wieland

samos® PRO

Gateways

Operating instructions

Doc. No. BA000587
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CE

Contents

1 About this document

Please read this chapter carefully before working with these operating instructions and the ***samos***®PRO gateways.

1.1 Function of this document

These operating instructions only apply in conjunction with the other ***samos***®PRO operating instructions (see section 1.2 "The ***samos***®PRO operating instructions" below) and provide the technical personnel at the machine manufacturer or machine operating organisation information on safe mounting, adjustment, electrical installation, commissioning as well as on operation and maintenance of the ***samos***®PRO gateways.

These operating instructions do not provide information on the operation of the machine in which a ***samos***®PRO modular safety controller and a ***samos***®PRO gateway is integrated. Information on this is to be found in the appropriate operating instructions for the machine.

1.2 The *samos*®PRO operating instructions

For the ***samos***®PRO system there are three operating instructions with clearly distinguished fields of application as well as mounting instructions for each module.

- The mounting instructions (Wieland document nos. BA000572, BA000583) are enclosed with each ***samos***®PRO module. They inform on the basic technical specifications of the modules and contain simple mounting instructions. Use the mounting instructions when mounting ***samos***®PRO safety controllers.
- The ***samos***®PRO hardware operating instructions (Wieland document no. BA000497) describe all ***samos***®PRO modules and their functions in detail. Use the Hardware operating instructions in particular to configure ***samos***®PRO safety controllers.
- The ***samos***®PRO gateways operating instructions (this document) describe all ***samos***®PRO gateways and their functions in detail.
- The ***samos***®PLAN operating instructions (Wieland part no. BA000518) describe the software-supported configuration and parameterization of the ***samos***®PRO safety controllers. In addition, the software operating instructions contain the description of the diagnostics functions that are important for operation and detailed information for the identification and elimination of errors. Use the Software operating instructions in particular for the configuration, commissioning and operation of ***samos***®PRO safety controllers.

1.3 Target group

These operating instructions are addressed to planning engineers, machine designers and the operators of systems in which a ***samos***®PRO modular safety controller is integrated and who want to exchange data with a fieldbus (a controller) via a gateway.

They are also addressed to people who are placing a ***samos***®PRO gateway in operation for the first time or maintaining it.

1.4 Information depth

These operating instructions contain information on the ***samos***®PRO gateways on the following subjects:

- mounting
- implementation into a network
- configuration via ***samos***®PLAN software
- data transfer to and from the network
- status information, planning and related mapping
- part numbers

Warning!
Pay attention to the safety notes and safety measures on the ***samos***®PRO gateway!

Note

We also refer you to our homepage on the Internet at
www.wieland-electric.com ("Support/Download Center")
There you will find the following files for download:
- SP-EN-IP EDS file for EtherNet/IP
- SP-EN-PN GSDML file for Profinet IO
- SP-PROFIBUS-DP GSD file for PROFIBUS DP

1.5 Scope

These operating instructions apply to the ***samos***®PRO gateway modules SP-PROFIBUS-DP, SP-EN-MOD, SP-EN-IP and SP-EN-PN with the following entry in the *Operating Instructions* field of the type label: BA000587.

This document is part of Wieland document number BA000587 ("***samos***®PRO gateways" operating instructions in all available languages).

This document is the original operating instructions.

1.6 Abbreviations used

Enhanced Function Interface	**EFI**
Short integer = 1 Byte	**SINT**
Unsigned double integer = 4 Bytes = 2 Words	**UDINT**
Unsigned integer = 2 Byte = 1 Word	**UINT**

1.7 Symbols used

Refer to notes for special features of the device. **Notes**

Warning!
A warning notice indicates an actual or potential risk or health hazard. They are designed to help you to prevent accidents.
Read carefully and follow the warning notices!

1.8 Trademarks

Windows 98, Windows NT 4.0, Windows 2000, Windows XP and Internet Explorer are registered trademarks of Microsoft Corporation in the USA and other countries.

SIEMENS SIMATIC Manager is a registered trademark of SIEMENS AG.

DeviceNet and DeviceNet Safety are registered trademarks of the Open DeviceNet Vendor Association, Inc. (ODVA).

Other product names and company names referenced in this manual are trademarks or registered trademarks of their respective companies.

2 On safety

This chapter deals with your own safety and the safety of the equipment operators.

➡ Please read this chapter carefully before working with a ***samos***®PRO gateway.

2.1 Qualified safety personnel

The ***samos***®PRO gateway must only be installed, commissioned and serviced by qualified safety personnel.

Qualified safety personnel are defined as persons who …

- have undergone the appropriate technical training

and

- have been instructed by the responsible machine operator in the operation of the machine and the current valid safety guidelines

and

- have access to the operating instructions of the ***samos***®PRO gateway and ***samos***®PRO modular safety controller and have read and familiarised themselves with them.

2.2 Correct use

The ***samos***®PRO gateways can only be operated with a ***samos***®PRO system. The firmware version of the connected SP-SCON must be at least V1.10.0, the version of the ***samos***®PLAN configuration software must be at least 1.2.0.40.

The ***samos***®PRO gateways do not have a dedicated voltage supply.

The *samos*®PRO gateways are not suitable for operation on a safety fieldbus!
These gateways only generate non-safety-related fieldbus data (status bytes) for control and diagnostics purposes.

Do not use non-safe data from a *samos*®PRO gateway for safety related applications!
With the ***samos***®PRO gateways it is possible to integrate non-safe data into the logic editor such that the safety function of the ***samos***®PRO system is compromised. Never implement the gateway into a ***samos***®PRO system without having this danger checked by a safety specialist.

WARNING

These modules may only be used by qualified safety personnel and only on the machine where they have been installed and initialised by qualified safety personnel in accordance with the operating instructions.

Pay attention to the safety notes and safety measures on the *samos*®PRO gateway!
If the device is used for any other purposes or modified in any way — also during mounting and installation — any warranty claim against Wieland Electric GmbH shall become void.

WARNING

Notes

- During the mounting, installation and usage of the ***samos***®PRO gateway, observe the standards and directives applicable in your country.
- The national/international rules and regulations apply to the installation, commissioning, use and periodic technical inspection of the ***samos***®PRO modular safety controller, in particular:
  - EMC directive 2004/108/EC,
  - Provision and Use of Work Equipment Directive 89/655/EC,
  - the work safety regulations/safety rules.
- The operating instructions must be made available to the operator of the machine where a ***samos***®PRO system is used. The machine operator is to be instructed in the use of the device by qualified safety personnel and must be instructed to read the operating instructions.

WARNING

The ***samos***®PRO system complies, as per the "radiated emissions" generic standard, with the requirements of class A (industrial applications). The ***samos***®PRO system is therefore only suitable for use in an industrial environment.

2.3 Environmental protection

The ***samos***®PRO gateways are designed for minimum impact on the environment, they consume only a minimum of energy and resources.

➡ At work, always act in an environmentally responsible manner.

2.3.1 Disposal

Unusable or irreparable devices should always be disposed as per the applicable national regulations on waste disposal (e.g. European waste code 16 02 14).

Note

We would be pleased to be of assistance to you on the disposal of these devices. Contact us.

2.3.2 Separation of materials

WARNING

Only appropriately trained personnel are allowed to separate materials!
Caution is required when dismantling devices. There is a risk of injuries.

Before you send the devices for appropriate recycling, it is necessary to separate the different materials of the ***samos***®PRO gateways.

➡ Separate the housing from the rest of the parts (in particular the circuit board).
➡ Send the separated parts for recycling as appropriate (see Tab. 1).

Tab. 1: Overview on disposal by components

Components	Disposal
Product Housing, circuit boards, cables, connectors and electrical connecting pieces	Electronic recycling
Packaging Cardboard, paper	Paper/cardboard recycling

3 Product description *samos*®PRO gateways

The ***samos***®PRO gateways allow the ***samos***®PRO System to send and receive non-safety related data to and from the external fieldbus system for control and diagnostics purposes.

Note

In this manual, the data exchanged between the ***samos***®PRO system and the respective network will be considered always from the network master (PLC) point of view. Therefore data sent from the ***samos***®PRO system into the network will be referred to as *input data* while data received from the network will be referred to as *output data*.

Do not operate a *samos*®PRO gateway on a safety fieldbus!
The ***samos***®PRO gateway modules are not suitable for operation on a safety fieldbus. They do not support any safety mechanism, which would be mandatory to communicate within a safety network.

WARNING

Configuration of the ***samos***®PRO gateways is performed using the ***samos***®PLAN configuration software on a PC or laptop connected to the SP-SCON over RS-232 interface or connected to the Ethernet gateways over Ethernet TCP/IP.

The safety relevant logic of the ***samos***®PRO system operates independently from the gateway. If however the ***samos***®PRO system has been configured to integrate non-safe information from the fieldbus into the logic editor, a decoupling of the gateway can result in availablity problems.

A ***samos***®PRO gateway can only be operated on a ***samos***®PRO system. It does not have a dedicated voltage supply. It is possible to use two ***samos***®PRO gateways per system.

The gateways are fitted in a 22.5 mm wide housing for 35 mm rails in accordance with EN 60715.

Ordering information can be found in section 8.5 “Ordering information ***samos***®PRO gateways” on page 93. A list of available accessories can be found in section 8.6 “Ordering information accessories/spare parts” on page 93.

3.1 Device variants

Four ***samos***®PRO gateways are available for the different network types. Suitable for Ethernet networks are the EtherNet/IP gateway SP-EN-IP, the Modbus TCP gateway SP-EN-MOD and the Profinet IO gateway SP-EN-PN. The PROFIBUS DP gateway SP-PROFIBUS-DP is a fieldbus gateway without Ethernet functionality. With the SP-DeviceNet for DeviceNet and the SP-CANopen for CANopen, two further fieldbus gateways will be available in the future.

Tab. 2: Device variants and features overview

	SP-EN-IP	SP-EN-MOD	SP-EN-PN	SP-PROFIBUS-DP
Network type	EtherNet/IP explicit messaging	Modbus TCP master & slave receive method	Profinet IO slave conformance class A	PROFIBUS DP slave
Ethernet TCP/IP socket interface	Client/server	Client/server	Client/server	–
TCP/IP configuration interface	Available at port 9000	Available at port 9000	Available at port 9000	–

3.2 Data transmitted into the network (network input data sets)

Available data

The ***samos***®PRO gateways can provide the following data:

- Operational data
  - **Logic results** from the ***samos***®PRO main unit (SP-SCON) (see section 3.2.1 on page 14)
  - **Input values** (HIGH/LOW) for all ***samos***®PRO input extension modules in the system and EFI devices connected (see section 3.2.2 on page 14)
  - **Output values** (HIGH/LOW) for all ***samos***®PRO input/output extension modules connected (see section 3.2.2 on page 14)
  - **Output data** from another network, i.e. data received by a second gateway in the ***samos***®PRO system (see section 3.2.3 on page 14)
- Diagnostics
  - **Checksums** (CRCs) (see section 3.2.4 on page 14)
  - **Error and status information** for all modules except the SA-OR-S2 and SA-OR-S1 (see section 3.2.5 on page 14)

Data sets

The physical ***samos***®PRO modules are not represented as typical hardware modules in the network. Instead, the data available from the ***samos***®PRO system has been organized into four input *data sets*.

- **Data set 1** (max. 50 bytes) contains the operational data. It can be compiled using the ***samos***®PLAN tool. Upon delivery there is a default selection for the content of data set 1 which can be freely modified. For details see Tab. 4 on page 13.
  For the SP-EN-PN and the SP-PROFIBUS-DP, data set 1 has been subdivided in five input *data blocks*, where data block 1-4 contain 12 bytes each and data block 5 contains two bytes. For detailed information see the section on the related gateway.
- **Data set 2** (32 bytes) contains the system configuration CRCs. See Tab. 4 on page 13.
- **Data set 3** (60 bytes) contains the individual module status and diagnostics data with four (4) bytes per module. For details see **Tab. 5** on page 15.
- **Data set 4** (60 bytes) is currently filled with reserved values.

Tab. 3 gives an overview which data sets are available for which gateway.

	Data set 1	Data set 2	Data set 3	Data set 4
SP-EN-IP	EtherNet/IP or TCP/IP	EtherNet/IP or TCP/IP	EtherNet/IP or TCP/IP	EtherNet/IP or TCP/IP
SP-EN-MOD	Modbus TCP or TCP/IP	Modbus TCP or TCP/IP	Modbus TCP or TCP/IP	Modbus TCP or TCP/IP
SP-EN-PN	Profinet IO or TCP/IP	Profinet IO or TCP/IP	Profinet IO or TCP/IP	Profinet IO or TCP/IP
SP-PROFIBUS-DP	PROFIBUS DP	–	–[1)]	–

Tab. 3: Availability of data set 1-4

	Data set 1	Data set 2	Data set 3
Byte 0	Logic result 1	Overall CRC	Module status module 0. Module 0 is always the CPU. For detailed information about the module status see Tab. 5.
Byte 1	Logic result 2		
Byte 2	Logic result 3		
Byte 3	Logic result 4		
Byte 4	Input values module 1	System CRC (SCID)	Module status module 1
Byte 5	Input values module 2		
Byte 6	Input values module 3		
Byte 7	Input values module 4		
Byte 8	Input values module 5	Reserved	Module status module 2
Byte 9	Input values module 6		
Byte 10	Input values module 7		
Byte 11	Input values module 8		
Byte 12	Input values module 9		Module status module 3
Byte 13	Input values module 10		
Byte 14	Input values module 11		
Byte 15	Input values module 12		
Byte 16	Output values module 1		Module status module 4
Byte 17	Output values module 2		
Byte 18	Output values module 3		
Byte 19	Output values module 4		
Byte 20	Output values module 5		Module status module 5
Byte 21	Output values module 6		
Byte 22	Output values module 7		
Byte 23	Output values module 8		
Byte 24	Output values module 9		Module status module 6
Byte 25	Output values module 10		
Byte 26	Output values module 11		
Byte 27	Output values module 12		
Byte 28	Not assigned		Module status module 7
Byte 29	Not assigned		
Byte 30	Not assigned		
Byte 31	Not assigned		
Byte …	Not assigned		…
Byte 49	Not assigned		…
Byte …			…
Byte 56			Module status module 14. Module 13 and 14 are always the gateways.
Byte 57			
Byte 58			
Byte 59			
Length	50 bytes	32 bytes	60 bytes

Tab. 4: Overview input data sets 1-3 (default settings for EtherNet IP, Modbus TCP and TCP/IP)

[1)] With the SP-PROFIBUS-DP, diagnostics data is available via PROFIBUS standard DP-V0 diagnostics. For more information on how to retrieve module status and diagnostics data via the PROFIBUS DP gateway please refer to chapter 6.1 “PROFIBUS DP gateway” on page 71.

Note

If there are dual channel input or output elements configured at the IO module, then only the lowest bit represents the element's input or output status (on/off). It is represented by the element's tag name. The highest bit is not supported.

3.2.1 Logic results

Logic results generated by the logic editor of the ***samos***®PRO main unit can be made available to the network. Up to 20 bytes are available where each bit represents one logic result from the logic editor.

Data set 1 containing the logic results can be customized. For detailed information see the chapter on the related gateway and chapter 7 "Layout and content of the process image" on page 83.

3.2.2 Module input and output values

The ***samos***®PRO gateways can transmit all input and output states of all ***samos***®PRO modules connected to the ***samos***®PRO system into the network. Data set 1 containing the input and output values can be customized. For detailed information see the chapter on the related gateway and chapter 7 "Layout and content of the process image" on page 83.

Module input and output states
The input and output states of the modules are transmitted using one byte for each module's inputs and one byte for each module's outputs where each bit represents the state of one input or output (on/off).

3.2.3 Routing of data from a second network

If your ***samos***®PRO system contains two gateways, it is possible to rout information received by the first gateway from one network (e.g. from a Modbus PLC) into a second network via the second gateway (e.g. to a PROFIBUS master) and vice versa.

3.2.4 Configuration checksums (CRCs)

Data set 2 contains the following configuration CRCs for the ***samos***®PRO system:

- Overall CRC (same as system CRC)
- System CRC (SCID)

Each checksum is four bytes long. The overall CRC is the checksum displayed in the ***samos***®PLAN report. Data set 2 can not be customized.

3.2.5 Error and status information of the modules

Data set 3 contains the module status information transferred to the network.

Four bytes are used for each module (e.g. SP-SDIO). These four bytes are being transferred in Big Endian format, i.e. in 16 bit word format with the first byte placed in the least significant, or rightmost byte of the integer and the second byte placed in the most significant, or leftmost byte of the integer:

Data set 3 can not be customised.

Byte	Bit	I/O modules (e.g. SP-SDIO, SP-SDI)[2)]	CPU modules (e.g. SP-SCON)	Gateway modules
0	0	Module operating state 1 = Executing 0 = Any other state	Module operating state 1 = Executing 0 = Any other state	Module operating state 1 = Executing 0 = Any other state
	1	Internal error: Internal tests failed or watchdog test failed or bad process data or self test failure 1 = No error 0 = Error	Module operating state is Critical Fault 1 = No error 0 = Critical Fault	Internal error: Internal tests failed, bad process data 1 = No error 0 = Error
	2	External error: Input test or dual channel evaluation failure, or bad output power supply range, or output(s) stuck-at-high or stuck-at-low. 1 = No error 0 = Error	Power supply out of range 1 = No error 0 = Error	External error: network connection inactive/failure 1= No error 0 = Error/inactive
	3	Reserved	Reserved	Reserved
	4	Configuration status changed to invalid. 1 = Configuration valid 0 = Conf. invalid or unknown	Configuration status changed to invalid. 1 = Configuration valid 0 = Conf. invalid or unknown	Configuration status changed to invalid. 1 = Configuration valid 0 = Conf. invalid or unknown
	5	Output power supply out of range. 1 = Power supply o.k. 0 = Power supply out of range	Output power supply out of range. 1 = Power supply o.k. 0 = Power supply out of range	Input status 1 = Valid network communication 0 = Invalid or no communication
	6	Reserved	EFI 1 communication failure 1 = No error 0 = Error	Output status 1 = Valid network communication 0 = Invalid or no communication
	7	Reserved	EFI 2 communication failure 1 = No error 0 = Error	Reserved
1	0	Input 1-2 dual channel input evaluation error 1 = No error 0 = Error	Reserved	Reserved
	1	Input 3-4 dual channel input evaluation error 1 = No error 0 = Error		
	2	Input 5-6 dual channel input evaluation error 1 = No error 0 = Error		
	3	Input 7-8 dual channel input evaluation error 1 = No error 0 = Error		
	4	Status output 1 fast shut off logic control time out. 1 = No error 0 = error		
	5	Status output 2 fast shut off logic control time out.		

Tab. 5: Meaning of the module status bits

[2)] The module status bits for the SP-SDIO and SP-SDI are fully supported only with firmware version 1.2.x and higher.

Byte	Bit	I/O modules (e.g. SP-SDIO, SP-SDI)[2)]	CPU modules (e.g. SP-SCON)	Gateway modules
		1 = No error 0 = error		
	6	Status output 3 fast shut off logic control time out. 1 = No error 0 = error		
	7	Status output 4 fast shut off logic control time out. 1 = No error 0 = error		
2	0	Input 1 external test signal failure. 1 = No error 0 = Error	Reserved	Reserved
	1	Input 2 external test signal failure. 1 = No error 0 = Error		
	2	Input 3 external test signal failure. 1 = No error 0 = Error		
	3	Input 4 external test signal failure. 1 = No error 0 = Error		
	4	Input 5 external test signal failure. 1 = No error 0 = Error		
	5	Input 6 external test signal failure. 1 = No error 0 = Error		
	6	Input 7 external test signal failure. 1 = No error 0 = Error		
	7	Input 8 external test signal failure. 1 = No error 0 = Error		
3	0	Output 1 stuck-at-high error. 1 = No error 0 = Error	Reserved	Reserved
	1	Output 1 stuck-at-low error. 1 = No error 0 = Error		
	2	Output 2 stuck-at-high error. 1 = No error 0 = Error		
	3	Output 2 stuck-at-low error. 1 = No error 0 = Error		
	4	Output 3 stuck-at-high error. 1 = No error 0 = Error		
	5	Output 3 stuck-at-low error. 1 = No error 0 = Error		
	6	Output 4 stuck-at-high error. 1 = No error 0 = Error		
	7	Output 4 stuck-at-low error. 1 = No error 0 = Error		

Notes

- Reserved (for future use) = static 1 (no status change)
- If no module is present, all values including the reserved values are set to logical 1.

You will find an example process image in section 5.1.3 “TCP/IP process image example” on page 35.

3.3 Data received from the network (network output data sets)

The data received from the network are organised in output data sets (max. 50 bytes). These data have been subdivided in five data blocks holding 10 bytes each for the SP-EN-IP, SP-EN-MOD and SP-EN-PN; for the SP-PROFIBUS-DP output data blocks 1-4 hold 12 bytes each while output data block 5 holds 2 bytes.

Gateway	Output data block 1 size	Output data block 2 size	Output data block 3 size	Output data block 4 size	Output data block 5 size
SP-EN-IP	10 bytes	10 bytes	10 bytes	10 bytes	10 bytes
SP-EN-MOD	10 bytes	10 bytes	10 bytes	10 bytes	10 bytes
SP-EN-PN	10 bytes	10 bytes	10 bytes	10 bytes	10 bytes
SP-PROFIBUS-DP	12 bytes	12 bytes	12 bytes	12 bytes	2 bytes

Tab. 6: Output data blocks 1-5 for the different gateways

The contents of the output data blocks can be used within the ***samos***®PRO CPU logic editor and can also be made available to another network via a second ***samos***®PRO gateway in the ***samos***®PRO system.

Notes

- In order to make the data from the network available in the logic editor or as input to another network, you will have to define a tag name for each bit that shall be used.
- Bits without a specific tag name will not be available in the logic editor nor for routing via a second gateway. For detailed information on how to define tag names for the data received please see the related section in the chapters on the different gateways.
- The status of the communication to and from the network can be monitored in the logic editor using the module input status bit for data from the network and the module output status bit for data to the network. When the gateway detects an invalid communication, the contents of the data sets will be set to zero (logical 0) and the corresponding module status bit will also be set to zero (logical 0).
- In case the communication is dropped, the data of the output data sets will be set to zero (logical 0) and the module input status bit will also be set to zero (logical 0).

Do not use the same output data set number for two different PLC connections or TCP/IP sockets!
The output data set can be written to the Ethernet gateways in parallel by all communication interfaces or TCP/IP sockets (e.g. Modbus TCP and Ethernet TCP/IP), if they use the same output data set number. In that case the last message overrides data received earlier.

4 Mounting and basic configuration of the gateways

4.1 Mounting/Dismantling

This chapter describes the mounting of the ***samos***®PRO gateways.

WARNING

Make sure that the connection of the *samos*®PRO gateway cannot lead to hazardous situations during installation!
Ensure that connecting a ***samos***®PRO gateway cannot lead to a hazardous situation when implementing the unit on to the ***samos***®PRO system and Ethernet network. Prevent unintended start-up of equipment during connection of a ***samos***®PRO gateway.

4.1.1 Steps for mounting the modules

WARNING

- The ***samos***®PRO system is only suitable for mounting in a control cabinet with at least IP 54 degree of protection.
- While supply voltage is applied, modules must not be plugged to nor be removed from the ***samos***®PRO system.
- To ensure full electromagnetic compatibility (EMC), the DIN mounting rail must be connected to functional earth (FE). Additionally connect all network cable shields directly at the control cabinet entrance to a common FE ground line.

- In a ***samos***®PRO system the main module SP-SCON is positioned at the extreme left.
- The two optional gateways follow directly to the right of the main module.
- Connect further ***samos***®PRO extension modules (e.g. SP-SDIO or SP-SDI) onto the right side of the gateways and any additional relay modules (SA-OR-S2 or SA-OR-S1) to the extreme right of the entire ***samos***®PRO system.
- Ensure that suitable ESD protective measures are taken during mounting. Otherwise the devices may be damaged.
- The connection between the modules is effected by means of the plug connection integrated in the housing. Take into account that, when replacing a module, the ***samos***®PRO modules have to be pushed approx. 10 mm apart before the corresponding module can be removed from the DIN rail.
- Take suitable measures to ensure that foreign matter does not penetrate the connector openings, in particular that of the system plug.
- Mount the modules in accordance with EN 50274.
- The modules are located in a 22.5 mm wide modular system for 35 mm DIN rails according to EN 60715.

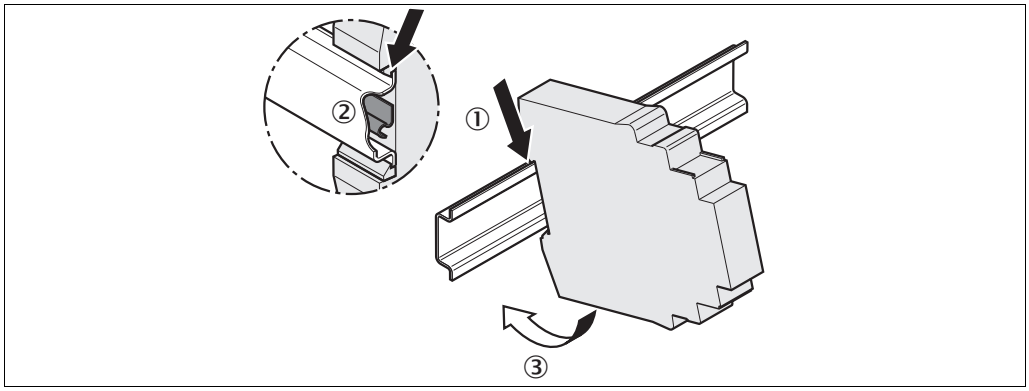


Fig. 1: Mounting the module onto the DIN rail

- Make sure that the voltage supply of the ***samos***®PRO system is switched off.
- Hang the device onto the DIN rail (1).
- Connect the gateways directly onto the right side of the SP-SCON module of the ***samos***®PRO system. Up to two gateways per system are possible.
- Ensure that the earthing spring contact (2) contacts the DIN rail such that it can electrically conduct.
- Latch the module onto the DIN rail by pressing it lightly in the direction of the arrow (3).

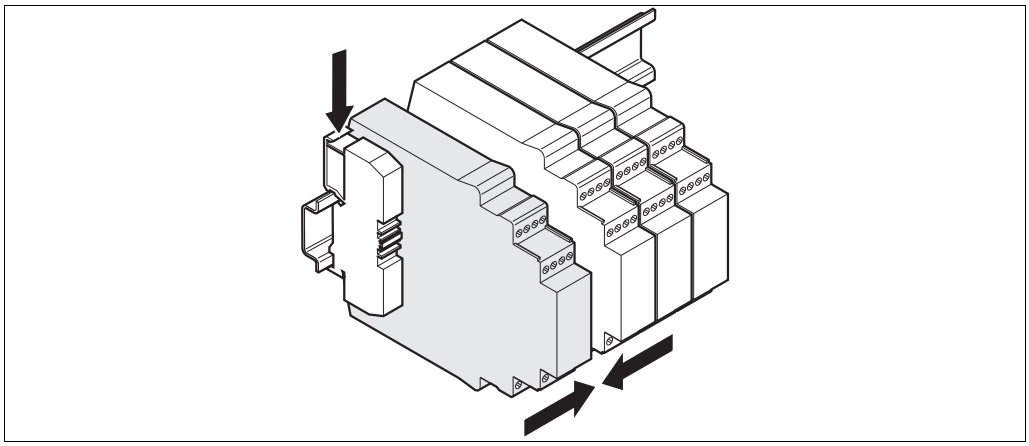


Fig. 2: Installing the end clips

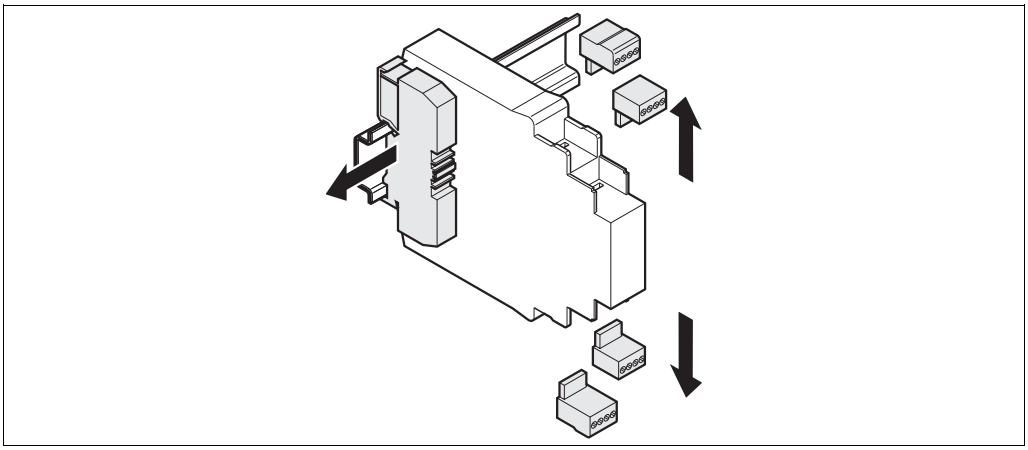
- If there are several modules, slide the modules together individually in the direction of the arrow until the side plug connection latches in.
- Install end clips on the left and right.

The following steps are necessary after mounting:

- Complete the electrical connections (see section 4.2 “Electrical installation” on page 30)
- Configuration (see section 4.3 “First configuration steps” on page 21 and the ***samos***®PLAN operating instructions (Wieland part no. BA000518).
- Checking the installation (see the chapter on commissioning in the ***samos***®PRO hardware operating instructions, Wieland document no. BA000497).

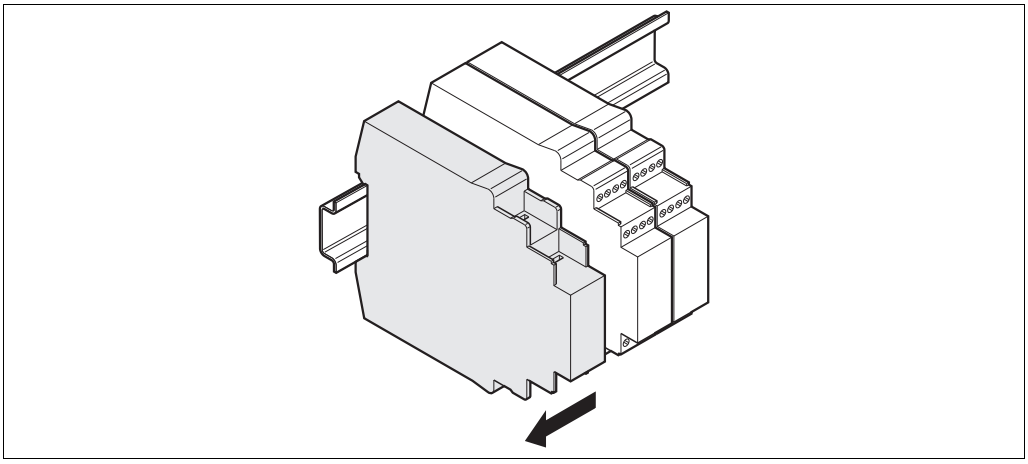
4.1.2 Steps for dismantling the modules

Fig. 3: Removing the removable terminals



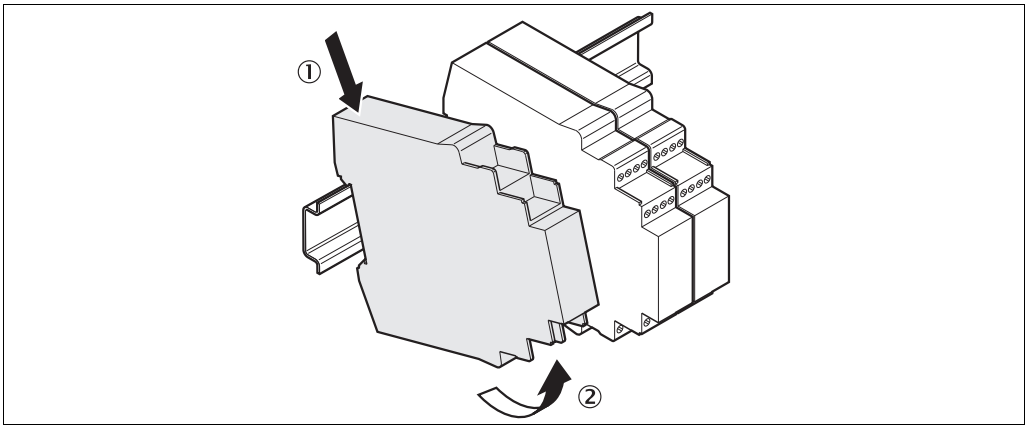
➡ Remove the removable terminals with the wiring and the end clips.

Fig. 4: Disconnecting the plug connections



➡ If there are several modules, slide the modules away from each other individually in the direction of the arrow until the side plug connection is separated.

Fig. 5: Removing modules from the DIN rail



➡ Press the module downwards at the rear (1) and remove it from the DIN rail in the direction of the arrow while keeping it pressed down (2).

4.2 Electrical installation

Switch the entire machine/system off line!
The system could start up unexpectedly while you are connecting the devices.

WARNING

Notes

- The ***samos***®PRO gateways fulfil the EMC requirements in accordance with the basic specification EN 61000-6-2 for industrial use.
- To ensure full electromagnetic compatibility (EMC), the mounting rail has to be connected to functional earth (FE).
- The control cabinet or assembly casing of the ***samos***®PRO system must comply at least with enclosure rating IP 54.
- Mounting in accordance with EN 50274.
- Electrical installation in accordance with EN 60204-1.
- The voltage supply of the devices must be capable of buffering brief mains voltage failures of 20 ms as specified in EN 60204-1.
- The voltage supply has to fulfil the regulations for extra-low voltages with safe separation (SELV, PELV) in accordance with EN 60·664 and DIN 50·178 (equipment of electrical power installation with electronic devices).
- Ensure that all the modules of the ***samos***®PRO system, the connected protective devices as well as the voltage supplies are connected with the same GND plane. The GND of the RS232 interface is connected internally to the GND of the supply of the main module (A2).
- Connect all fieldbus and Ethernet cable shields directly at the control cabinet entrance to the functional earth (FE).

4.3 First configuration steps

This chapter describes the basic steps you have to perform for the configuration of the gateway:

- Establish a first connection between the gateway and a PC or laptop
- Upload or transfer of a configuration
- Verification of a configuration

4.3.1 Establishing a connection between gateway and PC

➡ Connect a PC or notebook to the RS-232 interface of the SP-SCON.
➡ Power on the ***samos***®PRO System.
➡ Open the ***samos***®PLAN configuration tool installed on the PC.
➡ Click on **Edit com. interface settings** to ensure the correct communication interface has been selected. The following dialog appears:

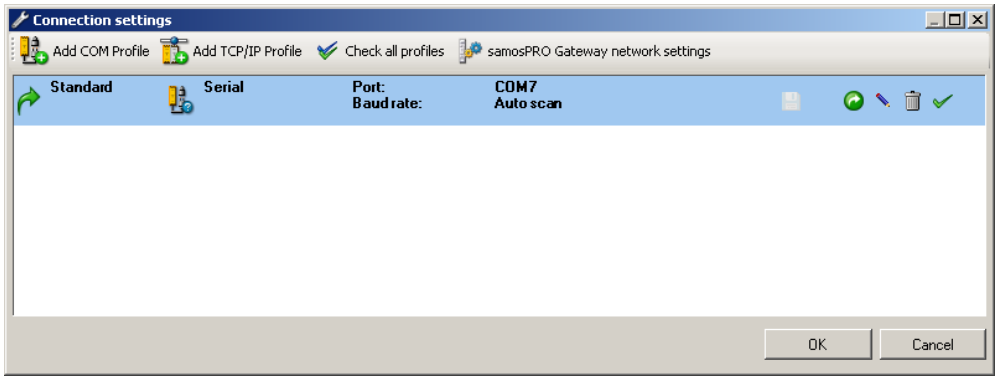
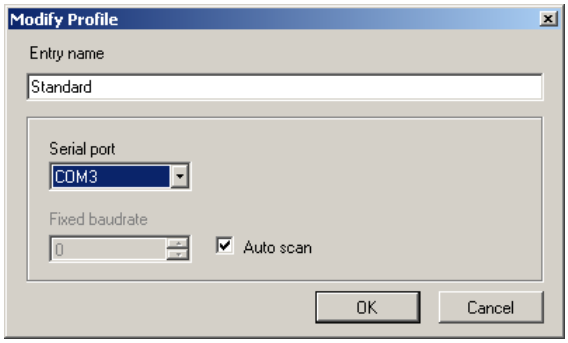


Fig. 6: Com settings dialog

➡ To edit the settings click on the pencil icon to the right. The following dialog appears:

Fig. 7: Com settings dialog



➡ Modify the settings if required and click **OK**.

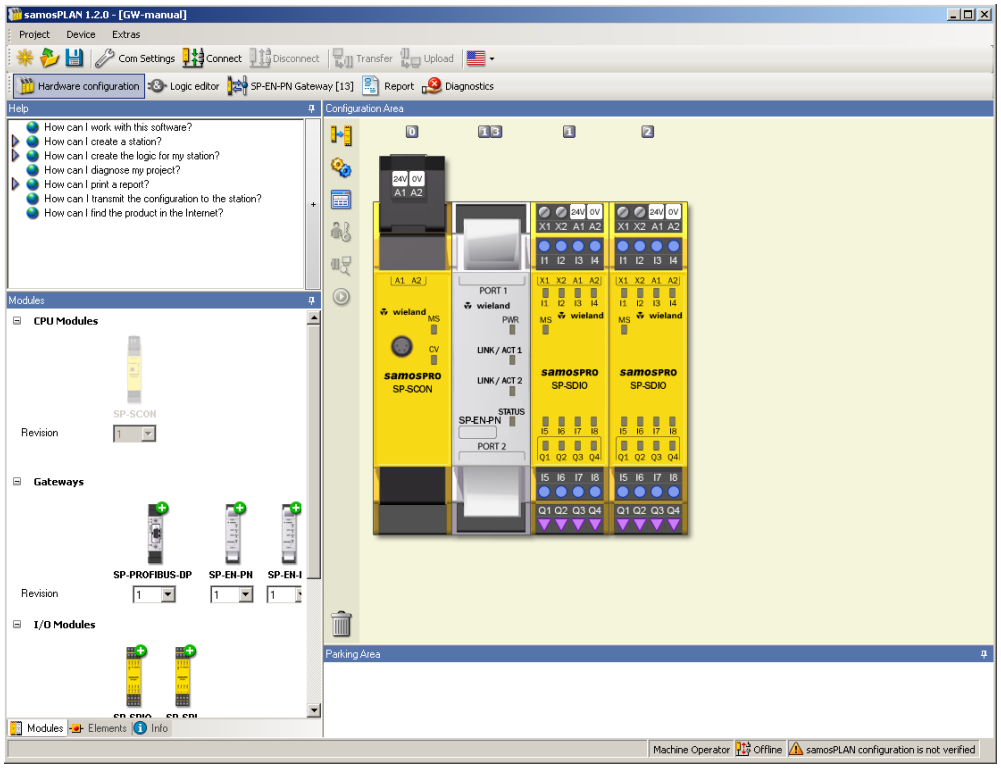
➡ Click **OK**. The dialog closes.

➡ Click on **Connect to physical device**. The ***samos***®PLAN will search for connected ***samos***®PRO devices and load the hardware configuration into the hardware configuration dialog. Once all modules have been identified correctly, the ***samos***®PLAN will ask whether the configuration shall be uploaded.

➡ Click **Yes** to upload the configuration.

As an example, the following hardware configuration may appear:

Fig. 8: Hardware configuration dialog



➡ Click **Disconnect** to go into the offline mode if you want to change the configuration of the ***samos***®PRO modules.

4.3.2 Configuration of the gateways

For the configuration of the gateways please refer to the sections on the related gateway:

- Section 5.2 “EtherNet/IP gateway” on page 37
- Section 5.3 "Modbus TCP gateway" on page 50
- Section 5.4 "PROFINET IO gateway" on page 59
- Section 6.1 “PROFIBUS DP gateway” on page 71

For the configuration of the TCP/IP interface of the Ethernet gateways, please refer to the following sections:

- Section 5.1.1 “TCP/IP configuration interface” on page 25
- Section 5.1.2 “Ethernet TCP/IP socket interface” on page 28

For the configuration of the operational data (data transfer from and to the network), please refer to chapter 7 “Layout and content of the process image” on page 83.

More information can be found in the ***samos***®PLAN operating instructions (Wieland part no. BA000518).

4.3.3 Transfer of a configuration

Once you have finished the configuration, you have to transfer the configuration to your ***samos***®PRO system. In order to transfer a configuration, perform the following steps:

➡ Click **Connect** to go online. The ***samos***®PLAN connects to the ***samos***®PRO system.
➡ Click **Transfer** to transfer the configuration to the ***samos***®PRO system.

Note

Depending on your current user level, you will be prompted to log on as authorized client to be able to transfer a configuration. For details please see the ***samos***®PLAN operating instructions.

➡ Once the transfer has been completed, you will be asked whether you want to run the CPU module. Depending on your choice, click **Yes** or **No** to leave the dialog.

Note

You can also start and stop the application in the **Hardware configuration** view using the **Run application** or **Stop application** buttons while the project is online.

More information can be found in the ***samos***®PLAN operating instructions (Wieland part no. BA000518).

4.3.4 Verification of a configuration

After the configuration has been transferred successfully, the ***samos***®PRO system can be verified. To this purpose, the downloaded configuration data are read back out from the ***samos***®PRO system and compared with the project data. If they match, the data are displayed in a report. If the user confirms that they are correct, the system is considered to be verified.

➡ In the **Hardware configuration** view, click on the **Upload and Verify configuration** button. A report of the current configuration will be generated.
➡ Click Yes below at the question **Mark device as verified?** if the displayed configuration is the expected configuration. The system is then considered to be verified.

Notes

- You have to be logged in as authorized user in order to mark the configuration as “verified”.
- If the verification is completed successfully, a “Read in and compare” report that provides the most important project information is created subsequently. You can print out or store this report.
- The status verified/not verified is indicated in the lower right-hand corner of the ***samos***®PLAN and by the CV LED at the ***samos***®PRO main module lighting up.

- Only if the device and the corresponding configuration have been marked as verified, the "Auto Start mode" is active in the configuration of the main module. If the configuration is not set to verified after power up, the system stays in Idle mode (CV LED on the SP-SCON module flashing) and the system needs to be set to Run mode using the ***samos***®PLAN.
- If differences between the project data and the read-back configuration data are detected, a corresponding message including information about possible actions is displayed. Verification of the configuration is not possible then. Observe the information in the error message for the further procedure. Terminate the dialog box by clicking **Close**.
- If you change a verified configuration, the status is reset to "not verified".
  Exception: If you make only non safety-related changes such as modifying the gateway name, the gateway's IP address or the port number for a TCP/IP socket connection, the configuration status remains "verified".

More information can be found in the ***samos***®PLAN operating instructions (Wieland part no. BA000518).

4.3.5 Upload of a configuration

When in online mode, you can upload a configuration from the connected ***samos***®PRO system:

➡ Click on **Upload**. The current configuration of the ***samos***®PRO system will be loaded into the ***samos***®PLAN and can be edited after going offline.

5 Ethernet gateways

This chapter describes the following ***samos***®PRO gateways:

- EtherNet/IP gateway (SP-EN-IP)
- Modbus TCP gateway (SP-EN-MOD)
- Profinet IO gateway (SP-EN-PN)

5.1 Common features of the Ethernet gateways

5.1.1 TCP/IP configuration interface

The ***samos***®PRO Ethernet gateways offer a TCP/IP configuration interface which allows the configuration of the ***samos***®PRO System over Ethernet TCP/IP. This runs parallel to the Ethernet TCP/IP or other Ethernet protocols.

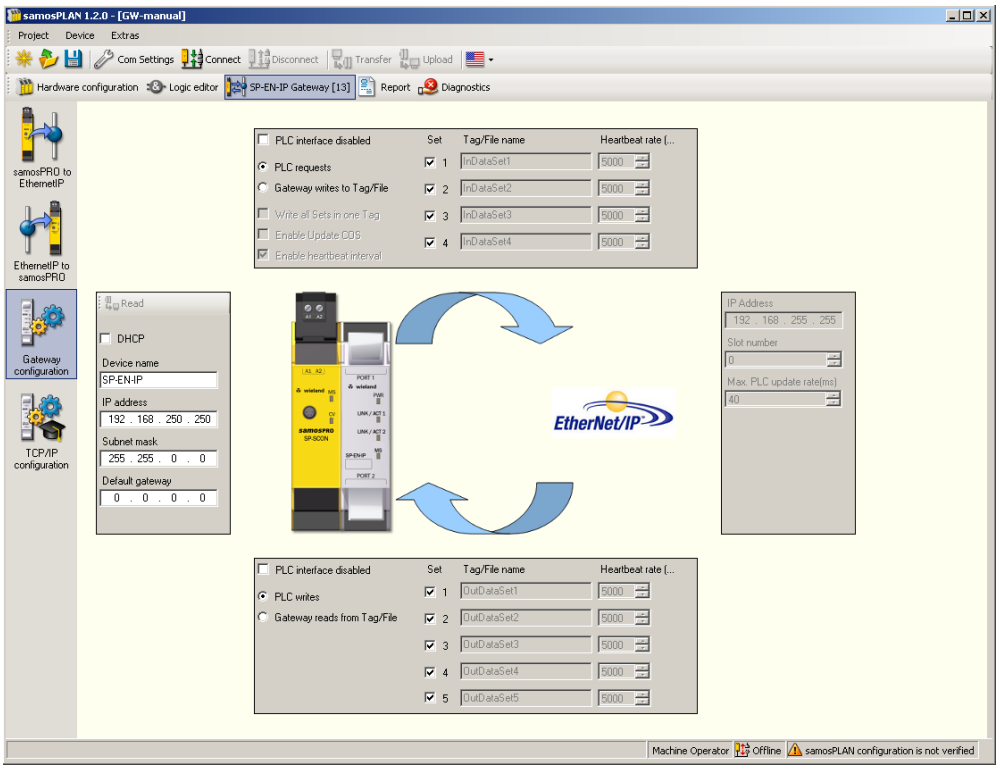
Do not connect to the *samos*®PRO system via the RS-232 and the Ethernet interface at the same time!
The ***samos***®PRO system can only communicate with one instance of the ***samos***®PLAN at one time. Connecting to the ***samos***®PRO system using multiple instances of the Designer, either on a single PC or multiple PCs, may result in inconsistencies of the configuration and the diagnostics as well as in operational errors. This applies to both RS-232 and Ethernet connections equally.

In order to configure a gateway for TCP/IP configuration for the first time, perform the following steps:

Step 1: Assign an IP address

➡ Connect a PC or notebook to the RS-232 interface of the SP-SCON.
➡ Power on the ***samos***®PRO System.
➡ Open the ***samos***®PLAN configuration tool installed on the PC and load the hardware configuration including the gateway.
➡ If your project is online, click on the **Disconnect** button to go offline.
➡ Click on the **Gateway** button above the main window and select the desired gateway.
➡ Click on **Gateway configuration** on the left hand menu. The following dialog appears:

Fig. 9: Gateway configuration dialog



On the left side of the dialog you will find the area for the gateway IP configuration.

- If desired, enter a **Device name** for the ***samos***®PRO gateway.
- Enter a valid **IP address**, for the ***samos***®PRO gateway, and if required a valid **Subnet mask** and a valid IP address for a **Default gateway**.

Or:

- If your network uses a DHCP server, activate the **DHCP** checkbox.
- Click **Connect** to go online and transfer the configuration to the ***samos***®PRO system.

Notes:

- If your project is online, you can use the **Read IP address** button at the upper left corner of the gateway IP configuration area to retrieve the current IP settings of the gateway.
- The out-of-the-box default IP address of the gateway is 192.168.250.250. You can find the default IP address also on the type label of the gateway.

Step 2: Add a TCP/IP profile to your project

- Connect one of the two Ethernet ports of the gateway with your Ethernet network using a shielded Ethernet cable.
- Connect a PC (or notebook) to the same Ethernet network. Ensure the IP address settings of the PC match the network setup.

Note

You can also connect your PC directly to one of the two Ethernet ports of the gateway. In this case, you can either adapt the IP address settings of your PC or the IP address settings of the gateway to match the other device's IP setup.

- Open the ***samos***®PLAN configuration tool installed on the PC and load the hardware configuration including the gateway.
- If your project is online, click on the **Disconnect** button to go offline.
- Click on **Com Settings**. The following dialog appears:

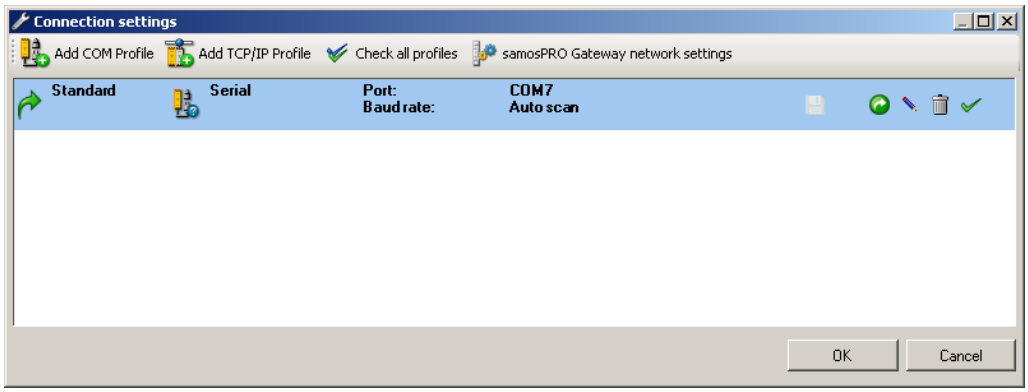


Fig. 10: Com settings dialog

➡ Click on **Add TCP/IP Profile**. The following dialog appears:

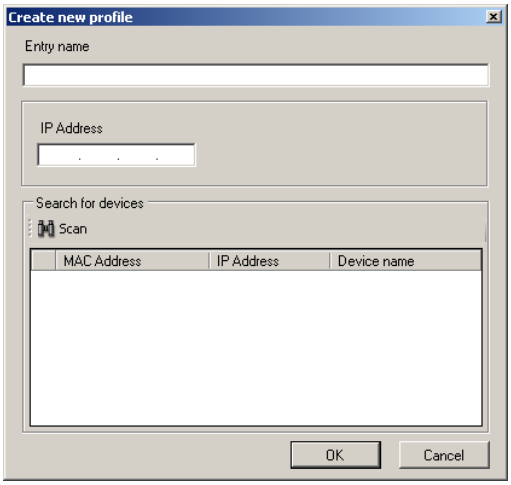


Fig. 11: Add TCP/IP Profile dialog

➡ Click on **Scan** to search for ***samos***®PRO gateways on your Ethernet network. Gateways located will be displayed as shown in the dialog below. The IP address will be displayed as well as MAC address and device name.

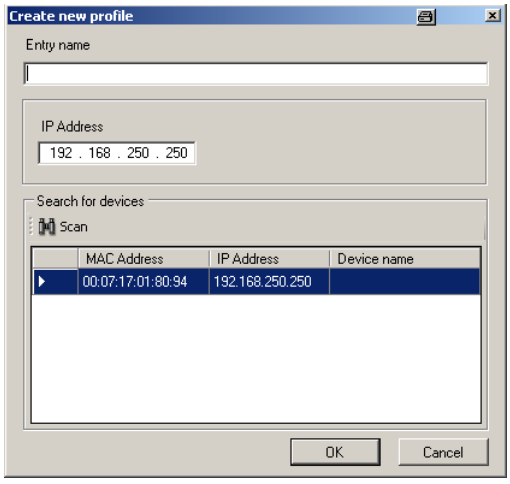
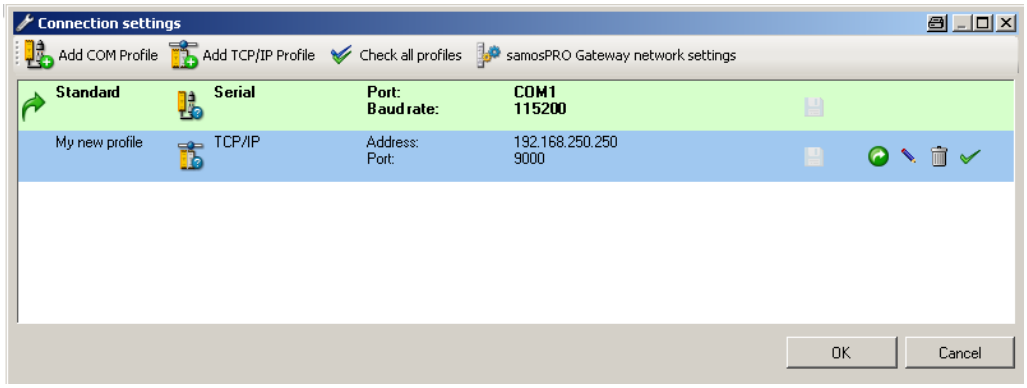


Fig. 12: Add TCP/IP Profile dialog after scan has been performed

➡ Select the gateway that you want to use as entry point.
➡ Enter a name for the entry point to the **Entry name** edit field.
➡ Click **OK**. The entry point has now been created and is shown in the connection dialog:

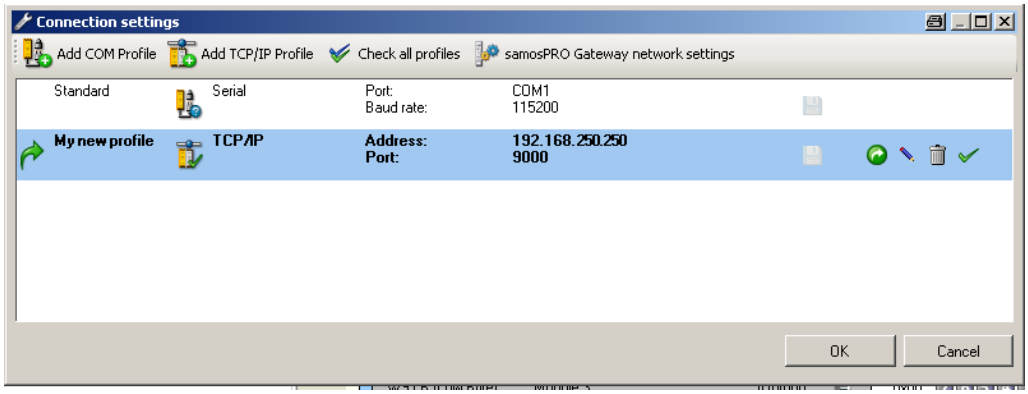
Fig. 13: Connection settings dialog with new TCP/IP entry point



In order to use this entry point, it needs to be activated.

➡ Click on the **Activate Entry Point** icon (white arrow in green circle) on the far right. The entry point will then be activated and marked as such:

Fig. 14: Connection settings dialog with new TCP/IP entry point activated



➡ Click **OK**. All communication to the ***samos***®PRO system will now happen via TCP/IP. In order to use the entry point via the serial interface again, you will have to re-activate it.

Note

The port number for the TCP/IP configuration interface is pre-set to port 9000 and can not be changed.

Step 3: Connect via TCP/IP

➡ Click on the **Connect** button to go online.

5.1.2 Ethernet TCP/IP socket interface

Each ***samos***®PRO Ethernet gateway supports a total number of four TCP/IP socket interfaces. This allows up to four different applications to communicate with the gateway at the same time over Ethernet TCP/IP. The gateway's proprietary network interface (e.g. Modbus TCP) runs in parallel and its configuration or usage does not interact with the TCP/IP socket configuration as it happens independently on separate ***samos***®PLAN pages.

WARNING

Do not use the same output data set number for two different PLC connections or TCP/IP sockets!

The output data set can be written to the Ethernet gateways in parallel by all communication interfaces or TCP/IP sockets (e.g. Modbus TCP and Ethernet TCP/IP), if they use the same output data set number. In that case the last message overrides data received earlier.

The gateway processes the data of a ***samos***®PRO system and makes it available in different compilations, the *data sets*. These data sets are available over the TCP/IP interface. For a

detailed description of the data sets please refer to section 3.2 “Data transmitted into the network (network input data sets)” on page 12.

In order to configure the Ethernet TCP/IP socket interface, perform the following steps:

- ➡ Open the ***samos***®PLAN and load the hardware configuration including the gateway.
- ➡ Click on the **Gateway** button above the main window and select the respective gateway to open the gateway configuration dialog.
- ➡ Click on **TCP/IP configuration** on the left hand menu. The following dialog appears:

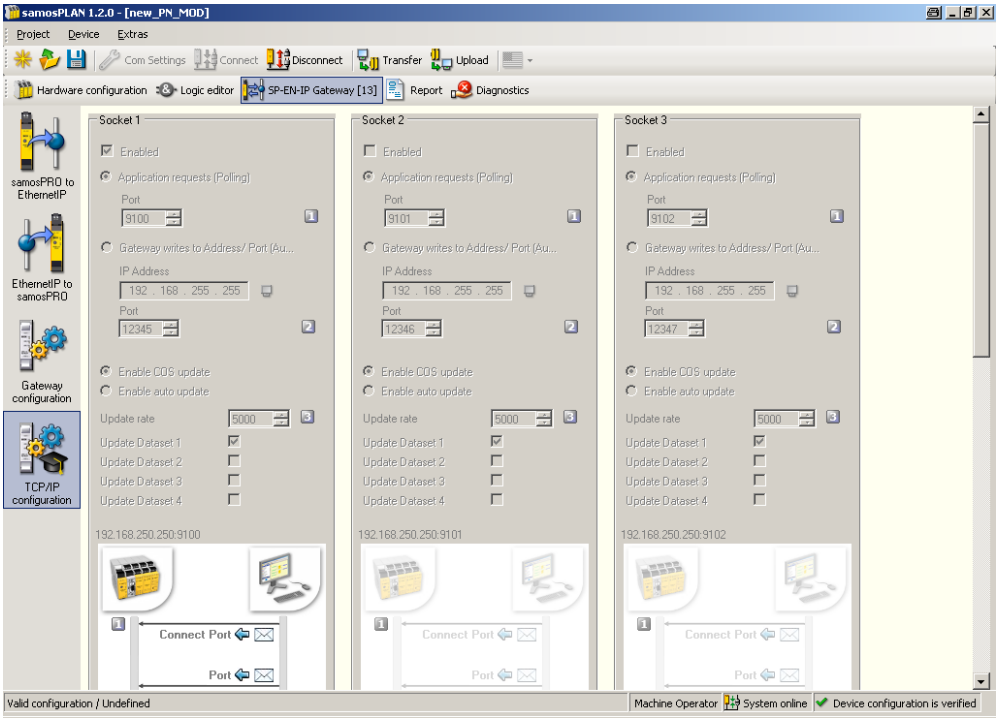


Fig. 15: TCP/IP configuration dialog

Configuration of the TCP/IP interface — who establishes the connection

If the ***samos***®PRO gateway shall connect to the external application, perform the following configuration steps:

- ➡ Activate the **Connect to** radio button.
- ➡ Set **IP Address** to the IP address of the computer the application is running on.
- ➡ Enter the port number of the application for **Port**.

Note

The configuration is considered faulty if either the connect socket port and/or the connect IP address is zero when in **Connect** mode.

If the external application shall connect to the ***samos***®PRO gateway, perform the following configuration steps:

- ➡ Activate the **Listen on** radio button.
- ➡ Enter the **Port** number for the application.

Notes

- Suggested port numbers are 9100 to 9103 (default values).
- Port 0 and port 9000 are reserved and can not be used (faulty configuration).
- Port numbers 0 to 1023 are managed by the Internet Assigned Numbers Authority (IANA) and can not be used. See http://www.iana.org/assignments/port-numbers.

Finally, determine how the data is transferred. Follow the steps outlined in the following section.

Data transfer method — how the data is transferred

Whenever the TCP/IP socket connection has been established (either by an application on a PC or by the gateway itself), there are two possible methods how the data sets can be transferred:

- The application requests the data set(s) per command message (Application requests (Polling) mode),

or

- the gateway auto-updates the data sets as per configuration (Gateway writes to Address/Port (Auto update) mode).

For both methods there are two update modes how the gateways update the data:

- *Change of state (COS)*: when any data of the input data set change status.
- *Automatic update*: data will be sent according to the configured update rate in ms.

Note

If automatic update is enabled, a change of state will trigger an immediate update of the data as well, regardless of the set update interval. I.e. COS is always active.

For both methods the following structure of messages applies.

General telegram structure

The request/response message (e.g. telegram) is structured as shown below:

0	1	…	…	…	…	…	…	…	…	…	…	…	…	n
Command	Parameter(s) (content depends on type of command)											Data		

Tab. 7: Telegram structure

Parameter	Length	Description
Command	WORD	0hex = Undefined (no command) Polling mode specific 00F1hex = Input data set(s) request message 001Fhex = Input data set(s) response message Auto-update specific 00E1hex = Auto update control 001Ehex = Auto update control response 002Ehex = Auto update input data set(s) message Digital outputs read/write 00F2hex = Write output data set settings 002Fhex = Response to write output data set settings
Parameter(s)	Length determined by command	As defined in specific command
Data	Length determined by command	As defined in specific command

Error response to invalid messages

The gateway will set the most significant bit of the command word in the event that an invalid or improperly formatted message is received.

Parameter	Length	Description
Command	WORD	Bit 15 of received command will be set (i.e. command of 00F2hex would become 80F2hex)
Following data	Length determined by command	Unchanged. Returned as it was received

Tab. 8: Error response message

Application requests (Polling) mode

In this mode the gateway will only send any data upon request (e.g. polling). Therefore the application shall send request telegrams as per definition below and the gateway will respond with telegrams structured as per definition below.

Get input data set(s)

The request message is sent by an application to the gateway. The request message telegram shall be structured as shown below:

Parameter	Length	Value
Command	WORD	00F1hex = Data set(s) request message
Request data set 1	WORD	0 = Do not send data set 1 1 = Send data set 1
Request data set 2	WORD	0 = Do not send data set 2 1 = Send data set 2
Request data set 3	WORD	0 = Do not send data set 3 1 = Send data set 3
Request data set 4	WORD	0 = Do not send data set 4 1 = Send data set 4

Tab. 9: Get data set(s) request

The response message is returned to the application by the gateway. The response message telegram will be structured as shown below:

Parameter	Length	Value
Command	WORD	00F1hex = Data set(s) response message
Data set 1 length	WORD	0 = Data set not returned in data set(s) data field Non-zero = Length of data set
Data set 2 length	WORD	0 = Data set not returned in data set(s) data field Non-zero = Length of data set
Data set 3 length	WORD	0 = Data set not returned in data set(s) data field Non-zero = Length of data set
Data set 4 length	WORD	0 = Data set not returned in data set(s) data field Non-zero = Length of data set
Data set(s) data	Array of bytes	Data set(s) information

Tab. 10: Get data set(s) response

Write output data sets

The following command message is sent by the application to the gateway to write to the output data sets:

Tab. 11: Write output data set setting command

Parameter	Length	Value
Command	WORD	00F2hex = Set output data set(s) command message
Output data set 1 length	WORD	0 = Output data set not included in data set(s) data field Non-zero = Length of data set
Output data set 2 length	WORD	0 = Output data set not included in data set(s) data field Non-zero = Length of data set
Output data set 3 length	WORD	0 = Output data set not included in data set(s) data field Non-zero = Length of data set
Output data set 4 length	WORD	0 = Output data set not included in data set(s) data field Non-zero = Length of data set
Output data set 5 length	WORD	0 = Output data set not included in data set(s) data field Non-zero = Length of data set
Data set(s) data	Array of bytes	Data set(s) information

The response message is returned to the application by the gateway. The response message telegram is structured as shown below:

Tab. 12: Write output data set setting response

Parameter	Length	Value
Command	WORD	002Fhex = Response to write output data set settings message
Status	WORD	0 = Success. Output data sets written correctly 1 = Error — Can not write output data sets due to either: Loss of backplane communication Incorrect routing information

*Configuration via **samos**®PLAN tool*

In order to configure the **Application requests (Polling) mode** of the gateway via the ***samos***®PLAN tool, perform the following steps:

- Open the ***samos***®PLAN and load the hardware configuration including the gateway.
- Click on the **Gateway** button above the main window and select the respective gateway to open the gateway configuration dialog.
- Click on **TCP/IP configuration** on the left hand menu. The following dialog appears:

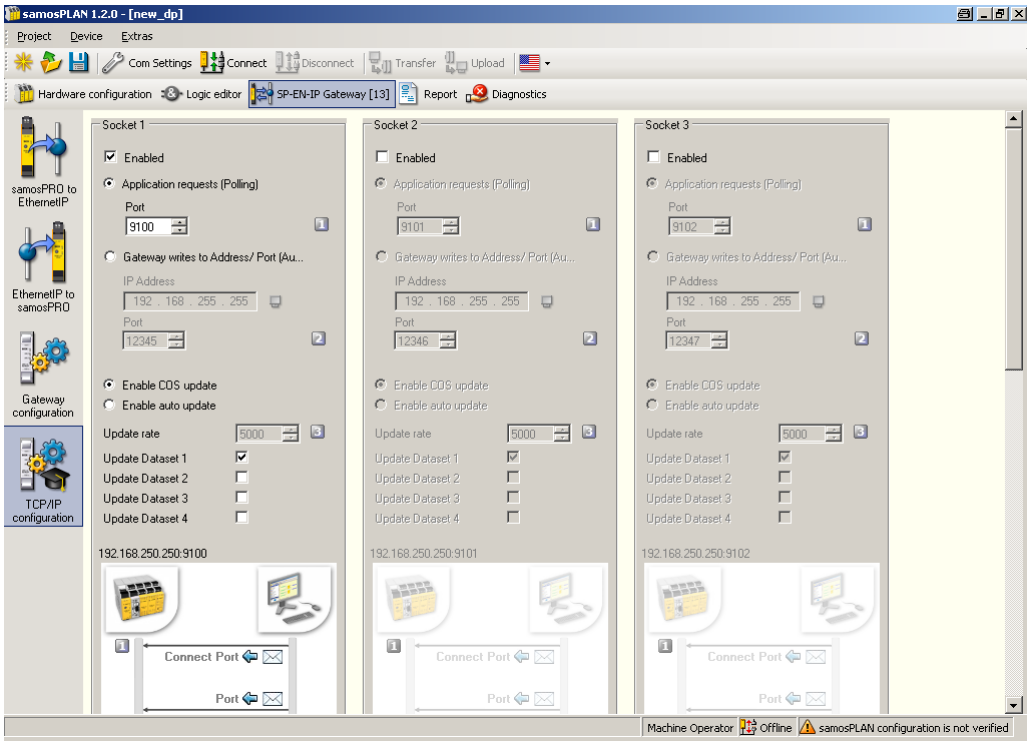


Fig. 16: TCP/IP configuration for Application requests (Polling) mode

➡ Check the **Listen on** checkbox.
➡ Enter the **Port** number on which the application will connect.
➡ Select the update mode: **Enable COS update** or **Enable auto update and COS**.
➡ If you have selected **Enable auto update and COS**, select the **Update rate** in ms.
➡ Select which data sets shall be updated: Check the **Update Dataset n** checkbox.

Gateway writes to Address/Port (Auto update) mode

The gateway can be configured to automatically update the data set information (i.e. the application does not need to send any request messages as it would do in polling mode) once the connection to the application has been made.

The configuration settings are available via the ***samos***®PLAN configuration tool or via the TCP/IP interface itself. Using one interface does not disable the other: The auto update mode could be enabled via ***samos***®PLAN and disabled via TCP/IP command, for example.

Configuration via TCP/IP interface

This command message is sent by an application to the gateway to configure the auto update mode. This message can be used to either disable or enable the auto update mode directly through the TCP/IP interface.

Tab. 13: Auto update mode configuration command

Parameter	Length	Value
Command	WORD	00E1hex = Auto update control
Request data set 1	WORD	0 = Do not send data set 1 1 = Send data set 1
Request data set 2	WORD	0 = Do not send data set 2 1 = Send data set 2
Request data set 3	WORD	0 = Do not send data set 3 1 = Send data set 3
Request data set 4	WORD	0 = Do not send data set 4 1 = Send data set 4
Heartbeat mode update rate	WORD	0 = Disable heartbeat messages Non-zero = Enable heartbeat message at specified rate in ms. Minimum = 40 ms

Note

Auto update is disabled if all Request Input Data Set flags are set to zero.

The response message returned to the application by the gateway:

Tab. 14: Auto update mode configuration response

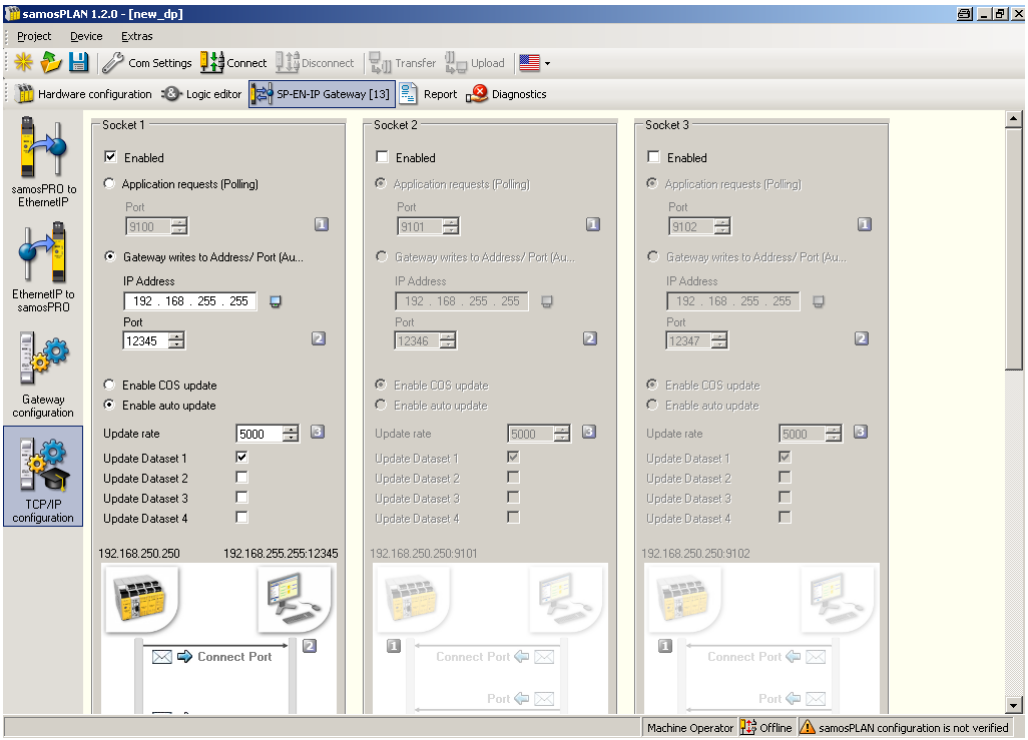
Parameter	Length	Value
Command	WORD	001Ehex = Response to the auto update control message

*Configuration via **samos**®PLAN tool*

In order to configure the **Gateway writes to Address/Port (Auto update)** mode of the gateway via the ***samos***®PLAN tool, perform the following steps:

- Open the ***samos***®PLAN and load the hardware configuration including the gateway.
- Click on the **Gateway** button above the main window and select the respective gateway to open the gateway configuration dialog.
- Click on **TCP/IP configuration** on the left hand menu. The following dialog appears:

Fig. 17: TCP/IP configuration for auto update



- Check the **Connect to** checkbox.
- Enter the **IP Address** and the **Port** number the gateway shall write to.
- Select the update mode: **Enable COS update** or **Enable auto update and COS**.

➧ If you have selected **Enable auto update and COS**, select the **Update rate** in ms.
➧ Select which data sets shall be updated: Check the **Update Dataset n** checkbox.

Normal operation

The following message is sent from the gateway to the application while operating in auto update mode.

Parameter	Length	Value
Command	WORD	002Ehex = Auto update data set(s) message
Data set 1 length	WORD	0 = Data set not returned in data set(s) data field Non-zero = Length of data set
Data set 2 length	WORD	0 = Data set not returned in data set(s) data field Non-zero = Length of data set
Data set 3 length	WORD	0 = Data set not returned in data set(s) data field Non-zero = Length of data set
Data set 4 length	WORD	0 = Data set not returned in data set(s) data field Non-zero = Length of data set
Data set(s) data	Array of bytes (length dependent on set definition)	Data set(s) information. Details see section 3.2 “Data transmitted into the network (network input data sets)” on page 12 and chapter 7 “Layout and content of the process image” on page 83.

Tab. 15: Auto update mode normal operation message

5.1.3 TCP/IP process image example

The following example shows a possible process image sent by a SP-EN-IP gateway via TCP/IP in auto update mode:

Byte values (hex)	Part of message	Meaning
00 2E	Command	Auto update data sets (see Tab. 15)
00 32	Command parameters	Length of data set 1: 50 bytes
00 20		Length of data set 2: 32 bytes
00 3C		Length of data set 3: 60 bytes
00 3C		Length of data set 4: 60 bytes
03 FF 03 03	Data set 1 (default byte assignments, see Tab. 4)	Logic results 1-4
C0		Input values module 1: C0 = 11000000 = Inputs I8 and I7 **Active**
03		Input values module 2: 03 = 00000011 = Inputs I2 and I1 **Active**
3F 05 05 05 00 00 00 00 00 00		Input values module 3-12
00 00 00 00 00 00 00 00 00 00 00 00		Output values module 1-12
00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00		Not assigned
52 A1 10 4C	Data set 2 (see Tab. 4)	Overall CRC (same as system CRC)
52 A1 10 4C		System CRC
00 00 00 00		Reserved
00 00 00 00		
00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00		
FF FF FF FF	Data set 3	Status module 0 (SP-SCON): OK

Tab. 16: TCP/IP process image example

Byte values (hex)	Part of message	Meaning
FF FF FF FF	(see Tab. 4 and Tab. 5) Data set 3 data is transferred in Big Endian format, i.e. in 32 bit double word format with the most significant byte placed in the leftmost position.	Status module 1 (e.g. SP-SDI): OK
FD FB FF FF		Status module 2 (e.g. SP-SDIO): Byte 0: FF = 11111111: No errors Byte 1: FF = 11111111: No errors Byte 2: FB = 11111011: Input 3 external test signal failure Byte 3: FD = 11111101: Output 1 stuck-at-low error
FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF		Status modules 3-6: OK
FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF		Status modules 7-12 (no modules present)
FF FF FF FF		Status module 13 (e.g. SP-EN-IP): OK
FF FF FF FF		Status module 14 (no module present)
00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00	Data set 4	Reserved

5.2 EtherNet/IP gateway

The following ***samos***®PRO gateway can be used for EtherNet/IP: SP-EN-IP.

You will find the EDS file and device icon for PLC interfacing

- on www.wieland-electric.com (go to "Support/Download Center")
- in the ***samos***®PLAN program folder on your hard disc (default installation folder is "C:\programs\Wieland\samosPRO\DeviceDescriptions\...")

The ***samos***®PRO EtherNet/IP gateway SP-EN-IP supports only EtherNet/IP explicit messaging. Class 1 messaging is not supported.

5.2.1 Interfaces and operation

The SP-EN-IP is equipped with an integrated three-port switch for connection with the Ethernet network. Two RJ45 sockets are available for the connection. The switch functionality allows the SP-EN-IP to be used for connection to another Ethernet component (e.g. connection to a notebook) without having to interrupt the Ethernet connection to the network.

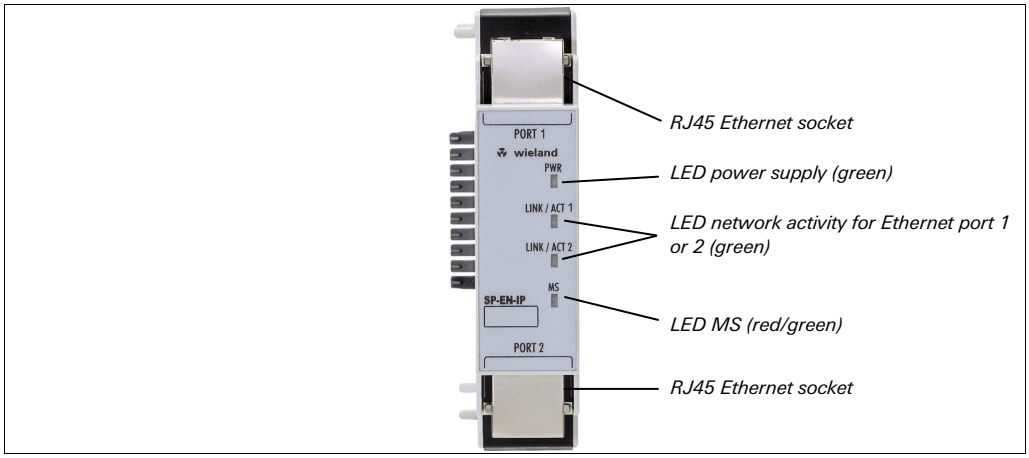


Fig. 18: Interfaces and display elements of the SP-EN-IP

LED		Meaning
PWR	○	No power supply
	● Green	Power supply switched on
LINK/ACT 1 LINK/ACT 2	○	No Ethernet connection
	● Green	Ethernet connection active, no data transmission
	☼ Green	Ethernet connection active, data transmission
MS	○	Power-up
	● Green	Executing (live process data from/to CPU)
	☼ Green	1 Hz: Idle
	☼ Red	1 Hz: Configuring/configuration required 2 Hz: Critical fault on gateway
	● Red	Critical fault on another module
	☼ Red/Green	Executing, but Ethernet communication not established or faulty

Tab. 17: Meaning of the LED displays of the SP-EN-IP

Symbol description:
○: LED off ● Green: LED lights up green ☼ Red: LED flashes red

Note

Error elimination is described in section 5.2.6 “Diagnostics and troubleshooting” on page 48.

Power-up sequence

On power up, the following LED test sequence is performed:

- LED MS ○ **Off** for 6 s.
- LED MS ● **Red** for 0.25 s.
- LED MS ● **Green** for 0.25 s.
- LED MS ○ **Off**.

5.2.2 Basic configuration — assigning a device name and IP address

Configuration of the SP-EN-IP is performed via the ***samos***®PLAN tool.

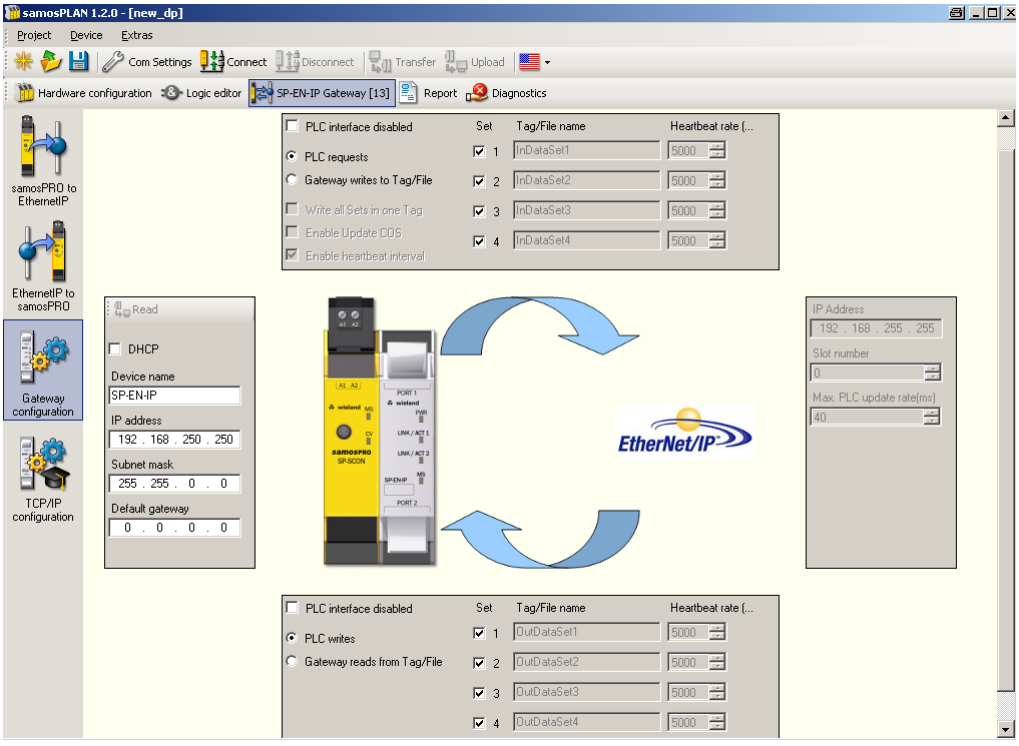
Via *samos*®PLAN tool

➡ Open the ***samos***®PLAN and load the hardware configuration including the EtherNet/IP gateway.

➡ Click on the **Gateway** button above the main window and select the SP-EN-IP to open the gateway configuration dialog.

➡ Click on **Gateway configuration** on the left hand menu. The following dialog appears:

Fig. 19: Gateway configuration dialog



➡ If desired, change the **Device name** for the ***samos***®PRO gateway.

➡ Enter a valid **IP address** for the ***samos***®PRO gateway, and if required a valid **Subnet mask** and a valid IP address for a **Default gateway**.

➡ Click **Connect** to go online and download the configuration to the ***samos***®PRO system.

5.2.3 Configuration of the interface to the PLC — how the data are transferred

Transfer methods

The configuration steps in this section specify how the data to the higher-level PLC are transferred. In general, there are two different transfer *methods* available for both transfer *directions* such as ***samos***®PRO to Network and Network to ***samos***®PRO:

- **Gateway writes to Tag/File** and/or **Gateway reads from Tag/File** — The SP-EN-IP gateway operates as *master*. It writes the data into and/or reads from the PLC memory.
- **PLC requests** and/or **PLC writes** — The SP-EN-IP gateway operates as *slave*. The PLC requests the data from the gateway and/or writes the data to the gateway.

Both methods can be mixed. E.g. it is possible to configure the gateway as master for the ***samos***®PRO to Network direction (option **Gateway writes to Tag/File** activated) while it operates at the same time as slave for the Network to ***samos***®PRO direction (option **PLC writes** activated).

Number of possible connections

The number of possible connections to the PLC depends on whether the SP-EN-IP is operated as *master* or *slave*. Depending on the setting, up to 128 PLCs can address the SP-EN-IP at the same time.

Operating mode of the SP-EN-IP	Maximum connections
Rx (To PLC) Transfer mode: Gateway writes to Tag/File Tx (From PLC) Transfer mode: Gateway reads from Tag/File	Rx and Tx: 1
Rx (To PLC) Transfer mode: Gateway writes to Tag/File Tx (From PLC) Transfer mode: PLC writes	Rx: 1 Tx: 127
Rx (To PLC) Transfer mode: PLC requests Tx (From PLC) Transfer mode: Gateway reads from Tag/File	Rx: 127 Tx: 1
Rx (To PLC) Transfer mode: PLC requests Tx (From PLC) Transfer mode: PLC writes	Rx and Tx: 128

Tab. 18: Number of possible connections

Configuration process

The following table outlines the configuration process depending on the transfer method:

Gateway is master (Gateway writes to Tag/File and/or Gateway reads from Tag/File)	
To do in the gateway configuration (via ***samos***®PLAN tool)	To do in the PLC program and/or EtherNet/IP network configuration tool
Select which data shall be written to/read from the PLC	—
Define where in the PLC memory the selected data shall be written to: Enter tag names. Example: InDataSet1 And/or define where in the PLC memory the selected data shall be read from: Enter tag names. Example: OutDataSet1	Define exactly the same tag names in the PLC program. Example: InDataSet1 INT[25] OutDataSet1 INT[5] The data type shall be INT.
Select how often this data shall be transmitted.	—
Define where the data shall be read from/written to in the EtherNet/IP network: Enter the IP address and controller slot number of the PLC.	—

Tab. 19: Configuration guideline — gateway as master

Tab. 20: Configuration guideline — gateway as slave

Gateway is slave (PLC requests and/or PLC writes)	
To do in the gateway configuration (via ***samos***®PLAN tool)	To do in the PLC program and/or EtherNet/IP network configuration tool
—	Download and install the SP-EN-IP EDS file from www.wieland-electric.com ("Support/Download Center")
—	Integrate the SP-EN-IP into the EtherNet/IP network via network configuration tool (i.e. RSNetworx).
—	Program the explicit message "Get_Attribute_..." or "Set_Attribute_..." in the PLC program to read/write data from/to the gateway
—	Program the trigger for sending the explicit messages.

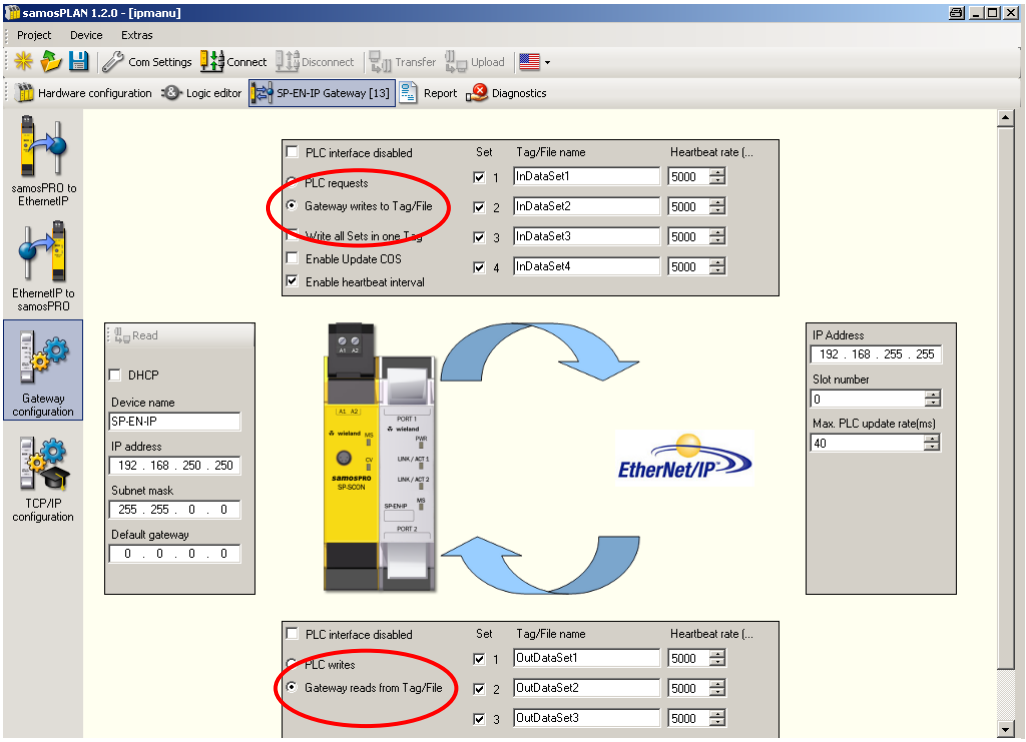
Method 1: Gateway writes to/reads from Tag/File — SP-EN-IP gateway writes the data into/reads the data from the PLC memory

In this operating mode the SP-EN-IP as a *master* writes the data of all activated data sets into the specified memory areas of the PLC. The only task for the PLC programmer is to de-fine a controller tag name which matches the gateway configuration tag name.

In order to configure the gateway to be *master*, perform the following steps:

- Open the ***samos***®PLAN and load the hardware configuration including the EtherNet/IP gateway.
- Click on the **Gateway** button above the main window and select the SP-EN-IP to open the gateway configuration dialog.
- Click on **Gateway configuration** on the left hand menu. The following dialog appears:

Fig. 20: Gateway configuration dialog



- Within the **Gateway configuration** dialog, select the transfer method by activating **Gateway writes to Tag/File** for the ***samos***®PRO to Network direction and **Gateway reads from Tag/File** for the Network to ***samos***®PRO direction.
- Select which data shall be written to/read from the PLC by checking the checkbox for the required data set.

- ➡ Define where in the PLC memory the selected data shall be written to or read from: Enter tag names into the **Tag/File name** edit fields (max. 20 characters).
- ➡ Select **Write all Sets in one Tag** if all data sets shall be written into one tag in the PLC memory. In this case, the tag defined for data set 1 will be used.
- ➡ Define how often the data shall be transmitted to the PLC:
  - – Select **Enable Update COS** (update on change of state) if the SP-EN-IP is to update the data in the PLC immediately when changes occur in the data sets.
  - – Select **Enable heartbeat interval** to activate updating of the selected data sets with the set **Heartbeat rate** in ms.
  - – Both options may be selected at the same time.
- ➡ Define how often the data shall be read from the PLC:
  - – Enter a **Heartbeat rate** in ms to activate updating of the selected data sets with the set time.
- ➡ Define where the data shall be read to/written from in the EtherNet/IP network: Enter the **IP address** and controller **Slot number** of the PLC.

Note

The configuration is considered faulty, if the PLC IP address is zero and either **Gateway writes to Tag/File** for the ***samos***®PRO to Network direction and/or **Gateway reads from Tag/File** for the Network to ***samos***®PRO direction is activated.

- ➡ The **Max. PLC update rate (ms)** defines the maximum rate (the minimum time interval) for transferring the data sets to and from the PLC. Settings occur dependent on the PLC processing speed. Minimum = 10 ms, maximum = 65535 ms. The default value of 40 ms is suitable for most PLCs.

Notes

- If the value entered for the **Max. PLC update rate** is greater than the **Heartbeat rate** set for writing to or reading from the PLC, the heartbeat rate will be automatically increased (i.e. slowed down) to this value.
- All data sets are transferred to the PLC in 16 bit integer format with the first byte placed in the most significant, or leftmost byte of the integer.

- ➡ Click **Connect** to go online and download the configuration to the ***samos***®PRO system.
- ➡ Open the PLC programming tool.
- ➡ Define the PLC tag names as previously configured in the ***samos***®PRO EtherNet/IP gateway. Fig. 21 shows an example for the definition of tag names in a PLC program written with RSLogix:

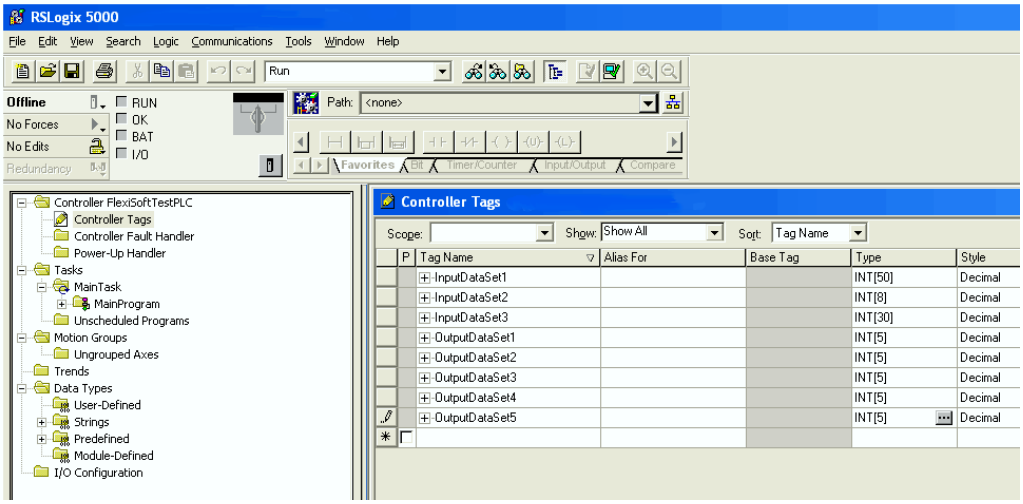


Fig. 21: Example of tag names in a PLC program

Notes

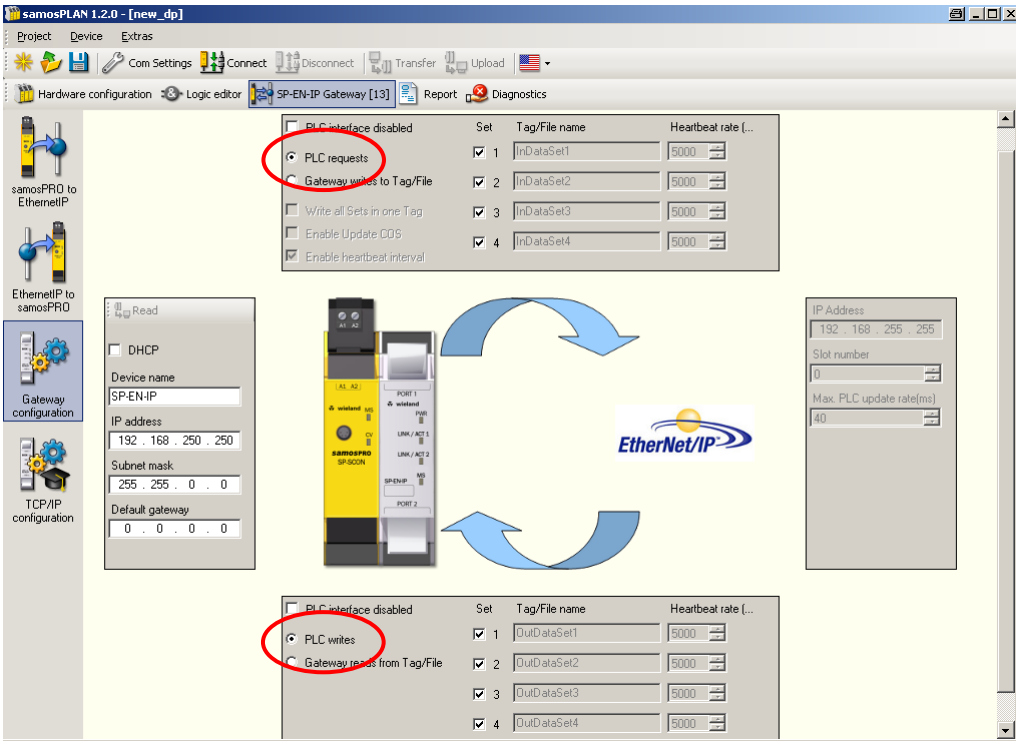
- Tag names for Allen Bradley SLC/PLC-5 PLCs must begin with a “$” (i.e. $N10:0).
- Tag names for Allen Bradley MicroLogix PLCs must begin with a “#” (i.e. #N10:0).

Method 2: Polling mode — PLC requests the data from/PLC writes the data to the SP-EN-IP

In this operating mode the SP-EN-IP operates as *slave*. It sends the data to the PLC upon request and the PLC writes the data to the gateway. If this operating mode is desired:

- Open the ***samos***®PLAN and load the hardware configuration including the EtherNet/IP gateway.
- Click on the **Gateway** button above the main window and select the SP-EN-IP to open the gateway configuration dialog.
- Click on **Gateway configuration** on the left hand menu. The following dialog appears:

Fig. 22: Gateway configuration dialog



- Within the **Gateway configuration** dialog, select the transfer method by activating **PLC requests** for the ***samos***®PRO to Network direction, **PLC writes** for the Network to ***samos***®PRO direction.
- Select which data shall be requested or written by the PLC by checking the checkboxes for the required data sets.
- Click **Connect** to go online and download the configuration to the ***samos***®PRO system.
- Program the explicit messaging in the PLC.

Polling data sets via explicit messaging

The SP-EN-IP supports two vendor specific objects which can be polled via explicit messaging:

- The *Full Data Set Transfer* object allows to poll for each of the data sets. There is one instance where each attribute represents a data set.
- The *Individual Input Data Set Transfer* object allows to poll for the individual data set parameters. There is one instance per data set and each attribute represents one byte of the data set.

Full Data Set Transfer object definition (72 HEX – one instance)

The vendor specific **Full Data Set Transfer** object defines the attributes by which the PLC can:

- Request the complete input data set information from the SP-EN-IP.
- Write the complete output data set information to the SP-EN-IP.

Class attributes

Attribute ID	Name	Data type	Data value(s)	Access rule
1	Revision	UINT	1	Get
2	Max. instance	UINT	1	Get
3	Num. instances	UINT	1	Get

Tab. 21: Full Data Set Transfer object (72hex) class attributes

Instance attributes

These attributes provide access to input and output data sets. *Get Attribute Single* requests for a specific input data set will return the input data set information. *Get Attribute All* requests will return all enabled input data sets.

All data set information will be returned in integer (16 bit word) format. For byte data, the first byte will be placed in the most significant or leftmost byte of the integer and the second byte will be placed in the least significant or rightmost byte of the integer.

Attribute ID	Name	Data type	Data value(s)	Access rule
samos®PRO to Network				
1	Request input data set 1 specific data	Array of UINT	0-255	Get
2	Request input data set 2 specific data	Array of UINT	0-255	Get
3	Request input data set 3 specific data	Array of UINT	0-255	Get
4	Request input data set 4 specific data	Array of UINT	0-255	Get
Network to ***samos***®PRO				
5	Write the output data set 1 specific data	Array of UINT	0-255	Set
6	Write the output data set 2 specific data	Array of UINT	0-255	Set
7	Write the output data set 3 specific data	Array of UINT	0-255	Set
8	Write the output data set 4 specific data	Array of UINT	0-255	Set
9	Write the output data set 5 specific data	Array of UINT	0-255	Set

Tab. 22: Full Data Set Transfer object (72hex) instance attributes

Common services

Service code	Implemented in class	Implemented in instance	Service name
01hex	Yes	Yes	Get_Attributes_All
0Ehex	Yes	Yes	Get_Attribute_Single
10hex	No	Yes	Set_Attribute_Single
02hex	No	Yes	Set_Attribute_All

Tab. 23: Full Data Set Transfer object (72hex) common services

Individual Input Data Set Transfer object definition (73 HEX – one instance per data set)

The vendor specific **Individual Input Data Set Transfer** object defines the attributes by which the PLC can request either full input data sets or individual parameters within an input data set.

Class attributes

Tab. 24: Individual Input Data Set Transfer object (73hex) class attributes

Attribute ID	Name	Data type	Data value(s)	Access rule
1	Revision	UINT	1	Get
2	Max instance	UINT	4	Get
3	Num instances	UINT	4	Get

Instance attributes

Tab. 25: Individual Input Data Set Transfer object (73hex) instance attributes

Attribute ID	Name	Data type	Data value(s)	Access rule
1 to *n* (dependent on data set definition)	Request input data set specific data	SINT	0-255	Get

Common services

Tab. 26: Individual Input Data Set Transfer object (73hex) common services

Service code	Implemented in class	Implemented in instance	Service name
01hex	Yes	Yes	Get_Attributes_All
0Ehex	Yes	Yes	Get_Attribute_Single

Instance attribute definitions

Attribute 1 to *n* — Request input data set specific parameters

These attributes return the input data set specific data arrays. **Get Attribute Single** requests for a specific input data set will return only the requested data set parameter information. **Get Attribute All** requests will return the entire data set.

The data set attributes, numbered from 1 to N, refer to each individual attribute of each individual input data set. Each instance refers to a unique input data set and each input data set has a unique attribute numbering scheme. The following tables reflect the attribute definitions for each input data set.

Get All Data Set Attributes request

All data set information will be returned in integer (16 bit word) format. For byte data, the first byte will be placed in the least significant or rightmost byte of the integer and the second byte will be placed in the most significant or leftmost byte of the integer.

Example:

For an input data set, the data will be returned as follows:

- IntegerArray[0]: AABB (hex) – AA = BYTE1; BB = BYTE2
- IntegerArray[1]: CCDD (hex) – CC = MED1; BB = MED2
- …
- IntegerArray[6]: MMNN (hex) – MM = BYTE13; NN = BYTE14

Note

The typical PC tools of Rockwell/Allen Bradley change this data format back to BBAA (hex) format for visualisation purposes. Check your data for plausibility before putting your ***samos***®PRO system into operation.

Instance 1 – Input data set 1 attribute definitions

Attribute number	Data set parameter	Size
1	Byte 0	SINT
2	Byte 1	SINT
…	…	…
50	Byte 49	SINT

Tab. 27: Individual Input Data Set Transfer object (73hex) instance 1 attribute definitions

Instance 2 – Input data set 2 attribute definitions

Attribute number	Data set parameter	Size
1	Overall CRC	UDINT
2	System CRC (SCID)	UDINT
3	Reserved	UDINT
4	Reserved	UDINT
5	Reserved	UDINT
6	Reserved	UDINT
7	Reserved	UDINT
8	Reserved	UDINT

Tab. 28: Individual Input Data Set Transfer object (73hex) instance 2 attribute definitions

Instance 3 - Input data set 3 attribute definitions

Attribute number	Data set parameter	Size
1	Module status module 0	UINT[2]
2	Module status module 1	UINT[2]
…	…	…
15	Module status module 14	UINT[2]

Tab. 29: Individual Input Data Set Transfer object (73hex) instance 3 attribute definitions

Instance 4 - Input data set 4 attribute definitions

Attribute number	Data set parameter	Size
1	Reserved	UINT[2]
2	Reserved	UINT[2]
…	…	…
15	Reserved	UINT[2]

Tab. 30: Individual Input Data Set Transfer object (73hex) instance 4 attribute definitions

PLC-5/SLC/MicroLogix interface

The PLC-5, SLC and MicroLogix PLC interfaces are supported by:

- The same write to PLC functionality as provided to ControlLogix PLCs provided in the Write-to-File receive method.
- PCCC based messages transferred via the PCCC object.
  - SLC Typed Read Message.
  - SLC Typed Write Message.
  - PLC-5 Typed Read Message (Logical ASCII and Logical Binary address format).
  - PLC-5 Typed Write Message (Logical ASCII and Logic binary address format).
- Normal PLC-5/SLC file naming conventions are used.

The primary differences between the PLC-5/SLC/MicroLogix interface and the ControlLogix interfaces are:

- Polling is performed through the SLC and PLC-5 specific messages instead of accessing the Data Transfer object.
- Data is written into files on the PLC, instead of tags as on ControlLogix PLCs.

Note

While ControlLogix PLCs support the SLC and PLC-5 messages, using those messages on ControlLogix PLCs is not recommended due to data size and performance considerations.

Receive communication methods

- Polling Receive Method
  This method provides a polling method that allows the PLC to request data on a periodic basis.
  In this method, the input data set information is returned in the response to the data request message. The PLC requests data by accessing the corresponding data file address on the SP-EN-IP with either a SLC typed read or PLC-5 typed read message.
  The following restrictions apply to this method:
  – The file location to receive the input data set on the PLC must be of type INTEGER and large enough to contain the input data set table(s).
  – If no data has been received on the SBUS+ for the specified module, all zeros will be returned.
- Unsolicited – Write to File Receive Method
  When it is determined that data received on the ***samos***®PRO gateway's SBUS+ interface is to be sent to the PLC, the data is immediately written to a file location on the PLC.
  The following restrictions apply to this method:
  – The Receive Data Area File Name must have the same name as the file defined on the PLC. For SLC and PLC-5 PLCs, all file names must be configured with a preceding "$" (i.e $N10:0). For MicroLogix PLCs, all file names must be configured with a preceding "#" (i.e # N10:0).
  – The file on the PLC must be of type INTEGER and must be large enough to contain the input data set table(s).
  – Data will be written with the first byte placed in the MS byte location of the integer.
  Example: aabb, ccdd, eeff, etc. where aa = byte 1, bb = byte 2, cc = byte 3, etc.

Transmit (From PLC) Data Transfer Methods

The SP-EN-IP will support the following methods of receiving or retrieving the output data set(s) from the PLC.

- PLC Writes Method
  This is the standard method where the PLC uses a message instruction to write the output data sets to the SP-EN-IP. With this method, the output data sets can be updated via a PCCC message written to the corresponding file/address location on the SP-EN-IP.
- Read-from-File Transmit Method (Poll the PLC)
  With this method, the SP-EN-IP will monitor the configured PLC memory location for changes to the output data set(s). When a change is detected, the output data sets will be processed accordingly.
  The following restrictions apply to this method:
  – The output data set file locations must be of INTEGER (16 bit word) format and must be of sufficient length to contain the entire output data set.
  – Data in the INTEGER file must be formatted with the first byte placed in the MS byte location.
  Example: aabb, ccdd, eeff, etc. where aa = byte 1, bb = byte 2, cc = byte 3, etc.

PLC-5 and SLC Messages

The following PCCC messages are supported for the PLC-5, SLC and MicroLogix PLCs:

Message type	PCCC message	Maximum message size
SLC Typed Read	162	CLX: 242 SINTs (121 INTs) SLC: 206 SINTs (103 INTs)
SLC Typed Write	170	CLX: 220 SINTs (110 INTs) SLC: 206 SINTs (103 INTs)
PLC-5 Typed Read	104	CLX: 234 SINTs (117 INTs) SLC: 252 SINTs (126 INTs)
PLC-5 Typed Write	103	CLX: 226 SINTs (113 INTs) SLC: 226 SINTs (113 INTs)

Tab. 31: Supported PCCC messages for the PLC-5, SLC and MicroLogix PLCs

Note

Both the PLC-5 and SLC Typed Read message can be used to retrieve all input data sets.

Address	Description	Access rule	Data size (words)
N10:0	All enabled input data sets data	Get	16-101[3)]
N11:0	Request input data set 1 data	Get	25
N12:0	Request input data set 2 data	Get	16
N13:0	Request input data set 3 data	Get	30
N14:0	Request input data set 4 data	Get	30
N20:0	Write all enabled output data sets	Set	5-25[4)]
N21:0	Write output data set 1 data	Set	5
N22:0	Write output data set 2 data	Set	5
N23:0	Write output data set 3 data	Set	5
N24:0	Write output data set 4 data	Set	5
N25:0	Write output data set 5 data	Set	5

Tab. 32: Addressing for the PLC-5/SLC messages

PLC-5/SLC Receive Data Message

The Receive Input Data Set Message format is as defined for each individual input data set. Please refer to Tab. 4 and Tab. 5 in section 3.2 “Data transmitted into the network (network input data sets)” on page 12 for further details.

PCCC object (67 HEX – 1 instance)

The **PCCC** object provides the ability to encapsulate and then transmit and receive PCCC messages between devices on an EtherNet/IP network. This object is used to communicate to SLC 5/05 and PLC-5 PLCs over EtherNet/IP.

Class attributes

Not supported.

Instance attributes

Not supported.

Instances

Supports instance 1.

[3)] Will correspond to all enabled input data sets.
[4)] Must correspond to all enabled output data sets. Example: If only output data sets 1 and 2 are enabled, then 10 words, (20 bytes), must be written. If all output data sets are enabled, then 25 words, (50 bytes), must be written.

Common services

Tab. 33: PCCC object (67hex) common services

Service code	Implemented in class	Implemented in instance	Service name
4Bhex	No	Yes	Execute_PCCC

Message structure for Execute_PCCC

Tab. 34: PCCC object (67hex) request message

Name	Data type	Description
Length	USINT	Length of requestor ID
Vendor	UINT	Vendor number of requestor
Serial number	UDINT	ASA serial number of requestor
CMD	USINT	Command byte
STS	USINT	0
TNSW	UINT	Transport word
FNC	USINT	Function code
PCCC_params	Array of USINT	CMD/FMC specific parameters

Tab. 35: PCCC object (67hex) response message

Name	Data type	Description
Length	USINT	Length of requestor ID
Vendor	UINT	Vendor number of requestor
Serial number	UDINT	ASA serial number of requestor
CMD	USINT	Command byte
STS	USINT	Status byte
TNSW	UINT	Transport word. Same value as request
EXT_STS	USINT	Extended status (if error)
PCCC_params	Array of USINT	CMD/FMC specific result data

Tab. 36: PCCC object (67hex) supported PCCC command types

CMD	FNC	Description
0Fhex	67hex	PLC-5 write
0Fhex	68hex	PLC-5 read
0Fhex	A2hex	SLC 500 protected read with 3 address fields
0Fhex	AAhex	SLC 500 protected write with 3 address fields

5.2.4 TCP/IP configuration interface

See section 5.1.1 “TCP/IP configuration interface” on page 25.

5.2.5 Ethernet TCP/IP socket interface

See section 5.1.2 “Ethernet TCP/IP socket interface” on page 28.

5.2.6 Diagnostics and troubleshooting

For information how to perform diagnostics on the ***samos***®PRO system please refer to the operating instructions for the ***samos***®PLAN software (Wieland part no. BA000518).

Error	Cause	Possible remedy
The ***samos***®PLAN tool does not connect to the ***samos***®PRO gateway module	SP-EN-IP has no power supply. SP-EN-IP is not in the same physical network as the PC. The PC is configured to another subnet mask in the TCP/IP settings. SP-EN-IP has already been configured once and has a fixed set IP address or an IP address assigned by a DHCP server that is not recognised.	Establish the power supply. Check the Ethernet wiring and network settings on the PC and correct if necessary. Set the subnet mask on the PC to 255.255.0.0 (factory setting of the SP-EN-IP). Check the communication settings in the ***samos***®PLAN.
SP-EN-IP does not supply any data. LED PWR ● Green LED LINK/ACT ●/☼ Green LED MS ☼ Red/Green	SP-EN-IP is configured for data transfer to PLC, but Ethernet communication is not yet established or faulty. Duplicate IP address detected. Another device on the network has the same IP address.	Minimum one Ethernet connection needs to be established. Set up Ethernet connection on PLC side, check Ethernet cabling, check Ethernet connection settings on PLC and in the ***samos***®PLAN. If no Ethernet communication is required, disable the Ethernet connections/PLC interfaces on the SP-EN-IP. Adjust IP address and power cycle device.
SP-EN-IP does not supply any data. LED PWR ● Green LED LINK/ACT ●/☼ Green LED MS ☼ Red (1 Hz)	Configuration required. Configuration download is not completed.	Configure the SP-EN-IP and download the configuration to the device. Wait until the configuration download has been completed.
SP-EN-IP does not supply any data. LED PWR ● Green LED LINK/ACT ●/☼ Green LED MS ● Green	No data set is activated. No Ethernet communication interface is enabled.	Activate at least one data set.
SP-EN-IP does not supply any data. LED PWR ● Green LED LINK/ACT ●/☼ Green LED MS ☼ Green (1 Hz)	SP-EN-IP is in Idle mode.	CPU/application is stopped. Start CPU (change into Run mode) .
SP-EN-IP functioned correctly after configuration, but suddenly no longer supplies data. LED PWR ● Green LED LINK/ACT ●/☼ Green LED MS ☼ Red/Green	SP-EN-IP is operated in slave mode, the IP address is assigned from a DHCP server. After the SP-EN-IP or the DHCP server has been restarted, a different IP address that is unknown to the PLC has been assigned to the SP-EN-IP.	Either assign a fixed IP address to the SP-EN-IP, or reserve a fixed IP address for the SP-EN-IP in the DHCP server (manual assignment by means of the MAC address of the SP-EN-IP).
SP-EN-IP/ ***samos***®PRO system is in Critical fault mode. LED PWR ● Green LED LINK/ACT ☼ Green LED MS ● Red	SP-EN-IP is not plugged properly into the other ***samos***®PRO module. Module connection plug is soiled or damaged. Other ***samos***®PRO module has internal critical error.	Plug the SP-EN-IP in correctly. Clean the connecting socket/plug. Repower the system. Check the other ***samos***®PRO modules.
SP-EN-IP is in Critical fault mode. LED PWR ● Green LED LINK/ACT ●/☼ Green LED MS ☼ Red (2 Hz)	SP-EN-IP internal device error CPU firmware version does not support ***samos***®PRO gateways.	Switch off the power supply of the ***samos***®PRO system and switch it on again. Check the diagnostics messages with the ***samos***®PLAN. Use a CPU with the required firmware version (see section 2.2 “Correct use” on page 9). If the error remains, replace the gateway.

Tab. 37: Troubleshooting for the SP-EN-IP

Symbol description:
○: LED off ● Green: LED lights up green ☼ Red: LED flashes red

5.3 Modbus TCP gateway

The following ***samos***®PRO gateway can be used for Modbus/TCP: SP-EN-MOD.

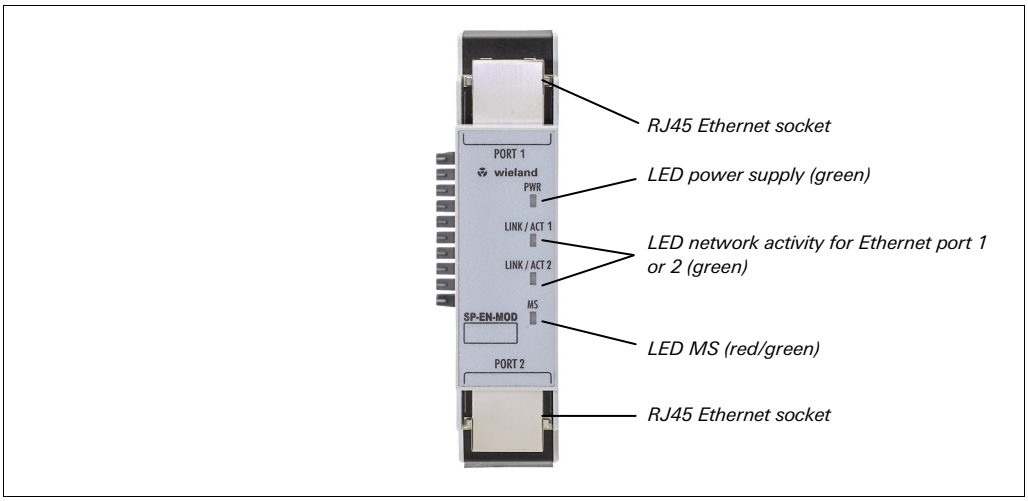
The ***samos***®PRO Modbus TCP gateway supports:

- Modbus TCP master and slave receive methods
- Ethernet TCP/IP socket interface, polling and auto update function

5.3.1 Interfaces and operation

The SP-EN-MOD is equipped with an integrated three-port switch for connection with the Ethernet network. Two RJ45 sockets are available for the connection. The switch functionality allows the SP-EN-MOD to be used for connection to another Ethernet component (e.g. connection to a notebook) without having to interrupt the Ethernet connection to the network.

Fig. 23: Interfaces and display elements of the SP-EN-MOD



Tab. 38: Meaning of the LED displays

LED		Meaning
PWR	○	No power supply
	● Green	Power supply switched on
LINK/ACT 1 LINK/ACT 2	○	No Ethernet connection
	● Green	Ethernet connection active, no data transmission
	☼ Green	Ethernet connection active, data transmission
MS	○	Power-up
	● Green	Executing (live process data from/to CPU)
	☼ Green	1 Hz: Idle
	☼ Red	1 Hz: Configuring/configuration required 2 Hz: Critical fault on gateway
	● Red	Critical fault on another module
	☼ Red/Green	Executing, but Ethernet communication not established or faulty

Symbol description:
○: LED off ● Green: LED lights up green ☼ Red: LED flashes red

Note

Error elimination is described in section 5.3.6 “Diagnostics and troubleshooting” on page 57.

Power-up sequence

On power up, the following LED test sequence is performed:

- LED MS ○ **Off** for 6 s.
- LED MS ● **Red** for 0.25 s.
- LED MS ● **Green** for 0.25 s.
- LED MS ○ **Off**.

5.3.2 Basic configuration — assigning an IP address

Configuration of the SP-EN-MOD is performed via the ***samos***®PLAN tool.

Via *samos*®PLAN tool

➡ Open the ***samos***®PLAN and load the hardware configuration including the Modbus TCP gateway.

➡ Click on the **Gateway** button above the main window and select the SP-EN-MOD to open the gateway configuration dialog.

➡ Click on **Gateway Configuration** on the left hand menu. The following dialog appears:

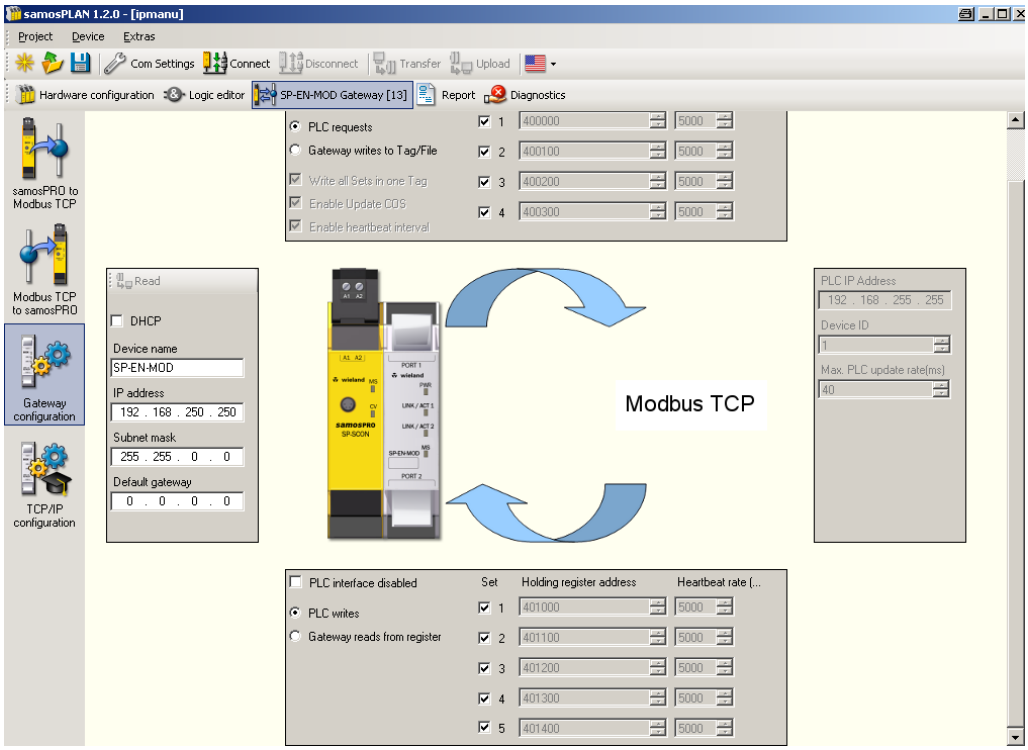


Fig. 24: Gateway configuration dialog

➡ Enter a valid **IP address**, **Subnet mask** and if required a valid IP address for a **Default gateway**.

➡ Click **OK**.

➡ Click **Connect** to go online and download the configuration to the ***samos***®PRO system.

5.3.3 Configuration of the Modbus TCP interface to the PLC — how the data is transferred

Modbus TCP application characteristics:

- Support of standard Modbus TCP addressing conventions.
- Master and Slave receive methods

Modbus TCP PLC requirements:

- The PLC must support the Modbus TCP protocol.
- The PLC must support the Read Holding Registers and Write Multiple Registers commands or, alternatively, the Read/Write Multiple Registers command.

The configuration steps in this section specify how the data to the higher-level PLC are transferred.

In general, there are two different transfer methods available for each transfer direction such as ***samos***®PRO *to Network* and *Network to* ***samos***®PRO:

- Polling receive method/PLC requests (gateway as slave)
  This method provides a polling method that allows the PLC to request data on a periodic basis. In this method, the data is returned in the response to the data request message. The PLC requests data by accessing the receive data address on the SP-EN-MOD module with a Read Holding Registers message.
- Master receive method – Gateway writes to PLC (auto-update, gateway as master)
  When it is determined that data received on the SP-EN-MOD module backplane interface is to be sent to the PLC, the data is immediately written to a data memory location on the PLC.
- Slave transmit method - PLC writes (gateway as slave)
  In this method, the PLC will send write messages to the SP-EN-MOD module to set the output data sets. To write to the output data sets, the PLC writes the data to specified addresses.
- Master transmit method - Gateway reads from PLC (auto-update, gateway as master)
- In the master transmit mode, the SP-EN-MOD module will poll the PLC for the output data set settings.

Note

The configuration is considered faulty, if the PLC IP address is zero and either the Read Transfer mode and/or the Write Transfer mode is set to Master.

The number of possible connections to the PLC depends on whether the SP-EN-MOD is operated as a master or slave. Depending on the setting, up to 32 PLCs can address the SP-EN-MOD at the same time.

Tab. 39: Number of possible connections

Operating mode of the SP-EN-MOD	Maximum connections
Rx (To PLC) transfer mode: Master Tx (From PLC) transfer mode: Master	Rx and Tx: 1
Rx (To PLC) transfer mode: Master Tx (From PLC) transfer mode: Slave	Rx: 1 Tx: 31
Rx (To PLC) transfer mode: Slave Tx (From PLC) transfer mode: Master	Rx: 31 Tx: 1
Rx (To PLC) transfer mode: Slave Tx (From PLC) transfer mode: Slave	Rx and Tx: 32

The following table outlines a guideline to the configuration process depending on the transfer method:

Gateway is master

Tab. 40: Configuration guideline — gateway as master

To do in the gateway configuration (via ***samos***®PLAN tool)	To do in the PLC program and/or Modbus TCP network configuration tool
Select **Gateway writes to Tag/File** and/or **Gateway reads from register** to configure gateway as master..	–
Select which data shall be written to/read from the PLC	–
Define where in the PLC memory the selected	Ensure the addresses defined in the ***samos***®PLAN

To do in the gateway configuration (via *samos*®PLAN tool)	To do in the PLC program and/or Modbus TCP network configuration tool
data shall be written to: Enter holding register address(es). Example: "400001" And/or define where in the PLC memory the selected data shall be read from: Enter holding register addresses.	configuration are available and contain the data determined for the *samos*®PRO system.
Select how often this data shall be transmitted.	–
Define where the data shall be read from/written to in the Modbus TCP network: Enter the IP address and controller slot number of the PLC.	–

Gateway is slave

To do in the gateway configuration (via *samos*®PLAN tool)	To do in the PLC program and/or Modbus TCP network configuration tool
Select **PLC requests** and **PLC writes** in the gateway configuration dialog	–
–	Define which data shall be written to/read from the gateway. Ensure the PLC program writes the data into the addresses defined for the gateway (refer to section "SP-EN-MOD as slave — data addressing").

Tab. 41: Configuration guideline — gateway as slave

Note

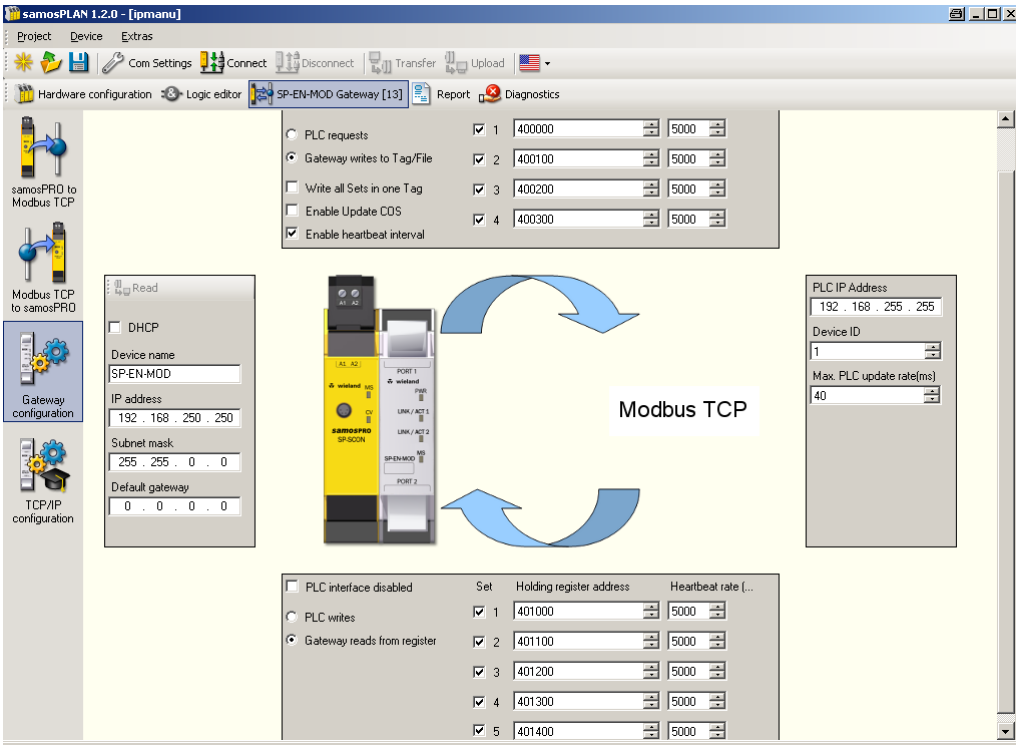
The Modbus TCP gateway address setting is based 1. Please add 1 to the holding register address set in the *samos*®PLAN for an address setting based 0.

Master mode — SP-EN-MOD reads from/writes to the PLC

In order to configure the gateway to be *master*, perform the following steps:

- ➡ Open the *samos*®PLAN and load the hardware configuration including the Modbus TCP gateway.
- ➡ Click on the **Gateway** button above the main window and select the SP-EN-MOD to open the gateway configuration dialog.
- ➡ Click on **Gateway Configuration** on the left hand menu. The following dialog appears:

Fig. 25: Gateway configuration dialog



- Within the **Gateway Configuration** dialog, select the transfer method by checking **Gateway writes to Tag/File** for the ***samos***®PRO to Network direction and **Gateway reads from register** for the Network to ***samos***®PRO direction.
- Select which data shall be written to/read from the PLC by checking the checkbox for the required data set. For the exact description of the data sets please refer to section 3.2 “Data transmitted into the network (network input data sets)” on page 12.
- Define where in the PLC memory the selected data shall be written to or read from: Enter addresses into the **Holding register address** field (max. 20 characters).
- Select **Write all Sets in one tag** if all data sets shall be written into one address in the PLC memory. In this case, the tag/file defined for data set 1 will be used.
- For the ***samos***®PRO **to Network** direction, define how often the data shall be transmitted:
  - Select **Enable Update COS** if the SP-EN-MOD is to update the data in the PLC immediately when changes occur in the data sets.
  - Select **Enable heartbeat interval** to activate updating of the selected data sets with the set Heartbeat rate.
  - Both options may be selected at the same time.
- For the **Network to *samos***®PRO direction, define how often the data shall be read:
  - Enter a **Heartbeat rate** to activate updating of the selected data sets with the set time interval.
- Define where the data shall be read from/written to in the Modbus TCP network: Enter the **PLC IP address** and the Modbus **Device ID** of the PLC.
- **Max. PLC update rate** defines the maximum rate (the minimum time interval) for sending the data sets to the PLC. Settings occur dependent on the PLC processing speed. Minimum = 10 ms, maximum = 65535 ms. The default value of 40 ms is suitable for most PLCs.

Note

If this value is greater than the **Heartbeat rate**, the heartbeat rate is slowed down to this value.

- Click **OK**.

➡ Go online and download the configuration to the ***samos***®PRO system.

Write to PLC

Note

The following restrictions apply when the gateway is master and writes the input data sets to the PLC:

- The input data set address (set via ***samos***®PLAN Tool) must be the same as that defined on the PLC.
- The variable to receive the data on the PLC must be:
  – in the 40xxxx address range (for Schneider Modicon type PLCs)
  – an array of 16 bit words
  – long enough to contain the specified input data set array.
- All input data sets are transferred to the PLC in 16 bit word format with the first byte placed in the least significant, or rightmost byte of the integer and the second byte placed in the most significant, or leftmost byte of the integer.

Read from PLC

Note

The following restrictions apply when the gateway is master and reads the output data sets from the PLC:

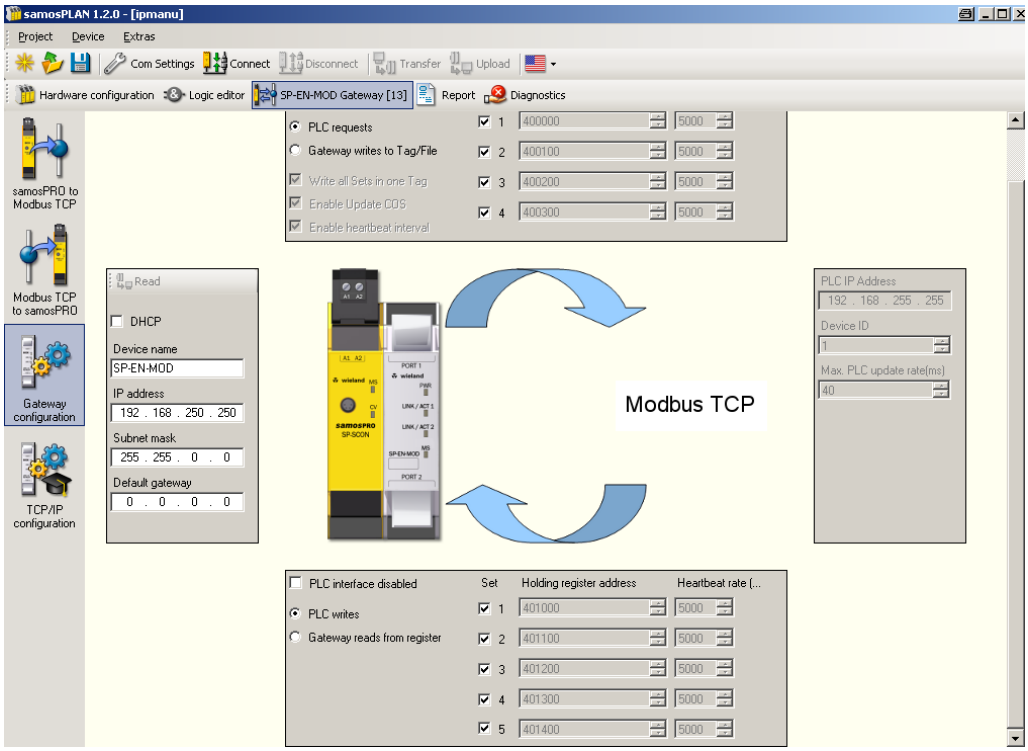
- The output data set addresses must be the same as those defined on the PLC.
- The variables to request the data on the PLC must be:
  – In the 40xxxx address range (for Schneider Modicon type PLCs)
  – for the output data set settings, an array of 16 bit words long enough to contain the entire output data set.
- All output data sets are transferred from the PLC in 16 bit word format and the first byte must be placed in the least significant, or rightmost byte of the integer and the second byte placed in the most significant, or leftmost byte of the integer.

Slave mode — PLC reads from/writes to the SP-EN-MOD

In this operating mode the SP-EN-MOD sends the data as *slave* upon request from the PLC. If this operating mode is desired:

➡ Open the ***samos***®PLAN and load the hardware configuration including the Modbus TCP gateway.
➡ Click on the **Gateway** button above the main window and select the SP-EN-MOD to open the gateway configuration dialog.
➡ Click on **Gateway Configuration** on the left hand menu. The following dialog appears:

Fig. 26: Gateway configuration dialog



- Within the **Gateway Configuration** dialog, select the transfer method by checking **PLC requests** for the ***samos***®PRO to Network direction and **PLC writes** for the Network to ***samos***®PRO direction.
- Select which data shall be written/read to/from the PLC by checking the checkbox for the required data set. For the exact description of the data sets please refer to section 3.2 “Data transmitted into the network (network input data sets)” on page 12.
- Click **OK**.
- Go online and download the configuration to the ***samos***®PRO system.

PLC writes output data sets

The following restrictions apply when the PLC writes the output data sets:

- The device index must be 1.
- The message must be sent in word format.
- All output data sets are transferred from the PLC in 16 bit word format and the first byte must be placed in the least significant, or rightmost byte of the integer and the second byte placed in the most significant, or leftmost byte of the integer.

PLC polls input data sets

The following restrictions apply to this method:

- The device index must be 1.
- The variable to receive the data on the PLC must be:
  - in the 40xxxx address range (for Modicon type PLCs)
  - an array of 16 bit words
  - long enough to contain the data set array(s)
- All input data sets are transferred to the PLC in 16 bit word format with the first byte placed in the least significant, or rightmost byte of the integer and the second byte placed in the most significant, or leftmost byte of the integer.

SP-EN-MOD as slave — data addressing

The following table lists the address to read out the data sets.

Unit ID 1

Address (Base 1)	Description	Access	Scope (words)
1000	Request all enabled input data sets	Get	16-101 [5]
1100	Request input data set 1 data	Get	25
1200	Request input data set 2 data	Get	16
1300	Request input data set 3 data	Get	30
1400	Request input data set 4 data	Get	30
2000	Write all enabled output data sets data	Set	5-25 [6]
2100	Write output data set 1 data	Set	5
2200	Write output data set 2 data	Set	5
2300	Write output data set 3 data	Set	5
2400	Write output data set 4 data	Set	5
2500	Write output data set 5 data	Set	5

Tab. 42: Data addressing for SP-EN-MOD as receiver

Modbus commands and error messages

The SP-EN-MOD supports the following Modbus commands and error messages:

Modbus command	Value
Read holding registers	3
Write multiple registers	16 (10hex)
Read/write multiple registers	23 (17hex)

Tab. 43: Modbus commands

Modbus error response	Description
1 Illegal function	The requested function is not supported
2 Illegal data address	Undefined data address received
3 Illegal data value	Request with illegal data values, for example not enough data requested for a data set
10 Gateway paths not available	Invalid configuration, for example polling or setting of the digital outputs via PLC during operation of the SP-EN-MOD in master mode

Tab. 44: Modbus error messages

5.3.4 TCP/IP configuration interface

See section 5.1.1 “TCP/IP configuration interface” on page 25.

5.3.5 Ethernet TCP/IP socket interface

See section 5.1.2 “Ethernet TCP/IP socket interface” on page 28.

5.3.6 Diagnostics and troubleshooting

For information how to perform diagnostics on the ***samos***®PRO system please refer to the operating instructions for the ***samos***®PLAN software (Wieland part no. BA000518).

[5] Will correspond to all enabled input data sets.
[6] Must correspond to all enabled output data sets. Example: If only output data sets 1 and 2 are enabled, then 10 words (20 bytes) must be written. If all output data sets are enabled, then 25 words (50 bytes) must be written.

Tab. 45: Troubleshooting for the SP-EN-MOD

Error	Cause	Possible remedy
The ***samos***®PLAN tool does not connect to the ***samos***®PRO gateway module	SP-EN-MOD has no power supply. SP-EN-MOD is not in the same physical network as the PC. The PC is configured to another subnet mask in the TCP/IP settings. SP-EN-MOD has already been configured once and has a fixed set IP address or an IP address assigned by a DHCP server that is not recognised.	Establish the power supply. Check the Ethernet wiring and network settings on the PC and correct if necessary. Set the subnet mask on the PC to 255.255.0.0 (factory setting of the SP-EN-MOD). Check the communication settings in the ***samos***®PLAN.
SP-EN-MOD does not supply any data. LED PWR ● Green LED LINK/ACT ●/☼ Green LED MS ☼ Red/Green	SP-EN-MOD is configured for data transfer to PLC, but Ethernet communication is not yet established or faulty. Duplicate IP address detected. Another device on the network has the same IP address.	Minimum one Ethernet connection needs to be established. Set up Ethernet connection on PLC side, check Ethernet cabling, check Ethernet connection settings on PLC and in the ***samos***®PLAN. If no Ethernet communication is required, disable the Ethernet connections/PLC interfaces on the SP-EN-MOD. Adjust IP address and power cycle device.
SP-EN-MOD does not supply any data. LED PWR ● Green LED LINK/ACT ●/☼ Green LED MS ☼ Red (1 Hz)	Configuration required. Configuration download is not completed.	Configure the SP-EN-MOD and download the configuration to the device. Wait until the configuration download has been completed.
SP-EN-MOD does not supply any data. LED PWR ● Green LED LINK/ACT ●/☼ Green LED MS ● Green	No data set is activated. No Ethernet communication interface is enabled.	Activate at least one data set.
SP-EN-MOD does not supply any data. LED PWR ● Green LED LINK/ACT ●/☼ Green LED MS ☼ Green (1 Hz)	SP-EN-MOD is in Idle mode.	CPU/application is stopped. Start CPU (change into Run mode) .
SP-EN-MOD functioned correctly after configuration, but suddenly no longer supplies data. LED PWR ● Green LED LINK/ACT ●/☼ Green LED MS ☼ Red/Green	SP-EN-MOD is operated in slave mode, the IP address is assigned from a DHCP server. After the SP-EN-MOD or the DHCP server has been restarted, a different IP address that is unknown to the PLC has been assigned to the SP-EN-MOD.	Either assign a fixed IP address to the SP-EN-MOD, or reserve a fixed IP address for the SP-EN-MOD in the DHCP server (manual assignment by means of the MAC address of the SP-EN-MOD).
SP-EN-MOD/ ***samos***®PRO system is in Critical fault mode. LED PWR ● Green LED LINK/ACT ☼ Green LED MS ● Red	SP-EN-MOD is not plugged properly into the other ***samos***®PRO module. Module connection plug is soiled or damaged. Other ***samos***®PRO module has internal critical error.	Plug the SP-EN-MOD in correctly. Clean the connecting socket/plug. Repower the system. Check the other ***samos***®PRO modules.
SP-EN-MOD is in Critical fault mode. LED PWR ● Green LED LINK/ACT ●/☼ Green LED MS ☼ Red (2 Hz)	SP-EN-MOD internal device error CPU firmware version does not support ***samos***®PRO gateways.	Switch off the power supply of the ***samos***®PRO system and switch it on again. Check the diagnostics messages with the ***samos***®PLAN. Use a CPU with the required firmware version (see section 2.2 “Correct use” on page 9). If the error remains, replace the gateway.

Symbol description:
○: LED off ● Green: LED lights up green ☼ Red: LED flashes red

5.4 PROFINET IO gateway

The following ***samos***®PRO gateway can be used for PROFINET IO: SP-EN-PN.

You will find the GSDML file and device icon for PLC interfacing with PROFIBUS support
- on www.wieland-electric.com (go to "Support/Download Center")
- in the ***samos***®PLAN program folder on your hard disc (default installation folder is "C:\programs\Wieland\samosPLAN\DeviceDescriptions\...")

The SP-EN-PN supports

- PROFINET IO conformance class A
- LLDP
- SNMP
- MIB II
- Fast integrated switching
- Auto-MDI
- Auto negotiation
- Cyclic IO communication

5.4.1 Interfaces and operation

The SP-EN-PN is equipped with an integrated 3-port switch for connection with the Ethernet network. Two RJ45 sockets are available for the connection. The switch functionality allows the SP-EN-PN to be used for connection to another Ethernet component (e.g. connection to a notebook) without having to interrupt the Ethernet connection to the network.

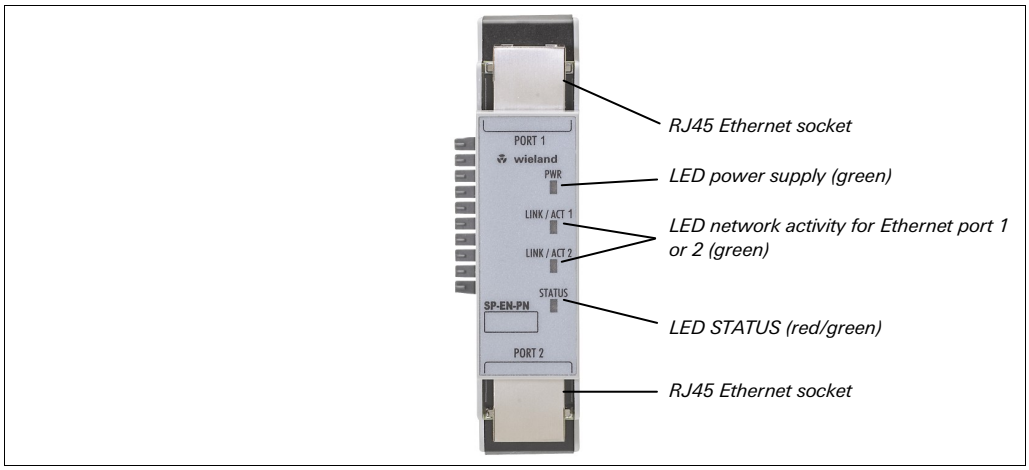


Fig. 27: Interfaces and display elements of the SP-EN-PN

LED		Meaning
PWR	○	No power supply
	● Green	Power supply switched on
LINK/ACT 1 LINK/ACT 2	○	No Ethernet connection
	● Green	Ethernet connection active, no data transmission
	☼ Green	Ethernet connection active, data transmission
STATUS	○	Power-up
	● Green	Executing (live process data from/to CPU)
	☼ Green	1 Hz: Idle 2 Hz: Profinet master requested LED flashing for physical device identification
	☼ Red	1 Hz: Configuring/configuration required 2 Hz: Critical fault on gateway
	● Red	Critical fault on another module
	☼ Red/Green	Executing, but Ethernet communication not established or faulty

Tab. 46: Meaning of the LED displays of the SP-EN-PN

Symbol description:
○: LED off ● Green: LED lights up green ☼ Red: LED flashes red

Note

Error elimination is described in section 5.4.7 “Diagnostics and troubleshooting” on page 69.

Power-up sequence

On power up, the following LED test sequence is performed:

- LED MS ○ Off for 6 s.
- LED MS ● Red for 0.25 s.
- LED MS ● Green for 0.25 s.
- LED MS ○ Off.

5.4.2 Basic configuration – assigning a device name and IP address

Configuration and diagnostic of the SP-EN-PN may be performed via the ***samos***®PLAN tool as well as with the PROFINET IO network programming tool (e.g. SIEMENS SIMATIC).

Configuration via PROFINET IO

In the out-of-the-box configuration, each PROFINET IO field device, e.g. the SP-EN-PN has a MAC address and a symbolic name stored.

Notes

- The symbolic name for the gateway is **SP-EN-PN**.
- This name is used by the IO controller (i.e. PLC) to assign the IP address to the field device.
- If the IP address is also used for other Ethernet communications like TCP/IP or configuration over Ethernet, remember that the PLC can change the IP address so these can be interupted.

Address assignment is performed in two steps.

➡ Assign a unique plant specific name to the gateway by using either the network configuration tool, e.g. SIEMENS SIMATIC Manager or the ***samos***®PLAN tool.
➡ Using the plant specific (unique) name, the IO controller (i.e. PLC) can now assign the IP address to the gateway before system boot.

Note

The SP-EN-PN MAC address is printed on the device type label (example: 00:06:77:02:00:A7).

Device name set via SIEMENS SIMATIC Manager

Refer to section “STEP 4 – Assign the device name” on page 63.

Device name set via *samos*®PLAN

➡ Open the ***samos***®PLAN and load the hardware configuration including the PROFINET IO gateway. Ensure your project is offline.
➡ Click on the **Gateway** button above the main window and select the SP-EN-PN to open the gateway configuration dialog.
➡ Click on **Gateway configuration** on the left hand menu. The following dialog appears:

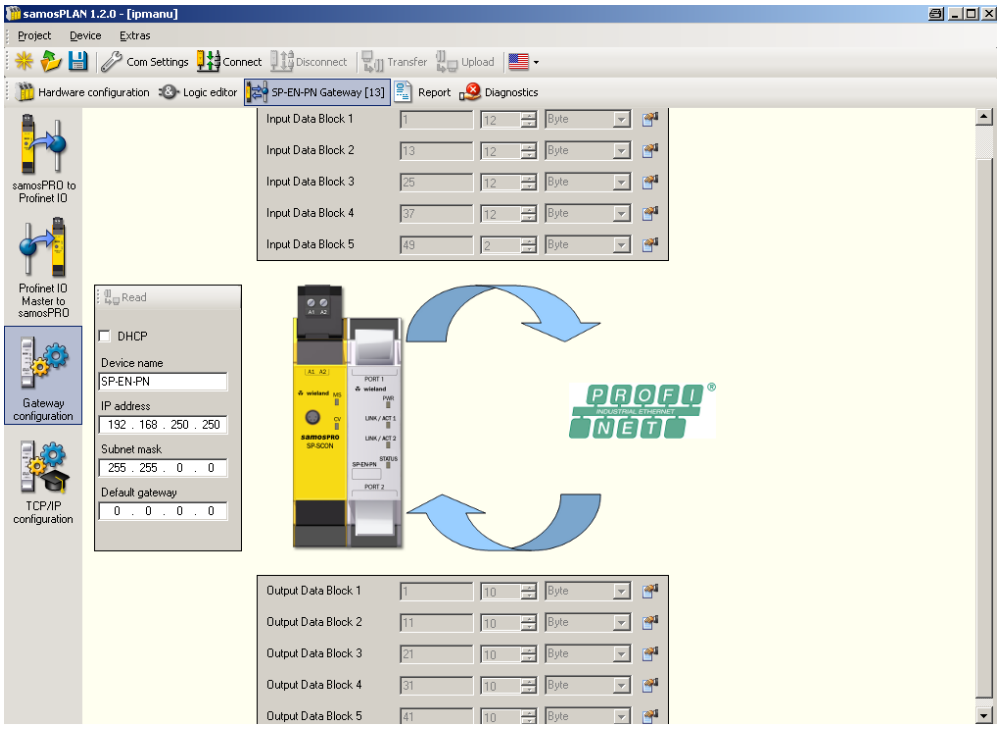


Fig. 28: Gateway configuration dialog

➡ Enter the device name in the **Device name** field (maximum length 255 characters).

Notes

- The device name format must apply to the PROFINET standard specification.
- Ensure that the default gateway address corresponds to the address set by the PLC for the gateway. If there is no router used, Siemens Step 7 use as default gateway address the same address as the IP address for the GPNT.

IP address set via *samos*®PLAN tool

Usually the IP address will be assigned by the PROFINET IO controller (e.g. PLC). However, the SP-EN-PN allows configuration of the entire ***samos***®PRO system over Ethernet TCP/IP. In this case, it may be necessary to assign an IP address to the gateway even before the PROFINET IO network has been setup. This can be done on the configuration page shown in Fig. 28 as well.

5.4.3 PROFINET configuration of the gateway – how the data is transferred

The following steps need to be taken in order to configure the communication between PLC and gateway.

Note

This document does not cover the creation of the PROFINET IO network or the rest of the automation system project in the network configuration tool. It is assumed the PROFINET project has already been set up in the configuration program, e.g. SIEMENS SIMATIC Manager. Examples refer to configurations performed with SIEMENS SIMATIC manager.

STEP 1 – Install the generic station description file (GSDML file)

Before the SP-EN-PN can be used as device in the network configuration tool, e.g. SIEMENS SIMATIC Manager, for the first time, the generic station description (GSDML) of the gateway must be installed into the hardware catalogue of the tool.

➡ Download the GSDML file and device icon from www.wieland-electric.com ("Support/Download Center").

➡ Follow the instructions in the online help or in the user manual of the PROFINET network configuration tool for installing generic station description files.

Using the SIEMENS SIMATIC Manager – HW Config, the gateway then appears in the hardware catalogue under >>**PROFINET IO** > **Additional Field Devices** > **Gateway** > **Wieland**.

STEP 2 – Add the gateway to the project

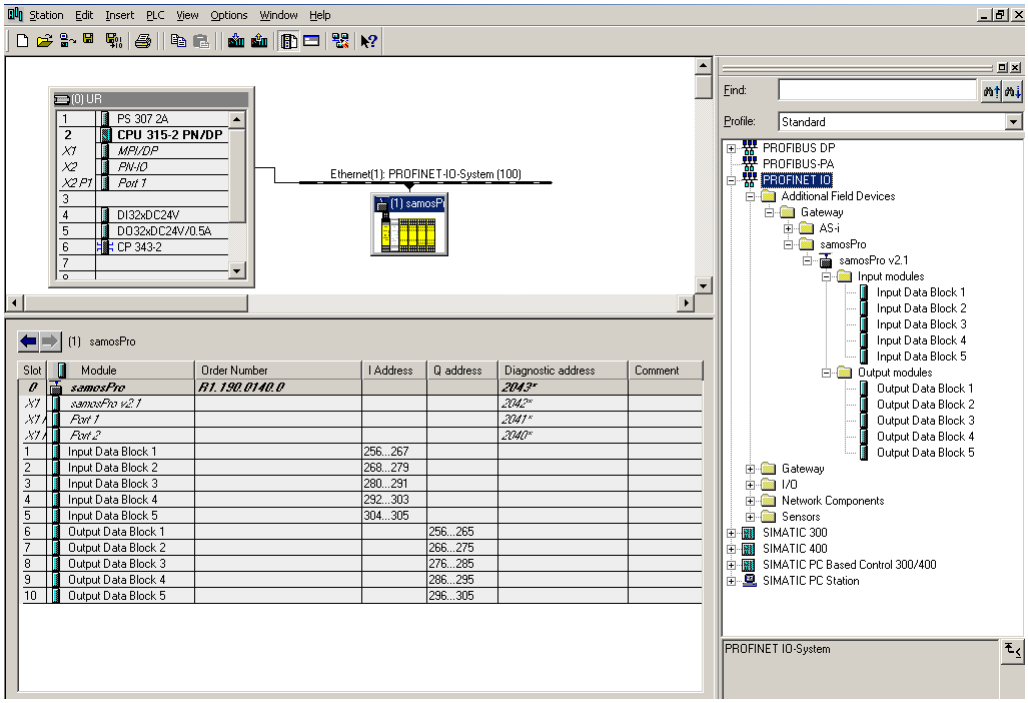
In order to have the ***samos***®PRO system data available in the PLC process image, the gateway must be added to the hardware configuration first. The procedure associated with this depends on the hardware configuration program of the PLC being used. On this topic, please also read the documentation for the corresponding program.

The example below shows how to add the gateway to a SIEMENS SIMATIC Manager project.

In the SIEMENS SIMATIC Hardware Manager, the gateway can be found in the hardware catalogue under >>**PROFINET IO** > **Additional Field Devices** > **Gateway** > **Wieland**.

➡ Drag & drop the device into the Ethernet PROFINET IO network. Example:

Fig. 29: Gateway in the PROFINET IO HW Config



After adding the device to the automation network it is required to configure which of the cyclic data blocks will be used and where they will be addressed in memory. For details refer to section 5.4.4 “PROFINET configuration of the gateway — which data are transferred” on page 63.

STEP 3 – Configure the properties of the gateway

➡ Double click on the gateway hardware symbol.

➡ Configure the update time of the cyclic IO data exchange. To do this click on the **IO Cycle** tab and select the desired rate from the update time pull-down menu.

STEP 4 – Assign the device name

In order for the PLC to communicate with the SP-EN-PN, the PLC software and the gateway must agree on the name of the gateway.

Specify the gateway's PROFINET IO device name

- ➡ Double click on the gateway hardware symbol.
- ➡ Select the **General** tab.
- ➡ Enter the desired device name in the dialog as shown below:

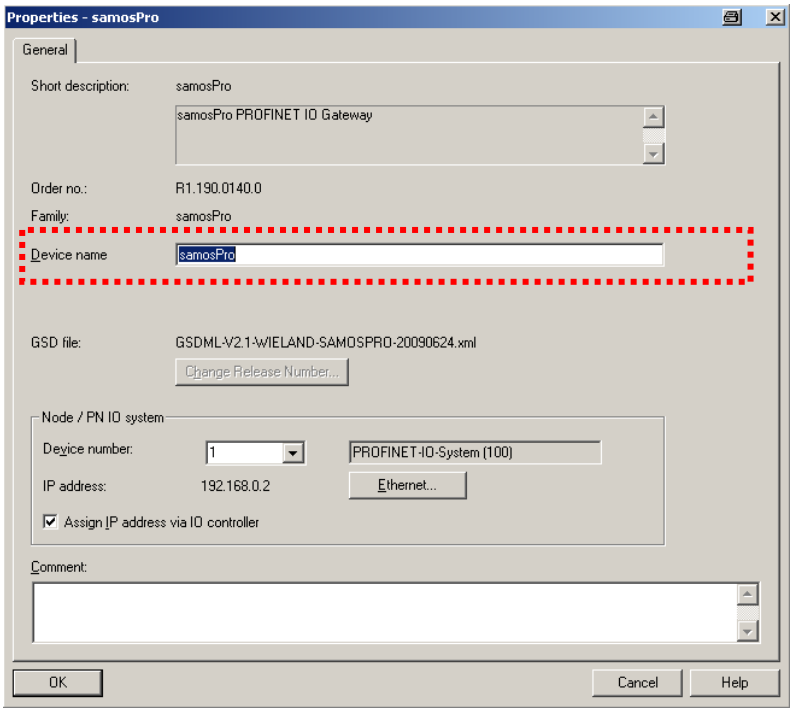


Fig. 30: Properties dialog of the SP-EN-PN

Note The device name format shall apply to the PROFINET standard specification.

Assign the device name to the gateway.

- ➡ Select **PLC > Ethernet > Assign Device Name**. The **Assign device name** dialog opens.
- ➡ From the **Assign device name** dialog, find and select the Wieland gateway that you wish to assign the device name to in the list.
- ➡ Click the **Assign name** button.

5.4.4 PROFINET configuration of the gateway — which data are transferred

Cyclic data

The physical ***samos***®PRO IO modules are not represented as typical hardware modules in the PROFINET IO hardware catalogue. Instead, the data available from the ***samos***®PRO system has been organized into data blocks. Each data block represents a “hardware” module in the PROFINET IO hardware catalogue. The ***samos***®PRO PROFINET IO gateway GSDML supports ten (10) slots (see Fig. 31) where the modules can be placed into. This allows each data block to be mapped once.

Process data from the *samos*®PRO system to the PLC

The SP-EN-PN provides 5 input data blocks (virtual I/O device modules) containing the process image. These must be projected in a hardware configurator (e.g. SIEMENS HW Config) in natural order (1, 2, 3, 4, 5). No other sequence is possible.

Notes

- Depending on the type of PLC used, further modules may be displayed (e.g."universal module"). These modules are not needed and should be ignored.
- The input data blocks 1-4 contain 12 bytes each, input data block 5 contains 2 bytes.
- The contents of the input data blocks are freely selectable, but are preconfigured in the ***samos***®PLAN configuration software:

Tab. 47: Default content of input data block 1-5 of the SP-EN-PN

	Data block 1	**Data block 2**	**Data block 3**	**Data block 4**	**Data block 5**
	Input data	Input data	Input data	Input data	Input data
Byte 0	Input values module 1	Output values module 1	Logic result 1	Not assigned	Not assigned
Byte 1	Input values module 2	Output values module 2	Logic result 2	Not assigned	Not assigned
Byte 2	Input values module 3	Output values module 3	Logic result 3	Not assigned	Not available
Byte 3	Input values module 4	Output values module 4	Logic result 4	Not assigned	
Byte 4	Input values module 5	Output values module 5	Not assigned	Not assigned	
Byte 5	Input values module 6	Output values module 6	Not assigned	Not assigned	
Byte 6	Input values module 7	Output values module 7	Not assigned	Not assigned	
Byte 7	Input values module 8	Output values module 8	Not assigned	Not assigned	
Byte 8	Input values module 9	Output values module 9	Not assigned	Not assigned	
Byte 9	Input values module 10	Output values module 10	Not assigned	Not assigned	
Byte 10	Input values module 11	Output values module 11	Not assigned	Not assigned	
Byte 11	Input values module 12	Output values module 12	Not assigned	Not assigned	
Length	12 bytes	12 bytes	12 bytes	12 bytes	2 bytes

For detailed information about the content of the process image please see section 3.2 "Data transmitted into the network" on page 12.

For information on how to configure the process image, see chapter 7 "Layout and content of the process image" on page 83 and the ***samos***®PLAN operating instructions (Wieland part no. BA000518).

Data from the PLC to the *samos*®PRO CPU

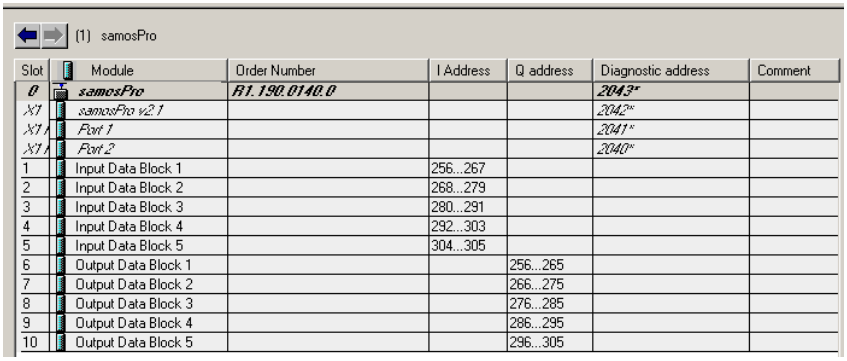
There are five (5) output data blocks, 10 bytes each.

The content of these data blocks can be used as input in the ***samos***®PRO logic editor or can be routed via a second gateway into another network. In order to have the desired bits available for routing or in the logic editor, tag names have to be defined for each bit that shall be used. Bits without a tag name will not be available.

For detailed information how to define and customize the content and tag names of the input and output data please see chapter 7 "Layout and content of the process image" on page 83 and the operating instructions for the ***samos***®PLAN software (Wieland part no. BA000518).

Settings within the PROFINET IO network configuration tool

➡ Drag the data blocks from the SIEMENS SIMATIC Manager – HW Config hardware catalogue under **>>PROFINET IO > Additional Field Devices > Gateway > Wieland > *samos*®PRO... > data blocks** into the slots of the SP-EN-PN shown in the SIEMENS SIMATIC Manager – HW Config configuration table.



(1) samosPro

Slot	Module	Order Number	I Address	Q address	Diagnostic address	Comment
0	samosPro	R1.190.0140.0			2043*	
X1	samosPro v2.1				2042*	
X1 P1	Port 1				2041*	
X1 P2	Port 2				2040*	
1	Input Data Block 1		256...267			
2	Input Data Block 2		268...279			
3	Input Data Block 3		280...291			
4	Input Data Block 4		292...303			
5	Input Data Block 5		304...305			
6	Output Data Block 1			256...265		
7	Output Data Block 2			266...275		
8	Output Data Block 3			276...285		
9	Output Data Block 4			286...295		
10	Output Data Block 5			296...305		

Fig. 31: Projecting the SP-EN-PN

Notes

- The I and Q addresses reflect where in memory the cyclic data will be available.
- Each input data block can only be placed into the slot of the same number. Example: Input data block **4** can only be mapped into slot **4**.

Acyclic data and alarms

Record read

samos®PRO system diagnostic data is available as data record to be read by the PLC. There are three data sets, data set 2, 3 and 4, providing diagnostic information:

- Data Set 2 contains the system CRCs.
- Data Set 3 contains the individual module status with four (4) bytes per module.
- Data Set 4 is currently filled with reserved values.

The format of the data sets is as specified in the tables below.

To access the acyclic data sets, a record read must be performed on the appropriate address as shown in the following table.

	Data set 2	Data set 3	Data set 4
Location	1200-1231	1300-1359	1400-1459
Size in bytes	32 bytes	60 bytes	60 bytes

Tab. 48: Memory location for data set 2, 3 and 4

Note

Data set 1 is mapped into the cyclic transferred PROFINET modules of the device. The content may be defined by the user. Refer to chapter 7 “Layout and content of the process image” on page 83 for details.

Tab. 49: Default content of input data set 2-4 of the SP-EN-PN

	Data set 2	Data set 3	Data set 4
Byte 0	Overall CRC	Module status module 0	Reserved
Byte 1			
Byte 2			
Byte 3			
Byte 4	System CRC (SCID)	Module status module 1	
Byte 5			
Byte 6			
Byte 7			
Byte 8	Reserved	Module status module 2	
Byte 9			
Byte 10			
Byte 11			
Byte 12		Module status module 3	
Byte 13			
Byte 14			
Byte 15			
Byte 16		Module status module 4	
Byte 17			
Byte 18			
Byte 19			
Byte 20		Module status module 5	
Byte 21			
Byte 22			
Byte 23			
Byte 24		Module status module 6	
Byte 25			
Byte 26			
Byte 27			
Byte 28		Module status module 7	
Byte 29			
Byte 30			
Byte 31			
Byte ...		...	
Byte 49		...	
Byte ...		...	
Byte 56		Module status module 14. Module 13 and 14 are always the gateways.	
Byte 57			
Byte 58			
Byte 59			
Length	32 bytes	60 bytes	60 bytes

For the interpretation of the module status bit in data set 3 please see Tab. 5 on page 15.

Alarms

Alarms can be read acyclically through the Profinet IO alarms infrastructure. Once an error occurs on any ***samos***®PRO module, the Profinet IO gateway raises the appropriate diagnostic alarm to the network. This will trigger the fault LED on the PLC, and make the specifics (text and help) of the diagnostic alarm available through the SIMATIC PLC interface. The RALRM function block (SFB54) in OB82 (the diagnostic interrupt) allows the user to retrieve specifics on the alarm raised within the PLC program itself.

Notes

- All alarms are output to module 0.
- The subslot number indicates the ***samos***®PRO module that has caused the alarm. Number 0 = CPU, 1 = 1st XT module, 2 = 2nd XT module ... 13 = 1st gateway, 14 = 2nd gateway.

- The reason for the alarm is being identified by an error text message from the GSDML file. Up to 32 different error messages per ***samos***®PRO module type are possible.
- For the possible causes for an alarm please refer to Tab. 50.
- The same diagnostic information is available through a record read to data set 3.

The following table matches the PROFINET IO error type (as defined by the GSDML) to the appropriate message.

Tab. 50: PROFINET IO error type definitions

	Message	
Error type	**Error origin**	**Error definition**
0100	CPU	Reserved
0101		Module operating state is Critical Fault
0102		Power supply out of range or EFI communication failure
0103		Reserved
0104		Configuration status of a module within the system changed to invalid
0105		Power supply out of specified range
0106		EFI 1 communication failure
0107		EFI 2 communication failure
0200	I/O module	Reserved
0201		Internal error: Internal tests failed or watchdog test failed or bad process data or self test failure
0202		Reserved
0203		Error history item existing: Access via configuration tool
0204		Configuration status changed to invalid
0205		Output power supply out of range
0206		Reserved
0207		Reserved
0208		Input 1-2 dual channel input evaluation: error detected
0209		Input 3-4 dual channel input evaluation: error detected
0210		Input 5-6 dual channel input evaluation: error detected
0211		Input 7-8 dual channel input evaluation: error detected
0212		Status output 1 fast shut off logic control time out
0213		Status output 2 fast shut off logic control time out
0214		Status output 3 fast shut off logic control time out
0215		Status output 4 fast shut off logic control time out
0216		Input 1 external test signal failure. Check for stuck-at-high or cabling
0217		Input 2 external test signal failure. Check for stuck-at-high or cabling
0218		Input 3 external test signal failure. Check for stuck-at-high or cabling
0219		Input 4 external test signal failure. Check for stuck-at-high or cabling
0220		Input 5 external test signal failure. Check for stuck-at-high or cabling
0221		Input 6 external test signal failure. Check for stuck-at-high or cabling
0222		Input 7 external test signal failure. Check for stuck-at-high or cabling
0223		Input 8 external test signal failure. Check for stuck-at-high or cabling
0224		Output 1 stuck-at-high error
0225		Output 1 stuck-at-low error
0226		Output 2 stuck-at-high error
0227		Output 2 stuck-at-low error
0228		Output 3 stuck-at-high error
0229		Output 3 stuck-at-low error
0230		Output 4 stuck-at-high error

	Message	
Error type	**Error origin**	**Error definition**
0231		Output 4 stuck-at-low error
0300	PROFIBUS gateway	Reserved
0301		Internal error: Internal tests failed
0302		Reserved
0303		Reserved
0304		Configuration status changed to invalid
0305		Reserved
0306		Reserved
0307 ... 0331		Reserved
0400	CANopen gateway	Reserved
0401		Internal error: Internal tests failed
0402		Reserved
0403		Reserved
0404		Configuration status changed to invalid
0405		Reserved
0406		Reserved
0407 ... 0431		Reserved
0500	DeviceNet gateway	Reserved
0501		Internal error: Internal tests failed
0502		Reserved
0503		Reserved
0504		Configuration status changed to invalid
0505		Reserved
0506		Reserved
0507 ... 0531		Reserved
0600	Modbus gateway	Reserved
0601		Internal error: Internal tests failed
0602		Reserved
0603		Reserved
0604		Configuration status changed to invalid
0605		Reserved
0606		Reserved
0607 ... 0631		Reserved
0700	Ethernet/IP gate-way	Reserved
0701		Internal error: Internal tests failed
0702		Reserved
0703		Reserved
0704		Configuration status changed to invalid
0705		Reserved
0706		Reserved
0707 ... 0731		Reserved
0800	ProfiNet gateway	Reserved
0801		Internal error: Internal tests failed
0802		Reserved
0803		Reserved
0804		Configuration status changed to invalid
0805		Reserved
0806		Reserved
0807 ... 0831		Reserved
0900	Other module	Reserved

	Message	
Error type	**Error origin**	**Error definition**
0901		Internal error: Internal tests failed
0902		Reserved
0903		Reserved
0904		Configuration status changed to invalid
0905 ... 0931		Reserved
1200	Other module	Reserved
1201		Internal error: Internal tests failed
1202		Reserved
1203		Reserved
1204		Configuration status changed to invalid
1205 ... 1231		Reserved

5.4.5 TCP/IP configuration interface

See section 5.1.1 “TCP/IP configuration interface” on page 25.

5.4.6 Ethernet TCP/IP socket interface

See section 5.1.2 “Ethernet TCP/IP socket interface” on page 28.

5.4.7 Diagnostics and troubleshooting

For information how to perform diagnostics on the ***samos***®PRO system please refer to the operating instructions for the ***samos***®PLAN software (Wieland part no. BA000518).

Error	Cause	Possible remedy
The ***samos***®PLAN tool does not connect to the ***samos***®PRO gateway module	SP-EN-PN has no power supply. SP-EN-PN is not in the same physical network as the PC. The PC is configured to another subnet mask in the TCP/IP settings. SP-EN-PN has already been configured once and has a fixed set IP address or an IP address assigned by a DHCP server that is not recognised.	Establish the power supply. Check the Ethernet wiring and network settings on the PC and correct if necessary. Set the subnet mask on the PC to 255.255.0.0 (factory setting of the SP-EN-PN). Check the communication settings in the ***samos***®PLAN.
SP-EN-PN does not supply any data. LED PWR ● Green LED LINK/ACT ●/☼ Green LED STATUS ☼ Red/Green	SP-EN-PN is configured for data transfer to PLC, but Ethernet communication is not yet established or faulty. Duplicate IP address detected. Another device on the network has the same IP address. Improperly formatted Profinet device name.	Minimum one Ethernet connection needs to be established. Set up Ethernet connection on PLC side, check Ethernet cabling, check Ethernet connection settings on PLC and in the ***samos***®PLAN. If no Ethernet communication is required, disable the Ethernet connections/PLC interfaces on the SP-EN-PN. Adjust IP address and power cycle device. Adjust device name between Profinet Master and GPNT.
SP-EN-PN does not supply any data. LED PWR ● Green LED LINK/ACT ●/☼ Green LED STATUS ☼ Red (1 Hz)	Configuration required. Configuration download is not completed.	Configure the SP-EN-PN and download the configuration to the device. Wait until the configuration download has been completed.
SP-EN-PN does not supply	No data set is activated.	Activate at least one data set.

Tab. 51: Troubleshooting for the SP-EN-PN

Error	Cause	Possible remedy
any data. LED PWR ● Green LED LINK/ACT ●/☼ Green LED STATUS ☼ Green (1 Hz)	***samos***®PRO system is in Idle mode.	Start CPU (change into Run mode) .
SP-EN-PN does not supply any data. LED PWR ● Green LED LINK/ACT ●/☼ Green LED STATUS ☼ Green (2 Hz)	Profinet Master requested LED flashing for physical device identification.	Stop flashing with Simatic Manager or power cycle ***samos***®PRO system to clear.
SP-EN-PN functioned correctly after configuration, but suddenly no longer supplies data. LED PWR ● Green LED LINK/ACT ●/☼ Green LED STATUS ● Red/Green	SP-EN-PN is operated in slave mode, the IP address is assigned from a DHCP server. After the SP-EN-PN or the DHCP server has been restarted, a different IP address that is unknown to the PLC has been assigned to the SP-EN-PN.	Either assign a fixed IP address to the SP-EN-PN, or reserve a fixed IP address for the SP-EN-PN in the DHCP server (manual assignment by means of the MAC address of the SP-EN-PN).
SP-EN-PN/ ***samos***®PRO system is in Critical fault mode. LED PWR ● Green LED LINK/ACT ☼ Green LED STATUS ● Red	SP-EN-PN is not plugged properly into the other ***samos***®PRO module. Module connecting plug is soiled or damaged. Other ***samos***®PRO module has internal critical error.	Plug the SP-EN-PN in correctly Clean the connecting socket/plug. Repower the system. Check the other ***samos***®PRO modules.
SP-EN-PN is in Critical fault mode. LED PWR ● Green LED LINK/ACT ●/☼ Green LED STATUS ☼ Red (2 Hz)	SP-EN-PN internal device error CPU firmware version does not support ***samos***®PRO gateways.	Switch off the power supply of the ***samos***®PRO system and switch it on again. Check the diagnostics messages with ***samos***®PLAN. Use a CPU with the required firmware version (see section 2.2 “Correct use“ on page 9). If the error remains, replace the gateway.

Symbol description:
○: LED off ● Green: LED lights up green ☼ Red: LED flashes red

6 Fieldbus gateways

6.1 PROFIBUS DP gateway

The following ***samos***®PRO gateways can be used for PROFIBUS DP:

- SP-PROFIBUS-DP

6.1.1 Interfaces and operation

Controls and status indicators

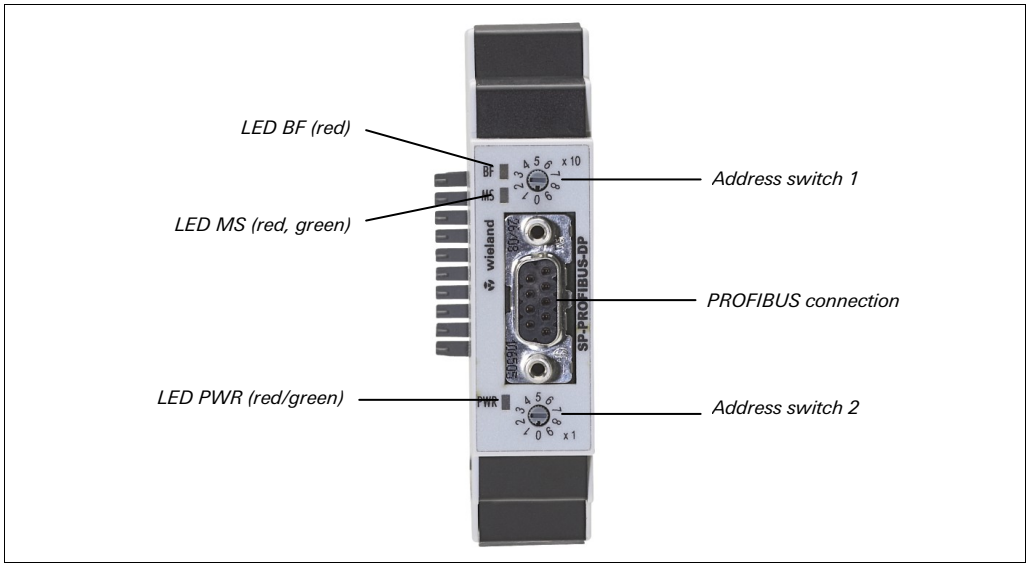


Fig. 32: Controls and status indicators SP-PROFIBUS-DP

LED		Meaning
BF	○	Connection to DP master established
	● Red	No bus connection: Fieldbus cable break, address fault or master is not (or no longer) writing to the bus
MS	○	Power up, waiting for bus off
	● Green	Executing
	☼ Green	Idle
	☼ Red/Green	Executing, but there is an error at the gateway
	☼ Red	1 Hz: Configuration required or in progress 2 Hz: Critical fault on gateway
	● Red	Critical fault on another module
PWR	○	No power supply
	● Green	Power supply switched on, no error
	● Red	Critical fault

Tab. 52: Meaning of the status LEDs of the SP-PROFIBUS-DP

Symbol description:
○: LED off ● Green: LED lights up green ☼ Red: LED flashes red

Tab. 53: Address switch SP-PROFIBUS-DP

Switch/button	Function
× 10	Address switch 1 10-position rotary switch for setting the module address (tens)
× 1	Address switch 2 10-position rotary switch for setting the module address (ones)

How to set the PROFIBUS DP address via hardware address switches:

➡ Set the PROFIBUS DP address using the hardware address switches on the device front. Then switch the ***samos***®PRO system off and back on again.

How to set the PROFIBUS DP address via software using the *samos*®PLAN:

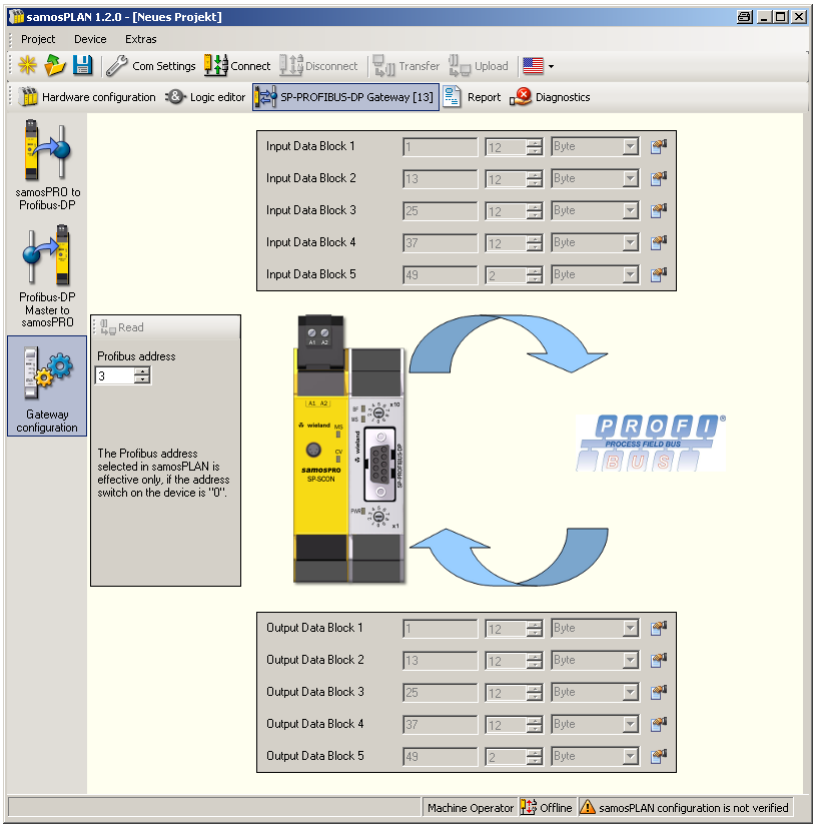
➡ Set both hardware address switches on the device front to 0.

➡ Open the ***samos***®PLAN and load the hardware configuration including the PROFIBUS DP gateway. Ensure your project is offline.

➡ Click on the **Gateway** button above the main window and select the SP-PROFIBUS-DP to open the gateway configuration dialog.

➡ Click on **Gateway configuration** on the left hand menu. The following dialog appears:

Fig. 33: Setting the PROFIBUS address for the SP-PROFIBUS-DP



➡ Select the PROFIBUS address in the **PROFIBUS address** field.

Notes

- The address that can be set via the hardware address switch ranges from 1 … 99.
- The address that can be set via the ***samos***®PLAN software ranges from 3 … 125.
- The PROFIBUS master cannot overwrite the address.
- A modified address setting only becomes effective after switching off and switching on the ***samos***®PRO system.
- In online mode, you can read the address set on the PROFIBUS DP gateway by clicking on the **Read** button above the **PROFIBUS address** field.

Plug assignment

The connection to the PROFIBUS DP fieldbus is made using a 9 pin Sub-D socket.

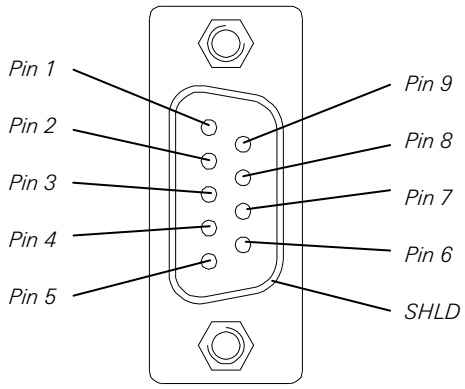


Fig. 34: D-Sub socket and plug pin assignments SP-PROFIBUS-DP

Pin	Description
1	NC
2	NC
3	RxD/TxD-P
4	CNTR-P
5	GND-EXT
6	+5V-EXT
7	NC
8	RxD/TxD-N
9	CNTR-N (GND-EXT)
SHLD	Shield

Bus cable

The bus topology for PROFIBUS DP is a linear structure comprising a screened, twisted 2-core cable with active bus termination at both ends. The possible bus lengths are 100 m at 12 MBit/s up to 1,200 m at 94 KBit/s.

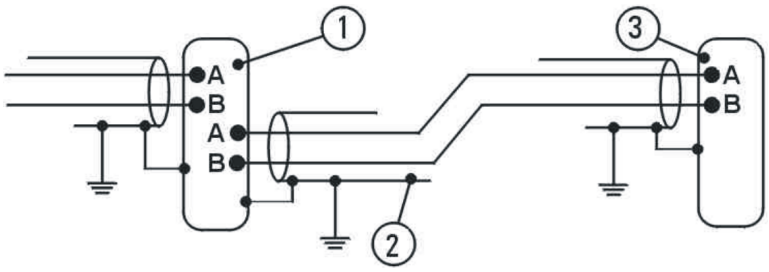


Fig. 35: Bus cable SP-PROFIBUS-DP

Position	Description
1	PROFIBUS user grey
2	Shielded bus cable
3	PROFIBUS termination yellow (with integrated terminating resistors)

Tab. 54: Explanation bus cable SP-PROFIBUS-DP

Cable parameters

The properties of the bus cable are specified in EN 50·170 as cable type A.

Property	Value
Characteristic impedance	135-165 Ω (at a frequency of 3-20 MHz)
Capacitance per unit length	< 30 pF/m
Loop resistance	≤ 110 Ω/km
Core diameter	> 0.64 mm
Core cross-section	> 0.34 mm^2

Tab. 55: Cable parameters SP-PROFIBUS-DP

With these cable parameters, the following maximum physical sizes are possible for a bus segment:

Tab. 56: Maximum cable lengths SP-PROFIBUS-DP

Baud rate (Kbit/s)	Max. cable length (m)
9.6	1200
19.2	1200
93.75	1200
187.5	1000
500	400
1500	200
12000	100

Data transmission rate
The data transmission rate is set automatically.

The maximum baud rate is 12 MBit/s.

6.1.2 Planning

GSD file
In the normal case the SP-PROFIBUS-DP is used on a DP master that looks up the device characteristics in the GSD file.

You will find the GSD file and device icon for PLC interfacing with PROFIBUS support

- in the download center on the Internet at www.wieland-electric.com ("Support/Download Center")
- in the ***samos***®PLAN program folder on your hard disc (default installation folder is "C:\programs\Wieland\samosPRO\DeviceDescriptions\...")

Operational data transmitted by the SP-PROFIBUS-DP
The SP-PROFIBUS-DP GSD file provides input/output data blocks (virtual I/O device modules) containing the operational data. These five blocks must be projected in a DP configurator in natural order (1, 2, 3, 4, 5). No other sequence is possible.

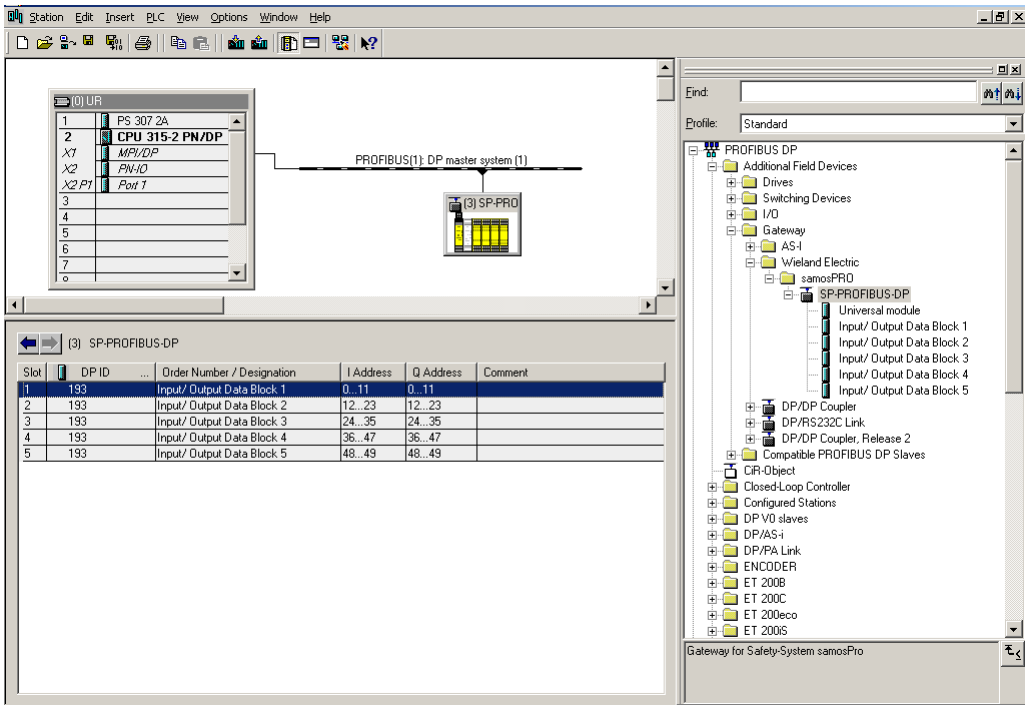


Fig. 36: PROFIBUS DP configuration example in Siemens SIMATIC Manager

Notes

- Depending on the type of PLC used, further modules may be displayed (e.g.“universal module”). These modules are not needed and should be ignored.
- The data blocks 1-4 contain 12 bytes each, data block 5 contains 2 bytes.
- The contents of the data blocks are freely selectable, but are preconfigured in the ***samos***®PLAN configuration software:

	Data block 1	**Data block 2**	**Data block 3**	**Data block 4**	**Data block 5**
	Input data	Input data	Input data	Input data	Input data
Byte 0	Input values module 1	Output values module 1	Logic result 1	Not assigned	Not assigned
Byte 1	Input values module 2	Output values module 2	Logic result 2	Not assigned	Not assigned
Byte 2	Input values module 3	Output values module 3	Logic result 3	Not assigned	Not available
Byte 3	Input values module 4	Output values module 4	Logic result 4	Not assigned	
Byte 4	Input values module 5	Output values module 5	Not assigned	Not assigned	
Byte 5	Input values module 6	Output values module 6	Not assigned	Not assigned	
Byte 6	Input values module 7	Output values module 7	Not assigned	Not assigned	
Byte 7	Input values module 8	Output values module 8	Not assigned	Not assigned	
Byte 8	Input values module 9	Output values module 9	Not assigned	Not assigned	
Byte 9	Input values module 10	Output values module 10	Not assigned	Not assigned	
Byte 10	Input values module 11	Output values module 11	Not assigned	Not assigned	
Byte 11	Input values module 12	Output values module 12	Not assigned	Not assigned	
Length	12 bytes	12 bytes	12 bytes	12 bytes	2 bytes

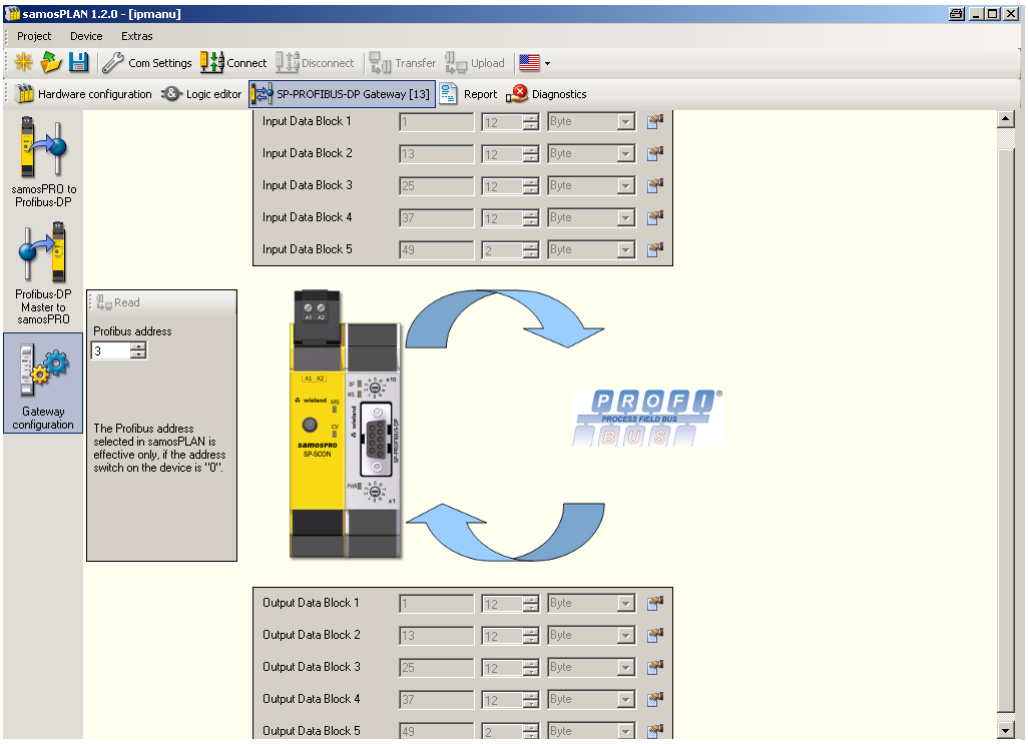
Tab. 57: Default content of input data block 1-5 of the SP-PROFIBUS-DP

For detailed information about the content of the process image please see section 3.2 “Data transmitted into the network” on page 12.

How to set the start address for the data blocks:

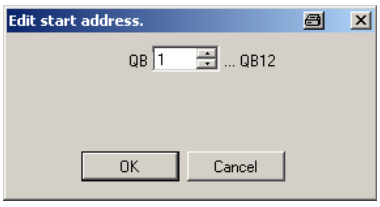
- Open the ***samos***®PLAN and load the hardware configuration including the PROFIBUS DP gateway. Ensure your project is offline.
- Click on the **Gateway** button above the main window and select the SP-PROFIBUS-DP to open the gateway configuration dialog.
- Click on **Gateway configuration** on the left hand menu. The following dialog appears:

Fig. 37: Gateway configuration dialog for the SP-PROFIBUS-DP



- Click on the button to the right of the data block for which you want to change the start address. The following dialog appears:

Fig. 38: Edit the data block start address



- Type in the desired new start address or use the arrows to change the address. The address set will be checked automatically for plausibility, i.e. it is not possible to configure data blocks with overlapping address ranges.
- Click **OK** to accept the new start address.

For further information on how to configure the process image, see chapter 7 “Layout and content of the process image” on page 83 and the ***samos***®PLAN operating instructions (Wieland part no. BA000518).

6.1.3 PROFIBUS configuration of the gateway – how the data is transferred

The following steps need to be taken in order to configure the communication between PLC and gateway.

Note

This document does not cover the creation of the PROFIBUS DP network or the rest of the automation system project in the network configuration tool. It is assumed the PROFIBUS

project has already been set up in the configuration program, e.g. SIEMENS SIMATIC Manager. Examples refer to configurations performed with SIEMENS SIMATIC manager.

STEP 1 – Install the generic station description file (GSD file)
Before the SP-PROFIBUS-DP can be used as device in the network configuration tool, e.g. SIEMENS SIMATIC Manager, for the first time, the generic station description (GSD) of the gateway must be installed into the hardware catalogue of the tool.

➡ Download the GSD file and device icon from www.wieland-electric.com ("Support/Download Center").

➡ Follow the instructions in the online help or in the user manual of the PROFINET network configuration tool for installing generic station description files.

Using the SIEMENS SIMATIC Manager – HW Config, the gateway then appears in the hardware catalogue under >>**PROFIBUS DP** > **Additional Field Devices** > **Gateway** > **Wieland** > ***samos***®PRO.

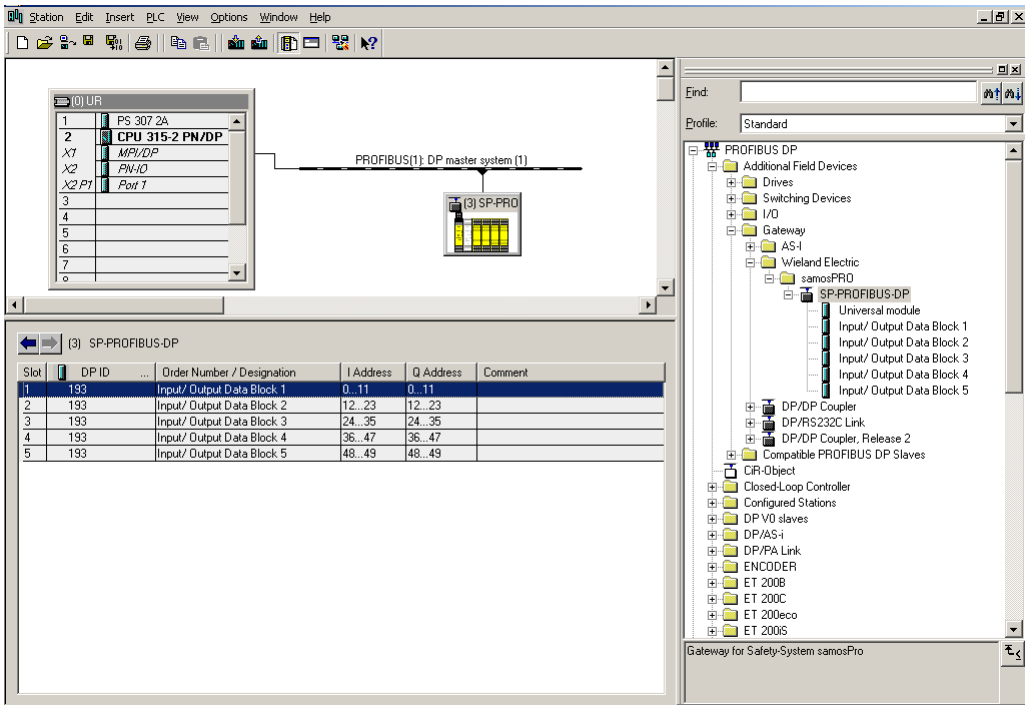
STEP 2 – Add the gateway to the project
In order to have the ***samos***®PRO system data available in the PLC process image, the gateway must be added to the hardware configuration first. The procedure associated with this depends on the hardware configuration program of the PLC being used. On this topic, please also read the documentation for the corresponding program.

The example below shows how to add the gateway to a SIEMENS SIMATIC Manager project.

In the SIEMENS SIMATIC Hardware Manager, the gateway can be found in the hardware catalogue under >>**PROFIBUS DP** > **Additional Field Devices** > **Gateway** > **Wieland** > ***samos***®PRO.

➡ Drag & drop the device into the PROFIBUS network. Example:

Fig. 39: Gateway in the PROFIBUS HW Config



Diagnostics data SP-PROFIBUS-DP

With the SP-PROFIBUS-DP, diagnostics data are available via PROFIBUS standard DP-V0 diagnostics:

- Standard diagnostics (6 bytes)
- Device related diagnostics: Status messages or manufacturer specific messages

Each ***samos***®PRO module supports a unique module ID. Based on this ID the gateway determines the manufacturer specific diagnostics number. This way it is possible to retrieve module specific diagnostics texts from the GSD file. The content of the diagnostics message is shown in Tab. 58.

Tab. 58: Content of the PROFIBUS diagnostics messages

Octet	Content	Comment
7	0x09	Header
8	See **Tab. 59**	Module number
9	0	PROFIBUS module slot number. The PROFIBUS gateway supports five slots, which do not represent the physical slots, thus all messages shall be tied to slot 0 (gateway itself).
10 (Bit 0…2)	001 or 010	001 = error coming, 010 = error going
10 (Bit 3…7)	00000…11111	Alarm sequence number, will be incremented for each state change of octet 10 Bit 0…2 (error coming/going)
11	0 … 14	Position of the ***samos***®PRO module raising the diagnostic information. 0 = CPU 1 = 1st XT module … 13 = 1st gateway 14 = 2nd gateway (relay modules are not counted)
12 … 15	Variable	4 bytes module specific diagnostics data. See Tab. 60.

The following table lists the module numbers for the ***samos***®PRO system.

*Tab. 59: **samos**® PRO module numbers*

Module number	Module
161	***samos***®PRO main module (SP-SCON)
162	SP-SDI, SP-SDIO module
163	PROFIBUS gateway (SP-PROFIBUS-DP)
164	CANopen gateway (SP-CANopen)
165	DeviceNet gateway (SP-DeviceNet)
166	Modbus gateway (SP-EN-MOD)
167	Ethernet/IP gateway (SP-EN-IP)
168	Profinet IO gateway (SP-EN-PN)

The following table matches the module specific diagnostics data (as defined by the GSD) to the appropriate error message.

Tab. 60: PROFIBUS error messages

Module number	Diagnostics bit (X_Unit_Diag_Bit)	Error origin	Error message
1	**0**	CPU	Reserved
	1		Module operating state is Critical Fault
	2		Power supply out of range or EFI communication failure
	3		Reserved
	4		Configuration status of a module within the system changed to invalid
	5		Power supply out of specified range
	6		EFI 1 communication failure
	7		EFI 2 communication failure
	8 ... 31		Reserved
2	**0**	I/O module	Reserved
	1		Internal error: Internal tests failed or watchdog test failed or bad process data or self test failure
	2		Reserved
	3		Error history item existing: Access via configuration tool
	4		Configuration status changed to invalid
	5		Output power supply out of range
	6 ... 7		Reserved
	8		Input 1-2 dual channel input evaluation: error detected
	9		Input 3-4 dual channel input evaluation: error detected
	10		Input 5-6 dual channel input evaluation: error detected
	11		Input 7-8 dual channel input evaluation: error detected
	12		Status output 1 fast shut off logic control time out
	13		Status output 2 fast shut off logic control time out
	14		Status output 3 fast shut off logic control time out
	15		Status output 4 fast shut off logic control time out
	16		Input 1 external test signal failure. Check for stuck-at-high or cabling
	17		Input 2 external test signal failure. Check for stuck-at-high or cabling
	18		Input 3 external test signal failure. Check for stuck-at-high or cabling
	19		Input 4 external test signal failure. Check for stuck-at-high or cabling
	20		Input 5 external test signal failure. Check for stuck-at-high or cabling
	21		Input 6 external test signal failure. Check for stuck-at-high or cabling
	22		Input 7 external test signal failure. Check for stuck-at-

Module number	Diagnostics bit (X_Unit_Diag_ Bit)	Error origin	Error message
			high or cabling
	23		Input 8 external test signal failure. Check for stuck-at-high or cabling
	24		Output 1 stuck-at-high error
	25		Output 1 stuck-at-low error
	26		Output 2 stuck-at-high error
	27		Output 2 stuck-at-low error
	28		Output 3 stuck-at-high error
	29		Output 3 stuck-at-low error
	30		Output 4 stuck-at-high error
	31		Output 4 stuck-at-low error
3	**0**	PROFIBUS gateway	Reserved
	1		Internal error: Internal tests failed
	2		Reserved
	3		Reserved
	4		Configuration status changed to invalid
	5		Reserved
	6		Reserved
	7 ... 31		Reserved
4	**0**	CANopen gateway	Reserved
	1		Internal error: Internal tests failed
	2		Reserved
	3		Reserved
	4		Configuration status changed to invalid
	5		Reserved
	6		Reserved
	7 ... 31		Reserved
5	**0**	DeviceNet gateway	Reserved
	1		Internal error: Internal tests failed
	2		Reserved
	3		Reserved
	4		Configuration status changed to invalid
	5		Reserved
	6		Reserved
	7 ... 31		Reserved
6	**0**	Modbus gateway	Reserved
	1		Internal error: Internal tests failed
	2		Reserved
	3		Reserved
	4		Configuration status changed to invalid
	5		Reserved
	6		Reserved
	7 ... 31		Reserved
7	**0**	Ethernet/IP gateway	Reserved
	1		Internal error: Internal tests failed
	2		Reserved
	3		Reserved
	4		Configuration status changed to invalid
	5		Reserved
	6		Reserved
	7 ... 31		Reserved
8	**0**	ProfiNet gateway	Reserved
	1		Internal error: Internal tests failed
	2		Reserved

Module number	Diagnostics bit (X_Unit_Diag_Bit)	Error origin	Error message
	3		Reserved
	4		Configuration status changed to invalid
	5		Reserved
	6		Reserved
	7 ... 31		Reserved
9	**0**	Other module	Reserved
	1		Internal error: Internal tests failed
	2		Reserved
	3		Reserved
	4		Configuration status changed to invalid
	5 ... 31		Reserved
12	**0**	Other module	Reserved
	1		Internal error: Internal tests failed
	2		Reserved
	3		Reserved
	4		Configuration status changed to invalid
	5 ... 31		Reserved

6.1.4 Diagnostics and troubleshooting

For information how to perform diagnostics on the ***samos***®PRO system please refer to the operating instructions for the ***samos***®PLAN software (Wieland part no. BA000518).

Tab. 61: Troubleshooting for the SP-PROFIBUS-DP

Error	Cause	Possible remedy
The ***samos***®PLAN tool does not connect to the ***samos***®PRO gateway module	SP-PROFIBUS-DP has no power supply.	Establish the power supply. Check the communication settings in the ***samos***®PLAN.
SP-PROFIBUS-DP does not supply any data. LED PWR ● Green LED BF ○ Off LED MS ☼ Red (1 Hz)	Configuration required. Configuration download is not completed.	Configure the SP-PROFIBUS-DP and download the configuration to the device. Wait until the configuration download has been completed.
SP-PROFIBUS-DP does not supply any data. LED PWR ● Green LED BF ○ Off LED MS ● Green	No data set is activated.	Activate at least one data set.
SP-PROFIBUS-DP does not supply any data. LED PWR ● Green LED BF ○ Off/● Red LED MS ☼ Green (1 Hz)	SP-PROFIBUS-DP is in Idle mode	CPU/application is stopped. Start CPU (change into Run mode)
SP-PROFIBUS-DP does not supply any data. LED PWR ● Green LED BF ○ Off LED MS ● Green	PROFIBUS master is in stop mode	Set PROFIBUS master into Run mode
SP-PROFIBUS-DP functioned correctly after configuration, but suddenly no longer supplies data. LED PWR ● Green LED BF ● Red LED MS ☼ Red/Green	SP-PROFIBUS-DP PROFIBUS hardware address is changed. PROFIBUS cable is disconnected.	Check PROFIBUS address setting at hardware address Check PROFIBUS cable. Check PROFIBUS master.
SP-PROFIBUS-DP is in critical fault. LED PWR ● Green LED BF ● Red LED MS ☼ Red (2 Hz)	SP-PROFIBUS-DP internal device error CPU firmware version does not support ***samos***®PRO gateways.	Switch off the power supply of the ***samos***®PRO system and switch it on again. Check the diagnostics messages with ***samos***®PLAN. Use a CPU with the required firm-

Error	Cause	Possible remedy
		ware version (see section 2.2 “Correct use” on page 9). If the error remains, replace the gateway.
SP-PROFIBUS-DP/ ***samos***®PRO System is in critical fault LED PWR ● Red LED BF ○ Off LED MS ● Red	SP-PROFIBUS-DP is not plugged properly into the other ***samos***®PRO module. Module connecting plug is soiled or damaged. Other ***samos***®PRO module has internal critical error.	Plug the SP-PROFIBUS-DP in correctly. Clean the connecting socket/plug. Repower the system. Check the other ***samos***®PRO modules.

Symbol description:
○: LED off ● Green: LED lights up green ☼ Red: LED flashes red

7 Layout and content of the process image

7.1 Routing

The process image transmitted by the ***samos***®PRO gateways into the network consists of the operational data (e.g. logic results, input and output states) and the diagnostics data (e.g. module status, CRCs). These data are organised in 4 data sets.

Data set #	Content	Size	Can be customized
1	Operational data	50 bytes	Yes
2	CRCs	32 bytes	No
3	Status and diagnostics	60 bytes	No
4	Reserved	60 bytes	No

Tab. 62: Content of the data sets 1-4

The operational data in data set 1 may comprise up to maximally 50 bytes, independent of the network protocol used. These 50 bytes are organized into one or several data blocks, dependent of the network protocol. For detailed information about the modularisation of the data sent into the network please see Tab. 63 and read the chapter on the related gateway.

The content of data set 1 can be freely customized with a granularity of 1 byte but is pre-configured in the delivery status (see section 7.2 “Default settings for the operational data” on page 83 and section 7.3 “Customizing the operational data ” on page 84).

The diagnostics data in data sets 2-4 depend on the network protocol used and are described in the chapter on the related gateway.

7.2 Default settings for the operational data

In the delivery status, the operational data are pre-configured. Depending on the gateway used, these data are subdivided in several data blocks.

The following table gives an overview which bytes are assigned to the default configuration and how the data are modularised for the different gateways.

Tab. 63: Default configuration for the operational data transmitted into the network

	EtherNet/IP, Modbus TCP, Ethernet TCP/IP		Profinet IO, PROFIBUS DP	
Byte	**Default assignment**	**Input data set**	**Default assignment**	**Input data block**
0	Logic result 0	#1 (50 bytes)	Module 1 input	#1 (12 bytes)
1	Logic result 1		Module 2 input	
2	Logic result 2		Module 3 input	
3	Logic result 3		Module 4 input	
4	Module 1 input		Module 5 input	
5	Module 2 input		Module 6 input	
6	Module 3 input		Module 7 input	
7	Module 4 input		Module 8 input	
8	Module 5 input		Module 9 input	
9	Module 6 input		Module 10 input	
10	Module 7 input		Module 11 input	
11	Module 8 input		Module 12 input	
12	Module 9 input		Module 1 output	#2 (12 bytes)
13	Module 10 input		Module 2 output	
14	Module 11 input		Module 3 output	
15	Module 12 input		Module 4 output	
16	Module 1 output		Module 5 output	
17	Module 2 output		Module 6 output	
18	Module 3 output		Module 7 output	
19	Module 4 output		Module 8 output	
20	Module 5 output		Module 9 output	
21	Module 6 output		Module 10 output	
22	Module 7 output		Module 11 output	
23	Module 8 output		Module 12 output	
24	Module 9 output		Logic result 0	#3 (12 bytes)
25	Module 10 output		Logic result 1	
26	Module 11 output		Logic result 2	
27	Module 12 output		Logic result 3	
28-35	Not assigned		Not assigned	
36-47	Not assigned		Not assigned	#4 (12 bytes)
48-49	Not assigned		Not assigned	#5 (2 bytes)

The default byte assignment can be freely customised as will be described in the following section.

7.3 Customizing the operational data (*samos*®PRO to Network)

This section outlines briefly how you can customize the operational data that the ***samos***®PRO gateway transmits to the network. You will find more detailed information in the ***samos***®PLAN software operating instructions (Wieland part no. BA000518).

In the delivery status, the data routing configuration of the ***samos***®PRO gateways is shown in the gateway configuration dialog.

➡ Click on the **Gateway** button above the main window and select the respective gateway to open the gateway configuration dialog.
➡ Click on the ***samos***®PRO **to Network** tab on the left hand menu to display the routing configuration dialog.

The default setting is as follows (example for Modbus TCP):

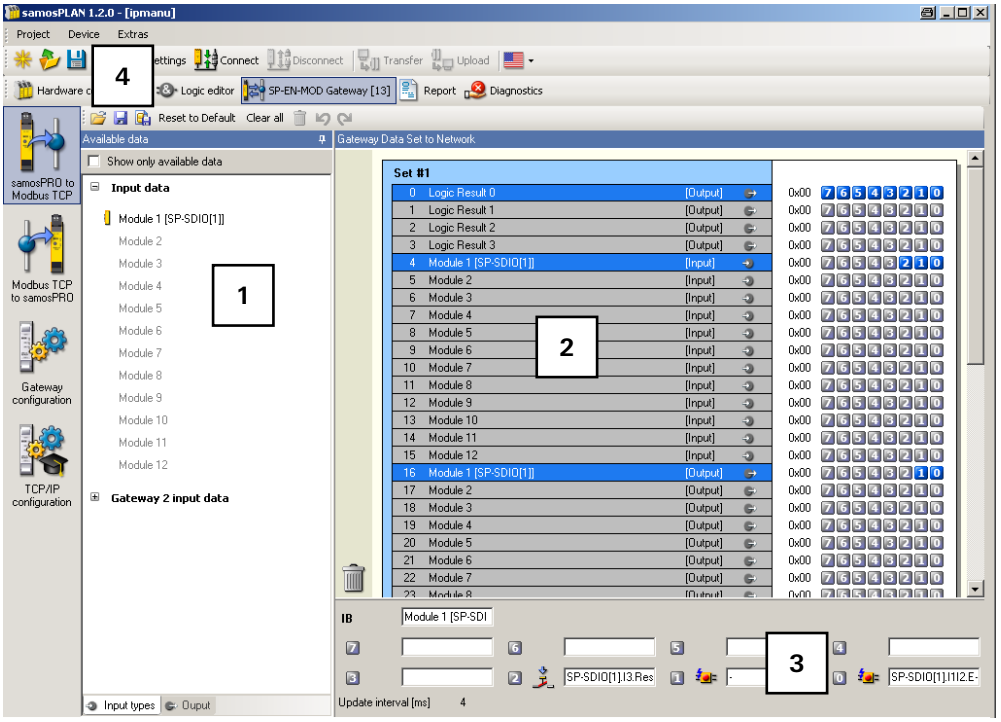


Fig. 40: Default configuration for the operational data transmitted into the network

Basically this dialog is divided into three areas: **Available data** [1], **Gateway data** [2] and **Tag Names** [3]. The upper left corner of the dialog holds the toolbar [4].

7.3.1 The toolbar

Fig. 41: Toolbar for the routing configuration

The toolbar contains buttons for the following actions (from left to right):

- The **Load user configuration** and **Save user configuration** buttons allow you to load and/or save a configuration in XML format. If you load a configuration, all previously made changes that have not been saved will be lost. You can not undo this action.
- With the **Import** and **Export** buttons you can import and export a configuration including the tag names used as a CSV (comma separated values) file or in a network specific file format, e.g. SIEMENS .seq for PROFIBUS or Profinet. This allows you to import and use the assigned tag names in a PLC program.

Note

The **Import** button is only available for the *Network to gateway* routing configuration.

- **Reset to Default** restores the default routing configuration. You will be prompted for confirmation. If you click **Yes**, all previously made changes that have not been saved will be lost. You can not undo this action.
- **Clear all** clears the configuration, i.e. deletes all assigned bytes in the **Gateway Data** area. You will be prompted for confirmation.
- **Delete routing** deletes the selected byte from the **Gateway Data** area.
- The **Undo** and **Redo** buttons allow you to undo or redo changes you made to your configuration.

7.3.2 Available data area

This area offers all sources from which data may be routed into the network. It is divided in two views holding the available **Input types** and **Output** data. You can switch between these views using the file cards at the bottom.

- The **Input types** view contains the input values for the connected ***samos***®PRO modules. If your ***samos***®PRO system contains a second gateway, the input data of this gateway (i.e. data received from the network the second gateway is connected to) will be available here as well.
- The **Output** view offers the output values for the connected ***samos***®PRO modules as well as the **Logic results** from the logic editor.

All sources supported by the current configuration are displayed in black:

- connected ***samos***®PRO modules
- configured logic results[7)]
- gateway input data available from another gateway in the system

Sources currently not configured will be displayed in grey. Activating the **Show only available data** checkbox in the upper left corner hides the unused sources from the view.

Sources that offer "live" data are marked with a little icon next to the text.

How to add a data byte to the routing table:

➡ Drag and drop an element (i.e. byte) from the **Available data** area to a free slot in the **Gateway Data** area. If the desired position is not free, you will have to clear it first by deleting or moving the byte currently assigned to it.

Note

It is possible to use the same byte several times in the routing table.

7.3.3 Gateway Data area

This area contains the routing table. It shows the current content of the ***samos***®PRO gateway's input data modules, Bytes and bits highlighted blue will hold "live" data from the system since the hardware configuration does support the source. Bytes highlighted grey actually do not have data associated with them since the hardware configuration does not support the sources.

How to delete a data byte from the routing table:

➡ Drag and drop the byte you want to delete to the trashcan icon in the bottom left corner of the **Gateway Data** area.

Or:

➡ Select the byte you want to delete by clicking it with the left mouse button. Then, click on the **Delete routing** button in the toolbar.

Or:

➡ Call up the context menu by clicking the respective byte with the right mouse button. In the context menu, select the **Delete routing** command.

7) In the default configuration, only the first logic result byte (Logic Result 0) is active and available. You can activate more logic result output bits in the logic editor (see the Samos(r)PLAN operating instructions, Wieland part no. 8012479).

How to move a data byte to another place in the routing table:

➧ Drag and drop the byte you want to move to the desired position. If the desired position is not free, you will have to clear it first by deleting or moving the byte currently assigned to it.

7.3.4 Tag names area

This area shows the tag names associated with each bit of the byte currently selected in the **Available Data** or the **Gateway Data** area. You can enter these tag names in the logic editor and in the hardware configuration dialog (e.g. for extension modules).

In the **Tag Names** area of the ***samos***®PRO to Network configuration dialog, it is not possible to edit the tag names.

7.3.5 Tag names for incoming data (Network to *samos*®PRO)

In order to enable incoming data bits:

➧ Click on **Network to *samos***®PRO on the left hand menu. The following dialog appears:

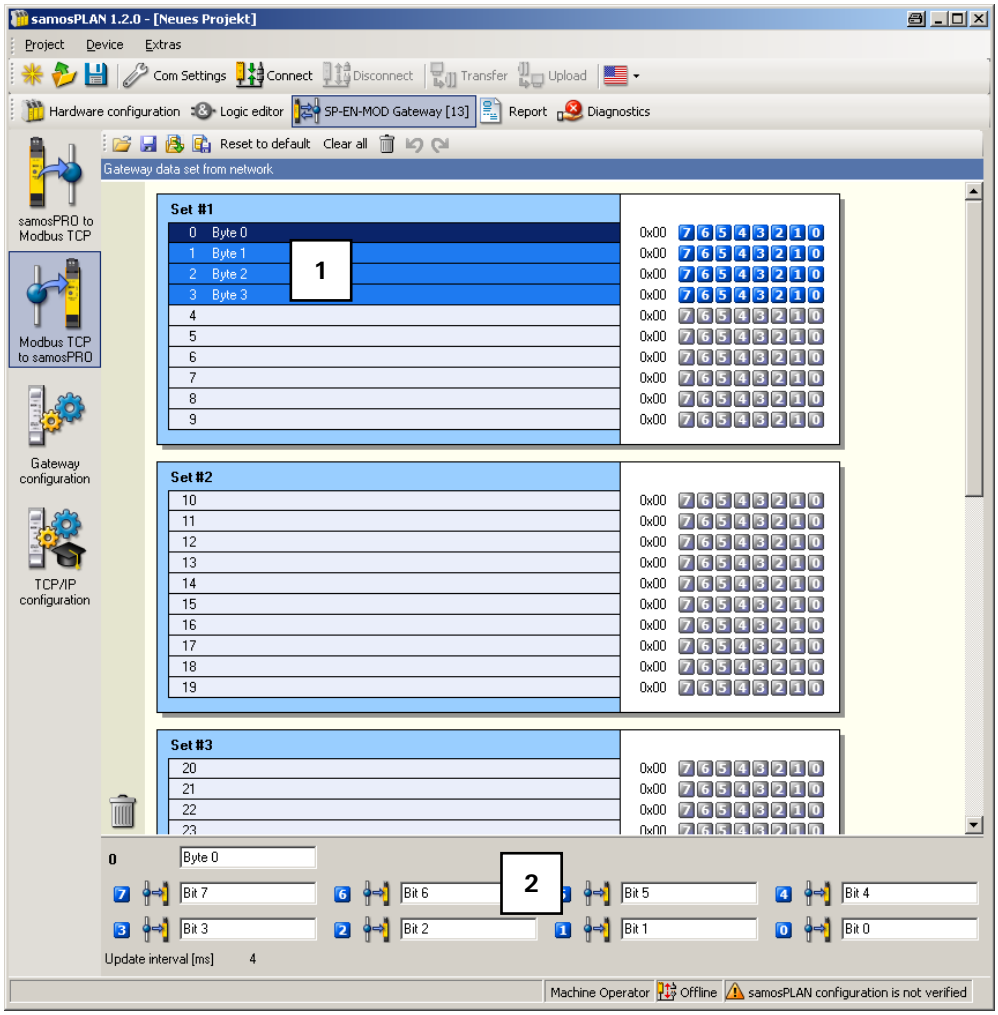


*Fig. 42: Network to **samos**® PRO dialog of the SP-EN-MOD*

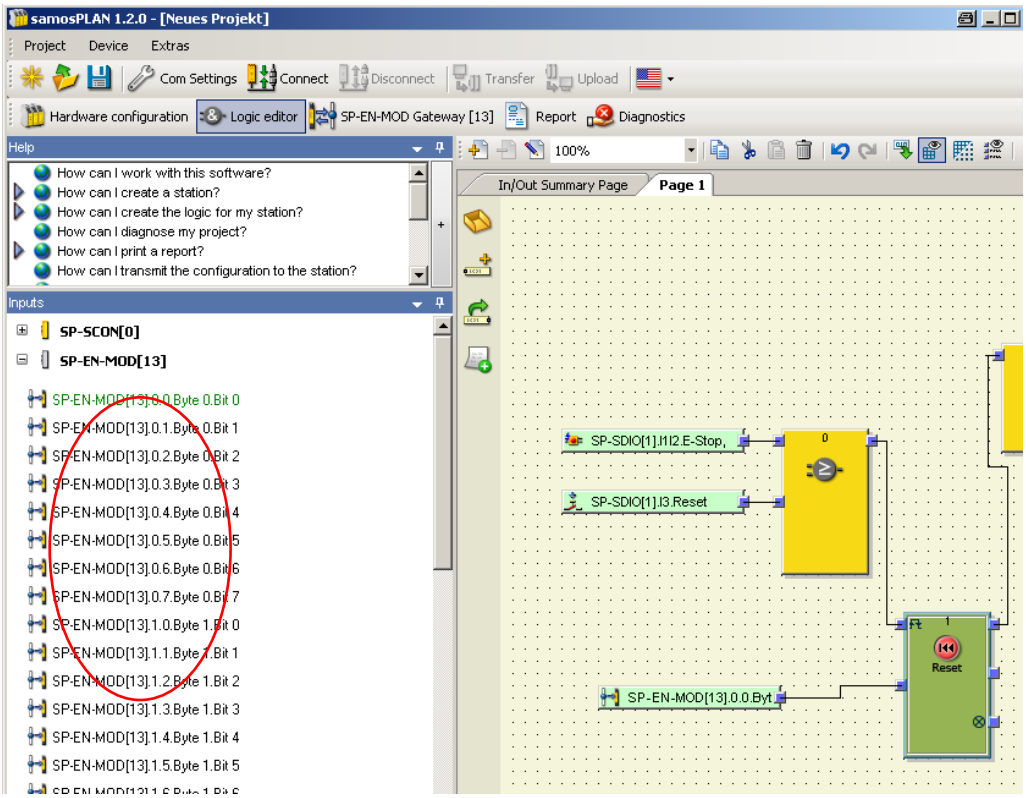
Basically this dialog is divided into two areas: **Gateway data** [1] and **Tag Names** [2]:
The **Gateway data** area shows the current configuration of the output modules,
The **Tag Names** area shows the tag names associated to the byte selected in the **Gateway data** area.

➧ Select a byte in the **Gateway data** area.

➡ For each bit of the selected byte that you wish to use, enter a tag name in the **Tag Names** area.

Each bit you enter a tag name for here will be available within the logic editor or for the process image of a second gateway:

Fig. 43: Tag names of incoming bits in the logic editor dialog of the SP-SCON



7.3.6 Saving and loading a configuration

Using the buttons **Load user configuration** and **Save user configuration** you can save and load your configuration in XML format. If you load a configuration, all previously made changes that have not been saved will be lost. You can not undo this action.

7.3.7 Importing and exporting a configuration

With the **Import** and **Export** buttons you can import and export a configuration including the tag names used as a CSV (comma separated values) file or in a network specific file format, e.g. SIEMENS .seq for PROFIBUS or Profinet. This allows you to import and use tag names you have assigned in the ***samos***®PRO project in the PLC program and vice versa.

If you import a configuration, all previously made changes that have not been saved will be lost. You can not undo this action.

Note

The **Import** button is only available for the *Network to gateway* routing configuration.

7.4 Monitoring the operational data online

When the ***samos***®PRO system is online and running, you can monitor the operational data online in the gateway configuration window.

- Click on the **Gateway** button above the main window and select the respective gateway to open the gateway configuration dialog.
- Click on the ***samos***®PRO **to Network** or the **Network to *samos***®PRO tab on the left hand menu to display the routing view for the input or output data you want to monitor.

For both directions, ***samos***®PRO **to Network** as well as **Network to *samos***®PRO, inactive bits are displayed grey while active bits are highlighted green:

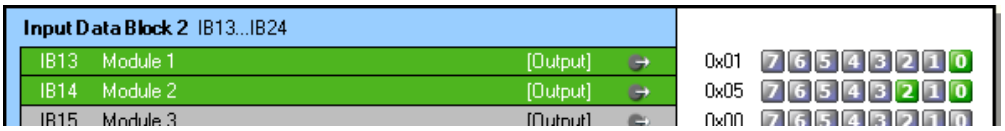


Fig. 44: Active and inactive bits in the online process image

In the ***samos***®PRO **to Network** view, bits that are inactive due to an error are displayed red. This could be the case e.g. for the outputs of an SP-SDIO module if the power supply of this module is faulty:

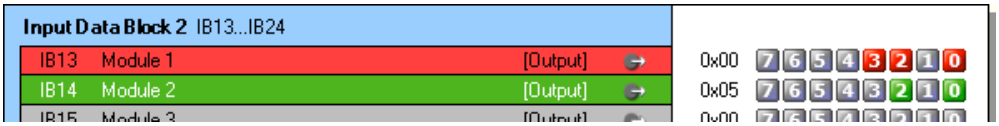


Fig. 45: Inactive Network input bits as a result of an error.

In the **Network to *samos***®PRO view, bits that have no tag name assigned (so that they can not be used in the logic editor) but which are included in the process image that the ***samos***®PRO gateway receives from the PLC, are highlighted yellow:

Fig. 46: Network output bits with no tag names assigned in the online process image

Note

The ***samos***®PRO gateways always reflect the actual physical status of the inputs and outputs on the connected modules and devices. This means that even when Force mode is active and inputs that are physically **Low** are forced **High** (or vice versa) the actual physical status of these inputs will be transmitted to the PLC instead of the (virtual) forced status. If, however, as a result of forcing of one or several inputs, one or several outputs change their status, the changed status of these outputs will be transmitted to the PLC since the actual physical status of the outputs on the devices has changed.

8 Technical specifications

8.1 Technical specifications gateways

8.1.1 PROFIBUS DP

Interface	Min.	Typ.	Max.
Fieldbus	PROFIBUS-DP-V0		
Interface level	RS-485		
Connector technology	D-Sub socket 9-pin		
Slave address (set via rotary switches)	0		99
Slave address (set via ***samos***®PLAN) [8)]	3		125
Baud rate (automatic adjustment)			12 MBaud
Baud rate (kBits/s with standard cable)			Max. cable length
9.6/19.2/93.75			1200 m
187.5			1000 m
500			400 m
1,500			200 m
12,000			100 m

Cable parameters see chapter 6.1 “PROFIBUS DP gateway” from page 71.

8.1.2 EtherNet/IP, PROFINET IO, Modbus TCP

Interface	
Fieldbus	EtherNet/IP, PROFINET IO, Modbus TCP
Integrated switch	3-port layer-2 managed switch with Auto-MDI-X for automatic detection of crossed Ethernet cable
Connection technique	RJ45 socket
Transfer rate	10 Mbit/sec (10Base-T) or 100 Mbit/sec (100Base-TX), autosensing
Update rate (heartbeat rate)	Configurable from 40 … 65535 ms
Change of state (COS) update rate	10 ms
Addressing factory setting	IP: 192.168.250.250 Subnet mask: 255.255.0.0 Default gateway: 0.0.0.0
MAC address	Printed on type label, example: 00:06:77:02:00:A7

[8)] In order to set the slave address via software, the hardware setting for the address must be “0”.

8.2 Technical specifications, supply circuit

These technical specifications apply to all gateways.

Supply circuit (e.g. via SBUS+)	Min.	Typ.	Max.
Supply voltage	16.8 V DC	24 V DC	30 V DC
Power consumption			2.4 W

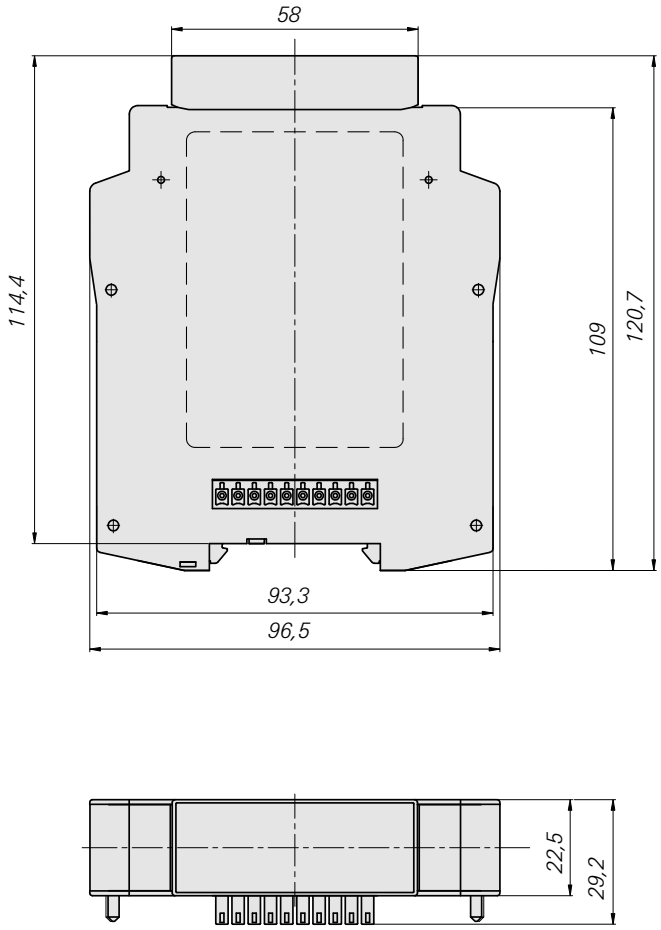
8.3 General technical specifications

These technical specifications apply to all gateways.

Terminals	
Fieldbus	See section **8.1** "**Technical specifications gateways**"
SBUS+	10-pin connector for internal safety bus (plug)
Climatic conditions	
Ambient operating temperature T_A	–25 to +55 °C
Storage temperature	–25 to +70 °C
Relative humidity	10% to 95%, non-condensing
Climatic conditions (EN 61131-2) Air pressure in operation	 860 to 1060 hPa
Mechanical strength	
Sinusoidal vibration (EN 60068-2-6) Frequency range Amplitude Acceleration Number of cycles	 5 to 150 Hz 3.5 mm (5 to < 9 Hz) 1 g (9 to 150 Hz) 10 per axis (on 3 axes)
Vibration wideband noise (EN 60068-2-64) Frequency range Acceleration	 10 to 500 Hz 5 g
Half-sinusoidal shocks (EN 60068-2-27) Acceleration Duration	 15 g 11 ms
Electrical safety	See SP-SCON
Enclosure rating (EN 60·529)	IP 20
Protection class	III
Electromagnetic compatibility	EN 61000-6-2/EN 55011 Class A
Mechanical and assembly	
Housing material	Polycarbonate
Housing type	Device for control cabinet installation
Housing enclosure rating/terminals	IP 20/IP 40
Colour Gateways	 Light grey
Weight	0.16 kg
SBUS+ connection (internal bus) Number of poles Gateways	 10 1 connector left and 1 connector right
Mounting rail	Mounting rail acc. to EN 60715

8.4 Dimensional drawings

Fig. 47: Dimensional drawing SP-EN-IP, SP-EN-MOD and SP-EN-PN (mm)



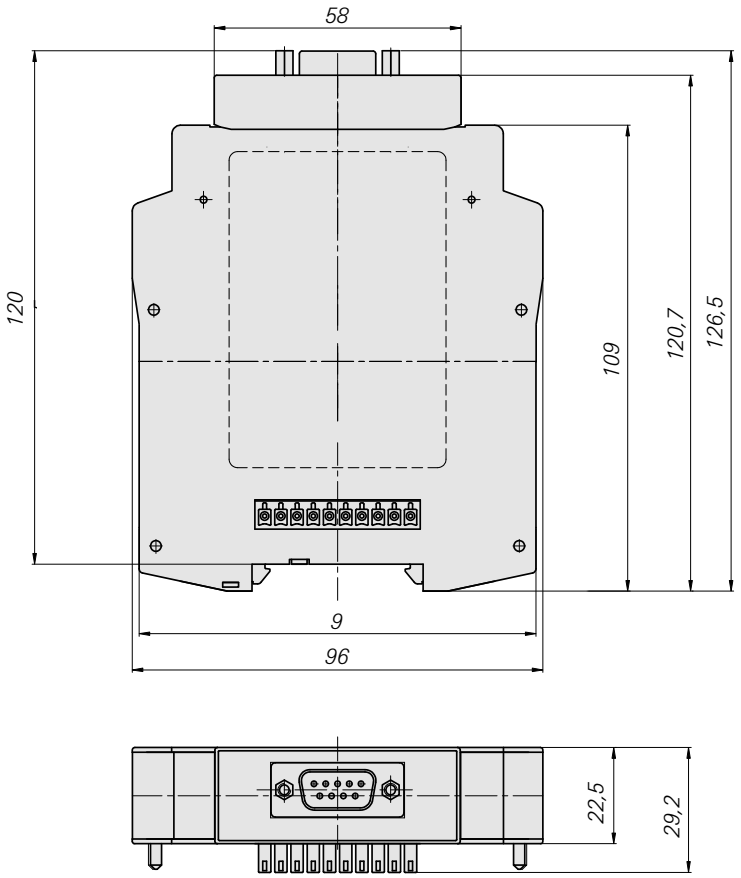


Fig. 48: Dimensional drawing SP-PROFIBUS-DP (mm)

8.5 Ordering information *samos*®PRO gateways

Type	Gateway	Part number
SP-EN-IP	EtherNet/IP	R1.190.0150.0
SP-EN-MOD	Modbus TCP	R1.190.0130.0
SP-EN-PN	PROFINET IO	R1.190.0140.0
SP-PROFIBUS-DP	PROFIBUS DP	R1.190.0190.0

8.6 Ordering information accessories/spare parts

Part	Description	Part number
samos®PLAN CD-ROM	CD-ROM with ***samos***®PRO operating instructions, application examples and software tool ***samos***®PLAN	R1.190.0070.0

*Tab. 64: Part number **samos**® PLAN CD-ROM*

9 Annex

9.1 Index of tables

9.2 Index of illustrations

Annex

wieland

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