User Manual

TesiMod Operating Terminal BT2

Part Number: 80 860.569

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Version	Date	Modifications
1	29 July 1999	First Edition
2	10 November 2003	INTERBUS interface added.

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Overall Table of Contents

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1 Important Notes

1.1 Symbols

The symbols in this manual are used to draw your attention on notes and dangers.

1.1.1 General Symbols

Danger
This symbol is used to refer to instructions which, if ignored or not carefully followed could result in personal injury.

Note
This symbol indicates application tips or supplementary notes.

Reference to source of information
This symbol refers to detailed sources of information on the current topic.

1.1.2 Specific Symbols

The following symbols indicate specific dangers which could result in damage to equipment or personal injury or even up to the death of the operator.

Danger - Electric Shock

Danger - Corrosive

Danger - Toxic

Danger - Explosive

Danger - Fire

Danger - Infrared Light

Danger - Electrostatic Charge

1.2   Safety Notes

- Read this manual carefully before using the operating device. Keep this manual in a place where it is always accessible to all users.
- Proper transportation, handling and storage, placement and installation of this product are prerequisites for its subsequent flawless and safe operation.
- This user manual contains the most important information for the safe operation of the device.
- The user manual, in particular the safety notes, must be observed by all personnel working with the device.
- Observe the accident prevention rules and regulations that apply to the operating site.
- Installation and operation must only be carried out by qualified and trained personnel.

1.3   Intended Use

- The device is designed for use in the industry.
- The device is state-of-the art and has been built to the latest standard safety requirements. However, dangerous situations or damage to the machine itself or other property can arise from the use of this device.
- The device fulfills the requirements of the EMC directives and harmonized European standards. Any modifications to the system can influence the EMC behavior.

1.4   Target Group

All configuration, programming, installation, commissioning, operating and maintenance work in connection with the automation system must be performed by trained personnel only (e.g. qualified electricians, electrical engineers, etc.).

The configuration and programming personnel must be familiar with the safety concepts of automation technology.

The operating personnel must have been trained in handling the controller and be familiar with the operating instructions.

The installation, commissioning and maintenance personnel must have an education which entitles them to work on automation systems.

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2 Installation and Commissioning

2.1 Unpacking the Device

Unpack all parts carefully and check the contents for any visible damage in transit. Also check whether the shipment matches the specifications on your delivery note.

If you notice damages in transit or discrepancies, please contact our sales department immediately.

2.2 Mounting the Device

⚠️ When installing the operating device, keep a minimum clearance of 30 mm (1.181") around the operating device to ensure adequate air circulation.

⚠️ When the operating device is installed horizontally, please note that additional sources of heat beneath the operating device may result in heat accumulation.
Make sure to allow sufficient heat dissipation!
Comply with the allowable temperature range listed in the technical data for the use of the operating device!

⚠️ To maintain the specified degree of protection, make sure the seal is evenly seated on the installation surface and the hexagon nuts are tightened uniformly.
Ensure that the maximum torque of 0.6 Nm is not exceeded.

The operating device can be easily and quickly mounted from the rear of the operating device. This is particularly recommended for mounting in switchboards with a plate thickness of approx. 1 mm to 6 mm (0.039" to 0.236").

1. Insert the operating device from the front through the mounting cutout.
2. Fasten the operating device using hexagon nuts.

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2.2.1   Front Panel Dimensions
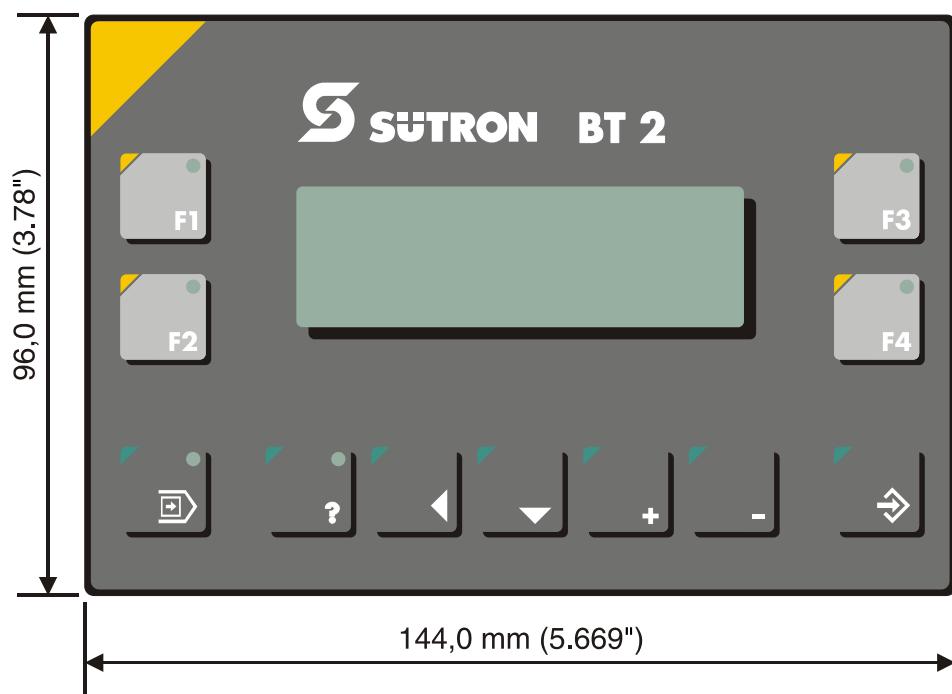
Figure 2-1   Front panel dimensions

2.2.2 Mounting Cutout
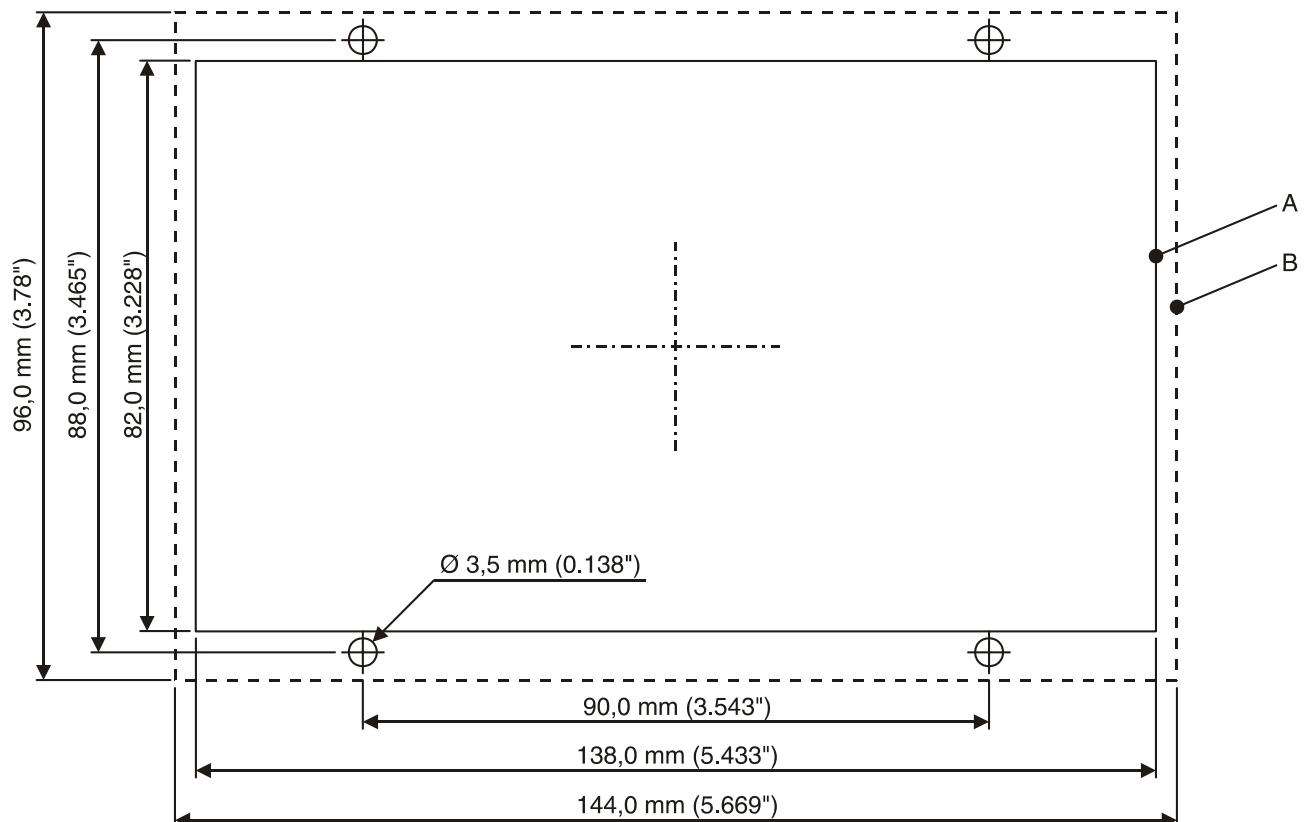
Figure 2-2   Mounting cutout

A   Mounting Cutout
B   Front Panel

2.2.3   Side View, Mounting Depth
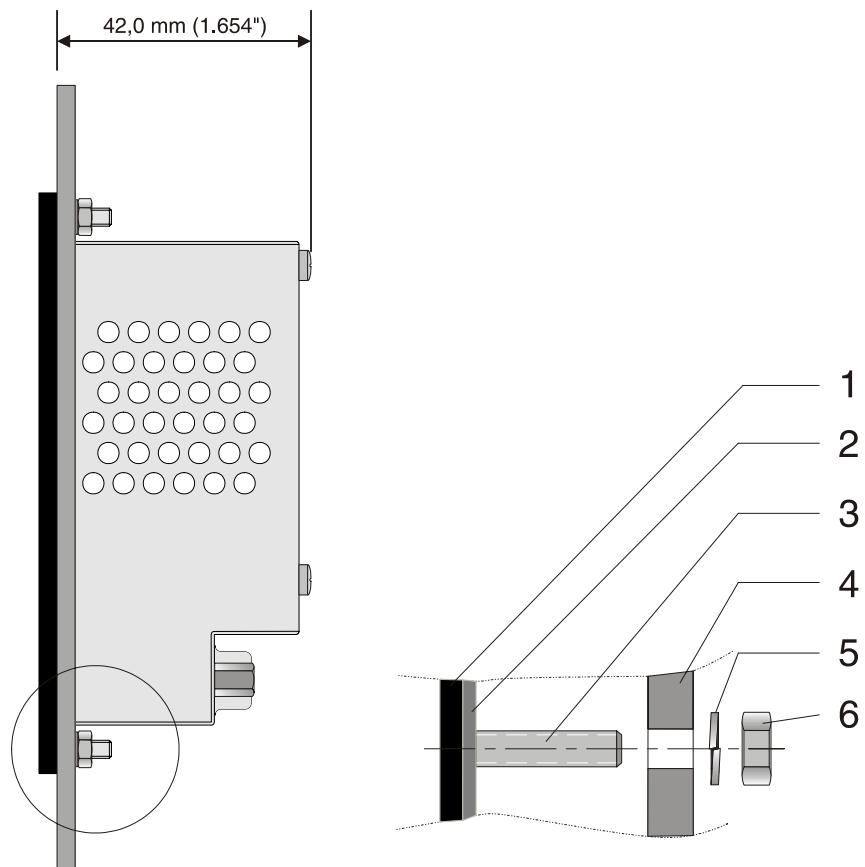
Figure 2-3   Side view, mounting depth

1   Front Panel

2   Circumferential Seal

3   Press-in Threaded Bolt M3 x 12 mm (0.709")

4   Mounting Surface Thickness 1 mm to 6 mm (0.039" to 0.236")

5   Spring Lock Washer B3 DIN 127 Form B (not supplied)

6   Nut M3 DIN 934 (not supplied)

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2.3 Connecting the Device

2.3.1 Supply Voltage 24 V

The supply voltage is connected via the connector X1.

The unit is equipped with a reverse voltage protection. If the polarity is not correct, the unit does not operate.

This unit conforms to the safety class I. For safe operation it is necessary to use safety extra-low voltage (SELV) in accordance with DIN EN 61131 for the supply voltage.

Connector in the operating device: 3-pin connector Phoenix Contact COMBICON MSTBV 2,5/3-GF.

Table 2-1   Pin assignment supply voltage

Pin	Designation	Function
1	⏚	Low-noise earth
2	0 V	Supply voltage 0 V
3	24 VDC	Supply voltage 24 VDC

The suitable female connector Phoenix Contact COMBICON MSTB 2,5/3-STF is supplied.

Cables with finely stranded conductors with a minimum cross-section of 0.75 mm² (18 AWG) and a maximum cross-section of 2.5 mm² (14 AWG) must be used for the supply voltage.

Hazardous voltages can exist inside electrical installations that can pose a danger to humans. Coming in contact with live parts **may result in electric shock!**

Use the following procedure to connect the operating device to the supply voltage:

1. Strip approx. 30 mm (1.181") off the outer cable sheath and approx. 5 mm (0.197") off the wires.
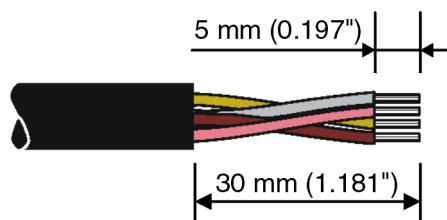
Figure 2-4   Preparing the cable

2. Fit the wires with wire end ferrules and connect the wires to the connector.
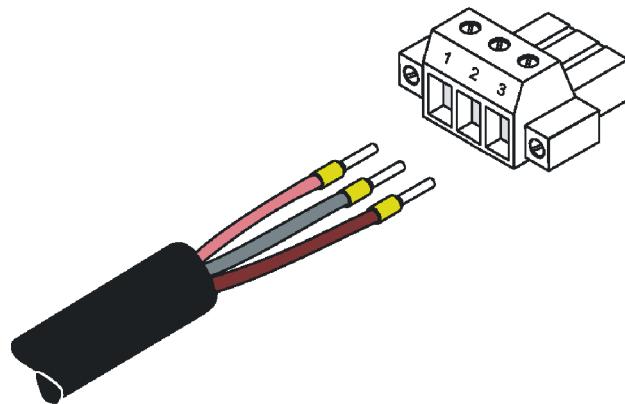
Figure 2-5   Connecting the female connector strip

If shielded connecting cables are used in the supply voltage area, the shield should be connected to pin 1.

3.   Plug the female connector strip onto connector X1.
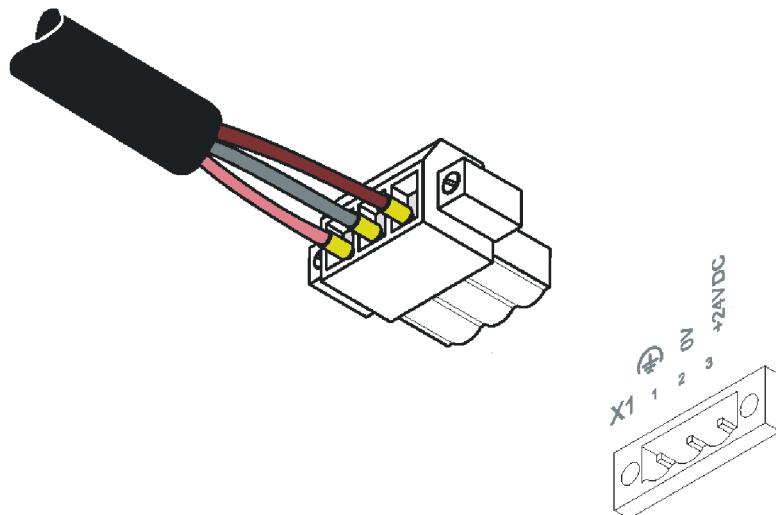
Figure 2-6   Female connector strip is plugged on

4.   Secure the female connector strip in place with a screw-type locking to prevent it from slipping out.

A separate conductor must always be provided for the protective grounding at the threaded bolt. The conductor must have a minimum cross-section of 1.5 mm² (16 AWG) and must be kept as short as possible. Complying with this will increase operating safety

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2.4 Switching the Device on

After you applied the supply voltage, a system test is carried out during which the modules in the operating device are tested and initialized. All status LEDs are activated for a short time. A number of system and error messages can be output by the system test. If the application memory contains a valid project, the first mask, i.e. the „Start mask" or the mask defined in the TSwin language parameters as the Start-up mask appears on the display.

The „Start mask" is displayed for 5 seconds. This is a fixed time setting. After this time has elapsed, the „Main mask" or the mask defined in the language parameters as the Main mask appears on the display. This is the first mask of the operator guidance.

When you push any button while the „Start mask" is displayed, the „Setup mask" appears. In this mask you define the parameters for the interfaces and the operating device.

2.5 Identification

You can identify the operating device by the nameplate on the rear.
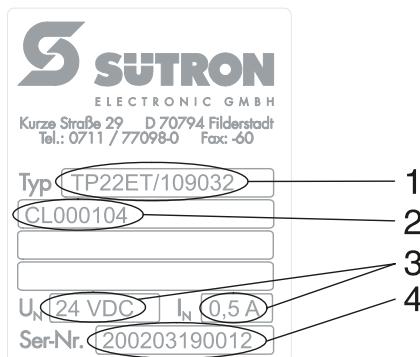
Figure 2-7   Nameplate (example)

1   Order Number
2   Firmware Version (Version on Delivery)
3   Voltage and Current
4   Serial Number

Depending on the size of the display, you will be able to read various types of information as the operating device is initialized: clock frequency, application memory size, current firmware version, TSwin version, project name, time, date, number of compilation runs and a random number.

Because the initialization mask is visible only for a few seconds there is a possibility to represent this mask for a longer time period.

1. Hold down an arbitrary key at the operating device to generate an error message.
2. Read the firmware version now.
3. Release the key to complete the initialization procedure of the operating device.

3 Control and Display Elements

3.1 Keyboard

The keys are positioned under an environmental-proof polyester foil. You project the operating principle of the keys in the programming software.
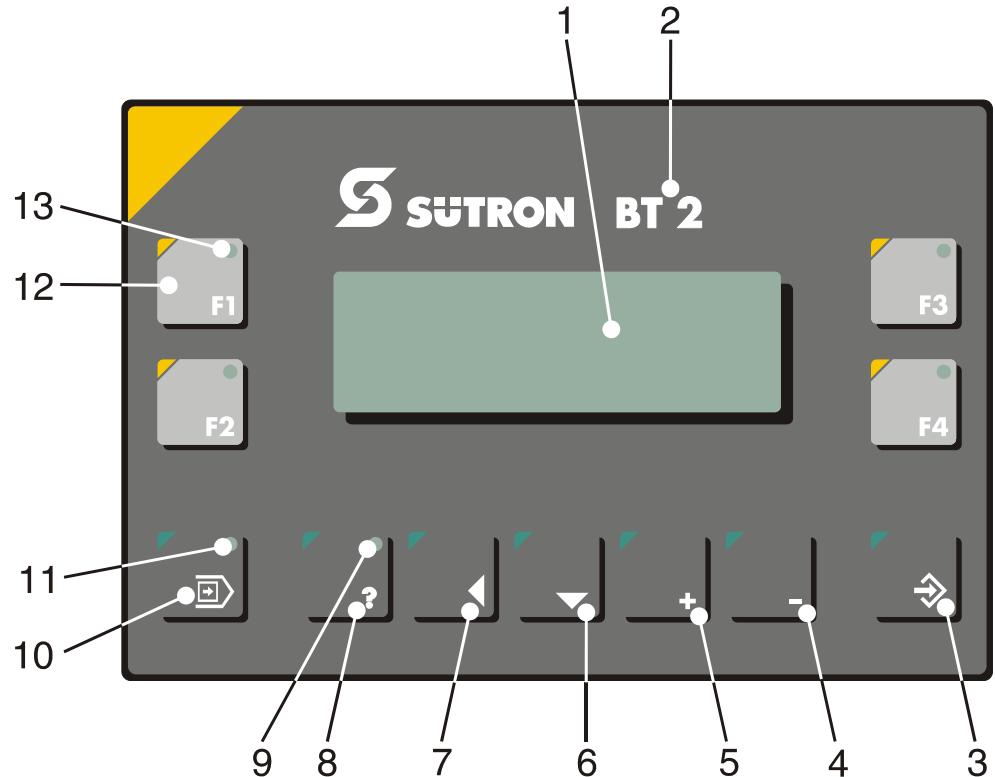
Figure 3-1   Front view

1 Display
2 Device Designation
3 Special Key Enter
4 Editing Key Minus
5 Editing Key Plus
6 Control Key Cursor Down
7 Control Key Cursor Left
8 Special Key Help
9 Status LED Help
10 Special Key Data Release
11 Status LED Data Release
12 Function Key
13 Status LED Function Key

3.1.1 Editing Keys
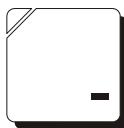
The key **Minus** is used to enter negative values within the editor. In the increment editor, the variable value is decreased by 1. When the key is held down, the function is repeated at an automatically increasing rate of repetition.
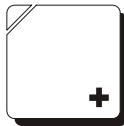
The key **Plus** is used to enter positive values within the editor. In the increment editor, the variable value is increased by 1. When the key is held down, the function is repeated at an automatically increasing rate of repetition.

3.1.2 Control Keys

The key **Cursor left** can be programmed to directly select adjacent I/O masks. In the editor, it moves the cursor within a variable to the left by one character (character selection).

The key **Cursor down** can be programmed to directly select adjacent I/O masks. In the editor, it moves the cursor downwards to the next variable (variable selection).

3.1.3 Special Keys

The key **Help** always displays the current help text (online help). The help key LED flashes when a system message is pending. The system message is always displayed in plain-text.

The key **Data Release** is used to switch from the menu into the editor. The integrated LED lights up in the editing mode if the external data release has been set. When the Data Release key is pressed within the editor, the editing mode is exited.

The key **Enter** is used to conclude data entry. When pressed while in the Startup Mask, the key switches into the Setup Mask.

3.1.4 Function Keys

The function of the function keys is freely assignable (with soft key functions). The function keys can be used either as direct keys for menu control or for triggering a function in the controller.

3.1.4.1 Function Key Arrangement

Figure 3-2   Arrangement of the Function Keys

3.1.4.2 Slide-in Identification Strips for the Function Keys

The identifications strips can be replaced when the operating device is removed. Inserting the strip from the rear side of the front plate does not influence the specified seal of the operator terminal. A set of identification strips is supplied with the operator terminal.

For the labeling use:

Single pieces, prototypes	Label with a water-resistant pen
Small series	Copying foil with laser print
Large series	Customer-specific labeled identification strips
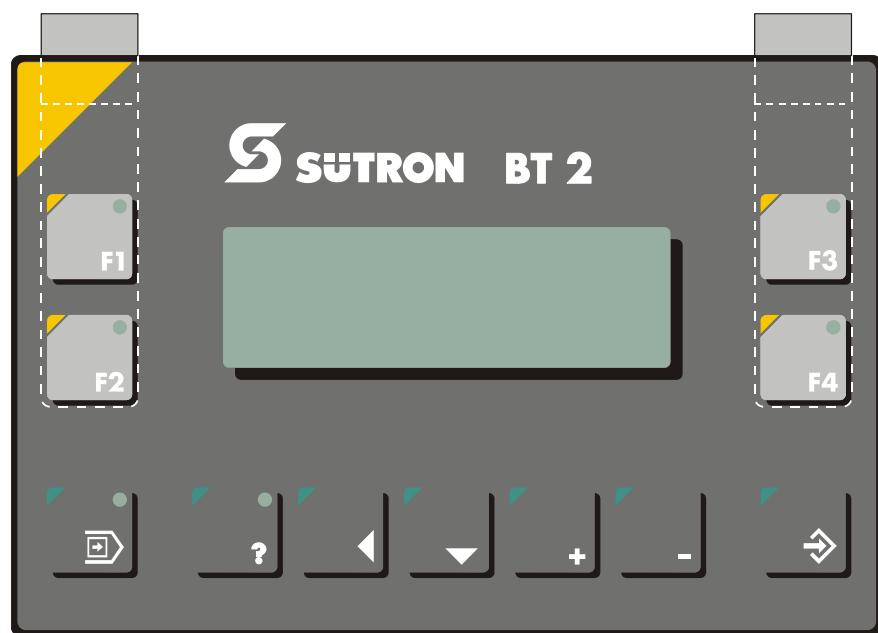
Figure 3-3   Position of the slide-in identification strips
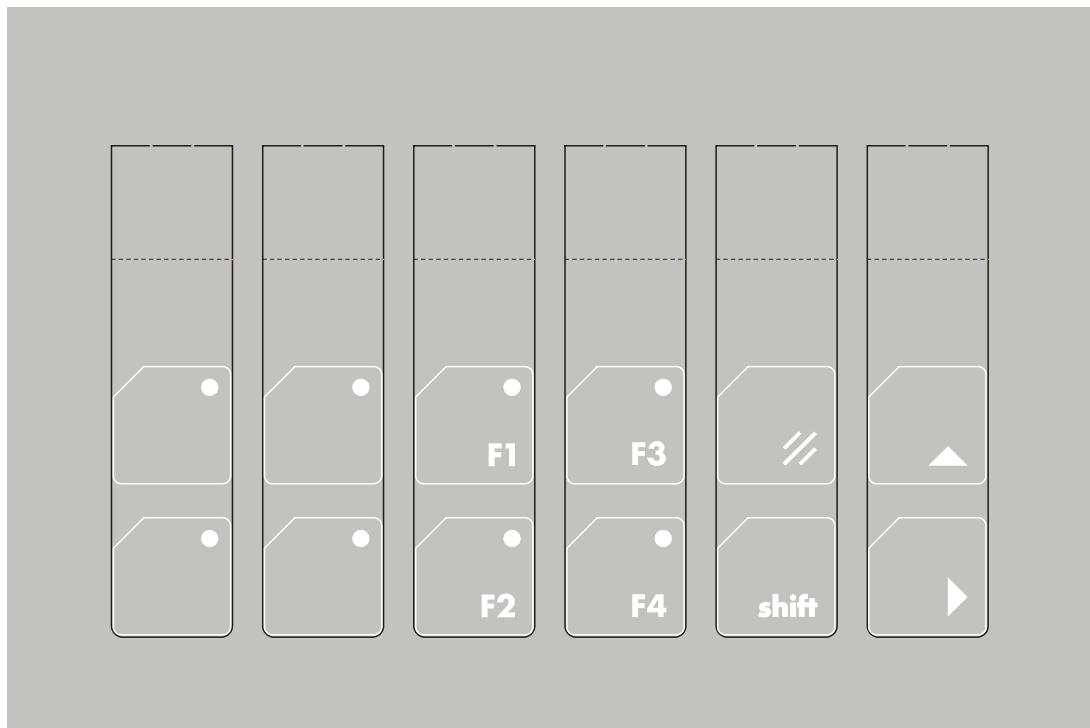
Figure 3-4   Set of slide-in identification strips

3.2   User Mode Switch

The user mode switch is installed at the rear of the operating device.

The switch positions for ON or OFF are shown on the user mode switch.

Table 3-1   User mode switch

S1	S2	S3	S4	Function
I	X	–	–	Standard mode with PLC (default upon delivery)
I	X	I	–	Standard mode without PLC
–	I	–	–	Transparent-Mode with start- and stop code of the keys
–	–	–	I	Transparent-Mode without stop code of the keys
I	–	–	I	Activate download (erases the application memory) and default contrast / brightness setting
I	–	I	I	Activate upload

Legend for table:

I = Switch ON

– = Switch OFF

X = Any switch position

3.3　　Display

Danger - Toxic!
If the display is damaged, avoid touching, swallowing or breathing in the liquids or gases which may leak out!

Danger - Corrosive!
If the display is damaged, avoid touching, swallowing or breathing in the liquids or gases which may leak out!

The operating device is equipped with different displays depending on variant.

3.3.1　　Contrast Setting

To define the contrast setting, use the programming software to set up the system variable**LcdContrast** in any mask.

To do so, follow the instructions listed in the programming software's help topic "How do I specify the contrast setting for the operating device".

In the programming software, enter the following values as lower and upper limits for the representation type.

Table 3-2　　Values for the representation type

Display type	Order number	Lower limit	Upper limit	Default set-ting
LCD	BT2-xx/xxxxxx	- 25	+ 70	+ 25
	BT2K-xx/xxxxxx			
VF	BT2VF-xx/xxxxxx	1	4	0

Operating devices with VF display use the following contrast values at transgression of the limiting values.

Table 3-3　　VF display contrast

Input value	Contrast value	Contrast
< 1	2	50%
1	1	25%
2	2	50%
3	3	75%
4	4	100%
> 4	2	50%

If you do not configure the system variable **LcdContrast**, the default setting is used when the device is initialized.

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If you did set-up the system variable, you can set the contrast as follows. Open the mask where you set up the system variable and:

1. Press the data release key if the data release is not automatically active.
2. Enter a new value for the contrast. To do so, use the keys plus and minus.
3. Confirm with Enter.
4. Finally press the data release key.

The new contrast setting becomes effective immediately after the Enter key is pressed. If necessary, repeat the steps two and three until you are satisfied with the contrast.

3.3.2 Default Contrast Setting

If the contrast setting is such that it is no longer possible to read the masks, you can use the user mode switch to reset the contrast to the default value.

See chapter "User Mode Switch" on page 3-4.

The switch position for the default contrast is identical with the „Activate download via hardware". The contrast is reset before a corresponding message is displayed. The warning will be displayed in a legible manner.

To restore the default contrast / brightness:

1. Switch the device off.
2. Set the switches S1 and S4 of the user mode switch to ON.
3. Switch the device on again.
4. When the warning appears, switch the device off again.
5. Set switch S4 to OFF.
6. Then switch the device on again.

The application will not be lost.

3.3.3 Character Attributes

The following character attributes can be displayed on the device:
– Normal
– Flashing

3.3.4 Fonts

You are able to use internal the font „Normal". Depending on the display variant you can use the fonts as follows:

Table 3-4   Fonts

Display type	Order number	Font
VF	BT2VF-xx/xxxxxx	Katakana
LCD	BT2-xx/xxxxxx	Katakana
LCD	BT2K-xx/xxxxxx	Cyrillic

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3.3.4.1 Font Katakana

Figure 3-5   Font Katakana

3.3.4.2   Font Cyrillic

Figure 3-6   Font Cyrillic

4 Interfaces of the Device

The device can either be supplied as a standard device or field bus device.

Depending on the device variant, several interfaces are available to you:

Table 4-1   Device variants

Order number	Available interfaces				
	RS232c (X3)	TTY / 20mA, RS485, RS232c (X2-SER1/SER2)	INTERBUS	MPI	PROFIBUS-DP
BT2-xx/10xxxx	-	X	-	-	-
BT2-xx/06xxxx	X	-	X	-	-
BT2-xx/16xxxx	X	-	-	X	-
BT2-xx/08xxxx	X	-	-	-	X

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4.1 Standard Interfaces

The universal interface X2 combines several interface standards in one connector. The connector is divided into two channels. The communication channel (SER1) is operated separately from the channel for the upload/download/logging printer/scanner (SER2).

For the communication channel (SER1), the protocol-specific use only allows one of the three interface standards to be used.
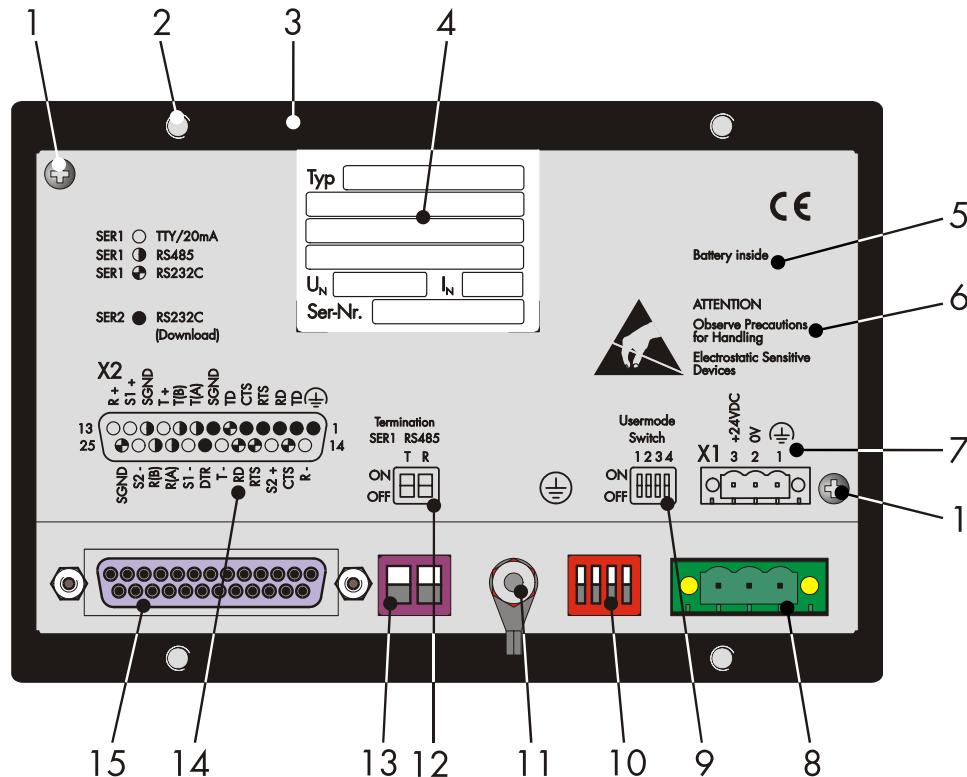
Figure 4-1   Rear view standard device

1 Fastening Screws

2 Mounting Bolts

3 Front Panel

4 Nameplate

5 Battery Information

6 Warning

7 Assignment Connector X1 (Supply Voltage)

8 Connector X1 (Supply Voltage)

9 Switch Assignment User Mode Switch

10 User Mode Switch

11 Threaded Bolt for Protective Ground

12 Switch Assignment Termination Switch (X2-SER1 RS485)

13 Termination Switch (X2-SER1 RS485)

14 Assignment Female Connector X2 (TTY/RS485/RS232c)

15 Female Connector X2 (TTY/RS485/RS232c)

4.1.1   TTY / 20 mA Current Loop (X2-SER1)

Depending on the wiring, it is possible to connect the interface either as an active or passive current loop. The transmit line and the receive line are each provided with a separate 20 mA power source. The compliance voltage is approx. 24 VDC.

The 20 mA power should be supplied by the transmitter unit. This decreases crosstalk on the signal lines considerably.

In idle state (signal logic 1), a 20 mA current loop can be measured in the cable.

Signal Logic 1	Current Flow 20 mA
Signal Logic 0	Current Flow Interrupted

4.1.1.1   Pin Assignment

Connector in the terminal: 25 pin D-SUB female connector strip.

Table 4-2   Pin assignment TTY / 20 mA, passive

Pin	Designation	Function
10	T+	Transmitted Data, Positive Polarity
13	R+	Received Data, Positive Polarity
14	R-	Received Data, Negative Polarity
19	T-	Transmitted Data, Negative Polarity

Table 4-3   Pin assignment TTY / 20 mA, active

Pin	Designation	Function
10	T+	Transmitted Data, Positive Polarity
12	S1+	Power Source 1, Positive Polarity
13	R+	Received Data, Positive Polarity
14	R-	Received Data, Negative Polarity
16	S2+	Power Source 2, Positive Polarity
19	T-	Transmitted Data, Negative Polarity
21	S1-	Current Sink 1, Negative Polarity
24	S2-	Current Sink 2, Negative Polarity

The D-SUB connector strips must be shielded sufficiently.
See chapter "Shielding D-SUB Connectors" on page 4-17.

4.1.1.2   Termination

For the operation of channel SER1 as a current loop, the termination for the RS485 must be deactivated.

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4.1.2   RS485 (X2-SER1)

The interface is suitable for point-to-point and for multi-point connections.

The wires belonging together are marked with „A" and „B". Some descriptions refer to the pins with „+" and „-" , where A = + and B = -.

Signal Logic 1   UA - UB <= -0.3 V i.e. (UA < UB)

Signal Logic 0   UA - UB >= +0.3 V i.e. (UA > UB)

4.1.2.1   Pin Assignment

Connector in the operating device: 25 pin D-SUB female connector strip.

Table 4-4   Pin assignment RS485

Pin	Designation	Function
8	T(A)	Transmitted Data (-)
9	T(B)	Transmitted Data (+)
11	SGND	Signal Ground
22	R(A)	Received Data (-)
23	R(B)	Received Data (+)

☞ The D-SUB connector strips must be shielded sufficiently.
See chapter "Shielding D-SUB Connectors" on page 4-17.

4.1.2.2   Termination

For point-to-point connections, always activate the termination. For multi-point connections, only activate the termination at the cable end.
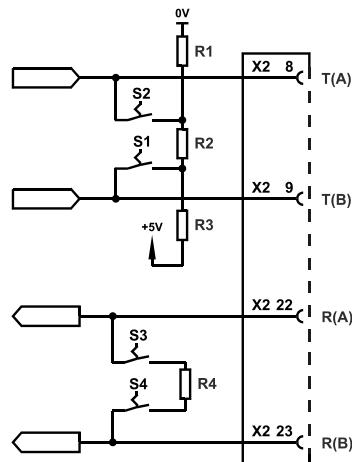
Figure 4-2   Block diagram termination RS485

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Table 4-5   Resistance values termination RS485

Designation	Value
R1, R3	510 Ohm
R2	150 Ohm
R4	120 Ohm

The switch positions for ON or OFF are printed onto the termination switch. Only the specified switch positions are permitted.

Table 4-6   Termination switch

S1	S2	S3	S4	Function
Transmitter		Receiver		
I	I	I	I	Termination is ON
–	–	–	–	Termination is OFF

Legend for table:

I = Switch ON

– = Switch OFF

4.1.3   RS232c (X2-SER1)

The interface is suitable to establish a point-to-point connection.

4.1.3.1   Pin Assignment

Connector in the operating device: 25 pin D-SUB female connector strip.

Table 4-7   Pin assignment RS232c

Pin	Designation	Function
6	TD	Transmitted Data
15	CTS	Clear to Send
17	RTS	Request to Send
18	RD	Received Data
25	SGND	Signal Ground

The D-SUB connector strips must be shielded sufficiently.
See chapter "Shielding D-SUB Connectors" on page 4-17.

4.1.3.2   Termination

For the operation of channel SER1 as a RS232, the termination for the RS485 must be OFF.

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4.1.4   RS232c (X2-SER2)

The interface is only designed to be used for downloads, uploads, a scanner or a logging printer because the interface is not electrically isolated.

4.1.4.1   Pin Assignment
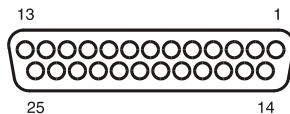
Figure 4-3   25 pin D-SUB female connector strip

Connector in the operating device: 25 pin D-SUB female connector strip.

Table 4-8   Pin assignment RS232c

Pin	Designation	Function
1	⏚	Low-Noise Ground
2	TD	Transmitted Data
3	RD	Received Data
4	RTS	Request to Send
5	CTS	Clear to Send
7	SGND	Signal Ground
20	DTR	Data Transfer Request

☞ The D-SUB connector strips must be shielded sufficiently.
See chapter "Shielding D-SUB Connectors" on page 4-17.

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4.2 Field Bus Interfaces

4.2.1 INTERBUS (X2.1/X2.2) and RS232c (X3)

The device can be integrated into the INTERBUS using the interfaces available for INTERBUS connections.
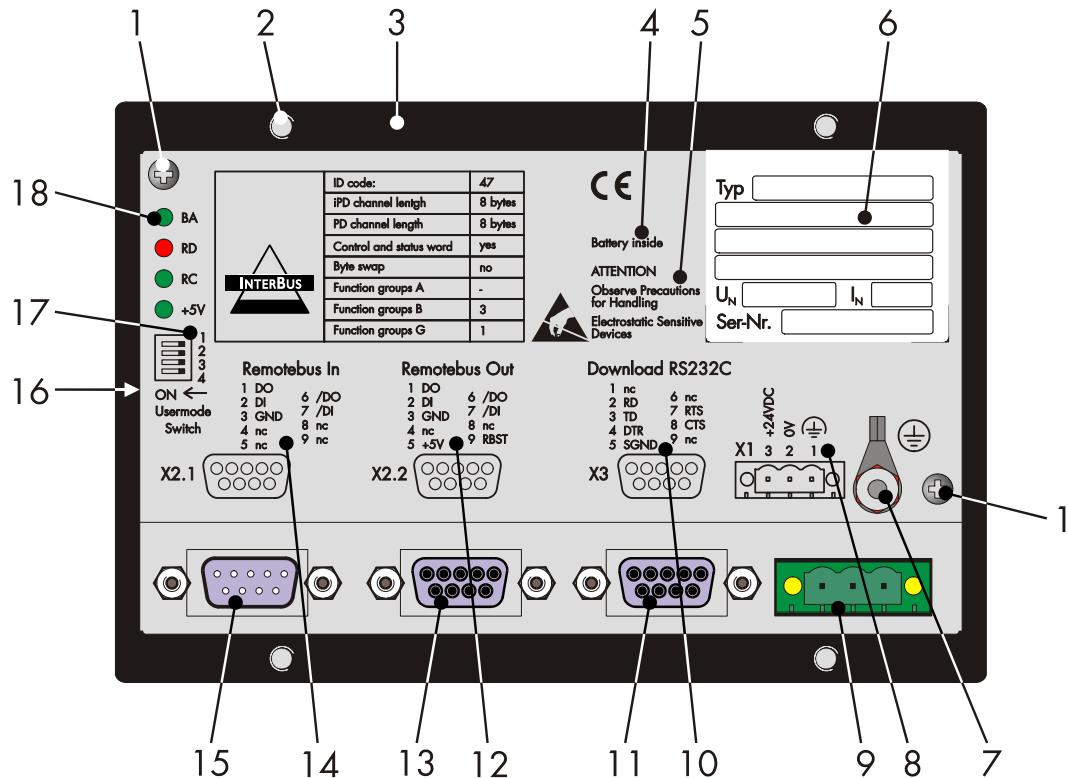
Figure 4-4   Rear view INTERBUS

1   Fastening Screws

2   Mounting Bolts

3   Front Panel

4   Battery Information

5   Warning

6   Nameplate

7   Threaded Bolt for Protective Ground

8   Assignment Connector X1 (Supply Voltage)

9   Connector X1 (Supply Voltage)

10 Assignment Female Connector X3 (RS232c)

11 Female Connector X3 (RS232c)

12 Assignment Female Connector X2.2 (Remote Bus Out)

13 Female Connector X2.2 (Remote Bus Out)

14 Assignment Connector X2.1 (Remote Bus In)

15 Connector X2.1 (Remote Bus In)

16 Switch Assignment User Mode Switch

17 User Mode Switch

18 Diagnostics LEDs

4.2.1.1 Pin Assignment

Connector in the operating device: 9 pin D-SUB male connector strip for remote bus in.

Table 4-9   Pin assignment remote bus in (INTERBUS)

Pin	Designation	Function
1	DO	Data Output
2	DI	Data Input
3	GND	Ground
4	nc	Not Connected
5	nc	Not Connected
6	/DO	Data Output, Inverted
7	/DI	Data Input, Inverted
8	nc	Not Connected
9	nc	Not Connected

Connector in the operating device: 9 pin D-SUB female connector strip for remote bus out.

Table 4-10   Pin assignment remote bus out (INTERBUS)

Pin	Designation	Function
1	DO	Data Output
2	DI	Data Input
3	GND	Ground
4	nc	Not Connected
5	+5 V	Power Supply +5 VDC
6	/DO	Data Output, Inverted
7	/DI	Data Input, Inverted
8	nc	Not Connected
9	RBST	Remote Bus Status

The interface X3 is only designed to be used for downloads, uploads, a scanner or a logging printer because the interface is not electrically isolated.

Connector in the operating device: 9 pin D-SUB female connector strip.

Table 4-11   Pin assignment RS232c

Pin	Designation	Function
1	nc	Not Connected
2	RD	Received Data
3	TD	Transmitted Data
4	DTR	Data Transfer Request
5	SGND	Signal Ground

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Table 4-11   Pin assignment RS232c

Pin	Designation	Function
6	nc	Not Connected
7	RTS	Request to Send
8	CTS	Clear to Send
9	nc	Not Connected

The D-SUB connector strips must be shielded sufficiently.
See chapter "Shielding D-SUB Connectors" on page 4-17.

4.2.1.2   Cable

A shielded twisted-pair cable (cable type LiYCY-TP) must be used. The maximum cable length depends on its use within the INTERBUS topology.

4.2.1.3   Diagnostic

The diagnostics LEDs are located at the rear of the operating device. The LEDs show the states of the bus system

⬤ BA
🔴 RD
⬤ RC
🟢 +5V

Figure 4-5   Arrangement of the INTERBUS diagnostics LEDs

The diagnostics LEDs at the operating device has the following functions:

Table 4-12   Functions of the INTERBUS diagnostics LEDs

Designation	Color	State	Function
RC	Green	On	Remote Bus Check
+5V	Green	On	Supply Voltage OK
		Off	No Supply Voltage
BA	Green	On	Bus Active
		Off	Bus Not Active
RD	Red	On	Remote Bus Inactive

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4.2.2   MPI (X2) and RS232c (X3)

The device can be integrated into a Siemens MPI bus structure using the interface available for Siemens MPI connections.
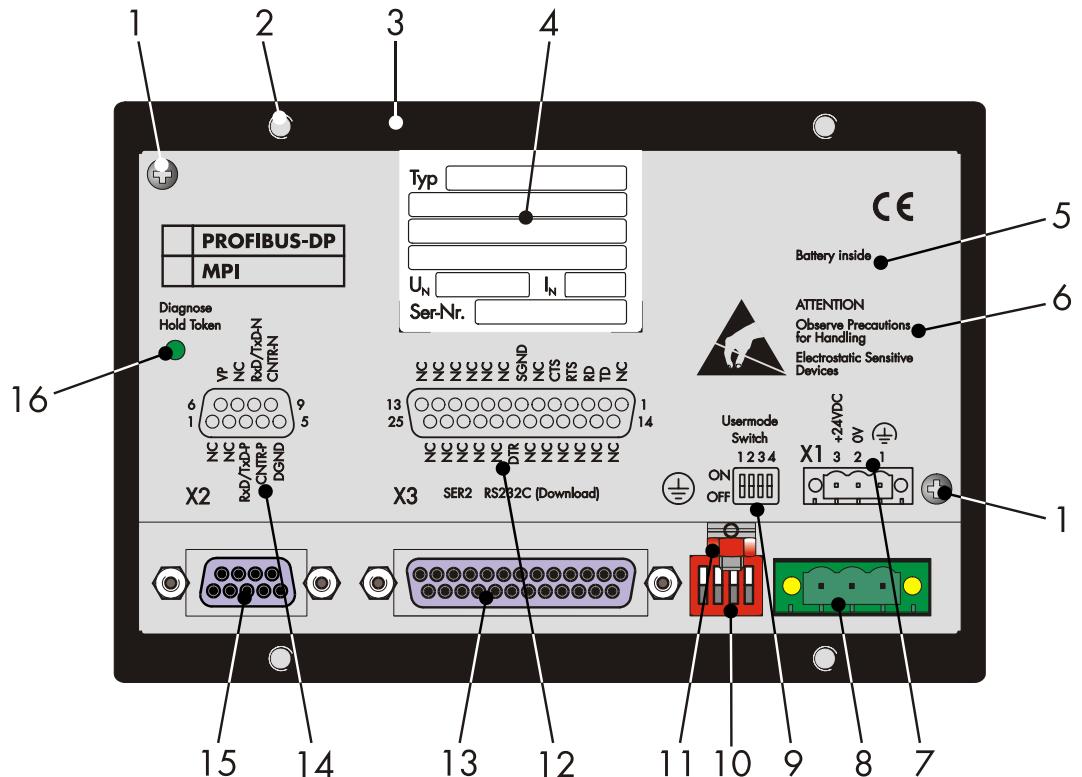
Figure 4-6   Rear view MPI

1 Fastening Screws

2 Mounting Bolts

3 Front Panel

4 Nameplate

5 Battery Information

6 Warning

7 Assignment Connector X1 (Supply Voltage)

8 Connector X1 (Supply Voltage)

9 Switch Assignment User Mode Switch

10 User Mode Switch

11 Threaded Bolt for Protective Grounding

12 Assignment Female Connector X3 (RS232c)

13 Female Connector X3 (RS232c)

14 Assignment Female Connector X2 (MPI)

15 Female Connector X2 (MPI)

16 Diagnostics LED

4.2.2.1 Pin Assignment

Connector in the operating device: 9 pin D-SUB female connector strip.

Table 4-13   Pin assignment MP

Pin	Designation	Function
1	nc	Not Connected
2	nc	Not Connected
3	RxD/TxD-P	Received Data / Transmitted Data Plus
4	CNTR-P	Repeater Control Signal Plus
5	DGND	Data Transmission Potential
6	VP	Supply Voltage of Terminators Plus
7	nc	Not Connected
8	RxD/TxD-N	Received Data / Transmitted Data Minus
9	CNTR-N	Repeater Control Signal Minus

The interface X3 is only designed to be used for downloads, uploads, a scanner or a logging printer because the interface is not electrically isolated.

Connector in the operating device: 25 pin D-SUB female connector strip.

Table 4-14   Pin assignment RS232c

Pin	Designation	Function
1	nc	Not Connected
2	TD	Transmitted Data
3	RD	Received Data
4	RTS	Request to Send
5	CTS	Clear to Send
7	SGND	Signal Ground
20	DTR	Data Transfer Request

👉 The D-SUB connector strips must be shielded sufficiently.
See chapter "Shielding D-SUB Connectors" on page 4-17.

4.2.2.2 Cable

👉 Any cable that conforms with the following parameters can be used:

Loop resistance	110 Ohm/km
Capacitance	30 nF/km
Surge impedance	150 Ohm

The maximum length of one segment is 50 m which cannot be exceeded. This 50 m applies from the first node to the last node in the segment. For further information on the installation, please refer to the Siemens manual "SIMATIC S7-400 and M7-400 Programmable Controllers Hardware and Installation, 6ES7498-8AA03-8BA0".

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4.2.2.3 Termination

The bus line is terminated at the connector.
For point-to-point connections, always activate the termination. For multi-point connections, only activate the termination at the cable end. For spur lines, always deactivate the termination.

4.2.2.4 Diagnostic

A diagnostics LED is located at the rear of the operating device. The LED shows the state of the bus system

Diagnose
Hold Token

🟢

Figure 4-7   Arrangement of the MPI diagnostics LED

The diagnostics LED at the operating device has the following function:

Table 4-15   Function of the MPI diagnostics LED

Color	State	Function
Green	Flashing	Operating Device has the Token

4.2.3   PROFIBUS-DP (X2) and RS232c (X3)

The interface for PROFIBUS-DP connections is available to integrate the device into a PROFIBUS-DP structure.
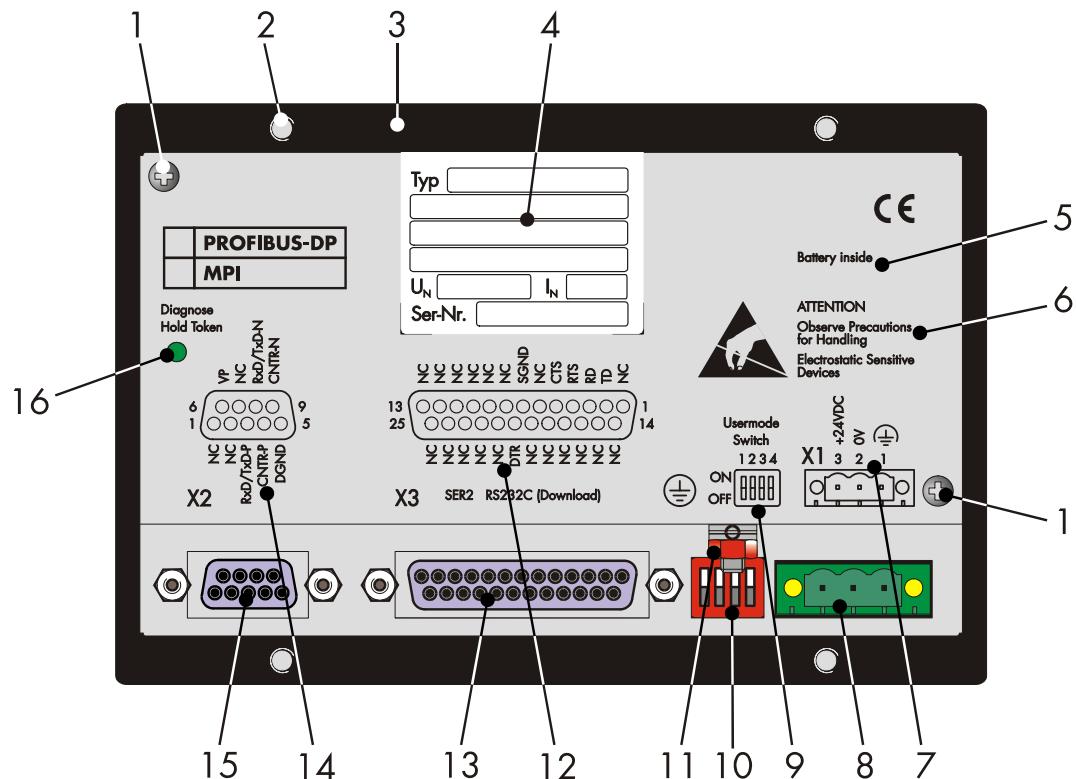

Figure 4-8   Rear view PROFIBUS-DP

1   Fastening Screws

2   Mounting Bolts

3   Front Panel

4   Nameplate

5   Battery Information

6   Warning

7   Assignment Connector X1 (Supply Voltage)

8   Connector X1 (Supply Voltage)

9   Switch Assignment User Mode Switch

10   User Mode Switch

11   Threaded Bolt for Protective Ground

12   Assignment Female Connector X3 (RS232c)

13   Female Connector X3 (RS232c)

14   Assignment Female Connector X2 (PROFIBUS-DP)

15   Female Connector X2 (PROFIBUS-DP)

16   Diagnostics LED

4.2.3.1 Pin Assignment

Connector in the operating device: 9 pin D-SUB female connector.

Table 4-16   Pin assignment PROFIBUS-DP

Pin	Designation	Function
1	nc	Not Connected
2	nc	Not Connected
3	RxD/TxD-P	Received Data / Transmitted Data Plus
4	CNTR-P	Repeater Control Signal Plus
5	DGND	Data Transmission Potential
6	VP	Supply Voltage of Terminators Plus
7	nc	Not Connected
8	RxD/TxD-N	Received Data / Transmitted Data Minus
9	CNTR-N	Repeater Control Signal Minus

The interface X3 is only designed to be used for downloads, uploads, a scanner or a logging printer because the interface is not electrically isolated.

Connector in the operating device: 25 pin D-SUB female connector strip.

Table 4-17   Pin assignment RS232c

Pin	Designation	Function
1	nc	Not Connected
2	TD	Transmitted Data
3	RD	Received Data
4	RTS	Request to Send
5	CTS	Clear to Send
7	SGND	Signal Ground
20	DTR	Data Transfer Request

The D-SUB connector strips must be shielded sufficiently.
See chapter "Shielding D-SUB Connectors" on page 4-17.

4.2.3.2 Cable

Any PROFIBUS-DP-approved cables specified in the EN 50170 as cable type A can be used.

Impedance	136 to 165 Ohm
Capacitance	< 30 pf/m
Loop resistance	110 Ohm/km
Wire gauge	0.64 mm

The maximum cable length depends on the baud rate (DIN EN 19245 Part 3).

Table 4-18   Baud rate PROFIBUS-DP

Baud rate	Cable length
187.5 kBit/s	1000 m
500 kBit/s	400 m
1500 kBit/s	200 m
3000 to 12000 kBit/s	100 m

4.2.3.3 Diagnostic

A diagnostics LED is located on the rear of the operating device. The LED shows a state of the bus system.

Diagnose
Hold Token

Figure 4-9   Arrangement of the PROFIBUS-DP diagnostics LED

The diagnostics LED on the operating device has the following function:

Table 4-19   Function of the PROFIBUS-DP diagnostics LED

Color	State	Function
Green	On	Communication Active

4.3   Shielding D-SUB Connectors

You must shield D-SUB connectors as follows:
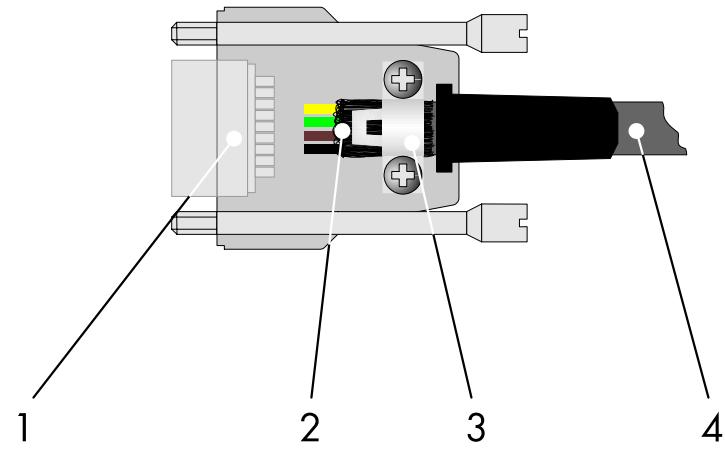
Figure 4-10   Shielding D-SUB connectors

1   D-SUB connector
2   Shield
3   Cable clip
4   Cable

The shield must be folded back into a flat position over the cable sheath.

When fastening the cable with the cable clip, as much of the shielding as possible must be in contact with the housing and sufficient strain relieve must be ensured.

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5   Maintenance and Servicing

5.1   Front Panel

You should use a damp cloth only to remove any dirt from the panel.

5.2   Fuse

⚠️ The semiconductor fuse cannot be replaced!

A semiconductor fuse is used to protect the device. Once the fuse has been tripped, the device must be disconnected from the supply voltage to allow the semiconductor fuse to regenerate. At an ambient temperature of 20 °C (68 °F), the regeneration takes approximately 20 seconds. The higher the ambient temperature, the longer the regeneration takes.

5.3   Battery

The built-in battery preserves the data in the CMOS-RAM and supplies the real-time clock. The minimum battery life is 5 years, even under unfavorable operating conditions. When the battery runs down, the message „Change battery" is generated automatically.

We recommend you change the battery approximately every 4 years as part of the regular maintenance work. A prepared battery including connector can be obtained directly from Sütron electronic.

If the „Change battery" message is detected too late, e.g. the real-time clock stopped or shows the wrong date, data in the CMOS-RAM may have already been lost. For this reason, after changing a battery, always check data such as passwords that can be modified, parameters in the system variables, recipe data sets and entries in the message system.

5.4 Changing the Battery

Batteries must only be changed by authorized and trained experts!

Electrostatic discharge can damage electronic components. **Observe the ESD protective measures!**

Do not throw lithium batteries into fire, heat to 100 °C (212 °F) or higher and do not recharge. **Danger - Explosive!**

Do not open lithium batteries. **Danger - Toxic!**

To ensure that the data in the CMOS-RAM and the time are preserved, it is possible to change the battery under operating voltage. Observe the safety notes!

1. Remove the threaded bolts of the interfaces.
2. Remove the screws on the rear panel of the device and lift off the enclosure.
3. Disconnect the connector from the battery and remove the dead battery.
4. Plug in the connector of the new battery.
5. Place the rear panel back onto the device.
6. Carefully tighten the screws of the rear panel and then the threaded bolts of the interfaces.

5.5 Battery Disposal

To prevent short circuitry in the collection boxes, insulate the poles of each battery with insulation tape or put each single battery into a plastic bag.

You must always return old batteries to a dealer or to a returns depot set up for this purpose by the public waste disposal body or a licensed battery dealer for recycling. Only dispose of dead batteries in public or commercial collection boxes. The battery is drained when the message „Change battery" appears on the display of the operating device.

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6   Technical Data

Keyboard	
Type	Short-stroke Keyboard
Number of Keys	11
Key Area (Embossment)	15 mm x 15 mm (0.591" x 0.591")
Actuator Travel	0.5 mm (0.02")
Activation Power	2 - 3 N
Lifetime (Minimum)	1 Million Switching Cycles
Display Elements	6 Status LEDs

Display	BT2	BT2VF
Type	STN	VF
Resolution	4 x 20 Characters	4 x 20 Characters
Reading Angle	90°	90°
Default Contrast Setting	By User Mode Switch	By User Mode Switch
Contrast Setting	Temperature Compensation	Temperature Compensation
Half-Life LCD	100.000 h	30.000 h
Half-Life Backlighting	100.000 h	-
Lines	4	4
Characters/Line	20	20
Display Area	74 mm x 23 mm (H x W) (2.913" x 0.906")	74 mm x 23 mm (H x W) (2.913" x 0.906")

Electrical Data	
Supply Voltage	24 V DC (SELV in Accordance with DIN EN 61131)
Residual Ripple	Maximum 10%
Minimum Voltage	19.2 V
Maximum Voltage	30.2 V
Power Consumption	0.3 A
Connected Load	7.2 W
Fuse	Semiconductor Fuse, Self-resetting
Protection against Polarity Reversal	Integrated

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Interfaces	
Variable Baud Rates and Data Formats	
X2 SER1 TTY / 20 mA	According to CL 2 and DIN 66 348 T1 Transmission Length: 0 - 1000 m (3280.84 ft.), Twisted Pair, Shielded Electrically Isolated
X2 SER1 RS485	According to DIN 66259-4 Transmission Length: 0 - 1200 m (3937.01 ft.), Twisted Pair, Shielded Electrically Isolated
X2 SER1 RS232c / X2 SER2 RS232c	According to DIN 66259 T1, CCITT V.28 Transmission Length: 0 - 15 m (49.21 ft.), Layer-stranded, Shielded X2 SER1: Electrically Isolated X2 SER2: Not Electrically Isolated
X2.1 / X2.2 INTERBUS	Electrically Isolated
X2 MPI	Electrically Isolated
X2 PROFIBUS-DP	Electrically Isolated
X3 RS232c	According to DIN 66259 T1, CCITT V.28 Transmission Length: 0 - 15 m (49.21 ft.), Layer-stranded, Shielded Not Electrically Isolated

Central Unit	
Central Unit	Z84
Clock Frequency	10 MHz
Other Characteristics	Watchdog Timer, Real-Time Clock, Temperature Compensation of the Display, Battery Monitoring

Memory	
Application Memory	256 KByte Flash
RAM	128 KByte Static CMOS-RAM, Battery-Backed

Connection System	
D-SUB Female and Male Connector Strips, 9 Pin and 25 Pin	
Female and Male Connector Strips Phoenix COMBICON, 3 Pin	

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Environmental Conditions	
Operation	0 °C to 50 °C (32 °F to 122 °F)
Storage, Transportation	- 20 °C to + 70 °C (- 4 °F to + 158 °F)
Relative Humidity for Operation and Storage	10% to 95%, No Condensation
Application Area	Degree of Pollution 1, Overvoltage Category II

Standards and Guidelines	
Interference Immunity	EN 50082-2 EN 61000-4-2 EN 61000-4-3 EN 61000-4-4 EN 61000-4-5 EN 61000-4-6
Emitted Interference	EN 50081-1 EN 55011 EN 55022
Equipment Requirements	EN 61131
Storage and Transportation	EN 61131 Part 2
Power Supply	EN 61131 Part 2
Electromagnetic Compatibility	89/336/EWG (Including all Applicable Amendments)
Degree of Protection	EN 60529
Impact Load, Shocks	EN 60068 Part 2-27
Sinusoidal Vibrations	EN 60068 Part 2-6
Corrosion Protection	IEC 60068

Enclosure and Front Panel	
Enclosure	Steel Sheet, Galvanized
Front Panel	Aluminium, Anodized 96 mm x 144 mm x 3.5 mm (H x W x D) - (3.78" x 5.669" x 0.138")
Front Panel Cover	Polyester Foil
Seal	Circumferential Foam Seal on the Rear
Mounting Cutout	82 mm x 138 mm (H x W) - (3.228" x 5.433")
Mounting Depth	Approx. 42 mm (1.654") - (without Connector)
Degree of Protection	At the Front: IP65 At the Back: IP20
Total Weight	Approx. 400 g

7 Ordering Data

Table 7-1   Accessories

Description	Article No.
9 Pin Download Cable	88100.030
25 Pin Download Cable	88175.030
USB-RS232 Converter for Download (Only in Combination with 88175.030 or 88100.030)	81215.000
Battery, Prepared with Cable and Connector	66694.000

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