MICRO-EPSILON

Operating Instructions

IF2035-PROFINET

Interface Module

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Contents

1. Safety

System operation assumes knowledge of the operating instructions.

1.1 Symbols Used

The following symbols are used in these operating instructions.

⚠ CAUTION	Indicates a hazardous situation which, if not avoided, may result in minor or moderate injury.
NOTICE	Indicates a situation that may result in property damage if not avoided.
➡	Indicates a user action.
i	Indicates a tip for users.
`Measurement`	Indicates hardware or a software button/menu.

1.2 Warnings

⚠ CAUTION

Connect the power supply and the display/output device according to the safety regulations for electrical equipment.
> Risk of injury
> Damage to or destruction of the interface module

NOTICE

The supply voltage must not exceed the specified limits.
> Damage to or destruction of the interface module

Avoid shocks and impacts to the interface module.
> Damage to or destruction of the interface module

1.3 Notes on CE Marking

CE marking

- Directive 2014/30/EU
- Directive 2011/65/EU

Products which carry the CE marking satisfy the requirements of the EU Directives cited and the relevant applicable harmonized European standards (EN). The product is designed for use in industrial environments.

The EU Declaration of Conformity and the technical documentation are available to the responsible authorities according to the EU Directives.

UKCA marking

The following applies to the product:

- SI 2016 No. 1091:2016-11-16
- SI 2012 No. 3032:2012-12-07

Products which carry the UKCA marking satisfy the requirements of the directives cited and the relevant applicable harmonized standards. The product is designed for use in industrial environments.

The UKCA Declaration of Conformity and the technical documentation are available to the responsible authorities according to the UKCA Directives.

1.4 Intended Use

- The IF2035-PROFINET interface module is designed for use in industrial applications.
  It is used to convert the internal MICRO-EPSILON sensor protocol (RS485, RS422) to PROFINET.
- The IF2035-PROFINET must only be operated within the limits specified in the technical data, see Chap. 2.2.
- The IF2035-PROFINET must be used in such a way that no persons are endangered or machines and other material goods are damaged in the event of malfunction or total failure.
- Take additional precautions for safety and damage prevention in case of safety-related applications.

1.5 Proper Environment

- Protection class: IP 20
- Temperature range
  - Operation: 0 ... +50 °C (+32 ... +122 °F)
  - Storage: -20 ... +70 °C (-4 ... +158 °F)
- Humidity: 5 - 95% (non-condensing)
- Ambient pressure: Atmospheric pressure

2. Functional Principle, Technical Data

2.1 Functional Principle

The IF2035-PROFINET interface module is used to convert the internal Micro-Epsilon sensor protocol (RS485 or RS422) to PROFINET IO.

Features:

- Synchronization output, LED status display
- PROFINET interface
- Housing for top-hat rail

Depending on the interface used, one sensor (with RS422) or several sensors (with RS485) can be connected via one module.

2.2 Technical Data

Model		IF2035-EtherCAT	IF2035-PROFINET	IF2035-EIP
Speed [1]		0.25 ms	1 ms, 0.5 ms (IRT)	1 ms
Supply voltage		9 ... 36 VDC		
Power consumption		approx. 1.25 W with 24 VDC (without sensor)		
Digital interface		RS422, RS485 (with Micro-Epsilon specific data protocol), baud rate 9600 baud ... 4 MBaud, EtherCAT	RS422, RS485 (with Micro-Epsilon specific data protocol), baud rate 9600 baud ... 4 MBaud, PROFINET	RS422, RS485 (with Micro-Epsilon specific data protocol), baud rate 9600 baud ... 4 MBaud, EtherNet/IP
Digital output		Digital output synchronization (TTL, HTL) for RS422 sensors		
Connection		2 x RJ45 for fieldbus, 4 screw terminals for sensor connection and power supply		
Mounting		DIN rail 35 mm		
Temperature range	Storage	-20 ... 70°C		
	Operation	0 ... 50 °C		

1) corresponds to the minimum cycle time

Model		IF2035-EtherCAT	IF2035-PROFINET	IF2035-EIP
Humidity		5 % RH ... 95 % RH (non condensing)		
Shock (DIN EN 60068-2-27)		5 g, 6 ms, 1000 shocks, 3 axes in 2 directions each		
Vibration (DIN EN 60068-2-6)		2 g, sinusoidal excitation with 50 ... 2000 Hz, 10 cycles, 3 axes		
Protection class (DIN EN 60529)		IP20		
Compatibility	RS485	inertialSENSOR: ACC5703, INC5701; capaNCDT 6120; induSENSOR MSC7401, MSC7602, MSC7802, DTD		
	RS422	optoNCDT 1220, 1320, 1420, 1750, 1900, 2300; confocalDT 242x, 246x; interferoMETER IMS5400-TH, IMS5400-DS, IMS5600-DS; colorCONTROL ACS7000, MFAx; optoCONTROL 2520; 2700 optoNCDT ILR2250		
Control and indicator elements		4 status LEDs (System, Status, RUN, ERR)	4 status LEDs (System, Status, COM0, COM1)	4 status-LEDs (System, Status, NS, MS)
Special features [2]		EtherCAT compliant 2.3.0.0 / Software integration in PLC: ESI file	Certification: PNIO V2.43 / Software integration in PLC: GSDML file	Certification: CT-19.1 / Software integration in PLC: EDS file
Weight		approx. 120 g		

2) available for download on Micro-Epsilon website

3. Delivery

3.1 Unpacking, Included in Delivery

1 IF2035-PROFINET interface module

1 Assembly Instructions

➡ Carefully remove the components of the interface module from the packaging and ensure that the goods are forwarded in such a way that no damage can occur.

➡ After unpacking, check immediately for completeness and transport damage.

➡ If there is damage or parts are missing, immediately contact the manufacturer or supplier.

3.2 Download

GSDML file, available at https://www.micro-epsilon.de/service/download/

TIA function components for easier configuration, available at https://www.micro-epsilon.de/service/download/

3.3 Storage

Storage temperature:	-20 ... +70 °C (-4 ... +158 °F)
Humidity:	5 - 95% (non-condensing)

4. Installation and Assembly

Ensure careful handling during installation and operation.

4.1 Installation of the Interface Module

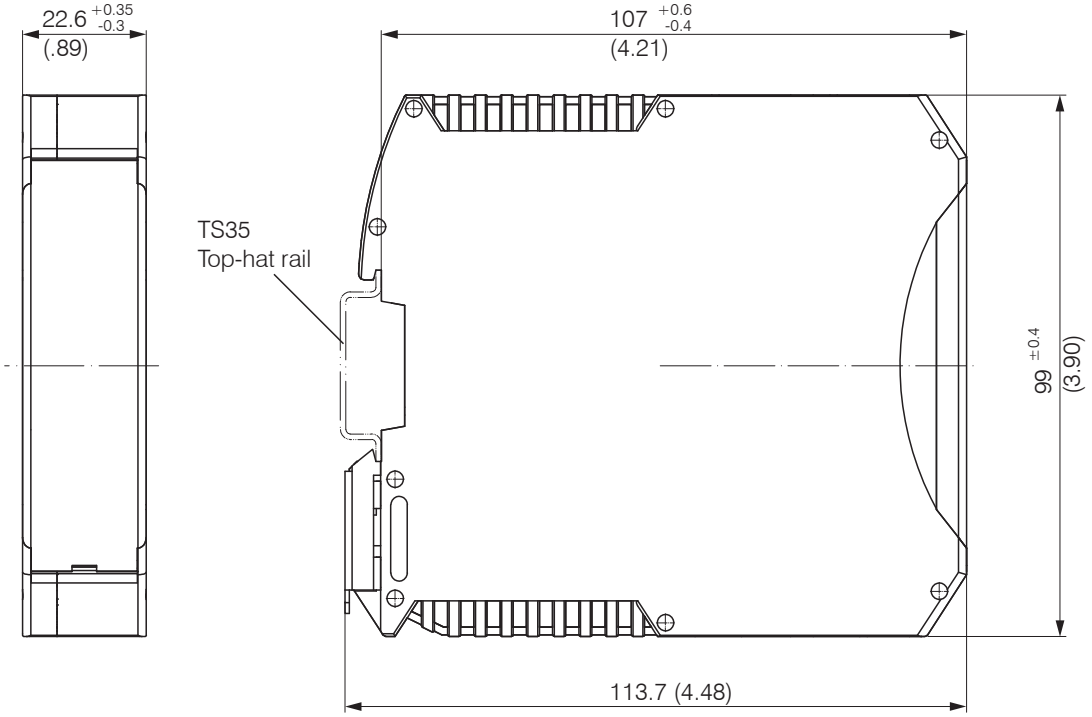


Fig. 1 IF2035-PROFINET dimensional drawing, dimensions in mm (inches)

4.2 Pin Assignment

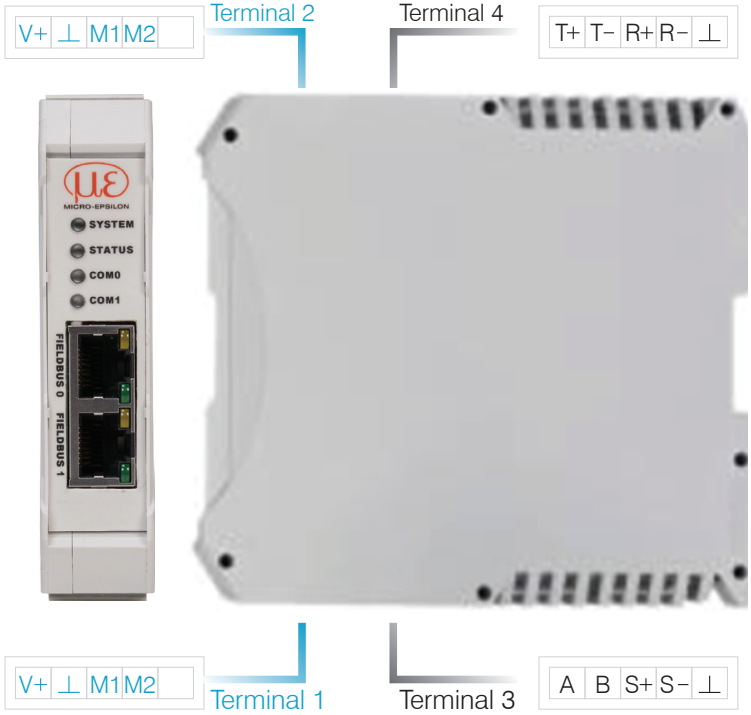


Fig. 2 Interface module terminals

Terminal 1 and 2	
V+	Supply voltage [2]
⊥	Ground for supply voltage
M1, M2	Multifunction input 1/2 sensor
Terminal 1 and 2 connections daisy-chained	

Terminal 4	
T+	RS422 Tx+
T-	RS422 Tx-
R+	RS422 Rx+
R-	RS422 Rx-
⊥	Ground [1] e.g., for RS422 shield connection

Terminal 3	
A	RS485 A
B	RS485 B
S+	Synchronization output +
S-	Synchronization output -
⊥	Ground [1] e.g., for RS485 shield connection

1) Internally connected to supply ground

2) If the distance between IF2035-PROFINET and the sensor/controller is long, a separate supply for the sensor/controller may be advisable.

4.2.1 Supply Voltage

The supply voltage is daisy-chained from the supply port (terminal 1) to the sensor port (terminal 2), i.e., the supply voltage must match that of the sensor. Positive voltage must be between 9 V and 36 V.

➡ Connect the inputs V+ and ⊥ on terminal 1 to a voltage supply. Maximum cable length 3 m.

The voltage supply must match that of the connected sensor, because the voltage is internally daisy-chained.

MICRO-EPSILON recommends using the optionally available power supply PS2020, input 100 - 240 VAC, output 24 VDC/2.5 A, see Chap. A 1.

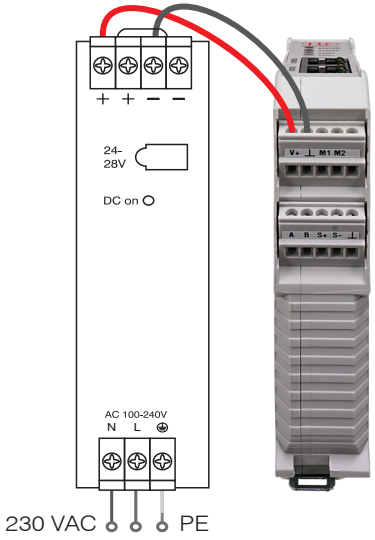


Fig. 3 Interface module with optional PS2020 power supply

ℹ If the distance between IF2035-PROFINET and the connected sensor/controller is long, Micro-Epsilon recommends that a separate supply be used for the sensor/controller.

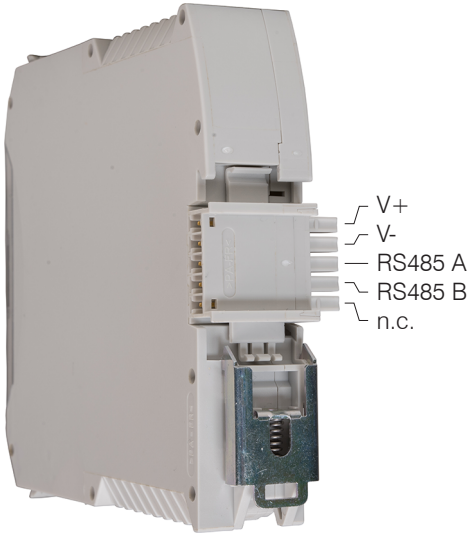
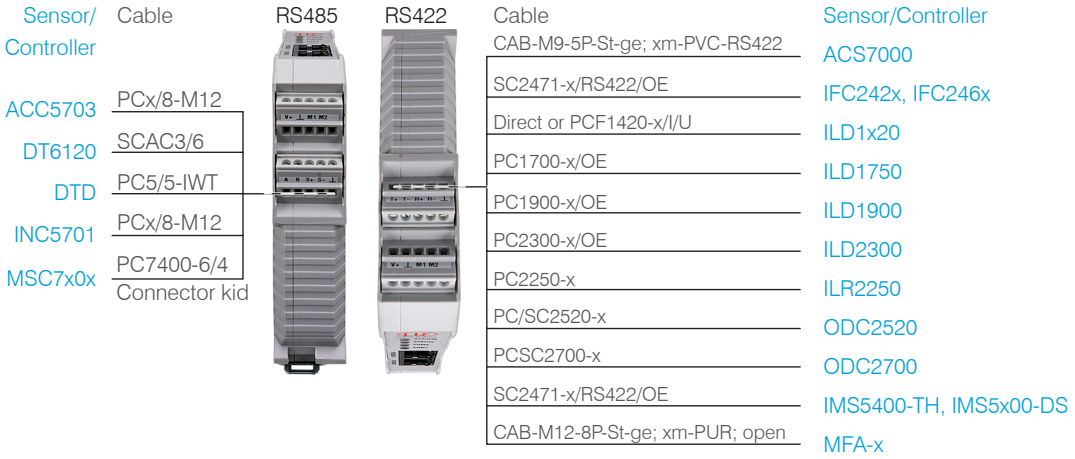


Fig. 4 Optional supply voltage wiring at rear of terminal

4.2.2 Connection Options



The length of the cable between IF2035-PROFINET and sensor/controller is 10 m at most. Because of the PCx/8-M12 cable, the sensor supply for ACC5703 and INC5701 sensors is possible only via the IF2035-PROFINET.

Fig. 5 Connection examples for IF2035-PROFINET

Fig. 6 Connection of an MSC7602 with MSC7602 connector kit

IF2035-PROFINET	Sensor/Controller
RS422	
T+ T - R+ R -	R+ R - T+ T -
⊥	Cable shield
RS485	
A B	A B
⊥	Cable shield

Fig. 7 Wiring regulation for connections with RS485 or RS422

4.2.3 Cable Termination at Interface

Ensure correct cable termination for an RS485 bus or RS422 bus!

We recommend a 120 Ohm terminating resistor between the signal lines at both the bus start and end. IF2035-PROFINET works as a master for both interfaces; internally, a 120 Ohm terminating resistor has already been permanently incorporated. The IF2035-PROFINET should be at the bus start.

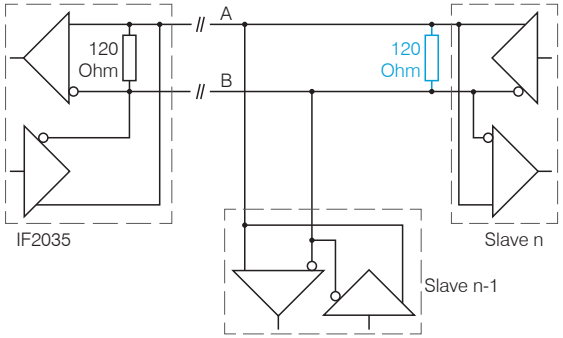


Fig. 8 Cable termination RS485, n = max. 16 slaves

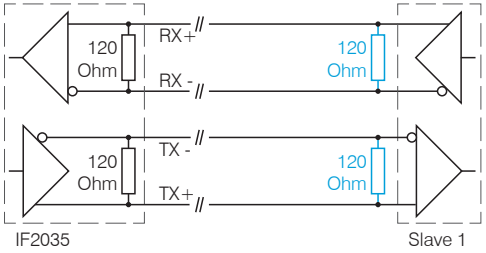


Fig. 9 Cable termination RS422

4.3 Fieldbus Cabling

During cabling, channel 0 of the IO controller is connected to a port of the first IO device (slave device). The second port of the first slave device is connected to the input port of the next slave device, etc. One port of the last slave device and channel 1 of the master device remain unused.

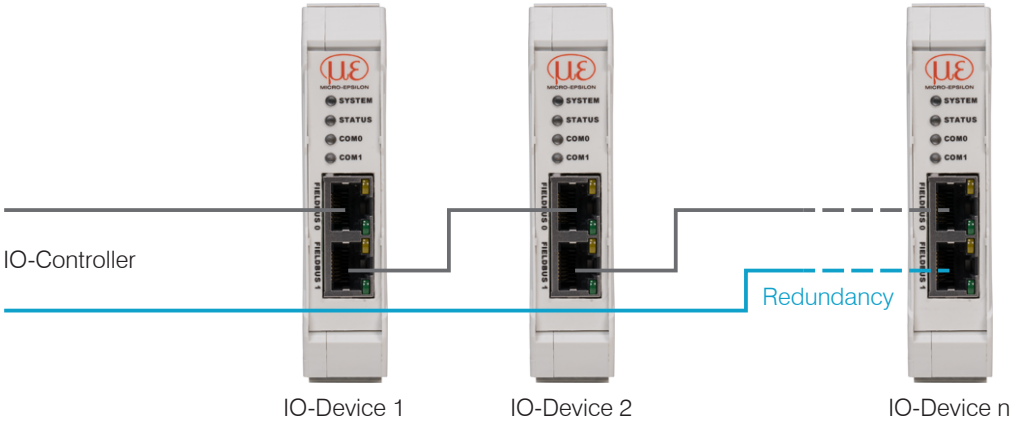


Fig. 10 Cabling in the PROFINET IO network

Optional: You achieve greater failsafe network performance if you implement an additional redundant connection (MRP = Media Redundancy Protocol) between the output port of the last slave device and channel 1 of the IO controller. IF2035 can participate in an MRP ring as a client; however, it cannot manage the ring. To achieve ring functionality, all participants must be configured as ring participants.

4.4 Indicator Elements, LED

LED	Color / State			Meaning
SYSTEM	☀	green	On	No error
STATUS	☀	green	On	
SYSTEM	☀	green	On	Error stage 1: Serial connection error, Write/Read at incorrect object index
STATUS	☀ ☀	red/green	On, up to FW1.1.1	
	○		Off, from FW1.1.1	
SYSTEM	☀	green	On	Error stage 2: Critical error e.g. no compatible ME-Bus-sensor found
STATUS	☀	red	On	
SYSTEM	☀	red	On	Error stage 3: Hardware error
STATUS	☀	red	On	
COM 0	○		Off	No error
	☀	red	Flashing (1 Hz, 3 s)	DCP signal service is initiated via the bus.
	☀	red	On	Watchdog time-out; channel, generic or extended diagnosis present; system error
COM 1	○		Off	No error
	☀	red	Flashing (2 Hz)	No data exchange
	☀	red	On	No configuration; or low speed physical link; or no physical link

5. Initial Operation

5.1 Configuring the Sensors

The sensor used must be correctly configured to work with the IF2035. Micro-Epsilon recommends that the sensor's base configuration be set by using its web interface. The configuration can later also be adjusted via fieldbus.
Please refer to the operating instructions of the corresponding sensor for detailed information on configuring the sensor.

5.2 Baud Rate and Sensor Interface

IF2035-PROFINET must be set for the interface used and the sensor's baud rate. The baud rate and sensor interface can be configured in various ways.

Sensor/Controller	Baud rate [Baud]	RS485	RS422
ACC5703	230400	•	
ACS7000	230400		•
DT6120	230400	•	
DTD	256000	•	
IFC242x, IFC246x	115200		•
ILD1220, ILD1320	921600		•
ILD1420	921600		•
ILD1750, ILD1900	921600		•

Sensor/Controller	Baud rate [Baud]	RS485	RS422
ILD2300	921600 [1]		•
ILR2250	115200		•
IMS5400-TH, IMS5x00-DS	115000		•
INC5701	230400	•	
MFAx	115200		•
MSC7401, MSC7x02	256000	•	
ODC2520	115200		•
ODC2700	921600		•

Fig. 11 Baud rate (factory setting) of the sensors or controllers to be connected

5.2.1 Option 1: Module Parameters

After selecting an input module, the IF2035-PROFINET can be configured using the associated module parameters.

➡ Select the baud rate and interface as necessary, see Chap. 5.7.4.

1) The ILD2300 is set for 691.2 kBaud ex factory. Increase the baud rate to 921.6 kBaud in the sensor.

5.2.2 Option 2: TIA Components

The download package with the GSDML file includes preset function components that allow for easy access to options for the IF2035-PROFINET.

➡ Select the `IF203x_BaudrateInterface` component and transfer the parameters, see Chap. 5.7.3.

5.2.3 Option 3: Directly Access the Object Directory

Use the `WRREC_DB` function component to send the desired baud rate and sensor interface to the IF2035-PROFINET, see Chap. 5.5.

5.3 Data Format

All configuration parameters and data are transmitted in Little Endian format.

Sensors/controllers with RS485: cyclical data are transmitted via the fieldbus without change, i.e., as a binary block as described and supplied by the sensor. Please refer to the sensor's operating instructions for the data set structure.

Sensors/controllers with RS422: cyclical data are decoded, i.e., a 4th byte is added to the 3 bytes and then transmitted. The sensor signals selected for transfer and their sequence are available on the sensor's web interface.

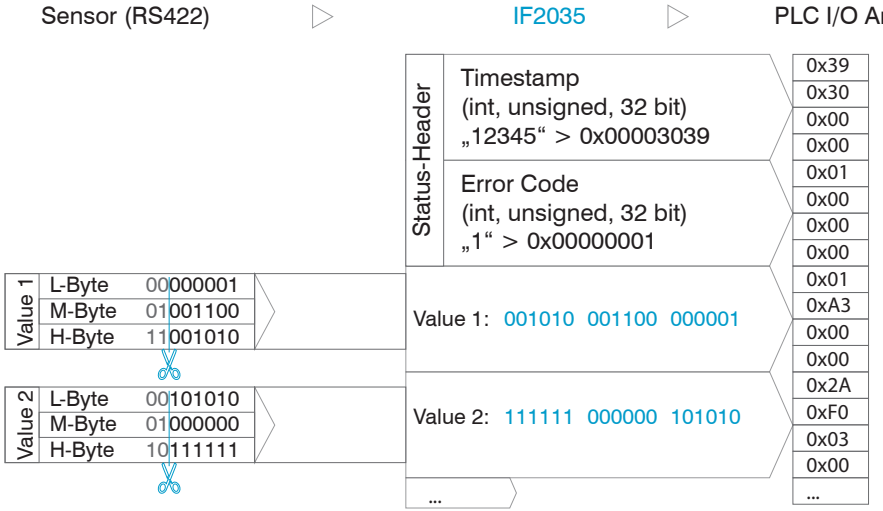


Fig. 12 Interpretation of RS422 sensor data in IF2035-PROFINET

5.4 Object Directory

Index	Subindex	Data type		Name	RS485	RS422	Description
0x2000	0	Uint8	RW	select sensor	✓		Address of currently selected sensor
0x2001	0	Uint8[32]	R	sensor addresses	✓		Shows address list of available sensors
0x2010	0	Uint32[64]	R	device error log	✓	✓	Reads out the last 32 error codes with time stamp
0x2020	0	Uint32	RW	baud rate	✓	✓	IF2035 baud rate
0x2021	0	Uint8	RW	minimum cycle time	✓	✓	Minimum time for one communication cycle in ms, cycle time = 0: use estimated time
0x2023	0	Uint8	RW	serial sensor interface	✓	✓	0: RS485, 1: Reserved, 2: ASCII + RS422 3: 32 Bit ASCII + RS422
0x2024	0	Uint8	W	clear device config	✓	✓	One byte deletes settings from flash, settings are included in RAM until restart
0x2025	0	Uint8	W	clear sensor config	✓		One byte deletes settings from flash, settings are included in RAM until restart
0x2026	0	Uint8	W	reset device	✓	✓	One byte performs reset
0x2027	0	Uint8	RW	enable/disable HTTL Sync	✓	✓	0: Disable HTTL synchronization 1: Enable HTTL synchronization

Index	Subindex	Data type		Name	RS485	RS422	Description
0x2210				Device Info	✓		Read out the block of the current sensor
	0	Uint8	R	NrOfObjects			
	1	Uint8	R	Block version			Block version
	2	Uint8	R	Endianness			Endian
	3	Uint16	R	Software version			Software version
	4	Int32	R	Article number			Part number
	5	Int32	R	Option			Option
	6	Int32	R	Batch number			Batch number
	7	Int32	R	Serial number			Serial number
	8	Uint8	R	Change index			Change index
	9	Uint8	R	Calibration day			Day of calibration
	10	Uint8	R	Calibration month			Month of calibration
	11	Uint8	R	Calibration year			Year of calibration
	12	Uint16	R	Calibration software version			Version of calibration software
	13	Uint16	R	Test software version			
	14	Uint8	R	Test hour			
	15	Uint8	R	Test day			
	16	Uint8	R	Test month			
	17	Uint8	R	Test year			
	18	Int32	R	Article number circuit board			
	19	Int32	R	Serial number circuit board			
	20	Uint8[32]	R	Name			
	21	Uint8	R	sensor/channel count			
	22	Uint8	R	protocol block count			
	23	Uint8[164]	R	protocol blocks			

Index	Subindex	Data type		Name	RS485	RS422	Description
0x2213				Diagnostic block	✓		RS485 bus diagnostic block (if available)
	0	Uint8		NrOfObjects			
	1	Uint8	RW	page index to read			Specifying an index lets you scroll through existing pages
	2	Uint8	R	number of pages			
	3	Uint8	R	diagnose Type			
	4	Uint8[235]	R	String Page			Diagnostic message

Index	Subindex	Data type		Name	RS485	RS422	Description
0x2220				Sensor block	✓		Request sensor information
	0	Uint8	R	NrOfObjects			
	1	Uint8	RW	block index offset			The offset lets you scroll through existing sensor blocks [0 - 0x1F]
	2	Uint8	RW	page index to read			Specifying an index lets you scroll through existing pages
	3	Uint8	R	number of pages			Max. number of pages
	4	Uint8	R	measurement unit			Signal unit
	5	Int32	R	article number			Part number
	6	Int32	R	Option			Option
	7	Int32	R	Batch number			Batch number
	8	Int32	R	serial number			Serial number
	9	Float	R	Nominal measuring range			Nominal measuring range
	10	Float	R	Nominal offset			Nominal offset
	11	Float	R	current measuring range			Actual measuring range
	12	Float	R	current offset			Actual offset
	13	Uint8[32]	R	Target material			Target material
	14	Uint8[32]	R	Sensor/channel name			Sensor/channel name
	15	uint8	R	extension length			Length of block extension
	16	uint8[138]	R	extension			

Index	Subindex	Data type		Name	RS485	RS422	Description
0x2501				Parameter Info	✓		Request configuration parameters, e.g., sensor exposure time, request via subindex 1, configure interface with objects 0x2510 through 0x2540
	0	Uint8	R	NrOfObjects			
	1	Uint16	RW	Parameter ID			Please refer to the sensor documentation for available parameter IDs and their types
	2	Uint8[14]	R	Name			
	3	Uint8[8]	R	Unit			
	4	Uint8[8]	R	Type			

0x2510				Float parameter	✓		Read or write float parameter
	0	Uint8		NrOfObjects			
	1	Uint16	RW	Parameter ID			Please refer to the sensor documentation for available parameter IDs and their types
	2	Uint8	RW	Reserved			
	3	Float	RW	Value			Value
	4	Uint8[14]	R	Name			Designation
	5	Uint8[8]	R	Unit			Unit as a string
	6	Float	R	Min			
	7	Float	R	Max			

Index	Subindex	Data type		Name	RS485	RS422	Description
0x2520				Int Parameter	✓		Read or write integer parameter
	0	Uint8		NrOfObjects			
	1	Uint16	RW	Parameter ID			Please refer to the sensor documentation for available parameter IDs and their types
	2	Uint8	RW	Reserved			
	3	Int32	RW	Value			Value
	4	Uint8[14]	R	Name			Designation
	5	Uint8[8]	R	Unit			Unit as a string
	6	Int32	R	Min			
	7	Int32	R	Max			

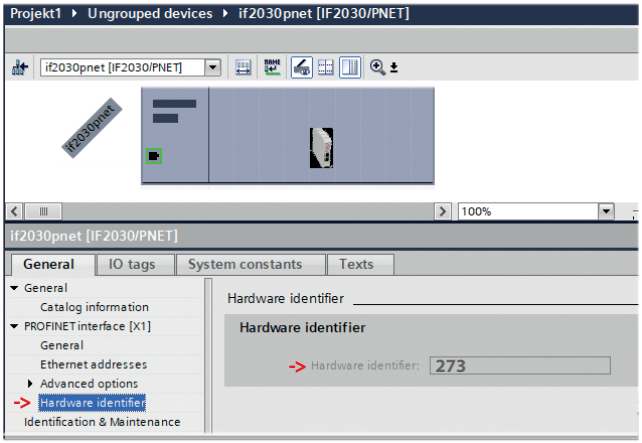
0x2530				Uint Parameter	✓		Read or write unsigned integer parameter
	0	Uint8		NrOfObjects			
	1	Uint16	RW	Parameter ID			Please refer to the sensor documentation for available parameter IDs and their types
	2	Uint8	RW	Reserved			
	3	Uint32	RW	Value			Value
	4	Uint8[14]	R	Name			Designation
	5	Uint8[8]	R	Unit			Unit as a string
	6	Uint32	R	Min			
	7	Uint32	R	Max			

Index	Subindex	Data type		Name	RS485	RS422	Description
0x2540				String Parameter	✓		Read or write string parameter
	0	Uint8		NrOfObjects			
	1	Uint16	RW	Parameter ID			Please refer to the sensor documentation for available parameter IDs and their types
	2	Uint8	RW	Reserved			
	3	Uint8[246]	RW	Value			Value
	4	Uint8[14]	R	Name			Designation

0x2600				RS422 ASCII Access		✓	RS422 commando
	1	Uint8[128]	RW	Send Cmd			Buffer for a 128-character ASCII command, termination with '\n' or 0x0A
	2	Uint8[896]	R	Cmd Answer			Answer from sensor without shortening, e.g., Line feed; if buffer overflows, e.g., PRINT ALL, answer is truncated

5.5 Sequence When Writing and Reading Acyclical Data

Determine the hardware identification (ID) of the module. To do so, switch to the `General` > `PROFINET-Interface` > `Advanced Options` tab.



In the example to the right, you get the value 273.

On the SPS, `WRREC_DB` with input parameters (:=) is called.

`REQ` // Start execution

`ID` // Hardware ID of the target device addressed

`INDEX` // Target address in the object directory

`LEN` // Length of the binary data block to be written

`RECORD` // Usable data for writing

`RECORD`, `VALID`, `BUSY`, `ERROR`, `STATUS` and `LEN` contain return parameters (=>) that allow for determining the success or progress of the write command.

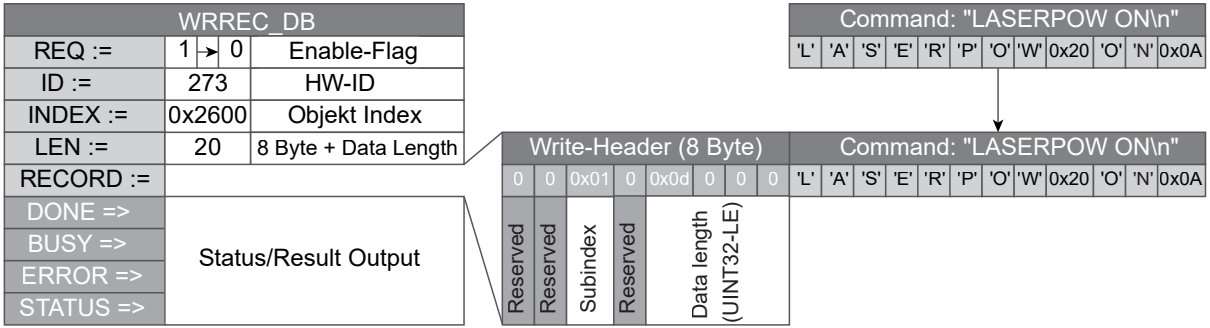


Fig. 13 SPS write command with 8 Byte prefix to turn on the laser light source on the sensor

The write and read commands, see Fig. 14, belong together. The write command `WRREC` that is used to send the command to the IF2035 is executed first. IF2035 forwards the command to the sensor. IF2035 immediately notes the sensor answer in a buffer. On the SPS `RDREC` is executed and thus the last command and the answer buffer are read back at the same time; the answer from IF2035 is saved in the RECORD buffer.

Fetch answer, see Fig. 14.

This chronology is a reaction to the prior write command, see Fig. 13.

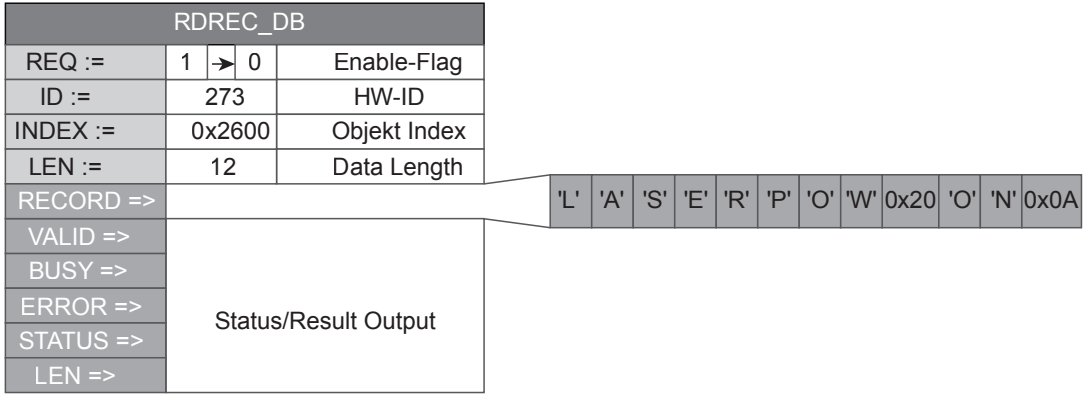


Fig. 14 SPS read command

The examples below show how to turn off the laser light source on the sensor.

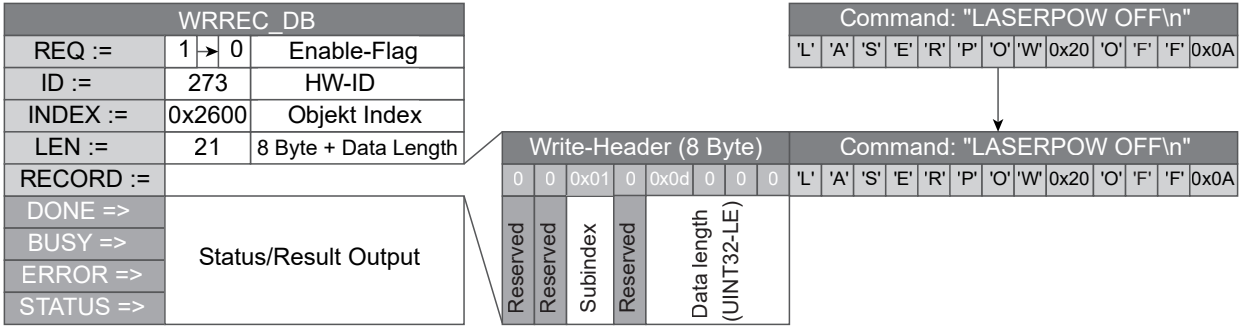


Fig. 15 SPS write command with 8 Byte prefix to turn off the laser ligth source on the sensor

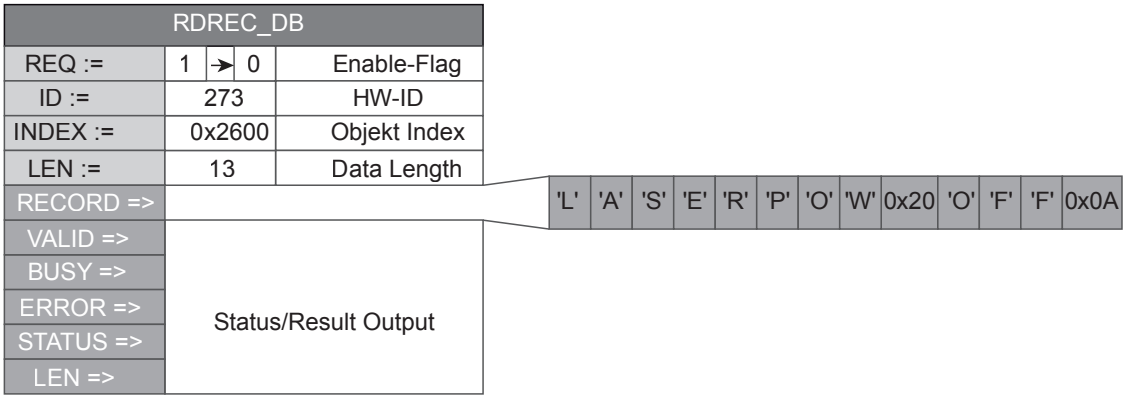


Fig. 16 SPS read command to turn off the laser light source on the sensor

5.6 Sequence When Writing Structured Data

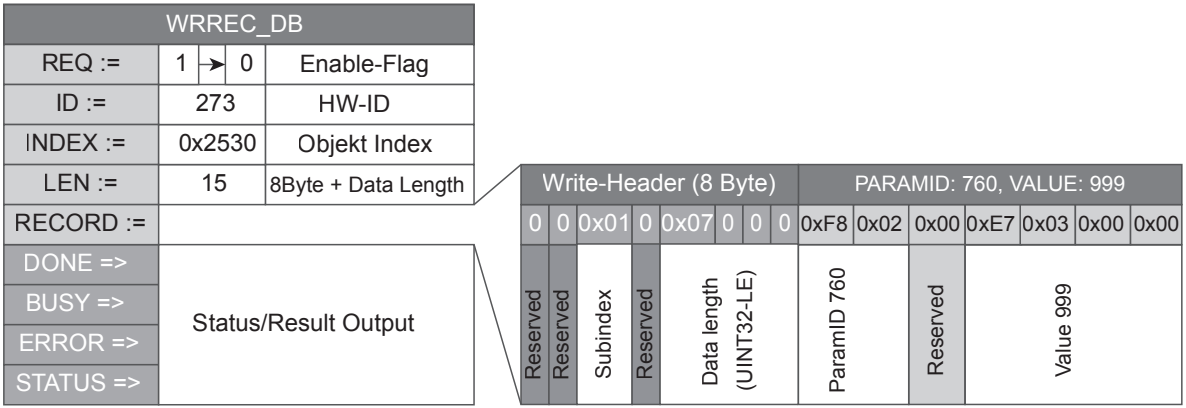


Fig. 17 Write command with data from SPS to IF2035-PROFINET

5.7 TIA Function Components

5.7.1 General

You can configure your IF2035-PROFINET via S7 by using several function components. They cover core functions that can be used for all compatible Micro-Epsilon sensors.

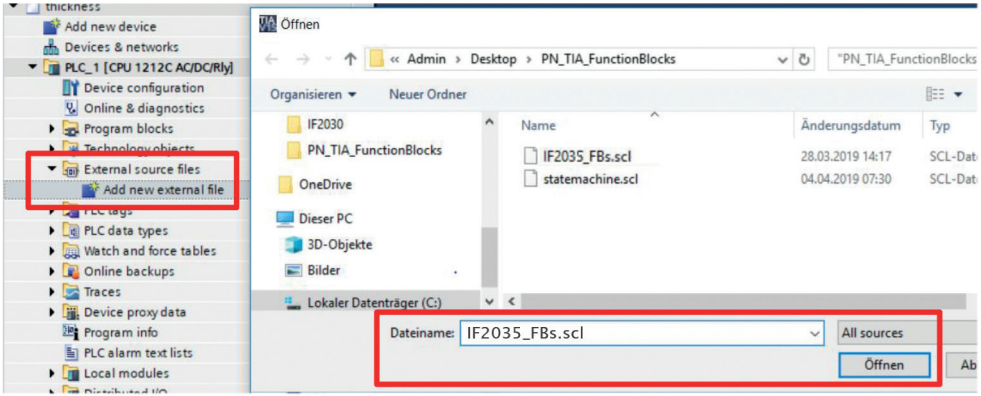
The components are available in an unencrypted form to allow you to view the code (“Structured Control Language”) and use it as a template for your own programs. The function components are provided together with the GSDML file. An overview of configuration examples, incl. register addresses in hexadecimal format, is provided below.

- IF203x_BaudrateInterface: R/W sensor interface (0x2023) and baud rate (0x2020)
- IF203x_HTTL-Debug: R/W switching between HTL/TTL (0x2027)
- IF203x_MEB_floatparam: R/W Float-type sensor parameter (0x2510)
- IF203x_MEB_intparam: R/W Int-type sensor parameter (0x2520)
- IF203x_MEB_uintparam: R/W UInt-type sensor parameter (0x2530)
- IF203x_Reset: Delete W IF2035-PROFINET- (0x2024) or sensor configuration (0x2025) and perform a reboot (0x2026)
- IF203x_SelectSensor: R/W sensor selection (0x2000) and R sensor list (0x2001)

i The `device_id` of the connected sensor or controller must be transferred to each function component. A trigger for `TRUE` in a program cycle triggers the desired action, a Read command is prioritized over a Write command, and the action’s end is signaled by `done = TRUE`. A `status != 0` shows an error when data is sent or received. With `reset_after_write = TRUE`, the IF2035-PROFINET is rebooted after successful configuration to allow the changes made to take effect immediately.

5.7.2 Importing Function Components

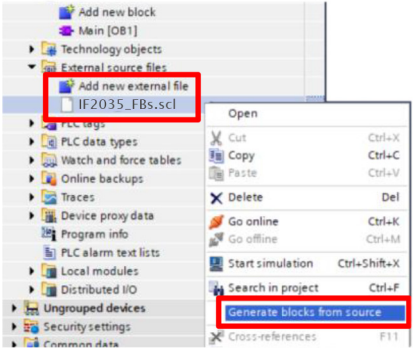
- Go to `Project navigation`. In your SPS, follow the path `External source files > Add new external file`. Double-clicking that link opens a `Dialog window`.



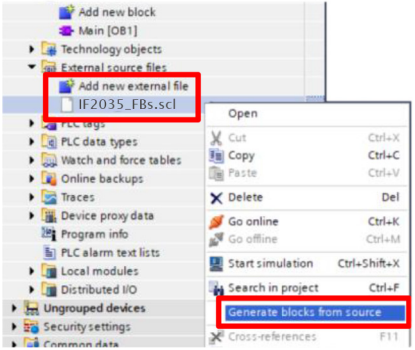
- Now select the path for the source file `IF2035_FBs.scl` and click the `Open` button.

The file is located in the `External source files` folder. Next, the function components must be transferred to the program components.

- Open the context menu by right-clicking the file and select the `Generate blocks from source` function in that menu. If displayed, confirm a message that existing blocks will be overwritten.

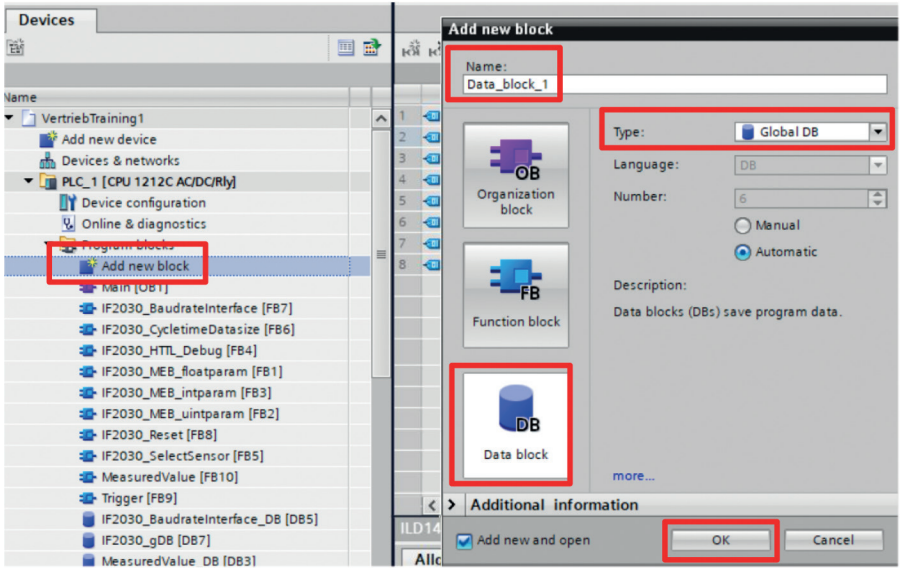


The function components generated are now available in the `Program components` folder. You can also view the result of generating them in the `Inspection window` on the `Info` > `Compile` tab. Please note that these messages refer to the source file.



5.7.3 Executing Function Component

- To create a global data component, select your CPU's `Program components` folder in the `Project navigation` and then click `Add new block`.
- In the next dialog window, select the option `Data block` and change the name, if necessary. Select `Global DB` for the type. Enable the check mark `Add new and open`, unless this has already been done automatically. Confirm the selection with OK.

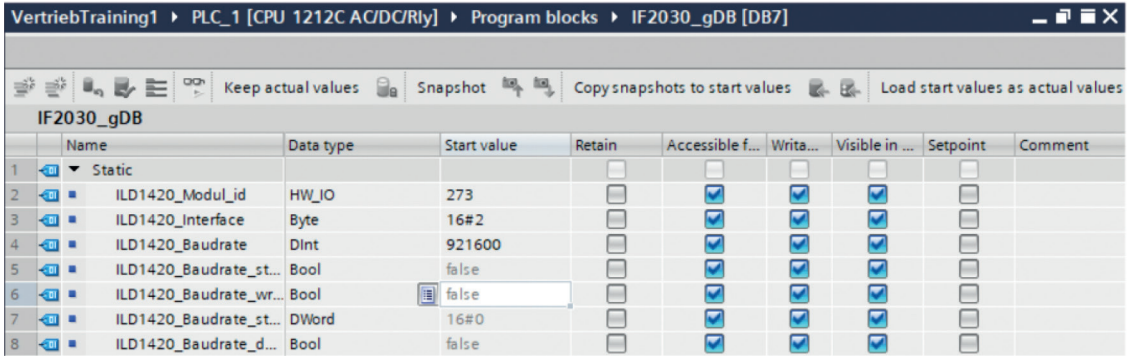


The data component is automatically displayed.

- Now create the necessary variables, depending on the function component.

The starting value is the value used when the data component is loaded into the CPU's memory.

- Next, click the `Save project` button (top left on the function bar).



	Name	Data type	Start value	Retain	Accessible f...	Writa...	Visible in ...	Setpoint	Comment
1	Static			☐	☐	☐	☐	☐	
2	ILD1420_Modul_id	HW_IO	273	☐	☑	☑	☑	☐	
3	ILD1420_Interface	Byte	16#2	☐	☑	☑	☑	☐	
4	ILD1420_Baudrate	DInt	921600	☐	☑	☑	☑	☐	
5	ILD1420_Baudrate_st...	Bool	false	☐	☑	☑	☑	☐	
6	ILD1420_Baudrate_wr...	Bool	false	☐	☑	☑	☑	☐	
7	ILD1420_Baudrate_st...	DWord	16#0	☐	☑	☑	☑	☐	
8	ILD1420_Baudrate_d...	Bool	false	☐	☑	☑	☑	☐	

i Ensure that you use the correct data types. You must correctly link the global variables with those in the function component.

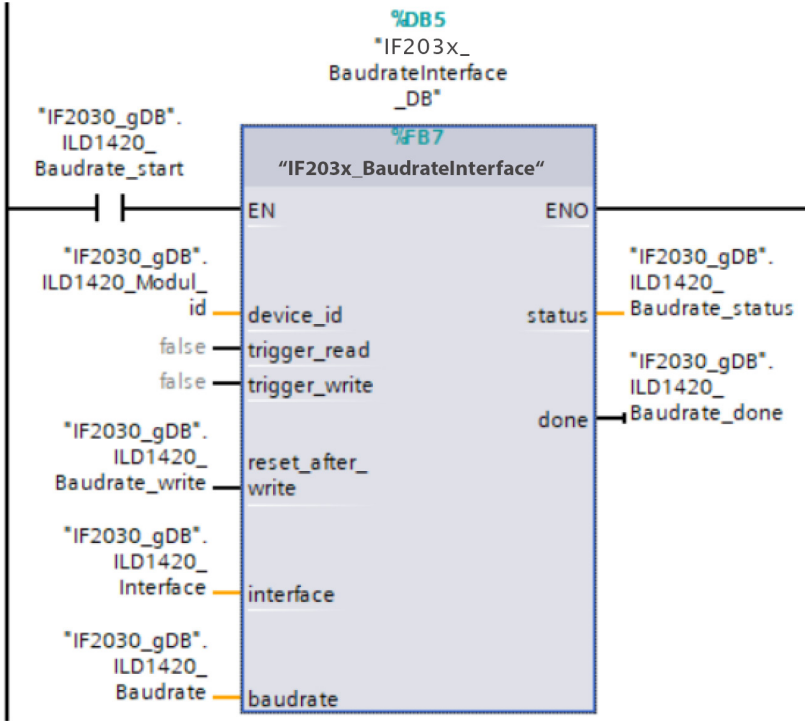
For a function component to be processed, it must be called in the program.

➡ Open the `Main [OB1]` organization component by double-clicking it. Mark your function component and drag it into the program of the previously opened organization component.

i There is no requirement that the call be performed via the main program OB1; that program is always processed by the CPU by default.

➡ Now use your mouse to drag-and-drop the variables needed for the circuit from your data component to the connections of your function component that is to be called. Alternatively, you can also enter the variables manually.

i If you vertically separate the editing area by clicking the symbol button on the function bar, the data component and the `Main [OB1]` organization component are displayed next to each other.



➡ Save your project. To translate all components, click the `Program components` folder in `Project navigation` and select the symbol button for `Translation` on the function bar.

i The components that were translated successfully are then displayed under `Inspection window` > `Info` > `Translation`.

After successful translation, the entire control system with the program generated, including the hardware configuration, can be loaded by using the `Load to device` symbol button.

5.7.4 Module Parameters

You can specify basic settings using the TIA portal interface. Proceed as follows to configure the IF2035-PROFINET based on a few basic parameters.

- In the `Hardware catalog`, select the `Basic settings` output module and place it in the next free slot in the `Device overview`.

The input module must be located before the basic settings module.

- Double-click the module in the `Device overview`. In the `Inspection window`, navigate to the `Properties` > General > Component parameters tab.

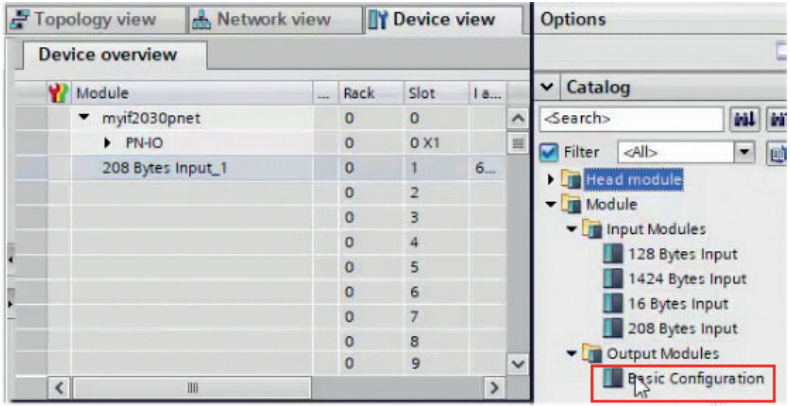


Fig. 18 Basic settings module in the hardware catalog

➡ Specify the required settings, e.g., baud rate, sensor interface. Enable the settings by using the parameter `Init-Config`.

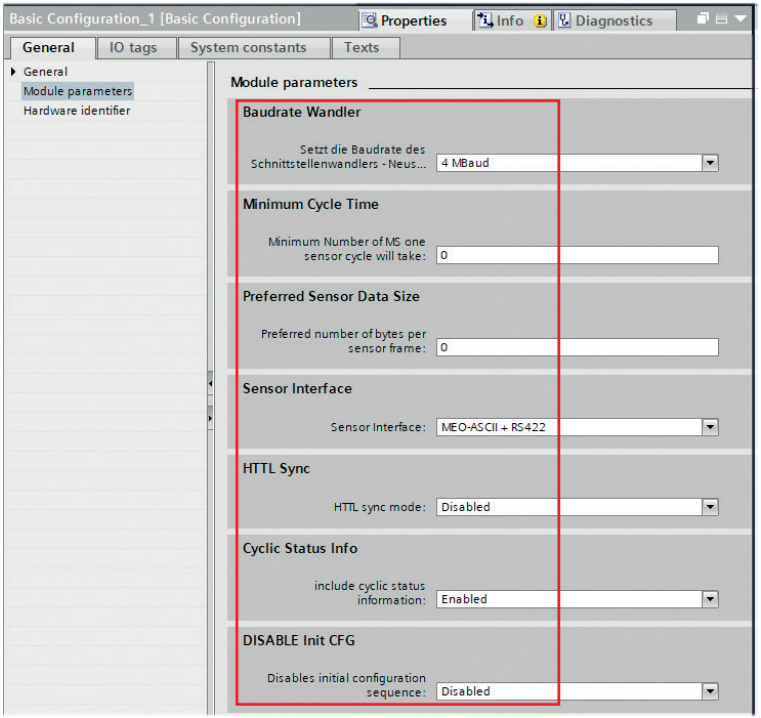
Detailed information about this process is available in the Baud rate and Interface section, see Chap. 5.2.

➡ Save your changes by clicking the `Save` button (at top left on the function bar).

Now you can load the settings into the CPU.

➡ Select your S7 device in the `Working window` if this has not been done already, and click the `Load to device` symbol button on the `Function bar`.

➡ Reboot the IF2035-PROFINET to have the changes take effect!



i This step is necessary because of the selected/used mechanism for establishing a GUI to parameterize the IF2035-PROFINET; it prevents the configuration from being sent repeatedly to the CPU as programs are run.

6. Disclaimer

All components of the device have been checked and tested for functionality in the factory. However, should any defects occur despite careful quality control, these shall be reported immediately to MICRO-EPSILON or to your distributor / retailer.

MICRO-EPSILON undertakes no liability whatsoever for damage, loss or costs caused by or related in any way to the product, in particular consequential damage, e.g., due to

- non-observance of these instructions/this manual,
- improper use or improper handling (in particular due to improper installation, commissioning, operation and maintenance) of the product,
- repairs or modifications by third parties,
- the use of force or other handling by unqualified persons.

This limitation of liability also applies to defects resulting from normal wear and tear (e.g., to wearing parts) and in the event of non-compliance with the specified maintenance intervals (if applicable). MICRO-EPSILON is exclusively responsible for repairs. It is not permitted to make unauthorized structural and / or technical modifications or alterations to the product. In the interest of further development, MICRO-EPSILON reserves the right to modify the design.

In addition, the General Terms of Business of MICRO-EPSILON shall apply, which can be accessed under Legal details | Micro-Epsilon https://www.micro-epsilon.com/impressum/. For translations into other languages, the German version shall prevail.

7. Service, Repair

If the interface module is defective, please send us the affected parts for repair or exchange.

If the cause of a fault cannot be clearly identified, please send the entire system to

MICRO-EPSILON MESSTECHNIK
GmbH & Co. KG
Koenigbacher Str. 15
94496 Ortenburg / Germany

Tel. +49/8542/168 - 0
Fax +49/8542/168 - 90
info@micro-epsilon.com
www.micro-epsilon.com

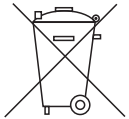
8. Decommissioning, Disposal

In order to avoid the release of environmentally harmful substances and to ensure the reuse of valuable raw materials, we draw your attention to the following regulations and obligations:

- Remove all cables from the interface module.
- Dispose of the interface module, its components and accessories, as well as the packaging materials in compliance with the applicable country-specific waste treatment and disposal regulations of the region of use.
- You are obliged to comply with all relevant national laws and regulations.

For Germany / the EU, the following (disposal) instructions apply in particular:

Waste equipment marked with a crossed garbage can must not be disposed of with normal industrial waste (e.g. residual waste can or the yellow recycling bin) and must be disposed of separately. This avoids hazards to the environment due to incorrect disposal and ensures proper recycling of the old appliances.



- A list of national laws and contacts in the EU member states can be found at
- https://ec.europa.eu/environment/topics/waste-and-recycling/waste-electrical-and-electronic-equipment-weee_en. Here you can inform yourself about the respective national collection and return points.
- Old devices can also be returned for disposal to MICRO-EPSILON at the address given in the imprint at https://www.micro-epsilon.de/impressum/.
- We would like to point out that you are responsible for deleting the measurement-specific and personal data on the old devices to be disposed of.
- Under the registration number WEEE-Reg.-Nr. DE28605721, we are registered at the foundation Elektro-Altgeräte Register, Nordostpark 72, 90411 Nuremberg, as a manufacturer of electrical and/or electronic equipment.

Appendix

A 1 Optional Accessories

PS2020

Power supply; installation of top-hat rail, 2.5 A, input 100 - 240 VAC, output 24 VDC/2.5 A, installation type; installation on symmetrical standard rail 35 mm x 7.5 mm, DIN 50022

A 2 Factory Settings

Baudrate	9600 Baud
cycleMinTime	0 (= IF2035 calculates cycle time)
SensorInterface	MEO+RS422
HTTL	OFF
CyclicDebugHeader	OFF

A 3 Integration Into TIA Portal

The GSDML file contains information about a PROFINET device. This file is needed for the PROFINET controller and must be integrated into the corresponding configuration software.

➡ Import the GSDML file. To do so, in the `Extras` > `Manage device description files (DDF)` menu, select the path for the file <`GSDML-Vx-MICRO-EPSILON-IF2035.xml`>.

➡ Click the `Install` button.

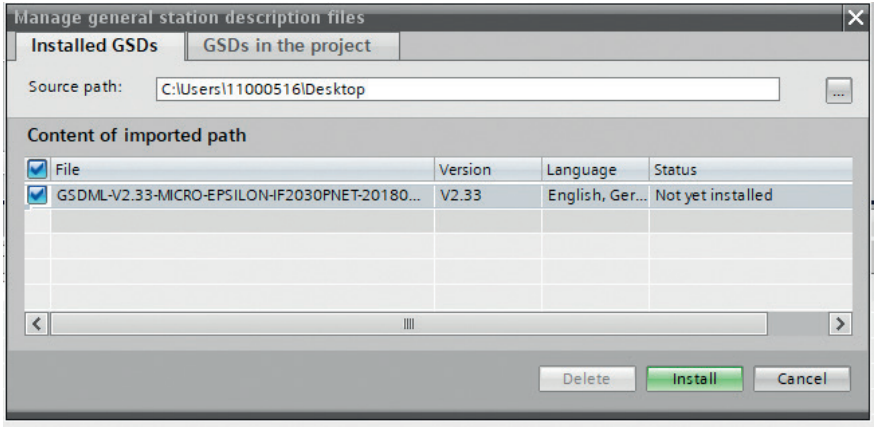
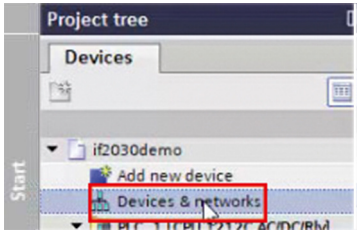


Fig. 19 Importing the device description file

After installation, switch to the project view.

➡ In `Project navigation`, click `Devices & networks`.



Add IF2035-PROFINET to the project.

➡ Switch to the hardware catalog tab.

➡ In the menu, select `Other field devices > PROFINET IO > I/O > MICRO-EPSILON MESSTECHNIK GmbH > PNS > IF2035-PROFINET`.

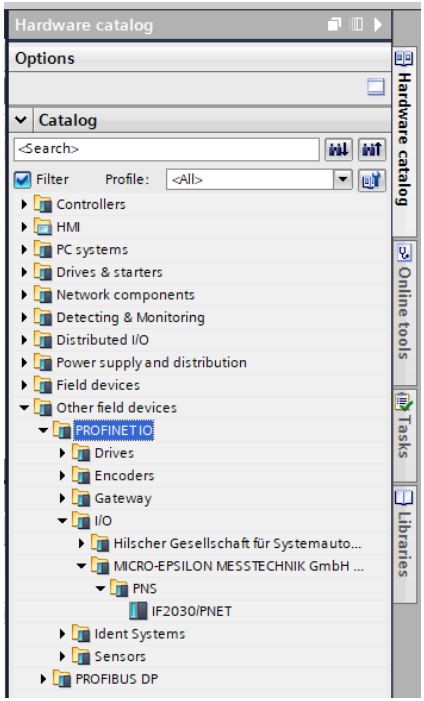
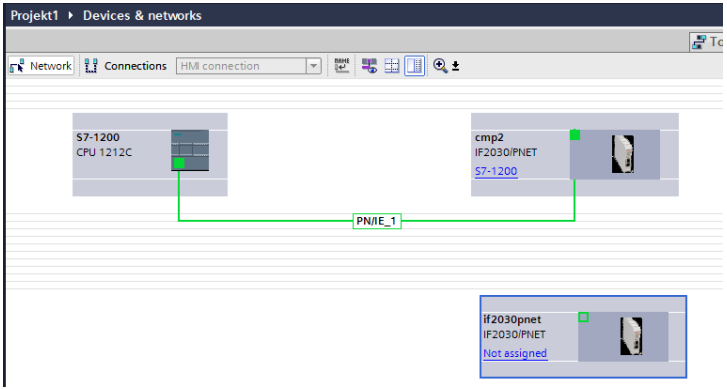
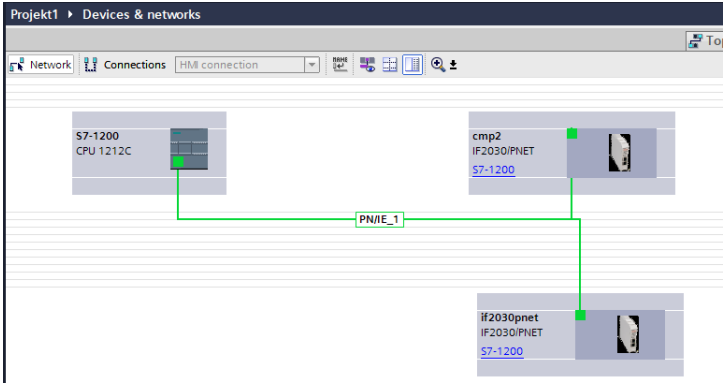


Fig. 20 Selecting IF2035-PROFINET as the hardware

➡ Drag `IF2035-PROFINET` into the project.



➡ Connect the green PN port in the device diagram to the PN network or to the PN connection of the SPS.



Enter the device name for identification in the PN network.

➡ Switch to the `Device view`, double-click your IF2035-PROFINET and set its device name in the `Inspection window` (`Properties` > `General` tab).

i The device name is used to identify the device on the PN network and as an address; it must be unique across the entire system.

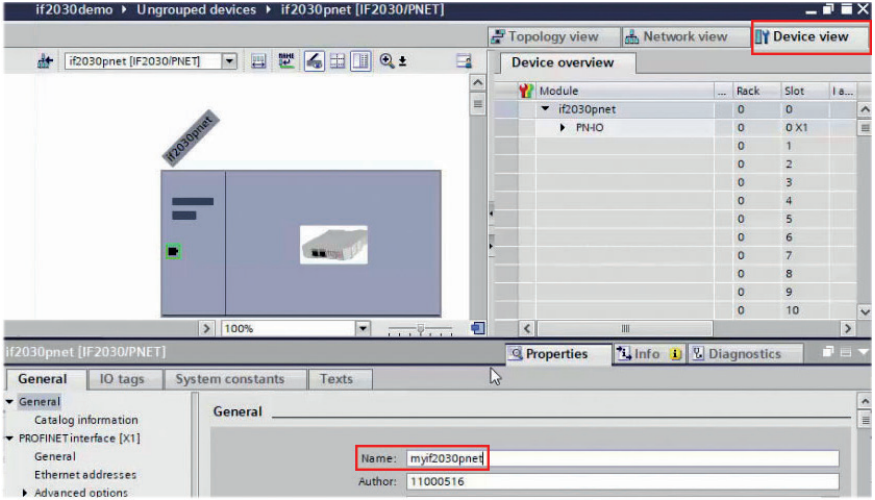


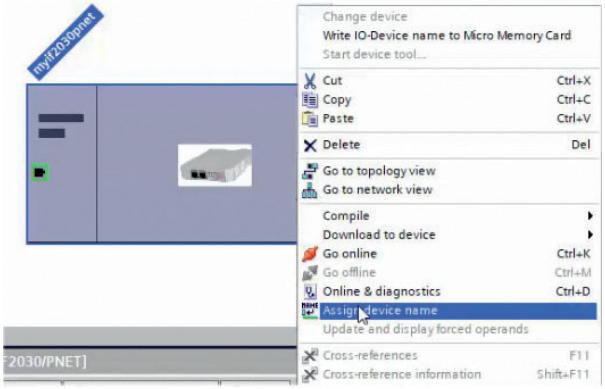
Fig. 21 Assigning a device name

The change of name must be communicated to the PN network.

➡ Right-click the IF2035-PROFINET.

You now reach the context menu shown.

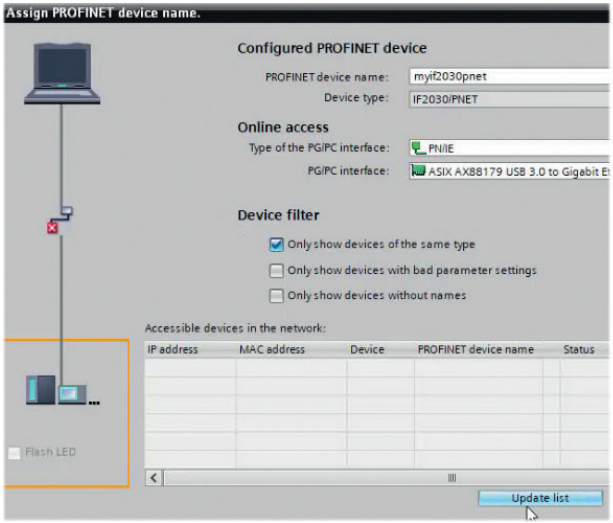
➡ Select the `Assign device name` entry.

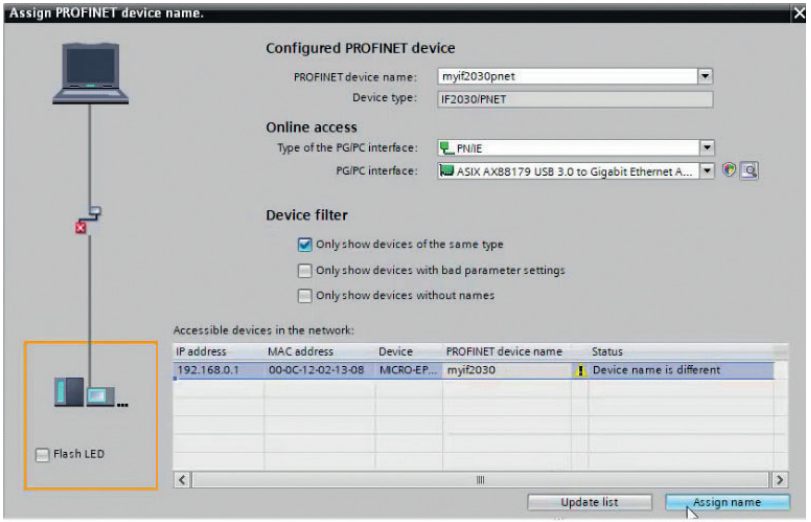


➡ In the open dialog window, click the `Update list` button.

Potential devices on the PN network are displayed.

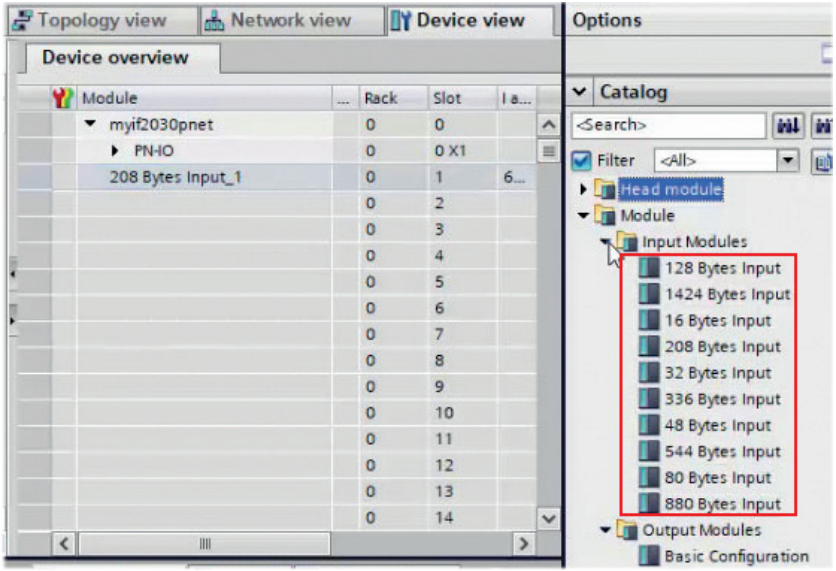
➡ In the list that is now displayed, mark the row with your IF2035-PROFINET that is to be renamed; field `Status`, “*Device name is different*”. Finally, click the `Assign name` button.





Add modules to the device.

- Double-click the device.
- In the `Hardware catalog`, first select the matching input module for the usable data (the module is determined by the component and must match the one selected in TIA); drag it to the first free slot in the `Device overview`.
- In the hardware catalog, select the output module `Basic settings` and drag it to the next free slot in the device overview.



A 4 Sensor Values, Data Format, Conversion

A 4.1 General

The sensors or controllers do not solely output distance values. The overview below describes the conversion during output of distance values. Please refer to the corresponding operating instructions for detailed information on conversion when additional values are output.

A 4.2 ACC5703

Baud rate 230400 b/s RS485 half duplex Max. sampling rate 1 kHz: measurements with variable number ex factory scaled to ±2 g, Little Endian

Bus address 126

Byte Data	Meaning	Data format
Data[0]	Status byte (contains error flags, normally 0x00)	8 bit
Data[1] ... Data[4]	Measured value counter [bit 0:31]	Uint 32 bit
Data[5]	Number of measured values in this package = 3*x mit x [1 ... 19]	8 bit
Data[6]	Padding-Byte	8 bit
Data[7]	Padding-Byte	8 bit
Data[8]	Measuring value 1 x-axis [bit 0:7]	Float 32 bit
Data[9]	Measuring value 1 x-axis [bit 8:15]	
Data[10]	Measuring value 1 x-axis [bit 16:23]	
Data[11]	Measuring value 1 x-axis [bit 24:31]	
...	...	
Data[n] n=8+(4*Data [5]/3)	Measuring value 1 x-axis [bit 0:7]	Float 32 bit
Data[n+1]	Measuring value 1 x-axis [bit 8:15]	
Data[n+2]	Measuring value 1 x-axis [bit 16:23]	
Data[n+3]	Measuring value 1 x-axis [bit 24:31]	
...	...	...
Data[n+m] m=4*Data[5]/3	Measuring value 1 z-axis [bit 0:7]	Float 32 bit
Data[n+m+1]	Measuring value 1 z-axis [bit 8:15]	
Data[n+m+2]	Measuring value 1 z-axis [bit 16:23]	
Data[n+m+2]	Measuring value 1 z-axis [bit 24:31]	

Please refer to the operating instructions for the acceleration sensor for more information. The current version is available at:

https://www.micro-epsilon.de/download/manuals/man--inertialSENSOR-ACC5703--en.pdf

Fig. 22 Encoding of Measured Data in the Transmission Protocol, ACC5703

A 4.3 ACS7000

RS422	Measuring rate 250 Hz ex factory, all color values and color distances. Up to 32 output values can be transmitted at the same time.
Baud rate	115200 b/s

ACS7000 supplies 3 bytes per value at the output. These bytes are coded by the IF2035-PROFINET into 4 bytes, see Chap. 5.3.

Group	Name	Index	Raw		Scaled			
			Min	Max	Min	Max	Formula	Unit
Status	Framerate	1	2500	250000	20,00	2000,00	10 ^ 6/(x*12,5*2 ^ 4)*1000	Hz
	Shutter	2	2500	250000	20,00	2000,00	x*12,5*2 ^ 4)/10 ^ 9	µs
	TempDetector	3	-1024	1023	-256,00	255,75	x/4	°C
	TempLightSrc	4	-1024	1023	-256,00	255,75	x/4	°C
LightSensor	Red	5	0	65535	0,00	100,00	x/65536*100	%
	Green	6	0	65535	0,00	100,00	x/65536*100	%
	Blue	7	0	65535	0,00	100,00	x/65536*100	%
	Brightness	8	0	65535	0,00	100,00	x/65536*100	%
Status	Counter	9	0	262143	0	262143	x	-
	Timestamp	10	0	262143	0,00	67,11	x*256/100000	s
Color	XYZ	11-13	0	131072	0,00	256,00	x/512	-
	RGB	14-16	0	131072	0,00	256,00	x/512	-
	LAB	17-19	-131072	131071	-256,00	256,00	x/512	-
	LUV	20-22	-131072	131071	-256,00	256,00	x/512	-
	LCH (L/C)	23-24	-131072	131071	-256,00	256,00	x/512	-
	LCH (H)	25	0	131071	0,00	256,00	x/512	°
	LAB99	26-28	-131072	131071	-256,00	256,00	x/512	-
	LCH99 (L/C)	29-30	-131072	131071	-256,00	256,00	x/512	-
	LCH99 (H)	31	0	184320	0,00	360,00	x/512	°

Group	Name	Index	Raw		Scaled			
			Min	Max	Min	Max	Formula	Unit
Status	Error	32	0	262143	0	262143	x	-
Distance	1_1/2/3	33-35	NA	-				
	…	36-77						
	16_1/2/3	78-80		-				
	Min_1/2/3	81-83	-131072	131071	-256,00	256,00	x/512	-
	DetectedID	84	0	16	0	16	-	-
	MinDistID	85	0	16	0	16	-	-

Fig. 23 Overview of output data via RS422

Please refer to the operating instructions for the color measuring system colorCONTROL ACS7000 for more information, especially about possible output values. The current version is available at:

https://www.micro-epsilon.com/download/manuals/man--colorCONTROL-ACS7000--en.pdf

A 4.4 DT6120

Baud rate	230400 b/s	RS485 half duplex	Measurements ex factory scaled to sensor measuring range, Little Endian
Bus address	126		

Measuring data consist of a counter, the packet length m and the measurements. The packet length m determines how many measurements are transmitted. The packet length m is the number of measurements that have been queried by the electronic system since the last time measuring data were queried, but is limited to the most recent 20 measurements. The first measurement in the data [] package is the oldest value queried, the last one is the most recently queried value.

Byte Data	Meaning	Data format
Data[0]	Counter [7:0]	unsigned short
Data[1]	Counter [15:8]	
Data[2]	Packet length m [7:0]	unsigned char
Data[3]	Filler byte [7:0]	unsigned char
Data[4]	Measuring value 1 [7:0]	signed integer
Data[5]	Measuring value 1 [15:8]	
Data[6]	Measuring value 1 [23:16]	
Data[7]	Measuring value 1 [31:24]	
	. . .	
Data[..]	Measuring value m [7:0]	signed integer
Data[..]	Measuring value m [15:8]	
Data[..]	Measuring value m [23:16]	
Data[..]	Measuring value m [31:24]	

Scaling of measurements

BY default, 24-bit measurements are transmitted.
The following equivalences therfore apply:

0x0 = 0 % of the sensor measuring range

0xF00000 = 100 % of the sensor measuring range

If the sensor is outside the measuring range, accordingly larger measurements are output.

Fig. 24 Encoding of Measured Data in the Transmission Protocol, DT6120

Please refer to the operating instructions for the capacitive displacement measuring system for more information. The current version is available at:

https://www.micro-epsilon.de/download/manuals/man--capaNCDT-6110-6120IP--en.pdf

A 4.5 IFC2421, IFC2422, IFC2451, IFC2461, IFC2471

RS422	Up to 32 output values can be transmitted at the same time. The data are configured or selected via ASCII commands or via the web interface.
Baud rate	115200 b/s ex factory

Ex factory, the controller is set for the `Distance measurement` measuring program. Please refer to the associated operating instructions for descriptions of additional measuring programs. IFC24xx supplies 3 bytes per value at the output. These bytes are coded by the IF2035-PROFINET into 4 bytes, see Chap. 5.3.

The linearized measuring values can be converted in µm using the following formula:

$$x = \frac{(d_{OUT} - 98232) * MR}{65536}$$

x	=	Displacement / Thickness in mm
d_{OUT}	=	digital output value
MR	=	Measuring range in mm
131000	=	Midrange for the displacement measurement

Please refer to the operating instructions for the confocal displacement measuring system

- confocalDT 2421/2422
- confocalDT 2451/2461/2471

for more information, especially about possible output values.

The current version is available at:

https://www.micro-epsilon.com/download/manuals/man--confocalDT-2421-2422--en.pdf

https://www.micro-epsilon.de/download/manuals/man--confocalDT-2451-2461-2471--en.pdf

A 4.6 ILD1220, ILD1320, ILD1420

RS422	The data are configured or selected via ASCII commands or via the web interface.
Baud rate	921600 baud ex factory

i The sensor can continue to supply measurements to the RS422 output even while the sensor is communicating.

The digital measurements are output at the sensor as unsigned digital values (raw values). The sensors supply 3 bytes per value at the output. These bytes are coded by the IF2035-PROFINET into 4 bytes, see Chap. 5.3.

The linearized measuring values can be converted in µm using the following formula:

Value	Variables	Value range	Formula
Distance	x = digital value	[0; <643] SMR reserve [643; 64877] Measuring range [>64877; 65520] EMR reserve	$d\ [\text{mm}] = \frac{1}{100}\left(\frac{102}{65520}\,x - 1\right) * MR\ [\text{mm}]$
	MR = measuring range [mm]	{10/25/50/100/200/500}	
	d = distance [mm]	[-0,01MB; 1,01MR]	

Fig. 25 Calculation of distance value from the digital value, ILD1220/1320/1420

Please refer to the operating instructions for the laser-optical displacement sensors optoNCDT 1220/1320/1420 for more information, especially about possible output values. The current version is available at:

https://www.micro-epsilon.de/download/manuals/man--optoNCDT-1220--en.pdf

https://www.micro-epsilon.de/download/manuals/man--optoNCDT-1320--en.pdf

https://www.micro-epsilon.de/download/manuals/man--optoNCDT-1420--en.pdf

1) Distance value without the Master function.

A 4.7 ILD1750

RS422	The data are configured or selected via ASCII commands or via the web interface.
Baud rate	921600 baud ex factory

i The sensor can continue to supply measurements to the RS422 output even while the sensor is communicating.

The digital measurements are output at the sensor as unsigned digital values (raw values). The sensors supply 3 bytes per value at the output. These bytes are coded by the IF2035-PROFINET into 4 bytes, see Chap. 5.3.

The linearized measuring values can be converted in µm using the following formula:

Value	Variables	Value range	Formula
Distance	x = digital value	[0; 230604]	$d\ [\text{mm}] = \frac{x - 98232}{65536} * MR\ [\text{mm}]$
	MR = measuring range [mm]	{2/10/20/50/100/200}	
	d = distance [mm]	without Mastern [-0,01MR; 1,01MR]	
		with Mastern [-2MR; 2MR]	

Fig. 26 Calculation of distance value from the digital value, ILD1750

Please refer to the operating instructions for the laser-optical displacement sensors optoNCDT 1750 for more information, especially about possible output values. The current version is available at:

https://www.micro-epsilon.de/download/manuals/man--optoNCDT-1750--en.pdf

A 4.8 ILD1900

RS422	The data are configured or selected via ASCII commands or via the web interface.
Baud rate	921600 baud ex factory

i The sensor can continue to supply measurements to the RS422 output even while the sensor is communicating.

The digital measurements are output at the sensor as unsigned digital values (raw values). The sensors supply 3 bytes per value at the output. These bytes are coded by the IF2035/ENETIP into 4 bytes, see Chap. 5.3.

The linearized measuring values can be converted in µm using the following formula:

Value	Variables	Value range	Formula
Distance	x = digital value	[0; 230604]	$d\ [\text{mm}] = \frac{x - 98232}{65536} * MR\ [\text{mm}]$
	MR = measuring range [mm]	{2/10/25/50/100/200/500}	
	d = distance [mm]	without Mastern [-0,01MR; 1,01MR]	
		with Mastern [-2MR; 2MR]	

Fig. 27 Calculation of distance value from the digital value, ILD1900

Please refer to the operating instructions for the laser-optical displacement sensors optoNCDT 1900 for more information, especially about possible output values. The current version is available at:

https://www.micro-epsilon.de/download/manuals/man--optoNCDT-1900--en.pdf

A 4.9 ILD2300

RS422	The data are configured or selected via ASCII commands or via the web interface.
Baud rate	691200 baud ex factory [1]

i The sensor can continue to supply measurements to the RS422 output even while the sensor is communicating.

The digital measurements are output at the sensor as unsigned digital values (raw values). 16 Bit per value are transmitted. The sensors supply 3 bytes per value at the output. These bytes are coded by the IF2035-PROFINET into 4 bytes, see Chap. 5.3.

The linearized measuring values can be converted in µm using the following formula:

Value	Variables	Value range	Formula
Distance	x = digital value	[0; <643] SMR reserve [643; 64877] Measuring range [>64877; 65520] EMR reserve	$d\ [\mathrm{mm}] = \frac{1}{100}\left(\frac{102}{65520}\,x - 1\right) * MR\ [\mathrm{mm}]$
	MR = measuring range [mm]	{10/25/50/100/200/500}	
	d = distance [mm]	[-0,01MR; 1,01MR]	

Fig. 28 Calculation of distance value from the digital value, ILD2300

Please refer to the operating instructions for the laser-optical displacement sensors optoNCDT 2300 for more information, especially about possible output values. The current version is available at:

https://www.micro-epsilon.de/download/manuals/man--optoNCDT-2300--en.pdf

1) When delivered, ILD2300 is set for 691.2 kBaud. Increase the baud rate to 921.6 kBaud in the sensor.

A 4.10 ILR2250

RS422	The data are configured or selected via ASCII commands or via the web interface.
Baud rate	115200 b/s ex factory

i The sensor can continue to supply measured values to the RS422 output even while the sensor is communicating.

28 bits each output value are transmitted via RS422. Each data frame consists of the timestamp in ms and the distance in 1/10 mm, followed by a footer byte.

- The sensor sends data in big endian format.
- Each value is transmitted in 4 bytes; the lower 7 bits are used for the data.
- The IF2035-PROFINET extracts the distance value from the data frame and deletes the flag bits.
- The 4*7 bits are combined into a 28 bit value.
- The IF2035-PROFINET sends data in little endian format.

Distance value in millimeter:
The user or a PLC must divide the transmitted value by 10 to obtain distance values with a resolution of 0.1 mm.

A 4.11 INC5701

Baud rate 230400 b/s RS485 half duplex max. sampling rate 250 Hz, ex factory INC5701D, Little Endian
Bus address 126

Byte	Meaning	Data format
Data[0]	Status byte (contains error flags, normaly 0x00)	8 bit
Data[1]	Long term values counter [bit 0:7]	Uint 32 bit
Data[2]	Long term values counter [bit 8:15]	
Data[3]	Long term values counter [bit 16:23]	
Data[4]	Long term values counter [bit 24:31]	
Data[5]	Number of measured values in this package	8 bit
Data[6]	Padding byte	8 bit
Data[7]	Padding byte	8 bit
Data[8]	Measured value 1 [bit 0:7]	Float 32 bit
Data[9]	Measured value 1 [bit 8:15]	
Data[10]	Measured value 1 [bit 16:23]	
Data[11]	Measured value 1 [bit 24:31]	
Data[12]	Measured value 2 [bit 0:7]	Float 32 bit
Data[13]	Measured value 2 [bit 8:15]	
Data[14]	Measured value 2 [bit 16:23]	
Data[15]	Measured value 2 [bit 24:31]	

Fig. 29 Encoding of Measured Data in the Transmission Protocol, INC5701S

Byte Data	Meaning	Data format
Data[0]	Status byte (contains error flags, normally 0x00)	8 bit
Data[1] ... Data[4]	Measured value counter [bit 0:31]	Uint 32 bit
Data[5]	Number of measured values in this package	8 bit
Data[6], Data[7]	Padding-Byte	8 bit
Data[8]	Measuring value 1 LP [1] [bit 0:7]	Float 32 bit
Data[9]	Measuring value 1 LP [1] [bit 8:15]	
Data[10]	Measuring value 1 LP [1] [bit 16:23]	
Data[11]	Measuring value 1 LP [1] [bit 24:31]	
Data[12]	Measuring value 2 LP [1] [bit 0:7]	
Data[13]	Measuring value 2 LP [1] [bit 8:15]	
Data[14]	Measuring value 2 LP [1] [bit 16:23]	
Data[15]	Measuring value 2 LP [1] [bit 24:31]	
...	...	...
Data[n] n=8+(4*Data [5])	Measuring value 2 SF [2] [bit 0:7]	Float 32 bit
Data[n + 1]	Measuring value 2 SF [2] [bit 8:15]	
Data[n + 2]	Measuring value 2 SF [2] [bit 16:23]	
Data[n + 3]	Measuring value 2 SF [2] [bit 24:31]	
Data[n + 4]	Measuring value 2 SF [2] [bit 24:31]	
Data[n + 5]	Measuring value 2 SF [2] [bit 24:31]	
...	...	

Fig. 30 Encoding of Measured Data in the Transmission Protocol, INC5701D

1) LP = Low pass filter 2) SF = SensorFUSION filter

Please refer to the operating instructions for the inclination sensor for more information. The current version is available at:

https://www.micro-epsilon.de/download/manuals/man--inertial-SENSOR-INC5701--de.pdf

The measurement data consits of one status byte, measured values counter, number of measured values, and the measured data. The measured values counter increases continuously with each sampled value. It represents the number of measured values transmitted in this package (floats). The first measurement value in the Data [] package is the oldest measured value. A measured value is represented as 4-byte float data type in the unit angular degrees [°].

A 4.12 DTD, MSC7401, MSC7602, MSC7802

Baud rate 256000 baud ex factory, [9600 ... 256000] RS485 half duplex Measurements ex factory scaled to analog value, Little Endian

Bus address 126 [2 ... 126]

Sequence for a measurement value request:

Send	0x10	0x7E [1]	0x01 [2]	0x4C	0xCB [3]	0x16									
Receive	0x68	0x0B	0x0B	0x68	0x01 [2]	0x7E [1]	0x08	0xAE	0x47	0x61	0x3F	0x00	0x00	0x00	0x00
	0x1C [4]	0x16													

Result	Description	Format	Example
	Unscaled value	Bytes 8 - 11: 4 Bytes, float, Little-Endian	0x3F6147AE (float) = 0.88 V
	Scaled value	Bytes 12 - 15: 4 Bytes, float, Little-Endian	If this value is 0, the controller was not set up. Otherwise, the digital counterpart of the analog output will be sent according the setting you have done in the controller before.
	Maximum speed for data transmission (1x send + 1x receive): ~3 ms @ 256.000 Baud		

1) DA: 126
2) SA: 1
3) CH: Checksum Send: Bytes 2 - 4
4) CH: Checksum Receive: Bytes 5 - 15

Fig. 31 Encoding of Measured Data in the Transmission Protocol

Please refer to the operating instructions for the inductive displacement measuring system for more information.
The current version is available at:

https://www.micro-epsilon.de/download/manuals/man--induSENSOR-MSC7xxx--en.pdf

A 4.13 ODC2520

RS422	The data are configured or selected via ASCII commands or via the web interface.
Baud rate	115200 Baud ex factory

Ex factory, the controller outputs the measurements in the `Edge light-dark` measuring program to the web diagram, i.e., output must be redirected to the RS422 interface.
The ODC2520 supplies 3 bytes per value at the output. These bytes are coded by the IF2035-PROFINET into 4 bytes, see Chap. 5.3.
The linearized measuring values can be converted in µm using the following formula:

$$x\ [\mu m] = d_{OUT} - 131000$$

x = Measuring value (edge position, difference, center axis) in µm

d_{OUT} = digital output value; $d_{OUT} \geq 262072$ are error values

Fig. 32 Calculation of edge position from the digital value, ODC2520

Please refer to the operating instructions for the laser micrometer optoCONTROL 2520 for more information. The current version is available at:
https://www.micro-epsilon.de/download/manuals/man--optoCONTROL-2520--en.pdf

A 4.14 ODC2700

RS422	The data are configured or selected via ASCII commands or via the web interface.
Baud rate	921600 Baud ex factory

Ex factory, the controller outputs the measurements in the `Strip edge` preset to the web diagram, i.e., output must be redirected to the RS422 interface.
The ODC2700 supplies 3 bytes per value at the output. These bytes are coded by the IF2035-PROFINET into 4 bytes, see Chap. 5.3.
The linearized measuring values can be converted in µm using the following formula:

$$x\ [\text{mm}] = \frac{d_{OUT}}{100000}$$

x = Measuring value (1st edge starting with SMR) in mm

d_{OUT} = digital output value

Fig. 33 Calculation of edge position from the digital value, ODC2700

Please refer to the operating instructions for the laser micrometer optoCONTROL 2700 for more information. The current version is available at:
https://www.micro-epsilon.com/download-file/manuals/man--optoCONTROL-2700--en.pdf

A 5 Cheat-Sheets

IF203x Hardware Configuration - Settings								
Sensor	Input-width [Byte]	Baudrate [KBaud]	Mini-mum Cycle Time [ms]	Sensor Interface	HTTL Sync	Cycl. Status Info (8 Byte Header) (DW0= Counter DW1=Errorcode)	ME-Bus Ar-ticle number checking	Initial Configura-tion (see manual plc-example) PROFINET only
MSC7401/DTD	16	256.000	4	0: ME-Bus + RS485	enabled	enabled	enabled	enabled/disabled
MSC7x02	32	256.000	10	0: ME-Bus + RS485	enabled	enabled	enabled	enabled/disabled
INC5701	32	230.400	0	0: ME-Bus + RS485	enabled	enabled	enabled	enabled/disabled
DT6120	16	230.400	0	0: ME-Bus + RS485	enabled	enabled	enabled	enabled/disabled
ILD1x20 ab FW V1.65	16	921.600	0	2: MEO-ASCII + RS422	enabled	enabled	enabled	enabled/disabled
ILD1750		691.200						
ILD1900		921.600						
ILD2300		691.200						
IFC2421	32	115.200	0	2: MEO-ASCII + RS422	enabled	enabled	enabled	enabled/disabled
IFC2422								
ODC2520 [1]	16	115.200	0	2: MEO-ASCII + RS422	enabled	enabled	enabled	enabled/disabled
ODC2700	32	921.600	0	3: MEO-ASCII + RS422 - 32 Bit	enabled	enabled	enabled	enabled/disabled
C-Box	32	115.200	0	2: MEO-ASCII + RS422	enabled	enabled	enabled	enabled/disabled
MFA				2: MEO-ASCII + RS422	enabled	enabled	enabled	enabled/disabled
ILR2250	16	115.200	50	3: MEO-ASCII + RS422 - 32 Bit	enabled	enabled	enabled	enabled/disabled

1) Baudrate 4 Mbaud recommended

Sensor	Input-width [Byte]	Baudrate [KBaud]	Mini-mum Cycle Time [ms]	Sensor Interface	HTTL Sync	Cycl. Status Info (8 Byte Header) (DW0= Counter DW1=Errorcode)	ME-Bus Article number checking	Initial Configuration (see manual plc-example) PROFINET only
IMC5xx0	16	115.200	0	3: MEO-ASCII + RS422 - 32 Bit	enabled	enabled	enabled	enabled/disabled
CT/CTL	32	9.600	4	4: MEthermo + RS485	enabled	enabled	enabled	enabled/disabled

The input width is the length of the „Cyclic Status Information“ plus the „Preferred Sensor Data Size“ (user data). E.g.: 8 bytes (cyclic status information) + 16 bytes (preferred sensor data size/user data) = 24 bytes --> input width = 32 bytes

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