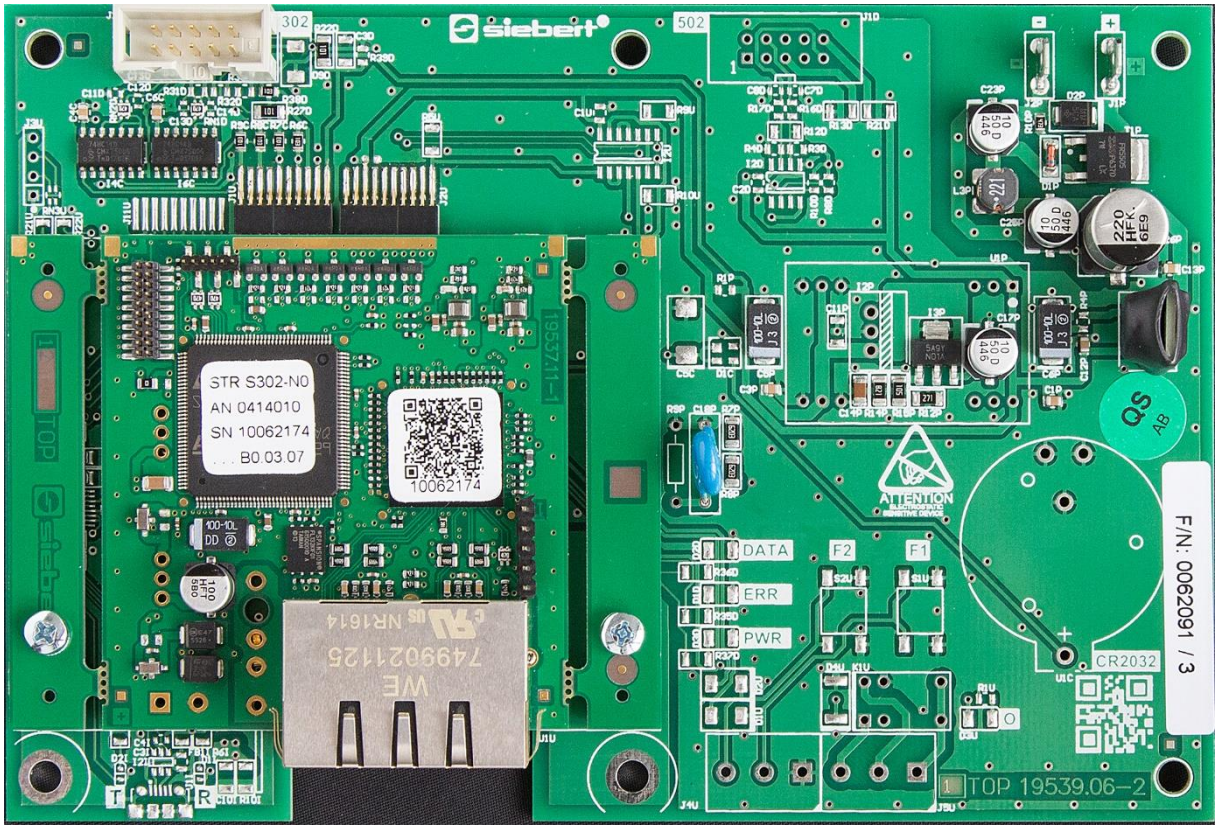

C9302-N0

Control computer for XC-Boards® with PROFINET interface

Operating instructions

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2 Legal note

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This operation manual has been prepared with the utmost care. However, we do not accept any liability for possible errors. We always appreciate your suggestions for improvement, corrections, comments and proposals. Please contact us: editing@siebert-group.com

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Table of contents

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

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 entries.

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 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.

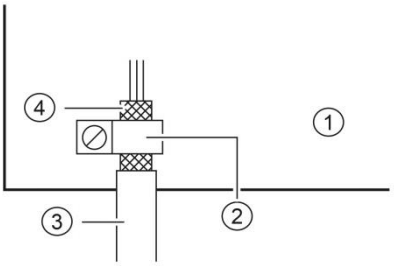
The data and operating voltage cables must be laid separately. They may not be laid together with heavy-current cables or other interference-producing cables.

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:



① mounting plate ② conductive clamp
③ data lines ④ cable shielding

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

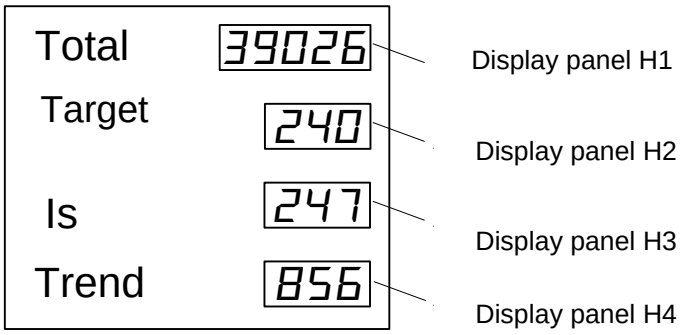
Units or unit parts which are no longer needed are to be disposed of in accordance with the regulations in effect in your country.

4 Field control

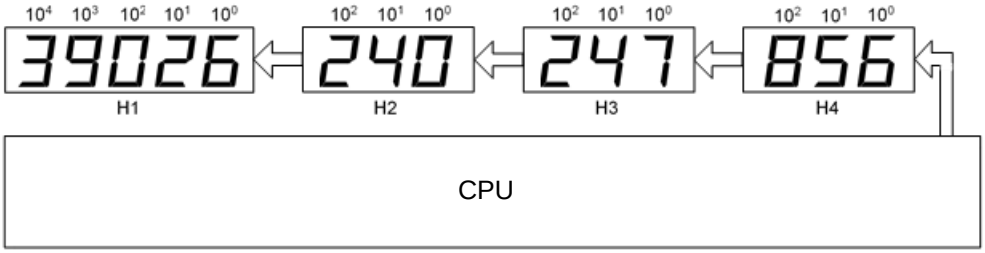
XC-Board®

The control computer C9302-N0 is used for the selective control and formatting of numeric or alphanumeric display fields in XC-Boards® via a PROFINET interface.

The following figure shows an example of an XC-Board® with four display panels:



The electrical design of the XC-Boards® is documented in the function chart supplied. The following figure shows the basic structure of the XC-Boards®.



Data telegrams sent to the display are valid for either a specific display field or for all display fields (see chapter 'Data format').

5 Number format

Numbers in this manual are displayed hexadecimal and decimal.

Hexadecimal numbers are always shown with the prefix '16 # 'and depending on the application with leading zeros. The lowest value digit is on the right.

Example: The decimal number '10' equals '16#A' or '16#0A', the decimal number 100 equals '16#64' or '16#0064'.

Decimal numbers do not have a special marking.

6 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	XC-Board
Engineering-Framework	Siemens TIA Portal V13, Service Pack1 , Update 9
SPS	Siemens S7-1513-1 PN
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

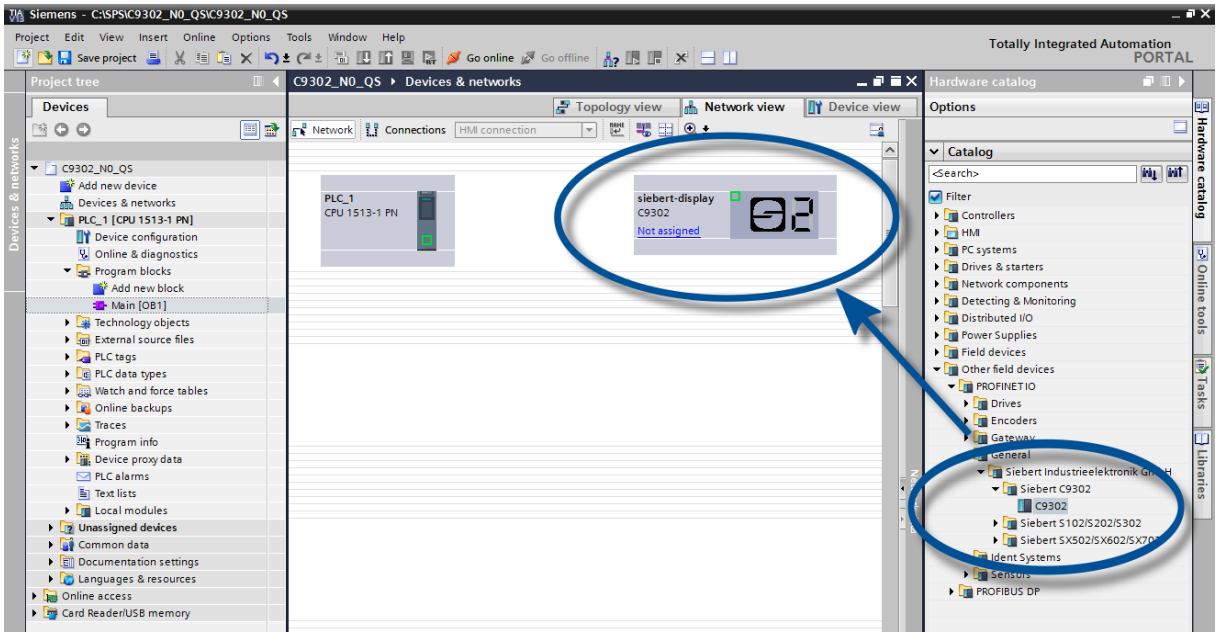
Open your project in the Engineering-Framework.

Step 2: Switch to project view

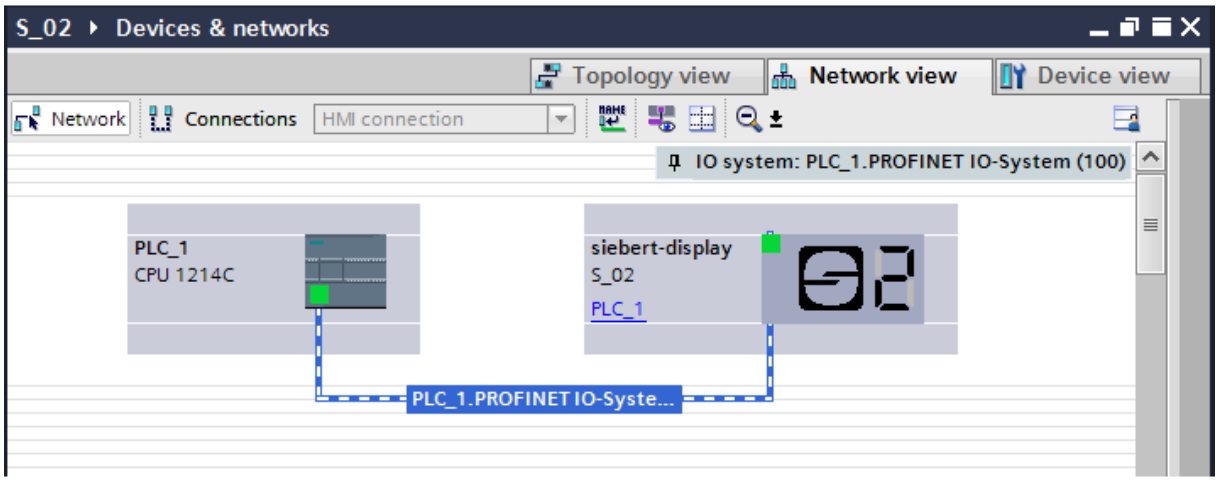
Switch to project view.

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

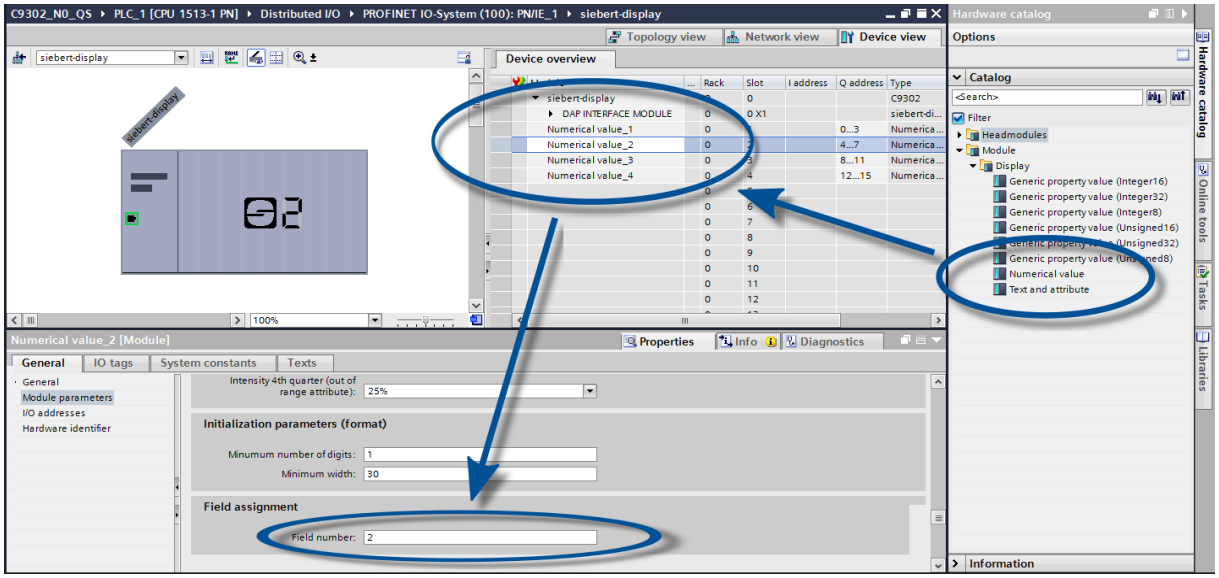


Assign the display to the desired control in the network view. Then the PROFINET connection is shown.

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

Now add the module 'Numerical Value' for each field from the hardware catalog to the device overview.

This specifies that the display, on each field, expects the values to be shown in INT32 format. The module occupies 4 bytes.



For each numerical value module, you must define the assigned field number in the module parameters. For example, the data from module Numerical Value_2 is mapped to field 2 in the screenshot. This corresponds to field H2 in the device overview.

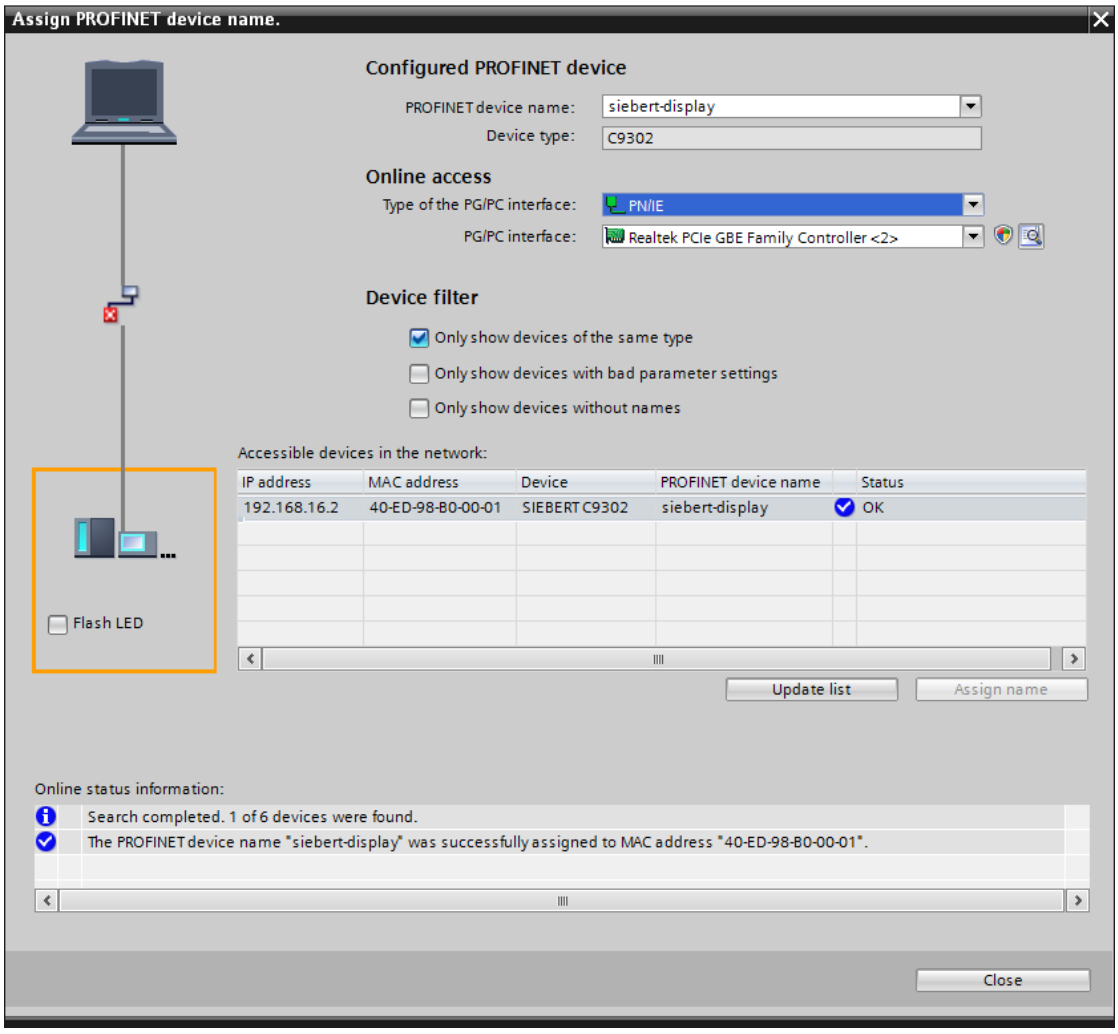
The assigned field numbers must be different for each numerical value module. If a field is linked with two different numerical value modules, the control reports the error 'Property mapped more than once'.

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.



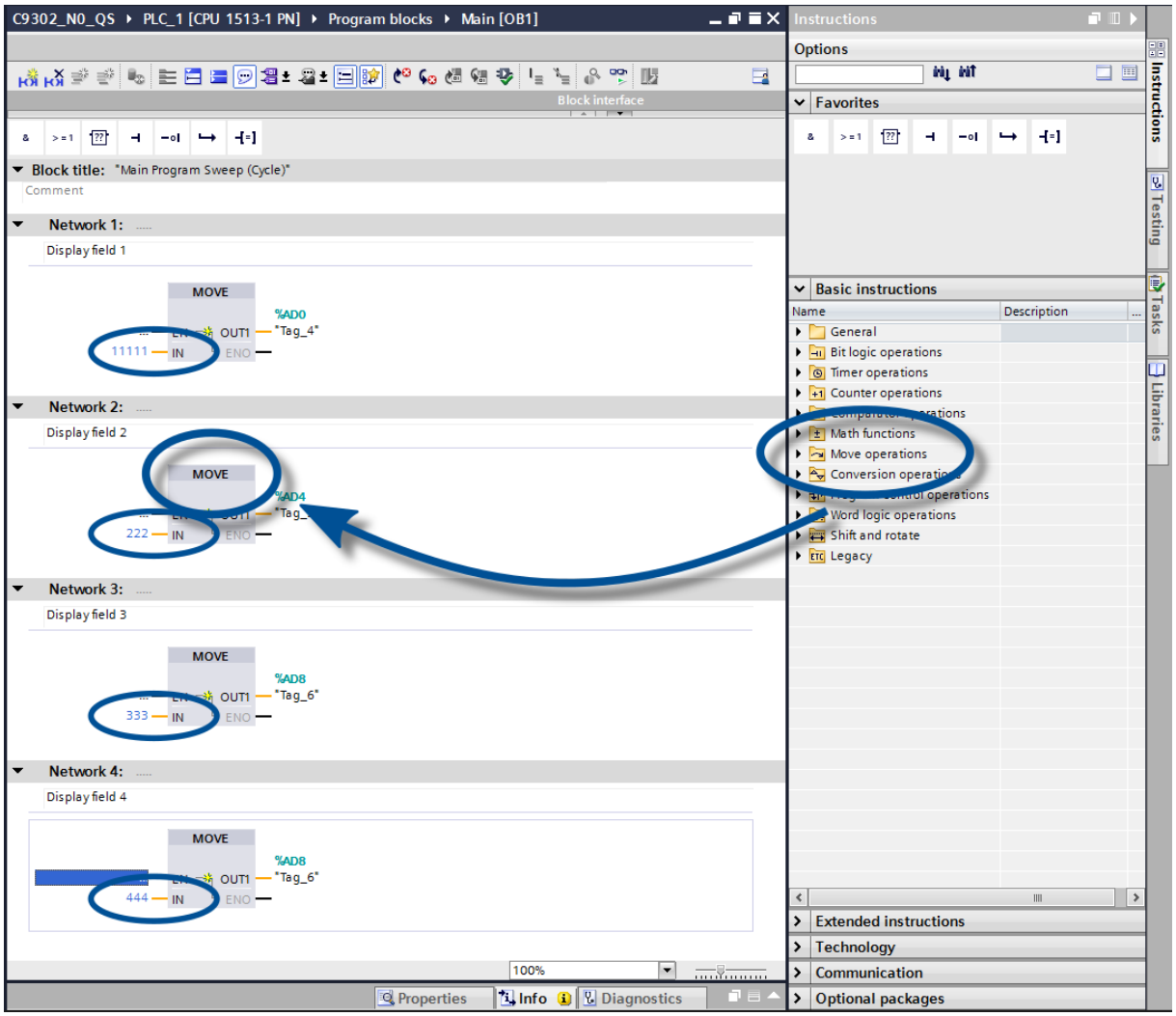
Step 7: Download configuration in the controller

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 a certain field of the display you can for example, create a function chart with the instruction 'MOVE'.

In the following screenshot, one such block is defined for each of the four fields of the display. The number '11111' is sent to the first field, the number '222', is sent to the second field, etc..



7 Quick start for alphanumeric operation mode (ASCII format)

If the display receives data in ASCII format it can display also characters and special characters which can be displayed by seven segments besides the digits.

Received characters which can not be displayed with seven segments are displayed as Ξ.

Step 1 to 4: See quick start for numeric operation mode (INT32 format)

Step 1: Open project

Step 2: Switch to project view

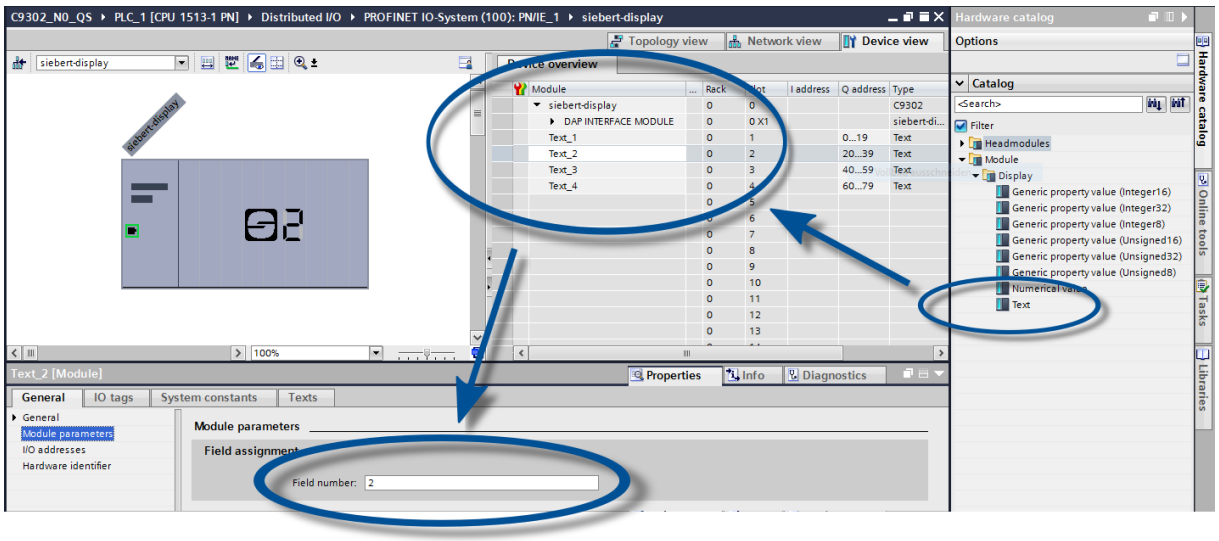
Step 3: Install the GSDML file of the ad and add the display

Step 4: Establish a connection to the display

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

Now add the module 'Text' for each field from the hardware catalog to the device overview.

This specifies that the display, on each field, expects the values to be shown as an ASCII string. In the output address area 20 bytes are reserved for each 'text' module.



For each text module, you must define the assigned field number in the module parameters. For example, the data from module text_2 is mapped to field 2 in the screenshot. This corresponds to field H2 in the device overview.

The assigned field numbers must be different for each text module. If a field is linked with two different text modules, the control reports the error 'Property mapped more than once'.

Step 6 and 7: See quick start for numeric operation mode (INT32-Format)

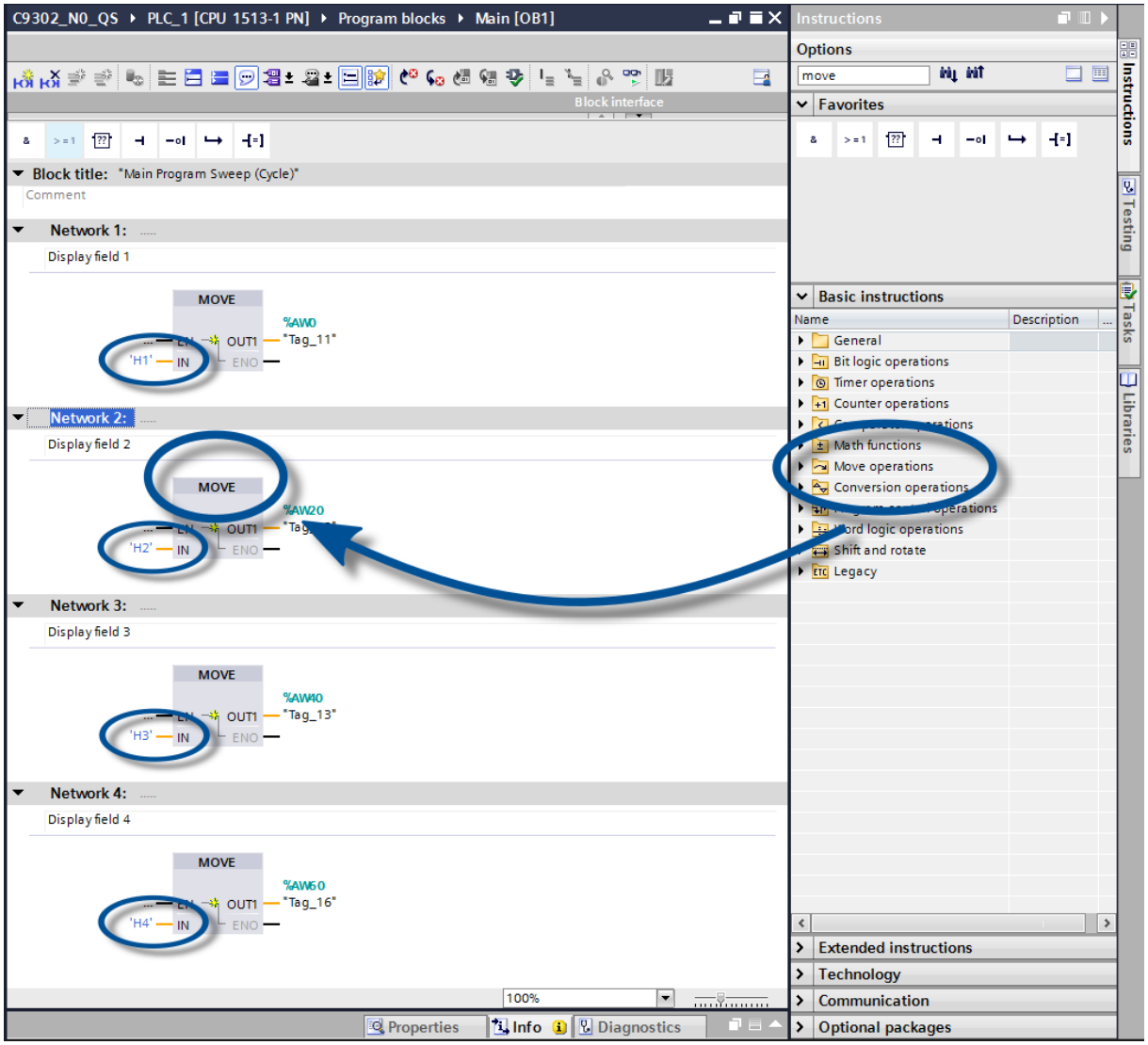
Step 6: Assign a PROFINET device name to the display

Step 7: Download the configuration to the controller

Step 8: Transmit values and texts to the display

For example, to send a value to a particular field of the display, you can create a function plan with the 'MOVE' statement. In the following screenshot, one such block is defined for each of the four fields of the display. The text 'H1' is sent to the first field, the text 'H2' to the second field, and so on.

The string sent to each field 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.



8 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	▪ no power supply ▪ no network connection
on	ons	▪ network connection exists
on	flashing	▪ initialization phase ▪ application relation is set up
on	on	▪ 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.

9 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).

The operation mode numeric ('Numerical Value' module) or alphanumeric ('Text' module) can be set for each field regardless of the operating modes of the other fields. To do this, you only have to assign the corresponding modules to the fields in the display.

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

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

Number to be displayed

Raw Value (property number 0)

A number marked by this property is interpreted as a numerical value, which is displayed on the display according to the set parameters.

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 typep	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 und 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'.

11 Flashing modes and display attributes

The display can show the values to be displayed in a plurality of brightnesses 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.

In the case of displays with multicolor LEDs (red and green), the attribute for the red color is set with the least significant byte and the attribute for the green color with the next higher byte. The meaning of the bytes for red and green is identical.

With the same attributes for red and green the display shines orange. Diverse mixed colors, flashing effects and color changing effects can be defined by different attributes, for example:

25% of the basic brightness, orange	16#5555
50% of the basic brightness, orange	16#AAAA
100% of the basic brightness, orange	16#FFFF
Slow flashing (off – on), red	16#000F
Slow inverse flashing (on – off), green	16#F000
Flashing red/green alternately	16#F00F

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

12 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 trancated.*	
:	:	:	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 0 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, = is shown on each position.

Overflow

If the value sent to the display is that large that it cannot be displayed on the display O 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 u 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.

13 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)

14 Technical data

Fieldbus

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

Ambient conditions

Operating temperature	0…55 °C, with heating -20…55 °C
Storage temperature	-30…85 °C
Relative humidity	max. 95 % (non condensing)