



Series S102

Numeric displays in build-in housings
with Profinet IO RT-interface

Operating instructions

1 Contact

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2 Legal note

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3 Safety precautions

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 is 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 is not complied with.

Safety

Installation work may only be carried out by qualified personnel in compliance with the relevant safety regulations. Inside the housing there are no parts that must be accessible to the user during installation or operation of the device. The housing must never be opened.

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. .

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.

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.

Grounding

All devices are equipped with a plastic housing and are operated with 24 V DV. They have a flat plug, which is connected to the shield of the PROFINET sockets and the metal back wall. A connection with the protective conductor is recommended.

EMC measures

The devices comply with the current EU Directive (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.

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.

4 Model designation

This manual applies to units with the following model designation: (x = the 'x's in the model designation indicate the size and design of the units).

S102-xx/xx/xx-xxx/xx-N0

5 Quick start for numerical operation mode (INT32 format)

The display is put into operation with the following steps. The display then shows the values sent via PROFINET.

The screenshots were created with the following hardware and software. For other engineering frameworks, the descriptions shown in this user's guide may differ from the screen display on your device.

Display	S102-04/14/0R-001/OB-N0
Engineering-Framework	Siemens TIA Portal V13, Service Pack1 , Update 9
SPS	Siemens S7-1214C
Operating system	Microsoft Windows 7 Professional, 64 Bit, english

The quick start describes the parameterization of the display. Operation of the TIA Portal is required. The devices are delivered with the PROFINET name 'siebert-display'.

Step 1: Open project

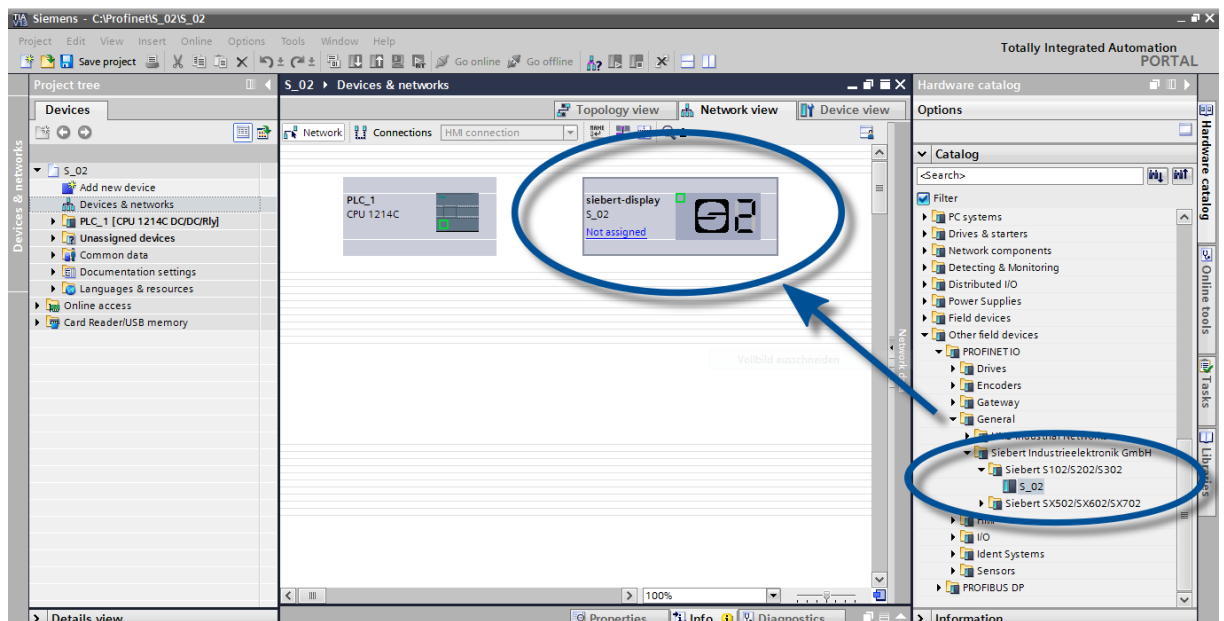
Open your project in the Engineering-Framework.

Step 2: Switch to project view

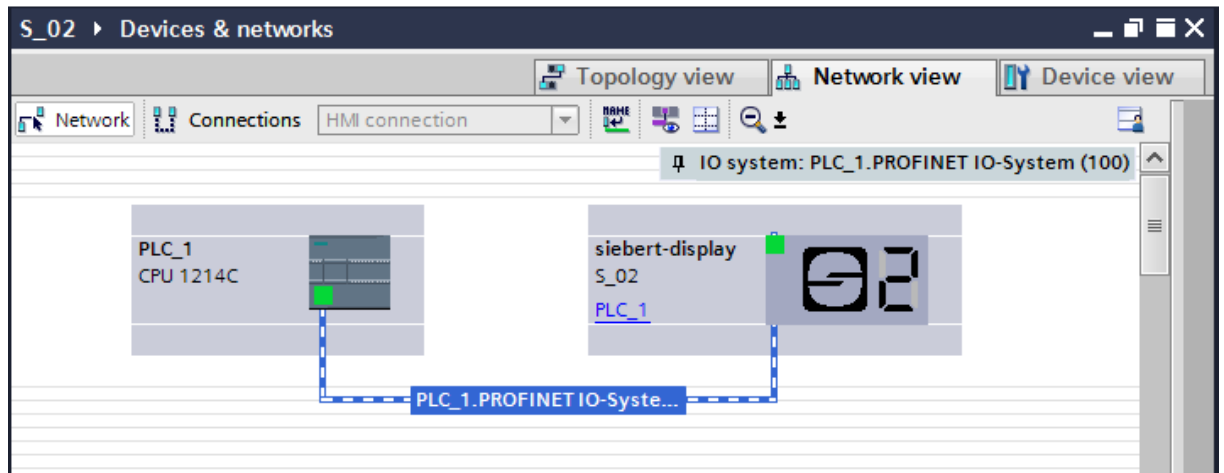
Switch to project view.

Step 3: Install the GSDML file of the ad and add the display

Install the GSDML file of the display. You find the file on the supplied data carrier or at www.siebert-group.com. After installation, the display is listed in the hardware catalog. Add the module 'siebert-display' to 'Devices & Networks/Network view'.



Step 4: Establish a connection to the display

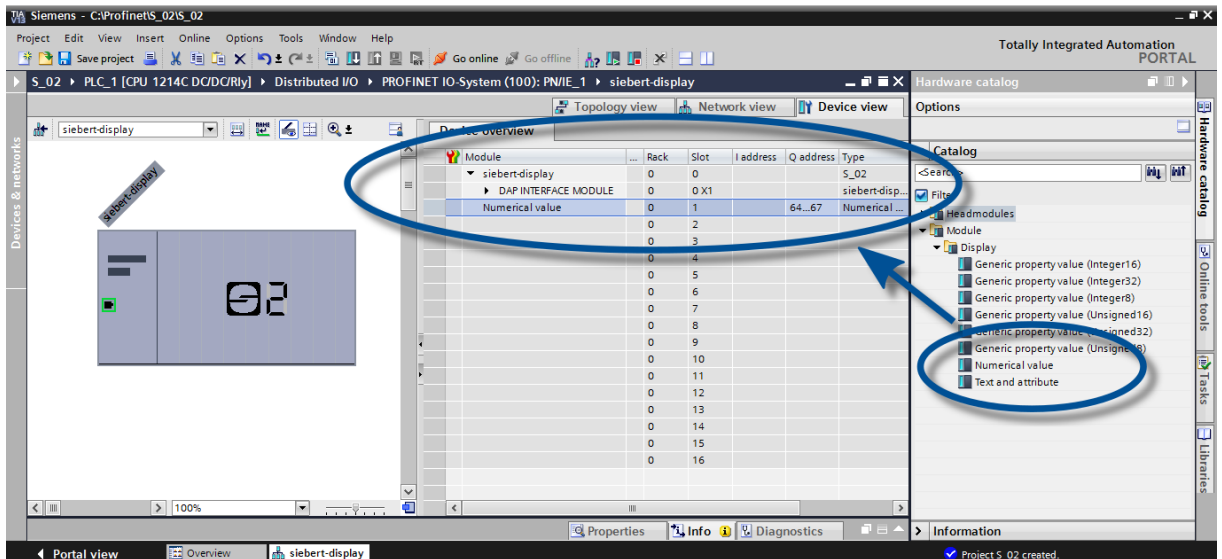


Assign the display to the desired control in the network view. Then the PROFINET connection is shown.

Step 5: Add sub-module to the display and define address range

Add the module 'Numerical Value' from the hardware catalog to the device overview.

This specifies that the display expects the values to be shown in INT32 format. The module occupies 4 bytes (in this example the addresses 64 to 67).



The screenshot shows the 'Hardware catalog' and 'Device overview' in Siemens TIA Portal. The 'Device overview' table lists modules for the 'siebert-display' rack. A blue circle highlights the 'Numerical value' module in slot 1, which is assigned to I address 64 and Q address 67. The 'Hardware catalog' on the right shows the 'Numerical value' module selected under the 'Display' category.

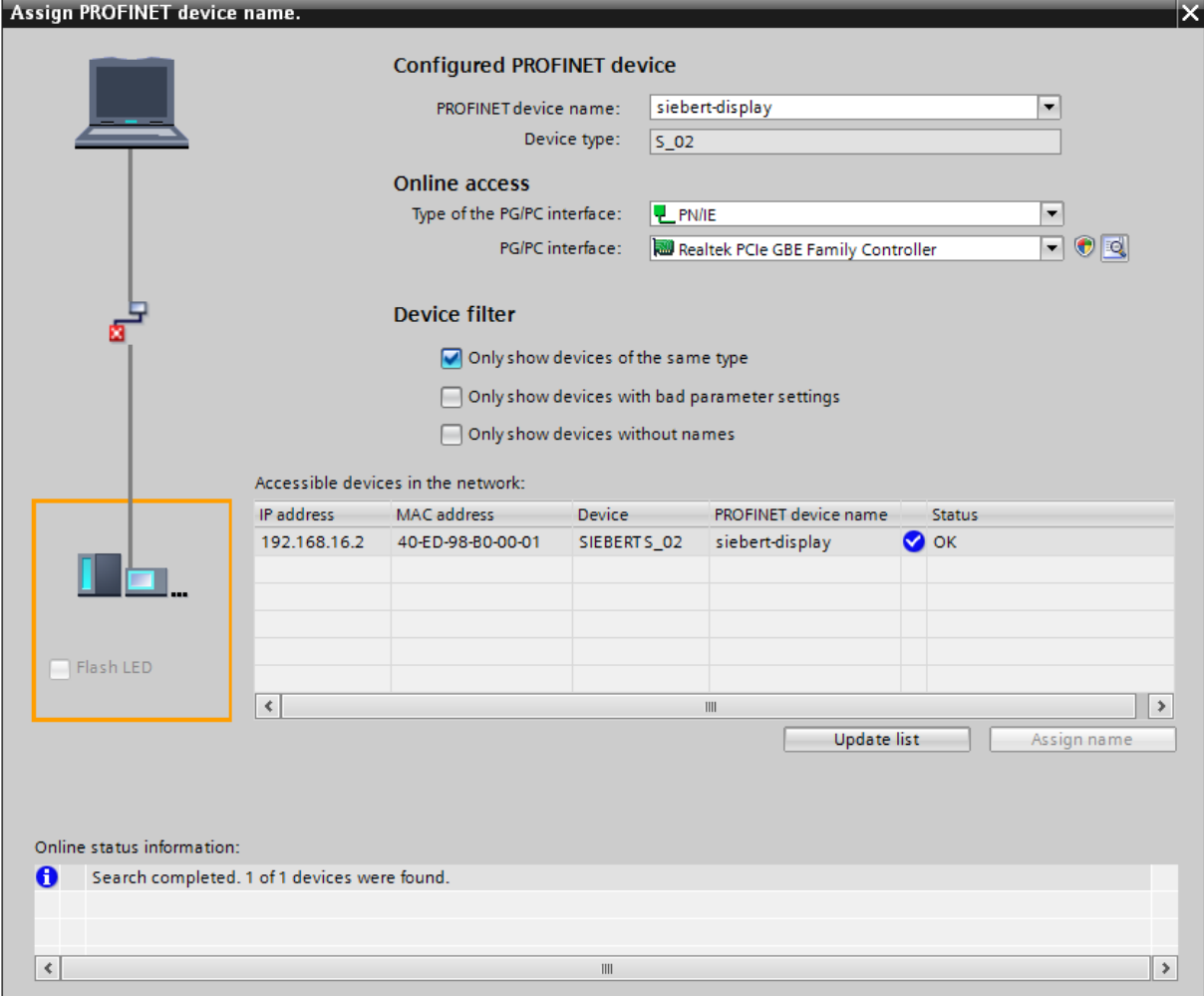
Module	Rack	Slot	I address	Q address	Type
siebert-display	0	0		S_02	siebert-disp...
DAP INTERFACE MODULE	0	0 X1			
Numerical value	0	1	64..67		Numerical ...
	0	2			
	0	3			
	0	4			
	0	5			
	0	6			
	0	7			
	0	8			
	0	9			
	0	10			
	0	11			
	0	12			
	0	13			
	0	14			
	0	15			
	0	16			

You can change the name given by the TIA Portal.

Step 6: Assign a PROFINET device name to the display

Now the IP address and the device name are assigned to the display.

After the data is transferred successfully to the display, the configuration is displayed as follows in the engineering tool.



Assign PROFINET device name.

Configured PROFINET device

PROFINET device name:

Device type:

Online access

Type of the PG/PC interface:

PG/PC interface:

Device filter

- Only show devices of the same type
- Only show devices with bad parameter settings
- Only show devices without names

Accessible devices in the network:

IP address	MAC address	Device	PROFINET device name	Status
192.168.16.2	40-ED-98-B0-00-01	SIEBERT S_02	siebert-display	OK

Flash LED

Update list Assign name

Online status information:

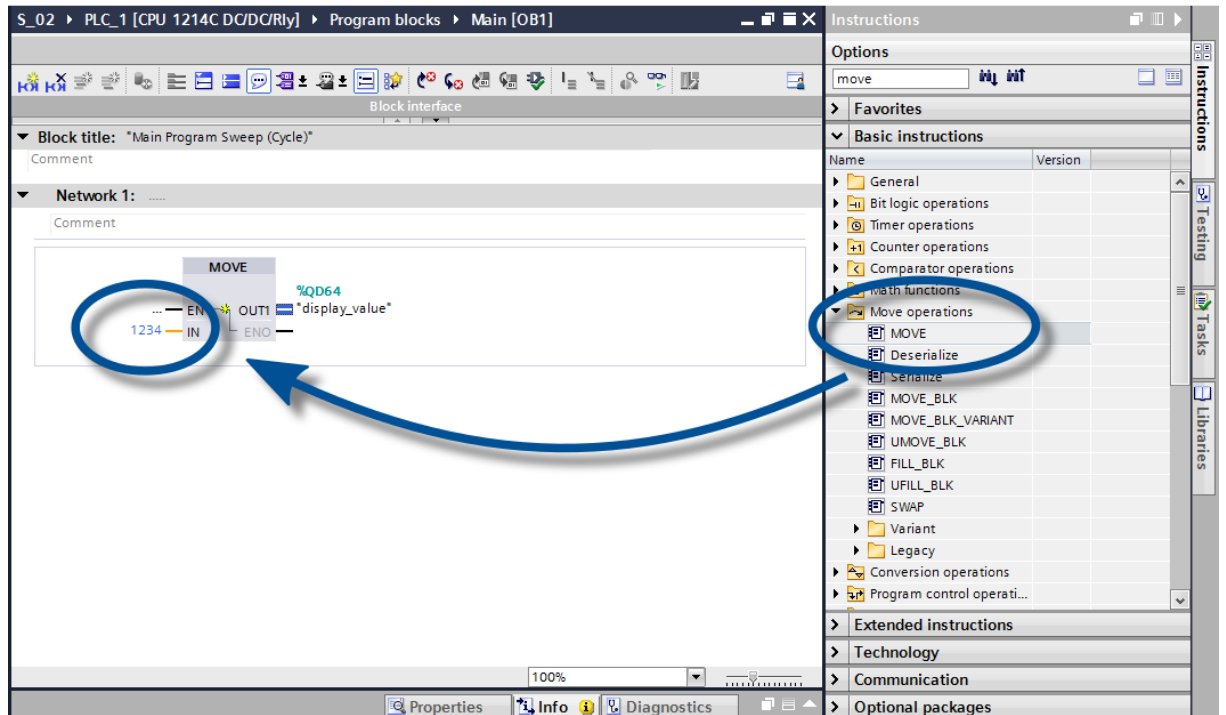
i Search completed. 1 of 1 devices were found.

Step 7: Download configuration in the controller

After the control can connect via PROFINET with the display. As soon as the connection is established the display shown the '0'. The display is now programmed to receive numerical values in INT32 format.

Step 8: Transmit data to the display

To transmit a value to the display you can for example, create a function chart with the instruction 'MOVE'. In the following screenshot the number '1234' is transmitted.



Step 8: Transmit values and texts to the display

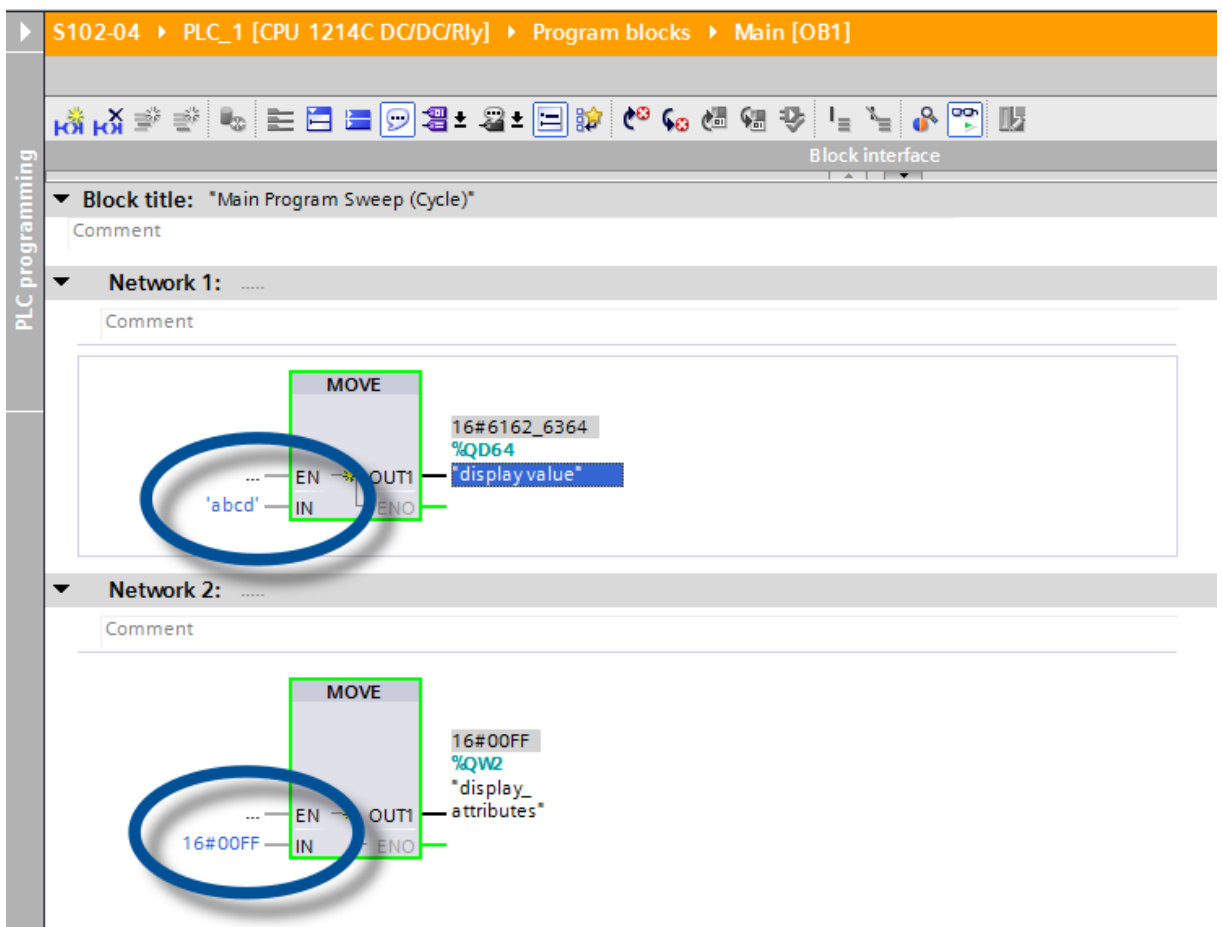
Since the display has two address areas in this operating mode, two function blocks (in the example 'Network 1' and 'Network 2') must also be defined.

In 'Network 1' a function plan is defined with the 'MOVE' statement. In the example, the output area begins with AD64. The following screenshot uses the string 'abcd'.

In 'Network 2', a further function plan is defined with the 'MOVE' statement. With this, the attributes are controlled. Attributes define the display type. In this example, the value '16 # 0033' is used to define fast flashing.

The string sent to the display can be up to 20 bytes long. The displayed bytes are dependent on the scope of the display. The not shown sequence bytes are ignored.

The attributes are binary coded. Its structure is described in the chapter 'Attributes'.



The screenshot displays the SIMATIC Manager interface for a PLC program. The breadcrumb path is: S102-04 > PLC_1 [CPU 1214C DC/DC/RIy] > Program blocks > Main [OB1]. The block title is "Main Program Sweep (Cycle)".

Network 1: Contains a MOVE instruction. The input (IN) is the string 'abcd'. The output (OUT1) is the address 16#6162_6364, which is assigned to the variable %QD64. The output is labeled "display value".

Network 2: Contains a MOVE instruction. The input (IN) is the hexadecimal value 16#00FF. The output (OUT1) is the address 16#00FF, which is assigned to the variable %QW2. The output is labeled "display_ attributes".

7 Messages on the display

The data traffic via PROFINET is indicated with status LEDs on both RJ45 sockets. The meaning is the same for both ports.

LED green	LED yellow	Meaning
off	off	<ul style="list-style-type: none"> ▪ no power supply ▪ no network connection
on	ons	<ul style="list-style-type: none"> ▪ network connection exists
on	flashing	<ul style="list-style-type: none"> ▪ initialization phase ▪ application relation is set up
on	on	<ul style="list-style-type: none"> ▪ application relation is established

If the connection can not be established or faults occur during operation the display shown the error message 'ERR'. Possible causes are IP problems due to incorrect network parameters, multiple device names, command of undefined properties or other fieldbus errors.

Once the connection has been established, the following messages can be displayed:

4-digit display	
[- -]	Until the first time user data is received, the display shows a frame on its display alternating with the above status messages.
≡ ≡ ≡ ≡	The "PROFINET flashing" diagnostic function, which can be called from the engineering tool, is signaled by three horizontal lines at each position.
UUUU	Underflow: The value sent to the display can not be displayed on the display. For example, the value '-1500' can not be displayed on a four-digit device.
OOOO	Overflow: The value sent to the display can not be displayed on the display. For example, the value '-26550' can not be displayed on a four-digit device.

8 Further settings

With the previous steps, the display shows the sent values with their default settings (factory settings).

In the numeric mode (INT32 format) these settings can be changed by changing the initialization values. These are transferred once to the display during connection setup via PROFINET.

The following setting options are available by changing the initialization values, see chapter setting the display settings during initialization (numeric operation mode only):

- Number and position of the decimal points
- Offset, scale factor (multiplier), and divisor for the conversion formula of the numerical value
- Upper and lower thresholds for automatically changing the display mode
- Luminosity of the LEDs
- Blinking in different modes when thresholds are exceeded or fallen below
- Lowering or raising the LED brightness when exceeding or falling below the thresholds
- Position of the displayed value
- Number of leading zeros

In addition, the display offers the possibility - in both operation modes (INT32 and ASCII format) - to change all previously mentioned settings as well as the setting of the basic brightness (LED brightness) in 16 steps during normal operation (see chapter setting of the display mode in normal operation mode).

9 Setting the display settings during initialization (numeric operation mode only)

Initialization parameters are loaded to the display once. They cannot be changed during operation.

Decimal points

Decimal Dots (property number 1)

The number and position of the decimal points can be defined with the help of a bit mask. For example, multiple decimal points can be used to display a date or codes.

A set bit corresponds with a set decimal point.

The least significant bit corresponds to the decimal point of the least significant digit. If, for example, the number '1234' is to be displayed with a decimal point between the 100th and the 10th digit, the bit mask must be set to the value '0x04' and '12 .34' appears on the display.

Offset, scale factor (multiplier) and divisor (property numbers 2, 3 and 12)

The formula that can be stored in the display allows you to display values in other units, such as degrees Fahrenheit in degrees Celsius, kilograms in tons, miles in kilometers, or adding an offset.

This initialization parameter consists of the values offset, scale factor (multiplier) and divisor.

Meaning	Property number	Data type	Default value
Offset	2	SINT32	0
Scale Factor	3	SINT16	1
Divisor	12	UINT16 (unsigned)	1

The calculation is based on the following linear function:

Displayed value = offset + scale factor (multiplier) / divisor x sent value

As a scale factor, integers are possible. Other factors can be formed by a combination of 'ScaleFactor' and 'Divisor'. For example, a multiplication with '13, 42' can be generated by the scale factor '1342' and divisor '100'.

Threshold values

Range (property numbers 4 and 5)

This initialization value defines the upper and lower thresholds at which the display automatically changes its display attribute.

Meaning	Property number	Data type	Default values
Upper bound	4	SINT32	-2147483648
Lower bound	5	SINT32	-2147483648

No threshold values are defined in the delivery state. The default value -2147483648 (hex: 16#80000000) commands this.

If a value is received outside the defined thresholds, the display automatically changes from 'standard' to 'out of range'. As soon as a value is received within the defined limits, the display returns to standard.

Example: For a temperature value display, the display should change its display mode, both when the temperature falls below 0 degrees Celcius and when it exceeds 100 degrees Celcius. For this, the values Upper bound = 100 and Lower bound = 0 must be entered.

Flags (property number 6)

In this initialization value (type INT16), display properties are set.

See chapter Flags.

Attributes for flashing and blinking (property numbers 7 and 9)

With these initialization values, the flashing modes for the standard display and the 'out of range' display can be defined.

See chapter Flashing modes.

Format (property numbers 10 and 11)

These two initialization parameters define the alignment of the displayed values and the number of leading zeros.

Meaning	Property number	Data type	Default values
Minimum number of digits	10	UINT8	1
Minimum width	11	UINT8	30

The minimum number of digits displayed is defined as 'Minimum number of digits'. If the value to be displayed has less digits than 'Minimum number of digits', the display is filled with zeros on the left side.

Example: For a six-digit display the 'Minimum number of digits' is set to 6. If the number '1234' is sent to the display, the display shows '001234'.

'Minimum Width' defines the minimum number of digits used for display. If the number representation contains less characters (including the sign), the space is filled with blanks on the left side.

Example: To display a number on the left-hand side, set the parameter 'Minimum Width' to '1'.

10 Flashing modes and display attributes

The display can show the values to be displayed in a plurality of brightness and blinking patterns, which are referred to as "display attribute".

For the initialization parameters, two blocks are defined: a block for 'standard attributes' (property number 7), the other for 'out of range attributes' (property number 9). In each block the values 0%, 25%, 50% and 100% can be entered.

So, for example, the following typical display effects can be defined:

Effect	1/4	2/4	3/4	4/4	Attribute value
25% of the basic brightness	25%	25%	25%	25%	16#0055
50% of the basic brightness	50%	50%	50%	50%	16#00AA
100% of the basic brightness	100%	100%	100%	100%	16#00FF
Pulsation	0%	0%	0%	0%	16#0000
Brief flashing	0%	0%	0%	100%	16#0003
Fast flashing	0%	100%	0%	100%	16#0033
Slow flashing	0%	0%	100%	100%	16#000F
Short darkening	0%	100%	100%	100%	16#003F
Low beaming	0%	25%	50%	100%	16#001B
High beaming	100%	50%	25%	0%	16#00E4

If the value '0%' is entered in all four fields, the display switches to a pulsating display. This prevents an inadvertent dark switching

The dark switching is possible by the global 'property 0'. Here the decimal point of the least significant decade flashes.

11 Flags

Bit number										Meaning	Default	
31...9	8	7	6	5	4	3	2	1	0			
:	:	:	:	:	:	:	:	:	:	0	Circumferential frame off	
:	:	:	:	:	:	:	:	:	:	1	Circumferential frame on	X
:	:	:	:	:	:	:	:	:	:	0	Underflow off	
:	:	:	:	:	:	:	:	:	:	1	Underflow on	X
:	:	:	:	:	:	:	:	:	:	0	Overflow off	
:	:	:	:	:	:	:	:	:	:	1	Overflow on	X
:	:	:	:	:	:	:	:	:	:	0	Invalid initial value off	X
:	:	:	:	:	:	:	:	:	:	1	Invalid initial value on	
:	:	:	:	:	:	:	:	:	:	0	Smart-Dot-Function off	
:	:	:	:	:	:	:	:	:	:	1	Smart-Dot-Function on	X
:	:	:	0	0	:	:	:	:	:		The decimal places are truncated.*	
:	:	:	0	1	:	:	:	:	:		The decimal places are rounded up*	
:	:	:	1	0	:	:	:	:	:		The decimal places are rounded down.*	
:	:	:	1	1	:	:	:	:	:		The decimal places are rounded commercially.*	X
:	:	:	0	:	:	:	:	:	:		Leading zeros off	
:	:	:	1	:	:	:	:	:	:		Leading zeros on	X
:	:	:	0	:	:	:	:	:	:		Value is displayed in decimal form	X
:	:	:	1	:	:	:	:	:	:		Value is displayed in hexadecimal form	
:	:	:	0	:	:	:	:	:	:		Without function. The bits are to be set to '0	X

* only with activated Smart-Dot-Function

Leading zeros

On the places in front of the value \square is shown automatically

Smart-Dot-Function

The display automatically moves the decimal point so that the decimal value is displayed completely when the value exceeds the maximum display capacity.

Invalid initial value

If the value sent to the display is invalid, Ξ is shown on each position.

Overflow

If the value sent to the display is that large that it cannot be displayed on the display \square is shown on each position on the upper segments.

If the overflow function is deactivated, the value that can be displayed as large as possible is displayed for a larger number than can be displayed. For example: numbers larger or equal 9999 are always displayed with '9999' on a four-digit display.

Underflow

If the value sent to the display is that small that it cannot be displayed on the display \sqcup is shown on each position of the lower segments.

If the underflow function is deactivated the value that can be displayed as small as possible is displayed for a smaller number than can be displayed. For example: numbers smaller or equal -9999 are always displayed with '-999' on a four-digit display.

Circumferential frame

Until user data is received for the first time the display alternately displays [] or various status messages on its display.

INT16 flags are to set specific display properties. In the delivery state, the flags are set to 16 # 00F6, corresponding to 246 decimal.

Bit numbers	Default valuest	Meaning
0	0	Leading zeros (0 = off, 1 = on) Leading zeros are automatically displayed.
1 + 2 = 00		Only with activated Smart-Dot-Function: The decimal places are cut off.
1 + 2 = 10		Only with activated Smart-Dot-Function: The decimal places are rounded.
1 + 2 = 01		Only with activated Smart-Dot-Function: The decimal places are rounded off.
1 + 2 = 11	11	Only with activated Smart-Dot-Function: The decimal places are rounded off commercially.
3	0	Smart-Dot-Function (0 = off, 1 = on) When the Smart-Dot-Function is activated, the display automatically moves the decimal point so that the decimal value is displayed completely when the value exceeds the maximum display capacity.
4	1	Invalid initial value (0 = off, 1 = on) An invalid initial value is signaled by 3 horizontal lines at each position.
5	1	Overflow (0 = off, 1 = on) The value sent tot he display can not be displayed on the display.
6	1	Underflow (0 = off, 1 = on) The value sent to the display can not be displayed on the display.
7	1	Circumferential frame (0 = off, 1 = on) Until user data is received for the first time the display alternately displays a frame or various status messages on its display.
8	0	Output of the number in decimal resp. hexadecimal form. (0 = decimal, 1 = hexadecimal)
9...15	0	Without function. The bits are to be set to '0'.

12 Setting the display mode in normal operation

The settings defined in chapter 'Setting the display settings during initialization' are defined in the engineering tool as initialization parameters and sent to the display once during the initialization of PROFINET. These settings can not be changed during normal operation.

The displays also allow to change these parameters during normal operation. Up to four 'generic property value modules' can be added.

A property number is be assigned to each of these modules. The display then shows the information sent via this module via PROFINET on the desired parameter.

Setting the basic brightness (luminosity of the LEDs)

The basic brightness of the display is controlled with the following 'global properties':

Global property number	Meaning	Allowed values
1	Select luminosity value	0 = Standard luminosity (default) 1 = Out of range luminosity
2	Standard luminosity	0 = off : 8 = middle luminosity (default) : 15 = maximum luminosity
3	'out of range'-luminosity	0 = off : 8 = middle luminosity (default) : 15 = maximum luminosity
4	Blanking of the display	0 = Display is dark all others: display lights (default)

Example: To darken the display at any time via the PLC the module 'generic property value (Integer8)' is added. The property-group 'global properties' and the property number '4' are set in the engineering tool in the initialization parameters of this module.

During operation, a number is transferred to this module during cyclic data transmission. If this number is set to '0', the display will be dark. During darkness, the decimal point of the least significant decade flashes. As soon as a value other than '0' is transmitted, the display switches its display on.

Setting of the display modes

With these setting options, the representation of the number which is transmitted cyclically via PROFINET is influenced. To control a specific property, a 'generic property value module' is added.

In the parameters of this module, in the Property-group the property 'Property of display field' is selected and in the field 'Property-number' the desired property is entered in the 'Property number' field.

The description of the properties can be found in chapter: Setting the display mode during initialization (numeric mode only).

Property of display field number	Property	Operation mode
1	Decimal dots	numeric (INT32)
2	Offset	numeric (INT32)
3	Scale factor	numeric (INT32)
4	Range – upper bound	numeric (INT32)
5	Range – lower bound	numeric (INT32)
6	Flags	numeric (INT32)
7	Standard-attribute	numeric (INT32)
8	Text-attribute	alphanumeric (ASCII)
9	Out of range-attribute	numeric (INT32)
10	Format – minimum number of digits	numeric (INT32)
11	Format – minimum width	numeric (INT32)
12	Divisor	numeric (INT32)

13 Technical data

Fieldbus

Interface	PROFINET IO RT, conformance class CC-B
MAC address	The MAC address for the PROFINET coupling is on the device
Integrated switch	PROFINET IO IRT, conformance class CC-C

Display

Character height 14 mm	Number of characters 4 or 6
Character height 25 mm	Number of characters 4 or 5
LED color	red or green

Power supply

Power supply	24 V DC (11 V DC...30 V DC), protected against reversed polarity
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Power consumption

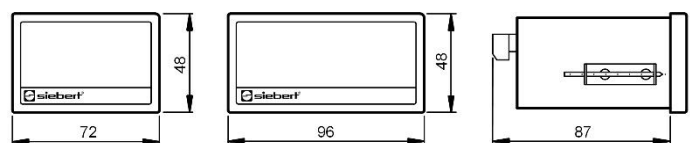
Devices with 14 mm character height	4-digit displays max. 90 mA (at 24 V DC) 6-digit displays max. 110 mA (at 24 V DC)
Devices with 25 mm character height	4-digit displays max. 250 mA (at 24 V DC) 5-digit displays max. 250 mA (at 24 V DC)

Weights

Devices with 14 mm character height	4-digit display: 140 g 6-digit display: 170 g
Devices with 25 mm character height	4-digit display ca. 300 g 5-digit display ca. 300 g

Dimensions and panel cut-outs

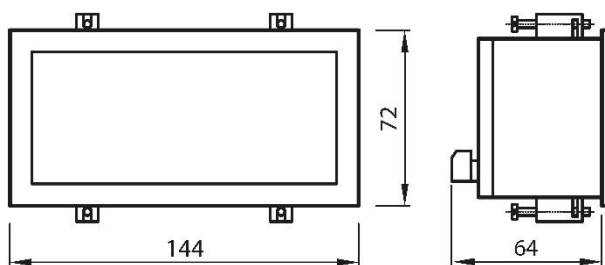
Devices with 14 mm character height



panel cut-out 4-digit display: 68 x 45 mm

panel cut-out 6-digit display: 92 x 45 mm

Devices with 25 mm character height



panel cut-out 4- and 5-digit displays: 136 x 66 mm

Housings

Material	plastic, black
Protection type	IP40, optional IP65, front (units with 14 mm character height) IP65, front (units with 25 mm character height)

Ambient conditions

Operating temperature	0...50 °C
Storage temperature	-30...85 °C
Relative humidity	max. 95 % (non condensing)