Operating instructions

Series SX302

Alphanumeric large size displays with Profibus DP interface

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Table of contents

Bus errors in profibus systems may result in personal injury or material damage. Therefore it is to observe that activating the menu during the operation of the units may cause a bus error at the profibus.

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.

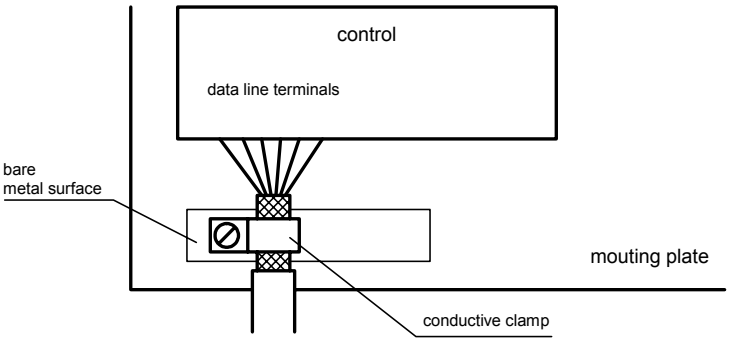
Grounding

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.

Model designation

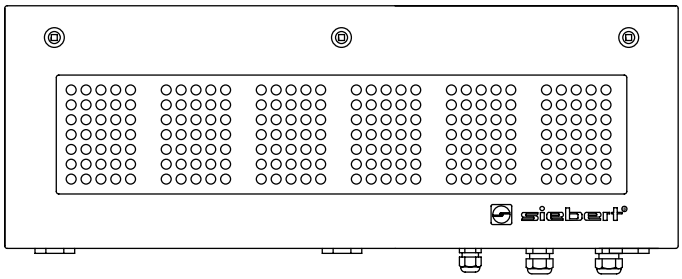
The model designation of the units is:

SX302-xx/xx/xx-xxx/xx-K0

x = The 'x's in the model designation indicate the size and design of the units (see Chapter 5).

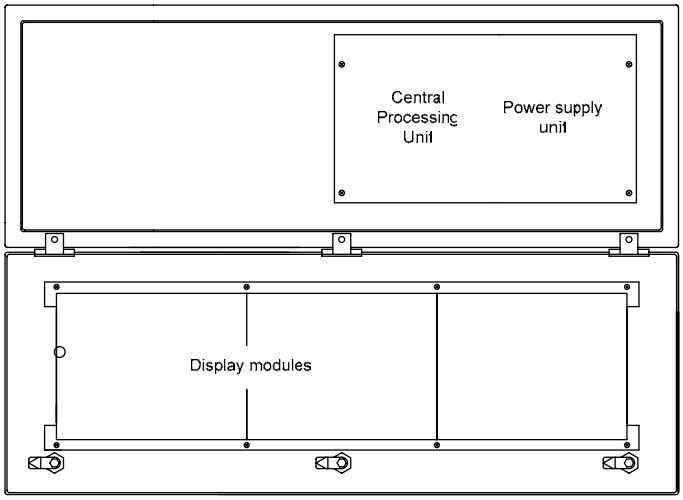
Unit construction

The following figure shows model type SX302-06/10/xx-xxx/xx-xx as example for the other model types. The front frame of the housing is locked with quick-action releases and can be hinged downward for opening the unit.



The following figure shows the unit when open and reveals the modular construction of the units. All components, controls and connections are directly accessible.

The display modules are found inside the housing front frame. The control computer and power supply unit are located in the lower housing section.

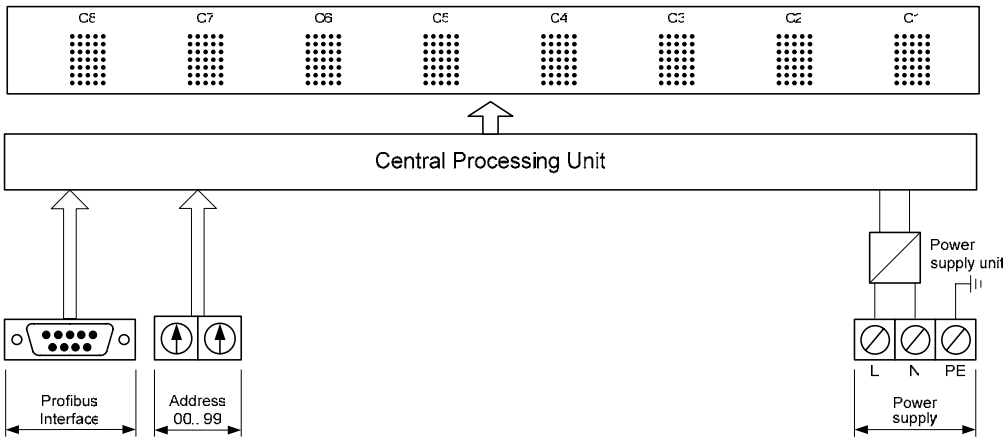


Display technology

Depending on the type, the units are provided with a light-emitting LED or light-reflecting LRD®- display:

- SX302-xx/xx/0x-xxx/xx-xx: LED display
- SX302-xx/xx/4x-xxx/xx-xx LRD® display

Principle circuit diagram



Display range

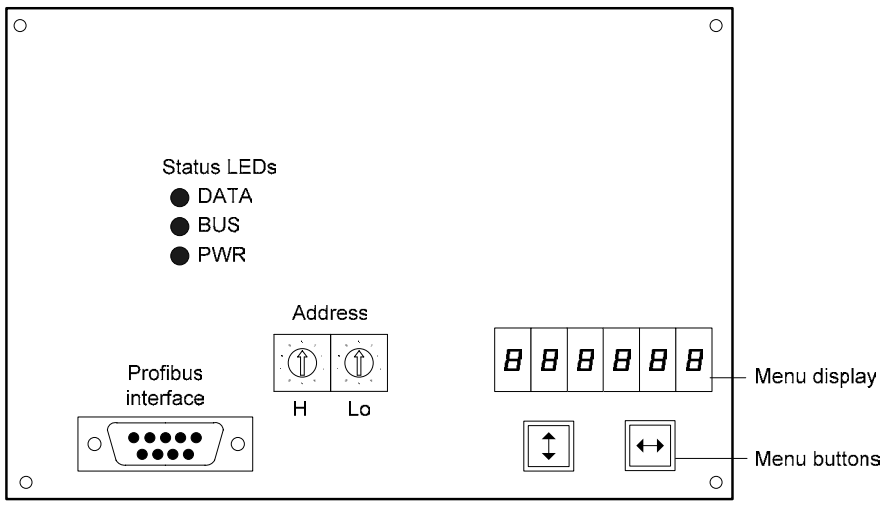
Depending on the type, the units have the following displays:

SX302-01/xx/xx-xxx/xx-xx (1 digit):	C1
SX302-02/xx/xx-xxx/xx-xx (2 digits):	C2…C1
SX302-03/xx/xx-xxx/xx-xx (3 digits):	C3…C1
SX302-04/xx/xx-xxx/xx-xx (4 digits):	C4…C1
SX302-05/xx/xx-xxx/xx-xx (5 digits):	C5…C1
SX302-06/xx/xx-xxx/xx-xx (6 digits):	C6…C1
SX302-07/xx/xx-xxx/xx-xx (7 digits):	C7…C1
SX302-08/xx/xx-xxx/xx-xx (8 digits):	C8…C1

Devices with double-sided display (SX302-xx/xx/xx-2xx/xx-xx) show the same information on the front and rear side.

Central Processing Unit

The following figure shows the Central Processing Unit:



Parameterization

The parameterization of the unit is done by means of a menu in the menu display (see chapter 4).

Profibus interface

The Profibus interface is located on the 9-pin SUB-D socket of the control computer. It has the following assignment:

Pin	1	2	3	4	5	6	7	8	9
Signal	–	–	B	–	GND	+ 5V	–	A	–

The units are Profibus-DP slaves according EN 50 170.

The baud rate is automatically recognized. It can reach up to 12 Mbaud.

The GSD file " SIEB06A1.GSD" on disc is included in the delivery'.

The address is set by means of the rotary code switches of the control computers (00...99).

In the case of a bus error, minus signs appear in the display.

Menu display

The menu display represents a menu for unit parameterization (see chapter 4).

In normal operation, OnlinE will appear on the menu display as soon as the unit has been configured successfully and detected on the Profibus.

Bus errors in Profibus systems may result in personal injury or material damage. Therefore it is to observe that activating the menu during the operation of the units may cause a bus error at the Profibus.

Menu buttons

The menu can be operated by means of the menu buttons (see chapter 4).

Status indicators

The status indicators (LEDs) of the central processing unit have the following function:

PWR	The Profibus interface is supplied with power.
BUS	The unit is parameterized on the bus and recognized as participant.
DATA	Short flashing: The information to be displayed is being updated.

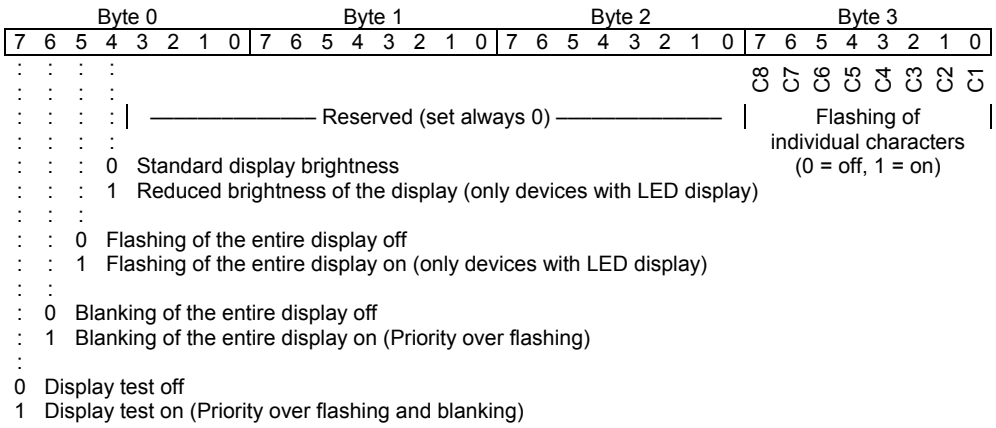
Power supply

The power supply of the units is connected to the terminals L, N and PE. They are located on the power supply unit.

In devices for a power supply of 24 V (SX302-xx/xx/xx-xxx/xB-xx), the terminals are designated with +, – and PE.

Data format ASCII

The first four bytes (byte 0 to 3) contain the formatting of the characters to be displayed (decimal point, brightness, flashing, blanking, display test):



The following bytes (from byte 4 onwards) contain the ASCII characters to be displayed. The number of these bytes depends on the number of characters of the units.

Units with 1 digit (SX302-x1/xx/xx-xxx/xx-xx)

Byte 4
Charact. C1

Units with 2 digits (SX302-x2/xx/xx-xxx/xx-xx)

Byte 4	Byte 5
Charact. C2	Charact. C1

Units with 3 digits (SX302-x3/xx/xx-xxx/xx-xx)

Byte 4	Byte 5	Byte 6
Charact. C3	Charact. C2	Charact. C1

Units with 4 digits (SX302-x4/xx/xx-xxx/xx-xx)

Byte 4	Byte 5	Byte 6	Byte 7
Charact. C4	Charact. C3	Charact. C2	Charact. C1

Units with 5 digits (SX302-x5/xx/xx-xxx/xx-xx)

Byte 4	Byte 5	Byte 6	Byte 7	Byte 8
Charact. C5	Charact. C4	Charact. C3	Charact. C2	Charact. C1

Units with 6 digits (SX302-x6/xx/xx-xxx/xx-xx)

Byte 4	Byte 5	Byte 6	Byte 7	Byte 8	Byte 9
Charact. C6	Charact. C5	Charact. C4	Charact. C3	Charact. C2	Charact. C1

Units with 7 digits (SX302-x7/xx/xx-xxx/xx-xx)

Byte 4	Byte 5	Byte 6	Byte 7	Byte 8	Byte 9	Byte 10
Charact. C7	Charact. C6	Charact. C5	Charact. C4	Charact. C3	Charact. C2	Charact. C1

Units with 8 digits (SX302-x8/xx/xx-xxx/xx-xx)

Byte 4	Byte 5	Byte 6	Byte 7	Byte 8	Byte 9	Byte 10	Byte 11
Charact. C8	Charact. C7	Charact. C6	Charact. C5	Charact. C4	Charact. C3	Charact. C2	Charact. C1

Flashing

If in byte 0 bit 5 is set, the whole display flashes. If individual characters shall flash, the corresponding bits are to be set in byte 3 (characters C8...C1).

Flashing of the total display has priority over the flashing of individual positions.

For units provided with an LRD® display flashing is not possible.

Blanking

If in byte 0 bit 6 is set, the display will be blank (priority over flashing).

Brightness

If in byte 0 bit 4 is set, the brightness of the display will be reduced.

For units provided with an LRD® display brightness reduction is not possible.

Display test

In menu item F, you can set whether a display test is to be performed after the operating voltage is applied.

The display test can also be activated via the Profibus interface by setting bit 7 in byte 0.

The display test has priority over flashing and blanking.

Demo operation mode

If the setting *PLAY* is selected in menu item F, random characters are displayed. In this case, it is impossible to activate the unit.

Power-on reset

After power-on, minus signs are displayed to signalize that the unit is ready for operation. If a display test has been preselected in menu item F, it will run beforehand.

Charater set

	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	▒	▒	▒	¦	┼	╣	╬	╩	═	▪	▪	▪	▪	▪	▪	Ë
C	А	Б	В	Г	Д	Е	Ж	З	И	и	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	∞	ø	∈	∩
F	≡	±	≥	≤	▪	▪	÷	≈	°	▪	·	▪	▪	²	▪	▪

The characters 00_h to $1F_h$ are displayed as dotted lines.

Error detection

If the unit detects an error, Errn will appear in the menu display. n indicates the type of error:

Error	Err 1
Error type	parameterization error
Cause	The operating mode projected in the master and the operating mode selected in the menu do not match.
Error elimination	Select the same operating mode in the menu as projected in the master.

Chapter 4 Parameterization

Menu

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

In normal operation, OnlinE will appear on the menu display as soon as the unit has been configured successfully and detected on the Profibus.

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

The menu ends in menu item Uwith 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 Ξ appears in 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 *.

F	Display test	No display test at power-on *	F ----
		Display test at power-on	F 8888
		Demo operation mode	F PLAY
U	Saving	Saving parameters* (Set)	U SEt
		Not saving parameters (Escape)	U ESC
		Resetting to the default settings (Default)	U dEF

Unit properties

The model designation is structured as follows:

SX302 – [ ][ ] / [ ][ ] / [ ][ ] – [ ][ ][ ] / [ ][ ] – K 0

	:	:	:	:	:	:	:	:	:	:	:	:	:	
1 digit	0	1	:	:	:	:	:	:	:	:	:	:	:	
2 digits	0	2	:	:	:	:	:	:	:	:	:	:	:	
3 digits	0	3	:	:	:	:	:	:	:	:	:	:	:	
4 digits	0	4	:	:	:	:	:	:	:	:	:	:	:	
5 digits	0	5	:	:	:	:	:	:	:	:	:	:	:	
6 digits	0	6	:	:	:	:	:	:	:	:	:	:	:	
7 digits	0	7	:	:	:	:	:	:	:	:	:	:	:	
8 digits	0	8	:	:	:	:	:	:	:	:	:	:	:	
			:	:	:	:	:	:	:	:	:	:	:	
Character height of 50 mm			0	5	:	:	:	:	:	:	:	:	:	
Character height of 100 mm			1	0	:	:	:	:	:	:	:	:	:	
					:	:	:	:	:	:	:	:	:	
LED					0	:	:	:	:	:	:	:	:	
LRD®					4	:	:	:	:	:	:	:	:	
						:	:	:	:	:	:	:	:	
Color of the characters red						R	:	:	:	:	:	:	:	
Color of the characters green						G	:	:	:	:	:	:	:	
Color of the characters white						W	:	:	:	:	:	:	:	
							:	:	:	:	:	:	:	
Display readable on one side							1	:	:	:	:	:	:	
Display readable on both sides							2	:	:	:	:	:	:	
								:	:	:	:	:	:	
Steel sheet housing, coated								0	:	:	:	:	:	
Steel sheet housing, bilayer painting								1	:	:	:	:	:	
Steel sheet housing V2A, coated								2	:	:	:	:	:	
Steel sheet housing V2A, brushed								3	:	:	:	:	:	
Steel sheet housing V4A, brushed								5	:	:	:	:	:	
									:	:	:	:	:	
Protection type IP54									0	:	:	:	:	
Protection type IP65									1	:	:	:	:	
Protection type IP54 climate adjustment									2	:	:	:	:	
Protection type IP54 climate adjustment and heating									4	:	:	:	:	
										:	:	:	:	
Wall mounting, cable entry point from the bottom										0	:	:	:	
Wall mounting, cable entry point from the top										1	:	:	:	
Hanging installation, cable entry point from the bottom										2	:	:	:	
Hanging installation, cable entry point from the top										3	:	:	:	
Wall and hanging installation, cable entry point from the bottom										4	:	:	:	
Wall and hanging installation, cable entry point from the top										5	:	:	:	
											:	:	:	
Power supply 230 V AC ±15 %, 50 Hz												A		
Power supply 24 V DC ±15 %												B		
Power supply 115 V AC ±15 %, 60 Hz												C		

Max. power consumption

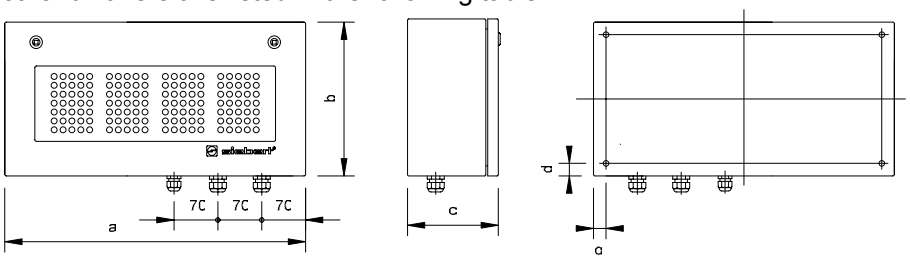
Units with one-side display		Units with double-sided display	
1 digit		1 digit	
SX302-01/10/0x-1xx/xx-xx	approx. 12 VA	SX302-01/10/0x-2xx/xx-xx	approx. 16 VA
SX302-01/10/4x-1xx/xx-xx	approx. 50 VA	SX302-01/10/4x-2xx/xx-xx	approx. 91 VA
2 digits		2 digits	
SX302-02/05/0x-1xx/xx-xx	approx. 12 VA	SX302-02/05/0x-2xx/xx-xx	approx. 15 VA
SX302-02/10/0x-1xx/xx-xx	approx. 15 VA	SX302-02/10/0x-2xx/xx-xx	approx. 21 VA
SX302-02/10/4x-1xx/xx-xx	approx. 50 VA	SX302-02/10/4x-2xx/xx-xx	approx. 91 VA
3 digits		3 digits	
SX302-03/05/0x-1xx/xx-xx	approx. 13 VA	SX302-03/05/0x-2xx/xx-xx	approx. 17 VA
SX302-03/10/0x-1xx/xx-xx	approx. 17 VA	SX302-03/10/0x-2xx/xx-xx	approx. 26 VA
SX302-03/10/4x-1xx/xx-xx	approx. 50 VA	SX302-03/10/4x-2xx/xx-xx	approx. 91 VA
4 digits		4 digits	
SX302-04/05/0x-1xx/xx-xx	approx. 14 VA	SX302-04/05/0x-2xx/xx-xx	approx. 19 VA
SX302-04/10/0x-1xx/xx-xx	approx. 21 VA	SX302-04/10/0x-2xx/xx-xx	approx. 33 VA
SX302-04/10/4x-1xx/xx-xx	approx. 50 VA	SX302-04/10/4x-2xx/xx-xx	approx. 91 VA
5 digits		5 digits	
SX302-05/05/0x-1xx/xx-xx	approx. 15 VA	SX302-05/05/0x-2xx/xx-xx	approx. 21 VA
SX302-05/10/0x-1xx/xx-xx	approx. 23 VA	SX302-05/10/0x-2xx/xx-xx	approx. 38 VA
SX302-05/10/4x-1xx/xx-xx	approx. 50 VA	SX302-05/10/4x-2xx/xx-xx	approx. 91 VA
6 digits		6 digits	
SX302-06/05/0x-1xx/xx-xx	approx. 16 VA	SX302-06/05/0x-2xx/xx-xx	approx. 23 VA
SX302-06/10/0x-1xx/xx-xx	approx. 26 VA	SX302-06/10/0x-2xx/xx-xx	approx. 43 VA
SX302-06/10/4x-1xx/xx-xx	approx. 50 VA	SX302-06/10/4x-2xx/xx-xx	approx. 91 VA
7 digits		7 digits	
SX302-07/05/0x-1xx/xx-xx	approx. 17 VA	SX302-07/05/0x-2xx/xx-xx	approx. 25 VA
SX302-07/10/0x-1xx/xx-xx	approx. 30 VA	SX302-07/10/0x-2xx/xx-xx	approx. 51 VA
SX302-07/10/4x-1xx/xx-xx	approx. 50 VA	SX302-07/10/4x-2xx/xx-xx	approx. 91 VA
8 digits		8 digits	
SX302-08/05/0x-1xx/xx-xx	approx. 18 VA	SX302-08/05/0x-2xx/xx-xx	approx. 27 VA
SX302-08/10/0x-1xx/xx-xx	approx. 32 VA	SX302-08/10/0x-2xx/xx-xx	approx. 55 VA
SX302-08/10/4x-1xx/xx-xx	approx. 50 VA	SX302-08/10/4x-2xx/xx-xx	approx. 91 VA

For units with built-in heating, the values for power consumption specified in the table increase by approx. 10 – 100 VA (exact values on request), depending on the unit size).

Screw type terminal	Control computer	Capacity of terminals 0,14…1,5 mm^2
	Power supply	Capacity of terminals 0,2…4 mm^2
Housing colors	Front pane	RAL 5002 ultramarine
	Front pane	RAL 7035 light grey
Front frame	SX302-xx/xx/xR-xxx/xx-xx	plastic, tinted red, non-reflective
	SX302-xx/xx/xG-xxx/xx-xx	plastic, tinted green, non-reflective
Ambient conditions	Operating temperature	0…55 °C
	Storage temperature	-30…85 °C
	Relative humidity	max. 95 % (non-condensing)

Units with one-side display

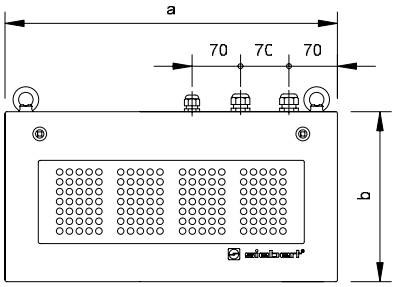
The following figure shows unit version S302-04/10/4x-1xx/xx-xx, representing the other unit versions listed in the following table.

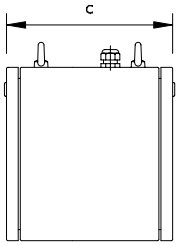


1 digit	A	B	C	D	ø	Weight
SX302-01/10/xx-1xx/xx-xx	330 mm	245 mm	145 mm	32 mm	7 mm	approx. 7 kg
2 digits						
SX302-02/05/xx-1xx/xx-xx	400 mm	185 mm	110 mm	32 mm	7 mm	approx. 5 kg
SX302-02/10/xx-1xx/xx-xx	330 mm	245 mm	145 mm	32 mm	7 mm	approx. 7 kg
3 digits						
SX302-03/05/xx-1xx/xx-xx	400 mm	185 mm	110 mm	32 mm	7 mm	approx. 5 kg
SX302-03/10/xx-1xx/xx-xx	480 mm	245 mm	145 mm	32 mm	7 mm	approx. 9 kg
4 digits						
SX302-04/05/xx-1xx/xx-xx	400 mm	185 mm	110 mm	32 mm	7 mm	approx. 5 kg
SX302-04/10/xx-1xx/xx-xx	480 mm	245 mm	145 mm	32 mm	7 mm	approx. 9 kg
5 digits						
SX302-05/05/xx-1xx/xx-xx	400 mm	185 mm	110 mm	32 mm	7 mm	approx. 6 kg
SX302-05/10/xx-1xx/xx-xx	680 mm	245 mm	145 mm	32 mm	7 mm	approx. 12 kg
6 digits						
SX302-06/05/xx-1xx/xx-xx	400 mm	185 mm	110 mm	32 mm	7 mm	approx. 6 kg
SX302-06/10/xx-1xx/xx-xx	680 mm	245 mm	145 mm	32 mm	7 mm	approx. 12 kg
7 digits						
SX302-07/05/xx-1xx/xx-xx	510 mm	185 mm	110 mm	32 mm	7 mm	approx. 7 kg
SX302-07/10/xx-1xx/xx-xx	870 mm	245 mm	145 mm	32 mm	7 mm	approx. 14 kg
8 digits						
SX302-08/05/xx-1xx/xx-xx	510 mm	185 mm	110 mm	32 mm	7 mm	approx. 7 kg
SX302-08/10/xx-1xx/xx-xx	870 mm	245 mm	145 mm	32 mm	7 mm	approx. 14 kg

Units with double-sided display

The following figure shows unit version S302-04/10/4x-2xx/xx-xx, representing the other unit versions listed in the following table.





Units with character height of 50 mm (SX302-xx/06/xx-2xx/xx-xx) are provided with 2 eyes instead of 4.

1 digit	A	B	C	Weight
SX302-01/10/xx-2xx/xx-xx	330 mm	245 mm	240 mm	approx. 11 kg
2 digits				
SX302-02/05/xx-2xx/xx-xx	400 mm	185 mm	150 mm	approx. 9 kg
SX302-02/10/xx-2xx/xx-xx	330 mm	245 mm	240 mm	approx. 11 kg
3 digits				
SX302-03/05/xx-2xx/xx-xx	400 mm	185 mm	150 mm	approx. 9 kg
SX302-03/10/xx-2xx/xx-xx	480 mm	245 mm	240 mm	approx. 15 kg
4 digits				
SX302-04/05/xx-2xx/xx-xx	400 mm	185 mm	150 mm	approx. 9 kg
SX302-04/10/xx-2xx/xx-xx	480 mm	245 mm	240 mm	approx. 15 kg
5 digits				
SX302-05/05/xx-2xx/xx-xx	400 mm	185 mm	150 mm	approx. 9 kg
SX302-05/10/xx-2xx/xx-xx	680 mm	245 mm	240 mm	approx. 19 kg
6 digits				
SX302-06/05/xx-2xx/xx-xx	400 mm	185 mm	150 mm	approx. 9 kg
SX302-06/10/xx-2xx/xx-xx	680 mm	245 mm	240 mm	approx. 19 kg
7 digits				
SX302-07/05/xx-2xx/xx-xx	510 mm	185 mm	150 mm	approx. 11 kg
SX302-07/10/xx-2xx/xx-xx	870 mm	245 mm	240 mm	approx. 23 kg
8 digits				
SX302-08/05/xx-2xx/xx-xx	510 mm	185 mm	150 mm	approx. 11 kg
SX302-08/10/xx-2xx/xx-xx	870 mm	245 mm	240 mm	approx. 23 kg