|-----------------------------------|---------------------|---|---------------|
| ≥ 1450.1                          | 32767               | 7FFF <sub>H</sub>                           | Overflow      |
| 1450.0<br>:<br>1200.1             | 14500<br>:<br>12001 | 38A4 <sub>H</sub><br>:<br>2EE1 <sub>H</sub> | Overrange     |
| 1200.0<br>:<br>-210.0             | 12000<br>:<br>-2100 | 2EE0 <sub>H</sub><br>:<br>F7CC <sub>H</sub> | Nominal range |
| ≤ -210.1                          | -2101               | F7CB <sub>H</sub>                           | Underrange    |

If wiring is incorrect or a sensor error in the negative range occurs, the analog-input module signals underrun when F3C1<sub>H</sub> is undershot and outputs 8000<sub>H</sub>.

**Measuring Range,  
Type K Thermo-  
couples**

The table below shows the assignments of analog to digitized measured values for Type K thermocouples.

Table 8-32 Representation of Digitized Measured Values of the ET 200B-4/8AI with Linearization; Type K Thermocouples

| Temperature Range in °C<br>Type K   | Decimal             | Hexadecimal                                 | Range         |
|---|---------------------|---|---------------|
| ≥ 1622.1  | 32767               | 7FFF <sub>H</sub>                           | Overflow      |
| 1622.0<br>:<br>1372.1   | 16220<br>:<br>13721 | 3F5C <sub>H</sub><br>:<br>3599 <sub>H</sub> | Overrange     |
| 1372.0<br>:<br>-270.0   | 13720<br>:<br>-2700 | 3598 <sub>H</sub><br>:<br>F574 <sub>H</sub> | Nominal range |
| ≤ -270.1  | -2701               | F573 <sub>H</sub>                           | Underrange    |
| If wiring is incorrect or a sensor error in the negative range occurs, the analog-input module signals underrun when F0C4 <sub>H</sub> is undershot and outputs 8000 <sub>H</sub> . |                     |   |               |

**Measuring Range,  
Type L Thermo-  
couples**

The table below shows the assignments of analog to digitized measured values for Type L thermocouples.

Table 8-33 Representation of Digitized Measured Values of the ET 200B-4/8AI with Linearization; Type L Thermocouples

| Temperature Range in °C<br>Type L   | Decimal            | Hexadecimal                                 | Range         |
|---|--------------------|---|---------------|
| ≥ 1150.1  | 32767              | 7FFF <sub>H</sub>                           | Overflow      |
| 1150.0<br>:<br>900.1  | 11500<br>:<br>9001 | 2CEC <sub>H</sub><br>:<br>2329 <sub>H</sub> | Overrange     |
| 900.0<br>:<br>-200.0  | 9000<br>:<br>-2000 | 2328 <sub>H</sub><br>:<br>F830 <sub>H</sub> | Nominal range |
| ≤ -200.1  | -2001              | F82F <sub>H</sub>                           | Underrange    |
| If wiring is incorrect or a sensor error in the negative range occurs, the analog-input module signals underrun when F380 <sub>H</sub> is undershot and outputs 8000 <sub>H</sub> . |                    |   |               |



**Measuring Range,  
Type N Thermo-  
couples**

The table below shows the assignments of analog to digitized measured values for Type N thermocouples.

Table 8-34 Representation of Digitized Measured Values of the ET 200B-4/8AI with Linearization; Type N Thermocouples

| Temperature Range in °C<br>Type N | Decimal             | Hexadecimal                                 | Range         |
|-----------------------------------|---------------------|---|---------------|
| ≥ 1550.1                          | 32767               | 7FFF <sub>H</sub>                           | Overflow      |
| 1550.0<br>:<br>1300.1             | 15500<br>:<br>13001 | 3C8C <sub>H</sub><br>:<br>32C9 <sub>H</sub> | Overrange     |
| 1300.0<br>:<br>-270.0             | 13000<br>:<br>-2700 | 32C8 <sub>H</sub><br>:<br>F574 <sub>H</sub> | Nominal range |
| ≤ -270.1                          | -2701               | F573 <sub>H</sub>                           | Underrange    |

If wiring is incorrect or a sensor error in the negative range occurs, the analog-input module signals underrun when F0C4<sub>H</sub> is undershot and outputs 8000<sub>H</sub>.

**Measuring Range,  
Type T Thermo-  
couples**

The table below shows the assignments of analog to digitized measured values for Type T thermocouples.

Table 8-35 Representation of Digitized Measured Values of the ET 200B-4/8AI with Linearization; Type T Thermocouples

| Temperature Range in °C<br>Type T | Decimal            | Hexadecimal                                 | Range         |
|-----------------------------------|--------------------|---|---------------|
| ≥ 540.1                           | 32767              | 7FFF <sub>H</sub>                           | Overflow      |
| 540.0<br>:<br>400.1               | 5400<br>:<br>4001  | 1518 <sub>H</sub><br>:<br>0FA1 <sub>H</sub> | Overrange     |
| 400.0<br>:<br>270.0               | 4000<br>:<br>-2700 | 0FA0 <sub>H</sub><br>:<br>F574 <sub>H</sub> | Nominal range |
| ≤ -270.1                          | -2701              | F573 <sub>H</sub>                           | Underrange    |

If wiring is incorrect or a sensor error in the negative range occurs, the analog-input module signals underrun when F0C4<sub>H</sub> is undershot and outputs 8000<sub>H</sub>.

**Measuring Range,  
Type U Thermo-  
couples**

The table below shows the assignments of analog to digitized measured values for Type U thermocouples.

Table 8-36 Representation of Digitized Measured Values of the ET 200B-4/8AI with Linearization; Type U Thermocouples

| Temperature Range in °C<br>Type U   | Decimal            | Hexadecimal                                 | Range         |
|---|--------------------|---|---------------|
| ≥ 850.1   | 32767              | 7FFF <sub>H</sub>                           | Overflow      |
| 850.0<br>:<br>600.1   | 8500<br>:<br>6001  | 2134 <sub>H</sub><br>:<br>1771 <sub>H</sub> | Overrange     |
| 600.0<br>:<br>200.0   | 6000<br>:<br>-2000 | 1770 <sub>H</sub><br>:<br>F830 <sub>H</sub> | Nominal range |
| ≤ -200.1  | -2001              | F82F <sub>H</sub>                           | Underrange    |
| If wiring is incorrect or a sensor error in the negative range occurs, the analog-input module signals underrun when F380 <sub>H</sub> is undershot and outputs 8000 <sub>H</sub> . |                    |   |               |

### 8.4.6 Block Diagram, Terminal Assignment and Technical Data

**Block Diagram** Simplified representation of potential for the ET 200B-4/8AI and TB8:

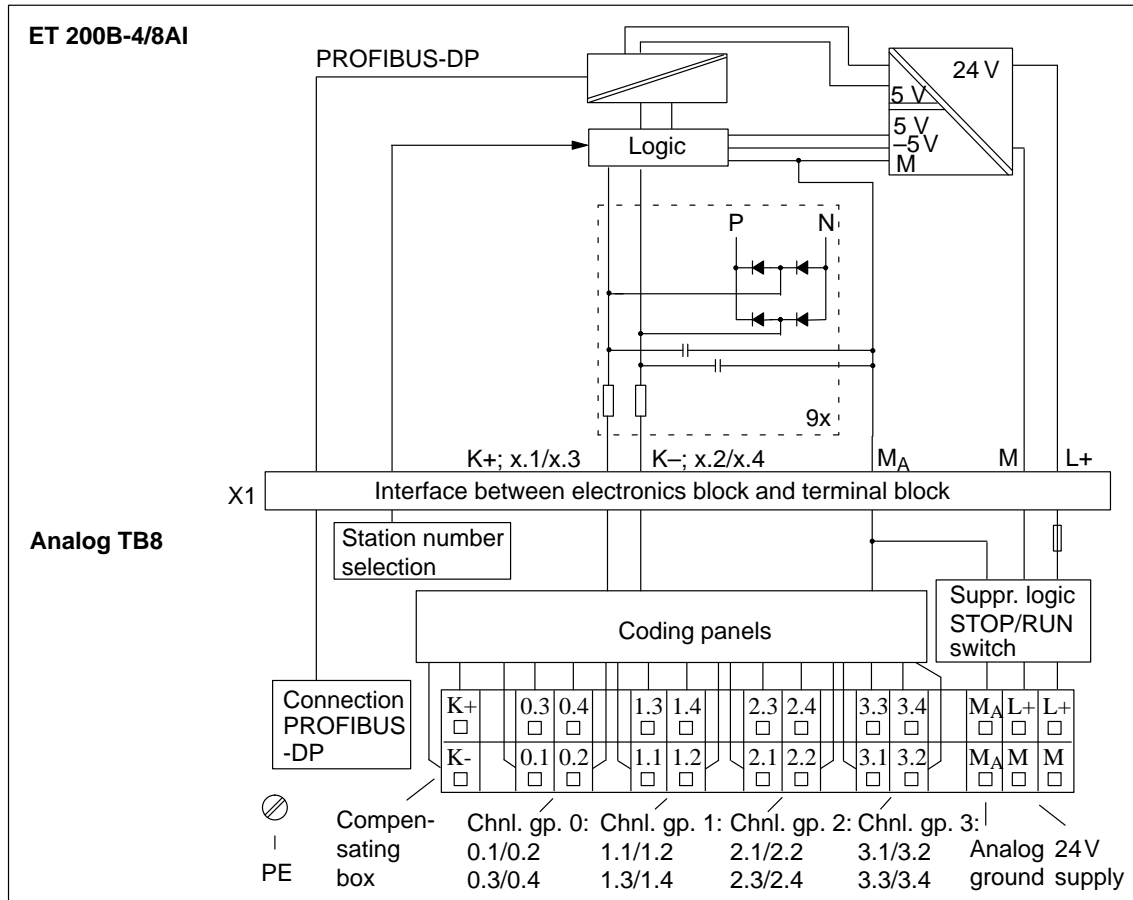


Figure 8-15 Block Diagram: ET 200B-4/8AI (6ES7 134-0KH01-0XB0) and TB8

**Terminal Assignment**

The table below contains the terminal assignments of the TB8 for ET 200B-4/8AI, depending on the sensor connected.

Table 8-37 Terminal Assignment of the TB8 for ET 200B-4/8AI (6ES7 134-0KH01-0XB0)

| Terminal       | Assignment When the Following are Connected |                                       |                    |
|----------------|---|---------------------------------------|--------------------|
|                | Thermocouple                                | Resistance Thermometer                | Voltage Sensor     |
| K+             | Compensating box                            | Unassigned                            | Unassigned         |
| K-             | Compensating box                            | Unassigned                            | Unassigned         |
| x.1            | Measuring line (+)                          | Constant current line I <sub>C+</sub> | Measuring line (+) |
| x.2            | Measuring line (-)                          | Constant current line I <sub>C-</sub> | Measuring line (-) |
| x.3            | Measuring line (+)                          | Measuring line (+)                    | Measuring line (+) |
| x.4            | Measuring line (-)                          | Measuring line (-)                    | Measuring line (-) |
| M <sub>A</sub> | Analog ground (M <sub>A</sub> )             |                                       |                    |
| M <sub>A</sub> | Analog ground (M <sub>A</sub> )             |                                       |                    |
| L+             | Voltage supply, internal logic              |                                       |                    |
| L+             | Voltage supply, internal logic              |                                       |                    |
| M              | Voltage supply, internal logic              |                                       |                    |
| M              | Voltage supply, internal logic              |                                       |                    |

x = 0, 1, 2, 3

**Note**

Certain additional settings must be made for the input circuit by means of the coding plugs of the TB8. The settings of the coding plugs are illustrated in Figures 8-6 to 8-14.

**Technical Data**

The technical data of the ET200B-4/8AI electronics block are listed in the table below.

| Technical specifications  |   | Inputs  |  |
|---|---|---|--|
| Baud rates*   | 9.6/19.2/93.75/187.5/500/1500/3000/6000/12000 kbaud | Number of inputs  | 8 voltage inputs or 4 inputs for resistance thermometers and resistors or 8 inputs for thermocouples |
| Bus protocol  | PROFIBUS-DP   | Galvanic isolation to internal electronics                      | No   |
| Galvanic isolation to the SINEC L2-DP bus                                       | Yes   | Galvanic isolation to voltage supply of internal logic          | Yes  |
| Power losses  | Typically 2 W                                       | Measured value ranges   |  |
| Weight (EB and TB)  | Approx. 550 g (19.25 oz.)                           | • Thermocouples   | Types E, J, K, L, N, T, U  |
| Dimensions (EB and TB: W x H x D)   | 160 x 130 x 60                                      | • Resistors   | 48 Ω<br>150 Ω<br>300 Ω<br>600 Ω  |
| <b>Diagnostics functions, alarms</b>  |   | • Resistance thermometers                                       | Pt 100, Ni 100   |
| Voltage monitoring  | Green "RUN" LED                                     | • Voltage   | ± 80 mV<br>± 250 mV<br>± 500 mV<br>± 1000 mV   |
| Bus monitoring, SINEC L2-DP   | Red "BF" LED  | Permissible input voltage for voltage input (destruction limit) | 32 V   |
| Group diagnostics   | Red "DIA" LED, parameterizable                      | Characteristic-curve linearization                              |  |
| Alarms  |   | • for thermocouples   | Types E, J, K, L, N, T, U  |
| • Limit-value alarm   | Yes, parameterizable channels 0 and 2               | • for thermal resistors   | Pt 100 (standard range)<br>Ni 100 (standard range)   |
| • Diagnostics alarm   | Yes, parameterizable                                | Linearization accuracy in nominal range for thermocouples       | ± 1°C  |
| • End-of-cycle alarm  | Yes, parameterizable                                | Connection of signal sensors                                    |  |
| <b>Supply voltage for inputs and internal logic</b>                             |   | • For voltage measurement                                       | Possible   |
| Supply voltage (L+)   |   | • For resistance measurement:                                   |  |
| • Rated value   | 24 V DC   | 2-wire connection   | Possible   |
| • Permissible range   | 18.5 ... 30.2 V                                     | 4-wire connection   | Possible   |
| • Value for t < 0.5 s   | 35 V  | Input resistance  | ≥ 10 MΩ  |
| Current consumption from L+   |   | Measured value representation                                   |  |
| • Logic   | 80 mA   | • SIMATIC S5  | 12-bit complement of twos or 11-bit amount with sign (selectable)                                    |
| * In operation with the IM 308-B, the maximum possible baud rate is 1500 kbaud. |   | • SIMATIC S7  | Max. 14-bit complement of twos (depends on integration time)   |
|   |   | Overrange   | Approx. 17.5 %   |

| Inputs (continued)   |   |      |     |     | Inputs (continued)  |            |
|--|---|------|-----|-----|---|------------|
| Measuring principle  | Integrating   |      |     |     | Crosstalk between inputs  |            |
| Integration/conversion time/<br>resolution (per channel)                             |   |      |     |     | • At 50 Hz  | 50 dB      |
| • Parameterizable  | Yes   |      |     |     | • At 60 Hz  | 50 dB      |
| • Integration time in ms   | 2.5   | 16.7 | 20  | 100 | Working error limit (over entire temperature range, in relation to input range) |            |
| • Basic conversion time incl. integration time and offset measuring time in ms or    | 8   | 35   | 42  | 200 | • 80 mV   | ± 1 %      |
| Additional conversion time for wire-break monitoring in ms                           | 10  | 10   | 10  | 10  | • From 250 to 1000 mV   | ± 0.6 %    |
| • Resolution in bits (incl. overrange)   | 9+  | 12+  | 12+ | 14+ | • Thermocouples   | ± 10 K     |
|  | SI  | SI   | SI  | SI  | • Thermal resistors   | ± 5 K      |
| • Noise suppression for interference frequency f1 in Hz                              | 400   | 60   | 50  | 10  | • Resistors   | ± 1 %      |
| Permissible potential difference   |   |      |     |     | Basic error limit (working error limit at 25 °C, in relation to input range)    |            |
| • Across inputs  | Max. ± 1 V  |      |     |     | • 80 mV   | ± 0.6 %    |
| • Inputs to M <sub>A</sub> (U <sub>CM</sub> )  | Max. ± 1 V  |      |     |     | • From 250 to 1000 mV   | ± 0.4 %    |
| • M <sub>A</sub> to PE or M  | Max. 75 V DC/60 V AC  |      |     |     | • Thermocouples   | ± 7 K      |
| Error message in the event of  |   |      |     |     | • Thermal resistors   | ± 3 K      |
| • Range overshoot (overrange)  | Yes   |      |     |     | • Resistors   | ± 0.6 %    |
| • Wire break of signal-sensor lines  | Yes, for Pt 100, Ni 100, R, ± 80 mV, Type E, J, K, L, N, T, U thermocouples (parameterizable) |      |     |     | Temperature error (in relation to input range)                                  |            |
| Noise suppression for f = n × (f1 ± 1 %), (f1 = interference frequency)              |   |      |     |     | ± 0.005 %/K   |            |
| • Common-mode interference (U <sub>SS</sub> < 3 V)                                   | > 70 dB   |      |     |     | Linearity error (in relation to input range)                                    |            |
| • Series-mode interference (peak value of interference < rated value of input range) | > 40 dB   |      |     |     | ± 0.05 %  |            |
|  |   |      |     |     | Repeatability (in steady-state condition at 25 °C, in relation to input range)  |            |
|  |   |      |     |     | ± 0.05 %  |            |
|  |   |      |     |     | Cable length  |            |
|  |   |      |     |     | • Shielded  | Max. 100 m |

## 8.5 Electronics Block ET 200B-4AI (6ES7 134-0HF01-0XB0)

### Characteristics

The ET 200B-4AI electronics block has the following characteristics:

- 4 inputs, floating to the supply voltage of the internal logic
- Measuring ranges:
  - Voltage:  $\pm 1.25\text{ V}$ ,  $\pm 2.5\text{ V}$ ,  $\pm 5\text{ V}$ ,  $\pm 10\text{ V}$ ,
  - Current: 0 to 20 mA, 4 to 20 mA,  $\pm 20\text{ mA}$
- Measuring principle: successive approximation
- Supply voltage: 24 V DC
- Connectable sensors
  - Voltage sensors (2-wire connection)
  - Current sensors (2-wire connection)
- Measured-value range selection via COM ET 200 or STEP 7 or directly via parameterization telegram (see Chapter 4)

### Dimensional Drawing

See Figure 8-4 for the precise dimensions.

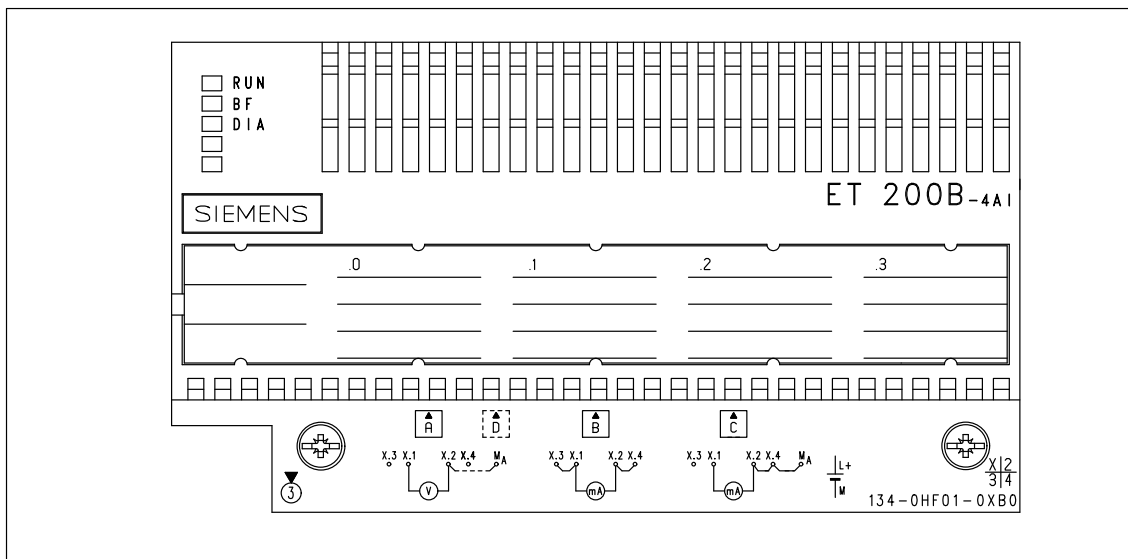


Figure 8-16 Front Elevation: ET 200B-4AI (6ES7 134-0HF01-0XB0)

**List of Subsections**

The following aspects of the ET 200B-4AI are described below:

| <b>In Section</b> | <b>you will find</b>  | <b>on Page</b> |
|-------------------|---|----------------|
| 8.5.1             | Connecting transducers  | 8-53           |
| 8.5.2             | Configuration options   | 8-61           |
| 8.5.3             | Setting the operating mode  | 8-62           |
| 8.5.4             | Analog-value representation, operation with SIMATIC S5            | 8-65           |
| 8.5.5             | Analog-value representation, operation with SIMATIC S7            | 8-70           |
| 8.5.6             | Schematic circuit diagram, terminal assignment and technical data | 8-72           |



## 8.5.1 Connecting Transducers

### Possible Connections

You can connect the following to the ET 200B-4AI:

- Up to 4 voltage sensors (2-wire connection)
- Up to 4 current sensors (2-wire connection)

Mixed configurations with different types of sensor are possible.

2-wire measuring transducers and 4-wire measuring transducers require a separate voltage supply (see Figures 8-21 and 8-22).

### Input Circuit

There are two ways of measuring analog signals from current/voltage sensors:

- Floating-ground measurement
- Ground-referenced measurement

You set the input circuit for floating-ground or ground-referenced measurement by means of the coding plugs on the TB8 (one coding plug per channel).

### Floating-Ground Measurement

In the case of floating-ground measurement (differential measurement), each signal line has its own signal reference conductor.

Differential measurement is required in the following cases:

- If the sensors are connected to different potentials and
- If the different signal sources are physically apart.

---

### Note

The maximum permissible common mode voltage ( $V_{CM}$ ) of the differential inputs to analog ground ( $M_A$ ) is  $\pm 1$  V.

The maximum permissible voltage difference between  $M_A$  and PE must not exceed 75 V DC/60 V AC.

Avoid ground loops!

---


**Ground-Referenced Measurement**

In the case of ground-referenced measurement, all signal reference conductors in the TB8 are connected to a common reference point (analog ground  $M_A$ ).

To avoid ground loops, galvanically isolated and ungrounded signal sources (thermocouples, voltage sources) are required.

---

**Note**

Connect  $M_A$  to PE() to enhance noise immunity in the case of ground-referenced measurement.


---

**On the Following Pages**

The following pages contain a connection example for every connection possibility and measuring principle. Please note the following rules.

**Rules**

Please note the following rules when connecting measured-value sensors to the ET 200B-4AI:

- The permissible potential difference at the differential input ( $x.1 \leftrightarrow x.2$ ,  $x = 0$  to  $3$ ) must not exceed  $\pm 10$  V.
- The maximum permissible common mode voltage ( $V_{CM}$ ) between the differential inputs ( $x.1 \leftrightarrow x.2$ ,  $x=0$  to  $3$ ) and analog ground  $M_A$  is  $\pm 1$  V.
- The maximum permissible isolation voltage between analog ground ( $M_A$ ) and PE () or between the reference potential of the supply voltage (M) is 75 V DC/60 V AC.
- You must short-circuit the connection terminals of unused voltage inputs and connect them to  $M_A$  (coding plug at position “D” for voltage sensors; position “C” implements the connection to  $M_A$  for current sensors).
- You must short-circuit terminals “K+” and “K-”. For this purpose, set the coding plug to the “C” position.

---

**Note**

Please note the explanation of shielding of analog lines in Sections 3.1 and 3.5.

---

**Connecting Voltage Sensors**

Voltage sensors for the following measured value ranges can be connected:  
 $\pm 1.25\text{ V}$ ,  $\pm 2.5\text{ V}$ ,  $\pm 5\text{ V}$ ,  $\pm 10\text{ V}$

Figures 8-17 and 8-18 show the two methods of connecting voltage sensors.

**Floating-Ground Measurement**

Figure 8-17 shows the 2-wire connection of voltage sensors (floating-ground measurement):

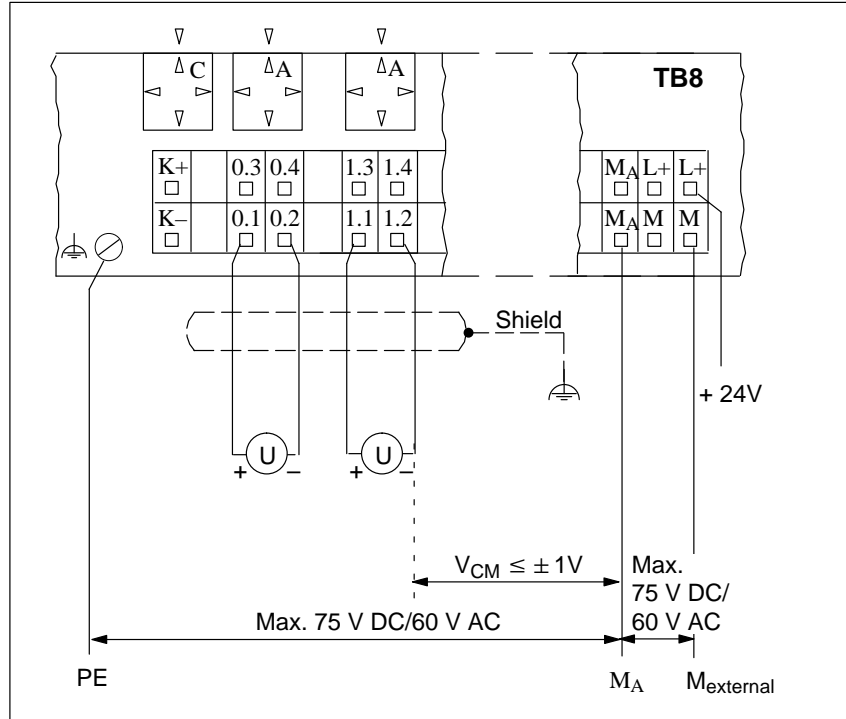
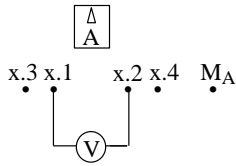
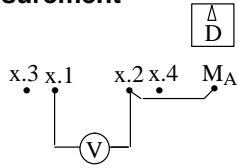


Figure 8-17 Two-Wire Connection of Voltage Sensors to ET 200B-4AI (Floating-Ground Measurement)

**Note**

The maximum permissible common mode voltage ( $V_{CM} \leq \pm 1\text{ V}$ ) must not be exceeded at any of the differential inputs with reference to  $M_A$ .

**Ground-Referenced Measurement**



The 2-wire connection of voltage sensors (ground-referenced measurement) is shown below:

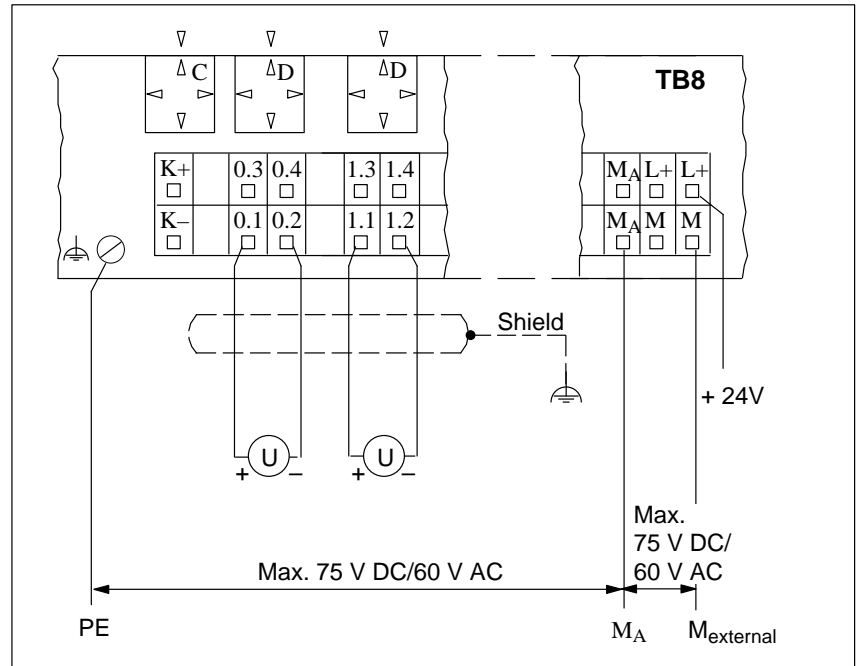


Figure 8-18 Two-Wire Connection of Voltage Sensors to ET 200B-4AI (Ground-Referenced Measurement)

**Connecting Current Sensors**

Current sensors for the following measured value ranges can be connected:  
0 to 20 mA, 4 to 20 mA,  $\pm 20$  mA

Figures 8-19 and 8-20 show the two methods of connecting current sensors.

**Floating-Ground Measurement**

The 2-wire connection of current sensors (floating-ground measurement) is shown below:

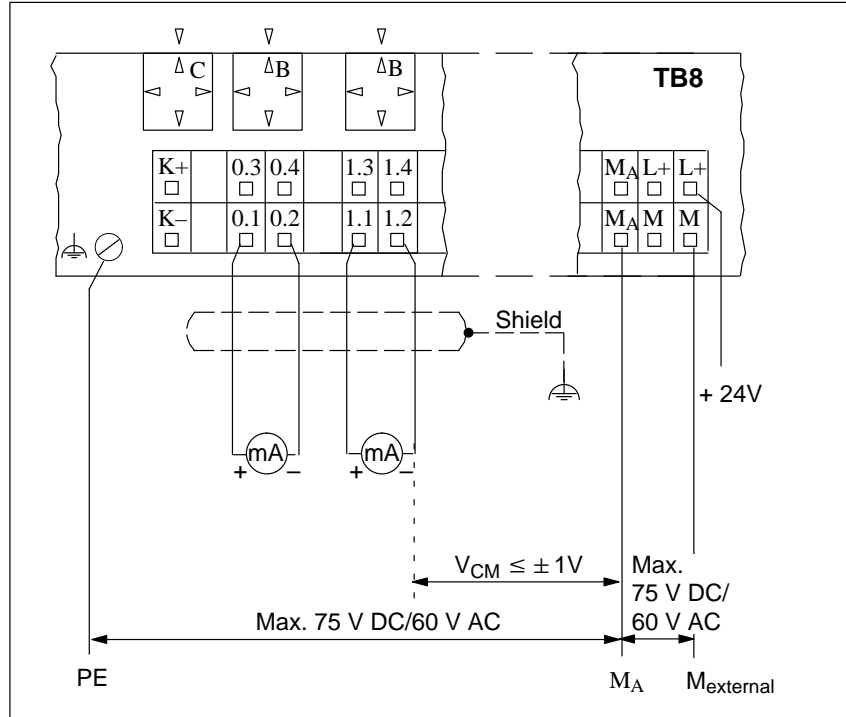
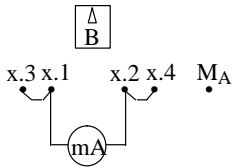
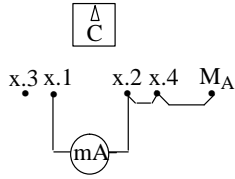


Figure 8-19 Two-Wire Connection of Current Sensors (Floating-Ground Measurement)

**Note**

The maximum permissible common mode voltage ( $V_{CM} \leq \pm 1$  V) must not be exceeded at any of the differential inputs with reference to  $M_A$ .

**Ground-Referenced Measurement**



The 2-wire connection of current sensors (ground-referenced measurement) is shown below:

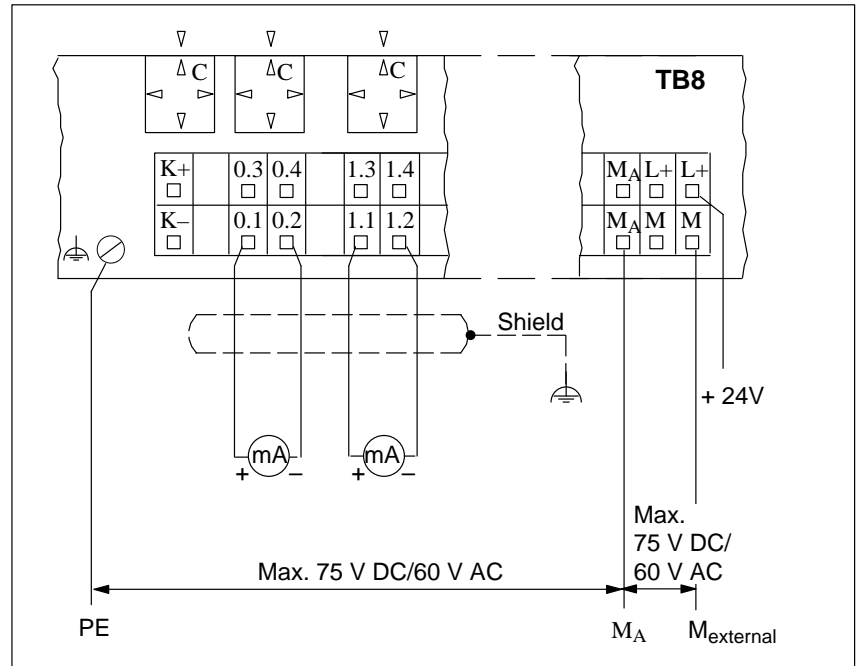


Figure 8-20 Two-Wire Connection of Current Sensors (Ground-Referenced Measurement)

**Connecting 2-Wire and 4-Wire Measuring Transducers**

The 2-wire and 4-wire measuring transducers receive a separate supply voltage.

2-wire measuring transducer converts the incoming measured variable into a current. 4-wire measuring transducers can be used to measure current and voltage.

**2-Wire Measuring Transducers**

The figure below shows how to connect the 2-wire measuring transducer as a current sensor:

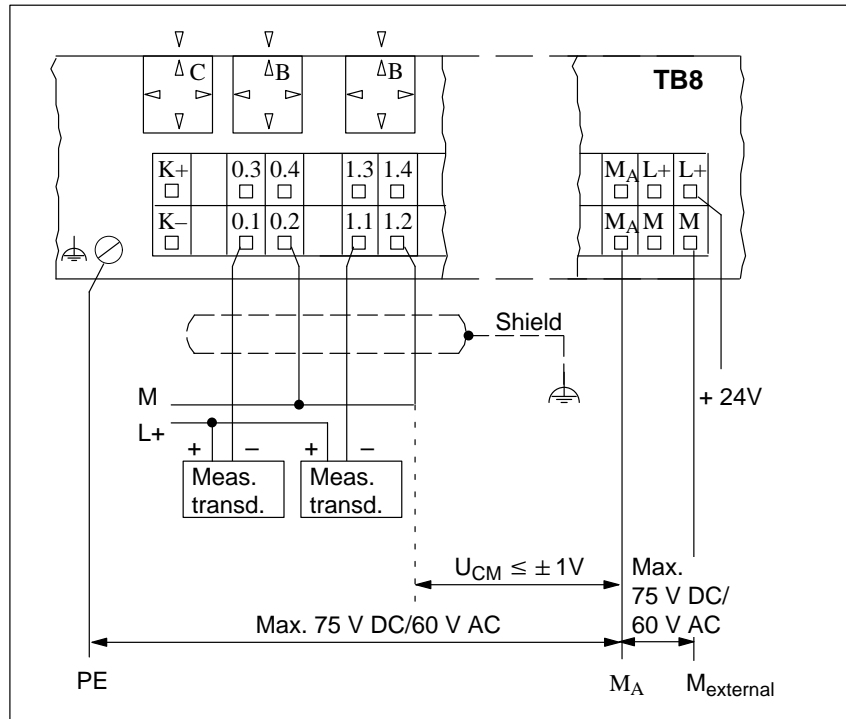
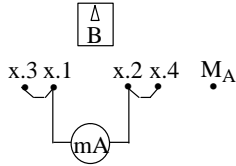


Figure 8-21 Connection of 2-Wire Measuring Transducer as Current Sensor

**Note**

The maximum permissible common mode voltage of the differential inputs to analog ground  $M_A$  is ( $U_{CM} \leq \pm 1V$ ).

Avoid ground loops!

**4-Wire Measuring Transducer**

The figure below shows how to connect the 4-wire measuring transducer as a current sensor or voltage sensor:

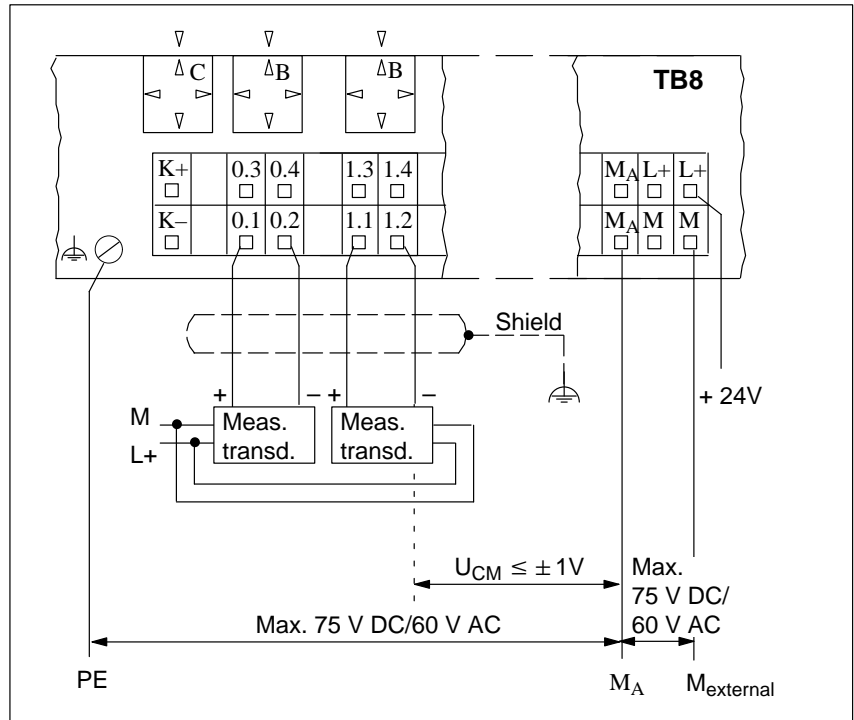
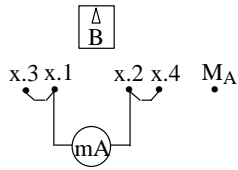


Figure 8-22 Connection of 4-Wire Measuring Transducer as Current Sensor or Voltage Sensor

**Note**

The maximum permissible common mode voltage of the differential inputs to analog ground  $M_A$  is ( $U_{CM} \leq \pm 1V$ ).



## 8.5.2 Configuration Options

**Type File** The information in this section applies to the type file **SI8019BE.200**.  
The type file contains the possible configurations. The configuration you choose depends on the wiring of the module.

**Configuration** Table 8-38 shows the possible configurations of the ET 200B-4AI with COM ET 200 Windows or STEP 7.  
Table 8-38 lists only the slots for configuring the Input areas (slots 4 to 7). Slots 1 to 4 have the default value "004".

Table 8-38 Possible Configurations for the Input Areas of ET 200B-4AI

| Config-uration | Terminals used |           |           |           | Length <sup>1</sup><br>(in words) | Meaning   |
|----------------|----------------|-----------|-----------|-----------|-----------------------------------|---|
|                | Channel 0      | Channel 1 | Channel 2 | Channel 3 |                                   |   |
|                | 0.1/0.2        | 1.1/1.2   | 2.1/2.2   | 3.0/3.1   |                                   |   |
| 4AI            | ×              | ×         | ×         | ×         | 4                                 | A start address is assigned for the entire module, addresses for 4 words are reserved.<br>(= module addressing) |
| 4 x 1AI        | ×              | ×         | ×         | ×         | 4                                 | A separate start address can be assigned for each channel.<br>(= single-channel addressing)                     |
| 3 x 1AI        | ×              | ×         | ×         |           | 3                                 |   |
| 2 x 1AI        | ×              | ×         |           |           | 2                                 |   |
| 1 x 1AI        | ×              |           |           |           | 1                                 |   |

<sup>1</sup> Length of user data  
× = Connection of measuring lines

**Diagnostics** Diagnostics messages and diagnostics data (slave diagnostics) are returned only for the configured channels.

### 8.5.3 Setting the Operating Mode

#### Setting the Operating Mode

You set the operating mode of the ET 200B-4AI electronics block

- by means of the coding plugs on the TB8 terminal block and
- by means of the COM ET 200 or STEP7 parameterization software.

#### Coding Plugs

The coding plugs of the TB8 enable you to set the input circuit of the TB8 for analog value measurement of each individual channel of the ET 200B-4AI in accordance with the measured-value sensor connected and the desired mode of measurement.

The possible settings of the coding plugs are: "A", "B", "C" and "D".

For details of the relationships between the settings of the coding plugs and the mode of measurement and the measured-value sensors, see Section 8.5.1. Section 3.1 describes how to change the settings of the coding plugs.

#### Channel

Some parameters of the ET 200B-4AI listed on the following pages apply only to individual channels. Table 8-39 lists the assignment of TB8 terminals to channels.

Table 8-39 Assignment of Terminals to Channels

| Channel   | Terminals         |
|-----------|-------------------|
| Channel 0 | Terminals 0.1/0.2 |
| Channel 1 | Terminals 1.1/1.2 |
| Channel 2 | Terminals 2.1/2.2 |
| Channel 3 | Terminals 3.1/3.2 |

**Parameters**

Table 8-40 shows all the parameters for parameterizing the ET 200B-4AI with COM ET 200 Windows or STEP 7.

You can set these parameters for the ET 200B-4AI if you use the type file **SI8019BE.200**.

Table 8-40 Parameters for ET 200B-4AI (6ES7 134-0HF01-0XB0)

| Parameter                                  | Explanation  | Value Range  |
|--|--|--|
| Diagnostics alarm                          | Diagnostics alarm enable for module  | Disable<br>Enable  |
| Limit-value alarm                          | Limit-value alarm enable for module  | Disable<br>Enable  |
| Diagnostics enable for channel 0           | Diagnostics messages enabled separately for each channel   | Disable<br>Enable  |
| Diagnostics enable for channel 1           |  |  |
| Diagnostics enable for channel 2           |  |  |
| Diagnostics enable for channel 3           |  |  |
| Wire break monitoring enable for channel 0 | Wire break monitoring enabled separately for each channel group for measuring range 4 ... 20 mA                                    | Disable<br>Enable  |
| Wire break monitoring enable for channel 1 |  |  |
| Wire break monitoring enable for channel 2 |  |  |
| Wire break monitoring enable for channel 3 |  |  |
| Measurement type and range for channel 0   | You can set the measurement type and range separately for each channel<br>For voltage measurement:<br><br>For current measurement: | Channel not activated<br><br>± 10 V<br>± 5 V<br>± 2.5 V<br>± 1.25 V<br><br>± 20 mA<br>0 ... 20 mA<br>4 ... 20 mA |
| Measuring type and range for channel 1     |  |  |
| Measuring type and range for channel 2     |  |  |
| Measuring type and range for channel 3     |  |  |
| Representation of measured values          | Sets representation of the analog measured values for module   | SIMATIC S5<br>SIMATIC S7   |
| Measured value representation: S5          | Sets data format for analog value representation, SIMATIC S5   | Complement of twos<br>Amount with sign<br>Binary   |

Table 8-40 Parameters for ET 200B-4AI (6ES7 134-0HF01-0XB0), continued

| Parameter                       | Explanation                                   | Value Range            |
|---------------------------------|---|------------------------|
| Upper limit value for channel 0 | Upper and lower limit values for each channel | 0<br>– 32768 ... 32767 |
| Lower limit value for channel 0 |   | 0<br>– 32768 ... 32767 |
| Upper limit value for channel 2 |   | 0<br>– 32768 ... 32767 |
| Lower limit value for channel 2 |   | 0<br>– 32768 ... 32767 |

■ : Default

### 8.5.4 Analog Value Representation, Operation with SIMATIC S5

**Analog Value Representation, SIMATIC S7**

If you operate the ET 200B-4AI with SIMATIC S5, you can utilize the analog value representation of SIMATIC S7 (higher measured-value resolution: max. 14 bits + sign). See Section 8.5.5 for the measured-value tables for analog value representation in SIMATIC S7.

**Analog Value Representation, SIMATIC S5**

Analog values can be represented in three data formats with the ET 200B-4AI:

- 12-bit complement of twos representation (range: -2048 to +2047 units)
- 11-bit amount and 1-bit sign (range: -2048 to +2047 units)
- 12-bit binary number (range: 0 to 4095 units)

The table below shows the analog value representation of the ET 200B-4AI:

Table 8-41 Representation of an Analog Input Value as a Bit Pattern (6ES7 134-0HF01-0XB0)

|                             | High Byte |                 |                 |                |                |                |                |                | Low Byte       |                |                |                |                |   |   |    |
|-----------------------------|-----------|-----------------|-----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|---|---|----|
| Bit number                  | 15        | 14              | 13              | 12             | 11             | 10             | 9              | 8              | 7              | 6              | 5              | 4              | 3              | 2 | 1 | 0  |
| Analog value representation | SI        | 2 <sup>11</sup> | 2 <sup>10</sup> | 2 <sup>9</sup> | 2 <sup>8</sup> | 2 <sup>7</sup> | 2 <sup>6</sup> | 2 <sup>5</sup> | 2 <sup>4</sup> | 2 <sup>3</sup> | 2 <sup>2</sup> | 2 <sup>1</sup> | 2 <sup>0</sup> | X | X | OV |

Bits 0 to 2 and bit 15 have no significance for the amount of the measured value. See Table 8-42 for a detailed description of these bits.

**Supplementary Bits**

Bits 0 to 2 and bit 15 have the following meaning in the bit pattern of the analog input value:

Table 8-42 Description of the Bits (6ES7 134-0HF01-0XB0)

| Bit | Meaning      | Signal Status | Meaning of the Signal Status |
|-----|--------------|---------------|------------------------------|
| OV  | Overflow bit | 1             | Overrange <sup>1</sup>       |
| SI  | Sign         | 0             | “+” sign                     |
|     |              | 1             | “-” sign                     |
| X   | Irrelevant   | –             | –                            |

<sup>1</sup> In the event of overflow at one measuring point, the overflow bits of the other channels remain unaffected; this means the values of the other channels are correct and can be evaluated.

**Voltage Measuring Ranges**

The tables below show the assignments of analog to digitized measured values for the measuring ranges:  $\pm 1.25\text{ V}$ ,  $\pm 2.5\text{ V}$ ,  $\pm 5\text{ V}$ ,  $\pm 10\text{ V}$ .

The ET 200B-4AI module (6ES7 134-0HF01-0XB0) does not have an over-range.

Table 8-43 Representation of Digitized Measured Values of the ET 200B-4AI (6ES7 134-0HF01-0XB0); Measuring Ranges:  $\pm 1.25\text{ V}$ ,  $\pm 2.5\text{ V}$ ,  $\pm 5\text{ V}$ ,  $\pm 10\text{ V}$ ; **Complement of Twos**

| Units | Measured Value in V |                   |                 |                  | Digitized Measured Value |    |    |    |    |    |   |   |   |   |   |   |   |   |   | X | X             | OV | Range |
|-------|---------------------|-------------------|-----------------|------------------|--------------------------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|---------------|----|-------|
|       | $\pm 1.25\text{V}$  | $\pm 2.5\text{V}$ | $\pm 5\text{V}$ | $\pm 10\text{V}$ | 15                       | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 |   |               |    |       |
| 2047  | 1.2494              | 2.4988            | 4.9976          | 9.9951           | 0                        | 0  | 1  | 1  | 1  | 1  | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 1 | Nominal range |    |       |
| 2046  | 1.2488              | 2.4975            | 4.9951          | 9.9902           | 0                        | 0  | 1  | 1  | 1  | 1  | 1 | 1 | 1 | 1 | 1 | 1 | 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 |               |    |       |
| 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         | -10.000          | 1                        | 1  | 0  | 0  | 0  | 0  | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |               |    |       |

Table 8-44 Representation of Digitized Measured Values of the ET 200B-4AI (6ES7 134-0HF01-0XB0); Measuring Ranges:  $\pm 1.25\text{ V}$ ,  $\pm 2.5\text{ V}$ ,  $\pm 5\text{ V}$ ,  $\pm 10\text{ V}$ ; **Amount and Sign**

| Units | Measured Value in V |                   |                 |                  | SI | Digitized Measured Value |    |    |    |    |    |   |   |   |   |   |   |   |   |   | X             | X | OV | Range |
|-------|---------------------|-------------------|-----------------|------------------|----|--------------------------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---------------|---|----|-------|
|       | $\pm 1.25\text{V}$  | $\pm 2.5\text{V}$ | $\pm 5\text{V}$ | $\pm 10\text{V}$ |    | 15                       | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 |               |   |    |       |
| 2047  | 1.2494              | 2.4988            | 4.9976          | 9.9951           | 0  | 0                        | 1  | 1  | 1  | 1  | 1  | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 1 | Nominal range |   |    |       |
| 2046  | 1.2488              | 2.4975            | 4.9951          | 9.9902           | 0  | 0                        | 1  | 1  | 1  | 1  | 1  | 1 | 1 | 1 | 1 | 1 | 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 |               |   |    |       |
| 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  | 0                        | 0  | 0  | 0  | 0  | 0  | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |               |   |    |       |
| :     | :                   | :                 | :               | :                | :  |                          |    |    |    |    |    |   |   |   |   |   |   |   |   |   |               |   |    |       |
| -2047 | -1.2494             | -2.4988           | -4.9976         | -9.9951          | 1  | 0                        | 1  | 1  | 1  | 1  | 1  | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 |               |   |    |       |
| -2048 | -1.2500             | -2.5000           | -5.0000         | -10.000          | 1  | 1                        | 0  | 0  | 0  | 0  | 0  | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |               |   |    |       |

Table 8-45 Representation of Digitized Measured Values of the ET 200B-4AI (6ES7 134-0HF01-0XB0; Measuring Ranges:  $\pm 1.25\text{ V}$ ,  $\pm 2.5\text{ V}$ ,  $\pm 5\text{ V}$ ,  $\pm 10\text{ V}$ ; **Binary**)

| Units | Measured Value in V |                   |                 |                  | Digitized Measured Value |    |    |    |    |    |   |   |   |   | X | X | OV | Range |   |   |               |
|-------|---------------------|-------------------|-----------------|------------------|--------------------------|----|----|----|----|----|---|---|---|---|---|---|----|-------|---|---|---------------|
|       | $\pm 1.25\text{V}$  | $\pm 2.5\text{V}$ | $\pm 5\text{V}$ | $\pm 10\text{V}$ | 15                       | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 |   |   |    |       | 5 | 4 | 3             |
| 4095  | 1.2494              | 2.4988            | 4.9976          | 9.9951           | 0                        | 1  | 1  | 1  | 1  | 1  | 1 | 1 | 1 | 1 | 1 | 1 | 1  | 0     | 0 | 1 | Nominal range |
| 4094  | 1.2488              | 2.4975            | 4.9951          | 9.9902           | 0                        | 1  | 1  | 1  | 1  | 1  | 1 | 1 | 1 | 1 | 1 | 1 | 0  | 0     | 0 |   |               |
| :     | :                   | :                 | :               | :                | :                        |    |    |    |    |    |   |   |   |   | : | : | :  |       |   |   |               |
| 2049  | 0.0006              | 0.0012            | 0.0024          | 0.0049           | 0                        | 1  | 0  | 0  | 0  | 0  | 0 | 0 | 0 | 0 | 0 | 0 | 1  | 0     | 0 | 0 |               |
| 2048  | 0.0000              | 0.0000            | 0.0000          | 0.0000           | 0                        | 1  | 0  | 0  | 0  | 0  | 0 | 0 | 0 | 0 | 0 | 0 | 0  | 0     | 0 | 0 |               |
| 2047  | -0.0006             | -0.0012           | -0.0024         | -0.0049          | 0                        | 0  | 1  | 1  | 1  | 1  | 1 | 1 | 1 | 1 | 1 | 1 | 1  | 0     | 0 | 0 |               |
| :     | :                   | :                 | :               | :                | :                        |    |    |    |    |    |   |   |   |   | : | : | :  |       |   |   |               |
| 1     | -1.2494             | -2.4988           | -4.9976         | -9.9951          | 0                        | 0  | 0  | 0  | 0  | 0  | 0 | 0 | 0 | 0 | 0 | 0 | 1  | 0     | 0 | 0 |               |
| 0     | -1.2500             | -2.5000           | -5.0000         | -10.000          | 0                        | 0  | 0  | 0  | 0  | 0  | 0 | 0 | 0 | 0 | 0 | 0 | 0  | 0     | 0 | 1 |               |

**Current Measuring Ranges**

The tables below show the assignments of analog to digitized measured values for the measuring ranges: 0 ... 20 mA, 4 ... 20 mA,  $\pm 20\text{ mA}$ .

The ET 200B-4AI module (6ES7 134-0HF01-0XB0) does not have an over-range.

Table 8-46 Representation of Digitized Measured Values of the ET 200B-4AI (6ES7 134-0HF01-0XB0; Measuring Range:  $\pm 20\text{ mA}$ ; **Complement of Twos**)

| Units | Measured Value in mA | Digitized Measured Value |    |    |    |    |    |   |   |   |   | X | X | OV | Range |   |   |   |   |               |
|-------|----------------------|--------------------------|----|----|----|----|----|---|---|---|---|---|---|----|-------|---|---|---|---|---------------|
|       |                      | 15                       | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 |   |   |    |       | 5 | 4 | 3 | 2 | 1             |
| 2047  | 19.9902              | 0                        | 0  | 1  | 1  | 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 | 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 |   |   |               |

Table 8-47 Representation of Digitized Measured Values of the ET 200B-4AI (6ES7 134-0HF01-0XB0; Measuring Range:  $\pm 20$  mA; Amount and Sign)

| Units | Mea-<br>sured<br>Value in<br>mA | SI | Digitized Measured Value |    |    |    |    |    |   |   |   |   |   | X | X | OV | Range |   |   |                       |
|-------|---------------------------------|----|--------------------------|----|----|----|----|----|---|---|---|---|---|---|---|----|-------|---|---|-----------------------|
|       |                                 |    | 15                       | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 |   |   |    |       | 4 | 3 | 2                     |
| 2047  | 19.9902                         | 0  | 0                        | 1  | 1  | 1  | 1  | 1  | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1  | 0     | 0 | 1 | No-<br>minal<br>range |
| 2046  | 19.9804                         | 0  | 0                        | 1  | 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 | 0 | 1 | 0  | 0     | 0 |   |                       |
| 0     | 0.0000                          | 0  | 0                        | 0  | 0  | 0  | 0  | 0  | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0  | 0     | 0 |   |                       |
| -1    | -0.00976                        | 1  | 0                        | 0  | 0  | 0  | 0  | 0  | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0  | 0     | 0 |   |                       |
| :     | :                               |    |                          |    |    |    |    |    |   |   |   |   |   |   |   |    |       |   |   |                       |
| -2047 | -19.9902                        | 1  | 0                        | 1  | 1  | 1  | 1  | 1  | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0  | 0     | 0 |   |                       |
| -2048 | -20.0000                        | 1  | 1                        | 0  | 0  | 0  | 0  | 0  | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0  | 0     | 1 |   |                       |

Table 8-48 Representation of Digitized Measured Values of the ET 200B-4AI (6ES7 134-0HF01-0XB0; Measuring Range:  $\pm 20$  mA; Binary)

| Units | Mea-<br>sured<br>Value in<br>mA | SI | Digitized Measured Value |    |    |    |    |    |   |   |   |   |   | X | X | OV | Range |   |                   |
|-------|---------------------------------|----|--------------------------|----|----|----|----|----|---|---|---|---|---|---|---|----|-------|---|-------------------|
|       |                                 |    | 15                       | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 |   |   |    |       | 4 | 3                 |
| 4095  | 19.9902                         | 0  | 1                        | 1  | 1  | 1  | 1  | 1  | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0  | 0     | 1 | Nomina<br>l range |
| 4094  | 19.9804                         | 0  | 1                        | 1  | 1  | 1  | 1  | 1  | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0  | 0     |   |                   |
| :     | :                               |    |                          |    |    |    |    |    |   |   |   |   |   |   |   |    |       |   |                   |
| 2049  | 0.00976                         | 0  | 1                        | 0  | 0  | 0  | 0  | 0  | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0  | 0     |   |                   |
| 2048  | 0.0000                          | 0  | 1                        | 0  | 0  | 0  | 0  | 0  | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0  | 0     |   |                   |
| 2047  | -0.00976                        | 0  | 0                        | 1  | 1  | 1  | 1  | 1  | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0  | 0     |   |                   |
| :     | :                               |    |                          |    |    |    |    |    |   |   |   |   |   |   |   |    |       |   |                   |
| 1     | -19.9902                        | 0  | 0                        | 0  | 0  | 0  | 0  | 0  | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0  | 0     |   |                   |
| 0     | -20.0000                        | 0  | 0                        | 0  | 0  | 0  | 0  | 0  | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0  | 1     |   |                   |



Table 8-49 Representation of Digitized Measured Values of the ET 200B-4AI (6ES7 134-0HF01-0XB0; Measuring Range: 0 ... 20 mA)

| Units | Measured Value in mA | Digitized Measured Value <sup>1</sup> |    |    |    |    |    |   |   |   |   |   | X | X | OV | Range |   |
|-------|----------------------|---------------------------------------|----|----|----|----|----|---|---|---|---|---|---|---|----|-------|---|
|       |                      | 15                                    | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 |   |   |    |       | 4 |
|       | 0 to 20 mA           |                                       |    |    |    |    |    |   |   |   |   |   |   |   | 2  | 1     | 0 |
| 4095  | 19.9951              | 0                                     | 1  | 1  | 1  | 1  | 1  | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0  | 0     | 1 |
| 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 |

<sup>1</sup> Same representation for two's complement, amount and sign, and binary

Table 8-50 Representation of Digitized Measured Values of the ET 200B-4AI (6ES7 134-0HF01-0XB0; Measuring Range: 4 ... 20 mA)

| Units | Measured Value in mA | Digitized Measured Value <sup>1</sup> |    |    |    |    |    |   |   |   |   |   | X | X | OV | Range |   |
|-------|----------------------|---------------------------------------|----|----|----|----|----|---|---|---|---|---|---|---|----|-------|---|
|       |                      | 15                                    | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 |   |   |    |       | 4 |
|       | 4 to 20 mA           |                                       |    |    |    |    |    |   |   |   |   |   |   |   | 2  | 1     | 0 |
| 2559  | 19.992               | 0                                     | 1  | 0  | 0  | 1  | 1  | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0  | 0     | 1 |
| 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 |
| 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     | 1 |

<sup>1</sup> Same representation for two's complement, amount and sign, and binary

**Note**

The measuring range 4 to 20 mA is resolved to 2048 units in the interval 512 to 2560. For a representation in the range 0 to 2048 units, 512 units must be subtracted per software.

### 8.5.5 Analog Value Representation, Operation with SIMATIC S7

#### Analog Value Representation, SIMATIC S7

If you operate the ET 200B-4AI with SIMATIC S7 the analog values are represented in complements of twos.

The table below shows the analog value representation of the ET 200B-4AI:

Table 8-51 Representation of an Analog Input Value as a Bit Pattern for SIMATIC S7 and ET 200B-4AI

|                             | High Byte |                 |                 |                 |                 |                 |                |                | Low Byte       |                |                |                |                |                |                |                |
|-----------------------------|-----------|-----------------|-----------------|-----------------|-----------------|-----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|
| Bit Number                  | 15        | 14              | 13              | 12              | 11              | 10              | 9              | 8              | 7              | 6              | 5              | 4              | 3              | 2              | 1              | 0              |
| Analog Value Representation | SI        | 2 <sup>14</sup> | 2 <sup>13</sup> | 2 <sup>12</sup> | 2 <sup>11</sup> | 2 <sup>10</sup> | 2 <sup>9</sup> | 2 <sup>8</sup> | 2 <sup>7</sup> | 2 <sup>6</sup> | 2 <sup>5</sup> | 2 <sup>4</sup> | 2 <sup>3</sup> | 2 <sup>2</sup> | 2 <sup>1</sup> | 2 <sup>0</sup> |

Bit 15 has no significance for the amount of the measured value. It merely represents the sign.

#### Voltage Measuring Ranges

The table below shows the representation of the digitized measuring values of the ET 200B-4AI for the measuring ranges: ± 1.25 V, ± 2.5 V, ± 5 V and ± 10 V.

Table 8-52 Representation of Digitized Measured Values of the ET 200B-4AI (Measuring Ranges: ± 1.25 V, ± 2.5 V, ± 5 V and ± 10 V)

| Measuring Range<br>± 1.25 V | Measuring Range<br>± 2.5V | Measuring Range<br>± 5 V | Measuring Range<br>± 10 V | Units       |                        | Range         |
|-----------------------------|---------------------------|--------------------------|---------------------------|-------------|------------------------|---------------|
|                             |                           |                          |                           | Decimal     | Hexadecimal            |               |
| ≥ 1.4699                    | ≥ 2.9398                  | ≥ 5.8796                 | ≥ 11.759                  | 32767       | 7FFF <sub>H</sub>      | Overflow      |
| 1.46986                     | 2.9397                    | 5.8794                   | 11.7589                   | 32511       | 7EFF <sub>H</sub>      | Overrange     |
| :<br>1.25005                | :<br>2.5001               | :<br>5.0002              | :<br>10.0004              | :<br>27649  | :<br>6C01 <sub>H</sub> |               |
| 1.25                        | 2.50                      | 5.00                     | 10.00                     | 27648       | 6C00 <sub>H</sub>      | Nominal range |
| 0.9375                      | 1.875                     | 3.75                     | 7.50                      | 20736       | 5100 <sub>H</sub>      |               |
| :<br>- 0.9375               | :<br>- 1.875              | :<br>- 3.75              | :<br>- 7.50               | :<br>-20736 | :<br>AF00 <sub>H</sub> |               |
| - 1.25                      | - 2.50                    | - 5.00                   | - 10.00                   | -27648      | 9400 <sub>H</sub>      |               |
| - 1.25005                   | - 2.5001                  | - 5.0002                 | - 10.0004                 | -27649      | 93FF <sub>H</sub>      | Underrange    |
| :<br>- 1.4699               | :<br>- 2.9398             | :<br>- 5.8796            | :<br>- 11.759             | :<br>-32512 | :<br>8100 <sub>H</sub> |               |
| ≤ - 1.47                    | ≤ - 2.94                  | ≤ - 5.88                 | ≤ - 11.76                 | -32768      | 8000 <sub>H</sub>      | Underrun      |

**Current Measuring Ranges**

The two tables below show the representation of the digitized measuring values of the ET 200B-4AI for the measuring ranges:  $\pm 20$  mA, 0 ... 20 mA and 4 ... 20 mA.

Table 8-53 Representation of Digitized Measured Values of the ET 200B-4AI (Measuring Range:  $\pm 20$  mA)

| Measuring Range<br>$\pm 20$ mA | Units   |                   | Range         |
|--------------------------------|---------|-------------------|---------------|
|                                | Decimal | Hexadecimal       |               |
| $\geq 23.5185$                 | 32767   | 7FFF <sub>H</sub> | Overflow      |
| 23.518                         | 32511   | 7EFF <sub>H</sub> | Overrange     |
| :                              | :       | :                 |               |
| 20.0007                        | 27649   | 6C01 <sub>H</sub> |               |
| 20.000                         | 27648   | 6C00 <sub>H</sub> | Nominal range |
| 15.000                         | 20736   | 5100 <sub>H</sub> |               |
| :                              | :       | :                 |               |
| - 15.000                       | -20736  | AF00 <sub>H</sub> |               |
| - 20.000                       | -27648  | 9400 <sub>H</sub> |               |
| - 20.0007                      | -27649  | 93FF <sub>H</sub> | Underrange    |
| :                              | :       | :                 |               |
| - 23.5185                      | -32512  | 8100 <sub>H</sub> |               |
| $\leq - 23.519$                | -32768  | 8000 <sub>H</sub> | Underrun      |

Table 8-54 Representation of Digitized Measured Values of the ET 200B-4AI (Measuring Ranges: 0 to 20 mA and 4 to 20 mA)

| Measuring Range<br>From 0<br>to 20 mA | Measuring Range<br>From 4<br>to 20 mA | Units   |                   | Range         |
|---------------------------------------|---------------------------------------|---------|-------------------|---------------|
|                                       |                                       | Decimal | Hexadecimal       |               |
| $\geq 23.5185$                        | $\geq 22.815$                         | 32767   | 7FFF <sub>H</sub> | Overflow      |
| 23.518                                | 22.814                                | 32511   | 7EFF <sub>H</sub> | Overrange     |
| :                                     | :                                     | :       | :                 |               |
| 20.0007                               | 20.0006                               | 27649   | 6C01 <sub>H</sub> |               |
| 20.000                                | 20.000                                | 27648   | 6C00 <sub>H</sub> | Nominal range |
| 15.000                                | 16.000                                | 20736   | 5100 <sub>H</sub> |               |
| :                                     | :                                     | :       | :                 |               |
| 0.000                                 | 4.000                                 | 0       | 0 <sub>H</sub>    |               |
| -0.0007                               | 3.9995                                | -1      | FFFF <sub>H</sub> |               |
| :                                     | :                                     | :       | :                 | Underrange    |
| -3.5185                               | 1.1852                                | -4864   | ED00 <sub>H</sub> |               |
| $\leq -3.5192$                        | $\leq 1.1846$                         | -32768  | 8000 <sub>H</sub> | Underrun      |

### 8.5.6 Block Diagram, Terminal Assignment and Technical Data

**Schematic Circuit Diagram** Simplified representation of potential for the ET 200B-4AI and TB8:

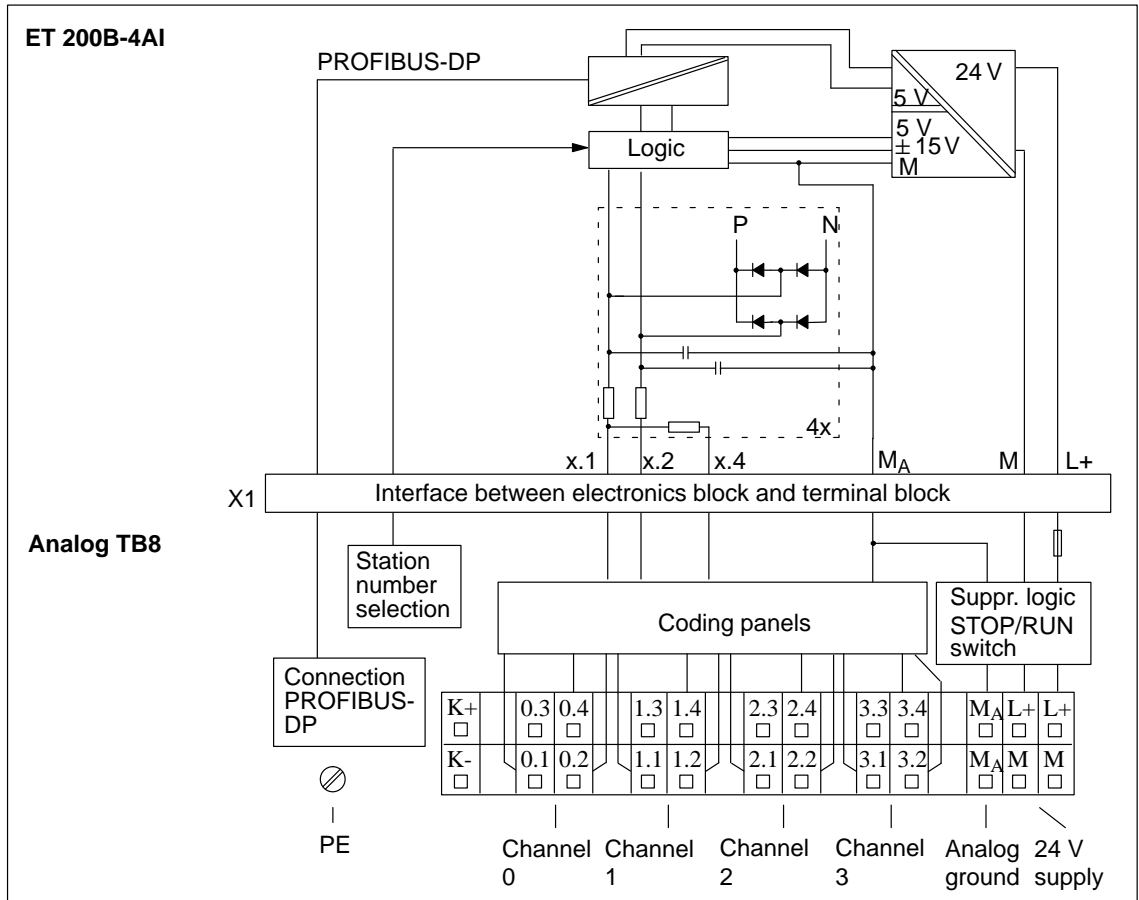


Figure 8-23 Block Diagram: ET 200B-4AI (6ES7 134-0HF10-0XB0) and TB8

**Terminal Assignment**

The table below contains the terminal assignments of the TB8 for ET 200B-4AI:

Table 8-55 Terminal Assignment of the TB8 for ET 200B-4AI (6ES7 134-0HF01-0XB0)

| Terminal       | Assignment                         |
|----------------|------------------------------------|
| K+             | Unassigned                         |
| K-             | Unassigned                         |
| x.1            | Measuring line (+)                 |
| x.2            | Measuring line (-)                 |
| x.3            | Unassigned                         |
| x.4            | Connection, resistance measurement |
| M <sub>A</sub> | Analog ground (M <sub>A</sub> )    |
| M <sub>A</sub> | Analog ground (M <sub>A</sub> )    |
| L+             | Voltage supply, internal logic     |
| L+             | Voltage supply, internal logic     |
| M              | Voltage supply, internal logic     |
| M              | Voltage supply, internal logic     |

x = 0, 1, 2, 3

**Note**

Certain additional settings must be made for the input circuit by means of the coding plugs of the TB8. The settings of the coding plugs are illustrated in Figures 8-17 to 8-22.

**Technical Data**

The technical data of the ET200B-4AI electronics block are listed in the table below.

| Technical specifications                     |   | Inputs   |  |
|--|---|--|--|
| Baud rates*                                  | 9.6/19.2/93.75/187.5/500/1500/3000/6000/12000 kbaud | Number of inputs                                       | 4  |
| Bus protocol                                 | PROFIBUS-DP   | Galvanic isolation to internal electronics             | No   |
| Galvanic isolation to the SINEC L2-DP bus    | Yes   | Galvanic isolation to voltage supply of internal logic | Yes  |
| Power losses                                 | Typically 1.8 W                                     | Measured value ranges                                  |  |
| Weight (EB and TB)                           | Approx. 550 g (19.25 oz.)                           | • Voltage sensors                                      | ± 1.25 V<br>± 2.5 V<br>± 5 V<br>± 10 V   |
| Dimensions (EB and TB: W x H x D)            | 160 x 130 x 60                                      | • Current sensors                                      | 0 ... 20 mA<br>4 ... 20 mA<br>± 20 mA  |
| Diagnostics functions, alarms                |   | Connection of signal sensors                           |  |
| Voltage monitoring                           | Green "RUN" LED                                     | • For voltage measurement                              | Possible (2-wire connection)   |
| Bus monitoring, SINEC L2-DP                  | Red "BF" LED  | • For current measurement                              | Possible (2-wire connection)   |
| Group diagnostics                            | Red "DIA" LED, parameterizable                      | • For measuring transducer                             | Possible, 2-wire- and 4-wire measuring transducers                                 |
| Alarms                                       |   | Input resistance                                       |  |
| • Limit-value alarm                          | Yes, parameterizable channels 0 and 2               | • Voltage measurement                                  | ≥ 100 KΩ   |
| • Diagnostics alarm                          | Yes, parameterizable                                | • Current measurement                                  | 125 Ω  |
| Supply voltage for inputs and internal logic |   | Measured value representation                          |  |
| Supply voltage (L+)                          |   | • SIMATIC S5   | 12-bit complement of twos or 11-bit amount with sign or 12-bit binary (selectable) |
| • Rated value                                | 24 V DC   | • SIMATIC S7   | Max. 14-bit complement of twos (depends on integration time)                       |
| • Permissible range                          | 18.5 ... 30.2 V                                     | Measuring principle                                    | Successive approximation   |
| • Value for t < 0.5 s                        | 35 V  | Conversion time  | Max. 100 μs  |
| Current consumption from L+                  |   | Cycle time of module                                   | Approx. 5 ms   |
| • Logic                                      | 70 mA   | Permissible potential difference                       |  |
|  |   | • Across inputs of a channel                           | Max. ± 10 V  |
|  |   | • Inputs to M <sub>A</sub> (U <sub>CM</sub> )          | Max. ± 1 V   |
|  |   | • M <sub>A</sub> to PE or M                            | Max. 75 V DC/60 V AC   |
|  |   | Error message in the event of                          |  |
|  |   | • Range overshoot (nominal range)                      | Yes  |
|  |   | • Wire break of signal-sensor lines                    | Only for measuring range 4 ... 20 mA   |

\* In operation with the IM 308-B, the maximum possible baud rate is 1500 kbaud.

| <b>Inputs (continued)</b>   |  |
|---|--|
| Noise suppression for $f = n$<br>$x$ (50/60 Hz $\pm$ 1%) $n =$<br>1, 2, ... |  |
| • Common-mode interference ( $U_{SS} < 1$ V)                                | min. 70 dB   |
| Basic error limit   |  |
| • Voltage ranges  | 0.15 %   |
| • Current range   | 0.20 %   |
| Working error limit (0 ...<br>60 °C)  |  |
| • Voltage ranges  | 0.32 %   |
| • Current range   | 0.41 %   |
| Permissible input voltage<br>(destruction limit)                            | Max. $\pm$ 30 V (static) <b>or</b><br>$\pm$ 75 V (pulse for max.<br>1ms and 1:20 sampling) |
| Permissible input current<br>(destruction limit)                            | Max. 24 mA   |
| Cable length  |  |
| • Shielded  | Max. 100 m   |

## 8.6 Electronics Block ET 200B-4AO (6ES7 135-0HF01-0XB0)

### Characteristics

The ET 200B-4AO electronics block has the following characteristics:

- 4 inputs, floating to the supply voltage of the internal logic
- Output ranges:
  - Voltage output:  $\pm 10\text{ V}$ ,  $0 \dots 10\text{ V}$
  - Current output:  $\pm 20\text{ mA}$ ,  $0 \dots 20\text{ mA}$ ,  $4 \dots 20\text{ mA}$
- Supply voltage:  $24\text{ V DC}$
- Loads connectable in
  - 4-wire connection
  - 2-wire connection
- Output range selection via COM ET 200 or STEP 7 or directly via parameterization telegram (see Chapter 4)

### Dimensional Drawing

See Figure 8-4 for the precise dimensions.

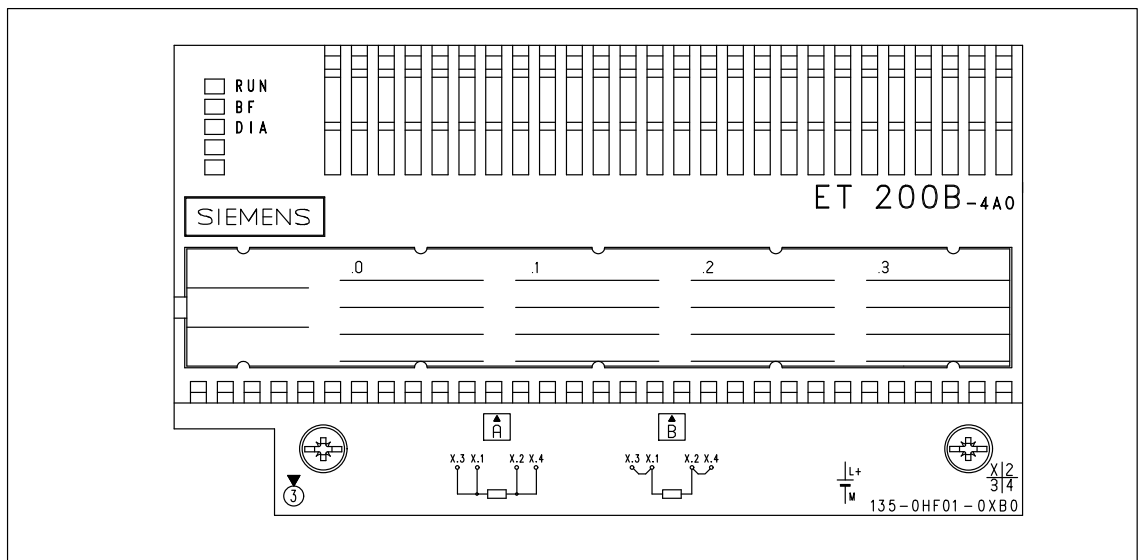


Figure 8-24 Front Elevation: ET 200B-4AO (6ES7 135-0HF01-0XB0)



**List of Subsections**

The following aspects of the ET 200B-4AO are described below:

| <b>In Section</b> | <b>you will find</b>                                   | <b>on Page</b> |
|-------------------|--|----------------|
| 8.6.1             | Connecting loads                                       | 8-78           |
| 8.6.2             | Configuration options                                  | 8-82           |
| 8.6.3             | Setting the operating mode                             | 8-83           |
| 8.6.4             | Analog-value representation, operation with SIMATIC S5 | 8-85           |
| 8.6.5             | Analog-value representation, operation with SIMATIC S7 | 8-87           |
| 8.6.6             | Block diagram, pin assignment and technical data       | 8-89           |

## 8.6.1 Connecting Loads

### Possible Connections

There are two methods of connecting loads to the ET 200B-4AO:

- 4-wire connection of loads
- 2-wire connection of loads

### On the Following Pages

The following pages contain a connection example for every connection possibility. Please note the following rules.

### Rules

Please note the following rules when connecting loads to the ET 200B-4AO:

- The output terminals  $x.2$  ( $x = 0$  to  $3$ ) have a fixed connection to analog ground ( $M_A$ ).  
If non-floating loads are connected to a common reference potential, please ensure minimum potential differences. Failure to do so can lead to undesired transient currents across the output module.
- You are recommended to connect floating-ground loads which are floating with reference to each other. In such cases, connect analog ground ( $M_A$ ) with PE ( $\perp$ ) to enhance noise immunity.
- The connection terminals of unused outputs are left open.
- You must short-circuit terminals “K+” and “K-”. For this purpose, set the coding plug to the “C” position.



### Caution

If the supply voltage is below the lower tolerance limit, the output analog values can deviate from the specified values.

---

### Note

Please note the explanation of shielding of analog lines in Sections 3.1 and 3.5.

---

**4-Wire Connection of Loads (Voltage Output)**

The voltage on the load is re-adjusted via two high-resistance sensor lines per channel (S+, S- at terminals x.3 and x.4). In this way, voltage drops of up to 3 V per line can be re-adjusted.

Please ensure that the sensor lines are connected directly to the load.

4-wire connection of loads for voltage output is shown below:

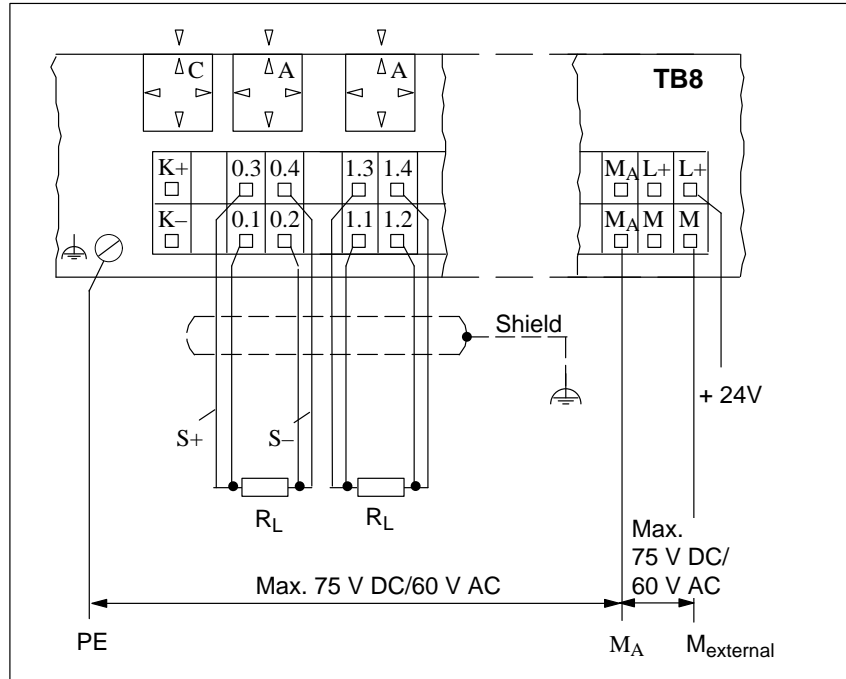
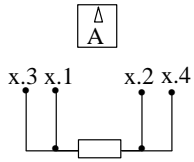


Figure 8-25 4-Wire Connection of Loads for Voltage Output

**2-Wire Connection of Loads (Voltage Output)**

The sensor lines are not required for 2-wire connection. Two-wire connection is possible for voltage output if the line resistance of the signal lines is negligible compared to the load resistance.

2-wire connection of loads for voltage output is shown below:

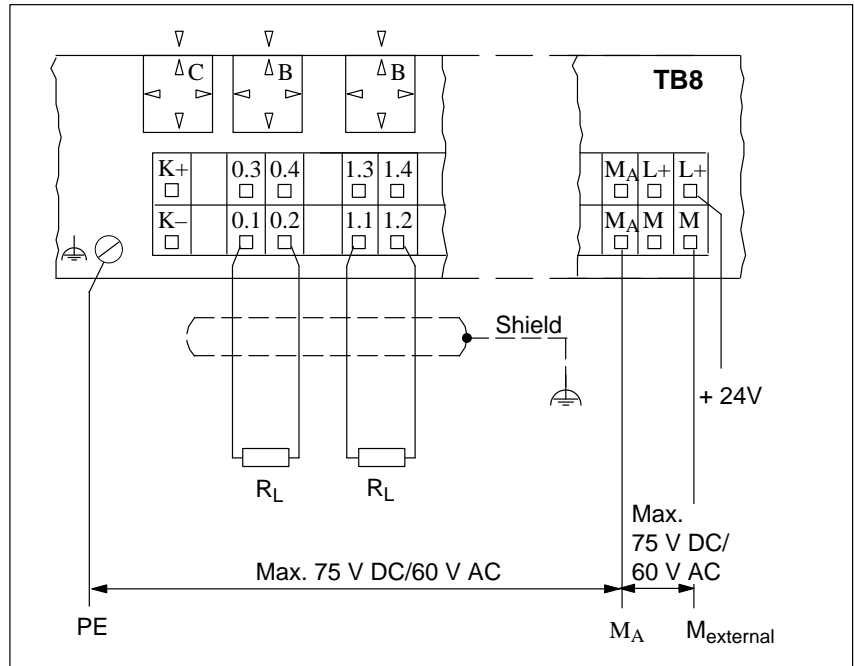
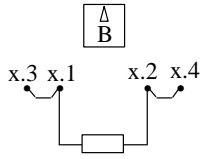


Figure 8-26 2-Wire Connection of Loads for Voltage Output

**Two-Wire Connection of Loads (Current Output)**

Two-wire connection of loads for current output is shown below:

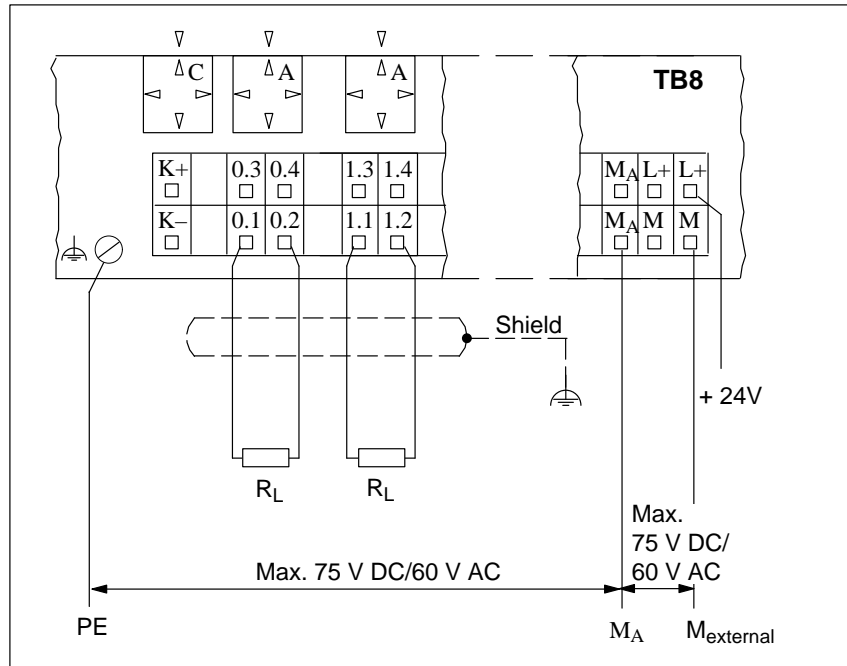
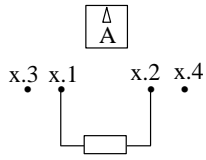


Figure 8-27 2-Wire Connection of Loads for Current Output

## 8.6.2 Configuration Options

**Type File** The information in this section applies to the type file **SI8018BE.200**.  
The type file contains the possible configurations. The configuration you choose depends on the wiring of the module.

**Configuration** Table 8-56 shows the possible configurations of the ET 200B-4AO with COM ET 200 Windows or STEP 7.  
Table 8-56 lists only the slots for configuring the output areas (slots 4 to 7). Slots 1 to 3 have the default value "004".

Table 8-56 Possible Configurations for the Output Areas of ET 200B-4AO

| Config-<br>uration | Terminals used |             |             |             |             |             |             |             | Length <sup>1</sup><br>(in<br>words) | Meaning  |
|--------------------|----------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|--------------------------------------|--|
|                    | Channel 0      |             | Channel 1   |             | Channel 2   |             | Channel 3   |             |                                      |  |
|                    | 0.1/<br>0.2    | 0.3/<br>0.4 | 1.1/<br>1.2 | 1.3/<br>1.4 | 2.1/<br>2.2 | 2.3/<br>2.4 | 3.0/<br>3.1 | 3.3/<br>3.4 |                                      |  |
| 4AO                | ×              | o           | ×           | o           | ×           | o           | ×           | o           | 4                                    | A start address is assigned for the entire module, addresses for 4 are reserved. (= module addressing) |
| 4 x 1AO            | ×              | o           | ×           | o           | ×           | o           | ×           | o           | 4                                    |  |
| 3 x 1AO            | ×              | o           | ×           | o           | ×           | o           |             |             | 3                                    |  |
| 2 x 1AO            | ×              | o           | ×           | o           |             |             |             |             | 2                                    |  |
| 1 x 1AO            | ×              | o           |             |             |             |             |             |             | 1                                    |  |

<sup>1</sup> Length of user data  
 × = Connection of load  
 o = Connection of sensor lines for voltage measurement

**Diagnostics** Diagnostics messages and diagnostics data (slave diagnostics) are returned only for the configured channels.

### 8.6.3 Setting the Operating Mode

#### Setting the Operating Mode

You set the operating mode of the ET 200B-4AO electronics block

- by means of the coding plugs on the TB8 terminal block and
- by means of the COM ET 200 or STEP7 parameterization software.

#### Coding Plugs

The coding plugs of the TB8 enable you to set the output circuit for analog value output of each individual channel of the ET 200B-4AO.

The possible settings of the coding plugs are: "A", "B", "C" and "D".

For details of the relationships between the settings of the coding plugs and the output mode or load, see Section 8.6.1. Section 3.1 describes how to change the settings of the coding plugs.

#### Channel

Some parameters of the ET 200B-4AO listed on the following pages apply only to individual channels. Table 8-57 lists the assignment of TB8 terminals to channels.

Table 8-57 Assignment of Terminals to Channels

| Channel   | Terminals         |
|-----------|-------------------|
| Channel 0 | Terminals 0.1/0.2 |
| Channel 1 | Terminals 1.1/1.2 |
| Channel 3 | Terminals 2.1/2.2 |
| Channel 4 | Terminals 3.1/3.2 |

**Parameters**

Table 8-58 shows all the parameters for parameterizing the ET 200B-4AO with COM ET 200 Windows or STEP 7.

You can set these parameters for the ET 200B-4AO if you use the type file **SI8018BE.200**.

Table 8-58 Parameters for ET 200B-4AO (6ES7 135-0HF01-0XB0)

| Parameter                            | Explanation  | Explanation   |
|--------------------------------------|--|---|
| Diagnostics alarm                    | Diagnostics alarm enable for module  | Disable<br>Enable   |
| Diagnostics enable for channel 0     | Diagnostics messages enabled separately for each channel                                   | Disable<br>Enable   |
| Diagnostics enable for channel 1     |  |   |
| Diagnostics enable for channel 2     |  |   |
| Diagnostics enable for channel 3     |  |   |
| Output value and range for channel 0 | Type and range of output defined separately for each channel                               | ± 10 V<br>0 ... 10 V<br><br>± 20 mA<br>0 ... 20 mA<br>4 ... 20 mA |
| Output value and range for channel 1 | For voltage output:  |   |
| Output value and range for channel 2 | For current output:  |   |
| Output value and range for channel 3 |  |   |
| Representation of output values      | Sets representation of the analog values for module  | SIMATIC S5<br>SIMATIC S7  |
| Type of dummy value for channel 0    | Defines the dummy value output for each channel in the event of communication interruption | Parameterizable<br>Last value                                     |
| Type of dummy value for channel 1    |  |   |
| Type of dummy value for channel 2    |  |   |
| Type of dummy value for channel 3    |  |   |
| Dummy value for channel 0            | Sets dummy value for each channel  | 0<br>- 32786 ... 32767  |
| Dummy value for channel 1            |  |   |
| Dummy value for channel 2            |  |   |
| Dummy value for channel 3            |  |   |

■ : Default



## 8.6.4 Analog Value Representation, Operation with SIMATIC S5

### Analog Value Representation, SIMATIC S7

If you operate the ET 200B-4AO with SIMATIC S5, you can utilize the analog value representation of SIMATIC S7. See Section 8.6.5 for the measured-value tables for analog value representation in SIMATIC S7.

### Analog Value Representation, SIMATIC S5

Analog values are represented in complements of twos with the ET 200B-4AO.

The table below shows the analog value representation of the ET 200B-4AO:

Table 8-59 Representation of an Analog Output Value as a Bit Pattern (6ES7 135-0HF01-0XB0)

| Bit number                  | High Byte |                 |                |                |                |                |                |                | Low Byte       |                |                |                |   |   |   |   |
|-----------------------------|-----------|-----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|---|---|---|---|
|                             | 15        | 14              | 13             | 12             | 11             | 10             | 9              | 8              | 7              | 6              | 5              | 4              | 3 | 2 | 1 | 0 |
| Analog value representation | SI        | 2 <sup>10</sup> | 2 <sup>9</sup> | 2 <sup>8</sup> | 2 <sup>7</sup> | 2 <sup>6</sup> | 2 <sup>5</sup> | 2 <sup>4</sup> | 2 <sup>3</sup> | 2 <sup>2</sup> | 2 <sup>1</sup> | 2 <sup>0</sup> | X | X | X | X |

Bits 0 ... 3 and 15 have no significance for the amount of the measured value. See Table 8-60 for a detailed description of these bits.

### Supplementary Bits

Bits 0 ... 3 and 15 have the following meaning in the bit pattern of the analog output value:

Table 8-60 Description of the Bits (6ES7 135-0HF01-0XB0)

| Bit | Meaning    | Signal Status | Meaning of the Signal Status |
|-----|------------|---------------|------------------------------|
| SI  | Sign       | 0             | “+” sign                     |
|     |            | 1             | “-” sign                     |
| X   | Irrelevant | –             | –                            |

**Voltage and Current Output Ranges**

The table below shows the assignments of analog to digitized output signals for the value ranges:  $\pm 10$  V, 0 ... 10 V,  $\pm 20$  mA, 0 ... 20 mA, 4 ... 20 mA.

Table 8-61 Analog Output Signals of the ET 200B-4AO (Value Ranges:  $\pm 10$  V, 0 ... 10 V,  $\pm 20$  mA, 0 ... 20 mA, 4 ... 20 mA; Complement of Twos)

| Units | Output Value in mV |             |             |            |            | Digitized Output Value |    |    |    |    |    |   |   | Range |   |   |   |               |
|-------|--------------------|-------------|-------------|------------|------------|------------------------|----|----|----|----|----|---|---|-------|---|---|---|---------------|
|       | 0 ... 20 mA        | 4 ... 20 mA | $\pm 20$ mA | 0 ... 10 V | $\pm 10$ V | 15                     | 14 | 13 | 12 | 11 | 10 | 9 | 8 |       | 7 | 6 | 5 | 4             |
| 1249  |                    | 23.52       |             |            |            | 0                      | 1  | 0  | 0  | 1  | 1  | 1 | 0 | 0     | 0 | 0 | 1 | Over-range    |
| 1204  | 23.52              | :           | 23.52       | 11.758     | 11.758     | 0                      | 1  | 0  | 0  | 1  | 0  | 1 | 1 | 0     | 1 | 0 | 0 |               |
| :     | :                  | :           | :           | :          | :          |                        |    |    |    |    |    |   | : |       |   |   |   |               |
| 1025  | 20.0195            | 20.016      | 20.2        | 10.0098    | 10.0098    | 0                      | 1  | 0  | 0  | 0  | 0  | 0 | 0 | 0     | 0 | 0 | 1 |               |
| 1024  | 20.0               | 20.0        | 20.0        | 10.00      | 10.00      | 0                      | 1  | 0  | 0  | 0  | 0  | 0 | 0 | 0     | 0 | 0 | 0 | Nominal range |
| 1023  | 19.98              | 19.98       | 19.98       | 9.99       | 9.990      | 0                      | 0  | 1  | 1  | 1  | 1  | 1 | 1 | 1     | 1 | 1 | 1 |               |
| 512   | 10.0               | 12.0        | 10.0        | 5.00       | 5.000      | 0                      | 0  | 1  | 0  | 0  | 0  | 0 | 0 | 0     | 0 | 0 | 0 |               |
| 256   | 5.0                | 8.00        | 5.0         | 2.50       | 2.500      | 0                      | 0  | 0  | 1  | 0  | 0  | 0 | 0 | 0     | 0 | 0 | 0 |               |
| 1     | 0.0195             | 4.015       | 0.02        | 0.0098     | 0.0098     | 0                      | 0  | 0  | 0  | 0  | 0  | 0 | 0 | 0     | 0 | 0 | 0 |               |
| 0     | 0.0                | 4.0         | 0.0         | 0.0        | 0.000      | 0                      | 0  | 0  | 0  | 0  | 0  | 0 | 0 | 0     | 0 | 0 | 0 |               |
| -1    | 0.0                | 3.984       | -0.02       | 0.0        | -0.0098    | 1                      | 1  | 1  | 1  | 1  | 1  | 1 | 1 | 1     | 1 | 1 | 1 |               |
| -256  | 0.0                | 0.0         | -05.0       | 0.0        | -2.500     | 1                      | 1  | 1  | 1  | 0  | 0  | 0 | 0 | 0     | 0 | 0 | 0 |               |
| -512  | 0.0                | 0.0         | -10.0       | 0.0        | -5.000     | 1                      | 1  | 1  | 0  | 0  | 0  | 0 | 0 | 0     | 0 | 0 | 0 |               |
| -1024 | 0.0                | 0.0         | -20.00      | 0.0        | -10.000    | 1                      | 1  | 0  | 0  | 0  | 0  | 0 | 0 | 0     | 0 | 0 | 0 |               |
| -1025 | 0.0                | 0.0         | -20.02      | 0.0        | -10.009    | 1                      | 0  | 1  | 1  | 1  | 1  | 1 | 1 | 1     | 1 | 1 | 1 | Over-range    |
| :     | :                  | :           | :           | :          | :          |                        |    |    |    |    |    |   | : |       |   |   |   |               |
| -1204 | 0.0                | 0.0         | -23.52      | 0.0        | -11.758    | 1                      | 0  | 1  | 1  | 0  | 1  | 0 | 0 | 1     | 1 | 0 | 0 |               |

### 8.6.5 Analog Value Representation, Operation with SIMATIC S7

**Analog Value Representation, SIMATIC S7**

Analog values are represented in complements of twos with the ET 200B-4AO for SIMATIC S7.

The table below shows the analog value representation ET 200B-4AO:

Table 8-62 Representation of an Analog Output Value as a Bit Pattern for SIMATIC S7 and ET 200B-4AO

|                             | High Byte |                 |                 |                 |                 |                 |                |                | Low Byte       |                |                |                |                |                |                |                |
|-----------------------------|-----------|-----------------|-----------------|-----------------|-----------------|-----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|
| Bit number                  | 15        | 14              | 13              | 12              | 11              | 10              | 9              | 8              | 7              | 6              | 5              | 4              | 3              | 2              | 1              | 0              |
| Analog value representation | SI        | 2 <sup>14</sup> | 2 <sup>13</sup> | 2 <sup>12</sup> | 2 <sup>11</sup> | 2 <sup>10</sup> | 2 <sup>9</sup> | 2 <sup>8</sup> | 2 <sup>7</sup> | 2 <sup>6</sup> | 2 <sup>5</sup> | 2 <sup>4</sup> | 2 <sup>3</sup> | 2 <sup>2</sup> | 2 <sup>1</sup> | 2 <sup>0</sup> |

Bit 15 has no significance for the amount of the output value. It merely represents the sign.

**Voltage Output Ranges**

The table below shows the assignments of analog to digitized output signals for the value ranges: ± 10 V, 0 ... 10 V.

Table 8-63 Representation of Digitized Measured Values of the ET 200B-4AO (Output Ranges: 0 to 10 V and ± 10 V)

| Output Range<br>0 to 10 V | Output Range<br>± 10 V | Units     |                     | Range         |
|---------------------------|------------------------|-----------|---------------------|---------------|
|                           |                        | Decimal   | Hexa-<br>decimal    |               |
| 0                         | 0                      | ≥ 32512   | ≥ 7F00 <sub>H</sub> | Overflow      |
| 11.7589                   | 11.7589                | 32511     | 7EFF <sub>H</sub>   | Overrange     |
| :                         | :                      | :         | :                   |               |
| 10.0004                   | 10.0004                | 27649     | 6C01 <sub>H</sub>   |               |
| 10.0000                   | 10.0000                | 27648     | 6C00 <sub>H</sub>   | Nominal range |
| :                         | :                      | :         | :                   |               |
| 0                         | 0                      | 0         | 0 <sub>H</sub>      |               |
| 0                         | :                      | :         | :                   |               |
|                           | :                      | - 6912    | E500 <sub>H</sub>   |               |
|                           | :                      | - 6913    | E4FF <sub>H</sub>   |               |
|                           | - 10.0000              | - 27648   | 9400 <sub>H</sub>   |               |
|                           | 10.0004                | - 27649   | 93FF <sub>H</sub>   | Underrange    |
|                           | :                      | :         | :                   |               |
|                           | - 11.7593              | - 32512   | 8100 <sub>H</sub>   |               |
|                           | 0                      | ≤ - 32513 | ≤ 80FF <sub>H</sub> | Underrun      |

**Current Output Ranges**

The table below shows the assignments of analog to digitized output signals for the value ranges:  $\pm 20$  mA, 0 ... 20 mA, 4 ... 20 mA.

Table 8-64 Representation of Digitized Measured Values of the ET 200B-4AO (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        | Hexadecimal       |               |
| 0                        | 0                       | 0                       | $\geq 32512$   | $\geq 7F00_H$     | Overflow      |
| 23.518                   | 23.518                  | 22.81                   | 32511          | 7EFF <sub>H</sub> | Overrange     |
| :                        | :                       | :                       | :              | :                 |               |
| 20.0007                  | 20.0007                 | 20.006                  | 27649          | 6C01 <sub>H</sub> |               |
| 20.000                   | 20.000                  | 20.000                  | 27648          | 6C00 <sub>H</sub> | Nominal range |
| 0                        | :                       | :                       | :              | :                 |               |
| :                        | 0                       | 4.000                   | 0              | 0 <sub>H</sub>    |               |
|                          | 0                       | :                       | :              | :                 |               |
|                          |                         | 0                       | - 6912         | E500 <sub>H</sub> |               |
|                          |                         | 0                       | - 6913         | E4FF <sub>H</sub> |               |
| - 20.000                 |                         |                         | :              | :                 |               |
|                          |                         |                         | - 27648        | 9400 <sub>H</sub> |               |
|                          |                         |                         | - 27649        | 93FF <sub>H</sub> | Underrange    |
| :                        |                         |                         | :              | :                 |               |
| - 23.519                 |                         |                         | - 32512        | 8100 <sub>H</sub> |               |
| 0                        |                         |                         | $\leq - 32513$ | $\leq 80FF_H$     | Underrun      |

### 8.6.6 Block Diagram, Terminal Assignment and Technical Data

**Block Diagram** Simplified representation of potential for the ET 200B-4AO and TB8:

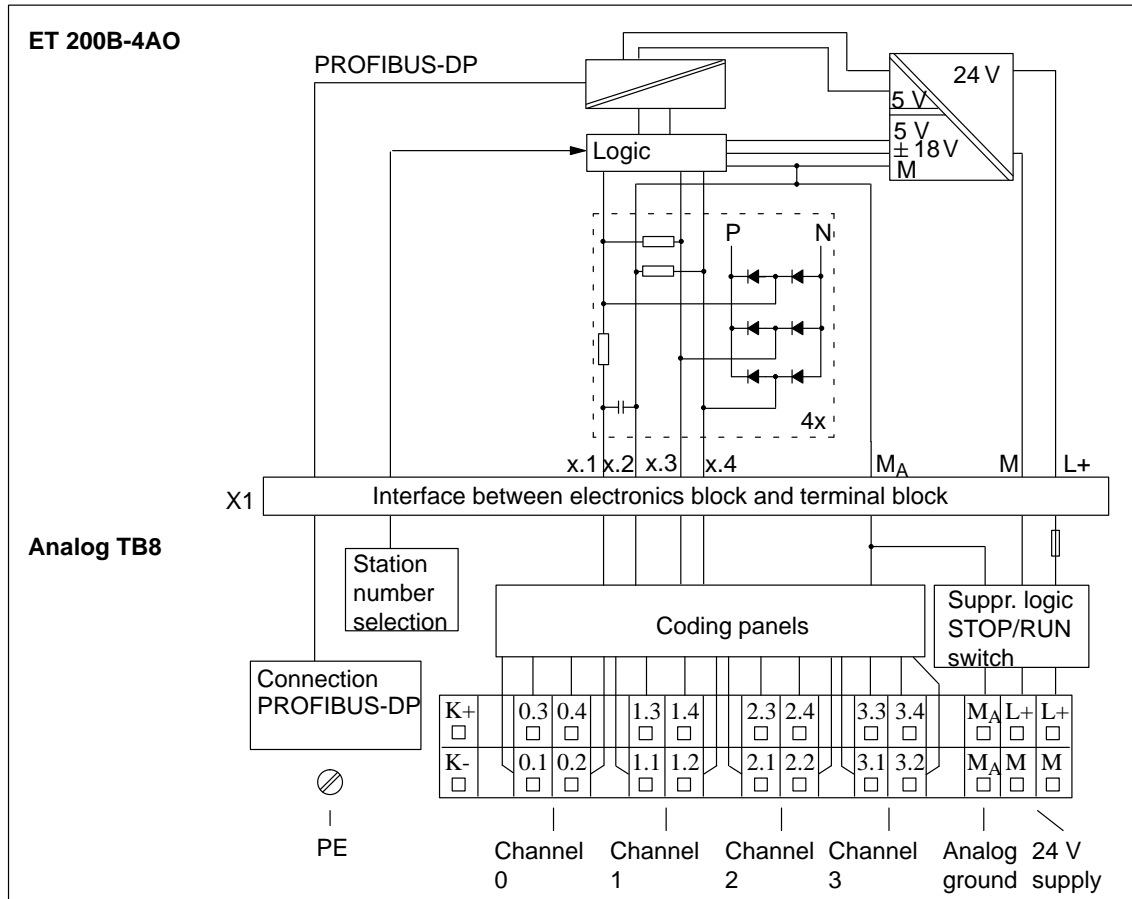


Figure 8-28 Block Diagram: ET 200B-4AO (6ES7 135-0HF01-0XB0) and TB8

**Terminal Assignment**

The table below contains the terminal assignments of the TB8 for ET 200B-4AO, depending on the circuit type used.

Table 8-65 Terminal Assignment of the TB8 for ET 200B-4AO (6ES7 135-0HF01-0XB0)

| Terminal       | 4-Wire Connection                 | 2-Wire Connection                      |
|----------------|-----------------------------------|--|
| K+             | Unassigned                        |  |
| K-             | Unassigned                        |  |
| x.1            | Analog output "voltage" (+)       | Analog output "current or voltage" (+) |
| x.2            | Analog output "voltage" (-)       | Analog output "current or voltage" (-) |
| x.3            | Sensor line (S+)                  | connected to x.1                       |
| x.4            | Sensor line (S-)                  | connected to x.2                       |
| M <sub>A</sub> | Analog ground (M <sub>A</sub> )   |  |
| M <sub>A</sub> | Analog ground (M <sub>A</sub> )   |  |
| L+             | Voltage supply for internal logic |  |
| L+             | Voltage supply for internal logic |  |
| M              | Voltage supply for internal logic |  |
| M              | Voltage supply for internal logic |  |

x = 0, 1, 2, 3

**Note**

You must make additional settings for the input circuits of the TB8 via coding plugs. See Figures 8-25 and 8-27 for the necessary settings of the coding plugs.

**Technical Data**

The technical data of the ET200B-4AO electronics block are listed in the table below.

| Technical specifications                                    |   | Outputs, continued   |  |
|---|---|--|--|
| Baud rates*   | 9.6/19.2/93.75/187.5/500/<br>1500/3000/6000/<br>12000 kbaud | Data input format  | 11-bit complement of twos              |
| Bus protocol  | PROFIBUS-DP   | Overrange  | Approx. 17.5 %                         |
| Galvanic isolation to SI-<br>NEC L2-DP bus                  | Yes   | Conversion time  | Approx. 1 ms                           |
| Power losses  | Typically 2.4 W   | Settling time  |  |
| Weight (EB and TB)  | Approx. 550 g (19.25 oz.)                                   | • For resistive load   | 0.1 ms                                 |
| Dimensions (EB and TB:<br>W x H x D)                        | 160 x 130 x 60 mm<br>(6.24 x 5.07 x 2.34 in.)               | • For capacitive load  | 3.3 ms                                 |
| <b>Diagnostics functions, alarms</b>                        |   | • For inductive load   | 0.5 ms                                 |
| Voltage monitoring  | Green "RUN" LED   | Permissible potential dif-<br>ference  |  |
| Bus monitoring SINEC<br>L2-DP                               | Red "BF" LED  | • M <sub>A</sub> to PE or M  | Max. 75 V DC/60 V AC                   |
| Group diagnostics   | Red "DIA" LED, parame-<br>terizable                         | Crosstalk between outputs  | 40 dB                                  |
| Diagnostics alarm   | Yes, parameterizable  | Working error limit (over<br>entire temperature range in<br>relation to output range)            |  |
| <b>Supply voltage for outputs and internal logic</b>        |   | • Voltage  | ± 0.5 %                                |
| Supply voltage (L+)   |   | • Current  | ± 1 %                                  |
| • Rated value   | 24 V DC   | Basic error limit (working<br>error limit at 25°C (77 °F)<br>in relation to output range)        |  |
| • Permissible range   | 18.5 to 30.2 V  | • Voltage  | ± 0.2 %                                |
| • Value for t < 0.5s  | 35 V  | • Current  | ± 0.3 %                                |
| Current consumption from<br>L+                              |   | Temperature error (in rela-<br>tion to output range)   | ± 0.02 %/K                             |
| • Logic   | Max. 200 mA   | Linearity error (in relation<br>to output range)   | ± 0.05 %                               |
| <b>Outputs</b>  |   | Repeatability (in steady-<br>state condition at 25°C (77<br>°F), in relation to output<br>range) | ± 0.05 %                               |
| Number of outputs   | 4   | Output ripple (in relation<br>to output range)   | ± 0.05 %                               |
| Galvanic isolation to inter-<br>nal electronic circuits     | No  | Voltage output   |  |
| Galvanic isolation to volt-<br>age supply of internal logic | Yes   | • Short-circuit protec-<br>tion  | Yes, max. 1 output simul-<br>taneously |
| Output ranges   |   | • Short-circuit current  | Max. 25 mA                             |
| • Voltage range   | ± 10 V, 0 to 10 V   | Current output   |  |
| • Current ranges  | ± 20 mA, 0 to 20 mA,<br>4 to 20 mA                          | • Idle voltage   | Max. 18 V                              |
| Connection type   | 2- or 4-wire connection                                     | Cable length   |  |
| Load resistance   |   | • Shielded   | Max. 100 m (328 ft.)                   |
| • Voltage output  | Min. 3.3 kΩ   | * In operation with the IM 308-B, the maximum possible<br>baud rate is 1500 kbaud.               |  |
| • Load impedance for<br>current output                      | Max. 300 Ω  |  |  |
| • Capacitive load   | Max. 1 μF   |  |  |
| • Inductive load  | Max. 1 mH   |  |  |





# Type Files and GSD Files

# A

## In this Chapter

In order to operate an ET 200B module you require

- a type file for operation with COM ET 200 V4.x, COM ET 200 Windows or STEP 7
- or
- a GSD file for operation with PROFIBUS-DP masters from Siemens or other vendors.

| Section | Describes                         | Page |
|---------|-----------------------------------|------|
| A.1     | Type files of the ET 200B modules | A-2  |
| A.2     | GSD files of the ET 200B modules  | A-4  |

## A.1 Type Files of the ET 200B Modules

**Type File** COM ET 200 V4.x, COM ET 200 Windows and STEP 7 require a type file for each ET 200B module (DP slave). The type file contains the definitions of all the module's characteristics.

Before you start working with the software, make sure that the type file of the ET 200B module is installed in a type-file directory recognized by the software.

**Provision of Type Files** All the type files needed to start ET 200B with COM ET 200 V4.x, COM ET 200 Windows and STEP 7 are available in the Interface Center. The modem number to dial is: +49 (0911) 737972

**Digital Modules** The designations of the type files for the digital ET 200B modules are as follows:

Table A-1 Designations of Type Files for Digital Modules

| Station Type     | Type File for COM ET 200 V4.x | Type File for COM ET 200 Windows and STEP 7 <sup>1</sup> |
|------------------|-------------------------------|--|
| B-16DI DP        | SI0001TE.200                  | SI0001AX.200   |
| B-32DI DP        | SI0004TE.200                  | SI0004AX.200   |
| B-32DI.2 DP      | SI000CTE.200                  | SI000CAX.200   |
| B-16DO DP        | SI0002TE.200                  | SI0002AE.200   |
| B-16DO/2A DP     | SI0005TE.200                  | SI0005AE.200   |
| B-32DO DP        | SI000DTE.200                  | SI000DAE.200   |
| B-8DI/8DO DP     | SI000BTE.200                  | SI000BAE.200   |
| B-8DI/8DO HWA DP | SI0010TE.200                  | SI0010AE.200   |
| B-16DI/16DO DP   | SI000ATE.200                  | SI000AAE.200   |
| B-24DI/8DO DP    | SI000FTE.200                  | SI000FAE.200   |
| B-24DI/8DO.2 DP  | SI000ETE.200                  | SI000EAE.200   |
| B-16DI-AC DP     | SI0019TE.200                  | SI0019TX.200   |
| B-16DO-AC DP     | SI001ATE.200                  | SI001ATX.200   |
| B-16RO-AC DP     | SI001CTE.200                  | SI001CTX.200   |
| B-8DI/8RO-AC DP  | SI001DTE.200                  | SI001DTX.200   |
| B-8RO DP         | SI0003TE.200                  | SI0003AX.200   |

<sup>1</sup> These type files are valid for the digital modules described in this manual (order numbers are listed in Appendix F), even if the type files contain some order numbers of fully compatible predecessor modules.

**Analog Modules**

The designations of the type files for the analog ET 200B modules are as follows:

Table A-2 Designations of Type Files for Analog Modules

| Station Type<br>(in COM ET 200) |    | Type File for<br>COM ET 200 V4.x | Type File for<br>COM ET 200 Windows<br>and STEP 7 |
|---------------------------------|----|----------------------------------|---|
| B-4/8AI                         | DP | SI801ATE.200                     | SI801AAE.200                                      |
| B-4AI                           | DP | SI8019TE.200                     | SI8019AE.200                                      |
| B-4AO                           | DP | SI8018TE.200                     | SI8018AE.200                                      |
| B-4/8AI-2                       | DP | –                                | SI801ABE.200                                      |
| B-4AI-2                         | DP | –                                | SI8019BE.200                                      |
| B-4AO-2                         | DP | –                                | SI8018BE.200                                      |

**SIxxxxBE.200**

There are two type-file version for configuring analog modules with COM ET 200 Windows (SIxxxxAE.200 and SIxxxxBE.200).

You can use either version. The SIxxxxBE.200 version supports additional functions for analog modules (alarms, dummy-value output for 4AO) and additional measuring ranges.

The SIxxxxBE.200 version now also supports single-channel addressing.

**Installation**

The manuals on the software contain notes on installation.

**Note**

The type files listed in Tables A-1 and A-2 are valid for the modules described in this manual (order numbers are listed in Appendix F), even if the type files contain the order numbers of predecessor modules!

## A.2 GSD Files of the ET 200B Modules

**GSD File** You need a device master data file, or GSD file to EN 50170, Part 3 to connect ET 200B modules to DP masters which cannot process the type files (e.g. DP masters from other vendors. The GSD file contains the definitions of all slave-specific characteristics.

**Provision of GSD Files** All GSD files for ET 200B are available on a diskette which you can order, quoting the following order number:

Diskette with GSD files: 6ES7 190-1AA00-0AA0

You can also fetch the GSD files by modem from the Interface Center: the modem number to dial is:

Tel.: +49 (0911) 737972

**Major Characteristics** In case the GSD file is not available, the major characteristics of the ET 200B modules are listed in the tables below. This information will suffice to start ET 200B with a CP 5431, for example.

**16DI, 32DI, 16DO  
and 16DO/2A**

The table below lists the master data of the ET 200B modules: 16DI, 32DI, 32DI 0.2 ms, 16DO and 16DO/2A.

Table A-3 Characteristics according to EN 50170, Part 3 for ET 200B-16DI, ET 200B-32DI, ET 200B-32DI 0.2ms, ET 200B-16DO, ET 200B-16DO/2A

| Characteristic   | DP Keyword to EN 50170, Part 3 | 16DI  | 32DI              | 32DI 0.2ms        | 16DO              | 16DO/2A           |
|--|--------------------------------|---|-------------------|-------------------|-------------------|-------------------|
| Manufacturer ID  | Ident_Number                   | 0001 <sub>H</sub>   | 0004 <sub>H</sub> | 000C <sub>H</sub> | 0002 <sub>H</sub> | 0005 <sub>H</sub> |
| Supports 9.6 kbaud                                       | 9.6_supp                       | Yes   |                   |                   |                   |                   |
| Supports 19.2 kbaud                                      | 19.2_supp                      | Yes   |                   |                   |                   |                   |
| Supports 93.75 kbaud                                     | 93.75_supp                     | Yes   |                   |                   |                   |                   |
| Supports 187.5 kbaud                                     | 187.5_supp                     | Yes   |                   |                   |                   |                   |
| Supports 500 kbaud                                       | 500_supp                       | Yes   |                   |                   |                   |                   |
| Supports 1.5 Mbaud                                       | 1.5M_supp                      | Yes   |                   |                   |                   |                   |
| Supports 3 Mbaud   | 3M_supp                        | Yes   |                   |                   |                   |                   |
| Supports 6 Mbaud   | 6M_supp                        | Yes   |                   |                   |                   |                   |
| Supports 12 Mbaud  | 12M_supp                       | Yes   |                   |                   |                   |                   |
| Supports FREEZE control command                          | Freeze_Mode_supp               | Yes   | Yes               | Yes               | –                 | –                 |
| Supports SYNC control command                            | Sync_Mode_supp                 | –   | –                 | –                 | Yes               | Yes               |
| Supports autobaud search                                 | Auto_Baud_supp                 | Yes   |                   |                   |                   |                   |
| Software-settable station number                         | Set_Slave_Add_supp             | No  |                   |                   |                   |                   |
| Length of user-specific data (parameterization telegram) | User_Prm_Data_Len              | 5 Byte  |                   |                   |                   |                   |
| User-specific data (parameterization telegram)           | User_Prm_Data                  | 00 <sub>H</sub> , 00 <sub>H</sub> , 00 <sub>H</sub> , 00 <sub>H</sub> , 00 <sub>H</sub> |                   |                   |                   |                   |
| Modular station  | Modular_Station                | No  |                   |                   |                   |                   |

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**32DO, 8RO,  
8DI/8DO and  
8DI/8DO HWA**

The table below lists the master data of the ET 200B modules: 32DO, 8RO, 8DI/8DO and 8DI/8DO HWA.

Table A-4 Characteristics according to EN 50170, Part 3 for ET 200B-32DO, ET 200B-8RO, ET 200B-8DI/8DO, ET 200B-8DI/8DO HWA

| Characteristic   | DP Keyword to EN 50170, Part 3 | 32DO  | 8RO               | 8DI/8DO           | 8DI/8DO HWA       |
|--|--------------------------------|---|-------------------|-------------------|-------------------|
| Manufacturer ID  | Ident_Number                   | 000D <sub>H</sub>   | 0003 <sub>H</sub> | 000B <sub>H</sub> | 0010 <sub>H</sub> |
| Supports 9.6 kbaud                                       | 9.6_supp                       | Yes   |                   |                   |                   |
| Supports 19.2 kbaud                                      | 19.2_supp                      | Yes   |                   |                   |                   |
| Supports 93.75 kbaud                                     | 93.75_supp                     | Yes   |                   |                   |                   |
| Supports 187.5 kbaud                                     | 187.5_supp                     | Yes   |                   |                   |                   |
| Supports 500 kbaud                                       | 500_supp                       | Yes   |                   |                   |                   |
| Supports 1.5 Mbaud                                       | 1.5M_supp                      | Yes   |                   |                   |                   |
| Supports 3 Mbaud   | 3M_supp                        | Yes   |                   |                   |                   |
| Supports 6 Mbaud   | 6M_supp                        | Yes   |                   |                   |                   |
| Supports 12 Mbaud  | 12M_supp                       | Yes   |                   |                   |                   |
| Supports FREEZE control command                          | Freeze_Mode_supp               | –   | –                 | Yes               | Yes               |
| Supports SYNC control command                            | Sync_Mode_supp                 | Yes   | Yes               | Yes               | Yes               |
| Supports autobaud search                                 | Auto_Baud_supp                 | Yes   |                   |                   |                   |
| Software-settable station number                         | Set_Slave_Add_supp             | No  |                   |                   |                   |
| Length of user-specific data (parameterization telegram) | User_Prm_Data_Len              | 5 Byte  |                   |                   |                   |
| User-specific data (parameterization telegram)           | User_Prm_Data                  | 00 <sub>H</sub> , 00 <sub>H</sub> , 00 <sub>H</sub> , 00 <sub>H</sub> , 00 <sub>H</sub> |                   |                   |                   |
| Modular station  | Modular_Station                | No  |                   |                   |                   |

**16DI/16DO,  
24DI/8DO and  
24DI/8DO 0.2ms**

The table below lists the master data of the ET 200B modules: 16DI/16DO, 24DI/8DO and 24DI/8DO 0.2 ms.

Table A-5 Characteristics according to EN 50170, Part 3 for ET 200B-16DI/16DO, ET 200B-24DI/8DO, ET 200B-24DI/8DO 0.2ms

| Characteristic   | DP Keyword to EN 50170, Part 3 | 16DI/16DO   | 24DI/8DO          | 24DI/8DO 0.2ms    |
|--|--------------------------------|---|-------------------|-------------------|
| Manufacturer ID  | Ident_Number                   | 000A <sub>H</sub>   | 000F <sub>H</sub> | 000E <sub>H</sub> |
| Supports 9.6 kbaud                                       | 9.6_supp                       | Yes   |                   |                   |
| Supports 19.2 kbaud                                      | 19.2_supp                      | Yes   |                   |                   |
| Supports 93.75 kbaud                                     | 93.75_supp                     | Yes   |                   |                   |
| Supports 187.5 kbaud                                     | 187.5_supp                     | Yes   |                   |                   |
| Supports 500 kbaud                                       | 500_supp                       | Yes   |                   |                   |
| Supports 1.5 Mbaud                                       | 1.5M_supp                      | Yes   |                   |                   |
| Supports 3 Mbaud   | 3M_supp                        | Yes   |                   |                   |
| Supports 6 Mbaud   | 6M_supp                        | Yes   |                   |                   |
| Supports 12 Mbaud  | 12M_supp                       | Yes   |                   |                   |
| Supports FREEZE control command                          | Freeze_Mode_supp               | Yes   | Yes               | Yes               |
| Supports SYNC control command                            | Sync_Mode_supp                 | Yes   | Yes               | Yes               |
| Supports autobaud search                                 | Auto_Baud_supp                 | Yes   |                   |                   |
| Software-settable station number                         | Set_Slave_Add_supp             | No  |                   |                   |
| Length of user-specific data (parameterization telegram) | User_Prm_Data_Len              | 5 Byte  |                   |                   |
| User-specific data (parameterization telegram)           | User_Prm_Data                  | 00 <sub>H</sub> , 00 <sub>H</sub> , 00 <sub>H</sub> , 00 <sub>H</sub> , 00 <sub>H</sub> |                   |                   |
| Modular station  | Modular_Station                | No  |                   |                   |

**A**

**16DI-AC, 16DO-AC, 16RO-AC and 8DI/8RO-AC** The table below lists the master data of the ET 200B modules: 16DI-AC, 16DO-AC, 16RO-AC and 8DI/8RO-AC.

Table A-6 Characteristics according to EN 50170, Part 3 for ET 200B-16DI-AC, ET 200B-16DO-AC, ET 200B-16RO-AC, ET 200B-8DI/8RO-AC

| Characteristic   | DP Keyword to EN 50170, Part 3 | 16DI-AC   | 16DO-AC           | 16RO-AC           | 8DI/8RO-AC        |
|--|--------------------------------|---|-------------------|-------------------|-------------------|
| Manufacturer ID  | Ident_Number                   | 0019 <sub>H</sub>   | 001A <sub>H</sub> | 001C <sub>H</sub> | 001D <sub>H</sub> |
| Supports 9.6 kbaud                                       | 9.6_supp                       | Yes   |                   |                   |                   |
| Supports 19.2 kbaud                                      | 19.2_supp                      | Yes   |                   |                   |                   |
| Supports 93.75 kbaud                                     | 93.75_supp                     | Yes   |                   |                   |                   |
| Supports 187.5 kbaud                                     | 187.5_supp                     | Yes   |                   |                   |                   |
| Supports 500 kbaud                                       | 500_supp                       | Yes   |                   |                   |                   |
| Supports 1.5 Mbaud                                       | 1.5M_supp                      | Yes   |                   |                   |                   |
| Supports 3 Mbaud   | 3M_supp                        | Yes   |                   |                   |                   |
| Supports 6 Mbaud   | 6M_supp                        | Yes   |                   |                   |                   |
| Supports 12 Mbaud  | 12M_supp                       | Yes   |                   |                   |                   |
| Supports FREEZE control command                          | Freeze_Mode_supp               | Yes   | –                 | –                 | Yes               |
| Supports SYNC control command                            | Sync_Mode_supp                 | –   | Yes               | Yes               | Yes               |
| Supports autobaud search                                 | Auto_Baud_supp                 | Yes   |                   |                   |                   |
| Software-settable station number                         | Set_Slave_Add_supp             | No  |                   |                   |                   |
| Length of user-specific data (parameterization telegram) | User_Prm_Data_Len              | 5 Byte  |                   |                   |                   |
| User-specific data (parameterization telegram)           | User_Prm_Data                  | 00 <sub>H</sub> , 00 <sub>H</sub> , 00 <sub>H</sub> , 00 <sub>H</sub> , 00 <sub>H</sub> |                   |                   |                   |
| Modular station  | Modular_Station                | No  |                   |                   |                   |



**4/8AI, 4AI and 4AO** The table below lists the master data of the ET 200B modules: 4/8AI, 4AI and 4AO.

Table A-7 Characteristics according to EN 50170, Part 3 for ET 200B-4/8AI, ET 200B-4AI, ET 200B-4AO

| Characteristic   | DP Keyword to EN 50170, Part 3 | 4/8AI             | 4AI               | 4AO               |
|--|--------------------------------|-------------------|-------------------|-------------------|
| Manufacturer ID  | Ident_Number                   | 801A <sub>H</sub> | 8019 <sub>H</sub> | 8018 <sub>H</sub> |
| Supports 9.6 kbaud                                       | 9.6_supp                       | Yes               |                   |                   |
| Supports 19.2 kbaud                                      | 19.2_supp                      | Yes               |                   |                   |
| Supports 93.75 kbaud                                     | 93.75_supp                     | Yes               |                   |                   |
| Supports 187.5 kbaud                                     | 187.5_supp                     | Yes               |                   |                   |
| Supports 500 kbaud                                       | 500_supp                       | Yes               |                   |                   |
| Supports 1.5 Mbaud                                       | 1.5M_supp                      | Yes               |                   |                   |
| Supports 3 Mbaud   | 3M_supp                        | Yes               |                   |                   |
| Supports 6 Mbaud   | 6M_supp                        | Yes               |                   |                   |
| Supports 12 Mbaud  | 12M_supp                       | Yes               |                   |                   |
| Supports FREEZE control command                          | Freeze_Mode_supp               | Yes               | Yes               | –                 |
| Supports SYNC control command                            | Sync_Mode_supp                 | –                 | –                 | Yes               |
| Supports autobaud search                                 | Auto_Baud_supp                 | Yes               |                   |                   |
| Software-settable station number                         | Set_Slave_Add_supp             | No                |                   |                   |
| Length of user-specific data (parameterization telegram) | User_Prm_Data_Len              | see Appendix C    |                   |                   |
| User-specific data (parameterization telegram)           | User_Prm_Data                  | see Appendix C    |                   |                   |
| Modular station  | Modular_Station                | No                |                   |                   |

A



# Configuration Telegram

# B

## **Applicability**

If you use configuration software such as COM ET 200 or STEP 7, you can ignore this chapter.

## **In this Chapter**

If you address ET 200B modules via a configuration telegram for example with CP 5431 as DP master, you can consult this chapter for details of how to structure the configuration telegram for the various types of ET 200B module.

**Structure for Digital Modules**

The configuration telegram for digital modules consists of 2 bytes.

The structure of the configuration telegram for digital ET 200B modules is as follows:

Table B-1 Structure of the Configuration Telegram for Digital ET 200B Modules

| Slot  | Byte n        |
|---|---------------|
| Slot 1 - Output area of the digital module (byte 0) | See Table B-2 |
| Slot 2 - Input area of the digital module (byte 1)  |               |

**IDs for Digital ET 200B**

Table B-2 contains all IDs (hexadecimal) for the digital ET 200B modules.

Table B-2 IDs for Digital ET 200B Modules

| Digital Module         | Order Number        | ID            |               | Consistency | Address Scope (Bytes) |   | Address Area |
|------------------------|---------------------|---------------|---------------|-------------|-----------------------|---|--------------|
|                        |                     | Byte 0 Slot 0 | Byte 1 Slot 1 |             | O                     | I |              |
|                        |                     |               |               |             |                       |   |              |
| ET 200B-16DI           | 6ES7 131-0BH00-0XB0 | 00            | 11            | Byte        | -                     | 2 | digital      |
| ET 200B-32DI           | 6ES7 131-0BL00-0XB0 | 00            | 13            | Byte        | -                     | 4 | digital      |
| ET 200B-32DI 0.2ms     | 6ES7 131-0BL10-0XB0 |               |               |             |                       |   |              |
| ET 200B-16DO           | 6ES7 132-0BH00-0XB0 | 21            | 00            | Byte        | 2                     | - | digital      |
| ET 200B-16DO/2A        | 6ES7 132-0BH10-0XB0 | 21            | 00            | Byte        | 2                     | - | digital      |
| ET 200B-32DO           | 6ES7 132-0BL00-0XB0 | 23            | 00            | Byte        | 4                     | - | digital      |
| ET 200B-8DI/8DO        | 6ES7 133-0BH00-0XB0 | 20            | 10            | Byte        | 1                     | 1 | digital      |
| ET 200B-8DI/8DO HWA    | 6ES7 133-0BH10-0XB0 | 21            | 10            | Byte        | 2                     | 1 | digital      |
| ET 200B-16DI/16DO      | 6ES7 133-0BL00-0XB0 | 21            | 11            | Byte        | 2                     | 2 | digital      |
| ET 200B-24DI/8DO       | 6ES7 133-0BN00-0XB0 | 20            | 12            | Byte        | 1                     | 3 | digital      |
| ET 200B-24DI/8DO 0.2ms | 6ES7 133-0BN10-0XB0 |               |               |             |                       |   |              |
| ET 200B-8RO            | 6ES7 132-0GF00-0XB0 | 20            | 00            | Byte        | 1                     | - | digital      |
| ET 200B-16DI-AC        | 6ES7 131-0HF00-0XB0 | 00            | 11            | Byte        | -                     | 2 | digital      |
| ET 200B-16DO-AC        | 6ES7 132-0HF00-0XB0 | 21            | 00            | Byte        | 2                     | - | digital      |
| ET 200B-16RO-AC        | 6ES7 132-0HH00-0XB0 | 21            | 00            | Byte        | 2                     | - | digital      |
| ET 200B-8DI/8RO-AC     | 6ES7 133-0HH00-0XB0 | 20            | 10            | Byte        | 1                     | 1 | digital      |

**Structure for Analog Modules**

The length of the configuration telegram for analog modules depends on the type of configuration.

The structure of the configuration telegrams for analog ET 200B modules is as follows:

Table B-3 Structure of the Configuration Telegram for Analog ET 200B Modules

| Slot   | Byte          |       |       |       |       |
|--|---------------|-------|-------|-------|-------|
|  | n             | n + 1 | n + 2 | n + 3 | n + 4 |
| Slot 1 (virtual only) (n = 0)  | 04            | 00    | 00    | AD    | C4    |
| Slot 2 (virtual only) (n = 5)  | 04            | 00    | 00    | 9B    | 40    |
| Slot 3 (virtual only) (n = 10)   | 04            | 00    | 00    | 8F    | C0    |
| Slots 4 to 11 – input and output areas of the analog module (n = 15, n = 20, ... n = 50) | See Table B-4 |       |       |       |       |

**IDs for Analog ET 200B**

Table B-4 contains all IDs (hexadecimal) for the analog ET 200B modules

Table B-4 IDs for Analog ET 200B Modules

| Analog Module (Order No.: 6ES7 ...) | Slot  | Byte <sup>1</sup> |       |       |       |       |
|-------------------------------------|---|-------------------|-------|-------|-------|-------|
|                                     |   | n                 | n + 1 | n + 2 | n + 3 | n + 4 |
| ET 200B-4/8AI                       | Configuration for entire module (8AI):        |                   |       |       |       |       |
|                                     | 4   | 43                | 47    | 00    | 15    | C5    |
|                                     | Configuration by channels (1 × AI to 8 × AI): |                   |       |       |       |       |
|                                     | 4   | 43                | 40    | 00    | 15    | C2    |
| ET 200B-4AI                         | 5 to 11                                       | 43                | 40    | 00    | 95    | C2    |
|                                     | Configuration for entire module (4AI):        |                   |       |       |       |       |
|                                     | 4   | 43                | 43    | 00    | 15    | C4    |
|                                     | Configuration by channels (1 × AI to 4 × AI): |                   |       |       |       |       |
| ET 200B-4AO                         | 4   | 43                | 40    | 00    | 15    | C2    |
|                                     | 5 to 7  | 43                | 40    | 00    | 95    | C2    |
|                                     | Configuration for entire module (4AO):        |                   |       |       |       |       |
|                                     | 4   | 83                | 43    | 00    | 25    | D0    |
| ET 200B-4AO                         | Configuration by channels (1 × AO to 4 × AO): |                   |       |       |       |       |
|                                     | 4   | 83                | 40    | 00    | 25    | D0    |
|                                     | 5 to 7  | 83                | 40    | 00    | A5    | D0    |

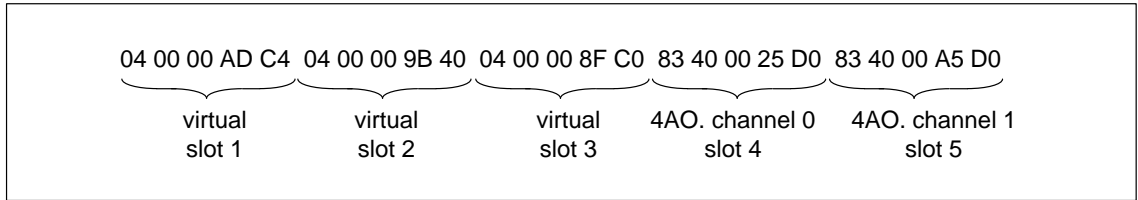
<sup>1</sup> n = 15: slot 4 ... n = 50: slot 11



**Example of a Configuration Telegram**

You want to configure an ET 200B-4AO with two output channels (channels 0 and 1).

The configuration telegram consists of 25 bytes, as follows:



# Parameterization Telegram

# C

## Applicability

If you use configuration software such as COM ET 200 or STEP 7, you can ignore this chapter.

## In this Chapter

If you parameterize ET 200B modules via a parameterization telegram for example with CP 5431 as DP master, you can consult this chapter for details of how to structure the parameterization telegram for the various types of ET 200B module.

| Section | Describes                                      | Page |
|---------|--|------|
| C.1     | Structure of the parameterization telegram     | C-2  |
| C.2     | Standard part of the parameterization telegram | C-3  |
| C.3     | Parameters for status                          | C-4  |
| C.4     | Parameters for analog input modules            | C-5  |
| C.5     | Parameters for analog output module            | C-10 |

## C.1 Structure of the Parameterization Telegram

### Definition: Parameterization Telegram

All the parameterizable values of the ET 200B are stored in the parameterization telegram.

### Structure for Digital Modules

No settings can be made for digital ET 200B modules via the parameterization telegram. 5 bytes must contain "00<sub>H</sub>" by default.

The structure of the parameterization telegrams for digital ET 200B modules is as follows:

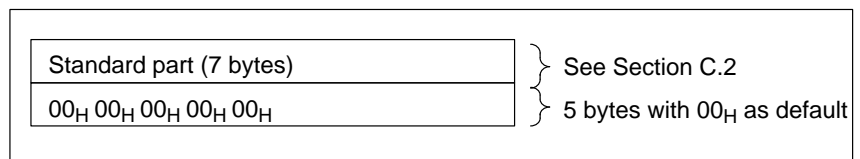


Figure C-1 Structure of the Parameterization Telegram for Digital ET 200B modules

### Structure for Analog Modules

In the case of analog ET 200B modules, you can use the parameterization telegram to define diagnostics response and set the defaults for analog value measurement or analog value output, as applicable.

Structure of the parameterization telegram for analog ET 200B modules is as follows:

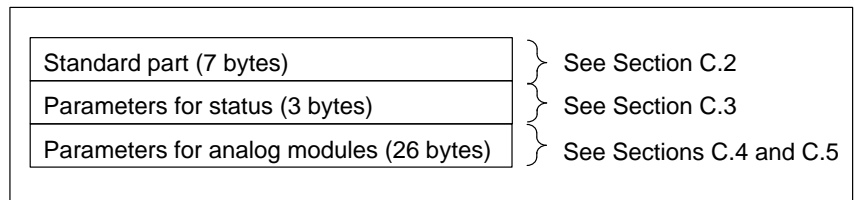


Figure C-2 Structure of the Parameterization Telegram for Analog ET 200B Modules



## C.2 Standard Part of the Parameterization Telegram

### Standard Part

The first 7 bytes of the parameterization telegram are standardized to EN 50170, Part 3, and their contents could be as follows:

|               |                 |                                 |
|---------------|-----------------|---------------------------------|
| <b>Byte 0</b> | 08 <sub>H</sub> | Station status                  |
| <b>Byte 1</b> | 01 <sub>H</sub> | Watchdog factor 1               |
| <b>Byte 2</b> | 06 <sub>H</sub> | Watchdog factor 2               |
| <b>Byte 3</b> | 0B <sub>H</sub> | Response delay T <sub>RDY</sub> |
| <b>Byte 4</b> | 80 <sub>H</sub> | Manufacturer ID, high byte;     |
| <b>Byte 5</b> | 1D <sub>H</sub> | Manufacturer ID, low byte       |
| <b>Byte 6</b> | 00 <sub>H</sub> | Group ID                        |

Figure C-3 Standard Part of the Parameterization Telegram

### C.3 Parameters for Status

#### Parameters for Status

The next 3 bytes contain the status bytes. The meanings of the parameters are described in Figure C-4.

The defaults for these three bytes are:

- 00<sub>H</sub> 60<sub>H</sub> 0D<sub>H</sub>: for 4/8AI and 4AI
- 00<sub>H</sub> 20<sub>H</sub> 0D<sub>H</sub>: for 4AO

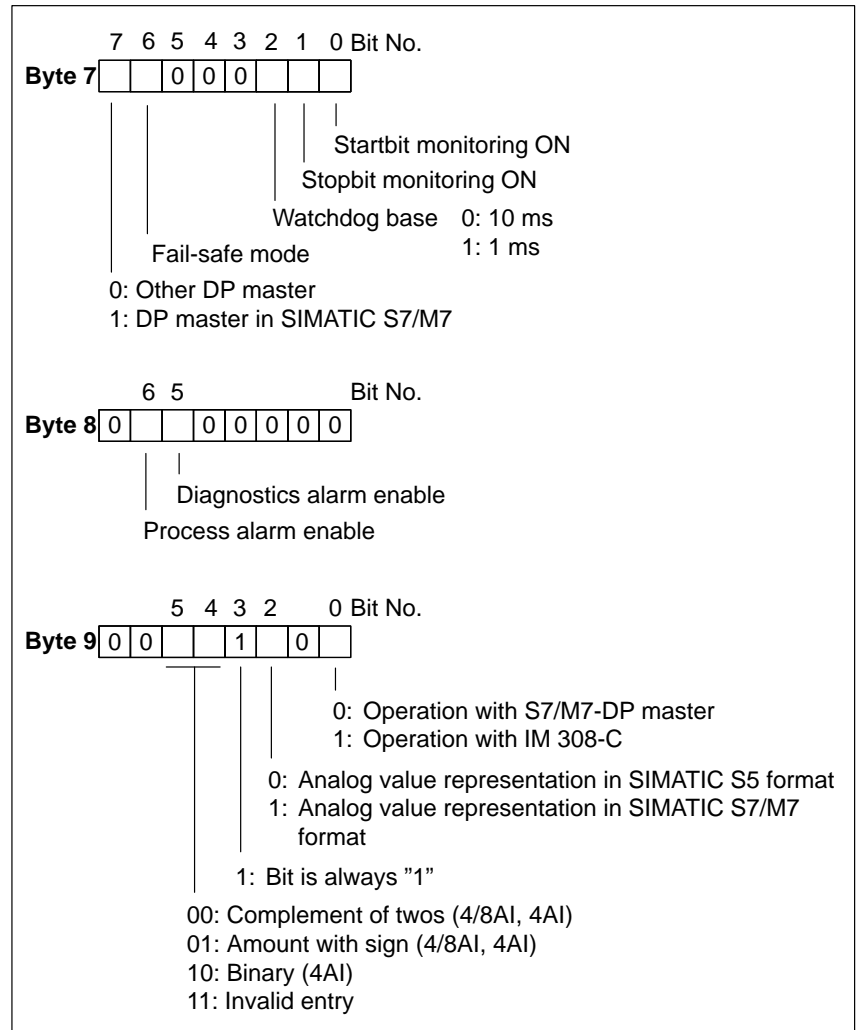


Figure C-4 Parameters for Status

### C.4 Parameters for Analog Input Modules

#### Parameters for 4/8AI and 4AI

The next bytes (bytes 10 to 35) contain the following parameters for ET 200B-4/8AI and ET 200B-4AI:

|                       |                 |   |                         |
|-----------------------|-----------------|---|-------------------------|
| <b>Byte 10</b>        | 07 <sub>H</sub> | Block length                            | } For bytes<br>15, 16   |
| <b>Byte 11</b>        | 5F <sub>H</sub> | S7 constant                             |                         |
| <b>Byte 12</b>        | 04 <sub>H</sub> | Slot                                    |                         |
| <b>Byte 13</b>        | 00 <sub>H</sub> | Data record number                      |                         |
| <b>Byte 14</b>        | 02 <sub>H</sub> | Data record length                      |                         |
| <b>Byte 15</b>        |                 | Diagnostics enable                      | } See Figure C-6        |
| <b>Byte 16</b>        |                 | Wire break monitor enable               |                         |
| <b>Byte 17</b>        | 13 <sub>H</sub> | Block length                            | } For bytes<br>22 to 35 |
| <b>Byte 18</b>        | 5F <sub>H</sub> | S7 constant                             |                         |
| <b>Byte 19</b>        | 04 <sub>H</sub> | Slot                                    |                         |
| <b>Byte 20</b>        | 01 <sub>H</sub> | Data record number                      |                         |
| <b>Byte 21</b>        | 0E <sub>H</sub> | Data record length                      |                         |
| <b>Bytes 22 to 35</b> |                 | Parameters for analog value measurement | } See Figure C-7        |

Figure C-5 Parameters for Analog Input Modules 4/8AI, 4AI

#### Channel (Group)

The parameters listed on the following pages refer to channel groups for ET 200B-4/8AI and to channels for ET 200B-4AI. Table C-1 shows the assignment of terminals to channels and channel groups.

Table C-1 Assignment of Terminals to Channel (Groups)

| Channel (Group) n | 4/8AI   | 4AI                              |
|-------------------|---|----------------------------------|
| Channel (group) 0 | Channel group 0<br>(terminals 0.1/0.2, 0.3/0.4) | Channel 0<br>(terminals 0.1/0.2) |
| Channel (group) 1 | Channel group 1<br>(terminals 1.1/1.2, 1.3/1.4) | Channel 1<br>(terminals 1.1/1.2) |
| Channel (group) 2 | Channel group 2<br>(terminals 2.1/2.2, 2.3/2.4) | Channel 2<br>(terminals 2.1/2.2) |
| Channel (group) 3 | Channel group 3<br>(terminals 3.1/3.2, 3.3/3.4) | Channel 3<br>(terminals 3.1/3.2) |

**Bytes 15, 16**

Figure C-6 shows the contents of bytes 15 and 16. You activate a parameter by setting the corresponding bit to "1".

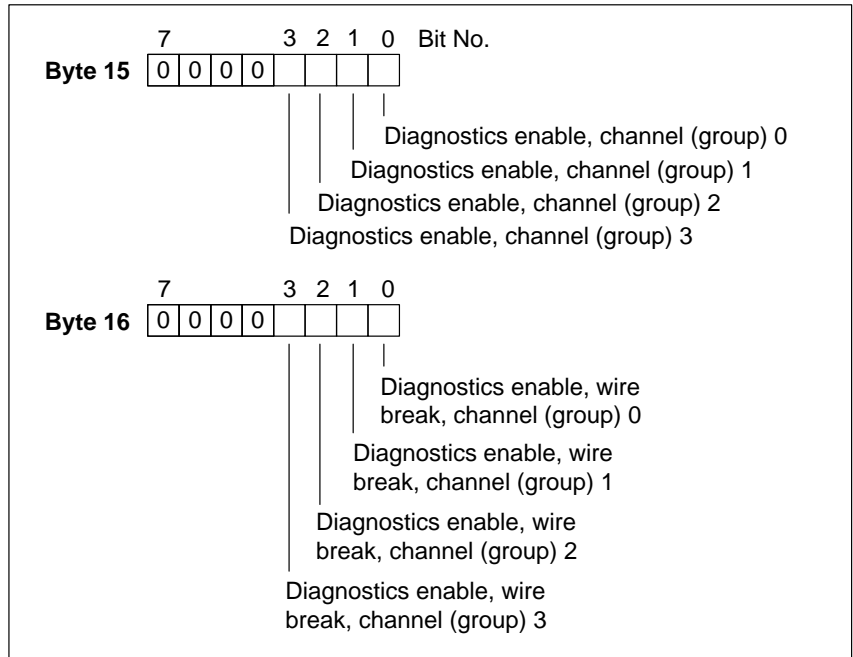


Figure C-6 Bytes 15 and 16 for Analog Input Modules 4/8AI, 4AI

**Bytes 22 to 35**

Figure C-7 shows the structure of bytes 22 to 35. You activate a parameter by setting the corresponding bit to "1".

**Note**

Representation of the limit values corresponds to analog value representation. Always bear the limit ranges in mind when setting the limit values.

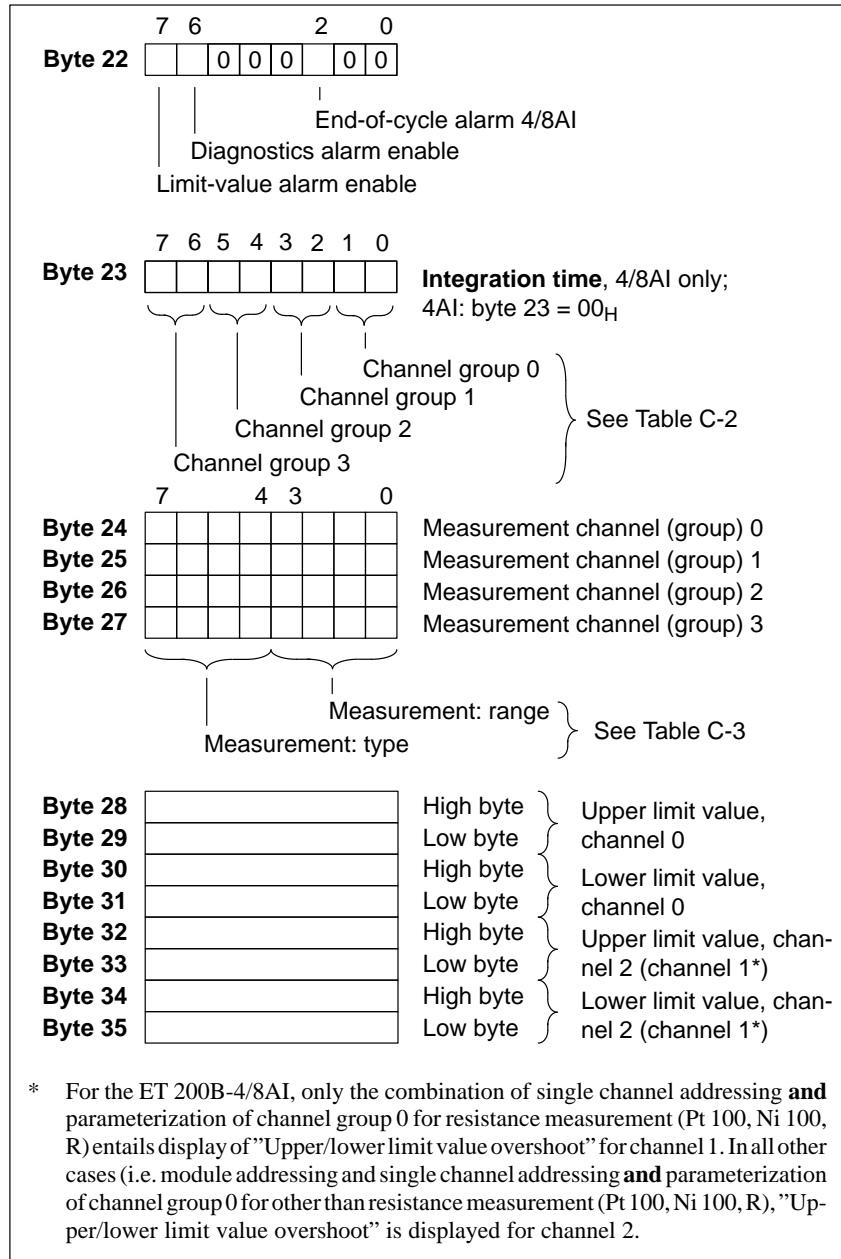


Figure C-7 Bytes 22 and 35 for Analog Input Modules 4/8AI, 4AI



**Integration Time**

Table C-2 contains the codings for the various integration times that you can set per channel group in byte 23 for the 4/8AI (see Figure C-7).

Table C-2 Codings for the Integration Times of the 4/8AI

| Integration Time | Coding |
|------------------|--------|
| 2.5 ms           | 2#00   |
| 16.7 ms          | 2#01   |
| 20 ms            | 2#10   |
| 100 ms           | 2#11   |

**Type of Measurement and Measuring Ranges**

Table C-3 lists all measuring ranges of the analog input modules. The table shows the codings for the type of measurement plus the codings for the corresponding measuring ranges. You must enter the codings for the desired measuring range in bytes 24 to 27 (see Figure C-7).

Table C-3 Codings for the Measuring Ranges of the Analog Input Modules

| Measurement: Type                  | Coding (Bits 4 to 7) | Measuring Range <sup>1</sup>  | Coding (Bits 0 to 3) |
|------------------------------------|----------------------|-------------------------------|----------------------|
| Deactivated                        | 2#0000               | Deactivated                   | 2#0000               |
| Voltage                            | 2#0001               | ± 80 mV (4/8AI)               | 2#0001               |
|                                    |                      | ± 250 mV (4/8AI)              | 2#0010               |
|                                    |                      | ± 500 mV (4/8AI)              | 2#0011               |
|                                    |                      | ± 1 V (4/8AI)                 | 2#0100               |
|                                    |                      | ± 2.5 V (4AI)                 | 2#0101               |
|                                    |                      | ± 5 V (4AI)                   | 2#0110               |
|                                    |                      | ± 1.25 V (4AI)                | 2#0100               |
|                                    |                      | ± 10 V (4AI)                  | 2#1001               |
| Current                            | 2#0010               | 0 ... 20 mA (4AI)             | 2#0010               |
|                                    |                      | 4 ... 20 mA (4AI)             | 2#0011               |
|                                    |                      | ± 20 mA (4AI)                 | 2#0100               |
| Resistance                         | 2#0100               | 48 Ω (4/8AI)                  | 2#0001               |
|                                    |                      | 150 Ω (4/8AI)                 | 2#0010               |
|                                    |                      | 300 Ω (4/8AI)                 | 2#0100               |
|                                    |                      | 600 Ω (4/8AI)                 | 2#0110               |
| Thermal resistance + linearization | 2#1000               | Pt 100 standard range (4/8AI) | 2#0010               |
|                                    |                      | Ni 100 standard range (4/8AI) | 2#0011               |

Table C-3 Codings for the Measuring Ranges of the Analog Input Modules, continued

| Measurement:<br>Type                   | Coding<br>(Bits 4 to 7) | Measuring Range <sup>1</sup>   | Coding<br>(Bits 0 to 3) |
|--|-------------------------|--------------------------------|-------------------------|
| Thermal elements<br>with linearization | 2#1110                  | Type N [NiCrSi – NiSi] (4/8AI) | 2#0001                  |
|  |                         | Type E [NiCr – CuNi] (4/8AI)   | 2#0010                  |
|  |                         | Type J [Fe – CuNi IEC] (4/8AI) | 2#0101                  |
|  |                         | Type L [Fe – CuNi DIN] (4/8AI) | 2#0110                  |
|  |                         | Type T [Cu – CuNi IEC] (4/8AI) | 2#0111                  |
|  |                         | Type K [NiCr – Ni] (4/8AI)     | 2#1000                  |
|  |                         | Type U [Cu – CuNi DIN] (4/8AI) | 2#1001                  |

<sup>1</sup> The measuring ranges apply only to the modules in parentheses.

## C.5 Parameters for Analog Output Module

### Parameters for 4AO

The next bytes (bytes 10 to 35) contain the following parameters for ET 200B-4AO:

|                      |                 |                                    |                      |
|----------------------|-----------------|------------------------------------|----------------------|
| <b>Byte 10</b>       | 07 <sub>H</sub> | Block length                       | } For bytes 15, 16   |
| <b>Byte 11</b>       | 5F <sub>H</sub> | S7 constant                        |                      |
| <b>Byte 12</b>       | 04 <sub>H</sub> | Slot                               |                      |
| <b>Byte 13</b>       | 00 <sub>H</sub> | Data record number                 |                      |
| <b>Byte 14</b>       | 02 <sub>H</sub> | Data record length                 |                      |
| <b>Byte 15</b>       |                 | Diagnostics enable                 | } See Figure C-9     |
| <b>Byte 16</b>       |                 | Reserved                           |                      |
| <b>Byte 17</b>       | 13 <sub>H</sub> | Block length                       | } For bytes 22 to 35 |
| <b>Byte 18</b>       | 5F <sub>H</sub> | S7 constant                        |                      |
| <b>Byte 19</b>       | 04 <sub>H</sub> | Slot                               |                      |
| <b>Byte 20</b>       | 01 <sub>H</sub> | Data record number                 |                      |
| <b>Byte 21</b>       | 0E <sub>H</sub> | Data record length                 |                      |
| <b>Byte 22 to 35</b> | ⋮               | Parameters for analog value output | } See Figure C-10    |

Figure C-8 Parameters for Analog Output Module 4AO

### Channel

In the tables on the next pages, the parameters for ET 200B-4AO apply to channels. Table C-4 shows the assignment of terminals to channels

Table C-4 Assignment of Terminals to Channels

| Channel n | Terminals on 4AO  |
|-----------|-------------------|
| Channel 0 | Terminals 0.1/0.2 |
| Channel 1 | Terminals 1.1/1.2 |
| Channel 2 | Terminals 2.1/2.2 |
| Channel 3 | Terminals 3.1/3.2 |





**Bytes 22 to 35**

Figure C-10 shows the structure of bytes 22 to 35. You activate a parameter by setting the corresponding bit to "1".

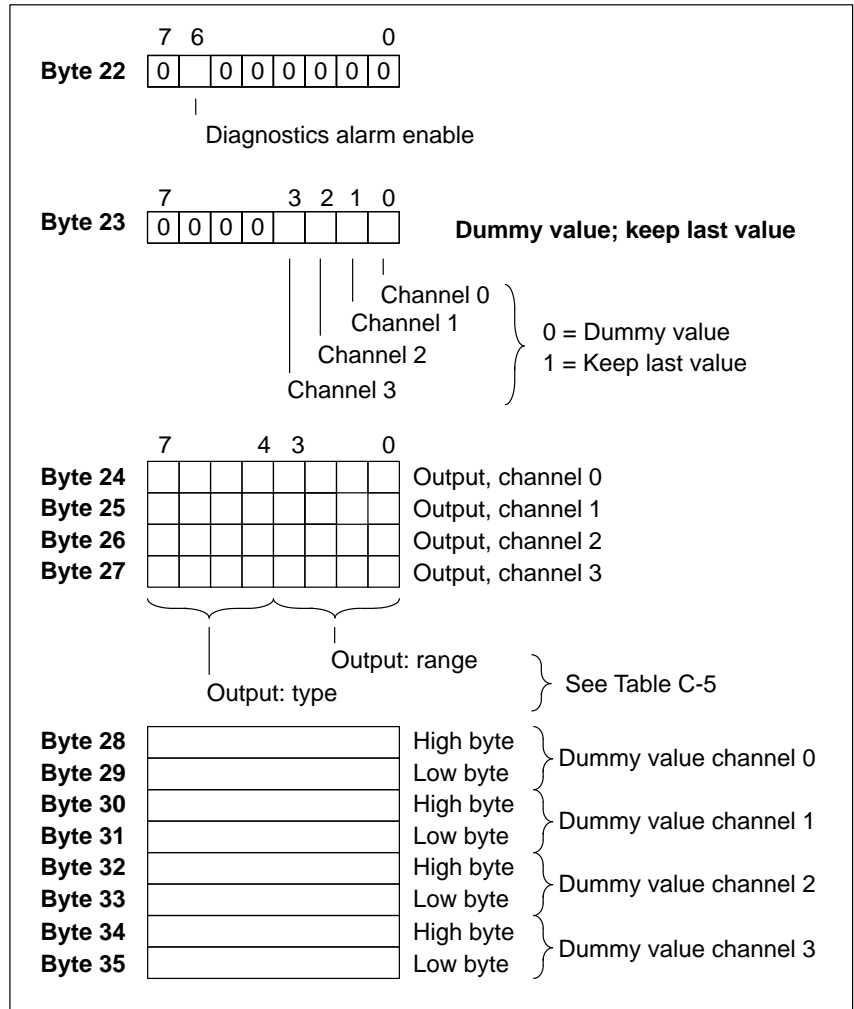


Figure C-10 Bytes 22 to 35 for Analog Output Module 4AO

**Note**

Representation of the dummy values corresponds to analog value representation. Bear the applicable range limits in mind when setting the dummy values.

### Type of Output and Output Ranges

Table C-5 lists all output ranges of the analog output module. The table shows the codings for the type of output plus the codings for the corresponding output ranges. You must enter the codings for the desired output range in bytes 24 to 27 (see Figure C-10).

Table C-5 Codings for Output Ranges of the Analog Output Module

| Output: Type | Coding<br>(Bits 4 to 7) | Output Range                            | Coding<br>(Bits 0 to 3)    |
|--------------|-------------------------|---|----------------------------|
| Deactivated  | 2#0000                  | Deactivated                             | 2#0000                     |
| Voltage      | 2#0001                  | 0 to 10 V<br>$\pm$ 10 V                 | 2#1000<br>2#1001           |
| Current      | 2#0010                  | 0 to 20 mA<br>4 to 20 mA<br>$\pm$ 20 mA | 2#0010<br>2#0011<br>2#0100 |



# Configuring with COM ET 200 V4.x

# D

## Introduction

You do not need the information in this chapter unless you want to replace old ET 200B modules that you configured with **COM ET 200 V4.x** with the new ET 200B modules (order numbers: see Appendix F) described in this manual.

## Compatibility

You can easily replace old ET 200B modules with the new ET 200B modules without having to reconfigure and parameterize the modules.

You can also configure the new ET 200B modules with the type files under COM ET 200 V4.x.

When used in conjunction with the IM 308-B and COM ET 200 V 4.x, the new modules behave like the old ET 200B modules they replace with regard to configuration and diagnostics.

## Type Files

The names of the type files needed for COM ET 200 V4.x are listed in Appendix A.1. (see also Table 4-1)

## In this Chapter

In case you do not have access to the previous edition of this manual, the most important information for configuring with COM ET 200 V 4.x is summarized below.

| In Section | you will find                                   | on Page |
|------------|---|---------|
| D.1        | Status and error indication by LEDs             | D-2     |
| D.2        | Slave diagnostics                               | D-3     |
| D.3        | Configuration options                           | D-11    |
| D.4        | Setting the operating mode with COM ET 200 V4.x | D-12    |

If information on these topics would be redundant, you will find a reference to the corresponding section of the manual on COM ET 200 Windows.

## Additional Information

The manual *ET 200 Distributed I/O System* (Order No.: 6ES5 998-3ES.1) contains detailed information on how to use COM ET 200 V4.x.

## D.1 Status and Error Indication by LEDs

**Error Indication, Digital ET 200B** See Table 5-1, Section 5.2.

**Error Indication, Analog ET 200B** The table below explains the meanings of the signals provided by the LEDs on analog ET 200B modules for configuration with COM ET 200 V4.x.

Table D-1 LEDs on Analog ET 200B Modules and their Meanings

| LED RUN     | LED BF             | LED DIA         | Meaning  | Remedy  |
|-------------|--------------------|-----------------|--|---|
| Off         | Off                | Off             | Voltage not applied to module.   | <ul style="list-style-type: none"> <li>Check the power supply.</li> <li>Check that the electronics block is correctly mounted on the terminal block.</li> </ul>   |
| Lit (green) | Off                | Off             | Module is on the PROFIBUS-DP and is exchanging data.   | -   |
| Lit (green) | Lit (red) or off   | Lit (red)       | An error has occurred on the module (e.g. parameterization incorrect, wire break, measuring range overshoot)   | <ul style="list-style-type: none"> <li>Read the diagnostics buffer to identify the error, see Sections 5.3 and D.2</li> <li>If there is no diagnostics information in the buffer, check parameterization to ascertain whether the diagnostics alarm and corresponding channel diagnostics have been enabled.</li> </ul> |
| Lit (green) | Flashing (red)     | Off             | Either <ul style="list-style-type: none"> <li>Module has not received a parameterization telegram, or telegram is incorrect.</li> </ul> or <ul style="list-style-type: none"> <li>Incorrect bus protocol</li> </ul> or <ul style="list-style-type: none"> <li>Module has received incorrect configuration data.</li> </ul> | <ul style="list-style-type: none"> <li>Check the configuration in the DP master (station number, station type).</li> <li>Check the configuration.</li> </ul>  |
| Lit (green) | Flashing (red)     | Lit (red)       | Module has received incorrect parameterization or configuration telegram.  | Check parameterization and configuration.   |
| Lit (green) | Flashes once (red) | Off             | Module is powering up.   | -   |
| Lit (green) | Lit (red)          | No significance | Baud rate matching in progress.  | <ul style="list-style-type: none"> <li>Check the PROFIBUS-DP connection.</li> <li>Check the DP master.</li> </ul>   |

## D.2 Slave Diagnostics

### In this Section

This section contains information on slave diagnostics of ET 200B in operation with IM 308-B.

| Section | Describes   | Page |
|---------|---|------|
| D.2.1   | General information on slave diagnostics, operation with IM 308-B | D-4  |
| D.2.2   | Structure of slave diagnostics                                    | D-6  |
| D.2.3   | Structure of device-related diagnostics (analog ET 200B)          | D-8  |

## D.2.1 General Information on Slave Diagnostics, Operation with IM 308-B

### Requesting Slave Diagnostics

Diagnostics are loaded word by word in the STEP5 application program and transferred to the diagnostics word. (The load and transfer operations always refer in the following to the default diagnostics address 252).

In the case of page addressing, the diagnostics word is on the "basic page". Before requesting diagnostics in the case of page addressing, you must first "switch" to the basic page.

Basic Structure of the STEP 5 Listing for Diagnostics:

| STL                          | Explanation  |
|------------------------------|--|
| L KB (basic page number)     | Page selection   |
| T PY 255                     | (basic page number: nx16, n=0,1,..)  |
| L KY (station number),(code) | Load diagnostics (station number: 3...99, code: → Table D-2 and D-3) and transfer to the diagnostics word (diagnostics word: here PW 252). |
| T PW 252                     |  |
| L PW 252                     | Evaluate diagnostics word (hex-code: → Section D.2.2)  |
| L KH (hex-code: no error)    | Error?   |
| !=F                          |  |
| BEC                          |  |
| JC FBx                       | Evaluate error in FBx.   |

### More Information

Handling a request for slave diagnostics corresponds to general access to diagnostics data for the IM 308-B and is described in detail in the manual *ET 200 Distributed I/O System* (Order No. 6ES5 998-3ES.1).

The following is an example of how to request slave diagnostics with the STEP5 application program and place the data in the diagnostics word.



**Example: Requesting Diagnostics**

This example shows how to request station status 1 and 2.  
Program the following in STEP 5:

| STL   | Explanation  |
|---|--|
| L KY n,0<br>T PW 252                          | Store in the "Diagnostics address" byte the number of the slave station (n = station number) from which the station status is to be requested; store the code for "station status 1 and station status 2" (code = 0) in the "Diagnostics address +1" byte. |
| L PW 252<br>L KH 000C<br>!=F<br>BEC<br>JC FBx | Load the diagnostics word<br>Response monitoring activated<br>No error?<br><br>Evaluate error in FBx.  |

## D.2.2 Structure of Slave Diagnostics

### Introduction

16 bytes per slave are reserved for slave diagnostics. These 16 bytes are organized in 8 words.

The 2 diagnostics bytes of the diagnostics word are referred to below as the "Diagnostics address" and "Diagnostics address +1".

### Digital ET 200B

The table below shows the structure of slave diagnostics for digital ET 200B modules:

Table D-2 Structure of Slave Diagnostics for Digital ET 200B, Operation with IM 308-B

| Code | Diagnostics address                             | Diagnostics address +1                                     |
|------|---|--|
| 0    | Station status 1 (byte 0)                       | Station status 2 (byte 1)                                  |
| 1    | Station status 3 (byte 2)                       | Master station number (byte 3)                             |
| 2    | Manufacturer ID (high) (byte 4 )                | Manufacturer ID (low) (byte 5)                             |
| 3    | Header (byte 6)<br>(device-related diagnostics) | Device-related diagnostics (byte 7)<br>(group diagnostics) |
| 4    | Free  | Free   |
| 5    | Free  | Free   |
| 6    | Free  | Free   |
| 7    | Free  | Free   |

### More Information, Digital ET 200B

You will find the information you need on slave diagnostics for digital ET 200B modules in the following sections.

| You will find   | on Section |
|---|------------|
| General information on slave diagnostics, operation with IM 308-B | D.2.1      |
| Structure of station status 1 to 3                                | 5.3.4      |
| Structure of the master station number and manufacturer ID        | 5.3.5      |
| Structure of device-related diagnostics (digital ET 200B)         | 5.3.6      |

**Analog ET 200B**

The table below shows the structure of slave diagnostics for analog ET 200B modules:

Table D-3 Structure of Slave Diagnostics for Analog ET 200B, Operation with IM 308-B

| Code | Diagnostics address  | Diagnostics address +1                                       |
|------|--|--|
| 0    | Station status 1 (byte 0)  | Station status 2 (byte 1)                                    |
| 1    | Station status 3 (byte 2)  | Master station number (byte 3)                               |
| 2    | Manufacturer ID (high) (byte 4 )                                   | Manufacturer ID (low) (byte 5)                               |
| 3    | Header (byte 6)<br>(device-related diagnostics)                    | Device-related diagnostics (byte 7)<br>(reserved)            |
| 4    | Device-related diagnostics (byte 8)<br>(reserved)                  | Device-related diagnostics (byte 9)<br>(type of error)       |
| 5    | Device-related diagnostics (byte 10)<br>(always: 15 <sub>H</sub> ) | Device-related diagnostics (byte 11)<br>(wrong station type) |
| 6    | Device-related diagnostics (byte 12)<br>(EPROM or ADC/DAC error)   | Device-related diagnostics (byte 13)<br>(channel type)       |
| 7    | Device-related diagnostics (byte 14)<br>(always: 08 <sub>H</sub> ) | Device-related diagnostics (byte 15)<br>(number of channels) |

**More Information,  
Analog ET 200B**

You will find the information you need on slave diagnostics for analog ET 200B modules in the following sections.

| you will find   | in Section |
|---|------------|
| General information on slave diagnostics, operation with IM 308-B | D.2.1      |
| Structure of station status 1 to 3                                | 5.3.4      |
| Structure of the master station number and manufacturer ID        | 5.3.5      |
| Structure of device-related diagnostics (analog ET 200B)          | D.2.3      |

## D.2.3 Structure of Device-Related Diagnostics (Analog ET 200B)

### Introduction

The structure of device-related diagnostics for configuring the analog modules with COM ET 200 V4.x is described below.

In essence, this section is comparable with Section 5.3.8 of this manual.

No ID-related diagnostics are displayed in operation with COM ET 200 V4.x.

### Diagnostics Alarm, Process Alarm

Analog modules configured with COM ET 200 V4.x do not support alarms (diagnostics alarm, process alarm).

### Device-Related Diagnostics

The device-related diagnostics for an analog ET 200B shows you the error reported by the ET 200B. The header indicates the length of device-related diagnostics.

---

#### Note

Chapter 8 contains a discussion of "Supplementary Bits" in the section dealing with analog value representation: these bits contain additional diagnostics information.

---

### Header (Byte 6)

The analog ET 200B modules contain the following information in the "Header (device-related diagnostics)" byte.

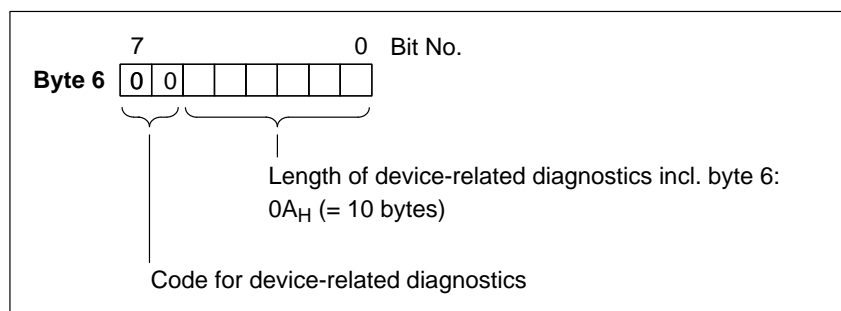


Figure D-1 Structure of the Header (Device-Related Diagnostics) for Analog ET200B

**Device-Related Diagnostics**

Device-related diagnostics of the analog ET 200B modules comprises 9 bytes:

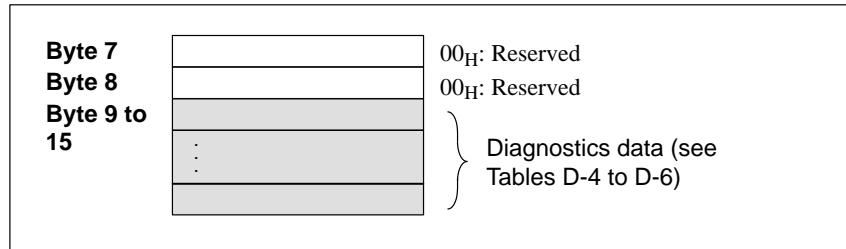


Figure D-2 Structure of Device-Related Diagnostics for Analog ET 200B (Bytes 7 to 15)

**Bytes 9 to 12**

Table D-4 shows the structure and contents of bytes 9 to 12.

Table D-4 Diagnostics Data, Bytes 9 to 12

| Byte                    | Bit    | Meaning                         |                    | Byte | Bit | Meaning                    |
|-------------------------|--------|---------------------------------|--------------------|------|-----|----------------------------|
| 9<br>(→<br>Tab.<br>D-5) | 0      | Diagnostics message waiting     |                    | 11   | 0   | Wrong ET 200B station type |
|                         | 1      | Internal error                  |                    |      | 1   | Reserved                   |
|                         | 2      | External error, e.g. wire break |                    |      | 2   | Reserved                   |
|                         | 3      | Channel error                   |                    |      | 3   | Reserved                   |
|                         | 4      | Reserved                        |                    |      | 4   | Reserved                   |
|                         | 5      | Reserved                        |                    |      | 5   | Reserved                   |
|                         | 6      | Reserved                        |                    |      | 6   | Reserved                   |
|                         | 7      | Incorrect parameters in module  |                    |      | 7   | Reserved                   |
| 10                      | 0 to 3 | Module class                    | 0101 Analog module | 12   | 0   | Reserved                   |
|                         | 4      | Channel information waiting     |                    |      | 1   | Reserved                   |
|                         | 5      | Reserved                        |                    |      | 2   | EPROM error (4AI)          |
|                         | 6      | Reserved                        |                    |      | 3   | Reserved                   |
|                         | 7      | Reserved                        |                    |      | 4   | ADC/DAC error (4AO)        |
|                         |        |                                 |                    |      | 5   | Reserved                   |
|                         |        |                                 |                    |      | 6   | Reserved                   |
|                         |        |                                 |                    |      | 7   | Reserved                   |

**Possible Values, Byte 9**      The possible values for byte 9 are as follows:

Table D-5      Possible Values for Byte 9

| Value                              | Bit 3 | Bit 2 | Bit 1 | Bit 0 | Meaning   |
|------------------------------------|-------|-------|-------|-------|---|
| 00 <sub>H</sub>                    | 0     | 0     | 0     | 0     | No error  |
| 03 <sub>H</sub> (83 <sub>H</sub> ) | 0     | 0     | 1     | 1     | Internal error, no channel error; (incorrect parameters in the module)        |
| 0B <sub>H</sub> (8B <sub>H</sub> ) | 1     | 0     | 1     | 1     | Internal error, channel error; (incorrect parameters in the module)           |
| 0D <sub>H</sub>                    | 1     | 1     | 0     | 1     | External error, channel error   |
| 0F <sub>H</sub> (8F <sub>H</sub> ) | 1     | 1     | 1     | 1     | Summation error of all the above errors; (incorrect parameters in the module) |

**Bytes 13 to 15**      Table D-6 shows the structure and contents of bytes 13 to 15.

Table D-6      Diagnostics Data, Bytes 13 to 15

| Byte | Bit    | Meaning  | Remark                             |                   |
|------|--------|--|------------------------------------|-------------------|
| 13   | 0 to 7 | Channel type   | 71 <sub>H</sub><br>73 <sub>H</sub> | 4/8AI, 4AI<br>4AO |
| 14   | 0 to 7 | Number of diagnostics bits output per channel by a module. | 08 <sub>H</sub>                    | 4/8AI, 4AI, 4AO   |
| 15   | 0 to 7 | Number of channels of a module.                            | 04 <sub>H</sub><br>08 <sub>H</sub> | 4AI, 4AO<br>4/8AI |

### D.3 Configuration Options

**IDs** Table D-7 shows the possible IDs for configuring the ET 200B modules with COM ET 200 V4.x. The following address IDs are possible for ET 200B:

Table D-7 IDs for ET 200B

| Module                 | Order Number        | Address ID |            | Consistency | Address Scope (Bytes) |    | Address Area |
|------------------------|---------------------|------------|------------|-------------|-----------------------|----|--------------|
|                        |                     | Slot 0     | Slot 1     |             | O                     | I  |              |
| ET 200B-16DI           | 6ES7 131-0BH00-0XB0 | 000        | 017        | Byte        | –                     | 2  | digital      |
| ET 200B-32DI           | 6ES7 131-0BL00-0XB0 | 000        | 019        | Byte        | –                     | 4  | digital      |
| ET 200B-32DI 0.2ms     | 6ES7 131-0BL10-0XB0 |            |            |             |                       |    |              |
| ET 200B-16DO           | 6ES7 132-0BH01-0XB0 | 033        | 000        | Byte        | 2                     | –  | digital      |
| ET 200B-16DO/2A        | 6ES7 132-0BH11-0XB0 | 033        | 000        | Byte        | 2                     | –  | digital      |
| ET 200B-32DO           | 6ES7 132-0BL01-0XB0 | 035        | 000        | Byte        | 4                     | –  | digital      |
| ET 200B-8DI/8DO        | 6ES7 133-0BH01-0XB0 | 8DA or 032 | 8DE or 016 | Byte        | 1                     | 1  | digital      |
| ET 200B-8DI/8DO HWA    | 6ES7 133-0BH10-0XB0 | 033        | 8DE or 016 | Byte        | 1                     | 1  | digital      |
| ET 200B-16DI/16DO      | 6ES7 132-0BL00-0XB0 | 033        | 017        | Byte        | 2                     | –  | digital      |
| ET 200B-24DI/8DO       | 6ES7 133-0BN01-0XB0 | 8DA or 032 | 018        | Byte        | 1                     | 3  | digital      |
| ET 200B-24DI/8DO 0.2ms | 6ES7 133-0BN11-0XB0 |            |            |             |                       |    |              |
| ET 200B-8RO            | 6ES7 132-0GF00-0XB0 | 032        | 000        | Byte        | 1                     | –  | digital      |
| ET 200B-16DI-AC        | 6ES7 131-0HF00-0XB0 | 000        | 017        | Byte        | –                     | 2  | digital      |
| ET 200B-16DO-AC        | 6ES7 132-0HF00-0XB0 | 033        | 000        | Byte        | 2                     | –  | digital      |
| ET 200B-16RO-AC        | 6ES7 132-0HH00-0XB0 | 033        | 000        | Byte        | 2                     | –  | digital      |
| ET 200B-8DI/8RO-AC     | 6ES7 133-0HH00-0XB0 | 8DA or 032 | 8DE or 016 | Byte        | 1                     | 1  | digital      |
| ET 200B-4/8AI          | 6ES7 134-0KH01-0XB0 | 087        | –          | Word        | –                     | 16 | analog       |
| ET 200B-4AI            | 6ES7 134-0HF01-0XB0 | 4AE or 083 | –          | Word        | –                     | 8  | analog       |
| ET 200B-4AO            | 6ES7 135-0HF01-0XB0 | 099        | –          | Word        | 8                     | –  | analog       |

## D.4 Setting the Operating Mode with COM ET 200 V4.x

### Introduction

The structure of the parameterization telegram for configuring with COM ET 200 V4.x is described below.

### Structure for Digital Modules

In the case of digital ET 200B modules, no settings can be made by means of the parameterization telegram. When you open the "DP Slave Parameterization Telegram" dialog box, 5 bytes are assigned "00<sub>H</sub>" by default.

#### Note

In the case of digital ET 200B modules, **do not** overwrite the 5 bytes which default to "00<sub>H</sub>" in the parameterization telegram.

### Structure for Analog Modules

In the case of analog ET 200B modules, you can use the parameterization telegram to define diagnostics response and set the defaults for analog value measurement or analog value output, as applicable.

When parameterizing with COM ET 200 V4.x you enter only the user-specific part of the parameterization telegram (without standard part) in the KH format ("DP Slave Parameterization Telegram" dialog box).

### Defaults and Structure of the Parameterization Telegram

When you open the "DP Slave Parameterization Telegram" dialog box for the first time, the parameterization telegram is structured and contains certain defaults, as shown below.

- For ET 200B-4/8AI:

| DP SLAVE PARAMETERIZATION TELEGRAM |                      |    |    |    |    |    |    |    |    |    |
|------------------------------------|----------------------|----|----|----|----|----|----|----|----|----|
| Byte                               | (input in KH format) |    |    |    |    |    |    |    |    |    |
| 0                                  | 13                   | 00 | 00 | 00 | 00 | 00 | AA | 14 | 14 | 14 |
| 10                                 | 14                   | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 06 |
| 20                                 | FF                   | 00 | 00 | 00 | 00 |    |    |    |    |    |

- For ET 200B-4AI:

| DP SLAVE PARAMETERIZATION TELEGRAM |                      |    |    |    |    |    |    |    |    |    |
|------------------------------------|----------------------|----|----|----|----|----|----|----|----|----|
| Byte                               | (input in KH format) |    |    |    |    |    |    |    |    |    |
| 0                                  | 13                   | 00 | 00 | 00 | 00 | 00 | 00 | 19 | 19 | 19 |
| 10                                 | 19                   | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 06 |
| 20                                 | FF                   | 00 | 00 | 00 | 00 |    |    |    |    |    |



- For ET 200B-4AO:

| DP SLAVE PARAMETERIZATION TELEGRAM |    |    |    |    |    |    |    |    |    |    |
|------------------------------------|----|----|----|----|----|----|----|----|----|----|
| Byte   (input in KH format)        |    |    |    |    |    |    |    |    |    |    |
| 0                                  | 13 | 00 | 00 | 00 | 00 | 00 | 00 | 19 | 19 | 19 |
| 10                                 | 19 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 06 |
| 20                                 | FF | 00 | 00 | 00 | 00 |    |    |    |    |    |

**Note**

As regards parameterization of the functions of the analog modules, only the bytes with borders "□" in the Figures are of relevance.

All other bytes contain "00<sub>H</sub>" or COM ET 200 V4.x-specific codes that you **must** leave unchanged.

**Parameters for Analog Modules**

The meanings of the bytes with borders "□" in the figures above are as follows:

Table D-8 Content and Meanings of the Bytes in the Parameterization Telegram

| Byte | Breakdown  | Code   |  |
|------|--|--|--|
| 3    | Diagnostics message enable per channel (group).  |  |  |
|      | Bit 0 = channel (group) 0<br>Bit 1 = channel (group) 1<br>Bit 2 = channel (group) 2<br>Bit 3 = channel (group) 3       | Bit is "1": Diagnostics message enabled<br>Bit is "0": Diagnostics message disabled (default)  |  |
| 4    | Wire break monitor enable, only ET 200B-4/8AI with selected value range Pt 100, thermocouple or voltage sensor ± 80 mV |  |  |
|      | Bit 0 = channel group 0<br>Bit 1 = channel group 1<br>Bit 2 = channel group 2<br>Bit 3 = channel group 3               | Bit is "1": Diagnostics message enabled<br>Bit is "0": Diagnostics message disabled (default)<br><br>(If wire break occurs, the overflow bit is also set.) | 4/8AI  |
| 6    | Setting for integration time, ET 200B-4/8AI only   |  |  |
|      |  | AA <sub>H</sub><br>55 <sub>H</sub>   | Integration time 20 ms for 50 Hz supply (default)<br>Integration time 16.7 ms for 60 Hz supply |



Table D-8 Content and Meanings of the Bytes in the Parameterization Telegram, continued

| Byte            | Breakdown  | Code            |                                    |            |
|-----------------|--|-----------------|------------------------------------|------------|
| 7, 8, 9, 10     | Setting for analog value range   |                 |                                    |            |
|                 | Byte 7 = channel (group) 0   | 19 <sub>H</sub> | ± 10 V (default)                   | 4AI, 4AO   |
|                 | Byte 8 = channel (group) 1   | 18 <sub>H</sub> | 0 ... 10 V                         | 4AO        |
|                 | Byte 9 = channel (group) 2   | 16 <sub>H</sub> | ± 5 V                              | 4AI        |
|                 | Byte 10 = channel (group) 3  | 15 <sub>H</sub> | ± 2.5 V                            | 4AI        |
|                 |  | 14 <sub>H</sub> | ± 1.25 V, for ET 200B-4AI          | 4AI        |
|                 |  | 14 <sub>H</sub> | ± 1 V, for ET 200B-4/8AI (default) | 4/8AI      |
|                 |  | 13 <sub>H</sub> | ± 0.5 V                            | 4/8AI      |
|                 |  | 12 <sub>H</sub> | ± 0.25 V                           | 4/8AI      |
|                 |  | 11 <sub>H</sub> | ± 80 mV                            | 4/8AI      |
|                 |  | 24 <sub>H</sub> | ± 20 mA                            | 4AI, 4AO   |
|                 | 22 <sub>H</sub>  | 0 ... 20 mA     | 4AI, 4AO                           |            |
|                 | 23 <sub>H</sub>  | 4 ... 20 mA     | 4AI, 4AO                           |            |
| 82 <sub>H</sub> | Pt 100 Standard  | 4/8AI           |                                    |            |
| E5 <sub>H</sub> | Thermocouple Type J with linearization   | 4/8AI           |                                    |            |
| E8 <sub>H</sub> | Thermocouple Type K with linearization   | 4/8AI           |                                    |            |
| E6 <sub>H</sub> | Thermocouple Type L with linearization   | 4/8AI           |                                    |            |
| 23              | Selection for measured-value representation (ET 200B-4AI and ET 200B-4/8AI only) |                 |                                    |            |
|                 |  | 00 <sub>H</sub> | Complement of twos                 | 4AI, 4/8AI |
|                 |  | 01 <sub>H</sub> | Amount and sign                    | 4AI, 4/8AI |
|                 |  | 02 <sub>H</sub> | Binary                             | 4AI        |

# Analog Modules and Old Type Files

## Introduction

You do not need the information in this chapter unless you want to replace old analog modules that you configured with the type file **SIxxxxAE.200** under COM ET 200 Windows with the new analog modules (order numbers: see Appendix F) described in this manual.

If you use the type file **SIxxxxBE.200** for configuring under COM ET 200 Windows, you can ignore this chapter (see also Table 4-1).

## Compatibility

You can easily replace old analog modules with the new analog modules without having to reconfigure and parameterize the modules.

You can also configure the new analog modules with the type file **SIxxxxAE.200** under COM ET 200 Windows.

When configured with **SIxxxxAE.200**, the new modules behave like the old analog modules they replace with regard to configuration and diagnostics.

## Type Files

The names of the type files needed for COM ET 200 Windows are listed in Appendix A.1.

## In this Chapter

The two type-file versions **SIxxxxAE.200** and **SIxxxxBE.200** evince differences with regard to configuration, parameterization and diagnostics information.

In case you do not have access to the previous edition of this manual, the points in which the newer version of the type file differs from the **SIxxxxAE.200** are described below.

| In Section | you will find  | on Page |
|------------|--|---------|
| E.1        | Status and error indication by LEDs                      | E-2     |
| E.2        | Structure of device-related diagnostics (analog ET 200B) | E-3     |
| E.3        | Configuration options                                    | E-7     |
| E.4        | Parameters for the analog modules                        | E-8     |

## E.1 Status and Error Indication by LEDs

**Introduction** The table below explains the error indications for analog ET 200B modules for configuration with the type file **SIxxxxAE.200**.

**Error Indication, Analog ET 200B** The table below explains the meanings of the signals provided by the LEDs on analog ET 200B modules.

Table E-1 LEDs on Analog ET 200B Modules and their Meanings

| LED RUN     | LED BF             | LED DIA         | Meaning  | Remedy  |
|-------------|--------------------|-----------------|--|---|
| Off         | Off                | Off             | Voltage not applied to module.   | <ul style="list-style-type: none"> <li>Check the power supply.</li> <li>Check that the electronics block is correctly mounted on the terminal block.</li> </ul>   |
| Lit (green) | Off                | Off             | Module is on the PROFIBUS-DP and is exchanging data.   | -   |
| Lit (green) | Lit (red) or off   | Lit (red)       | An error has occurred on the module (e.g. wire break, measuring range overshoot)   | <ul style="list-style-type: none"> <li>Read the diagnostics buffer to identify the error, see Sections 5.3 and E.2</li> <li>If there is no diagnostics information in the buffer, check parameterization to ascertain whether the diagnostics alarm and corresponding channel diagnostics have been enabled.</li> </ul> |
| Lit (green) | Flashing (red)     | Off             | Either <ul style="list-style-type: none"> <li>Module has not received a parameterization telegram, or telegram is incorrect.</li> </ul> or <ul style="list-style-type: none"> <li>Incorrect bus protocol</li> </ul> or <ul style="list-style-type: none"> <li>Module has received incorrect configuration data.</li> </ul> | <ul style="list-style-type: none"> <li>Check the configuration in the DP master (station number, station type).</li> <li>Check the configuration.</li> </ul>  |
| Lit (green) | Flashing (red)     | Lit (red)       | Module has received incorrect parameterization or configuration data.  | Check parameterization and configuration  |
| Lit (green) | Flashes once (red) | Off             | Module is powering up.   | -   |
| Lit (green) | Lit (red)          | No significance | Baud rate matching in progress.  | <ul style="list-style-type: none"> <li>Check the PROFIBUS-DP connection.</li> <li>Check the DP master.</li> </ul>   |

## E.2 Structure of Device-Related Diagnostics (Analog ET 200B)

### Introduction

The structure of device-related diagnostics for configuring the analog modules with the type file **SIxxxxAE.200** is described below.

In essence, this section is comparable with Section 5.3.8 of this manual. All other information on slave diagnostics with the IM 308-C applies as described in Section 5 above.

No ID-related diagnostics are displayed for configuration with SIxxxxAE.200.

### Diagnostics Alarm, Process Alarm

Analog modules configured with SIxxxxAE.200 do not support alarms (diagnostics alarm, process alarm).

### Device-Related Diagnostics

The device-related diagnostics for an analog ET 200B shows you the error reported by the ET 200B. The header indicates the length of device-related diagnostics. (see Figure 5-2)

---

#### Note

Chapter 8 contains a discussion of "Supplementary Bits" in the section dealing with analog value representation: these bits contain additional diagnostics information.

---

### Header (Byte 6)

The analog ET 200B modules contain the following information in the "Header (device-related diagnostics)" byte.

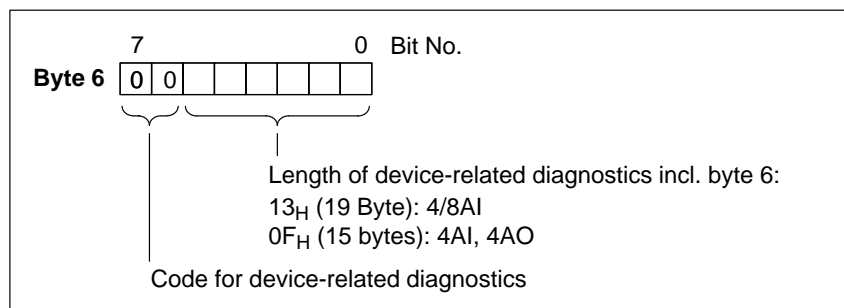


Figure E-1 Structure of the Header (Device-Related Diagnostics) for Analog ET200B

**Device-Related Diagnostics**

Device-related diagnostics of the analog ET 200B modules comprises a maximum of 18 bytes:

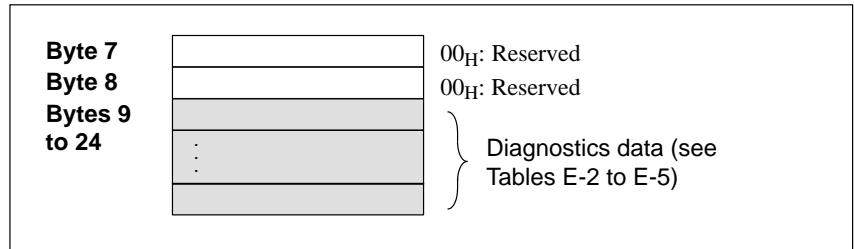


Figure E-2 Structure of Device-Related Diagnostics for Analog ET 200B (Bytes 7 to 24)

**Bytes 9 to 12**

Table E-2 shows the structure and contents of bytes 9 to 12.

Table E-2 Diagnostics Data, Bytes 9 to 12

| Byte                    | Bit    | Meaning                         |      |               | Byte | Bit | Meaning                    |
|-------------------------|--------|---------------------------------|------|---------------|------|-----|----------------------------|
| 9<br>(→<br>Tab.<br>E-3) | 0      | Diagnostics message waiting     |      |               | 11   | 0   | Wrong ET 200B station type |
|                         | 1      | Internal error                  |      |               |      | 1   | Reserved                   |
|                         | 2      | External error, e.g. wire break |      |               |      | 2   | Reserved                   |
|                         | 3      | Channel error                   |      |               |      | 3   | Reserved                   |
|                         | 4      | Reserved                        |      |               |      | 4   | Reserved                   |
|                         | 5      | Reserved                        |      |               |      | 5   | Reserved                   |
|                         | 6      | Reserved                        |      |               |      | 6   | Reserved                   |
|                         | 7      | Incorrect parameters in module  |      |               |      | 7   | Reserved                   |
| 10                      | 0 to 3 | Module class                    | 0101 | Analog module | 12   | 0   | Reserved                   |
|                         | 4      | Channel information waiting     |      |               |      | 1   | Reserved                   |
|                         | 5      | Reserved                        |      |               |      | 2   | EPROM error (4AI)          |
|                         | 6      | Reserved                        |      |               |      | 3   | Reserved                   |
|                         | 7      | Reserved                        |      |               |      | 4   | ADC/DAC error (4AO)        |
|                         |        | Reserved                        |      |               |      | 5   | Reserved                   |
|                         |        | Reserved                        |      |               |      | 6   | Reserved                   |
|                         |        | Reserved                        |      |               |      | 7   | Reserved                   |

**Possible Values, Byte 9**      The possible values for byte 9 are as follows:

Table E-3      Possible Values for Byte 9

| Value                              | Bit 3 | Bit 2 | Bit 1 | Bit 0 | Meaning   |
|------------------------------------|-------|-------|-------|-------|---|
| 00 <sub>H</sub>                    | 0     | 0     | 0     | 0     | No error  |
| 03 <sub>H</sub> (83 <sub>H</sub> ) | 0     | 0     | 1     | 1     | Internal error, no channel error; (incorrect parameters in the module)        |
| 0B <sub>H</sub> (8B <sub>H</sub> ) | 1     | 0     | 1     | 1     | Internal error, channel error; (incorrect parameters in the module)           |
| 0D <sub>H</sub>                    | 1     | 1     | 0     | 1     | External error, channel error   |
| 0F <sub>H</sub> (8F <sub>H</sub> ) | 1     | 1     | 1     | 1     | Summation error of all the above errors; (incorrect parameters in the module) |

**Bytes 13 to 16**      Table E-4 shows the structure and contents of bytes 13 to 16.

Table E-4      Bytes 13 to 16 for Diagnostics Alarm

| Byte                  | Bit                          | Meaning  | Remark                             |                   |
|-----------------------|------------------------------|--|------------------------------------|-------------------|
| 13                    | 0 to 7                       | Channel type   | 71 <sub>H</sub><br>73 <sub>H</sub> | 4/8AI, 4AI<br>4AO |
| 14                    | 0 to 7                       | Number of diagnostics bits output per channel by a module. | 08 <sub>H</sub>                    | 4/8AI, 4AI, 4AO   |
| 15                    | 0 to 7                       | Number of channels of a module.                            | 04 <sub>H</sub><br>08 <sub>H</sub> | 4AI, 4AO<br>4/8AI |
| 16                    | <b>Channel error vector:</b> |  |                                    |                   |
|                       | 0                            | Channel error, channel 0                                   | 4/8AI, 4AI, 4AO                    |                   |
|                       | 1                            | Channel error, channel 1                                   | 4/8AI, 4AI, 4AO                    |                   |
|                       | 2                            | Channel error, channel 2                                   | 4/8AI, 4AI, 4AO                    |                   |
|                       | 3                            | Channel error, channel 3                                   | 4/8AI, 4AI, 4AO                    |                   |
|                       | 4                            | Channel error, channel 4                                   | 4/8AI                              |                   |
|                       | 5                            | Channel error, channel 5                                   | 4/8AI                              |                   |
|                       | 6                            | Channel error, channel 6                                   | 4/8AI                              |                   |
| 7                     | Channel error, channel 7     | 4/8AI  |                                    |                   |
| 17 to 24 <sup>1</sup> | -                            | Channel-specific errors                                    | see Table E-5                      |                   |

<sup>1</sup> The number of bytes depends on the number of channels in the module.

**Analog Channel**

Table E-5 shows the assignment of the diagnostics byte for an analog input or analog output channel.

Table E-5 Diagnostics Byte for an Analog Input/Analog Output Channel

| Byte        | Bit | Analog Input Channel (4/8AI, 4AI)  | Analog Output Channel (4AO) |
|-------------|-----|--|-----------------------------|
| as of<br>17 | 0   | Configuration/parameterization error   |                             |
|             | 1   | Common-mode error (4/8AI only)   | "0" (Reserved)              |
|             | 2   | "0" (Reserved)   |                             |
|             | 3   | "0" (Reserved)   | Ground short-circuit        |
|             | 4   | Wire-break/feed-current monitoring: measuring transducer/Pt 100 <sup>1</sup> |                             |
|             | 5   | "0" (Reserved)   | "0" (Reserved)              |
|             | 6   | Measuring range undershoot   | "0" (Reserved)              |
|             | 7   | Measuring range overshoot  | "0" (Reserved)              |

<sup>1</sup> In the case of the ET 200B-4/8AI, a "wire break" error is superimposed on common-mode and measuring-range errors occurring at the same time (common-mode and measuring-range errors are not signaled).



### E.3 Configuration Options

**Type File**                    The information in this section applies to the type file **SIxxxxAE.200**.

**IDs**                            Table E-6 shows the possible IDs for configuring analog modules with COM ET 200 Windows.

Single channel addressing is not possible with the type file SIxxxxAE.200.

Table E-6      Possible IDs for Configuring Input and Output and Areas

| Module        | Order Number        | Slot 0 | Length | Format | Meaning                                    |
|---------------|---------------------|--------|--------|--------|--|
| ET 200B-4/8AI | 6ES7 134-0KH01-0XB0 | 8AI    | 8      | Word   | All channels are transferred. <sup>1</sup> |
| ET 200B-4AI   | 6ES7 134-0HF01-0XB0 | 4AI    | 4      | Word   | All channels are transferred. <sup>1</sup> |
| ET 200B-4AO   | 6ES7 135-0HF01-0XB0 | 4AO    | 4      | Word   | All channels are transferred. <sup>1</sup> |

<sup>1</sup> The address assigned is the start address for the entire module

## E.4 Parameters for Analog Modules

### Parameters for ET 200B-4/8AI

Table 8-9 shows all the parameters for parameterizing the ET 200B-4/8AI with COM ET 200 Windows.

You can set these parameters for the ET 200B-4/8AI if you use the type file **SI801AAE.200**.

Table E-7 Parameters for ET 200B-4/8AI (6ES7 134-0KH01-0XB0)

| Parameter  | Explanation  | Value Range   |
|--|--|---|
| Diagnostics enable for channel group 0 (channels 0, 1)           | Diagnostics messages enabled separately for each channel group:<br><b>only</b> for thermocouples, resistance thermometers (Pt 100, Ni 100) and voltage sensors $\pm 80$ mV   | <div style="background-color: #cccccc; display: inline-block; padding: 2px;">Disable</div><br>Enable  |
| Diagnostics enable for channel group 1 (channels 2, 3)           |  |   |
| Diagnostics enable for channel group 2 (channels 4, 5)           |  |   |
| Diagnostics enable for channel group 3 (channels 6, 7)           |  |   |
| Wire break monitoring enable for channel group 0 (channels 0, 1) | Wire break monitoring enabled separately for each channel group  | <div style="background-color: #cccccc; display: inline-block; padding: 2px;">Disable</div><br>Enable  |
| Wire break monitoring enable for channel group 1 (channels 2, 3) |  |   |
| Wire break monitoring enable for channel group 2 (channels 4, 5) |  |   |
| Wire break monitoring enable for channel group 3 (channels 6, 7) |  |   |
| Integration time for module                                      | Enter an optimum integration time for the A/D converter to help suppress noise voltage.  | 16.7 ms<br><div style="background-color: #cccccc; display: inline-block; padding: 2px;">20 ms</div>   |
| Measurement type and range for channel group 0 (channels 0, 1)   | You can set the measurement type and range separately for each channel group<br><br>For voltage measurement:<br><br>For resistance thermometer with linearization:<br>For thermocouple with external reference junction: | <div style="background-color: #cccccc; display: inline-block; padding: 2px;"><math>\pm 1</math> V</div><br>$\pm 0.5$ V<br>$\pm 0.25$ V<br>$\pm 80$ mV<br><br>Pt 100 standard range<br><br>Type J with linearization<br>Type L with linearization<br>Type K with linearization |
| Measurement type and range for channel group 1 (channels 2, 3)   |  |   |
| Measurement type and range for channel group 2 (channels 4, 5)   |  |   |
| Measurement type and range for channel group 3 (channels 6, 7)   |  |   |
| Representation of measured values                                | Sets representation of the measured values for module  | <div style="background-color: #cccccc; display: inline-block; padding: 2px;">SIMATIC S5</div><br>SIMATIC S7   |
| Measured value representation                                    | Sets data format for analog value representation, SIMATIC S5   | <div style="background-color: #cccccc; display: inline-block; padding: 2px;">Complement of twos</div><br>Amount with sign   |

: Default

**Parameters for ET 200B-4AI**

Table 8-40 shows all the parameters for parameterizing the ET 200B-4AI with COM ET 200 Windows.

You can set these parameters for the ET 200B-4AI if you use the type file **SI8019AE.200**.

Table E-8 Parameters for ET 200B-4AI (6ES7 134-0HF01-0XB0)

| Parameter                                  | Explanation  | Value Range                                      |
|--|--|--|
| Diagnostics enable for channel 0           | Diagnostics messages enabled separately for each channel   | Disable  |
| Diagnostics enable for channel 1           |  | Enable   |
| Diagnostics enable for channel 2           |  |  |
| Diagnostics enable for channel 3           |  |  |
| Wire break monitoring enable for channel 0 | Wire break monitoring enabled separately for each channel for measuring range 4 ... 20 mA  | Disable  |
| Wire break monitoring enable for channel 1 |  | Enable   |
| Wire break monitoring enable for channel 2 |  |  |
| Wire break monitoring enable for channel 3 |  |  |
| Measurement type and range for channel 0   | You can set the measurement type and range separately for each channel<br>For voltage measurement:<br><br>For current measurement: | Channel not activated                            |
| Measurement type and range for channel 1   |  | ± 10 V<br>± 5 V<br>± 2.5 V<br>± 1.25 V           |
| Measurement type and range for channel 2   |  |  |
| Measurement type and range for channel 3   |  | ± 20 mA<br>0 ... 20 mA<br>4 ... 20 mA            |
| Representation of measured values          | Sets representation of the analog measured values for module   | SIMATIC S5<br>SIMATIC S7                         |
| Measured value representation              | Sets data format for analog value representation, SIMATIC S5   | Complement of twos<br>Amount with sign<br>Binary |

■ : Default

**Parameters for ET 200B-4AO**

Table 8-58 shows all the parameters for parameterizing the ET 200B-4AO with COM ET 200 Windows.

You can set these parameters for the ET 200B-4AO if you use the type file **SI8018AE.200**.

Table E-9 Parameters for ET 200B-4AO (6ES7 135-0HF01-0XB0)

| Parameter                           | Explanation  | Explanation   |
|-------------------------------------|--|---|
| Diagnostics enable for channel 0    | Diagnostics messages enabled separately for each channel     | Disable   |
| Diagnostics enable for channel 1    |  | Enable  |
| Diagnostics enable for channel 2    |  |   |
| Diagnostics enable for channel 3    |  |   |
| Output type and range for channel 0 | Type and range of output defined separately for each channel | ± 10 V<br>0 ... 10 V<br><br>± 20 mA<br>0 ... 20 mA<br>4 ... 20 mA |
| Output type and range for channel 1 | For voltage output:  |   |
| Output type and range for channel 2 | For current output:  |   |
| Output type and range for channel 3 |  |   |
| Representation of output values     | Sets representation of the analog values for module          | SIMATIC S5<br>SIMATIC S7  |

■ : Default

# Order Numbers

# F

## Introduction

If you require additional components for your ET 200B system or want to expand your PROFIBUS-DP, you will find the order numbers of the components you need in this chapter.

## In this Chapter

The components are listed in two groups:

- ET 200B components
- Accessories for PROFIBUS-DP; the entries are accompanied by references to the various manuals for the PROFIBUS-DP master and configuration software.

| Section | Describes                                 | Page |
|---------|---|------|
| F.1     | Order numbers for ET 200B components      | F-2  |
| F.2     | Order numbers for PROFIBUS-DP accessories | F-4  |

## F.1 Order Numbers for ET 200B Components

**Electronic Blocks** The following types of electronics block are available:

Table F-1 Order Numbers, Electronics Blocks for ET 200B

| Electronics Block      | Order Number        | Description  |
|------------------------|---------------------|--|
| ET 200B-16DI           | 6ES7 131-0BH00-0XB0 | Inputs: 16 × DC 24 V (3 ms)  |
| ET 200B-32DI           | 6ES7 131-0BL00-0XB0 | Inputs: 32 × DC 24 V (3 ms)  |
| ET 200B-32DI 0.2ms     | 6ES7 131-0BL10-0XB0 | Inputs: 32 × DC 24 V (0.2 ms)  |
| ET 200B-16DO           | 6ES7 132-0BH01-0XB0 | Outputs: 16 × DC 24 V (0.5 A/2 A)  |
| ET 200B-16DO/2A        | 6ES7 132-0BH11-0XB0 | Outputs: 16 × DC 24 V (2 A)  |
| ET 200B-32DO           | 6ES7 132-0BL01-0XB0 | Outputs: 32 × DC 24 V (0.5 A)  |
| ET 200B-8DI/8DO        | 6ES7 133-0BH01-0XB0 | Inputs: 8 × DC 24 V (3 ms)<br>Outputs: 8 × DC 24 V (0.5 A)                           |
| ET 200B-8DI/8DO HWA    | 6ES7 133-0BH10-0XB0 | Inputs: 8 × DC 24 V (3 ms)<br>Outputs: 8 × DC 24 V (0.5 A)/hardware shut-down        |
| ET 200B-16DI/16DO      | 6ES7 133-0BL00-0XB0 | Inputs: 16 × DC 24 V (3 ms)<br>Outputs: 16 × DC 24 V (0.5 A)                         |
| ET 200B-24DI/8DO       | 6ES7 133-0BN01-0XB0 | Inputs: 24 × DC 24 V (3 ms)<br>Outputs: 8 × DC 24 V (0.5 A)                          |
| ET 200B-24DI/8DO 0.2ms | 6ES7 133-0BN11-0XB0 | Inputs: 24 × DC 24 V (0.2 ms)<br>Outputs: 8 × DC 24 V (0.5 A)                        |
| ET 200B-8RO            | 6ES7 132-0GF00-0XB0 | Outputs: 8 × REL. DC 24 ... 60 V   |
| ET 200B-16DI-AC        | 6ES7 131-0HF00-0XB0 | Inputs: 16 × AC 120/230 V  |
| ET 200B-16DO-AC        | 6ES7 132-0HF00-0XB0 | Outputs: 16 × AC 120/230 V (0.5 A)   |
| ET 200B-16RO-AC        | 6ES7 132-0HH00-0XB0 | Outputs: 16 × REL. AC 120 V/DC 24 ... 150 V  |
| ET 200B-8DI/8RO-AC     | 6ES7 133-0HH00-0XB0 | Inputs: 8 × AC 120/230 V<br>Outputs: 8 × REL. AC 120 V/DC 24 ... 150 V               |
| ET 200B-4/8AI          | 6ES7 134-0KH01-0XB0 | 8 analog differential inputs <b>or</b> 4 x Pt 100 (measuring principle: integrating) |
| ET 200B-4AI            | 6ES7 134-0HF01-0XB0 | 4 analog differential inputs<br>(Measuring principle: successive approximation)      |
| ET 200B-4AO            | 6ES7 135-0HF01-0XB0 | 4 analog outputs   |

**Terminal Blocks** The following types of terminal block are available:

Table F-2 Order Numbers, Terminal Blocks for ET 200B

| Terminal Block | Order Number        | Description  |
|----------------|---------------------|--|
| TB1/DC         | 6ES7 193-0CA10-0XA0 | 16 channels, screw terminals, 3 tiers  |
| TB1-4/DC       | 6ES7 193-0CA20-0XA0 | 16 channels, screw terminals, 4 tiers  |
| TB2/DC         | 6ES7 193-0CB10-0XA0 | 32 channels, screw terminals, 3 tiers  |
| TB2-4/DC       | 6ES7 193-0CB20-0XA0 | 32 channels, screw terminals, 4 tiers  |
| TB3/DC         | 6ES7 193-0CA30-0XA0 | 16 channels, spring-latching terminals   |
| TB4/DC         | 6ES7 193-0CB30-0XA0 | 32 channels, spring-latching terminals   |
| TB4M/DC        | 6ES7 193-0CE30-0XA0 | 32 channels, spring-latching terminals with 4th terminal tier for extra ground connections |
| TB6/AC         | 6ES7 193-0CC10-0XA0 | 16 channels, screw terminals, 3 tiers  |
| TB8-analog     | 6ES7 193-0CD40-0XA0 | 4-/8 channels, spring-latching terminals   |

**Labeling Strips** You can order additional sets of labeling strips under the following order numbers:

Table F-3 Order Numbers, Labeling Strips

| Labeling Strips for  | Set of | Order Number        |
|--|--------|---------------------|
| 16DI, 16DO, 8DI/8DO, 8DI/8DO HWA                           | 10     | 6ES7 193-0BB00-0XA0 |
| 32DI, 32DI 0.2ms 32DO, 16DI/16DO, 24DI/8DO, 24DI/8DO 0.2ms | 7      | 6ES7 193-0BD00-0XA0 |
| 8RO  | 10     | 6ES7 193-0BA00-0XA0 |
| 16DO/2A  | 7      | 6ES7 193-0BC00-0XA0 |
| 16DI-AC, 16DO-AC, 16RO-AC, 8DI/8RO                         | 7      | 6ES7 193-0BF00-0XA0 |
| 4/8AI, 4AI, 4AO  | 10     | 6ES7 193-0BE00-0XA0 |

## F.2 Order Numbers for PROFIBUS-DP Accessories

### Introduction

This section contains a list of the order numbers for the PROFIBUS-DP accessories you need for ET 200B.

It also contains lists of the various manuals that you may need, depending on the PROFIBUS-DP master in use.

### Network Components for ET 200

Table F-4 shows all the network components for the ET 200 distributed I/O system that you may need in conjunction with ET 200B.

Table F-4 Accessories for the ET 200 Distributed I/O System

| Accessory  | Order Number                     |
|--|----------------------------------|
| RS 485 repeater, PROFIBUS-DP, IP 20                                      | 6ES7 972-0AA00-0XA0              |
| Bus connectors   |                                  |
| • without programmer adapter (max. 12 MB)                                | 6ES7 972-0BA10-0XA0              |
| • with programmer adapter (max. 12 MB)                                   | 6ES7 972-0BB10-0XA0              |
| • without programmer adapter, without terminating resistor (max. 1.5 MB) | 6ES7 972-0BA30-0XA0              |
| Bus cables   |                                  |
| • Normal   | 6XV1 830-0AH10                   |
| • Drum   | 6XV1 830-3BH10                   |
| • Underground  | 6XV1 830-3AH10                   |
| Repeater adapters  | 6GK1 510-1AA00                   |
| Optical link modules for fiber-optic waveguides                          | 6GK1 502-3AB00<br>6GK1 502-4AB00 |
| PROFIBUS-DP dropline   | 6ES7 901-4BD00-0XA0              |



**Manuals for ET 200 in SIMATIC S5** In order to program and start up an ET 200B with COM ET 200, you will need one of the manuals listed in Table F-5.

Table F-5 Manuals for ET 200 in SIMATIC S5

| Manual   | Contents  |
|--|---|
| ET 200 Distributed I/O System (6ES5 988-3ES.1) | <ul style="list-style-type: none"> <li>• Description of the IM 308-B master interface for S5-115U, S5-135U and S5-155U</li> <li>• Use of COM ET 200 V4.x</li> </ul>   |
| ET 200 Distributed I/O System (6ES5 988-3ES.2) | <ul style="list-style-type: none"> <li>• Description of the IM 308-C master interface for S5-115U, S5-135U and S5-155U</li> <li>• Description of the S5-95U with PROFIBUS-DP master interface</li> <li>• Use of COM ET 200 Windows</li> <li>• Working with the FB IM308C</li> </ul> |

**Manuals for STEP 7 and SIMATIC S7** In order to program and start up an ET 200B with STEP 7, you require the manuals listed in Table F-6.

To order manuals with 6ES7 order numbers: see Catalog ST 70

Table F-6 Manuals for STEP 7 and SIMATIC S7

| Manual   | Contents  |
|--|---|
| S7-300 Programmable Controller Hardware and Installation                             | Topics including <ul style="list-style-type: none"> <li>• Description of the PROFIBUS-DP interface of the CPU 315-2 DP</li> <li>• Structuring the PROFIBUS-DP network</li> <li>• Bus connectors and RS 485 repeaters</li> </ul> |
| M7-300 Programmable Controller Hardware and Installation                             | Topics including <ul style="list-style-type: none"> <li>• Description of the PROFIBUS-DP interfaces in M7-300</li> <li>• Structuring the PROFIBUS-DP network</li> <li>• Bus connectors and RS 485 repeaters</li> </ul>          |
| S7-400, M7-400 Programmable Controllers Module Specification                         | Topics including <ul style="list-style-type: none"> <li>• Description of the PROFIBUS-DP interfaces in S7-400 and M7-400</li> <li>• Structuring a PROFIBUS-DP network</li> <li>• Bus connectors and RS 485 repeaters</li> </ul> |
| System Software for S7-300 and S7-400 Program Design Programming Manual              | Topics including description of addressing and diagnostics in SIMATIC S7  |
| System Software for S7-300 and S7-400 System and Standard Functions Reference Manual | Description of the SFCs in STEP 7   |



# Glossary

## B

**Baud rate** Data transmission rate; specifies the number of bits transferred per second (baud rate = bit rate).

ET 200 supports baud rates from 9.6 kbaud to 12 Mbaud.

**Bus** Common transmission path connecting all stations; has two defined ends.  
In ET 200 the bus is a two-wire cable or a waveguide.

**Bus connector** Physical connection between bus station and bus cable.  
ET 200 has bus connectors with and without adapter for programming device/PC and having IP 20 and IP 65 protection ratings.

**Bus segment** → Segment

**Bus station** Device which can send or receive data via the bus or amplify this data, e.g. DP master, DP slave, RS 485 repeater, active star coupler.

## C

**Chassis ground** The entire range of interconnected inactive parts of a device that are not subject to any dangerous touch voltages even in the event of a fault.

**Coding plug** You set the input/output circuit of analog modules by means of the coding plugs.

**Coding slide switch** The setting of the coding slide switch on the → terminal block determines which → electronics block can be connected.

|                                   |   |
|-----------------------------------|---|
| <b>Configuring</b>                | Assigning addresses for the inputs/outputs of a slave station.  |
| <b>Control command</b>            | <p>A DP master can send commands simultaneously to a group of slaves to synchronize the slave stations.</p> <p>Event-driven synchronization of slave stations is possible using the control commands → FREEZE and → SYNC.</p>   |
| <b>CP 5410 S5-DOS/ST</b>          | Programming device interface for connection to SINEC L2 and to SINEC L2-DP. The CP 5410 S5-DOS/ST can be plugged into only the PG 730, 740, 750 and 770 programming devices.  |
| <b>D</b>                          |   |
| <b>Device-related diagnostics</b> | The highest level of slave-specific diagnostics. Device-related diagnostics refers to the entire slave.   |
| <b>Diagnostics</b>                | <p>The detection, pinpointing, classification and further evaluation of errors, faults, malfunctions and signals.</p> <p>Diagnostics provides monitoring functions which run automatically while the system is in operation. This enhances plant availability by reducing setup times and outages.</p> <p>ET 200 supports a number of diagnostics options ranging from an overview of the DO slaves which have reported diagnostics down to monitoring of individual channels.</p>  |
| <b>Diagnostics alarm</b>          | <p>Modules having diagnostics capability report systems to the central CPU by means of diagnostics alarms.</p> <p>In SIMATIC S7/M7: When an error is detected or disappears (e.g. wire break), the module triggers a diagnostics alarm if alarms are enabled. The CPU interrupts processing of the application program or lower priority classes and processes the diagnostics alarm block (OB 82).</p> <p>In SIMATIC S5: The diagnostics alarm is mapped within device-related diagnostics. Errors such as wire break, etc. are detected by regularly querying the diagnostics bits of device-related diagnostics.</p> |

---

|                                |   |
|--------------------------------|---|
| <b>Distributed I/O station</b> | <p>An input/output device used not in the central device but installed at a considerable distance from the CPU. Distributed I/O stations include:</p> <ul style="list-style-type: none"><li>• ET 200M, ET 200B, ET 200C, ET 200U</li><li>• DP/AS-I Link</li><li>• S5-95U with PROFIBUS-DP slave interface</li><li>• Other DP slaves from Siemens or other vendors</li></ul> <p>The distributed I/O stations connect to the DP master via the PROFIBUS-DP bus.</p>   |
| <b>DP master</b>               | <p>A → master which behaves in accordance with standard EN 50170, Part 3 is known as a DP master.</p>   |
| <b>DP slave</b>                | <p>A → slave which operates on the PROFIBUS with the PROFIBUS-DP protocol and which behaves in accordance with standard EN 50170, Part 3, is a DP slave.</p>  |
| <b>E</b>                       |   |
| <b>Electronics block</b>       | <p>Upper section of the ET 200B distributed I/O station. The electronics block contains the logic and plugs into the → terminal block.</p>  |
| <b>ET 200</b>                  | <p>The ET 200 distributed I/O system with the PROFIBUS-DP protocol is a bus for connecting distributed I/O to a CPU or an adequate DP master. ET 200 is characterized by fast reaction times since only small amounts of data (bytes) are transferred on the bus.</p> <p>ET 200 is based on the PROFIBUS standard EN 50170, Part 1, and the PROFIBUS-DP standard, EN 50170, Part 3.</p> <p>ET 200 operates on the master/slave principle. DP masters can be, for example, the IM 308-C master interface module or the CPU 315-2 DP.</p> <p>DP slaves can be the ET 200B, ET 200C, ET 200M, ET 200U distributed I/O stations or Siemens DP slaves or other-vendor devices.</p> |
| <b>F</b>                       |   |
| <b>Floating</b>                | <p>The reference potentials of control and load circuits are galvanically isolated in the case of floating I/O modules; this is achieved, for example, by means of optocouplers, relay contacts or line transformers. Input and output circuits may be grouped.</p>   |

**Floating-ground measurement**

Each signal line has its own signal reference line.

Floating-ground measurement is required,

- if the sensors are connected to different potentials and
- if different signal sources are physically apart.

**FREEZE**

A →control command issued by the DP master to a group of DP slaves.

When it receives the FREEZE control command, the DP slave freezes the current status of the **inputs** and transmits this information cyclically to the DP master.

Every time it receives a FREEZE control command, the DP slave re-freezes the status of its **inputs**.

The input data is not again cyclically transmitted by the DP slave to the DP master until the DP master sends the UNFREEZE control command.

**G**

**Ground-referenced measurement**

All signal reference lines are run to a common → reference potential.

**GSD file**

Device master data file; file in which the slave-specific characteristics such as number of inputs or outputs, number of diagnostics bits, SYNC-capability, etc. are defined. There is a GSD file for every Siemens DP standard slave.

You need this file only if you want to connect a DP standard slave to a DP master that is not a Siemens product. If you are using a Siemens DP master you do not need a GSD file. The device master data for Siemens DP masters is defined in the → type file (COM ET 200-specific format).

**I**

**IP 20**

Degree of protection to DIN 40050: protection against touch with the fingers and ingress of foreign bodies having a diameter larger than 12mm.

**M**

**Master**

When in possession of the token, the master can send data to other stations and request data from other stations (= active stations).

→ DP masters include, for example the CPU 315-2 DP and the IM 308-C.

**Master interface module** Module for distributed configuration. The distributed I/O "connects" to the PLC via the IM 308-C master interface module.

**Master/slave method** Bus access method in which only one station is the → DP master and all other stations are → DP slaves.

## N

**Non-floating** The reference potentials of control and load circuits are electrically connected in the case of non-floating I/O modules.

## P

**Parameterization master** Each DP slave has **one** parameterization master. On startup, the parameterization master downloads the parameterization data to the DP slave. The parameterization master has read and write access to the DP slave and can change the configuration of a DP slave.

**Process alarm** A process alarm is triggered by S7 modules with interrupt capability in response to certain events in the process. The process alarm is reported to the central CPU. The appropriate organization block is then processed, in accordance with the priority of the interrupt.

In SIMATIC S7/M7: An operating range is defined, for example by parameterizing an upper and lower limit value. If the process signal (e.g. temperature) of an analog input module exists this range, the module triggers a process alarm if alarms are enabled. The CPU interrupts processing of the application program or lower priority classes and processes the process alarm block (OB 40).

In SIMATIC S5: The process alarm is mapped within device-related diagnostics. Errors such as upper limit-value overshoot, etc. are detected by regularly querying the diagnostics bits of device-related diagnostics.

**PROFIBUS** PROcess FieLd BUS, German process and field-bus standard, defined by the PROFIBUS standard (EN 50170). It specifies the functional, electrical and mechanical characteristics for a bit-serial field bus system.

PROFIBUS is a bus system which networks PROFIBUS-compatible automation systems and field devices on the cell and field levels. PROFIBUS versions support the protocols DP (= Dezentrale Peripherie, distributed I/O), FMS (= Fieldbus Message Specification) or TF (= Technological Functions).

**PROFIBUS-DP** PROFIBUS system supporting the DP protocol. DP stands for "dezentrale Peripherie", or distributed I/O. The ET 200 distributed I/O system is based on the PROFIBUS-DP standard (EN 50170, Part 3).

Siemens also uses the designation "SINEC L2-DP" for PROFIBUS-DP.

**Protective ground conductor** A conductor required as a protective measure against electric shock currents. The symbol for the protective ground conductor is PE.

## R

**Reference potential** Potential in relation to which the voltages of the circuits concerned are considered and/or measured.

**Response monitoring time** A slave parameter in COM ET 200. If a slave station is not addressed within the response monitoring time, it automatically goes to the safe state, i.e. all outputs are set to "0".

## S

**Segment** The bus cable between two terminating resistors forms a segment. A segment contains 0 ... 32 → bus stations. Segments can be linked by → repeaters.

**Short-circuit** A conductive connection, caused by a fault, between conductors that are live in normal operation if no load resistance is inserted in the faulty circuit.

**Station number** Each ET 200 bus station must be assigned a station number. The programming device is addressed at station number "0".  
Masters and slaves are assigned station numbers in the range 3 ... 125. Exception: ET 200B is assigned a station number in the range 3 ... 99.

**STEP 7** Programming language for generating application programs for SIMATIC S7 controllers.

**SYNC** A → control command issued by the master to a slave.  
Using this control command, the master can freeze the outputs at the instantaneous value. The output data for the subsequent frames is stored, but the statuses of the outputs remain unchanged. The outputs are not updated until the master sends the UNSYNC control command.



**SYNC** A → control command issued by the DP master to a group of DP slaves.

Using this control command, the DP master instructs the DP slave to freeze the **outputs** at the instantaneous value. In subsequent frames the slave stores the output data, but the statuses of the outputs remain unchanged.

Every time it receives a SYNC control command, the DP slave sets the outputs it had stored as output data.

The outputs are not again cyclically updated until the DP master sends the UNSYNC control command.

## T

**Terminal block** The terminal block carries the hard wiring. The → electronics block plugs into the terminal block.

**Terminating resistor** Resistor for matching the impedance of bus cables; terminating resistors are always required at the ends of cables or segments.

In ET 200 the terminating resistors are activated/deactivated in → bus connectors.

**Type file** File required by COM ET 200 for configuring a slave station. The type file contains the definitions of the slave-specific characteristics, for example number of inputs or outputs, number of diagnostics bytes, SYNC capability, etc.

Each ET 200B station type has its own type file, which is generated by Siemens, forms a component part of COM ET 200 (version 4.1 and later) or is supplied with the manual.

## W

**Wire break** A break in the lines to a sensor or a fault in the sensor itself.



# Index

## A

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