$\ominus$ siebert®

Operating instructions

C9302-S0, C9302-T0

Control computer for XC-Boards®
with serial interface

Table of contents

Notes on RS485 interface configuration

Menu settings
Data lines
Application example A
Application example B
Application example C
Application example D

Important information   Read these operating instructions before starting the unit. They provide you with important information on the use, safety and maintenance of the units. This helps you to protect yourself and prevent damage to the unit.

⚠️ Information intended to help you to avoid death, bodily harm or considerable damage to property are highlighted by the warning triangle shown here; it is imperative that this information be properly heeded.

The operating instructions are intended for trained professional electricians familiar with the safety standards of electrical technology and industrial electronics.

Store these operating instructions in an appropriate place.

The manufacturer is not liable if the information in these operating instructions are not complied with.

Safety   ⚠️ Components inside the units are energized with electricity during operation. For this reason, mounting and maintenance work may only be performed by professionally-trained personnel while observing the corresponding safety regulations.

The repair and replacement of components and modules may only be carried out by the manufacturer for safety reasons and due to the required compliance with the documented unit properties.

The units do not have a power switch. They are operative as soon as the operating voltage is applied.

Intended use   The units are intended for use in industrial environments. They may only be operated within the limit values stipulated by the technical data.

When configuring, installing, maintaining and testing the units, the safety and accident-prevention regulations relevant to use in each individual case must be complied with.

Trouble-free, safe operation of the units requires proper transport, storage, installation, mounting and careful operation and maintenance of the units.

Mounting and installation   The attachment options for the units were conceived in such a way as to ensure safe, reliable mounting.

⚠️ The user must ensure that the attachment hardware, the unit carrier and the anchoring at the unit carrier are sufficient to securely support the unit under the given surrounding conditions.

The units are to be mounted in such a way that they can be opened up while mounted. Sufficient space for the cables must be available in the unit near the cable infeed.

Sufficient space is to be kept clear around the units to ensure air circulation and to prevent the build-up of heat resulting from use. The relevant information must be heeded in the case of units ventilated by other means.

⚠️ When the housing fasteners are opened, the front frame of the housing hinges out upward or downward (depending on the unit version) automatically.

Grounding	All devices are equipped with a metal housing. They comply with safety class I and require a protective earth connection. The connecting cable for the operating voltage must contain a protective earth wire of a sufficient cross section (DIN VDE 0106 part 1, DIN VDE 0411 part 1).
EMC measures	The devices comply with the EU Directive 89/336/EEC (EMC Directive) and provide the required interference immunity. Observe the following when connecting the operating voltage and data cables:

- Use shielded data cables.

- The data and operating voltage cables must be laid separately. They may not be laid together with heavy-current cables or other interference-producing cables.

- The cable thickness must be properly assessed (DIN VDE 0100 Part 540).

- The cable lengths inside the units are to be kept as short as possible to prevent interference. This applies especially to unshielded operating voltage cables. Shielded cables are also to be kept short due to any interference which might be emitted by the shielding.

- Neither excessively long cables nor cable loops may be placed inside the units.

- The connection of the cable shielding to the functional ground (PE) must be as short and low-impedance as possible. It should be made directly to the mounting plate over a large area with a conductive clip:
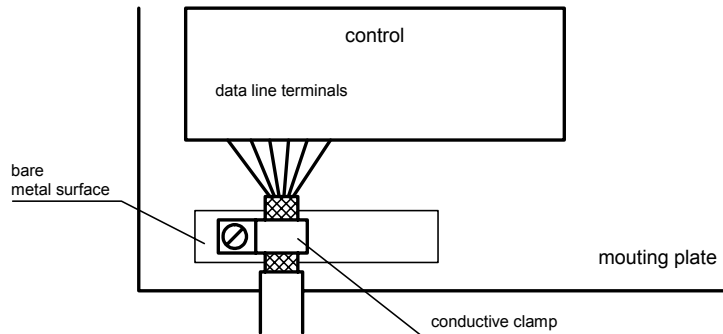
- The cable shielding is to be connected at both cable ends. If equipotential bonding currents are expected due to the cable arrangement, electrical isolation is to be performed on one side. In this case, capacitive connection (approx. 0.1µF/600 V AC) of the shielding on the isolated side must occur.

Disposal	Units or unit parts which are no longer needed are to be disposed of in accordance with the regulations in effect in your country.

XC-Board®

The control computers C9302-S0 and C9302-T0 serve for the activation of numeric or alphanumeric display fields in XC-Boards® via a serial interface.

The following picture shows an example for an XC-Board® with four display fields:

Total   39026   — Display panel H1
Soll   240   — Display panel H2
Ist   247   — Display panel H3
Trend   856   — Display panel H4
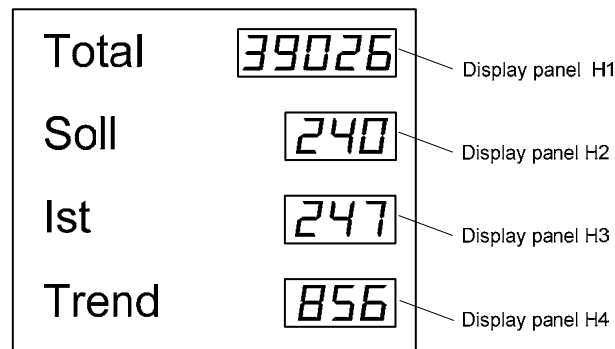
The following picture shows the electrical structure of the XC-Boards®:

C5 C4 C3 C2 C1	C3 C2 C1	C3 C2 C1	C3 C2 C1
39026	240	247	856
Display panel H1	Display panel H2	Display panel H3	Display panel H4

Serial Interface   Central Processing Unit
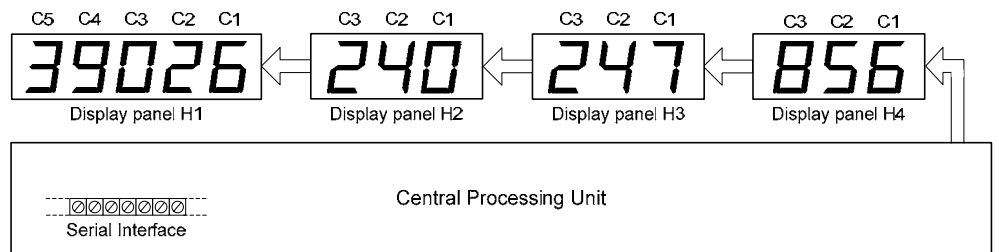
The electrical structure of the XC-Boards® is documented in the included logic diagram.

The control computer serves for the selective activation of individual display fields including decimal point, leading zero suppression and flashing. The control computer also carries out the formatting of the entire display (display test, blanking, reduction of brightness, relay control and flashing of all display fields).

Central Processing Unit

S1 ▮▮ S2

Screw terminal strip

OUT

888888 — Menu display

— ERR
— DATA

— Menu buttons

Switch S1/S2 only with C9302-S0
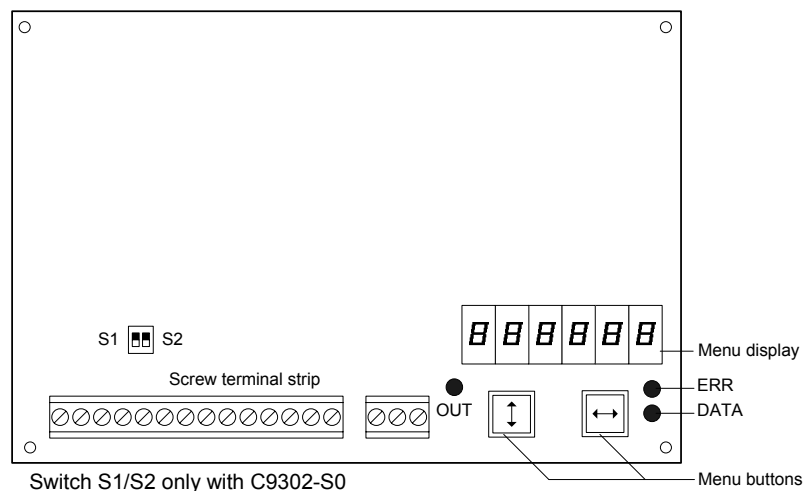
Principle circuit diagram

Control computer with RS485/RS232 interface (C9302-S0)
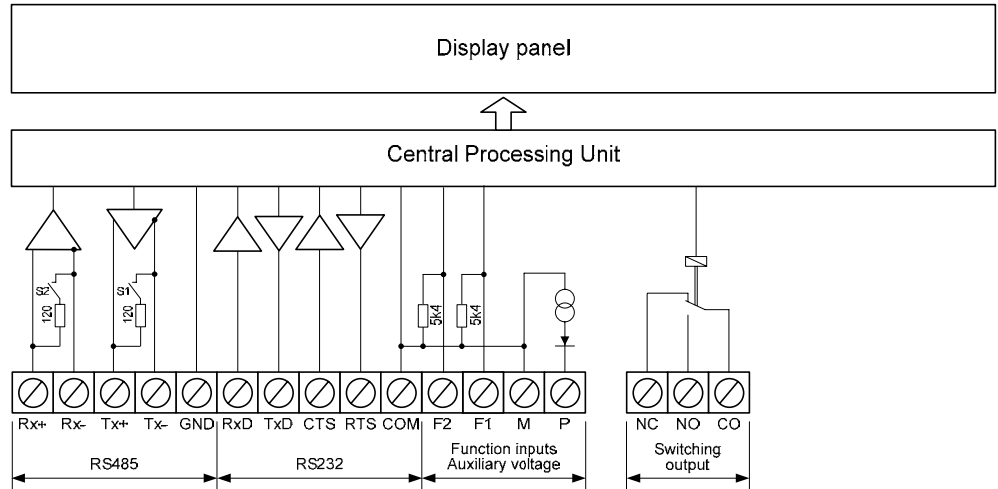
Control computer with TTY 20mA/RS232 interface (C9302-T0)

Relay cards

Optionally, up to two relay cards with 8 relays each (type C9210) can be connected to the control computer, for example, for activating optical and acoustic signal transmitters.

The following picture shows the control computer with two relay cards:

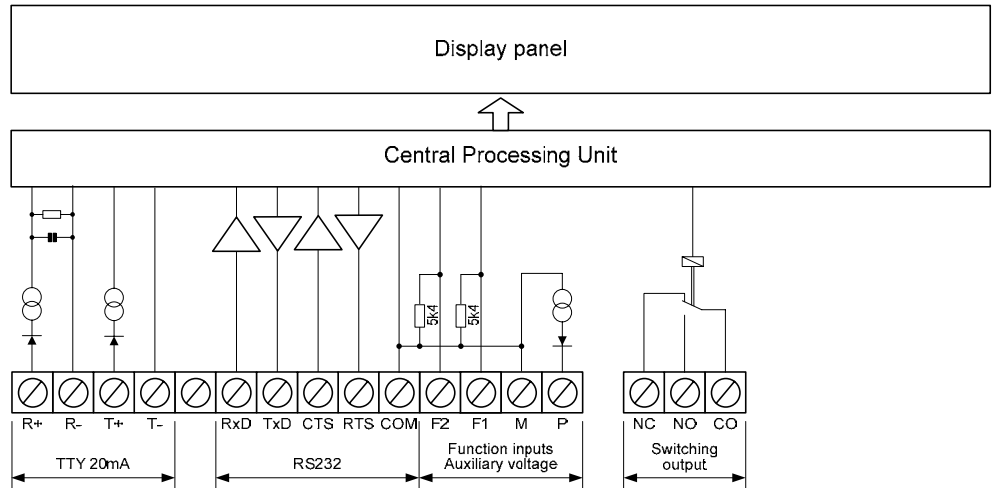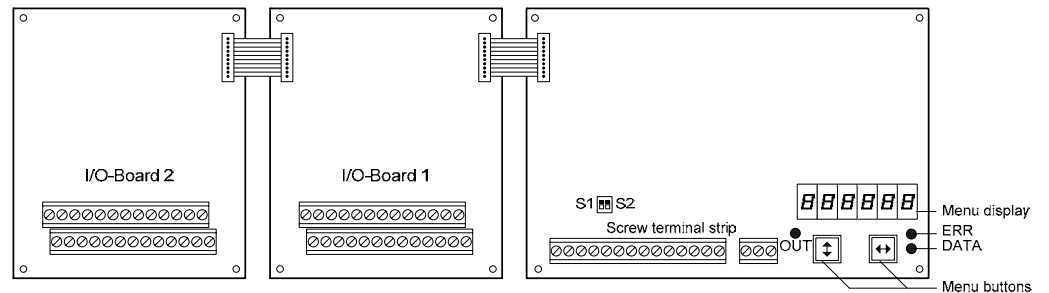| Parameterization	The parameterization of the unit is done by means of a menu in the menu display (see chapter 3).
Serial Interface	The serial interface is located on the screw-type terminal strip of the control computer. Depending on the device model, it has the following formats: C9302-S0 RS485 and RS232 C9302-T0 TTY 20mA and RS232 The interface format is set in menu item 1 (see chapter 3). The switches S1 (Tx) and S2 (Rx) serve for locking the data lines of the RS485 (see chapter 5). Preferably, the interfaces RS485 or TTY 20 mA are to be used for activation. They are galvanically isolated from all other electric circuits and provide the best preconditions for a reliable and safe operation of the devices due to its physical characteristics. The interface RS232 is determined for testing purposes and is not recommended for activation because of its physical properties.
Function inputs	The functional inputs allow, independently of commands, via Ethernet interface to reduce the brightness and flashing of the display(see chapter 3). It is located on the screw type terminal of the control computer. The function inputs are PLC-compatible and are designed for the following signal voltages: Signal voltage: L = -3.5...+5 V (open input = L) H = +18...30 V (active H), M = reference potential
Auxiliary voltage	The units supply terminal P with an auxiliary voltage galvanically isolated from the operating voltage (24 V ± 25%, max. 50 mA, M = reference potential). It can be used for supplying power to the current loop or as H signal.
Menu display	The menu display represents a menu for unit parameterization (see chapter 3). In normal operation, $OnlinE$ is shown in the menu display.
Menu buttons	The menu can be operated by means of the menu buttons (see chapter 3).
Switching output	The devices dispose of a switching output (relay) with potential-free change-over contact (NC, NO, CO).
Status indicators	The status indicators (LEDs) of the central processing unit have the following function: DATA Data are received ERR Communication error OUT Switching output is active

Serial Interface	Select in menu item 1 between the interface formats which are available in the central processing unit.

C9302-S0   RS485 or RS232
C9302-T0   TTY 20mA or RS232

In the interface format RS485, you can select several settings in the menu item 1. Which settings are to be selected is described in chapter 5.

Parity, baud rate and protocol reply are set in menu items 3, 4 and 6.

In the interface format RS485, the XON/XOFF handshake is active.
In the interface format RS232, the RTS/CTS handshake is active.

If ACK/NAK is selected in menu item 6, the control computer transmits the character ACK (06_h) after receipt of correctly addressed data. In case of an error, it transmits the character NAK (15_h). |
| Addressing | The address of the control computer (= basic address) is set in menu item 9. The address precedes the data to be displayed in a 2-digit ASCII format.

Commands which apply to all display fields are transmitted to the basic address. Commands for a single display field are transmitted to its field address.

The field address is composed of the basic address and an address offset. Display field H1 has the offset 1, display field H2 the offset 2 etc.. The caption of the display fields is documented in the included logic diagram of the XC-Boards®.

Example 1: The control computer has the basic address 40. The field address of the display field H2 is 40 + 2 = 42.

Example 2: The control computer has the basic address 40 (protocol CR/LF). The brightness of all display fields shall be reduced. The command is **40$L1<CR><LF>**.

Example 3: The control computer has the basic address 40 (protocol CR/LF). The display field H2 shall display the value 123. The command is **42123<CR><LF>**. |
| Broadcast address | The control computer also reacts on the basic address 00, independently from the basic address set in menu item 9. It allows the activation of all control computers provided in an XC-Board®.

Example: The brightness of all display fields shall be reduced in an XC-Board® with several control computers. The command is (protocol CR/LF): **00$L1<CR><LF>**

In case of an interfacing with the basic address 00 the control computer does not transmit any telegram answer, independently from the setting under menu item 6. |
| Protocol | The data to be displayed are transmitted to the control computer in ASCII format, including the field address.

If the protocol CR/LF is selected under menu item 5, each telegram is to be terminated with the character <CR> ($0D_h$), <LF> ($0A_h$) or the combination <CR><LF>.

If the protocol STX/ETX is selected, the data including the address are embedded between the characters <STX> (02_h) and <ETX> (03_h).

The representation in numeric display fields is right-aligned. The representation in alphanumeric fields is left-aligned. |

Flashing	The flashing of all display fields can be activated by means of the following commands to the basic address of the control computer (protocol CR/LF):
	$F1<CR><LF>** Flashing on **$F0<CR><LF> Flashing off
	If **$F1** is sent in the data telegram to a field address, the succeeding digits will flash until the end of the data telegram or until **$F0** is sent in the data telegram.
	Flashing of all display fields can also be activated by the H signal on functional input F1 (priority compared to the commands).
	For units provided with an LRD® display flashing is not possible.
Brightness	The brightness of all display fields can be reduced by means of the following commands to the basic address of the control computer (protocol CR/LF):
	$L1<CR><LF>** Reduced brightness **$L0<CR><LF> Normal brightness
	The brightness of the display fields can also be reduced with an H signal applied to functional input F2 (priority compared to the commands).
	For units provided with an LRD® display brightness reduction is not possible.
Blanking	The display can be blanked with the following command (priority over flashing) (protocol CR/LF):
	$B1<CR><LF>** Blanking on **$B0<CR><LF> Blanking off
Decimal point	In the menu items A1...A8, the decimal point can be set for each display (for numeric display fields only).
	The decimal points may also be activated via the serial interface. For this purpose, you must select setting 0 (no fixed decimal point) in the respective menu item.
	Units with a LRD® display have no decimal points.
Leading zero suppression	In menu item C1…C8 you can set if leading zeros are to be displayed or suppressed (for numeric display fields only). If leading zeros shoud be suppressed for units with LRD® display and fixed decimal point (e.g. self-adhesive foil), the corresponding position must be set in menu item A1…A8.
Display test	In menu item F, you can set whether a short-time display test is automatically carried out in all display fields after power-on.
LED color	Devices with switchable LED color display the digits in red by default. If the command **$A…** is sent in the data telegram, the subsequent digits are displayed in the corresponding LED color:
	$A0 = red, **$A1** = green, **$A2** = orange
	Example: The display field H3 shall display the value 123 in green. The command is **03$A1123**.
Power-on reset	After switching the operating voltage on, minus signs are displayed in all display fields to signalize that the unit is ready for operation. If a display test has been preselected in menu item F, it will run beforehand.

Overflow	If more data are transmitted than can be displayed in a display field, ▫ (overflow) is displayed in all digits of the display field.
	For alphanumeric display fields, ▫ is displayed in all digits of the display field.
Switching output	The devices dispose of a switching output (relay) with potential-free change-over contact (NC, NO, CO).
	When setting OFF in menu item r, the switching output can be activated with the following command:

`$Q@1`   Activate switching contact
`$Q@0`   Deactivate switching contact

The relay does not switch before the end of the telegram.

When setting 1, 2 or 4 in menu item r, the command `$Q@1` causes a wiping pulse at the switching output with a duration of 1, 2 or 4 seconds.

When setting A1, A2 or A4 in menu item r, each telegram to the basic address or a field address causes automatically a wiping pulse at the switching output with a duration of 1, 2 or 4 seconds.

The wiping function is suitable, for example, for activating optical and acoustic signal transmitters.

The status indicator OUT of the control computer is lighted with active switching output.

Relay cards	The optional relay cards are interfaced with the following commands to the basic address of the control computer:

Relay card 1		Relay card 2	
`$QA1`	Relay 1 on	`$QI1`	Relay 1 on
`$QA0`	Relay 1 off	`$QI0`	Relay 1 off
`$QB1`	Relay 2 on	`$QJ1`	Relay 2 on
`$QB0`	Relay 2 off	`$QJ0`	Relay 2 off
`$QC1`	Relay 3 on	`$QK1`	Relay 3 on
`$QC0`	Relay 3 off	`$QK0`	Relay 3 off
`$QD1`	Relay 4 on	`$QL1`	Relay 4 on
`$QD0`	Relay 4 off	`$QL0`	Relay 4 off
`$QE1`	Relay 5 on	`$QM1`	Relay 5 on
`$QE0`	Relay 5 off	`$QM0`	Relay 5 off
`$QF1`	Relay 6 on	`$QN1`	Relay 6 on
`$QF0`	Relay 6 off	`$QN0`	Relay 6 off
`$QG1`	Relay 7 on	`$QO1`	Relay 7 on
`$QG0`	Relay 7 off	`$QO0`	Relay 7 off
`$QH1`	Relay 8 on	`$QP1`	Relay 8 on
`$QH0`	Relay 8 off	`$QP0`	Relay 8 off

Example: The control computer has the basic address 40 (protocol CR/LF). On relay card 1 relay 5 shall be switched on. The command is: **40$QE1<CR><LF>**

Time-out	In menu item t, it is possible to set whether a time-out occurs, and if so, after what time. Time-out means that a minus sign appears in all display fields if the control computer has not received a data telegram to the basic address or a field address after a defined time.	

Character set for numeric display fields

20/2B	2D	30	31	32	33	34	35	36	37	38	39	2C/2E
	−	0	1	2	3	4	5	6	7	8	9	.

41/61	42/62	43	44/64	45/65	46/66	47/67	48	49	4A/6A	4C/6C	50/70	55
A	b	C	d	E	F	G	H	I	J	L	P	U

59/79	5F	63	68	69	4E/6E	4F/6F	52/72	54/74	75	58/78	other
Y	_	c	h	i	n	o	r	t	u	ᵒ	≡

Character set for alphanumeric display fields

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
2		!	"	#	$	%	&	'	(	)	*	+	,	−	.	/
3	0	1	2	3	4	5	6	7	8	9	:	;	<	=	>	?
4	@	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
5	P	Q	R	S	T	U	V	W	X	Y	Z	[	\	]	^	_
6	`	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o
7	p	q	r	s	t	u	v	w	x	y	z	{			}	~	△
8	€	Ü	é	â	ä	à	å	ç	ê	ë	è	ï	î	ì	Ä	Å
9	É	æ	Æ	ô	ö	ò	û	ù	ÿ	Ö	Ü	¢	£	¥	₧	ƒ
A	á	í	ó	ú	ñ	Ñ	ª	º	¿	⌐	¬	½	¼	¡	«	»
B	░	▒	▓	│	┤	╡	╢	╖	╕	╣	║	╗	╝	╜	╛	Ё
C	А	Б	В	Г	Д	Е	Ж	З	И	Й	К	Л	М	Н	О	П
D	Р	С	Т	У	Ф	Х	Ц	Ч	Ш	Щ	Ъ	Ы	Ь	Э	Ю	Я
E	α	ß	Γ	π	Σ	σ	µ	τ	Φ	Θ	Ω	δ	∞	φ	ε	∩
F	≡	±	≥	≤	⌠	⌡	÷	≈	°	∙	·	√	ⁿ	²	■	

Chapter 4	Parameterization

Menu

The parameterization of the devices is carried out in a menu of the menu display.

In normal operation, $OnlinE$ is shown in the menu display.

Menu operation

To reach the menu, press both menu buttons simultaneously (approx. 1 sec.) until an audible signal is heard and menu item 01 appears in the menu display. Now, you can navigate in the menu as follows:

Next setting	Shortly press key [↕]
Page menu items forward	Press key [↕] long
Previous setting	Double click on key [↕]
Page menu items backward	Double click on [↕] and keep it pressed

Next setting	Shortly press key [↔]
Page settings forward	Press key [↔] long
Previous setting	Double click on key [↔]
Page settings backward	Double click on [↔] and keep it pressed

The menu ends in menu item U with the button [↕]. The settings made are either saved (set), not saved (escape) or the factory settings are reset, depending on the setting selected in menu item U.

Canceling the menu without saving the settings made is possible by pressing both menu buttons longer (approx. 1 sec.) or will occur automatically if 60 seconds pass without a menu button being pressed.

Once the menu is closed, the unit behaves in the same manner as when the operating voltage was applied.

In the menu mode, the character $\bar{=}$ appears in all fields of the main display. Control of the display is not possible in menu mode.

Menu table

The menu items are displayed in the following menu table. The factory settings are marked with an *. Individual menu items or settings can be suppressed in another menu item, depending on the unit version or setting.

Menu item		Settings	Menu display
1	Serial Interface	RS232	_I_ _232_
		RS485	_I_ _485_
		RS485 (4-wire bus)	_I_ _485.4_
		RS485 (2-wire bus)	_I_ _485.2_
		TTY 20mA	_I_ _tty_
2	Data format	7 bit with even or odd parity	_2_ _7b it_
		8 bit with or without parity*	_2_ _8b it_
3	Parity	No parity*	_3_ _nonE_
		odd parity	_3_ _odd_
		even parity	_3_ _EuEn_
4	Baud rate	1200	_4_ _1200_
		2400	_4_ _2400_
		4800	_4_ _4800_
		9600*	_4_ _9600_
		19200	_4_ _192_
5	Protocol	CR/LF*	_5_ _CrLF_
		STX/ETX	_5_ _5-E_
6	protocol reply	No protocol reply*	_6_ _nonE_
		ACK/NAK	_6_ _AcnA_
9	Address	Address 1	_9_ _01_
		↓	↓
		Address 10*	_9_ _10_
		↓	↓
		Address 90	_9_ _90_
r	Switching output	No wiping pulse*	_r_ _OFF_
		Wiping pulse 1 sec	_r_ _1_
		Wiping pulse 2 sec	_r_ _2_
		Wiping pulse 4 sec	_r_ _4_
		Automatic wiping pulse 1 sec	_r_ _A1_
		Automatic wiping pulse 2 sec	_r_ _A2_
		Automatic wiping pulse 4 sec	_r_ _A4_
t	Time-out	No time-out *	_t_ _0_
		Time-out after 2 s	_t_ _2_
		Time-out after 4 s	_t_ _4_
		Time-out after 8 s	_t_ _8_
		Time-out after 16 s	_t_ _16_
		Time-out after 32 s	_t_ _32_
		Time-out after 64 s	_t_ _64_
		Time-out after 128 s	_t_ _128_

Menu item			Settings	Menu display
A1	Decimal point display field H1		No decimal point*	*A1 0*
			Decimal point digit C1	*A1 1*
			Decimal point digit C2	*A1 2.*
			↓	↓
			Decimal point digit C8	*A1 8*
A2	Decimal point display field H2		No decimal point*	*A2 0*
			Decimal point digit C1	*A2 1*
			Decimal point digit C2	*A2 2.*
			↓	↓
			Decimal point digit C8	*A2 8*
	⇩	⇩		⇩
A8	Decimal point display field H8		No decimal point*	*A8 0*
			Decimal point digit C1	*A8 1*
			Decimal point digit C2	*A8 2.*
			↓	↓
			Decimal point digit C8	*A8 8*
C1	Leading zeros display field H1		Leading zeros not displayed*	*C1 00*
			Leading zeros displayed	*C1 0000*
C2	Leading zeros display field H2		Leading zeros not displayed*	*C2 00*
			Leading zeros displayed	*C2 0000*
	⇩	⇩		⇩
C8	Leading zeros display field H8		Leading zeros not displayed*	*C8 00*
			Leading zeros displayed	*C8 0000*
F	Display test		No display test at power-on *	*F ----*
			Display test at power-on	*F 8888*
U	Saving		Saving parameters* (Set)	*U SEt*
			Not saving parameters (Escape)	*U ESC*
			Resetting to the default settings (Default)	*U dEF*

Chapter 5   Technical data

|		
Switching output	Maximum switching voltage	30 V AC/DC
	Maximum switching current	500 mA (resistive load)
Screw clips	clamping range	$0{,}14\ldots1{,}5\ \text{mm}^2$
Ambient conditions	Operating temperature	0…55 °C
	Storage temperature	-30…85 °C
	Relativ humidity	max. 95 % (non-condensing)

Menu settings

The interface format RS485 allows the settings ４８５, ４８５４ and ４８５２ in the menu item 1 (see chapter 4). The selected setting depends on whether the protocol reply is to be sent by the unit:
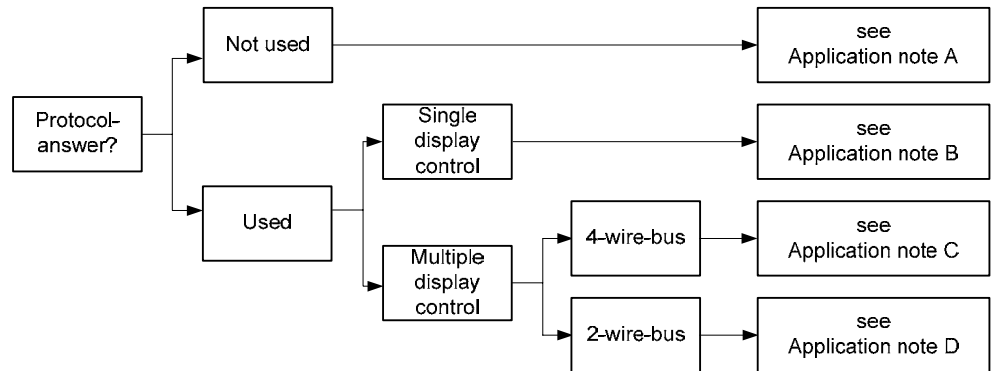
If the unit should not send a protocol reply (normal case), application example A applies for activating one or more units.

If a protocol reply is expected, a differentiation has to be made whether one single unit or more units are to be activated. If one single unit is activated, application example B is valid.

If several units are to be activated, a bus wiring is necessary. You have to differentiate, if a 4-wire bus (full-duplex) or a 2-wire bus (half-duplex) is used. Application example C applies for 4-wire bus and application example D applies for 2-wire bus.

Data lines

To achieve the highest possible interference immunity, the data lines of the RS485 have to be terminated on both ends. The required resistors are provided in the unit and can be connected on the screw terminal strip with the jumpers S1 (Tx) and S2 (Rx) (see chapter 2, block diagram).

The polarization of the data lines must be ensured by means of the master.

For the data lines, you always have to ensure that:

- Shielded twisted-pair cables of sufficiently large cross-section are used.

- The shielding is connected on both line ends.

- For the signal ground (GND) use a wire pair short-circuited on both ends in the data cable. The shielding may not be used as the signal ground.

- A twisted core pair is used each for Tx+ and Tx- and for Rx+ and Rx-. Non-observance of this instruction causes the protective function of the twisted-pair cable to be lost.

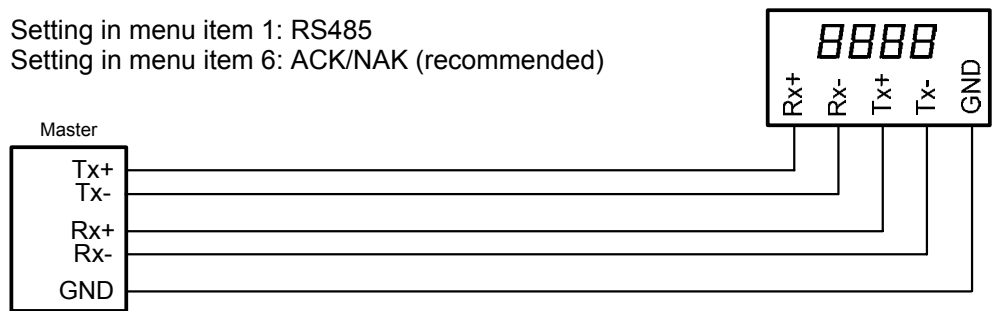- Improperly terminated data lines cause faults during data transfer.

Application example A

Setting in menu item 1: RS485
Setting in menu item 6: No protocol reply

Master
Tx+
Tx-
GND

Rx+ Rx- Tx+ Tx- GND   Rx+ Rx- Tx+ Tx- GND   Rx+ Rx- Tx+ Tx- GND
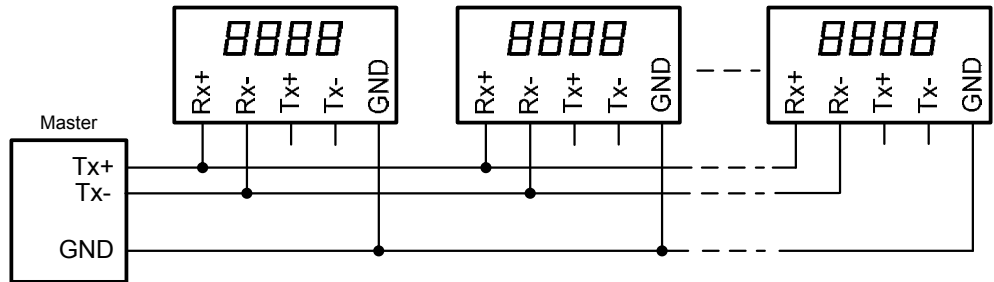
Application example B

Setting in menu item 1: RS485
Setting in menu item 6: ACK/NAK (recommended)

Master
Tx+
Tx-
Rx+
Rx-
GND

Rx+ Rx- Tx+ Tx- GND

Application example C

Setting in menu item 1: RS485.4
Setting in menu item 6: ACK/NAK (recommended)

Master
Tx+
Tx-
Rx+
Rx-
GND

Rx+ Rx- Tx+ Tx- GND   Rx+ Rx- Tx+ Tx- GND   Rx+ Rx- Tx+ Tx- GND
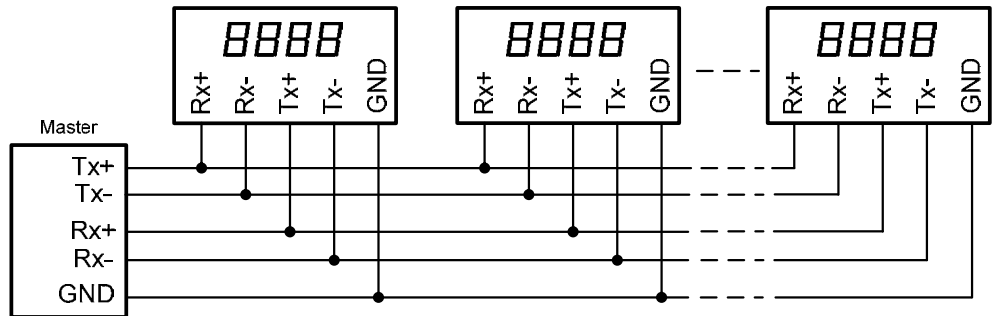
Application example D

Setting in menu item 1: RS485.2
Setting in menu item 6: ACK/NAK (recommended)

Master
Tx+/Rx+
Tx-/Rx-
GND

Rx+ Rx- Tx+ Tx- GND   Rx+ Rx- Tx+ Tx- GND   Rx+ Rx- Tx+ Tx- GND