SIEMENS

SICAM A8000 Series

CP-8000, CP-8021, CP-8022

User Manual

Preface

Open Source Software

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DC8-037-2.04 Unrestricted

Note

Please take notice of the notes and warnings for your safety in the preface.

Disclaimer of Liability

Although we have carefully checked the contents of this publication for conformity with the hardware and software described, we cannot guarantee complete conformity since errors cannot be excluded.

The information provided in this manual is checked at regular intervals and any corrections that might become necessary are included in the next releases. Any suggestions for improvement are welcome.

Subject to change without prior notice.

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Preface

Purpose of this manual

This manual describes the characteristics and functions of the following products:

- CP-8000
- CP-8021
- CP-8022 (GPRS)

Particularly it contains the following information:

- Safety instructions
- Fields of application and advantages of the system
- Configuration possibilities
- Functional overviews
- Technical specifications
- Order information
- Installation instructions
- Hardware descriptions (modules)
- Engineering options
- Parameterization of telecontrol applications
- Programming of open-/closed-loop control functions
- Saving and loading of application data
- Test functions
- Loading of firmware
- Diagnosis

Target Group

The document you are reading right now is addressed to users, who are in charge of the following engineering tasks:

- Evaluation of the suitability of the system
- Evaluation of the module specifications
- Evaluation of quotation criteria, such as technical specifications of the system or environmental conditions
- Conceptual activities, such as design and configuration
- Mechanical installation
- Creation of the assembly technical documentation
- Engineering and testing with the designated engineering tools
- Technical system maintenance and service, module handling

Within this manual there are hints how to obtain information or files by means of the website http://www.siemens.com/sicam. If you have no access please consult your project manager at Siemens.

Recommendations for Third-party Products

Siemens does neither receive liability nor warranty for recommendations which are given or implied by this manual. For the correct and intended use of the respective product the associated technical descriptions must be paid attention to in any case.

Links to Third-Party Websites

Siemens is not responsible for the contents of third-party websites mentioned in this document, as well as the correctness of the publications and links. For all product information the respective manufacturer is responsible.

Conventions Used

- Manuals to be referred to are represented in italics, such as for instance *SICAM RTUs Common Functions Protocol Elements, chapter "Dial-Up Traffic (DIA)"*.
- Outputs visible on the screen `are described in this font`.
- Inputs via keyboard or mouse keys and visible on the screen `are described in this font`.
- Menu positions visible on the screen `are described in this font`.
- Unchangeable texts that are contained in windows and are visible on the screen ARE DESCRIBED IN THIS FONT.
- Buttons in windows visible on the screen and to be operated by keyboard or mouse `are described in this font`.
- Operation code from programs and variable names `are described in this font`.
- Path statements in the directory tree, which lead to parameters, **are described in this font**.
- Names of parameters `are described in this font`.
- Names of values **are described in this font**.
- Symbolic names, program names and file name extensions *are described in this font*.

Note

Within this manual described functions for operation, diagnosis and test of CP-8000/CP-802*x* have been recorded by means of an industrial PC with operating system Microsoft Windows 7 Enterprise (Service Pack 1) [64 bit] and web browser Microsoft Internet Explorer 10. They are valid likewise – sometimes with inessential deviations – for other operating systems and web browsers.

Placement into the Information Landscape

Document name	Item number
SICAM RTUs IEC 60870-5-101/104 Interoperability	DC0-013-2
SICAM RTUs IEC 60870-5-103 Interoperability	DC0-026-2
SICAM RTUs TG800 Interoperability	DC0-041-2
SICAM RTUs DNP3 Interoperability	DC0-046-2
SICAM RTUs MODBUS Interoperability	DC0-073-2
Data Sheet CM-0819	MC0-043-2
Data Sheet CM-0821	MC0-031-2
Data Sheet CM-0822	MC0-033-2
Data Sheet CM-0823	MC0-035-2
Data Sheet CM-0827	MA0-025-2
Data Sheet CM-0847	MA0-065-2
SICAM TM System Data Sheet	MC6-007-2
SICAM TM I/O Modules Manual	DC6-041-2
SICAM I/O Modules Manual	DC8-012-2
SICAM RTUs Common Functions Peripheral Elements According to IEC 60870-5-101/104	DC0-011-2
SICAM RTUs Common Functions System and Basic System Elements	DC0-015-2
SICAM RTUs • Ax 1703 Common Functions Protocol Elements	DC0-023-2
SICAM RTUs Common Functions MODBUS	DC0-088-2
SICAM RTUs Common Functions DNP3	DC0-090-2
SICAM RTUs Common Functions Printer Logging (ASCII) and SMS Alarms	DC0-096-2
SICAM RTUs Common Functions Landis & Gyr TELEGYR 800 GV-S	DC0-103-2
SICAM RTUs Common Functions ABB RP5UT1 MPT-S	DC0-105-2
SICAM A8000 Series/ RTUs / TOOLBOX II / Device Manager ADMINISTRATOR Security Manual	DC0-115-2
Folder SICAM TOOLBOX II	M30-001-5
SICAM TOOLBOX II License Catalog	D30-017-5
SICAM TOOLBOX II Online Help	D3E-019-1
CAEx *plus* Online Help	*)
SICAM Device Manager Product Information	D51-001-1
SICAM Device Manager User Manual	D51-003-1
PC Products Reference List	D95-003-1

*) available in the engineering system SICAM TOOLBOX II

Further Support

For more information, please contact our Customer Support Center:
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Notes on Safety

This manual does not constitute a complete catalog of all safety measures required for operating the equipment (module, device) in question because special operating conditions might require additional measures. However, it does contain notes that must be adhered to for your own personal safety and to avoid damage to property. These notes are highlighted with a warning triangle and different keywords indicating different degrees of danger.

Danger
means that death, serious bodily injury or considerable property damage **will** occur, if the appropriate precautionary measures are not carried out.

Warning
means that death, serious bodily injury or considerable property damage **can** occur, if the appropriate precautionary measures are not carried out.

Caution
means that minor bodily injury or property damage could occur, if the appropriate precautionary measures are not carried out.

Note
is important information about the product, the handling of the product or the respective part of the documentation, to which special attention is to be given.

Qualified Electrical Engineering Personnel

Qualified electrical engineering personnel may commission and operate the device described in this document. Qualified electrical engineering personnel in the sense of this document are people who can demonstrate up to date technical qualifications as electrical technicians including safety and first aid training. These person may commission, isolate, ground and label devices, systems and circuits according to the standards of safety engineering.

Use as Prescribed

The device may only be used for such applications as set out in the catalogs and the technical description, and only in combination with third-party equipment recommended and approved by Siemens.

Correct and safe operation of the product requires adequate transportation, storage, installation and mounting in a control cabinet, as well as appropriate use and maintenance.

During operation of electrical equipment, it is unavoidable that certain parts of this equipment will carry dangerous voltages. Severe injury or damage to property can occur if the appropriate measures are not taken:

- Before making any connections, ground the equipment and the grounding terminal.
- Hazardous voltages can be present on all switching components connected to the power supply.
- The device does not represent a safety-oriented application; it does not provide fault protection. Any fault protection must be provided by protection relays or other suitable means.
- Even after the supply voltage has been disconnected, hazardous voltages can still be present in the equipment (capacitor storage).
- LED display does not ensure that the connectors are free of voltage.
- The limit values indicated in the manual must not be exceeded; that also applies to testing and commissioning.

Danger

Consider obligatory the safety rules for the accomplishment of works at electrical plants:

1. Switch off electricity all-pole and on all sides!
2. Ensure that electricity cannot be switched on again!
3. Double check that no electrical current is flowing!
4. Discharge, ground, short circuit!
5. Cover or otherwise isolate components that are still electrically active!

Information on Conformity

The product described conforms to the regulations of the following European Directives:

- 2014/30/EU
  Directive of the European Parliament and of the Council of 26 February 2014 on the harmonization of the laws of the Member States relating to electromagnetic compatibility; Official Journal of the EU L96, 29/03/2014, p. 79–106
- 2014/35/EU
  Directive of the European Parliament and of the Council of 26 February 2014 on the harmonization of the laws of the Member States relating to the making available on the market of electrical equipment designed for use within certain voltage limits; Official Journal of the EU L96, 29/03/2014, p. 357–374
- 2014/53/EU (applies for CP-8022)
  Directive of the European Parliament and of the Council of 16 April 2014 on the harmonisation of the laws of the Member States relating to the making available on the market of radio equipment and repealing Directive 1999/5/EC; Official Journal of the EC L153, 22/05/2014, p. 62–106
- 2011/65/EU
  Directive of the European Parliament and of the Council of 8 June 2011 on the restriction of the use of certain hazardous substances in electrical and electronic equipment; Official Journal of the EU L174, 01/07/2011, p. 88–110

The conformity of the product with the regulations of the above-mentioned directives is proven through the observance of the following harmonized standards:

- EN 60870-2-1:1996 for 2014/30/EU
- EN 61010-1:2010 and EN 61010-2-201:2013 for 2014/35/EU; EN 61010-2-030:2010 (only AI-8510, AI-8511, CM-8820)
- EN 301489-1:2017, EN 301489-52:2016 and EN 301511:2017 for 2014/53/EU
- EN 50581:2012 for 2011/65/EU

This declaration certifies the conformity with the specified directives but is not an assurance of characteristics in the sense of the product liability law.

The product is intended exclusively for use in an industrial environment.

Other Standards

UL 61010-2-201 including UL 61010-1; UL 61010-2-030
CAN/CSA-C22.2 No.61010-1, CAN/CSA-C22.2 No.61010-2-030 and CAN/CSA-C22.2 No.61010-2-201

The technical data of the product is approved in accordance with UL.
For more information about the UL database, see: www.ul.com.

Select **Online Certifications Directory** and enter **E486146** or **E496940** as **UL File Number**.

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Note

The UL approvement does not apply for CP-8000.

FCC Conformity Information

This device complies with part 15 of the FCC rules and the operation is subject to the following two conditions:
(1) This device may not cause harmful interference, and
(2) This device must accept any interference received, including Interference that may cause undesired operation.

Note

Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment.

Caution

This equipment should be installed and operated with minimum distance 20 cm between the radiator and your body.

Part 15B compliance statements for digital devices:

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation.

If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

IC Conformity Information

This Class A digital apparatus complies with Canadian ICES-003.

This device complies with Industry Canada license-exempt RSS standard(s). Operation is subject to the following two conditions:
1) This device may not cause interference, and
2) This device must accept any interference, including interference that may cause undesired operation of the device.

This equipment complies with radio frequency exposure limits set forth by Industry Canada for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20 cm between the device and the user or bystanders.

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation.

If this equipment does cause harmful interference to radio or television reception n, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

Open Source Software

This product contains, among other things, Open Source Software developed by third parties. The Open Source Software used in this product and the license agreements concerning this software can be found in the Readme_OSS. These Open Source Software files are protected by copyright.

Your compliance with those license conditions will entitle you to use the Open Source Software as foreseen in the relevant license. In the event of conflicts between Siemens license conditions and the Open Source Software license conditions, the Open Source Software conditions shall prevail with respect to the Open Source Software portions of the software. The Open Source Software is licensed royalty-free.

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The Open Source Software used in this product and the license agreements concerning this software can be found on the SICAM RTUs SD card in the file *ReadmOSS.htm.*

Path for Readme_OSS: *SD card:\OSS\<Firmwarenumber>\<Revision>\ReadmOSS.htm* (e.g.: *SD card:\OSS\CPC80\01.01\ReadmOSS.htm).*

You need a SD card reader and a webbrowser to read the htm file.

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1 General Information

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1.1 The Basic Units CP-8000, CP-8021, CP-8022

CP-8000

CP-8021

CP-8022

1.1.1 High Performing

With CP-8000/CP-802*x* you can implement different applications, depending on the requirements: telecontrol applications and automation solutions. Evidently all applications can be combined with each other.

CP-8000/CP-802*x* can be deployed universally and is suitable for electrical distribution substations, gas distribution substations, hydropower plants, pipelines, railway power supplies, as well as in building protection or for alarm signaling.

Your advantages at a glance:

- Local operation via display and function keys (only CP-8000)
- Coupling of additional devices thanks to integrated node functionality
- Expandable with external I/O Modules
- Configuration, diagnostics and tests via the engineering system SICAM TOOLBOX II, alternatively via a Web server
- User-friendly through remote maintenance, remote diagnosis and remote parameterization
- Interlocking and local control in compliance with IEC 61131-3 thanks to smart user programs
- Data storage on SD card; plug-and-play for start-up and service
- Use of CP-8000/CP-802*x* under varied ambient conditions thanks to wide temperature range and extremely high degree of EMC

Note

Please consider the performance features of the systems and of its components in chapter 5, System Components and Technical Data.

1.1.2 Different Fields of Application

Due to their node functionality, CP-8000/CP-802*x* can be used in a variety of ways:

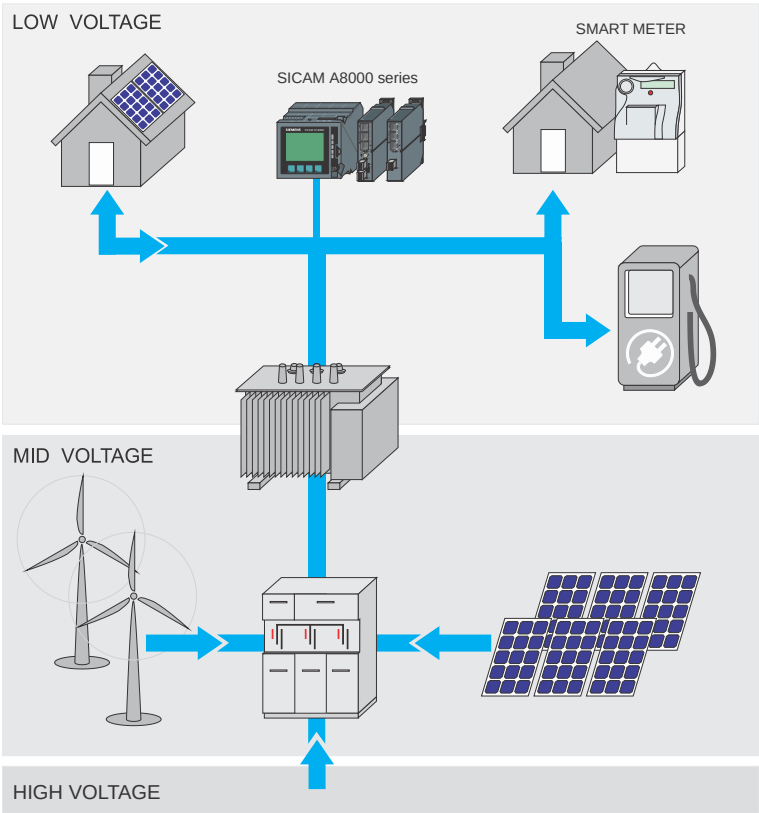
- Classical small telecontrol unit
- Remote terminal unit with manifold communication to the central station
- Automation and supervision of local network stations
- Transformer control
- Automation in the fields of gas, water and waste water

In principle, for this all necessary functionalities are available. The actual application is defined through the corresponding configuration and parameterization.

Main Field of Application: Local Network Control

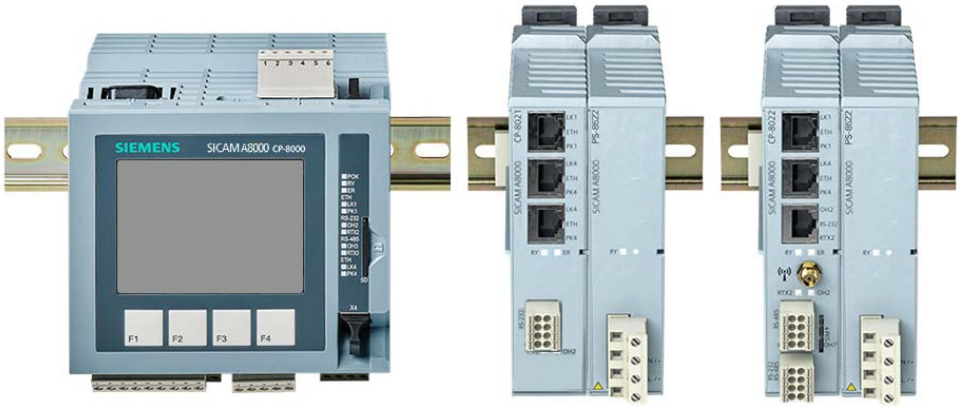
With this application, CP-8000/CP-802*x* enables a three-stage intelligence:

- Supervision
  - High availability
  - Rapid fault location
- Telecontrol
  - Minimizing downtime
- Load flow control
  - Management of distributed infeeds
  - Minimizing losses



1.1.3 Mechanical Design

The mechanical design is focused on achieving highest ease in handling. As a result, CP-8000/CP-802*x* is designated for mounting on a DIN rail (TS35).



The communication interfaces are designed according to the RJ45 standard or as removable terminals.

Process signals can be connected via removable screw terminals directly at CP-8000 or at additionally equipped I/O Modules. This efficient and simple way of interfacing permits a direct sensor/actuator wiring without requiring the use of intermediate terminals. Wherethrough the peripheral signals can be acquired very close to their point of origin; a wide cabling can be reduced to a minimum.

When the system is exchanged no connections need to be detached, since the screw terminals carry the wiring. Thereby the assembly effort required for the connection is considerably less.

With delivery, the screw terminals are plugged on the device.

1.1.4 Local Operation with CP-8000

In addition to status LEDs, CP-8000 provides function keys and a display on the front of the housing.

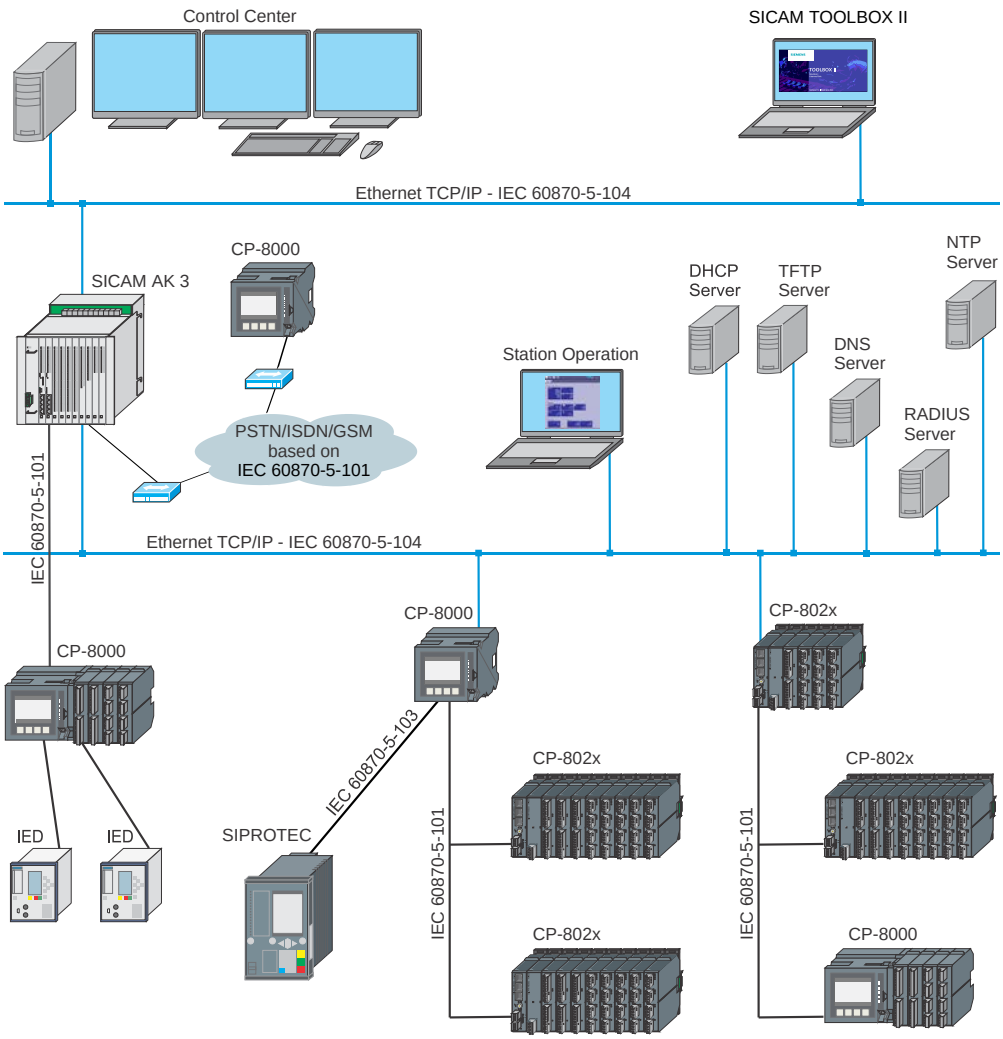
1.1.5 Versatile Communication, Integrated Node Functionality

There are several possible means of communicating with the control center:

- Multi-point communications
  You can connect external communications modules via the RS-232 or via the RS-485 interface for transmission in joint traffic. The standard protocols are freely selectable (IEC 80870-5-101, DNP 3.0, Modbus RTU). Additional protocols are available on request.
- Dial-up traffic
  Various connection-oriented transmission media are supported as standard via dial-up traffic (PSTN, ISDN, GSM, TETRA).
- LAN/WAN
  In the case of communication via LAN/WAN networks, transmission is implemented in accordance with the standards IEC 60870-5-104 or IEC 61850 or DNP(i) – based on Ethernet TCP/IP.

Further local devices can be connected in a very simple way via the further communication interfaces, in order to connect them to an entire unit.

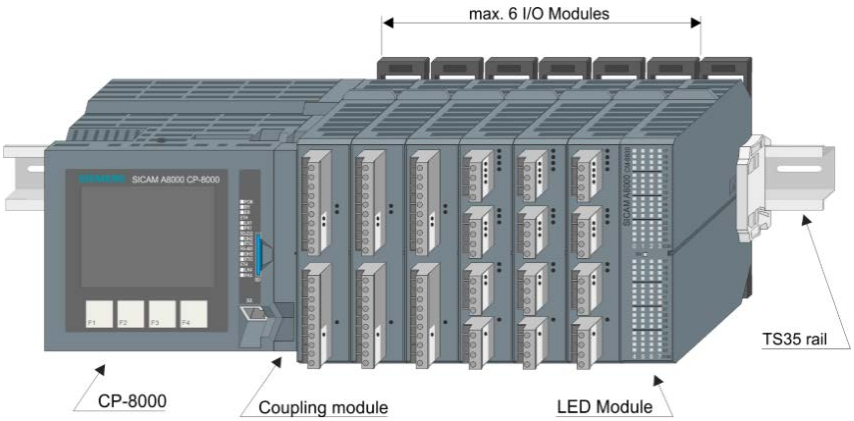
Networked Plant (Example)

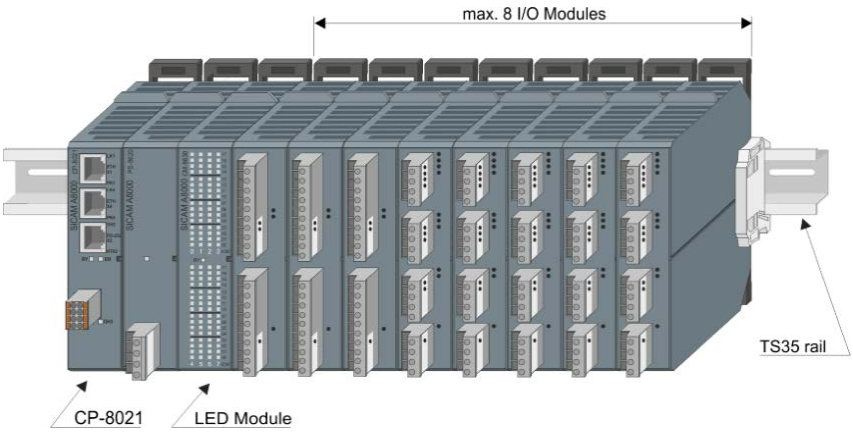


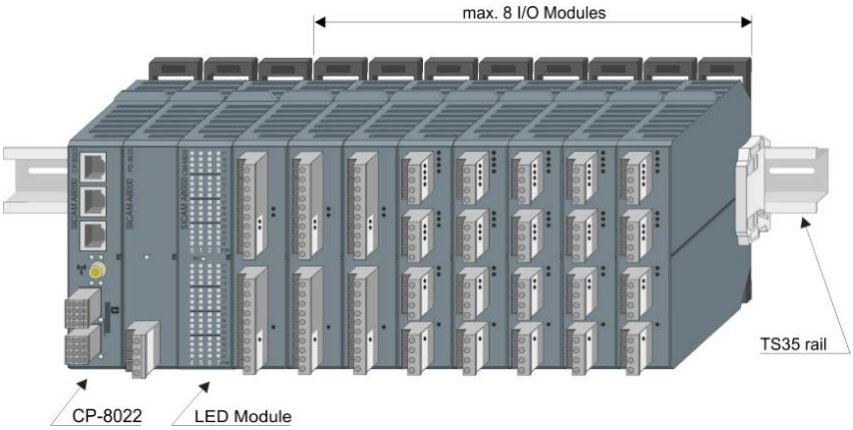
1.1.6 Expandibility

To expand the scope of substation signals, additional I/O Modules can be configured or further CP-8000/CP-802*x* can be connected via the communication interfaces.

Freely programmable user programs for local control or regulating functions round out the versatile attributes of CP-8000/CP-802*x*.







1.1.7 Data Storage on SD Card

With the engineering, all data of a device – such as firmware and parameters – are stored centrally on an exchangeable SD card in a non-volatile manner.

Upon startup of the device, all required data is checked and is - in case of differences to the device settings - automatically transferred from the SD card. The transfer only occurs in case of valid firmware and parameter signatures. Thus, when the device is exchanged with the same type, no subsequent loading process, this means, no engineering tool, will be required. The configuration is transferred directly to the replacement device (plug and play).

1.1.8 Compatibility

CP-8000/CP-802*x* is in the range of IEC 60870-5-101/103/104, when using standard protocols, compatible with the hitherto existing SICAM RTUs system family (SICAM AK, SICAM TM, SICAM EMIC, SICAM MIC, SICAM BC).

CP-8000/CP-802*x* is, when using external I/Os, compatible with the hitherto existing SICAM TM I/O Modules.

1.2 Performance Characteristics

General features	CP-8000	CP-8021	CP-8022
Maintenance-free, small compact device for mounting on DIN rail	✓	✓	✓
Local operation via function keys and display (LCD)	✓	-	-
Internal digital inputs for binary information acquisition	12	-	-
Internal digital outputs for command output	8	-	-
Expandable with external SICAM I/O Modules	6	8	8
Expandable with external SICAM TM I/O Modules	6	8	8
Combined automation and telecontrol function	✓	✓	✓
Freely programmable application programs according to IEC 61131-3	✓	✓	✓
Ethernet interfaces 10/100Base-TX with parameter-settable protocols according to IEC 60870-5-104, IEC 61850 Ed. 2 Client/Server, DNP 3 TCP/IP Slave	2 [1)]	2 [1)]	2 [1)]
Serial interfaces with parameter-settable protocols according to IEC 60870-5-101/-103, Modbus RTU, DNP 3 and others	2 [2)]	2 [2)]	3 [2) 3)]
Integrated GPRS modem	-	-	✓
Engineering, diagnosis and test via SICAM TOOLBOX II • SICAM TOOLBOX II connection via LAN/WAN (“remote connection”) • Connection via proprietary TCP/IP protocol (one SICAM TOOLBOX II session can be served at the same time)	✓	✓	✓
Integrated web server for the engineering, diagnosis and test via web browser (application SICAM WEB) • Access to the web server with standard web browser via http(s)	✓	✓	✓
Engineering via SICAM Device Manager	✓	✓	✓
Optional autoconfiguration via DHCP service	✓	✓	✓
Optional dynamic IP settings via DHCP server	✓	✓	✓
Integrated protocol SNMP	✓	✓	✓
Time synchronization via SNTP server	✓	✓	✓
Simplified maintenance operation by means of data storage on SD card	✓	✓	✓
Optional authentication via RADIUS server	✓	✓	✓
Secure password storage	✓	✓	✓
Security • BDEW White Paper conformity and integrated crypto chip • IPSec • Security Logging	✓	✓	✓
Process signal status display via LCD	✓	-	-
Function and error display via LED	✓	✓	✓

1) common or separate IP address configurable (2 MAC addresses reserved, see type label of the device)

2) 1x RS-232 and 1x RS-485

3) 1x selectable RS-232 or RS-485

1.3 System Architecture

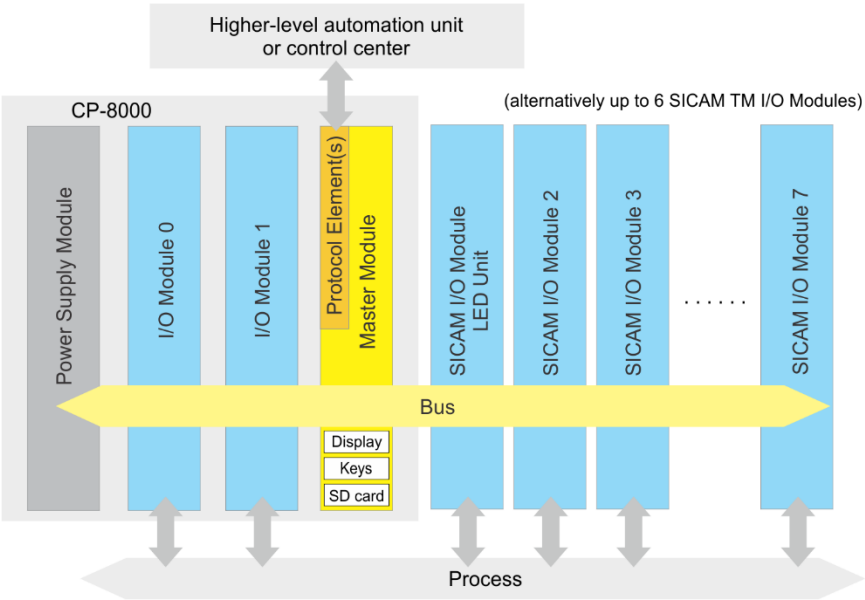
1.3.1 CP-8000

The basic system of CP-8000 consists of the following components:

- A Master Module with
  - an internal Power Supply Module
  - 2 internal I/O Modules

Based on the requirement, the basic system can be expanded:

- Up to 4 optional protocol elements for the communication with higher-level automation units or a control center (can be loaded on the Master Module)
- Up to 6 external I/O Modules for the communication with the field process
- An LED Module for the visualization of the process data of the internal I/O Modules and of the external SICAM I/O Modules



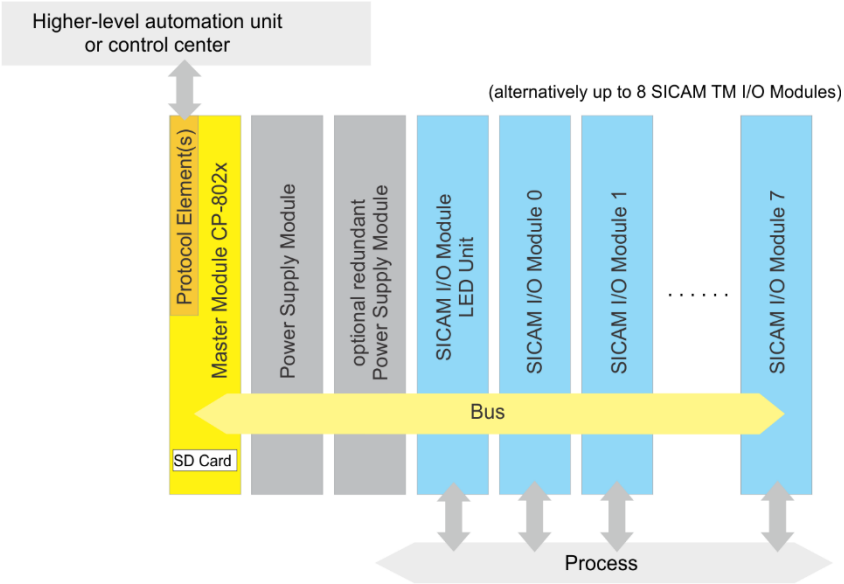
1.3.2 CP-8021 and CP-8022

The basic system of CP-802*x* consists of the following components:

- A Master Module
- An external Power Supply Module

Based on the requirement, the basic system can be expanded:

- Another external Power Supply Module (optional for redundancy reasons)
- Up to 4 optional protocol elements for the communication with higher-level automation units or a control center (can be loaded on the Master Module)
- Up to 8 external I/O Modules for the communication with the field process
- An LED Module for the visualization of the process data of the external SICAM I/O Modules



2 System Overview

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2.4 Engineering 58

2.1 Modules

2.1.1 Power Supply

2.1.1.1 CP-8000

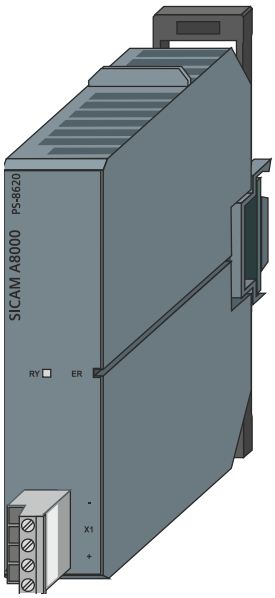
With CP-8000 the supply is carried out via an internal power supply module. This provides the operating voltage for the internal modules (Master Module and I/O Modules) and for selected transmission facilities with multi-point traffic and dial-up traffic, as well as for the external I/O Modules.

Features

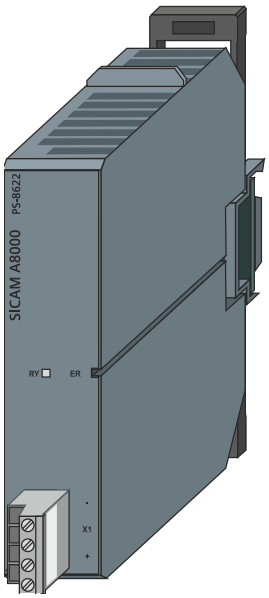
- Input voltage DC 24…60 V
- System output voltages
  - DC 5.2/10 V for internal supply and for external modem
  - DC 5.2 V for external I/O Modules
  - Wiring block for contact wetting
- Monitoring of the output voltage
- Environmental conditions with enhanced electromagnetic compatibility
- Withdrawable srew terminals
- Function display via LED

2.1.1.2 CP-8021 and CP-8022

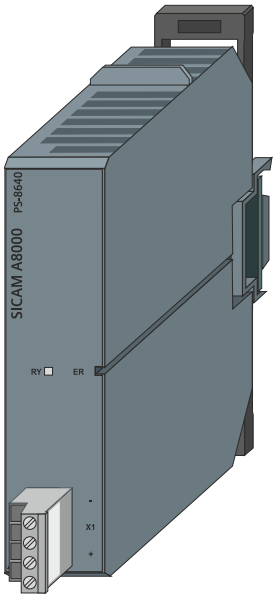
With CP-8021 and CP-8022 the power supply is carried out by the external power supply modules PS-862x and PS-864x. These provide the operating voltage for the Master Module and for selected transmission facilities with multi-point traffic and dial-up traffic, as well as for the external I/O Modules.



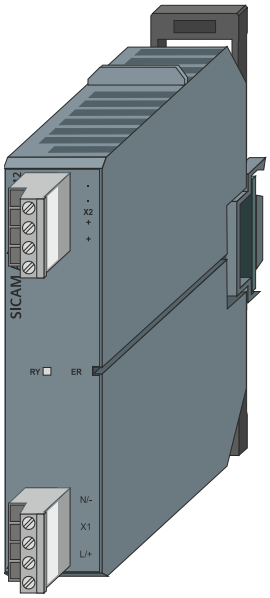
PS-8620



PS-8622



PS-8640



PS-8642

Features PS-86xx

- Different input voltages as according to the following table
  - PS-862x: DC voltage input
  - PS-864x: DC or AC voltage input
- Output voltages for system-internal use
  - DC 5 V/28 V
- Output voltages for external use (only PS-8642)
  - DC 24 V
- Monitoring of the output voltages
- Monitoring of the input voltage
- 2 redundant power supply modules possible (not for power enhancement)
- Environmental conditions with enhanced electromagnetic compatibility
- Withdrawable srew terminals
- Function display via LED

Product Overview

Type	Designation
PS-8620	Power Supply DC 24 to 60 V, 12 W
PS-8622	Power Supply DC 110 to 220 V, 12 W
PS-8640	Power Supply DC 24 to 60 V, 45 W
PS-8642	Power Supply DC or AC 100 to 240 V, 45 W

2.1.2 Master Module

The Master Module is the central processing unit. Its functionality is provided by means of a loadable and parameter-settable firmware.

The Master Module integrates the function packages for the *telecontrol function* (spontaneous processing and communication) and the *open-/closed-loop control function* (periodical processing and peripheral functions) into one common device.

Additionally, it serves as centrally coordinating element for all *system services*.

Features

- Data node functionality
- Organization of the data flow from and to the communication interfaces
  - Ethernet (TCP/IP) for LAN/WAN connections according to IEC 60870-5-104
  - RS-232 for multi-point, point-to-point or dial-up traffic according to IEC 60870-5-101 with supply for an external transmission facility
  - RS-485 for multi-point traffic
- Main focus in telecontrol
  - Parameter-settable *telecontrol function* according to IEC 61131-3
  - Parameter-settable communication protocols
  - Time management and time synchronization via SNTP (Simple Network Time Protocol)
    - Up to 4 different NTP servers (redundancy)
    - Cyclical, can be set in a seconds grid, self-adapting
  - Monitoring and simulation of process signals
- Automation
  - Freely programmable *open-/closed-loop control function*
  - Deterministic behavior of the *open-/closed-loop control function* with guaranteed reaction times and thereby time-consistent
  - Test and diagnosis of the *open-/closed-loop control function*
- Autonomous behavior (for instance in the case of communication failure)
- Logging and display of events and alarms
- Decentralized archive (DEAR) for the avoidance of data loss during communication fault
- Loadable firmware
- Storage of application data and firmware on SD card

Product Overview

Type	Designation
CP-8000	Master Module with I/O
CP-8021	Master Module
CP-8022	Master Module with GPRS
CPC80	Firmware *Central Processing and Communication*
SWEB00	Firmware *SICAM WEB*
Sicam_first_startup	Initialization tool for the detection of devices and IP address allocation
SD card	Memory card for parameters and firmware

Note

In a system of the SICAM A8000 series only 1 Master Module may be used.

2.1.3 Protocol Elements

A protocol element serves for the exchange of data – and thus for the transmission of messages – via a communication interface to other automation units or process control systems.

The hardware for the protocol elements is integrated on the Master Module, and their functionality is provided by means of loadable and parameter-settable firmwares.

Via the communication interfaces the Master Module is able to communicate with an arbitrary superior or subordinate automation unit in multi-point, point-to-point or dial-up traffic (with the aid of an external transmission facility), or via LAN/WAN.

2.1.3.1 Supported Protocols

CP-8000/CP-802*x* supports the following protocols and interfaces.

Type	Designation	Interface
Standard protocols		
103MT0	IEC 60870-5-103 Master	RS-232, RS-485
BPPT0	IEC 60870-5-101 point-to-point	RS-232, RS-422
DIAST0	Dial-up traffic Slave	RS-232
ET83	IEC 61850 Ed. 1 (Client, Server, GOOSE)	LAN
ET84	IEC 60870-5-104	LAN
ET85	IEC 61850 Ed. 2 (Client, Server, GOOSE), Ed. 1 (Client)	LAN
UMPMT0	IEC 60870-5-101 Master	RS-232, RS-485
UMPST0	IEC 60870-5-101 Slave	RS-232, RS-485
Third-party protocols		
AGPMT0	AGP coupling Master	RS-232, RS-485
BMCUT0	Benning MCU ASCII protocol	RS-232, RS-422
COUMT0	IEC 62056-21 (IEC 1107) Master	RS-232, RS-485
DNPST0	DNP3 Slave	RS-232, RS-485
DNPMT0	DNP3 Master	RS-232, RS-485
DNPiT1	DNP3 TCP/IP Slave	LAN
DNPiT2	DNP3 TCP/IP Master	LAN
MODST0	MODBUS RTU Slave	RS-232, RS-485
MODMT2	MODBUS RTU Master	RS-232, RS-485
PCBST0	SAT SK 1703 PCMBA Slave	RS-232, RS-485
RP5UT1	ABB RP570/571 Slave	RS-232, RS-485
SMST0	ASCII protocol for SMS alerting	RS-232
ST1ST0	Siemens SINAUT-ST1 Slave	RS-232, RS-485
TG8ST0	L&G Telegyr 800 Slave	RS-232, RS-485

Additional information on interfacing to third-party systems and further protocols is available on request.

2.1.4 I/O Master Module

The virtual I/O Master Module serves for the acquisition or output of process signals and performs the process-compliant adaptation, monitoring and processing of the process signals at each point of entrance or exit of the system. Its functionality is provided by means of a loadable and parameter-settable firmware.

Features

- Support of I/O Modules
  - CP-8000: 2 internal and up to 6 external I/O Modules (maximal 116 I/Os)
  - CP-802*x*: up to 8 external I/O Modules (maximal 128 I/Os)
- Acquisition and preprocessing of process data according to IEC 60870-5-101/104 with and without time tag
  - Transmission of process information to the *telecontrol function* (for further distribution) and to the *open-/closed-loop control function* (for further processing)
    - Single-point and double-point information items
    - Count pulses
    - Measured values
  - Transmission of system information (example: diagnosis data)
- Postprocessing and output of process data according to IEC 60870-5-101/104
  - Reception of process information from the *telecontrol function* and from the *open-/closed-loop control function*
    - Single-point information items
    - Single-point and double-point commands
    - Setpoint commands
  - Reception of system information (example: parameters)
- Test functions for process signals
- Secured data exchange with the I/O Modules
- Supervision of the I/O Modules and failure handling
- Status for process signals via display (CP-8000 only)
- Error display via LED

Product Overview

Type	Designation
USIO80	Firmware *Universal Signal Input and Output* for the connection of SICAM TM I/O Modules
USIO81	Firmware *Universal Signal Input and Output* for the connection of SICAM I/O Modules

2.1.5 I/O Modules

The I/O Modules support the I/O Master Module with the input and output of process data.

The I/O Modules communicate with the Master Module via an internal bus. This bus transports data of different classes:

- Spontaneous data for the spontaneous *telecontrol function* including communication
  - Process information and system information transmitted acknowledged between the Master Module and the I/O Modules within the acquisition and output grid
- Periodical data for the function package *Automation*
  - Information transmitted between the Master Module and the I/O Modules in the cycle of the *open-/closed-loop control function*
- I/O process data
  - I/O process status and I/O process errors transmitted from the SICAM I/O Modules to the LED Module

Features

- Acquisition of process signals and preprocessing by means of hardware
  - Binary inputs
  - Analog inputs (current, voltage, temperature)
- Output of process signals and postprocessing by means of hardware
  - Binary outputs
  - Analog outputs (current and voltage)
- Visualization of I/O process data via the LED Module in a SICAM I/O Module row without any additional tool

Types and Field of Operation

	CP-8000	**CP-8021**	**CP-8022**
System-internal I/O Modules	2	-	-
External SICAM I/O Modules	max. 6 [1)]	max. 8	max. 8
External SICAM TM I/O Modules	max. 6 [2)]	max. 8 [3)]	max. 8 [3)]

1) connectable via coupling module CM-8811

2) connectable via coupling module CM-6811

3) connectable via coupling module CM-6812

2.1.5.1 Internal I/O Modules

Internal I/O Modules are available only with CP-8000. They are fixed integrated.

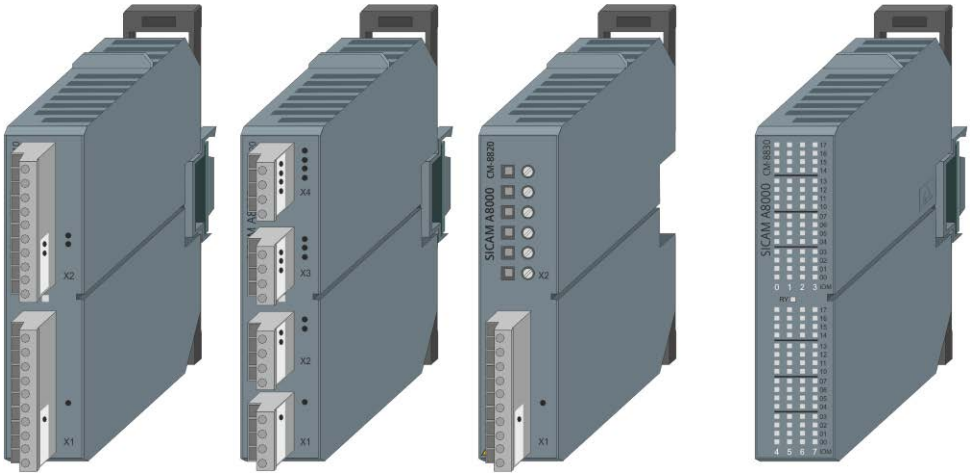
Product Overview

Type	**Designation**
DI-8100	Binary Input 12x DC 24 to 60 V, 1 ms
DO-8203	Binary Output Relays 8x DC 24 to 220 V/AC 230 V

2.1.5.2 External SICAM I/O Modules

The external SICAM I/O Modules can be used with all products of the SICAM A8000 series:

- With CP-8000, up to 6 external SICAM I/O Modules can be used, thereby the additional coupling module CM-8811 is required
- With CP-8021 and CP-8022, up to 8 external SICAM I/O Modules can be used



SICAM I/O Modules (type overview), LED Module

Product Overview

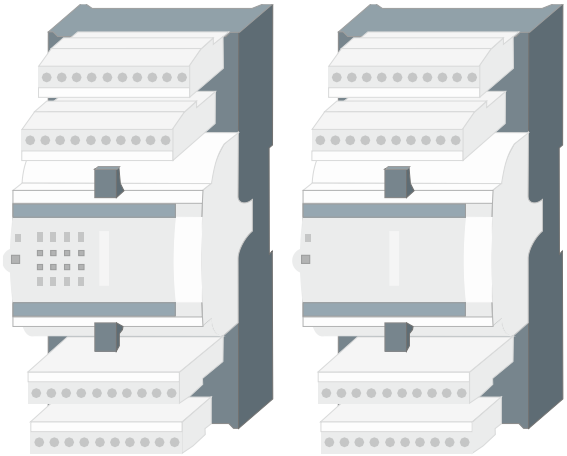
Type	Designation	Max. power
DI-8110	Digital Input 2x8 DC 24 V	130 mW
DI-8111	Digital Input 2x8 DC 48/60 V	130 mW
DI-8112	Digital Input 2x8 DC 110 V	130 mW
DI-8113	Digital Input 2x8 DC 220 V	130 mW
DO-8212	Digital Output Relays 8x DC 24 to 220 V/AC 230 V	800 mW
AI-8310	Analog Input 2x2 Pt100/Pt1000	500 mW
AI-8320	Analog Input 4x ±20 mA/±10 V	180 mW
AI-8510	Analog Input 3x U (240 V), 3x I (LoPo)	800 mW
AI-8511	Analog Input 3x U (LoPo), 3x I (LoPo)	800 mW
AO-8380	Analog Output 4x ±20 mA/±10 V	2200 mW
CM-8811	Coupling Module for SICAM I/O Modules (only for CP-8000)	–
CM-8812 *)	Bus Connector for SICAM I/O Modules	–
CM-8820	CT-Adapter 3x I 1 A_5 A/225 mV (only for AI-8510)	–
CM-8830	SICAM I/O Module LED Unit	500 mW

*) supplied with each I/O Module

2.1.5.3 External SICAM TM I/O Modules

If needed, also external SICAM TM I/O Modules can be used. Thereby, a 2-line arrangement is possible with the TM I/O Modules extension cable CM-6810. You will find further information in the manual *SICAM RTUs SICAM TM I/O Modules*.

- With CP-8000, up to 6 external SICAM TM I/O Modules can be used, thereby the additional coupling module CM-6811 is required
- With CP-8021 and CP-8022, up to 8 external SICAM TM I/O Modules can be used, thereby the additional coupling module CM-6812 is required



SICAM TM I/O Modules (type overview)

Product Overview

Type	Designation	Max. power
DI-6100	Digital Input 2x8 DC 24 to 60 V	170 mW
DI-6101	Digital Input 2x8 DC 110/220 V	170 mW
DI-6102	Digital Input 2x8 DC 24 to 60 V, 1 ms	170 mW
DI-6103	Digital Input 2x8 DC 110/220 V, 1 ms	170 mW
DI-6104	Digital Input 2x8 DC 220 V	170 mW
DO-6200	Digital Output Transistor 2x8 DC 24 to 60 V	600 mW
DO-6212	Digital Output Relays 8x DC 24 to 220 V / AC 230 V	800 mW
DO-6220	Checked Command Out Basic Module	560 mW
DO-6221	Checked Command Out Basic Module Measurement	1380 mW
DO-6230	Checked Command Output Relay Module	130 mW
AI-6300	Analog Input 2x2 ±20 mA/±10 V	480 mW
AI-6307	Analog Input 2x2 ±2.5 mA/±5 mA/±10 V	480 mW
AI-6308	Analog Input 2x2 ±1 mA/±2 mA/±10 V	480 mW
AI-6310	Analog Input 2x2 Pt100/Ni100	480 mW
AO-6380	Analog Output 4x ±20 mA/±10 mA/±10 V	1900 mW
TE-6430	Counter Input 2x DC 24 to 60 V (only existing plants)	600 mW
CM-6810	TM I/O Modules Extension Cable	–
CM-6811	Coupling Module for SICAM TM I/O Modules (only for CP-8000)	–
CM-6812	Coupling Module for SICAM TM I/O Modules (only for CP-802*x*)	–

2.1.5.4 Configuration Rules for I/O Modules

If you use external I/O Modules, pay attention to the following rules.

General

- The total power of the external I/O Modules must not exceed the following values:
  - CP-8000: 5 W
  - CP-802*x*: 7 W (PS-862*x*), 8 W (PS-864*x*)

  (when using the fiberoptical interface CM-0847, available with < 1 W)
- The total power consumption of all modules (including supplied data transmission facility) must not exceed the power provided by the Power Supply Module.
- I/O Modules with a power consumption > 800 mW must be mounted directly to the right of the Power Supply Module (or directly right of CP-8000).
- When using the LED Module for a SICAM A8000 I/O row, the module can be mounted at any position on the right side from the Power Supply Module.
  The LED Module can also be mounted before the I/O module which is having a power consumption > 800 mW.
- The combination of current and voltage on a single AI-8320 (AI-630*x*) is not possible.
- The combination of binary information and pulse commands on a single DO module is not possible, except with usage of the categories DO_SX and DO_DX (for details, refer to the manual *SICAM RTUs Common Functions Peripheral Elements According to IEC 60870-5-101/104, chapter "Binary Information and Command Output"*).
  Following cases explain the mixing of binary information and pulse commands on a single DO-820*x* or DO-821*x* (DO-621*x*):
  - Mixing of DO_SX, DO_DX, DO_SC_1.5POL and DO_DC_1.5POL possible
  - Mixing of DO_SC_1POL and DO_DC_1POL possible
  - Mixing of DO_SC_2POL and DO_DC_2POL possible
  - Mixing of DO_SX and/or DO_DX with DO_SC_1POL and/or DO_DC_1POL not possible
- For current measurement of each AI-8510, a CM-8820 must be used; CM-8820 must be always mounted at the end of an I/O row or at a separate I/O row.

Option “Assignment of Return Information to Pulse Command”

- With the parameter-settable assignment the sequence of DI modules and DO modules is arbitrary
- With the fixed assignment respectively after a DI-811*x* (DI-610*x*) a DO-821*x* (DO-62*xx*) must be equipped

For further details refer to section 9.1.11.5.6, Assignment Return Information to Pulse Command.

Option “Checked Command Output” (applies only for SICAM TM I/O Modules)

- Only 1 Command Output Basic Module may be connected, alternatively
  - DO-6220, command output according to *IC1*
  - DO-6221, command output according to *RC1*
- The command output via DO-6220 or DO-6221 without a DO-6230 is not possible
- Up to 7 Command Output Relay Modules DO-6230 may be connected
- The command output via DO-6230 without a DO-6220 or DO-6221 is not possible
- On a DO-6230 either 1-, or 1.5- or 2-pole impulse commands can be assigned (mixture on the same module is not permitted)
- Additionally, further DO module types can be used

For further details refer to section 9.1.11.5.7, Checked Command Output.

2.2 Communication

2.2.1 Interfaces

For a multitude of communication possibilities CP-8000/CP-802*x* provides the following interfaces:

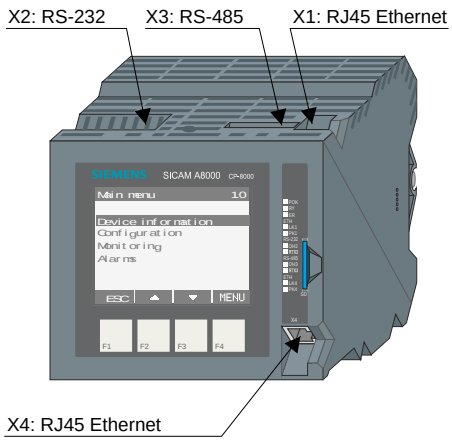
- 2 Ethernet TCP/IP interfaces LAN/WAN (X1 and X4)
  both Ethernet interfaces have optionally one common IP address or two independent IP addresses (2 separate MAC addresses
- 1 serial interface according to standard RS-232 (X2)
- 1 serial interface according to standard RS-485 (X3)

CP-8022 provides moreover

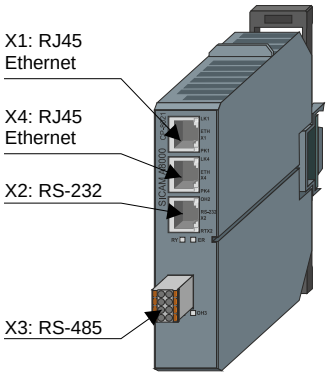
- 1 serial interface configurable for standard RS-232 or RS-485 (X6)
- 1 GPRS antenna connection for integrated GPRS modem (X7)

All interfaces can be operated simultaneously.

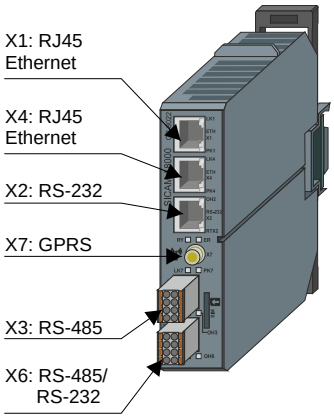
CP-8000



CP-8021



CP-8022



The protocols are available via the respective interfaces at the Master Module.

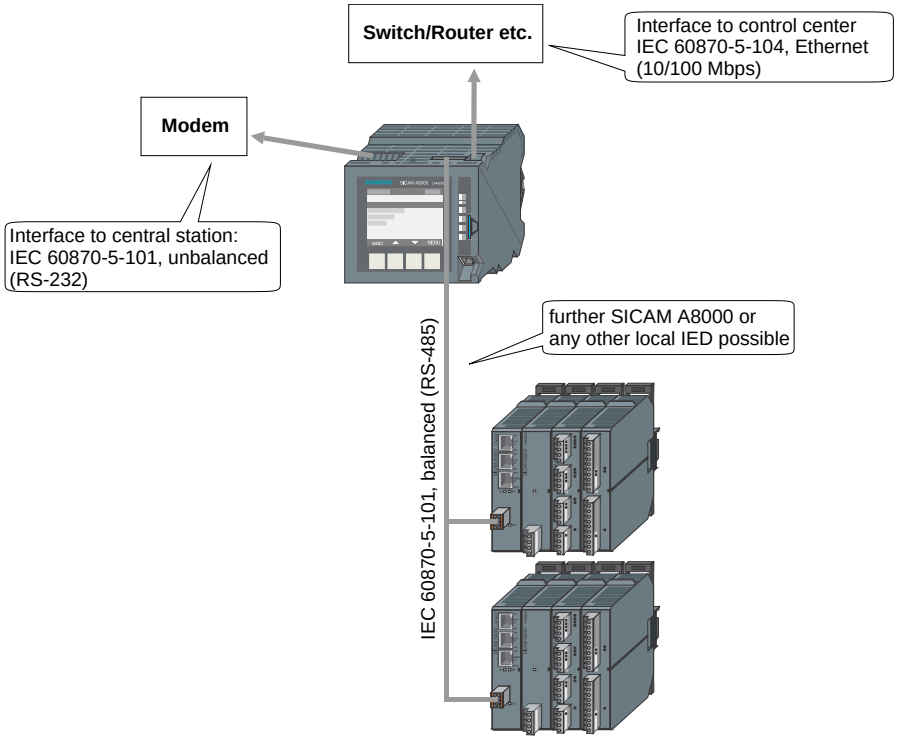
Firmware	Protocol name	CP-8000, CP-8021			CP-8022			
		LAN	RS-232	RS-485	LAN	RS-232	RS-485	GPRS
Integrated standard protocols								
CPC80	Remote operation	X1, X4	X2		X1, X4	X2		X7
CPC80	SNMP	X1, X4			X1, X4			X7
CPC80	SysLog client	X1, X4			X1, X4			X7
CPC80	NTP/SNTP	X1, X4			X1, X4			X7
CPC80	RADIUS	X1, X4			X1, X4			X7
Equipable standard protocols								
103MT0	IEC 60870-5-103 Master		X2	X3		X2, X6	X3, X6	
BPPT0	IEC 60870-5-101 point-to-point		X2	3)		X2, X6	3)	
DIAST0	Dial-up traffic Slave		X2			X2, X6		
ET83	IEC 61850 Ed. 1 (Client, Server, GOOSE) 1)	X1, X4			X1, X4			
ET84	IEC 60870-5-104 2)	X1, X4			X1, X4			X7
ET85	IEC 61850 Ed. 2 (Client, Server, GOOSE), Ed. 1 (Client)	X1, X4			X1, X4			
UMPMT0	IEC 60870-5-101 Master		X2	X3		X2, X6	X3, X6	
UMPST0	IEC 60870-5-101 Slave		X2	X3		X2, X6	X3, X6	
Equipable third-party protocols								
AGPMT0	AGP interfacing Master		X2	X3		X2, X6	X3, X6	
BMCUT0	Benning MCU ASCII protocol		X2	3)		X2, X6	3), X6	
COUMT0	IEC 62056-21 (IEC 1107) Master		X2	X3		X2, X6	X3, X6	
DNPST0	DNP3 Slave		X2	X3		X2, X6	X3, X6	
DNPMT0	DNP3 Master		X2	X3		X2, X6	X3, X6	
DNPiT1	DNP3 TCP/IP Slave	X1, X4			X1, X4			
DNPiT2	DNP3 TCP/IP Master	X1, X4			X1, X4			
MODST0	MODBUS RTU Slave		X2	X3		X2, X6	X3, X6	
MODMT2	MODBUS RTU Master		X2	X3		X2, X6	X3, X6	
PCBST0	SAT SK 1703 PCMBA Slave		X2	X3		X2, X6	X3, X6	
RP5UT1	ABB RP570/571 Slave		X2	X3		X2, X6	X3, X6	
SMST0	ASCII protocol for SMS alerting		X2			X2, X6		
ST1ST0	Siemens SINAUT-ST1 Slave		X2	X3		X2, X6	X3, X6	
TG8ST0	L&G Telegyr 800 Slave		X2	X3		X2, X6	X3, X6	

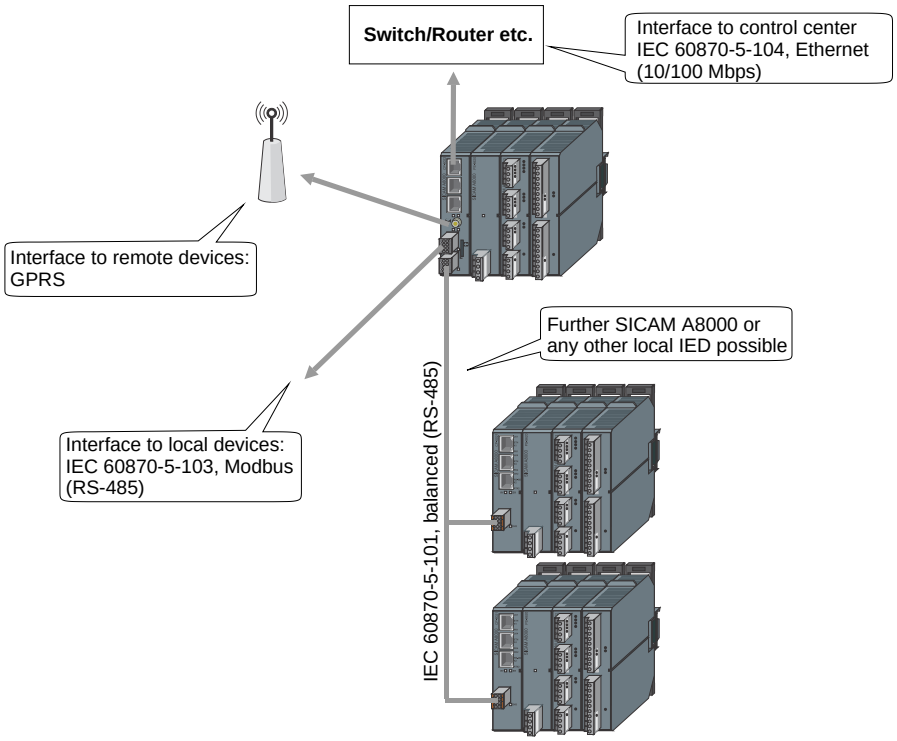
1) only if Server Ed. 1 is required, else is ET85 to be used

2) GPRS communication possible via X1, X4 and external GPRS modem

3) X3 in RS-422 mode

2.2.2 Configuration Examples





2.2.3 Transmission Facilities

CP-8000/CP-802*x* supports the following transmission facilities.

Connection	Transmission facility	Protocol
Multi-point traffic Point-to-point traffic (serial)	CE-0700 V.23 Leased line modem [1]	PCBST0, RP5UT1, ST1ST0, TG8ST0, UMPMT0, UMPST0
	CE-0701 VFT Channel modem [1]	PCBST0, RP5UT1, ST1ST0, TG8ST0, UMPMT0, UMPST0
	CM-0819 converter RS-232/RS-485 (galvanically insulated)	103MT0, DNPST0, MODMT2, ST1ST0, TG8ST0, UMPMT0
	CM-0821 field bus interface ring (3x FO, 1x electrical)	103MT0, DNPST0, MODMT2, MODST0, UMPMT0, UMPST0
	CM-0822 field bus interface star (4x FO)	103MT0, MODMT2, MODST0, UMPMT0, UMPST0
	CM-0823 field bus interface ring (3x FO, 1x RS-485)	103MT0, MODMT2, MODST0, UMPMT0, UMPST0
	CM-0829 converter RS-232/RS-422;-485	MODST0, PCBST0, RP5UT1
	CM-0847 (CM-0827) fiberoptical interface (electrical-FO) [2]	103MT0, DNPST0, MODMT2, MODST0, UMPMT0, UMPST0
	Siemens 7XV5450 Mini star coupler	103MT0, UMPMT0, UMPST0
	Siemens 7XV5652 RS-232/LWL converter	103MT0, UMPMT0, UMPST0
	PHOENIX PSM-ME-RS232/RS485-P	103MT0, UMPMT0, UMPST0, MODMT2, MODST0, BPPT0
	Westermo TD-23 (analog) [3]	UMPMT0, UMPST0
	SATELLINE 2ASxE	PCBST0, ST1ST0, TG8ST0, UMPMT0
	TP Radio WDM 8000	UMPST0
	Radio digital	PCBST0, ST1ST0, TG8ST0, UMPMT0, UMPST0
	Radio analog	PCBST0, ST1ST0, TG8ST0, UMPMT0, UMPST0,
	Direct connection RS-232	103MT0, BPPT0, DNPMT0, DNPST0, MODMT2, MODST0, PCBST0, RP5UT1, ST1ST0, TG8ST0, UMPMT0, UMPST0,
	Direct connection RS-485	DNPMT0, DNPST0, MODMT2, ST1ST0, UMPMT0, UMPST0
Dial-up traffic (serial)	Westermo TD-36 / TDW-33 (analog)	DIAST0
	Westermo IDW-90 (ISDN)	DIAST0
	Westermo GDW-11 (GSM)	DIAST0
	Cinterion MC52iT (dualband GSM) [4]	DIAST0
SMS	MC Technologies MC55iw Terminal	SMST0
GPRS	integrated GPRS modem (CP-8022)	ET84
	Siemens SCALANCE M874-2	ET84
	Siemens MD741-1 [4]	ET84
	Dr. Neuhaus Tainy EMOD-V2-IO	ET84
	Dr. Neuhaus Tainy EMOD-L1-IO [5]	ET84
	Welotech TK701G / TK704G	ET84
Ethernet		ET84, ET85

[1] supply 5 V via modem cable for CE-070x
[2] supply 5 V via RS-232 interface (in case of CP-8022 as of production level CC)
[3] provides RS-232 and RS-485 interface
[4] transmission of SMS possible
[5] without IPsec VPN tunnel

2.3 Firmware Structure and Data Flow

The basis for CP-8000/CP-802*x* is a modular, open, and thus non-technology-dependent system architecture for processing, communication, and peripherals (single-processor system, firmware).

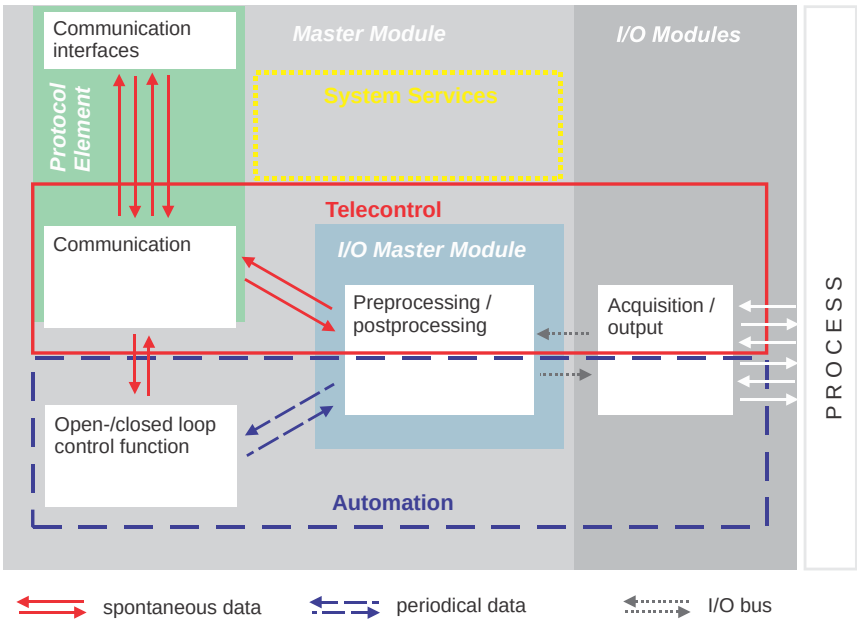
The adaptation to the specific needs of the application is accomplished by relying on an individual hardware configuration and by loading standard firmware and parameters. The parameters influence, within their defined limits, not only the behavior of the firmware functions, but also that of the hardware functions. As a result, mechanical parameterizations such as the changing of jumpers or loads are no longer necessary on any of the module types. This permits not only online reconfiguration but also the gapless documentation of set parameters by the engineering system, as well as simplified inventory management.

Due to the different requirements in terms of functionality, also different data flow concepts are produced:

- Telecontrol
  For telecontrol tasks and the distribution of user data in networked plants, the use of spontaneous transmission proves advantageous for optimizing the utilization of the in many cases limited communication bandwidth. This helps avoid constant burdening of the data sinks with unnecessary data.
- Automation
  For the implementation of a freely definable *open-/closed-loop control function* a deterministic guaranteed reaction time is needed. This is achieved by using the consistently periodic concept with regard to data acquisition, execution of functions, and data transfer, regardless of the number of changing signals.

As interface to the process serve the integrated I/O Modules. The input/output and processing of the process signals is performed by means of the I/O Master Module.

Internal Data Flow



2.4 Engineering

Engineering, diagnosis and test of CP-8000/CP-802*x* takes place alternatively via

- SICAM TOOLBOX II (as of Version 6.01)
- SICAM WEB
- SICAM Device Manager

2.4.1 SICAM TOOLBOX II

The integrated engineering system SICAM TOOLBOX II comprises all stages of plant configuration and maintenance, this means data collection, configuring, parameter setting, expanding, changing, testing, system diagnosis, and documentation.

The introduction of object orientation allows project engineers to describe real units and pieces of equipment in the configuration process (circuit breakers, feeders, etc.). Project engineers can take advantage of these structural advantages especially in cases where systems are constituted of a plurality of primary units and pieces of equipment of equal type (for example a transformer substation). This yields enormous streamlining effects for the engineering process.

The SICAM TOOLBOX II stores all information in one central database. Once a piece of information has been entered, it will immediately and always be available in its latest updated form to all tools of the SICAM TOOLBOX II and to all people working on a project.

This reaches from stand-alone terminal solutions all the way to complex network solutions. In networks, several engineers may work on one or more projects at the same time. Whether on a standalone terminal or in a network, always the same SICAM TOOLBOX II is used.

Implementation of Application Programs

When configuring via the SICAM TOOLBOX II, application programs (*open-/closed-loop control function*) can be created as function diagram (FUD) with the tool CAEx *plus*. Optionally, also an existing instruction list can be imported into the SICAM TOOLBOX II.

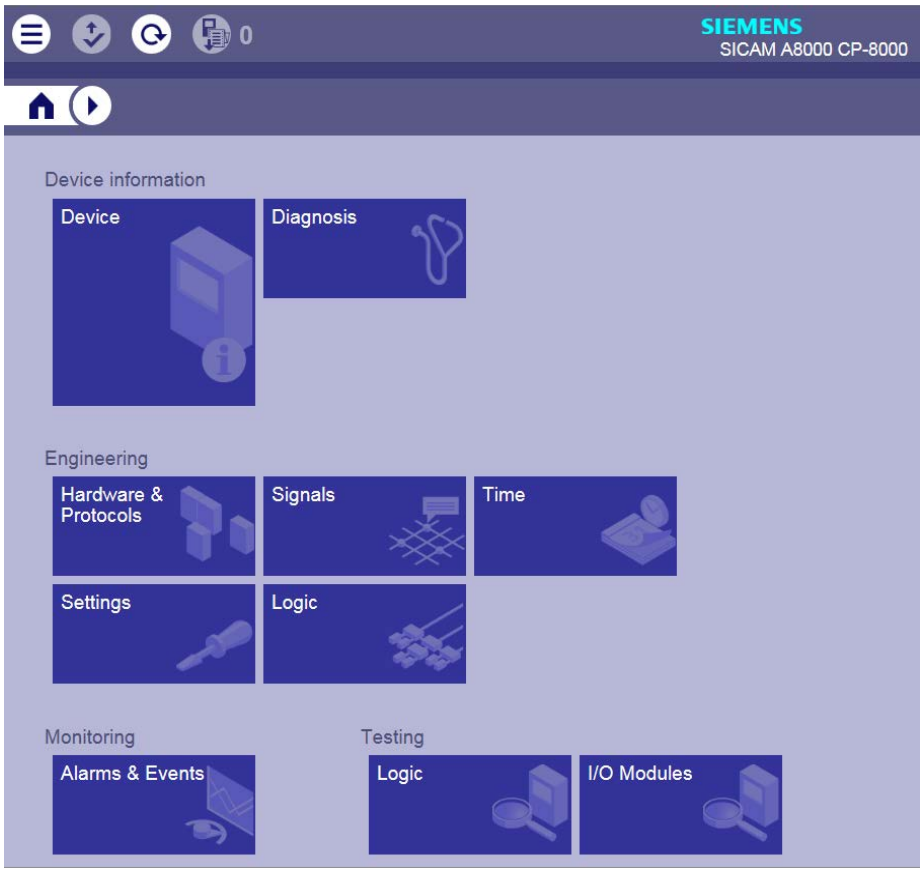
In view of its conformity with IEC 61131-3, CAEx *plus* grants the user access to a well-established and generally acknowledged standard. This helps shorten staff training times considerably.

By means of the available standard-conformal module libraries and standard-conformal data types, the engineering becomes more transparent and is possible with high application quality.

2.4.2 SICAM WEB for Simple Applications

A top priority was also a simplified engineering possibility.

For the configuration, diagnosis and testing, CP-8000/CP-802*x* provides an integrated web server that is operated with a standard web browser. By means of that, no special tools or additional licenses are needed.



When configuring via web browser, there are some restrictions in the engineering options. You can find more details thereto in the following section.

Implementation of Application Programs

Simple application programs can be created with an ASCII text editor as instruction list (IL), based on the standard IEC 61131-3. Via the web browser, the instruction list can be uploaded into the automation unit for execution.

2.4.3 Differences with the Engineering Tools

	SICAM TOOLBOX II	**SICAM WEB**
License required	✓	–
Interfacing	• Directly via RS-232 • Remotely via Toolbox cable and further SICAM RTUs automation units • Via Ethernet	• Directly via RS-232 • Via Ethernet
Addressing	Via region, component	Via IP address
Engineering mode	Offline, subsequently transform parameters and load into target system	Online in the target system
Remote maintenance	✓	–
HW configuration	I/O Modules must be configured in the OPM II after configuring the I/O Master Module	I/O Modules will be “learnt” automatically after configuration of the I/O Master Module and restart
Process-technical parameterization	• Images can be created for the instancing of object types • Bulk edit for the values of the images possible	• Process signals are configured individually per hardware I/O • No automatic protocol parameterization
Application program	Based on IEC 61131-3, with restrictions (memory) • Function chart via CAEx *plus* • Instruction list	Based on IEC 61131-3, with restrictions (memory) • Instruction list
Test functions for Telecontrol	• Data flow test • Topology test • I/O test	I/O test (with restrictions)
Test of application program	• Online test • Offline simulation	Online test (with restrictions)
Diagnosis	✓	With restrictions
Sum diagnosis information	✓	Via instruction list Via SNMP traps
Read Security Logbook		✓
Extras		Program *Sicam_first_startup* (find all CP-8000/CP-802*x* devices in a network and preset IP addresses)

3 Function Packages

Contents

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3.2 Telecontrol 69
3.3 Automation 74

3.1 System Services

The function package *System Services* provides general functions and basic services that are required by other function packages. It contains

- IPSec VPN
- Security Logging
- Communication with the engineering system
- Integrated webserver
- Data flow control
- Addressing
- Real-time concept
- General interrogation
- Monitoring functions
- Failure management
- Diagnostics and signaling
- Autonomy
- Storage of application data
- Storage of firmware

3.1.1 IPSec VPN

IPSec VPN (Internet Protocol Security – Virtual Private Network) is an extension of the Internet Protocol (IP) for encryption and authentication mechanisms. IPSec VPN actively establishes a VPN tunnel (initiator), which guarantees the required confidentiality, authenticity and integrity of data transmission in IP networks. The termination of the IPSec VPN tunnel takes place in a router. CP-8000/CP-802*x* supports 2 IPSec VPN tunnels.

Thus, it is e.g. possible, to completely secure the IEC 60870-104 communication between CP-8000/CP-802*x* and a higher-level control center, even if the connection is running over a public network.

CP-8000/CP-802*x* uses the IKE protocol (Internet Key Exchange) and the PSK authentification process (Pre-Shared Key). The used pre-shared key can be set by means of the engineering tool (e.g. SICAM TOOLBOX II) and is securely stored in SICAM TOOLBOX II and in CP-8000/CP-802*x*.

3.1.2 Security Logging

CP-8000/CP-802*x* provides a security logbook which acquires security-relevant events and transmits it by means of a SysLog client to a SysLog server. One automation unit (AU) can operate several SysLog clients (up to 20).

3.1.3 Communication with the Engineering System (SICAM TOOLBOX II)

For the communication between the SICAM TOOLBOX II and CP-8000/CP-802*x* exist different variants:

- Physical connection
  - Locally by means of a direct cable (RS-232 interface)
  - Remotely
    - Serial communication link via modems (RS-232 or RS-485 interface)
    - Ethernet connection (TCP/IP) and Terminal Server (RS-232 interface)
    - Ethernet connection (TCP/IP)
- Logical connection of the SICAM TOOLBOX II with that automation unit, that is the subject of the engineering task:
  - Local automation unit
    (that is that one, to which the physical connection exists, regardless in which of the previously mentioned forms)
  - Remote automation unit
    (automation unit that can be reached via the local automation unit; consistent remote communication according to IEC 60870-5-101 or -104 is required)

Except for first-time initialization processes, all tasks are possible in each of the variants listed above:

- Parameter setting
- Diagnostics
- Test
- Load firmware, load parameters

3.1.4 Simplified Engineering via SICAM WEB

For simple engineering tasks a webserver resides on the Master Module. The webserver provides the menus for the engineering and maintenance designed as websites. The engineering takes place online via a standard web browser.

The following functions are supported:

- Configuration of I/O Master Module and protocol elements
- System-technical parameter-setting
- Process display, process simulation
- Diagnosis
- Event list, alarm list
- Read Security Logbook
- Load backup file, save backup file
- Application program handling (IL)
  - Configuration
  - Load code
  - Diagnosis
  - Online test

3.1.5 Data Flow Control

The data flow control is that system function which coordinates the communication of messages within the automation unit.

This function supports:

- *Messages with Process Information*
- *Messages with System Information*

For the tracking of messages within an automation unit the following test functions are available:

- Data Flow Test
- Message Simulation

3.1.5.1 Messages with Process Information

IEC 60870-5 distinguishes between the following classes of messages. The type identification of each message provides information about the class to which a message belongs and with which methods it is to be distributed:

- *Messages with process information* in monitor direction
  - binary information, measured values, integrated totals and bit patterns
- *Messages with process information* in control direction
  - commands, setpoint values and bit patterns

The distribution of *messages with process information* takes place by way of routing (*telecontrol function*) or assignment (*open/closed-loop control function*) based on the message address and type identification in the message.

Messages with process information, that are to be transmitted to other automation units via protocol elements, are distributed with the help of the function Automatic Data Flow Routing.

For *messages with process information* that are to reach sinks within the automation unit (I/O Modules, *open-/closed-loop control function*) the routing information or as-signments are automatically derived from parameters (datapoint address).

Predominantly used are message formats according to IEC 60870-5-101/104 in the public range with the exception of user data containers. Therefore, for their part the messages are compatible and interoperable with many other manufacturers.

Messages with process information have a 5-stage message address. Message addresses must be parameterized at the sources (I/O Modules, *open-/closed-loop control function*).

3.1.6 Addressing

3.1.6.1 Addressing of Automation Units

Each device CP-8000/CP-802*x* forms an automation unit and is addressed with

- Region number (0…249)
- Component number (0…255)

Within a system-technical plant, the automation unit must be uniquely addressed, which makes the maximum size of a system-technical plant 64000 automation units.

3.1.6.2 Addressing of Process Information

Addressing and the structure of the process information to be passed on by CP-8000/CP-802*x* are consistent with the IEC 60870-5-101/104 standard. Therefore, the information is in turn compatible and interoperable with many other vendors.

In the automation network, each data point is addressed by means of

CASDU 1……Common address of ASDU, octet 1
CASDU 2……Common address of ASDU, octet 2
IOA 1……Information object address, octet 1
IOA 2……Information object address, octet 2
IOA 3……Information object address, octet 3
TI……..Type identification

3.1.7 Time Management

3.1.7.1 Clock

Generally, CP-8000/CP-802*x* supports automatical time tagging for all data. On the Master Module resides the central clock of the automation unit.

Time tagging takes place automatically at each point in the system where spontaneous data originates. Data is transferred priority-controlled, in standard protocols with 7 octet date and time with resolution of 1 ms.

3.1.7.2 Time Setting and Synchronization

For time setting and synchronization, the following possibilities are available:

- Time setting and synchronization via serial communication
- Time setting and synchronization via LAN/WAN (NTP)

NTP/SNTP Client

Up to 4 different NTP servers can be parameterized for the time setting. The time for the synchronization is determined via a defined algorithm from the received times of the NTP servers.

Integrated NTP Server

With the integrated NTP server time can be provided to further devices via LAN communication lines.

3.1.8 General Interrogation

During startup and after errors in the system (communication errors, FIFO overflow events), the automation units involved ensure that operations are resumed automatically in a coordinated manner.

This means that the communication connection is established and all data concerned as well as relevant system information are transferred from their source all the way to their sink, in order to update the process images throughout the system (taking a multi-hierarchical network into account). This is done by prompting a general interrogation of the respective portion of the automation network where the error has occurred.

3.1.9 Monitoring Functions

Monitoring of an automation unit

- Functionality of the processor and of the memories (periodical test of the program, data, and parameter memories, as well as watchdog function)
- Internal communication capability (periodical internal test messages with monitoring function)
- Data integrity (internally secured data transmission with parity, plausibility check at the internal interfaces, identification of data of failing modules)
- Information loss due to a buffer overflow
- Correctness of internal workflow sequences

Monitoring of system environment

- Plausibility of process states
- Plausibility of process sequences
- Availability of process circuits

Monitoring of communication

- Functionality (periodical call messages with monitoring function, monitoring of transmission quality)
- Data integrity (secured transmission, identification through failure of data concerned)

3.1.10 Failure Management

The failure management system concept implemented in CP-8000/CP-802*x* ensures the individual identification of data of failing system components and the correct system and process behavior in disturbance events. For this purpose, the failure management function includes

- a system function for failure detection (for instance for modules, communication)
- derived therefrom a system signaling in the form of status information in spontaneous messages and in the form of special data points for the *open-/closed loop control function*
- a parameter-settable behavior of I/O Master Modules with output function.

This way, the state for each process information is available at all data sinks (peripheral outputs, *open-/closed-loop control function*, process control system), and it is possible - depending on the requirement and functionality - to elicit an appropriate counterreaction therefrom.

3.1.11 Diagnostics and Signaling

The diagnostics function manages the system states and error information detected by the various functions and their watchdogs. It permits the indication of the internal system and error information, and of the process states by means of the engineering tool.

System and error states are filed in tables as current and saved information. This information can be displayed in detail locally and from remote locations. The saved information can be acknowledged and can therefore be updated again. For the sake of better clarity, these tables are divided into various classes.

The internal I/O Modules supply the detected system and error states together with additional information (for instance cause of error, originator description).

A sum information about the detailed errors is transmitted via the communication to the closest automation units, where it is managed.

Important detailed and sum information is indicated by means of LEDs, process states via the display at the front panel.

3.1.12 Storage of Application Data

With engineering via the SICAM TOOLBOX II, application data is stored in a data base on the engineering PC. From there it can be loaded into a target system, or else be written on a suitable SD card.

With engineering via the web browser, application data is written directly on the SD card in the target system.

The application data of a project created via the web browser can be saved in a file on the engineering PC. With the aid of the program *Sicam_first_startup* this data can be written on a suitable SD card (for instance for the duplication of a project).

After putting a written SD card into a target system, the target system transfers changed or added data into its main memory during a subsequent startup.

3.1.13 Storage of Firmware

Current firmware revisions for CP-8000/CP-802*x* can be loaded as binary files

- online into a target system with an equipped SD card
- offline through storage on a suitable SD card

In both cases, the target system unpackes the corresponding files and stores the firmwares in the main memory during startup.

3.1.14 Autonomy

This system concept ensures that, if central parts succumb to a failure, as much of the functionality as possible will remain intact. CP-8000/CP-802*x* is capable of functioning autonomously – this means, it will continue carrying out its defined local function even where the entire communication is disturbed.

In such events, the system invariably ensures that the failure is detected and signaled. Based thereon, a functional behavior may be defined, if necessary, that is adapted to the disturbance event at hand.

3.2 Telecontrol

The function package *Telecontrol* includes the following functions:

- Communication with other stations via selectable protocols
  - Protocol elements
  - Automatic or selective data flow routing
  - Data storage
  - Priority control
  - Monitoring of the communication links upon failure
- Communication within the Automation Unit
- Protocol element control and return information
- Archiving of events (DEAR)
- Process data archive
- Test functions
- Process data input and output

Note

The listed functions are described in detail in the document *SICAM SICAM RTUs Common Functions System and Basic System Elements*.

3.2.1 Communication with other Stations

3.2.1.1 Protocol Elements

The communication function controls the transmission of messages via protocol elements to other automation units or control systems.

A protocol element is based on hardware integrated in the Master Module for serial or LAN/WAN communication, and supports protocols according to IEC 60870-5-101/103/104, as well as various protocols for the communication with third-party systems.

Communication in Transmit Direction

- The messages to be transmitted are learned through the automatic data flow routing and stored in the data storage
- The transfer of the messages from the data storage to the protocol elements takes place via a priority control in order to optimally utilize the transmission route

Communication in Receive Direction

- *Messages with process information* are distributed to all functions within the automation unit
- *Messages with system information* are either processed directly (example: station interrogation) or distributed further based on their destination address (CASDU) (example: messages for remote maintenance)

3.2.1.2 Automatic or Selective Data Flow Routing

For the data flow routing, a routing of individual process information items is not necessary. Simply only the direction (monitor direction, control direction, both directions) in which the messages are to be transmitted must be parameterized.

The type identification of each message provides information about the class (refer to Messages with Process Information) to which a message belongs and with which methods it is to be distributed:

- *Messages with process information* in monitor direction
  - For simple applications, the messages can be distributed via an entry in the topology
  - For more complex applications, the messages can be distributed selectively by means of data flow filters
    For each communication interface, pass-through filters or blocking filters can be set; since wildcards can also be used for all address attributes of the message, it is possible to control the data flow very specifically with simple means
- *Messages with process information* in control direction
  - The messages are distributed to the destinations determined by their CASDU over interfaces that are defined in the topology; the CASDU is interpreted as destination address

3.2.1.3 Data Storage

The messages that are intended for transmission over communication interfaces, are in principle stored chronologically in rings. There is a process image both before and after a ring. The arrangement, consisting of one ring and two process images, is called a priority channel (priority channels for transparent data do not have any process images).

Depending on the data communication mode of the protocol element over which the communication is processed, priority channels are provided for every priority of the messages to be transmitted and for every station that can be reached via the protocol element:

- Data communication mode "multi-point" (e.g. multi-point traffic, LAN)
  One priority channel for every transmission priority, for every station and for every protocol element
- Data communication mode "single-point"
  One priority channel for every transmission priority and for every protocol element

With regard to the data that they transport, priority channels are distinguished as follows:

- Time synchronization
- System information
- Process information in control direction
- Process information in monitor direction priority HIGH with class 1 data
- Process information in monitor direction priority MEDIUM with class 2 data
- Process information in monitor direction priority LOW with class 2 data
- Transparent information

Functions for priority channels:

- State compression for measured values (can be set using parameters) for the reduction of the flood of messages, that can continuously generate fluctuating measured values
- Behavior with a priority channel overload
- Behavior during a communication failure (transmit direction)
- Monitoring of the dwell time (parameter-settable) of *messages with process information* in control direction

  Messages that are stored too long in the priority channel are discarded
- Answering of station interrogations
- Behavior during failure of I/O Master Modules, communication interfaces etc.
- Blocking (series of information elements)

3.2.1.4 Priority Control

The priority controller has the task of selecting messages recorded in the data memories independently and individually for each interface and station, and to direct the transmission of the messages via the protocol elements in accordance with their priority. This ensures that with simultaneous existence of several active information items, the higher-priority, highly important information is transmitted first.

The prioritization does not however represent an absolute priority status, but rather a measure for dividing up the channel capacity. This ensures that even with continuously available higher-priority data, those of lower priority can also be transmitted.

3.2.2 Communication within the Automation Unit

Within the automation unit, the function package *Telecontrol* communicates with the function package *Automation* via its Telecontrol Interface.

3.2.3 Protocol Element Control and Return Information

This function is used for the user-specific influencing of the functions of the protocol elements. The main application lies with protocol elements with multi-point data communication mode and especially for dial-up traffic configurations.

This function contains two separate independent parts:

- Protocol element control
  - Test if stations are reachable
  - Suppression of errors with intentionally switched-off stations
- Protocol element return information
  - Cost control of telephone charges
  - Cost-efficient utilization of the telephone line
    (for instance command initiation only if a connection has already been established)

3.2.4 Decentralized Archive

In case of a communication fault, occurring events can be recorded in a decentralized archive. After elimination of the fault the superior control system can demand the archive of the respective target system. By means of this function, a possible data loss will be prevented .

- Reconstruction of all process-relevant data during a communication fault
- Transmission of the archive to the control system
  - Automatic initiation by the control system
  - File transfer acc. to IEC 60870-5-101, section 7.4.11
- Data saving
  - Datapoint-specific parameter-settable
  - Number of files, memory size parameter-settable
  - Spontaneous for binary information items and integrated totals
  - Definable cycle for measured values
  - Non-volatile on flash card
- Configuration acc. to IEC 60870-5-101/104 (point-to-point, multi-point traffic, dial-up traffic, Ethernet), also multi-hierarchical configurations possible
- Also multi-hierarchical configurations are possible
- Reading of the archive via SICAM TOOLBOX II possible
- Front-end: SICAM AK 3, optionally redundant
- Supported by SICAM SCC (also third-party control system possible)
  - Update of the archive in the control system
  - Own status marking
  - Automatic subsequent billing of
    - Counter differencies
    - Secondary values
    - Mean values and extreme values

3.2.5 Process Data Archive

Binary information states, measured values and integrated totals can be recorded in a process data archive. This archive comprises up to 5.000.000 records over a maximal period of 3 months.

- Data saving
  - Datapoint-specific parameter-settable
  - Spontaneous for binary information items and integrated totals
  - Definable cycle for measured values
  - Non-volatile on flash card
- Reading of the archive via SICAM WEB by means of file download possible

3.2.6 Test Functions via SICAM WEB

The test functions provide a status display with the actual process values at each optional I/O Module. Additionally, process data outputs can be changed manually

3.2.7 Process Data Input and Output

The process data input and output comprises

- Acquisition and preprocessing of the process data from the process image of the I/O Modules
- Generation and spontaneous transfer of *messages with process information* to the communication for further processing

  therein included are

  - time information (resolution 1 ms)
  - processed input signals
    - change-monitored conditioned values
    - change-monitored derived information
- Spontaneous reception of *messages with process information* from the communication
- Postprocessing and forwarding of the process data for the output via I/O Modules

3.3 Automation

The function package *Automation* contains the following functions:

- Telecontrol interface
  - Reception of messages with process information
  - Handling of commands according to IEC 60870-5-101/104
  - Change management and generation of messages with time tag
- *Open-/closed-loop control function*
  - Test functions
- Process data input and output

3.3.1 Telecontrol Interface

3.3.1.1 Transfer of Messages with Process Information

Reception of *messages with process information* and transfer to the *open-/closed-loop control function* for the purpose of further processing.

Messages with process information in monitor direction:

- Single-point information, double-point information, step position information
- Measured values
- Integrated totals
- Bitstring of 32 bit

Messages with process information in control direction:

- Single commands, double commands, regulating step commands
- Setpoint commands
- Bitstring of 32 bit

3.3.1.1.1 Treatment for Commands According to IEC 60870-101/104

The treatment for commands serves for the check of the spontaneous information objects to be processed with the help of the *open-/closed loop control function* and transmission of the confirmation for:

- Pulse commands (single commands, double commands, regulating step commands)
- Setpoint values (setpoint command)
- Bitstring of 32 bit

The data transfer of the spontaneous information objects to the *open-/closed-loop control function* for further processing is dependent on the result of the checks.

The activation of the element or function to be controlled is the task of the *open-/closed-loop control function*.

For the proper operation of this function, information is required by the *open-/closed-loop control function* (e.g. from an interlocking logic) for the choice of a posi-tive or negative confirmation.

The treatment for commands can be activated individually for each command via a parameter.

The treatment for pulse command comprises the following processing functions:

- Prepare command output procedure
  - Formal check
  - Retry suppression
  - 1 out of n check
  - Direct command or
  - Select and execute command
  - Control location check
  - Command locking
- Initiate command output procedure
  - Command to application program
- Monitor pulse duration (only pulse commands)
  - Command output time
  - Return information monitoring
- Terminate command output procedure

3.3.1.2 Change Monitoring and Generation of Messages with Time Tag

For the generation of *messages with process information*, the signals in the output process images that are assigned to an element of a spontaneous information object, are monitored for change.

The change monitoring takes place in the grid of the cycle time of the *open-/closed-loop control function*, in which the signal is assigned to a spontaneous information object.

On a change of the state in a corresponding element of the spontaneous information object, the generation of the message is initiated.

If a spontaneous information object has been activated for transmission due to a change, a message with process information is generated. The time tag corresponds either cycle-synchronous with the current time (resolution corresponds with the cycle time) or the time information from an assigned spontaneous information object.

3.3.2 Open-/Closed-Loop Control Function

The *open-/closed-loop control function* is used for the management of automation tasks with the help of a freely programmable application program.

The creation of the application program is carried out by the SICAM TOOLBOX II with the tool CAEx *plus* predominantly in function diagram technology according to IEC 61131-3. Alternatively, the application program can be created as instruction list with an ASCII editor.

The application program processes process information (so-called signals) from the connected I/O Modules and/or from other system elements in the automation network of the specific process-technical plant.

Process images form the interface of the application program to the outside world. It is distinguished between input process images and output process images.

The exchange of the process information can take place in two ways:

- Transmission of periodical information objects from and to the I/O Master Module (process data input and output)
- Transmission of spontaneous information objects from and to functions within the automation unit, other automation units or control systems via the telecontrol interface

3.3.2.1 Non-Volatile Storage

Variables, signals (input process images for spontaneous information objects) and function blocks can be saved non-volatile. That means, that after a power failure these variables and signals are immediately available again with their values before the power failure.

3.3.2.2 Task Management

The *open-/closed-loop control function* manages the application program in a periodically running task.

Coordination of the Sequences of a Task

- Periodical start in the selected cycle
- Programmable single-run upon change of a signal from the communication or from the I/O Modules (no hardware interrupt)
- Input handling
- Program processing
- Output handling

Cycle Time

- Within the cycle time, the application programs must process the input handling and the output handling
- The cycle time can be set in the application program

Watchdog Timer

This function monitors the proper sequence of the task within its set cycle time. If the task is not finished with its input handling, program processing and its output handling within this time, the next cycle for this task is omitted and a time-out is signaled.

With serious time-outs, for example due to a malfunction, the reliability of the application program becomes questionable. A time scale can be defined for such cases, the exceeding of which leads to an error message and a controlled shutdown of parts or the entire application program as well as all I/O Master Modules connected.

3.3.2.3 Loading Application Program

The initial loading of an application program is always associated with a startup.

Fundamentally however, the fault-free operation and consequently the availability of every control or controller depends on the quality of the program – in other words the measure of how free they are of formal and logical errors. The loading of error-burdened changes can always lead to interruptions to operation.

3.3.2.4 Test Functions

The entire functionality of the test functions applies to

- the engineering tool ("CAEx *plus* Online Test" of the SICAM TOOLBOX II or SICAM WEB)
- the online test function of the *open-/closed-loop control function* of the automation unit

While in the engineering tool all functions of the user interface can be found, the *open-/closed-loop control function* provides functions for the execution of the operator inputs.

If for example a value is to be displayed, the selection of the value and its display takes place in the engineering tool. For this purpose, the *open-/closed-loop control function* is given the task of reading out the selected value and transmit it to the user interface.

In the following, those functions are listed that the test function of the *open-/closed-loop control function* provides.

Display and Setting of Variables and Signals

- Display of variables and signals
- Single setting of variables (single forcing)
  - The value of a variable can change again at any time after setting, due to the function of the program (“CAEx *plus* Online Test”)
  - The value of a variable remains maintained until the test mode is active (SICAM WEB)

Blocking and Enabling of Messages with Process Information and Periodical Information

The copy operation of *messages with process information* and periodical information can be blocked and enabled:

- in the input-side process images
- in the output-side process images

This can take place with the following granularity:

- Per message
- All messages
- Per periodical information
- I/O Master Module

Changing the Execution Status of the Open-/Closed-Loop Control Function

- Halt and continue program
- Perform cold start or warm start of the program

Test Means

The available test means are:

(a) Halting of the execution due to a trigger condition (breakpoint)
(b) Execution of the task in cycle steps

The function (a) is not supported by SICAM WEB.

For the function (a) a trigger condition is defined in the tool "CAEx *plus* Online Test". A trigger conditions consists of up to 4 conditions. The conditions of a trigger condition are combined equal-ranking with AND or OR.

A condition compares a variable with a constant value to be specified:

Variable of the Type	**Condition**	**<operator>**			
BOOL	*variable* <operator> *value*	=		<>	
INT or REAL	*variable* <operator> *value*	<	=	<>	>

The function "halting the execution due to a trigger condition" halts the task, if the trigger condition is satisfied. The trigger condition is evaluated at the end of the task.

Display Statistic Information

The following information on the application program is made available:

- Parameterized cycle time
- Current run time
- Maximum run time
- Number of time-outs that the system has registered
- Used memory space
- Compiler errors

During the course of the interrogation, the current run time and the number of time-outs can be optionally reset (does not apply for SICAM WEB).

3.3.3 Process Data Input and Output

The peripheral functions comprise the process signal input and output.

- Acquisition and preprocessing of the process data from the process image of the I/O Modules
- Periodical transfer of the process information to the *open-/closed-loop control function* therein included are
  - Processed input signals as not change-monitored conditioned values
  - Processed input signals as change-monitored conditioned values
  - For processing, operations-relevant error information of the processed input signals (for instance "measured value faulty")
- Periodical reception of the process information from the *open-/closed-loop control function* therein included are
  - Derived information items
  - Processing results
  - Operations-relevant error information (for instance “command output fault”)
- Postprocessing and forwarding of the process data for the output via I/O Modules

4 Ambient Conditions

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Note

The following data applies for CP-8000/CP-802*x* without external SICAM TM I/O Modules.

If CP-8000/CP-802*x* is expanded with external SICAM TM I/O Modules, the corresponding data of the SICAM TM system apply. Refer to *SICAM TM System Datasheet, MC6-007-2*.

4.1 Protection Type

Operational equipment	Protection type acc. to IEC 60529	Protection class acc. to IEC 61140
CP-8000 CP-8021 CP-8022	• Front: IP 40 • Other sides of housing: IP 20 (incl. terminals)	Class II Protection through double or reinforced insulation
PS-8620 PS-8622 PS-8640 PS-8642	• Front: IP 40 • Other sides of housing: IP 20 (incl. terminals)	Class II Protection through double or reinforced insulation
SICAM I/O Modules SICAM TM I/O Modules	• Front: IP 40 • Other sides of housing: IP 20 (incl. terminals)	Class II *) Protection through double or reinforced insulation
CM-8830	• Front: IP 40 • Other sides of housing: IP 20	Class III Extra-low voltage

*) AO-8380: class III

4.2 Mechanical Ambient Conditions

Parameter	Value	Test standard	Product standard	Class
Harmonic				
Amplitude of the excursion 1…9 Hz Acceleration 9…200 Hz Acceleration 200…500 Hz	±3.0 mm 10 m/s² 15 m/s²	IEC 60068-2-6	IEC 60870-2-2	Bm
Amplitude 10…60 Hz Acceleration 60…150 Hz	±0.075 mm 1 g	IEC 60068-2-6	IEC 60255-21-1	2
Shock				
Acceleration; 11 ms duration (functional capability)	100 m/s²	IEC 60068-2-27	IEC 60870-2-2	Bm
Acceleration; 11 ms duration (resistivity)	15 g	IEC 60068-2-27	IEC 60255-21-2	1
Continuous shock				
Acceleration; 16 ms duration	10 g	IEC 60068-2-27	IEC 60255-21-2	1
Seismic harmonic				
Amplitude 1…8 Hz (horizontal) Amplitude 1…8 Hz (vertical) Acceleration 8…35 Hz (horizontal) Acceleration 8…35 Hz (vertical)	±7.5 mm ±3.5 mm 2 g 1 g	IEC 60068-3-3	IEC 60255-21-3	2

The listed values cover or exceed the required seismic loading according to IEC 60870-2-2 Cl.S3 and IEC 60255-21-3 Cl.1. The values apply in operation and for storage.

The permitted mechanical stresses during transport depend on the transport packaging. The device packaging is not a transport packaging.

4.3 Climatic Ambient Conditions

Parameter	Value	Test standard	Product standard	Class
Minimum air temperature (cold)	-25°C/96 h [1)] -40°C/96 h [2)]	IEC 60068-2-1 Ad	IEC 60870-2-2 IEC 60654-1	C2/C3 C2/C3
Maximum air temperature (dry heat)	70°C/96 h 10% rH	IEC 60068-2-2 Bd	IEC 60870-2-2 IEC 60654-1	C3 C3
Cyclic damp heat	25/40°C/120 h 95% rH	IEC 60068-2-30		
Temperature gradient	≤ 30°C/h		IEC 60870-2-2 IEC 60654-1	C2 C2
Relative air humidity	5…95%		IEC 60870-2-2 IEC 60654-1	C1 C1
Absolute air humidity	≤ 35 g/m^3		IEC 60870-2-2 IEC 60654-1	C2 C2
Air pressure	70…106 kPa (up to 3000 m)		IEC 60870-2-2 IEC 60654-1	C2 C2
Temperature with storage and transport	-30…+85°C			
Pollution degree	2	IEC 61010-1		

1) applies for CP-8000 (6MF21010AB100AA0)

2) applies for CP-8000 (6MF21011AB100AA0), CP-8021, CP-8022, SICAM I/O Modules

SICAM TM I/O modules are tested partially against deviating values. You will find the details in the *SICAM TM System Datasheet*.

The listed values apply for the use in open-air cabinets for bay devices. The products can be exposed to sun and heat. They can be exposed as well to air flow caused by draught in buildings, e.g. by open windows or influences of technical processes.

Bedewing is possible for a short time, e.g. during the course of maintenance tasks (not in operation). Condensation, precipitations, water and icing are not permitted in operation.

Heating and cooling is used to maintain the necessary conditions, especially in case of great differences between indoor and outdoor climate.

The conditions of this class normally occur in living and working areas, as well as in production rooms for electronic and electrotechnical products, telecontrol rooms, storage rooms for valuable and sensible devices.

Note

CP-8000: With cold temperatures the display becomes more sluggish and the legibility may be restricted (at –25°C the reaction time is 5 s).

4.4 Electromagnetic Compatibility

4.4.1 System Properties

Parameter	Value	Test standard	Product standard	Class
Discharge of static electricity (ESD)	8 kV-A 6 kV-C	IEC 61000-4-2	IEC 60870-2-1 IEC 60255-26	3
Electromagnetic fields	10 V/m 80 MHz…1 GHz 3 V/m 1…6 GHz	IEC 61000-4-3	IEC 60870-2-1 IEC 60255-26	3
50 Hz magnetic fields	100 A/m (cont.) 1000 A/m (3 s)	IEC 61000-4-8	IEC 60870-2-1	4
Pulse-shaped magnetic fields	1000 A/m	IEC 61000-4-9		
Radio interference voltage approx. peak value	79 dBµV (0.15…0.5 MHz) 73 dBµV (0.5…30 MHz)	CISPR22	IEC 60870-2-1 CISPR22	A A
Radio interference voltage mean value	66 dBµV (0.15…0.5 MHz) 60 dBµV (0.5…30 MHz)	CISPR22	IEC 60870-2-1 CISPR22	A A
Radio interference field strength (10 m) approx. peak value	40 dBµV/m (30…230 MHz) 47 dBµV/m (0.23…2 GHz)	CISPR22	IEC 60870-2-1 CISPR22	A A

The characteristics required according to the standards IEC 61000-6-2 and IEC 61000-6-4 are covered by the listed values.

Warning

This is a class A product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

4.4.2 Power Supply

Parameter	Value	Test standard	Product standard	Class
Dielectrical test (50 Hz) U ≤ DC 70 V/AC 33 V	3.0 kV_{eff} 60 s	IEC 61010-1	IEC 61010-1	VW3
Dielectrical test (50 Hz) DC 70 V/AC 33 V ≤ U ≤ DC 286 V/AC 253 V (220 VDC+30%/230 VAC+10%)	3.0 kV_{eff} 60 s 3.8 kV_{eff} 5 s	IEC 61010-1	IEC 61010-1	VW3
Impulse voltage 1.2/50 µs common	5.0 kVp	IEC 60255-27	IEC 60870-2-1	VW3
Impulse voltage 1.2/50 µs normal	5.0 kVp	IEC 60255-27	IEC 60870-2-1	VW3
Voltage tolerance DC	+30/-25%		IEC 60870-2-1 IEC 60654-2	DC3 DC4
Voltage tolerance AC	+10/-15%		IEC 60870-2-1 IEC 60654-2	AC2 AC3
Starting current	Klasse S1	IEC 60870-4		
Fast transient burst common	4.0 kVs 5 kHz	IEC 61000-4-4	IEC 60870-2-1	4
Fast transient burst (fast repitition)	4.0 kVp 100 kHz	IEC 61000-4-4		
Fast transient burst common	4.0 kV	IEEE C37.90.1		
Fast transient burst transverse	4.0 kV	IEEE C37.90.1		
Surge 1.2/50 µs common	4.0 kVp	IEC 61000-4-5	IEC 60870-2-1	4
Surge 1.2/50 µs normal	4.0 kVp	IEC 61000-4-5	IEC 60870-2-1	>4
Induced HF voltage	10 V 0.15…80 MHz 80% AM 1 kHz	IEC 61000-4-6	IEC 60870-2-1	3
Voltage dips, short-time interruption and voltage fluctuations on AC input connections	Dips: (ΔU_N) 20% 5s 30% 20ms 30% 500ms 40% 200ms 60% 200ms 60% 1s 70% 500ms Interruptions: (ΔU_N) 100% 10ms 100% 20ms 100% 50ms 100% 100ms 100% 1s 100% 5s Fluctuations: (ΔU_N) ±8% 5s	IEC 61000-4-11	IEC 60870-2-1 IEC 61850-3 Ed.2	
Frequency fluctuations AC	10%	IEC 61000-4-11	IEC 60870-2-1	>F3
Ring waves 100 kHz common	2.0 kVp	IEC 61000-4-12	IEC 60870-2-1	3
Ring waves 100 kHz normal	2.0 kVp	IEC 61000-4-12	IEC 60870-2-1	>3

Parameter	Value	Test standard	Product standard	Class
Conducted common mode disturbances common	30…3 V 15 Hz…150 kHz 30 V 16⅔/50/60 Hz 60 s 300 V 16⅔/50/60 Hz 1 s	IEC 61000-4-16		
Voltage ripple DC	10% U_N	IEC 61000-4-17	IEC 60870-2-1	>VR3
Damped oscillotory waves 1 MHz common	2.5 kVp	IEC 61000-4-18	IEC 60870-2-1	4
Damped oscillotory waves 1 MHz normal	2.5 kVp	IEC 61000-4-18	IEC 60870-2-1	>4
Damped oscillotory waves 1 MHz common	2.5 kVp	IEEE C37.90.1		
Damped oscillotory waves 1 MHz transverse	2.5 kVp	IEEE C37.90.1		
Voltage dips, short-time interruption and voltage fluctuations on DC input connections	Dikps: (ΔUn) 30% 100ms 30% 500ms 60% 100ms 60% 500ms Interruptions: (ΔUn) 100% 10ms 100% 50ms 100% 100ms 100% 500ms 100% 5s	IEC 61000-4-29	IEC60870-2-1 IEC 61850-3 Ed.2	

*) for interruptions/fluctuations > 50 ms applies criterion B: restart of the device allowed (CP-8000: > 100 ms)

4.4.3 Digital I/Os

Parameter	Value	Test standard	Product standard	Class
Dielectrical test (50 Hz) U ≤ DC 70 V/AC 33 V	3.0 kV_{eff} 60 s	IEC 61010-1	IEC 61010-1	VW3
Dielectrical test (50 Hz) DC 70 V/AC 33 V ≤ U ≤ DC 286 V/AC 253 V (220 VDC+30%/230 VAC+10%)	3.0 kV_{eff} 60 s 3.8 kV_{eff} 5 s	IEC 61010-1	IEC 61010-1	VW3
Impulse voltage 1.2/50 µs common	5.0 kVp	IEC 60255-27	IEC 60870-2-1	VW3
Impulse voltage 1.2/50 µs normal	5.0 kVp	IEC 60255-27	IEC 60870-2-1	VW3
Fast transient burst common	4.0 kVp 5 kHz	IEC 61000-4-4	IEC 60870-2-1	4
Fast transient burst (fast repitition)	4.0 kVp 100 kHz	IEC 61000-4-4		
Fast transient burst common	4.0 kVp	IEEE C37.90.1		
Fast transient burst transverse	4.0 kVp	IEEE C37.90.1		
Surge 1.2/50µs common	4.0 kVp	IEC 61000-4-5	IEC 60870-2-1	4
Surge 1.2/50µs normal	4.0 kVp	IEC 61000-4-5	IEC 60870-2-1	>4
Conducted disturbances (induced HF)	10 V 0.15…80 MHz 80% AM 1 kHz	IEC 61000-4-6	IEC 60870-2-1	3
Ring waves 100 kHz common	2.0 kVp	IEC 61000-4-12	IEC 60870-2-1	4
Ring waves 100 kHz normal	2.0 kVp	IEC 61000-4-12	IEC 60870-2-1	4
Conducted common mode disturbances (induced HF)	30…3 V 15 Hz…150 kHz 30 V 16⅔/50/60 Hz 60 s 300 V 16⅔/50/60 Hz 1 s	IEC 61000-4-16		
Damped oscillotory waves 1 MHz common	2.5 kVp	IEC 61000-4-18	IEC 60870-2-1	4
Damped oscillotory waves 1 MHz normal	2.5 kVp	IEC 61000-4-18	IEC 60870-2-1	>4
Damped oscillotory waves 1 MHz common	2.5 kVp	IEEE C37.90.1		
Damped oscillotory waves 1 MHz transverse	2.5 kVp	IEEE C37.90.1		

4.4.4 Analog I/Os

Parameter	Value	Test standard	Product standard	Class
Dielectrical test (50 Hz) U ≤ DC 70 V/AC 33 V	1.6 kV_{eff} 60 s 1.8 kV_{eff} 5 s	IEC 61010-1	IEC 61010-1 IEC 60870-2-1	 >VW2
Impulse voltage 1.2/50 µs common	2.5 kVp	IEC 60255-27	IEC 60870-2-1	>VW2
Impulse voltage 1.2/50 µs normal	2.5 kVp	IEC 60255-27	IEC 60870-2-1	>VW2
Fast transient burst common	4.0 kVp 5 kHz	IEC 61000-4-4	IEC 60870-2-1	3
Fast transient burst (fast repetition)	4.0 kVp 100 kHz	IEC 61000-4-4		
Fast transient burst common	4.0 kVp	IEEE C37.90.1		
Surge 1.2/50µs common	2.0 kVp [1]	IEC 61000-4-5	IEC 60870-2-1	4
Surge 1.2/50µs normal	2.0 kVp	IEC 61000-4-5	IEC 60870-2-1	4
Conducted disturbances (induced HF)	10 V 0.15…80 MHz 80% AM 1 kHz	IEC 61000-4-6		
Ring waves 100 kHz common	2.0 kVp	IEC 61000-4-12	IEC 60870-2-1	4
Ring waves 100 kHz normal	2.0 kVp	IEC 61000-4-12	IEC 60870-2-1	4
Conducted common mode disturbances common	30…3 V [2] 15 Hz…150 kHz 30 V [3] 16⅔/50/60 Hz 60 s 300 V [4] 16⅔/50/60 Hz 1 s	IEC 61000-4-16		
Damped oscillatory waves 1 MHz common	2.5 kVp	IEC 61000-4-18	IEC 60870-2-1	4
Damped oscillatory waves 1 MHz normal	1.0 kVp	IEC 61000-4-18	IEC 60870-2-1	4
Damped oscillatory waves 1 MHz common	2.5 kVp	IEEE C37.90.1		

[1] AO-8380: tested with 4.0 kVp

[2] AI-8310: tested with 10…1 V

[3] AI-8310: tested with 10 V

[4] AI-8310: tested with 100 V

4.4.5 Communication with Insulation: RS-485/RS-232

Parameter	Value	Test standard	Product standard	Class
Dielectrical test (50 Hz) U ≤ DC 70 V/AC 33 V	1.5 kV_{eff} 60 s	IEC 60255-27	IEC 60870-2-1	>VW2
Impulse voltage 1.2/50 µs common	2.5 kVp	IEC 60255-27	IEC 60870-2-1	>VW2
Impulse voltage 1.2/50 µs normal	2.5 kVp	IEC 60255-27	IEC 60870-2-1	>VW2
Fast transient burst common	4.0 kVp 5 kHz *)	IEC 61000-4-4	IEC 60870-2-1	3
Fast transient burst common	4.0 kVp	IEEE C37.90.1		
Fast transient burst normal	4.0 kVp	IEEE C37.90.1		
Surge 1.2/50µs common	2.0 kVp	IEC 61000-4-5	IEC 60870-2-1	3
Surge 1.2/50µs normal	2.0 kVp	IEC 61000-4-5	IEC 60870-2-1	3
Conducted disturbances (induced HF)	10 V 0.15…80 MHz 80% AM 1 kHz	IEC 61000-4-6	IEC 60870-2-1	3
Ring waves 100 kHz common	2.0 kVp	IEC 61000-4-12	IEC 60870-2-1	4
Ring waves 100 kHz normal	2.0 kVp	IEC 61000-4-12	IEC 60870-2-1	4
Conducted common mode disturbances common	30…3 V 15 Hz…150 kHz 30 V 16⅔/50/60 Hz 60 s 300 V 16⅔/50/60 Hz 1 s	IEC 61000-4-16	IEC 61850-3 Ed.2	
Damped oscillatory waves 1 MHz common	2.5 kVp	IEC 61000-4-18	IEC 60870-2-1	4
Damped oscillatory waves 1 MHz common	2.5 kVp	IEEE C37.90.1		

*) CP-8000: tested with 2.0 kVp

The listed values are valid for shielded cables.

4.4.6 Communication without Insulation: RS-232

The communication via RS-232 is designed only for distances ≤ 2.5 m. Therefore, this interface does not need to show an immunity. The immunity and the galvanic insulation are assumed by the external data communications equipment.

You can find the electrical ambient conditions of data transmission equipment in the related data sheets.

4.4.7 Communication with Insulation: LAN

Parameter	Value	Test standard	Product stand.	Class
Dielectrical test (50 Hz) U ≤ DC 70 V/AC 33 V	1.5 kV_{eff} 60 s	IEC 60255-27	IEC 60870-2-1	>VW2
Impulse voltage 1.2/50 µs common	2.5 kVp	IEC 60255-27	IEC 60870-2-1	>VW2
Impulse voltage 1.2/50 µs normal	2.5 kVp	IEC 60255-27	IEC 60870-2-1	>VW2
Fast transient burst common	4.0 kVp 5 kHz *)	IEC 61000-4-4	IEC 60870-2-1	3
Fast transient burst normal	4.0 kVp	IEEE C37.90.1		
Surge 1.2/50µs common	2.0 kVp	IEC 61000-4-5	IEC 60870-2-1	3
Surge 1.2/50µs normal	2.0 kVp	IEC 61000-4-5	IEC 60870-2-1	3
Conducted disturbances (induced HF)	10 V 0.15…80 MHz 80% AM 1 kHz	IEC 61000-4-6	IEC 61850-3	
Ring waves 100 kHz common	2.0 kVp	IEC 61000-4-12	IEC 60870-2-1	4
Ring waves 100 kHz normal	2.0 kVp	IEC 61000-4-12	IEC 60870-2-1	4
Conducted common mode disturbances common	30…3 V 15 Hz…150 kHz 30 V 16⅔/50/60 Hz 60 s 300 V 16⅔/50/60 Hz 1 s	IEC 61000-4-16	IEC 61850-3 Ed.2	
Damped oscillatory waves 1 MHz common	2.5 kVp	IEC 61000-4-18	IEC 60870-2-1	4
Damped oscillatory waves 1 MHz common	2.5 kVp	IEEE C37.90.1		

*) CP-8000: tested with 2.0 kVp

The listed values are valid for shielded cat.5 cables with a length of up to 100 m.

4.5 Storage and Transport

Storage

Store the device in dry and clean rooms. The relative humidity must not lead to the formation of either condensation water or ice.

For storage Siemens recommends that you maintain a limited temperature range of between +10°C and +35°C, in order to prevent premature ageing of the electrolytic capacitors used.

For a longer storage period Siemens also recommends connecting the device to the supply voltage once a year for 1 to 2 days, in order to form the electrolytic capacitors used. You should proceed likewise before a planned use of the device.

Transport

The transport packaging of the devices can be re-used for forwarding. If other packaging is used the observance of the transport requirements according to ISO 2248 must be ensured. Storage packaging of the individual devices is not adequate for transport.

5 System Components and Technical Data

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5.1 Power Consumption Total System

5.1.1 Master Module without External Consumers

Designation	MLFB	Power consumption
CP-8000 Master Module with I/O -25 to +70°C	6MF21010AB100AA0	4.3 W *)
CP-8000 Master Module with I/O -40 to +70°C	6MF21011AB100AA0	4.3 W *)
CP-8021 Master Module	6MF28021AA00	1.6 W
CP-8022 Master Module with GPRS	6MF28022AA00 BB 6MF28022AA00 CC	12 W 6 W

*) inclusive internal periphery

5.1.2 Master Module with External Consumers

If a Master Module is expanded with external consumers (modem, I/O Modules) then you have to add their power consumption to that of the Master Module.

With the power supply modules (with CP-8000 internal), it must be considered that due to the efficiency factor (typical 80%; sub-zero temperature 77%) the power consumption values of the external consumers must be corrected.

Example:

External consumer DO-8212	0.8 W
Addition based on PS efficiency factor	0.2 W
Power consumption for DO-8212	1.0 W

This results in following power consumption:

Power consumption CP-8000	4.3 W
Power consumption for DO-8212	1.0 W
Power consumption for CM-8830	0.5 W
Power consumption for system	5.8 W

Note

For the power consumption values of the external I/O Modules please refer to the sections 2.1.5.2, External SICAM I/O Modules and 2.1.5.3, External SICAM TM I/O Modules.

For the values of the used modems see the documentation of the respective modem.

5.2 Mechanical Design

	CP-8000	CP-8021	CP-8022
Mechanics			
Structure	System for mounting on 35 mm DIN rail	System for mounting on 35 mm DIN rail	System for mounting on 35 mm DIN rail
Dimension (HxWxD)	124 x 128 x 123 mm	132 x 30 x 142 mm	132 x 30 x 142 mm
Weight	ca. 800 g	ca. 210 g	ca. 260 g
Connections			
Connection system for peripheral signals and power supply	Removeable screw terminals, wire cross section up to 2.5 mm² (applies for wires with realization rigid/multi-wire/fine-wire with conductor end sleeve)	–	–
Ethernet/LAN Communication via	2x RJ45 socket connector 8-pole, for connecting cat.5 cable X1, X4	2x RJ45 socket connector 8-pole, for connecting cat.5 cable X1, X4	2x RJ45 socket connector 8-pole, for connecting cat.5 cable X1, X4
Communication via RS-232	D-SUB 9-pole, male, with additional supply output for external transmission facility X2	1x RJ45 socket 8-pole, with supply output for external transmission facility X2	1x RJ45 socket 8-pole, with supply output for external transmission facility X2 1x removable push-in terminal 8-pole X6 [1]
Communication via RS-485 (RS-422)	1x removable screw terminal 6-pole X3	1x removable push-in terminal 8-pole X3	2x removable push-in terminal 8-pole X3, X6 [1]
Peripheral bus	5-pole connector for SICAM I/O coupling module or SICAM TM I/O coupling module	18-pole connector for bus connector	18-pole connector for bus connector
Communication via GPRS	[2]	[2]	SMA connector X7

[1] interface can be used optionally for RS-232 or RS-485 communication

[2] ext. GPRS modem/router with Ethernet/LAN interface

5.3 Power Supply Modules

5.3.1 PS-8630 (CP-8000 internal)

5.3.1.1 Technical Data

Voltage input		
Input voltage	DC 24…60 V +15%/-25% [1)] +30%/-25% [2)]	
Input power	34 W	
Protection type	Double insulation	
Rated impulse voltage	4 kV	
Voltage outputs		
Output voltage 1 (internal)	DC 5.2 V ±3%	
Output voltage 2 (internal)	DC 12 V +30/-5%	
Output voltage 3 (external)	DC 5.2 V ±3% [3)]	
Output voltage for contact wetting	Equals input voltage 3x each 100 mA [4)]	
Output power 1	2.5 W	
Output power 2	3 W	
Output power 3	5 W	
Guaranteed interruption time	100 ms	
Connections/mechanics		
Connections	Removable screw terminals for direct conductor assembly	
Connection data X12, X13	Locking torque	0.5 Nm
	AWG	min. 22 max. 12
	Conductor cross section solid	min. 0.2 mm² max. 2.5 mm²
	Conductor cross section stranded	min. 0.2 mm² max. 2.5 mm²
	Conductor cross section stranded with ferrule without plastic sleeve	min. 0.25 mm² max. 2.5 mm²
	Conductor cross section stranded with ferrule with plastic sleeve	min. 0,25 mm² max. 2.5 mm²
	2 wires stranded with ferrule without plastic sleeve	min. 0.25 mm² max. 1 mm²
	2 wires stranded with TWIN ferrule with plastic sleeve	min. 0.5 mm² max. 1.31 mm²
	Wire strip length	min. 6 mm max. 7 mm
	Length ferrule	10 mm

1) caused by the connection between input voltage and AUXV0 the input voltage must be < DC 70 V

2) the reliable function of the power supply is guaranteed up to DC 78 V

3) not short-circuit proof and not overload proof

4) protective mechanism is a self resetting fuse (PTC); statistical values:
operation voltage: DC 60 V max., switching capacity: < 40 A,
ohmic resistance: < 5 Ω, permanent floating current after activation of the fuse: < 1.3 A

5.3.2 PS-8620, PS-8622

External power supply modules for

- CP-8021
- CP-8022 (as of production level CC)

5.3.2.1 Technical Data

Voltage input		
(voltage is provided via terminals)	PS-8620	PS-8622
Input voltage	DC 24…60 V	DC 110…220 V
Operating voltage	DC 18…70 V (78 V [1)])	DC 82.5…253 V (286 V [1)])
Input current	0.8 A at DC 24 V 0.4 A at DC 48 V 0.3 A at DC 60 V	0.16 A at DC 110 V 0.08 A at DC 220 V
Reverse voltage protection	Yes	
Overload protection	Yes	
Short-circuit protection	Yes	
Can be connected in parallel	Yes (for redundancy, not for power enhancement) [1)]	
Inrush peak current	Specified acc. to IEC 60870-4 (90) class S1	
Voltage outputs		
Output nominal voltage 1	DC 5.15 V ± 2% static, ±3% dynamic	
Output nominal current 1	0…1.8 A	
Output nominal voltage 2	DC 28 V ±10%static, ±3% dynamic [2)]	
Output nominal current 2	0…0.43 A	
Output power 1 ($P_{out\ 1}$)	9 W	
Output power 2 ($P_{out\ 2}$)	12 W - $P_{out\ 1}$ (12 W if $P_{out\ 1}$ = 0 W)	
Total output power	12 W	
Guaranteed interruption time	50 ms	
Startup time	< 2 s	
Permanent short-circuit proof	Yes	

Connections/mechanics		
Connections	Removable screw terminals, 4-pole (grid size 5.08)	
Connection data X1	Locking torque [3] (PHOENIX) (FCI)	0.5 Nm to 0.6 Nm 0.36 Nm to 0.4 Nm
	AWG	min. 22 max. 12
	Conductor cross section solid	min. 0,33 mm² max. 2,5 mm²
	Conductor cross section stranded	min. 0,33 mm² max. 2,5 mm²
	Conductor cross section stranded with ferrule without plastic sleeve	min. 0,33 mm² max. 2,5 mm²
	Conductor cross section stranded with ferrule with plastic sleeve	min. 0,33 mm² max. 2,5 mm²
	2 wires stranded with ferrule without plastic sleeve	min. 0,33 mm² max. 1 mm²
	2 wires stranded with TWIN ferrule with plastic sleeve	min. 0,5 mm² max. 1,31 mm²
	Wire strip length	min. 6 mm max. 7 mm
	Length ferrule	10 mm
Dimension (LxWxH)	124 x 30 x 132 mm (measure without DIN rail)	
Weight	Approx. 240 g (incl. bus module 12 g)	

[1] as of production level CC

[2] for the generation of the auxiliary voltage for specific transmission facilities

[3] the respective manufacturer is imprinted at the terminal

5.3.3 PS-8640, PS-8642

External power supply modules for CP-8021 and CP-8022.

5.3.3.1 Technical Data

Voltage input			
(voltage is provided via terminals)	PS-8640	PS-8642	
Input voltage	DC 24…60 V	DC 100…240 V	AC 100…240 V
Operating voltage	DC 18…78 V	DC 82.5…286 V	AC 85…264 V (45…66 Hz)
Input current	3.05 A at DC 18 V 2.20 A at DC 24 V 0.90 A at DC 60 V 0.67 A at DC 78 V	0.68 A at DC 82,5 V 0.55 A at DC 100 V 0.24 A at DC 240 V 0.20 A at DC 286 V	0.66 A at AC 85 V 0.56 A at AC 100 V 0.26 A at AC 240 V 0.25 A at AC 264 V
Power consumption	55 W at DC 18 V 52.9 W at DC 48 V 52.5 W at DC 78 V	55.5 W at DC 82,5 V 55.1 W at DC 220 V 55.3 W at DC 286 V	55.2 W at AC 85 V 55.0 W at AC 100 V 54.8 W at AC 264 V
Reverse voltage protection	Yes		
Overload protection	Yes		
Short-circuit protection	Yes		
Can be connected in parallel	Yes (for redundancy, not for power enhancement)		
Inrush peak current	Specified acc. to IEC 60870-4 (90) class S1		
Voltage outputs			
Output nominal voltage 1	DC 5.15 V ± 2% static, ±3% dynamic		
Output nominal current 1	0…2 A		
Output nominal voltage 2	DC 28 V ±10%static, ±3% dynamic [1)]		
Output nominal current 2	0…1.79 A		
Output nominal voltage 3	DC 24 V +0%/-15% [2)]		
Output nominal current 3	0.42 A [2)]		
Output power 1 ($P_{out\ 1}$)	10 W		
Output power 2 ($P_{out\ 2}$)	45 W - $P_{out\ 1}$ – P_{AUX} (45 W if $P_{out\ 1/AUX}$ = 0 W)		
Output power 3 (P_{AUX})	10 W (30 W peak) [2)]		
Total output power	45 W		
Guaranteed interruption time	50 ms		
Startup time	< 2 s		
Permanent short-circuit proof	Yes		

Connections/mechanics		
Connections	Removable screw terminals, 4-pole (grid size 5.08)	
Connection data X1, X2	Locking torque [3] (PHOENIX) (FCI)	0.5 Nm to 0.6 Nm 0.36 Nm to 0.4 Nm
	AWG	min. 22 max. 12
	Conductor cross section solid	min. 0,33 mm² max. 2,5 mm²
	Conductor cross section stranded	min. 0,33 mm² max. 2,5 mm²
	Conductor cross section stranded with ferrule without plastic sleeve	min. 0,33 mm² max. 2,5 mm²
	Conductor cross section stranded with ferrule with plastic sleeve	min. 0,33 mm² max. 2,5 mm²
	2 wires stranded with ferrule without plastic sleeve	min. 0,33 mm² max. 1 mm²
	2 wires stranded with TWIN ferrule with plastic sleeve	min. 0,5 mm² max. 1,31 mm²
	Wire strip length	min. 6 mm max. 7 mm
	Length ferrule	10 mm
Dimension (LxWxH)	124 x 30 x 132 mm (measure without DIN rail)	
Weight	Approx. 400 g (inkl. bus module 12 g)	

1) for the generation of the auxiliary voltage for specific transmission facilities

2) applies only for PS-8642

3) the respective manufacturer is imprinted at the terminal

5.4 Master Modules

5.4.1 CP-8000

5.4.1.1 Technical Data

Processor and memory	
Processor	Blackfin BF536
Clock pulse frequency	Core clock approx. 400 MHz System clock approx. 133 MHz
Accuracy clock pulse	± 3.5 ppm (-40°C to +80°C), ± 2 ppm (0°C to 40°C)
Internal real time clock and external synchronization	• Buffered maintenance-free (72 h) • Automatical daylight-saving time/normal time change • (S)NTP time server
Free run accuracy	12.6 ms/h
Program memory	Flash-PROM 16 MB (parallel connected)
Main memory	SDRAM 32 MB
Local non-volatile memory	FRAM 8 KB
Changeable non-volatile memory	SD card up to 2 GB
Max. number of data points	20000 (sum of process images over all 4 interfaces)
Memory for application program	128 KB, thereof 4 KB temporary memory for variables
Number of variables for application program	512 variables possible, thereof 256 bytes non-volatile (variables: BOOL = 1 bit, DINT = 4 bytes, REAL = 4 bytes)
Program sampling	• Cyclical 10…2000 ms (settable raster 1 ms) • Spontaneous (settable; run not based on interrupt)
Acquisition grid digital I/O	10 ms
Decentralized archive	Recording raster for measured values 1, 2, 3, 5, 10, 15, 30, 60 min, settable
	Max. message length of a segment 1…200 bytes, settable
	Memory configuration, settable 10 files of 1000 records each (= 10000 records) 20 files of 500 records each (= 10000 records) 50 files of 400 records each (= 20000 records) 80 files of 450 records each (= 36000 records) 100 files of 100 records each (= 10000 records) 100 files of 25 records each (= 2500 records) 200 files of 50 records each (= 10000 records) 200 files of 25 records each (= 5000 records)

Communication		
2 Ethernet/LAN interfaces (X1, X4)	• Ethernet acc. to IEEE 802.3 (10Base-T or 100Base-TX) • Galvanically insulated • Transmission rate 10 Mbit/s or 100 Mbit/s • Half duplex or full duplex • Auto-MDI(X) • Time synchronization via NTP server • Sub station function • Line length 0…100 m • Rated impulse voltage 2 kV	
1 serial interface (X2)	• Unbalanced interchange circuit RS-232, V.24/V.28 • Galvanically not insulated • ESD protection • Transmission rate up to 115.2 kbit/s (depending on protocol) • Line length up to 2.5 m	
1 serial interface (X3)	• Balanced interchange circuit RS-422/RS-485 • Galvanically insulated • ESD protection • Configuration 4-wire/2-wire with/without terminating resistor (parameter-settable) • Transmission rate up to 115.2 kbit/s (depending on protocol) • Rated impulse voltage 2 kV	
Power supply		
Power supply	DC 5.2 V 1.5 W	
Internal operating voltages	Logic DC 3.3 /2.5/1.2 V LCD DC 12 V	
Optional power supply for external modem via X2 *)	• De-energized (for modem reset) • DC 5.2 V ± 5 % 2.5 W • DC 12 V ± 5 % 2.5 W	
Connections/mechanics		
Ethernet/LAN (X1, X4)	RJ45 socket connector 8-pole (IEC 60603-7)	
Serial RS-232 (X2)	Connection D-SUB 9-pole, male (DIN 41652)	
Serial RS-485 (X3)	Removable screw terminal 6-pole with shield interception	
Connection data X3	Locking torque	0.5 Nm
	AWG	min. 22 max. 12
	Conductor cross section solid	min. 0.2 mm² max. 2.5 mm²
	Conductor cross section stranded	min. 0.2 mm² max. 2.5 mm²
	Conductor cross section stranded with ferrule without plastic sleeve	min. 0.25 mm² max. 2.5 mm²
	Conductor cross section stranded with ferrule with plastic sleeve	min. 0,25 mm² max. 2.5 mm²
	2 wires stranded with ferrule without plastic sleeve	min. 0.25 mm² max. 1 mm²
	2 wires stranded with TWIN ferrule with plastic sleeve	min. 0.5 mm² max. 1.31 mm²
	Wire strip length	min. 6 mm max. 7 mm
	Length ferrule	10 mm
Dimension (LxWxH)	124 x 128 x 123 mm (measure without DIN rail)	
Weight	Approx. 800 g	

*) only for specific transmission facilities

5.4.2 CP-8021 and CP-8022

5.4.2.1 Technical Data

Processor and memory	
Processor	Blackfin BF536
Clock pulse frequency	Core clock approx. 400 MHz System clock approx. 133 MHz
Accuracy clock pulse	± 3.5 ppm (-40°C to +80°C), ± 2 ppm (0°C to 40°C)
Internal real time clock and external synchronization	• Buffered maintenance-free (72 h) • Automatical daylight-saving time/normal time change • (S)NTP time server
Free run accuracy	12.6 ms/h
Program memory	Flash-PROM 16 MB
Main memory	SDRAM 32 MB
Local non-volatile memory	FRAM 8 KB
Changeable non-volatile memory	• SD card up to 2 GB • SIM card standard (mini SIM) for GPRS communication [1)]
Max. number of data points	20000 (sum of process images over all 4 interfaces)
Memory for application program	128 KB, thereof 4 KB temporary memory for variables
Number of variables for application program	512 variables possible, thereof 256 bytes non-volatile (variables: BOOL = 1 bit, DINT = 4 bytes, REAL = 4 bytes)
Program sampling	• Cyclical 10…2000 ms (settable raster 1 ms) • Spontaneous (settable; run not based on interrupt)
Acquisition grid digital I/O	10 ms
Decentralized archive	Recording raster for measured values 1, 2, 3, 5, 10, 15, 30, 60 min, settable
	Max. message length of a segment 1…200 bytes, settable
	Memory configuration, settable 10 files of 1000 records each (= 10000 records) 20 files of 500 records each (= 10000 records) 50 files of 400 records each (= 20000 records) 80 files of 450 records each (= 36000 records) 100 files of 100 records each (= 10000 records) 100 files of 25 records each (= 2500 records) 200 files of 50 records each (= 10000 records) 200 files of 25 records each (= 5000 records)

Communication	
2 Ethernet/LAN interfaces (X1, X4)	• Ethernet acc. to IEEE 802.3 (10Base-T or 100Base-TX) • Galvanically insulated • Transmission rate 10 Mbit/s or 100 Mbit/s • Half duplex or full duplex • Auto-MDI(X) • Time synchronization via NTP server • Line length 0…100 m • Rated impulse voltage 2 kV
1 serial interface (X2)	• Unbalanced interchange circuit RS-232, V.24/V.28 • Galvanically not insulated • ESD protection • Transmission rate up to 115.2 kbit/s (depending on protocol) • Time synchronization • Line length up to 2.5 m
1 serial interface (X3)	• Balanced interchange circuit RS-422/RS-485 • Galvanically insulated • ESD protection • Configuration 4-wire/2-wire with/without terminating resistor (parameter-settable) • Transmission rate up to 115.2 kbit/s (depending on protocol) • Rated impulse voltage 2 kV
1 serial interface (X6) [1)]	RS-232 Mode: • Unbalanced interchange circuit RS-232, V.28 • Galvanically insulated • ESD protection • Transmission rate up to 115.2 kbit/s (depending on protocol) • Rated impulse voltage 2 kV • Line length up to 2.5 m RS-485 Mode: • Balanced interchange circuit RS-422/RS-485 • Galvanically insulated • ESD protection • Configuration 4-wire/2-wire with/without terminating resistor (parameter-settable) • Transmission rate up to 115.2 kbit/s (depending on protocol) • Rated impulse voltage 2 kV
1 radio interface (X7) [1)]	GPRS • Quad band EGSM 850/900/1800/1900 MHz • GPRS modem (radio standard 2G) class 10 (production level CC), class4 (production level BB) • Coding scheme CS 1-4 • Uplink up to 80 kbit/s (HW rev. BB: 60 kbit/s) • Downlink up to 40 kbit/s (Hw rev. BB: 20 kbit/s) • Maximum transmitted RF power: − 2 W (33 dBm) for GSM 850 and GSM 900 − 1 W (30 dBm) for GSM 1800 and GSM 1900 • Permitted antenna gain: − GSM 850 MHz ≤ 6 dBi − GSM 900 MHz ≤ 6 dBi − GSM 1800 MHz ≤ 2.25 dBi − GSM 1900 MHz ≤ 2.25 dBi • ESD protection • Licensing RED 2014/53/EU

Power supply		
Operating voltage	Input DC 5 V: DC 4.75…5.5 V 1.5 W Input DC 28 V: DC 25.2…30.8 V 3.5 W (CP-8021) 5.5 W (CP-8022)	
Internal operating voltages	Logic DC 3.3 /2.5/1.2 V	
Optional power supply for external modem via X2 [2] (CP-8021; CP-8022 with deactivated internal GPRS modem [3])	• De-energized (for reset of modem) • DC 5.2 V ± 5 % 2.5 W • DC 12 V ± 5 % 2.5 W	
Optional power supply for external modem via X2 [2] (CP-8022 with activated internal GPRS modem [3])	• De-energized (for reset of modem) • DC 5.2 V ± 5 % 0.75 W	
Connections/mechanics		
Ethernet/LAN (X1, X4)	RJ45 socket 8-pole (IEC 60603-7)	
Serial RS-232 (X2)	RJ45 socket 8-pole (IEC 60603-7)	
Serial RS-485 (X3)	Push-in terminal 8-pole (without interception)	
serial RS-232/RS-485 (X6) [1]	Push-in terminal 8-pole (without interception)	
GPRS (X7) [1]	SMA connector	
Connection data X3, X6	AWG	min. 24 max. 16
	Conductor cross section solid	min. 0,21 mm² max. 1,31 mm²
	Conductor cross section stranded	min. 0,21 mm² max. 1,31 mm²
	Conductor cross section stranded with ferrule without plastic sleeve	min. 0,25 mm² max. 1,31 mm²
	Conductor cross section stranded with ferrule with plastic sleeve	min. 0,21 mm² max. 0,75 mm²
	2 wires stranded with ferrule without plastic sleeve	min. 0,21 mm² max. 0,51 mm²
	2 wires stranded with ferrule with plastic sleeve	min. 0,21 mm² max. 0,51 mm²
	Wire strip length	min. 9 mm max. 10 mm
	Length ferrule	10 mm
Dimension (LxWxH)	132 x 30 x 142 mm (measure without DIN rail)	
Weight	Approx. 210 g (CP-8021), ca. 260 g (CP-8022)	

[1] only CP-8022

[2] only for specific transmission facilities

[3] as of production level CC

5.5 Protocol Elements

Note

The hardware of the protocol elements is integrated on the Master Module. The relevant technical data are described there.

5.5.1 UMPMT0, UMPST0

5.5.1.1 Functions

Communication of a central station with one or several substations in multi-point traffic.

Central Station

- Serial communication protocol according IEC60870-5-101
  UMPT0 is central station
- Unbalanced transmission Master
  - Network configuration
    - Multipoint-partyline
    - Multipoint-star
    - Max. connections: 100
  - System or device (application function)
    - Controlling station
- Physical layer / data flow control
  - Unbalanced interchange circuit accordingV.24/V.28 standard
  - Transmission medium (half duplex)
  - Byte Frame (8E1)
  - Data flow control Bit in receive direction
  - Data flow control Bit supervision
- Interoperability according to IEC 60870-5-101 Ed.1
- Interoperability according to the following document:
  - *SICAM RTUs Interoperability IEC 60870-5-101/104* (DC0-013-2)
- Data acquisition by polling (station interrogation)
  - Continuous Interrogation of a Remote Terminal Unit
  - Station failure delay
- Acquisition of events (transmission of data ready to be sent)
- General interrogation, outstation interrogation
- Clock synchronization according IEC 60870-5-101
  - Clock synchronization with <TI:=103> clock synchronization command
  - Acquisition of transmission delay (primary station) used for correction of clock synchronization (with request status of link = proprietary)
- Command transmission
  - Demand
  - Set control location
  - Check control location

- Transmission of integrated totals
- File transfer
- Optimized parameters for selected transmission facilities (modems)
  - Predefined optimized parameters for selected transmission facilities
  - Free definable parameters for transmission facility
  - 5 V power supply for external modem
    ATTENTION: check power consumption of external modem!
- Standby transmission line over the public telephone network (PSTN)
- Data transmission using time slot radio
- Co-ordination of several masters
- Data transmission in relay operation mode (multi-point traffic with routing)
  - Main and Standby Transmission Line
- Protocol element control and return information
  - Protocol element control messages
    - Send (general) interrogation command to all
    - Send (general) interrogation command to selective CASDU
    - Set control location
    - Data filter in transmit direction “ON/OFF”
    - Data filter in receive direction “ON/OFF”
    - “Activate/Deactivate” interface
    - “Activate/Deactivate” interface + protocol functions
    - Add / Remove station to station polling
    - Call cycle START / STOP / CONTINUE
    - Continuous call station x ON / OFF
    - Main/ Standby transmission line ACTIVE
  - Protocol element return information
    - Station failure
    - Station status
    - Status DTR (1 = state line active)
    - Status DSR (1 = state line active)
    - Protocol-specific return information 0-3, 6, 7, 8-11
- Remote maintenance with SICAM TOOLBOX II via serial connection
- Special functions
  - Summer time bit (SU) = 0 for all messages in transmit direction (summer time bit in time tag)
  - Day of week (DOW) = 0 for all messages in transmit direction (day of week time tag)
  - Originator address = 0 for all messages in transmit direction
- Transparent Mode (Tunneling)

Substation

- Serial communication protocol according to IEC60870-5-101
  UMPST0 is substation
- Unbalanced transmission Slave
  - Network configuration
    - Multipoint-partyline
    - Multipoint-star
    - Max. connections: 1
  - System or device (application function)
    - Controlled station
- Physical layer / data flow control
  - Unbalanced interchange circuit according to V.24/V.28 standard
  - Transmission medium (half duplex)
  - Byte Frame (8E1)
- Interoperability according to IEC 60870-5-101 Ed.1
- Interoperability according to the following document:
  - *SICAM RTUs Interoperability IEC 60870-5-101/104* (DC0-013-2)
- Acquisition of events (transmission of data ready to be sent)
- General interrogation, outstation interrogation
  - Non Interruptible GI
  - Send GI-data as class 1 data
  - Convert general interrogation command in receive direction to Broadcast
- Clock synchronization according to IEC 60870-5-101
  - Clock synchronization with <TI:=103> clock synchronization command
  - Acquisition of transmission delay (secondary station) used for correction of clock synchronization with <TI:=106>
  - Correction of clock synchronization (via parameter)
  - Accuracy +/-20ms
  - Accuracy (relay operation) +/-20ms *)
- File transfer
- Optimized parameters for selected transmission facilities (modems)
  - Predefined optimized parameters for selected transmission facilities
  - Free definable parameters for transmission facility
  - 5 V power supply for external modem
    ATTENTION: check power consumption of external modem!
- Data transmission in relay operation mode (multi-point traffic with routing)
- Protocol element control and return information
  - Protocol element control messages
    - Send (general) interrogation command to all
    - I bit handling for time ON/OFF
  - Protocol element return information
    - Status DTR (1 = state line active)
    - Status DSR (1 = state line active)

- Special functions
  - Summer time bit (SU) = 0 for all messages in transmit direction (summer time bit in time tag)
  - Day of week (DOW) = 0 for all messages in transmit direction (day of week time tag)
  - Originator address = 0 for all messages in transmit direction
  - Send GI-data as class 1 data
  - Non interruptible GI
  - Convert general interrogation command to BROADCAST in receive direction
  - Do not store general interrogation commands in receive direction
  - Send End of init message as class 1 data
  - Send ACTCON, ACTTERM message as class 1 data
  - Send ACTCON for clock synchronization command
  - Emulate ACTCON+/-
  - Emulate ACTCON, ACTTERM for commands (with control message)
  - Message synchronization
  - Filtering of measured values with COT = 3 (spontaneous) in transmit direction

*) with relay operation accuracy will be reduced 10 ms per routing station

Note

The previously mentioned functions are described in detail in the document *SICAM SICAM RTUs • Ax 1703 Common Functions Protocol Elements*, section *"Multi-Point Traffic (UMP)"*.

5.5.1.2 Operating Modes

The operating mode of the interface is determined by parameters of the protocol element and optional devices.

Operating mode	**Interface → optional DTE**	**Interface signals**
Unbalanced interchange circuit (V.24/V.28) RS-232 asynchronous	X2	RXD, TXD, CTS [1], RTS, DCD, DTR, DSR/VCC, GND
Balanced interface (V.11) RS-485 (2-wire)/ RS-422 (4-wire) asynchronous	X3	TXD+/RXD+, TXD-/RXD- (2-wire) TXD+, TXD-, RXD+, RXD- (4-wire)
Balanced interface (V.11) RS-485 (2-wire)/ RS-422 (4-wire) asynchronous	X2 → CM-0829 (CM-0819) [2]	RXD, TXD, CTS, RTS, DCD, DTR, DSR/VCC, GND (to CM-08x9)
Optical interface (multimode fibre optic) ring	X2 → CM-0821	RXD, TXD, CTS, RTS, DCD, DTR, DSR/VCC, GND (to CM-0821)
Unbalanced interchange circuit (V.24/V.28) RS-232 asynchronous	X6 [3]	RXD, TXD, CTS, RTS, DCD, DTR, DSR, GND
Balanced interface (V.11) RS-485 (2-wire)/ RS-422 (4-wire) asynchronous	X6 [3]	TXD+/RXD+, TXD-/RXD- (2-wire) TXD+, TXD-, RXD+, RXD- (4-wire)

1) not usable (reserved for SICAM TOOLBOX II)

2) with transmission rate > 9600 bit/s, converter PHOENIX PSM-ME-RS232/RS485-P is required: interface signals D(A), D(B), GND (RS-485); D(A), D(B), T(A), T(B), GND (RS-422); CM-0819 does not support RS-422

3) only CP-8022 (switchable mode via parameter)

Note

Details about realization of various operation modes are given in the manual *SICAM SICAM RTUs Platforms – Configuration Automation Units and Automation Networks*.

5.5.1.3 Communication

For the communication infrastructure, additional suitable transmission facilities and/or network components may be needed.

Own Station (Central Station)

System	System element	Protocol element	Remarks
SICAM A8000	CP-8000/CPC80 CP-802x/CPC80	UMPMT0 UMPMT0	

Remote Station (Substation)

System	System element	Protocol element	Remarks
SICAM A8000	CP-8000/CPC80 CP-802x/CPC80 CP-8050/CPCI85	UMPST0 UMPST0 UMPSI0	
SICAM AK 3	CP-2016/CPCX26 CP-2019/PCCX26	SM-2551/UMPSA0 SM-0551/UMPSA0	
Legacy systems (SICAM AK, SICAM TM, SICAM EMIC, SICAM MIC, SICAM BC, Ax 1703)	CP-20xx CP-50xx CP-60xx	SM-2551/UMPSA0 SM-0551/UMPSA0 UMPST0 SM-2541/UMPS00	acc. to *SICAM RTUs IEC 60870-5-101/104 Inter-operability*
Third-party system	–	–	acc. to *SICAM RTUs IEC 60870-5-101/104 Inter-operability*

Own Station (Substation)

System	System element	Protocol element	Remarks
SICAM A8000	CP-8000/CPC80 CP-802x/CPC80	UMPST0 UMPST0	

Remote Station (Central Station)

System	System element	Protocol element	Remarks
SICAM A8000	CP-8000/CPC80 CP-802x/CPC80	UMPMT0 UMPMT0	
SICAM AK 3	CP-2016/CPCX26 CP-2019/PCCX26	SM-2551/UMPMA0 SM-0551/UMPMA0	
Legacy systems (SICAM AK, SICAM TM, SICAM BC, Ax 1703)	CP-20xx CP-50xx CP-60xx	SM-2551/UMPMA0 SM-0551/UMPMA0 UMPMT0 SM-2541/UMPM00	acc. to *SICAM RTUs IEC 60870-5-101/104 Inter-operability*
Third-party system	–	–	acc. to *SICAM RTUs IEC 60870-5-101/104 Inter-operability*

5.5.2 DIAST0

5.5.2.1 Functions

Communication of a central station with up to 100 substations.

- Unbalanced dial-up traffic Slave based on IEC 60870-5-101
  DIAST0 is substation
- Controlling connection establishment and disconnection
  - Connection establishment spontaneously and cyclically,
    controlling station ⇔ controlled station
    - Establishing a connection cyclically at a settable interval (monitoring cycle)
      - for transmission of low-priority data
      - for monitoring the station availability
      - for clock synchronization
  - Controlling connection establishment by means of modem commands
    - AT Hayes, V.25bis, X.20, X.28
    - Arbitrary main telephone number of a telephone network (PSTN)
  - Access control (LOGIN with password) in the private range of IEC 60870-5-101
  - Disconnection control in the private range of IEC 60870-5-101
- Communication when a connection is established according to
  unbalanced multi-point (dial-up traffic) based on IEC 60870-5-101
  - Data acquisition by polling (station interrogation)
  - Acquisition of events (transmission of data ready to be sent)
  - General interrogation, outstation interrogation
  - Clock synchronization
    - Each time a connection has been established
    - When a connection is established, one time per minute
  - Command transmission
  - Transmission of integrated totals
- Co-ordination of several masters in "multi-master operation" (availability and data throughput)
  - The controlling station can simultaneously establish connections to different controlled stations
- Standby transmission line(s) by means of standby telephone numbers of the same or another (PSTN) telephone network
- Multi-hierarchical configurations
- Optimized parameters for selected transmission facilities
- Toll-saving transmission strategies
- Having a telephone set connected in parallel
- Functions for supporting redundant communication routes

Note

The previously mentioned functions are described in detail in the document *SICAM SICAM RTUs • Ax 1703 Common Functions Protocol Elements*, section "*Dial-Up Traffic (DIA)*".

5.5.2.2 Operating Modes

The operating mode of the interface is determined by parameters of the protocol element and optional devices.

Operating mode	Interface → optional DTE	Interface signals
Unbalanced interchange circuit (V.24/V.28) RS-232 asynchronous	X2 → Modem (GSM, PSTN, TETRA, ISDN)	RXD, TXD, CTS [1], RTS, DCD, DTR, DSR/VCC, GND
Unbalanced interchange circuit (V.24/V.28) RS-232 asynchronous	X6 [2]	RXD, TXD, CTS, RTS, DCD, DTR, DSR, GND

[1] not usable (reserved for SICAM TOOLBOX II)

[2] only CP-8022 (RS-232 mode)

Note

Details about realization of various operation modes are given in the manual *SICAM SICAM RTUs Platforms – Configuration Automation Units and Automation Networks*.

5.5.2.3 Communication

For the communication infrastructure, additional suitable transmission facilities and/or network components may be needed.

Own Station (Substation)

System	System element	Protocol element	Remarks
SICAM A8000	CP-8000/CPC80 CP-802x/CPC80	DIAST0 DIAST0	

Remote Station (Central Station)

System	System element	Protocol element	Remarks
SICAM AK 3	CP-2016/CPCX26 CP-2019/PCCX26	SM-2551/DIAMA1 SM-0551/DIAMA1	
Legacy systems (SICAM AK, SICAM TM, SICAM BC, Ax 1703)	CP-20xx CP-50xx CP-60xx	SM-2551/DIAMA1 SM-0551/DIAMA1 SM-2541/DIAM00	

5.5.3 103MT0

5.5.3.1 Functions

Communication between one central station and up to 100 protective devices.

- Serial communication protocol according to IEC 60870-5-103
  103MT0 is central station
- Unbalanced multi-point traffic (primary station)
  - Network configuration
    - Point-to-point configuration (Master+ 1 Slave)
    - Multiple point-to-point configuration (separate interface for each single point-to-point configuration required)
    - Multipoint partyline
    - Multipoint star
    - Max. connections: 100 [1)]
  - System or device (application function)
    - Controlling station
- Physical layer/data flow control
  - Unbalanced interchange circuit according to V.24/V.28 standard
  - Transmission medium (half duplex)
  - Byte Frame (8E1)
  - Data flow control bit in receive direction
  - Data flow control bit supervision
- Interoperability
  - Compatibility level 1 (VDEW/ZVEI Standard)
  - Compatibility level 2 (Disturbance Data)
  - Message Conversion (protocol mode/message format)
    - IEC 60870-5-103/IEC 60870-5-103 “standard“ [default]
    - IEC 60870-5-103/IEC 60870-5-101 “tunneling mode“ [2)]
- Interoperability according to the following document:
  - *SICAM RTUs IEC 60870-5-103 Interoperability* (DC0-026-2)
- Data acquisition by polling (station interrogation)
  - Continuous interrogation of a remote terminal unit
- Acquisition of events (transmission of data ready to be sent)
  - Test mode
- General interrogation, outstation interrogation
  - Delayed transmission of general interrogation command
- Clock synchronization according to IEC 60870-5-103
  - Cyclic clock synchronization (parameterizable)
  - Correction of clock synchronization (via parameter)
- Command transmission
  - Demand
  - Set control location
  - Check control location
- Transmission of integrated totals
- File transfer
  - Disturbance records to SICAM DISTO
  - Disturbance records to control center systems according to IEC 60870-5-101/104

- Optimized parameters for selected transmission facilities (modems)
  - Predefined optimized parameters for selected transmission facilities
  - Free definable parameters for transmission facility
  - 5 V power supply for external modem
    ATTENTION: check power consumption of external modem!
- Protocol element control and return information
  - Protocol element control messages
    - Send (general) interrogation command to all
    - Send (general) interrogation command to selective CASDU
    - Set control location
    - Call cycle START/STOP/CONTINUE
    - Continuous call station x ON/OFF
    - “Activate/Deactivate” interface
  - Protocol element return information
    - Station failure
    - Station status
    - Status DTR (1 = state line active)
    - Status DSR (1 = state line active)
    - Protocol-specific return information 0-3, 6, 7
- Special functions
  - Send short-circuit location values with GI
  - Resetting the short-circuit location values
    - Reset short-circuit location values with command
    - Reset short-circuit location values automatically
  - Signaling/measured value disabling
  - Technological adaptation for measured values
  - Measured value change monitoring
  - Monitoring intermediate and faulty positions of double-point information
  - Transfer of the information "blocked activation/tripping of the protection"
  - Transmit non-updated process images
  - Emulation of the going binary information
  - Remote-configuration of Reyrolle relays

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1) recommendation max. 30 stations

2) IEC 60870-5-101 messages are transmitted in IEC 60870-5-103 container messages (in the private range); with SICAM RTUs configurations with BC 1703 the conversion of IEC 60870-5-101 → IEC 60870-5-103 → IEC 60870-5-101 can be omitted

Note

The previously mentioned functions are described in detail in the document *SICAM SICAM RTUs • Ax 1703 Common Functions Protocol Elements*, section "*Interfaces of Protective Devices (103)*".

5.5.3.2 Operating Modes

The operating mode of the interface is determined by parameters of the protocol element and optional devices.

Operating mode	**Interface → optional DTE**	**Interface signals**
Unbalanced interchange circuit (V.24/V.28) RS-232 asynchronous	X2	RXD, TXD, CTS [1], RTS, DCD, DTR, DSR/VCC, GND
Balanced interface (V.11) RS-485 (2-wire)/ RS-422 (4-wire) asynchronous	X3	TXD+/RXD+, TXD-/RXD- (2-wire) TXD+, TXD-, RXD+, RXD- (4-wire)
Balanced interface (V.11) RS-485 (2-wire)/ RS-422 (4-wire) asynchronous	X2 → CM-0829 (CM-0819) [2]	RXD, TXD, CTS, RTS, DCD, DTR, DSR/VCC, GND (to CM-08x9)
Optical interface (multimode fibre optic) ring	X2 → CM-0821	RXD, TXD, CTS, RTS, DCD, DTR, DSR/VCC, GND (to CM-0821)
Unbalanced interchange circuit (V.24/V.28) RS-232 asynchronous	X6 [3]	RXD, TXD, CTS, RTS, DCD, DTR, DSR, GND
Balanced interface (V.11) RS-485 (2-wire)/ RS-422 (4-wire) asynchronous	X6 [3]	TXD+/RXD+, TXD-/RXD- (2-wire) TXD+, TXD-, RXD+, RXD- (4-wire)

[1] not usable (reserved for SICAM TOOLBOX II)

[2] with transmission rate > 9600 bit/s, converter PHOENIX PSM-ME-RS232/RS485-P is required: interface signals D(A), D(B), GND (RS-485); D(A), D(B), T(A), T(B), GND (RS-422); CM-0819 does not support RS-422

[3] only CP-8022 (switchable mode via parameter)

Note

Details about realization of various operation modes are given in the manual *SICAM RTUs Platforms - Configuration Automation Units and Automation Networks*.

5.5.3.3 Communication

For the communication infrastructure, additional suitable transmission facilities and/or network components may be needed.

Own Station (Central Station)

System	System element	Protocol element	Remarks
SICAM A8000	CP-8000/CPC80 CP-802x/CPC80	103MT0 103MT0	

Remote Station (Substation; e.g. protective device, power meter)

System	System element	Protocol element	Remarks
Legacy systems (SICAM BC, Ax 1703)	CP-50xx	SM-2551/103SA0 SM-0551/103SA0 SM-2541/103S00 Local serial interface	electrical optical
Protection devices of SIPROTEC series	–	–	acc. to *SICAM RTUs IEC 60870-5-103 Inter-operability*
Third-party system	–	–	acc. to *SICAM RTUs IEC 60870-5-103 Inter-operability*

5.5.4 BPPT0

5.5.4.1 Functions

Communication of a central station with a substation.

- Serial communication protocol according to IEC60870-5-101
- Balanced point-to-point transmission
  - Network configuration
    - Point-to-point configuration
    - Multiple point-to-point configuration *)
  - Max. connections: 1
  - System or device (application function)
    - Controlled station
    - Controlling station
- Physical layer / data flow control
  - Unbalanced interchange circuit accordingV.24/V.28 standard
  - Transmission medium (full duplex)
  - Byte Frame (8E1)
  - Data flow control Bit in receive direction
- Interoperability
  - IEC60870-5-101 Ed.1
- Interoperability according to the following document:
  - *SICAM RTUs Interoperability IEC 60870-5-101/104* (DC0-013-2)
- Acquisition of events (transmission of data ready to be sent)
- General interrogation, outstation interrogation
  - Uninterruptible general interrogation
- Clock synchronization according IEC 60870-5-101
  - Clock synchronization with <TI:=103> clock synchronization command
  - Acquisition of transmission delay (primary station) used for correction of clock synchronization with <TI:=106>
  - Acquisition of transmission delay (secondary station) used for correction of clock synchronization with <TI:=106>
- Command transmission
  - Set control location
  - Check control location
- Transmission of integrated totals
- File transfer
- Optimized parameters for selected transmission facilities (modems)
  - Free definable parameters for transmission facility
- Protocol element control and return information
  - Protocol element control
    - Send (general) interrogation command to all
    - Send (general) interrogation command to selective CASDU
    - Send (general) interrogation command for image GI to own Master Module
    - Set control location
    - Data filter in transmit direction “ON/OFF“
    - Data filter in receive direction “ON/OFF”
    - Activate/Deactivate interface
    - Activate/Deactivate interface + protocol functions

- Protocol element return information
  - Protocol-specific return information 0 "Interface activated/deactivated"
  - Protocol-specific return information 1 "Interface + protocol functions activated/deactivated"

- Remote maintenance with SICAM TOOLBOX II via serial connection
- Special functions
  - Summer time bit (SU) = 0 for all messages in transmit direction (time tag)
  - Day of week (DOW) = 0 for all messages in transmit direction (time tag)
  - Originator address = 0 for all messages in transmit direction
  - Convert general interrogation command in receive direction to BROADCAST
  - Uninterruptible general interrogation
  - ACTCON for clock synchronization command
  - Emulate ACTCON+/-
  - Emulate ACTCON, ACTTERM for commands with control message
  - Compatibility TCS100
  - Special functions for project DBAG
    - Breaker delay in transmit direction (DBAG-specific special message format <TI=150>)
    - Send originator address with settable value
    - Transparent Mode (tunneling, container mode)
  - Special functions for project RWE
    - NT bit, IV bit according to RWE requirements

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*) separate interface for each single-point-to-point configuraration required

Note

The previously mentioned functions are described in detail in the document *SICAM RTUs • Ax 1703 Common Functions Protocol Elements*, chapter *"Point-to-Point Traffic (BPP)"*.

5.5.4.2 Operating Modes

The operating mode of the interface is determined by parameters of the protocol element and optional devices.

Operating mode	**Interface → optional DTE**	**Interface signals**
Unbalanced interchange circuit (V.24/V.28) RS-232 asynchronous	X2	RXD, TXD, CTS 1), RTS, DCD, DTR, DSR/VCC, GND
Balanced interface (V.11) RS-422 (4-wire) asynchronous	X3	TXD+, TXD-, RXD+, RXD- (4-wire)
Balanced interface (V.11) RS-422 (4-wire) asynchronous	X2 → CM-0829 2)	RXD, TXD, CTS, RTS, DCD, DTR, DSR/VCC, GND (to CM-08x9)
Optical interface (multimode fibre optic) ring	X2 → CM-0821	RXD, TXD, CTS, RTS, DCD, DTR, DSR/VCC, GND (to CM-0821)
Unbalanced interchange circuit (V.24/V.28) RS-232 asynchronous	X6 3)	RXD, TXD, CTS, RTS, DCD, DTR, DSR, GND
Balanced interface (V.11) RS-422 (4-wire) asynchronous	X6 3)	TXD+, TXD-, RXD+, RXD- (4-wire)

1) not usable (reserved for SICAM TOOLBOX II)

2) with transmission rate > 9600 bit/s, converter PHOENIX PSM-ME-RS232/RS485-P is required: interface signals D(A), D(B), T(A), T(B), GND (RS-422)

3) only CP-8022 (switchable mode via parameter)

Note

Details about realization of various operation modes are given in the manual *SICAM RTUs Platforms - Configuration Automation Units and Automation Networks*.

5.5.4.3 Communication

For the communication infrastructure, additional suitable transmission facilities and/or network components may be needed.

Own Station

System	System element	Protocol element	Remarks
SICAM A8000	CP-8000/CPC80 CP-802x/CPC80	BPPT0 BPPT0	

Remote Station

System	System element	Protocol element	Remarks
SICAM A8000	CP-8000/CPC80 CP-802x/CPC80 CP-8050/CPCI85	BPPT0 BPPT0 BPPI0	
SICAM AK 3	CP-2016/CPCX26 CP-2019/PCCX26	SM-2551/BPPA0 SM-0551/BPPA0	
Legacy systems (SICAM AK, SICAM TM, SICAM EMIC, SICAM BC, Ax 1703)	CP-20xx CP-50xx CP-60xx	SM-2551/BPPA0 SM-0551/BPPA0 BPPT0 SM-2541/BPP00	
Third-party system	–	–	acc. to *SICAM RTUs IEC 60870-5-101/104 Inter-operability*

5.5.5 ET84

5.5.5.1 Functions

- LAN/WAN communication over Ethernet TCP/IP - general
  - 10 Mbit/s (full duplex) [1)]
  - 10 Mbit/s (half duplex) [1)]
  - 10 Mbit/s (full duplex , auto negotiation) [1)]
  - 10 Mbit/s (half duplex, auto negotiation) [1)]
  - 10/100 Mbit/s (half duplex / full duplex, auto negotiation) [1)]
  - 100 Mbit/s (full duplex) [1)]
  - 100 Mbit/s (half duplex) [1)]
  - 100 Mbit/s (full duplex, auto negotiation) [1)]
  - 100 Mbit/s (half duplex, auto negotiation) [1)]
  - Auto-MDIX (Auto Medium Dependent Interface Crossover) [1)]
  - Parameters for TCP/IP optimization [1)]
  - TCP/IP Keep Alive [1)]
- LAN/WAN communication over Ethernet TCP/IP according to IEC 60870-5-104
  - Controlled station
  - Controlling Station
  - Max. connections: 100 [2)]
- Supported Ports
  - Port 2404: IEC 60870-5-104
  - Port 80: HTTP (Hypertext Transfer Protocol) - “Remote operation for SICAM TOOLBOX II“ [1)]
  - Port 443: HTTPS (Hypertext Transfer Protocol over SSL/TLS) - “Remote operation for SICAM TOOLBOX II“ [1)]
  - Port 123: NTP V3 (Network Time Protocol) [1)]
  - Port 123: SNTP V3 (Simple Network Time Protocol) [1)]
- Special protocols:
  - Address Resolution Protocol (Gratuitous ARP) [1)]
- Interoperability according to the following document:
  - *SICAM RTUs Interoperability IEC 60870-5-101/104* (DC0-013-2)
- Acquisition of events (transmission of data ready to be sent)
- General interrogation, outstation interrogation
- Clock synchronization according to NTP (Network Time Protocol)
  - NTP server [1)]
  - NTP client [1)]
  - SNTP client [1)]
- Command transmission
  - Command transfer monitoring (dwell time monitoring)
  - Set control location
  - Check control location
- Transmission of integrated totals
- Protocol element control and return information

  Protocol element control message
  - Send (general) interrogation command
  - Preset control location

  Protocol element return information
  - PRE return information 0 “Status DATA TRANSFER (Master Module)”
  - PRE return information 1 “Status DATA TRANSFER (104)”

- Functions for the support of redundant communication routes
  - PSI redundancy (synchronous connections)
  - 104 redundancy according IEC 60870-5-104 Edition 2.0
    - 104 redundancy “controlled station” with 1 Ethernet interface
  - 1703 redundancy
  - Dual LAN interface with integrated switch for ring or star configurations (DNIP)
    - Switch mode [1)]
- SICAM TOOLBOX II connection over LAN/WAN ("remote connection")
  - Remote connection based on HTTP/HTTPS [1)]
  - Authentication in SICAM RTUs using connection password (optional) [1)]
  - Warning “Remote Operation” [1)]
- Security
  - IPSec VPN
    - IPSec in tunnel mode: initiator [1)]
    - Authentication / encryption based on pre-shared key [1)]
    - Internet Key Exchange protocol: IKEv1, IKEv2 [1)]
    - Authentication: HMAC-SHA1, SHA2_224, SHA2_256, SHA2_384, SHA2_512, HMAC-MD5 [1)]
    - Encryption: AES-128/-192/-256, 3DES [1)]
    - Diffie Hellman group: group 1, 2, 5, 14 [1)]
  - Security logging
    - SysLog Client [1)]
- Special functions
  - Summer time bit (SU) = 0 for all messages in transmit direction (time tag)
  - Day of week (DOW) = 0 for all messages in transmit direction (time tag)
  - Originator address = 0 for all messages in transmit direction
  - WhiteList filter
  - Data throughput limitation
    - Suppress error in case of connection failure
    - Error handling for connection with “failure = suppress”
  - NT-Bit simulation after connection failure
  - General interrogation after connection is OK

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1) function is integrated in the Master Module

2) recommendation max. 10 connections

Note

The previously mentioned functions are described in detail in the document *SICAM RTUs • Ax 1703 Common Functions Protocol Elements*, section "*LAN Communication (104)*".

The detailed information on “Security” and “Security Logging” can be found in the document *SICAM A8000 Series/ RTUs / TOOLBOX II / Device Manager ADMINISTRATOR Security Manual*.

5.5.5.2 Operating Modes

Operating mode	Interface → optional DTE	Interface signals
Electrical Ethernet interface (twisted pair)	X1 X4	TXD+, TXD-, RXD+, RXD-
GPRS	X7 *)	(Antenna)

*) only CP-8022

Note

Details about realization of various operation modes are given in the manual *SICAM RTUs Platforms - Configuration Automation Units and Automation Networks*.

5.5.5.3 Communication

For the communication infrastructure, additional suitable transmission facilities and/or network components may be needed.

Own Station

System	System element	Protocol element	Remarks
SICAM A8000	CP-8000/CPC80 CP-802x/CPC80	ET84 ET84	

Remote Station

System	System element	Protocol element	Remarks
SICAM A8000	CP-8000/CPC80 CP-802x/CPC80 CP-8050/CPCI85	ET84 ET84 ETI4	
SICAM AK 3	CP-2016/CPCX25 CP-2019/PCCX25	ET24 SM-2558/ETA4	only 100 Mbit/s
Legacy systems (SICAM AK, SICAM TM, SICAM EMIC, SICAM MIC, SICAM BC, Ax 1703)	CP-20xx CP-50xx CP-60xx	SM-2558/ETA4 SM-2557/ETA2 ETT0 SM-15x4/ET00	acc. to *SICAM RTUs IEC 60870-5-101/104 Inter-operability*
Third-party system	–	–	acc. to *SICAM RTUs IEC 60870-5-101/104 Inter-operability*

5.5.6 ET85

5.5.6.1 Functions

Common Functions IEC 61850 Client

- LAN/WAN communication over Ethernet TCP/IP - general
  - 100 Mbit/s (full duplex, auto negotiation) [1)]
  - Auto-MDIX (Auto Medium Dependent Interface Crossover) [1)]
- IEC 61850 client
  - Edition 1
  - Edition 2
  - Max. number of servers (max. connections): 20
  - Max. number of “logical devices” (for each connection): [2)]
  - Max. number of “logical nodes” (for each connection): [2)]
  - Max. number of data points: 1000
  - Startup time PRE: [3)]
  - Initialization (after startup time PRE): [4)]
  - ACSI services [5)]
  - Common data classes [5)]
  - Attributes [5)]
  - Supported functionality according to:
    - PICS (Protocol Implementation Conformance Statement)
    - PIXIT (Protocol Implementation Extra Information)
    - Supported Logical Nodes and their Attributes
- Supported ports
  - Port 102: MMS (Manufacturing Message Specification)
  - Port 80: HTTP (Hypertext Transfer Protocol) - “Web server“[1)]
  - Port 80: HTTP (Hypertext Transfer Protocol) - “Remote operation for SICAM TOOLBOX II“ [1)]
  - Port 443: HTTPS (Hypertext Transfer Protocol over SSL/TLS) - “Web server“ [1)]
  - Port 443: HTTPS (Hypertext Transfer Protocol over SSL/TLS) - “Remote operation for SICAM TOOLBOX II“ [1)]
  - Port 123: NTP V3 (Network Time Protocol) [1)]
  - Port 123: SNTP V3 (Simple Network Time Protocol) [1)]
- Acquisition of events
  - Static data sets
  - Dynamic data sets
  - Buffered reports
  - Unbuffered reports
- Transmission of files
  - Disturbance records to SICAM DISTO
- Transmission of integrated totals
- General interrogation
- Command transmission
  - Set control location
  - Check control location
  - Command interlocking
  - Direct control with normal security
  - Direct control with enhanced security
  - SBO control with enhanced security
- Setting groups

- Clock synchronization according to NTP (Network Time Protocol)
  - NTP server [1)]
  - NTP client [1)]
  - SNTP client [1)]
- Functions for the support of redundant communication routes
  - Dual LAN interface with integrated switch for ring or star configurations (DNIP)
    - Switch mode [1)]
    - Single mode [1)]
    - Single + service mode [1)]
- Protocol element control and return information

  Protocol element control message
  - START connection to server (“Initiate”)
  - STOP connection to server (“Conclude”)
  - Send (general) interrogation command
  - Preset control location
- SICAM TOOLBOX II connection over LAN/WAN ("remote connection")
  - Remote connection based on HTTP/HTTPS [1)]
  - Authentication in SICAM RTUs using connection password (optional) [1)]
  - Warning “Remote Connection” [1)]
- Web Server
  - Integrated web server to display connection-/statistic-/developer information
  - Access to the web server with standard web browser via HTTP [1)]
  - Access to the web server with standard web browser via HTTPS [1)]
  - Supported web browser
    - Microsoft Internet Explorer 9, 10, 11
    - Microsoft Edge
- Special functions
  - Conversion of the time information (UTC; local time w/wo Summer-Wintertime)
  - Signaling / measured value disabling
  - Emulation of the going binary information
  - Emulation of the data on reception of the attribute Beh.stVal = "OFF" and Beh.stVal = “BLOCKED”
  - Technological adaptation for measured values
  - Measured value change monitoring
  - Monitoring intermediate and faulty positions of double-point information
  - Remote parameterization/diagnostic of SICAM RTUs components via IEC 61850

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1) function is integrated in the Master Module

2) not limited (limited only by free memory)

3) due to performance matters (initialization times upon connection setup), no more than 2000 data points are recommended

4) max. startup time (with 10000 data points): approx. 4 min
min. startup time (with 1 data point): approx. 30…60 s (dependent on the configuration of the AU)

5) supported with restrictions (for details see *SICAM RTUs • Ax 1703 Common Functions Protocol Elements, chapter “LAN Communication (61850)”, section Basic Data Types” and “Conversion IEC 60870-5-101/104 ↔ IEC 61850“*)

Common Functions IEC 61850 Server

- LAN/WAN communication over Ethernet TCP/IP - general
  - 100 Mbit/s (full duplex, auto negotiation) [1)]
- IEC 61850 server
  - Edition 2
  - GOOSE [2)]
  - Max. number of servers (max. connections): 6
  - Max. number of “logical devices” (including all servers): 300
  - Max. number of “logical nodes” (including all servers): [3)]
  - Max. number of data points: [4)]
  - ACSI services [5)]
  - Common data classes [5)]
  - Attributes [5)]
  - Supported functionality according to:
    - PICS (Protocol Implementation Conformance Statement)
    - PIXIT (Protocol Implementation Extra Information)
    - Supported Logical Nodes and their Attributes
- Supported ports
  - Port 102: MMS (Manufacturing Message Specification)
  - Port 80: HTTP (Hypertext Transfer Protocol) - “Web server“[1)]
  - Port 80: HTTP (Hypertext Transfer Protocol) - “Remote operation for SICAM TOOLBOX II“ [1)]
  - Port 443: HTTPS (Hypertext Transfer Protocol over SSL/TLS) - “Web server“ [1)]
  - Port 443: HTTPS (Hypertext Transfer Protocol over SSL/TLS) - “Remote operation for SICAM TOOLBOX II“ [1)]
  - Port 123: NTP V3 (Network Time Protocol) [1)]
  - Port 123: SNTP V3 (Simple Network Time Protocol) [1)]
- Acquisition of events
  - Static data sets
  - Buffered reports
  - Unbuffered reports
- Transmission of files
  - Disturbance records to SICAM DISTO
- Transmission of integrated totals
- General interrogation
- Command transmission
  - Direct control with normal security
  - Direct control with enhanced security
  - SBO control with enhanced security
- Setting groups
- Clock synchronization according to NTP (Network Time Protocol)
  - NTP server [1)]
  - NTP client [1)]
  - SNTP client [1)]
- Functions for the support of redundant communication routes
  - Server redundancy
  - GOOSE redundancy
- Protocol element control and return information

  Protocol element control message
  - Send (general) interrogation command
- SICAM TOOLBOX II connection over LAN/WAN ("remote connection")
  - Remote connection based on HTTP/HTTPS
  - Authentication in SICAM RTUs using connection password (optional)
  - Warning “Remote Connection” [1)]

- Web Server
  - Integrated web server to display connection-/statistic-/developer information
  - Access to the web server with standard web browser via HTTP
  - Supported web browser
    - Microsoft Internet Explorer 9, 10, 11
    - Microsoft Edge
- Special functions
  - Conversion of the time information (UTC; local time w/wo Summer-Wintertime)
  - Technological adaptation for measured values
  - Measured value change monitoring
  - Logging of the remote commands at the local control center
  - Remote parameterization/diagnostic of SICAM RTUs components via IEC 61850

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1) function is integrated in the Master Module

2) with GOOSE publish and GOOSE subscribe only data attributes are supported (no data objects)!

3) not limited (limited only by free memory)

4) formulas for the determination of the total number of data points (n):

unbuffered reports:	#LD • 54 + #CON (13 (#LD + #DP/60) • 2) + #DP • 14 = n
buffered reports:	#LD • 54 + #CON (19 (#LD + #DP/60) • 2) + #DP • 14 = n
unbuffered + buffered reports:	#LD • 54 + #CON (32 (#LD + #DP/60) • 2) + #DP • 14 = n
Meaning:	Thereby, the following maximum value applies: n = 20000
#LD number of logical devices	
#CON number of connections	
#DP number of data points	

5) supported with restrictions (for details see *SICAM RTUs • Ax 1703 Common Functions Protocol Elements, chapter "LAN Communication (61850)", section Basic Data Types" and "Conversion IEC 60870-5-101/104 ↔ IEC 61850"*)

Note

The previously mentioned functions are described in detail in the document *SICAM RTUs • Ax 1703 Common Functions Protocol Elements*, section "*LAN Communication (61850)*".

Note

At the moment the IEC 61850 Server can be parameterized with the SICAM TOOLBOX II only (not with SICAM WEB).

5.5.6.2 Operating Modes

Operating mode	Interface → optional DTE	Interface signals
Electrical Ethernet interface (twisted pair)	X1 X4	TXD+, TXD-, RXD+, RXD-

Note

Details about realization of various operation modes are given in the manual *SICAM RTUs Platforms - Configuration Automation Units and Automation Networks*.

5.5.6.3 Communication

For the communication infrastructure, additional suitable transmission facilities and/or network components may be needed.

5.5.6.3.1 ET85 Client

Own Station (Client)

System	System element	Protocol element	Remarks
SICAM A8000	CP-8000/CPC80 CP-802x/CPC80	ET85 ET85	Edition 1 + 2

Remote Station (Server)

System	System element	Protocol element	Remarks
SICAM A8000	CP-8000/CPC80 CP-802x/CPC80 CP-8050/CPCI85	ET85 ET85 ETI5	Edition 2
SICAM AK 3	CP-2016/CPCX26 CP-2019/PCCX26	ET25 SM-2558/ETA5	Edition 2 Edition 2
Legacy systems (SICAM AK, SICAM TM, SICAM BC)	CP-20xx CP-50xx CP-60xx	SM-2558/ETA5 SM-2558/ETA3 SM-2557/ET03	Edition 2 Edition 1 Edition 1 IEC 61850 Interoperability
Protection devices of SIPROTEC series	–	–	IEC 61850 Interoperability
Third-party system	–	–	IEC 61850 Interoperability

5.5.6.3.2 ET85 Server

Own Station (Server)

System	System element	Protocol element	Remarks
SICAM A8000	CP-8000/CPC80 CP-802x/CPC80	ET85 ET85	Edition 2

Remote Station (Client)

System	System element	Protocol element	Remarks
SICAM A8000	CP-8000/CPC80 CP-802x/CPC80 CP-8050/CPCI85	ET85 ET85 ETI5	Edition 2
SICAM AK3	CP-2016/CPCX26 CP-2019/PCCX26	ET25 SM-2558/ETA5	Edition 2 Edition 2
Legacy systems (SICAM AK, SICAM TM, SICAM BC)	CP-20xx CP-50xx CP-60xx	SM-2558/ETA5	Edition 2
Third-party system	–	–	IEC 61850 Interoperability

5.5.7 COUMT0

5.5.7.1 Functions

Communication of a central station with up to 10 counter devices.

- Serial communication protocol according to IEC 62056-21 (IEC 61107)
  COUMT0 is central station
- Network configuration
  - Multipoint partyline
  - Multipoint star
- Max. connections: 10
- System or device (application function)
  - Controlling station
- Physical layer/data flow control
  - Unbalanced interchange circuit according to V.24/V.28 standard
  - Transmission medium (half duplex)
  - Byte Frame (8E1)
  - Data flow control bit in receive direction
  - Data flow control bit supervision
- Interoperability according to IEC 60870-5-101 Ed. 1
- Interoperability according to the following document:
  - *SICAM RTUs IEC 60870-5-104 Interoperability* (DC0-013-2)
- Data acquisition by polling (station interrogation)
  - Continuous interrogation of a remote terminal unit
  - Station failure delay
- Acquisition of events
- General interrogation, substation interrogation
- Clock synchronization according to IEC 60870-5-101
  - Clock synchronization with <TI:=103> clock synchronization command
  - Acquisition of transmission delay (primary station) used for correction of clock synchronization (with “request status of link” = proprietary)
- Command transmission
  - Demand
  - Set control location
  - Check control location
- Transmission of integrated totals
  - IEC 62056-21 (IEC 61107) Mode-C
  - EDIS data coding (EDIS = Energy Data Identification System)
  - OBIS data coding (OBIS = Objekt Identification System)
- Optimized parameters for selected transmission facilities
  - Predefined optimized parameters for selected transmission facilities
  - Free definable parameters for transmission facility
  - 5 V power supply for external modem
    ATTENTION: check power consumption of external modem!
- Standby transmission line over the public telephone network (PSTN)
- Data transmission using time slot radio
- Co-ordination of several masters

- Data transmission in relay operation mode (multi-point traffic with routing)
  - Main and Standby Transmission Line

- Functions for supporting redundant communication routes
  - NUC redundancy (Norwegian Users Convention)
    - NUC redundancy controlling station
  - 1703 redundancy
    - Listening mode with passive
    - Tristate of the RS-232 interfce with passive
- Special functions
  - Summer time bit (SU) = 0 for all messages in transmit direction (summer time bit in time tag)
  - Day of week (DOW) = 0 for all messages in transmit direction (day of week time tag)
  - Originator address = 0 for all messages in transmit direction

5.5.7.2 Operating Modes

The operating mode of the interface is determined by parameters of the protocol element and optional devices.

Operating mode	**Interface → optional DTE**	**Interface signals**
Unbalanced interchange circuit (V.24/V.28) RS-232 asynchronous	X2	RXD, TXD, CTS [1], RTS, DCD, DTR, DSR/VCC, GND
Balanced interface (V.11) RS-485 (2-wire)/ RS-422 (4-wire) asynchronous	X3	TXD+/RXD+, TXD-/RXD- (2-wire) TXD+, TXD-, RXD+, RXD- (4-wire)
Balanced interface (V.11) RS-485 (2-wire)/ RS-422 (4-wire) asynchronous	X2 → CM-0829 (CM-0819 [2])	RXD, TXD, CTS, RTS, DCD, DTR, DSR/VCC, GND (to CM-08x9)
Optical interface (multimode fibre optic) ring	X2 → CM-0821	RXD, TXD, CTS, RTS, DCD, DTR, DSR/VCC, GND (to CM-0821)
Unbalanced interchange circuit (V.24/V.28) RS-232 asynchronous	X6 [3]	RXD, TXD, CTS, RTS, DCD, DTR, DSR, GND
Balanced interface (V.11) RS-485 (2-wire)/ RS-422 (4-wire) asynchronous	X6 [3]	TXD+/RXD+, TXD-/RXD- (2-wire) TXD+, TXD-, RXD+, RXD- (4-wire)

[1] not usable (reserved for SICAM TOOLBOX II)

[2] RS-422 not supported

[3] only CP-8022 (switchable mode via parameter)

Note

Details about realization of various operation modes are given in the manual *SICAM SICAM RTUs Platforms – Configuration Automation Units and Automation Networks*.

5.5.7.3 Communication

For the communication infrastructure, additional suitable transmission facilities and/or network components may be needed.

Own Station (Central Station)

System	System element	Protocol element	Remarks
SICAM A8000	CP-8000/CPC80 CP-802x/CPC80	COUMT0 COUMT0	

Remote Station (Counter Device)

System	System element	Protocol element	Remarks
Third-party system	–	–	acc. to IEC 62056-21 (IEC 61107) mode C with EDIS/OBIS data coding

5.5.8 MODMT2, MODST0

5.5.8.1 Functions

Communication between one central station and up to 100 substations (MODBUS).

Central Station

- Serial communication according to MODBUS RTU Master “serial”
  MODMT2 is central station
- MODBUS protocol with half duplex link transmission procedure
  - MODBUS RTU mode
- Max. connections (number of supported MODBUS Slaves): 100 [1)]
  - max. number of SICAM FCMv2 devices per interface without SICAM FCMv2,v3 parameter loading: 100 [1)]
  - max. number of SICAM FCMv2 devices per interface with SICAM FCMv2,v3 parameter loading: 5…100 [1)]
    (5 parameter sets for SICAM FCM devices; each parameter set either for single SICAM FCM device or parameter set for group of SICAM FCM devices)
- Message protection
  - CRC16 + parity (optional) “RTU mode“
- Network Configurations
  - Point-to-point
  - Multiple point-to-point (extra interface required for each point-to-point configuration)
  - Multipoint-partyline
  - Multipoint-star
  - Data concentrator
- MODBUS Slave address 0 “Broadcast“ [2)]
- MODBUS Slave addresses 1…247
- Physical Interface
  - RS-232 - unbalanced interface according V.24/V.28 standard
  - RS-485 - balanced interface according V.11 standard [3)]
  - RS-422 - balanced interface according V.11 standard [3)]
  - Transmission line (half duplex)
- Supported Baud Rates
  - 50, 75, 100, 110, 134.5, 150, 200, 300, 600, 1050, 1200, 1800, 2000, 2400, 4800, 9600, 19200, 38400, 57600 bit/s
- Byte Frame
  - | 8N1, 8E1, 8O1 | 8N1.5, 8E1.5, 8O1.5 | 8N2, 8E2, 8O2 | [4)]
- Interoperability according to the following documents:
  - *SICAM RTUs MODBUS Interoperability* (DC0-073-2)
- MODBUS Register
  - MODBUS Register “16 Bit“
  - MODBUS register address range: 1 (0) … 65535
  - MODBUS register addressing - according MODBUS standard (YES/NO) (selective for each Slave)

- MODBUS Function Codes [5)]
  - 01 = READ COILS
  - 02 = READ DISCRETE INPUTS
  - 03 = READ HOLDING REGISTERS
  - 04 = READ INPUT REGISTERS
  - 05 = WRITE SINGLE COIL
  - 06 = WRITE SINGLE REGISTER
  - 15 = WRITE MULTIPLE COILS
  - 16 = WRITE MULTIPLE REGISTERS
- MODBUS Exception Codes
  - 01 = ILLEGAL FUNCTION
  - 02 = ILLEGAL DATA ADDRESS
  - 03 = ILLEGAL DATA VALUE
- Data Formats in MODBUS Registers
  - Format-1: INT16 — Signed integer 16 bit
  - Format-2: UINT16 — Unsigned integer 16 bit
  - Format-3: INT32 (H/L) — Signed integer 32 bit (HIGH before LOW)
  - Format-4: UINT32 (H/L) — Unsigned integer 32 bit (HIGH before LOW)
  - Format-5: INT32 (L/H) — Signed integer 32 bit (LOW before HIGH)
  - Format-6: UINT32 (L/H) — Unsigned integer 32 bit (LOW before HIGH)
  - Format-7a: FLOAT32 — Short floating point 32 bit (IEEE 754)
  - Format-7b: FLOAT32 (swapped) — Short floating point 32 bit (IEEE 754) „swapped“
  - Format-16: BS16 — Bitstring of 16 bit [6)]
  - Format-20: 1 Bit (SPI) — Single point information
  - Format-21: 2 Bit DPI (1=off,2=on) — Double point information (OFF before ON) [6)]
  - Format-22: 2 Bit DPI (1=on,2=off) — Double point information (ON before OFF) [6)]
  - Format-25: 3BIT/MCU — 3 Bit indication - Siemens MCU “Motor Control Unit“[6)]
  - Format-30: SC — Single command (1 bit) [7)]
  - Format-31: SC (pulse) — Single command (pulse 1 bit) [7)]
  - Format-33: DC1 — Double command (1 bit) [7)]
  - Format-35: DC2 (pulse) — Double command (pulse 2 bit) [7)]
  - Format-40: SC1n16R — Single command - 1 out of 16 (register) [7)]
  - Format-41: DC1n16R — Double command - 1 out of 16 (register) [7)]
  - Format-1xx: DTx — Date and time (free configurable) [7)]
  - Format-104: DTFCM — Date + time (SICAM FCM) [7)] [8)]
- Supported IEC60870-5-101/104 message formats in “Command- or Control Direction)” (MASTER transmit direction | SLAVE receive direction)
  - <TI=30>…Single-point information with time tag CP56Time2a
  - <TI=34>…Measured value, normalized value with time tag CP56Time2a (15 bit + sign)
  - <TI=35>…Measured value, scaled value with time tag CP56Time2a (15 bit + sign)
  - <TI=36>…measured value, short floating point number with time tag CP56Time2a
  - <TI=45>…Single command
  - <TI=46>…Double command
  - <TI=48>…Setpoint command, normalized value
  - <TI=49>…Setpoint command, scaled value
  - <TI=50>…Setpoint command, short floating point number
- Supported IEC60870-5-101/104 message formats in “Signaling- or Monitoring Direction“ (MASTER receive direction | SLAVE transmit direction)
  - <TI=30>…Single-point information with time tag CP56Time2a
  - <TI=31>…Double-point information with time tag CP56Time2a
  - <TI=33>…Bit string of 32 Bit with time stamp CP56Time2a
  - <TI=34>…Measured value, normalized value with time tag CP56Time2a (15 bit + sign)
  - <TI=35>…Measured value, scaled value with time tag CP56Time2a (15 bit + sign)
  - <TI=36>…Measured value, short floating point number with time tag CP56Time2a
  - <TI=37>…Counter value with time tag CP56Time2a (31 Bit + sign with sequence number)

- Acquisition of events (transmission of data ready to be sent)
- General interrogation, outstation interrogation
- Clock synchronization for selected MODBUS Slave devices
  - Clock synchronization - selectable for each MODBUS Slave
  - Clock synchronization for SICAM FCM
  - Clock synchronization for MODBUS Slaves “free definable”
- Optimized parameters for selected transmission facilities (modems)
  - Predefined optimized parameters for selected transmission facilities
  - Free definable parameters for transmission facility
  - 5 V power supply for external modem (via status line of the RS-232 interface)
    ATTENTION: check power consumption of external modem!
- Protocol element control and return information
  Protocol element return information
  - Station status
  - Station failure
- Special Functions
  - SICAM FCM “parameter loading“ (SICAM FCM V2.00, V2.10, V2.20, V2.30, V2.40, V2.50, V2.60, V2.61, V3.10)
  - SICAM FCM “firmware loading“ (SICAM FCM >= V2.00)
- Engineering
  - TOOLBOX II + OPM
  - Web engineering

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1) This specification refers to the max. number of possible stations for MODBUS Master in SICAM RTUs (per communication interface); due to performance and required response time, in most cases only a few stations are possible (typ. 20-30); the MODBUS protocol itself defines a max. possible number of 247 stations per line

2) Broadcast addressing is only restricted supported by Master

3) External converters (V.24/V.28 ↔ V.11) are required in some cases

4) Byte frame for MODBUS RTU mode according MODBUS standard: "8E1" (1 start bit, 8 data bits, 1 parity bit „even parity“, 1 stop bit). For maximum compatibility with other devices „odd parity, no parity“ and „1.5 stop bits, 2 stop bits“ is also supported.
The use of no parity requires 2 stop bits! (In old configurations byte frame "8N2" (8 data bits, no parity, 2 stop bits) is used typically for MODBUS RTU mode).

5) In addition to the supported MODBUS function codes the supported data formats in the MODBUS registers are also relevant!

6) Only in receive direction!

7) Only in transmit direction!

8) Time + date formats only in transmit direction for clock synchronization of the remote station. Data with time tagging is not supported (except Alarm Panel)!

Substation

- Serial communication according to MODBUS RTU Slave “serial”
  MODST0 is substation
- MODBUS protocol – half duplex link transmission procedure
  - MODBUS RTU-Mode
  - MODBUS ASCII-Mode
- Max. connections: 1 [1)]
- Message protection
  - CRC16 + parity (optional) “RTU-Mode“
  - LRC + parity (optional) “ASCII-Mode“
- Network Configurations
  - Point-to-point
  - Multiple point-to-point (extra interface required for each point-to-point configuration)
  - Multipoint-partyline
  - Multipoint-star
  - Data concentrator
- MODBUS Slave address 0 “Broadcast“
- MODBUS Slave addresses 1…247
- Physical interface
  - RS-232 - unbalanced interface according V.24/V.28 standard
  - RS-485 - balanced interface according V.11 standard [2)]
  - RS-422 - balanced interface according V.11 standard [2)]
  - Transmission line (half duplex)
- Supported Baud Rates
  - 50, 75, 100, 110, 134.5, 150, 200, 300, 600, 1050, 1200, 1800, 2000, 2400, 4800, 9600, 19200 bit/s
- Byte Frame
  - MODBUS RTU mode [3)]
    | 8N1, 8E1, 8O1 | 8N1.5, 8E1.5, 8O1.5 | 8N2, 8E2, 8O2 |
  - MODBUS ASCII mode [4)]
    | 7N1, 7E1, 7O1 | 7N1.5, 7E1.5, 7O1.5 | 7N2, 7E2, 7O2 |
- Interoperability according to the following documents:
  - *SICAM RTUs MODBUS Interoperability* (DC0-073-2)
- MODBUS Register
  - MODBUS Register “16 bit“
  - MODBUS register address range: 1 (0) … 65535
  - MODBUS register addressing – according MODBUS standard (YES/NO) (global for all slaves)
- MODBUS Function Codes [5)]
  - 01 = READ COILS
  - 02 = READ DISCRETE INPUTS
  - 03 = READ HOLDING REGISTERS
  - 04 = READ INPUT REGISTERS
  - 05 = WRITE SINGLE COIL
  - 06 = WRITE SINGLE REGISTER
  - 08 = DIAGNOSTICS (SUB-Code 00-18,20) "Return Query Data" (LOOPBACK CHECK)
  - 15 = WRITE MULTIPLE COILS
  - 16 = WRITE MULTIPLE REGISTERS
- MODBUS Exception Codes
  - 01 = ILLEGAL FUNCTION
  - 02 = ILLEGAL DATA ADDRESS
  - 04 = SLAVE DEVICE FAILURE [6)]

- Data Formats (MODBUS Registers)
  - Format-1: INT16 Signed integer 16 bit
  - Format-2: UINT16 Unsigned integer 16 bit
  - Format-3: INT32 (H/L) Signed integer 32 bit (HIGH before LOW)
  - Format-4: UINT32 (H/L) Unsigned integer 32 bit (HIGH before LOW)
  - Format-5: INT32 (L/H) Signed integer 32 bit (LOW before HIGH)
  - Format-6: UINT32 (L/H) Unsigned integer 32 bit (LOW before HIGH)
  - Format-7: FLOAT32s Short floating point (IEEE 754) “swapped”
  - Format-12: 32BIT/OMVZ OMV counter value format [7)]
  - Format-13: 16BIT/H&B H & B measured value format (0 – 4000)
  - Format-20: 1BIT (SPI) Single point information
  - Format-30: SC Single command (1 bit) [8)]
  - Format-31: SC (pulse) Single command (pulse 1 bit)
  - Format-33: DC1 Double command (1 bit) [8)]
  - Format-34: DC1 (pulse) Double command (pulse 1 bit)
  - Format-120: Date + Time (BCD) “OMV“ [7)] [9)]
  - Format-121: Date + Time (BCD reverse) “OMV“ [7)] [9)]
- Supported IEC60870-5-101/104 message formats in “Command- or Control Direction” (MASTER transmit direction | SLAVE receive direction)
  - <TI=30>…single-point information with time tag CP56Time2a
  - <TI=34>…Measured value, normalized value with time tag CP56Time2a (15 bit + sign)
  - <TI=35>…Measured value, scaled value with time tag CP56Time2a (15 bit + sign)
  - <TI=36>…measured value, short floating point number with time tag CP56Time2a
  - <TI=37>…Counter value with time tag CP56Time2a (31 bit + sign with sequence number)
  - <TI=45>…Single command
  - <TI=46>…Double command
  - <TI=48>…Setpoint command, normalized value
  - <TI=49>…Setpoint command, scaled value
  - <TI=50>…Setpoint command, short floating point number
- Supported IEC60870-5-101/104 message formats in “Signaling- or Monitoring Direction “ (MASTER receive direction | SLAVE transmit direction)
  - <TI=30>…single-point information with time tag CP56Time2a
  - <TI=31>…double-point information with time tag CP56Time2a
  - <TI=34>…Measured value, normalized value with time tag CP56Time2a (15 bit + sign)
  - <TI=35>…Measured value, scaled value with time tag CP56Time2a (15 bit + sign)
  - <TI=36>…measured value, short floating point number with time tag CP56Time2a
  - <TI=37>…Counter value with time tag CP56Time2a (31 bit + sign with sequence number)
  - <TI=45>…Single command
  - <TI=46>…Double command
  - <TI=48>…Setpoint command, normalized value
  - <TI=49>…Setpoint command, scaled value
  - <TI=50>…Setpoint command, short floating point number
- Clock synchronization for selected MODBUS Slave devices
  - Clock synchronization for OMV
- Optimized parameters for selected transmission facilities (modems)
  - Predefined optimized parameters for selected transmission facilities
  - Free definable parameters for transmission facility
  - 5 V power supply for external modem (via status line of the RS-232 interface) ATTENTION: check power consumption of external modem!
- Engineering
  - SICAM TOOLBOX II + OPM II
  - Web engineering

1) From the perspective of the remote terminal unit the max. number of stations per line is not relevant

2) External converters (V.24/V.28 ↔ V.11) are required in some cases

3) Byte frame for MODBUS RTU mode according MODBUS standard: "8E1" (1 start bit, 8 data bits, 1 parity bit “even parity“, 1 stop bit). For maximum compatibility with other devices “odd parity, no parity“ and “1.5 stop bits, 2 stop bits“ is also supported.
The use of no parity requires 2 stop bits! (In old configurations byte frame "8N2" (8 data bits, no parity, 2 stop bits) is used typically for MODBUS RTU mode).

4) Byte frame for MODBUS ASCII mode according MODBUS standard: "7E1" (1 start bit, 7 data bits, 1 parity bit “even parity“, 1 stop bit). For maximum compatibility with other devices „odd parity, no parity“ and „1.5 stop bits, 2 stop bits“ is also supported.
The use of no parity requires 2 stop bits! (In old configurations byte frame "7N2" (7 data bits, no parity, 2 stop bits) is used typically for MODBUS ASCII mode).

5) In addition to the supported MODBUS function codes the supported data formats in the MODBUS registers are also relevant!

6) Only with activated system technical parameter for data points marked faulty

7) Time + date formats only in transmit direction for clock synchronization of the remote station. Data with time tagging is not supported (except Alarm Panel)!

Note

The previously mentioned functions are described in detail in the document *SICAM RTUs ▪ Ax 1703 Common Functions MODBUS*.

Note

The MODBUS RTU protocol in SICAM A8000 does not support the full functionality of MODBUS RTU. The protocol defines only the transmission of coils and 16 bit register values, but not the data formats in the Modbus registers.

The MODBUS RTU protocol in SICAM A8000 supports many of the most commonly used data formats.

For the connection of devices with MODBUS RTU protocol, always check beforehand whether the required functionality and data formats are supported in the central station and in the substation!

5.5.8.2 Operating Modes

The operating mode of the interface is determined by parameters of the protocol element and optional devices.

Operating mode	Interface → optional DTE	Interface signals
Unbalanced interchange circuit (V.24/V.28) RS-232 asynchronous	X2	RXD, TXD, CTS [1], RTS, DCD, DTR, DSR/VCC, GND
Balanced interface (V.11) RS-485 (2-wire)/ RS-422 (4-wire) asynchronous	X3	TXD+/RXD+, TXD-/RXD- (2-wire) TXD+, TXD-, RXD+, RXD- (4-wire)
Balanced interface (V.11) RS-485 (2-wire)/ RS-422 (4-wire) asynchronous	X2 → CM-0829 (CM-0819) [2]	RXD, TXD, CTS, RTS, DCD, DTR, DSR/VCC, GND (to CM-08x9)
Unbalanced interchange circuit (V.24/V.28) RS-232 asynchronous	X6 [3]	RXD, TXD, CTS, RTS, DCD, DTR, DSR, GND
Balanced interface (V.11) RS-485 (2-wire)/ RS-422 (4-wire) asynchronous	X6 [3]	TXD+/RXD+, TXD-/RXD- (2-wire) TXD+, TXD-, RXD+, RXD- (4-wire)

[1] not usable (reserved for SICAM TOOLBOX II)

[2] with transmission rate > 9600 bit/s, converter PHOENIX PSM-ME-RS232/RS485-P is required: interface signals D(A), D(B), GND (RS-485); D(A), D(B), T(A), T(B), GND (RS-422); CM-0819 does not support RS-422

[3] only CP-8022 (switchable mode via parameter)

Note

Details about realization of various operation modes are given in the manual *SICAM RTUs Platforms - Configuration Automation Units and Automation Networks*.

5.5.8.3 Communication

For the communication infrastructure, additional suitable transmission facilities and/or network components may be needed.

Own Station (Central Station)

System	System element	Protocol element	Remarks
SICAM A8000	CP-8000/CPC80 CP-802x/CPC80	MODMT2 MODMT2	

Remote Station (Substation)

System	System element	Protocol element	Remarks
SICAM A8000	CP-8000/CPC80 CP-802x/CPC80 CP-8050/CPCI85	MODST0 MODST0 MODSI0	
SICAM AK 3	CP-2016/CPCX26 CP-2019/PCCX26	SM-2551/MODSA0 SM-0551/MODSA0	
Legacy systems (SICAM AK, SICAM TM, SICAM EMIC, SICAM BC, Ax 1703)	CP-20xx CP-50xx CP-60xx	SM-2551/MODSA0 SM-0551/MODSA0 MODST0 SM-2541/MODS00	acc. to *SICAM RTUs MODBUS Interoperability*
Third-party system	–	–	acc. to *SICAM RTUs MODBUS Interoperability*

Own Station (Substation)

System	System element	Protocol element	Remarks
SICAM A8000	CP-8000/CPC80 CP-802x/CPC80	MODST0 MODST0	

Remote Station (Central Station)

System	System element	Protocol element	Remarks
SICAM A8000	CP-8000/CPC80 CP-802x/CPC80 CP-8050/CPCI85	MODMT2 MODMT2 MODMI0	
SICAM AK 3	CP-2016/CPCX26 CP-2019/PCCX26	SM-2551/MODMA0 SM-0551/MODMA0	
Legacy systems (SICAM AK, SICAM TM, SICAM EMIC, SICAM BC, Ax 1703)	CP-20xx CP-50xx CP-60xx	SM-2551/MODMA0 SM-0551/MODMA0 MODMT0 SM-2541/MODM00 SM-1543/MODM00	acc. to *SICAM RTUs MODBUS Interoperability*
SICAM FCM	–	–	acc. to *SICAM RTUs MODBUS Interoperability*
Third-party system	–	–	acc. to *SICAM RTUs MODBUS Interoperability*

5.5.9 DNPMT0, DNPST0

5.5.9.1 Functions

Communication between one central station and one or several substations.

- Unbalanced multi-point traffic according to DNP3
  DNPMT0 is central station, DNPST0 is substation
  - Data acquisition by polling (station interrogation, register interrogation)
  - Acquisition of events (transmission of data ready to be sent, unsolicited responses)
  - General interrogation, outstation interrogation
  - Command transmission
  - Transmission of integrated totals
- Max. connections (number of supported DNP Slaves): 100 *)
- Physical interface
  - RS-232 – unbalanced interface according to V.24/V.28
  - RS-485 – balanced interface according to V.11
- Supported functionality according to the following document:
  - *SICAM RTUs DNP3 Interoperability* (DC0-046-2)
- Optimized parameters for selected transmission facilities
- Functions for supporting redundant communication routes
- Special functions

*) because of performance, required response time and limited storage capacity max. 20

Note

The previously mentioned functions are described in detail in the document *SICAM RTUs ▪ Ax 1703 Common Functions DNP3*.

5.5.9.2 Operating Modes

The operating mode of the interface is determined by parameters of the protocol element and optional devices.

Operating mode	**Interface → optional DTE**	**Interface signals**
Unbalanced interchange circuit (V.24/V.28) RS-232 asynchronous	X2	RXD, TXD, CTS 1), RTS, DCD, DTR, DSR/VCC, GND
Balanced interface (V.11) RS-485 (2-wire)/ RS-422 (4-wire) asynchronous	X3	TXD+/RXD+, TXD-/RXD- (2-wire) TXD+, TXD-, RXD+, RXD- (4-wire)
Balanced interface (V.11) RS-485 (2-wire)/ RS-422 (4-wire) asynchronous	X2 → CM-0829 (CM-0819 2))	RXD, TXD, CTS, RTS, DCD, DTR, DSR/VCC, GND (to CM-08x9)
Optical interface (multimode fibre optic) ring	X2 → CM-0821	RXD, TXD, CTS, RTS, DCD, DTR, DSR/VCC, GND (to CM-0821)
Unbalanced interchange circuit (V.24/V.28) RS-232 asynchronous	X6 3)	RXD, TXD, CTS, RTS, DCD, DTR, DSR, GND
Balanced interface (V.11) RS-485 (2-wire)/ RS-422 (4-wire) asynchronous	X6 3)	TXD+/RXD+, TXD-/RXD- (2-wire) TXD+, TXD-, RXD+, RXD- (4-wire)

1) not usable (reserved for SICAM TOOLBOX II)

2) RS-422 not supported

3) only CP-8022 (switchable mode via parameter)

Note

Details about realization of various operation modes are given in the manual *SICAM RTUs Platforms - Configuration Automation Units and Automation Networks*.

5.5.9.3 Communication

For the communication infrastructure, additional suitable transmission facilities and/or network components may be needed.

Own Station (Central Station)

System	System element	Protocol element	Remarks
SICAM A8000	CP-8000/CPC80 CP-802x/CPC80	DNPMT0 DNPMT0	

Remote Station (Substation)

System	System element	Protocol element	Remarks
SICAM A8000	CP-8000/CPC80 CP-802x/CPC80	DNPST0 DNPST0	
SICAM AK 3	CP-2016/CPCX26 CP-2019/PCCX26	SM-2551/DNPSA0 SM-0551/DNPSA0	
Legacy systems (SICAM AK, SICAM TM, SICAM BC, Ax 1703)	CP-20xx CP-50xx CP-60xx	SM-2551/DNPSA0 SM-0551/DNPSA0 SM-2541/DNPU00	acc. to *SICAM RTUs DNP3 Interoperability*
Third-party system	–	–	acc. to *SICAM RTUs DNP3 Interoperability*

Own Station (Substation)

System	System element	Protocol element	Remarks
SICAM A8000	CP-8000/CPC80 CP-802x/CPC80	DNPST0 DNPST0	

Remote Station (Central Station)

System	System element	Protocol element	Remarks
SICAM A8000	CP-8000/CPC80 CP-802x/CPC80	DNPMT0 DNPMT0	
SICAM AK 3	CP-2016/CPCX26 CP-2019/PCCX26	SM-2551/DNPMA0 SM-0551/DNPMA0	
Legacy systems (SICAM AK, SICAM TM, SICAM BC, Ax 1703)	CP-20xx CP-50xx CP-60xx	SM-2551/DNPMA0 SM-0551/DNPMA0 SM-2541/DNPM00 SM-1543/DNPM00	acc. to *SICAM RTUs DNP3 Interoperability*
Third-party system	–	–	acc. to *SICAM RTUs DNP3 Interoperability*

5.5.10 DNPiT1, DNPiT2

5.5.10.1 Functions

Communication between one central station and one or several substations according to DNP3 via Ethernet (TCP/IP).

- Unbalanced multi-point traffic according DNP3

  DNPiT1 is substation
  - Data acquisition by polling (station interrogation)
  - Acquisition of events (transmission of data ready to be sent, unsolicited responses)
  - General interrogation, outstation interrogation
  - Command transmission
  - Transmission of integrated totals

  DNPiT2 is central station
  - Data acquisition by polling (station interrogation, event interrogation)
  - General interrogation, outstation interrogation
  - Command transmission
- Max. connections (number of supported DNP Slaves): 4
- Physical interface
  - LAN (TCP/IP)
- Supported functionality according to the following document:
  - *SICAM RTUs DNP3 Interoperability, chapter "Interoperability of SICAM RTUs for DNP3 Slave (serial + Ethernet) using DNPS"* (DC0-046-2)
- Clock synchronization according to NTP (Network Time Protocol) - RFC 1305
  - NTP Client: Clock synchronization with one or more NTP servers
  - NTP Server: integrated NTP server for clock synchronization of one or several NTP clients
- Functions for supporting redundant communication routes
- SICAM TOOLBOX II connection over LAN/WAN ("remote operation")
  - connection via proprietary TCP/IP protocol (one SICAM TOOLBOX II session can be served at the same time)
- Web server
  - Integrated web server to display connection-/statistic-/developer information
  - Access to the web server with standard web browser via HTTP (Hyper Text Transfer Protocol)
- Special functions

Note

The previously mentioned functions are described in detail in the document *SICAM RTUs ▪ Ax 1703 Common Functions DNP3*.

5.5.10.2 Operating Modes

Operating mode	Interface → optional DTE	Interface signals
Electrical Ethernet interface (twisted pair)	X1 X4	TXD+, TXD-, RXD+, RXD-

Note

Details about realization of various operation modes are given in the manual *SICAM RTUs Platforms - Configuration Automation Units and Automation Networks*.

5.5.10.3 Communication

For the communication infrastructure, additional suitable transmission facilities and/or network components may be needed.

Own Station (Central Station)

System	System element	Protocol element	Remarks
SICAM A8000	CP-8000/CPC80 CP-802x/CPC80	DNPiT2 DNPiT2	

Remote Station (Substation)

System	System element	Protocol element	Remarks
SICAM A8000	CP-8000/CPC80 CP-802x/CPC80	DNPiT1 DNPiT1 DNPST0	additional serial/Ethernet converter (device server) is required
SICAM AK 3	CP-2016/CPCX26 CP-2019/PCCX26	SM-2551/DNPSA0 SM-0551/DNPSA0	additional serial/Ethernet converter (device server) is required
Legacy systems (SICAM AK, SICAM TM, SICAM BC, Ax 1703)	CP-20xx CP-50xx CP-60xx	SM-2551/DNPSA0 SM-0551/DNPSA0 SM-2541/DNPU00	additional serial/Ethernet converter (device server) is required acc. to *SICAM RTUs DNP3 Interoperability*
Third-party system	–	–	acc. to *SICAM RTUs DNP3 Interoperability*

Own Station (Substation)

System	System element	Protocol element	Remarks
SICAM A8000	CP-8000/CPC80 CP-802x/CPC80	DNPiT1 DNPiT1	

Remote Station (Central Station)

System	System element	Protocol element	Remarks
SICAM A8000	CP-8000/CPC80 CP-802x/CPC80	DNPiT2 DNPiT2 DNPMT0	additional serial/Ethernet converter (device server) is required
SICAM AK 3	CP-2016/CPCX26 CP-2019/PCCX26	SM-2551/DNPMA0 SM-0551/DNPMA0	additional serial/Ethernet converter (device server) is required
Legacy systems (SICAM AK, SICAM TM, SICAM BC, Ax 1703)	CP-20xx CP-50xx CP-60xx	SM-2551/DNPMA0 SM-0551/DNPMA0 SM-2541/DNPM00 SM-1543/DNPM00	additional serial/Ethernet converter (device server) is required acc. to *SICAM RTUs DNP3 Interoperability*
Third-party system	–	–	acc. to *SICAM RTUs DNP3 Interoperability*

5.5.11 ST1ST0

5.5.11.1 Functions

Communication of a central station with one or more substations.

- Unbalanced multi-point traffic according to Siemens SINAUT ST1 (TIM 11)
  ST1ST0 is substation
  - Data acquisition by polling (station interrogation)
  - Acquisition of events (transmission of data ready to be sent)
  - General interrogation, substation interrogation
  - Command transmission
  - Transmission of integrated totals
- Physical interface
  - RS-232 – unbalanced interface according to V.24/V.28
  - RS-485 – balanced interface according to V.11
- Supported functionality according to
  Siemens SINAUT ST1 (TIM 11)
  Protocol definition (with restrictions)
- Optimized parameters for selected transmission facilities
- Message conversion
  - IEC60870-5-101 <-> Siemens SINAUT ST1 (TIM11)

Note
The previously mentioned functions are described in detail in the document *SICAM RTUs • Ax 1703 Common Functions SIEMENS SINAUT-ST1 GV-S*.

5.5.11.2 Operating Modes

The operating mode of the interface is determined by parameters of the protocol element and optional devices.

Operating mode	**Interface → optional DTE**	**Interface signals**
Unbalanced interchange circuit (V.24/V.28) RS-232 asynchronous	X2	RXD, TXD, CTS [1], RTS, DCD, DTR, DSR/VCC, GND
Balanced interface (V.11) RS-485 (2-wire)/ RS-422 (4-wire) asynchronous	X3	TXD+/RXD+, TXD-/RXD- (2-wire) TXD+, TXD-, RXD+, RXD- (4-wire)
Balanced interface (V.11) RS-485 (2-wire)/ RS-422 (4-wire) asynchronous	X2 → CM-0829 (CM-0819 [2])	RXD, TXD, CTS, RTS, DCD, DTR, DSR/VCC, GND (to CM-08x9)
Optical interface (multimode fibre optic) ring	X2 → CM-0821	RXD, TXD, CTS, RTS, DCD, DTR, DSR/VCC, GND (to CM-0821)
Unbalanced interchange circuit (V.24/V.28) RS-232 asynchronous	X6 [3]	RXD, TXD, CTS, RTS, DCD, DTR, DSR, GND
Balanced interface (V.11) RS-485 (2-wire)/ RS-422 (4-wire) asynchronous	X6 [3]	TXD+/RXD+, TXD-/RXD- (2-wire) TXD+, TXD-, RXD+, RXD- (4-wire)

[1] not usable (reserved for SICAM TOOLBOX II)

[2] RS-422 not supported

[3] only CP-8022 (switchable mode via parameter)

Note

Details about realization of various operation modes are given in the manual *SICAM RTUs Platforms - Configuration Automation Units and Automation Networks*.

5.5.11.3 Communication

For the communication infrastructure, additional suitable transmission facilities and/or network components may be needed.

Own Station (Substation)

System	System element	Protocol element	Remarks
SICAM A8000	CP-8000/CPC80 CP-802x/CPC80	ST1ST0 ST1ST0	

Remote Station (Central Station)

System	System element	Protocol element	Remarks
SICAM AK 3	CP-2016/CPCX26 CP-2019/PCCX26	SM-2551/ST1MA0 SM-0551/ST1MA0	
Legacy systems (SICAM AK, SICAM TM, SICAM BC, Ax 1703)	CP-20xx CP-50xx CP-60xx	SM-2551/ST1MA0 SM-0551/ST1MA0 SM-2541/ST1M00	acc. to *Siemens SINAUT ST1 (TIM11) Interoperability*
Third-party system	–	–	acc. to *Siemens SINAUT ST1 (TIM11) Interoperability*

5.5.12 TG8ST0

5.5.12.1 Functions

Communication of a central station with one or more substations.

- Unbalanced multi-point traffic according to L&G TG800 (DIN 19244) in “leased line” mode or “dial-up” mode
  TG8ST0 is substation
  - Supported functionality according to document *SICAM RTUs Interoperability TG800*
  - Data acquisition by polling
  - Acquisition of events (transmission of data ready to be sent)
  - General interrogation, interrogation of integrated totals (counter values)
- Spontaneous transmission of commands and set points in command direction
- Spontaneous transmission of binary information, measured values and integrated totals (counter values) in monitoring direction
- Multi-hierarchical TG800 configurations possible
- Time synchronization via TG800 communication
- Subset of TG800 "system indications"
- Radio spontaneous mode

Note

The previously mentioned functions are described in detail in the document *SICAM RTUs ▪ Ax 1703 Common Functions Landis & Gyr TELEGYR 800 GV-S*.

5.5.12.2 Operating Modes

The operating mode of the interface is determined by parameters of the protocol element and optional devices.

Operating mode	**Interface → optional DTE**	**Interface signals**
Unbalanced interchange circuit (V.24/V.28) RS-232 asynchronous	X2	RXD, TXD, CTS [1], RTS, DCD, DTR, DSR/VCC, GND
Balanced interface (V.11) RS-485 (2-wire)/ RS-422 (4-wire) asynchronous	X3	TXD+/RXD+, TXD-/RXD- (2-wire) TXD+, TXD-, RXD+, RXD- (4-wire)
Balanced interface (V.11) RS-485 (2-wire)/ RS-422 (4-wire) asynchronous	X2 → CM-0829 (CM-0819 [2])	RXD, TXD, CTS, RTS, DCD, DTR, DSR/VCC, GND (to CM-08x9)
Optical interface (multimode fibre optic) ring	X2 → CM-0821	RXD, TXD, CTS, RTS, DCD, DTR, DSR/VCC, GND (to CM-0821)
Unbalanced interchange circuit (V.24/V.28) RS-232 asynchronous	X6 [3]	RXD, TXD, CTS, RTS, DCD, DTR, DSR, GND
Balanced interface (V.11) RS-485 (2-wire)/ RS-422 (4-wire) asynchronous	X6 [3]	TXD+/RXD+, TXD-/RXD- (2-wire) TXD+, TXD-, RXD+, RXD- (4-wire)

[1] not usable (reserved for SICAM TOOLBOX II)

[2] RS-422 not supported

[3] only CP-8022 (switchable mode via parameter)

Note

Details about realization of various operation modes are given in the manual *SICAM RTUs Platforms - Configuration Automation Units and Automation Networks*.

5.5.12.3 Communication

For the communication infrastructure, additional suitable transmission facilities and/or network components may be needed.

Own Station (Substation)

System	System element	Protocol element	Remarks
SICAM A8000	CP-8000/CPC80 CP-802x/CPC80	TG8ST0 TG8ST0	

Remote Station (Central Station)

System	System element	Protocol element	Remarks
SICAM AK 3	CP-2016/CPCX26 CP-2019/PCCX26	SM-2551/TG8MA0 SM-0551/TG8MA0	
Legacy systems (SICAM AK, SICAM TM, SICAM BC, Ax 1703)	CP-20xx CP-50xx CP-60xx	SM-2551/TG8MA0 SM-0551/TG8MA0 SM-2541/TG8M00	
Third-party system	–	–	acc. to *SICAM RTUs TG800 Interoperability*

5.5.13 SMST0

5.5.13.1 Functions

Printer logging (ASCII) and SMS alert/control.

- Printer logging
  - Logging on a serial printer (ASCII)
- SMS-alert
  - Send binary information with SMS
    - Aquisition time in SMS text
  - Send command with SMS
  - Member adminstration
  - Modem control with AT-Hayes commands
- SMS control
  - Receive command with SMS
    - Command delay supervision for SMS commands
  - Member administration
  - Modem control with AT-Hayes commands

Note

The previously mentioned functions are described in detail in the document *SICAM RTUs ▪ Ax 1703 Common Functions Printer Logging (ASCII) and SMS Alarms*.

5.5.13.2 Operating Modes

The operating mode of the interface is determined by parameters of the protocol element and optional devices.

Operating mode	**Interface → optional DTE**	**Interface signals**
Unbalanced interchange circuit (V.24/V.28) RS-232 asynchronous	X2→ modem (GSM)	RXD, TXD, CTS [1)], RTS, DCD, DTR, DSR/VCC, GND
Unbalanced interchange circuit (V.24/V.28) RS-232 asynchronous	X6 [3)] → modem (GSM)	RXD, TXD, CTS, RTS, DCD, DTR, DSR, GND

*) only CP-8022 (RS-232 mode)

5.5.13.3 Communication

For the communication infrastructure, additional suitable transmission facilities and/or network components may be needed.

5.5.13.3.1 Printer control

Own Station

System	System element	Protocol element	Remarks
SICAM A8000	CP-8000/CPC80 CP-802x/CPC80	SMST0 SMST0	

Remote Station

System	System element	Protocol element	Remarks
Third-party system	–	–	Serial printers (for printed protocols)

5.5.13.3.2 SMS Alert and Control

Own Station

System	System element	Protocol element	Remarks
SICAM A8000	CP-8000/CPC80 CP-802x/CPC80	SMST0 SMST0	

Remote Station

System	System element	Protocol element	Remarks
SICAM A8000	CP-8000/CPC80 CP-802x/CPC80	SMST0 SMST0	
SICAM AK 3	CP-2016/CPCX26 CP-2019/PCCX26	SM-2551/SMSA0 SM-0551/SMSA0	
Legacy systems (SICAM AK, SICAM TM, SICAM EMIC, SICAM MIC, SICAM BC, Ax 1703)	CP-20xx CP-50xx CP-60xx	SM-2551/SMSA0 SM-0551/SMSA0 SMST0 SM-2541/SMS00	
Third-party system	–	–	• Mobile phone (SMS alert/control) • Third-party system (SMS alert/control)

5.5.14 PCBST0

5.5.14.1 Functions

Communication of a substation with a central station (SAT SK 1703 Slave).

- Multi-point traffic slave for the transmision of SAT 1703 standard formats (external database formats)
  PCBST0 is substation
- Traffic handling optional according to "SK 1703 Multi-point traffic (Master = PCBM00, PCBM10, PCBMA0) or "Radio relay operation“ without routing procedure (Master = SKSZ40, SKSZA0)
- Message formats according to IEC 60870-5-1/FT1.2
- Puls code modulation; byte asynchronous
- Transmission rate 50 up to 19200 bps
- Protection of the messages with hamming distance HA = 4
- Control of the traffic handling with handshaking and message repititions upon acknowledgement failure
- Check of received messages
- Bundle in send/receive direction
- Chaining in send direction
- Linear measured value adaptation
- Timesetting and time synchronization of the automation unit
- Multi-hierarchical configurations possible (to substations in multi-point traffic further automation units can be connected)

Note

The previously mentioned functions are described in detail in the document *SICAM RTUs • Ax 1703 Common Functions SK 1703 Multi-Point Traffic GV-U*.

5.5.14.2 Operating Modes

The operating mode of the interface is determined by parameters of the protocol element and optional devices.

Operating mode	Interface → optional DTE	Interface signals
Unbalanced interchange circuit (V.24/V.28) RS-232 asynchronous	X2	RXD, TXD, CTS [1], RTS, DCD, DTR, DSR/VCC, GND
Balanced interface (V.11) RS-485 (2-wire)/ RS-422 (4-wire) asynchronous	X3	TXD+/RXD+, TXD-/RXD- (2-wire) TXD+, TXD-, RXD+, RXD- (4-wire)
Balanced interface (V.11) RS-485 (2-wire)/ RS-422 (4-wire) asynchronous	X2 → CM-0829 (CM-0819 [2])	RXD, TXD, CTS, RTS, DCD, DTR, DSR/VCC, GND (to CM-08x9)
Optical interface (multimode fibre optic) ring	X2 → CM-0821	RXD, TXD, CTS, RTS, DCD, DTR, DSR/VCC, GND (to CM-0821)
Unbalanced interchange circuit (V.24/V.28) RS-232 asynchronous	X6 [3]	RXD, TXD, CTS, RTS, DCD, DTR, DSR, GND
Balanced interface (V.11) RS-485 (2-wire)/ RS-422 (4-wire) asynchronous	X6 [3]	TXD+/RXD+, TXD-/RXD- (2-wire) TXD+, TXD-, RXD+, RXD- (4-wire)

[1] not usable (reserved for SICAM TOOLBOX II)

[2] RS-422 not supported

[3] only CP-8022 (switchable mode via parameter)

Note

Details about realization of various operation modes are given in the manual *SICAM RTUs Platforms - Configuration Automation Units and Automation Networks*.

5.5.14.3 Communication

For the communication infrastructure, additional suitable transmission facilities and/or network components may be needed.

Own Station (Substation)

System	System element	Protocol element	Remarks
SICAM A8000	CP-8000/CPC80 CP-802x/CPC80	PCBST0 PCBST0	

Remote Station (Central Station)

System	System element	Protocol element	Remarks
AK 1703	CP-2000/MC00 CP-2002PCCE00 CP-2002/CE00 CP-2012/CE20	SM-2551/PCBMA0 SM-0551/PCBMA0	
AMC 1703	CP-4000/CPC4x	SM-2551/PCBMA0 SM-0551/PCBMA0	
Third-party system	–	–	

5.5.15 RP5UT1

5.5.15.1 Functions

Communication of a substation with a central station.

- Multi-point traffic slave according to RP570/RP571 specification in dedicated line operation RP5UT1 is substation (ABB RP570/RP571 Slave)
- Data acquisition by means of interrogations
- General interrogation, counter request
- Spontaneous transmission of commands and setpoint values in control direction
- Spontaneous transmission of binary information, measured values and integrated totals in signalling direction
- Time synchronization via communication line
- Multi-hierarchical configurations possible (RP571 mode)

Note

The previously mentioned functions are described in detail in the document *SICAM RTUs • Ax 1703 Common Functions ABB RP570/571 GV-S*.

5.5.15.2 Operating Modes

The operating mode of the interface is determined by parameters of the protocol element and optional devices.

Operating mode	**Interface → optional DTE**	**Interface signals**
Unbalanced interchange circuit (V.24/V.28) RS-232 asynchronous	X2	RXD, TXD, CTS [1], RTS, DCD, DTR, DSR/VCC, GND
Balanced interface (V.11) RS-485 (2-wire)/ RS-422 (4-wire) asynchronous	X3	TXD+/RXD+, TXD-/RXD- (2-wire) TXD+, TXD-, RXD+, RXD- (4-wire)
Balanced interface (V.11) RS-485 (2-wire)/ RS-422 (4-wire) asynchronous	X2 → CM-0829 (CM-0819 [2])	RXD, TXD, CTS, RTS, DCD, DTR, DSR/VCC, GND (to CM-08x9)
Optical interface (multimode fibre optic) ring	X2 → CM-0821	RXD, TXD, CTS, RTS, DCD, DTR, DSR/VCC, GND (to CM-0821)
Unbalanced interchange circuit (V.24/V.28) RS-232 asynchronous	X6 [3]	RXD, TXD, CTS, RTS, DCD, DTR, DSR, GND
Balanced interface (V.11) RS-485 (2-wire)/ RS-422 (4-wire) asynchronous	X6 [3]	TXD+/RXD+, TXD-/RXD- (2-wire) TXD+, TXD-, RXD+, RXD- (4-wire)

[1] not usable (reserved for SICAM TOOLBOX II)

[2] RS-422 not supported

[3] only CP-8022 (switchable mode via parameter)

Note

Details about realization of various operation modes are given in the manual *SICAM RTUs Platforms - Configuration Automation Units and Automation Networks*.

5.5.15.3 Communication

For the communication infrastructure, additional suitable transmission facilities and/or network components may be needed.

Own Station (Substation)

System	System element	Protocol element	Remarks
SICAM A8000	CP-8000/CPC80 CP-802x/CPC80	RP5UT1 RP5UT1	

Remote Station (Central Station)

System	System element	Protocol element	Remarks
SICAM AK 3	CP-2016/CPCX26 CP-2019/PCCX26	SM-2551/RP5ZA1 SM-0551/RP5ZA1	
Legacy systems (SICAM AK, SICAM TM, SICAM BC, Ax 1703)	CP-20xx CP-4000 CP-50xx CP-60xx	SM-2551/RP5ZA1 SM-0551/RP5ZA1 SM-2541/RP5Z01	
Third-party system	–	–	

5.6 Integrated Protocol SNMP

5.6.1 Overview

CP-8000/CP-802*x* provides the protocol SNMP. This protocol is integrated in the firmware of the Master Module.

CP-8000/CP-802*x* is SNMP Agent.

SNMP Manager

- SNMP variables retrievable via:
  - Standard SNMP network management software
  - SCADA system with integrated SNMP manager
  - SICAM SCC

Note

The protocol SNMP is described in detail in the document *SICAM RTUs • Ax 1703 Common Functions Protocol Elements, chapter "SNMPv3 Agent"*.

5.7 I/O Master Module and I/O Modules

The virtual I/O Master Module is jointly with the integrated and optional external I/O Modules responsible for the process data input and output. The processing is performed partially by

- firmware (example: smoothing of measured values, time tagging)
- hardware (example: filter, ADC, 1-out-of-n check, DAC)

The peripheral functions are specific for each I/O Module.

Note

The functions and the belonging mode of action are described in detail in the manual *SICAM RTUs Common Functions Peripheral Elements according to IEC 60870 5 101/104*.

In the following listing, footnotes are used to specify the effect of the functions in detail.

---

[t] **Telecontrol**
the function affects process information which is **spontaneously** transmitted

[t1] **Telecontrol**
the function delivers (acquisition) **spontaneously** transmitted process information or is controlled by such information (output); partly, periodically transmitted information is also created/required

[a] **Automation**
the function affects process information which is **periodically** transmitted

[c] **Calculation**
the function affects process information which is used as input for the calculation of calculated (derived) values

5.7.1 Internal I/O Modules (only CP-8000)

5.7.1.1 DI-8100

5.7.1.1.1 Functions

- Single-point information
  - Acquisition with a resolution of 1 ms [t]
  - Update every 10 ms [a] (in the cycle of the *open-/closed-loop control function*, if larger)
  - Revision [ta]
  - Power monitoring [ta]
  - Inversion [ta]
  - Firmware filter [t]
  - Bounce suppression [t]
  - Determination of the cause of transmission [t]
  - Spontaneous transmission of changes [t]
  - Periodical transmission [a]
- Double-point information
  - Acquisition with a resolution of 1 ms [t]
  - Update every 10 ms [a] (in the cycle of the *open-/closed-loop control function*, if larger)
  - Revision [ta]
  - Power monitoring [ta]
  - Inversion [ta]
  - Firmware filter [t]
  - Bounce suppression [t]
  - Monitoring intermediate and faulty positions [t]
  - Determination of the cause of transmission [t]
  - Reporting switching operations in progress [t]
  - Breaker tripping detection [t]
  - Breaker tripping suppression during auto-reclose [t]
  - Spontaneous transmission of changes [t]
  - Periodical transmission [a]
- Integrated totals via count pulses [t1]
  - Acquisition by firmware with a maximum count frequency of 20 Hz
    - Pulse length/pause >2 ms/>2 ms
    - Revision
    - Power monitoring
    - Inversion
    - Pulse counting
  - Counter value formation
    - Count pulse evaluation
    - Set counter
  - Formation of integrated totals
    - Counter request
    - Interval control
    - Frozen absolute value
    - Frozen relative value
  - Not power-fail safe
  - Integrated total transmission according to iec 60870-5-101
  - Spontaneous transmission

5.7.1.1.2 Technical Data

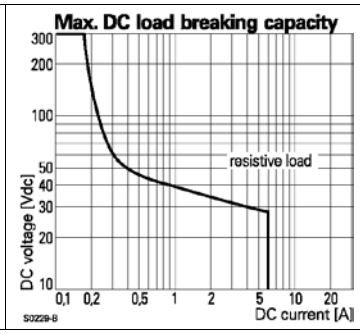
Binary inputs		
12 digital inputs	• 2 groups (with 8 and with 4 inputs) • Via optocouplers the inputs are galvanical insulated from logical circuits and ground with double insulation. • Each group is galvanically insulated from the other group, from logical circuits and from ground with double insulation • For each group one common return with selectable polarity • Function and status of the inputs via display	
Filter time	1 dedicated input per group 2 ms All other inputs 3 ms	
Nominal voltages	DC 24/48/60 V	
Operating points	Logical 0 ≤ 12 V Logical 1 ≥ 18 V	
Dynamic suppression of noise caused by cable capacitance	typ. 220 nF (for DC 18…78 V)	
Rated current	0.6…1.5 mA (at 18…78 V)	
Input circuits	DC 18…78 V (operated by means of an external voltage)	
Rated impulse voltage	4 kV	
Connectors		
Terminals	Removable screw terminals (grid size 5.08)	
Connection data X31, X32	Locking torque	0.5 Nm
	AWG	min. 22 max. 12
	Conductor cross section solid	min. 0.2 mm² max. 2.5 mm²
	Conductor cross section stranded	min. 0.2 mm² max. 2.5 mm²
	Conductor cross section stranded with ferrule without plastic sleeve	min. 0.25 mm² max. 2.5 mm²
	Conductor cross section stranded with ferrule with plastic sleeve	min. 0,25 mm² max. 2.5 mm²
	2 wires stranded with ferrule without plastic sleeve	min. 0.25 mm² max. 1 mm²
	2 wires stranded with TWIN ferrule with plastic sleeve	min. 0.5 mm² max. 1.31 mm²
	Wire strip length	min. 6 mm max. 7 mm
	Length ferrule	10 mm

5.7.1.2 DO-8203

5.7.1.2.1 Functions

- Pulse commands *t1*
  - Checked output of pulse commands
    - 1-pole, 1½-pole, 2-pole
    - Cannot be mixed
  - Single, double and regulating step commands
  - Command output (OC)
  - Application functions and procedures according to IEC 60870-5-101/104
    - Formal check
    - Direct command
    - Select and execute command
  - Retry suppression
  - 1-out-of-n check
  - Control location check
  - Command locking
  - Synchronization
  - Revision
  - Command output time
    - Settable
    - Dependent on the process
  - Return information monitoring
  - Command prolongation
  - Switching sequences
  - Command output for the auto-reclose function
  - If outputs are used for pulse commands, no outputs can be used for binary information output
- Binary information output
  - Selectable behavior on communication failure *ta*
    (deactivation or retention)
  - Deactivation on module failure *ta*
  - Spontaneous transmission *t* or
  - Periodical transmission *a*
  - If outputs are used for binary information output, no outputs can be used for pulse commands
  - Usage as watchdog realizable by means of application program (categories DO_EX and DO_DX must be used)
- Binary information and command output
  - Settable output of the categories DO_EX and DO_DX
    - Mixed output of binary information items and commands on 1 DO module possible
    - Output of persisting commands

5.7.1.2.2 Technical Data

Binary outputs	
8 digital outputs (relay)	• 4 groups with 2 outputs each • Each relay has a 1-pole normally-open contact • The outputs are galvanically insulated from logic circuits and ground by monostable relays with double insulation • Each group is galvanically insulated from the other groups, logic circuits and ground with double insulation • Within the groups the outputs are galvanically insulated with operational insulation (250 kV) • The Outputs can be used for switching of direct voltage or also alternating voltage • Function and status of the outputs via display
Nominal voltage	• DC 24/48/60/110/220 V • AC 110/230 V
Maximum continuous current Standard circuitry Circuitry with derating at 5 A Circuitry with derating resp. for switching load 6 A *)	 • 8 outputs max. 2 A each (5 A/1 min) • 1 output max. 5 A each • 7 outputs max. 1 A each or • 2 output max. 5 A each • 6 outputs max. 0 A each (relay must not be activated) • 4 outputs max. 3 A each • 4 outputs max. 1 A each
Switching capacity	DC voltage • Min. 50 mW at DC 5 V • Max. acc. to diagram  AC voltage • Max. 1250 VA 5 A/AC 250 V, resistive load • Max. 500 VA 2 A/AC 250 V, cosφ = 0.4
Switching cycles	• $3x10^4$
Output circuits	Max. DC 250 V/AC 253 V (operated with an external voltage)

Connectors		
Terminals	Removable screw terminals (grid size 5.08)	
Connection data X21, X22, X23, X24	Locking torque	0.5 Nm
	AWG	min. 22 max. 12
	Conductor cross section solid	min. 0.2 mm² max. 2.5 mm²
	Conductor cross section stranded	min. 0.2 mm² max. 2.5 mm²
	Conductor cross section stranded with ferrule without plastic sleeve	min. 0.25 mm² max. 2.5 mm²
	Conductor cross section stranded with ferrule with plastic sleeve	min. 0,25 mm² max. 2.5 mm²
	2 wires stranded with ferrule without plastic sleeve	min. 0.25 mm² max. 1 mm²
	2 wires stranded with TWIN ferrule with plastic sleeve	min. 0.5 mm² max. 1.31 mm²
	Wire strip length	min. 6 mm max. 7 mm
	Length ferrule	10 mm
Rated impulse voltage	4 kV	

*) with parallel connection

- For power augmentation 2 relays may be connected parallel, this must happen within one group (applies only for I < 6 A → 2 x 3 A)
- Groups with parallel connection must not be next to another
- Next to a group with parallel connection outputs may be loaded only with ≤ 2 A
- Outputs that are loaded with > 3 A must not be next to another;
  exception: with power augmentation the outputs of one group must be used
- Groups that are loaded with > 2 A should not be next to another;
  example: **3 A**-**3 A**-1 A-1 A-**3 A**-**3 A**-1 A-1 A instead of **3 A**-**3 A**-**3 A**-**3 A**-1 A-1 A1 A-1 A

5.7.2 External SICAM I/O Modules

Note

The technical data of the SICAM I/O Modules are described in the document *SICAM I/O Modules*.

5.7.2.1 DI-8110, DI-8111, DI-8112, DI-8113

5.7.2.1.1 Functions

- Single-point information
  - Acquisition with a resolution of 1 ms [t]
  - Update every 10 ms [a] (in the cycle of the *open-/closed-loop control function*, if larger)
  - Revision [ta]
  - Power monitoring [ta]
  - Inversion [ta]
  - Firmware filter [t]
  - Bounce suppression [t]
  - Determination of the cause of transmission [t]
  - Spontaneous transmission of changes [t]
  - Periodical transmission [a]
- Double-point information
  - Acquisition with a resolution of 1 ms [t]
  - Update every 10 ms [a] (in the cycle of the *open-/closed-loop control function*, if larger)
  - Revision [ta]
  - Power monitoring [ta]
  - Inversion [ta]
  - Firmware filter [t]
  - Bounce suppression [t]
  - Monitoring intermediate and faulty positions [t]
  - Determination of the cause of transmission [t]
  - Reporting switching operations in progress [t]
  - Breaker tripping detection [t]
  - Breaker tripping suppression during auto-reclose [t]
  - Spontaneous transmission of changes [t]
  - Periodical transmission [a]
- Integrated totals via count pulses [t1]
  - Acquisition by firmware with a maximum count frequency of 20 Hz
    - Pulse length/pause >20 ms/>20 ms
    - Revision
    - Power monitoring
    - Inversion
    - Pulse counting
  - Counter value formation
    - Count pulse evaluation
    - Set counter
  - Formation of integrated totals
    - Counter request
    - Interval control
    - Frozen absolute value
    - Frozen relative value
  - Not power-fail safe
  - Integrated total transmission according to iec 60870-5-101
  - Spontaneous transmission

5.7.2.2 DO-8212

5.7.2.2.1 Functions

- Pulse commands [t1]
  - Checked output of pulse commands
    - 1-pole, 1½-pole, 2-pole
    - Cannot be mixed
  - Single, double and regulating step commands
  - Command output (OC)
  - Application functions and procedures according to IEC 60870-5-101/104
    - Formal check
    - Direct command
    - Select and execute command
  - Retry suppression
  - 1-out-of-n check
  - Control location check
  - Command locking
  - Synchronization
  - Revision
  - Command output time
    - Settable
    - Dependent on the process
  - Return information monitoring
  - Command prolongation
  - Switching sequences
  - Command output for the auto-reclose function
  - If outputs of the module are used for pulse commands, no outputs of the same module can be used for binary information output
- Binary information output
  - Selectable behavior on communication failure [ta] (deactivation or retention)
  - Deactivation on module failure [ta]
  - Spontaneous transmission [t] or
  - Periodical transmission [a]
  - If outputs of the module are used for binary information output, no outputs of the same module can be used for pulse commands
  - Usage as watchdog realizable by means of application program (categories DO_EX and DO_DX must be used)

Note

The altitude at which DO-8212 is operated shall be considered applicable for all devices in the system.

5.7.2.3 AI-8310

5.7.2.3.1 Functions

- Temperatures [t1]
  - Connecting resistance thermometers: 2-, 3- or 4-wire technique
  - Settable measuring ranges
    - Temperature values
      Input range
      Pt100: -50…+350°C / -58…+662°F / (≈80.31…229.67 Ω)
      Pt100: -100…+700°C / -148…+1292°F / (≈60.25…345.13 Ω)
      Ni100: -60…+250°C / -76…+482°F / (≈69.5…289.2 Ω)
      Pt1000: -100…+700°C / -148…+1292°F / (≈602.5…3451.3 Ω)

      Resolution
      Pt100: -50…+350°C 0.15°C / 0.28°F / (10 mΩ)
      Pt100: -100…+700°C 0.15°C / 0.28°F / (10 mΩ)
      Ni100: -60…+250°C 0.15°C / 0.28°F / (10 mΩ)
      Pt1000: -100…+700°C 0,15°C / 0,28°F / (100 mΩ)

      Response time
      16⅔ Hz < 1.2 s
      50 Hz < 1.0 s
      60 Hz < 0.9 s
    - Resistance values
      Input range
      40…400 Ω, Resolution: 10 mΩ
      400…4000 Ω, Resolution: 100 mΩ

      Response time
      16⅔ Hz < 1.2 s
      50 Hz < 1.0 s
      60 Hz < 0.9 s
  - Revision
  - Noise rejection
  - Calibration for 2-wire technique
  - Smoothing
  - Adaption
    - Temperature value (°C, °F), conversion using implemented curves
    - Resistance value (Ω)
  - Change monitoring
  - Spontaneous transmission upon change

5.7.2.4 AI-8320

5.7.2.4.1 Functions

- Currents and voltages
  - Settable acquistion grid n*100 ms *t*
  - Measurement range settable with a resolution of *t*
    - 16 bits (15 bits + sign) at full measurement range
    - Shrinking the range results in decreasing resolution
  - Revision *t*
  - Noise rejection *t*
  - Automatic calibration *t*
  - Smoothing *t*
  - Adaptation *t*
    - Linear (normalized, technologically scaled or short floating point)
    - Suppression of zero range
    - Plausibility check
  - Change monitoring *t*
  - Spontaneous transmission of changes *t*
  - On the same module, currents and voltages cannot be mixed

5.7.2.5 AI-8510

5.7.2.5.1 Functions

- Acquisition of the measuring currents
  - Acquisition of currents through submodule CM-8820 using DFT algorithm, 1 signal sampling per millisecond
  - Nominal value 1 A/5 A with 16 bit resolution
- Acquisition of the measuring voltages
  - Acquisition of voltages through transformers or direct measurement using DFT algorithm, 1 signal sampling per millisecond
  - Circuitry of the voltage inputs with phase voltages
  - Nominal value 100 V/√3, 240 V, 415 V/√3 with 16 bit resolution
  - Supervision of the measuring voltage
- Acquisition of the frequency
  - Acquisition of frequency using signal zero crossing of voltage U1
  - Measuring range 45 Hz to 65 Hz (parameter-settable nominal frequencies of 50 Hz and 60 Hz) with a resolution of 100 mHz
- Calculation of values from acquired Values
  - Current r.m.s. value I1 ^{tc}, I2 ^{tc}, I3 ^{tc}
  - Phase voltage r.m.s. value U1 ^{tc}, U2 ^{tc}, U3 ^{tc}
  - Phase-to-phase voltage r.m.s. value U12 ^{tc}, U23 ^{tc}, U31 ^{tc}
  - Frequency ^{tc}

  Voltage and current r.m.s. values undergo a linear (technological) adaptation ^{tc} and are the base for calculating further values

  - Zero current r.m.s. value I0 ^{t}
  - Zero voltage r.m.s. value U0 ^{t}
  - Active power P1 ^{t}, P2 ^{t}, P3 ^{t}
  - Active power P (total value) ^{t}
  - Reactive power Q1 ^{t}, Q2 ^{t}, Q3 ^{t}
  - Reactive power Q (total value) ^{t}
  - Apparent power Q1 ^{t}, Q2 ^{t}, Q3 ^{t}
  - Apparent power Q (total value) ^{t}
  - Power factor 1 ^{t}, 2 ^{t}, 3 ^{t}
  - Power factor (total value) ^{t}
  - Phase angle I1 ^{t}, I2 ^{t}, I3 ^{t}, IN ^{t}
  - Phase angle U12 ^{t}, U23 ^{t}, U31 ^{t}
  - Phase angle , U1 ^{t}, U2 ^{t}, U3 ^{t}, U0 ^{t}

  To calculated values the following functions are applied:

  - Revision ^{tc}
  - Format conversion ^{t}
    - Normalized, technologically scaled or short floating point
    - Suppression of zero range
  - Change monitoring ^{t}
  - Fault detection
  - Spontaneous transmission of changes ^{t}

Note

The previously mentioned functions are described in detail in the document *SICAM RTUs Common Functions Peripheral Elements according to IEC 60870-5-101/104, chapter “Measurement in Three-Phase Systems – I/O Module”*.

The altitude at which AI-8510 is operated shall be considered applicable for all devices in the system.

5.7.2.6 AI-8511

5.7.2.6.1 Functions

- Acquisition of the measuring currents
  - Acquisition of currents through low-power measuring sensors using DFT algorithm, 1 signal sampling per millisecond
  - Nominal value 225 mV with 16 bit resolution
- Acquisition of the measuring voltages
  - Acquisition of voltages through low-power voltage transformers using DFT algorithm, 1 signal sampling per millisecond
  - Circuitry of the voltage inputs with phase voltages
  - Nominal value 3.25 V/√3 with 16 bit resolution
  - Supervision of the measuring voltage
- Acquisition of the frequency
  - Acquisition of frequency using signal zero crossing of voltage U1
  - Measuring range 45 Hz to 65 Hz (parameter-settable nominal frequencies of 50 Hz and 60 Hz) with a resolution of 100 mHz
- Calculation of values from acquired values
  - Current r.m.s. value I1 ^{tc}, I2 ^{tc}, I3 ^{tc}
  - Phase voltage r.m.s. value U1 ^{tc}, U2 ^{tc}, U3 ^{tc}
  - Phase-to-phase voltage r.m.s. value U12 ^{tc}, U23 ^{tc}, U31 ^{tc}
  - Frequency ^{tc}

  Voltage and current r.m.s. values undergo a linear (technological) adaption ^{tc} and are the base for calculating further values

  - Zero current r.m.s. value I0 ^{t}
  - Zero voltage r.m.s. value U0 ^{t}
  - Active power P1 ^{t}, P2 ^{t}, P3 ^{t}
  - Active power P (total value) ^{t}
  - Reactive power Q1 ^{t}, Q2 ^{t}, Q3 ^{t}
  - Reactive power Q (total value) ^{t}
  - Apparent power Q1 ^{t}, Q2 ^{t}, Q3 ^{t}
  - Apparent power Q (total value) ^{t}
  - Power factor 1 ^{t}, 2 ^{t}, 3 ^{t}
  - Power factor (total value) ^{t}
  - Phase angle I1 ^{t}, I2 ^{t}, I3 ^{t}, IN ^{t}
  - Phase angle U12 ^{t}, U23 ^{t}, U31 ^{t}
  - Phase angle , U1 ^{t}, U2 ^{t}, U3 ^{t}, U0 ^{t}

  To calculated values the following functions are applied:

  - Revision ^{tc}
  - Format conversion ^{t}
    - Normalized, technologically scaled or short floating point
    - Suppression of zero range
  - Change monitoring ^{t}
  - Fault detection
  - Spontaneous transmission of changes ^{t}

Note

The previously mentioned functions are described in detail in the document *SICAM RTUs Common Functions Peripheral Elements according to IEC 60870-5-101/104, chapter “Measurement in Three-Phase Systems – I/O Module”*.

5.7.2.7 AO-8380

5.7.2.7.1 Functions

- Setpoint values by means of currents and voltages
  - Output range settable with a resloution of [ta]
    - 16 bits (15 Bit + sign) at full output range
    - Shrinking the range results in decreasing resolution
  - Application functions and procedures according to IEC 60870-5-101/104 [ta]
    - Formal check
    - Direct command
    - Select and execute command ("select/execute")
  - Adaptation [t]
    - Linear (normalized, technologically scaled or short floating point) [t]
  - Selectable behavior on communication failure and module failure [ta] (keep value, output substitute value)
  - Spontaneous transmission [t] or
  - Periodical transmission [a]

5.7.2.8 CM-8820

5.7.2.8.1 Functions

Acquisition Functions

- Measuring currents
  - Acquisition of currents through measuring sensors
  - Measuring range 1 A or 5 A with 200% overrange

Output Functions

- Output through low-power outputs
  - Nominal voltage 225 mV
  - Measuring range 0 V to 450 mV

Note

For USA and Canada: NRTL/SCC certified current transformers are required. Use only UL listed energy-monitoring current transformers.

5.7.2.9 CM-8830

5.7.2.9.1 Features

The LED Module is a display module to visualize the I/O process status or I/O process errors via LEDs in a SICAM A8000 I/O row. The LEDs on the LED module are also an indication of correct wiring during the commissioning and provide actual status functions and status indications during system operation.

- Assembly on 35 mm DIN rail
- Indication of I/O module status (RY)
- Indication of I/O process data
- Indication of process errors (ER)
- CM-8830 is detected from the Master Module without any engineering
- CM-8830 updates the process data indication every 100 ms
- With a power consumption of less than 0.5 W, CM-8830 does not affect the power distribution of an existing SICAM A8000 I/O row
- The I/O process status of DI and AI I/O modules is displayed on CM-8830, without engineering the SICAM A8000 system
- CM-8830 can be plugged at any position right from the power supply

For detailed description of the visualization, refer to section 11.3.1.5, LED Module.

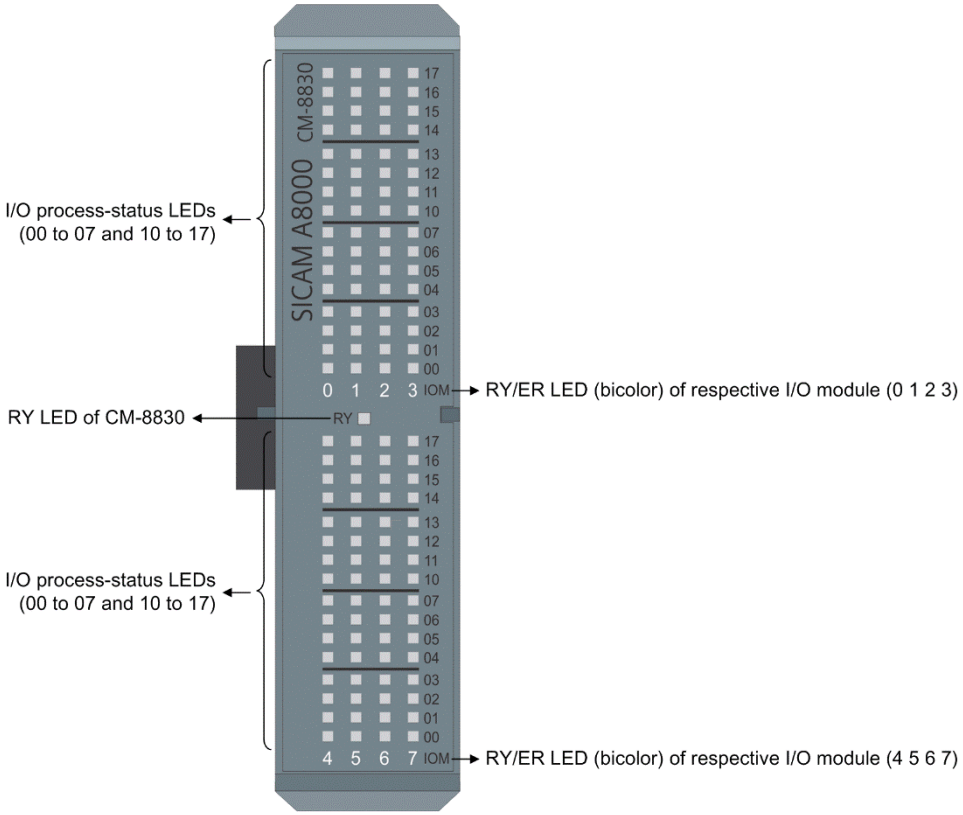
5.7.2.9.2 Technical Specifications

Power Supply	
Operating voltage	DC 4.75 V to 5.5 V The voltage is picked off from the bus
Power consumption	500 mW

Mechanics	
Dimension	124 x 30 x 132 mm (L x W x H, dimensions w/o DIN rail)
Weight	185 g (including bus module 12 g)
Protection Type	Class III

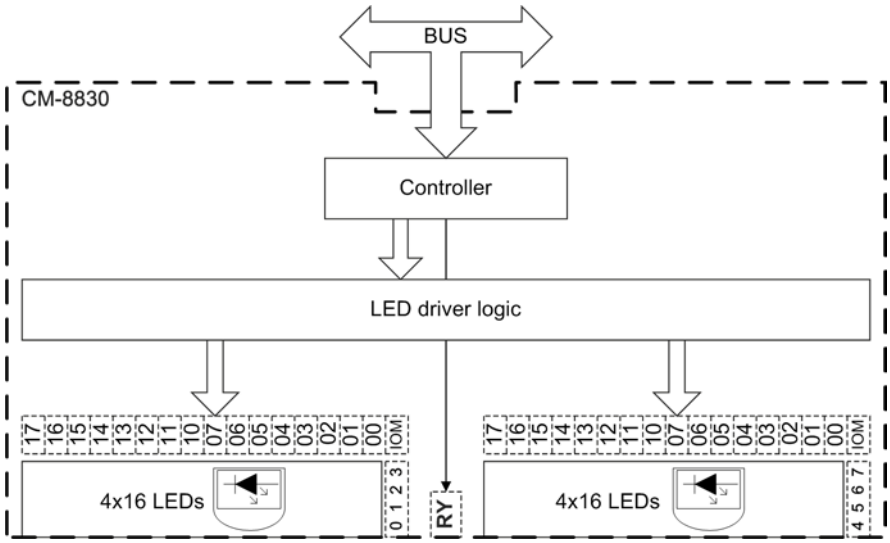
5.7.2.9.3 Mapping and Display with I/O Modules

The following figure describes the LED status on the LED module.



5.7.2.9.4 Block Diagram

The following circuitry variant is an example and does not relate exclusively to the depicted inputs/outputs.



5.7.3 External SICAM TM I/O Modules

Note

The technical data of the SICAM TM I/O Modules are described in the document *SICAM TM I/O Modules*.

5.7.3.1 DI-6100, DI-6101, DI-6104

5.7.3.1.1 Functions

- Single-point information
  - Acquisition with a resolution of 10 ms [t]
  - Update every 10 ms [a] (in the cycle of the *open-/closed-loop control function*, if larger)
  - Revision [ta]
  - Power monitoring [ta]
  - Inversion [ta]
  - Firmware filter [t]
  - Bounce suppression [t]
  - Determination of the cause of transmission [t]
  - Spontaneous transmission of changes [t]
  - Periodical transmission [a]
- Double-point information
  - Acquisition with a resolution of 10 ms [t]
  - Update every 10 ms [a] (in the cycle of the *open-/closed-loop control function*, if larger)
  - Revision [ta]
  - Power monitoring [ta]
  - Inversion [ta]
  - Firmware filter [t]
  - Bounce suppression [t]
  - Monitoring intermediate and faulty positions [t]
  - Determination of the cause of transmission [t]
  - Reporting switching operations in progress [t]
  - Breaker tripping detection [t]
  - Breaker tripping suppression during auto-reclose [t]
  - Spontaneous transmission of changes [t]
  - Periodical transmission [a]
- Integrated totals via count pulses [t1]
  - Acquisition by firmware with a maximum count frequency of 20 Hz
    - Pulse length/pause >20 ms/>20 ms
    - Revision
    - Power monitoring
    - Inversion
    - Pulse counting
  - Counter value formation
    - Count pulse evaluation
    - Set counter
  - Formation of integrated totals
    - Counter request
    - Interval control
    - Frozen absolute value
    - Frozen relative value
  - Not power-fail safe
  - Integrated total transmission according to iec 60870-5-101
  - Spontaneous transmission

5.7.3.2 DI-6102, DI-6103

5.7.3.2.1 Functions

- Single-point information
  - Acquisition with a resolution of 1 ms [t]
  - Update every 10 ms [a] (in the cycle of the *open-/closed-loop control function*, if larger)
  - Revision [ta]
  - Power monitoring [ta]
  - Inversion [ta]
  - Firmware filter [t]
  - Bounce suppression [t]
  - Determination of the cause of transmission [t]
  - Spontaneous transmission of changes [t]
  - Periodical transmission [a]
- Double-point information
  - Acquisition with a resolution of 1 ms [t]
  - Update every 10 ms [a] (in the cycle of the *open-/closed-loop control function*, if larger)
  - Revision [ta]
  - Power monitoring [ta]
  - Inversion [ta]
  - Firmware filter [t]
  - Bounce suppression [t]
  - Monitoring intermediate and faulty positions [t]
  - Determination of the cause of transmission [t]
  - Reporting switching operations in progress [t]
  - Breaker tripping detection [t]
  - Breaker tripping suppression during auto-reclose [t]
  - Spontaneous transmission of changes [t]
  - Periodical transmission [a]
- Integrated totals via count pulses [t1]
  - Acquisition by firmware with a maximum count frequency of 20 Hz
    - Pulse length/pause >2 ms/>2 ms
    - Revision
    - Power monitoring
    - Inversion
    - Pulse counting
  - Counter value formation
    - Count pulse evaluation
    - Set counter
  - Formation of integrated totals
    - Counter request
    - Interval control
    - Frozen absolute value
    - Frozen relative value
  - Not power-fail safe
  - Integrated total transmission according to IEC 60870-5-101
  - Spontaneous transmission

5.7.3.3 AI-6300, AI-6307, AI-6308

5.7.3.3.1 Functions

- Currents and voltages
  - Settable acquistion grid n*100 ms *t*
  - Measurement range settable with a resloution *t*
    - 13 bits (12 bits + sign) at full measurement range
    - Shrinking the range results in decreasing resolution
  - Revision *t*
  - Noise rejection *t*
  - Automatic calibration *t*
  - Smoothing *t*
  - Adaptation *t*
    - Linear (normalized, technologically scaled or short floating point)
    - Suppression of zero range
    - Plausibility check
  - Change monitoring *t*
  - Spontaneous transmission of changes *t*
  - On the same module, currents and voltages cannot be mixed

5.7.3.4 AI-6310

5.7.3.4.1 Functions

- Temperatures *t1*
  - Connection of the resistance thermometers: 2-, 3-, or 4-wire technique
  - Update every 400 ms
  - Settable measuring range
    - Temperaturwerte
      - Input range
        Pt100: -50…+350°C / -58…+662°F / (≈80,31…229,67 Ω)
        Pt100: -100…+700°C / -148…+1292°F / (≈60,25…345,13 Ω)
        Ni100: -60…+250°C / -76…+482°F / (≈69,5…289,2 Ω)
      - Resolution
        Pt100: -50…+350°C 0.15°C / 0.28°F / (56 mΩ)
        Pt100: -100…+700°C 0.15°C / 0.28°F / (56 mΩ)
        Ni100: -60…+250°C 0.15°C / 0.28°F / (56 mΩ)
      - Update grid
        16⅔ Hz <6,8 s
        50 Hz < 5,6 s
        60 Hz < 5,2 s
    - Resistance values
      - Input range 40…400 Ω
      - Resolution 56 mΩ
      - Update grid

HW rev. ="--"		HW rev. ≥"-A"	
16⅔ Hz	< 6,8 s	16⅔ Hz	< 1,68 s
50 Hz	< 5,6 s	50 Hz	< 1,44 s
60 Hz	< 5,2 s	60 Hz	< 1,36 s

  - Revision
  - Noise rejection
  - Automatic calibration
  - Calibration for 2-wire technique
  - Smoothing
  - Adaptation
    - Temperature value (°C, °F), conversion using implemented curves
    - Resistance (Ω)
  - Change monitoring
  - Spontaneous transmission of changes

5.7.3.5 TE-6430

5.7.3.5.1 Functions

- Integrated totals via counting pulses
  - 2 counting pulse inputs or
  - 1 counting pulse input and 1 transfer input
  - Inputs are galvanically insulated from logic circles and ground
  - Inputs are not galvanically insulated from each other
  - Input voltage range from 24 up to 60 V
  - Inputs are secured by means of EMC filter and protector equipment
  - The autonomous operable functions of the module are operated buffered, thus counting function and counts remain correct also over a voltage failure from up to 72 hours
  - Spontaneous transmission [f]

5.7.3.6 DO-6200

5.7.3.6.1 Functions

- Pulse commands [t1]
  - Output of pulse commands
    - 1-pole
  - Single, double and regulating step commands
  - Command output (OC)
  - Application functions and procedures according to IEC 60870-5-101/104
    - Formal check
    - Direct command
    - Select and execute command ("select/execute")
  - Retry suppression
  - 1-out-of-n check
  - Control location check
  - Command locking
  - Synchronization
  - Revision
  - Command output time
    - Settable
    - Dependent on the process
  - Return information monitoring
  - Command prolongation
  - Switching sequences
  - Command output for the auto-reclose function
  - If outputs of the module are used for pulse commands, no outputs of the same module can be used for binary information output
- Binary information output
  - Selectable behavior on communication failure [ta]
    (deactivation or retention)
  - Deactivation on module failure [ta]
  - Spontaneous transmission [t] or
  - Periodical transmission [a]
  - If outputs of the module are used for binary information output, no outputs of the same module can be used for pulse commands
  - Usage as watchdog realizable by means of application program (categories DO_EX and DO_DX must be used)
- Return information to pulse command assignment
  - Settable assignment for messages and pulse commands, which are acquired or output on the I/O Master Module
  - Predefined assignment for messages and pulse commands, which are acquired or output on the I/O Master Module

5.7.3.7 DO-6212

5.7.3.7.1 Functions

- Pulse commands *t1*
  - Output of pulse commands
    - 1-pole, 1½-pole, 2-pole
    - Cannot be mixed
  - Single, double and regulating step commands
  - Command output (OC)
  - Application functions and procedures according to IEC 60870-5-101/104
    - Formal check
    - Direct command
    - Select and execute command ("select/execute")
  - Retry suppression
  - 1-out-of-n check
  - Control location check
  - Command locking
  - Synchronization
  - Revision
  - Command output time
    - Settable
    - Dependent on the process
  - Return information monitoring
  - Command prolongation
  - Switching sequences
  - Command output for the auto-reclose function
  - If outputs of the module are used for pulse commands, no outputs of the same module can be used for binary information output
- Binary information output
  - Selectable behavior on communication failure *ta*
    (deactivation or retention)
  - Deactivation on module failure *ta*
  - Spontaneous transmission *t* or
  - Periodical transmission *a*
  - If outputs of the module are used for binary information output, no outputs of the same module can be used for pulse commands
  - Usage as watchdog realizable by means of application program (categories DO_EX and DO_DX must be used)
- Binary information and command output
  - Settable output of the categories DO_EX and DO_DX
    - Mixed output of binary information items and commands on 1 DO module possible
    - Output of pulse commands or persisting commands
- Return information to pulse command assignment
  - Settable assignment for messages and pulse commands, which are acquired or output on the I/O Master Module
  - Predefined assignment for messages and pulse commands, which are acquired or output on the I/O Master Module

5.7.3.8 DO-6220, DO-6221, DO-6230

5.7.3.8.1 Functions

- Pulse commands *t1*
  - Checked output of pulse commands
    - 1-pole, 1½-pole, 2-pole
    - Cannot be mixed on one module
  - Single, double and regulating step commands
  - Application functions and procedures according to IEC 60870-5-101/104
    - Formal check
    - Direct command
    - Select and execute command ("select/execute")
  - Control location check
  - Retry suppression
  - 1-out-of-n check
  - Command locking
  - Synchronization
  - Revision
  - DO-6220 - command output according to IC1
    - Idle check
    - Selective activation check
  - DO-6221 - command output according to RC1
    - Idle check
    - Selective activation check
    - Resistance check
    - Current flow information
    - Earth fault check
    - Interference voltage check
  - Command output time
    - Settable
    - Dependent on the process
  - Return information monitoring
  - Command prolongation
  - Periodical control circuit check
  - Switching sequences
  - Monitoring of command output sequence to prevent incorrect outputs
  - Command initionation for auto-reclose
  - Activation of command contactors with or without series-break contacts (with DO-6221)
- Return information to pulse command assignment (applies for DO-6230)
  - Settable assignment for messages and pulse commands, which are acquired or output on the I/O Master Module
  - Predefined assignment for messages and pulse commands, which are acquired or output on the I/O Master Module

5.7.3.9 AO-6380

5.7.3.9.1 Functions

- Setpoint values by means of currents and voltages
  - Output via analog outputs of a SM-0572 *ta*
  - Output range settable with a resloution of *ta*
    - 16 bits (15 bits + sign) at full output range
    - Shrinking the range results in decreasing resolution
  - Application functions and procedures according to IEC 60870-5-101/104 *ta*
    - Formal check
    - Direct command
    - Select and execute command ("select/execute")
  - Adaptation *t*
    - Linear (normalized, technologically scaled or short floating point) *t*
  - Selectable behavior on communication failure and module failure *ta*
    (keep value, output substitute value)
  - Spontaneous transmission *t* or
  - Periodical transmission *a*

5.8 MTBF Values of the SICAM A8000 Modules

The MTBF values shown in this section have been calculated according to Siemens standard SN29500.

All electrical and electromechanical components have been considered. Not included are mechanical components (screws, housing, adhesive labels, etc.).

The following specified values of MTBF are statistic values which serve only for the estimation of maintenance and substitute needs. These values are no guaranteed product attribute.

The values have been calculated for an ambient temperature of 40°C.

Master Modules

Typ	Module	[Hours]	[Years]
CP-8021	Master Module	682 165	77.87
CP-8022	Master Module with GPRS	485 206	55.39

Power Supply Modules

Type	Module	[Hours]	[Years]
PS-8620	Power Supply DC 24 to 60 V, 12 W	1 809 267	206.54
PS-8622	Power Supply DC 110 to 220 V, 12 W	1 748 221	199.57
PS-8640	Power Supply DC 24 to 60 V, 45 W	1 490 671	170.1
PS-8642	Power Supply DC or AC 100 to 240 V, 45 W	1 014 243	115.8

SICAM I/O Modules

Type	Module	[Hours]	[Years]
DI-8110	Digital Input 2x8 DC 24 V	1 617 914	184.69
DI-8111	Digital Input 2x8 DC 48/60 V	1 617 914	184.69
DI-8112	Digital Input 2x8 DC 110 V	1 617 914	184.69
DI-8113	Digital Input 2x8 DC 220 V	1 552 120	177.18
DO-8212	Digital Output Relays 8x DC 24 to 220 V/AC 230 V	2 362 056	269.64
AI-8310	Analog Input 2x2 Pt100/Pt1000	1 293 929	147.71
AI-8320	Analog Input 4x ±20 mA	2 238 589	255.55
AI-8510	Analog Input 3x V (240 V), 3x I (LoPo)	1 354 169	154.59
AI-8511	Analog Input 3x V (LoPo), 3x I (LoPo)	1 408 352	160.77
AO-8380	Analog Output 4x ±20 mA/±10 V	1 377 524	157.25

Accessories

Type	Module	[Hours]	[Years]
CM-8820	CT-Adapter 3x I 1 A_5 A/225 mV (only for AI-8510)	11 993 284	1369.10
CM-8830	SICAM I/O Module LED Unit	1 659 916	189.00

6 Installation and Circuitry

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This chapter describes the mechanical design of CP-8000/CP-802*x* and how the installation and wirings are to be accomplished.

This chapter shows further how the various communication methods can be realized by means of the standard modems and special cables.

6.1 Mechanical Design

6.1.1 CP-8000

The electrical components of the device are housed in a plastic casing with the dimensions 128 mm x 124 mm x 116 mm (W x H x D). The casing is designed for assembly on a DIN rail.

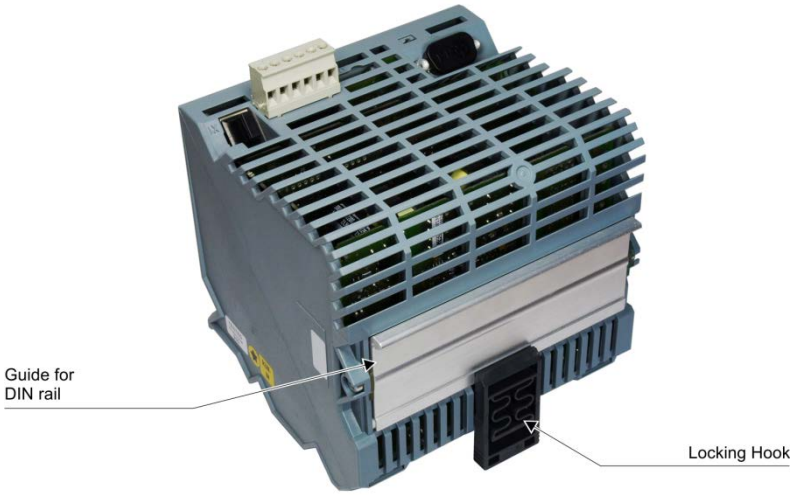
At the front are the operation and display elements, an interface for the communication via Ethernet, and a slot for the SD card.

At the top of the device are the connections for the communication via RS-485 and RS-232, as well as a further Ethernet interface.

On the right side of the housing is the bus connector for the I/O coupling module. It is covered with a label.

On the bottom side of the device are the connections for the process signals as well as for the supply voltage.

At the back is the DIN rail mounting.



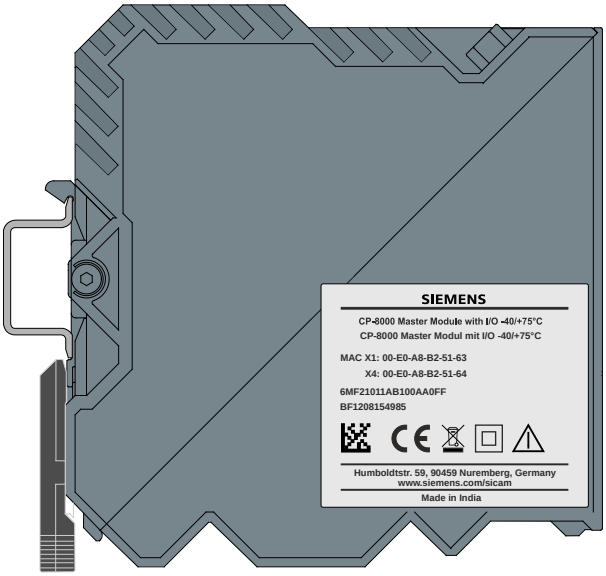
6.1.1.1 Locking Hook

The device is locked onto the DIN rail and also removed again using the locking hook.

Details see section 6.4.4, Mounting of the Basic Device.

6.1.1.2 Type Plate

On the left side of the housing resides the type plate with specific information as type, power consumption, order number, serial number, hardware addresses for the network operation (MAC address for interface X1 and X4).

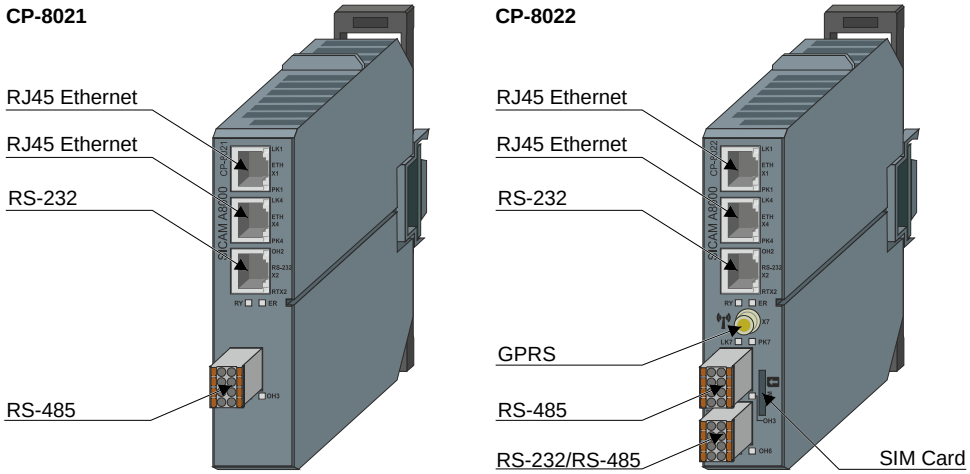


Symbol	Meaning
CE	CE conformity
	WEEE marking
	Protection class II / protective insulation
	Caution, risk of danger. The documentation must be observed.

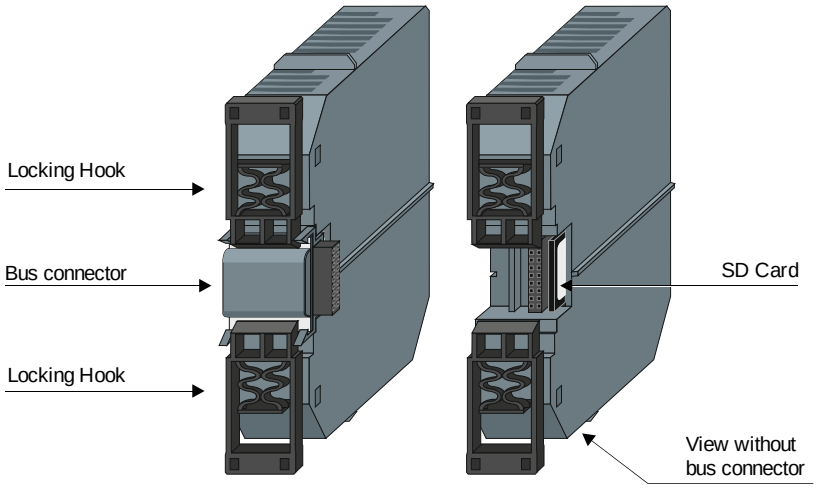
6.1.2 CP-802x

The electrical components of the device are housed in a plastic casing with the dimensions 30 mm x 132 mm x 124 mm (W x H x D). The casing is designed for assembly on a DIN rail.

At the front are the LED display elements, the communication interfaces and a slot for the SIM card.



At the back are the locking hooks, the bus connector and below the slot for the SD card.



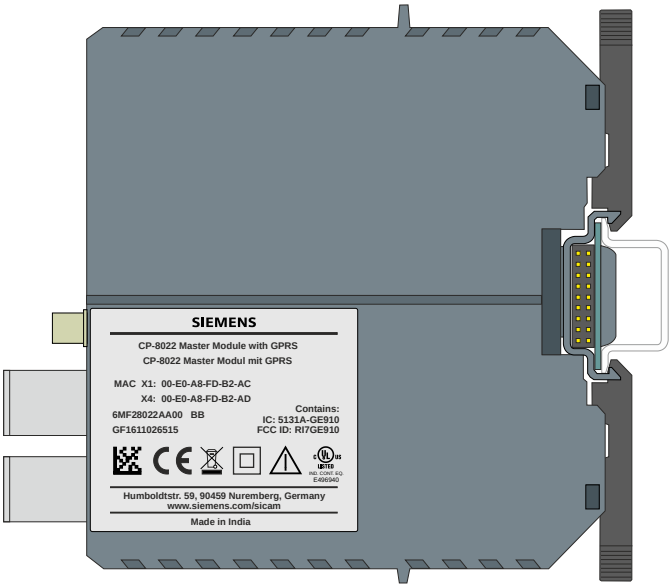
6.1.2.1 Locking Hook

The device is locked onto the DIN rail and also removed again using the locking hook.

Details see section 6.5.4, Mounting of a SICAM A8000 Module.

6.1.2.2 Type Plate

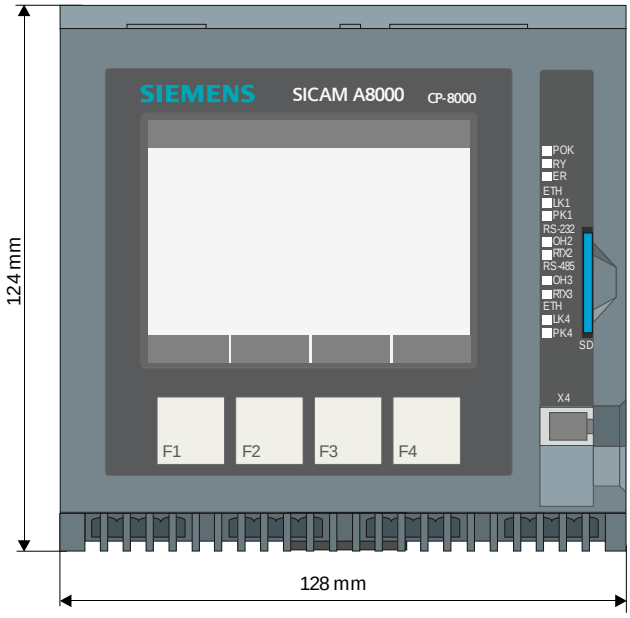
On the left side of the housing resides the type plate with specific information as type, power consumption, order number, serial number, hardware addresses for the network operation (MAC address for interface X1 and X4).



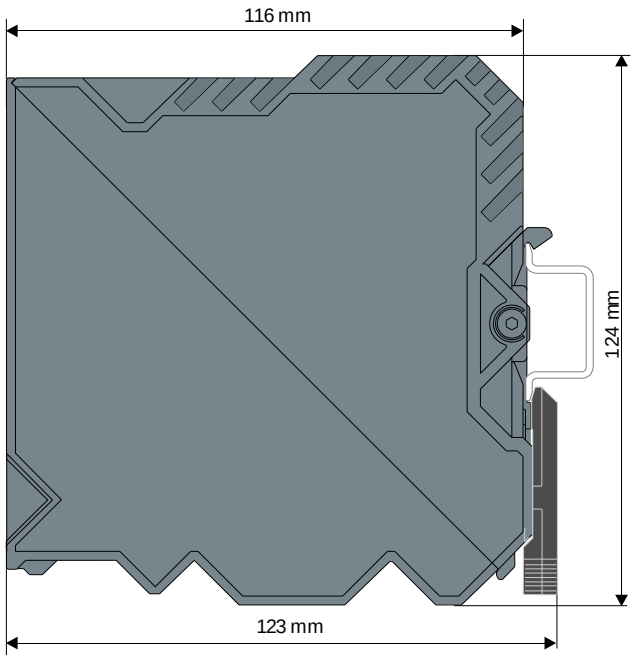
Symbol	Meaning
CE	CE conformity
c UL us LISTED	UL conformity
	WEEE marking
	Protection class II / protective insulation
	Caution, risk of danger. The documentation must be observed .

6.2 Dimensions

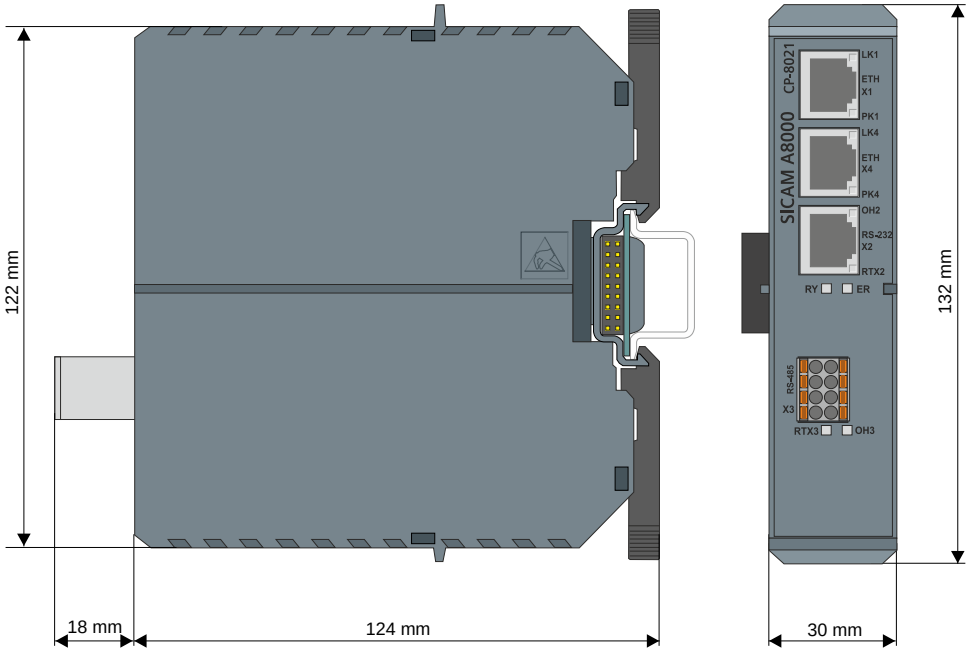
6.2.1 CP-8000 Front View

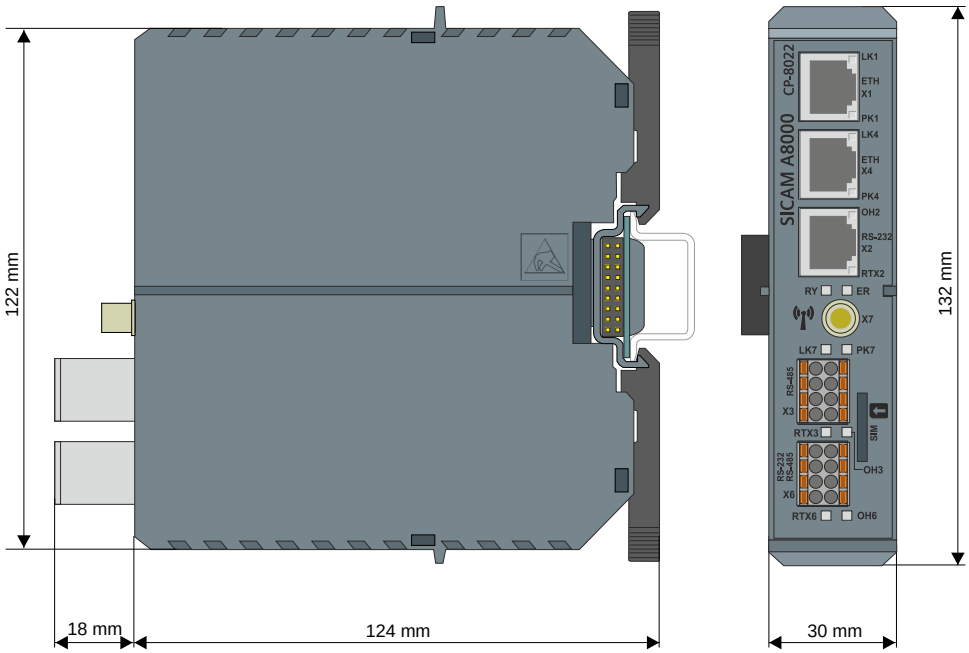


6.2.2 CP-8000 Side View



6.2.3 CP-802x Front and Side View



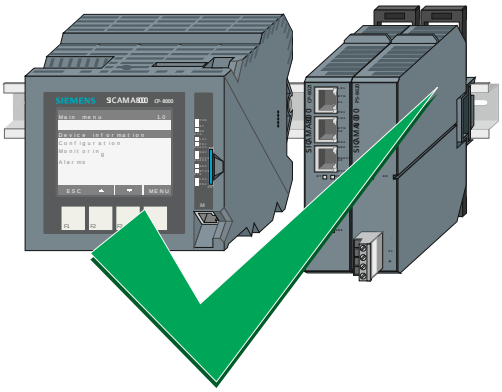


6.3 Installation Location and Position

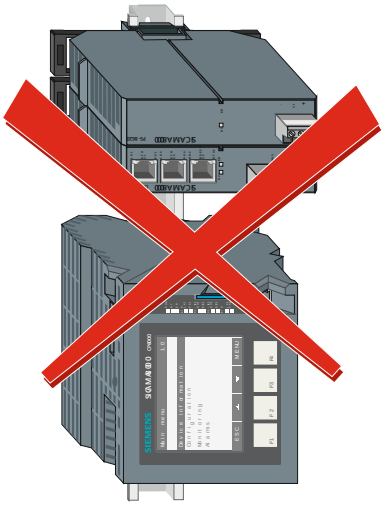
Correct and safe operation of the product requires adequate transportation, storage, installation and mounting in an NRTL certified fire/electrical industrial control panel/cabinet or similar enclosure. Furthermore, appropriate use and maintenance is necessary.

For details on the site of operation, please refer to chapter 4, Ambient Conditions.

The basic device (with or without I/O modules) may only be installed horizontally.



horizontal mounting position



vertical mounting position

Note

Not permitted is the vertical installation or installations on the ceiling and on the floor (excessive temperature, dust load).

6.3.1 DIN Rail (TS35 Rail)

For the installation of CP-8000/CP-802*x* a DIN rail is to be used, which conforms to the Standard EN 60715. The orientation and position in which the DIN rail is to be installed must be determined locally.

The DIN rail must be installed horizontally on a vertical wall.

Warning

The connection of the DIN rail with the cabinet/rack/mounting plate must guarantee a reliable grounding of the device. This base itself must be grounded properly. A mounting plate is recommended.

6.3.2 Cable Duct

Cable ducts are recommended for the cabling above and below the device. The minimum distance from the device to the cable duct is 30 mm.

Note

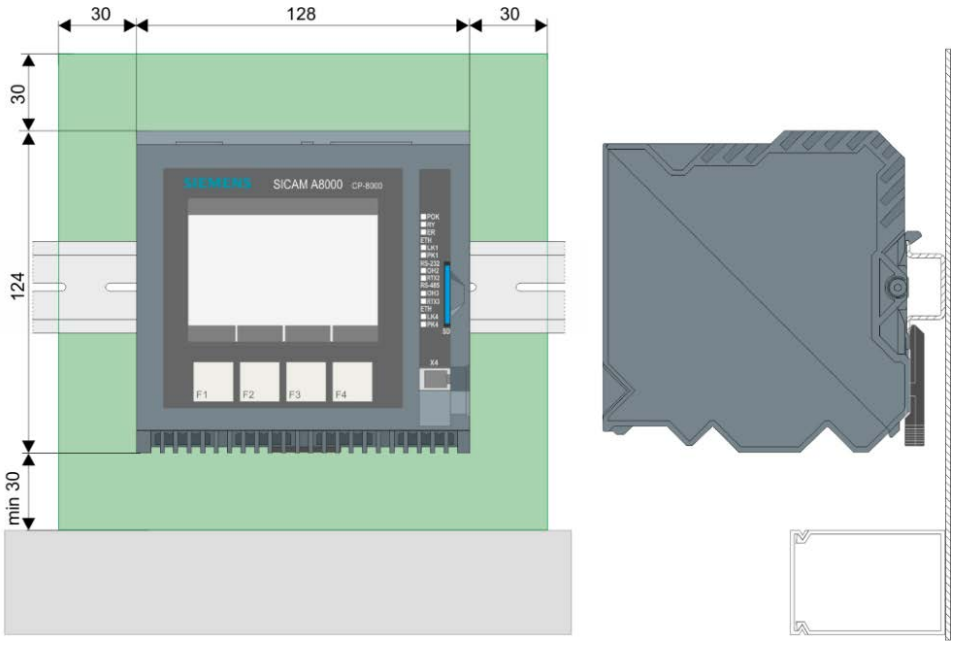
When using a cable duct with 100 mm depth below the device, it is necessary to keep a 50 mm minimum distance between device and cable duct to operate the locking hook.

6.4 Mounting of CP-8000

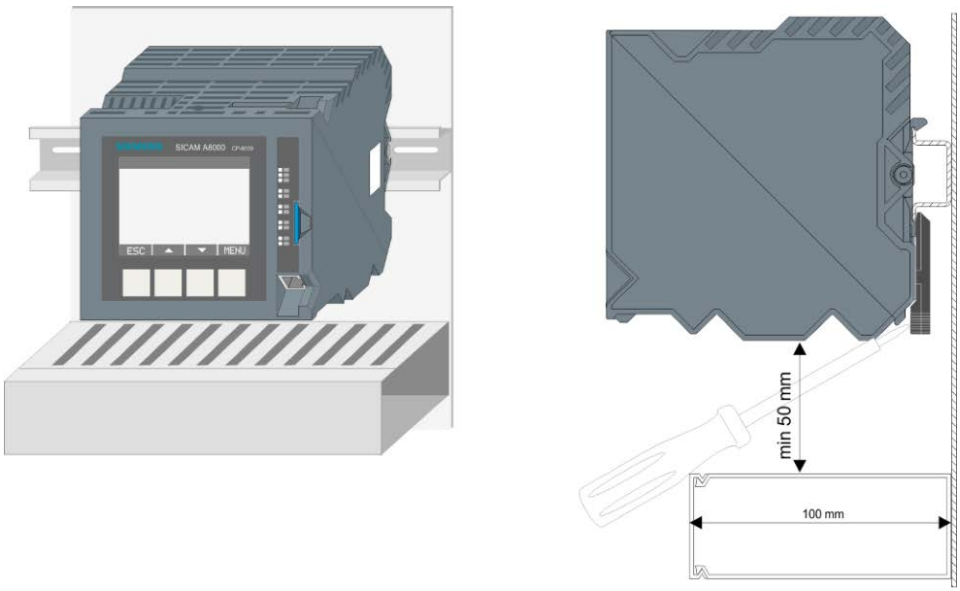
6.4.1 Space Requirement for the Basic Device

Besides the size of the device (128 mm x 124 mm) the space requirement for the height is dependent on the size of the cable ducts used and their minimum distance (30 mm) to the device.

For thermal reasons, a minimum distance of 30 mm must be maintained around the device.



When using a cable duct with 100 mm depth below the device, it is necessary to keep a 50 mm minimum distance between device and cable duct to operate the locking hook.

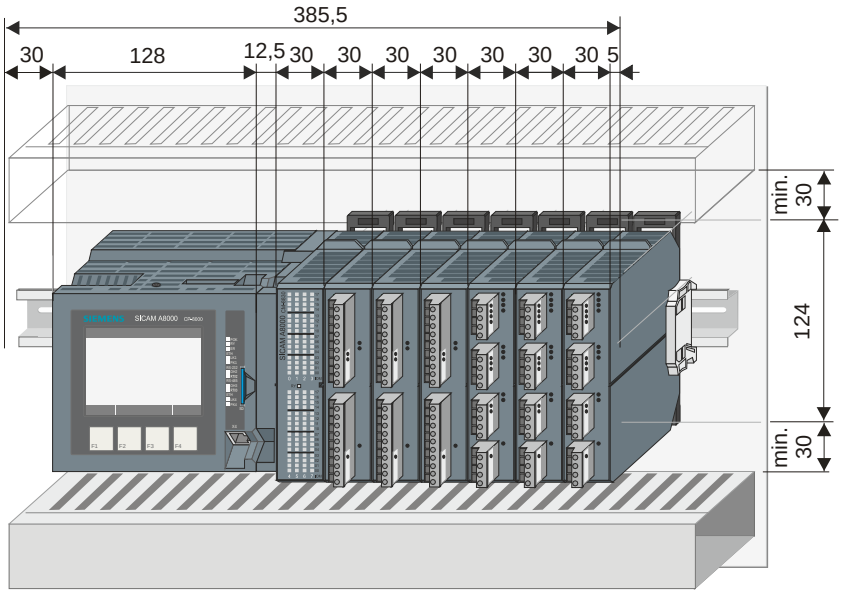


6.4.2 Space Requirement with SICAM I/O Modules

When connecting external SICAM I/O Modules, the dimensions given in the table must be considered in addition to the number of modules used (max. 6).

Example: Maximal number of installed modules

Thermal distance on the left	30 mm
CP-8000	128 mm
CM-8811 coupling module	12.5 mm
CM-8830 LED Module	30 mm
6 SICAM I/O Modules (6 x 30)	180 mm
End clamp	5 mm
Horizontal space requirement (mm)	385.5 mm

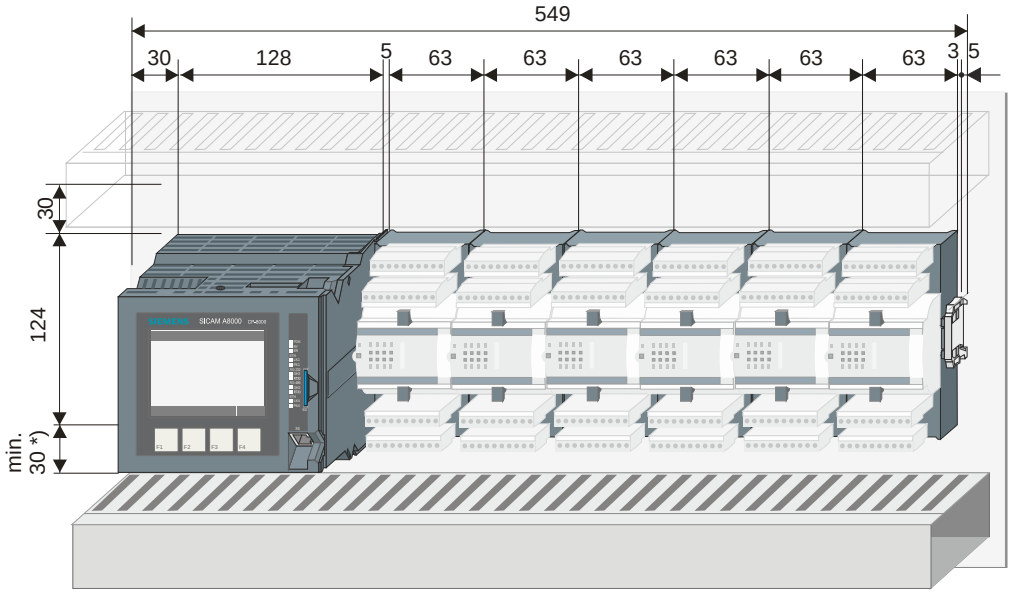


6.4.3 Space Requirement with SICAM TM I/O Modules

When connecting external SICAM TM I/O Modules, the dimensions given in the table must be considered in addition to the number of modules used (max. 6).

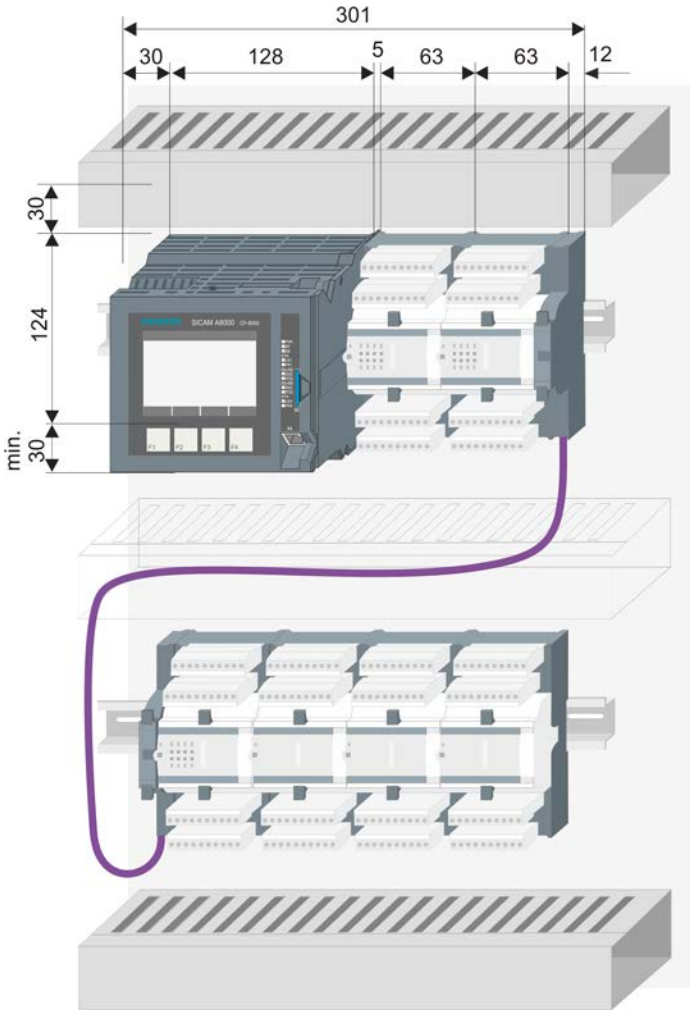
Example: Maximal number of installed modules

Thermal distance on the left	30 mm
CP-8000	128 mm
CM-6811 coupling module	5 mm
6 SICAM TM I/O Modules (6 x 63)	378 mm
Protective cap for bus	3 mm
End clamp	5 mm
Horizontal space requirement (mm)	549 mm



Example: 2-line arrangement with CM-6810

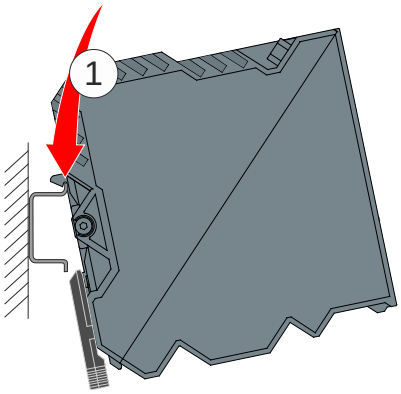
Thermal distance on the left	30 mm
CP-8000	128 mm
CM-6811 coupling module	5 mm
2 SICAM TM I/O Modules (2 x 63)	126 mm
CM-6810 coupling module	12 mm
Horizontal space requirement (mm)	301 mm



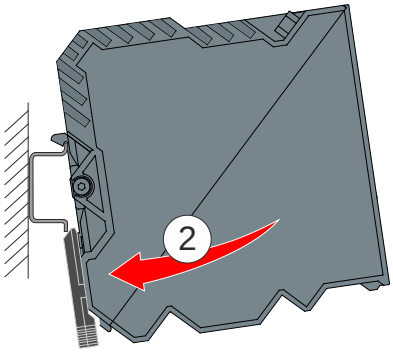
6.4.4 Mounting of the Basic Device

CP-8000 can be installed on the DIN rail by hand, without any tools.

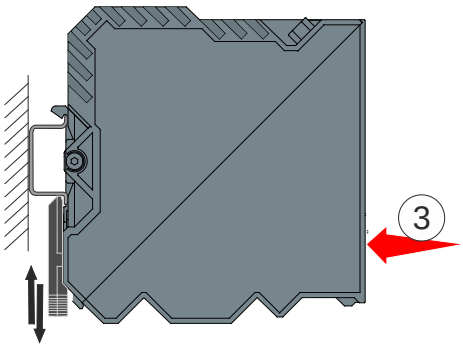
Hang the inclined device in the top edge of the DIN rail (1).



Swing the device until the locking hook has contact with the bottom edge of the DIN rail (2).



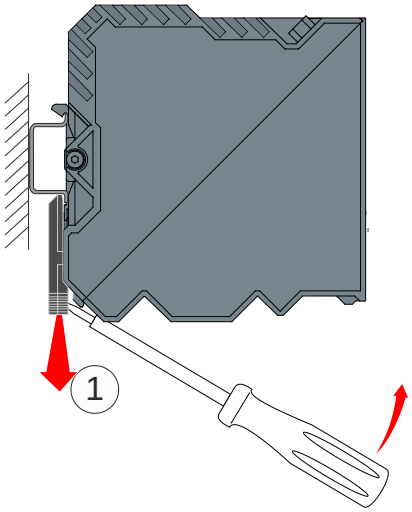
Push the casing to the back (3). As a result the locking hook opens briefly and the casing engages in the rail.



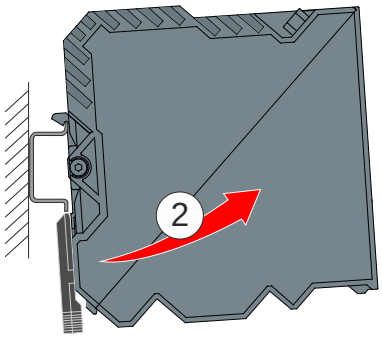
6.4.5 Removal of the Basic Device

To remove the device again, or to change its position on the DIN rail, the locking hook must be opened again.

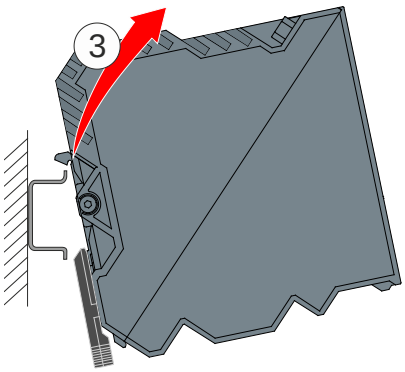
Insert a screwdriver suitable for slotted screws into the locking hook below the casing (1). The screw driver must have contact to the housing. The locking hook is opened by carefully pushing the screwdriver upwards.



Swing the bottom section of the device slightly forward (2).



Lift the device upwards out of the rail (3).



Note

If external I/O Modules are coupled to your device, then you can only remove the device after separating the external I/O Modules.

6.4.6 Coupling of external SICAM I/O Modules

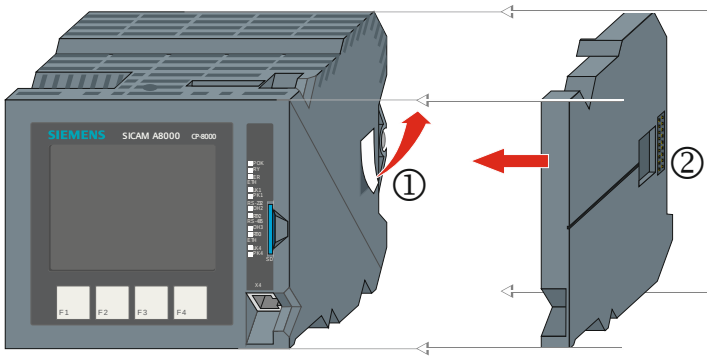
CP-8000 can be expanded by up to 6 external SICAM I/O Modules. Thereto the following steps are essential:

- Mounting of the coupling module for SICAM I/O Modules
- Mounting of the bus connector for SICAM I/O Modules
- Mounting of the SICAM I/O Modules

6.4.6.1 Mounting of the Coupling Module for SICAM I/O Modules

The coupling module CM-8811 must be mounted on the right side of the CP-8000 housing.

To mount the coupling module, it is necessary to remove the label (1) which covers the I/O bus. Afterwards lead the coupling module parallel to the housing (2) and push it evenly on it until it is engaged.



Now you can mount CP-8000 on the DIN rail.

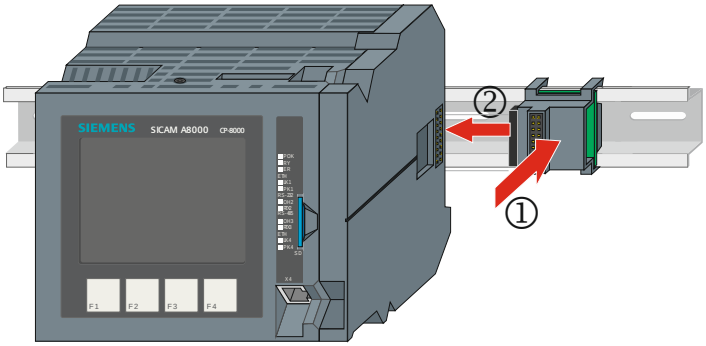
Note

The mounting of the coupling module on the CP-8000 housing can take place before or after the device is mounted on the DIN rail.

6.4.6.2 Mounting of the Bus Connector for SICAM I/O Modules

Each SICAM I/O Module is equipped with a bus connector CM-8812. This must be equipped separately from the I/O Module. You must disconnect the bus connector before mounting.

Click the first bus connector right beside the coupling module on the DIN rail (1) and push it into the bus plug of the coupling module (2). Both elements must be aligned seamlessly.



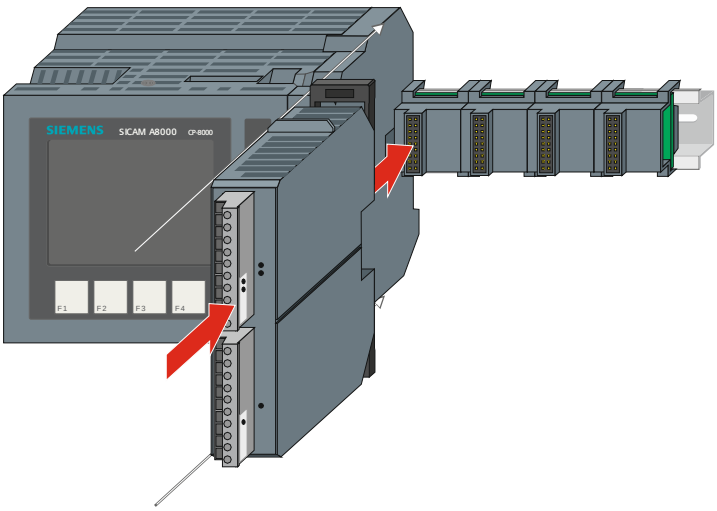
Afterwards you can attach the bus connectors of further SICAM I/O Modules in the same way.

Caution

Bus communication is system-internal only. It is not allowed to modify the bus connector.

6.4.6.3 Mounting of the SICAM I/O Modules

The SICAM I/O Modules can be mounted as shown in following picture.

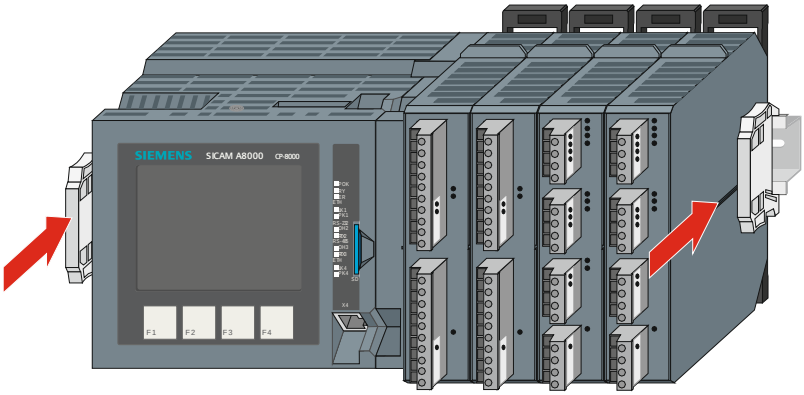


Note

The tongue and groove system integrated in the modules facilitates the correct combination. The module is only connected correctly when the locking hook is snapped onto the DIN rail.

End Clamp

To increase the stability, it is necessary to mount an end clamp flush left from the CP-8000 housing and flush right after the last SICAM I/O Module.



You can take information on the SICAM I/O Modules out of the following document:

Document name	Item number
SICAM I/O Modules User Manual	DC8-012-2

Please consider the notes in the section 2.1.5.4, Configuration Rules for I/O Modules.

6.4.6.4 Removal of the SICAM I/O Modules

For the removal, proceed according to section 6.5.5, Removal of a SICAM A8000 Module.

6.4.7 Mounting of External SICAM TM I/O Modules

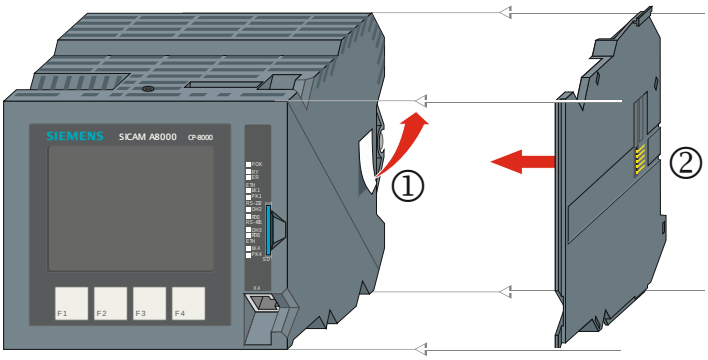
CP-8000 can be expanded with up to 6 external SICAM TM I/O Modules. Thereto the following steps are essential:

- Mounting of the coupling module for SICAM TM I/O Modules
- Mounting of the SICAM TM I/O Modules

6.4.7.1 Mounting of the Coupling Module for SICAM TM I/O Modules

The coupling module CM-6811 must be mounted on the right side of the CP-8000 housing.

To mount the coupling module, it is necessary to remove the label (1) which covers the I/O bus. Afterwards lead the coupling module parallel to the housing (2) and push it evenly on it until it is engaged.



Now you can mount CP-8000 on the DIN rail.

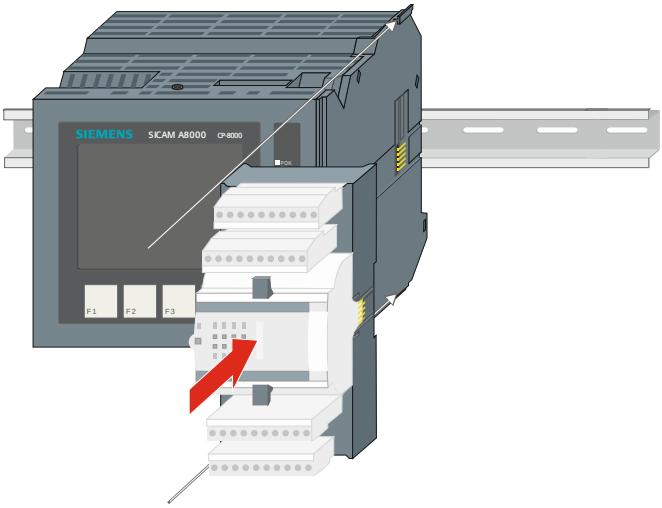
Note

The mounting of the coupling module on the CP-8000 housing can take place before or after the device is mounted on the DIN rail.

6.4.7.2 Mounting of the SICAM TM I/O Modules

After CP-8000 and the coupling module are mounted on the DIN rail you can start to mount the SICAM TM I/O Modules.

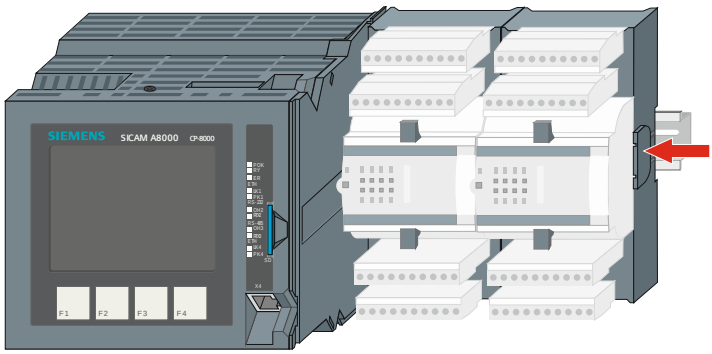
Lead the first I/O Module as shown in the following picture into the guides on the coupling module and press the locking clips on the top side of the module together. Now you can put the module on the DIN rail and release the locking clips. Make sure that the module is correctly engaged on the DIN rail.



Afterwards you can attach the further SICAM TM I/O Modules.

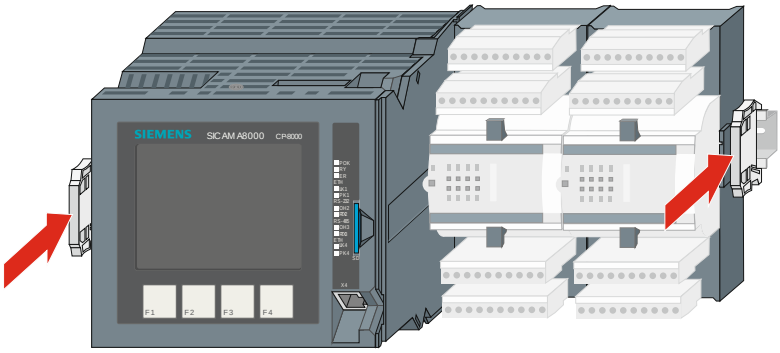
Caution

The last SICAM TM I/O Module must be equipped with a protective cap to protect the bus. The appropriate cap is delivered with the coupling module.



End Clamp

To increase the stability, it is necessary to mount an end clamp flush left from the CP-8000 housing and flush right after the last SICAM TM I/O Module.



You can take information on the SICAM TM I/O Modules out of the following documents:

Document name	Item number
SICAM TM I/O Modules User Manual	DC6-041-2

Please consider the notes in the section 2.1.5.4, Configuration Rules for I/O Modules.

6.4.7.3 Removal of the SICAM TM I/O Modules

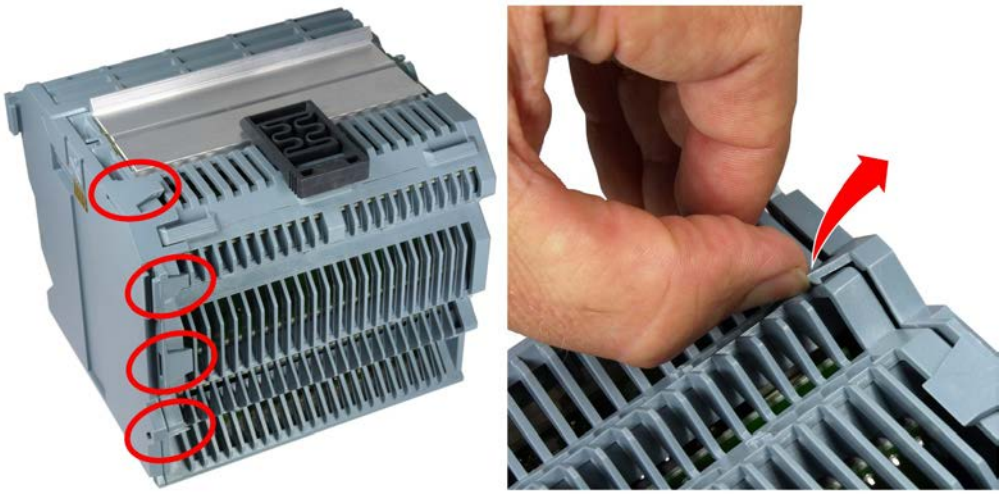
For the removal, proceed as follows:

- Press the locking clips together
- Withdraw the module with clips pressed together

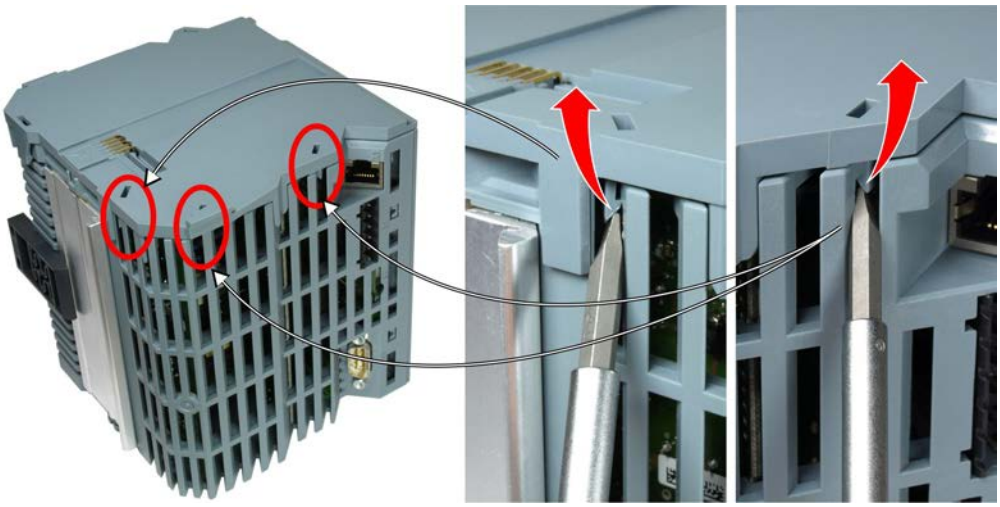
6.4.7.4 Separating of Basic Device and I/O Coupling Module

If you need to separate a CP-8000 from the I/O coupling module (e.g. spare part replacement), proceed as follows:

1. Separate the external I/O Modules from the basic device.
2. Remove the basic device including the coupling module from the DIN-rail.
3. Loose at first the 4 clamps of the coupling module which are arrested at the housing.



4. Loose the 3 clamps which are arrested inside the housing.
   Use a proper tool (e.g. a small slotted screwdriver).



5. Now you can demount the TM I/O coupling module.
6. Cover the holes of the bus with a label.

Note

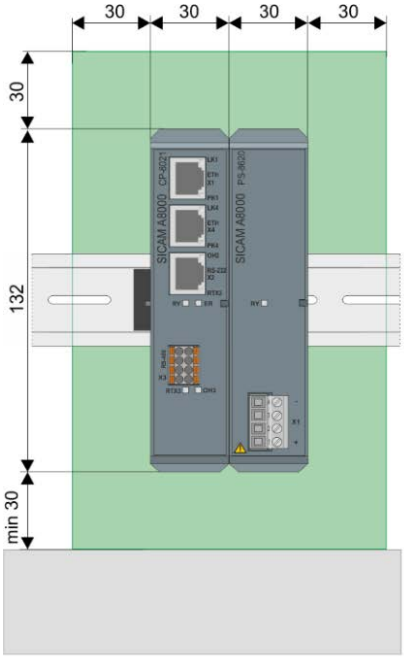
Above illustrations show the separation of a SICAM TM I/O coupling module from a CP-8000.
The separation of a for SICAM I/O coupling module works the same way.

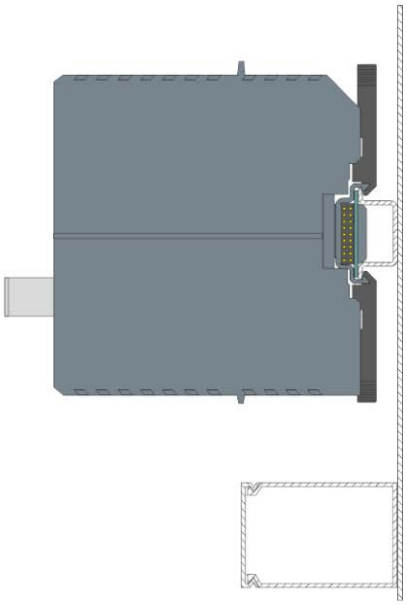
6.5 Mounting of CP-802x

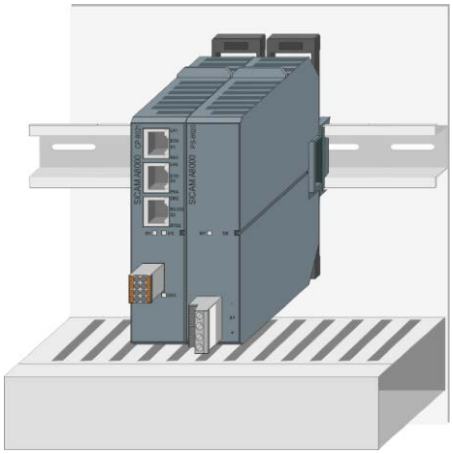
6.5.1 Space Requirement for the Basic Device with Power Supply

For the operation of CP-8021 or CP-8022 a power supply module is required. The belonging dimension and the minimum distance (30 mm) around the modules must be considered for the determination of the space requirement.

For thermal reasons, a minimum distance of 30 mm must be maintained around the device.





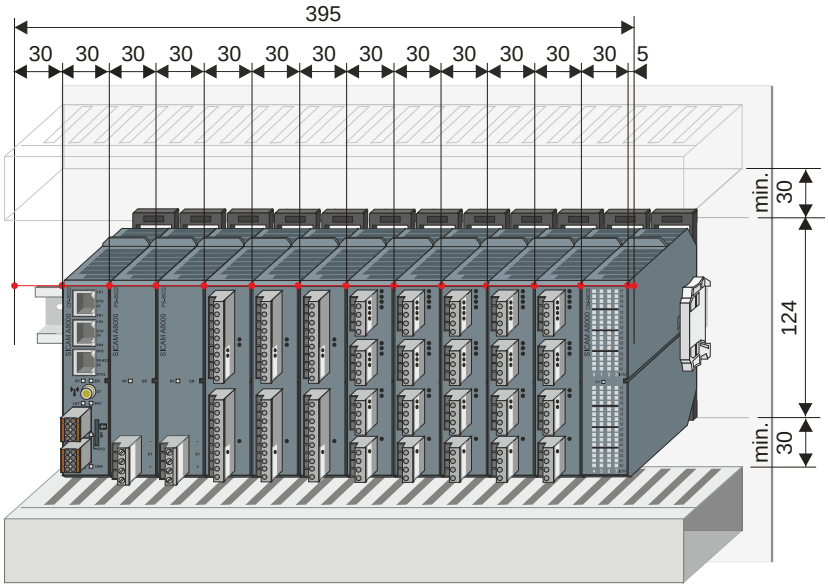


6.5.2 Space Requirement CP-802x with SICAM I/O Modules

When connecting external SICAM I/O Modules, the dimensions given in the table must be considered in addition to the number of modules used (max. 8).

Example: Maximal number of installed modules

Thermal distance on the left	30 mm
CP-802x	30 mm
2 SICAM PS-86xx (2 x 30)	60 mm
8 SICAM I/O Modules (8 x 30)	240 mm
CM-8830 LED Module	30 mm
End clamp	5 mm
Horizontal space requirement (mm)	395 mm

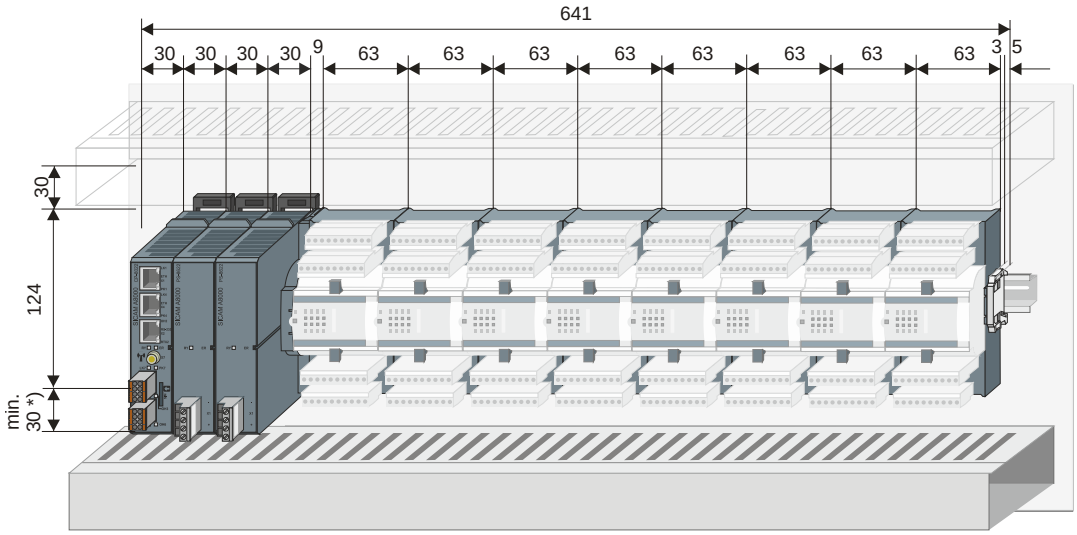


6.5.3 Space Requirement CP-802x with SICAM TM I/O Modules

When connecting external SICAM TM I/O Modules, the dimensions given in the table must be considered in addition to the number of modules used (max. 8).

Example: Maximal number of installed modules

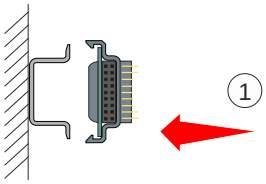
Thermal distance on the left	30 mm
CP-802x	30 mm
2 SICAM PS-86xx (2 x 30)	60 mm
CM-6812 coupling module	9 mm
8 SICAM I/O Modules (8 x 30)	504 mm
Protective cap for bus	3 mm
End clamp	5 mm
Horizontal space requirement (mm)	641 mm



6.5.4 Mounting of a SICAM A8000 Module

The modules of the SICAM A8000 series are installed on the DIN rail by means of a bus connector and a locking hook, without any tools.

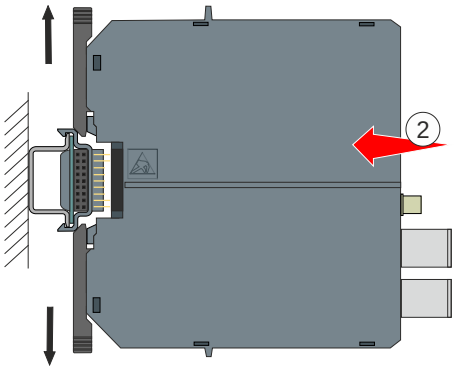
Each module is equipped with a bus connector. Remove this from the module and click it on the DIN rail (1).



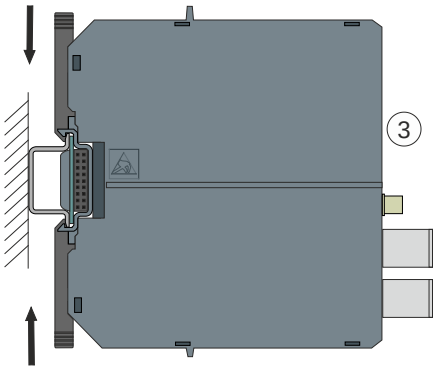
Caution

Bus communication is system-internal only. It is not allowed to modify the bus connector.

Press the module on the bus connector (2). Thereby the locking hooks are opened.



If module and bus connector are connected correctly, the locking hooks are latched on the DIN rail.



Note

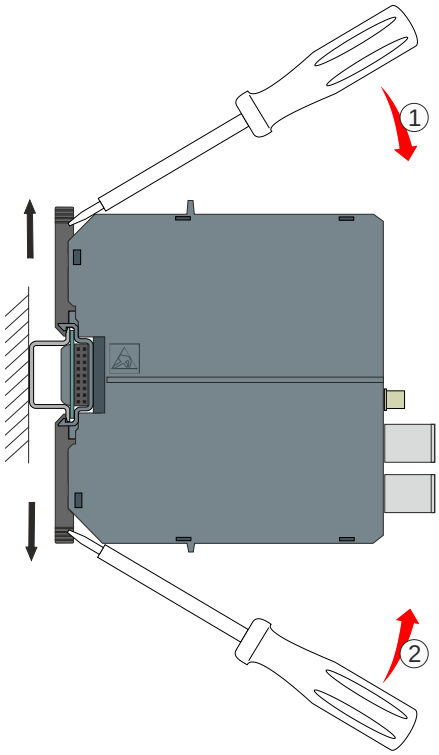
You also can open and lock the locking hooks on the module, before you mount the module. They must be closed manually after installation.

6.5.5 Removal of a SICAM A8000 Module

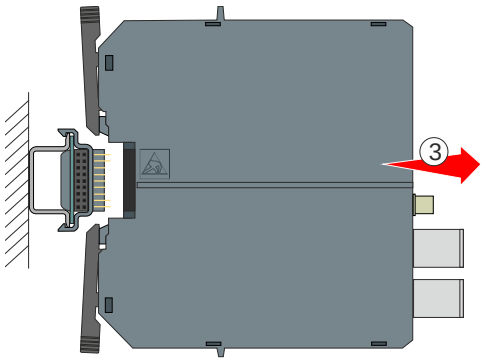
To remove a module again or to change its position on the DIN rail, the locking hooks must be opened again.

Insert a screwdriver suitable for slotted screws into the locking hook (as shown in the picture). The screw driver must have contact to the housing.

The locking hooks are opened by carefully pushing the screwdriver downwards (1) resp. upwards (2).



When the locking hooks are locked on the housing you can pull the module off forward (3.)



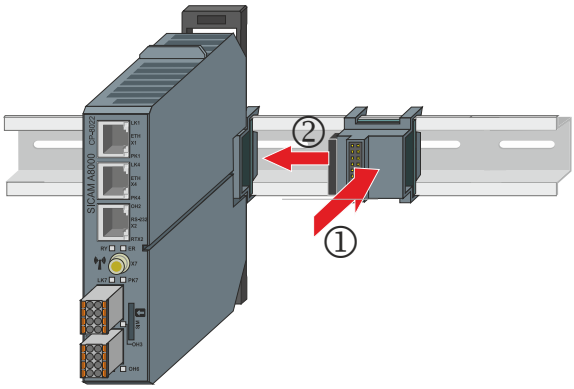
Note

If external I/O Modules are coupled to your device, then you can only remove the device after separating the external I/O Modules.

6.5.6 Mounting of the Power Supply Module

The Power Supply Module is equipped with a bus connector (CM-8812). This must be equipped separately from the module. You must disconnect the bus connector before mounting.

Click the bus connector right beside the Master Module on the DIN rail (1) and push it into the bus plug of the Master Module (2). Both elements must be aligned seamlessly.

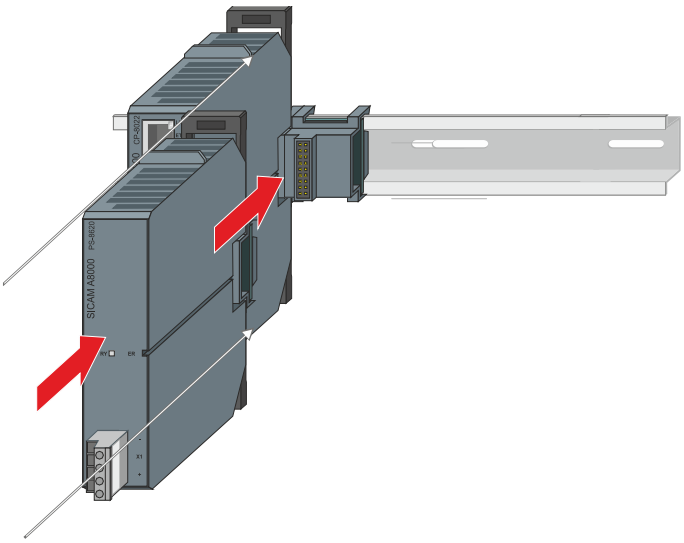


Caution

Bus communication is system-internal only. It is not allowed to modify the bus connector.

The devices must be powered by a SICAM A8000 power supply only. For USA and Canada: Use a UL listed SICAM A8000 power supply.

The Power Supply Module can be mounted as shown in the following picture.



Note

The tongue and groove system integrated in the modules facilitates the correct combination. The module is only connected correctly when the locking hook is snapped onto the DIN rail.

6.5.7 Mounting of External SICAM I/O Modules

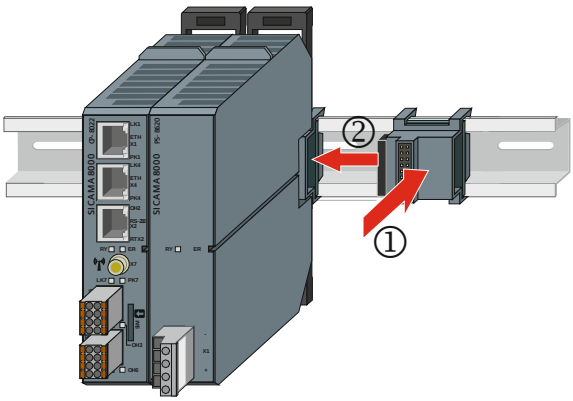
CP-802x can be expanded by up to 8 external SICAM I/O Modules. Thereto the following steps are essential:

- Mounting of the bus connector for SICAM I/O Modules
- Mounting of the SICAM I/O Modules

6.5.7.1 Mounting of the Bus Connector for SICAM I/O Modules

Each SICAM I/O Module is equipped with a bus connector CM-8812. This must be equipped separately from the I/O Module. You must disconnect the bus connector before mounting.

Click the first bus connector right beside the Power Supply Module on the DIN rail (1) and push it into the bus plug of the Power Supply Module (2). Both elements must be aligned seamlessly.



Afterwards you can attach the bus connectors of further SICAM I/O Modules in the same way.

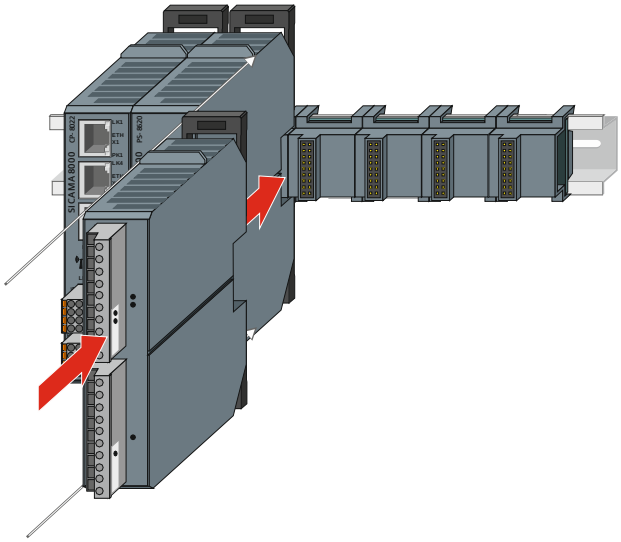
Caution

Bus communication is system-internal only. It is not allowed to modify the bus connector.

The devices must be powered by a SICAM A8000 power supply only. For USA and Canada: Use a UL listed SICAM A8000 power supply.

6.5.7.2 Mounting of the SICAM I/O Modules

The SICAM I/O Modules can be mounted as shown in following picture.

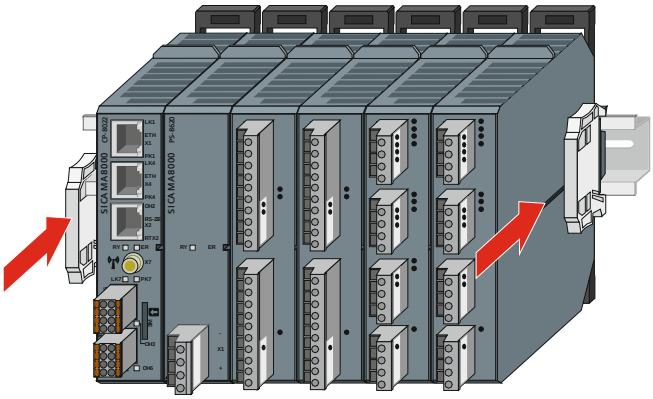


Note

The tongue and groove system integrated in the modules facilitates the correct combination. The module is only connected correctly when the locking hook is snapped onto the DIN rail.

End Clamp

To increase the stability, it is necessary to mount an end clamp flush left from the CP-802x housing and flush right after the last SICAM I/O Module.



You can take information on the SICAM I/O Modules out of the following document:

Document name	Item number
SICAM I/O Modules User Manual	DC8-012-2

Please consider the notes in the section 2.1.5.4, Configuration Rules for I/O Modules.

6.5.7.3 Removal of the SICAM I/O Modules

For the removal, proceed according to section 6.5.5, Removal of a SICAM A8000 Module.

6.5.8 Mounting of External SICAM TM I/O Modules

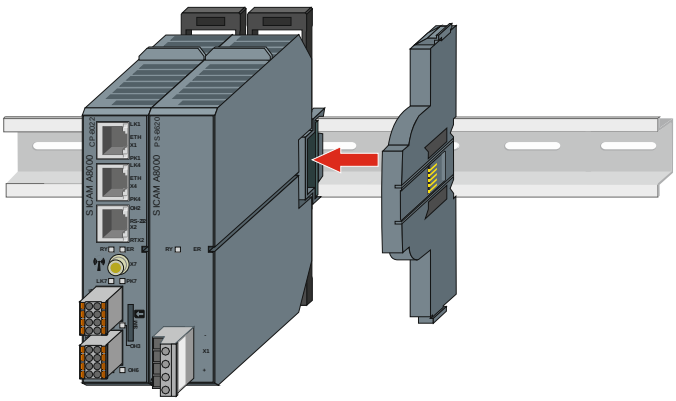
CP-802*x* can be expanded with up to 8 external SICAM TM I/O Modules. Thereto the following steps are essential:

- Mounting of the coupling module for SICAM TM I/O Modules
- Mounting of the SICAM TM I/O Modules

6.5.8.1 Mounting of the Coupling Module for SICAM TM I/O Modules

The coupling module CM-6812 must be mounted on the right side of the Power Supply Module housing.

Lead the coupling module parallel to the housing and push it evenly on it until it is engaged.



Afterwards you can mount SICAM TM I/O Modules on the DIN rail.

Note

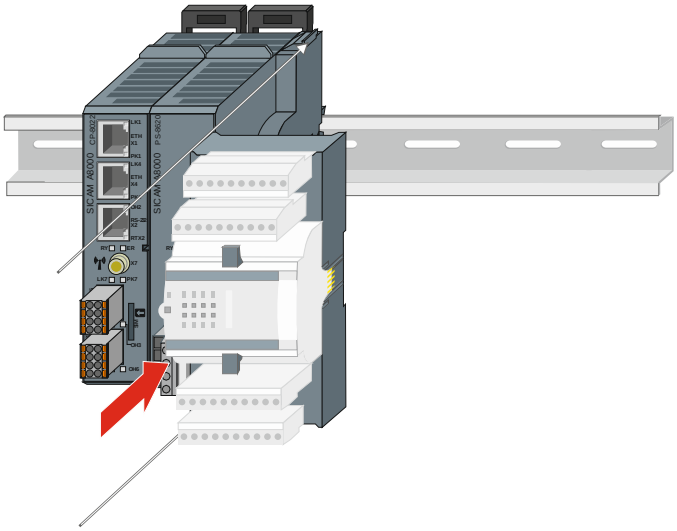
The mounting of the coupling module can take place before or after the housing is mounted on the DIN rail.

6.5.8.2 Mounting of the SICAM TM I/O Modules

After CP-802*x*, the Power Supply Module and the coupling module are mounted on the DIN rail, you can start to mount the SICAM TM I/O Modules.

Lead the first I/O Module as shown in the following picture into the guides on the coupling module and press the locking clips on the top side of the module together. Now you can put the module on the DIN rail and release the locking clips.

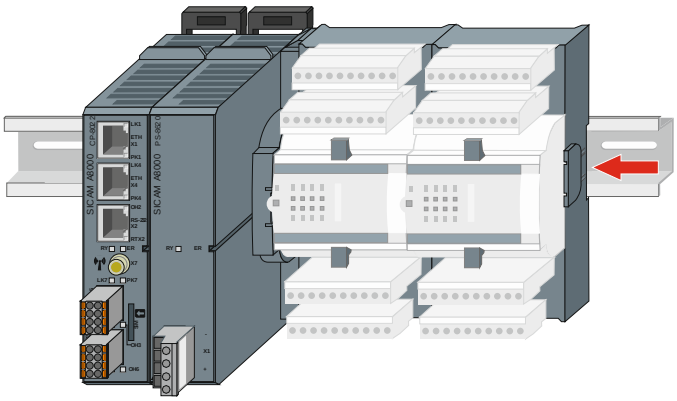
Make sure that the module is correctly engaged on the DIN rail.



Afterwards you can attach the further SICAM TM I/O Modules.

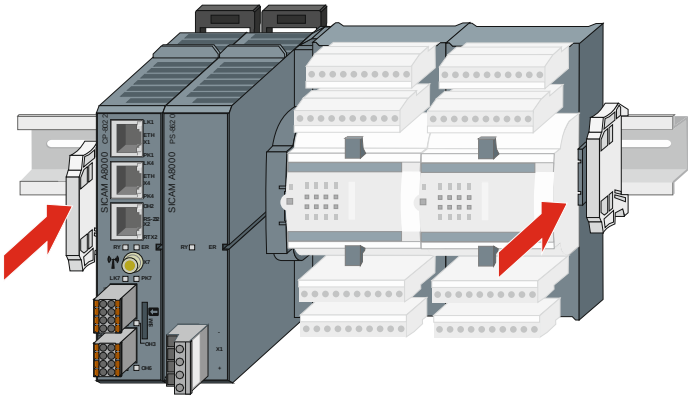
Caution

The last SICAM TM I/O Module must be equipped with a protective cap to protect the bus. The appropriate cap is delivered with the coupling module.



End Clamp

To increase the stability, it is necessary to mount an end clamp flush left from the CP-802*x* housing and flush right after the last SICAM TM I/O Module.



You can take information on the SICAM TM I/O Modules out of the following documents:

Document name	Item number
SICAM TM I/O Modules User Manual	DC6-041-2

Please consider the notes in the section 2.1.5.4, Configuration Rules for I/O Modules.

6.5.8.3 Removal of the SICAM TM I/O Modules

For the removal, proceed as follows:

- Press the locking clips together
- Withdraw the module with clips pressed together

6.6 Memory Cards

6.6.1 SD Card

CP-8000/CP-802*x* uses an SD card (Secure Digital) for the storage of firmware, application and diagnosis data. The Master Modules are supplied with an SD card inserted.

You find further information in section 7.5.1, SD Card.

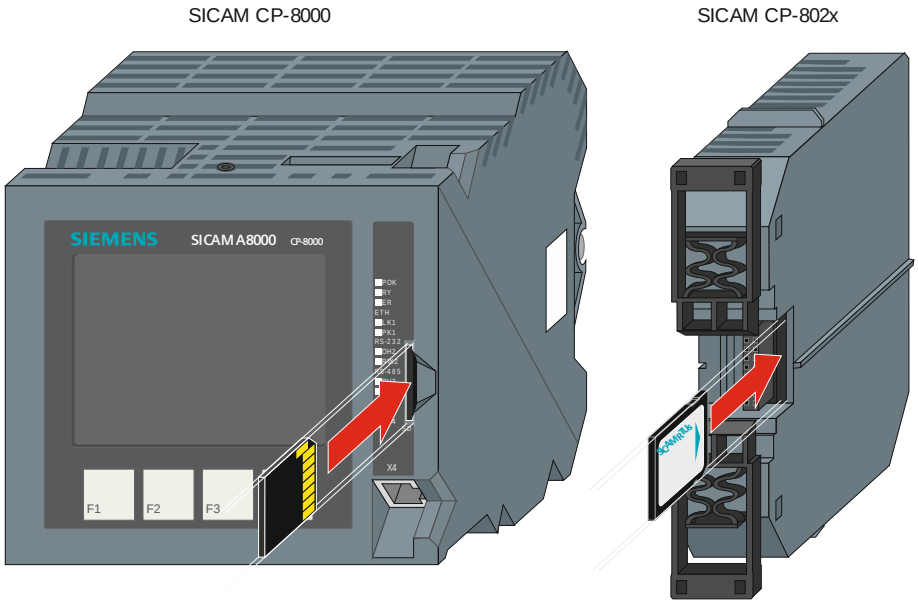
Note

Do not remove or insert the SD card during operation of the device.

6.6.1.1 Inserting the SD Card

Whith CP-8000 the SD card is inserted in the front of the device.

With CP-802*x* the SD card is inserted in the rear side, therefore the Master Module must be removed from the DIN rail when exchanging the SD card.



Put the SD card in the slot and press carefully until it engages.

6.6.1.2 Removing the SD Card

Disconnect the device from the supply voltage and wait for at least 30 s.

Push the SD card carefully until it is disengaged and springs out of the slot. The SD card can now be removed.

6.6.2 SIM Card (only CP-8022)

CP-8022 needs a SIM card for the communication via GPRS. This will be supported by your mobile network provider.

You find further information in section 7.5.2, SIM Card (only CP-8022).

Note

Do not insert or remove the SIM card during operation of the device. This can damage the SIM card and the device!

Please consider that the SIM card supports the required temperature range. Such kind of SIM cards are frequently managed under the tariff M2M.

6.6.2.1 Inserting the SIM Card

In CP-8022 the SIM card is inserted in the front of the device.

Put the SIM card in the corresponding slot and press carefully until it engages.

6.6.2.2 Removing the SIM Card

Disconnect the device from the supply voltage and wait for at least 30 s.

Push the SIM card carefully until it is disengaged and springs out of the slot. The SIM card can now be removed.

6.7 Wiring

Due to the power dissipation in the device there is a higher temperature on the terminals than the device ambient temperature. This increase is maximum 15°C with full load. For this reason the isolation of the wires must withstand a higher temperature than the device environment temperature (see example for process peripherals).

6.7.1 Power Supply

CP-8000 has an integrated power supply module (see 5.3.1, PS-8630 (CP-8000 internal)).

- The supply can be performed via a station battery or series power units.
- For the fuse protection a circuit breaker 2-pole 2 A, characteristic C is prescribed (standard type: Siemens 5SY5 202-7).

CP-802*x* needs an external power supply module PS-862*x* or PS-864*x* (see 5.3.2.1, Technical Data and 5.3.3.1, Technical Data).

- The supply can be performed via a station battery or series power units.
- PS-8642 can be supplied optionally via the public low-voltage network.
- Furthermore, 2 redundant power supply modules can be used (PS-862*x* as of production level CC).
- For the fuse protection of PS-862*x* a circuit breaker 2-pole with 2 A, characteristic C is prescribed (standard type: Siemens 5SY5 202-7).
- For the fuse protection of PS-864*x* a circuit breaker 2-pole with 10 A, characteristic C is prescribed (standard type: Siemens 5SY5 210-7).

You can establish the supply with single leads of the type H07V-K (1.5 to 2.5 mm²) or a cable of the type LA-YY-0 (2 x 1.5 to 2.5 mm²) or H05VV-F 3G (1.5 to 2.5 mm²).

Recommended and tested series power units (standard types) can be found in the Appendix A.7, Recommended Upstream Power Supply Devices.

6.7.2 Process Peripherals

Cabinet-internal wiring is preferably carried out with plastic-insulated cables according to DIN VDE 298 T4 2/89. Use only copper wires.

You can establish the connections with single leads of the type H05V-K or H05V2-K (0.5 to 1 mm²), as well as H07V-K or H07V2-K (1.5 to 2.5 mm²).

Max. ambient temperature	Max. operating temperature	Wire type
55°C	70°C	H05V-K, H07V-K
70°C	85°C	H05V2-K, H07V2-K

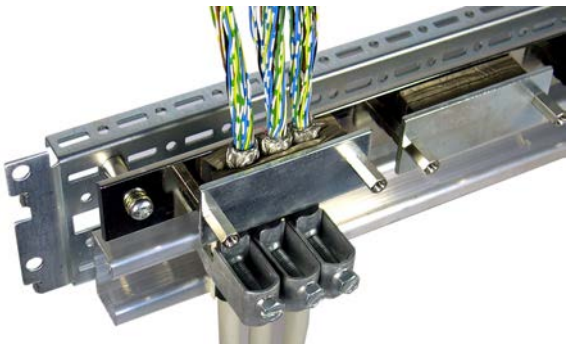
Conductor size, ampacity, and temperature rating per the National Electrical Code.

- If a wire bridge with 0.75 mm² is used or a bridged comb, the cable cross section is limited to 1.5 mm².
- The construction of the peripheral connectors is designed for direct peripheral wiring. That means, that the wiring can be carried out without the use of a routing terminal or other additional screw terminals.
- Removable screw terminals are used as peripheral connectors. These are attached to the device for delivery. Optionally spring-loaded- or crimp terminals can be used.
- Preferably wire end sleeves are to be used.
- A cable duct is to be provided for the wiring of the process signals.

6.7.3 Shielding

CP-8000/CP-802*x* is designed in order that no shielded cables are necessary.

Normally, shielded cables are strain-relieved directly after the cabinet/rack entry and then grounded on a large-surface screening rail installed for this purpose. The device itself provides no possibility of shield clamping.



6.7.4 Protective Earth/Ground

When installing CP-8000/CP-802*x*, it is to be ensured that the cabinet or rack used has proper protective earth and ground. That means, that all electrical conducting parts must be connected large-surface and as short as possible with the existing grounding system.

If these preconditions exist, the grounding of the device takes place via the connection of the DIN rail with the cabinet spar. A reliable connection is achieved by using screws with contact washers.

6.8 Switching the Device On and Off

Before switching the device on it must be connected to the designated power supply.

Switching on takes place by connecting the voltage at the corresponding connector (X12/CP-8000, X1/PS-862*x*, X1/PS-864*x*), commonly by switching on a miniature circuit breaker (Details see 6.7.1, Power Supply).

The circuit breaker must be arranged at a suitable location, simply accessible to the user, close to the device, and be marked as disconnector for the device.

The device starts up automatically. It is operational (without error display), as soon as all connected modules have concluded the startup. The startup time is dependent on the loaded data on the SD card and may last up to 15 minutes.

Pay attention to the status display during and after startup. You will find the details therreto in section 11.2, Checks and System Display.

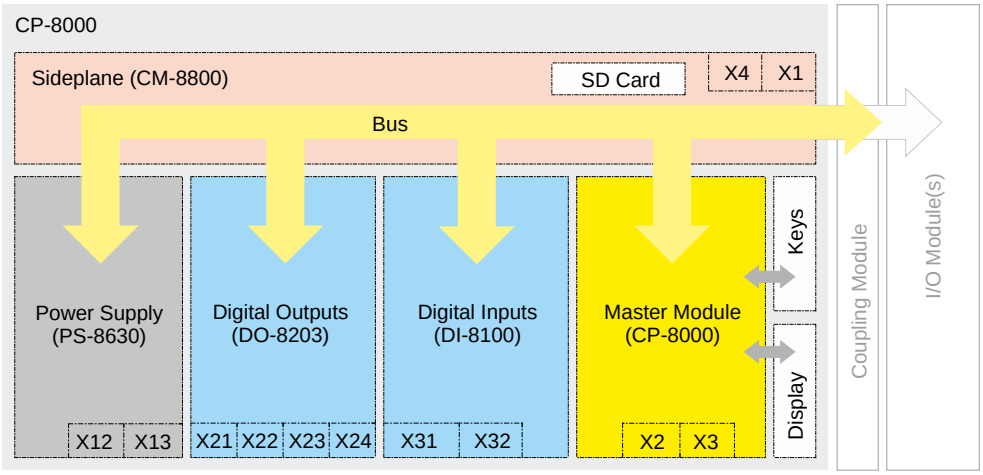
The switching off of the device takes place by disconnecting the power supply.

Caution

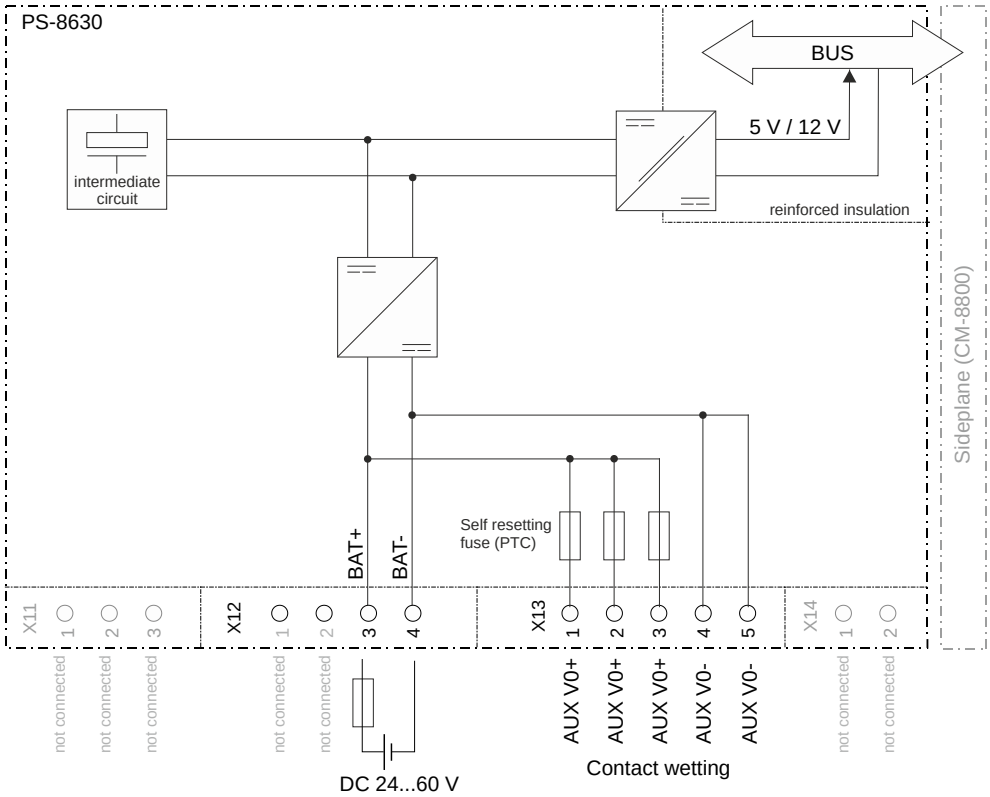
Switching off during writing operations to the SD card (load firmware, load parameters) is to be avoided without fail, since the data on the SD card could be destroyed as a result.

6.9 Block Diagrams and External Circuitry

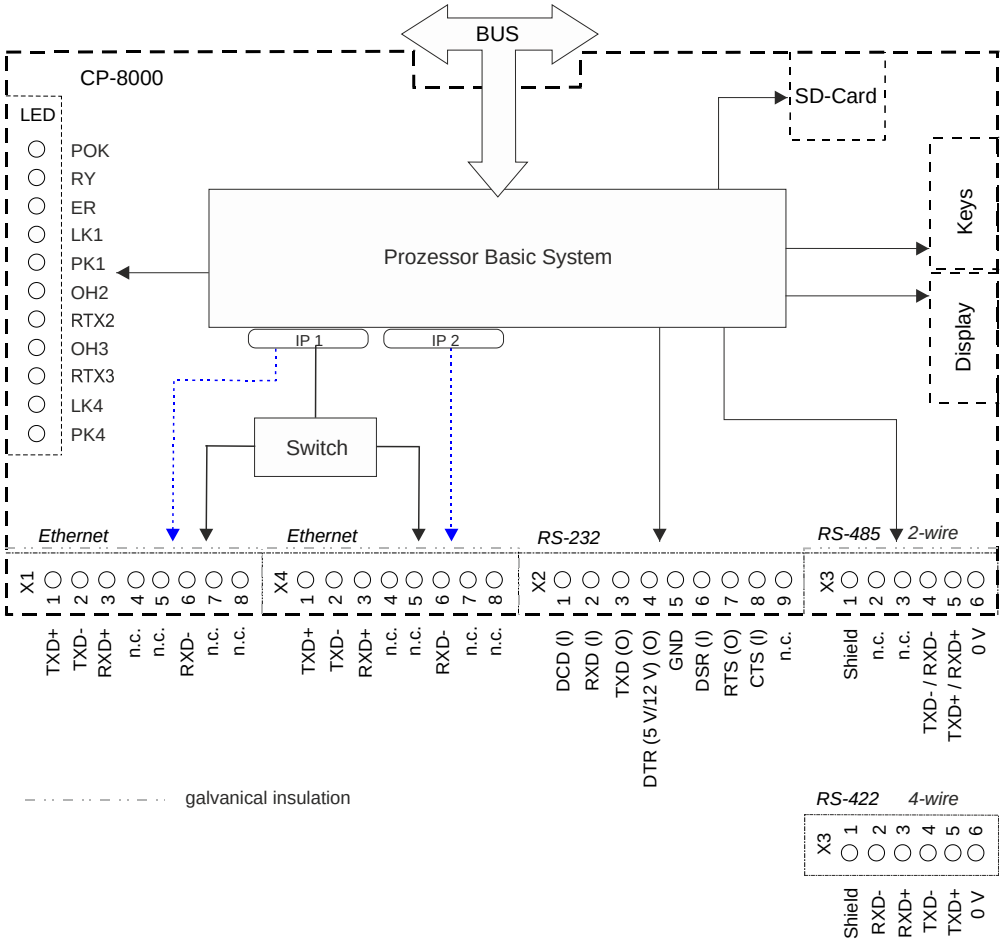
6.9.1 CP-8000



6.9.1.1 Power Supply



6.9.1.2 Master Module CP-8000

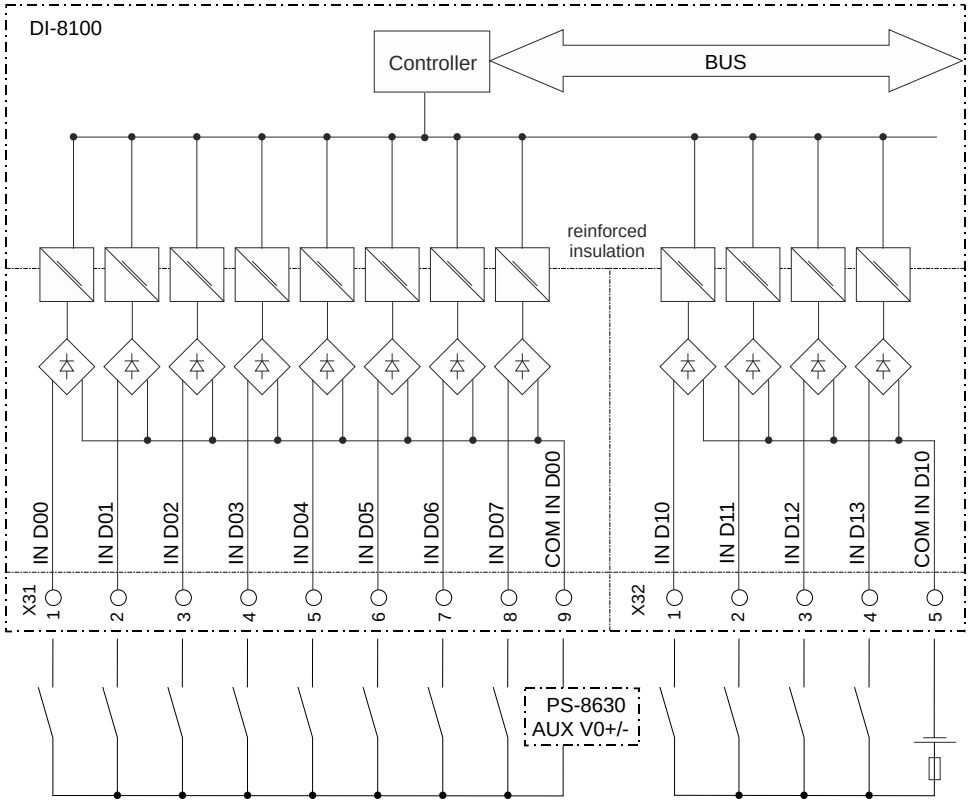


Note

X1 and X4 are alternatively 1 Ethernet interface (duplicated via an internal switch) or 2 independent Ethernet interfaces.

6.9.1.3 Digital Input DI-8100

The following circuitry variants are examples, and do not relate exclusively to the depicted inputs/outputs.



6.9.1.4 Digital Output DO-8203

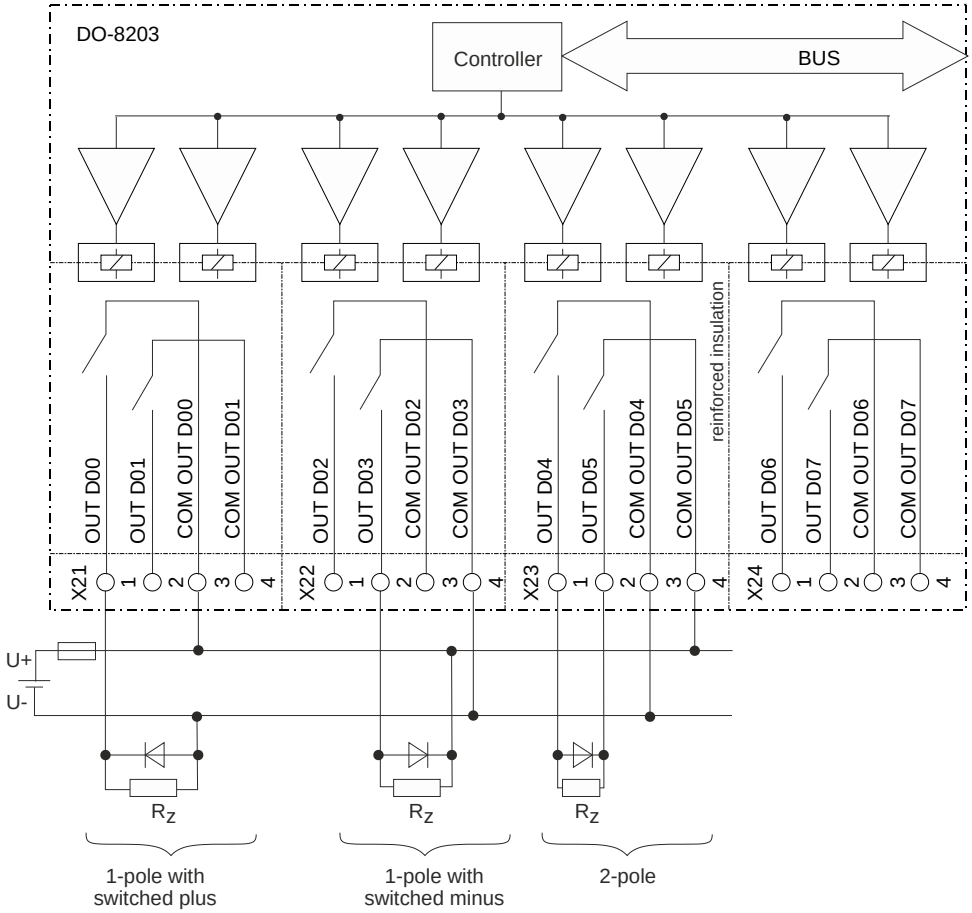
The following circuitry variants are examples, and do not relate exclusively to the depicted inputs/outputs.

Note

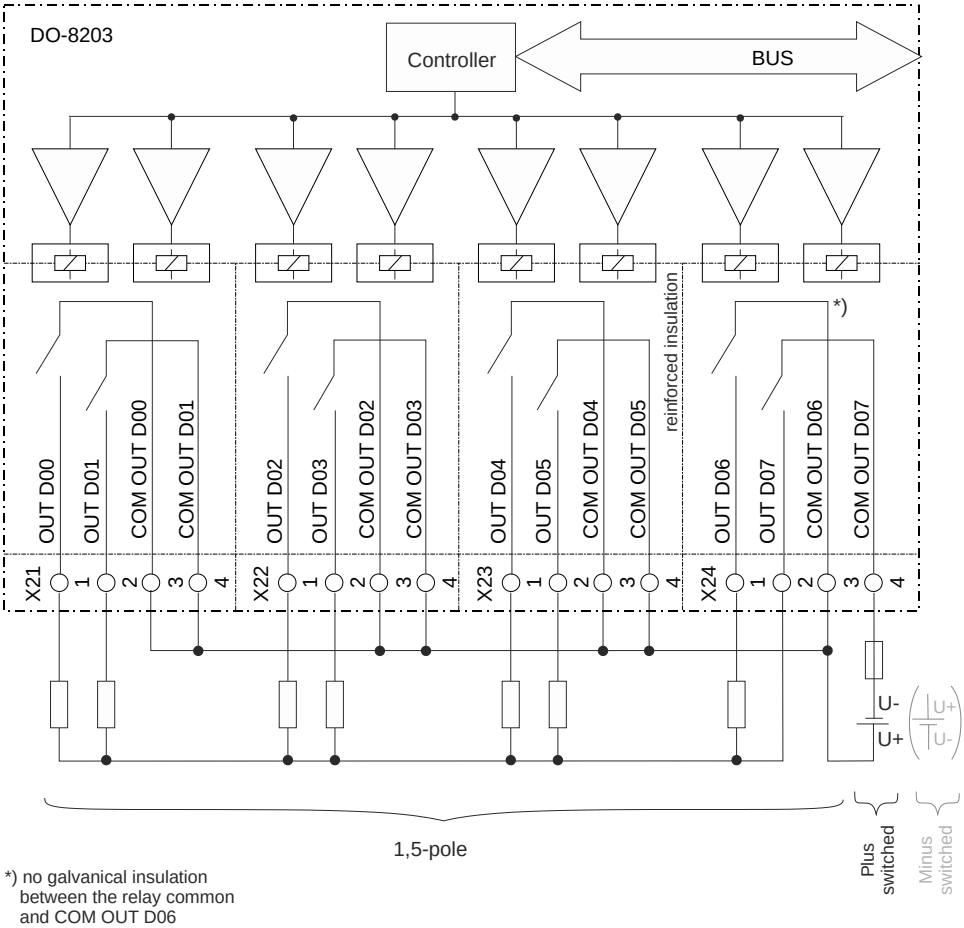
The module is monitoring autonomously the communication to the Master Module. With communication failure (> 150 ms) the parameterized failure behavior (terminate or keep) becomes active.

Further information see section 11.2.3, Behavior of the Process Outputs upon Startup and Failure.

6.9.1.4.1 1 and 2-pole Circuitry

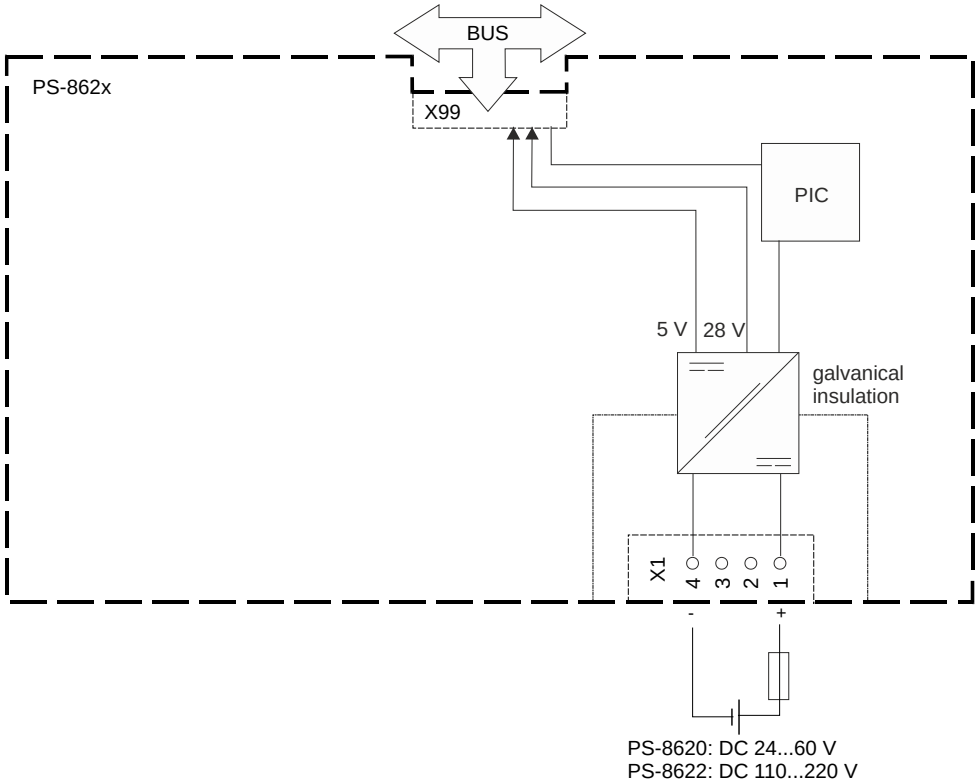


6.9.1.4.2 1½-pole Circuitry

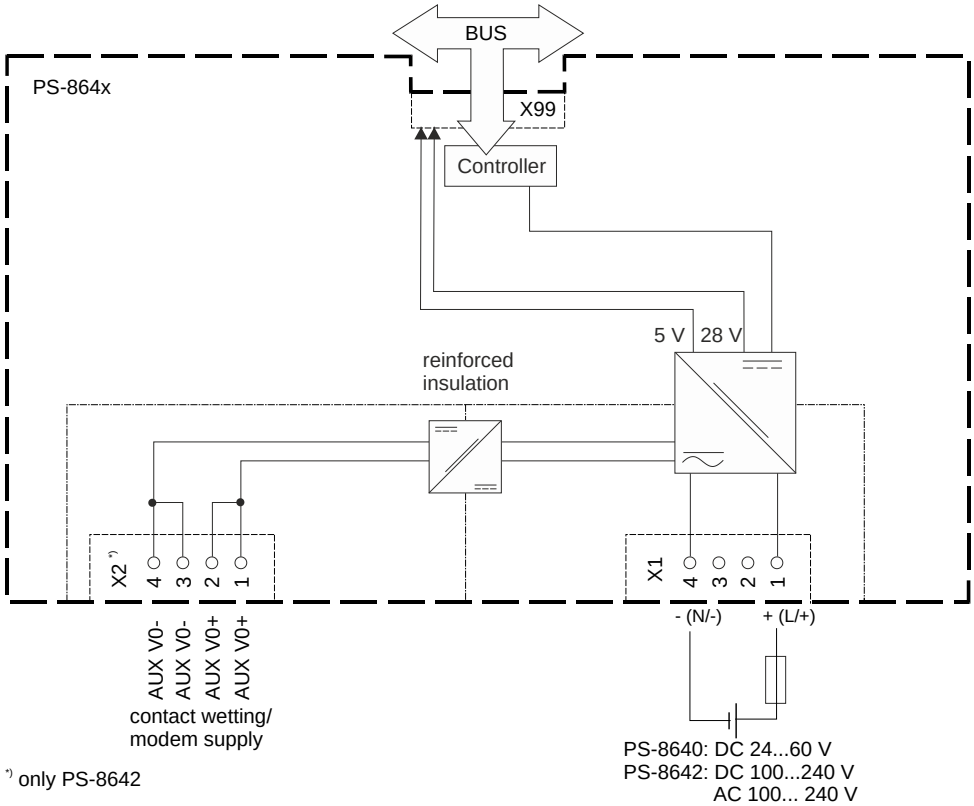


6.9.2 CP-802x

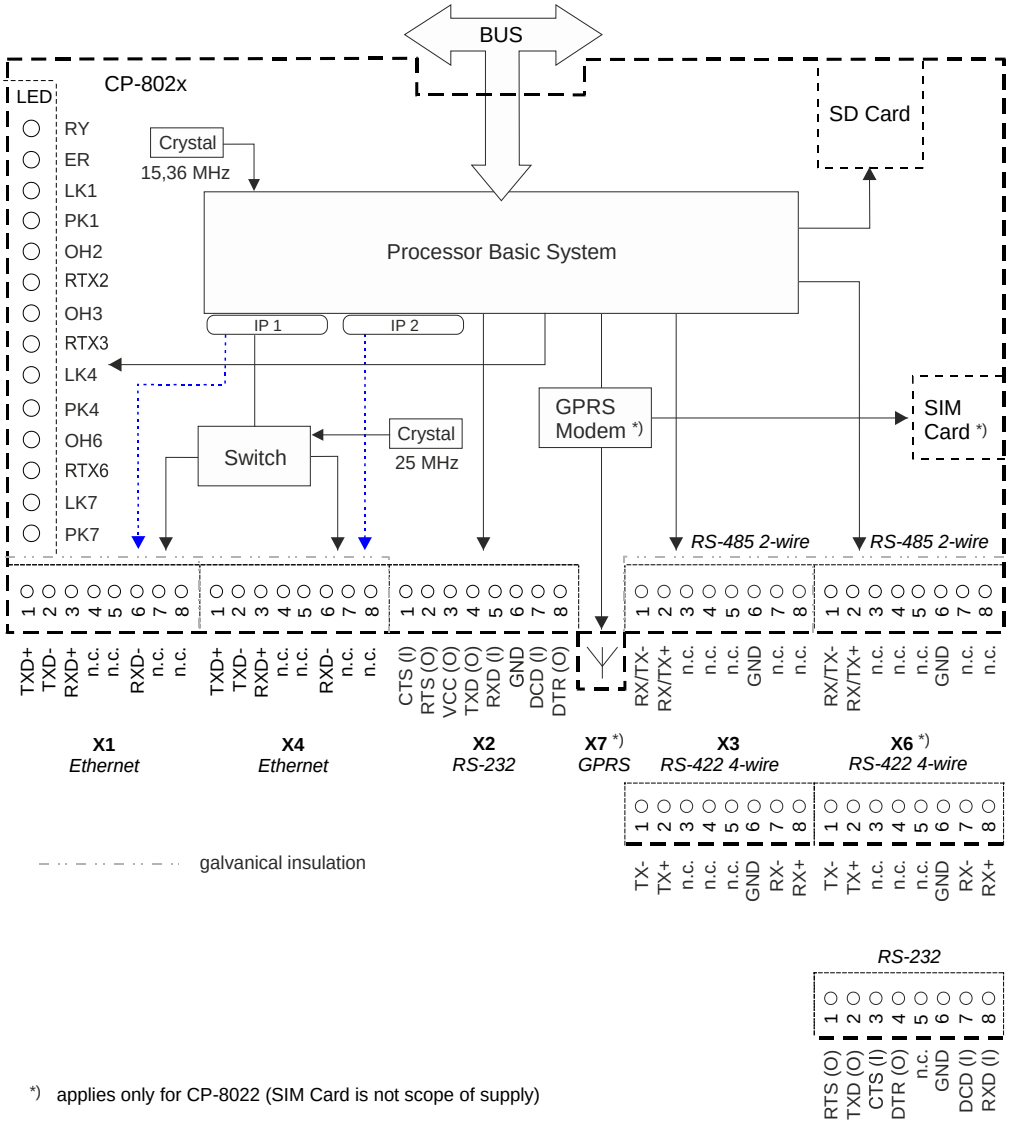
6.9.2.1 Power Supply Modules PS-8620 and PS-8622



6.9.2.2 Power Supply Modules PS-8640 and PS-8642



6.9.2.3 Master Module CP-8021 and CP-8022



Note

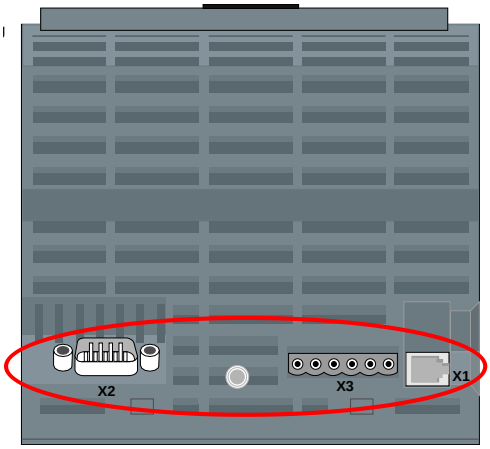
X1 and X4 are alternatively 1 Ethernet interface (duplicated via an internal switch) or 2 independent Ethernet interfaces.

6.10 Interfaces

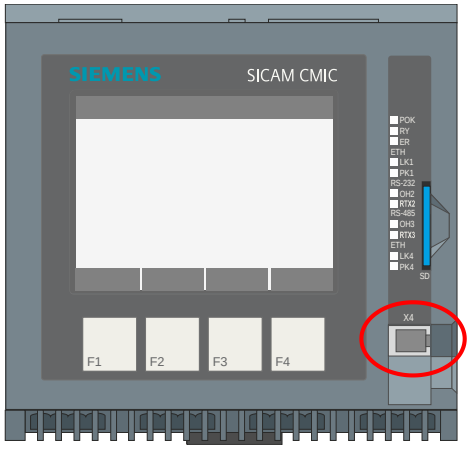
6.10.1 CP-8000

6.10.1.1 Position of the Interfaces on the Housing

The communication and process interfaces are positioned on the CP-8000 Master Module according to their use.



Top



Front

DI-8100
X31 to X32

DO-8203
X21 to X24

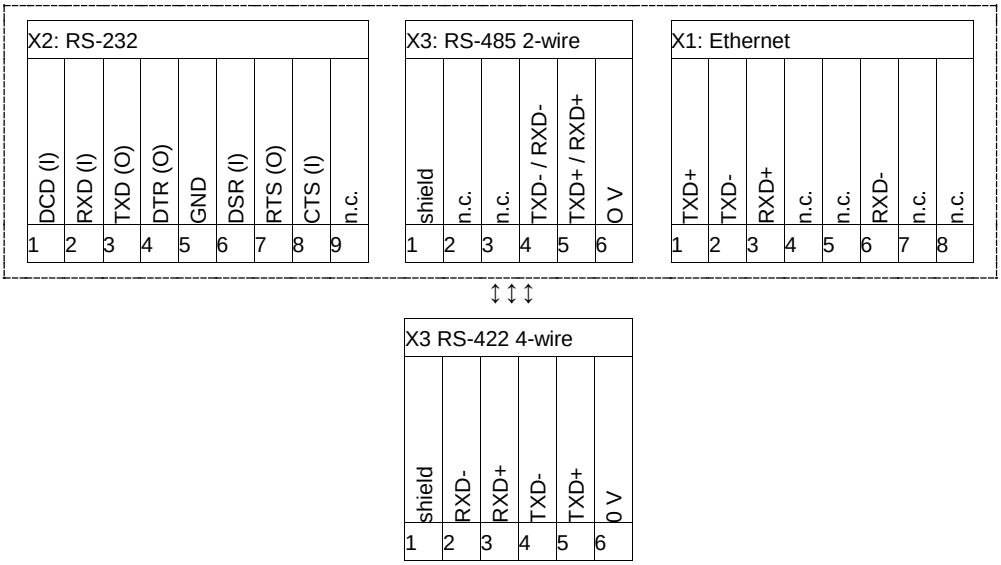
Power Supply
PS-8630
X12 to X13

Bottom

X1…Ethernet
X2…RS-232
X3…RS-485
X4…Ethernet

6.10.1.2 Pin Assignment

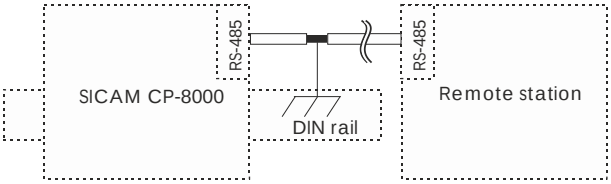
Interfaces at the Top



DCD (I)..... Data Carrier Detect (Input)
RXD (I)..... Receive Data (Input)
TXD (O)..... Transmit Data (Output)
DTR (O).....Data Terminal Ready (selectable as voltage output 5 V or 12 V)
GND..... Ground
DSR (I)..... Data Send Ready (Input)
RTS (O)..... Request To Send (Output)
CTS (I).....Clear to Send (Input)
TXD+, TXD-.....Transmit Data
RXD+, RXD-..... Receive Data
n.c. .....not connected

Note

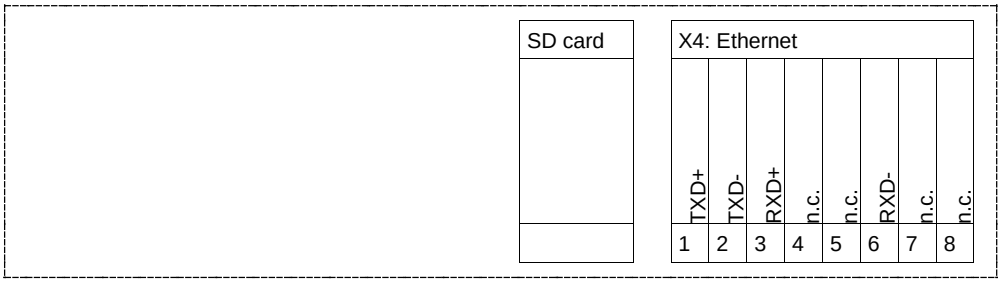
In case of using the RS-485 interface (X3) it is necessary to clamp the shield of the communication cable to the DIN rail. This shield clamping should be done close to the system.



Note

The assignment of X3 is independent whether a termination is existing or not (termination = resistance that is connected through parameter in the firmware).

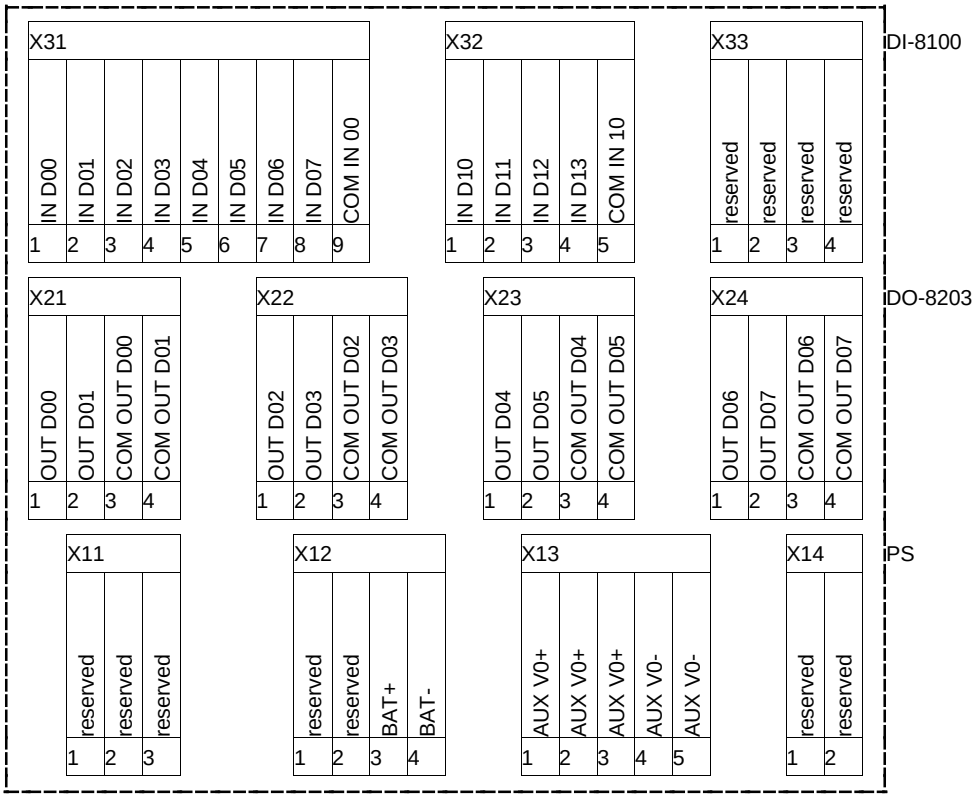
Interfaces at the Front



TXD+…… Transmit Data +
TXD-…… Transmit Data -
RXD+…… Receive Data +
RXD-…… Receive Data -
n.c. ……..not connected

Interfaces at the Bottom

The process signals are to be connected to screw terminals. The pin assignment of the peripheral connectors is described in the following table.

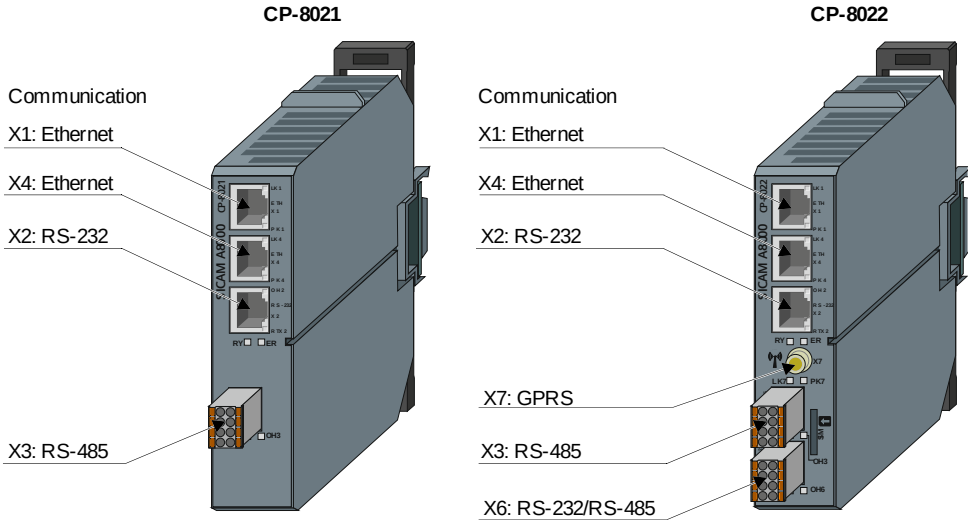


IN D00 to IN D07…… Binary inputs of group 0, inputs 0 to 7
IN D10 to IN D13…… Binary inputs of group 1, inputs 10 to 13
COM IN 00…… Common/supply of group 0
COM IN 10…… Common/supply of group 1
OUT D00 to D07…… Make contact outputs 0 to 7
COM OUT D00 to D07……..Common (root) outputs 0 to 7
BAT+/-……Input voltage
AUX V0+/-…… Voltage distribution

6.10.2 CP-802x

6.10.2.1 Position of the Interfaces

The communication interfaces are positioned on the front side of the CP-802x Master Module.



6.10.2.2 Pin Assignment

X1, X4: Ethernet

1	TXD+
2	TXD-
3	RXD+
4	n.c.
5	n.c.
6	RXD-
7	n.c.
8	n.c.

X2: RS-232

1	CTS (I)
2	RTS (O)
3	VCC (O)
4	TXD (O)
5	RXD (I)
6	GND
7	DCD (I)
8	DTR (O)

TXD+, TXD-..... Transmit Data
RXD+, RXD-..... Receive Data
CTS (I)..... Clear to Send (Input)
RTS (O)..... Request To Send (Output)
VCC (O) ..... Voltage output (selectable 5 V or 12 V)
TXD (O)..... Transmit Data (Output)
RXD (I) ..... Receive Data (Input)
DCD (I) ..... Data Carrier Detect (Input)
DTR (O)..... Data Terminal Ready (Output)
GND ..... Ground
n.c. …….not connected

Note

CP-8022 up to production level BB (6MF28022AA00BB) does not support VCC (O)!

CP-8022 as of production level CC (6MF28022AA00CC) supports VCC (O) (selectable 5 V or 12 V; 12 V is only possible if the internal GPRS modem is not used).

X3, X6: RS-485 2-Wire

1	TXD-/RXD-
2	TXD+/RXD+
3	n.c.
4	n.c.
5	n.c.
6	GND
7	n.c.
8	n.c.

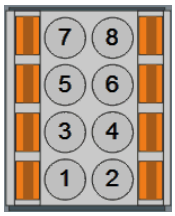
X3, X6: RS-422 4-Wire

1	TXD-
2	TXD+
3	n.c.
4	n.c.
5	n.c.
6	GND
7	RXD-
8	RXD+

X6: RS-232

1	RTS (O)
2	TXD (O)
3	CTS (I)
4	DTR (O)
5	n.c.
6	GND
7	DCD (I)
8	RXD (I)

Pins on Connector X3 and X6



(rear view)

TXD+, TXD- .....Transmit Data
RXD+, RXD- .....Receive Data
CTS (I).....Clear to Send (Input)
RTS (O) .....Request To Send (Output)
TXD (O) .....Transmit Data (Output)
RXD (I).....Receive Data (Input)
DCD (I) .....Data Carrier Detect (Input)
DTR (O).....Data Terminal Ready (Output)
GND.....Ground
n.c. ……..not connected

6.11 Installation of External Communication Connections

Via the communication interfaces of CP-8000/CP-802*x* selected transmission facilities can be connected. Depending on the kind of the selected communication type, different connection cables, plugs, and, if needed, converters, are required for the connection of a data transmission facility.

Connection type	Communication type	Transmission Facility	Connection cable
Serial (X2, X3, X6)	Multi-point traffic	• Interface converter • Leased line modem • VFT channel modem	See section 6.11.1.2
	Multi-point traffic via glass fiber optic	• RS-232/LWL converter • Optional star coupler	See section 6.11.1.3
	Dial-up traffic analog	Westermo TD-36, TDW-33 with external supply	See section 6.11.1.4
	Dial-up traffic ISDN	Westermo IDW-90 with external supply	See section 6.11.1.5
	Dial-up traffic GSM	Cinterion MC52iT	See section 6.11.1.6
	SMS	MC Technologies MC55iw	See section 6.11.1.6
	Point-to-point traffic	–	See section 6.11.1.7
Ethernet TCP/IP (X1, X4)	LAN/WAN		See section 6.11.2.1
	GPRS	• Internal (CP-8022) • M874-2 GPRS Modem • MD741-1 GPRS Router	See section 6.11.2.2

Order information for transmission facilities and cables see appendix A.6, Transmission Facilities and A.8, Cables and Plugs.

Note

Communication cables are, if possible, to be installed separately from the supply and peripheral cables.

Caution

It is not permitted to connect a serial port (e.g. X2) with an Ethernet interface (e.g. switch) and vice versa.

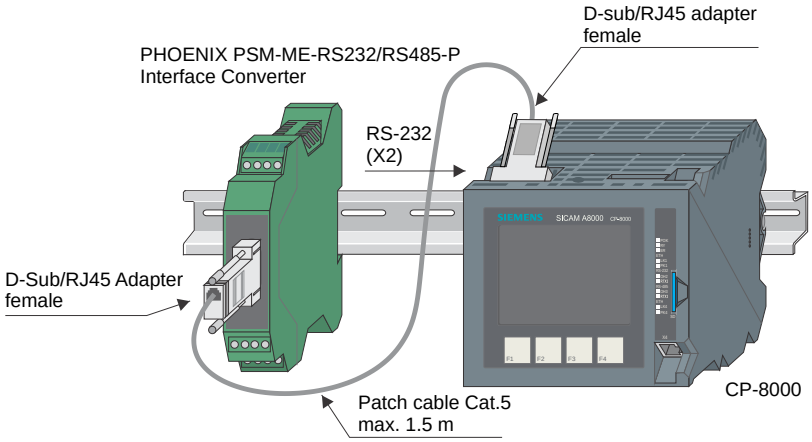
With the RJ45 interfaces, pay attention to the designation on the device (ETH = Ethernet, RS-232 = serial).

6.11.1 Serial Communication

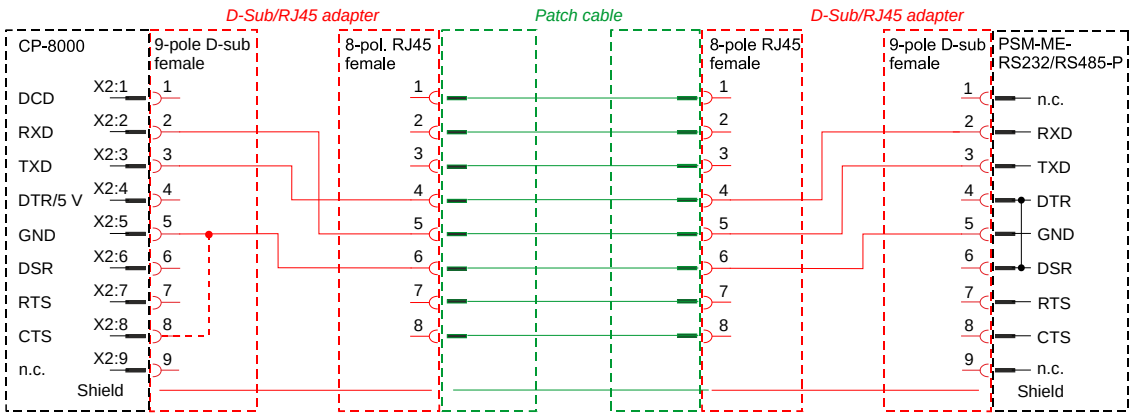
6.11.1.1 Communication via Interface Converter

In order to connect devices with RS-485/RS-422 to the interface X2 (RS-232) the deployment of an external interface converter is required. If the devices shall be connected with MODBUS RTU or with IEC 60870-5-103, Siemens recommends the usage of the PHOENIX PSM-ME-RS432/RS485-P. Order information see A.6.1, Recommended Third-Party Products.

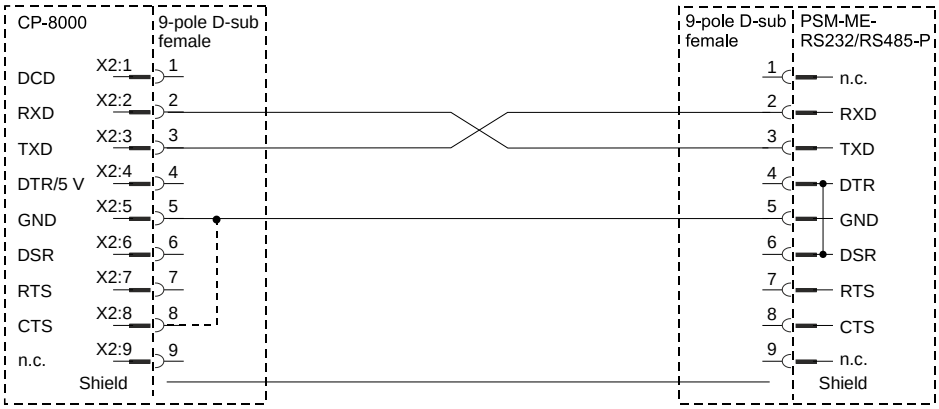
6.11.1.1.1 CP-8000



Wiring for Connection CP-802x – Interface Converter



Variant via D-sub connection cable:



Note

With a serial connection via X2 a bridge between CTS and GND is required, as far as the interface shall also be used for the connection with the engineering PC.

By means of a special parameter you can define that the interface X2 is not used for engineering (`Communication settings serial | Serial engineering interface` = **disabled**). Thereby the connection between CTS and GND is not required.

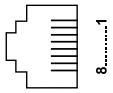
Recommended D-Sub/RJ45 Adapter

RS Pro MHDA9-SMJ8-M-K (see appendix A.8.1, Recommended Third-Party Products). This adapter provides a wired RJ45 socket and an unwired D-sub plug (female).

Pinning of the RJ45 socket:

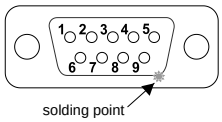
Pin	Wire color
1	black
2	yellow
3	orange
4	red
5	green
6	browne
7	grey
8	blue
Shield	black

RJ45 socket



Wiring on the D-sub plug:

D-sub plug (backside)



The assignment of the pins at the D-sub plug can be made according to wiring diagram.

Not used wires must be isolated!

With use of the shield this must be soldered at the metal plate of the D-sub plug.

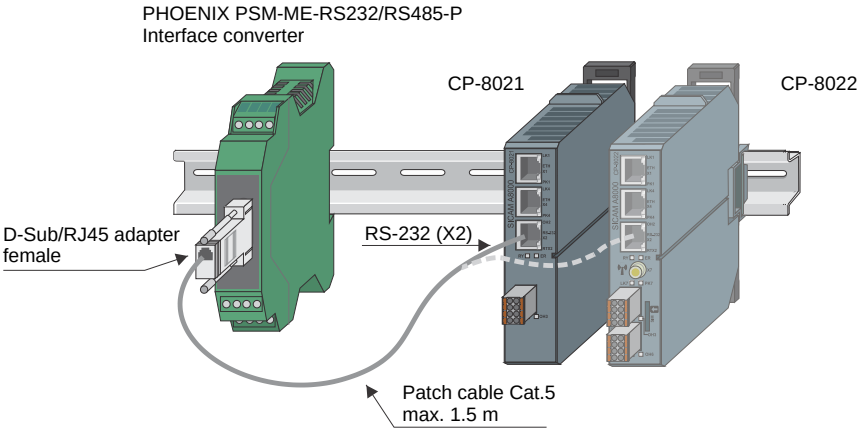
Configuration of the Phoenix PSM-ME-RS232/RS485-P-2744416

The interface converter must be configured for the operation as RS-485 interface. You will find the corresponding instructions in the package supplement. This is also available via https://www.phoenixcontact.com.

Note

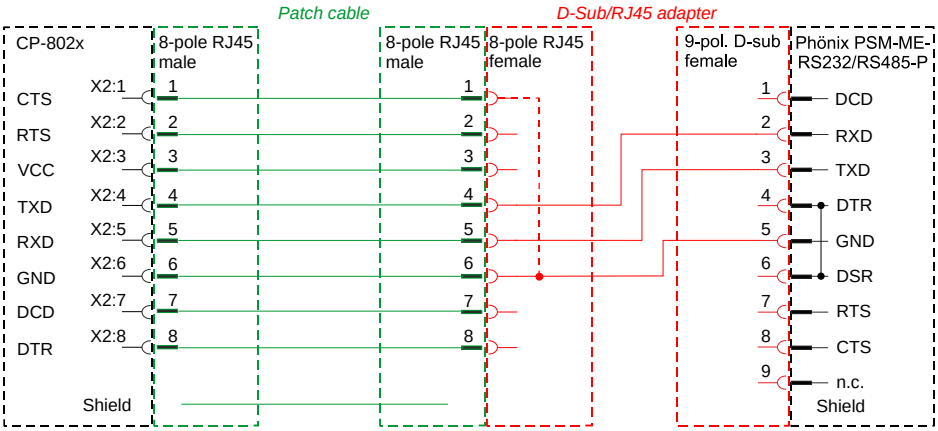
The PHOENIX converter must be operated in **Self Controlled Mode**.

6.11.1.1.2 CP-802x



Wiring for Connection CP-802x – Interface Converter

The connection is created with a standard patch cable and a D-Sub/RJ-45 adapter.



Note

With a serial connection via X2 a bridge between CTS and GND is required, as far as the interface shall also be used for the connection with the engineering PC.

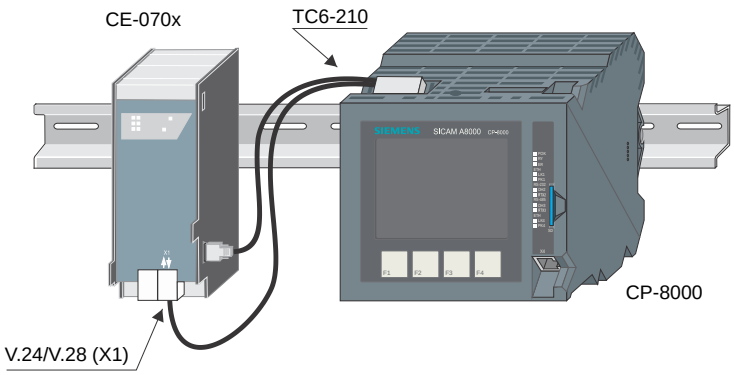
By means of a special parameter you can define that the interface X2 is not used for engineering (`Communication settings serial | Serial engineering interface` = **disabled**). Thereby the connection between CTS and GND is not required.

Recommended D-Sub/RJ45 Adapter

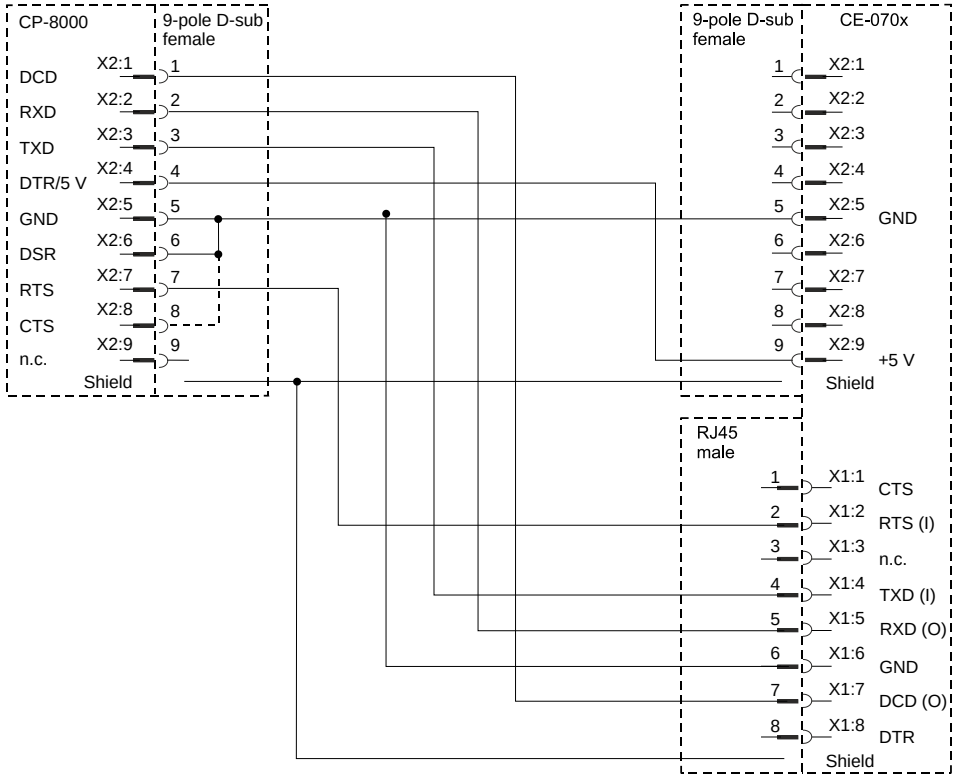
RS Pro MHDA9-SMJ8-M-K (see appendix A.8.1, Recommended Third-Party Products). This adapter provides a wired RJ45 socket and an unwired D-sub plug (female).

6.11.1.2 Multi-Point Traffic via Leased Line Modem/VFT Channel Modem

6.11.1.2.1 CP-8000



Wiring for Cable TC6-210

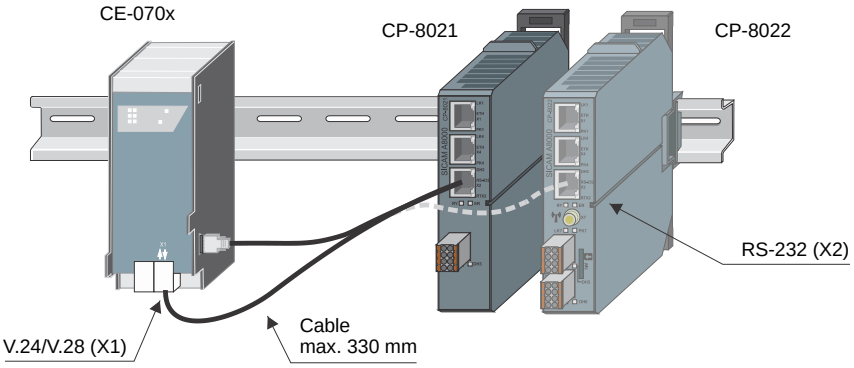


Note

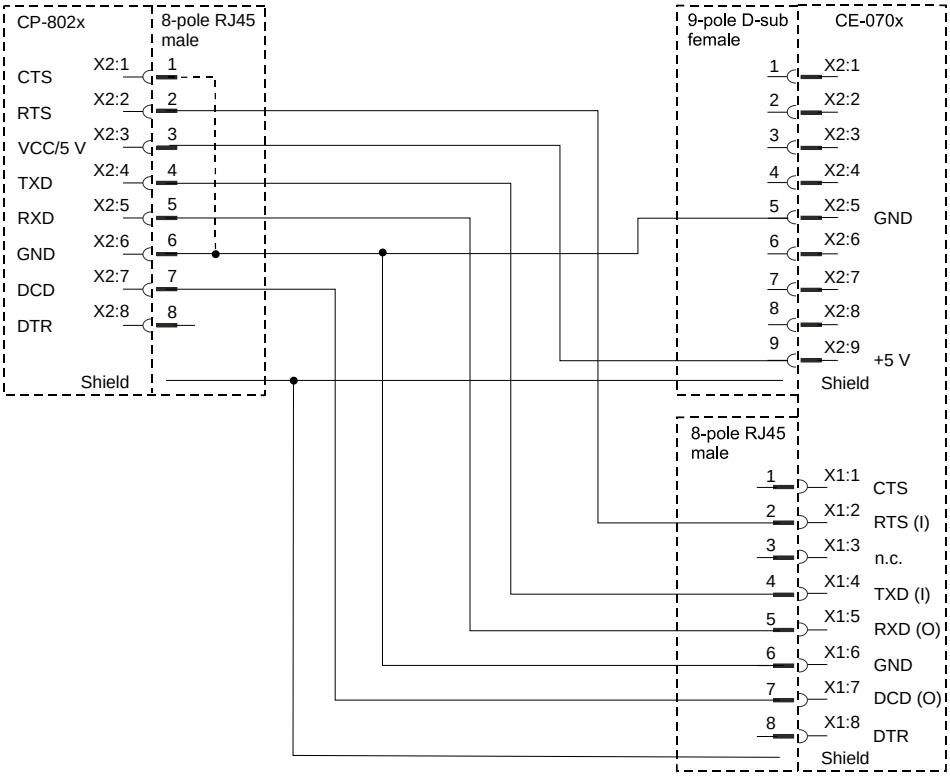
With a serial connection via X2 a bridge between CTS and GND is required, as far as the interface shall also be used for the connection with the engineering PC.

By means of a special parameter you can define that the interface X2 is not used for engineering (`Communication settings serial | Serial engineering interface` = **disabled**). Thereby the connection between CTS and GND is not required.

6.11.1.2.2 CP-802x



Wiring for Modem Cable



Note

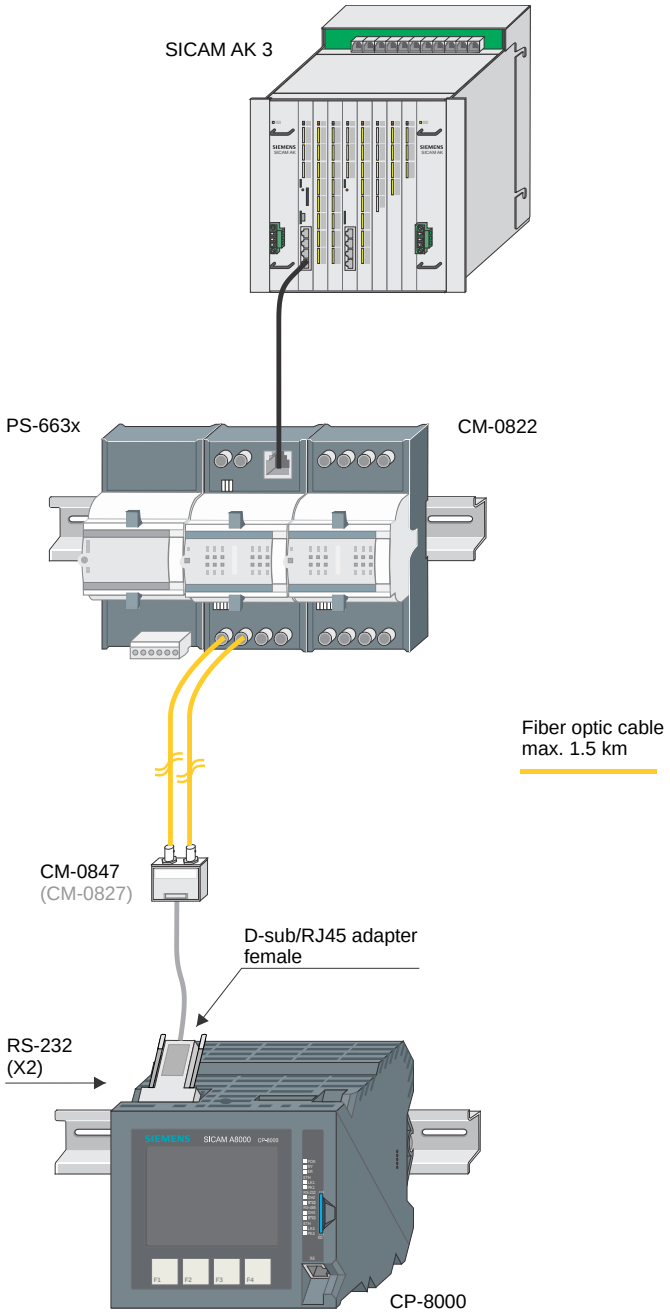
With a serial connection via X2 a bridge between CTS and GND is required, as far as the interface shall also be used for the connection with the engineering PC.

By means of a special parameter you can define that the interface X2 is not used for engineering (`Communication settings serial | Serial engineering interface` = **disabled**).
Thereby the connection between CTS and GND is not required.

6.11.1.3 Multi-Point Traffic via Glass Fiber Optic

6.11.1.3.1 CP-8000

Connection via Star Coupler and CM-0847

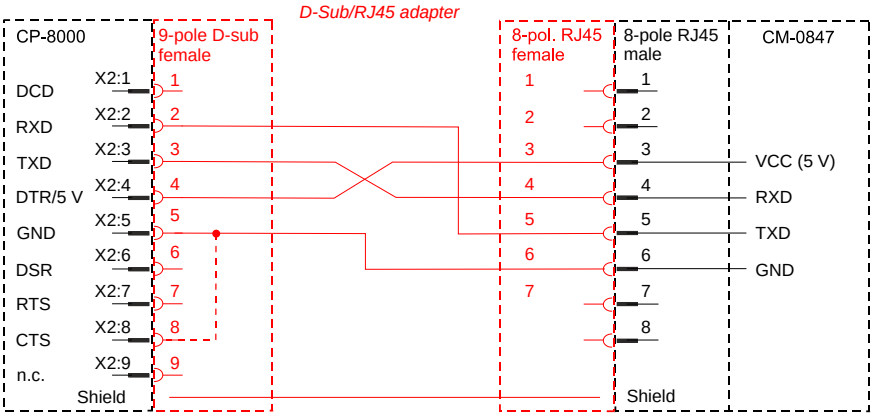


Note

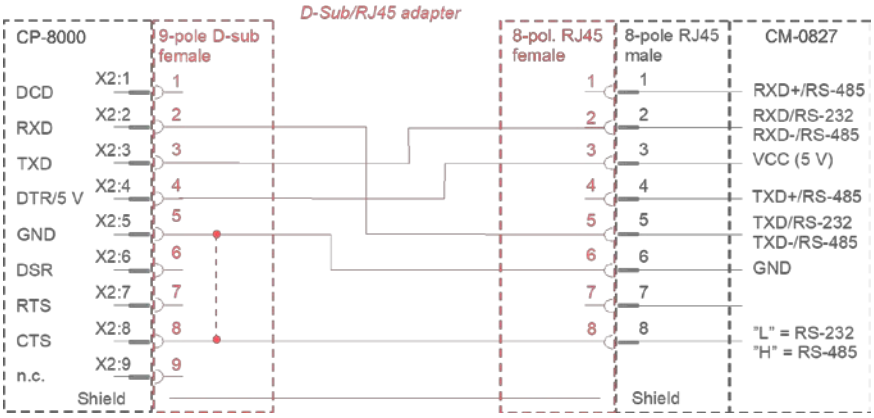
CM-0847 replaces CM-0827 which is used only in existing plants.

A maximum of 6 star couplers (CM-0822) may be attached next to each other.

Wiring for Connection CP-8000 – CM-0847 Fiberoptic Interface



Wiring for Connection CP-8000 – CM-0827 Fiberoptic Interface (Existing Plants)



Note

With a serial connection via X2 a bridge between CTS and GND is required, as far as the interface shall also be used for the connection with the engineering PC.

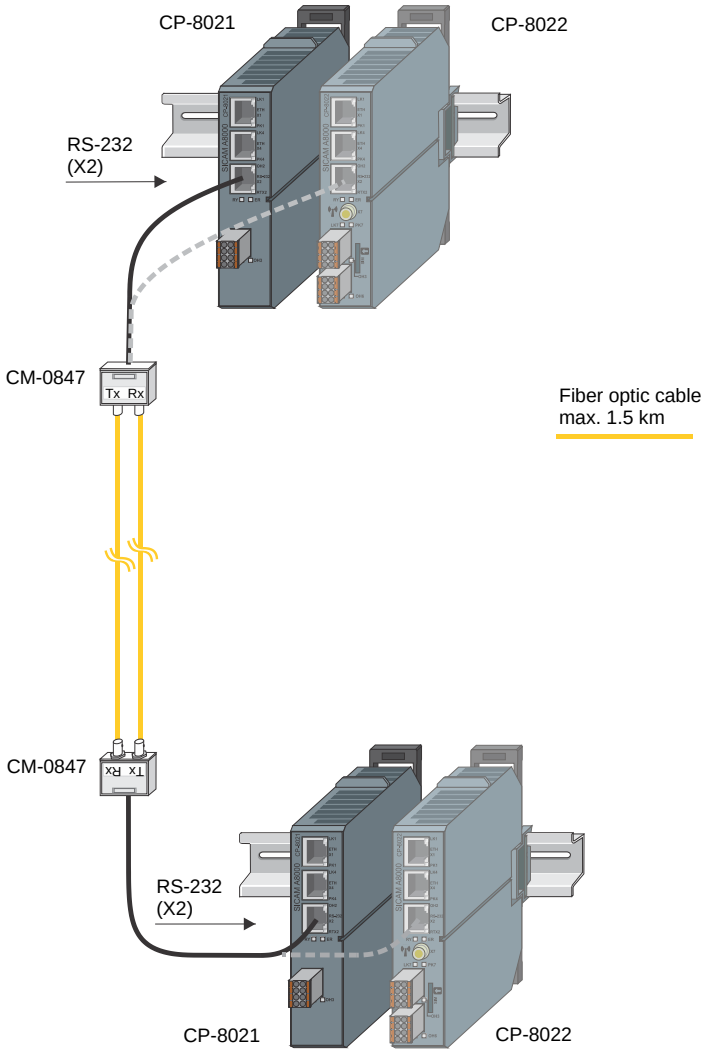
By means of a special parameter you can define that the interface X2 is not used for engineering (`Communication settings serial | Serial engineering interface` = **disabled**). Thereby the connection between CTS and GND is not required.

Recommended D-Sub/RJ45 Adapter

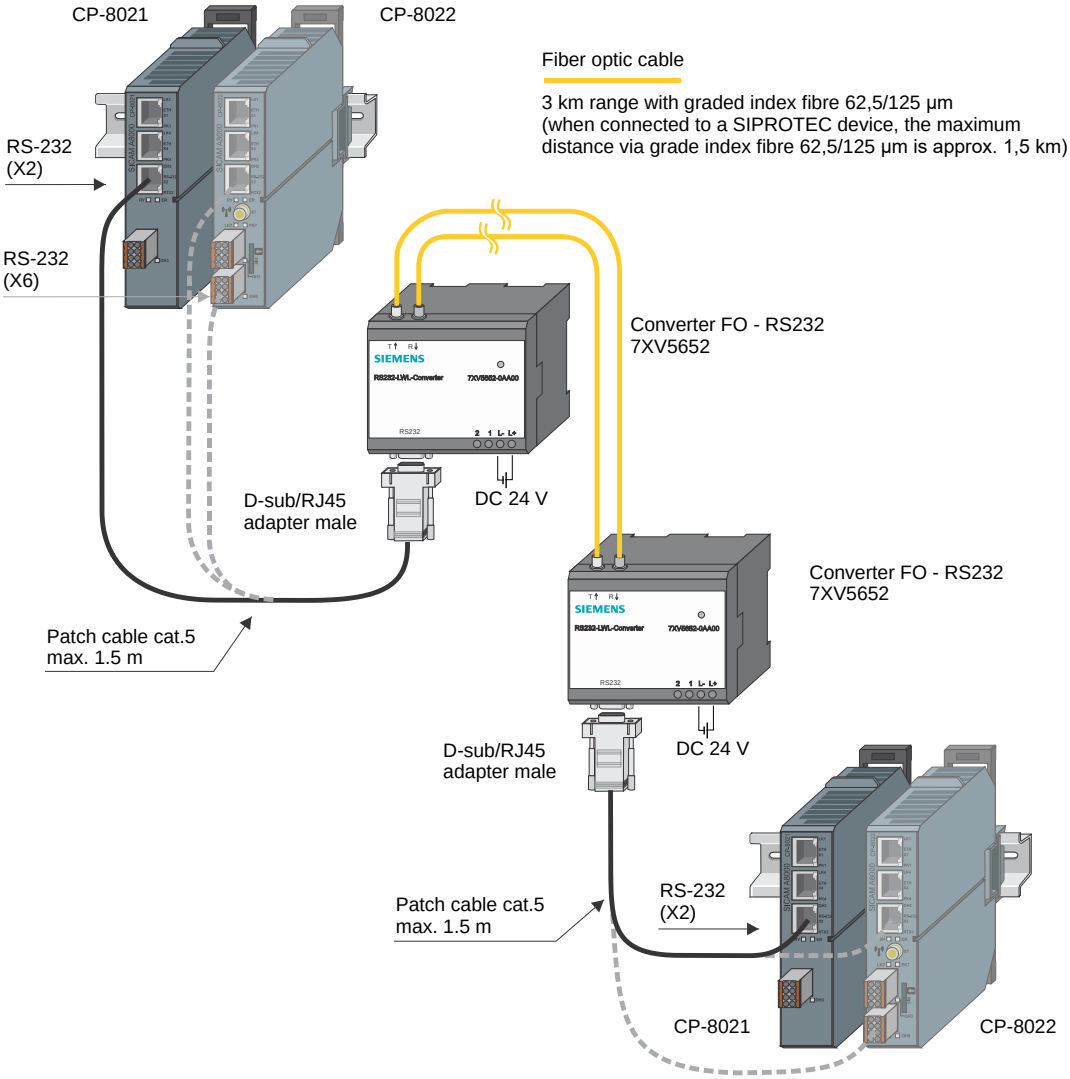
RS Pro MHDA9-SMJ8-M-K (see appendix A.8.1, Recommended Third-Party Products). This adapter provides a wired RJ45 socket and an unwired D-sub plug (female).

6.11.1.3.2 CP-802x

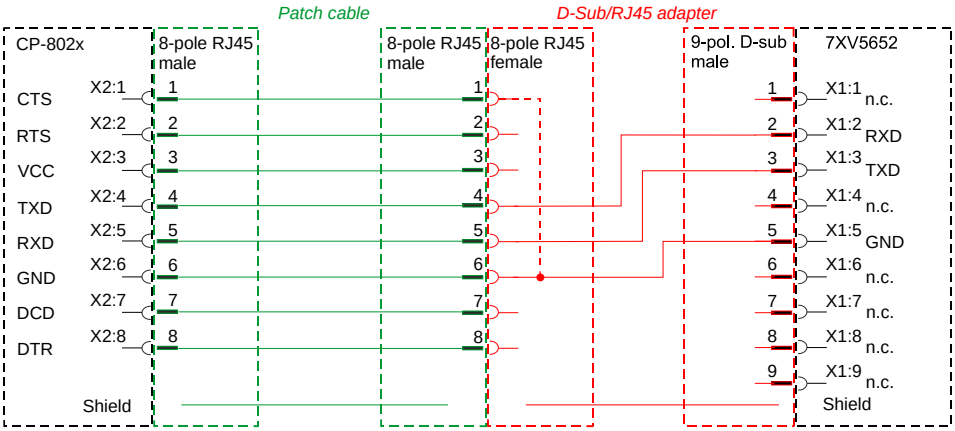
Connection via Point-to-Point and CM-0847



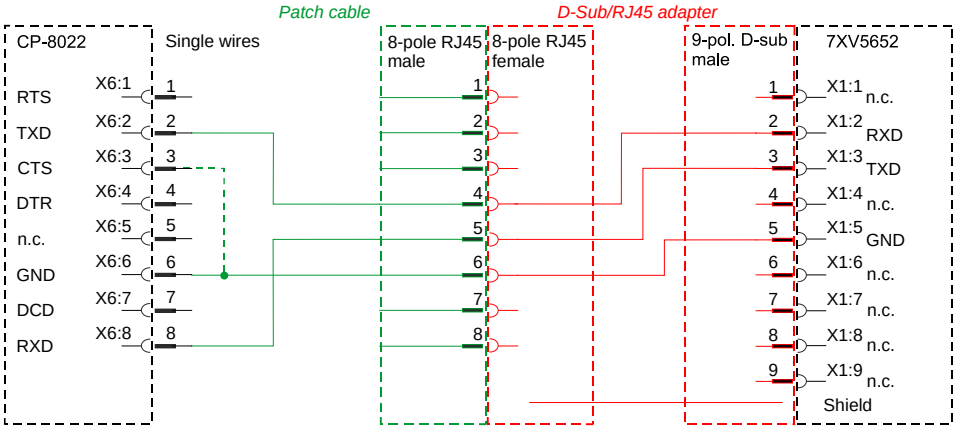
Connection via Point-to-Point and Converter 7XV5652



Wiring for Connection CP-802x/X2 – 7XV5652



Wiring for Connection CP-8022/X6 – 7XV5652



Note

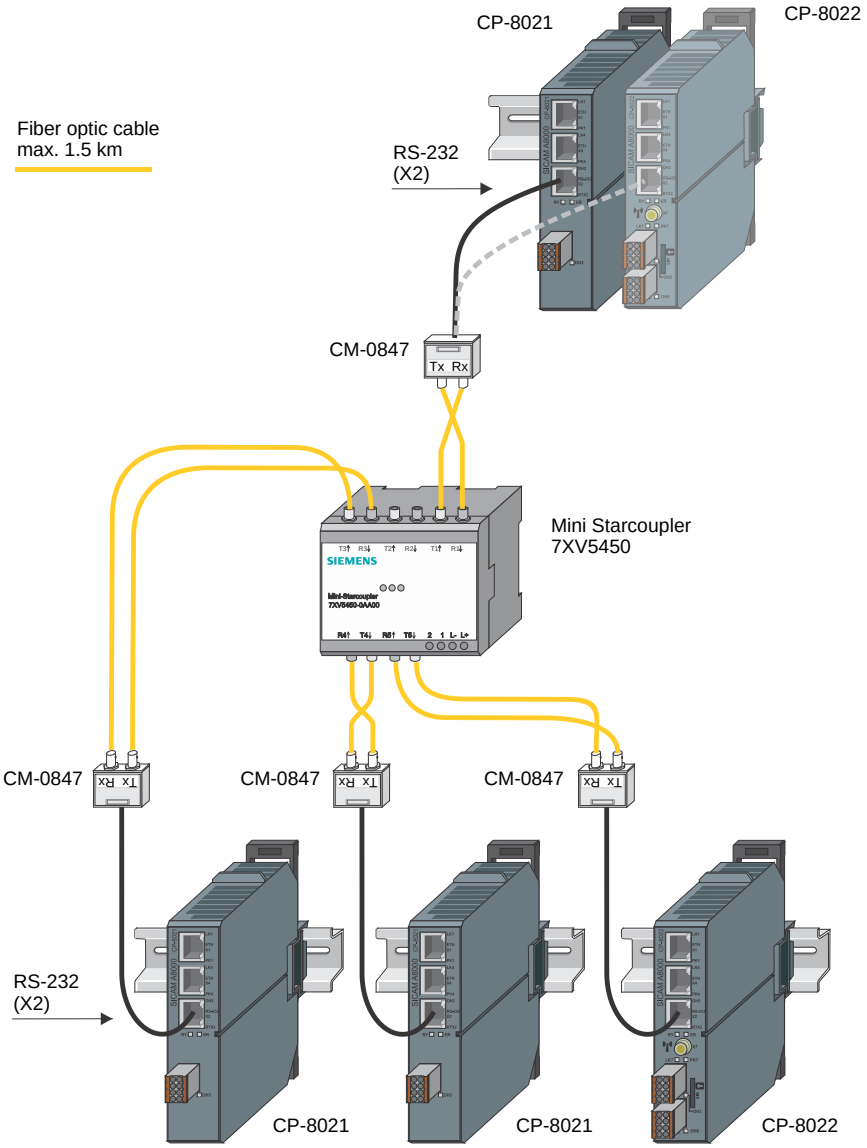
With a serial connection via X2 a bridge between CTS and GND is required, as far as the interface shall also be used for the connection with the engineering PC.

By means of a special parameter you can define that the interface X2 is not used for engineering (`Communication settings serial | Serial engineering interface` = **disabled**). Thereby the connection between CTS and GND is not required.

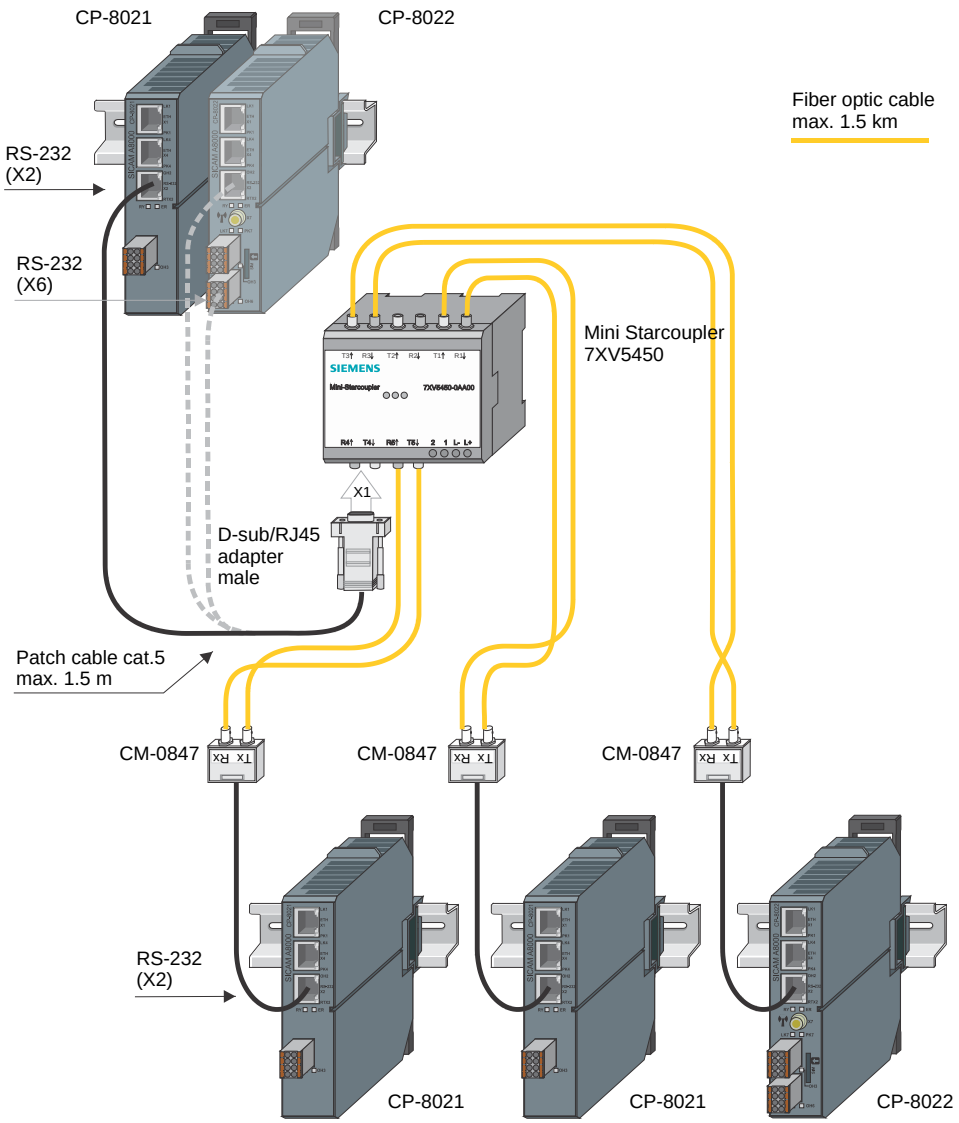
Recommended D-Sub/RJ45 Adapter

RS Pro MHDA9-PMJ8-M-K (see appendix A.8.1, Recommended Third-Party Products). This adapter provides a wired RJ45 socket and an unwired D-sub plug (male).

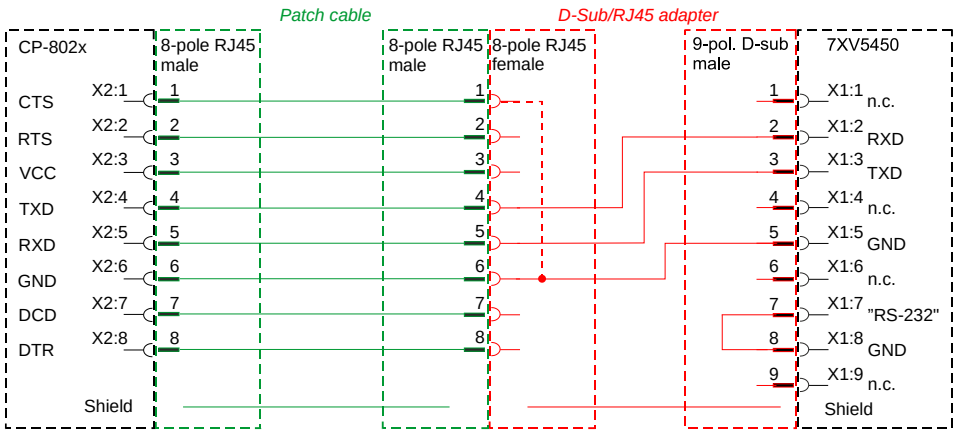
Connection via Star Coupler 7XV5450 to another AU



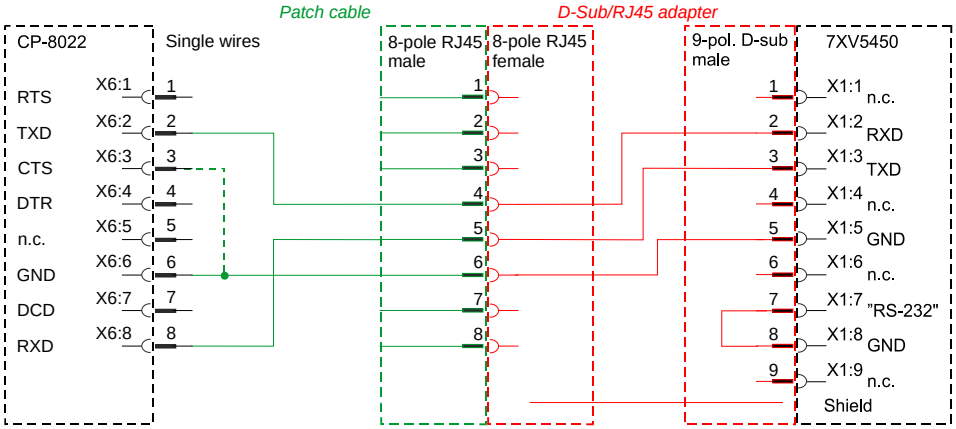
Connection via Star Coupler 7XV5450 to another AU



Wiring for Connection CP-802x/X2 – 7XV5450



Wiring for Connection CP-8022/X6 – 7XV5450



Note

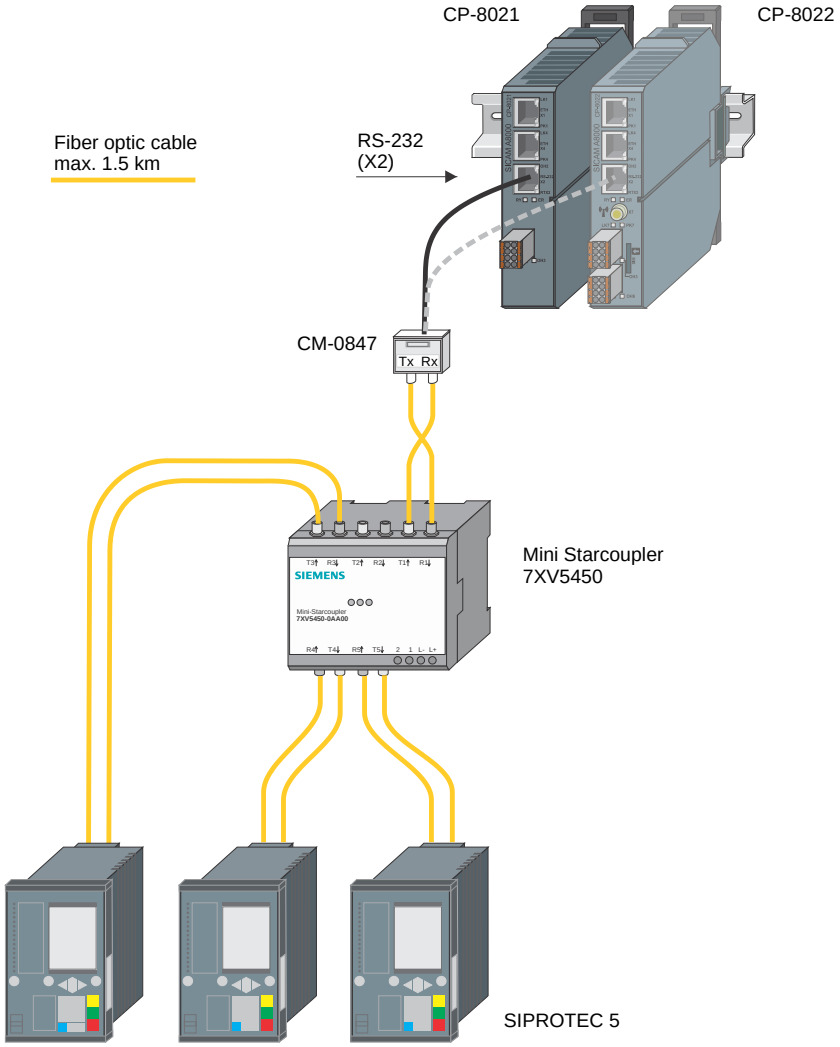
With a serial connection via X2 a bridge between CTS and GND is required, as far as the interface shall also be used for the connection with the engineering PC.

By means of a special parameter you can define that the interface X2 is not used for engineering (`Communication settings serial | Serial engineering interface` = **disabled**). Thereby the connection between CTS and GND is not required.

Recommended D-Sub/RJ45 Adapter

RS Pro MHDA9-PMJ8-M-K (see appendix A.8.1, Recommended Third-Party Products). This adapter provides a wired RJ45 socket and an unwired D-sub plug (male).

Connection via Star Coupler 7XV5450 to SIPROTEC 5

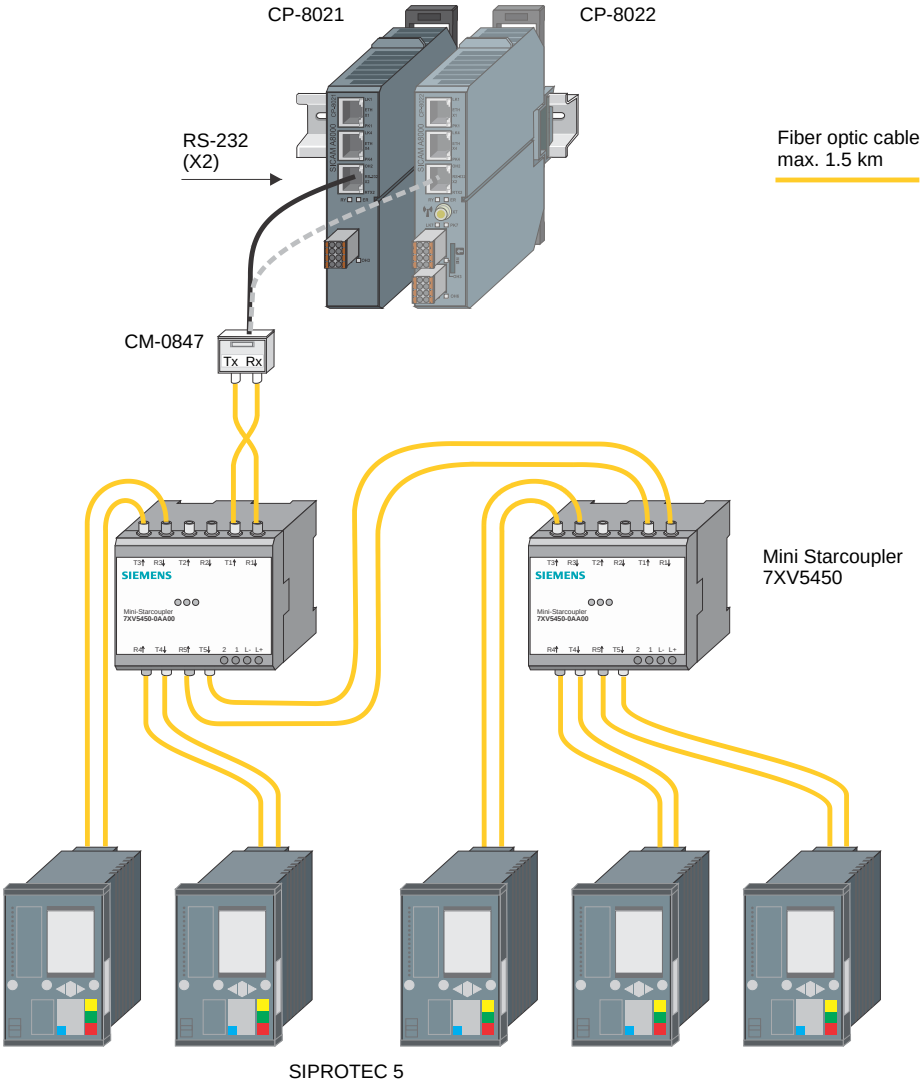


Note

No protective device slaves may be connected to the T1/R1 connector of the Siemens 7XV5450 star coupler.

T1/R1 is used for connection with the central station or to other star couplers in a star or ring structure.

Connection via Star Coupler 7XV5450 to SIPROTEC 5 (cascaded in Star Structure)



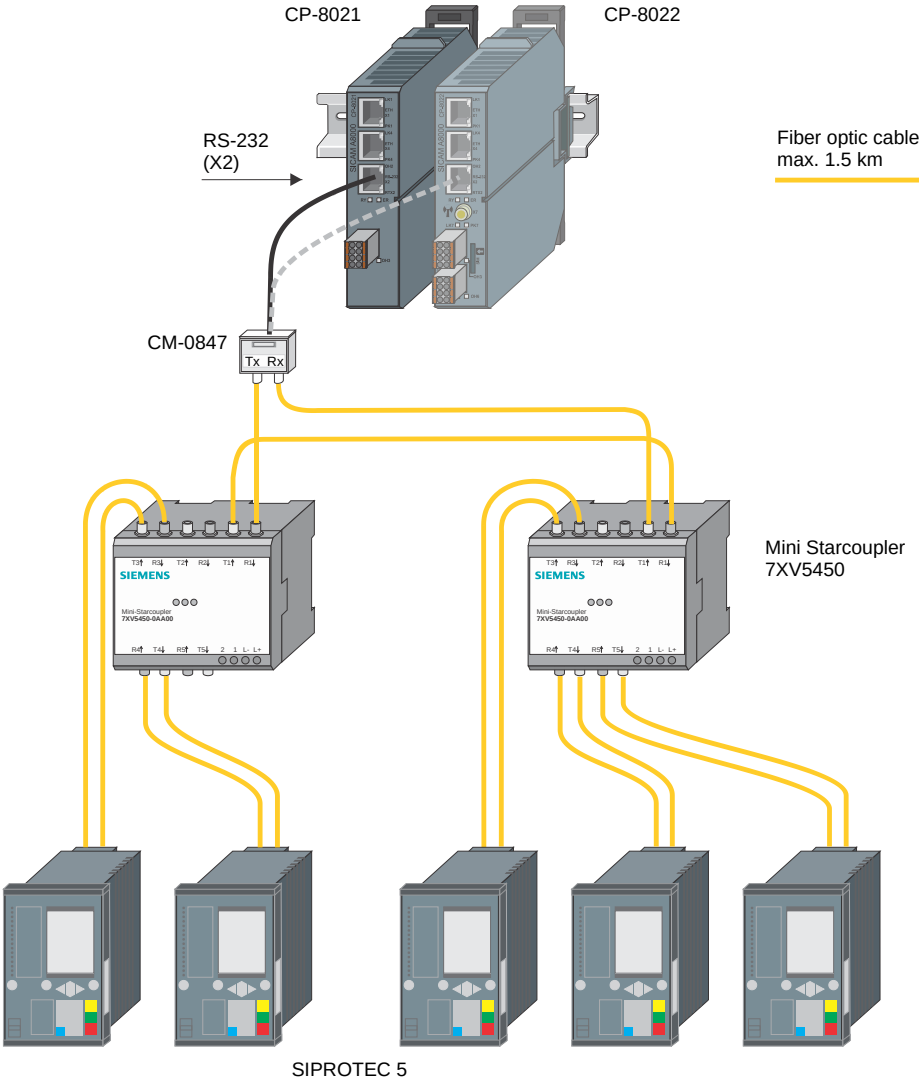
Note

A maximum of 30 Siemens 7XV5450 star couplers may be used in a star or ring structure.

No protective device slaves may be connected to the T1/R1 connector of the Siemens 7XV5450 star coupler.

T1/R1 is used for connection with the central station or to other star couplers in a star or ring structure.

Connection via Star Coupler 7XV5450 to SIPROTEC 5 (cascaded in Ring Structure)



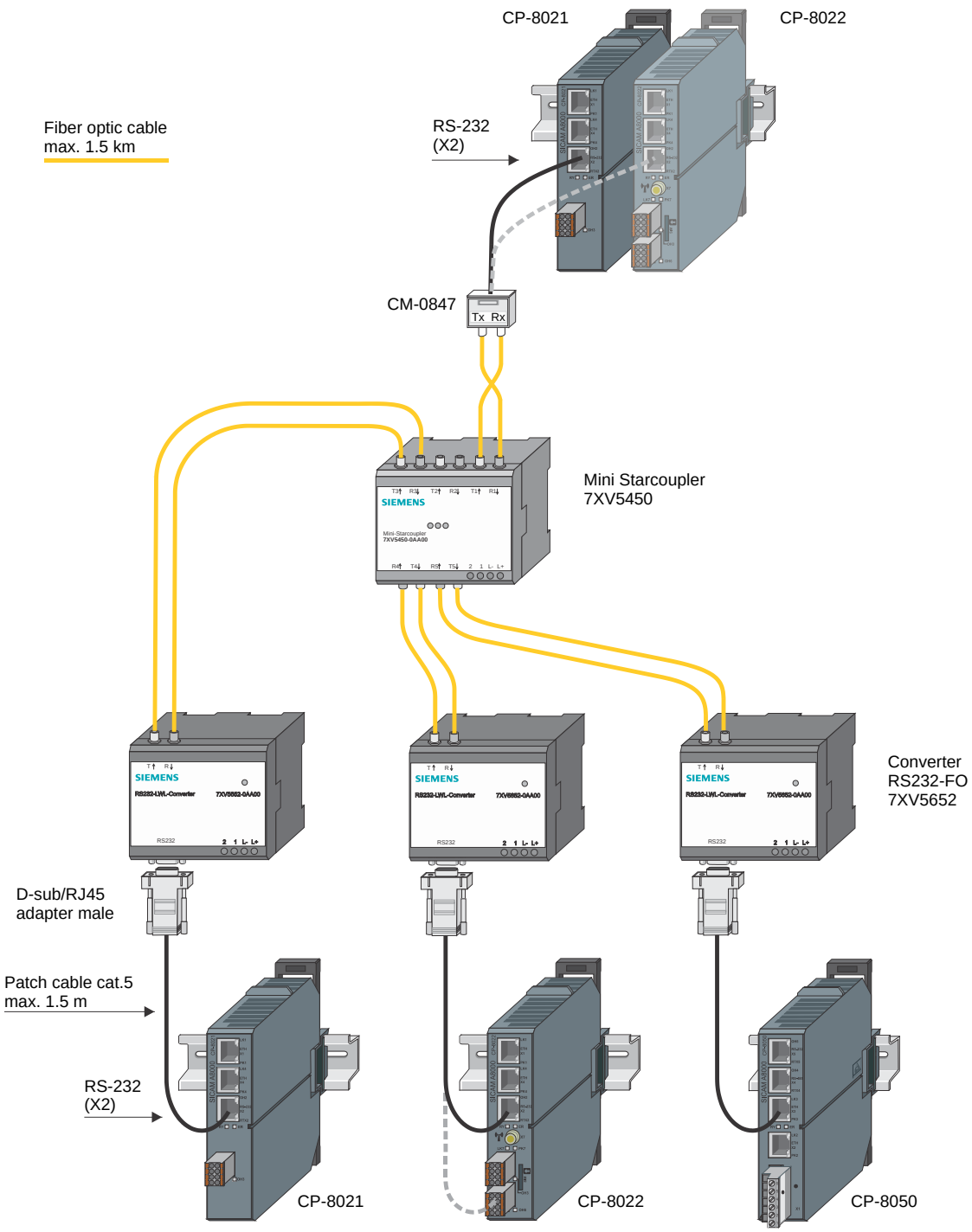
Note

A maximum of 30 Siemens 7XV5450 star couplers may be used in a star or ring structure.

No protective device slaves may be connected to the T1/R1 connector of the Siemens 7XV5450 star coupler.

T1/R1 is used for connection with the central station or to other star couplers in a star or ring structure.

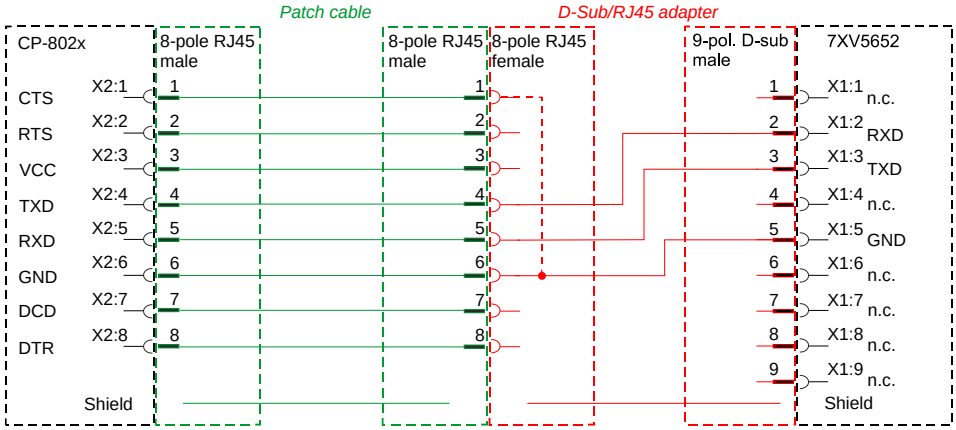
Connection via Star Coupler 7XV5450 and Converter 7XV5652 to other AU



Note

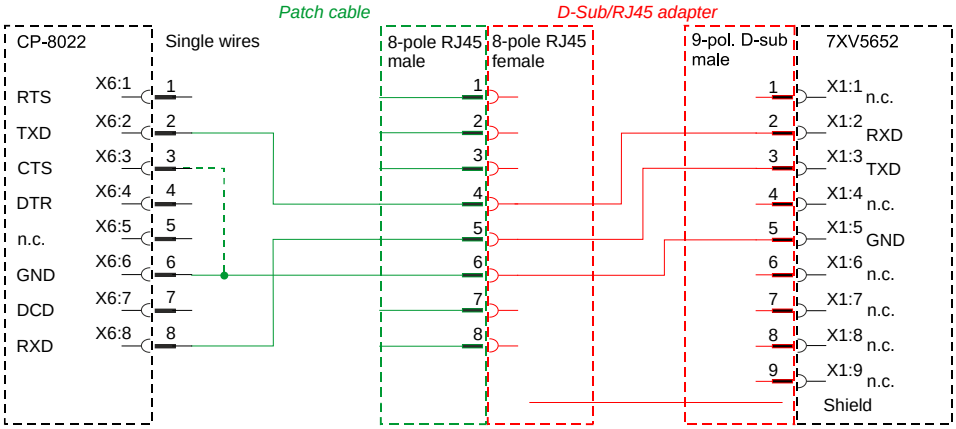
This configuration with converters exists when the complete communication infrastructure is already available. Alternatively, a CM-0847 can be used in the substations instead of the optical converter RS232-FO 7XV56529.

Wiring for Connection CP-802x/X2 – 7XV5652



Connection CTS–GND, D-Sub/RJ45 adapter: see note at page 6.11.1, Serial Communication.

Wiring for Connection CP-8022/X6 – 7XV5652



Note

With a serial connection via X2 a bridge between CTS and GND is required, as far as the interface shall also be used for the connection with the engineering PC.

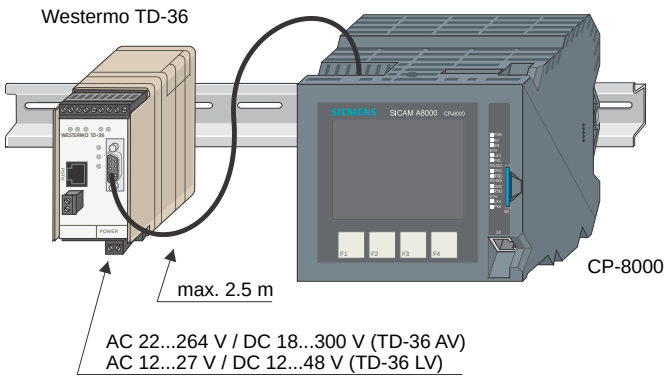
By means of a special parameter you can define that the interface X2 is not used for engineering (`Communication settings serial | Serial engineering interface` = **disabled**). Thereby the connection between CTS and GND is not required.

Recommended D-Sub/RJ45 Adapter

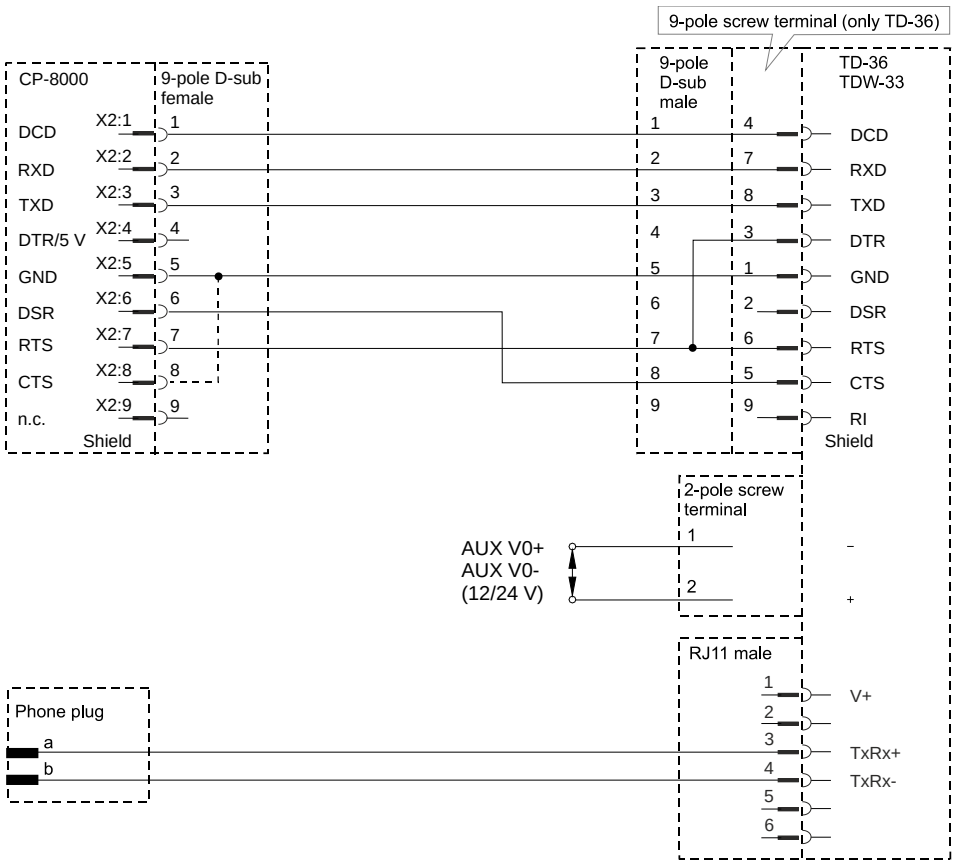
RS Pro MHDA9-PMJ8-M-K (see appendix A.8.1, Recommended Third-Party Products). This adapter provides a wired RJ45 socket and an unwired D-sub plug (male).

6.11.1.4 Dial-up Traffic Analog with Westermo TD-36 (TDW-33)

6.11.1.4.1 CP-8000



Wiring for Modem Cable



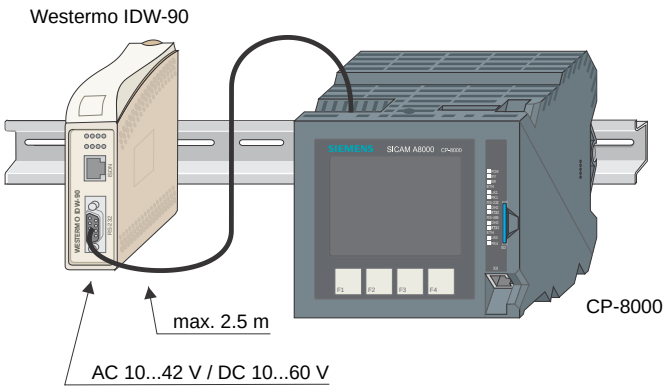
Note

With a serial connection via X2 a bridge between CTS and GND is required, as far as the interface shall also be used for the connection with the engineering PC.

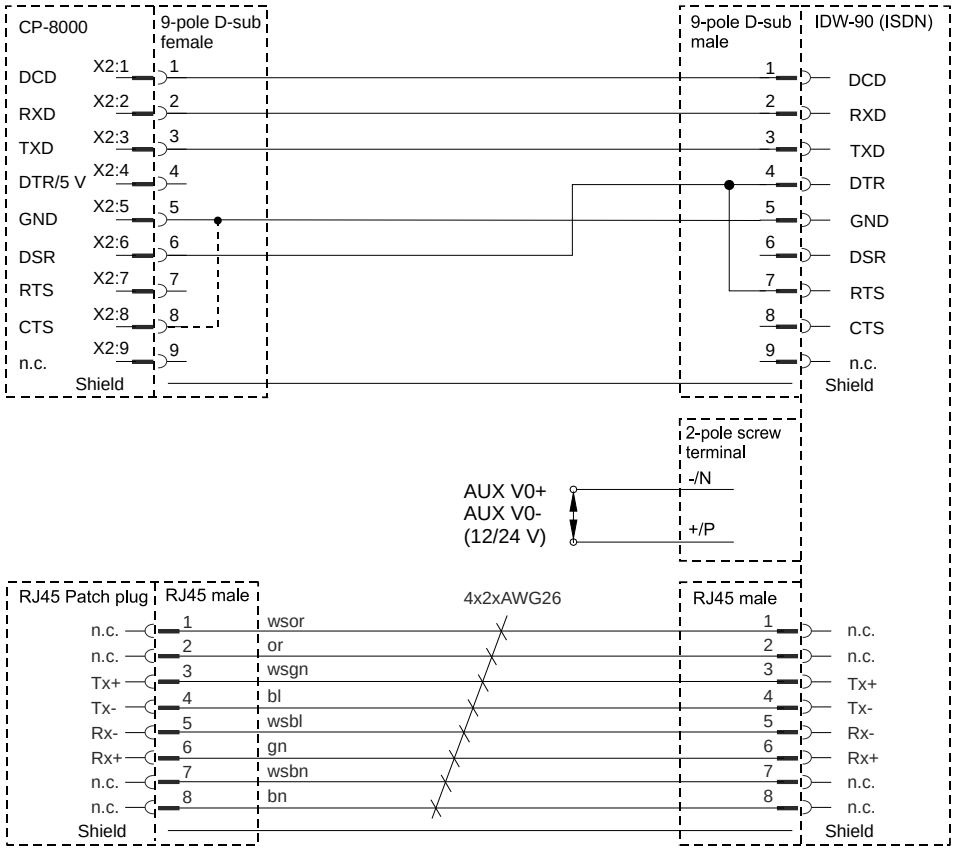
By means of a special parameter you can define that the interface X2 is not used for engineering (`Communication settings serial | Serial engineering interface` = **disabled**). Thereby the connection between CTS and GND is not required.

6.11.1.5 Dial-up Traffic ISDN with Westermo IDW-90

6.11.1.5.1 CP-8000



Wiring for Modem Cable



Note

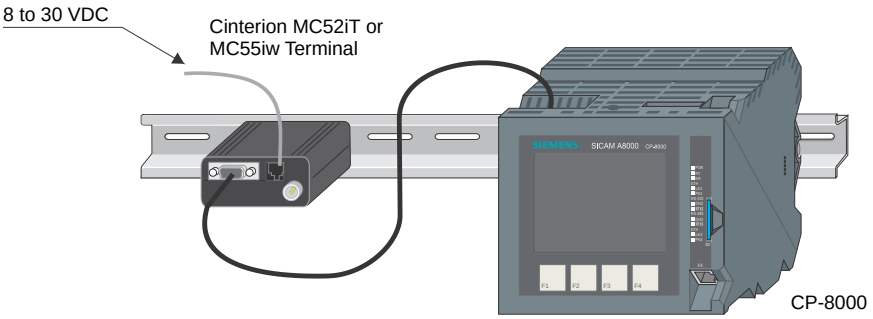
With a serial connection via X2 a bridge between CTS and GND is required, as far as the interface shall also be used for the connection with the engineering PC.

By means of a special parameter you can define that the interface X2 is not used for engineering (`Communication settings serial | Serial engineering interface` = **disabled**). Thereby the connection between CTS and GND is not required.

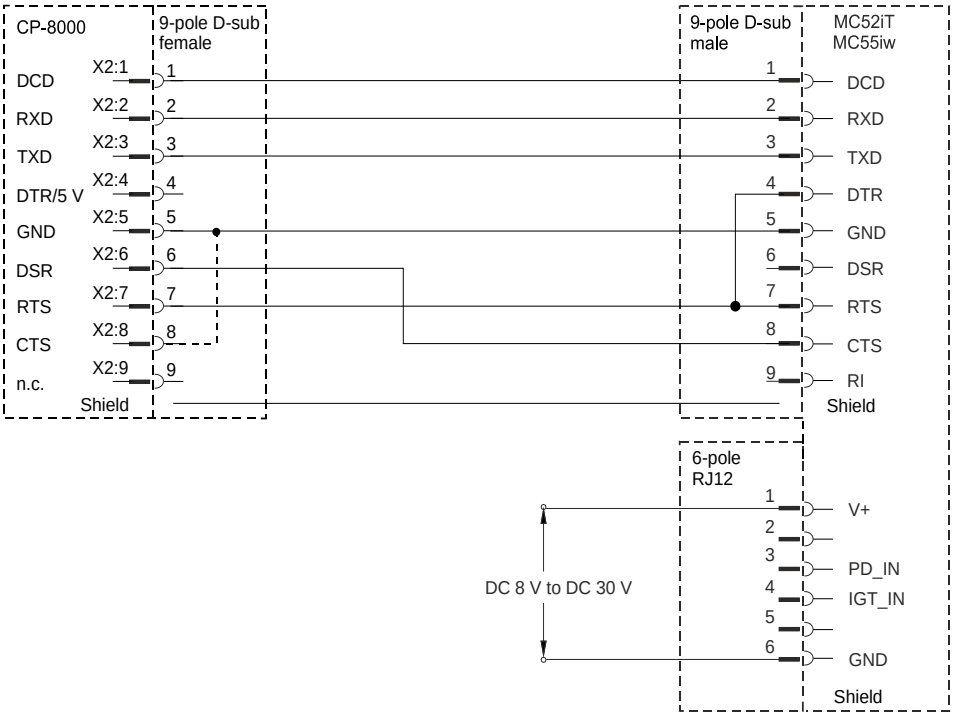
6.11.1.6 Dial-up Traffic GSM, SMS Sender/Receiver

Modem	Protocol	Description
Cinterion MC52iT	DIAST0	Data transmission via GSM with CSD-Service (Circuit Switched Data)
MC Technologies MC55iw	SMST0	SMS Sender/Receiver

6.11.1.6.1 CP-8000



Wiring for Modem Cable



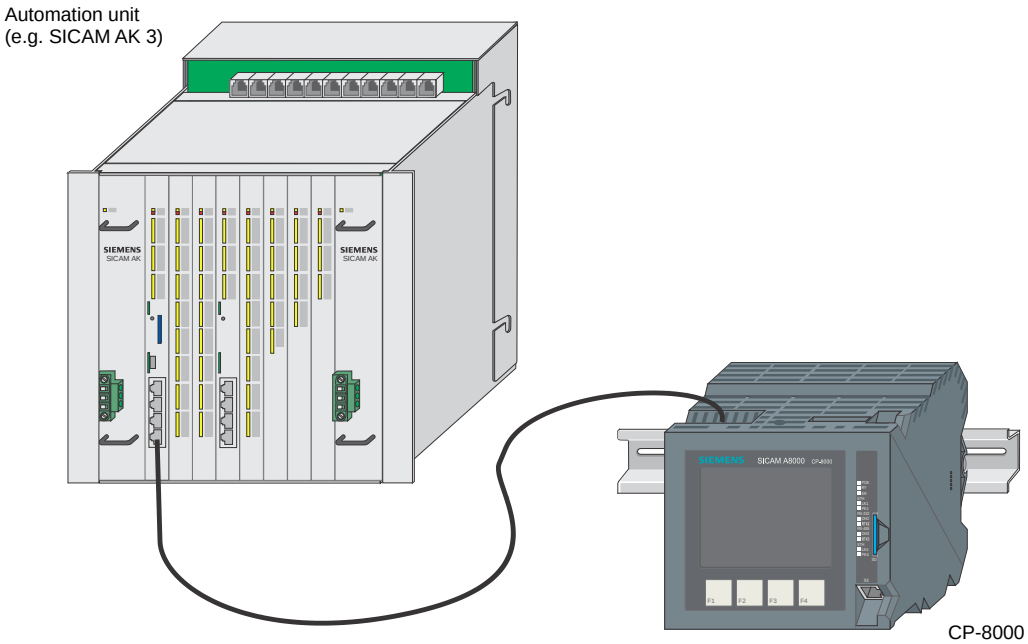
Note

With a serial connection via X2 a bridge between CTS and GND is required, as far as the interface shall also be used for the connection with the engineering PC.

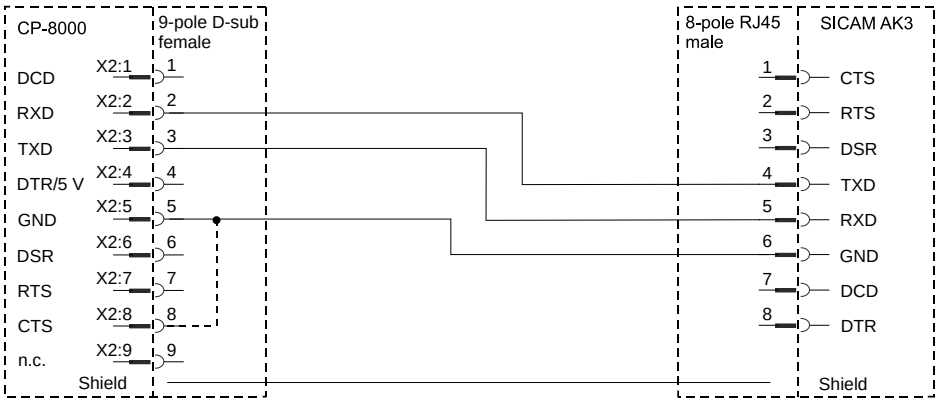
By means of a special parameter you can define that the interface X2 is not used for engineering (`Communication settings serial | Serial engineering interface` = **disabled**). Thereby the connection between CTS and GND is not required.

6.11.1.7 Point-to-Point Traffic with another AU

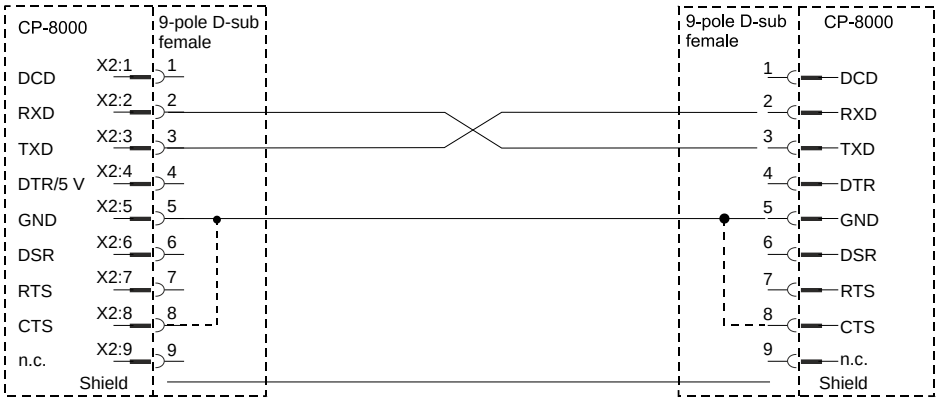
6.11.1.7.1 CP-8000



Wiring for Connection Cable for D-Sub – RJ45 (e.g. SICAM AK 3)



Wiring for Connection Cable for D-Sub – D-Sub (e.g. CP-8000)

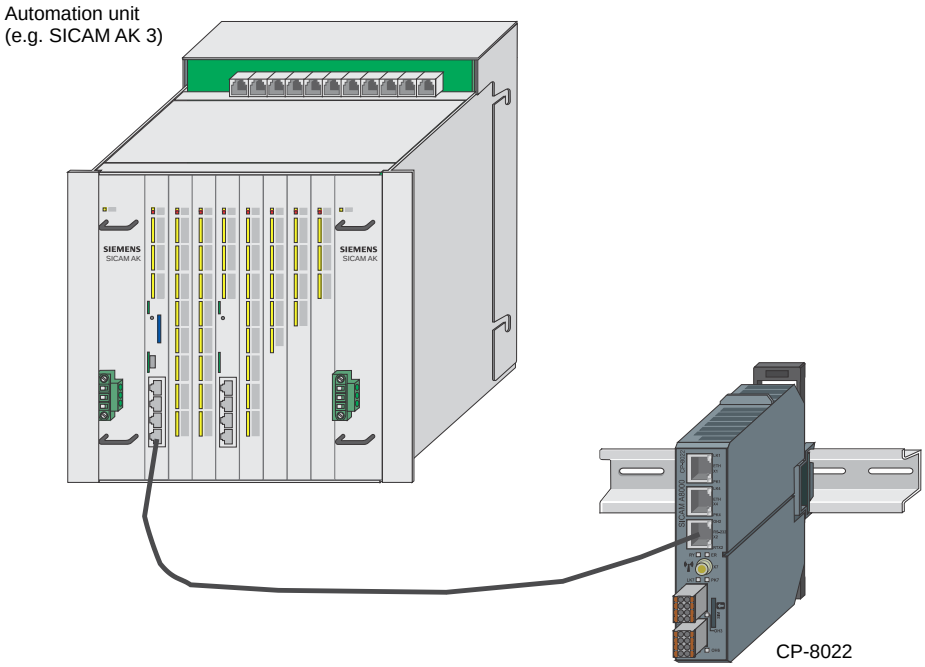


Note

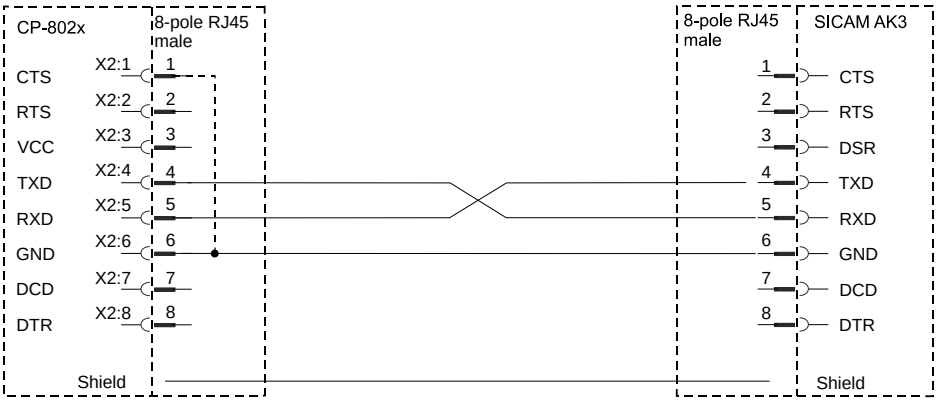
With a serial connection via X2 a bridge between CTS and GND is required, as far as the interface shall also be used for the connection with the engineering PC.

By means of a special parameter you can define that the interface X2 is not used for engineering (`Communication settings serial | Serial engineering interface` = **disabled**). Thereby the connection between CTS and GND is not required.

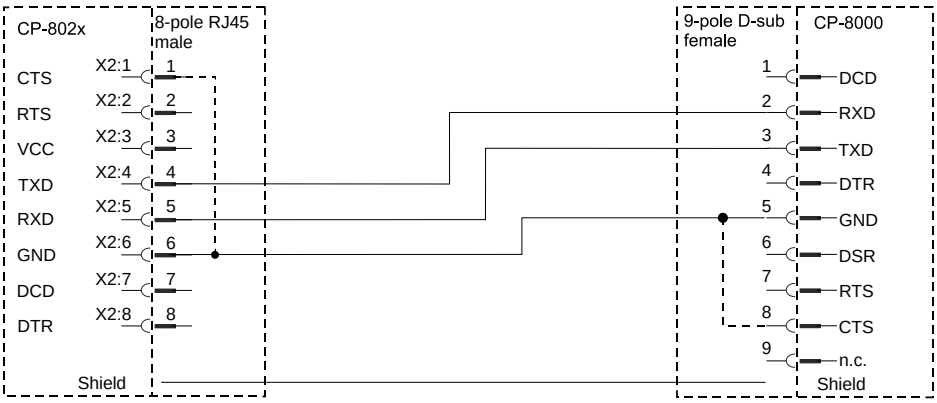
6.11.1.7.2 CP-802x



Wiring for Connection Cable for RJ45 – RJ45 (e.g. SICAM AK 3)



Wiring for Connection Cable for RJ45 – D-Sub (e.g. CP-8000)



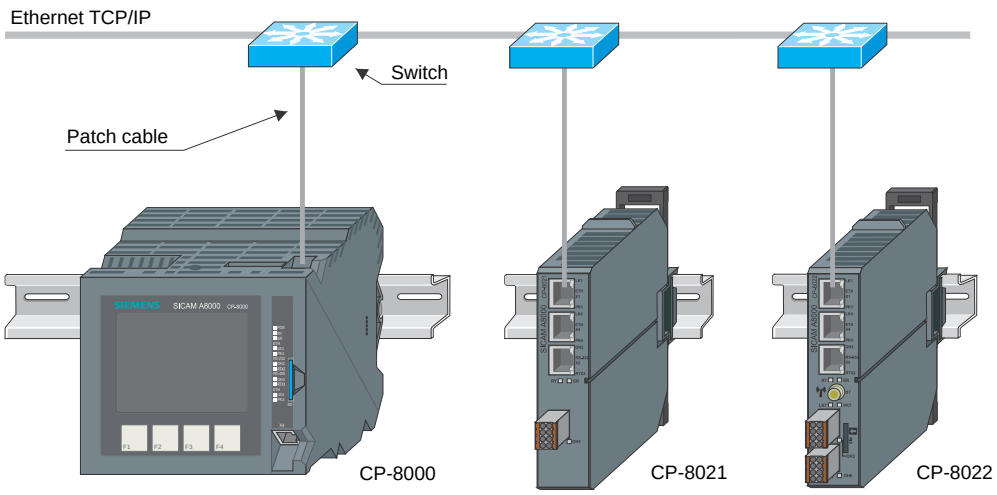
Note

With a serial connection via X2 a bridge between CTS and GND is required, as far as the interface shall also be used for the connection with the engineering PC.

By means of a special parameter you can define that the interface X2 is not used for engineering (`Communication settings serial | Serial engineering interface` = **disabled**).
Thereby the connection between CTS and GND is not required.

6.11.2 Ethernet TCP/IP

6.11.2.1 Communication via LAN/WAN



You will find more detailed information on network configuration in appendix E, Use Cases.

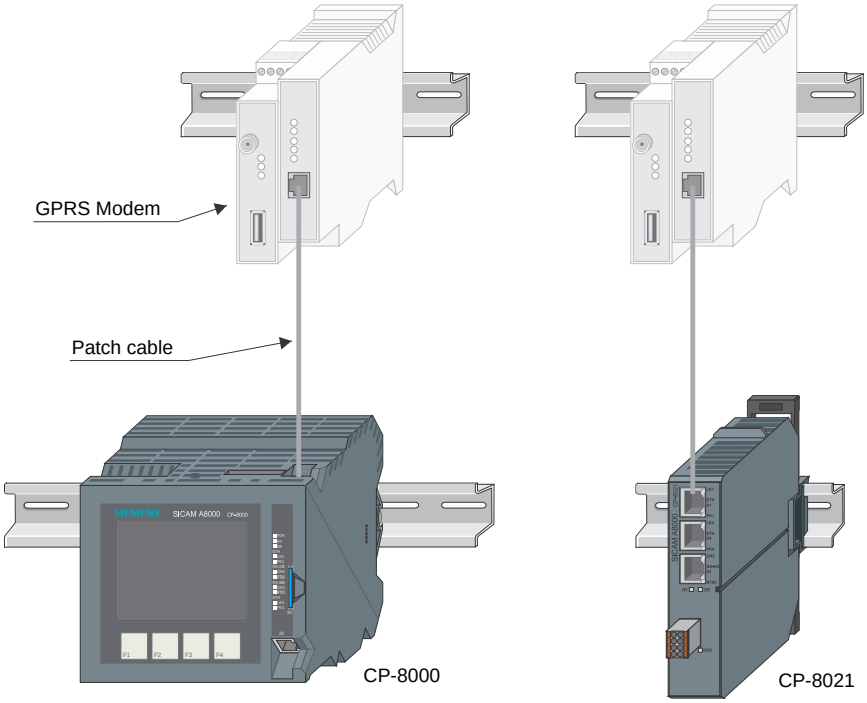
Note

Depending whether a connection is done inside or outside of cabinets, different types of patch cables must be used.

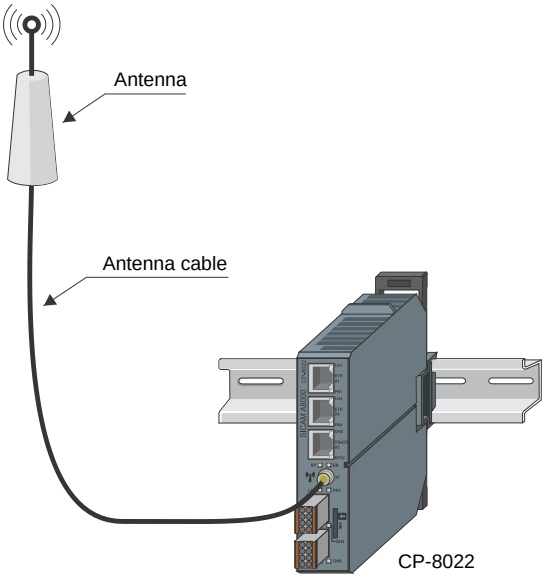
You can find details on connections above 10 m in the manual *SICAM RTUs Platforms Configuration Automation Units and Automation Networks, appendix A; section "Electrical Connection, Cable longer than 10 m"*.

6.11.2.2 Communicaton via GPRS

6.11.2.2.1 CP-8000, CP-8021



6.11.2.2.2 CP-8022



7 Preparing the Engineering

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7.6 Interfaces for the Communication 273
7.7 Connecting Engineering PC with the Target Device 274
7.8 Interaction with the Engineering Tool 293

This chapter describes with which methods CP-8000/CP-802*x* can be parameterized and programmed, and which prerequisites must be fulfilled thereto.

Note

Grafics and screenshots shown in this chapter relate to the engineering of CP-8000. They apply analogously for CP-8021 and CP-8022.

7.1 Engineering Tools

CP-8000/CP-802*x* is a parameter-settable miniature telecontrol device with optional automation function. The engineering is alternatively possible via

- SICAM TOOLBOX II, with tool OPM II
- SICAM WEB
- Device Manager

7.1.1 Differences

For the engineering via SICAM WEB no special knowledge of an engineering system is required, and also no licenses. The web user interface makes a very simple access to the parameter-setting of CP-8000/CP-802*x*.

The structure of the parameter blocks is basically identical structured like in the SICAM TOOLBOX II, an exception is the parameterization of the periphery (not consistent).

The engineering via SICAM WEB is useful for simple applications. There are not all the functions which offer the SICAM TOOLBOX II, available. You can find more details thereto section 7.8.2.9, Exceptions with Engineering via SICAM WEB.

You find an overview of the respective functions in the sections 8, Engineering via SICAM TOOLBOX II and 9, Engineering via SICAM WEB.

7.1.2 Interlocking

The writing access to a target device is exclusive. This means, changes of the parameterization of a target device are only possible with that engineering tool, with which engineering was begun for the first time.

If a target device has been parameterized via SICAM WEB, it is not possible to take over the parameterization into the SICAM TOOLBOX II. All online tools of the SICAM TOOLBOX II (diagnosis, dataflow test, message simulation, etc.) can not be used.

If a target device has been parameterized via the SICAM TOOLBOX II, there is only a reading access possible via SICAM WEB (change of parameters not possible). The online functions (diagnosis, process display) can be used in this case.

Note

CP-8000/CP-802*x* is delivered ex factory with an equipped SD card and a default web parameterization. At the moment that you load SICAM TOOLBOX II parameters, the access via SICAM WEB is only reading (role `guest`).

7.2 Software for the Engineering

7.2.1 SICAM TOOLBOX II

The SICAM TOOLBOX II (as of Version 6.01) is available on a USB stick and consists of the following toolsets:

- EM II
  Engineering Manager (base package)
- PSR II
  Engineering and Maintenance Computer
- OPMII
  Object-Oriented Process Data Manager
- CAEx *plus*
  Tool for the creation of an application program as function diagram (FUD), structured text (ST), sequential function chart (SF)

  Alternatively, an existing and compatible instruction list (IL) can be stored in the SICAM TOOLBOX II

The toolsets are also available as “Light” version. With this version, the engineering is limited to maximal 100 system elements and 2000 data points.

The toolsets are available individually. You find information and updates for the individual toolsets, as well as numerous licences, on the website http://www.siemens.com/sicam.

Document	Item number
SICAM TOOLBOX II V6 License Catalog, License Ordering	D30-017-6
SICAM TOOLBOX II Release Information V6	M3E-031-2

7.2.1.1 Prerequisites

Prerequisite for the operation of the SICAM TOOLBOX II is the usage of an appropriate PC, that must fulfill certain hardware requirements, depending on the license package you purchased.

Information thereto reside within a permanently updated *List of PC preference types*. Should that be not at your disposal, please consult your contact person at Siemens.

For the installation of the SICAM TOOLBOX II the following preconditions are required:

- USB interface must exist
- C:\ drive must exist
- File system NTFS be existing
- Administrator rights for operating system Microsoft Windows (read and write rights to the file system and the Windows Registry)
- Installed TCP/IP
- Other SICAM TOOLBOX II version must not be installed
- Other ORACLE applications (data base, client, etc.) must not be installed
- Necessary regional settings:
  - 'Dot' for decimal separator and 'comma' for the thousand separator must be different
  - As separator an 'inverted comma' must not be used
- Usage of Windows Fonts in normal size (96 DPI)
- Microsoft Internet Explorer as of version 6.0
- Installed Microsoft Media Player to play online help videos (www.microsoft.com)
- Installed Adobe Acrobat Reader to read related documentation (www.adobe.com)
- The initial installation needs 30 GB free harddisk memory
- An update needs additional 4 GB installed main memory

Supported Operating Systems and Hardware Requirements

You find the exact information on supported operating systems and hardware, as well as installation and accomplishment of updates, in the following document:

Document	Item number
SICAM TOOLBOX II USB BOX Booklet V6	D3E-021-1

7.2.2 SICAM WEB

For the engineering via SICAM WEB you need the following programs:

Program	Designation	Version
CPC80	Firmware for the Master Module [1)]	as of 10.01 (CP-8000) as of 11.01 (CP-8021, CP-8022 level BB) as of 12.01 (CP-8022 level CC)
SWEB00	Firmware SICAM WEB [1) 2)]	as of 4.2
Sicam_first_startup	Initializing tool for the device detection and IP address setting [1)]	as of 2
	ASCII text editor for the creation of an instruction list (IL)	

1) further information see 7.3, Loadable Firmwares

2) functionality of a web server as grafical user interface for the engineering

The following web browsers can be used alternatively:

Web browser	Download	Version
Microsoft Internet Explorer	www.microsoft.com	as of 11
Microsoft Edge	www.microsoft.com	as of 40
Google Chrome	support.google.com	(current)
Mozilla Firefox	www.mozilla.com	(current)
Apple Safari	support.apple.com	(current)
Opera	www.opera.com	(current)

Note
When accessing a SICAM A8000 device via other web browsers, a warning appears in the logon dialog.

7.2.2.1 Prerequisites

For SICAM WEB the following operating systems are supported:

Hardware	Operating system	Version
PC, Notebook	Windows 7 (64-bit) Windows 8 (64-bit) Windows Server 2012 (64-bit)	
Samsung Galaxy TAB 2 10.1	Android	as of 4
Apple iPad4	iOS	as of 6

The following minimum screen resolution is recommended:

- 1024 x 768 pixel screen resolution (1280 x 800 pixel recommended)
- 16 Bit color depth
- Screen diagonal: 7"

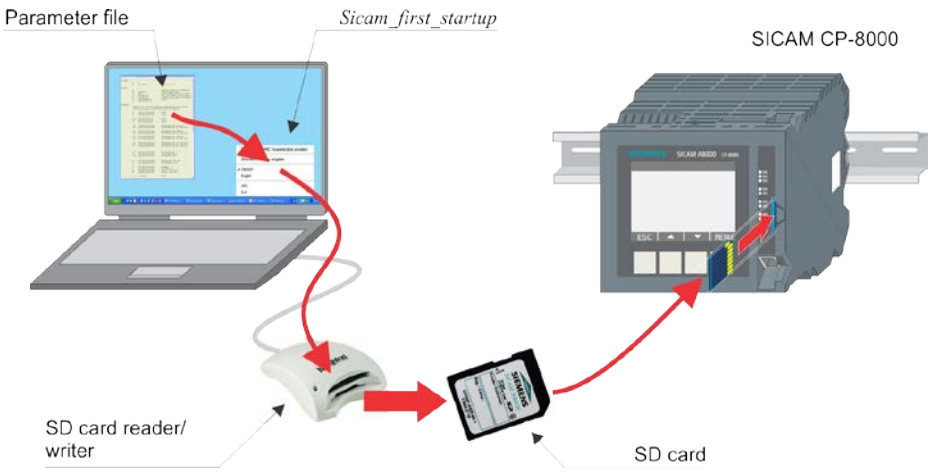
7.2.2.2 Program Sicam_First_Startup

The executable file *Sicam_first_startup.exe* must be stored locally on the engineering PC. For a convenient launching you can create a shortcut on the taskbar of the engineering PC.

With the program *Sicam_first_startup* you can

- find CP-8000/CP-802*x* connected in a network
- assign an IP address to a target device
- write a parameter file existing on the engineering PC on a SD card (backup of the parameterization of a target device)

With assistance of a SD card read/write device, engineering data and firmwares can be copied also without target device, directly from the engineering PC on a SD card, for instance for the replication of projects.



7.2.3 SICAM Device Manager

The SICAM Device Manager package consists of the following parts:

- DVD with software and license agreement
- USB stick with license key
- Product Information
- Certificate of license

Document	Item number
SICAM Device Manager	S51-000
SICAM Device Manager User Manual	D51-003-1

7.2.3.1 Prerequisites

Prerequisite for the operation of the SICAM Device Manager is the usage of an appropriate PC, that must fulfill certain hardware requirements.

For the installation of the SICAM Device Manager the following preconditions are required:

- USB interface must exist
- DVD drive must exist
- C:\ drive must exist
- File system NTFS be existing
- Administrator rights for operating system Microsoft Windows (read and write rights to the file system and the Windows Registry)
- Installed TCP/IP
- Enabled DirectX functions
- 30 GB free harddisk memory
- 4 GB installed main memory

The memory requirements and the hard disk space of the operating system and all applications running parallel to the SICAM Device Manager (Microsoft Office etc.) and/or memory usage of onboard graphic adapters must be considered.

To make sure that DirectX features are enabled on your PC

- Click the `Start` button, type `dxdiag` in the search box, and then press the enter key
- Click the `System` tab and then, under SYSTEM INFORMATION, check the DirectX version number, e.g.: DirectX 11
- Click `Next page`
- Under `DirectX Functions` all features must be enabled

The detailed information on operating systems and hardware, as well as to the installation and execution of updates, can be found in the following document:

Document	Item number
SICAM Product Information	D51-001-1

7.3 Loadable Firmwares

CP-8000/CP-802*x* consists of system elements that are designed for specific functions:

- Master module
  Central processing and communication
- Protocols
  Communication with control center and further automation units
- I/O Master Module
  Acquisition and output of process signals

For the performing of the respective function, a special firmware is provided for each system element. The functionality of each system element is adjustable by means of parameters.

As a partner of Siemens, you are able to download all the code revisions for your system as loadable binary files via the website http://www.siemens.com/sicam.

- Select **> Home > Products, Systems & Solutions > Products for Substation Automation > Substation Control Systems and Remote Terminal Units**
- Click on the `Downloads` tab
- Open `SICAM A8000 | Firmware and Device Drivers`
- In the result list you can select the required firmware(s)

Examples:

▼CPC80 Central Processing/Communication
CPC80 Binary File
TU CPC80 TB II Update

▼SWEB00 SICAM WEB
SWEB00 SICAM WEB Binary File

▼UMPMT0 Multipoint Master IEC60870-5-101
UMPMT0 Binary File
TU UMPMT0 TB II Update

▼USIO81 Universal Signal Input/Output
USIO81 Binary File
TU USIO81 TB II Update

A binary file contains the firmware code for the engineering via SICAM WEB.

A TB II update contains the firmware code and the master data for engineering via the SICAM TOOLBOX II.

For the parameterization of the corresponding system elements, the respective

- Firmware codes must exist in the target device (for engineering via SICAM WEB)
- TBII update must be stored in the SICAM TOOLBOX II (for engineering via SICAM TOOLBOX II)

How to load firmwares into a target device depends on the used engineering tool:

- SICAM TOOLBOX II: section 8.1.4, Import Firmware and 11.5.1, SICAM TOOLBOX II
- SICAM WEB: section 9.3.7, Update Firmware and 11.5.2, SICAM WEB

7.4 Integrated Protocol SNMP

CP-8000/CP-802*x* supports the protocol SNMP Agent (version 2 and version 3). For the engineering of the SNMP protocol you need to get MIB files and a MIB browser.

7.4.1 Download of the MIB-Files

MIB files can be downloaded from the website http://www.siemens.com/sicam-a8000:

- Click on the `Downloads` tab
- Select **+ Manuals, Certificates, Software, Device Drivers, CAx (SIOS)**
- Then click on Manuals, Certificates, Software, Device Drivers, CAx (SIOS)
- In the result list click on SICAM RTUs SNMP MIB File
- In the download page click on SICAMRTUs_SNMP_MIB_V06.00.00.zip (32,6 KB) to start the download
- After the download, save this compressed folder on the computer where the MIB browser is installed
- Extract the content of the folder and select a directory as storage location, for instance `C:/Siemens`

After saving, you will find the MIB files in the selected directory under `/SICAMRTUS_SNMB_MIB_V06.00.00/MIB-Files`.

You find the information on the MIB files in `/SICAMRTUS_SNMB_MIB_V06.00.00/readme.txt`.

7.4.2 Import of the MIB-Files in MIB-Browser

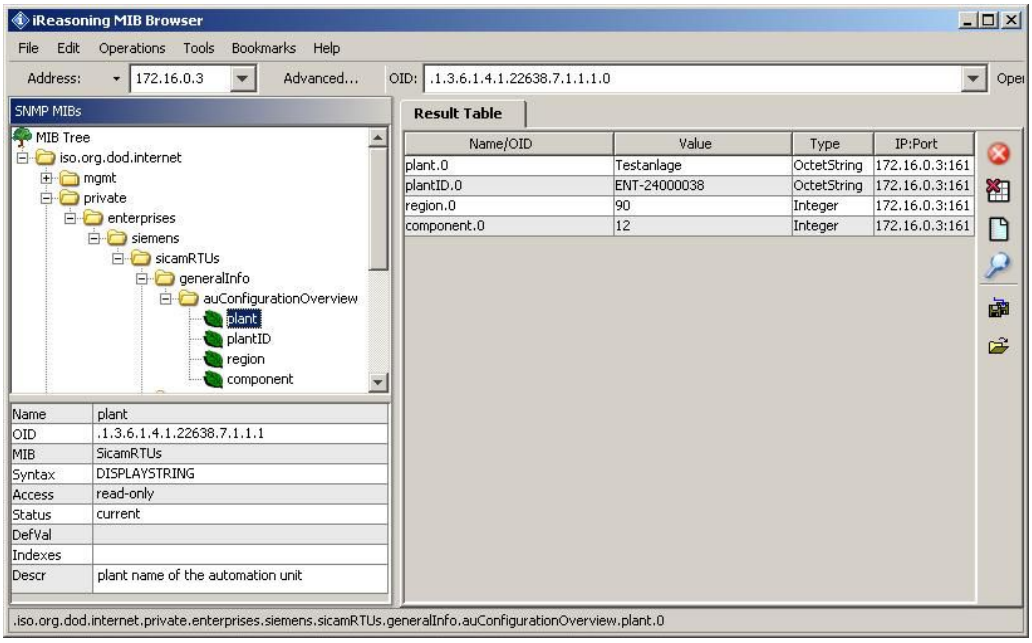
The import of the MIB files into your MIB browser must be done in the following sequence:

- `SIEMENS-SMI.mib`
- `sicamRTUs.mib`
- `RFC1213-MIB`
- `rfc3635_mib.mib`
- `rfc2790_mib.mib`
- `digitalGridProductInventory.mib`
- `EMERGENCY-USER-SMI.mib`

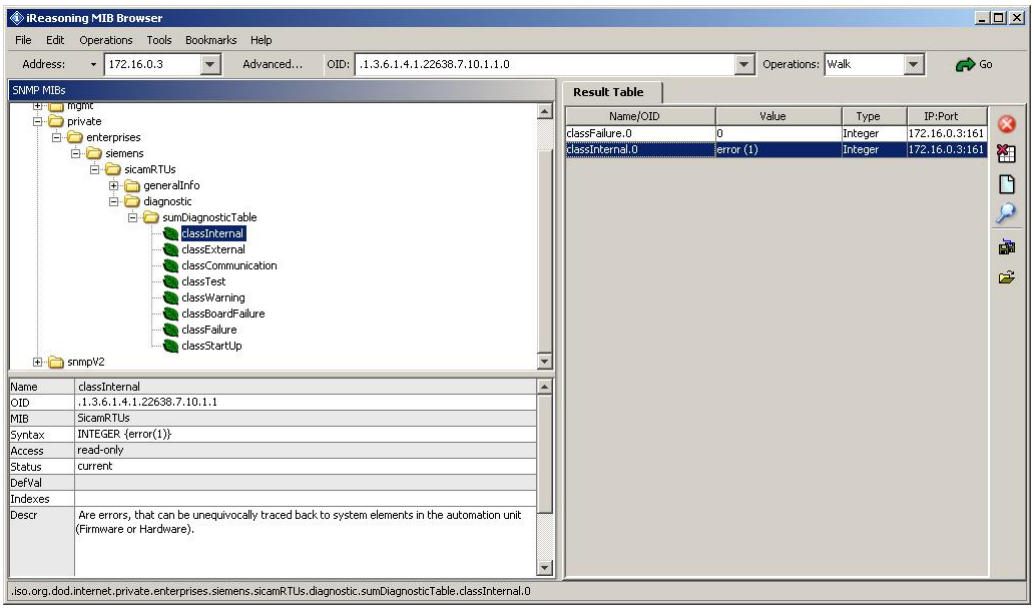
Besides a standard MIB browser you can load the MIB files also with the control center systems SICAM SCC and 250 SCALA.

7.4.3 Display of SNMP-Variables in MIB-Browser

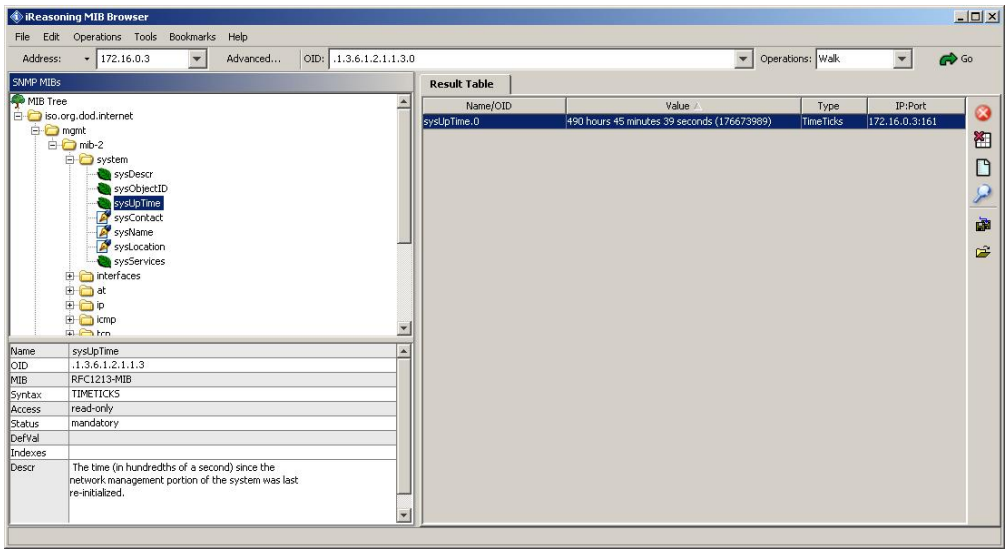
Example 1: SNMP variable `plant`



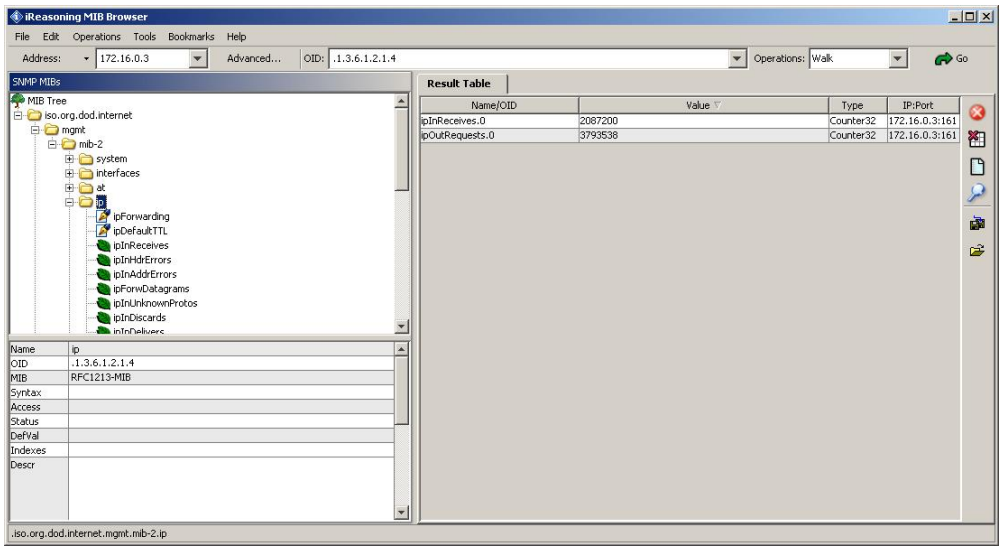
Example 2: SNMP variable `classInternal`.



Example 3: SNMP variable `sysUpTime`.



Example 4: SNMP variable `ipInReceives`.



7.5 Memory Cards

7.5.1 SD Card

For the storage of engineering data CP-8000/CP-802*x* needs an SD card. This resides in the slot at the housing front (CP-8000) or housing back (CP-802*x*), refer to section 6.6.1, SD Card.

With delivery of CP-8000/CP-802*x*, all required files for the correct operation are stored in folders on the SD card:

- Firmware SICAM WEB (short text: *SWEB00*), binary file: *SCD-001-1_xy.web*
- The Web files for SICAM WEB are unzipped on the SD card in the folder **SYSTEM\SICWEB**
- The master data for SICAM WEB are unzipped on the SD card in the subfolders of **SYSTEM\SICWEB\FW**
- Firmware of the device (*CPC80*), binary file: *SC8-080-1_xy.bin*
- Optional firmwares for protocol and peripherals

With usage of another suitable SD card, please consider the instruction in section 11.4.5, Replacement of the SD Card.

7.5.1.1 SD Card Reader/Writer

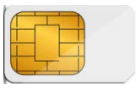
For archiving purposes, the engineering data and firmwares stored on the SD card can be read with a standard commercial SD card reader/writer and be stored on a PC. On the other hand, in particular for the initialization of a target device, the data can be written from a PC to the SD card.

If needed, a driver software required for the use of the SD card reader/writer must be installed on the PC. Follow thereto the instructions of the manufacturer.

For the formatting of the SD card the formatting tool *SD Card Formatter* must be used (https://www.sdcard.org/downloads/formatter_4/). The SD card must be formatted with the file system FAT16.

7.5.2 SIM Card (only CP-8022)

For the communication via GPRS you need a mobile network provider. This supplies a SIM card (choose the standard format = Mini SIM). The SIM card must be put in the slot at the housing front, refer to section 6.6.2, SIM Card.



7.6 Interfaces for the Communication

CP-8000/CP-802*x* provides the following interfaces for engineering and maintenance:

Interface	Type	Engineering tool
X1	Ethernet TCP/IP	SICAM TOOLBOX II or SICAM WEB
X2	Serial RS-232 *)	SICAM TOOLBOX II or SICAM WEB
X4	Ethernet TCP/IP	SICAM TOOLBOX II or SICAM WEB
X6	Serial RS-232 mode	SICAM WEB
X7	GPRS	SICAM TOOLBOX II or SICAM WEB

*) with additional voltage output (supply for external modem)

Via the duplicated Ethernet link (X1 and X4 in switch mode) it is for instance possible to connect a local engineering PC and at the same time a GPRS modem for the communication to the central station.

Furthermore, X1 and X4 can be operated via 2 independent IP addresses, you will find examples in appendix E, Use Cases.

Note

For CP-802*x* applies: X2/pin 3 (supply for external modem) must not be connected with the engineering PC!

Note

If the serial interface X2 is not used for the engineering, this can be set by means of a special parameter (`Communication settings serial | Serial engineering interface` = **disabled**).

The engineering via X2 is then no more possible, however, for the connection of other devices (see 6.11.1, Serial Communication) a simpler cable wiring can be created.

7.6.1 Required Accessories

Depending on the connection type, the following accessories are required:

- Direct cable
- D-sub/RJ45 adapter
- D-sub/USB adapter (if needed)

You will find the order information in appendix A.8, Cables and Plugs.

7.7 Connecting Engineering PC with the Target Device

7.7.1 SICAM TOOLBOX II

Before parameters can be loaded via the SICAM TOOLBOX II into CP-8000/CP-802*x*, the following steps must be performed:

- Insert a suitable SD card into the target device (if not present)
- Store required TBII updates in the SICAM TOOLBOX II
- Switch on the target device
- Set up physical connection with the target device

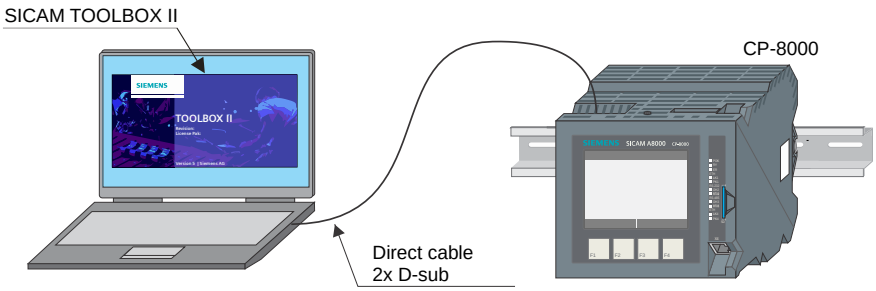
The following connection options are available:

- Serial point-to-point connection
- Serial connection via telecommunication facilities
- LAN/WAN connection via Ethernet interface
- LAN/WAN connection via serial interface and Terminalserver
- Connection via further automation unit(s)

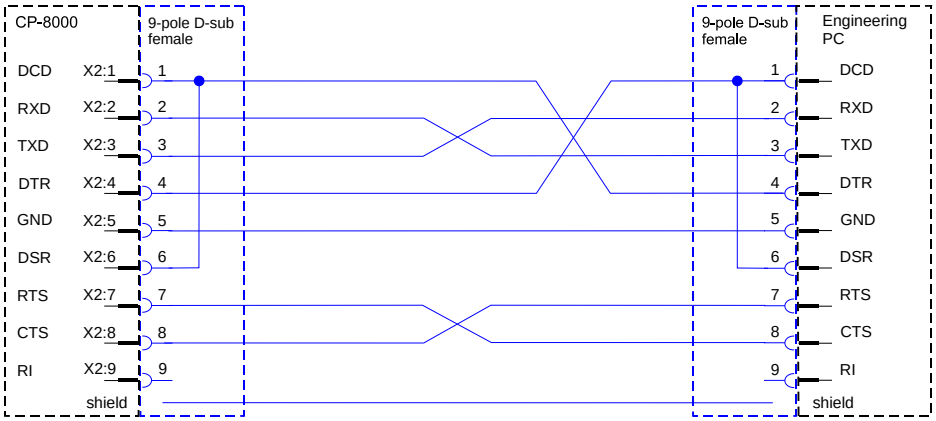
7.7.1.1 Physical Connection

7.7.1.1.1 Point-to-Point Connection via Serial Interface

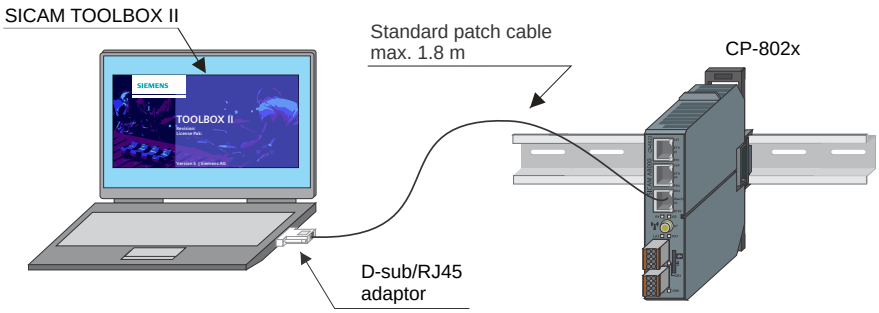
Engineering PC and CP-8000 are connected with a direct cable via the serial interface (X2).



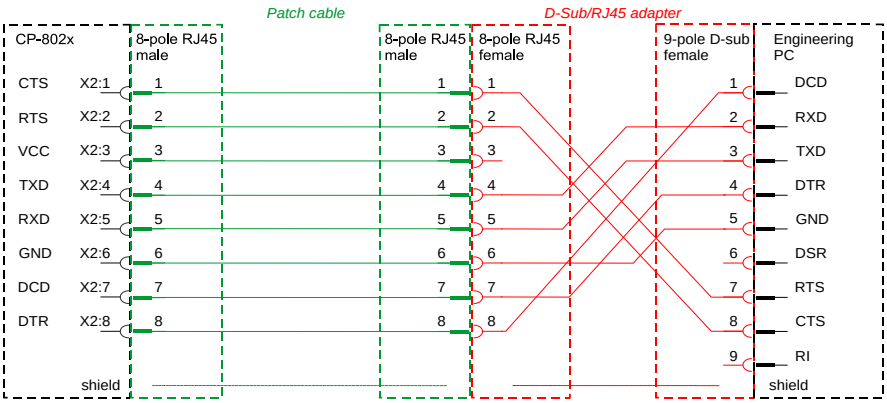
Wiring for Connection CP-8000 – PC (Direct Cable)



With CP-802x, a standard patch cable and a D-sub/RJ45 adapter must be used.



Wiring for Connection CP-8000 – PC (patch cable + D-sub/RJ45 adapter)



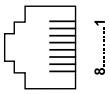
Recommended D-sub/RJ45 adapter

RS Pro MHDA9-SMJ8-M-K (see appendix A.8.1, Recommended Third-Party Products). This adapter provides a wired RJ45 socket and an unwired D-sub plug (female).

Pinning of the RJ45 socket:

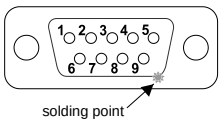
Pin	Wire color
1	black
2	yellow
3	orange
4	red
5	green
6	browne
7	grey
8	blue
Shield	black

RJ45 socket



Wiring on the D-sub plug:

D-sub plug (backside)



The assignment of the pins at the D-sub plug can be made according to wiring diagram.

Not used wires must be isolated!

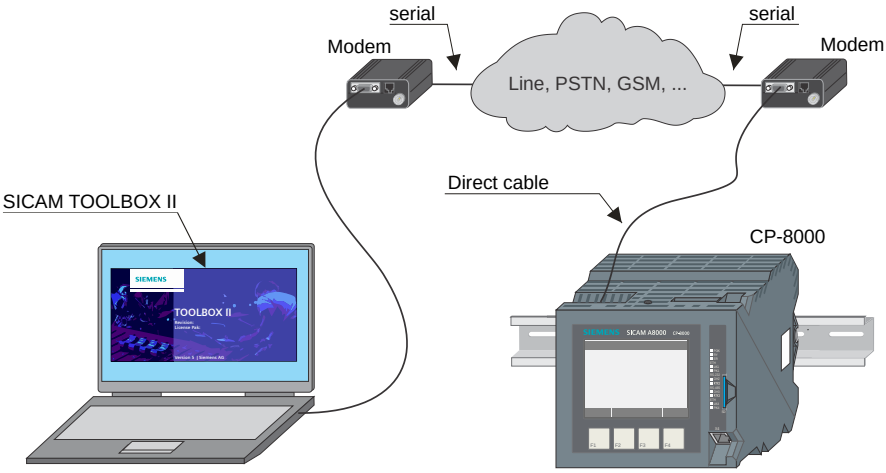
With use of the shield this must be soldered at the metal plate of the D-sub plug.

Note

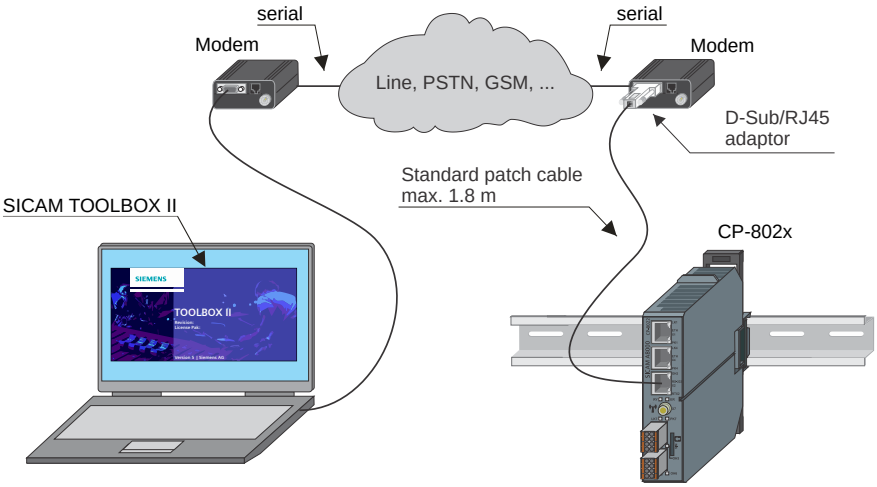
If the engineering PC does not provide a serial COM port, additionally a USB/RS-232 converter is required. Recommend products: FTDI Chip US232R-10 or FTDI Chip US232R-100-BLK (see appendix A.8.1, Recommended Third-Party Products).
The required driver can be found under http://www.ftdichip.com/Drivers/D2XX.htm.

7.7.1.1.2 Serial Connection via Telecommunication Facilities

Engineering PC and CP-8000 are connected via the serial interface (X2) via modems and alternatively via a dedicated line, the public fixed network, or wireless radio.



With CP-802x, a special modem cable (or standard patch cable and D-sub/RJ45 adapter) must be used.

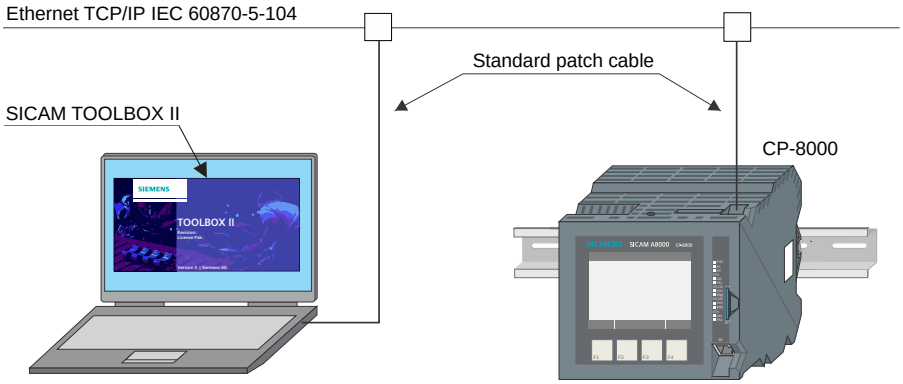


Note

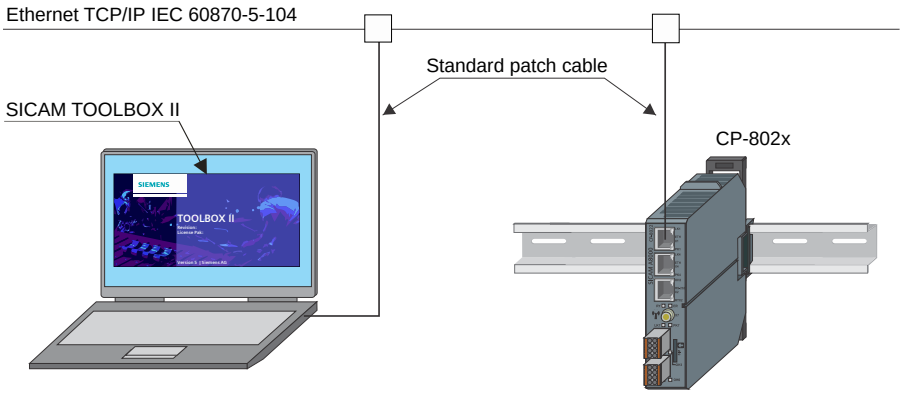
The circuitry of the modem cable (alternatively D-sub/RJ45 adapter) is dependent on the used modem. You will find the corresponding circuitries in section 6.11.1, Serial Communication.

7.7.1.1.3 LAN/WAN Connection via Ethernet Interface

Engineering PC and CP-8000 are connected via one of the Ethernet interfaces (X1 or X4) via a network by means of standard patch cables.

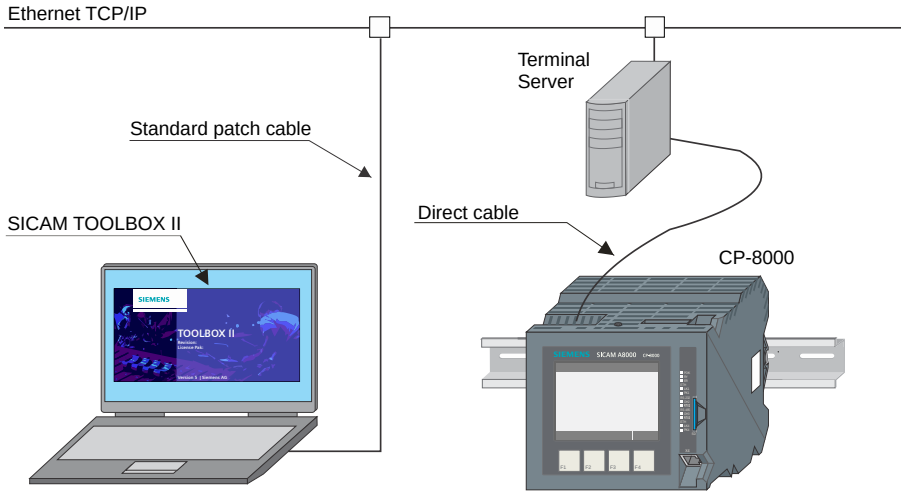


Engineering PC and CP-802x are connected via one of the Ethernet interfaces (X1 or X4) via a network by means of standard patch cables.



7.7.1.1.4 LAN/WAN Connection via Serial Interface and Terminalserver

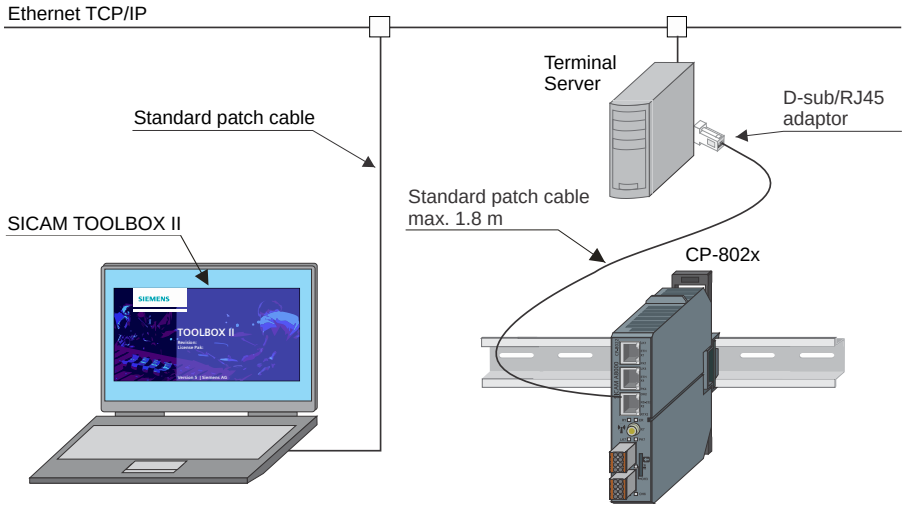
Engineering PC and CP-8000 are connected via the serial interface (X2) via a network and a terminal server.



Note

The circuitry of the direct cable is described in section 7.7.1.1.1, Point-to-Point Connection via Serial Interface.

With CP-802x, a standard patch cable and a D-sub/RJ45 adapter must be used for the connection with the terminal server.



Note

The circuitry of the D-sub/RJ45 adapter is described in section 7.7.1.1.1, Point-to-Point Connection via Serial Interface.

7.7.1.1.5 Remote Connection via further Automation Unit(s)

In need, the SICAM TOOLBOX II can also be connected indirectly via a connected automation unit (SICAM AK, SICAM AK3, SICAM TM).

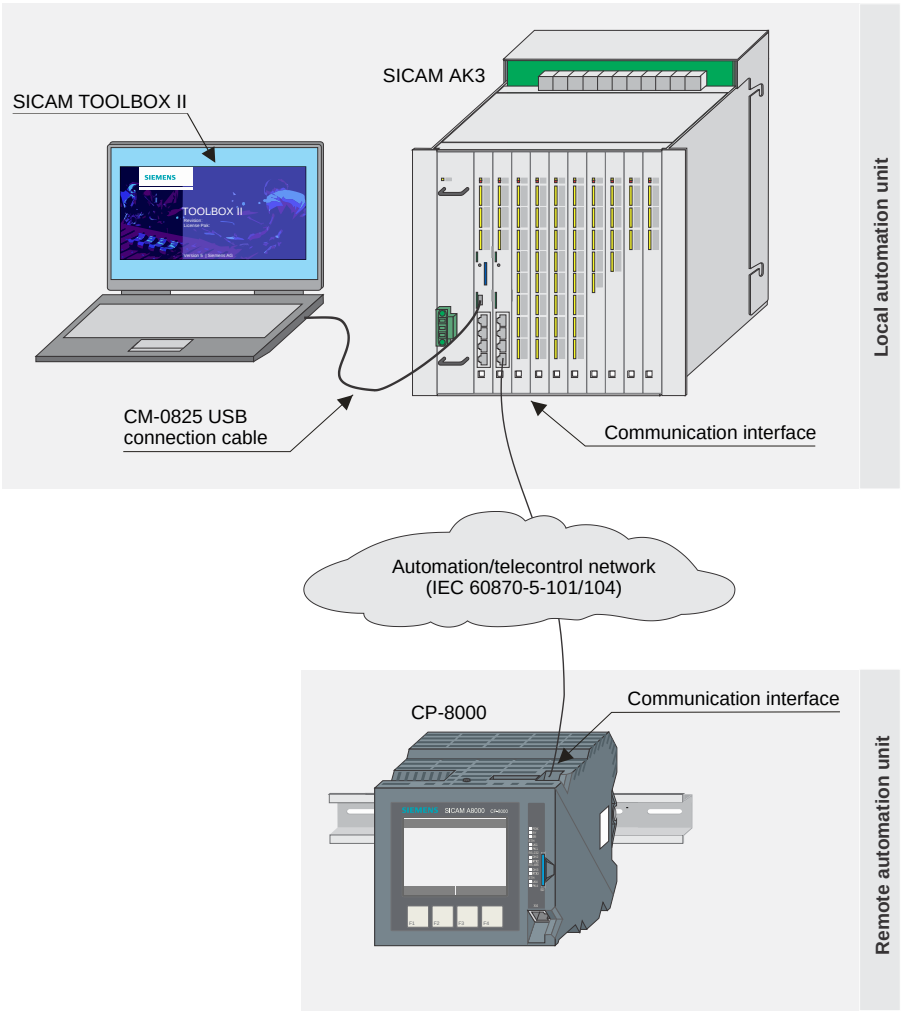
For engineering there must be a logical connection to that automation unit, which is subject of the engineering task. The both following cases are differentiated:

- Connection with a local automation unit (that one, to which a physical connection exists)

Note

A first initialization of the automation unit is only possible in this way.

- Connection with a remote automation unit that one, which can be accessed via a local automation unit; thereby, a continuous remote communication according to IEC 60870-5-101 or -104 is required)



7.7.2 SICAM WEB

Before CP-8000/CP-802*x* can be parameterized via SICAM WEB, the following steps must be performed:

- Insert a suitable SD card with the current firmware codes into the target device (if not present)
- Switch on the target device
- Set up physical connection with the target device
- Establish communication with the target device
  - Set up IP configuration on the engineering PC
  - Set up dial-up connection on the engineering PC (if necessary)
  - Install security certificate on the engineering PC (if necessary)
    instruction thereto see www.siemens.com/gridsecurity, tab `Cyber Security General Downloads`, directory `Application Notes`, document *Certificate trusting in web browsers*
  - Connect with the target device via web browser

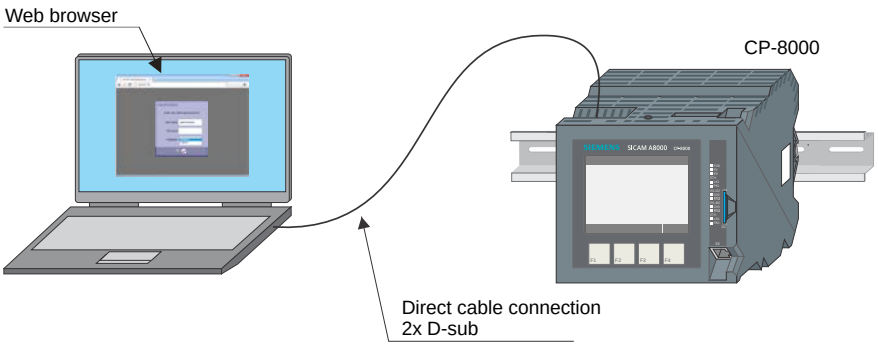
The following connection options are available:

- Point-to-point connection via serial interface
- Point-to-point connection via Ethernet interface
- LAN/WAN connection via Ethernet interface

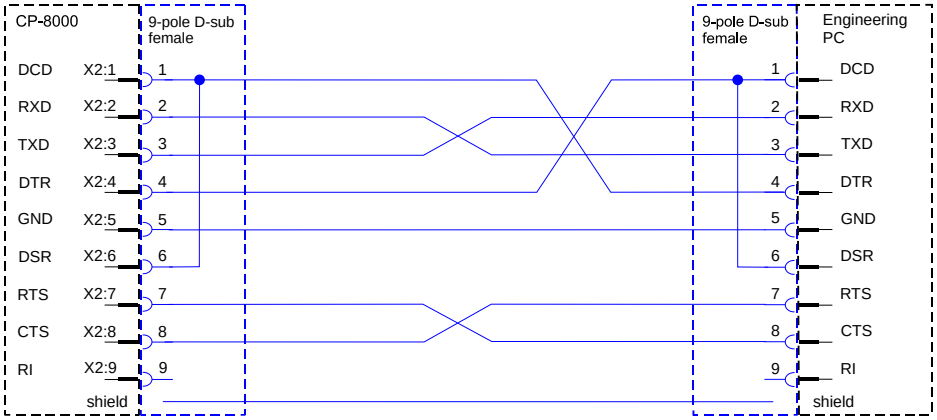
7.7.2.1 Physical Connection

7.7.2.1.1 Point-to-Point Connection via Serial Interface

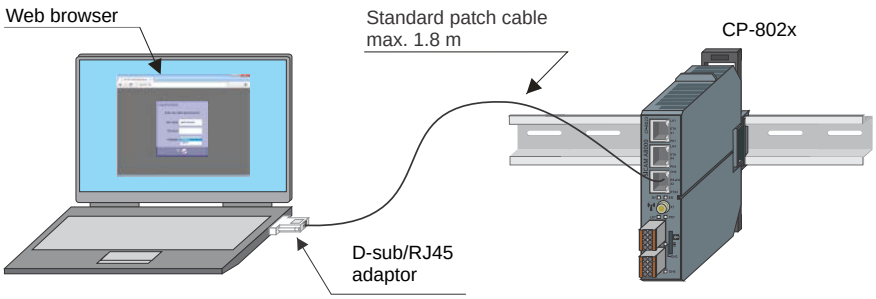
Engineering PC and CP-8000 are connected via the serial interface (X2) with a direct cable.



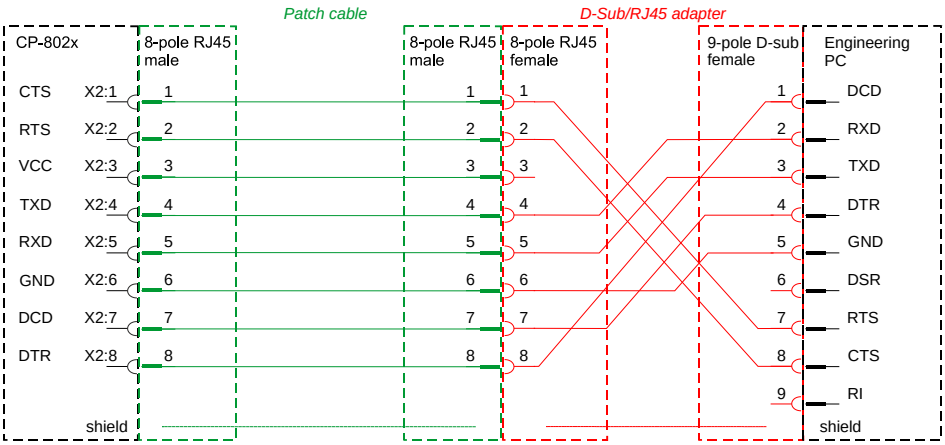
Wiring for Connection CP-8000 – PC (Direct Cable)



With CP-802x, a standard patch cable and a D-sub/RJ45 adapter must be used.



Wiring for Connection CP-8000 – PC (patch cable + D-sub/RJ45 adapter)



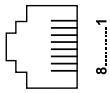
Recommended D-sub/RJ45 adapter

RS Pro MHDA9-SMJ8-M-K (see appendix A.8.1, Recommended Third-Party Products). This adapter provides a wired RJ45 socket and an unwired D-sub plug (female).

Pinning of the RJ45 socket:

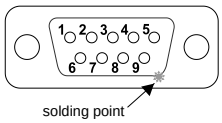
Pin	Wire color
1	black
2	yellow
3	orange
4	red
5	green
6	browne
7	grey
8	blue
Shield	black

RJ45 socket



Wiring on the D-sub plug:

D-sub plug (backside)



The assignment of the pins at the D-sub plug can be made according to wiring diagram.

Not used wires must be isolated!

With use of the shield this must be soldered at the metal plate of the D-sub plug.

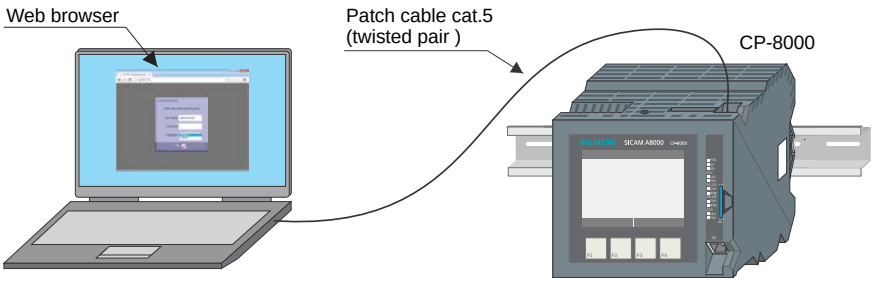
Note

If the engineering PC does not provide a serial COM port, additionally a USB/RS-232 converter is required. Recommend products: FTDI Chip US232R-10 or FTDI Chip US232R-100-BLK (see appendix A.8.1, Recommended Third-Party Products).
The required driver can be found under http://www.ftdichip.com/Drivers/D2XX.htm.

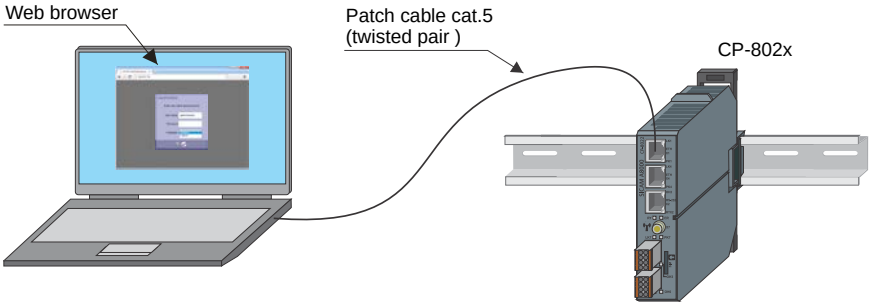
7.7.2.1.2 Point-to-Point Connection via Ethernet Interface

The parameterization via point-to-point is suitable if the engineering PC and the target device are not operated in a network.

Engineering PC and CP-8000 are connected with a cross connected patch cable via one of the Ethernet interfaces (X1 or X4).



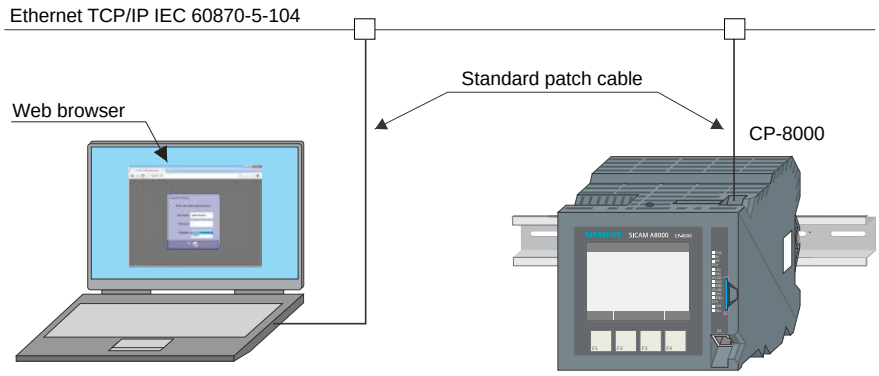
Engineering PC and CP-802x are connected with a cross connected patch cable via one of the Ethernet interfaces (X1 or X4).



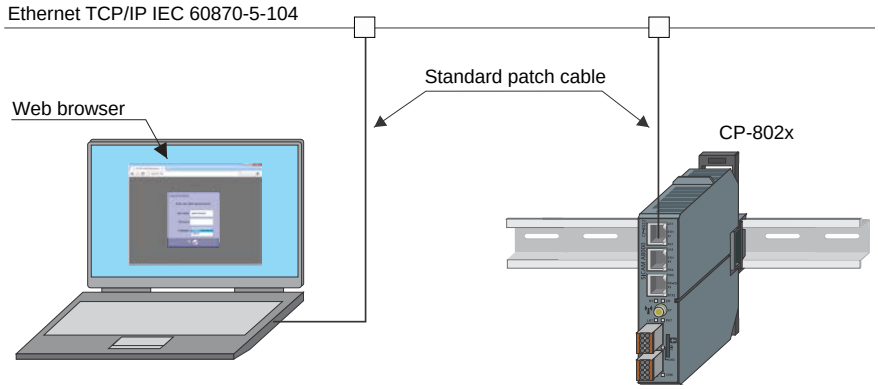
7.7.2.1.3 LAN/WAN Connection via Ethernet Interface

The parameterization via LAN/WAN is suitable if the engineering PC and (several) CP-8000/CP-802*x* are operated in a network.

Engineering PC and CP-8000 are connected with a cross connected patch cable via one of the Ethernet interfaces (X1 or X4).



Engineering PC and CP-802x are connected with a cross connected patch cable via one of the Ethernet interfaces (X1 or X4).



7.7.2.2 Communication with the Target Device

For the parameterization the target device must be connected with the engineering PC and switched on. In the Master Module of the target device a SD card must be equipped.

The establishing of a communication connection between engineering PC and the target device takes place via adjustable IP addresses. For the initial parameter setting of CP-8000/CP-802*x*, default IP addresses are available. These are specific for the respective physical connection.

With local engineering, fixed IP addresses are used since they are required only temporarily for the parameterization of the target device.

Default IP Configuration in CP-8000/CP-802*x*

Parameter	Value	Meaning/Remark
<Own IP address>	**172.16.0.1**	Address of CP-8000/CP-802*x* web server via serial interface X2 (fixed)
`Autoconfiguration`	**NO**	Configuration via DHCP service deactivated
`Mode of the Ethernet ports`	**1 IP address (connected ports in switch mode)**	Common IP address ON Ethernet interfaces X1 and X4
`Parameter "Mode of the Ethernet ports"`	**display (selection)**	Mode for X1 and X4 can be selected (configuration of separate IP addresses enabled)
`Own IP address`	**172.16.0.3**	Address of CP-8000/CP-802*x* web server via Ethernet interface X1 and X4
`Subnet mask`	**255.255.255.0**	0.0.0.0 = not used
`Default gateway`	**0.0.0.0**	0.0.0.0 = not used In practice the default gateway is assigned on the smallest (193) or greatest (222) usable IP address in the network. If the own network is connected via a router, the address of the router is to be set.
`Network connection`	**LAN**	Utilized transmission media

7.7.2.2.1 Point-to-Point Connection via Serial Interface

The following steps are necessary:

- Configure IP address for engineering PC
- Connection setup via SICAM WEB

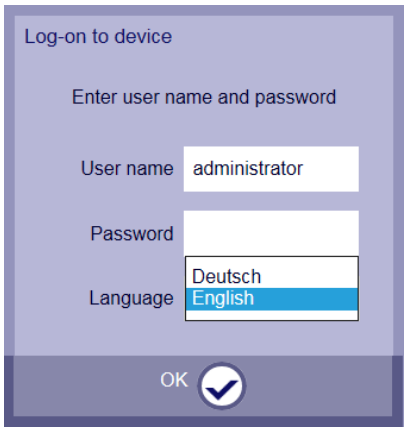
Configure IP Address for Engineering PC

For the parameter setting the IP addresses predefined in CP-8000/CP-802*x* are used. Thereby the web server of the target device assignes automatically the IP address `172.16.0.2` to the engineering PC, if this is configured for the automatic acceptance of an IP address.

For the communication via the serial interface, a dial-up connection must be set up on the engineering PC. You find the instruction thereto in Appendix D, Set Up Dial-Up Connection on Engineering PC.

Connection via SICAM WEB

Start the web browser and enter the IP address of your target device (`172.16.0.1`) in the address bar.



You find the further information in chapter 9, Engineering via SICAM WEB.

7.7.2.2.2 Point-to-Point Connection via Ethernet Interface

The following steps are necessary:

- Configure IP address for engineering PC
- Connection setup via SICAM WEB

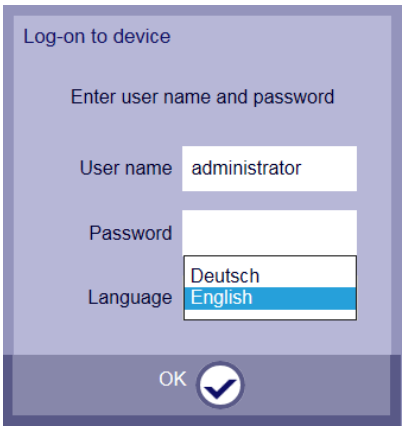
Configure IP Address for Engineering PC

For the parameter setting the engineering PC must be adjusted corresponding to the IP address predefined in CP-8000/CP-802*x*.

- Click in the control panel of the engineering PC on `Network connections`, after that on `Local Network` and `Properties`.
- Mark in the property dialog `Internet Protocol (TCP/IP)` and click on `Properties`.
- Select USE THE FOLLOWING IP ADDRESS: and enter for instance `172.16.0.4` and the subnet mask `255.255.0.0`, and confirm with `OK`.
- Confirm the network setings with `OK`.

Connection via SICAM WEB

Start the web browser and enter the IP address of your target device (`172.16.0.3`) in the address bar.



You find the further information in chapter 9, Engineering via SICAM WEB.

Note

According to the parameterization in CP-8000/CP-802*x* you have to enter a http:// or https:// address in the browser to establish the connection.

During the first time connetion establishment via https there is a check if the corresponding security certificate is installed. If it is missing, it must be installed manually (see www.siemens.com/gridsecurity, tab `Cyber Security General Downloads`, directory `Application Notes`, document *Certificate trusting in web browsers*).

7.7.2.2.3 LAN/WAN Connection via Ethernet Interface

The following steps are necessary:

- Writing IP address with *Sicam_first_startup*
- Connection setup via SICAM WEB

Configure IP Address with *Sicam_first_startup*

With operation in a network, an unambiguous IP address must be assigned to each connected CP-8000/CP-802*x*. The assignment of the IP address is dependent on the subnet mask used in the network.

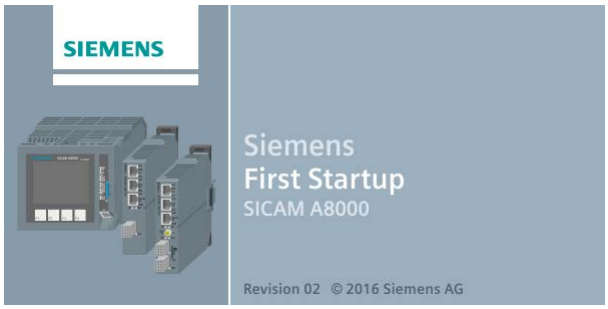
The identification for the assignment of the IP address happens solely via the MAC address of the target device. This is printed on the type plate at the left side of the housing, or it can be read also on the display under the menu `Device information`.

Note

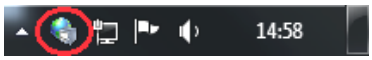
The IP address can be assigned with the tool *Sicam_first_startup* within a network segment (subnet). This can happen also if the IP address of the engineering PC is located out of this subnet. On the other side, the assignment of the IP address via a routed network (PC and target device separated via a router) is not possible.

For the address assignment start the program *Sicam_first_startup.exe* with double click.

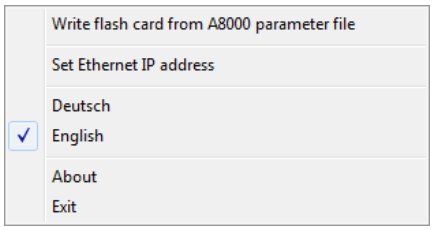
The *Sicam_first_startup* splash screen is opened, and the *Sicam_first_startup* symbol appears in the notification area of the taskbar:



- Click on the splash screen in order to close it
- Click then with the right mouse button on the *Sicam_first_startup* symbol



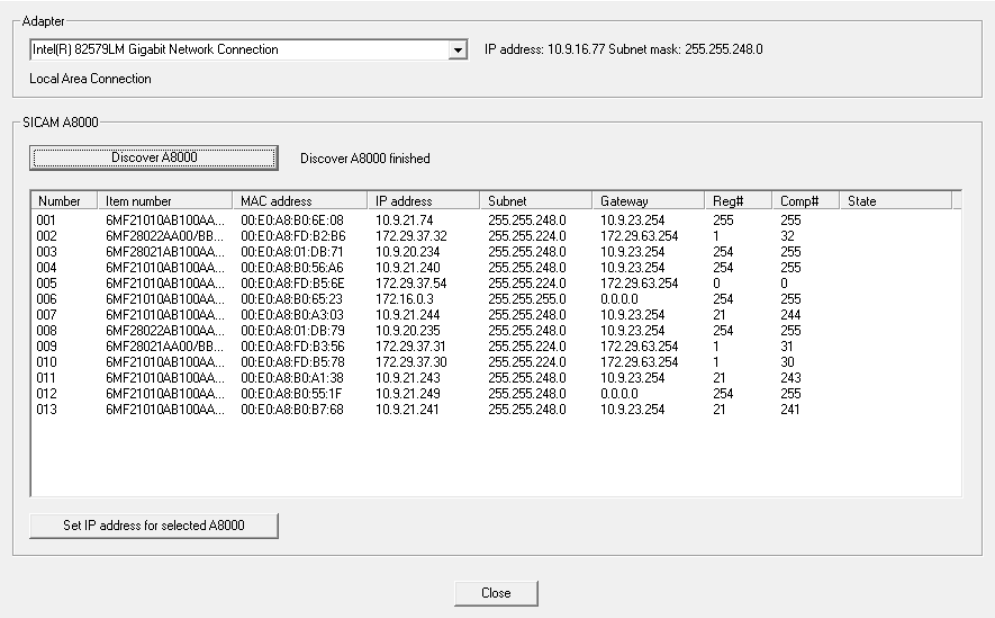
The context menu of *Sicam_first_startup* is opened:



- Change the language if needed and open the context menu again
- After that click on Set Ethernet IP Address

The window for the address assignment is opened.

Click Discover A8000 to find the physically connected automation units within the network. The found devices -unambigously identified by the respective MAC address – are listed in the table.



Number	Item number	MAC address	IP address	Subnet	Gateway	Reg#	Comp#	State
001	6MF21010AB100AA...	00:E0:A8:B0:6E:08	10.9.21.74	255.255.248.0	10.9.23.254	255	255	
002	6MF28022AA00/BB...	00:E0:A8:FD:B2:B6	172.29.37.32	255.255.224.0	172.29.63.254	1	32	
003	6MF28021AB100AA...	00:E0:A8:01:DB:71	10.9.20.234	255.255.248.0	10.9.23.254	254	255	
004	6MF21010AB100AA...	00:E0:A8:B0:56:A6	10.9.21.240	255.255.248.0	10.9.23.254	254	255	
005	6MF21010AB100AA...	00:E0:A8:FD:B5:6E	172.29.37.54	255.255.224.0	172.29.63.254	0	0	
006	6MF21010AB100AA...	00:E0:A8:B0:65:23	172.16.0.3	255.255.255.0	0.0.0.0	254	255	
007	6MF21010AB100AA...	00:E0:A8:B0:A3:03	10.9.21.244	255.255.248.0	10.9.23.254	21	244	
008	6MF28022AB100AA...	00:E0:A8:01:DB:79	10.9.20.235	255.255.248.0	10.9.23.254	254	255	
009	6MF28021AA00/BB...	00:E0:A8:FD:B3:56	172.29.37.31	255.255.224.0	172.29.63.254	1	31	
010	6MF21010AB100AA...	00:E0:A8:FD:B5:78	172.29.37.30	255.255.224.0	172.29.63.254	1	30	
011	6MF21010AB100AA...	00:E0:A8:B0:A1:38	10.9.21.243	255.255.248.0	10.9.23.254	21	243	
012	6MF21010AB100AA...	00:E0:A8:B0:55:1F	10.9.21.249	255.255.248.0	0.0.0.0	254	255	
013	6MF21010AB100AA...	00:E0:A8:B0:B7:68	10.9.21.241	255.255.248.0	10.9.23.254	21	241	

Note

The IP settings depend on the configuration and the used transmission media of your network. For the setting of these values please contact your network administrator.

Note

With the firmware *CPC80* as of revision 09 the setting of an IP address by means of *Sicam_first_startup* is supported only as long as the default IP address (**172.16.0.3**) exists in the target device.

You can change the settings for IP ADDRESS, SUBNET and GATEWAY by means of clicking on the respective value. Confirm each with the enter key. The status of the respective target device is set to `changed`.

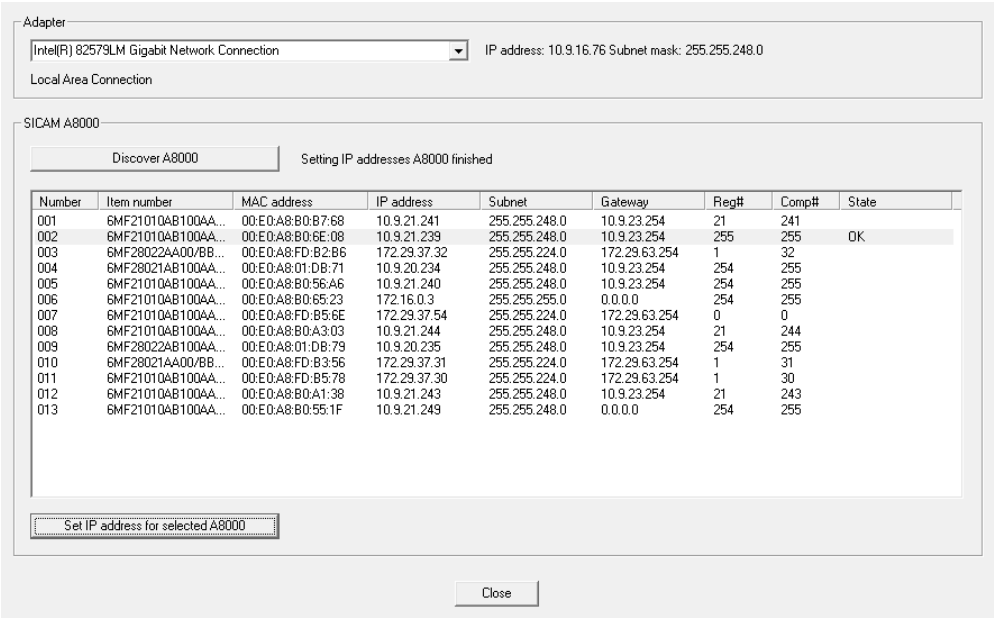
After completion of the entries mark the corresponding target devices by marking their lines. Then click on `Set IP address for selected A8000`.

Sicam_first_startup creates now the ARP table on the engineering PC (assignment MAC address to IP address). Afterwards *Sicam_first_startup* tries to reach the target device. If this is successful, the parameterized addresses are loaded into the respective target device and the status is set to `OK`. Thereafter a restart is performed.

The procedure is terminated for all target devices when the information `Setting IP addresses A8000 finished` appears.

The supplement `NOK` means that an error occurred with writing the addresses. Check the set network addresses and the physical connection. If necessary, check the IP settings of your PC via the command prompt with the command `ipconfig`.

Confirm the reset information with `OK`. After the startup, the respective target device can be addressed by the webbrowser.



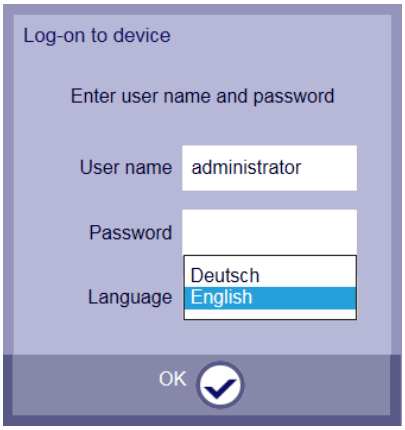
Number	Item number	MAC address	IP address	Subnet	Gateway	Reg#	Comp#	State
001	6MF21010AB100AA...	00:E0:A8:B0:B7:68	10.9.21.241	255.255.248.0	10.9.23.254	21	241	
002	6MF21010AB100AA...	00:E0:A8:B0:6E:08	10.9.21.239	255.255.248.0	10.9.23.254	255	255	OK
003	6MF28022AA00/BB...	00:E0:A8:FD:B2:B6	172.29.37.32	255.255.224.0	172.29.63.254	1	32	
004	6MF28021AB100AA...	00:E0:A8:01:DB:71	10.9.20.234	255.255.248.0	10.9.23.254	254	255	
005	6MF21010AB100AA...	00:E0:A8:B0:56:A6	10.9.21.240	255.255.248.0	10.9.23.254	254	255	
006	6MF21010AB100AA...	00:E0:A8:B0:65:23	172.16.0.3	255.255.255.0	0.0.0.0	254	255	
007	6MF21010AB100AA...	00:E0:A8:FD:B5:6E	172.29.37.54	255.255.224.0	172.29.63.254	0	0	
008	6MF21010AB100AA...	00:E0:A8:B0:A3:03	10.9.21.244	255.255.248.0	10.9.23.254	21	244	
009	6MF28022AB100AA...	00:E0:A8:01:DB:79	10.9.20.235	255.255.248.0	10.9.23.254	254	255	
010	6MF28021AA00/BB...	00:E0:A8:FD:B3:56	172.29.37.31	255.255.224.0	172.29.63.254	1	31	
011	6MF21010AB100AA...	00:E0:A8:FD:B5:78	172.29.37.30	255.255.224.0	172.29.63.254	1	30	
012	6MF21010AB100AA...	00:E0:A8:B0:A1:38	10.9.21.243	255.255.248.0	10.9.23.254	21	243	
013	6MF21010AB100AA...	00:E0:A8:B0:55:1F	10.9.21.249	255.255.248.0	0.0.0.0	254	255	

Note

The writing of the IP address with *Sicam_first_startup* is also possible locally via the serial interface.

Connection via SICAM WEB

Start the web browser and enter that IP address in the address bar you have previously assigned to your target device.



You find the further information in chapter 9, Engineering via SICAM WEB.

Note

According to the parameterization in CP-8000/CP-802*x* you have to enter a http:// or https:// address in the browser to establish the connection.

During the first time connetion establishment via https there is a check if the corresponding security certificate is installed. If it is missing, it must be installed manually (see www.siemens.com/gridsecurity, tab `Cyber Security General Downloads`, directory `Application Notes`, document *Certificate trusting in web browsers*).

Configure IP Address via Autoconfiguration

In a network, the IP address of the physically connected target devices CP-8000/CP-802*x* can be assigned by a DHCP server.

The DHCP service is switched off by default and can be only activated by means of parameter (see 9.1.2.7, Autoconfiguration).

7.8 Interaction with the Engineering Tool

7.8.1 SICAM TOOLBOX II

For the engineering of CP-8000/CP-802*x* serves the SICAM TOOLBOX II installed on the engineering PC.

Before you start with the engineering, the predefined configuration parameters of the SICAM TOOLBOX II must be checked and changed, if necessary (see section 8.1.1, Presets).

The system-technical and process-technical parameterization is performed with the tool "OPM II". An application program can be created with the tool "CAEx *plus*" as function diagram, or alternatively as instruction list with a text editor in ASCII format.

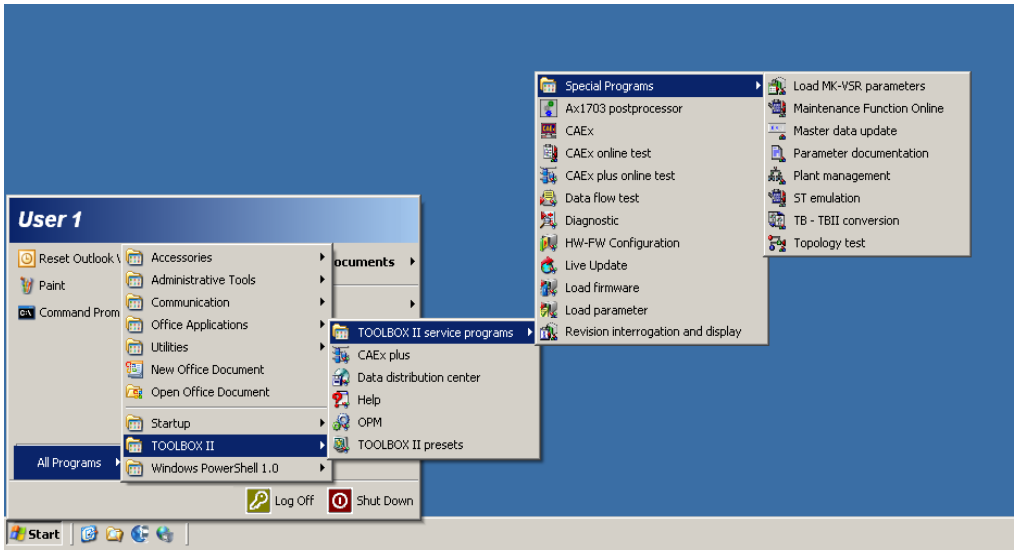
The setting of parameters is only possible independent from the target device (offline). Firmwares for the system elements and application programs must be imported into the SICAM TOOLBOX II.

Engineering data maintained with the SICAM TOOLBOX II is stored in a data base on the harddisk of the engineering PC. By means of loading processes, the engineering data can be transferred from the harddisk of the engineering PC to a target device. Thereto the target device must be connected with the engineering PC and switched on, and a SD card must be equipped in the Master Module of the target device.

The engineering data is stored during a load procedure on the SD card of the target device. With startup of the target device, all new or changed data is transferred into the main memory.

7.8.1.1 Structure

The individual tools of the SICAM TOOLBOX II have a design oriented according to Microsoft Windows. After successful installation they can be started from the Windows start menu `Start` | `All Programs` | `TOOLBOX II`, or via the Toolbox shortcut on the desktop.



The most frequently needed tools (Load Parameters, CAEx *plus*, etc.) can be started also directly from the central engineering tool "OPM II".

Note

The *SICAM TOOLBOX II Online Help* can be started either directly via the start menu of your PC, or from each single tool via the menu `Help`.

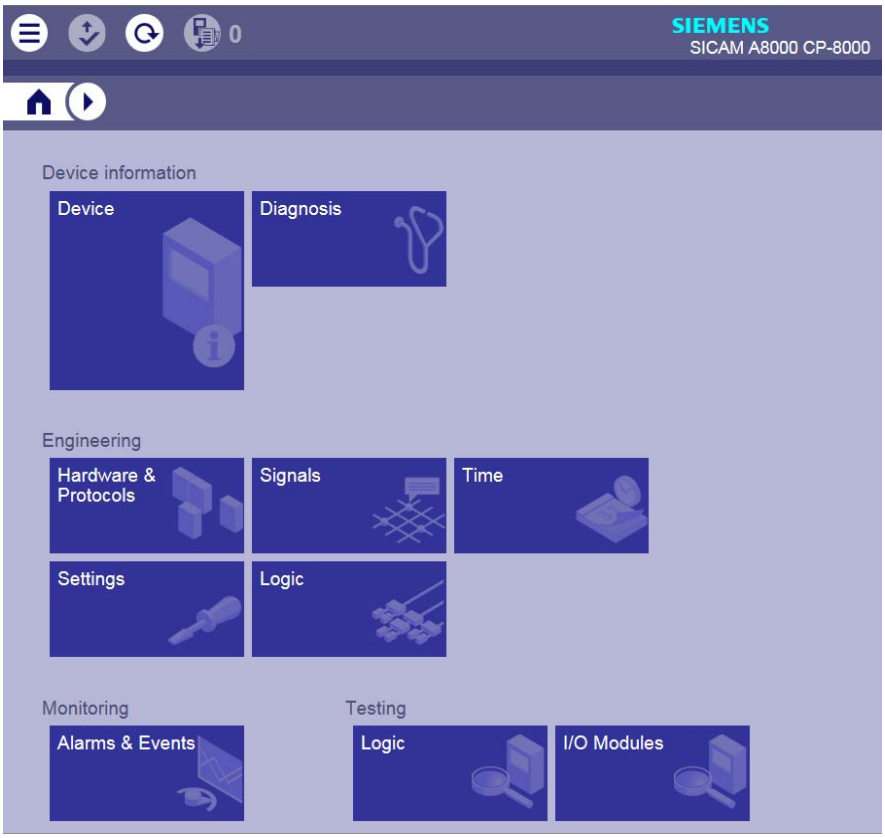
7.8.2 SICAM WEB

For the engineering of CP-8000/CP-802*x* serves the web browser installed on the engineering PC. The web browser shows HTML sites provided by the integrated web server of CP-8000/CP-802*x*. The parameterization is performed online in the target device.

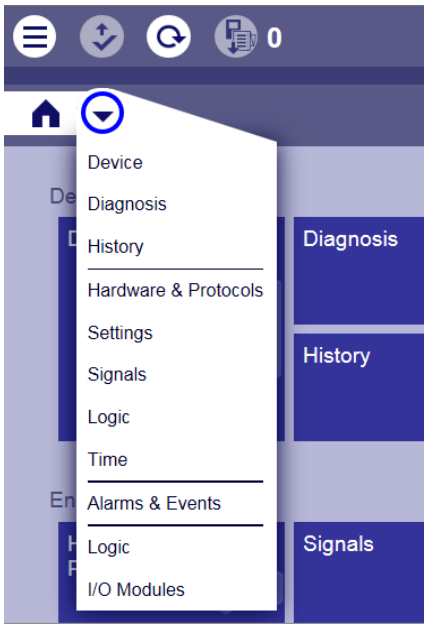
By means of the web server the engineering data is maintained and stored on the SD card of the Master Module. Engineering data can be transferred also by means of loading processes from the harddisk of the engineering PC to a target device and reversely.

7.8.2.1 Dashboard

After successful log-in, the so called *Dashboard* appears. Here you can select the individual submenus via the displayed tiles:



Alternatively, each area and each tab can be also accessed via the context menu:



Home

By clicking on this button you are able to return to the *Dashboard* from each website in SICAM WEB.

Navigation

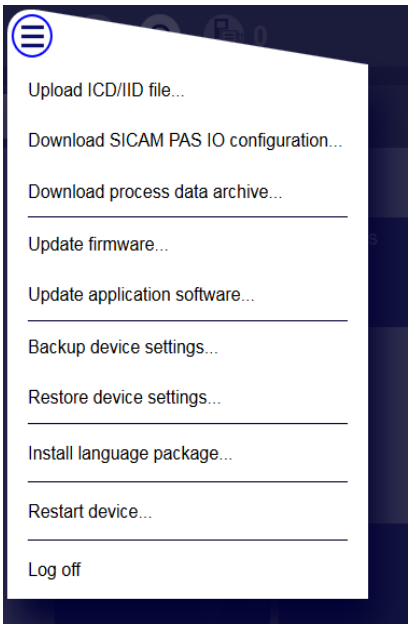
By clicking on this button you are able to select the desired area from a drop-down list from each website in SICAM WEB.

7.8.2.2 General Buttons

Open menu

The button contains the following menu functions available exclusively for the user name `administrator`.

The menu functions are also visible for the user name `guest`, however, he has no authorization to execute them. With attempt of a selection, a corresponding notification is recorded in the status log (example: `Missing privilege for restart`).



Apply changes

This button is disabled after logging in.

As soon as you modified the parameter settings the button is enabled.

During the saving procedure the changed parameters are transmitted into the device. Then the button remains disabled until the next modification of parameters. Thus, you can see at a glance whether there is a modification of parameters (button enabled) or not (button disabled).

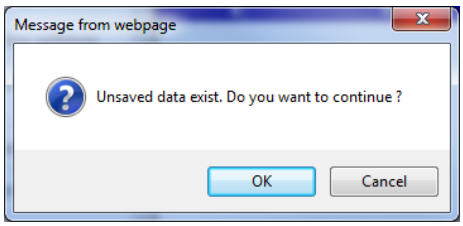
For the user name `guest` the button is always disabled.

Reload

This button causes an update of the data saved last in the device. If you changed values and you did not yet save it,

- Click on the button, if you want to discard these changes

The web browser opens an interrogation dialog according to the following example:

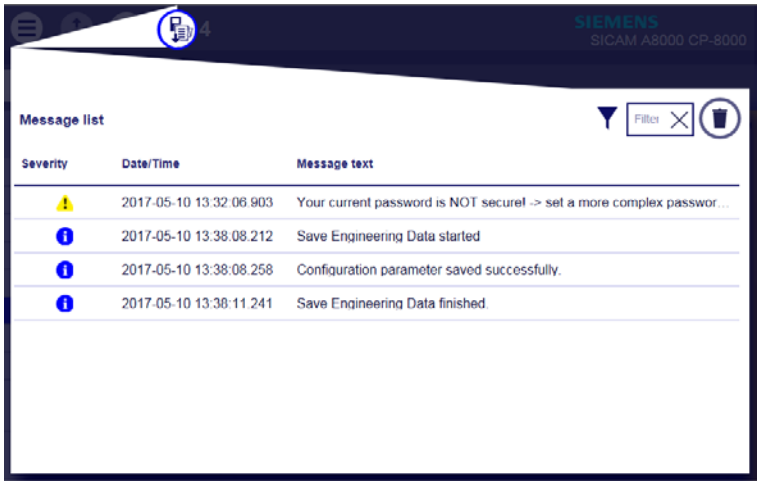


- select Cancel, if you want to abort the procedure
- select OK to update (unsaved data will be lost)

If for instance one `administrator` and up to two `guest` are logged on to the same device, the changes made and stored by the `administrator` will be visible for the `guest` only upon reload.

Show status log

This button causes the display of a list of error information, warnings and information logged during the current session:



- You may close the list by means of button
- You may clear all by means of button
- You have the possibility to specifically search for certain information:
  - In the field `Filter` enter the word (or a part of it) to search for
  - Click the cross to reset the filter

7.8.2.3 Parameter Entry

In the submenu `Settings` you find all configuration data of the device.

You have the possibility to change configuration parameters. In the left window area, all configuration data is shown as a hierarchical directory tree:

- CP-8000/CP-802*x*
  - Master Module

Note

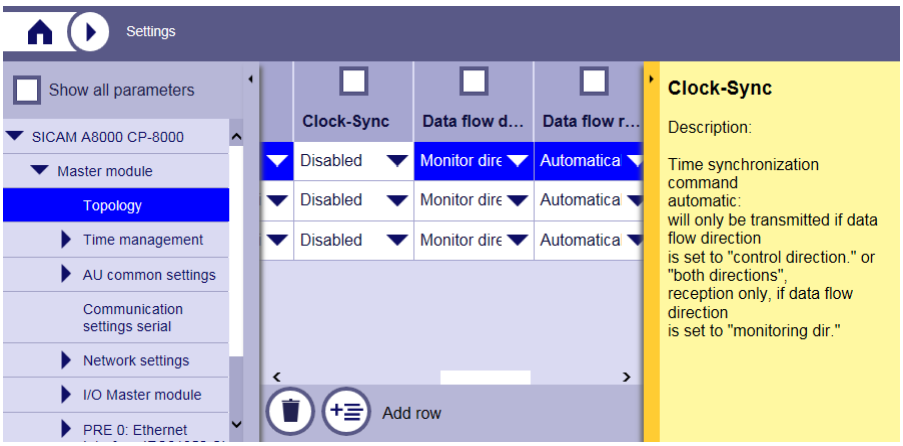
At present, a modification of periphery parameters (node I/O Master Module) is not possible.
At present, navigation is possible via mouse only (via finger in case of touch screen).
In order to carry out modifications, you have to log in as `administrator`.

This is how to retrieve information about parameters:

- In the directory tree, select any node
- You can expand or collapse each directory by clicking ▶ or ▼

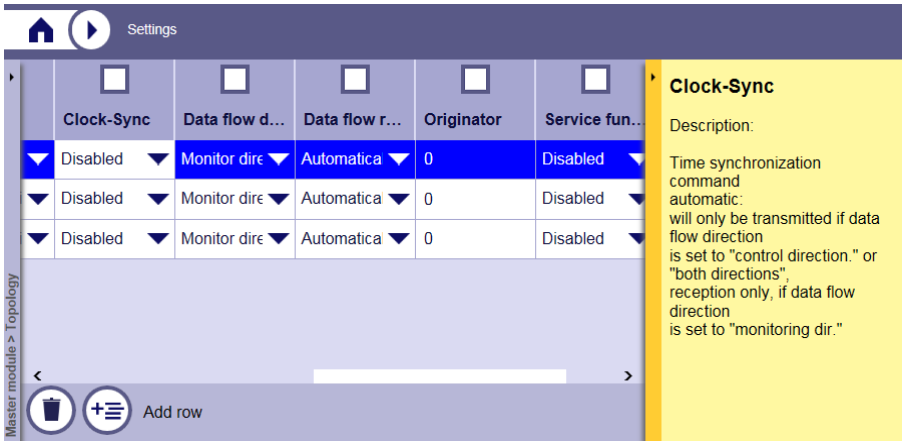
To the right of the directory tree, all parameters of the selected parameter group or table parameters (such as topology information, dataflow messages and so on) are shown in a table.

- Select the parameter group or parameter you want
- In the table, click on a value of a parameter
- For showing/hiding the description of the selected parameter, click on the yellow bar located to the right of the work area



This is how to enlarge the work area:

- For hiding the tree, and therefore enlarging the work area, click on the grey bar left to the work area



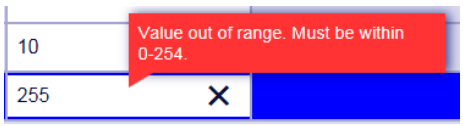
This is how to edit parameters:

Depending on the parameter, different options for the parameter entry exist:

- Click on a parameter in the table and modify the value (in the input field)
- Select a predefined value in the drop-down list

Each entered value has a specific validity range. Immediately after entering a value, a value range check will be carried out.

Only valid values will be accepted. When entering an invalid value, a red highlighted notification about the valid value range appears and the focus remains in the input field.



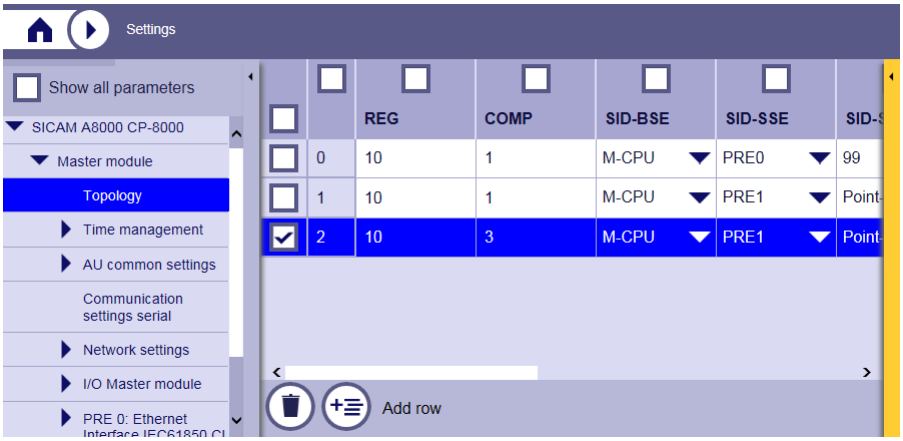
- Enter a new valid value
- Press ESC key if you want to restore the previous valid value

In case of table parameters, there is the possibility to define new rows with parameters. The procedure for that is described subsequently.

This is how to add new parameters:

- Click on the symbol

The new row containing initial values is added at the bottom of the table. These values may be modified as you wish.



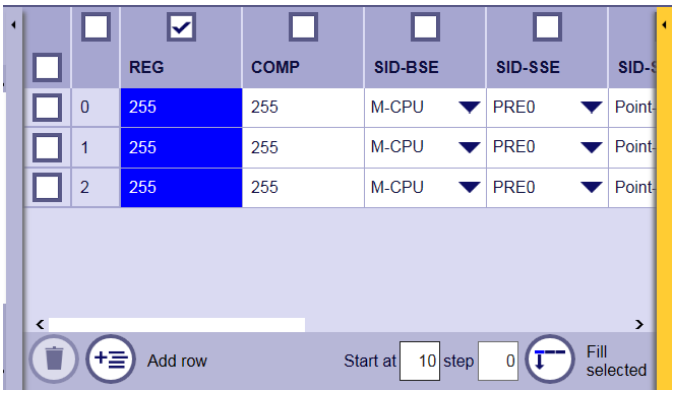
This is how to remove parameters:

- In the table, select a row by placing a checkmark on the left next to the row
- Click on the symbol for delete

This is how to fill an amount of table parameters automatically:

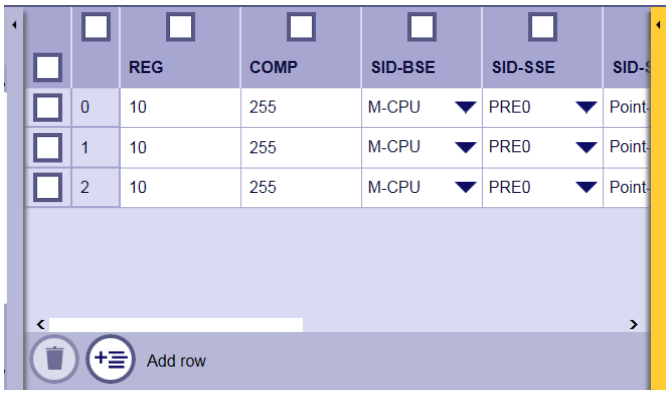
Example 1:

- Select the desired column



- Enter the start value and the increment, then click on

The selected column is now filled according to the input:

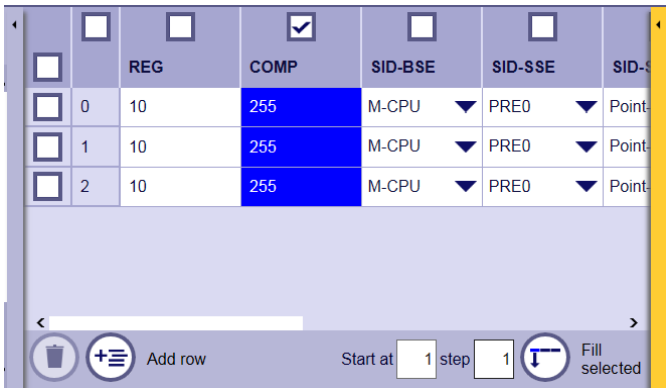


Note

The start value must be within the permitted range, the increment must be always a number.

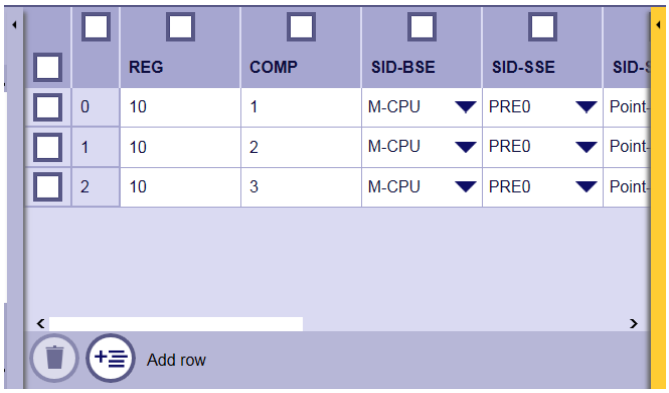
Example 2:

- Select the desired column



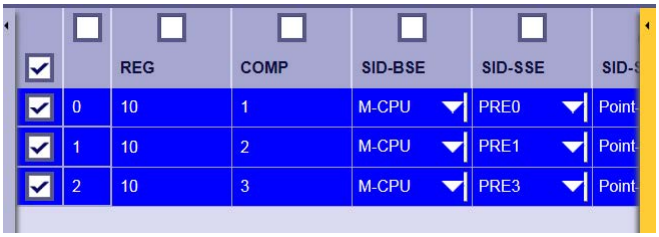
- Enter the start value and the increment, then click on

The selected column is now filled according to the input:



This is how to select all rows:

- Place a checkmark in front of the table name in the table header to place a checkmark in front of each row:



This is how to save your modifications:

- Click on the button (Apply) to save your changes

A restart with subsequent startup of the target device may be necessary after saving, refer to 9.3.1, Restart device.

Note
The storage of values is possible only with equipped SD card.

This is how to undo your modifications since the last saving procedure:

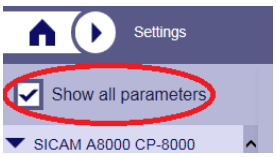
- Click on the symbol (refer to Reload)
  or
- Close the website without saving (with automatic logoff)

7.8.2.3.1 Show Expert Parameters

For the most applications not all of the available parameters are required. For special cases, additional parameters are provided (expert parameters).

To simplify the engineering of the target device, the expert parameters are hidden by default. Thereby the directory tree has a reduced number of directories and parameter tables have a reduced number of columns (no impact on the parameter table of the signals page).

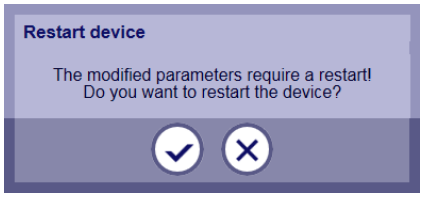
When activating the checkbox SHOW ALL PARAMETERS the expert parameters get visible:



The state of the checkbox is maintained during the current session. When logging on again, the state of the checkbox is deactivated.

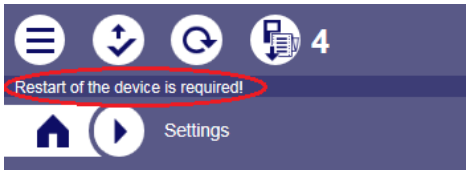
7.8.2.4 Automatic Restart Request

Under certain circumstances a restart of the device will be necessary (for instance if a changed parameter requires a restart for activation, or after updating of the SICAM WEB application). In this case, a corresponding dialog appears:



- Click , if you want to perform the restart instantly
- Click , if you want to change arbitrary further parameters yet

The restart request appears then as an indication in the headline:



You can define the moment of the restart, and with that the activation of the changed parameters, on your own. The indication is maintained also with change of the menus and also after abortion of the session. It disappears only after the performance of a startup of the target device.

For the information on execution of a restart refer to 9.3.1, Restart Device.

7.8.2.5 SICAM TOOLBOX II Locking

If the initial engineering has been performed with the SICAM TOOLBOX II, a corresponding indication appears in the header. Then only a reading access to the parameterization is possible.

7.8.2.6 Language Versions

SICAM WEB is available in the following languages:

- English
- German

The language of the GUI corresponds to the language settings of your browser. If the browser language is not supported, English will be used as the standard language.

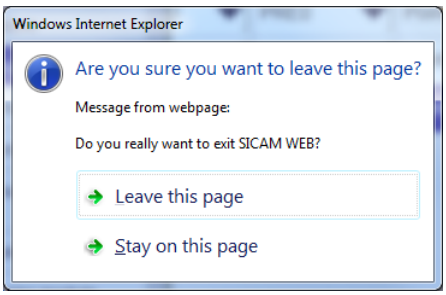
Additionally, you have the option of installing language packs, see 9.3.9, Install Language Package.

7.8.2.7 Navigation with the Web Browser

If you refresh or change the page in the web browser:

After using the functions refresh or back a new page build does not happen. An interrogation dialog of the web browser appears, whether you want to leave the page.

Example:



- If you leave the page, the session is automatically terminated and unsaved data is lost; afterwards the logon dialog appears
- If you stay on the page, you can continue workoing with the latest entered values

If you close the page in the web browser:

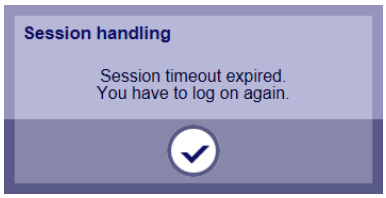
After clicking the button close of the web browser (or tab) an interrogation dialog of the web browser appears, whether you want to leave the page.

- If you leave the page, the web browser is closed, the session is automatically terminated, and unsaved data is lost
- If you stay on the page, you can continue workoing with the latest entered values

7.8.2.8 Session Monitoring

If you do not terminate a session with SICAM WEB via the menu:

An automatic logout occurs after 15 minutes of inactivity. Unsaved data is thereby lost:



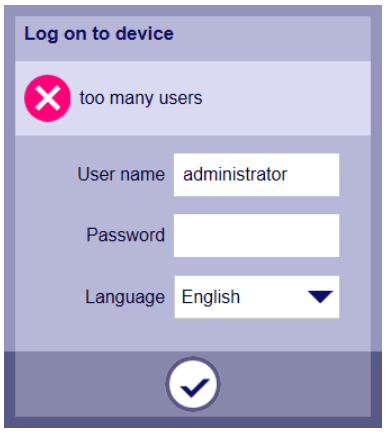
- Click OK in order to reconnect with the device, refer to 9.1.1.1, Logon

If you open a new browser window or a new browser tab:

You are already logged on at CP-8000/CP-802*x* (successful logon).

The logon dialog will appear after opening a new browser window or a new browser tab, after entering the IP address of the device and after a successful connection establishment.

With a log-on attempt, a corresponding error message will appear:



Note

Please note that no more than one `administrator` and two `guest` can be logged in to the device at the same time.

7.8.2.9 Exceptions with Engineering via SICAM WEB

The parameter records in the SICAM TOOLBOX II and in the SICAM WEB are basically identical structured. However, for the engineering via SICAM WEB some simplifications exist, hence the following functions are not supported or implemented in another manner:

- HW configuration Master Module

  The Master Module is automatically configured as soon as a SD card with the firmware *CPC80* has been installed.

- System technique I/O Master Module

  After the configuration of the I/O Master Module the I/O Modules must be configured in the OPM II. With the engineering via SICAM WEB the I/O Modules are configured automatically.

- Process technique I/O Master Module

  In contrast to the OPM II no images are applied, for each I/O Module an assignment page and a parameter page exist.
  In the assignment page the usage of the I/Os is defined (according to the assignment in the SICAM TOOLBOX II).
  In the setting page the previously configured I/Os are parameterized. There appear only the parameters relevant for the defined usage.

- Process technique protocol element

  In contrast to the OPM II no images are applied, the process technique is provided as spreadsheets (send detailed routing, receive detailed routing).

- Loading firmware of protocol elements

  Protocol elements can not be loaded slot-selectively. If for instance on PRE0 and on PRE1 the system element *UMPST0* is configured, both are loaded.

- Message simulation

  The message simulation is not supported (inserting of arbitrary messages into the system). However, there is the possibility of displaying current process values of the periphery (binary information states, integrated totals, measured values) and to set process values (commands, setpoint commands).

- Data flow test

  The data flow test is not supported (different log points, filters, etc.).

- Revision interrogation

  The current firmware revision of the Master Module is displayed in the header of the user interface, the revisions of the additional system elements (protocol elements, I/O Master Module) in the drop-down menu on the configuration page.

- Application program

  A graphical function diagram (FUD) creation is not possible, only an instruction list (IL) with ASCII format can be loaded into the target device.

- Test of the application program

  Offline simulation of the application program is not possible. A simplified online test (state display, forcing of a selectable signal) is available.

8 Engineering via SICAM TOOLBOX II

Contents

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8.2 Automation 325

This chapter is a guideline for the work with the SICAM TOOLBOX II. You find the detailed instructions for the work with the tools of the SICAM TOOLBOX II in the *SICAM TOOLBOX II Online Help* and in the *CAEx plus Online Help*.

Note

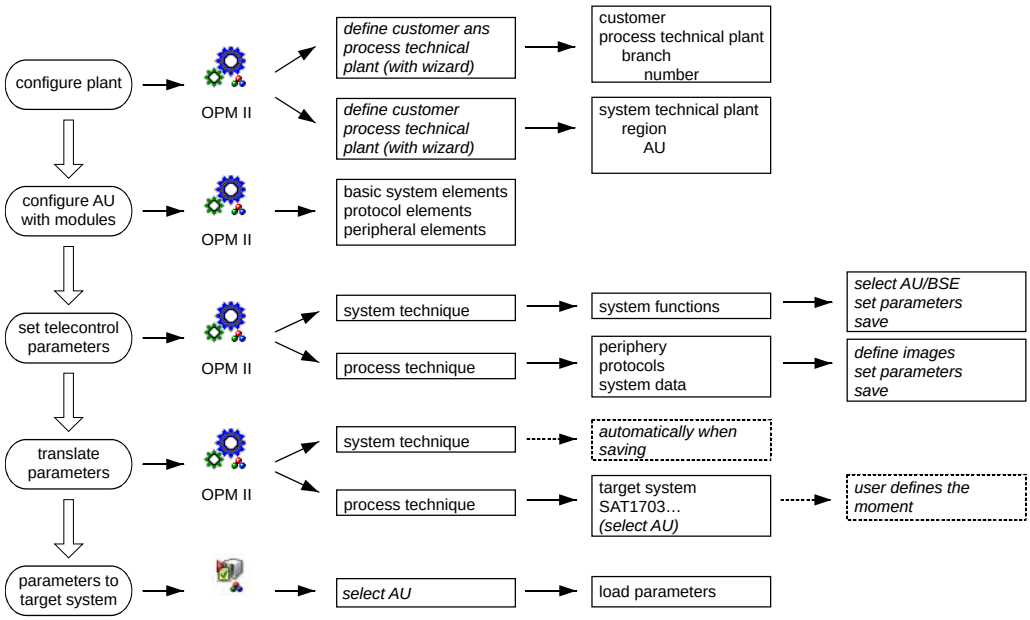
Screenshots shown in this chapter relate to the engineering of CP-8000. They apply analogously for CP-8021 and CP-8022.

8.1 Telecontrol

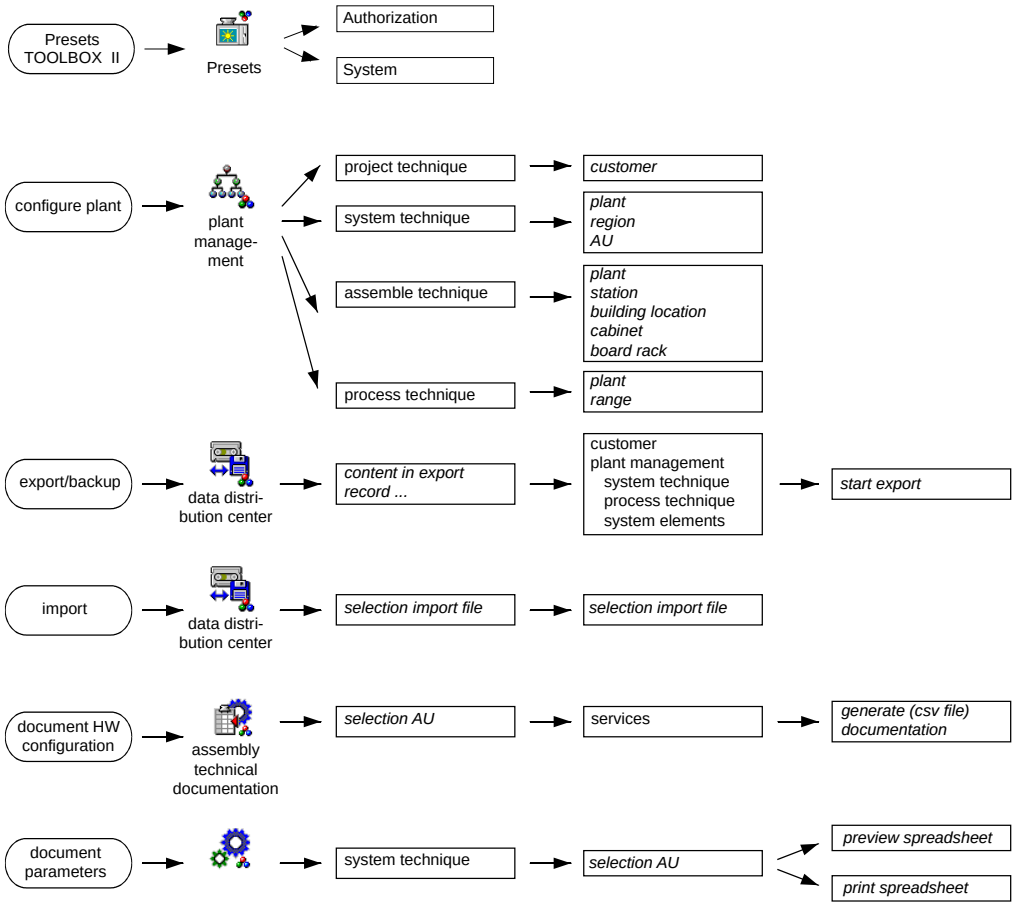
Overview of the Tasks

Task	Meaning
Presets	Define user and rights
Initialization of the plant data	Configure plant and automation unit
Import firmware	Load firmware into the SICAM TOOLBOX II
HW configuration	Selection of the installed system elements
Parameterization of the system technique	• Time management • Communication common • Protocol elements • Assignment of process signals to data points • Decentralized archive
Parameterization of the process technique	• Create images • Assign images to data points • Settings for configured process signals • Routing of send data and receive data
Bulk edit	Creation of great amounts of values of the images
Transfer parameters	Compile the set values
SD card	Write and read application data
Import/Export	Restore and backup of application data
Documentation	Prepared spreadsheets for printing • Hardware (configuration, pin assignment) • Parameters
Load parameters	Transfer parameters and function diagram to the target device
Parameter comparison	Compare settings between current project and target device
Dataflow test	Record and store dataflow in the target device
Message simulation	Send messages from the SICAM TOOLBOX II to a target device
Service function online	Read and set time of target device
ST emulation	Execute system-internal functions (only for authorized users)
Topology test	Acqusition of physically connected automation units in a SICAM RTUs automation network
Diagnosis	Read detailed information generated by the self monitoring
Read decentralized archive	Chronological display of parameterized events

Fundamental Procedure of the Parameterization



Essential Administrative Functions



8.1.1 Presets

Before you begin with the engineering of CP-8000/CP-802*x*, several basic settings are to be carried out for the work with the SICAM TOOLBOX II:

- User and rights
  - User-specific settings
- Password
- Workplace-secific settings
- Organization of the SICAM TOOLBOX II
- Language

For the access to the SICAM TOOLBOX II a logon with username and password is required.

The parameterization with the SICAM TOOLBOX II happens exclusively offline. Only the transfer of data (firmware, application data), as well as test and diagnosis are performed online via a communication connection.

The globally valid configuration parameters in the SICAM TOOLBOX II are displayed and set with the tool “TOOLBOX II Presets”. They can – dependent on the access rights – be changed at any optional time.

You find the details thereto in the *SICAM TOOLBOX II Online Help, chapter “TOOLBOX II Presets”* and *chapter “Administration of TOOLBOX II”*.

8.1.1.1 User and Rights

The following user names are predefined and can be selected. For each user name different rights are predefined.

- Type `admin`
- Type `profi`
- Type `standard`

As user name `admin` you can freely assign new user names (max. 8 characters). For each user a special role (max. 20 characters) can be assigned.

For each role certain rights can be freely selected and assigned from a list. Depending on which role a user has been assigned, he may control determined functions. An exception are the unchangeable roles, that are reserved for the Siemens specialists for maintenance purposes.

You find the details thereto in the *SICAM TOOLBOX II Online Help, chapter “TOOLBOX II Presets”, section “User/Role Administration”*.

Note

All operation and test functions of CP-8000/CP-802*x* described in this manual are generally applicable for the `admin` role available in the SICAM TOOLBOX II.

Note

From SICAM TOOLBOX II V5.11 it is possible to create domain users. Such a domain user does not use a specific SICAM TOOLBOX II user role to start SICAM TOOLBOX II, but he uses the user account for the logon on his workstation.

8.1.1.2 Password

The entrance into the SICAM TOOLBOX II is protected for each user by means of an individual password.

The preset password is equal to the predefined user name.

Note
The preset password must be changed after the first logon.

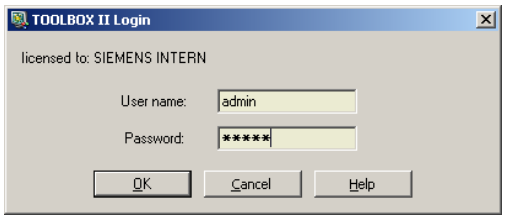
8.1.1.3 Language

The languages `Deutsch` or `English` can be selected:

8.1.2 Entrance into the Project

8.1.2.1 Logon

With the initial start of a tool of the SICAM TOOLBOX II you must enter a user name and a password. After that you are able to begin the parameterization.



A user change is possible with the tool “TOOLBOX II Presets”
(menu `Authorization` | `Login`).

8.1.2.2 Logoff

A user logoff is possible with the tool “TOOLBOX II Presets”
(menu `Authorization` | `Logout`). You can continue to operate tools that are still active, but the activation of tools requires another login.

If all tools are quit without logout, the user will remain logged in unless a logout from the Toolbox PC or Toolbox Server takes place.

8.1.2.3 Change Password

As user name `admin` you can define a password for each newly added user.

Guidelines for the Assignment of Passwords

- The password may consist of up to 8 characters
- No differentiation between upper case and lower case
- Special characters can be used
- Empty password possible (logon to the project without password)

Note
The preset password must be changed after the first logon.

8.1.3 Plant Configuration

A plant is configured according to different perspectives:

- Project technique
- System technique
- Process technique

The configuration data is in each case specifically parameterized for the different views.

With the initial creation of a plant you must enter the configuration data into the SICAM TOOLBOX II with the tool "OPM II". The entry of the parameters is thereby supported by "Wizards". The plant topology is determined based on the parameter setting of the configuration data.

After the initialization, the administration of the plant configuration can be carried out with the tool "Plant Management". With this tool the configuration data can be changed or deleted at any time.

You find the details thereto in the *SICAM TOOLBOX II Online Help, chapter "Plant Management"*.

8.1.4 Import Firmware

For the parameterization of a target device the system elements to be used must be equipped, and the belonging firmwares must be present in the SICAM TOOLBOX II.

You can import the required firmwares – if not yet present – into the data base of the SICAM TOOLBOX II with the tool “Master Data Update”. You find further information in section 11.5.1.2, Importing Master Data into the SICAM TOOLBOX II.

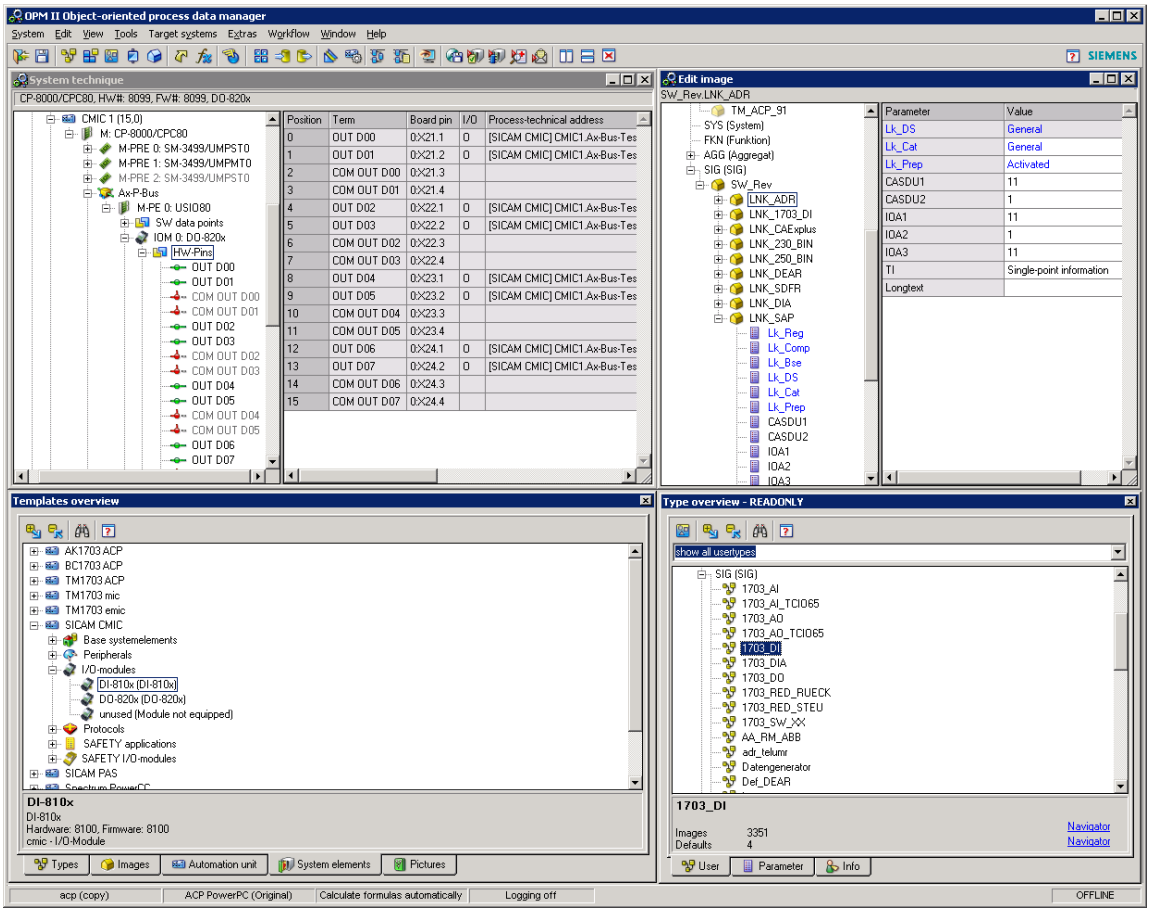
You find information on firmware files in section 7.3, Loadable Firmwares.

8.1.5 Configuration and Settings for Telecontrol

The acquisition, parameter setting and documentation for the telecontrol function and its associated data points is enabled in the SICAM TOOLBOX II mainly with the help of the tool “OPM II” (Object Orientated Process Data Manager).

The user’s guide of the OPM II can be found in the *SICAM TOOLBOX II Online Help, chapter “OPM II”*.

The description of the system-technical and process-technical settings can be found in the manual *SICAM RTUs Common Functions System and Basic System Elements, chapter “Telecontrol”*.



8.1.5.1 Hardware Configuration

Before the parameter setting a target device must be configured with the required system elements:

- Master module (details see 2.1.2, Master Module)
- Protocol elements (details see 2.1.3, Protocol Elements)
- I/O Master Module (details see 2.1.4, I/O Master Module)
  - I/O Modules (details see 2.1.5, I/O Modules)

Note

The firmware codes of the corresponding system elements must exist in the target device.

You find an overview of the available system elements and I/O Modules and their technical specification chapter 5, System Components and Technical Data.

The configuration takes place with the tool “OPM II” via the menu items `Tools` | `System Technique` and `Tools` | `Library Overview`.

By dragging the system elements of the system CP-8000/CP-802*x* from the Library Overview onto the respective target device in the system technique, the corresponding system elements are added with default parameters.

With use of I/Os, the higher-level I/O Master Module must be configured at first. After that you can drag I/O Modules onto the I/O Master Module and assign signals to the respective I/O Module (system technique).

Note

With CP-8000, the slots for the internal I/O Modules are predefined in the parameter-setting: *IOM0*: DO-8203, *IOM1*: DI-8100. For external I/O Modules, the slots *IOM2* … *IOM7* are available.

With CP-802x, the slots *IOM0*…*IOM7* are available for external I/O Modules.

When deleting an I/O Module, all the assigned signals (hardware pins and software data points) are then deleted from the plant tree.

The changed hardware configuration must be converted with the tool “OPM II”, menu `Destination systems` | `SICAM 1703 transformer`, and subsequently transmitted to the target device with the tool “Load parameters”, to become effective.

During startup the target device checks if the mechanically installed I/O Modules match the parameterization.

Note

The configuration in the "OPM II" must match the mechanically installed I/O Modules.

If you remove an I/O Module mechanically, you must delete it also in the "OPM II". If you do not adapt the configuration in the "OPM II", the target device detects this I/O Module as failed (error indication).

If you add an I/O Module mechanically without adapting the configuration in the "OPM II", this has no effects. In this case, the added I/O Module is ignored.

8.1.5.2 System-Technical Settings

The system-technical configuration of a target device resides in the window “System technique”. This can be opened via the menu `Tools` | `System technique`.

The parameter setting is carried out in the directory tree, respectively below the selected Master Module:

- Common settings
- Time management
- Communication protocols
- Network settings
- Topology
- Dataflow filter
- Periphery
- Decentralized archiving

8.1.5.2.1 Communication

The protocol is determined by configuring a protocol element suitable for the existing application and its parameterization.

For security relevant informationen refer to the *SICAM RTUs / SICAM TOOLBOX II – Administrator Security Manual*.

8.1.5.2.2 Periphery

The peripheral functions are defined by means of configuring the I/O Master Module, the I/O Modules suitable for the present application, as well as their parameters.

Below the level of the *Ax peripheral bus* the configured I/O Master Module with the configurable signals is displayed:

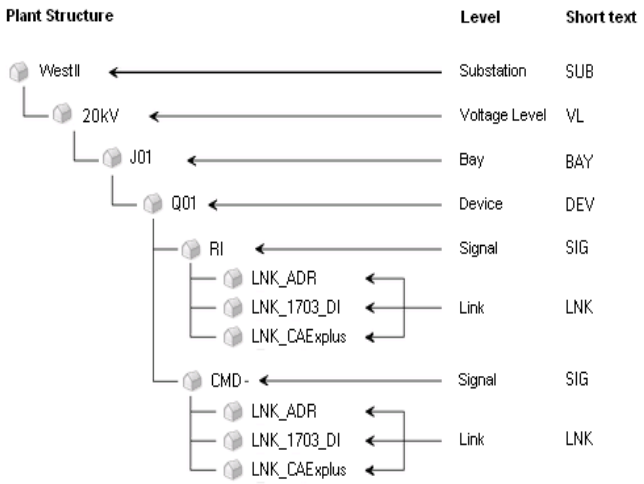
- Hardware pins
- Software data points

By means of the context menu of a hardware pin or software data point, selection `Edit image`, you get directly to the process-technical settings of the respective signal.

8.1.5.3 Process-Technical Settings

8.1.5.3.1 Levels

The process-technical plant can be structured in freely-definable hierarchy levels. The following graphic shows an example:



You find the instruction to create levels in the *SICAM TOOLBOX II Online Help, chapter "OPM II", section "Levels"*.

The process-technical settings of the system elements can be opened centrally via the menu item `Tools` | `Images`.

8.1.5.3.2 Types

Types form the template for the structure of a process-technical plant. They serve for the simplification with engineering of large quantities of objects, parameters and values.

Types of the following type categories can be defined below the levels:

- User names
- Link types
- Info types
- Parameter types

A type is defined respectively for objects, that have the same features (examples: feeder, circuit breaker, disconnector).

You find the instruction to define the different types in the *SICAM TOOLBOX II Online Help, chapter "OPM II", section "Types"*.

8.1.5.3.3 Images

Images are real objects of the plant with parameters and signals (examples: feeder north, circuit breaker Q00, disconnector Q10).

- Typified images

  Typified images can be created from the defined types, that means, each images is assigned to a type. The assigned type defines thereby the structure for the image. The structure defines which linktypes include a signal and which parameter includes a link. This structure can be changed only in the type of the belonging image. All images that are assigned to that type, adopt automatically the structure change (inheritance). The same behavior applies for default input.

  The usage of typified images is the more efficient, the more identic images are present.

- Typeless images

  Typeless images do not have a reference to the types, that means, no inheritance takes place. Typeless images are also created by structural changes of a typified image (since the image does not have the same structure as the type).

  Typeless images are advantageous, if images are only uniquely existing.

  Below typless images, typified images can be used (example: voltage level “20 kV“ is typeless since it is only uniquely existing, all feeders thereunder are typified images).

- Link images

  In the link images the parameters of the single target devices can be set.

  The signals of the libraries include as first link a so-called common link (LNK_ADR). There reside parameters (example: longtext, LAN station...) that include “references” to other links of the same signal or are source of “formulas”.

  A reference causes that upon changes of an entry in the common link the change takes place automatically in the link of the specific target device. Message address CASDU(1,2), IOA(1,2,3) and TI are generated automatically with filling of the 1703 link address (Lk_Reg, Lk_Komp, Lk_BSE, Lk_ZSE, Lk_DP) by means of formulas and references and do not have to be entered.

You find the instruction for the creation of images in the *SICAM TOOLBOX II Online Help, chapter "OPM II", section "Images"*.

Parameterization of the Process Signals and Assignment to the System Technique

The parameters for the technological processing of process signals reside in the directory tree below the link images:

- Addressing
- Signal preprocessing
- Signal postprocessing

You find the description of the parameters in the *SICAM TOOLBOX II Online Help, chapter "Parameter Documentation"*.

You find the description of the technological processing of inputs and outputs of the process periphery in the manual *SICAM RTUs Common Functions Peripheral Elements According to IEC 60870-5-101/104*.

The assignment of a process signal to a hardware pin or software data point in the system technique takes place by means of assignment (alternatively automatical or manual). You find the instruction thereto in the *SICAM TOOLBOX II Online Help, chapter "Parameter Documentation", section “Assign”*.

8.1.5.4 Decentralized Archiving (DEAR)

The decentralized archive serves for the local storage of events of a substation, and - whenever necessary - for the transmission to the control system. By means of that, it is for instance possible to recover the archive of a control system after a communication fault.

In the decentralized archive all the data points used in the substation can be acquired.

You can configure the archive in the system technique of the “OPM II” (parameter group `Decentralized archiving` of the respective automation unit). In the images you can define the process-technical settings of the data points to be acquired. During operation, these data points are archived chronologically upon status change. This applies for all commands and binary information items of the send and receive direction.

You find the detailed information on the settings in the manual *SICAM RTUs Common Functions System and Basic System Elements, chapter “Telecontrol”, section “Decentralized Archiving”*.

8.1.6 Transform Parameters

Before loading into the target device, the process-technical parameters of the plant must be transformed. This can be carried out with the tool “OPM II” through selection of the menu `Destination systems` | `SICAM 1703…` | `SICAM 1703 Transformer`.

System-technical parameters are automatically transformed when saved.

You find the details thereto in the *SICAM TOOLBOX II Online Help, chapter “OPM II”, section “Transform and Load”, “SICAM RTUs”*.

8.1.7 Import, Export and Backup of Engineering Data

The tool “Data Distribution Center” enables the importing and exporting of parameters, as well as the creation of backup files.

You find the details thereto in the *SICAM TOOLBOX II Online Help, chapter “Data Distribution Center”*.

8.1.8 Documentation

With the tool “OPM II” you can generate and print the documentation of the engineering data:

- Hardware configuration
- Assembly technique
- Interface to Elcad
- Telecontrol function
  - System-technical configuration
  - Process-technical settings

You find the details thereto in the *SICAM TOOLBOX II Online Help, chapter “OPM II”, section “System Technique”, section “Documentation”*.

8.1.8.1 Hardware Configuration

You can initiate the documentation of the system elements in the plant tree of the menu System technique , via the context menu of the automation unit.

The output takes place as a table in a file (format *.csv*) or to a printer.

With the tool “HW-FW Configuration” you can assign the required assembly-technical information to the system elements.

8.1.8.2 Assembly Technique

You can initiate the documentation of the assembly-technical configuration in the plant tree of the menu System technique , via the context menus of the I/O Modules.

The output takes place as a table with adjustable layout, optionally as preview on the screen or to a printer.

The documentation extends over the HW pins of the respective I/O Module and contains:

- Slot and type of I/O Module
- System-technical address of each pins within the message
- Process-technical address of each pins within the message
- Common information of a pin (long text)
- Assignment of the pins to a link image in the “OPM II”

8.1.8.3 Interface to ELCAD

For the coupling with the design tool ELCAD, it is possible to transfer images that are assigned to a system element via this defined interface.

The output takes place to a text file (format *asc*).

The generation of the file takes place via selection of the menu Destination systems | SICAM 1703... | SICAM 1703 Transformer.

You find the details thereto in the *SICAM TOOLBOX II Online Help, chapter “OPM II”, section “Elcad”*.

8.1.8.4 Telecontrol Function

8.1.8.4.1 System-Technical Configuration

You can initiate the documentation of the system-technical configuration in the menu System technique, via the context menu of an automation unit or of a specific system element.

The output takes place as a spreadsheet, optionally as preview on the screen or to a printer.

8.1.8.4.2 Process-Technical Settings

You can initiate the documentation of the process-technical settings in the tree of the menu Edit image, via the context menu of a selected hierarchical level.

The output takes place as a spreadsheet, optionally as preview on the screen or to a printer.

8.1.9 Commissioning and Test

For commissioning and test of the projected settings the following functions are available (online):

- Load engineering data
- Parameter comparison
- Test functions
- Diagnosis (see section 11.3.2, SICAM TOOLBOX II)

For these functions the engineering PC must be connected with the target device (see 7.7.1, SICAM TOOLBOX II).

8.1.9.1 Loading Engineering Data

The loading of the parameters of a process-technical plant from the PC into the target device takes place with the tool “Load Parameters”. You can launch it from the “OPM II” via the menu Target systems | SICAM 1703 | Parameter loader, or directly via the start menu of your PC.

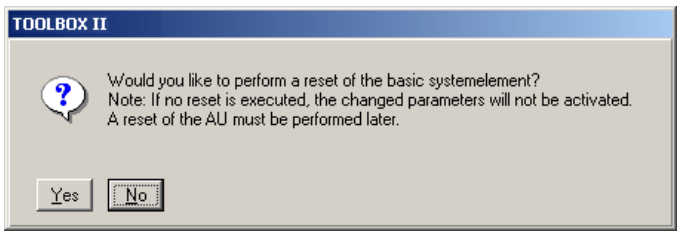
With the tool “Parameter Loader” you can add and select automation units, and initiate the loading via the menu Load | Selected Aus.

All settings that have been performed in the SICAM TOOLBOX II are thereby saved jointly on the SD card of the target device:

- Configuration parameters
- System-technical parameters
- Process-technical parameters (if they have been transformed previously)
- Application program (if code has been generated previously)

For the loading of the parameters there are different variants available:

- Load intelligent
  - only the changed parameters are loaded into the target device
  - can be applied locally or remotely
  - after the loading of the parameters an automatic startup of the target device is performed (for each selected automation unit a corresponding notification appears subsequently)
- Load unconditional
  - all parameters are loaded into the target device
  - can be applied locally or remotely
  - after the loading of the parameters an automatic startup of the target device is performed (for each selected automation unit a corresponding notification appears subsequently)
- Initialize
  - all parameters are deleted in the target device, and all parameters newly transferred
  - can be applied only with the locally connected automation unit
  - is used for the first loading of an automation unit or of a Master Module
  - if a changed parameter requires a startup of the Master Module, a notice appears after the loading, whether the startup is to be performed immediately or at a later time – for instance if further changed parameters are to be activated jointly



You find the details thereto in the *SICAM TOOLBOX II Online Help, chapter “Service Programs”, section “Parameter Loader”*.

Caution

During a loading operation, the switching off of the target device is to be absolutely avoided, since the data on the flash card could be destroyed as a result.

8.1.9.2 Parameter Comparison

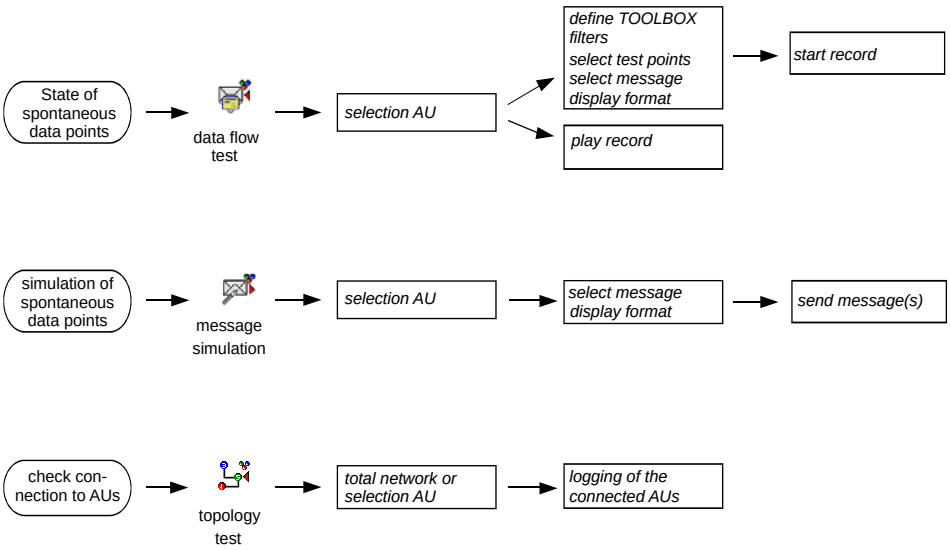
With the tool “Parameter Loader” you can check whether the parameter status in the target device is current. You can select an automation unit and start the comparison via the menu `Parameter | Comparison AUs <-> Toolbox`).

For each selected automation unit appears the indication whether the parameters are current or not current.

8.1.9.3 Test Functions

The following test functions are available:

- Data flow test
- Message simulation
- Topology test



8.1.9.3.1 Status Of Spontaneous Data Points

With the tool "Data Flow Test" data streams (flow of messages) can be simultaneously logged and visualized. For a subsequent analysis - also at another location - a recording can take place with the Interface Recorder.

The function `Simultaneous log` serves for the recording of messages within the internal data flow of an automation unit. In protocol elements, the data flow from and to other automation units can also be acquired.

The following data can (with change of the spontaneous data) be simultaneously logged:

- Change of state of inputs/outputs
- Communication from and to protocol elements
- Data traffic from and to the application program
- Data traffic from and to special functions (for example set counters, set time)

By means of triggering a General Interrogation all spontaneous input signals can be simultaneously logged at any arbitrary time.

You find the instruction for this test function in the *SICAM TOOLBOX II Online Help, chapter "Service Programs“, section "Data Flow Test"*.

You find further information in the manual *SICAM RTUs Common Functions System and Basic System Elements, chapter "System Services", section "Data Flow Test"*.

8.1.9.3.2 Simulation Of Spontaneous Data Points

With the tool "Message Simulation" messages can be transmitted from the SICAM TOOLBOX II to automation units. Just one message or up to 100 messages in succession can be transmitted; in addition sequential delays and message repetitions can be defined.

The messages can be passed in at defined points of the system. With this function the following possibilities exist:

- Setting of outputs
- Simulation of the communication from and to protocol elements
- Data traffic from and to the application program
- Data traffic from and to special functions (for example set counters, set time)

Pay attention that due to the simulation the plant state can change.

Warning

The manual controlling of outputs with the plant running can lead to damage to persons and machines. Ensure that aggregates in the control area of the command output and those subsequent aggregates in the process chain are protected and that persons in the vicinity are warned.

You find the instruction for this test function in the *SICAM TOOLBOX II Online Help, chapter "Service Programs“, section "Message Simulation"*.

You find further information in the manual *SICAM RTUs Common Functions System and Basic System Elements, chapter "System Services", section "Message Simulation"*.

8.1.9.3.3 Check The Connection To Automation Units

The tool "Topology Test" is used for the acquisition of all automation units in a SICAM RTUs automation network that are reachable or non-reachable from the automation unit momentarily physically connected.

You find the instruction for this test function in the *SICAM TOOLBOX II Online Help, chapter "Service Programs“, section "Topology Test"*.

8.1.9.4 Displaying Decentralized Archive (DEAR)

The current contents of DEAR can be displayed with the tool “OPM II”.

Via the context menu of the automation unit, submenu Display decentral archiving... , you get to the file directory.
Then select a file and click on the button Display archives to display the respective records.

Note

The data records of the decentralized archive are registered in configurable files. The files are stored on the SD card. The record of data points is therefore only possible with equipped SD card.

Example

IOA1	IOA2	IOA3	Name	Type	Length	Time
002	000	000	00013	File	0	07.07.04 01:45:00.000
003	000	000	00014	File	0	07.07.04 02:40:00.000
004	000	000	00015	File	0	07.07.04 03:34:00.000
005	000	000	00016	File	0	07.07.04 04:28:00.000
006	000	000	00017	File	0	07.07.04 05:22:00.000
007	000	000	00018	File	0	07.07.04 06:16:00.000
008	000	000	00019	File	0	07.07.04 07:10:00.000
009	000	000	00020	File	0	07.07.04 08:05:00.000
010	000	000	00021	File	0	07.07.04 08:56:00.000

You can save the displayed records of DEAR in a file (Format *.csv*) on the engineering PC.

You find the information thereto in the *SICAM TOOLBOX II Online Help, chapter “OPM II”, section “System Technique”, “General”, “SICAM RTUs”, “Decentral Archive Display”*.

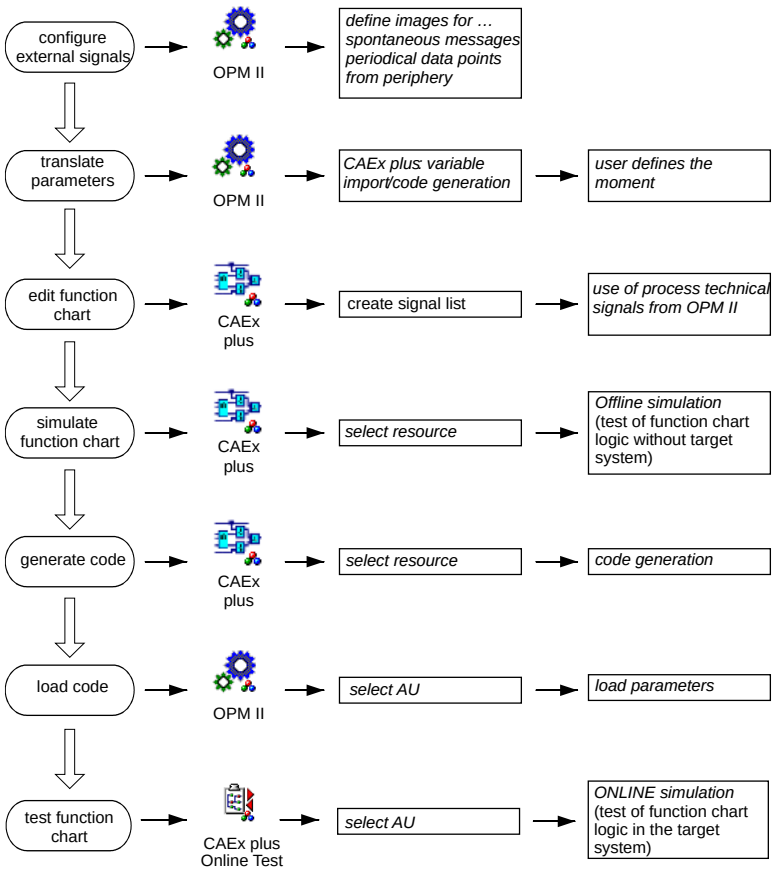
8.2 Automation

For the implementation of freely definable *open-/closed-loop control functions* you can create optionally an application program as function diagram.

Overview of the Tasks

Task	Meaning
Configure external signals	Create images for spontaneous and periodical data points
Create function diagram	Edit the application program
Simulate function diagram	Offline test of the application program
Generate program code	Compile application program
Load program code	Transfer application program into the target device
Perform startup	Initialize application program in the target device
Test function diagram	Online-Test des Anwenderprogramms
Documentation	Prepare application program for printing

Fundamental Procedure of the Programming



8.2.1 Creating a Function Diagram with CAEx *plus*

For the creation of a function diagram (FUD) the tool “CAEx *plus*” is required. This provides various editors and standard libraries for the creation of the *open-/closed-loop control function*.

The process-technical functions of a plant are created with the function diagram editor (FBD Editor). A function diagram is thereby created by the interconnection of

- predefined functions and function blocks (CP-8000/CP-802*x* library)
- functions and function blocks defined by the user

You find the description of the editor in the *CAEx plus Online Help, chapter “Editors”*.

Additional information can be found in the *SICAM TOOLBOX II Online Help, chapter “Tutorials”, section “CAEx plus”*.

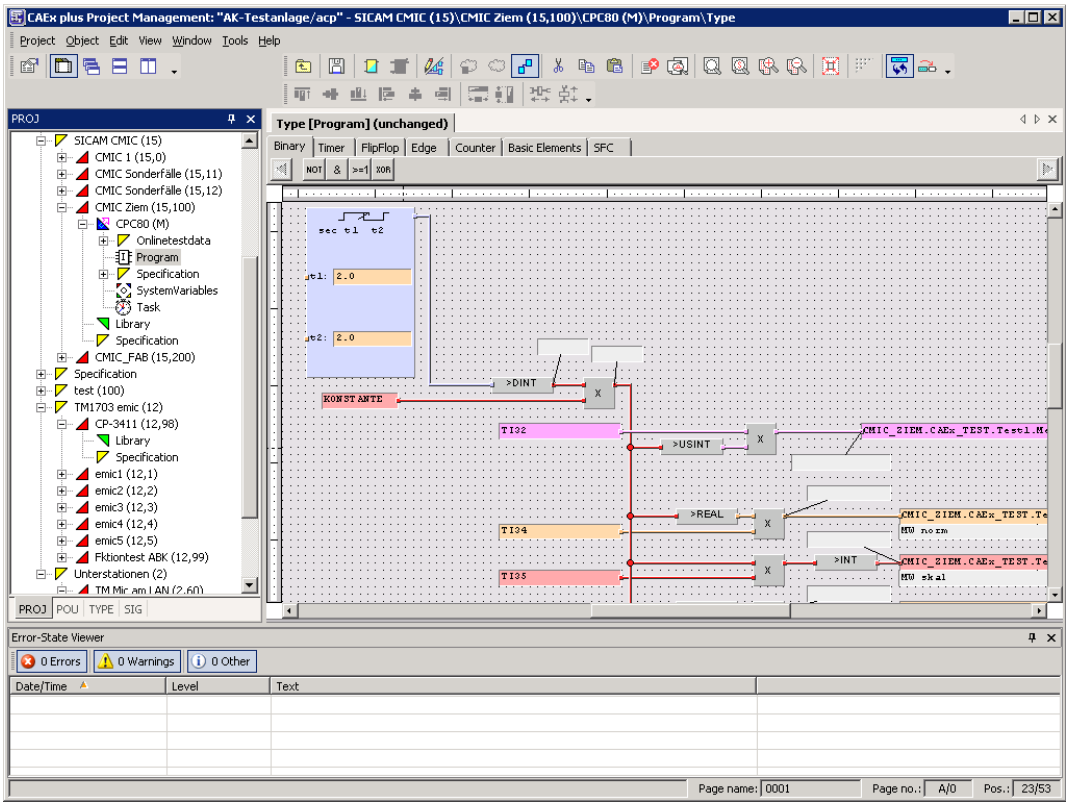
You find the most important characteristic values (limits) for the creation of the *open-/closed-loop control function* in section 5.4.1, CP-8000 and 5.4.2, CP-8021 and CP-8022.

You find the technical details for the processing of the *open-/closed-loop control function* and its partial functions in the manual *SICAM RTUs Common Functions System and Basic System Elements, chapter “Automation”, section “Restricted Open-/Closed-Loop Control Function”, “Application Program” | ”Function Diagram”*.

Note

Optionally to the creation of a function diagram, an instruction list (IL) with ASCII format can be imported in “CAEx *plus*” (tool “OPM II”, context menu of the CPU, `Instruction list` | `Import from file`).

Function Diagram (Example)



8.2.1.1 Restrictions with the Creation of a Function Diagram

For the creation of a function diagram several exceptions must be paid attention to:

- Blocks and data types

  In the type instance and in the application blocks of the AU library, only blocks and data types supported by CP-8000/CP-802*x* can be used.

- Signals from the signal list

  From the signal list only signal types supported by CP-8000/CP-802*x* can be used in the type instance (for instance the message with TI 38 – “protection event” is not allowed). The check is performed via the data type of the signal. Also the system data point from the signal list can not be used in the type instance.

- System data points

  These are available as global variables in the global variable object “System info” in the resource. These global variables can be used in the FUD.

- Type identifications

  Since the type identifications supported by CP-8000/CP-802*x* are restricted, a check is performed during the creation of the FUD. Messages with not supported type identifications can not be used in the FUD.

- Non-volatile states

  If messages or inputs/outputs of blocks are set to “retain” in the FUD, then a corresponding warning is output upon the code generation.

- CASDU

  All the information that is produced in the application program of CP-8000/CP-802*x* has the same CASDU in the message address. Thereby it is necessary that for parameter-settable messages that originate in the application program, the same CASDU is assigned in the CAEx *plus* link (see 9.1.3.1.1, Application Program). With “wrong” setting in the “OPM II” the code generaration aborts with a corresponding error information.

  For input messages in the FUD an arbitrary message address can be assigned.

- Status bit „Class 1“

  This is not supported by the FUD (priority management of the communication function).

- Status bit „R“ (redundancy)

  This can not be set by the target device. Using the redundancy bit a warning will be output upon code generation.

- Additional attributes

  These are not supported by CP-8000/CP-802*x*. Upon code generation these attributes are not taken account of, and neither a warning nor an error will be output.

- Periodical datapoints

  CP-8000/CP-802*x* does not support periodical links (1703 links with use in the FUD, no evaluation of the parameter `use_caex_plus`). With periodical use, the variables must be entered directly in the FUD (system variables with predefined names). These system variables can be found in the *SICAM TOOLBOX II Online Help* in the datenpoint description of the I/O Master Module firmware (internal key 92128 up to 92255).

You will find further information in the manual *SICAM RTUs Common Functions System and Basic System Elements, chapter “Automation”, section “Restricted Open-/Closed-Loop Control Function”*.

You will find some selected program examples in appendix B, Examples for Instruction Lists (IL).

8.2.1.2 Configuring External Signals

The I/O's are integrated into the Function Diagram via the Signal List. Dependent from the fact, whether the target device is engineered via the SICAM TOOLBOX II or via the SICAM WEB, the Signal List can be alternatively

- generated with the tool "OPM II"
- imported from a local parameterization (see thereto section 8.1.7, Import, Export and Backup of Engineering Data)

The signals of the process-technical plant can be used by "CAEx *plus*" after the transformation (see section 8.1.6, Transform Parameters). The structure of the project tree automatically adapts to the structure from the "OPM II".

An introduction how to create a project can be found in the *CAEx plus Online Help, chapter "First Steps"* and *chapter "Additional Products", section "Signal List (Optional)"*.

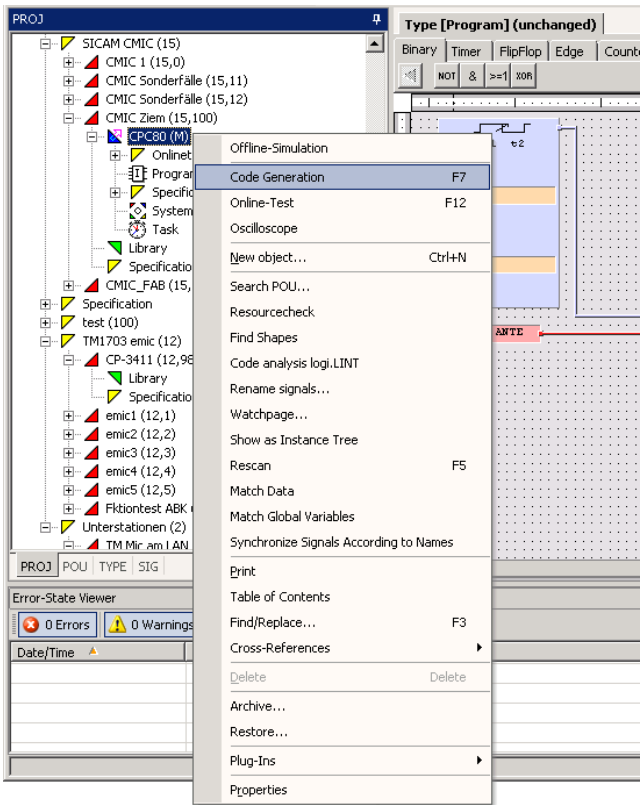
8.2.1.3 Program Code Generation

Before the loading of the *open-/closed-loop control function* into the target device, the program code must be generared.

You can start the code generation via the following ways:

- CAEx *plus* Transformer
- CAEx *plus*, via the context menu of the Master Module (*<firmware>*)

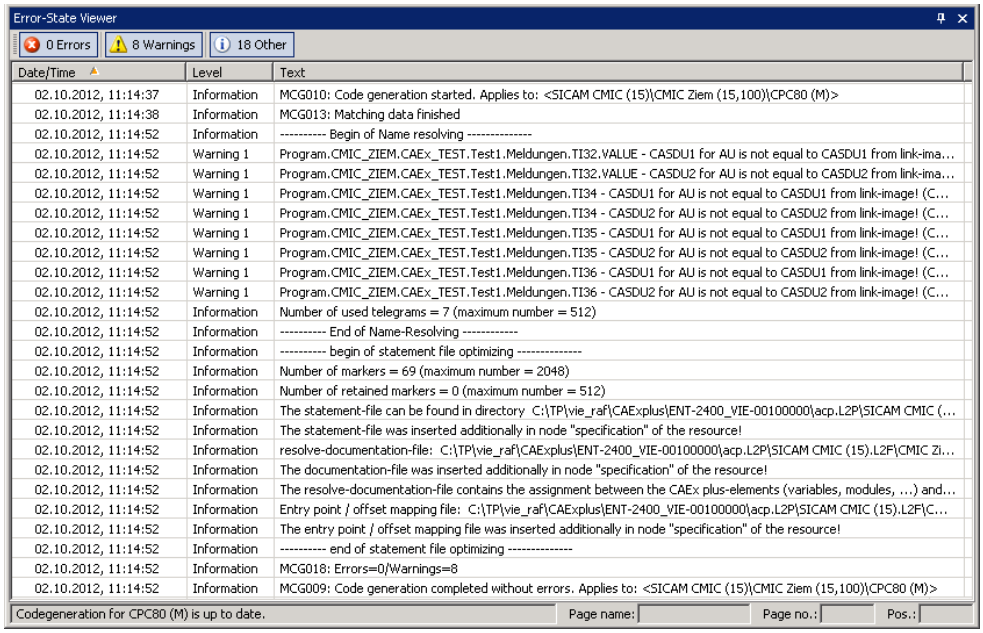
Start of the Program Code Generation



The function diagram is now translated and checked by a compiler. Simultaneously the program code is created as instruction list (IL) in the folder “Specification”.

Via the menu `Tools` | `Error-state viewer` you can activate the notification display of the code generation. There are recorded common notifications (as for instance information about the occupied storage space for code and variables), as well as detected errors in detail.

Error State of the Compiler



Date/Time	Level	Text
02.10.2012, 11:14:37	Information	MCG010: Code generation started. Applies to: <SICAM CMIC (15)\CMIC Ziem (15,100)\CPC80 (M)>
02.10.2012, 11:14:38	Information	MCG013: Matching data finished
02.10.2012, 11:14:52	Information	---------- Begin of Name resolving ----------
02.10.2012, 11:14:52	Warning 1	Program.CMIC_ZIEM.CAEx_TEST.Test1.Meldungen.TI32.VALUE - CASDU1 for AU is not equal to CASDU1 from link-ima...
02.10.2012, 11:14:52	Warning 1	Program.CMIC_ZIEM.CAEx_TEST.Test1.Meldungen.TI32.VALUE - CASDU2 for AU is not equal to CASDU2 from link-ima...
02.10.2012, 11:14:52	Warning 1	Program.CMIC_ZIEM.CAEx_TEST.Test1.Meldungen.TI34 - CASDU1 for AU is not equal to CASDU1 from link-image! (C...
02.10.2012, 11:14:52	Warning 1	Program.CMIC_ZIEM.CAEx_TEST.Test1.Meldungen.TI34 - CASDU2 for AU is not equal to CASDU2 from link-image! (C...
02.10.2012, 11:14:52	Warning 1	Program.CMIC_ZIEM.CAEx_TEST.Test1.Meldungen.TI35 - CASDU1 for AU is not equal to CASDU1 from link-image! (C...
02.10.2012, 11:14:52	Warning 1	Program.CMIC_ZIEM.CAEx_TEST.Test1.Meldungen.TI35 - CASDU2 for AU is not equal to CASDU2 from link-image! (C...
02.10.2012, 11:14:52	Warning 1	Program.CMIC_ZIEM.CAEx_TEST.Test1.Meldungen.TI36 - CASDU1 for AU is not equal to CASDU1 from link-image! (C...
02.10.2012, 11:14:52	Warning 1	Program.CMIC_ZIEM.CAEx_TEST.Test1.Meldungen.TI36 - CASDU2 for AU is not equal to CASDU2 from link-image! (C...
02.10.2012, 11:14:52	Information	Number of used telegrams = 7 (maximum number = 512)
02.10.2012, 11:14:52	Information	---------- End of Name-Resolving ----------
02.10.2012, 11:14:52	Information	---------- begin of statement file optimizing ----------
02.10.2012, 11:14:52	Information	Number of markers = 69 (maximum number = 2048)
02.10.2012, 11:14:52	Information	Number of retained markers = 0 (maximum number = 512)
02.10.2012, 11:14:52	Information	The statement-file can be found in directory C:\TP\vie_raf\CAExplus\ENT-2400_VIE-00100000\acp.L2P\SICAM CMIC (...
02.10.2012, 11:14:52	Information	The statement-file was inserted additionally in node "specification" of the resource!
02.10.2012, 11:14:52	Information	resolve-documentation-file: C:\TP\vie_raf\CAExplus\ENT-2400_VIE-00100000\acp.L2P\SICAM CMIC (15).L2F\CMIC Zi...
02.10.2012, 11:14:52	Information	The documentation-file was inserted additionally in node "specification" of the resource!
02.10.2012, 11:14:52	Information	The resolve-documentation-file contains the assignment between the CAEx plus-elements (variables, modules, ...) and...
02.10.2012, 11:14:52	Information	Entry point / offset mapping file: C:\TP\vie_raf\CAExplus\ENT-2400_VIE-00100000\acp.L2P\SICAM CMIC (15).L2F\C...
02.10.2012, 11:14:52	Information	The entry point / offset mapping file was inserted additionally in node "specification" of the resource!
02.10.2012, 11:14:52	Information	---------- end of statement file optimizing ----------
02.10.2012, 11:14:52	Information	MCG018: Errors=0/Warnings=8
02.10.2012, 11:14:52	Information	MCG009: Code generation completed without errors. Applies to: <SICAM CMIC (15)\CMIC Ziem (15,100)\CPC80 (M)>

The exact description of this tool resides in the *CAEx plus Online Help, chapter “Target System Connection”, section “Functions for Target System Connection”, section “Code Generation”*.

The code generation can be started independently from “CAEx *plus*” with the tool “OPM II” through selection of the menu `Destination systems` | `CAEx plus...` | `signal list/generate code`. Thereby a signal list is created for the processing of the parameterized signals in the *open-/closed-loop control function* and read into “CAEx *plus*”.

You find the details thereto in the *SICAM TOOLBOX II Online Help, chapter “OPM II”, section “Transform and Load”, “CAEx plus”*.

8.2.2 Documentation

8.2.2.1 Cross Reference List

With the tool “CAEx *plus*” a cross reference list over the project hierarchy can be generated, displayed on the screen, or printed.

The cross reference list refers alternatively to

- Entire function diagram of the selected Master Module
- Single program organization unit (POU)

It is executed via the respective context menu `Cross-references`.

You find the details thereto in the *CAEx plus Online Help, chapter “Basics”, section “Default Operating Elements”, section “Commands of the Pop-Up Menus”*.

8.2.2.2 Open-/Closed-Loop Control Function

In the project hierarchy of the tool “CAEx *plus*”, by selecting one of each level, by means of pop-up menu the function `Print` can be executed. The print operation is started on the default printer of the PC.

You find the details thereto in the *CAEx plus Online Help, chapter “Basics”, section “Default Operating Elements”, section “Commands of the Pop-Up Menus”, section “Print in Project Management”*.

Additional information can be found in the *CAEx plus Online Help, chapter “Basics”, section “Default Properties”* as well as *chapter “Lists and References”, section “Designing Printouts with DXF”*.

Further extensive possibilities for the documentation are provided by the optional function `Document Management` (additional product for “CAEx *plus*”).

You find the details thereto in the *CAEx plus Online Help, chapter “Additional Products”, section “Documents Management (optional)”*.

8.2.3 Commissioning and Test

8.2.3.1 Loading Program Code

To load the compiled program code into the target device, the engineering PC must be connected with the target device (see 7.7, Connecting Engineering PC with the Target Device).

The loading of the program code into the target device takes place jointly with the parameters set in the “OPM II”. Thereto the tool “Parameter Loader” must be used (see also section 8.1.9.1, Loading Engineering Data).

Caution

During a loading operation, the switching off of CP-8000/CP-802*x* is to be absolutely avoided, since the data on the SD card could be destroyed as a result.

You find the technical description thereto in the manual *SICAM RTUs Common Functions System and Basic System Elements, chapter “Automation”, section “Open-/Closed-Loop Control Function” | “Loading of Application Program (Reload)”*.

You find the instruction for the operation in the *SICAM TOOLBOX II Online Help, chapter “Service Programs”, section “Parameter Loader”*.

8.2.3.2 Test Functions

The following test functions are available:

- Simulating Function Diagram Offline
- Testing Function Diagram Online

8.2.3.2.1 Simulating Function Diagram Offline

The logic operations of a function diagram can be tested in “CAEx *plus*” with the `Offline simulation` .

This function can be called via the context menu of the Master Module, program instance or type instance. You can find the details thereto in the *CAEx plus Online Help, chapter “Additional Products”, section “Offline Simulation”*.

The oscilloscope function serves for the chronological representation of analog values and binary values during the offline simulation of the function diagram.

You find exact details thereto in the *CAEx plus Online Help, chapter "Additional Products", section "Logic Analysis with Oscilloscope Functions"*.

8.2.3.2.2 Testing Function Diagram Online

With the tool "CAEx *plus*", all open- and closed-loop technical tasks in processing elements of the system can be tested online.

This function can be called via the context menu of the Master Module *<firmware>*, selection ONLINE Test.

The following test functions are available:

- Display and force values
- Test switch input/output messages, input/output process images of the periphery
- Changing the execution status of the *open-/closed-loop control function*
  - Stop controller
  - Start controller
  - Perform cold start of the resource
  - Perform warm start of the resource
  - Halt task
  - Continue task
  - Perform cold start of a task
  - Perform warm start of a task
  - Halt program
  - Continue program
- Setting breakpoints
- Real time archive
- Display status information
- Read and write variables

The technical description of the online test function can be found in the manual *SICAM RTUs Common Functions System and Basic System Elements, chapter "Automation", section "Online Test"*.

The details for operation can be found in the *CAEx plus Online Help, chapter "Target System Connection", section "Functions for Target System Connection"*.

Note

With user program running, the simulated value of a variable is statically overwritten. In contrast to this, inputs/outputs are not statically overwritten, rather only with a change to their process image (edge-triggered).
With user program stopped, simulated values are retained.

9 Engineering via SICAM WEB

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9.3 Administrative Functions 473

This chapter describes how CP-8000/CP-802*x* can be parameterized via SICAM WEB, which possibilities exist for the loading and saving of data, and how an application program can be created.

Note

Screenshots shown in this chapter relate to the engineering of CP-8000. They apply analogously for CP-8021 and CP-8022.

9.1 Telecontrol

Overview of the Tasks

Task	Meaning
Start and terminate session	• Log on to the target device • Log off from the target device
Presets	• Define passwod • Set IP adresses
Common settings	• Configuration of the target device • Topology (routing of send data and receive data) • Failure behavior upon error
Hardware configuration	• Add or remove protocol element • Add or remove I/O Master Module
Time management	• Time settings • Local time setting • Time synchronization
Communication	• Settings of the messages • Interface for the communication • Transmission facility
Periphery	• Configuration of the signals • Signal list import/export • Settings for configured signals
Administration	• Restart device • Save device settings • Recover device settings • Firmware update • Install language package • Set date and time
Test functions	• Display of input/output signal states • Forcing of output signals
Event list	Chronological display of the occurred events
Alarm list	Chronological display of the occurred alarms
Diagnosis	Indications generated by the self monitoring

Preconditions for the Engineering

For the engineering via SICAM WEB the steps according to section 7.7.2, SICAM WEB must be performed:

- Firmware *CPC80* (as of rev. 10) is on the SD card
- Firmware *SWEB00* (as of rev. 03) is on the SD card
- SD card is installed in the target device
- Target device is switched on
- Physical connection to the target device is established
- IP addresses for target device and/or engineering PC are configured

9.1.1 Start and Terminate Session

9.1.1.1 Logon

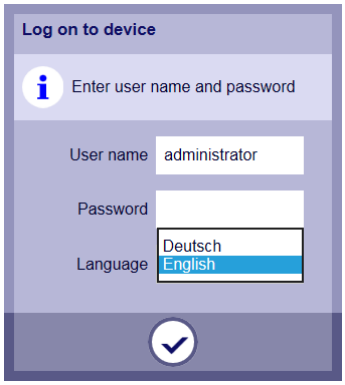
Prerequisite: the device is in operation and reachable via its IP address.

This is how to establish a connection to the Web server of the device:

- Open your browser
- In the URL field of your browser, enter the IP address of the device
- Confirm with the Enter key

After connection establishment the *Logon* dialog appears.

The language of the *Logon* dialog corresponds to the language settings of your browser/operating system.



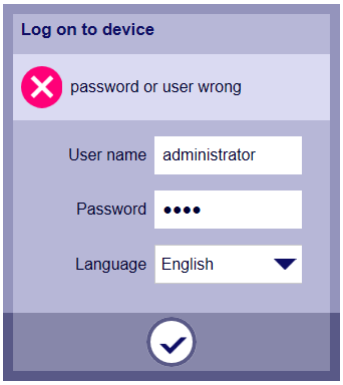
For the entrance into a target device, the following entries are required:

- Input field USER NAME (entry user name)
  - `administrator`
  - `guest`
- Input field PASSWORD (entry of a password)
  - preset:
- Dropdown list LANGUAGE (selection of the language)
  - `English`
  - `Deutsch`
- Click

If a connection via GPRS is used, the Dashboard will appear at the latest after 20 seconds. The session with the web server of the target device has started.

As user name `administrator` you can begin now with the parameter-setting.

In case of missing entries or inconsistent entries regarding user name and password, a corresponding error message will appear in a red line of the *Logon* dialog:



- Re-enter user name and password

After entering of a valid user name/password

- Click

After sussessful logon the Dashboard of the SICAM WEB application will appear.

9.1.1.1.1 Rights of the Users

Depending on the user name, different rights are defined:

- `administrator` is generally entitled to make changes
- `guest` does not have any editing permissions, the relevant buttons are disabled

Action		Administrator	Guest
Change administrator password		✓	-
Change guest password		✓	-
Perform restart		✓	-
HW configuration		✓	-
Change parameters		✓	-
Display parameters		✓	✓
Load parameters (backup upload)		✓	-
Save parameters (backup download)		✓	-
Load firmware		✓	-
Display I/O status		✓	✓
Force outputs		✓	-
Diagnosis		✓	✓

Note

No more than **1** `administrator` and **2** `guest` can be logged in to the device at the same time.

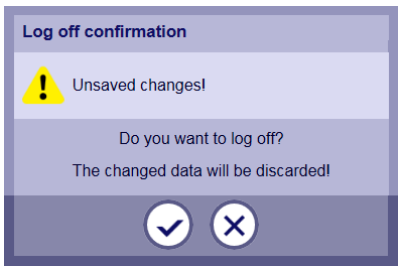
9.1.1.2 Logoff

If you want to finish your work you should log out.

- Click the button and then the submenu `Logout`

Thus, you are logged out again, the *Logon* dialog will appear. If a connection via GPRS is used, the *Logon* dialog will appear at the latest after 20 seconds.

If you made any changes after the last saving, the following dialog will appear after clicking `Logout`:



- If you click , changed data will not be saved and the logout will be performed
- If you click , you remain logged on and you can save the data

Note

The session will be closed by the web server after 15 minutes of inactivity. In this case you have to logon again. This applies also in case of an unwanted abortion of the communication connection (failure, closing of the web browser, etc.).

9.1.2 Basic Settings

- Menu `Home | Settings`

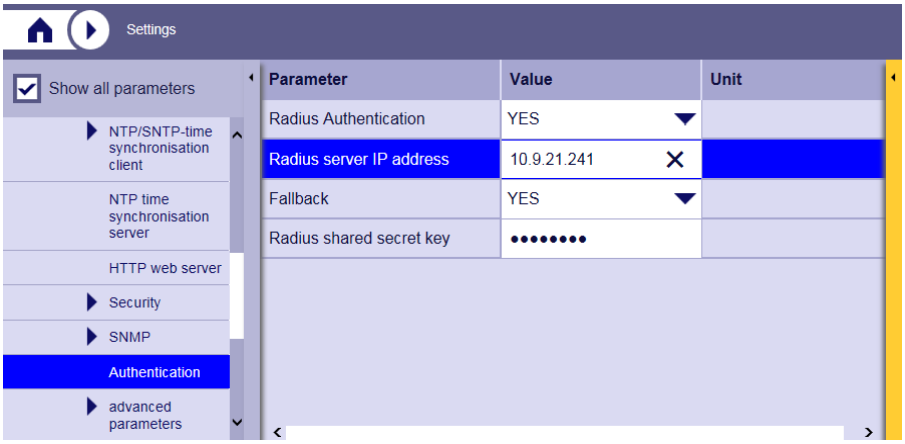
After the initial logon you should define some basic settings for working with SICAM WEB.

The basic settings are necessary to logon to the target device and security

- Authentication procedure
- Change web server password
- Set IP addresses
- Enable optional “Autoconfiguration”

9.1.2.1 Authentication Procedure

The authentication definition takes place in the directory tree under
SICAM A8000 CP-80xx | Master module | Network settings | Authentication
(the checkbox SHOW ALL PARAMETERS must be activated).



CP-8000/CP-802*x* provides different authentication mechanisms. Depending on the settings, SICAM WEB uses the respective role information:

- Authentication via locally stored credentials
  - Usernames, passwords, profiles defined by CP-8000/CP-802*x* will be used
- Authentication via external service (RADIUS server)
  - Usernames, passwords, profiles defined by the RADIUS server will be used
  - Fallback option, if the RADIUS server is not available

9.1.2.1.1 Authentication via Locally Stored Credentials

This is the default mechanism. After entering the login credentials and login attempt, the target device compares these credentials with the locally stored credentials:

- If the comparison is successful, the target device returns the specific user role
- If the comparison is not successful, the logon fails

9.1.2.1.2 Authentication via External Service

For this mechanism a RADIUS server can be configured. The parameter `Radius Authentication` must be set to **YES**.

If the RADIUS authentication is enabled, the target device uses the RADIUS server IP address and the RADIUS shared secret key for the RADIUS communication.

After entering the login credentials and login attempt, the target device sends these credentials to the RADIUS server for authentication:

- If the RADIUS server is available, it compares the login credentials
  - If the comparison is successful, the RADIUS server returns the specific user role; SICAM WEB and the internal role-based protection mechanism use this role-information for the user
  - If the login credentials are invalid, the logon fails
- If the RADIUS server is not available, the target device runs into a timeout
  - If the fallback option is enabled, the authentication mechanism falls back to local authentication and the target device compares the credentials with the locally stored credentials
    - If the comparison is successful, the target device returns the specific user role; SICAM WEB and the internal role-based protection mechanism use this role-information for the user
    - If the comparison is not successful, the logon fails
  - If the fallback option is not enabled, the logon fails

Configuration with RADIUS Server

The IP address of the RADIUS server must match with the setting in the target device (parameter `Radius server IP address`).

The shared key on the RADIUS server must match with the setting in the target device (parameter `RADIUS shared secret key`).

The target device sends User-Name (attribute 1), User-Password (attribute 2), NAS Identifier (attribute 32) and NAS Port (attribute 5) – possibly an application-specific server-side request – to the RADIUS server.

The RADIUS server should be configurated that way, that after successful authentication the role designed as a vendor-specific value (attribute 26) will be sent back.

You find detailed information on the RADIUS protocol under https://tools.ietf.org/html/rfc2865.

Structure of the authentication request from CP-8000/CP-802*x*:

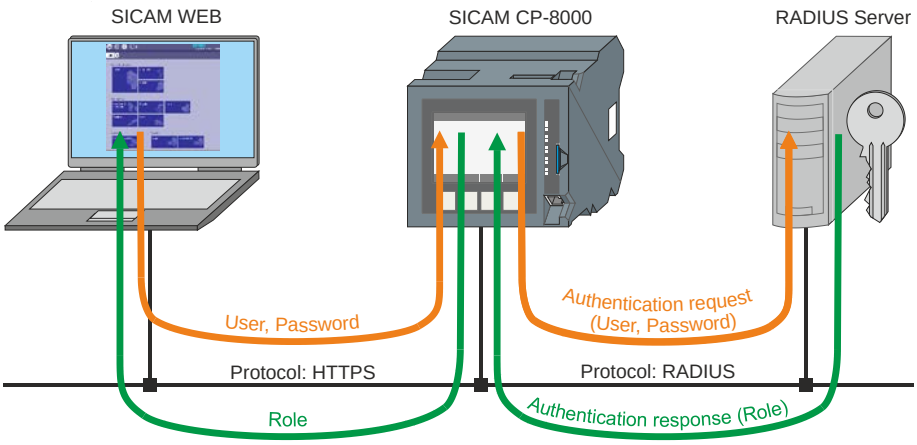
Connection via HTTP	Connection via HTTPS

`User-Name`
`User-Password`
`NAS-Identifier = ”00:E0:A8:B0:DC:80“`
`NAS-Port= “80“`
	`User-Name`
	`User-Password`
	`NAS-Identifier = “**:**:**:**:**:**“`
	`NAS-Port= “443“`

Structure of the response from the configured RADIUS server:

User role `Administrator`	User role `Guest`
`Service-Type = Login-User` `Cisco-AVPair = “priv-lvl=15“`	`Service-Type = Login-User` `Cisco-AVPair = “priv-lvl=0“`

Schematic Procedure of the Authentication



9.1.2.2 Change Web Server Password

The change of the password for the web server takes place in the directory tree under **SICAM A8000 CP-80xx | Master module | Network settings | IP address | HTTP web server**.

After the initial logon, an indication appears that a password must be defined. The password is required in order to protect the respective target device against unauthorized access.

To change the settings, the parameter `HTTP web server` must be set to **enabled**.

Note
With engineering via SICAM WEB, the HTTP web server is system-internally fixed enabled.

After transfer of the entered values, a new logon is only possible with the current password.

Password Assignment Rules

The following entries are allowed:

- Empty password possible (only with non-secure password)
- Maximum 8 characters
- Digits `0…9`
- Letters `A…Z` and `a…z` (no umlauts)
- Special characters `!?§$%&/\(){}[]=^°´`‘@*#|+-,.;:_`
- A secure password must contain at least one digit, one uppercase letter, one lowercase letter and one special character

Note
In case of problems with passwords please contact the Siemens Support Center.

9.1.2.3 Differentiation Secure/Non-Secure Passwords

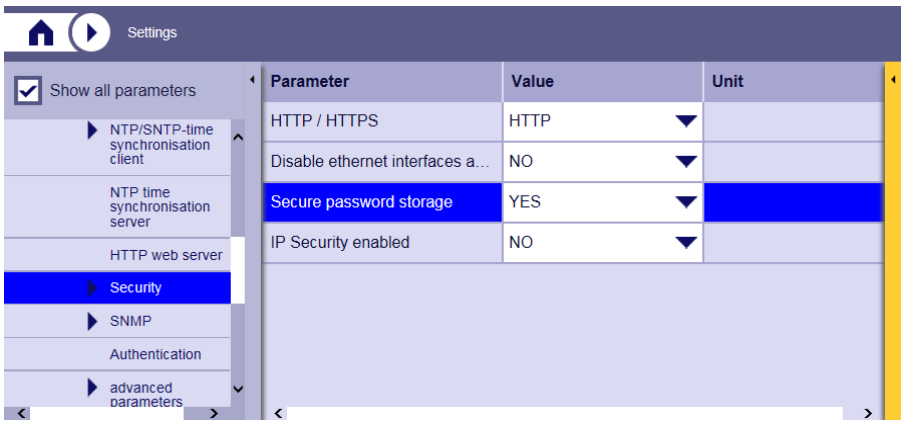
The selection of the secure password storage resides in the directory tree under **SICAM A8000 CP-80xx | Master module | Network settings | Security** (the checkbox SHOW ALL PARAMETERS must be activated).

All passwords can be stored in the target device in a secure manner. Thereto the passwords are stored irreversibly encrypted in a location not accessible by unauthorized persons. This applies for all protocols using a password for authentication, such as HTTP, HTTPS, SNMP.

Note

For secure password storage/https in CP-8000 a hardware revision >= ***CC is required.

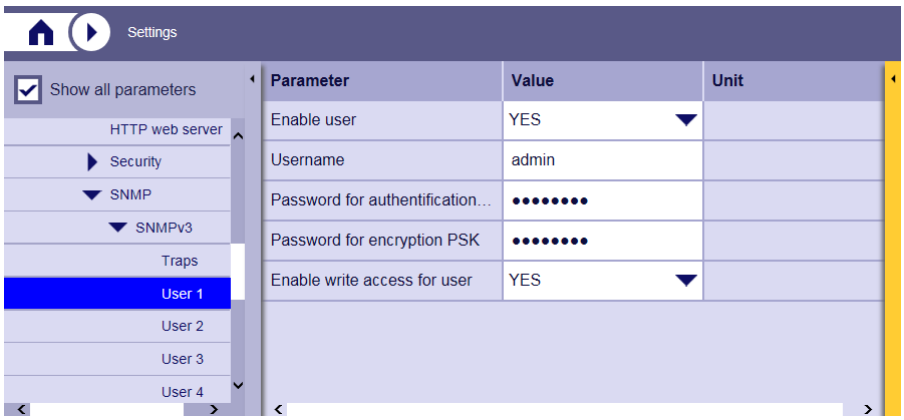
With the parameter `Secure password storage` you can select between non-secure or secure password storage.



If the secure password storage is activated (`Secure password storage` is **YES**), the parameter `HTTP/HTTPS` must be **HTTPS**, otherwise a warning is generated in the diagnosis.

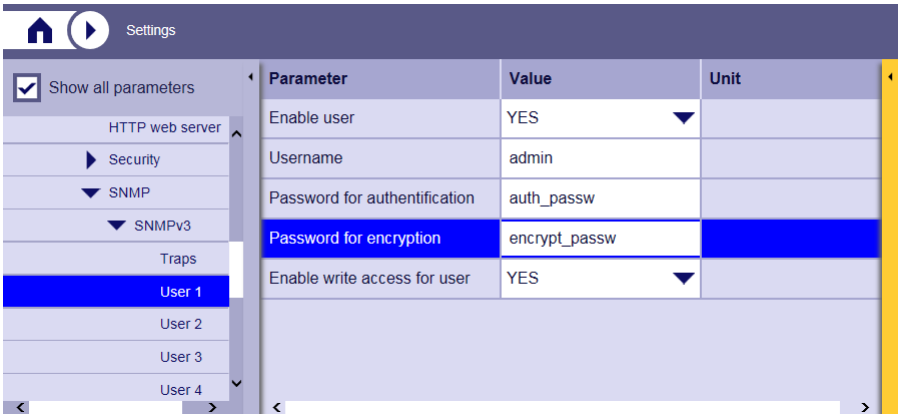
With the secure password storage, a password is masked behind 8 bullets, independently of the real length of the password, even if no password was entered.

Example:



If the secure password storage is deactivated (parameter `Secure password storage` = **NO**), a password is displayed as readable original text.

Example:

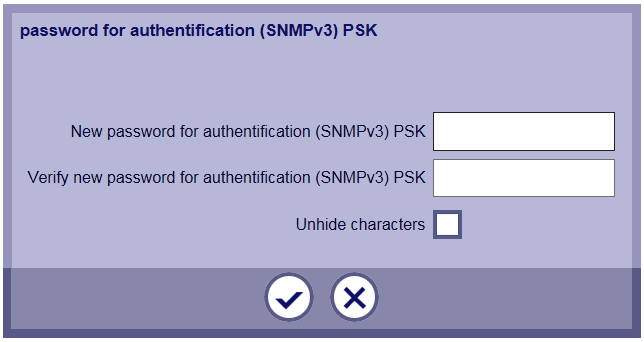


Change a Password

When modifying a secure password, a dialog is displayed when selecting a password field in the `Settings` page.

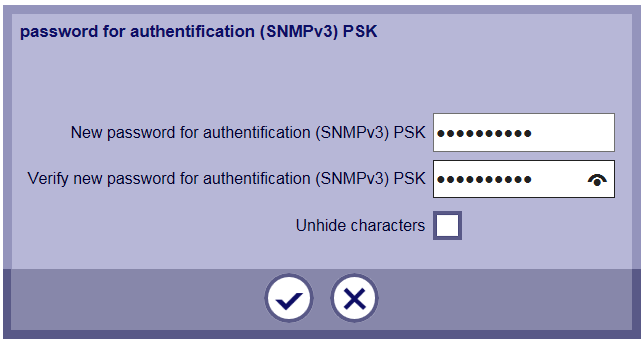
When opening the dialog both input fields are always empty and the checkbox UNHIDE CHARACTERS is deactivated.

Example:



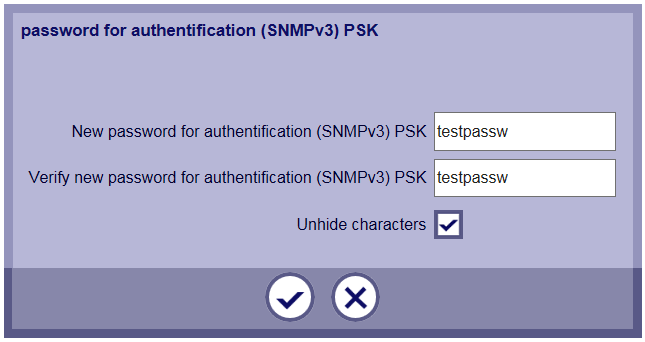
You must enter the same password in both input fields (new password and verify new password). Each entered character is shown as a bullet.

Example:



When activating the checkbox UNHIDE CHARACTERS, the entered characters in both input-fields are displayed.

Example:

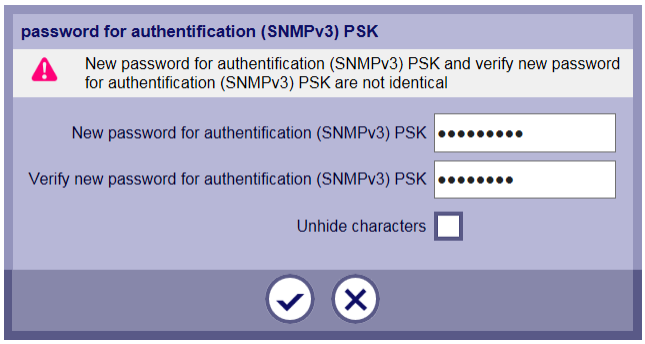


- To close the dialog, click (new entries are discarded)
- To confirm the entries, click

With the entries are checked against conformity and against the guideline for the password assignment.

If the checks are not successful, a notification is shown in the dialog.

Example:



If all checks have been passed, the dialog is closed and the new password is valid.

- When pressing the button , the target device stores the password; if the secure password storage is active, the password is encrypted before the storage

Switching Between Secure and Non-Secure Password

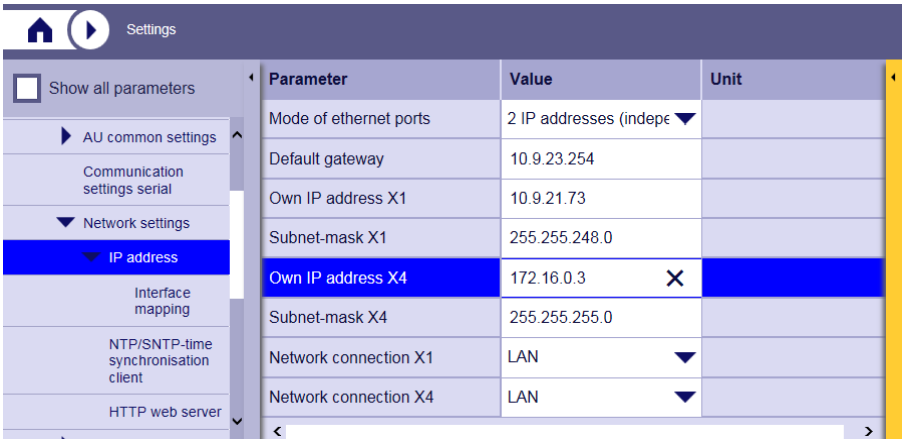
Secure passwords and non-secure passwords are stored separately in CP-8000/CP-802*x*.

If you enter a non-secure password in the target device, and you activate the secure password storage afterwards, you must enter a new secure password. The non-secure one still remains stored, but it is deactivated.

If you deactivate the secure password storage afterwards, the non-secure password is active again and the new secure password is deactivated.

9.1.2.4 Set IP Addresses

The settings of the IP addresses reside in the directory tree under
SICAM A8000 CP-80xx | Master module | Network settings | IP address.



With engineering in a network (company intranet, networked plant), conformable IP addresses must be assigned. The IP address for the web server of your target devices can be changed with the parameter `Own IP address`.

Note

The IP settings depend on the configuration and the used transmission media of your network. For the setting of these parameters please contact your network administrator.

The details for the setting of the advanced parameters for secure network configurations can be found in the *SICAM RTUs • SICAM TOOLBOX II Administrator Security Manual*.

With the parameter `Mode of ethernet ports` you can define whether the interfaces X1 and X4 are operated via the same or via 2 separate IP addresses. The presetting is **1 IP address (connected ports in switch mode)**.

Note

The IP address set via SICAM WEB is only relevant without use of a DHCP server (parameter `Autoconfiguration` = **NO**).

With use of a DHCP server the target device receives the the IP address automatically. Further details see 9.1.2.7, Autoconfiguration (restricted operation mode).

With the selection **2 IP addresses (independent ports)** you can define a 2nd IP address for X4. Thereby the target device can be accessed also via X4 independently of the network settings on X1, for instance

- X1: process LAN
- X2: office LAN

The server services of CP-8000/CP-802*x* are accessible on both interfaces.

The further possibilities resulting thereout are described in Appendix E, Use Cases.

If for security reasons no connection between the networks may be established, the use of a second IP address on interface X4 can be suppressed. Thereto, in the initial parameterization can be defined whether the parameter `Mode of ethernet ports` is permanently displayed or hidden.

This can be adjusted with the expert parameter `Advanced parameters | Parameter "Mode of ethernet ports"` using the following selection:

- **display (selection)** (default)
- **hide (freeze)**

Note

With the selection **hide (freeze)** this parameter and the parameter `Mode of ethernet ports` are permanently hidden. A further change of these parameters is no longer possible!

The set mode remains unchanged, unless the target device will be restarted via a complete reparameterization:

- Initialization with other parameters or with an anew generated SD card (SICAM TOOLBOX II).
- Initialization with an empty SD card (SICAM WEB).

- Store the changed settings by clicking

The stored values require a restart of the target device and are only active after the startup.

Note

After changing the data, the target device can be accessed only by selection of the newly set IP address(es). The current IP address is always displayed on the LCD of the target device (Main menu | Device).

If the access to the web server is no longer possible, check the IP settings of the engineering PC.

9.1.2.4.1 MAC Addresses of the Ethernet Interfaces

The local Ethernet interfaces X1 and X4 have dependent on the version of the module 1 or 2 MAC addresses.

Designation	MLFB	MAC addresses
CP-8000 -25/+70°C CP-8000 -40/+70°C	6MF21010AB100AA0EE 6MF21011AB100AA0EE	1
CP-8000 -25/+70°C CP-8000 -40/+70°C	6MF21010AB100AA0FF 6MF21011AB100AA0FF	2
CP-8021	6MF28021AA00 BB	1
CP-8021	6MF28021AA00 CC	2
CP-8022	6MF28022AA00 BB	1
CP-8022	6MF28022AA00 CC	2

The MAC addresses reside on the type plate sideways at the module housing (see 6.1.1.2, Type Plate and 6.1.2.2, Type Plate).

If parameter `Network settings | IP addresses | Mode of Ethernet ports` is set to value **1 IP address (connected ports in switch mode)**, then the first MAC address (of X1) is used on both local Ethernet interfaces.

If parameter `Network settings | IP addresses | Mode of Ethernet ports` is set to value **2 IP addresses (independent ports)**, then separate MAC addresses are used for X1 and X4.

9.1.2.4.2 Access Options for the Engineering PC in Operation

DHCP service used	DHCP server available	Access option	IP address SICAM A8000	IP address engineering PC
`Autoconfigu-ration` = **NO**	Irrelevant	Ethernet (X1)	`Own IP address` = *<set value>*	*<free address in subnet of SICAM A8000>*
`Autoconfigu-ration` = **YES**	Yes	Ethernet (X1)	`Own IP address` = *<automatic>*	assigned by DHCP-server, if DHCP is enabled on the PC
`Autoconfigu-ration` = **YES**	No	Ethernet (X1)	`Own IP address` = *<169.254.0.1>*	*<free address in subnet 169.254.0>* (IP address in SICAM A8000 is not routed)
Irrelevant	Irrelevant	Ethernet (X4)	`Own IP address (X4)` = *<set value>*	*<free address in subnet of SICAM A8000>* *)
Irrelevant	Irrelevant	Point-to-Point (X2)	**172.16.0.1**	**172.16.0.2** (assigned by SICAM A8000)

*) applies only if `Mode of the Ethernet ports` = **2 IP addresses (independent ports)**

9.1.2.5 Security Settings for Internet Security (IPSec)

The settings for internet security reside in the direction tree under **SICAM A8000 CP-8022 | Master module | Network settings | Security** (the checkbox SHOW ALL PARAMETERS must be activated).

The communication over IPSec can be enabled with the parameter `IP Security activated`.

With activated IPSec VPN a firewall is automatically activated. Only activated services can pass the firewall.

Interface Assignment

Furthermore, the assignment of the Ethernet interfaces according to the respective application is necessary. You will find more information in section 9.1.7.2, Physical Interface for the Communication.

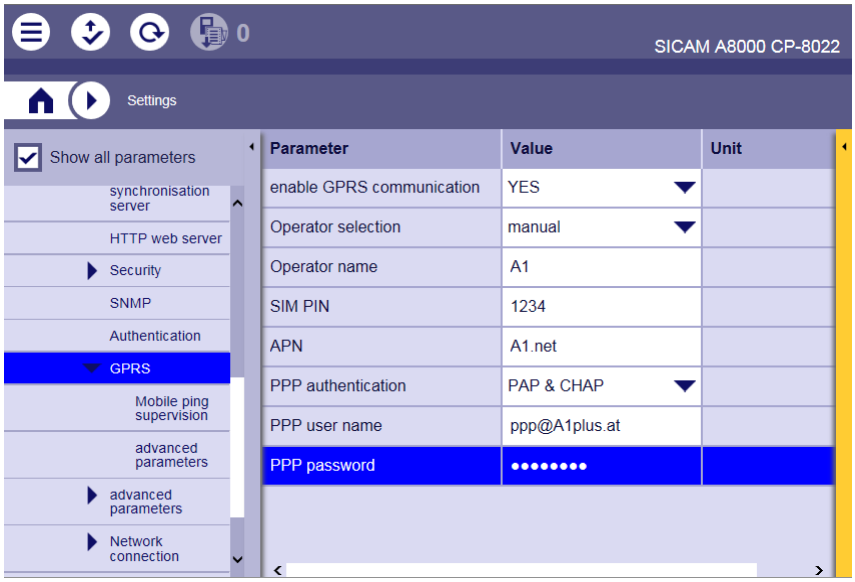
You will find further information in appendix E.6, Usage with IPSec VPN.

Note

The detailed information on Internet Security can be found in the document *SICAM A8000 Series/ RTUs / TOOLBOX II / Device Manager ADMINISTRATOR Security Manual*.

9.1.2.6 Settings for Internal GPRS Modem (CP-8022)

The settings for the internal GPRS modem reside in the direction tree under **SICAM A8000 CP-8022 | Master module | Network settings | GPRS** (the checkbox SHOW ALL PARAMETERS must be activated).



The GPRS communication is activated or deactivated with the parameter `enable GPRS communication`. With selection **YES** the parameter string for GPRS is visible and the parameter `Mode of ethernet ports` will be hidden. The both interfaces X1 and X4 operate as connected ports in switch mode via 1 common IP address.

You will find further information in appendix E.7, Usage of the Internal GPRS Modem (CP-8022).

9.1.2.6.1 Common Settings

With the parameter `Operator selection` you can define how to select the mobile radio provider:

- with selection **automatic** (default) the operator is read from the SIM card
- with selection **manual** the operator must be entered according to the corresponding SIM card; the operator list can be read out from the SD card, if the parameter `GPRS log` is set to **operator list**.

The entry for `SIM PIN` is needed if the SIM card is PIN protected. An empty PIN (default) corresponds to an unlocked SIM.

With parameter `APN` the acccess point name can be configured. If no APN is entered, then the default APN is used implicitly during the PDP context activation (acccess point name from provider).

The `PPP authentication` is required depending on the operator's policy in particular APNs. If authentication is needed, then `PPP user name` and `PPP password` have to be entered.

9.1.2.6.2 Monitoring of the GPRS Modem

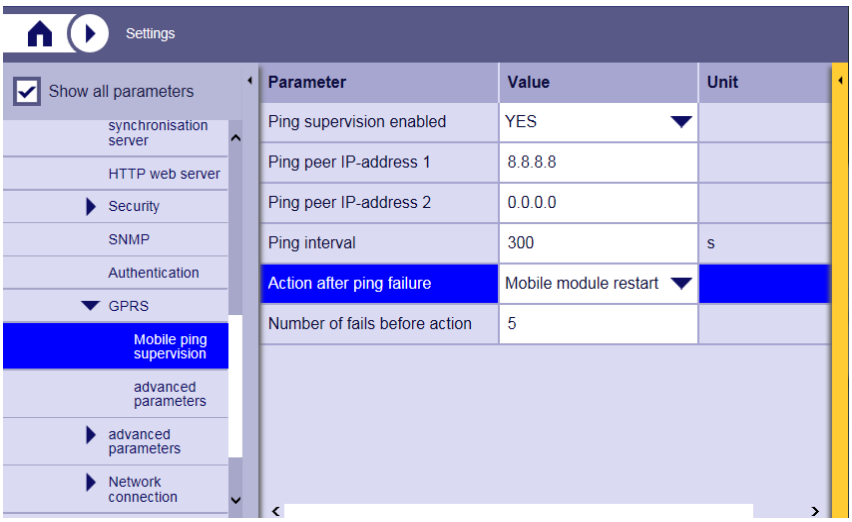
Additional settings for the handling in case of error reside in the direction tree under **SICAM A8000 CP-8022 | Master module | Network settings | GPRS | advanced parameters**.

With the parameter `advanced parameters | GPRS logging` the detail level of the logging procedure can be selected (**Operators + Modem status** / **Detailed logging of communication to modem (AT-CMD)**. Logs will be saved on the SD card in the GPRS directory).

With the parameter `advanced parameters | Debug trigger` the action upon GPRS modem error is defined for debugging (**None** / **Stop logging on modem error**).

9.1.2.6.3 Monitoring of the Mobile Radio Network

Settings for the monitoring of the mobile radio network reside in the direction tree under **SICAM A8000 CP-8022 | Master module | Network settings | GPRS | Mobile radio ping supervision**.



With the setting `Ping supervision enabled` = **YES** the belonging parameters get visible. With this function, 5 ping request are sent with an interval of 20 seconds to up to 2 adjustable IP addresses (`Ping peer IP address 1`, `Ping peer IP address 2`). If no reply is received, the ping counts as failed attempt. After that, the cycle time (`Ping interval` (**60…3600 s**)) is started for the next ping request.

After an adjustable number of failed attempts (`Number of fails before action` (**2…100**)), a selectable reaction is triggered (`Action after ping failure` (**logging only**/**mobile connection re-establishment**/ **mobile module restart**/**device reboot**)).

9.1.2.6.4 Interface Assignment

Furthermore, the assignment of the Ethernet interfaces according to the respective application is necessary. You will find more information in section 9.1.7.2, Physical Interface for the Communication.

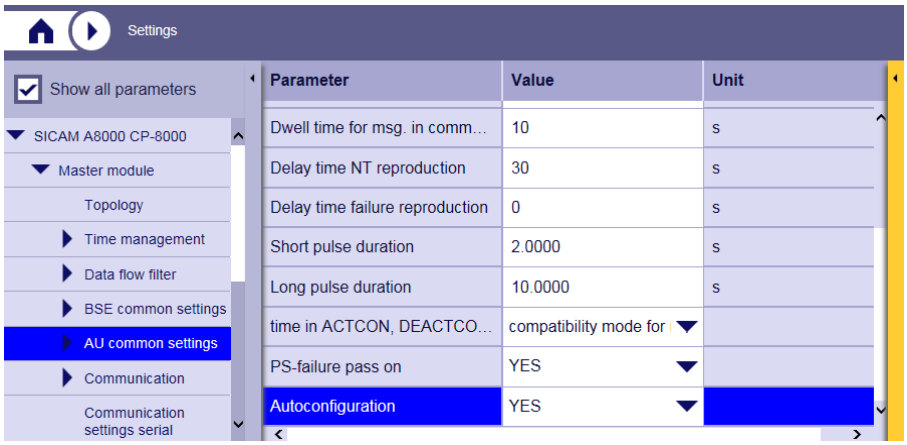
9.1.2.7 Autoconfiguration

CP-8000/CP-802*x* provides the option of being configured automatically by means of a complete autoconfiguration file via DHCP service. The autoconfiguration file is a previously generated CP-8000/CP-802*x* backup (see 9.3.2, Download Device Settings).

Note

If a SD card generated through copy is used, please make sure that the file *dhcpid* is deleted (located in AUTOCONFIG folder).

The selection of the autoconfiguration resides in the directory tree under
SICAM A8000 CP-80xx | Master module | AU common settings
(the checkbox SHOW ALL PARAMETERS must be activated).



With the expert parameter `Autoconfiguration` = **YES** the DHCP service is activated.

In a network with DHCP server, the DHCP server defines the IP address on X1. If the DHCP server is no more available, the target device can be accessed via X1 with the IP address `169.254.0.1`, if the “lease time” of the DHCP server is already terminated. Otherwise the IP address from the DHCP server is used until the termination of the time. The time is defined by the DHCP server.

Note

DHCP can be easily disturbed and manipulated because DHCP clients accept any DHCP server.
The accidental activation of a DHCP server, for example by a simple DSL router or wireless router on delivery status can largely paralyze a network. That may respond faster than the foreseen DHCP server and thereby distributes invalid configurations.

On the DHCP server, corresponding DHCP options must be configured:

Option 6: DNS Servers (optional)
Option 61: Client Identifier
Option 66: TFTP Server Name
Option 67: Backup File Name

Example: settings on a DHCP server

```
[SETTINGS]
IPBIND_1=172.16.0.5
IPPOOL_1=172.16.0.8-255
AssociateBindsToPools=1
UseClientID=1 ;
Trace=1
DeleteOnRelease=0
ExpiredLeaseTimeout=3600
ConfigureUnknownClients=0;
IgnoreUnknownClients=1;

[GENERAL]
LEASETIME=300
NODETYPE=8

[test1]
IPADDR=172.16.0.10
;IPADDR=0.0.0.0
SUBNETMASK=255.255.248.0
;NEXTSERVER=172.16.0.55
;ROUTER_0=172.16.0.250
OPTION_6=172.16.0.5 ;
OPTION_66="tftp.at" ;
OPTION_67="SICAM_A8000_BACKUP_Siemens_Testanlage_Station_0dac08636b6790f868f7870168d08df2.cmc" ;

[DNS-SETTINGS]
EnableDNS=0
FORWARD=172.16.0.5

[TFTP-SETTINGS]
EnableTFTP=1
PortRange=AUTO;
ROOT=C:\_DATA\DHCP_DNS_SERVER\DHCP-SERVER\dhcp\wwwroot
WritePermission=1

[HTTP-SETTINGS]
EnableHTTP=1
ROOT=E:\DHCP-SERVER\dhcp\wwwroot
```

TFTP Server

The TFTP protocol serves for the loading of operating systems or configurations via the network. It is designed for simpliest data transfer based on the client-server principle. The protocol supports only the reading and writing of files and is suitable for applications that do not require the complex procedures of FTP.

The TFTP server must provide the configuration file of the respective CP-8000/CP-802*x* target device.

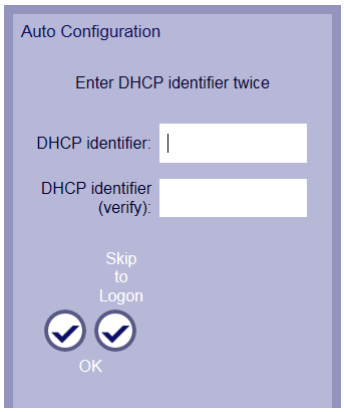
Note

TFTP does not provide authentication or encryption. Therefore, the Internet access should be denied by default when enabled TFTP service when using a firewall.

Connection via SICAM WEB

After the first startup with activated autoconfiguration, the engineering PC must be connected to the target device via the interface X1.

Start the web browser and enter the IP address `169.254.0.1` in the address bar.



A dialog for the entry of the DHCP identifier and the confirmation appears.

- Click on (OK), if you want to save the DHCP identifier
- Click on (Skip to Logon), if you want to log on directly at the target device

As soon as this setting is saved, the target device uses this identifier as DHCP option 61. If no identifier is set, the MAC address of the device is used. The parameter can be changed also afterwards in operation via SICAM WEB.

In order that the autoconfiguration works, at least the DHCP options 66 and 67 must be given. The TFTP Server Name can be either an IP address or likewise a Full Qualified Domain Name (see DNS), if one or more DNS servers are supplied via DHCP.

The target device connects to the TFTP server indicated in DHCP option 66, and downloads the configuration file indicated in DHCP option 67. The file is checked upon integrity by means of a cryptologic hash function that is calculated over the file. The result is compared with the hash value in the filename:

- if the file is valid, it is accepted and all settings in the target device are adapted
- with different results, the file is deleted and no changes are carried out

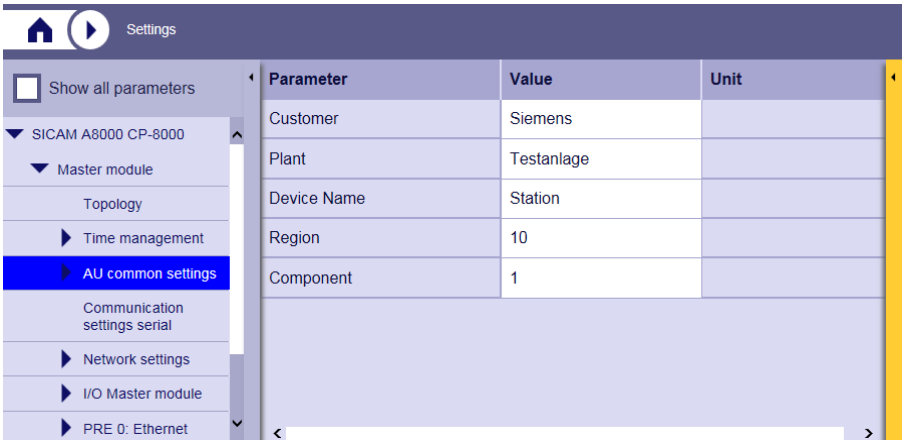
Depending on the setting of the “Lease Time” on the DHCP server, the configuration can be updated. If the same file name is given, the target device keeps its settings. If another name is given, the file is downloaded again and the settings are accepted.

9.1.3 Common Settings

- Menu `Home | Settings`

9.1.3.1 Configuration of the Target Device

The settings for the configuration of the target device reside in the directory tree under **SICAM A8000 CP-80xx | Master module | AU common settings**.



Here reside the basic settings for the identification of the target device (`Customer`, `Plant`, `Device Name`, `Region`, `Component`).

If the target device is integrated in an existing plant, these values should fit to the existing parameterization (conformable region and component number, same customer and plant designation).

Furthermore you can enter, amongst others, the values for `Short Pulse Duration` and `Long Pulse Duration`. Depending on whether the target device receives a command with short or with long command output time, the command is output with the duration adjusted here.

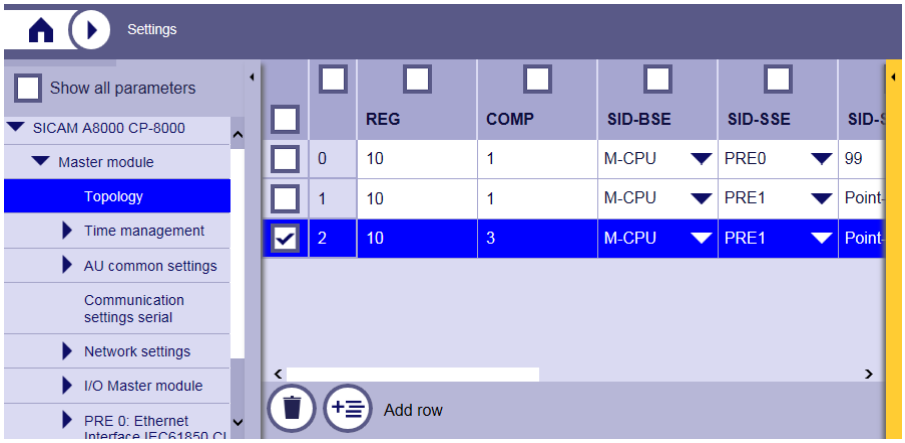
9.1.3.1.1 Application Program

With use of an application program, the address can be set which uses the application program for the generation of its data. The setting thereto resides under **SICAM A8000 CP-80xx | Master module | AU common settings | common address of ASDU (CASDU).**

`CASDU1` (least significant octet) and `CASDU2` (most significant octet) result automatically in the CASDU upon storing.

9.1.3.2 Topology

The settings for the topology reside in the directory tree under
SICAM A8000 CP-80xx | Master module | Topology.



Here is defined via which interface which remote stations are accessible, and which basical data flow direction is needed to these remote stations (control direction, monitor direction or both directions).

For the parameterization of remote stations you can insert lines with the button .

With activation of the checkbox SHOW ALL PARAMETERS the complete parameter block can be made visible (the hidden expert parameters serve for special applications and need not to be used in normal case).

9.1.3.3 Failure Behavior upon Fault

The setting for the failure behavior resides in the directory tree under
SICAM A8000 CP-80xx | Master module | BSE common settings.

The occurance of a heavy fault can lead to an undefined state in the processing of the firmware on the Master Module. Normally the target device stops thereby the firmware and records an error in the diagnosis.

You can change this behavior with the parameter `Failure behavior`.

The setting **Restart firmware** means that the firmware of the target device performs an automatic startup in case of error. This might be advantageous upon a temporary error that disappears by itself.

You find further information thereto in the manual *SICAM RTUs Common Functions System and Basic System Elements, chapter "System Services", section "Operating States", "Firmware Shut Down"*.

9.1.4 Configuration of Optional Modules

- Menu `Home | Hardware & Protocols`

9.1.4.1 Overview

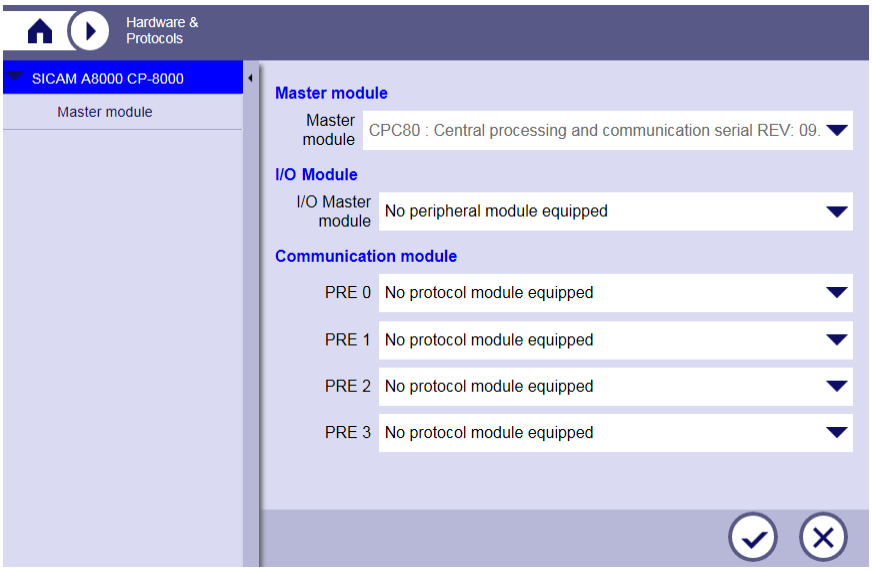
In addition to the Master Module, you can equip the following optional system elements:

- Protocol elements for the communication
  Hardware (integrated on the Master Module) + loadable firmware
- I/O Master Module for peripheral functions
  Hardware (integrated on the Master Module) + loadable firmware
  - internal I/O Modules (only CP-8000) are detected automatically
  - external I/O Modules are detected automatically

The protocol elements and I/O Modules supported by CP-8000/CP-802*x* are listed in chapter 2.1.3, Protocol Elements and 2.1.5, I/O Modules.

Prerequisite for the equipment of additional system elements is that the corresponding Firmwares are loaded in the target device. You find the instruction thereto in section 9.3.7, Update Firmware.

The hardware configuration overview resides in the directory tree under
SICAM A8000 CP-80xx.



This page shows an overview of the equipped system elements:

- Master module
- I/O Master module
  - I/O Modules
- Communication module (protocol elements)

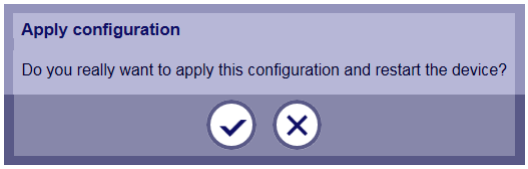
Note

The selection in the drop-down boxes contains only that system elements, whose firmware has already been loaded into the Master Module (with indication of the revision level).

By clicking you will leave the equipment program. Changes will not be saved, that means, selected system elements will be rejected.

- In the respective drop down list, select the desired entry
- If you want to save the adjusted equipment, click

A restart request appears:



You have the possibility to abort the procedure.

- Confirm by clicking

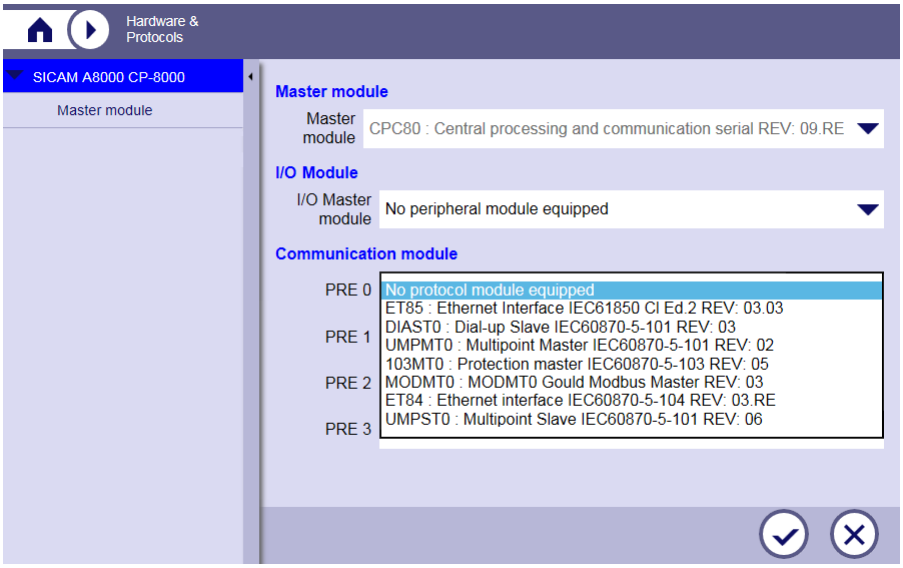
The target device performs a restart, refer to Restart device.

During startup, the settings are stored on the SD card and the configuration pages for the selected system elements are built in SICAM WEB.

9.1.4.2 Protocol Elements

You can equip up to 4 protocol elements. The hardware for a protocol element is integrated on the Master Module.

The selection of the protocol elements resides in the directory tree also under **SICAM A8000 CP-80xx | Master module**.



- In order to configure a protocol element, select a protocol for the respective protocol element number.

After selection of the protocol(s) and acceptance with a restart of the target device is required.

After the startup the configured protocol elements appear in the directory tree under **SICAM A8000 CP-80xx | Master module | PRE** *<0…3>*: *<protocol name>*.

The parameterization takes place for each protocol in the `settings` page. The parameters of newly identified protocols are assigned with their default values.

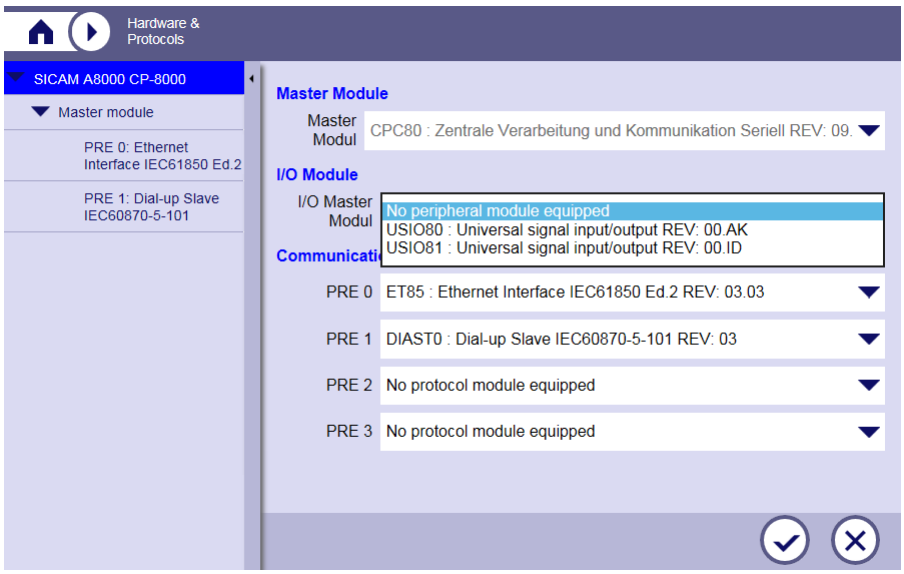
You find more detailed information on the protocols in the manual *SICAM RTUs • Ax 1703 Common Functions Protocol Elements*.

9.1.4.3 I/O Master Module

In CP-8000/CP-802*x* you can equip 1 I/O Master Module. The hardware for the I/O Master Module as well as 2 internal I/O Modules are integrated on the Master Module.

With use of external I/O Modules, these must be connected (mechanically) to the target device before the engineering in SICAM WEB.

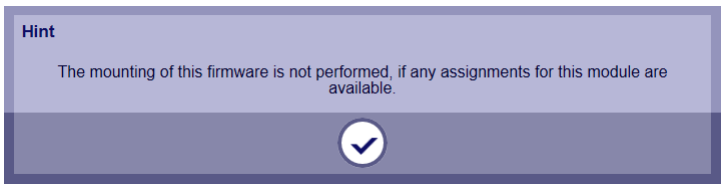
The selection of the I/O Master Module resides in the directory tree also under **SICAM A8000 CP-80xx | Master module | I/O Master module**.



- In order to configure a I/O Master Module, select the desired firmware:

  USIO80: operation with SICAM TM I/O Modules
  USIO81: operation with SICAM I/O Modules

After the selection of the I/O Master Module a notification appears:

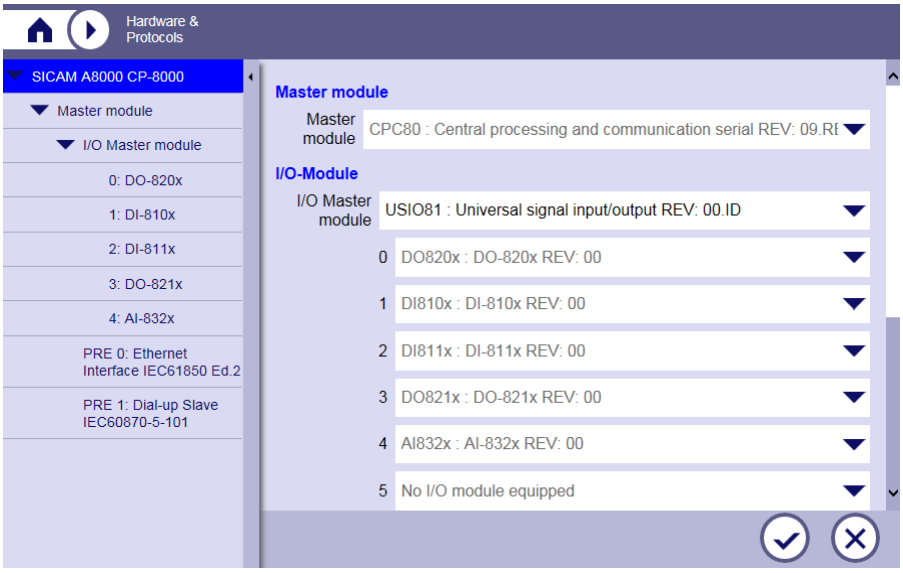


This means, a new I/O Master Module (firmware revision) can be accepted only if no signals are assigned to the I/O Master Module and to I/O Modules. If occasion arises, the corresponding signal assignments must be deleted (see 9.1.11.3, Assigning Signals to the I/O Master Module and 9.1.11.4, Assigning Signals to the I/O Module).

- Click on the button in order to close the dialog

After the selection of the I/O Master Module and acceptance with a restart of the target device is required. Thereby, the target device automatically detects the internal and the connected external I/O Modules. Hence, for the equipment of an I/O Module you need not make a selection.

After the startup the configured I/O Modules appear in the directory tree under **SICAM A8000 CP-80xx | Master module | I/O Master module |** *<0…7>*: *<I/O module name>*.



You find more detailed information on the I/O Modules in the manuals *SICAM RTUs • SICAM I/O Modules* and *SICAM RTUs • SICAM TM I/O Modules*.

Please pay attention to the configuration notes and rules for the equipment of I/O Modules in section 2.1.5, I/O Modules.

Note

The detected configuration is checked with each additional startup against the actually connected I/O Modules. With deviation the target device notifies an error.

If the once detected configuration is changed, pay attention to section 11.4.4, Adapt New Equipped I/O Modules in the Parameterization.

9.1.5 Configuration of the Time Management

- Menu `Home | Settings`

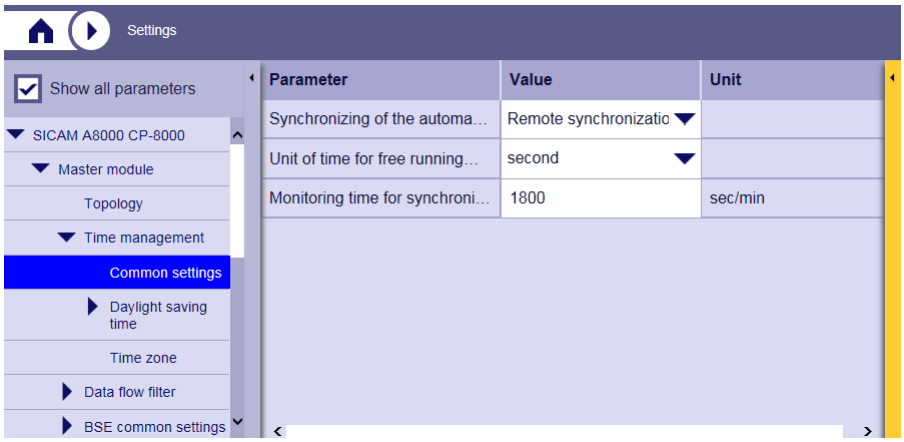
9.1.5.1 Time Synchronization

The internal clock of CP-8000/CP-802*x* serves for the time tagging of generated data

- from the periphery
- from the optional *Open/closed-loop control function*
- for the records in the diagnosis

The resolution of the time tag is 1 ms.

The settings for the time synchronization reside in the directory tree under **SICAM A8000 CP-80xx | Master module | Time management | Common settings** (the checkbox SHOW ALL PARAMETERS must be activated).



CP-8000/CP-802*x* supports the following time synchronization variants (selectable with parameter `Synchronizing of the automation unit`):

- Remote synchronization via serial communication or via LAN
- Free running

With the Parameter `Monitoring time for synchroniz. event` the monitoring fort he remote synchronization is defined. If the time was already set and if there is no synchronization within the parameterized time, a warning is recorded in the diagnosis.

With the Parameter `Unit of time for free running and monitoring time` the unit of the monitoring time is defined (seconds or minutes).

You find the detailed information on the time synchronization reside in the manual *SICAM RTUs Common Functions System and Basic System Elements, chapter "System Services", section "Time Management", section "Time Synchronization"*.

9.1.5.1.1 Time Synchronization with Multi-Point Traffic

The time is sent from a central station (time master) to CP-8000/CP-802*x*. The time master must synchronize at least each 60 s, in order that the minimum resolution of 10 ms is achieved. With failure of the time synchronization the target device records a warning in the diagnosis after 10 min.

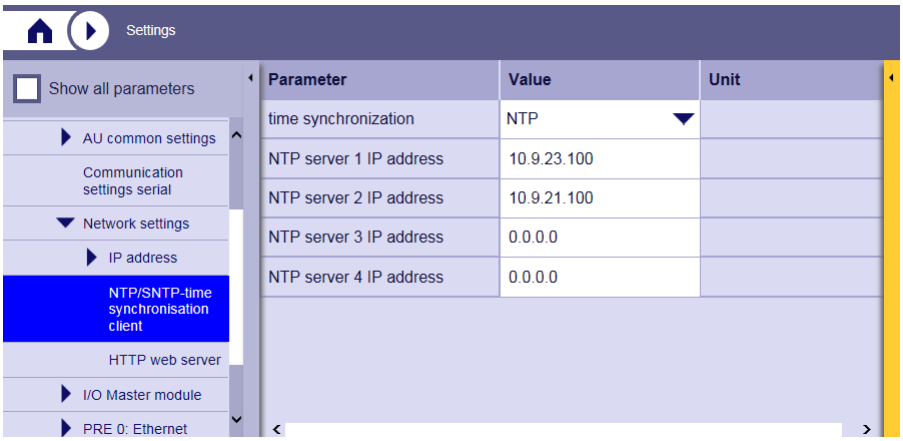
9.1.5.1.2 Time Synchronization with Dial-up Traffic

The time is sent from a central station (time master) to CP-8000/CP-802*x*. A synchronization can be performed only upon setup of a connection.

9.1.5.1.3 Time Synchronization with Ethernet

SNTP/NTP Client

The settings for the (S)NTP client reside in the directory tree under **SICAM A8000 CP-80xx | Master module | Network settings | NTP/SNTP time synchronization client**.



With communication according to IEC 60870-5-104 or IEC 61850, the time can be synchronized via NTP or SNTP. To achieve that, you can enter the IP address of up to 4 NTP servers, as well as the cycle time of the NTP synchronization.

For the time synchronization, the current NTP server is determined by "voting". This takes place according to the following weighting:

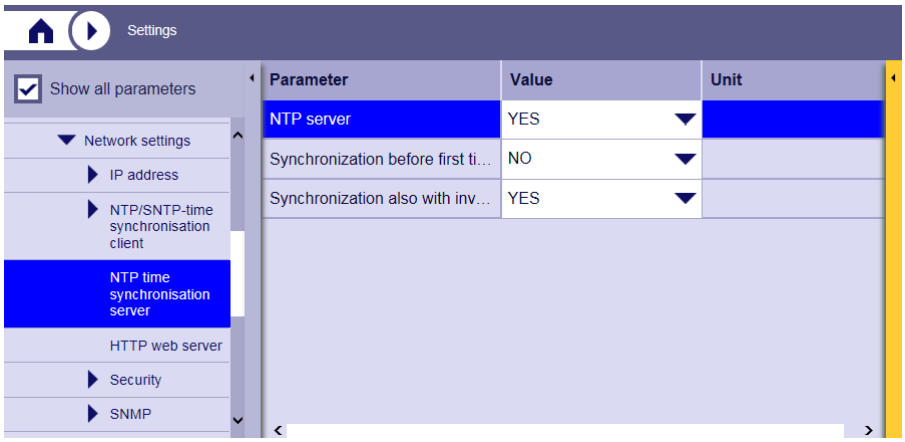
- Attainability
- Stand-alone (NTP server does not receive a time)
- Distance (with regard to the time)

A voting is performed after each 3-fold cycle time (parameter `NTP cycle time`). The minimum voting time is 1 hour. Upon failure of the time synchronization the target device records a warning in the diagnosis. With time synchronization via another automation unit (without NTP server) the warning is recorded after 10 minutes.

The description of the parameters reside in the manual *SICAM RTUs Common Functions Protocol Elements, chapter "LAN Communication (104)", section "Time Synchronization", as well as chapter "LAN Communication (61850)", section "Time Synchronization"*.

NTP Server

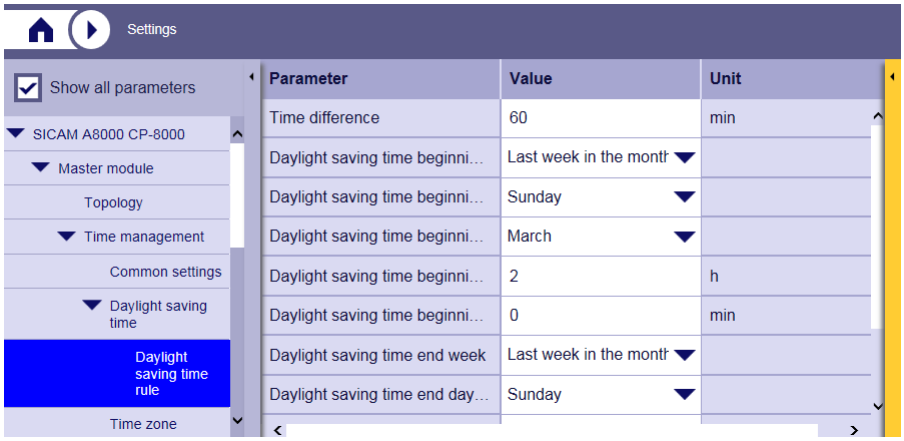
The settings for the NTP server reside in the directory tree under
SICAM A8000 CP-80xx | Master module | Network settings | NTP time synchronization server
(the checkbox SHOW ALL PARAMETERS must be activated).



If further devices that require a time synchronization by means of NTP are connected with a target device, these devices can be supplied also with the time via the function NTP Server. Thereby must be considered that the corresponding target device itself is already synchronized via a serial interface or via NTP.

9.1.5.2 Daylight Saving Time Rule

The settings for the daylight-saving time reside in the directory tree under
SICAM A8000 CP-80xx | Master module | Time management | Daylight saving time
(the checkbox SHOW ALL PARAMETERS must be activated).



You can enable the daylight saving time and select the format for the setting of the daylight saving time rule. In the subdirectory **Daylight saving time rule** you can adjust the exact data for the daylight saving time/normal time switchover.

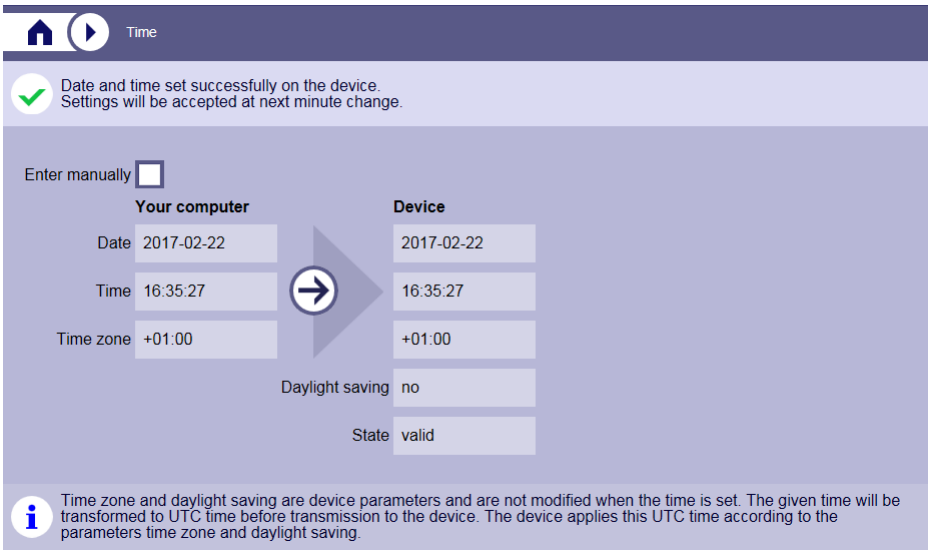
9.1.6 Local Time Setting

- Menu Home | Time

This function allows you to set any time or the time of your engineering PC in the target device manually. This function is useful especially for the "stand-alone" operation.

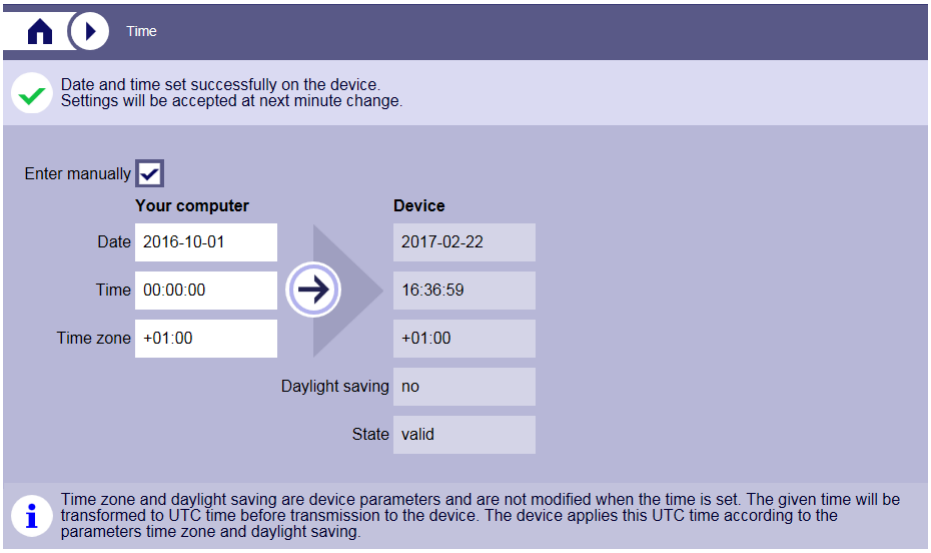
This is how to set the time of your engineering PC in the target device:

- Click on the button in order to load the PC time into the target device



This is how to set any time in the target device:

- Set a checkmark in the checkbox ENTER MANUALLY
- Edit the fields DATE, TIME and TIME ZONE as you wish
- Click on the button in order to load the defined time into the target device

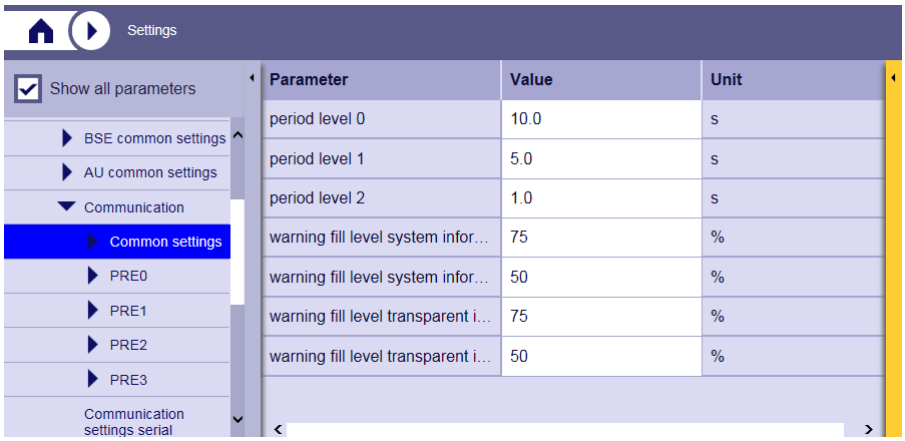


9.1.7 Configuration of the Communication

- Menu Home | Settings

9.1.7.1 Common Settings

The common settings of the communication reside in the directory tree under **SICAM A8000 CP-80xx | Master module | Communication | Common settings** (the checkbox SHOW ALL PARAMETERS must be activated).



Periodical Transfer of User Data

Each user data message can be assigned a periodical level (only in the case of datapoint-specific routing).

Three periodical levels are possible, and each of these levels can be assigned a parameterizable period length. Once the period length of a level elapses, all periodical data of this level will be chained. Such chaining takes place separately for each supplementary system element.

The chain of periodical data is processed via a separate priority level from the downstream process image. If another chaining activation occurs with the chain not being empty, it will be stored. Once the chain becomes vacant, a stored activation will cause the periodical data of this level to be chained again.

Blocked data will not be activated for transmission while a blocking condition is active.

Warning Filling Level Priority Channels

For the system information without storage and the transparent channel a warning for the filling level is generated. For each channel a warning for the entire Master Module is available (not for each remote station). The filling level for the incoming and outgoing warning can be parameterized in percent for each priority channel.

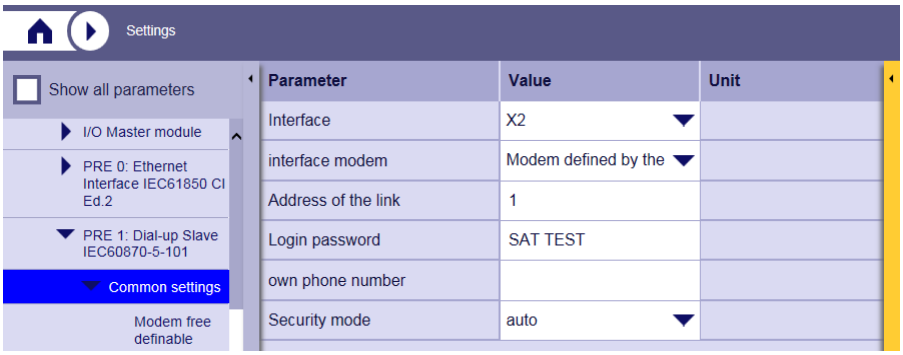
For the system information, this warning is activated if one of the remote stations reaches the parameterized filling level for the incoming warning. It will be reset if all remote stations where the warning has been activated reach the parameterized filling level for the outgoing warning.

For the transparent information, there is a channel for all remote stations. This is where the warning is set or reset if the filling level of the channel reaches the parameterized thresholds.

9.1.7.2 Physical Interface for the Communication

CP-8000/CP-802*x* can communicate simultaneously via multiple physical interfaces. For each configured protocol element an interface must be assigned exclusively.

The assignment of the interface for each protocol element resides in the directory tree under **SICAM A8000 CP-80xx | Master module | PRE** *<0…3>*: *<protocol>* **| Common settings**.



Equipable protocols can be assigned with the parameter `Interface`:

Firmware	Protocol name	X1	X2	X3	X4	X6	X7
103MT0	IEC 60870-5-103 Master	-	✓	✓	-	✓	-
BPPT0	IEC 60870-5-101 point-to-point	-	✓	✓ 1)	-	✓	-
DIAST0	Dial-up traffic Slave	-	✓	-	-	✓ 3)	-
ET83	IEC 61850 Ed. 1 (Client, Server, GOOSE)	✓ 2)	-	-	✓ 2)	-	-
ET84	IEC 60870-5-104	✓ 2)	-	-	✓ 2)	-	✓
ET85	IEC 61850 Ed. 2 (Client, Server, GOOSE), Ed. 1 (Client)	✓ 2)	-	-	✓ 2)	-	-
UMPMT0	IEC 60870-5-101 Master	-	✓	✓	-	✓	-
UMPST0	IEC 60870-5-101 Slave	-	✓	✓	-	✓	-
AGPMT0	AGP interfacing Master	-	✓	✓	-	✓	-
BMCUT0	Benning MCU ASCII protocol	-	✓	✓ 2)	-	✓	-
COUMT0	IEC 62056-21 (IEC 1107) Master	-	✓	✓	-	✓	-
DNPST0	DNP3 Slave	-	✓	✓	-	✓	-
DNPMT0	DNP3 Master	-	✓	✓	-	✓	-
DNPiT1	DNP3 TCP/IP Slave	✓ 2)	-	-	✓ 2)	-	-
DNPiT2	DNP3 TCP/IP Master	✓ 2)	-	-	✓ 2)	-	-
MODMT2	MODBUS RTU Master	-	✓	✓	-	✓	-
MODST0	MODBUS RTU Slave	-	✓	✓	-	✓	-
PCBST0	SAT SK 1703 PCMBA Slave	-	✓	✓	-	✓	-
RP5UT1	ABB RP570/571 Slave	-	✓	✓	-	✓	-
SMST0	ASCII protocol for SMS alerting	-	✓	-	-	✓ 3)	-
ST1ST0	Siemens SINAUT ST1 Slave	-	✓	✓	-	✓	-
TG8ST0	L&G Telegyr 800 Slave	-	✓	✓	-	✓	-

1) only in RS-422 mode

2) fixed if `Mode of ethernet ports` = **1 IP address (connected ports in switch mode)**

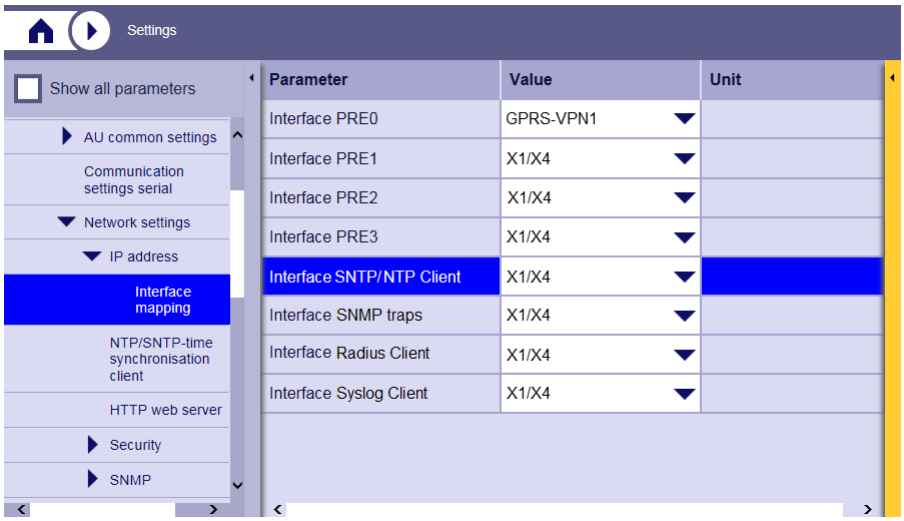
3) only in RS-232 mode

9.1.7.2.1 Protocols via Ethernet

The assignment of the Ethernet interface for all (integrated and equipable) protocols via Ethernet is dependent on the use case:

- Usage of 2 Ethernet interfaces (parameter `Mode of ethernet ports` = **2 IP addresses (independent ports)**)
- Communication with IP Security (parameter `IP security activated` = **YES**)
- GPRS communication (parameter `enable GPRS communication` = **YES**) (applies only for CP 8022)

The assignment of the Ethernet interface takes place in the directory tree under **SICAM A8000 CP-80xx | Master module | Network settings | IP addresses | Interface mapping**.



Overview of the select options for the assignment of the Ethernet interface

		`IP Security enabled`			
		NO	YES		
`IPSec VPN Tunnel 1 enabled`		-	YES	NO	YES
`IPSec VPN Tunnel 2 enabled`		-	NO	YES	YES
`enable GPRS communication`	NO	X1 X4	X1-VPN1 X4	X1-VPN2 X4	
	YES	-	GPRS-VPN1 X1/X4	GPRS-VPN2 X1/X4	GPRS-VPN1 GPRS-VPN2 X1/X4

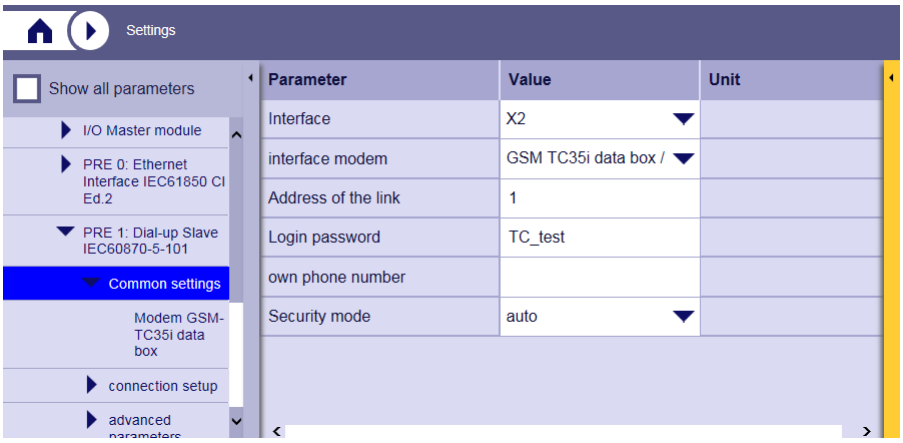
Note

In case of enabled IP Security always **LAN** must be selected with parameter `Network settings | IP address |Network connection X1` (`Network connection X2`), even if IP Security is used via GPRS.

9.1.7.3 Selection of the Transmission Facility

After the assignment of a physical interface, you can select a transmission facility usable for the respective protocol element with the parameter `Interface modem`.

Dependent on the selected transmission facility, in the directory tree under **SICAM A8000 CP-80xx | Master module | PRE** *<0…3>*: *<protocol>* **| Common settings** a dynamic subdirectory is created.



In this subdirectory, you can adapt the settings on the protocol element to the values of the transmission facility. Example: the speed for the transmission to the remote station by means of parameter `Baud rate`.

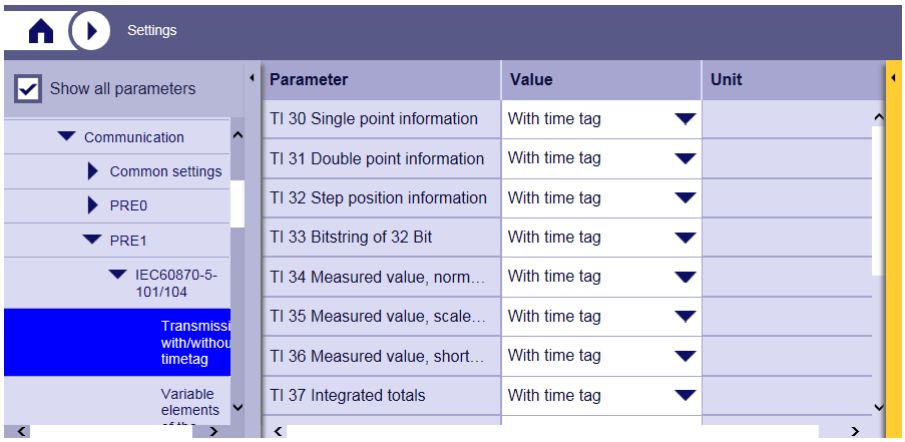
You find further details thereto in the manual *SICAM RTUs Common Functions Protocol Elements, respectively in the section "Optimized Parameters for selected Transmission Facilities"*.

After saving the settings a restart request appears.

- Click , if you want to change further parameters
- Click to perform a restart

9.1.7.4 Settings of the Messages

The settings of the messages reside in the directory tree under
SICAM A8000 CP-80xx | Master module | Communication | PRE<*0…3*> **| IEC60870-5-101/104**
(the checkbox SHOW ALL PARAMETERS must be activated).



These settings are independent on the communication type and exist on the Master Module individually for each protocol element:

- Transmission with/without time tag
- Variable elements of the message
- Command time monitoring
- Monitoring ACTCON

Transmission with/without time tag

The information objects supported by CP-8000/CP-802*x* can be transmitted to the control center either with time tag or without time tag. The definition happens selectively for each type identification.

You find the parameters thereto in the subdirectory **Transmission with/without time tag**.

Variable elements of the message

For the communication with different systems the byte numbers of the identifiers in the message header can be parameterized.

The settings on the Master Module reside in the subdirectory under
Variable elements of the message.

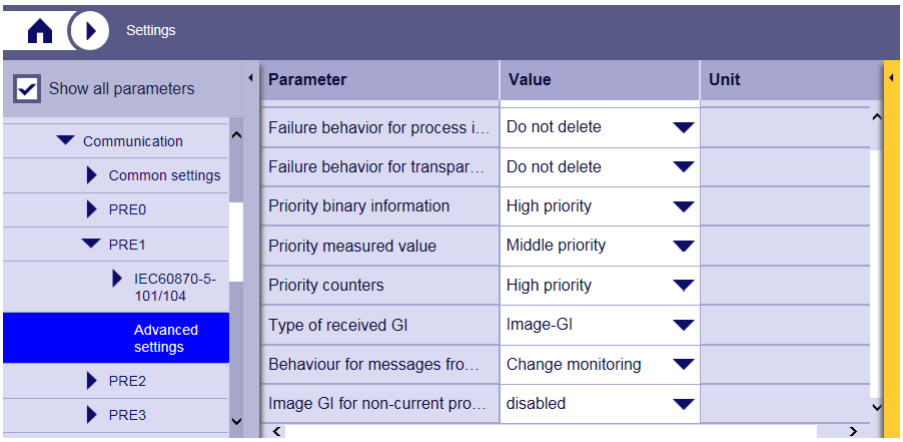
You find the information thereto in the manual *SICAM RTUs Common Functions System and Basic System Elements, Appendix "Message Formats"*.

The settings on the protocol element reside in the directory tree under
SICAM A8000 CP-80xx | Master module | PRE <*0…3*>**:** <*protocol* > **| Advanced settings | IEC 60870-5-101** (applies only for point-to-point traffic and multi-point traffic).

You find the information thereto in the manual *SICAM RTUs Common Functions Protocol Elements, chapter "Multi-Point Traffic (UMP)", section "Communication according to IEC 60870-5-101", "Data Acquisition by Polling (Station Interrogation)"*.

9.1.7.5 Data Management and Priority Control

The settings for data management and priority controltraffic) reside in the directory tree under **SICAM A8000 CP-80xx | Master module | Communication | PRE**<*0…3*> **| Advanced settings**.
(the checkbox SHOW ALL PARAMETERS must be activated).



- Behavior upon communication failure
- Priority for the emission

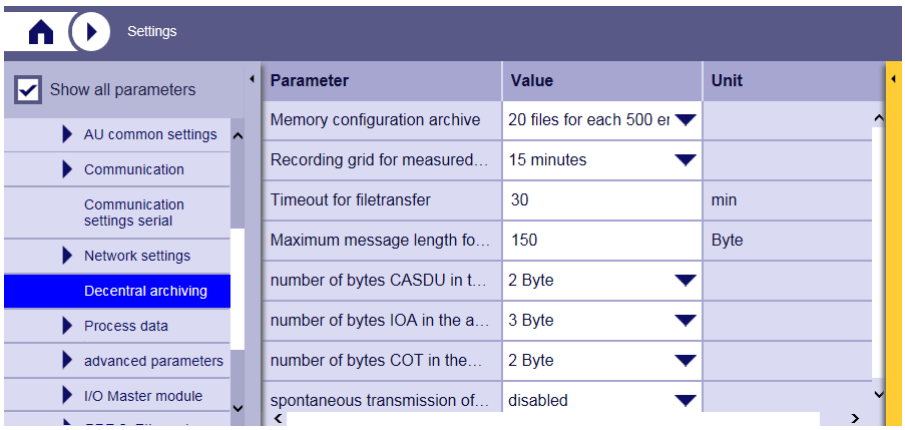
You find the information thereto in the manual *SICAM RTUs Common Functions System and Basic System Elements, chapter "Telecontrol", section "Communication with other Automation Units", section "Data Storage", "Behavior during a Communication Failure" and section "Priority Control"*.

9.1.8 Configuration of the Decentralized Archive

- Menu `Home | Settings`

The decentralized archive serves for the local storage of events of a substation, and - whenever necessary - for the transmission to the control system. By means of that, it is for instance possible to recover the archive of a control system after a communication fault.

The configuration of the decentralized archive resides in the directory tree under **SICAM A8000 CP-80xx | Master module | Decentral archiving** (the checkbox SHOW ALL PARAMETERS must be activated).



All the data points that are recorded in the event list are simultaneously recorded in the decentral archive. The definition thereto resides in the signal parameterization (see 9.1.11.2.1, Configurable Logging and Display of Signal States).

The data points to be recorded are archived chronologically during operation. The record happens for the following categories:

- Commands upon status change
- Binary information items upon status change
- Measured values according to parameter `Recording grid for measured values`

You find the detailed information on the settings in the manual *SICAM RTUs Common Functions System and Basic System Elements, chapter "Telecontrol", section "Decentralized Archiving"*.

Note

The data records of the decentralized archive are registered in configurable files. The files are stored on the SD card. The record of data points is therefore only possible with equipped SD card.

Memory Configuration Archive

With the help of this parameter it is possible to select the configuration of the archive stored on the SD card. You may select this parameter referring to your field of application. The smaller the bandwidth of your communication line is the smaller the separated files should be.

Recording Grid for Measured Values

This parameter defines the recording grid (the cycle time) for measured values. It can be set from 1 to 60 minutes.

Timeout for Filetransfer

With this parameter it is defined when the data transmission will be cancelled if a disturbance occurs during a file transfer (connection error etc.).

Number of Bytes for CASDU, IOA, COT in the Archive

You can select the format of saving the entries into the archive. If there is a control system which needs another format for the CASDU, IOA or COT you can define this with the help of these parameters. The parameters only affect the entries in the archive, however, it will not affect any other data in your automation unit.

Note

It is not possible to call the archive from more than one different control system which use different settings for the number of bytes for CASDU, IOA, COT, because the settings for these parameters affect the whole archive of a automation unit.

Spontaneous Transmission of Directory List

It is possible to transmit the directory list spontaneously. This behavior is specified in the IEC 60870-5. It means, that whenever there is a change in the directory list (one file was written, or an old file was deleted), this change may be reported to the control system. However, since upon initialization of a file transfer the control system asks for the directory list anyway, it is not useful to transmit the directory list spontaneously.

Note

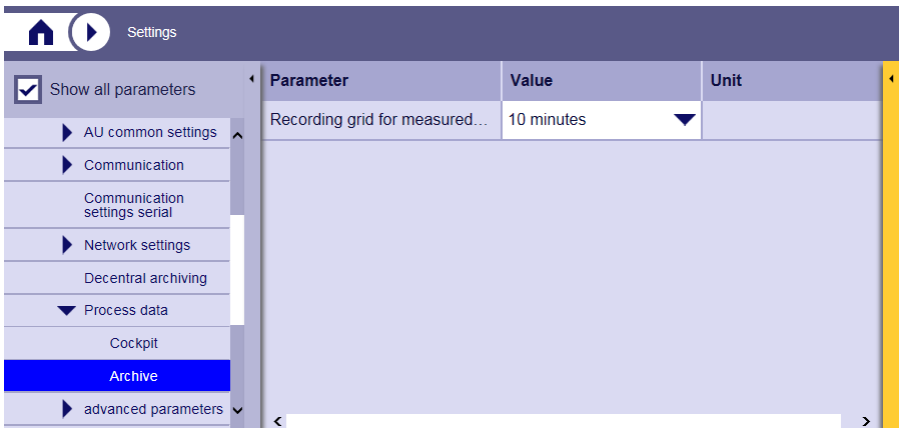
The addresses that are calculated automatically are not shown in the web browser. If such an address is set in the parameterization of the telecontrol function, an error message occurs on attempt to apply.

9.1.9 Configuration of the Process Data Archive

- Menu `Home | Settings`

The process data archive serves for the local storage of binary information items and measured values of a substation, and - whenever necessary - for the download and evaluation on the engineering PC.

The configuration of the process data archive resides in the directory tree under **SICAM A8000 CP-80xx | Master module | Process data | Archive** (the checkbox SHOW ALL PARAMETERS must be activated).



Only those data points are recorded in the archive, which are parameterized for that. The assignment thereto can be performed in the signal parameterization (see 9.1.11.2.1, Configurable Logging and Display of Signal States).

The data points to be recorded are archived chronologically during operation. The archive captures up to 5.000.000 records over a maximal period of 3 months. The record happens for the following categories:

- Binary information items: upon status change (process data message)
- Measured values: according to parameter `Recording grid for measured values` (process data measured values)

Note

The contents of the process data archive is deleted with every change of the configuration of process data measured values and/or of process data message (for instance if a new signal is added). If needed, download the archive before such kind of change (see 9.3.6, Download Process Data Archive).

Change of a signal name affects the archive only after startup. Before startup the archive shows the previous signal name.

Recording Grid for Measured Values

This parameter defines the recording grid (the cycle time) for measured values. It can be set from 1 to 60 minutes.

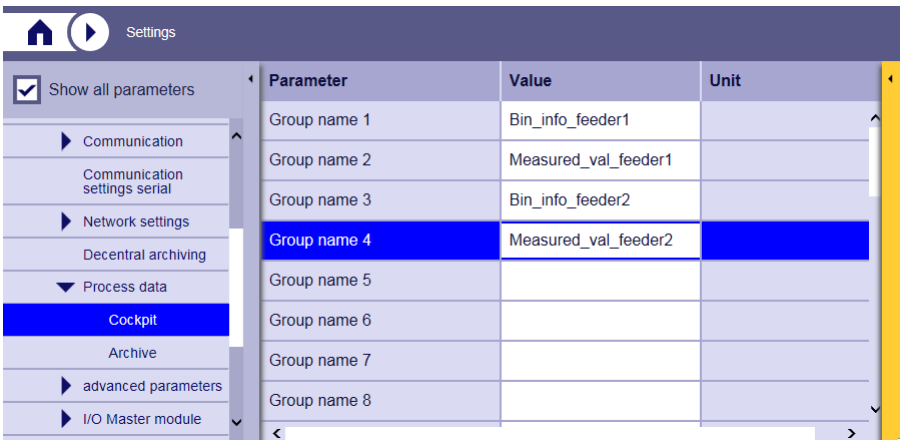
9.1.10 Configuration of the Local Process Data Display (only CP-8000)

The definition of the groups happens in the

- Menu `Home | Settings`

The local process data display (cockpit) enables the visualization of the status of process signals on the LCD. For the cockpit, binary information items, measured values and integrated totals can be selected by means of assignment to groups.

The configuration of the local process data display resides in the directory tree under **SICAM A8000 CP-80xx | Master module |Process data | Cockpit** (the checkbox SHOW ALL PARAMETERS must be activated).



For the local process data display in the cockpit, 32 freely definable groups are available with respectively up to 256 entries. The assignment to the groups can be performed in the signal parameterization (see 9.1.11.2.1, Configurable Logging and Display of Signal States).

- In the column Value, enter the respective desired name (max. 24 characters)
- Save the settings with the button

The group display on the LCD (menu `Cockpit`) is immediately refreshed thereupon.

Note

If in the signal settings a group is assigned for which no name has been set, in the Cockpit appears the default name (example: `Group_6`).

This is how you get to the display of signal states on the LCD:

- Menu `Monitoring | Cockpit` (see 11.1.2.4.5, Cockpit)

9.1.11 Configuration of Peripheral and Internal Signals

- Menu `Home | Signals`

In order to use the peripheral functios, on the I/O Master Module a corresponding firmware must be selected in the Configuration page.

The firmware of the I/O Master Module provides the functions for the technological preparation of the inputs/outputs (signal preprocessing, signal postprocessing).

CP-8000/CP-802*x* supports 2 internal and up to 6 external I/O Modules. The following types can be used:

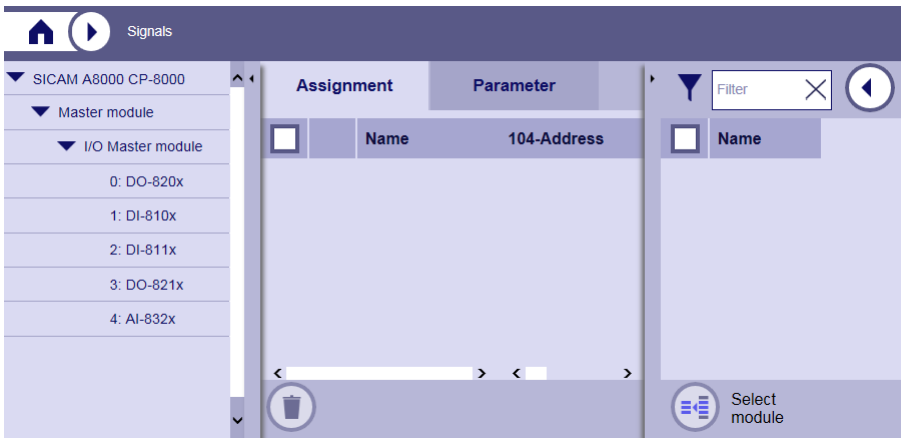
- Digital input (DI) for the acquisition of binary information and counting pulses
- Analog input (AI) for the acquisition of currents, voltages and temperatures
- Digital output (DO) of commands and binary information
- Analog output (AO) of currents and voltages

I/O Modules are equipped with an individual number of physical inputs/outputs that serve for the acquisition or for the output of electrical signals.

The names of the I/O Modules appear in the directory tree corresponding to the equipped configuration.

9.1.11.1 Defining Signals

You can define new signals, change existing ones and assign to the corresponding system element. The assignment of the electrical signals to an I/O Module takes place through the relative terminal assignment.



Under the tab `assignment` you can define the connectable inputs/outputs of the hardware (pins) on the I/O Module as data points in the target device.

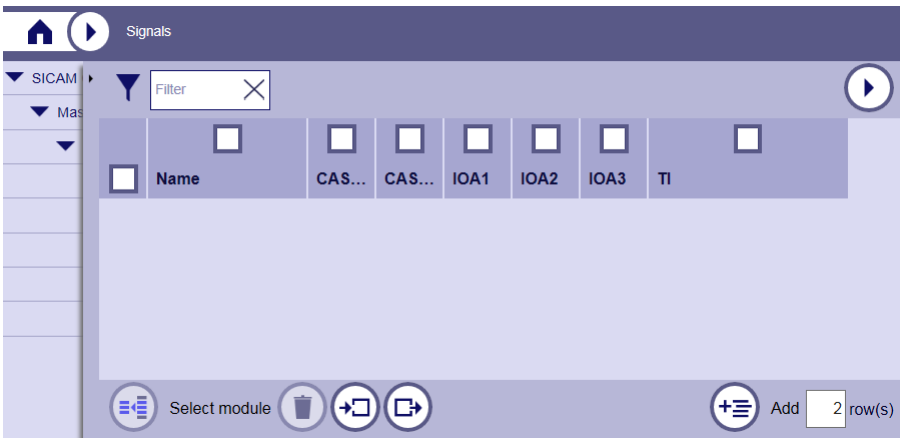
Under the tab `parameter` you find the type-specific parameter block of the assigned signals for the setting of the process-technical functionality.

You find the description the functions for the signal preprocessing and signal postprocessing, as well as their parameters, in the manual *SICAM RTUs Common Functions Peripheral Elements According to IEC 60870-5-101/104*.

You find an overview of the parameters and value ranges in the *SICAM TOOLBOX II Online Help, chapter "Parameter Documentation and Diagnostic Info", "SICAM RTUs and 1703 Ax (IEC) Periphery", "Firmwares“, “USIO80“ (“USIO81”)*.

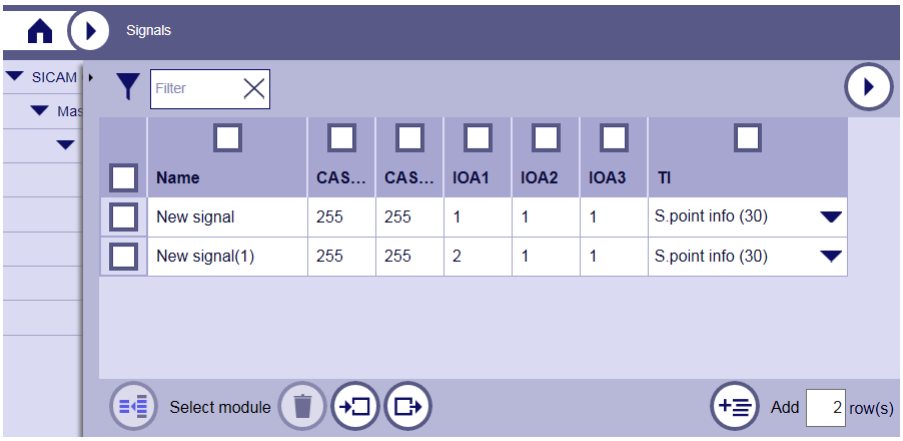
This is how to create a new signal:

- Click on the triangle on the upper right side to open the workspace defining signals



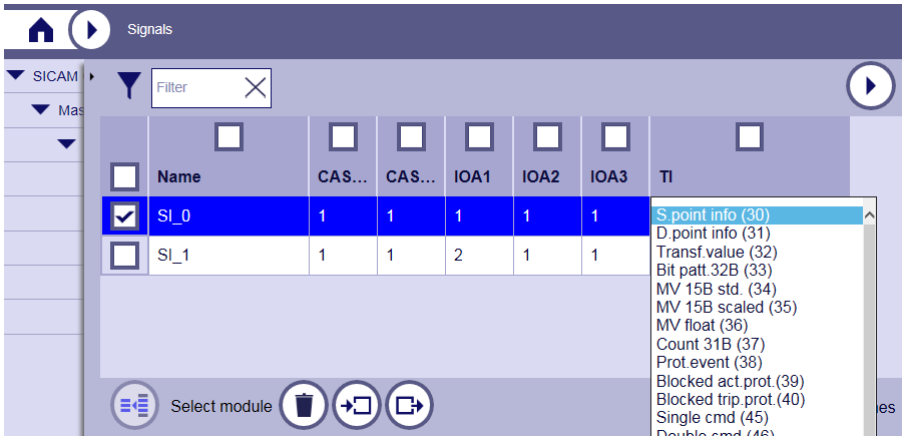
- Enter the desired number of rows (each row corresponds to 1 signal)
- Cick on the button

In the following example 2 new signals have been created:



This is how to define the signals:

- Enter a signal name (`Name`)
- Enter the message address (`CASDU1`, `CASDU2`, `IOA1`, `IOA2`, `IOA3`)
- Select the type identification (`TI`) from the drop-down list



Signal Name

The signal name may be from 1 up to 128 characters long. Besides the signal list it is used for the event logging and for the test functions (visualization via SICAM WEB and via LCD).

Message Address

With the message address the data points of the communication and of the *open-/closed-loop control function* are assigned. You find the exact details thereto in the manual *SICAM RTUs Common Functions System and Basic System Elements, chapter "System Services", section "Data Flow Control"*.

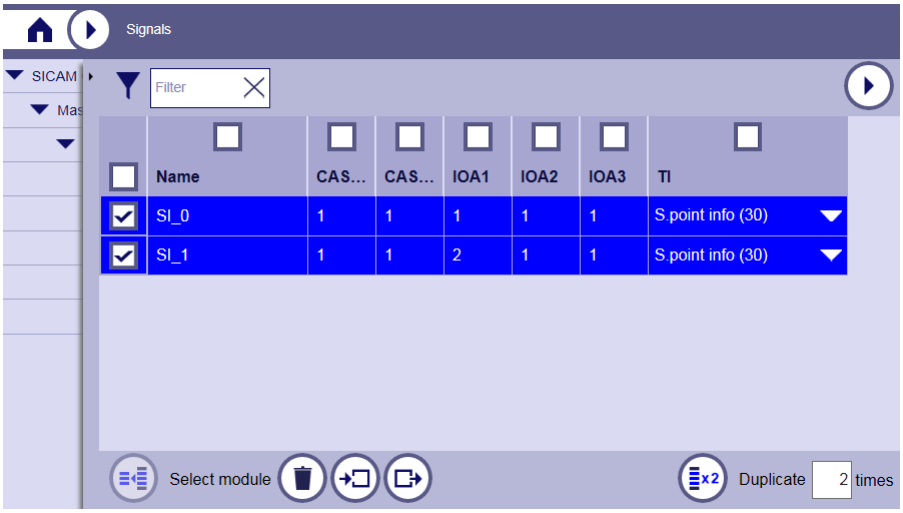
Type Identification

The description of the different type identifications (TI) resides in the manual *SICAM RTUs Common Functions System and Basic System Elements, Appendix "Message Formats"*.

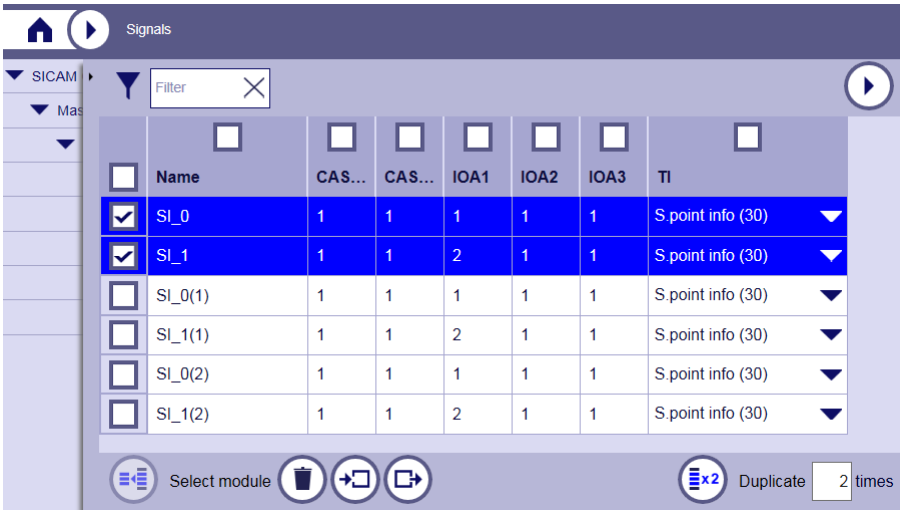
9.1.11.1.1 Duplicate and Delete Rows

This is how you can duplicate lines:

- Mark the row(s) to be copied
- Enter the desired factor
- Click on the button



With this example the signals SI_0 and SI_1 are duplicated twice each.



Define Name, IEC address and type identification for the new signals

This is how you can delete lines:

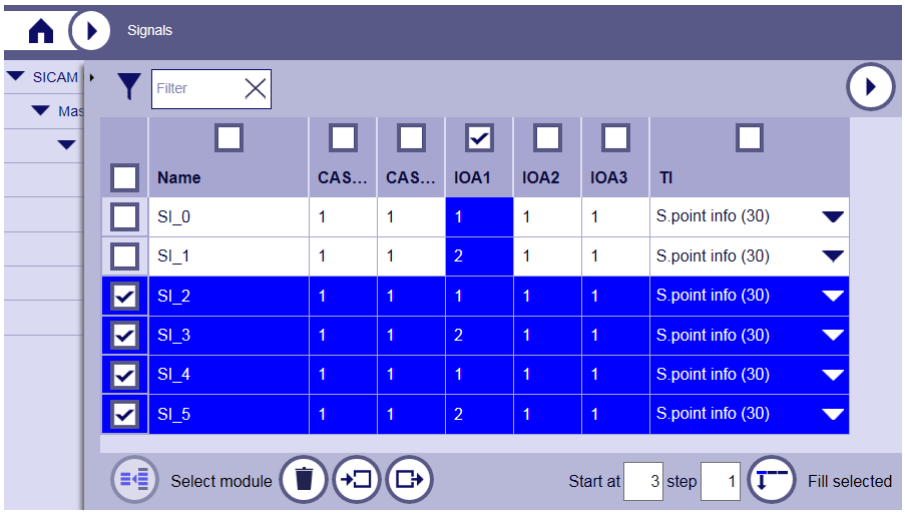
- Mark the relevant row
- Click on the button

9.1.11.1.2 Automatic Filling and Automatic Incrementation

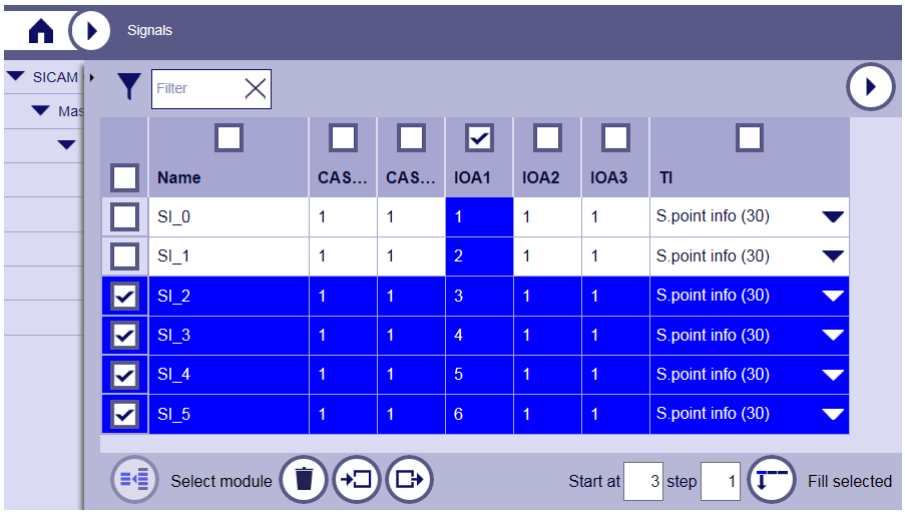
This function provides a quick and easy creation of multiple signals.

Example: You have created 10 new signals. The IOA1 of the first signal shall start with 3. The value of all subsequent signals shall be consecutively increased by 1.

- Set a mark in the checkbox left beside the desired rows (you can also mark all rows by means of the checkbox above the left-most column)
- Set a mark in the checkbox above the IOA1 column
- Enter the value 3 in the input field START AT (this field is always preset with the cross value of the selected column and the first selected row)
- Enter the value 1 in the input field STEP
- Click on the button (FILL SELECTED)



Result: The IOA1 of all subsequent signals is consecutively increased by the value 1.

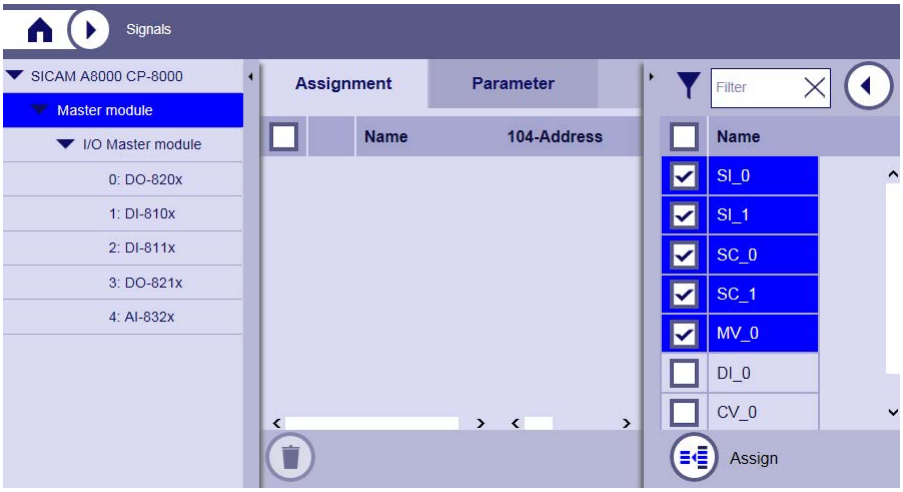


9.1.11.2 Assign Signals to the Master Module

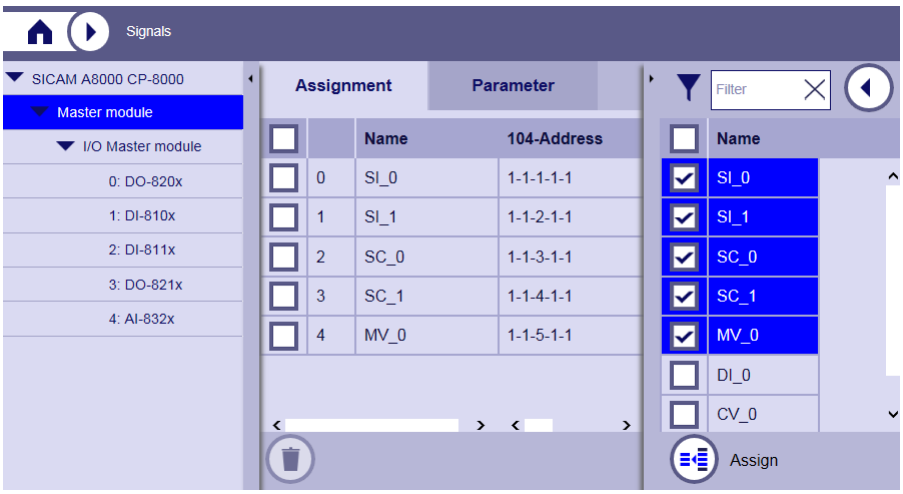
If you have already defined signals, these can be assigned to the Master Module for the further processing.

This is how to assign signals to the Master Module:

- Click on the button on the upper right side to close the workspace for the signals generation
- Select the directory **SICAM A8000 CP-80xx | Master module**
- Mark on the right side the signals you want to assign
- Click on the button (ASSIGN)



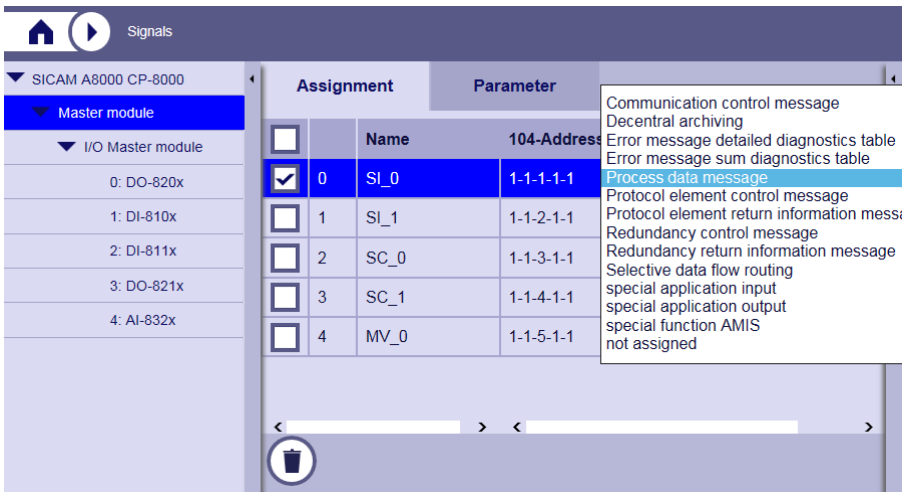
The assigned signals are now listed in a table under the tab Assignment.



Note

You can enlarge the work area by clicking on the bars right and/or left beside the work area.

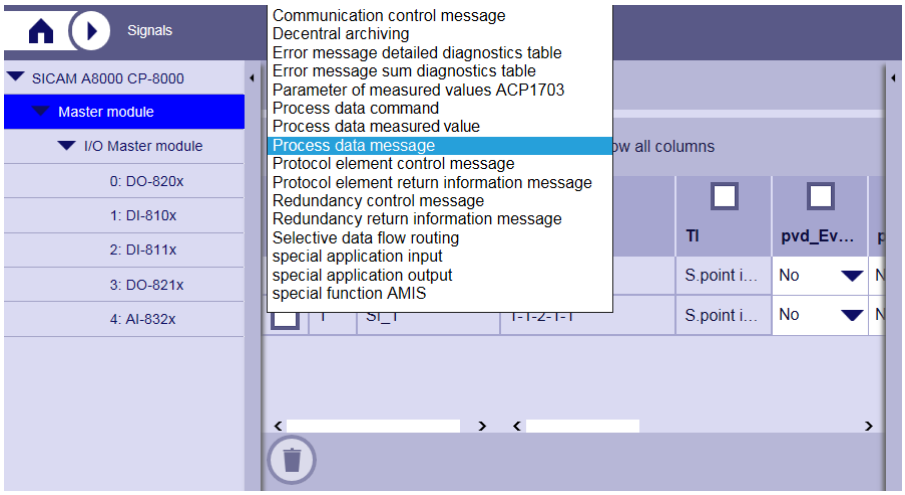
- In the drop-down list, select the desired category for the signal



In the drop-down list, only categories are offered that correspond with the TI of the signal.

This is how to parameterize the assigned signals:

- Open the `Parameter` tab
- Select the previously defined category for the newly assigned signal from the drop-down list



All signals of the selected category (on the selected system element) are displayed listed in the table. Thereby, the signal name, the message address and the type identification are taken over from the work area for the signal generation.

After selection of the category you can set the process-technical parameters for the respective signals.

- Activate the checkbox SHOW ALL PARAMETERS, if you want to edit expert parameters
- Save your changes from time to time, refer to Apply

Further steps: Restart device.

9.1.11.2.1 Configurable Logging and Display of Signal States

Process signals assigned to the Master Module can be configured for the logging (alarm, event, archive) and for the display on the LCD (cockpit – only CP-8000).

The following categories and signal types are designated for that:

Category	TI	Alarm list	Event list	Archive	Cockpit
Process data command	TI 45 TI 46		✓ ✓		
Process data message	TI 30 TI 31	✓ ✓	✓ ✓	✓ ✓	✓ ✓
Process data measured value	TI 34 TI 35 TI 36 TI 37			✓ ✓ ✓ ✓	✓ ✓ ✓ ✓

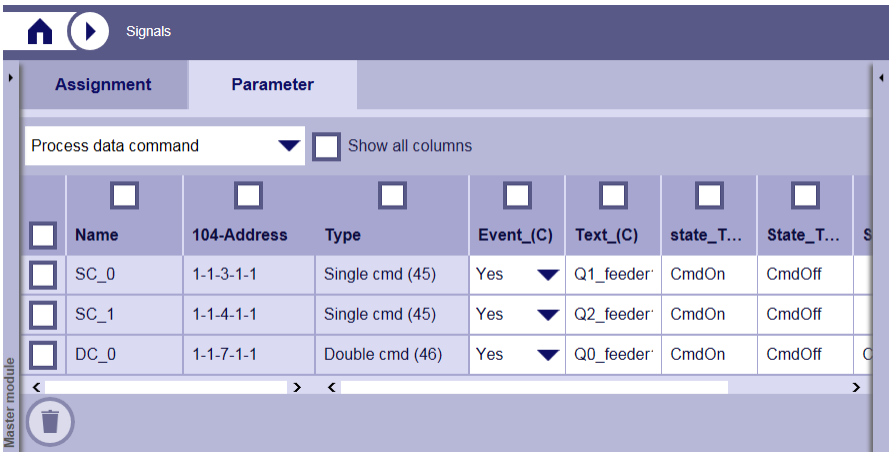
This is how to define signals for the logging and/or for the display on the LCD:

Example: Process data command

- Under the tab Parameter, select the category "Process data command"

All signals assigned to that categorie are displayed.

- Enter for each signal the desired texts for name and states
- Select for each signal, whether ist is to be logged as an event



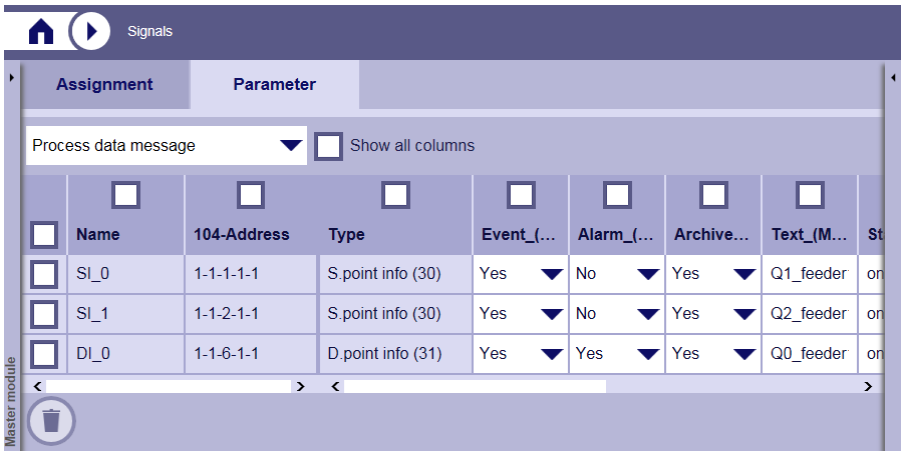
Description of the parameters see Process data command.

Example: Process data message

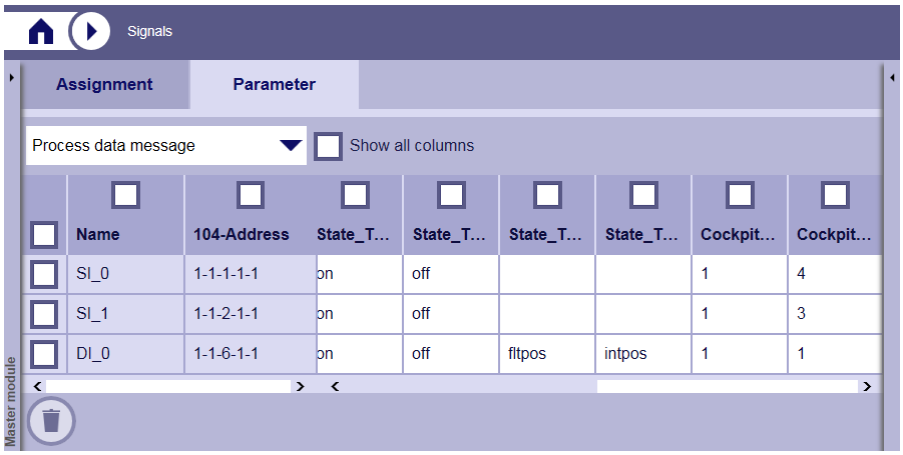
- Under the tab `Parameter`, select the category "Process data message"

All signals assigned to that category are displayed.

- Enter for each signal the desired texts for name and states
- Select for each signal, whether it is to be logged as an event
- Select for each signal, whether it is to be logged as an alarm
- Select for each signal, whether it is to be logged in the process data archive



- For the process display in the cockpit, assign the desired group number and the position within the group



In this example, 3 binary information items are assigned to the group positions 1, 3 and 4. When position 2 is not used, at this place an empty line will be displayed on the LCD (see 11.1.2.4.5, Cockpit).

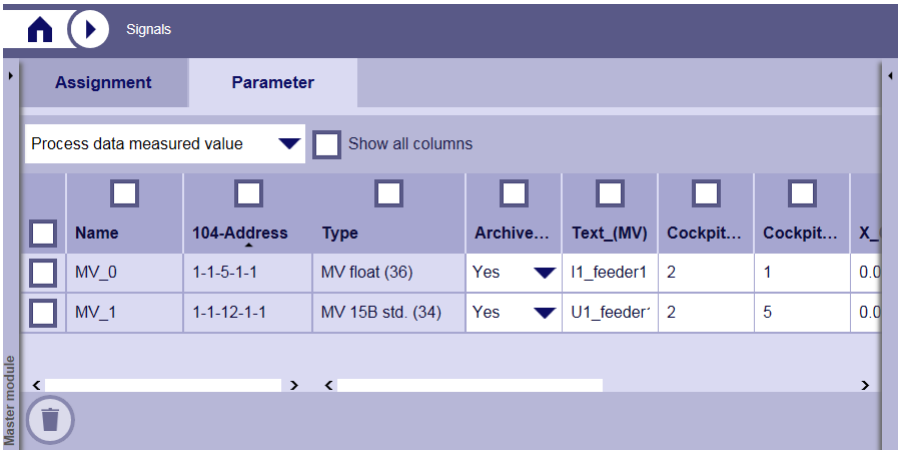
Description of the parameters see Process data message.

Example: Process data measured value

- Under the tab `Parameter`, select the category "Process data measured value"

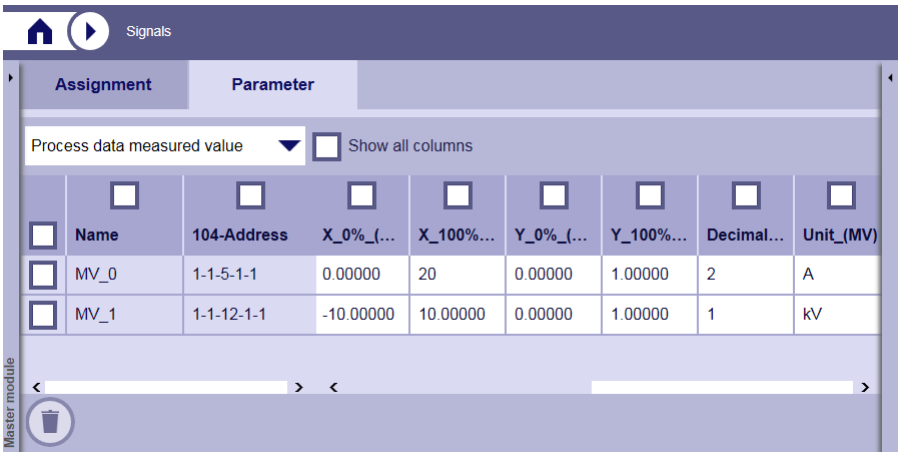
All signals assigned to that category are displayed.

- Enter for each signal the desired texts for name and states
- Select for each signal, whether it is to be logged in the process data archive
- Assign for each signal the desired group number and the position within the group for the process display in the cockpit



In this example, 2 measured values are assigned to the group positions 1 and 5. When the positions 2, 3 and 4 are not used, at this place an empty line will be displayed on the LCD (see 11.1.2.4.5, Cockpit).

- Enter the measuring range for the value adaptation
- Enter the number of decimal places for the display



Description of the parameters see Process data measured value.

This is how to define groups for the Cockpit:

- Menu `Home | Alarms & Events | Event list`
  (further information see 9.1.10, Configuration of the Local Process Data Display (only CP-8000))

This is how you get to the logging of signal states in SICAM WEB:

- Menu `Home | Alarms & Events | Event list`
  (further information see 9.1.14.1, Show Event List)
- Menu `Home | Alarms & Events | Alarm list`
  (further information see 9.1.14.2, Show Alarm List)

This is how you get to the logging of signal states on the LCD:

- Menu `Monitoring | Events`
  (further information see 11.1.2.4.2, Events | DEF Events)
- Menu `Monitoring | Alarms`
  (further information see 11.1.2.4.4, Alarms)

9.1.11.2.2 Parameters with Assignment on the Master Module

This data can be changed – for each category – in the table for the signal generation:

Category	Parameter	Meaning
Communication control message	Control_function_(COM)	• Revision function • Test function • Block function
	PRE	Protocol element
	Station_(COM)	Station number (selective 0…99 or all)
	CASDU1_(COM)	Address of the datapoint. The complete address consists of CASDU1, CASDU2, IOA1, IOA2 and IOA3. CASDU1 and CASDU2 = 255 means no spontaneous transmission.
	CASDU2_(COM)	Address of the datapoint. The complete address consists of CASDU1, CASDU2, IOA1, IOA2 and IOA3. CASDU1 and CASDU2 = 255 means no spontaneous transmission.
	Function_group_(COM)	Function group number (0…255)
	SID-BSE	Source identification basic system element
	SID-ST	Source identification station number if multipoint traffic mode 0…99 if R-SID 0…254; if automatic, the SID will be learned
	SID-SSE	Source identification supplementary system element
Decentral archiving	Function_(DEAR)	• Archive data • Address main directory • Address subdirectory • Address file
	SID-BSE	Source identification basic system element
	SID-ST	Source identification station number if multipoint traffic mode 0…99 if R-SID 0…254; if automatic, the SID will be learned
	SID-SSE	Source identification supplementary system element
Error message detailed diagnostics table	SSE	Supplementary system element
	Diagnostic_class	In case of "all bits, all records, all classes" the parameter "diagnostic record" and "diagnostic bit" are not significant
	Diagnostic_record	Diagnostic record 0…254 = record number whitin the selected diagnostic class 255 = sum of all bits of all records (the parameter "diagnostic bit" is not significant)
	Diagnostic_bit	Bit number (0…15; all bits)
Error message sum diagnostics table	Error_location/BSE	Error location/basic system element
	Error_location/SSE	Error location /supplementary system element
	Error type	Error class in the diagnosis

Category	Parameter	Meaning
Parameter of measured values ACP1703	Kind_of_parameter	• According NUC • Threshold value • Smoothing factor • Lower limit for transmission of measured values • Upper limit for transmission of measured values • Activation parameters for measured values
	Interrogation-group	General interrogation (group 1…16; none)
	MV_CASDU1	Address of the datapoint. The complete address consists of CASDU1, CASDU2, IOA1, IOA2 and IOA3. CASDU1 and CASDU2 = 255 means no spontaneous transmission.
	MV_CASDU2	Address of the datapoint. The complete address consists of CASDU1, CASDU2, IOA1, IOA2 and IOA3. CASDU1 and CASDU2 = 255 means no spontaneous transmission.
	MV_IOA1	Address of the datapoint. The complete address consists of CASDU1, CASDU2, IOA1, IOA2 and IOA3. CASDU1 and CASDU2 = 255 means no spontaneous transmission.
	MV_IOA2	Address of the datapoint. The complete address consists of CASDU1, CASDU2, IOA1, IOA2 and IOA3. CASDU1 and CASDU2 = 255 means no spontaneous transmission.
	MV_IOA3	Address of the datapoint. The complete address consists of CASDU1, CASDU2, IOA1, IOA2 and IOA3. CASDU1 and CASDU2 = 255 means no spontaneous transmission.
	MV_TI	Type identification according to IEC 60870-5-101/104
Process data command	Event_(C)	The data point is displayed in the event list
	Text_(C)	The data point is displayed with this name (max. 13 characters)
	State_TextOn_(C)	The state ON for single or double point information is displayed with this name (max. 6 characters)
	State_TextOff_(C)	The state OFF for single or double point information is displayed with this name (max. 6 characters)
	State_TextFlt_(C)	The state faulty position for double point information is displayed with this name (max. 6 characters)
	State_TextInt_(C)	The state intermediate position for double point information is displayed with this name (max. 6 characters)
	SID-BSE	Source identification basic system element
	SID-ST	Source identification station number if multipoint traffic mode 0…99 if R-SID 0…254; if automatic, the SID will be learned
	SID-SSE	Source identification supplementary system element
	SID-BSE	Source identification basic system element

Category	Parameter	Meaning
Process data measured value	SID-ST	Source identification station number if multipoint traffic mode 0…99 if R-SID 0…254; if automatic, the SID will be learned
	SID-SSE	Source identification supplementary system element
	Archive_(MV)	The data point is recorded in the decentralized archive
	Text_(MV)	The data point is displayed with this name (max. 13 characters)
	GroupNbr_(MV)	The data point is displayed in the cockpit in this group (1…32)
	GroupPos_(MV)	The data point is displayed in the cockpit on this position (1…256)
	X_0%_(MV)	Value adaptation: Lower limit of the used measuring range in the external (protocol specific) format. The corresponding internal value is defined at Y_0%.
	X_100%_(MV)	Value adaptation: Upper limit of the used measuring range in the external (protocol specific) format. The corresponding internal value is defined at Y_100%.
	Y_0%_(MV)	Value adaptation: Lower limit of the used measuring range in the selected internal format. The internal format is defined at TI (type identification). The corresponding external value is defined at X_0%.
	Y_100%_(MV)	Value adaptation: Upper limit of the used measuring range in the selected internal format. The internal format is defined at TI (type identification). The corresponding external value is defined at X_100%.
	Decimal_places_(MV)	Count of decimal places (max. 7)
	Unit_(MV)	The value is displayed with this unit text (max. 8 characters)
Process data message	Event_(MSG)	The data point is displayed in the event list
	Alarm_(MSG)	The data point is displayed in the alarme list
	Archive_(MSG)	The data point is recorded in the decentralized archive
	Text_(MSG)	The data point is displayed with this name (max. 13 characters)
	State_TextOn_(MSG)	The state ON for single or double point information is displayed with this name (max. 6 characters)
	State_TextOff_(MSG)	The state OFF for single or double point information is displayed with this name (max. 6 characters)
	State_TextFlt_(MSG)	The state faulty position for double point information is displayed with this name (max. 6 characters)
	State_TextInt_(MSG)	The state intermediate position for double point information is displayed with this name (max. 6 characters)
	Cockpit_GroupNbr_(MSG)	The data point is displayed in the cockpit in this group (1…32)
	Cockpit_GroupPos_(MSG)	The data point is displayed in the cockpit on this position (1…255)
	SID-BSE	Source identification basic system element

Category	Parameter	Meaning
	SID-ST	Source identification station number if multipoint traffic mode 0…99 if R-SID 0…254; if automatic, the SID will be learned
	SID-SSE	Source identification supplementary system element
Protocol element control message	Control_function_(PRE)	• 0...239 = function defined by protocol element • 240 = GI request • 241 = reserved • 242 = control location • 244 = CASDU selective GI request • 245...255 = reserve for further BSE functions
	Edge_(PRE)	• Positive edge • Negative edge • State (0 = function, 1 = function + 1)
	PRE_(CM)	Protocol element number • PRE0…PRE3 • distribute over multimaster function
	Station	• 0…99 = station number • 125 = to all stations • 255 = not used
	Additional_parameter_(PRE)	0...65535 = meaning for each function defined by the PRE firmware
	SID-BSE	Source identification basic system element
	SID-ST	Source identification station number if multipoint traffic mode 0…99 if R-SID 0…254; if automatic, the SID will be learned
	SID-SSE	Source identification supplementary system element
	104-Address	
	TI	Type identification according to IEC 60870-5-101/104 • Single-point information • Single command
Protocol element return information message	Return_information_function_(PRE)	
	PRE_(RM)	Protocol element number (0…3)
	Station	Station number (selective 0...99; to all stations; station not used)
Redundancy control message	Control_function_(RED)	• User priority • A/P-control • Key switch • Listening mode-control • A/P-control with failed SCA-RS • Switch-over disabled
	Failure_behavior_(RED)	• Terminate binary information • Maintain status
	BSE_(RED)	Basic system element
	PRE_(RED)	Protocol element number
	Priority_(RED)	Priority 0 (lowest)…priority 14 (highest)
	SID-BSE	Source identification basic system element
	SID-ST	Source identification station number if multipoint traffic mode 0…99 if R-SID 0…254; if automatic, the SID will be learned
	SID-SSE	Source identification supplementary system element

Category	Parameter	Meaning
Redundancy return information message	Return_information_function_ (RED)	• Redundancy state • Switchover runs at a global switchover • Keyswitch of the SCA-RS: system A active • Keyswitch of the SCA-RS: automatic • Keyswitch of the SCA-RS: system B active • Listening mode
	BSE_(RED)	Basic system element
	PRE_(RED)	Protocol element number
Selective data flow routing	PRE	Protocol element number (0…3)
	Station	0…99 = selective station unused = single-point-PRE or multi-point-PRE to all remote stations
	Data_class	• Data class 1 • Data class 2
	Periodical transfer	Selection periodical level or no periodical transfer
	Event_data	
	Time_tag	Transfer with or without time tag
	Function_group	
	address-conversion	0 = yes, 1 = no
	Change_sign_of_measured_ values	
	New_CASDU1	New address of the datapoint. The complete address consists of new CASDU1, CASDU2, IOA1, IOA2 and IOA3. New CASDU1 and CASDU2 = 255 means no address-conversion.
	New_CASDU2	New address of the datapoint. The complete address consists of new CASDU1, CASDU2, IOA1, IOA2 and IOA3. New CASDU1 and CASDU2 = 255 means no address-conversion.
	New_IOA1	New address of the datapoint. The complete address consists of new CASDU1, CASDU2, IOA1, IOA2 and IOA3. New CASDU1 and CASDU2 = 255 means no address-conversion.
	New_IOA2	New address of the datapoint. The complete address consists of new CASDU1, CASDU2, IOA1, IOA2 and IOA3. New CASDU1 and CASDU2 = 255 means no address-conversion.
	New_IOA3	New address of the datapoint. The complete address consists of new CASDU1, CASDU2, IOA1, IOA2 and IOA3. New CASDU1 and CASDU2 = 255 means no address-conversion.
	Selectivity	Selective or to all remote stations
	SID-BSE	Source identification basic system element
	SID-ST	Source identification station number if multipoint traffic mode 0…99 if R-SID 0…254; if automatic, the SID will be learned
	SID-SSE	Source identification supplementary system element
Special application input	OUT_CASDU1	Address of the datapoint
	OUT_CASDU2	Address of the datapoint

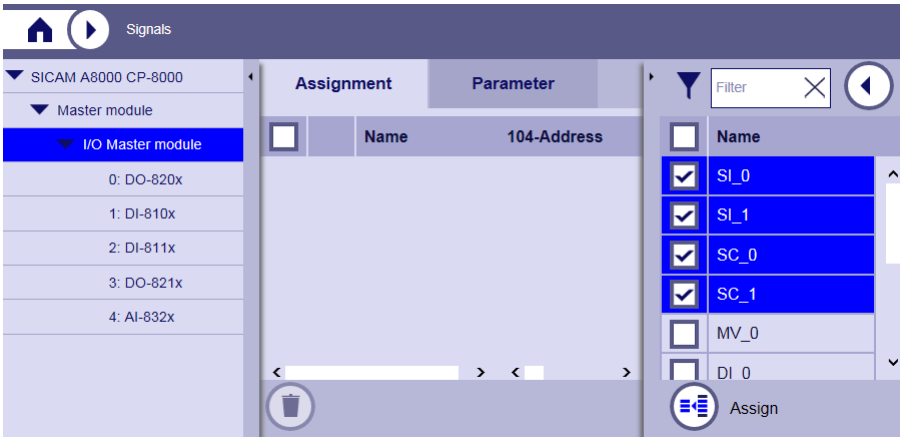
Category	Parameter	Meaning
	OUT_IOA1	Address of the datapoint
	OUT_IOA2	Address of the datapoint
	OUT_IOA3	Address of the datapoint
	OUT_TI	Type identification according to IEC 60870-5-101/104
	Inversion	NO/YES
	TI31_Selection	OFF/ON
	Fail_behav	Failure behavior
	Fail_subst_value	Substitute value at failure
	single_object_number	
	Command_state	• Command state not evaluate • Command state ON before OFF • Command state OFF before ON
	Command_output_time	For TI 160: 0...6200•50 ms, for TI 45, 46, 47: • 0=no additional definition • 1=short pulse duration • 2=long pule duration • 3=persistent output
	SID-BSE	Source identification basic system element
	SID-ST	Source identification station number if multipoint traffic mode 0…99 if R-SID 0…254; if automatic, the SID will be learned
	SID-SSE	Source identification supplementary system element
Special application output	Function	• OR conjunction, falling edge time delayed • AND conjunction, falling edge time delayed • OR conjunction, output as transients, falling edge time delayed • Message conversion • OR conjunction, rising edge time delayed
	Inversion	NO/YES
	Fail_behav_status	Conjunction type
	Time_delay	Time delay n•100 ms • 0 0 no delay • 1 = 100 ms • 255 = 25.5 s

9.1.11.3 Assigning Signals to the I/O Master Module

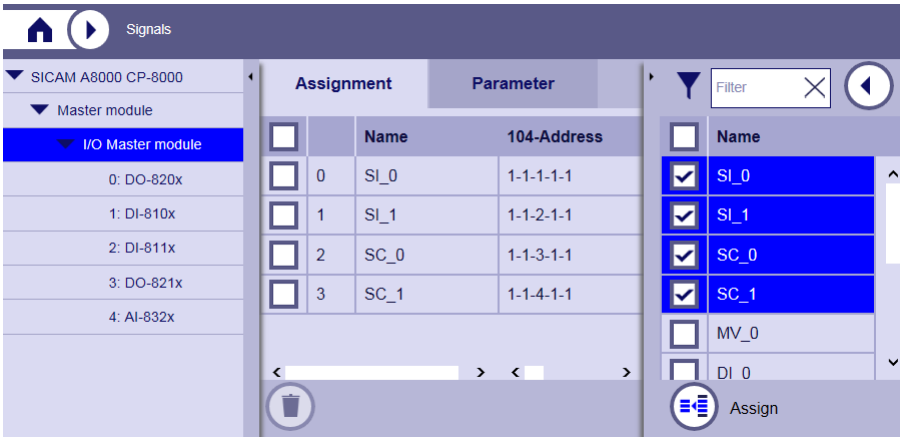
If you have already defined signals, these can be assigned to the I/O Master Module for the further processing.

This is how to assign signals to the I/O Master Module:

- Click on the button right above in order to close the work area for the signal generation
- Select the directory **SICAM A8000 CP-80xx | Master Module | I/O Master Module**
- Mark on the right side the signals to be assigned
- Click on the button (Assign)

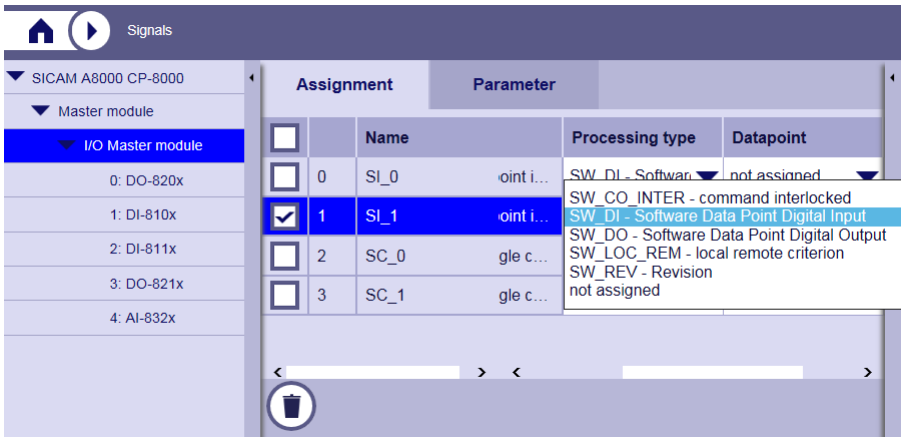


The assigned signals are now listed in a table under the tab `Assignment`.



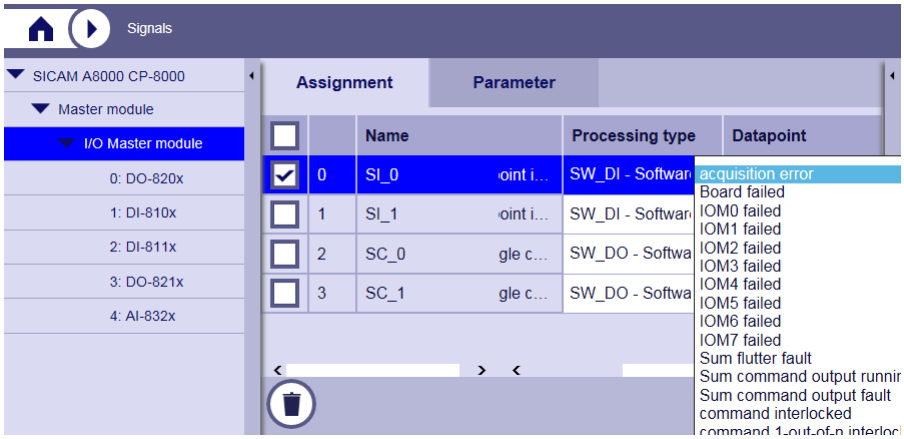
You can extend the work area by means of clicking on the sidebars left and/or right beside the work area.

- In the corresponding dropdown list, select the processing type for the respective signal



In the dropdown list only those processing types are offered that are compatible with the TI of the signal. Only software datapoints can be assigned to the I/O Master Module.

- In the corresponding dropdown list, select the DATAPOINT for the respective signal

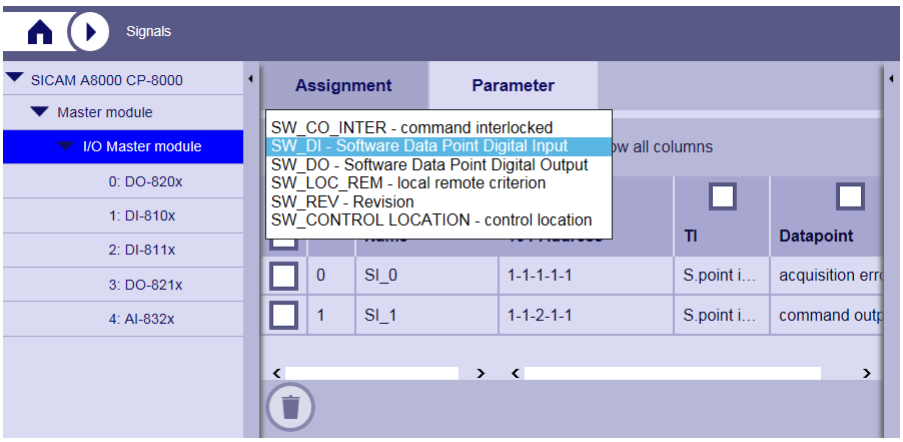


In the dropdown list only those datapoints are offered that are compatible with the processing type and that are not yet in use.

HW PINS are irrelevant here and therefore not editable.

This is how to parameterize the assigned signals:

- Open the Parameter tab
- In the dropdown list, select the previously defined processing type for the newly assigned signal



All signals of the selected processing type (on the selected system element) are displayed listed in the table. Thereby, the signal name, the message address and the type identification are taken over from the work area for the signal generation.

The processing types offered on the I/O Master Module are dependent on the configured firmware for the I/O Master Module and provide only expert parameters.

- Activate the checkbox SHOW ALL PARAMETERS if you want to edit expert parameters
- Save your changes from time to time, refer to Apply

Further steps: Restart device.

9.1.11.3.1 Parameters with Assignment on the I/O Master Module

This data can be changed – for each category – in the table for the signal generation:

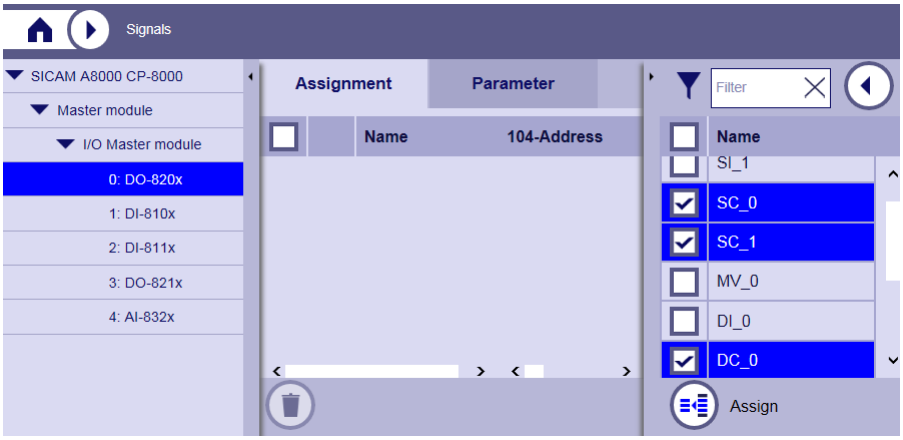
Processing type	Parameter	Meaning
SW_CO_INTER – command interlocked	–	
SW_DI – Software Data Point Digital Input	–	
SW_DO – Software Data Point Digital Output	–	
SW_LOC_REM – local remote criterion	SID-BSE	Source identification basic system element
	SID-ST	Source identification station number if multipoint traffic mode 0…99 if R-SID 0…254; if automatic, the SID will be learned
	SID-SSE	Source identification supplementary system element
SW_REV – Revision	SID-BSE	Source identification basic system element
	SID-ST	Source identification station number if multipoint traffic mode 0…99 if R-SID 0…254; if automatic, the SID will be learned
	SID-SSE	Source identification supplementary system element
SW_CONTROL LOCATION – control location	SID-BSE	Source identification basic system element
	SID-ST	Source identification station number if multipoint traffic mode 0…99 if R-SID 0…254; if automatic, the SID will be learned
	SID-SSE	Source identification supplementary system element
	ACTCON_yes_no	Sending of ACTCON and ACTTERM
SW_CO_EA – command error acknowledgement	–	
SW_DO_TE-6460	–	

9.1.11.4 Assigning Signals to the I/O Module

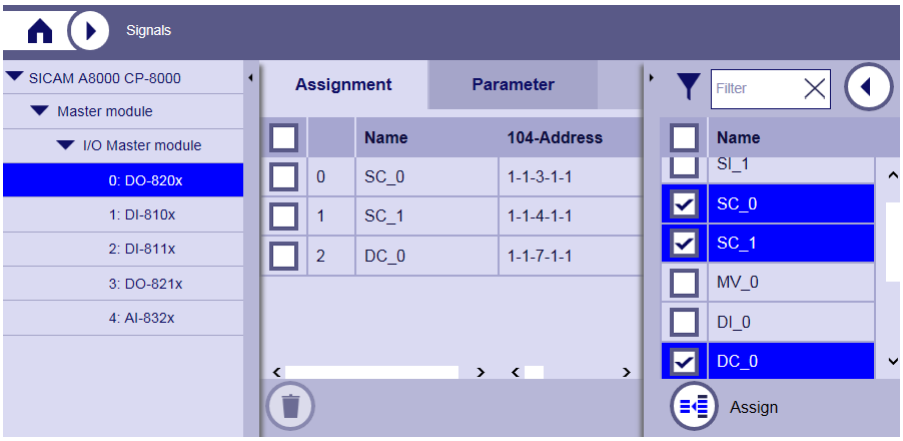
If you have already defined signals, these can be assigned to the I/O Modules.

This is how to assign signals to the I/O Master Module:

- Click on the button right above in order to close the work area for the signal generation
- Select the directory **SICAM A8000 CP-80xx | Master Module | I/O Master Module |** *<0…7>*: *<module name>*
- Mark on the right side the signals to be assigned
- Click on the button (Assign)

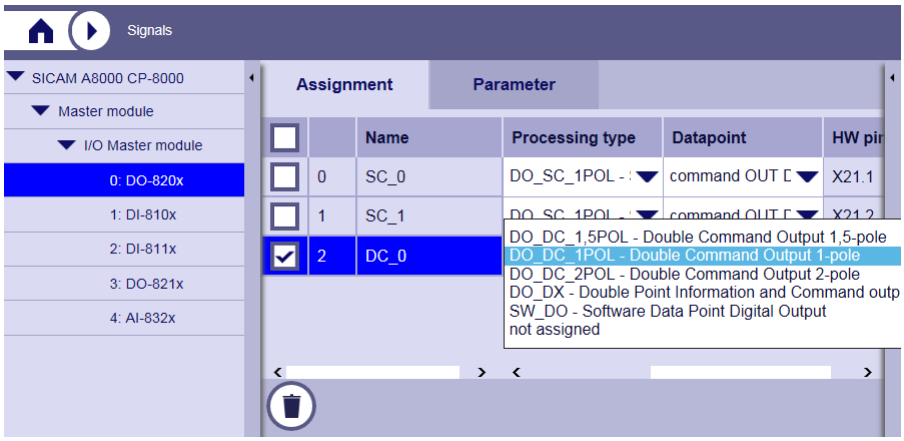


The assigned signals are now listed in a table under the tab `Assignment`.



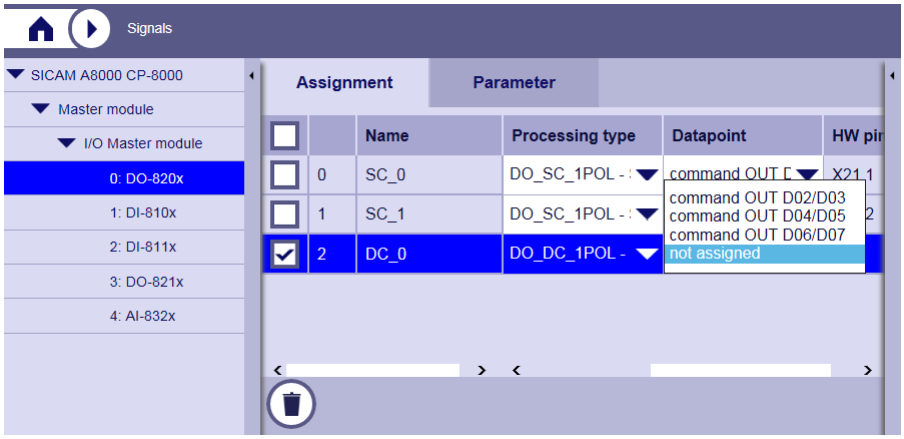
You can extend the work area by means of clicking on the sidebars left and/or right beside the work area.

- In the corresponding dropdown list, select the processing type for the respective signal



In the dropdown list only those processing types are offered that are compatible with the TI of the signal.

- In the corresponding dropdown list, select the DATAPOINT for the respective signal

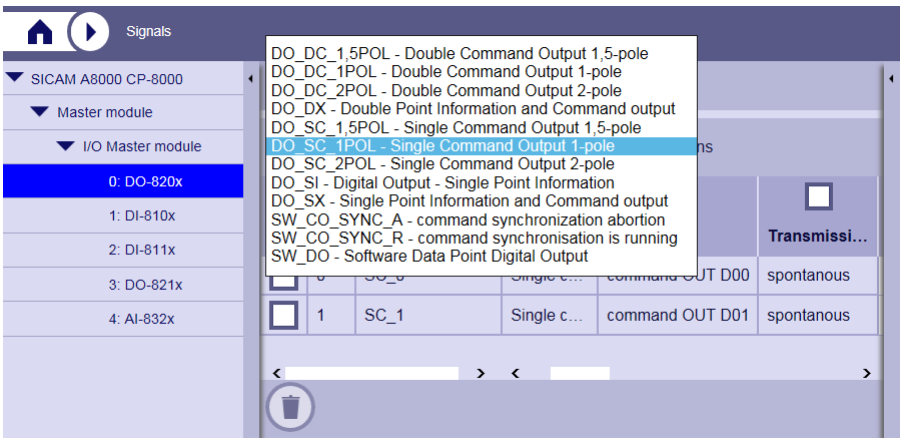


In the dropdown list only those datapoints are offered that are compatible with the processing type and that are not yet in use.

The HW pin is automatically assigned, as soon as you have defined processing type and datapoint of the signal.

This is how to parameterize the assigned signals:

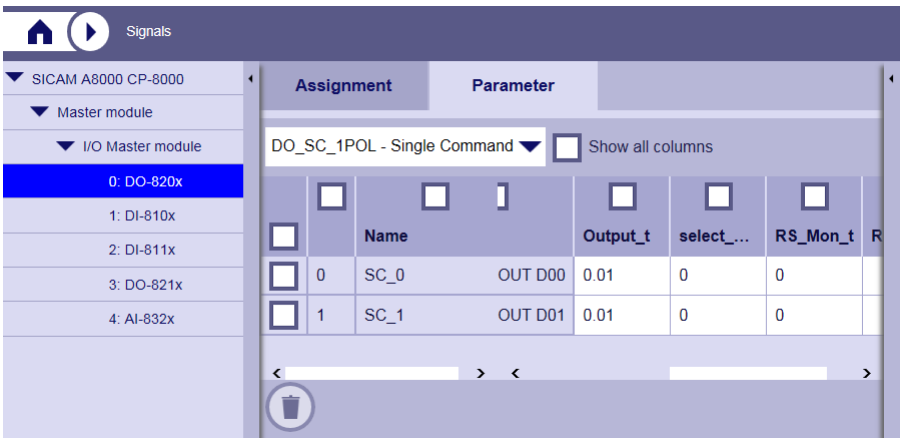
- Open the Parameter tab
- In the dropdown list, select the previously defined processing type for the newly assigned signal



All signals of the selected category (on the selected system element) are displayed listed in the table. Thereby, the signal name, the message address and the type identification are taken over from the work area for the signal generation.

The processing types offered on the I/O Master Module are dependent on the configured firmware for the I/O Master Module.

After selection of the processing type, you can now parameterize the relevant signals process-technically.



- Activate the checkbox SHOW ALL PARAMETERS if you want to edit expert parameters
- Save your changes from time to time, refer to Apply

Further steps: Restart device.

9.1.11.4.1 Automatic Display of Signal States

Process signals that are acquired or output via HW pins are automatically configured for the process display via SICAM WEB and for the process display on the LCD.

The automatic process display resides in SICAM WEB in the menu `I/O Modules` (see 9.1.13.2, Display Process Values).

The automatic process display resides on the LCD in the menu `Monitoring | I/O Modules` (see 11.1.2.4.6, I/O Modules).

9.1.11.4.2 Parameters with Assignment on the DI Module

Processing type	Parameter	Meaning
DI_DI – double-point information input	Inversion_0	Inversion (S) NO/YES
	Flutt_dp_qds	Datapoint quality discriptor for fluttery binary information BL/IV
	Inversion_1	Inversion (S) NO/YES
	block	Blocking (=not used) (S) NO/YES
	SVM_monitoring	Power monitoring. The sensor voltage is monitored by an own power monitoring input (S). NO/YES
	Flutt_Number	Number of transients for flutter suppression (S)
	SW_Filter_t	Software filter-time in s (S)
	Flutt_t	Flutter time in seconds. 0 = no fluttersuppression (S) 0.1 to 6553.5
	int_posit_t	Intermediate position suppression time in seconds. 0 = no intermediate position suppression (S)
	faulty_pos_t	Faulty position suppression time in seconds. 0 = no faulty position suppression (S)
	AR_sign_t	Time for signalling the automatic reclosure in seconds 0=no signalling of autom. reclosure (S) 0.1 to 25.5
	ON_before_OFF	Definition of the order for the wiring of double commands/double point information NO: OFF is I/O with lower I/O number ON is I/O with higher I/O number YES: ON is I/O with lower I/O number OFF is I/O with higher I/O number NO/YES
	Moduleselection_SVM_ monitoring	Switch for power monitoring handling (PM) Standard PM (PM inputs per modules) or input IN D17 of one BI-module as PM input for all modules Attention: Selected module must be a DI module.

Processing type	Parameter	Meaning
	Flutt_t_stable	Flutter suppression: stability time in seconds. 0 = stability time defined through parameter Flutt_t (S) 0.1 to 6553.5
DI_SI – single-point information input	Inversion	Inversion (S) NO/YES
	block	Blocking (= not used) (S) NO/YES
	Flutt_dp_qds	Datapoint quality discriptor for fluttery binary information BL/IV
	input function	Functionality of the binary input. This parameterization permits to disable the information input for revision handling.
	SVM_monitoring	Power monitoring. The sensor voltage is monitored by an own power monitoring input (S). NO/YES
	Flutt_Number	Number of transients for flutter suppression (S)
	SW_Filter_t	Software filter-time in s (S)
	Flutt_t	Flutter time in seconds. 0 = no fluttersuppression (S) 0.1 to 6553.5
	State_of_flutter_information	Information state in message with BL bit
	Delay_t	Delaytime from ON singlepoint information in seconds 0 to 16000
	Moduleselection_SVM_ monitoring	Switch for power monitoring handling (PM) Standard PM (PM inputs per modules) or input IN D17 of one BI-module as PM input for all modules Attention: Selected module must be a DI module.
	Flutt_t_stable	Flutter suppression: stability time in seconds. 0 = stability time defined through parameter Flutt_t (S) 0.1 to 6553.5
DI_CV – count pulse acquisition	message_blocking_t	Message blocking time in seconds. During this time period, identical messages will be discarded without error information. 0.1 to 6553.5
	interval_time_0	Interval time. As transmission trigger or latch trigger of the counts it is also possible to set an interval. The belonging time is to configure here.
	interval_time_1	Interval time. As transmission trigger or latch trigger of the counts it is also possible to set an interval. The belonging time is to configure here.
	Inversion	Inversion (S) NO/YES
	block	Blocking (= not used) (S) NO/YES
	Type	Conditioned value type (S) • Latched absolute value • Latched relative value

Processing type	Parameter	Meaning
	SVM_monitoring	Power monitoring. The sensor voltage is monitored by an own power monitoring input (S)
	transm_prompting	Transmission prompting. The initiating for the transfer of the latched count can happen through a counter interrogation message (group), through adjustable intervals, or through the function diagramm. (S)
	latch_prompting	Latch prompting can be different to the transmission prompting (S)
	Value range	Value range of the counter (S)
	Pulse value	Pulse value (S) 0.0001 bis 9999
	Moduleselection_SVM_ monitoring	Switch for power monitoring handling (PM) Standard PM (PM inputs per modules) or input IN D17 of one BI-module as PM input for all modules Attention: Selected module must be a DI-module.
SW_DI – software data point digital input	–	
SW_DI_AR - automatic reclosing	–	
SW_DI_UPDATE – update of double-point information	Originatoraddress	Allowed originator address
	QOC	there is no confirmation/termination for a received command with a different QOC
	SID-BSE	Source identification basic system element
	SID-ST	Source identification station number if multipoint traffic mode 0…99 if R-SID 0…254; if automatic, the SID will be learned
	SID-SSE	Source identification supplementary system element
SW_DI_BT – breaker tripping	–	
SW_DI_SOR – switching operation running	–	
SW_CV_SET – counter set	SID-BSE	Source identification basic system element
	SID-ST	Source identification station number if multipoint traffic mode 0…99 if R-SID 0…254; if automatic, the SID will be learned
	SID-SSE	Source identification supplementary system element

9.1.11.4.3 Parameters with Assignment on the DO Module

This data can be changed – for each category – in the table for the signal generation:

Processing type	Parameter	Meaning
DO_DC_1,5POL - double command output 1,5-pole	Retry_suppression_T	Command retry suppression time in seconds. Within this time a command with same address is discarded without error information (s) 0.1 to 6553.5
	output_t_0	Command output time in seconds (S). Attention: The time comes into effect only, if in the message is not defined any time. 0.01 to 327.67
	select_execute_t	Max. time between select and execute (in seconds). After this time a recent select command is necessary. 0 = no select command is expected (direct command transmission) 0.1 to 102.3
	Sync_t_0	Within this time (in sec) the interlock enabling must occur on the command. 0=no syncronisation over interlocking 0.1 to 6553.5
	RS_Mon_t	Return state information monitoring time in seconds (S). 0 = no return state information monitoring 0.01 to 655.35
	Command_prolong_t	Command prolongation time in seconds (S) 0.01 to 327.67
	output_t_1	Command output time in seconds (S). Attention: The time comes into effect only, if in the message is not defined any time. 0.01 to 327.67
	Sync_t_1	Within this time (in sec) the interlock enabling must occur on the command. 0 = no syncronisation over interlocking 0.1 to 6553.5
	RS_outp_same_state_0	Selection of command output and command confirmation, if return state is already end position before output. Attention: only active if RS_mon_t ≠0.
	Sync_Input_t_0	Within this time (in sec) the enabling over the syncronisation input must occur on the command. 0=no syncronisation over syncronisation input. Attention: Function only active if sync_t = 0. 0.1 to 6553.5
	1_out_of_n_t_0	Within this time (in sec) the 1 out of n enabling must occur on the command. 0 = no 1 out of n enabling necessary. Attention: Function only active if sync_t = 0. 0.1 to 25.5
	RS_outp_same_state_1	Selection of command output and command confirmation, if return state is already end position before output. Attention: only active if RS_mon_t ≠ 0

Processing type	Parameter	Meaning
	Sync_Input_t_1	Within this time (in sec) the enabling over the syncronisation input must occur on the command. 0 = no syncronisation over syncronisation input. Attention: Function only active if sync_t = 0 0.1 to 6553.5
	1_out_of_n_t_1	Within this time (in sec) the 1 out of n enabling must occur on the command. 0 = no 1 out of n enabling necessary. Attention: Function only active if sync_t = 0. 0.1 to 25.5
	Sw_Seq_command_seq_0	Switching sequence: output additional command before or after the command
	Sw_Seq_addtl_com_0	Switching sequence: Select the additional command
	Sw_Seq_command_seq_1	Switching sequence: output additional command before or after the command
	Sw_Seq_addtl_com_1	Switching sequence: Select the additional command
	RS_Mon_Source_0	Source of state information for state information monitoring • Peripherals • Open-/closed loop control function • Both (logical OR)
	RS_Mon_Source_1	Source of state information for state information monitoring • Peripherals • Open-/closed loop control function • Both (logical OR)
	SID-BSE	Source identification basic system element
	SID-ST	Source identification station number if multipoint traffic mode 0…99 if R-SID 0…254; if automatic, the SID will be learned
	SID-SSE	Source identification supplementary system element
	QOC>8	If QOC > 8 (Qualifier of Command) is accepted, so all QOC > 8 will be interpreted as QOC = 0
	ON_before_OFF	Definition of the order for the wiring of double commands/double point information. NO: OFF is I/O with lower I/O number ON is I/O with higher I/O number. YES: ON is I/O with lower I/O number OFF is I/O with higher I/O number
	Regulating_command	Use as regulating command (S) NO/YES
	RS_Image	Parameter works only with ACP 1703 platform

Processing type	Parameter	Meaning
DO_DC_1POL - double command output 1-pole	Retry_suppression_T	Command retry suppression time in seconds. Within this time a command with same address is discarded without error information (s) 0.1 to 6553.5
	output_t_0	Command output time in seconds (S). Attention: The time comes into effect only, if in the message is not defined any time. 0.01 to 327.67
	select_execute_t	Max. time between select and execute (in seconds). After this time a recent select command is necessary. 0 = no select command is expected (direct command transmission) 0.1 to 102.3
	Sync_t_0	Within this time (in sec) the interlock enabling must occur on the command. 0 = no syncronisation over interlocking 0.1 to 6553.5
	RS_Mon_t	Return state information monitoring time in seconds (S). 0 = no return state information monitoring 0.01 to 655.35
	Command_prolong_t	Command prolongation time in seconds (S) 0.01 to 327.67
	output_t_1	Command output time in seconds (S). Attention: The time comes into effect only, if in the message is not defined any time. 0.01 to 327.67
	Sync_t_1	Within this time (in sec) the interlock enabling must occur on the command. 0 = no syncronisation over interlocking 0.1 to 6553.5
	RS_outp_same_state_0	Selection of command output and command confirmation, if return state is already end position before output. Attention: only active if RS_mon_t is ≠ 0.
	Sync_Input_t_0	Within this time (in sec) the enabling over the syncronisation input must occur on the command. 0 = no syncronisation over syncronisation input. Attention: Function only active if sync_t = 0 0.1 to 6553.5
	1_out_of_n_t_0	Within this time (in sec) the 1 out of n enabling must occur on the command. 0=no 1 out of n enabling necessary. Attention: Function only active if sync_t = 0. 0.1 to 25.5
	RS_outp_same_state_1	Selection of command output and command confirmation, if return state is already end position before output. Attention: only active if RS_mon_t is ≠ 0.

Processing type	Parameter	Meaning
	Sync_Input_t_1	Within this time (in sec) the enabling over the syncronisation input must occur on the command. 0 = no syncronisation over syncronisation input. Attention: Function only active if sync_t = 0 0.1 to 6553.5
	1_out_of_n_t_1	Within this time (in sec) the 1 out of n enabling must occur on the command. 0 = no 1 out of n enabling necessary. Attention: Function only active if sync_t = 0. 0.1 to 25.5
	Sw_Seq_command_seq_0	Switching sequence: output additional command before or after the command
	Sw_Seq_addtl_com_0	Switching sequence: Select the additional command
	Sw_Seq_command_seq_1	Switching sequence: output additional command before or after the command
	Sw_Seq_addtl_com_1	Switching sequence: Select the additional command
	RS_Mon_Source_0	Source of state information for state information monitoring • Peripherals • Open-/closed loop control function • Both (logical OR)
	RS_Mon_Source_1	Source of state information for state information monitoring • Peripherals • Open-/closed loop control function • Both (logical OR)
	SID-BSE	Source identification basic system element
	SID-ST	Source identification station number if multipoint traffic mode 0…99 if R-SID 0…254; if automatic, the SID will be learned
	SID-SSE	Source identification supplementary system element
	QOC>8	If QOC > 8 (Qualifier of Command) is accepted, so all QOC > 8 will be interpreted as QOC = 0
	ON_before_OFF	Definition of the order for the wiring of double commands/double point information: • NO: OFF is I/O with lower I/O number ON is I/O with higher I/O number • YES: ON is I/O with lower I/O number OFF is I/O with higher I/O number
	Regulating_command	Use as regulating command (S) NO/YES
	RS_Image	Parameter works only with ACP 1703 platform

Processing type	Parameter	Meaning
DO_DC_2POL – double command output 2-pole	Retry_suppression_T	Command retry suppression time in seconds. Within this time a command with same address is discarded without error information (s) 0.1 to 6553.5
	output_t_0	Command output time in seconds (S). Attention: The time comes into effect only, if in the message is not defined any time. 0.01 to 327.67
	select_execute_t	Max. time between select and execute (in seconds). After this time a recent select command is necessary. 0 = no select command is expected (direct command transmission) 0.1 to 102.3
	Sync_t_0	Within this time (in sec) the interlock enabling must occur on the command. 0 = no syncronisation over interlocking 0.1 to 6553.5
	RS_Mon_t	Return state information monitoring time in seconds (S). 0 = no return state information monitoring 0.01 to 655.35
	Command_prolong_t	Command prolongation time in seconds (S) 0.01 to 327.67
	output_t_1	Command output time in seconds (S). Attention: The time comes into effect only, if in the message is not defined any time. 0.01 to 327.67
	Sync_t_1	Within this time (in sec) the interlock enabling must occur on the command. 0 = no syncronisation over interlocking 0.1 to 6553.5
	RS_outp_same_state_0	Selection of command output and command confirmation, if return state is already end position before output. Attention: only active if RS_mon_t is ≠ 0.
	Sync_Input_t_0	Within this time (in sec) the enabling over the syncronisation input must occur on the command. 0 = no syncronisation over syncronisation input. Attention: Function only active if sync_t = 0 0.1 to 6553.5
	1_out_of_n_t_0	Within this time (in sec) the 1 out of n enabling must occur on the command. 0=no 1 out of n enabling necessary. Attention: Function only active if sync_t = 0. 0.1 to 25.5
	RS_outp_same_state_1	Selection of command output and command confirmation, if return state is already end position before output. Attention: only active if RS_mon_t is ≠ 0.

Processing type	Parameter	Meaning
	Sync_Input_t_1	Within this time (in sec) the enabling over the syncronisation input must occur on the command. 0 = no syncronisation over syncronisation input. Attention: Function only active if sync_t = 0 0.1 to 6553.5
	1_out_of_n_t_1	Within this time (in sec) the 1 out of n enabling must occur on the command. 0 = no 1 out of n enabling necessary. Attention: Function only active if sync_t = 0. 0.1 to 25.5
	Sw_Seq_command_seq_0	Switching sequence: output additional command before or after the command
	Sw_Seq_addtl_com_0	Switching sequence: Select the additional command
	Sw_Seq_command_seq_1	Switching sequence: output additional command before or after the command
	Sw_Seq_addtl_com_1	Switching sequence: Select the additional command
	RS_Mon_Source_0	Source of state information for state information monitoring • Peripherals • Open-/closed loop control function • Both (logical OR)
	RS_Mon_Source_1	Source of state information for state information monitoring • Peripherals • Open-/closed loop control function • Both (logical OR)
	SID-BSE	Source identification basic system element
	SID-ST	Source identification station number if multipoint traffic mode 0…99 if R-SID 0…254; if automatic, the SID will be learned
	SID-SSE	Source identification supplementary system element
	QOC>8	If QOC > 8 (Qualifier of Command) is accepted, so all QOC > 8 will be interpreted as QOC = 0
	ON_before_OFF	Definition of the order for the wiring of double commands/double point information: • NO: OFF is I/O with lower I/O number ON is I/O with higher I/O number • YES: ON is I/O with lower I/O number OFF is I/O with higher I/O number
	Regulating_command	Use as regulating command (S) NO/YES
	RS_Image	Parameter works only with ACP 1703 platform

Processing type	Parameter	Meaning
DO_DX – double-point information and double command output	Fail_behav	Behavior at failure • Keep • Terminate
	SID-BSE	Source identification basic system element
	SID-ST	Source identification station number if multipoint traffic mode 0…99 if R-SID 0…254; if automatic, the SID will be learned
	SID-SSE	Source identification supplementary system element
	select_execute_t	Max. time between select and execute (in seconds). After this time a recent select command is necessary. 0 = no select command is expected (direct command transmission) 0 to 6553.5
	RS_Image_CASDU1	Address of corresponding return state information (S) 0 to 255
	RS_Image_CASDU2	Address of corresponding return state information (S) 0 to 255
	RS_Image_IOA1	Address of corresponding return state information (S) 0 to 255
	RS_Image_IOA2	Address of corresponding return state information (S) 0 to 255
	RS_Image_IOA3	Address of corresponding return state information (S) 0 to 255
	RS_Image_TI	Type identifier of corresponding return state information (S) • Single-point information • D.-point information
	Term_with_Conf	Sending of termination immediately after sending of confirmation (S) NO/YES
	Output_t_0	Command output time in seconds (S). Attention: The time comes into effect only, if in the message is not defined any time. 0.01 to 327.67
	termination_t_0	Time between confirmation and termination (s) 0 = no termination 0 to 6553.5
	RS_react_t_0	Information reaction time (S) Pulse command: 0 .. time appropriate to output time Persistent command: 0 .. time appropriate to termination time 0 to 6553.5
	Output_t_1	Command output time in seconds (S). Attention: The time comes into effect only, if in the message is not defined any time. 0.01 to 327.67

Processing type	Parameter	Meaning
	termination_t_1	Time between confirmation and termination (s) 0 = no termination 0 to 6553.5
	RS_react_t_1	Information reaction time (S) Pulse command: 0 .. time appropriate to output time Persistent command: 0 .. time appropriate to termination time 0 to 6553.5
DO_SC_1,5POL – single command output 1,5-pole	Retry_suppression_T	Command retry suppression time in seconds. Within this time a command with same address is discarded without error information (s) 0.1 to 6553.5
	Output_t	Command output time in seconds (S). Attention: The time comes into effect only, if in the message is not defined any time. 0.01 to 327.67
	select_execute_t	Max. time between select and execute (in seconds). After this time a recent select command is necessary. 0 = no select command is expected (direct command transmission) 0.1 to 102.3
	Sync_t	Within this time (in sec) the interlock enabling must occur on the command. 0 = no syncronisation over interlocking 0.1 to 6553.5
	RS_Mon_t	Return state information monitoring time in seconds (S). 0 = no return state information monitoring 0.01 to 655.35
	Command_prolong_t	Command prolongation time in seconds (S) 0.01 to 327.67
	RS_outp_same_state_1	Selection of command output and command confirmation, if return state is already end position before output. Attention: only active if RS_mon_t is ≠ 0.
	Sync_Input_t	Within this time (in sec) the enabling over the syncronisation input must occur on the command. 0 = no syncronisation over syncronisation input. Attention: Function only active if sync_t = 0 0.1 to 6553.5
	1_out_of_n_t	Within this time (in sec) the 1 out of n enabling must occur on the command. 0 = no 1 out of n enabling necessary. Attention: Function only active if sync_t = 0. 0.1 to 25.5
	RS_Mon_Source	Source of state information for state information monitoring • Peripherals • Open-/closed loop control function • Both (logical OR)
	Sw_Seq_command_seq	Switching sequence: output additional command before or after the command

Processing type	Parameter	Meaning
	Sw_Seq_addtl_com	Switching sequence: Select the additional command
	SID-BSE	Source identification basic system element
	SID-ST	Source identification station number if multipoint traffic mode 0…99 if R-SID 0…254; if automatic, the SID will be learned
	SID-SSE	Source identification supplementary system element
	QOC>8	If QOC > 8 (Qualifier of Command) is accepted, so all QOC > 8 will be interpreted as QOC = 0
	RS_Image	Parameter works only with ACP 1703 platform
DO_SC_1POL – single command output 1-pole	Retry_suppression_T	Command retry suppression time in seconds. Within this time a command with same address is discarded without error information (s) 0.1 to 6553.5
	Output_t	Command output time in seconds (S). Attention: The time comes into effect only, if in the message is not defined any time. 0.01 to 327.67
	select_execute_t	Max. time between select and execute (in seconds). After this time a recent select command is necessary. 0 = no select command is expected (direct command transmission) 0.1 to 102.3
	Sync_t	Within this time (in sec) the interlock enabling must occur on the command. 0 = no syncronisation over interlocking 0.1 to 6553.5
	RS_Mon_t	Return state information monitoring time in seconds (S). 0 = no return state information monitoring 0.01 to 655.35
	Command_prolong_t	Command prolongation time in seconds (S) 0.01 to 327.67
	RS_outp_same_state_1	Selection of command output and command confirmation, if return state is already end position before output. Attention: only active if RS_mon_t is ≠ 0.
	Sync_Input_t	Within this time (in sec) the enabling over the syncronisation input must occur on the command. 0 = no syncronisation over syncronisation input. Attention: Function only active if sync_t = 0 0.1 to 6553.5
	1_out_of_n_t	Within this time (in sec) the 1 out of n enabling must occur on the command. 0 = no 1 out of n enabling necessary. Attention: Function only active if sync_t = 0. 0.1 to 25.5

Processing type	Parameter	Meaning
	RS_Mon_Source	Source of state information for state information monitoring • Peripherals • Open-/closed loop control function • Both (logical OR)
	Sw_Seq_command_seq	Switching sequence: output additional command before or after the command
	Sw_Seq_addtl_com	Switching sequence: Select the additional command
	SID-BSE	Source identification basic system element
	SID-ST	Source identification station number if multipoint traffic mode 0…99 if R-SID 0…254; if automatic, the SID will be learned
	SID-SSE	Source identification supplementary system element
	QOC>8	If QOC > 8 (Qualifier of Command) is accepted, so all QOC > 8 will be interpreted as QOC = 0
	RS_Image	Parameter works only with ACP 1703 platform
DO_SC_2POL – single command output 2-pole	Retry_suppression_T	Command retry suppression time in seconds. Within this time a command with same address is discarded without error information (s) 0.1 to 6553.5
	Output_t	Command output time in seconds (S). Attention: The time comes into effect only, if in the message is not defined any time. 0.01 to 327.67
	select_execute_t	Max. time between select and execute (in seconds). After this time a recent select command is necessary. 0 = no select command is expected (direct command transmission) 0.1 to 102.3
	Sync_t	Within this time (in sec) the interlock enabling must occur on the command. 0 = no syncronisation over interlocking 0.1 to 6553.5
	RS_Mon_t	Return state information monitoring time in seconds (S). 0 = no return state information monitoring 0.01 to 655.35
	Command_prolong_t	Command prolongation time in seconds (S) 0.01 to 327.67
	RS_outp_same_state_1	Selection of command output and command confirmation, if return state is already end position before output. Attention: only active if RS_mon_t is ≠ 0.
	Sync_Input_t	Within this time (in sec) the enabling over the syncronisation input must occur on the command. 0 = no syncronisation over syncronisation input. Attention: Function only active if sync_t = 0 0.1 to 6553.5

Processing type	Parameter	Meaning
	1_out_of_n_t	Within this time (in sec) the 1 out of n enabling must occur on the command. 0 = no 1 out of n enabling necessary. Attention: Function only active if sync_t = 0. 0.1 to 25.5
	RS_Mon_Source	Source of state information for state information monitoring • Peripherals • Open-/closed loop control function • Both (logical OR)
	Sw_Seq_command_seq	Switching sequence: output additional command before or after the command
	Sw_Seq_addtl_com	Switching sequence: Select the additional command
	SID-BSE	Source identification basic system element
	SID-ST	Source identification station number if multipoint traffic mode 0…99 if R-SID 0…254; if automatic, the SID will be learned
	SID-SSE	Source identification supplementary system element
	QOC>8	If QOC > 8 (Qualifier of Command) is accepted, so all QOC > 8 will be interpreted as QOC = 0
	RS_Image	Parameter works only with ACP 1703 platform
DO_SI – digital output – single-point information	receive_format	Source of datapoint
	Fail_behav	Behavior at failure
	SID-BSE	Source identification basic system element
	SID-ST	Source identification station number if multipoint traffic mode 0…99 if R-SID 0…254; if automatic, the SID will be learned
	SID-SSE	Source identification supplementary system element
DO_SX – single-point information and single command output	receive_format	Source of datapoint
	Fail_behav	Behavior at failure • Keep • Terminate
	SID-BSE	Source identification basic system element
	SID-ST	Source identification station number if multipoint traffic mode 0…99 if R-SID 0…254; if automatic, the SID will be learned
	SID-SSE	Source identification supplementary system element
	select_execute_t	Max. time between select and execute (in seconds). After this time a recent select command is necessary. 0 = no select command is expected (direct command transmission) 0 to 6553.5
	RS_Image_CASDU1	Address of corresponding return state information (S) 0 to 255
	RS_Image_CASDU2	Address of corresponding return state information (S) 0 to 255

Processing type	Parameter	Meaning
	RS_Image_IOA1	Address of corresponding return state information (S) 0 to 255
	RS_Image_IOA2	Address of corresponding return state information (S) 0 to 255
	RS_Image_IOA3	Address of corresponding return state information (S) 0 to 255
	Term_with_Conf	Sending of termination immediately after sending of confirmation (S) NO/YES
	Output_t	Command output time in seconds (S). Attention: The time comes into effect only, if in the message is not defined any time. 0.01 to 327.67
	termination_t	Time between confirmation and termination (s) 0 = no termination 0 to 6553.5
	RS_react_t	Information reaction time (S) Pulse command: 0 .. time appropriate to output time Persisitent command: 0 .. time appropriate to termination time 0 to 6553.5
SW_CO_SYNC_A – command synchronization abortion	–	
SW_CO_SYNC_R - command synchronization is running	–	
SW_DO – Software data point digital output	–	

9.1.11.4.4 Parameters with Assignment on the AI Module

Processing type	Parameter	Meaning
AI_I – current value acqisition	line frequency	The noise rejection takes place for the parametrized line frequency • 50 Hz • 60 Hz • 16.7 Hz
	Zero range	Zero range suppression (and check of the plausibility limits) (S) NO/YES
	thresh_additive	Change threshold in % of X_100% (S) AI_T: % of temperature range 0 to 1000.0
	thresh_uncond	Change threshold in % of X_100% (S) AI_T: % of temperature range 0 to 103.00
	block	Blocking (=not used) (S) NO/YES
	Processing grid	Processing grid in seconds 0.1 to 25.5
	X_0%	Nominal range in the physical unit of the input/output (0%) (S) -50.0 to 50.0
	X_100%	Nominal range in the physical unit of the input/output (100%) -50.0 to 50.0
	Y_0%	Technological or normalized value 0% (S) -1000000000000000.000 to 1000000000000000.000
	Y_100%	Technological or normalized value 100% (S) -1000000000000000.000 to 1000000000000000.000
	Smoothing	0 - 99 in %. 0% = no smoothing, 99% = highest possible smoothing 0 to 99
	MV_conv_free_Xl	Limit of not plausible range. Parameter is only effective, if the parameter zero_range_a_MV_conv is set to free parametrizable (in the physical unit of the input) (S) -103.00 to 103.00
	zero_range_Xzu	Upper limit of zero range in % of X_100% (S) -103.00 to 103.00
	zero_range_Xzl	Lower limit of zero range in % of X_100% (S) -103.00 to 103.00
	zero_range_Yz	Technological or normalized value of zero range (S) -1000000000000000.000 to 1000000000000000.000
	zero_range_a MV_conv	Zero range suppression (and check of the plausibility limits) either standard or free parametrizable (S) • Standard • Free configurable

Processing type	Parameter	Meaning
	OV_suppr_t	OV suppression time in seconds, 0=no OV suppression 0 to 255
	standard load	The measuring range can be adapted with changing the load (S) NO/YES
AI_U – voltage value acqisition	line frequency	The noise rejection takes place for the parametrized line frequency • 50 Hz • 60 Hz • 16.7 Hz
	Zero range	Zero range suppression (and check of the plausibility limits) (S) NO/YES
	thresh_additive	Change threshold in % of X_100% (S) AI_T: % of temperature range 0 to 1000.0
	thresh_uncond	Change threshold in % of X_100% (S) AI_T: % of temperature range 0 to 103.00
	block	Blocking (=not used) (S) NO/YES
	Processing grid	Processing grid in seconds 0.1 to 25.5
	X_0%	Nominal range in the physical unit of the input/output (0%) (S) -50.0 to 50.0
	X_100%	Nominal range in the physical unit of the input/output (100%) -50.0 to 50.0
	Y_0%	Technological or normalized value 0% (S) -1000000000000000.000 to 1000000000000000.000
	Y_100%	Technological or normalized value 100% (S) -1000000000000000.000 to 1000000000000000.000
	Smoothing	0 - 99 in %. 0% = no smoothing, 99% = highest possible smoothing 0 to 99
	MV_conv_free_Xl	Limit of not plausible range. Parameter is only effective, if the parameter zero_range_a_MV_conv is set to free parametrizable (in the physical unit of the input) (S) -103.00 to 103.00
	zero_range_Xzu	Upper limit of zero range in % of X_100% (S) -103.00 to 103.00
	zero_range_Xzl	Lower limit of zero range in % of X_100% (S) -103.00 to 103.00
	zero_range_Yz	Technological or normalized value of zero range (S) -1000000000000000.000 to 1000000000000000.000

Processing type	Parameter	Meaning
	zero_range_a MV_conv	Zero range suppression (and check of the plausibility limits) either standard or free parametrizable (S) • Standard • Free configurable
	OV_suppr_t	OV suppression time in seconds, 0=no OV suppression 0 to 255
	standard load	The measuring range can be adapted with changing the load (S) NO/YES
SW_COSPHI - software power factor	thresh_additive	Change threshold in % of X_100% (S) AI_T: % of temperature range 0 to 1000.0
	thresh_uncond	Change threshold in % of X_100% (S) AI_T: % of temperature range 0 to 103.00
SW_CT_FDIR_I>_I>>	I>	Trip value in ampere for overcurrent detection for short circuit 0: function disabled 50 to 2000
	I>>	Trip value in ampere for overcurrent detection for short circuit 0: function disabled 50 to 2000
	I>>_t	Time delay for overcurrent detection 0.04 to 60
	I>_t	Time delay for overcurrent detection 0.04 to 60
	t_reset	Auto reset time 0 = function disabled
SW_CT_FDIR_IN	IN>	Trip value in ampere for ground fault 0: function disabled 0.4 to 2000
	IN>_Idir	Earth current for earth fault detection using the wattmetric method 0: function disabled 0.2 to 30
	IN>_ground_type	Ground point treatment method • Solid • Isolated • Resonant
	IN>_U0	Ground point displacement voltage in procent of primary voltage 0: function disabled 0 to 100
	IN>_U0_t	Ground point displacement voltage time delay 0.04 to 60
	IN>_t	Time delay for ground fault indication 0.04 to 60
	t_reset	Auto reset time 0 = function disabled

Processing type	Parameter	Meaning
SW_CT_MV_SELECTION	measured_value_selection	Selection of a measured value
	thresh_additive	Change threshold in % of X_100% (S) AI_T: % of temperature range 0 to 1000.0
	thresh_uncond	Change threshold in % of X_100% (S) AI_T: % of temperature range 0 to 103.00
SW_CT_PDIR	–	
SW_F – software frequency	thresh_additive	Change threshold in % of X_100% (S) AI_T: % of temperature range 0 to 1000.0
	thresh_uncond	Change threshold in % of X_100% (S) AI_T: % of temperature range 0 to 103.00
SW_PQ - software power	thresh_additive	Change threshold in % of X_100% (S) AI_T: % of temperature range 0 to 1000.0
	thresh_uncond	Change threshold in % of X_100% (S) AI_T: % of temperature range 0 to 103.00
SW_REV - revision	–	
SW_T_VT_NOK – voltage transformer nok	SID-BSE	Source identification basic system element
	SID-ST	Source identification station number if multipoint traffic mode 0…99 if R-SID 0…254; if automatic, the SID will be learned
	SID-SSE	Source identification supplementary system element
SW_UI - software voltage, current	thresh_additive	Change threshold in % of X_100% (S) AI_T: % of temperature range 0 to 1000.0
	thresh_uncond	Change threshold in % of X_100% (S) AI_T: % of temperature range 0 to 103.00
T_AI_I – current transformer input	line_frequency_transformer	Configuration of line frequency • 50 Hz • 60 Hz
	thresh_additive	Change threshold in % of X_100% (S) AI_T: % of temperature range 0 to 1000.0
	thresh_uncond	Change threshold in % of X_100% (S) AI_T: % of temperature range 0 to 103.00
	transformer_X_100%	Nominal range of transformer/input: secondary • 8510: 1 A - 8511: Low Power (225 mV) • 8510: 5 A - 8511: Low Power (225 mV)
	transformer_Y_100%	Nominal range of transformer: primary in kV of the phase-to-phase voltage or 240 V at direct measuring or in Ampere 50 to 800
	transformer_Y_100%_5A	Nominal range of 5A - current transformer: in Ampere. Only valid for AI-8510 and X_100% = 5 A. 50 to 400

Processing type	Parameter	Meaning
	Overrange	Definition of the overrange for QDS 'OV' in % of the nominal range of the transformer
T_AI_U - voltage transformer input	line_frequency_transformer	Configuration of line frequency • 50 Hz • 60 Hz
	primary_voltage_correction	Correction value for primary voltage
	thresh_additive	Change threshold in % of X_100% (S) AI_T: % of temperature range 0 to 1000.0
	thresh_uncond	Change threshold in % of X_100% (S) AI_T: % of temperature range 0 to 103.00
	transformer_X_100%	Nominal range of transformer/input: secondary • 8510: 100 V/SQRT3 - 8511: 3.25 V/SQRT3 • 8510: 240 V - 8511: 3.25 V/SQRT3 • 8510: 415 V/SQRT3 - 8511: 3.25 V/SQRT3
	transformer_Y_100%	Nominal range of transformer: primary in kV of the phase-to-phase voltage or 240 V at direct measuring or in Ampere 1.0 to 36.0
	transformer_type	Transformer type
	transformer_angle	Angle between upper and lower side of transformer 0 to 359
	Overrange	Definition of the overrange for QDS 'OV' in % of the nominal range of the transformer

9.1.11.4.5 Parameters with Assignment on the AO Module

Processing type	Parameter	Meaning
AO_I – analog output current	fail_subst value	Substitute value, if behavior of failure is parametrized on ouput substitute value (S) -1000000000000000.000 to 1000000000000000.000
	select_execute_t	Max. time between select and execute (in seconds). After this time a recent select command is necessary. 0 = no select command is expected (direct command transmission) 0 to 6553.5
	Fail_behav	Behavior at failure • Keep • Substitute value
	block	Blocking (=not used) (S) NO/YES
	X_0%	Nominal range in the physical unit of the input/output (0%) (S) -20.0 to 20.0
	X_100%	Nominal range in the physical unit of the input/output (100%) -20.0 to 20.0
	Y_0%	Technological or normalized value 0% (S) -1000000000000000.000 to 1000000000000000.000
	Y_100%	Technological or normalized value 100% (S) -1000000000000000.000 to 1000000000000000.000
	receive format	Source of datapoint spontaneous
	termination_t	Time between confirmation and termination (s) 0 = no termination 0 to 6553.5
	SID-BSE	Source identification basic system element
	SID-ST	Source identification station number if multipoint traffic mode 0…99 if R-SID 0…254; if automatic, the SID will be learned
	SID-SSE	Source identification supplementary system element

Processing type	Parameter	Meaning
AO_U – analog output voltage	fail_subst value	Substitute value, if behavior of failure is parametrized on ouput substitute value (S) -1000000000000000.000 to 1000000000000000.000
	select_execute_t	Max. time between select and execute (in seconds). After this time a recent select command is necessary. 0 = no select command is expected (direct command transmission) 0 to 6553.5
	Fail_behav	Behavior at failure • Keep • Substitute value
	block	Blocking (=not used) (S) NO/YES
	X_0%	Nominal range in the physical unit of the input/output (0%) (S) -10.0 to 10.0
	X_100%	Nominal range in the physical unit of the input/output (100%) -10.0 to 10.0
	Y_0%	Technological or normalized value 0% (S) -1000000000000000.000 to 1000000000000000.000
	Y_100%	Technological or normalized value 100% (S) -1000000000000000.000 to 1000000000000000.000
	receive format	Source of datapoint spontaneous
	termination_t	Time between confirmation and termination (s) 0 = no termination 0 to 6553.5
	SID-BSE	Source identification basic system element
	SID-ST	Source identification station number if multipoint traffic mode 0…99 if R-SID 0…254; if automatic, the SID will be learned
	SID-SSE	Source identification supplementary system element

9.1.11.5 Circuitry of Signals

For the signal types, different circuitry variants are resulting.

Function	Signal type	Wiring	Circuitry
Binary information acquisition	Single-point information		1 digital input
	Double-point information		2 subsequent digital inputs
Counting pulse acquisition	Integrated totals		1 digital input
Current/voltage acquisition	Current		1 analog input
	Voltage		1 analog input
Temperature acquisition	Temperature	2-wire	1 analog input
		3-wire	
		4-wire	
	Resistance	2-wire	1 analog input
		3-wire	
		4-wire	
Pulse command output	Single command	1-pole	1 digital output
		1.5-pole	1 digital output + 1 digital output for group relay
		2-pole	2 subsequent digital outputs
	Double command	1-pole	2 subsequent digital outputs
		1.5-pole	2 subsequent digital outputs + 1 digital output for group relay
		2-pole	4 subsequent digital outputs
Binary information output	Single-point information		1 digital output
Current/voltage output	Current		1 analog output
	Voltage		1 analog output

Signal type and wiring are dependent on the respective I/O Module.

Note

Please consider the indications in section 2.1.5.4, Configuration Rules for I/O Modules.

9.1.11.5.1 Binary Information Acquisition

For the acquisition of single-point or double-point information items, an appropriate digital input module must be equipped, and the DI signals to be used must be configured.

Power Monitoring

You can activate the power monitoring for digital inputs jeweils with the parameter `SVM_monitoring`. The monitoring takes place by groups:

Group 0: IOM *x* – IN D00…IN D07
Group 1: IOM 1 – IN D10…IN D13 (for DI-810x)
IOM *x* – IN D10…IN D17 (for DI-610x, DI-811x)

For the power monitoring, the last input of a group (IN D07 and IN D13 resp. IN D17) must be wired with the protected sensor voltage. Thereby the number of process information items is reduced to 7 resp. 3 inputs for each group.

By means of a further parameter, the power monitoring can be parameterized this way, that not one input for each group is responsible for the monitoring, but the last input of an I/O Module for the entire automation unit. Thereby the desired I/O Module is selected.

Note

With a mixture of 1 ms and 10 ms input modules, the power monitoring should be set on an input module with 1 ms accuracy.

You find further information in the manual *SICAM RTUs Common Functions Peripheral Elements According to IEC 60870-5-101/104, chapters "Single-Point Information" and "Double-Point Information", respectively in the section "Sensor Voltage Monitoring (Power Monitoring)"*.

9.1.11.5.2 Counting Pulse Acquisition

Standard Counting Pulse Acquisition

For the acquisition of counting pulses, an appropriate digital input module must be equipped, and the DI signals to be used must be configured.

Power Monitoring

You can activate the power monitoring for digital inputs jeweils with the parameter `SVM_monitoring`. The monitoring takes place by groups:

Group 0: IOM *x* – IN D00…IN D07
Group 1: IOM 1 – IN D10…IN D13 (for DI-810x)
IOM *x* – IN D10…IN D17 (for DI-610x, DI-811x)

For the power monitoring, the last input of a group (IN D07 and IN D13 resp. IN D17) must be wired with the protected sensor voltage. Thereby the number of process information items is reduced to 7 resp. 3 inputs for each group.

By means of a further parameter, the power monitoring can be parameterized this way, that not one input for each group is responsible for the monitoring, but the last input of an I/O Module for the entire automation unit. Thereby the desired I/O Module is selected.

Note

With a mixture of 1 ms and 10 ms input modules, the power monitoring should be set on an input module with 1 ms accuracy.

You find further information in the manual *SICAM RTUs Common Functions Peripheral Elements According to IEC 60870-5-101/104, chapters "Integrated Totals via Counting Pulses", in the section "Sensor Voltage Monitoring (Power Monitoring)"*.

Set Counter

You can set an integrated total on a defined value, if a message for set counter has been assigned to the respective data point (signal list).

You find the details thereto in the manual *SICAM RTUs Common Functions Peripheral Elements According to IEC 60870-5-101/104, chapter "Integrated totals via Count Pulses", section "Set Counter" and section "Counter Interrogation"*.

Buffered Counting Pulse Acquisition

The buffered counting pulse acquisition enables the acquisition of counting pulses, even if the target device is de-energized. Thereto a module TE-6430 must be equipped, and the DI signals to be used must be configured.

9.1.11.5.3 Current/Voltage Acquisition

For the acquisition of currents and voltages an appropriate analog input modul must be equipped, and the AI signals to be used must be configured.

You find the functional details and the settings in the manual *SICAM RTUs Common Functions Peripheral Elements According to IEC 60870-5-101/104, chapter "Currents" as well as chapter "Voltages"*.

Note

With the modules AI-6300, AI-6307, AI-6308, AI-8320 a mixed circuitry of current and voltage is not permitted .

For the direct acquisition of currents, voltages and the frequency the modules AI-8510 with CM-8820 and AI-8511 are available.

You find the functional details and the settings in the manual *SICAM RTUs Common Functions Peripheral Elements According to IEC 60870-5-101/104, chapter "Measurement in Three-Phase Systems – I/O Module"*.

Note

If with AI-8510 the parameter transformer_X_100% is set to 100 V/√3, then the parameter transformer_Y_100% may have a value from 1 to 36 only. The parameter transformer_Y_100% may be 240 V only if parameter transformer_X_100% is set to 240 V.

9.1.11.5.4 Temperature Acquisition

For the acquisition of temperatures an an appropriate analog input module must be equipped, and the AI signals to be used must be configured.

Connection of Resistance Thermometers

The connection of the resistance thermometers can be carried out in 2-, 3- or 4-wire technology. With the 2-wire technology a calibration process is required. If no calibration process has been carried out, the target device records a calibration error in the diagnosis.

You find the instruction for the calibration process in the manual *SICAM RTUs Common Functions Peripheral Elements According to IEC 60870-5-101/104, chapter "Temperatures", section "Acquisition"*.

Direct Measurement

In the configuration of the contacts for the module you can select between **Temperature** and **Resistor**.

With the resistance acquisition the preprocessing functions on the module (adaption, gradient monitoring) are deactivated, in order to meet the process requirements concerning the response time (for instance for the acquisition of transformer taps). The preprocessing functions must be replicated in need in the open-/ closed-loop control function.

Note

The direct measurement is supported for the module AI-6310 as of revision "-A".

The differentiation between temperature acquisition and resistance acquisition (parameter `value_selection`) happens group by group for each value. To activate the direct measurement, for the both values of a group a temperature acquisition must not be parameterized.

Group 0: IOM *x* – IN V0 and IOM *x* – IN V1
Group 1: IOM *x* – IN V2 and IOM *x* – IN V3

If for a group temperature acquisition and resistance acquisition is parameterized, the acquisition happens with all preprocessings (mean value creation and transient suppression).

With the temperature acquisition (i.e. Pt20) via a resistance acquisition, the mean value creation and transient monitoring must be replicated in the *open-/closed-loop control function*.

9.1.11.5.5 Standard Command Output

For the output of standard commands (*OC*) an appropriate digital output module must be equipped, and the DO signals to be used must be configured.

Common Settings:

- Monitor pulse duration
  The command output time defines how long the actuator is actuated. The output time can be set for each data point with the parameter `output_t`.
- Monitor return information
  The return information monitoring is used to limit the command output to the output time required by the process. The return information monitoring can be activated for each data point with parameter `RS_Mon_t`.
- Procedure for the command transmission according to IEC 60870-5-101/104
  The procedure for "direct command" is set by means of the parameter `select_execute_t` = `0`.

  The procedure for "select and execute command" is set by means of the parameter `select_execute_t` > `0`. The parameterized value specifies, within which time the execute command must be received following the selection command.

You find the exact information on the command output in the manual *SICAM RTUs Common Functions Peripheral Elements According to IEC 60870-5-101/104, chapter "Pulse Commands", section "Functions Independent on the Hardware of the System Element"*.

9.1.11.5.6 Assignment Return Information to Pulse Command

This function coordinates binary information and pulse commands that are acquired or output on SICAM TM I/O Modules. You find the exact information thereto in the manual *SICAM RTUs Common Functions Peripheral Elements According to IEC 60870-5-101/104, chapter "Return Information to Pulse Command Assignment"*.

- Parameter-settable assignment
  The assignment of an information (DI signal) to a pulse command (DO signal) is adjustable through the 5-digit address of the return information (parameters `RS_Image_CASDU1`, `RS_Image_CASDU2`, `RS_Image_IOA1`, `RS_Image_IOA2`, `RS_Image_IOA3`).

  No assignment takes place if the parameters are set to the value **255** (default value) the target device utilizes the fixed assignment.
- Predefined assignment
  If the equipped sequence of I/O Modules is suitable, an information is assigned automatically to a command. Otherwise no assignment takes place. You find the exact assignment in the following table.

I/O Master Module with Firmware USIO80

Type	Predefined Assignment
Single information to single command (1-pole): DI-610x with DO-6200	EM IOM *x* – IN D00 ... command IOM *y* – OUT D00 EM IOM *x* – IN D01 ... command IOM *y* – OUT D01 : : EM IOM *x* – IN D07 ... command IOM *y* – OUT D07 EM IOM *x* – IN D10 ... command IOM *y* – OUT D10 EM IOM *x* – IN D11 ... command IOM *y* – OUT D11 : : EM IOM *x* – IN D17 ... command IOM *y* – OUT D17
Single information to single command (1-pole): DI-610x with DO-6212 (2 DO-6212 with 1 DI-610x possible)	SI IOM *x* – IN D00 ... command IOM *y* – OUT D00 SI IOM *x* – IN D01 ... command IOM *y* – OUT D01 : : SI IOM *x* – IN D07 ... command IOM *y* – OUT D07 SI IOM *x* – IN D10 ... command IOM *z* – OUT D00 SI IOM *x* – IN D11 ... command IOM *z* – OUT D01 : : SI IOM *x* – IN D17 ... command IOM *z* – OUT D07
Single information to single command (1-pole): DI-610x with DO-6230	SI IOM *x* – IN D00 ... command IOM *y* – CA00 SI IOM *x* – IN D01 ... command IOM *y* – CA01 : : SI IOM *x* – IN D07 ... command IOM *y* – CA07 SI IOM *x* – IN D10 ... command IOM *y* – CB00 SI IOM *x* – IN D11 ... command IOM *y* – CB01 : : SI IOM *x* – IN D17 ... command IOM *y* – CB07
Single information to single command (1.5-pole): DI-610x with DO-6212 (2 DO-6212 with 1 DI-610x possible)	SI IOM *x* – IN D00 ... command IOM *y* – OUT D00 SI IOM *x* – IN D01 ... command IOM *y* – OUT D01 : : SI IOM *x* – IN D06 ... command IOM *y* – OUT D06 SI IOM *x* – IN D10 ... command IOM *z* – OUT D00 SI IOM *x* – IN D11 ... command IOM *z* – OUT D01 : : SI IOM *x* – IN D16 ... command IOM *z* – OUT D06
Single information to single command (1.5-pole): DI-610x with DO-6230	SI IOM *x* – IN D00 ... command IOM *y* – CA00 SI IOM *x* – IN D01 ... command IOM *y* – CA01 : : SI IOM *x* – IN D07 ... command IOM *y* – CA07 SI IOM *x* – IN D10 ... command IOM *y* – CB00 SI IOM *x* – IN D11 ... command IOM *y* – CB01 : : SI IOM *x* – IN D17 ... command IOM *y* – CB07
Single information to single command (2-pole): DI-610x with DO-6212 (2 DO-6212 with 1 DI-610x possible)	SI IOM *x* – IN D00 ... command IOM *y* – OUT D00/D01 SI IOM *x* – IN D02 ... command IOM *y* – OUT D02/D03 SI IOM *x* – IN D04 ... command IOM *y* – OUT D04/D05 SI IOM *x* – IN D06 ... command IOM *y* – OUT D06/D07 SI IOM *x* – IN D10 ... command IOM *z* – OUT D00/D01 SI IOM *x* – IN D12 ... command IOM *z* – OUT D02/D03 SI IOM *x* – IN D14 ... command IOM *z* – OUT D04/D05 SI IOM *x* – IN D16 ... command IOM *z* – OUT D06/D07
Single information to single command (2-pole): DI-610x with DO-6230	SI IOM *x* – IN D00 ... command IOM *y* – CA00/CB00 SI IOM *x* – IN D01 ... command IOM *y* – CA01/CB01 : : SI IOM *x* – IN D07 ... command IOM *y* – CA07/CB07
Double information to double command (1-pole): DI-610x with DO-6200	DI IOM *x* – IN D00/D01 ... command IOM *y* – OUT D00/D01 DI IOM *x* – IN D02/D03 ... command IOM *y* – OUT D02/D03 DI IOM *x* – IN D04/D05 ... command IOM *y* – OUT D04/D05 DI IOM *x* – IN D06/D07 ... command IOM *y* – OUT D06/D07 DI IOM *x* – IN D10/D11 ... command IOM *y* – OUT D10/D11 DI IOM *x* – IN D12/D13 ... command IOM *y* – OUT D12/D13 DI IOM *x* – IN D14/D15 ... command IOM *y* – OUT D14/D15 DI IOM *x* – IN D16/D17 ... command IOM *y* – OUT D16/D17

Type	Predefined Assignment
Double information to double command (1-pole): DI-610x with DO-6212 (2 DO-6212 with 1 DI-610x possible)	DI IOM *x* – IN D00/D01 ... command IOM *y* – OUT D00/D01 DI IOM *x* – IN D02/D03 ... command IOM *y* – OUT D02/D03 DI IOM *x* – IN D04/D05 ... command IOM *y* – OUT D04/D05 DI IOM *x* – IN D06/D07 ... command IOM *y* – OUT D06/D07 DI IOM *x* – IN D10/D11 ... command IOM *z* – OUT D00/D01 DI IOM *x* – IN D12/D13 ... command IOM *z* – OUT D02/D03 DI IOM *x* – IN D14/D15 ... command IOM *z* – OUT D04/D05 DI IOM *x* – IN D16/D17 ... command IOM *z* – OUT D06/D07
Double information to double command (1-pole): DI-610x with DO-6230	DI IOM *x* – IN D00/D01 … command IOM *y* – CA00/CA01 DI IOM *x* – IN D02/D03 ... command IOM *y* – CA02/CA03 DI IOM *x* – IN D04/D05 ... command IOM *y* – CA04/CA05 DI IOM *x* – IN D06/D07 ... command IOM *y* – CA06/CA07 DI IOM *x* – IN D10/D11 ... command IOM *y* – CB00/CB01 DI IOM *x* – IN D12/D13 ... command IOM *y* – CB02/CB03 DI IOM *x* – IN D14/D15 ... command IOM *y* – CB04/CB05 DI IOM *x* – IN D16/D17 ... command IOM *y* – CB06/CB07
Double information to double command (1.5-pole): DI-610x with DO-6212 (2 DO-6212 with 1 DI-610x possible)	DI IOM *x* – IN D00/D01 ... command IOM *y* – OUT D00/D01 DI IOM *x* – IN D02/D03 ... command IOM *y* – OUT D02/D03 DI IOM *x* – IN D04/D05 ... command IOM *y* – OUT D04/D05 DI IOM *x* – IN D10/D11 ... command IOM *z* – OUT D00/D01 DI IOM *x* – IN D12/D13 ... command IOM *z* – OUT D02/D03 DI IOM *x* – IN D14/D15 ... command IOM *z* – OUT D04/D05
Double information to double command (1.5-pole): DI-610x with DO-6230	DI IOM *x* – IN D00/D01 … command IOM *y* – CA00/CA01 DI IOM *x* – IN D02/D03 ... command IOM *y* – CA02/CA03 DI IOM *x* – IN D04/D05 ... command IOM *y* – CA04/CA05 DI IOM *x* – IN D06/D07 ... command IOM *y* – CA06/CA07 DI IOM *x* – IN D10/D11 ... command IOM *y* – CB00/CB01 DI IOM *x* – IN D12/D13 ... command IOM *y* – CB02/CB03 DI IOM *x* – IN D14/D15 ... command IOM *y* – CB04/CB05 DI IOM *x* – IN D16/D17 ... command IOM *y* – CB06/CB07
Double information to double command (2-pole): DI-610x with DO-6212 (2 DO-6212 with 1 DI-610x possible)	DI IOM *x* – IN D00/D01 ... command IOM *y* – OUT D00..D03 DI IOM *x* – IN D04/D05 ... command IOM *y* – OUT D04..D07 DI IOM *x* – IN D10/D11 ... command IOM *z* – OUT D00..D03 DI IOM *x* – IN D14/D15 ... command IOM *z* – OUT D04..D07
Double information to double command (2-pole): DI-610x with DO-6230	DI IOM *x* – IN D00/D01 ... command IOM *y* – CA00..CB01 DI IOM *x* – IN D02/D03 ... command IOM *y* – CA02..CB03 DI IOM *x* – IN D04/D05 ... command IOM *y* – CA04..CB05 DI IOM *x* – IN D06/D07 ... command IOM *y* – CA06..CB07

x = 0..7, y = x+1, z = x+2

Note

In each case the module DO-62xx must be equipped directly after the module DI-610x.

I/O Master Module with Firmware USIO81

Type	Predefined Assignment
Single information to single command (1-pole): DI-810x m with it DO-820x	EM IOM *x* – IN D00 ... command IOM *y* – OUT D00 EM IOM *x* – IN D01 ... command IOM *y* – OUT D01 : EM IOM *x* – IN D07 ... command IOM *y* – OUT D07
Single information to single command (1-pole): DI-811x with DO-821x (2 DO-8212 with 1 DI-811x possible)	EM IOM *x* – IN D00 ... command IOM *y* – OUT D00 EM IOM *x* – IN D01 ... command IOM *y* – OUT D01 : EM IOM *x* – IN D07 ... command IOM *y* – OUT D07 EM IOM *x* – IN D10 ... command IOM *z* – OUT D00 EM IOM *x* – IN D11 ... command IOM *z* – OUT D01 : EM IOM *x* – IN D17 ... command IOM *z* – OUT D07
Single information to single command (1,5-pole): DI-810x with DO-820x	EM IOM *x* – IN D00 ... command IOM *y* – OUT D00 EM IOM *x* – IN D01 ... command IOM *y* – OUT D01 : EM IOM *x* – IN D06 ... command IOM *y* – OUT D06
Single information to single command (1,5-pole): DI-811x with DO-821x (2 DO-821x with 1 DI-811x possible)	EM IOM *x* – IN D00 ... command IOM *y* – OUT D00 EM IOM *x* – IN D01 ... command IOM *y* – OUT D01 : EM IOM *x* – IN D06 ... command IOM *y* – OUT D06 EM IOM *x* – IN D10 ... command IOM *z* – OUT D00 EM IOM *x* – IN D11 ... command IOM *z* – OUT D01 : EM IOM *x* – IN D16 ... command IOM *z* – OUT D06
Single information to single command (2-pole): DI-810x with DO-820x	EM IOM *x* – IN D00 ... command IOM *y* – OUT D00/D01 EM IOM *x* – IN D02 ... command IOM *y* – OUT D02/D03 EM IOM *x* – IN D04 ... command IOM *y* – OUT D04/D05 EM IOM *x* – IN D06 ... command IOM *y* – OUT D06/D07
Single information to single command (2-pole): DI-811x with DO-821x (2 DO-821x with 1 DI-811x possible)	EM IOM *x* – IN D00 ... command IOM *y* – OUT D00/D01 EM IOM *x* – IN D02 ... command IOM *y* – OUT D02/D03 EM IOM *x* – IN D04 ... command IOM *y* – OUT D04/D05 EM IOM *x* – IN D06 ... command IOM *y* – OUT D06/D07 EM IOM *x* – IN D10 ... command IOM *z* – OUT D00/D01 EM IOM *x* – IN D12 ... command IOM *z* – OUT D02/D03 EM IOM *x* – IN D14 ... command IOM *z* – OUT D04/D05 EM IOM *x* – IN D16 ... command IOM *z* – OUT D06/D07
Double information to double command (1-pole): DI-810x with DO-820x	DM IOM *x* – IN D00/D01 ... command IOM *y* – OUT D00/D01 DM IOM *x* – IN D02/D03 ... command IOM *y* – OUT D02/D03 DM IOM *x* – IN D04/D05 ... command IOM *y* – OUT D04/D05 DM IOM *x* – IN D06/D07 ... command IOM *y* – OUT D06/D07
Double information to double command (1-pole): DI-811x with DO-821x (2 DO-821x with 1 DI-811x possible)	DM IOM *x* – IN D00/D01 ... command IOM *y* – OUT D00/D01 DM IOM *x* – IN D02/D03 ... command IOM *y* – OUT D02/D03 DM IOM *x* – IN D04/D05 ... command IOM *y* – OUT D04/D05 DM IOM *x* – IN D06/D07 ... command IOM *y* – OUT D06/D07 DM IOM *x* – IN D10/D11 ... command IOM *z* – OUT D00/D01 DM IOM *x* – IN D12/D13 ... command IOM *z* – OUT D02/D03 DM IOM *x* – IN D14/D15 ... command IOM *z* – OUT D04/D05 DM IOM *x* – IN D16/D17 ... command IOM *z* – OUT D06/D07
Double information to double command (1,5-pole): DI-810x with DO-820x	DM IOM *x* – IN D00/D01 ... command IOM *y* – OUT D00/D01 DM IOM *x* – IN D02/D03 ... command IOM *y* – OUT D02/D03 DM IOM *x* – IN D04/D05 ... command IOM *y* – OUT D04/D05
Double information to double command (1,5-pole): DI-811x with DO-821x (2 DO-821x with 1 DI-811x possible)	DM IOM *x* – IN D00/D01 ... command IOM *y* – OUT D00/D01 DM IOM *x* – IN D02/D03 ... command IOM *y* – OUT D02/D03 DM IOM *x* – IN D04/D05 ... command IOM *y* – OUT D04/D05 DM IOM *x* – IN D10/D11 ... command IOM *z* – OUT D00/D01 DM IOM *x* – IN D12/D13 ... command IOM *z* – OUT D02/D03 DM IOM *x* – IN D14/D15 ... command IOM *z* – OUT D04/D05

Type	Predefined Assignment
Double information to double command (2-pole): DI-810x with DO-820x	DM IOM *x* – IN D00/D01 ... command IOM *y* – OUT D00..D03 DM IOM *x* – IN D04/D05 ... command IOM *y* – OUT D04..D07
Double information to double command (2-pole): DI-811x with DO-821x (2 DO-821x mit 1 DI-811x possible)	DM IOM *x* – IN D00/D01 ... command IOM *y* – OUT D00..D03 DM IOM *x* – IN D04/D05 ... command IOM *y* – OUT D04..D07 DM IOM *x* – IN D10/D11 ... command IOM *z* – OUT D00..D03 DM IOM *x* – IN D14/D15 ... command IOM *z* – OUT D04..D07

x = 0..7, y = x+1, z = x+2

Note

In each case the module DO-62xx must be equipped directly after the module DI-610x.

9.1.11.5.7 Checked Command Output

For the output of checked commands the corresponding digital output modules must be equipped and the DO signals to be used must be configured.

Parameters are set only on the command output relay module.

You find the exact information on the checked command output in the manual *SICAM RTUs Common Functions Peripheral Elements According to IEC 60870-5-101/104, chapter "Pulse Commands", section "Functions Dependent on the Hardware of the System Element"*.

Required I/O Modules:

- 1 command output basic module, alternatively
  - DO-6220 – command output with internal checks *IC1*
  - DO-6221 – command output with resistance check *RC1*
- 1 up to 5 command output relay modules DO-6230, alternatively
  - 8 relay outputs for 16 pulse commands with 1- or 1.5-pole wiring
  - 8 pulse commands with 2-pole wiring

Note

A mixed wiring (1-, 1.5- and 2-pole) on one module DO-6230 is not permissible. For varied wirings additional DO-6230 must be used.

9.1.11.5.8 Binary Information Output

For the output of binary information a digital output module must be equipped, and the DO signals to be used must be configured.

With the parameter `Fail_behav` you can determine the behavior of a binary information output upon failure of the Master Module. You find further information thereto in the manual *SICAM RTUs Common Functions Peripheral Elements According to IEC 60870-5-101/104, chapter "Binary Information Output", section "Deactivation or Retention on Failure"*.

9.1.11.5.9 Current/Voltage Output

For the output of currents or Voltages an analog output module must be equipped, and the AO signals to be used must be configured.

With the parameter `Fail_behav` you can determine the behavior of a binary information output upon failure of the Master Module. You find further information thereto in the manual *SICAM RTUs Common Functions Peripheral Elements According to IEC 60870-5-101/104, chapter "Binary Information Output", section "Deactivation or Retention on Failure"*.

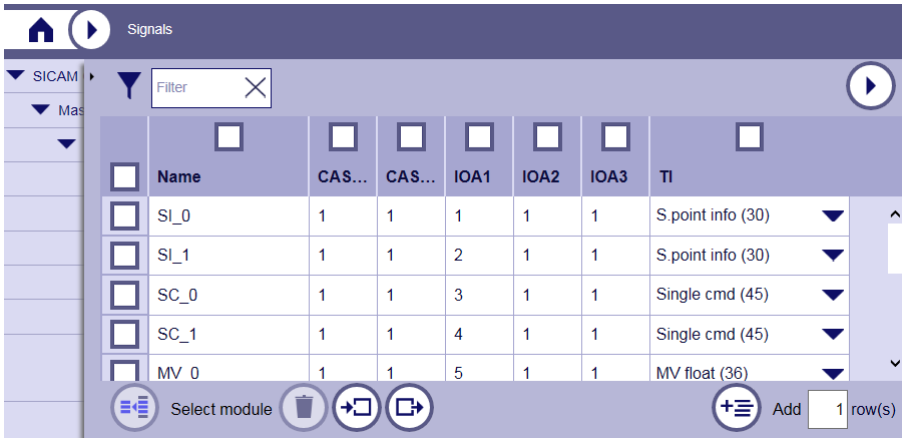
9.1.11.6 Import and Export of the Signal List

In the menu `Home | Signals` you can import and export a signal list already previously created.

9.1.11.6.1 Export Signal List

This is how to export your signal list:

- Click on the triangle on the upper right side in order to open the workspace for defining signals



- Click on the button

The signal list will be generated as *.*csv* file. After that, a dialog for download opens.

- Click Start download in order to save the file locally
- After saving, click on the button

The storage procedure is dependent on the web browser and consequently may vary. Follow the instructions of your web browser. The file type . *csv* must be kept.

Note

During the generation procedure the menu must not be left. The selection of another webpage may lead to the occurrence of undefined states.

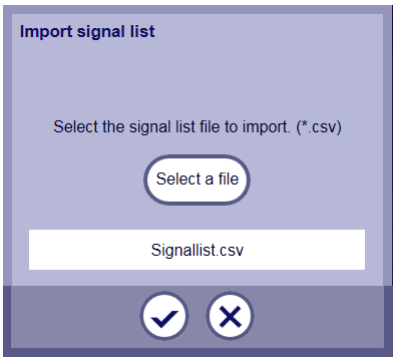
The signal list can now be opened as *.*csv* file and modified.

- Save your changes in the signal list and save it as *.*csv* file

9.1.11.6.2 Import Signal List

This is how to import your signal list:

- Click on the triangle on the upper right side in order to open the workspace for defining signals
- Click on the button



You have the possibility to abort the procedure via the button .

- Click Select a file to open the selection dialog
- Select the source directory and the source file (the file type must be *.*csv*)
- Click on the button

The target device starts the loading procedure. The duration of the loading procedure depends on the number of signals and the used communication connection.

The file is checked upon validity. If the data is valid, it is written on the SD card of the target device. Otherwise an error indication is displayed.

After successful import, the following dialog appears:

- Click on the button

Further steps: Assigning (Master, I/O Master, I/Os), Apply.

9.1.12 Usage of CP-8000/CP-802x as SICAM PAS I/O

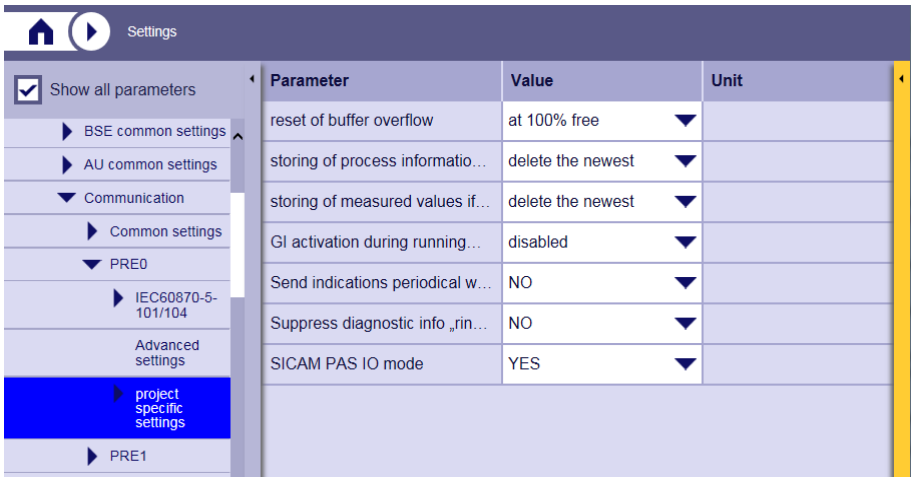
The devices CP-8000/CP-802*x* can be used as non-licensed SICAM PAS substations. The differentiation between normal operation and operation as SICAM PAS I/O is done via a parameter.

With operation as SICAM PAS I/O, the IEC 60870-5-104 protocol element is defined as a SICAM PAS I/O interface upon startup. All stations that are connected with this protocol element are switched to SICAM PAS I/O mode. A connection with a normally operated station on the same protocol element is not possible.

Prerequisite for the operation as SICAM PAS I/O is an equipped IEC 60870-5-104 protocol element (in the following example PRE0 is used).

Set in the directory **SICAM A8000 CP-80xx | Master module | Communication | PRE0** the `parameter project specific settings` to **YES**.

Now appears the directory **SICAM A8000 CP-80xx | Master module | Communication | PRE0 | project specific settings**. Here you can set the parameter SICAM PAS IO mode to **YES.**



For the operation as SICAM PAS I/O the following parameters are relevant:

- **SICAM A8000 CP-80xx | Master module | AU common settings**
  - `Plant`
  - `Device name`
- **SICAM A8000 CP-80xx | Master module | AU common settings | common address of ASDU (CASDU)**
  - `CASDU1` (must be set equally for all data points)
  - `CASDU2` (must be set equally for all data points)
- **SICAM A8000 CP-80xx | Master module | Network settings | IP address**
  - `Own IP address X1/X4`
- **SICAM A8000 CP-80xx | Master module | PRE0 | Network connection | LAN | IEC 104 parameter**
  - `Timeout connection setup t0`
  - `Timeout transmit t1`
  - `Timeout transmit acknowledge t2`
  - `Timeout connection check t3`
  - `Max. no. of APDUs until acknowledgement (k)`
  - `number of APDUs until acknowledgement (w)`

- **SICAM A8000 CP-80xx | Master module | PRE0 | Connection definition**
  - Since the IEC 60870-5-104 parameters in SICAM PAS can only be configured once for all connection, the following parameters must be adjusted equally in all connection definition:

Parameter	Value
Stat. no.	*<internal station number>*
IP address	*<SICAM PAS>*
Controlling/Controlled	Controlled
Redundancy	None
Stop behaviour	Save
Failure	Notify
Clear ring buffer	No
Data throughput limit in receive direction	0
Data throughput limit in send direction	0

Signals in the function diagram

Existing modules deliver signals. If the CASDU is invalid, it will be replaced by the CASDU parameterized on the Master Module.

Signals via I/O Modules

If available, each signal is described by its signal name, otherwise by its IEC 60870-5-104 address.l

The I/O modules deliver all signals assigned to software data points depending on a hardware pin.

9.1.12.1 Synchronization of the I/O Configuration in SICAM PAS

The configuration of the I/Os can be imported in SICAM PAS, for instance via a system configurator. Thereto the configuration can be downloaded as XML file via a menu item in SICAM WEB. You will find further details in section 9.3.5, Download SICAM PAS I/O Configuration.

9.1.13 Test Functions

- Menu `Home | I/O Modules`

The Test Functions serve for the visualization and for the intended changing of process signals with use of I/O Modules.

The test page supports the following tasks:

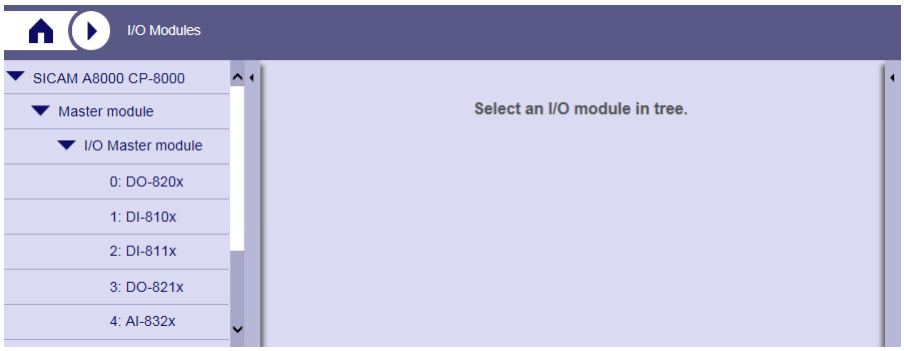
- Display signals assignments for a selected I/O Module
  - Display corresponding actual process values (signal inputs and outputs)
- Changing of process values (only signal outputs)

Note

The test functions are only supported for hardware datapoints (spontaneous input and output signals). Signals assigned to a software datapoint or to a datapoint that can only be transferred periodically are not supported.

Note

After the initial selection of the test page within a session, the directory tree is shown within 3 s in case of a fast connection. In case of a slow connection (GPRS), the loading time may be longer. The same applies also for the initial selection of an I/O Module.



Directory Tree

The test page contains a directory tree with all equipped modules on the left side. Only I/O Modules can be selected to perform test functions.

Side Bar

By means of clicking on the side bar right beside the directory tree, the display area can be extended.

By means of clicking on the side bar rightmost, the control area for the changing of process values can be opened (if the test page is opened for the first time in a session, the control area is closed).

9.1.13.1.1 Supported Signal Types

Processing type	Type identification
Signal inputs	
DI_SI	Single-point information (TI 30)
DI_DI	Double-point information (TI 31)
DI_CV	Counter value (TI 37)
DI_CV_Sub	Counter value (TI 37)
AI_I	Measured value normalized (TI 34) Measured value scaled (TI 35) Measured value short floating point (TI 36)
AI_U	Measured value normalized (TI 34) Measured value scaled (TI 35) Measured value short floating point (TI 36)
AI_T	Measured value normalized (TI 34) Measured value scaled (TI 35) Measured value short floating point (TI 36)
T_AI_I (CTVT)	Measured value normalized (TI 34) Measured value scaled (TI 35) Measured value short floating point (TI 36)
T_AI_U (CTVT)	Measured value normalized (TI 34) Measured value scaled (TI 35) Measured value short floating point (TI 36)
Signal outputs	
DO_SI	Single-point information (TI 30)
DO_SX	Single-point information (TI 30) Single command (TI 45)
DO_DX	Single command (TI 45) Double command (TI 46)
DO_SC_1POL	Single command (TI 45)
DO_SC_1.5POL	Single command (TI 45)
DO_SC_2POL	Single command (TI 45)
DO_DC_1POL	Single command (TI 45) Double command (TI 46) Tap positioning command (TI 47)
DO_DC_1.5POL	Single command (TI 45) Double command (TI 46) Tap positioning command (TI 47)
DO_DC_2POL	Single command (TI 45) Double command (TI 46) Tap positioning command (TI 47)
AO_I	Measured value normed (TI 34) Measured value scaled (TI 35) Measured value short floating point (TI 36) Setpoint normed (TI 48) Setpoint scaled (TI 49) Setpoint short floating point (TI 50)
AO_U	Measured value normed (TI 34) Measured value scaled (TI 35) Measured value short floating point (TI 36) Setpoint normed (TI 48) Setpoint scaled (TI 49) Setpoint short floating point (TI 50)

9.1.13.2 Display Process Values

If you select an I/O Module for the process display, SICAM WEB performs the following steps:

- Load signal assignments for the selected I/O Module from the target device
- Load actual process values and the according states from the target device

Note

If you modify the signal assignments for an I/O Module, these changes are not immediately visible in the test page. After changing a signal assignment you save the settings, after that a startup of the target device is required. Only then the data in the test page is loaded again from the device when selecting the corresponding I/O Module.

When selecting an I/O Module, a table is displayed in the status area right beside the directory tree. Each row of the table is a signal assignment of the related I/O Module. The displayed values can be read only.

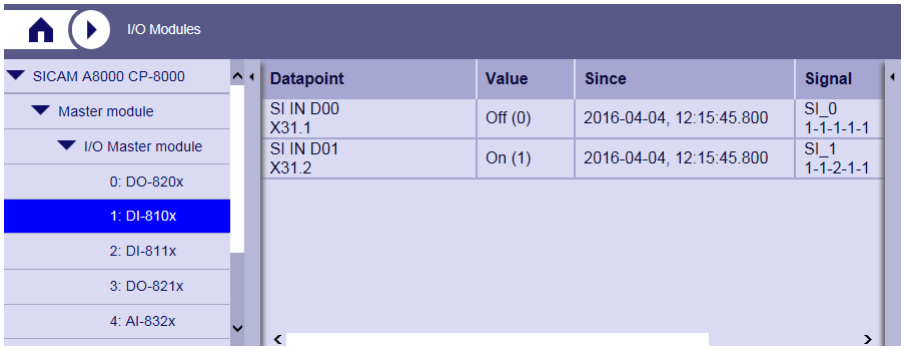
The table contains the following columns:

- Checkbox
  (only for signal output)
- DATAPOINT
  Datapoint name and Hardware pins on the I/O Module
- VALUE
  Actual process value
- SINCE
  Time tag of the last change of state
- SIGNAL
  Name *) and IEC 60870-5-101/104 address
- TI
  Type identification

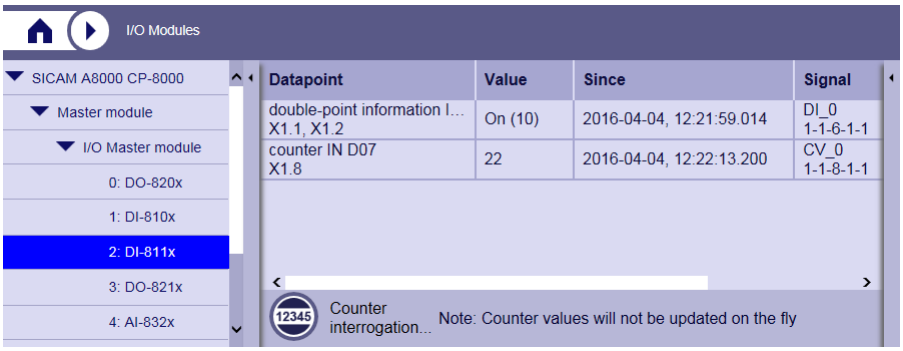
*) empty, if engineered with an older SICAM WEB version or with the SICAM TOOLBOX II

You can change the column width with exception of the fixed columns. The column width is maintained during the session, even if another menu is selected. Only if you select another I/O Module, the column width will be reset.

Example: Digital input – single-point information



Example: Digital input – double-point information, counter value

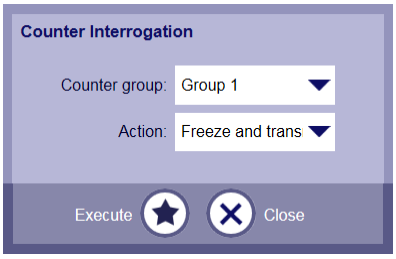


Update Counter Value

Counter values (TI 37) are not transmitted by the I/O Master Module upon each change, but by means of a corresponding counter interrogation. With that, the displayed process value can be also updated.

If a counter value is assigned on the selected DI module, then a button appears below the status area.

- In order to initiate the counter interrogation, click on the button



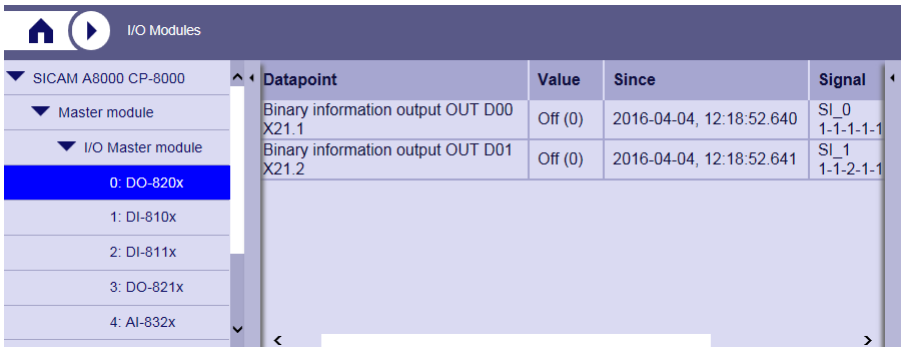
- Select in the dialog the parameterized counter group (or all groups)
- Select the desired action:
  - Example: “Freeze and transmit”, if you want to update the status display
  - Example: “Freeze with reset and transmit”, if you want to set the value to 0 and update the status display
- After that, click on the button
- Click on the button in order to close the dialog

The updated process value of the requested group is now displayed.

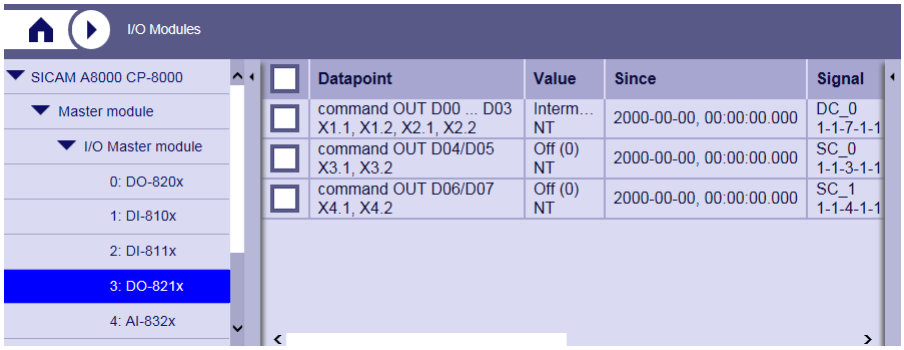
Note

The counter group and action correspond to the identifiers FRZ and RQT in the message to the I/O Master Module.

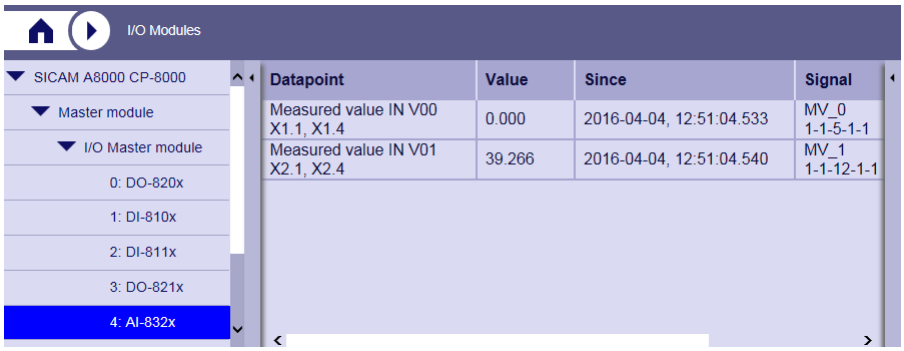
Example: Digital output – binary information state



Example: Digital output – command state



Example: Analog input – measured value, floating point



9.1.13.2.1 Supported Type Identifications and Possible Values

Type Identification	Possible value
Single-point information (TI 30)	Off (0) On (1)
Double-point information (TI 31)	Intermediate (00), Off (01) On (10) Error (11)
Single command (TI 45)	Off (0) On (1)
Double command (TI 46)	Terminated (00) Off (01) On (10) Error (11)
Tap position command (TI 47)	Terminated (00) Lower (01) Higher (10) Error (11)
Counter value (TI 37)	
Measured value normalized (TI 34)	$-1 \ldots +1^{-15}$
Measured value scaled (TI 35)	-32768…+32767 (15 Bit + sign)
Measured value short floating point (TI 36)	$-1.000 \cdot 10^{15} \ldots +1.000 \cdot 10^{15}$
Setpoint normalized (TI 48)	$-1 \ldots +1^{-15}$
Setpoint scaled (TI 49)	-32768…+32767 (15 Bit + sign)
Setpoint short floating point (TI 50)	$-1.000 \cdot 10^{15} \ldots +1.000 \cdot 10^{15}$ Value from device without conversion

The values are converted depending on the type identification (TI). Analog values are displayed as conditioned values.

The data format of the displayed inputs corresponds to the setting of the respective data point on the I/O Module (signal list).

9.1.13.3 Change Process Values

The status of signal outputs can be changed (forced) for test purposes. Please consider thereby that the status of a simulated output can change automatically by

- settings in the telecontrol function
- running application program (status change by logic operation)
- the communication (status change in the received message)

It is not possible to set new process values for signal inputs.

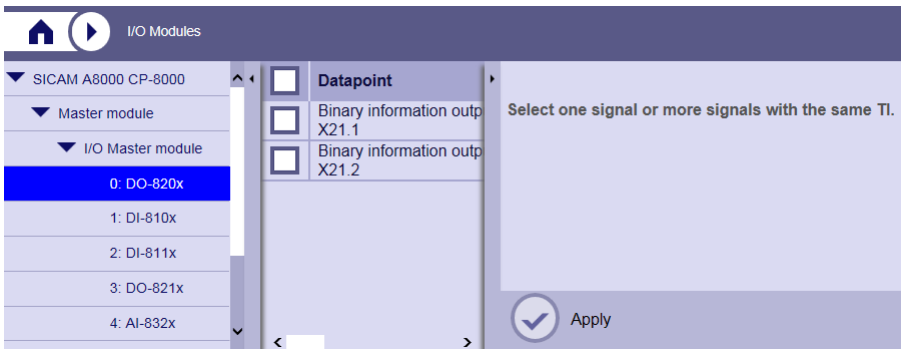
Warning

The status change of signal outputs with the plant running can lead to damage to persons and machines. Ensure that aggregates in the control area of the command output as well as those subsequent aggregates in the process chain are protected and that persons in the vicinity are warned.

- Select a DO module or an AO module

Signal outputs assigned to the selected I/O Module are listed in a table in the status area.

- Click on the side bar right beside the status area in order to open the control area on the right side



As long as no signal has been selected, the control area remains inactive.

You can select 1 signal output or several signal outputs of the same type in order to change their state conjointly. When selecting signal outputs with different type identifications, a notification is shown.

Exception with commands: Due to the 1-out-of-n interlocking, with commands only 1 signal output can be changed simultaneously.

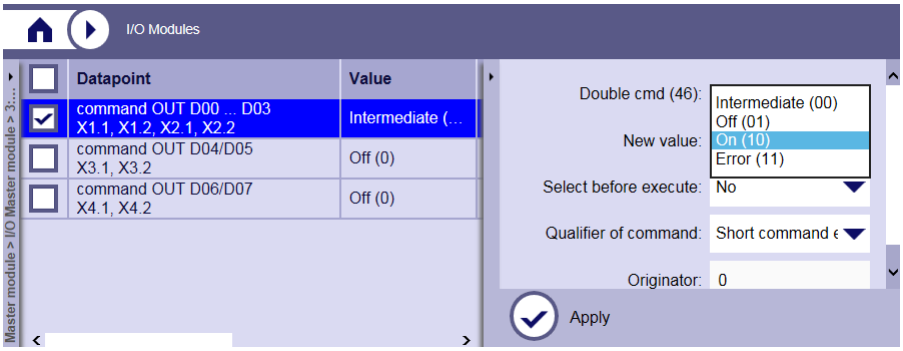
Note

Errors that the target device recognizes upon forcing outputs (for instance by means of internal interlocks, application parameters, etc.) are recorded in the diagnosis (menu History).

This is how to change a process value:

Example: double command output

- In the directory tree, mark the corresponding DO module
- Click on the side bar left beside the status area, if you want to extend it
- Mark the row with the desired datapoint



Control area:

- Select a “New value”
  The data format corresponds to the setting of the data point on the I/O Module (signal list).
- Select the “Qualifier of command“ option
  With selection **undefined** the settings of the respective data point on the I/O Module (`output_t_0`, `output_t_1`) are used for the duration for the command output.

  With selection **Short command execution time** or **Long command execution time** the corresponding values of the `AU common settings` are used for the duration for the command output.

  With selection **Persistant command** a continuous command is output (only with processing type DO_SX and DO_DX).
- Enter the “Originator“
  This value defines the source address for the respective command (**0**…**255**).
- Select the “Select before execute“ option
  With selection **Yes** and button you activate the select command. You activate the execute command, when you click on the butto once more within the adjusted time (`select_execute_t`).

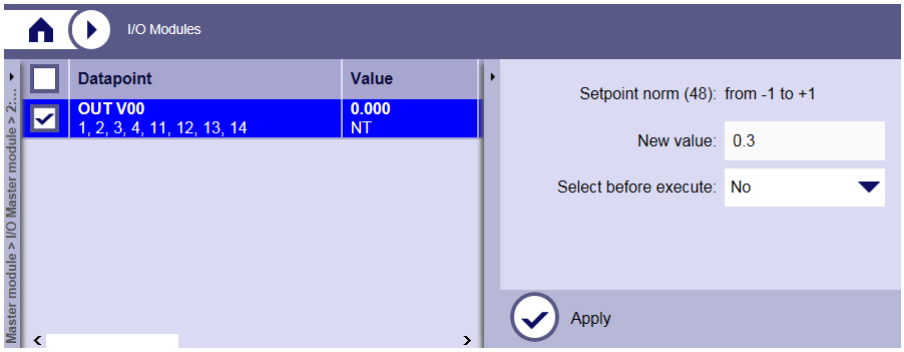
  With selection **No** and button you activate the execute command directly.

The new process value is transferred to the target device and displayed in the column VALUE.

You find further details in the manual *SICAM RTUs Common Functions Peripheral Elements According to IEC 60870-5-101/104,* chapter *"Pulse Commands", section "Functions Independent of the Hardware of the Systemelement", sections "Select and Execute Command", "Set Control Location", "Command Output Time"*.

Example: Setpoint command, normalized

- In the directory tree, mark the corresponding AO module
- Click on the side bar left beside the status area, if you want to extend it
- Mark the row with the desired datapoint



Control area:

- Select a “New value”
  The data format corresponds to the setting of the data point on the I/O Module (signal list).
- Select the “Select before execute“ option
  With selection **Yes** and button you activate the select command. You activate the execute command, when you click on the butto once more within the adjusted time (`select_execute_t`).

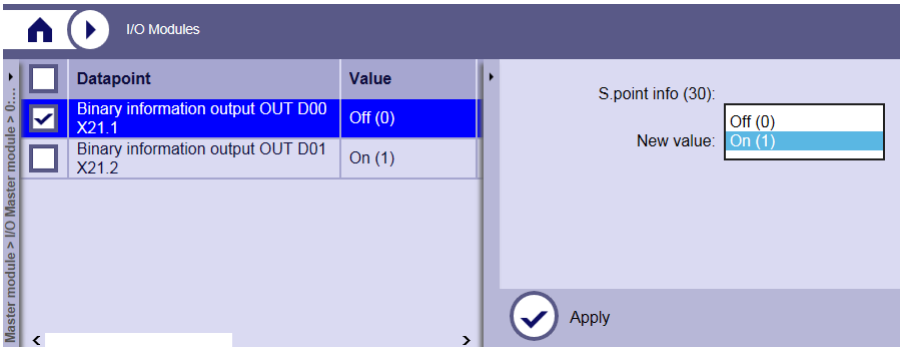
  With selection **No** and button you activate the execute command directly.

The new process value is transferred to the target device and displayed in the column VALUE.

You find further details in the manual *SICAM RTUs Common Functions Peripheral Elements According to IEC 60870-5-101/104,* chapter *"Setpoint Values by means of Currents and Voltages", section "Select and Execute Command"*.

Example: single-point information output

- In the directory tree, mark the corresponding DO module
- Click on the side bar left beside the status area, if you want to extend it
- Mark the row with the desired datapoint



Control area:

- Select a “New value”
- Click on the button

The new process value is transferred to the target device and displayed in the column VALUE.

Type Identifications and Possible Values

The following type identifications and attributes are supported to force a new process value:

Type identification	New value	Select before execute	Qualifier of command	Origi-nator
Single-point information (TI 30)	Off (0) On (1)			
Single command (TI 45)	Off (0) On (1)	No Yes	No determination Long command execution time Short command execution time Persistent command	0…255
Double command (TI 46)	Off (01) On (10)			
Tap position command (TI 47)	Lower (01) Higher (10)			
Measured value normalized (TI 34)	$-1…+1^{-15}$			
Measured value scaled (TI 35)	-32768… +32767			
Measured value short floating point (TI 36)	$-1.000•10^{15}$… $+1.000•10^{15}$			
Setpoint command normalized (TI 48)	$-1…+1^{-15}$	No Yes		
Setpoint command scaled (TI 49)	-32768… +32767			
Setpoint command short floating point (TI 50)	$-1.000•10^{15}$… $+1.000•10^{15}$			

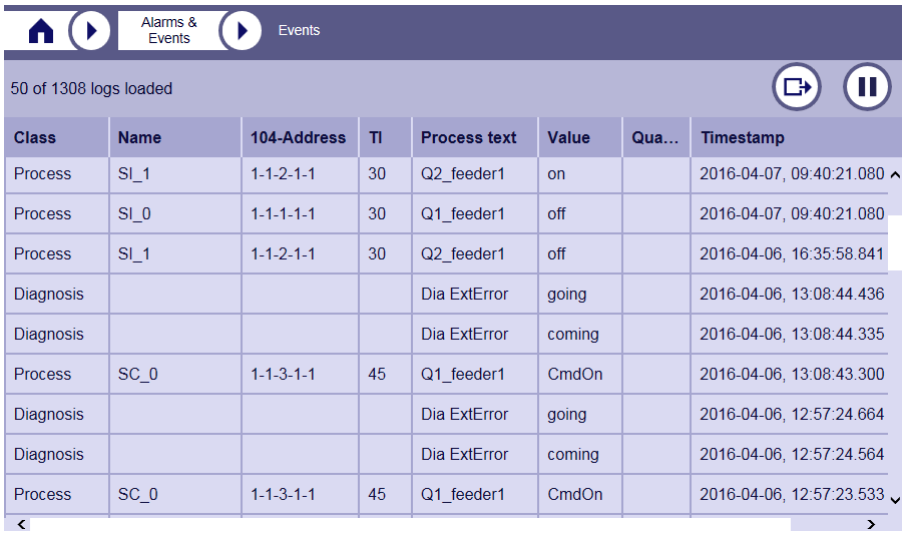
9.1.14 Logging

- Menu `Home | Alarms & Events`

In operation, the occurring notifications from the system diagnosis and from the process are recorded upon a change of state.

9.1.14.1 Show Event List

By selecting the submenu `Events` the event list is displayed. The display is performed as a table. The table has only reading rights.



Class	Name	104-Address	TI	Process text	Value	Qua...	Timestamp
Process	SI_1	1-1-2-1-1	30	Q2_feeder1	on		2016-04-07, 09:40:21.080
Process	SI_0	1-1-1-1-1	30	Q1_feeder1	off		2016-04-07, 09:40:21.080
Process	SI_1	1-1-2-1-1	30	Q2_feeder1	off		2016-04-06, 16:35:58.841
Diagnosis				Dia ExtError	going		2016-04-06, 13:08:44.436
Diagnosis				Dia ExtError	coming		2016-04-06, 13:08:44.335
Process	SC_0	1-1-3-1-1	45	Q1_feeder1	CmdOn		2016-04-06, 13:08:43.300
Diagnosis				Dia ExtError	going		2016-04-06, 12:57:24.664
Diagnosis				Dia ExtError	coming		2016-04-06, 12:57:24.564
Process	SC_0	1-1-3-1-1	45	Q1_feeder1	CmdOn		2016-04-06, 12:57:23.533

Events are recorded chronologically upon a change of state in an event buffer. The events are distinguished in 2 classes:

- Diagnosis events (notifications from the diagnosis function)
- Process events (states of signals that are marked as event), refer to 9.1.11.2.1, Configurable Logging and Display of Signal States

When selecting the event list, the most current records (up to 50) are loaded. If more than 50 records are in the event buffer, when scrolling to the bottom the next 50 records will be loaded. The number of loaded records and the total number are displayed above the table.

The table is sorted chronologically descending (latest event first, oldest event at last), the time tagging has a resolution of 1 ms. If a new event occurs, this automatically prepended at the first place of the table. The older events are moved down.

The event buffer contains up to 4096 records and is managed as ring buffer. This means, if the event buffer has been fully written, the respective oldest record is overwritten by the most current.

The event buffer is stored non-volatile.

Halt Function

By means of clicking on the button you can halt the display of new events. If new events occur, then they are recorded furthermore in the event buffer, but not displayed in the table.

Depending on the state the button changes its design:

- Event display halted and no new event occurred:
- Event display halted and new event occurred:
  By means of clicking the green button the new events are displayed in the table.

By means of clicking the general button the event list is reloaded. With activated halt function, this is thereby not canceled.

Structure of the Table

Column	Value	Meaning/Note
Class	Diagnosis	Diagnosis event
	Process	Process event
Name	*<Signal name>*	Max. 99 characters, only if engineered with SICAM WEB (applies for process events)
104 address	*<IEC 60870-5-101/104 address>*	Parameterized CASDU1-CASDU2-IOA1-IOA2-IOA3 (applies for process events)
TI	*<Number>*	Type identification (30, 31, 45, 46) (applies for process events)
Process text	*<Error class)*	Internal diagnosis class (applies for diagnosis events)
	<Status name>	Max. 13 characters (applies for process events)
Value	Coming Going	Defined status text (applies for diagnosis events)
	<Status text On> *<Status text Off>* *<Status text faulty position>* *<Status text intermediate position>*	Freely parameterizable status text (applies for process events)
Quality	NT IV	At failure of I/O Module If value invalid (applies for process events)
Time tag	YYYY-MM-DD, Thh:mm:ss:ms+hh:mm	Date and time

Note

When selecting another menu within the session (e.g. settings, signals), the content of the table remains, but the polling for new events is stopped. If the event page is reopened again, all events since leaving the event page are automatically loaded.

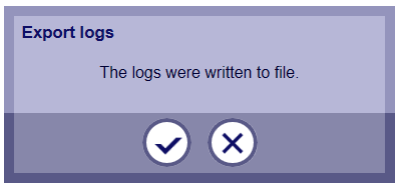
If during the leaving of the event page a ring buffer overflow occurred, only the last 4000 events can be loaded.

9.1.14.1.1 Export Event List

With the export function you can save the events which are recorded in the ring buffer in a file on your PC.

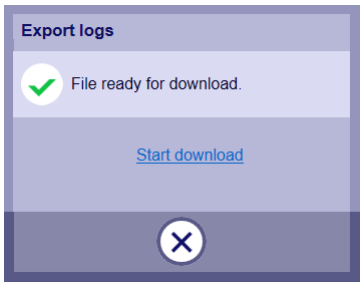
- Click on the button

The target device saves the records in a file.



- You can abort the procedure by clicking on
- Click on the button in order to start the export

After the export, the file is provided for the download (format *.csv*). A dialog is opened with the link Start download.



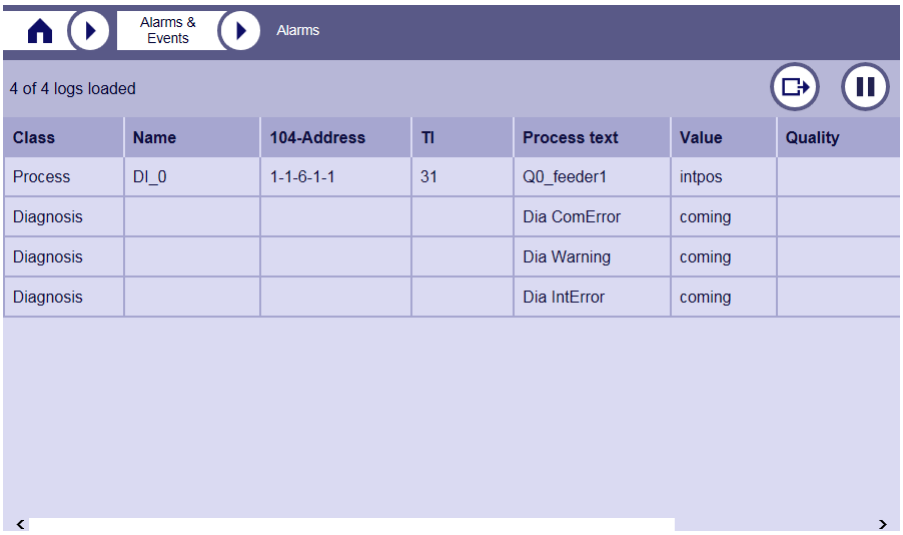
- Click with the right mouse button on the link

A dialog for the selection of the saving path is opened. The default file name can be changed, if needed. Follow the instructions of your web browser.

- You can abort the procedure by clicking on

9.1.14.2 Show Alarm List

By selecting the submenu `Alarms` the alarm list is displayed. The display is performed as a table. The table has only reading rights.



Class	Name	104-Address	TI	Process text	Value	Quality
Process	DI_0	1-1-6-1-1	31	Q0_feeder1	intpos	
Diagnosis				Dia ComError	coming	
Diagnosis				Dia Warning	coming	
Diagnosis				Dia IntError	coming	

Alarms are recorded chronologically upon a change of state in an alarm buffer. The alarms are distinguished in 2 classes:

- Diagnosis alarms (notifications from the diagnosis function)
- Process alarms (states of signals that are marked as an alarm), refer to 9.1.11.2.1, Configurable Logging and Display of Signal States

When selecting the alarm list, all the present alarms are loaded, this means, the table contains only current states. The states “going” and “off” are not displayed in the table. If a notification has the state “going” or “off”, the corresponding row disappears.

The table is sorted chronologically descending (latest alarm first, oldest alarm at last). If a new alarm occurs, this is automatically prepended at the first place of the table. The older alarms are moved down.

Halt Function

By means of clicking on the button you can halt the display of new alarms. If new alarms occur, then they are recorded furthermore in the alarm buffer, but not displayed in the table.

Depending on the state the button changes its design:

- Alarm display halted and no new alarm occurred:
- Alarm display halted and new alarm occurred:
  By means of clicking the green button the current alarms are displayed in the table.

By means of clicking the general button the alarm list is reloaded. With activated halt function, this is thereby not canceled.

Structure of the Table

Column	Value	Meaning/Note
Class	Diagnosis	Diagnosis alarm
	Process	Process alarm
Name	*<Signal name>*	Max. 99 characters, only if engineered with SICAM WEB (applies for process alarms)
104 address	*<IEC 60870-5-101/104 address>*	Parameterized CASDU1-CASDU2-IOA1-IOA2-IOA3 (applies for process alarms)
TI	*<Number>*	Type identification (30, 31, 45, 46) (applies for process alarms)
Process text	*<Error class)*	Internal diagnosis class (applies for diagnosis alarms)
	<Status name>	Max. 13 characters (applies for process alarms)
Value	Coming	Defined status text (applies for diagnosis alarms)
	<Status text On> *<Status text faulty position>* *<Status text intermediate position>*	Freely parameterizable status text (applies for process alarms)
Quality	NT IV	At failure of I/O Module If value invalid (applies for process alarms)

Note

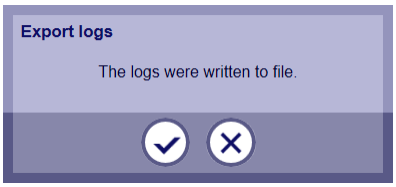
When selecting another menu within the session (e.g. settings, signals), the content of the table remains, but the polling for new alarms is stopped. If the alarm page is reopened again, all current alarms are automatically loaded.

9.1.14.2.1 Export Alarm List

With the export function you can save all the current alarms in a file on your PC.

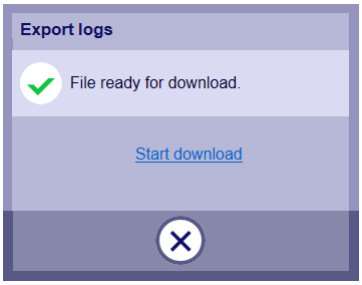
- Click on the button

The target device saves the records in a file.



- You can abort the procedure by clicking on
- Click on the button in order to start the export

After the export, the file is provided for the download (format *.csv*). A dialog is opened with the link Start download.



- Click with the right mouse button on the link

A dialog for the selection of the saving path is opened. The default file name can be changed, if needed. Follow the instructions of your web browser.

- You can abort the procedure by clicking on

9.2 Automation

For the accomplishment of freely definable open-/closed-loop control tasks you can create optionally an application program as instruction list (IL).

Overview of the Tasks

Task	Meaning
Create instruction list	Edit the application program
Import program code	Transfer instruction list from PC to the target device or copy offline on the SD card
Export program code	Transfer instruction list from target device nach PC
Cold start	Initialize instruction list and reset all variables
Warm start	Initialize instruction list and reset all volatile variables
Halt	Halt cyclic program processing
Continue	Continue cyclic program processing
Cycle step	Execute one program cycle
Statistics	Information on mode, cycle time and memory usage
Test functions	• Status of inputs/outputs • Simulation of inputs

You find further details in the manual *SICAM RTUs Common Functions System and Basic System Elements, chapter "Automation", section "Restricted Open-/Closed-Loop Control Function", "Application Program"*.

Exceptional thereto please consider the following:

Note

The signals from the periphery are distributed based on the settings in the Topology (data flow direction, data flow routing). Therefore, a system variable for the data flow routing must not be used in the instruction list.

9.2.1 Creating an Instruction List (IL)

The creation of an instruction list is only possible independently from the target device. For the programming is an ASCII-Editor (for instance Microsoft Notepad) required.

Example

```
PLC_RESET:
LD   10
ST   PLC_CYCLETIME       (*cycle time in ms*)

PLC_INIT:
LD   MR_DINT_MINUTES     (*load power-fail safe value*)
ST   M_DINT_MINUTESOLD   (*freeze in a flag as old value*)

PLC_START:

(*Operating hours counter*)
LD   PLC_SYSTIME.SEC     (*fetch second value of the system time*)
ST   M_DINT_SEC          (*and store in variable*)
LD   M_DINT_SEC          (*current second*)
EQ   0                   (*compare with second 0*)
ST   CTU_COUNTER.CU      (*HIGH always at the second 0 - required edge detection is*)
                         (*implemented within the counter*)
CAL  CTU_COUNTER         (*increments the counter*)
LD   CTU_COUNTER.CV      (*load current counter score*)
ST   ADD.IN0             (*store at input 0 for ADD function*)
LD   M_DINT_MINUTESOLD   (*load old value*)
ST   ADD.IN1             (*store at input 1 for ADD function*)
CAL  ADD                 (*call ADD function*)
ST   MR_DINT_MINUTES     (*store sum of operating minutes in a retaining flag, after startup*)
                         (*the old value will be added to the current counter score*)
ST   DIV.IN0             (*store at input 0 for DIV function*)
LD   60                  (*load constant for 60 minutes*)
ST   DIV.IN1             (*store at input 1 for DIV function*)
CAL  DIV                 (*call DIV function*)
ST   M_DINT_HOURS        (*sum of operating hours = minutes divided by 60*)
```

The instruction list must be stored as file type *.plc*.

For loading the program code into the target device please follow the instruction in section 9.2.2.1.1, Import Application Program.

You find the general specification of the programming language (IL) in the manual *SICAM RTUs Common Functions System and Basic System Elements, chapter "Automation", section "Restricted Open-/Closed-Loop Control Function", "Application Program", "Instruction List"*.

9.2.1.1 Structure of the Instruction List

The instruction list consists of 3 parts (in the following sequence):

- Startup (`PLC_RESET`)
  The startup part is run through once after a startup. Here all variables can be initialized, that are required directly **after** startup and before the current initial image.
- Initialization (`PLC_INIT`)
  The initialization part is run through once after a startup. Here all variables can be initialized, that are required directly **after** the current initial image and **before** the execution of the cycle part.
- Cycle (`PLC_START`)
  The cycle part is run through cyclically (CP-8000/CP-802*x* provides 1 task). The cycle time is definable by means of a system variable.

You will find some selected program examples in appendix B, Examples for Instruction Lists (IL).

9.2.1.2 Syntax for Instructions

9.2.1.2.1 General

Each instruction command must be in one line. Each line must be concluded with a paragraph break, line break or both (done automatically by the text editor).

An instruction command consists of the command (operation) and an operand.

Example:

```
LD   M_BOOL_TEST       (*command: LD  operand: M_BOOL_TEST*)
```

Each operation produces a calculated value (result). The following operation can calculate further with this result.

9.2.1.2.2 Adressing of I/O Variables

The format of an I/O variable must correspond with the respective input/output of the periphery.

A command or setpoint value is assigned to an I/O variable by an `ST` operation and the address of the operand. A state or value of an I/O variable is read by an `LD` operation and the address of the operand.

The attribute of the I/O variable must be separated by a "`.`". An I/O variable without attribute is not allowed.

Example for the simple syntax:

```
I_030_001_000_000_TEST.VALUE
0_031_005_001_000.OFF
```

Example for the expanded syntax:

```
E_045_001_001_001_002_003_TEST.VALUE  or
E_045_001_001_001_002_003.VALUE
```

Note

If the same IOA is used input- and output side, the freely definable *Name* must be different.

Special characters are not allowed.

Datapoints of the I/O Master Module

The datapoints of the I/O Master Module are listed in the *SICAM TOOLBOX II Online Help, chapter "Parameter Documentation and Diagnosis Info",* section *"1703 ACP and 1703 Ax (IEC)* | *Firmwares* | *USIO81* (USIO80 in case of SICAM TM I/O Modules) under the respective category.

9.2.1.2.3 Addressing of Flags

A flag is assigned by an ST operation and the address of the operand. The value of a flag is written by an LD operation and the address of the operand.

The number format must be chosen according to the format of the value to be stored.

Example:

```
LD    I_030_002_000_000.VALUE
ST    M_BOOL_FLAG00
```

Note

At startup all flags which are not signed as "retain" are initialized with 0.

9.2.1.2.4 Call of Functions

Functions have only temporary variables, therefore with each call all necessary call parameters must be set. Not used call parameters do not affect the result on execution of the function.

Example: If an addition (ADD) of 3 values is performed, then the inputs IN0, IN1, IN2 are used. The remaining inputs are automatically set to 0.

The writing of inputs of a function must always begin with IN0 and take place in ascending order without gaps.

The call parameters must be interchanged with a combination of LD and ST.

The name of the call parameter is produced from the name of the function and the name of the parameter separated by a ".".

Example:

```
LD   9                  (*load value 9 into the accumulator*)
ST   SQRT.IN0           (*store at input for square root function*)
CAL  SQRT               (*call function*)
ST   ADD.IN0            (*store result from*)
                        (*square root function at input 0 for ADD
function*)
LD   17                 (*load value 17 into the accumulator*)
ST   ADD.IN1            (*store at input 1 for ADD function*)
CAL  ADD                (*call function*)
ST   M_DINT_RESULT      (*store result in a flag*)
```

The results of the respective functions are written in the accumulator. In the example the value is also stored on the flag M_DINT_RESULT.

After the call of a function (CAL) all inputs of the respective function are set to the default values again.

Example:

```
LD   M_DINT_COMPARE            (*load flag*)
ST   EQ.IN0                    (*store at input 0 for equal function*)
LD   3                         (*load value 3*)
ST   EQ.IN1                    (*store at input 1 for equal function*)
CAL  EQ                        (*call function*)
ST   O_030_008_000_000.VALUE   (*if both values are equal the output of
the function is set to 1*)
```

If a comparison of two values is performed, the output is set if the flag `M_DINT_COMPARE` is written with **3** (the writing of the flag is not included here).

Note

When linking inputs of the following functions with „constant values“ the type-safe call `CAL` is to be used: `ADD`, `SUB`, `MUL`, `MUL`, `DIV`, `GT`, `GE`, `EQ`, `NE`, `LE`, `LT` (with the respective type specificities).

All binary functions (`AND`, `XOR`, …) are automatically BOOL and hence do not need to be provided with a `CAL`.

When creating an IL, at the listed functions BOOL must be linked as constant with **0** and **1**, numerical constant of the value **1** and **0** with **00** or **01**, since the runtime currently does not support a differentiating **+** (however, a leading **0**).

9.2.1.2.5 Call of Function Blocks

Function blocks do not have any temporary variables. Each new (derived) function block occupies a new memory in the RAM.

Respectively the first result of the function block is written in the accumulator. If a function block has more than one result, then this can be accessed as with the parameter transfer.

Example:

```
LD   1
ST   CTU_TEST.CU
ST   CTU_TEST.R
LD   5
ST   CTU_TEST.PV
CAL  CTU_TEST
LD   CTU_TEST.CV               (*access to 2nd result*)
```

9.2.1.3 Instruction Comments

Comments in the application program can be set at any arbitrary place and must be included between brackets and stars. The documentation can also extend over several lines.

Example:

```
LD   15                        (*load constant 15*)
ST   M_DINT_CONSTANT           (*store in flag*)
```

The following characters may be used:

- Numbers `0…9`
- Letters `A…Z`, `a…z`
- Special characters `^ ! " $ % & / ( ) = ? [ ] { } \ @ # ' + * ~ < > | , ; . : - _`

9.2.1.4 Settings in the Application Program

With help of system variables the following parameters can be set for the program execution:

- Cycle time
- Spontaneous program execution

9.2.1.4.1 Setting the Cycle Time

The cycle time determines the time interval for the execution of the application program. The shorter the set interval is the smaller must be the application program, otherwise a timeout happens. A cycle time of for instance 2 ms is only possible for a very small application program.

The cycle time can be specified in the IL with the variable `PLC_CYCLETIME`:

- In the program part `PLC_RESET`
  Time-scale is set one time with a startup.
- In the program part `PLC_START`
  Time-scale is set during running operation and can be changed by means of the application program.

Example:

```
PLC_RESET:
LD   20
ST   PLC_CYCLETIME             (*set cycle time 20 ms*)
```

If the cycle time is set to the value 0, no cyclic program execution takes place.

Under certain circumstances the cycle time can be changed independently by the system:

- If no cycle time is set, it is set to 100 ms (default)
- Extended due to timeout
- Retriggering due to spontaneous program execution

Affecting the Processing Time

The processing time is the duration of a complete program run. It is primarily determined by the size of the application program (number of operations).

Note

Consider that the processing time of the application program may be inconstant.

The processing time can be extended due to:

- Number of communication connections (to further automation units, control system)
- Number of used I/O Modules
- Conditional program calls
- Diagnosis and error handling
- Test- and commissioning functions such as status and simulation of inputs/outputs
- Saving the application program (download)
- Change of parameters online

The processing time of the application program is displayed on the user interface (online) under `PLC` | `Diagnosis`.

Timeout

The processing time must not be greater than the cycle time. If the maximum processing time successively exceeds 50% of the set cycle time five times, then the cycle time is increased by 50% independently by the system. Simultaneously an error information is set.

9.2.1.4.2 Spontaneous Program Execution

For faster reaction times, the application program can be executed spontaneous (event-controlled). This must be defined in the startup part of the IL (`PLC_RESET`).

Possible events are:

- Status change of a data point from the periphery
- Status change of a data point from the communication

The spontaneous program execution is enabled in the IL by setting the variable `PLC_SINGLE` to 1 (single run).

Example:

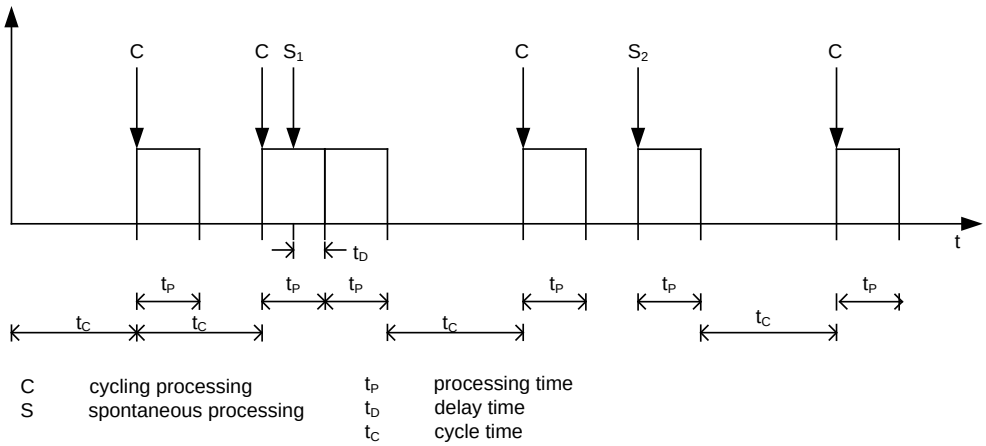
```
PLC_RESET:
LD   1
ST   PLC_SINGLE        (*set single run*)
```

With a spontaneous program execution the entire application program is processed one time. If an event occurs, the spontaneous program execution is first started after the current program execution has completed (the application program cannot interrupt itself). The reaction time can therefore be delayed accordingly.

If several events occur at the same time or one after the other just when the application program is running, then the states are temporarily stored in a ring and processed chronologically with the next spontaneous program execution. The same is also valid if a data point changes its state several times (transient storage).

Example:

Event occurs during a cyclic program execution (S1).
Event occurs during a pause (S2).



At the end of each spontaneous pass the cyclic pass is retriggered around the set cycle time. In this case no exceeding of the cycle time is signaled.

As long as the events occur in a time-scale that is smaller than the cycle time, only spontaneous program passes take place. If the cycle time is set to **0** and the spontaneous program execution to **1**, then only spontaneous program passes take place.

You find further details in the manual *SICAM RTUs Common Functions System and Basic System Elements, chapter "Automation", section "Restricted Open-/Closed-Loop Control Function", "Internal Signal Processing"*.

9.2.1.5 System Information

The following system variables (VAR_GLOBAL) can be read out and evaluated in the application program.

Variable name	Meaning	Format
PLC_CYCLETIME_OVERFLOW	Cycle time exceeded	BOOL
PLC_CYCLETIME	Cycle time	DINT
PLC_SINGLE	Single run	BOOL
PLC_PROCESSINGCOUNTER	Number of program runs	DINT
PLC_PROCESSINGTIME	Processing time	DINT
PLC_SYSTIME.MS	System time millisecond	DINT
PLC_SYSTIME.SEC	System time second	DINT
PLC_SYSTIME.MIN	System time minute	DINT
PLC_SYSTIME.IVT	System time IV bit	BOOL
PLC_SYSTIME.H	System time hour	DINT
PLC_SYSTIME.DST	System time daylight saving	BOOL
PLC_SYSTIME.DAY	System time day	DINT
PLC_SYSTIME.WEEKDAY	System time weekday	DINT
PLC_SYSTIME.MONTH	System time month	DINT
PLC_SYSTIME.YEAR	System time year	DINT
PLC_SYSTIME.TIME_DATE	System time complete (7 bytes)	TIME_DATE
PLC_SYSERROR_001	Sum error internal	BOOL
PLC_SYSERROR_002	Sum error external	BOOL
PLC_SYSERROR_003	Sum error communication	BOOL
PLC_SYSERROR_004	Sum error test	BOOL
PLC_SYSERROR_005	Sum error warning	BOOL
PLC_SYSERROR_006	Sum error board failure	BOOL
PLC_SYSERROR_007	Sum error failure	BOOL
PLC_SYSERROR_008	Sum error startup	BOOL
PLC_SYSERROR_009	M-CPU fault	BOOL
PLC_SYSERROR_010	Periphery fault	BOOL
PLC_SYSERROR_011	Protocol 0 fault	BOOL
PLC_SYSERROR_012	Protocol 1 fault	BOOL
PLC_SYSERROR_013	Protocol 2 fault	BOOL
PLC_SYSERROR_014	Protocol 0 communication fault	BOOL
PLC_SYSERROR_015	Protocol 1 communication fault	BOOL
PLC_SYSERROR_016	Protocol 2 communication fault	BOOL
PLC_SYSERROR_017	Periphery failure	BOOL
PLC_SYSERROR_018	Protocol 0 failure	BOOL
PLC_SYSERROR_019	Protocol 1 failure	BOOL
PLC_SYSERROR_020	Protocol 2 failure	BOOL
PLC_SYSERROR_021	Protocol 0 communication failure	BOOL
PLC_SYSERROR_022	Protocol 1 communication failure	BOOL
PLC_SYSERROR_023	Protocol 2 communication failure	BOOL
PLC_SYSERROR_024	Protocol 3 fault	BOOL
PLC_SYSERROR_025	Protocol 3 communication fault	BOOL
PLC_SYSERROR_026	Protocol 3 failure	BOOL

Variable name	Meaning	Format
PLC_SYSERROR_027	Protocol 3 communication failure	BOOL

Example:

```
PLC_START:
LD   PLC_SYSERROR_005          (*sum error warning if bit = "1"*)
ST   M_BOOL_ERROR005           (*store in a flag*)
```

You find the description of the system variables in the manual *SICAM RTUs Common Functions System and Basic System Elements, chapter "Automation", section "Restricted Open-/Closed-Loop Control Function", "Variables", "System Variables"*.

9.2.1.6 Command Processing According to IEC 60870-5-101/104

If a command (Activation, ACT) is generated by the controller and output on a I/O Master Module, then the messages for command acknowledgement (ACTCON) and command termination (ACTTERM) are generated with the corresponding output address of the control.

If the output address of the control is the same as the input address, then both messages are automatically transmitted again to the control.

If an ACT remains in the control (target = control, no periphery), then an ACTCON, ACTTERM that is to be possibly simulated can be generated in 1 cycle pass. For this the cause of transmission for the command must be set to 0 and the spontaneous bit to 1. Then one ACTCON and one ACTTERM respectively will be transmitted.

Example:

```
LD   0
ST   0_045_001_001_001.COT
LD   1
ST   0_045_001_001_001.S
```

If this function is not used, the ACTCON and ACTTERM can also be generated individually (for this at least 2 cycle passes are required).

Note

The corresponding typ identification can be generated by means of Verwendung of utilization of the command "with/without time" (for instance TI 45/TI 58).

Single Command and Double Command

Single commands (TI 45) can be generated by the IL only with the states
0 (OFF) only with COT = 7, 10 (CON, TERM) and S = 1
1 (ON)

Double commands (TI 46) can be generated by the IL only with the states
01 (OFF)
10 (ON)

Other states will not generate a command output.

You find the details for the processing of commands in the manual *SICAM RTUs Common Functions System and Basic System Elements, chapter "Automation", section "Treatment for Commands to the Open-/Closed-Loop Control Function according to IEC 60870-5-101/104"*.

9.2.1.7 Generation of Integrated Totals

There are two possibilities of integrated total generation in the control:

- Spontaneous transmission with change
  Automatically if the input address is **unequal** to the output address of the controller.
- Behavior according to parameter setting of the digital inputs (remote control)
  Automatically if the input address is **equal** to the output address of the controller.

9.2.2 Commissioning and Test

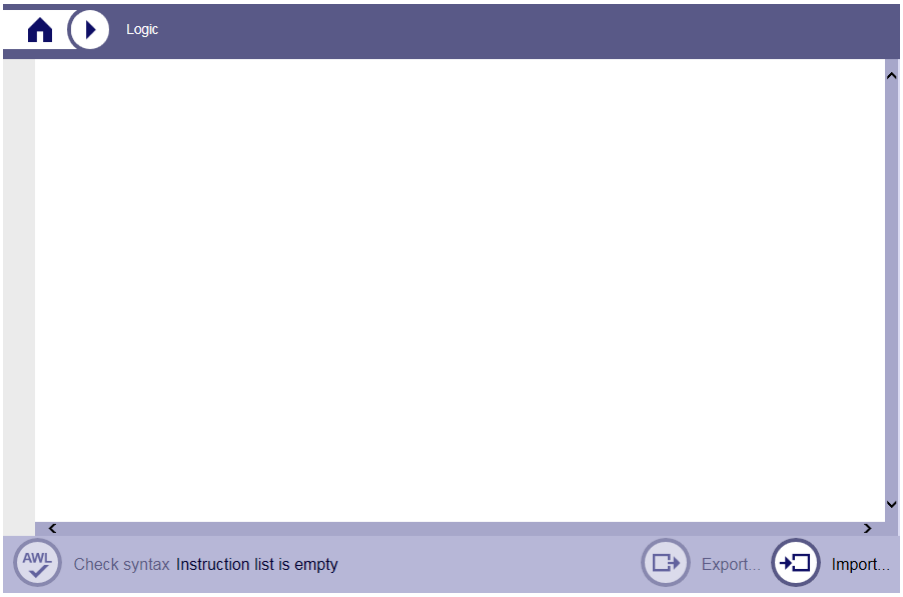
- Menu `Home | Logic`

For commissioning and test of the application program the following functions are available:

- General functions
  - Import application program
  - Export application program
  - Syntax check
- Test functions
  - Statistic information
  - Cold restart
  - Warm restart
  - Status of variables
  - Forcing signal inputs

9.2.2.1 Common Functions

When selecting the logic page, the instruction list (IL) which is currently loaded on the target device is displayed. If still no IL was loaded into the target device, the display in the logic page remains empty.

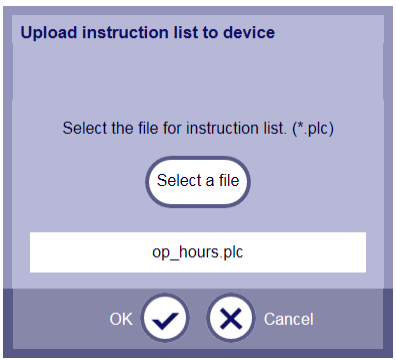


9.2.2.1.1 Import Application Program

For the execution of the *open-/closed-loop control function* the corresponding IL must be loaded on the target device.

This is how to upload an IL to the target device:

- Click on the button , if an IL is available in ASCII format



You have the possibility to abort the procedure.

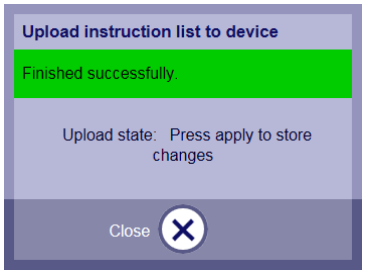
- Click Select a file to open the selection dialog
- Select the source directory and the source file (the file type must be *.plc*)
- Click on the button in order to start the import

The target device starts the loading procedure. The duration of the loading procedure depends on the program size and the used communication connection.

Note

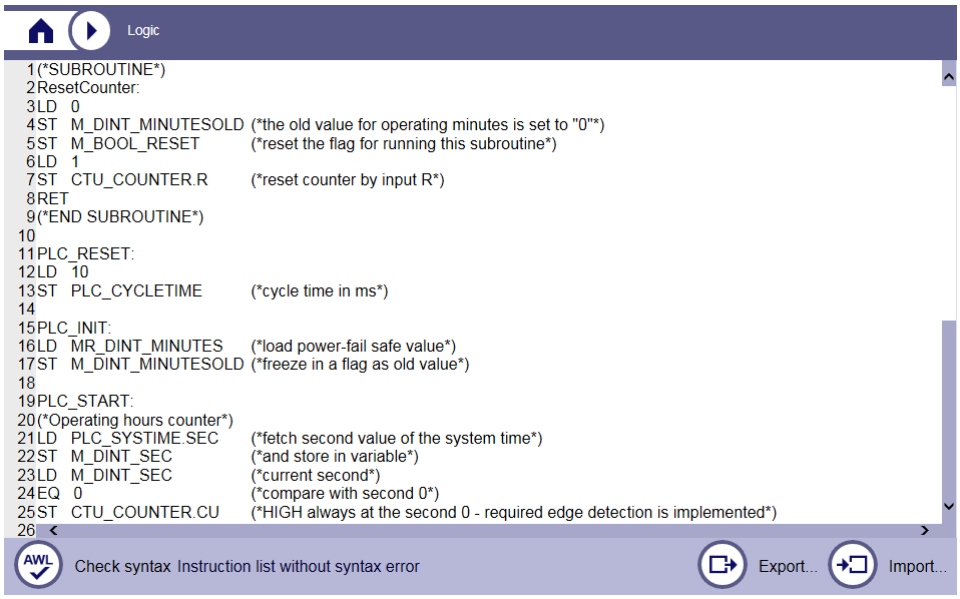
During the generation procedure the menu must not be left. The selection of another webpage may lead to the occurrence of undefined states.

The program file is checked upon validity. If the data is invalid, an error indication is displayed. If the data is valid, the following dialog appears:



- Click on the button

After successful upload, the content of the IL is displayed in the logic page and an automatic Syntax Check is performed.



The result of the syntax check is displayed in the bottom toolbar. In case of error you will find further details in the status log.

- Click on the general button , if you want to read the status log

In case of error, please consider the conventions described in section 9.2.1, Creating an Instruction List (IL).

This is how to activate an IL in the target device:

The changed data must be saved, otherwise the IL will be rejected when leaving the session.

- Click on the general button , if you want to save the IL

The application programm will be saved on the SD card. After the saving, a restart of the target device is required.

During startup the newly loaded program code is compiled,checked and written in the program memory. An already present program code is thereby overwritten.

- If no error is present, the program is processed after startup.
- If an error is present, the program is shut down and an error indication is recorded in the diagnosis and in the history.

Note

For the transmission via Ethernet, it is recommended to deactivate the settings for HTTP 1.1 of your PC (Control Panel, Internet Options, tab "Advanced"). Otherwise the possibility exists that CP-8000/CP-802*x* can not interprete the transmitted ASCII file.

9.2.2.1.2 Load Application Programm Offline

For instance, in course of an initialization of the target device (refer to Initialization of the Firmware) you can copy an instruction list saved as ASCII file from your PC directly on the SD card.

- Insert the SD card in a read/write device installed on the engineering PC
- Copy the program file in the root directory of the SD card
- Change the file name to case *plc_src.plc*
- After that, insert the SD card into the target device

The target device performs a startup and checks therteby the program code:

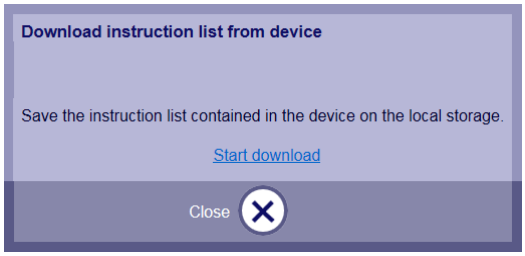
- If no error is present, the program code is compiled and written into the program memory. If present, the existing program code is thereby overwritten. After the startup, the new program code will be processed.
- If an error is present, an error indication with details is recorded in the history. If present, the existing program code is maintained and executed again after startup.

9.2.2.1.3 Export Application Program

For archiving purpose or for editing you can download the IL that is loaded in the target device.

This is how to download an IL from the target device:

- Click on the button , if you want to create a backup of the IL loaded in the target device



- Click with the right mouse button on Start download in order to open the dialog for saving
- Select the storage location and, if needed, change the file name; the file type *.plc* must be kept
- Click on the button in order to close the dialog

The storage procedure is dependent on the web browser and consequently may vary. Follow the instructions of your web browser.

The content of the displayed IL is written into the selected file. The target is a text file that contains the program code in ASCII format. The file can be read or changed with a text editor.

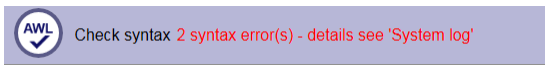
9.2.2.1.4 Syntax Check

Besides the automatic syntax check upon import of an IL, this function can be performed also manually at any time, for instance after termination and anew start of a session.

By clicking the button the instruction list can be checked upon errors, if needed. The following criteria are checked:

- Syntax, logic, addressirng
- Limits for program size, cycle time, memory

In case of error you find further information in the status log:



9.2.2.2 Test Functions

Diagnosis and test of the application program provide read functions that display information from the *open-/closed-loop control function* and write functions that influence the *open-/closed-loop control function*.

You get to the diagnosis and test of the application program via the menu `Home | Logic test` .

Read Functions

Available for the user names `administrator` and `guest` (can be used from `administrator` and more than one `guest` at the same time).

- Display statistic information of the application program
- Display current value of selected variables (signal status)

For both functions a cyclic polling from the target device in a grid of 1 s is performed.

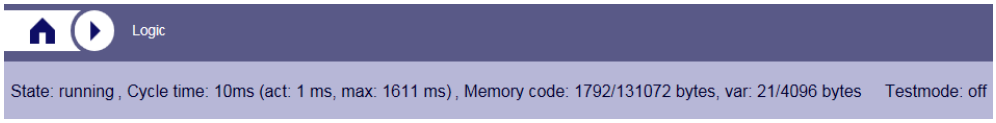
Write Functions

Only available for user name `administrator`. When logging on to the target device as `guest`, the control elements for the writing operations are not visible in the logic test page.

- Change status of the application program
  - Cold start
  - Warm start
  - Halt cyclic processing
  - Continue cyclic processing
  - Run 1 cycle
- Change value of selected variable (forcing signal)

9.2.2.2.1 Statistic Information

In the logic test page the program statistic information and the currently loaded IL are displayed. If no or an empty IL is loaded (no application program is running in the target device), the logic test page shows all the values set to **0** and the IL display is empty.

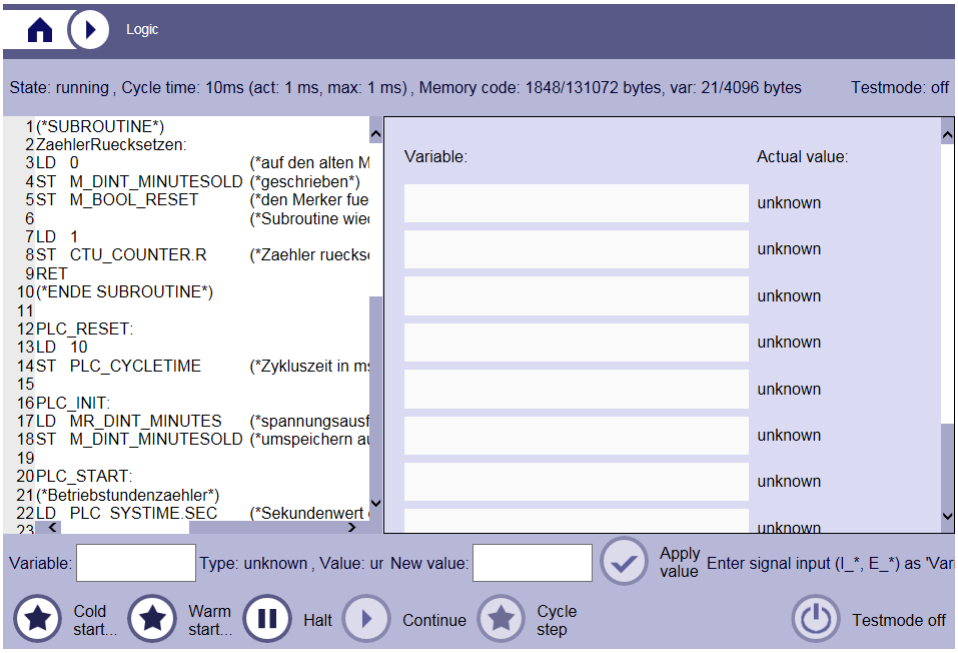


Display

Information	Meaning
State	Running Normal program execution
	Halt Program execution halted (the processing can be halted either manually or by the system due to an error)
Cycle time	*<Set value>* Increasement of the adjusted cycle time by the system possible (see section 9.2.1.4.1, Setting the Cycle Time)
	<Actual value> Processing time of the application program at the moment of the refreshment of the diagnosis menu
	<Maximal value> Maximum reached program processing time since the last startup
Memory code	*<Number>* / 131072 bytes Used program memory on the SD card of maximum number of bytes (application program size)
Var	*<Number>* / 4096 bytes Used variables of maximum number of bytes
Test mode	off / on

9.2.2.2.2 Display Current Value of Selected Variables

At the right side of the logic test page you can enter up to 10 variable names from the IL displayed at the left side of the page. You can also copy a variable name from the IL and paste it into an input field.

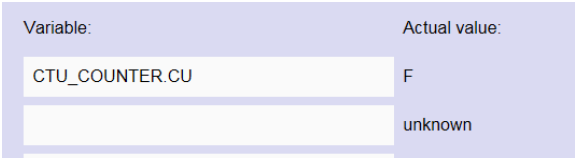


After entering a valid variable name into the input field, the current value of this variable is displayed right beside the input field.

The update is performed in a grid of 1 s.

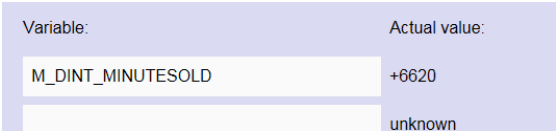
Example: Binary value

If you select a binary variable, T is displayed for TRUE and F for FALSE:



Example: Analog value

If you select a numeric variable, the number is displayed as follows:



Example: Various variables

The value display happens for each selected variable in the designated data format.

Variable:	Actual value:
M_DINT_MINUTESOLD	+6620
MR_DINT_MINUTES	+6636
M_DINT_SEC	+0
CTU_COUNTER.CU	T
M_DINT_HOURS	+110

Example: Invalid variable

With invalid variables, like with empty fields, the value unknown is displayed:

Variable:	Actual value:
M_DINT_MINUTES	unknown
	unknown

Valid are only those variables that are used in the current running IL.

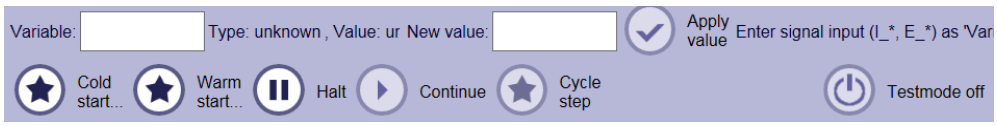
9.2.2.2.3 Change Status of the Application Program

For each possible action, an according button is placed in the logic test page. After each action, the current status of the application program is requested from the target device, and the buttons are enabled or disabled accordingly.

In normal mode of the application program, the state is displayed as follows:

State: running , Cycle time: 10ms (act: 1 ms, max: 1 ms) , Memory code: 1848/131072 bytes, var: 21/4096 bytes Testmode: off

The control buttons are enabled/blocked as follows:



With execution of one of the functions, the test mode is switched on:

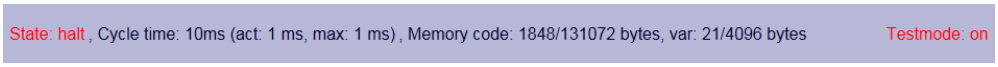
- Halt of the application program (immediately)
- Cold start of the application program (per request)
- Warm start of the application program (per request)

Halt program

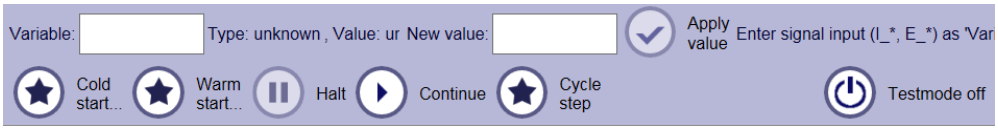
Precondition: The application program is running in normal mode.

When clicking on the button , the cyclic processing of the application program is halted and the test mode is automatically switched on.

This is displayed as follows:



The buttons are enabled/blocked as follows:



Run Single Program Cycle

Precondition: The application program is halted.

When clicking the button (Cycle step), the application program executes only one single cycle and is halted again.

The status display of the application program and the buttons do not change.

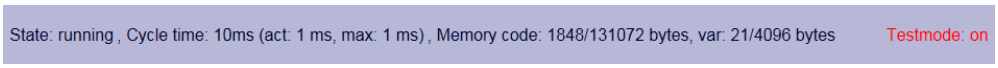
With this function you can trace for instance the status change of variables for each program cycle, or change the value of a signal input for exactly 1 program cycle.

Continue Program Processing

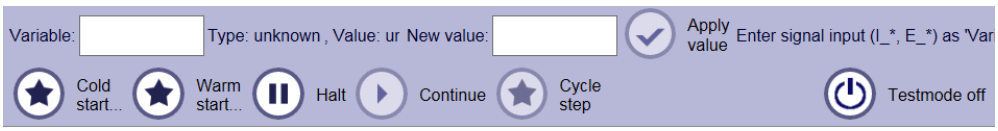
Precondition: The application program is halted.

When clicking the button , the application program is processed cyclically again and the test mode remains switched on.

This status changes as follows:



The buttons are enabled/blocked as follows:

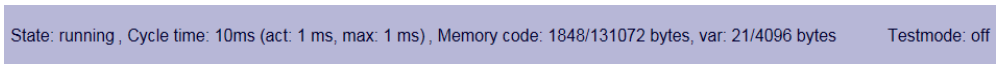


Switch off Test Mode

Precondition: The application program is in the test mode.

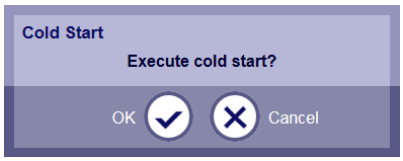
If you click on the button , the test mode will be terminated.

The status changes as follows:



Cold Start

When pressing the button (Cold start), the following dialog is opened:



You have the possibility to abort the procedure.

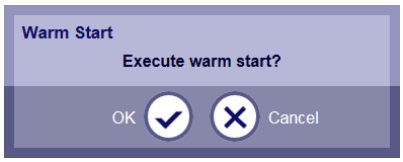
- Click on the button in order to perform a cold start

The test mode is switched on and the values of all variables are initialized with 0 and the application program is restarted. The program parts `PLC_RESET` and `PLC_INIT` are processed once and if the program has been previously

- in the State: running, the program part `PLC_START` is processed cyclically again
- in the State: halt, the program processing is halted

Warm Start

When pressing the button (Warm start), the following dialog is opened:



You have the possibility to abort the procedure.

- Click on the button in order to perform a warm restart

The test mode is switched on and the values of the volatile variables are initialized with 0 and the application program is restarted. The program parts `PLC_RESET` and `PLC_INIT` are processed once and if the program has been previously

- in the State: running, the program part `PLC_START` is processed cyclically again
- in the State: halt, the program processing is halted

9.2.2.2.4 Change Value of Selected Variable

The changing of values is only possible for signal inputs. Signal outputs and local variables are overwritten by the application program every cycle, therefore a permanent forcing for those values is not provided.

It is not possible to force more than one signal input at the same time. If you want to change more than one signal input, this can only be done one after another.

When forcing a signal input, the according signal is automatically separated from the input process image and therefore this signal is not overwritten each cycle. Additionally the application program is switched to the test mode automatically.

The test mode is maintained even if you switch to other pages within the session with the target device. If the communication with SICAM WEB is disconnected, the test mode is automatically terminated by the target device after 30 seconds.

You can terminate the test mode manually by pressing the button :

- All values for the signal inputs are taken from the process image again
- The manually changed values during test mode are then overwritten by the respective process value again

Warning

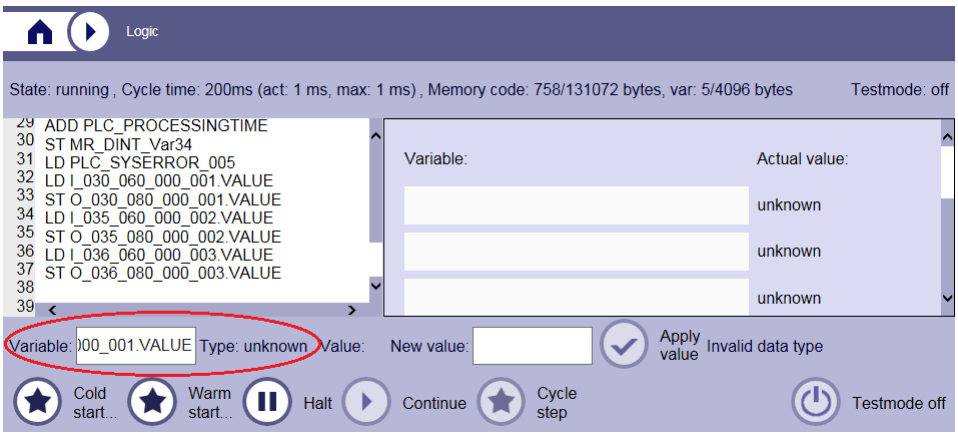
The value change of a signal input can – dependent on the programmed logic – have an impact on the status of signal outputs.

The change of state of signal outputs with the plant running can lead to damage to persons and machines. Ensure that aggregates in the control area of the command output as well as those subsequent aggregates in the process chain are protected and that persons in the vicinity are warned.

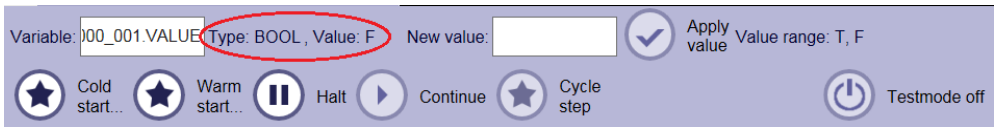
This is how to overwrite the value of a variable:

Below the IL you can enter a variable name from the IL into the input field VARIABLE. You can also copy a variable name from the IL and paste it into an input field.

If the variable name is invalid or empty, the type is displayed as `unknown` and the button is disabled.



If the variable name is valid, the type and the actual value of the variable is displayed:

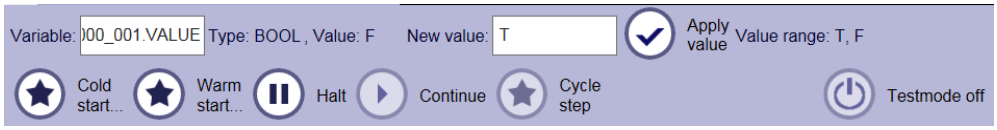


You can now enter a value into the field NEW VALUE. The permitted value range is displayed right beside the button .

<u>Example: Binary value</u>

If you select a signal input with data type BOOL, the value range T, F is displayed.

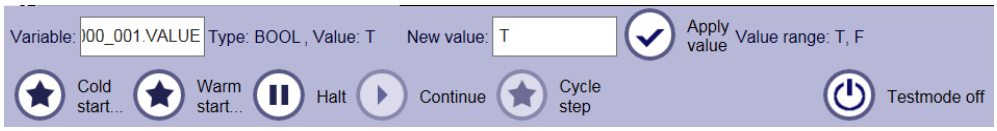
When you enter a valid value, for instance T, the button is enabled.



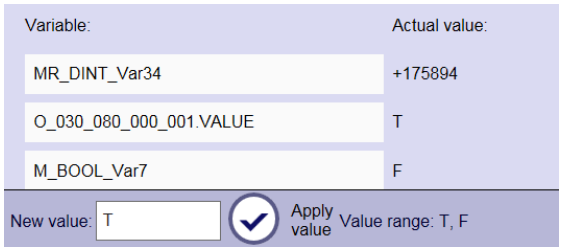
- Click on the button

The new value is written on the signal in the IL and is displayed right beside the variable type.

The test mode is automatically switched on and the button is enabled.



You also can regard simultaneously the status of up to 10 variables from the IL.

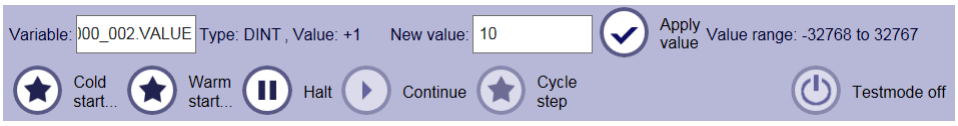


If you click on the button , the test mode is terminated.

Example: Analog value

When selecting a signal with datatype DINT, the value range `-32768 to 32767` is displayed.

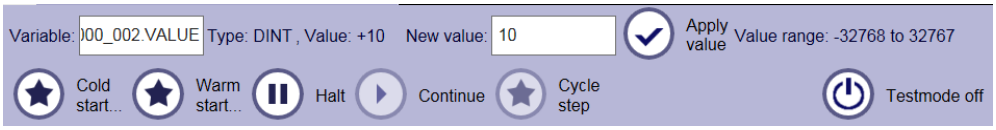
If you enter a valid value, for instance 10, the button is activated.



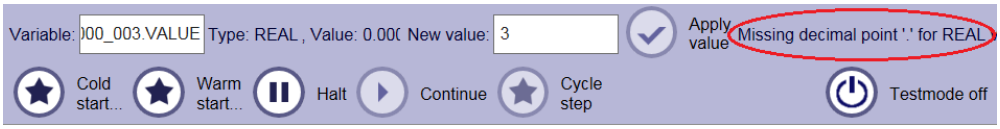
- Click on the button

The new value is written on the signal in the IL and is displayed right beside the variable type.

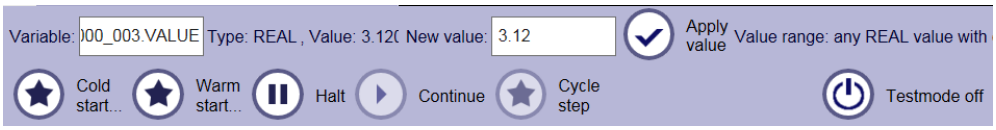
The test mode is automatically switched on and the button is enabled.



When entering a signal with data type REAL, you must enter the new value with a decimal point, otherwise a corresponding notice is displayed. The display looks then as follows:



When entering the new value correctly and pressing the button , the new value is written on the signal and is displayed right beside the data type:



If you click on the button , the test mode will be terminated.

9.3 Administrative Functions

For the performance of the following functions you get via the button :

- Restart device
- Backup device settings
- Restore device settings
- Upload ICD, IID file
- Download SICAM PAS IO configuration
- Download process data archive
- Update firmware
- Update SICAM WEB
- Install language package

Note

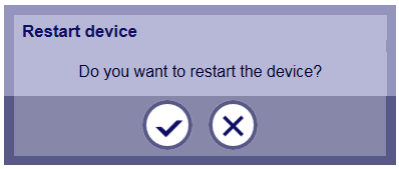
These functions are only allowed for the user type `administrator` (except download).

9.3.1 Restart Device

This function allows you to restart the target device at any arbitrary moment (for instance after change of several parameters that require a restart).

Select thereto the submenu `Restart device` .

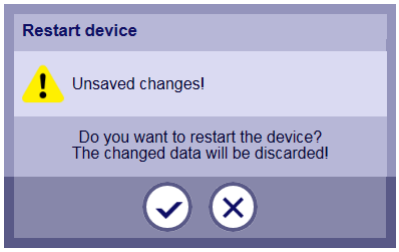
The following dialog will appear:



You have the possibility to abort the procedure.

- Confirm the procedure with

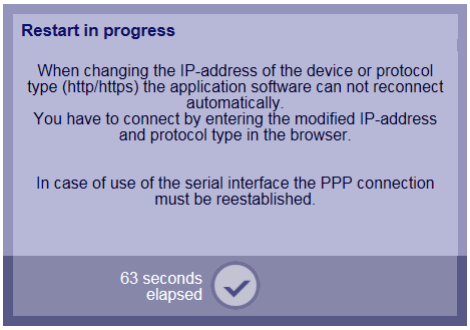
If settings still have not been saved, the following dialog will appear:



You have the possibility to abort the procedure in order to save the changes.

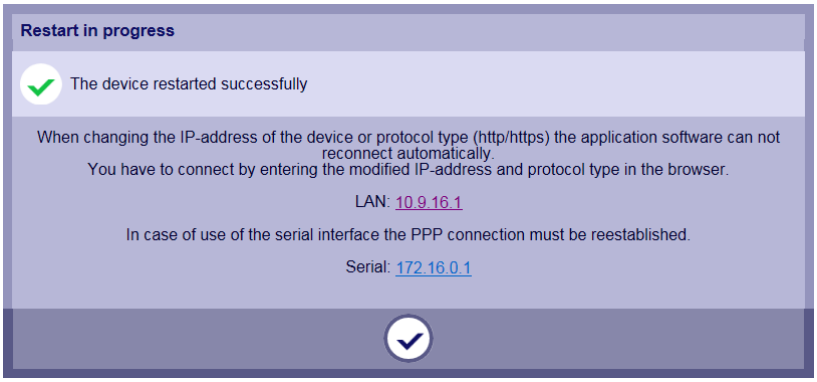
- If you want to perform the restart, click on the button
  → unsaved changes will be rejected thereby!

The following information will appear during a restart:



At the bottom of the dialog the current startup time is displayed. Depending on the size of the engineering data, the startup time can take up to 15 minutes.

A successful restart of the device is shown by the following dialog:



- Click in order to quit the session with the target device
- Click the suitable hyperlink in order to return to the Logon page of the previously started target device
- If in the target device the parameter `Autoconfiguration` was set to **YES**, the IP address is set to 169.254.0.1; that remains until it is assigned anew by the set DHCP server (see 9.1.2.7, Autoconfiguration)

Caution

A startup concernes also the automation function (if used). You find further information in section 9.2.2, Commissioning and Test.

Note

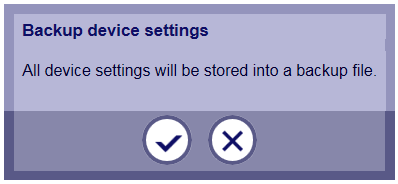
With the initial commissioning, the startup may last up to 15 minutes, since at this the files on the SD card will be unpacked and the system folders on the SD card are created.

9.3.2 Download Device Settings

This function enables to save the entire engineering data of the target device as a backup on the engineering PC. The backup contains firmware codes and engineering data (parameters and – if present - instruction list).

Select thereto the submenu `Backup device settings`.

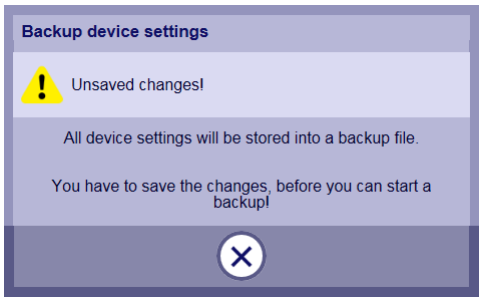
The following dialog will appear:



You have the possibility to abort the procedure.

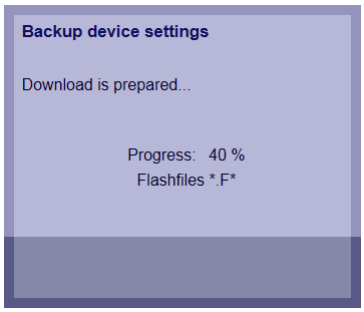
- Confirm the procedure with

If settings still have not been saved, the following dialog will appear:



You have to abort the procedure and save the changes.

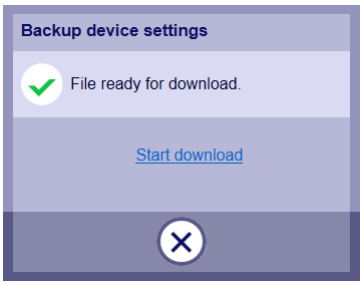
If the settings have been saved, the target device starts with the generation of the backup file. The progress is thereby displayed by the web server. This procedure can take a few minutes.



Note

During generation procedures the website must not be left. The selection of another website may lead to the occurrence of undefined states.

When the generation of the backup file has finished, the following dialog appears:



- Click on Start download

The storing procedure may vary dependent on the used web browser and may take some time, depending on the file size and transmission rate. Follow the instructions of your web browser. The file name is put together of SICAM_A8000_BACKUP_*<customer>*_*<plant>*_*<station>*_*<hash value of file>*.*cmc*.

- After successful generation click on ⊗ in order to close the dialog

Note

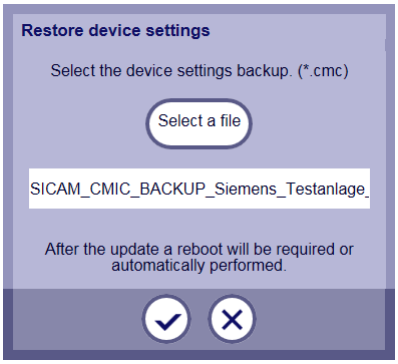
The file saved via SICAM WEB can not be imported into the SICAM TOOLBOX II.

9.3.3 Restore Device Settings

This function gives you the possibility of restoring and loading all previously backed up settings and parameterizations into the device.

With this procedure, all telecontrol parameters, instruction list and firmware codes are stored jointly on the SD card in the Master Module.

Select thereto the submenu `Restore device settings`.



You have the possibility to abort the procedure.

- Click Select a file in order to open the selection dialog
- Select the source directory and the source file (file type must be *cmc*, file name including path name must not exceed 128 characters)
- Click on the button

The target device starts the loading procedure. The duration of the loading procedure depends on the file size and the used communication connection.

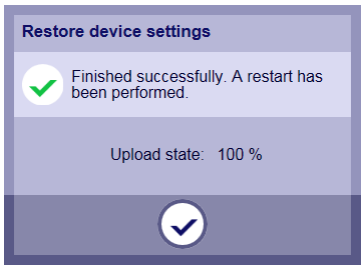
Note

During loading procedures the website must not be left. The selection of another website may lead to the occurrence of undefined states.

Subsequently the file is checked upon integrity. Thereto, a cryptologic hash function is calculated over the file and the result is compared with the hash value in the filename:

- If the file is valid, the data is written on the SD card of the target device and all settings in the target device are adapted
- With different results, the file is deleted and no changes are carried out; an error information is displayed

After successful upload the target device will be restarted:



- Click on the button in order to close the dialog

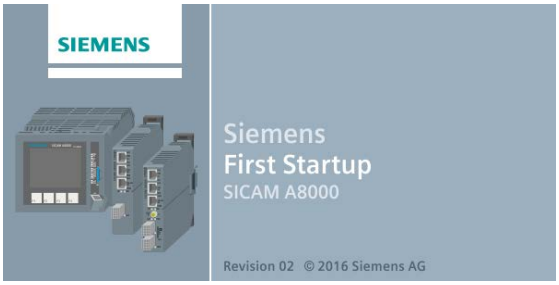
9.3.3.1 Loading Device Settings Offline

For the duplication of an already existing parameterization, you can write the data also without target device (offline) on a SD card with the program *Sicam_first_startup*.

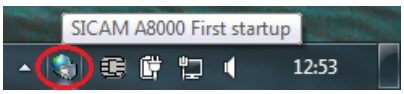
Thereto a backup file created with the function `Save device settings` via SICAM WEB must exist (file type *.cmc*). Further you need a read/write device for SD cards connected on the engineering PC, a corresponding driver installed on the PC (if needed), as well as a suitable SD card.

- Insert the SD card into the read/write device
- Start the program *Sicam_first_startup* per double click

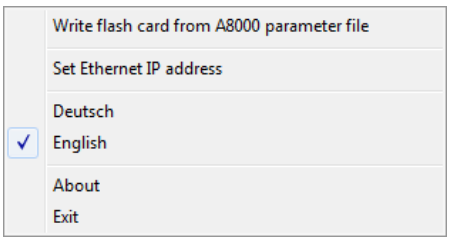
The *Sicam_first_startup* splash screen is opened, and the *Sicam_first_startup* symbol appears in the notification area of the taskbar:



- Click on the splash screen in order to close it
- Click then with the right mouse button on the *Sicam_first_startup* symbol

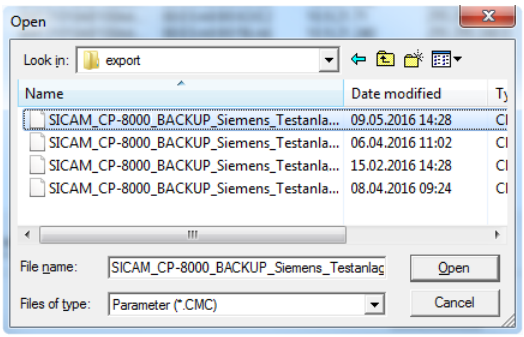


The context menu of *Sicam_first_startup* is opened:



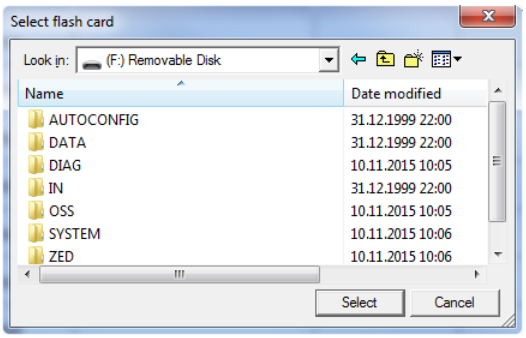
- Change the language if needed and open the context menu again
- After that click on `Write flash card from A8000 parameter file`

The file selection dialog for the source is opened:



- Select now the source directory and the source file of the type *.*cmc* and accept

The file selection dialog for the target is opened:



- Select the target drive (read/write device) and accept

Sicam_first_startup generates the files with the format needed for the web server from the parameter file and stores them on the SD card. The generation terminates with a notification.

The write procedure takes a few seconds (watch the Active-LED on the read/write device, as far as present). When the write procedure is completed, you can insert the SD card into the target device, whereupon a startup is performed.

After the startup you can logon to the target device via SICAM WEB, for instance to adapt the parameterization or to carry out test functions.

Note

With operation in a network first a valid IP address must be assigned by means of the program *Sicam_first_startup*.

9.3.4 Upload ICD/IID File

For the configuration of electrical substation devices IEC 61850 specifies the “substation configuration description language” (SCL) as representation format. Depending on the purpose of the SCL file, it is classified into various file types.

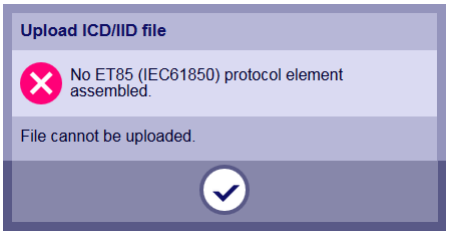
CP-8000/CP-802x devices support the file types ICD and IID. The corresponding files can be uploaded only to IEC 61850 protocol elements.

Note

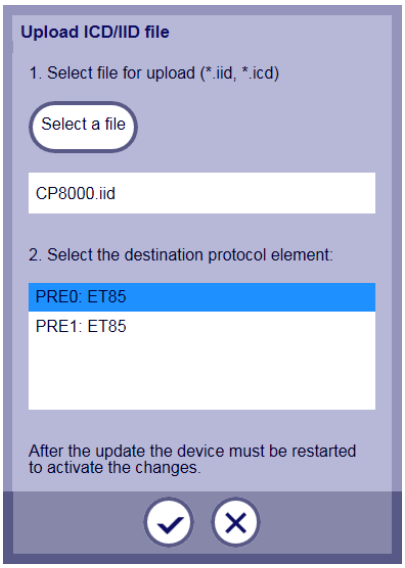
The function is supported as of the following firmware revision level: CPC80 V.12, ET85 V.04.

Select thereto the submenu Upload ICD/IID file .

If the IEC 61850 protocol element is not equipped or if the firmware revision (Master Module, protocol element) does not support ICD/IID file upload, an error information is displayed:



- Close the dialog with and check the configuration under Hardware & Protocols.



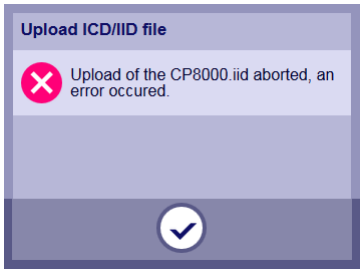
You have the possibility to abort the procedure.

- Click Select a file in order to open the selection dialog
- Select the source file (the file type must be *.*icd* or *.*iid*)
- Select the target protocol element
- Click on the button

The target device starts the loading procedure. The duration of the loading procedure depends on the file size and the used communication connection.

Subsequently the file is checked upon validity.

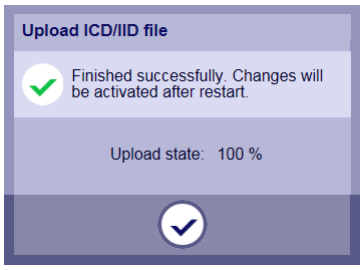
If the data is not valid or if the file size exceeds 10 MB, an error information is displayed.



- Close the dialog with

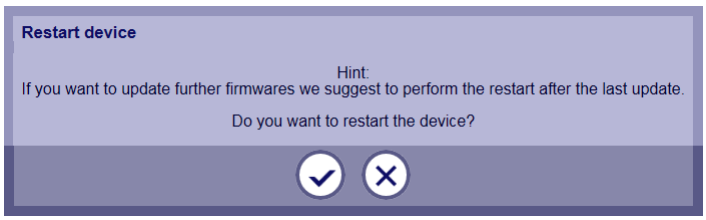
If the data is valid, it is written on the SD card of the target device.

After successful upload the following dialog appears:



- Confirm the procedure with

Subsequently the following dialog appears:



You have the possibility to abort the restart of the device and to update further firmware.

- Click on the button in order to restart the device

Note

During loading procedures the website must not be left. The selection of another website may lead to the occurrence of undefined states.

With startup the uploaded file will be stored on the SD card under *\ETx5\5_<BSE>_<ZSE>.icd*.

9.3.5 Download SICAM PAS I/O Configuration

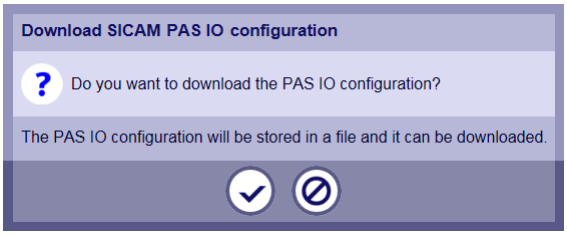
For the usage of CP-8000/CP-802*x* as SICAM PAS I/O the configuration of the data points can be synchronized with a superior device SICAM PAS.

The configuration of the data points can be downloaded as XML file and be stored on the engineering PC. This file can be imported subsequently into SICAM PAS.

The file contains system-technical information from the Master Module and from the IEC 60870-5-104 protocol element, as well as the signals processed via I/O Modules and via the application program.

Select thereto the submenu `Download SICAM PAS IO configuration` .

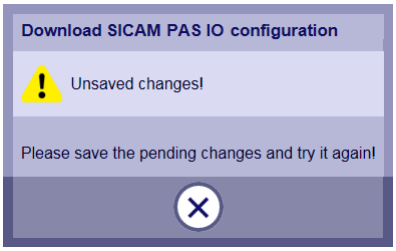
The following dialog will appear:



You have the possibility to abort the procedure.

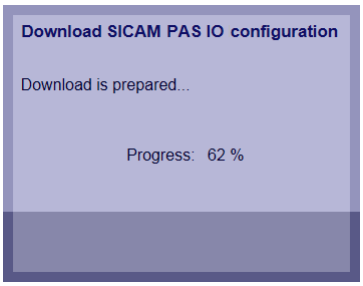
- Confirm the procedure with

If settings still have not been saved, the following dialog will appear:



You have to abort the procedure and save the changes.

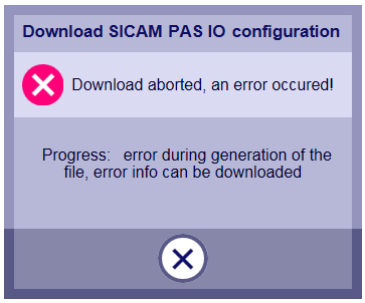
If the settings have been saved, the target device starts with the generation of the configuration file. The progress is thereby displayed by the web server. This procedure can take a few minutes.



Note

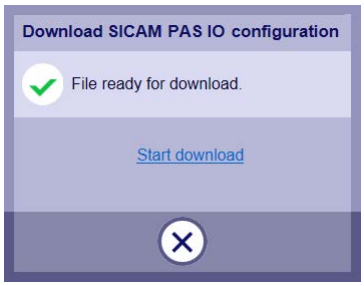
During generation procedures the website must not be left. The selection of another website may lead to the occurrence of undefined states.

With the generation of the configuration file the parameters used for SICAM PAS I\O are checked. With faulty parameterization the following dialog appears:



You have to abort the procedure and correct the parameters, refer to Parameter check.

When the generation of the configuration file has finished, the following dialog appears:



- Click on Start download

The storing procedure may vary dependent on the used web browser and may take some time, depending on the file size and transmission rate. Follow the instructions of your web browser. The file name is put together of PASIO_CFG*<date>*_*<time>*.*xml*.

- After successful generation click on in order to close the dialog

Example for a configuration


```
  <?xml version="1.0" encoding="UTF-8" ?>
- <SUBSTATION>
  - <RTU RTU_NAME="Testanlage">
    - <NETWORK_CONNECTION IP_ADDRESS="168366318" MAX_NUM_UNRECEIPTED_RECEIVED_TELEGRAMS="8"
        MAX_NUM_UNRECEIPTED_SEND_TELEGRAMS="12" TIMEOUT_T0="5" TIMEOUT_T1="15" TIMEOUT_T2="10" TIMEOUT_T3="20">
        <LRU_LINK LRU_NAME="Station 2" />
      </NETWORK_CONNECTION>
    - <LRU_TM1703mic ABSOLUTE_TIME_STAMP="YES" ASDU_ADDRESS="00257" ASDU_ADDRESS_LENGTH="2" INFO_OBJ_ADR_LENGTH="3"
        LRU_NAME="Station 2" SEND_CMD_END_TERMINATION="YES" SINGLE_CMD_SEL_BEFORE_EXE="DIRECT"
        DOUBLE_CMD_SEL_BEFORE_EXE="DIRECT" TAP_CMD_SEL_BEFORE_EXE="DIRECT" SETPOINT_NORMALIZED_SEL_BEFORE_EXE="DIRECT"
        SETPOINT_SCALED_SEL_BEFORE_EXE="DIRECT" SETPOINT_FLOAT_SEL_BEFORE_EXE="DIRECT" TEL_WITH_ORIGINATOR="YES">
        <DIGITAL_VALUE DIGITAL_VALUE_TYPE="SINGLE" HIERARCHICAL_NAME="SI_0" TELEGRAM_ADDRESS="65793" />
        <DIGITAL_VALUE DIGITAL_VALUE_TYPE="SINGLE" HIERARCHICAL_NAME="SI_1" TELEGRAM_ADDRESS="65794" />
        <DIGITAL_VALUE DIGITAL_VALUE_TYPE="SINGLE" HIERARCHICAL_NAME="SI_0" TELEGRAM_ADDRESS="65793" />
        <DIGITAL_VALUE DIGITAL_VALUE_TYPE="SINGLE" HIERARCHICAL_NAME="SI_1" TELEGRAM_ADDRESS="65794" />
        <DIGITAL_VALUE DIGITAL_VALUE_TYPE="SINGLE" HIERARCHICAL_NAME="DEAR_0" TELEGRAM_ADDRESS="131329" />
        <DIGITAL_VALUE DIGITAL_VALUE_TYPE="SINGLE" HIERARCHICAL_NAME="DEAR_1" TELEGRAM_ADDRESS="131330" />
        <DIGITAL_VALUE DIGITAL_VALUE_TYPE="DOUBLE" HIERARCHICAL_NAME="DI_0" TELEGRAM_ADDRESS="65798" />
        <COUNTER_VALUE HIERARCHICAL_NAME="CV_0" TELEGRAM_ADDRESS="65800" />
        <COUNTER_VALUE HIERARCHICAL_NAME="CV_1" TELEGRAM_ADDRESS="65805" />
        <COUNTER_VALUE HIERARCHICAL_NAME="CV_2" TELEGRAM_ADDRESS="65806" />
        <DIGITAL_CONTROL DIGITAL_CONTROL_TYPE="DOUBLE" HIERARCHICAL_NAME="DC_0" OUTPUT_TIME0="500" OUTPUT_TIME1="5000"
          OUTPUT_TIME2="10000" TELEGRAM_ADDRESS="65799" />
        <DIGITAL_CONTROL DIGITAL_CONTROL_TYPE="SINGLE" HIERARCHICAL_NAME="SC_0" OUTPUT_TIME0="800" OUTPUT_TIME1="5000"
          OUTPUT_TIME2="10000" TELEGRAM_ADDRESS="65795" />
        <DIGITAL_CONTROL DIGITAL_CONTROL_TYPE="SINGLE" HIERARCHICAL_NAME="SC_1" OUTPUT_TIME0="800" OUTPUT_TIME1="5000"
          OUTPUT_TIME2="10000" TELEGRAM_ADDRESS="65796" />
        <ANALOG_VALUE ANALOG_VALUE_TYPE="FLOAT" HIERARCHICAL_NAME="MV_0" TELEGRAM_ADDRESS="65797" />
        <ANALOG_VALUE ANALOG_VALUE_TYPE="NORMALIZED" HIERARCHICAL_NAME="MV_1" TELEGRAM_ADDRESS="65804" />
        <DIGITAL_VALUE DIGITAL_VALUE_TYPE="SINGLE" HIERARCHICAL_NAME="001_015" TELEGRAM_ADDRESS="1324923" />
        <DIGITAL_VALUE DIGITAL_VALUE_TYPE="DOUBLE" HIERARCHICAL_NAME="CASDU_257_IOA_3475988" TELEGRAM_ADDRESS="3475988" />
        <DIGITAL_VALUE DIGITAL_VALUE_TYPE="DOUBLE" HIERARCHICAL_NAME="CASDU_257_IOA_983316" TELEGRAM_ADDRESS="983316" />
        <DIGITAL_VALUE DIGITAL_VALUE_TYPE="SINGLE" HIERARCHICAL_NAME="CASDU_257_IOA_65586" TELEGRAM_ADDRESS="65586" />
        <DIGITAL_VALUE DIGITAL_VALUE_TYPE="SINGLE" HIERARCHICAL_NAME="CASDU_257_IOA_65596" TELEGRAM_ADDRESS="65596" />
        <DIGITAL_VALUE DIGITAL_VALUE_TYPE="SINGLE" HIERARCHICAL_NAME="CASDU_257_IOA_65616" TELEGRAM_ADDRESS="65616" />
        <ANALOG_VALUE ANALOG_VALUE_TYPE="SCALED" HIERARCHICAL_NAME="CASDU_257_IOA_131132" TELEGRAM_ADDRESS="131132" />
        <ANALOG_VALUE ANALOG_VALUE_TYPE="SCALED" HIERARCHICAL_NAME="CASDU_257_IOA_131152" TELEGRAM_ADDRESS="131152" />
        <ANALOG_VALUE ANALOG_VALUE_TYPE="FLOAT" HIERARCHICAL_NAME="CASDU_257_IOA_196668" TELEGRAM_ADDRESS="196668" />
        <ANALOG_VALUE ANALOG_VALUE_TYPE="FLOAT" HIERARCHICAL_NAME="CASDU_257_IOA_196688" TELEGRAM_ADDRESS="196688" />
        <DIGITAL_VALUE DIGITAL_VALUE_TYPE="SINGLE" HIERARCHICAL_NAME="CASDU_257_IOA_65793" TELEGRAM_ADDRESS="65793" />
        <DIGITAL_CONTROL DIGITAL_CONTROL_TYPE="SINGLE" HIERARCHICAL_NAME="CASDU_257_IOA_65795" OUTPUT_TIME0="0"
          OUTPUT_TIME1="5000" OUTPUT_TIME2="10000" TELEGRAM_ADDRESS="65795" />
        <DIGITAL_VALUE DIGITAL_VALUE_TYPE="SINGLE" HIERARCHICAL_NAME="CASDU_257_IOA_65794" TELEGRAM_ADDRESS="65794" />
        <DIGITAL_CONTROL DIGITAL_CONTROL_TYPE="SINGLE" HIERARCHICAL_NAME="CASDU_257_IOA_65796" OUTPUT_TIME0="0"
          OUTPUT_TIME1="5000" OUTPUT_TIME2="10000" TELEGRAM_ADDRESS="65796" />
        <DIGITAL_VALUE DIGITAL_VALUE_TYPE="DOUBLE" HIERARCHICAL_NAME="CASDU_257_IOA_65798" TELEGRAM_ADDRESS="65798" />
        <DIGITAL_CONTROL DIGITAL_CONTROL_TYPE="DOUBLE" HIERARCHICAL_NAME="CASDU_257_IOA_65799" OUTPUT_TIME0="0"
          OUTPUT_TIME1="5000" OUTPUT_TIME2="10000" TELEGRAM_ADDRESS="65799" />
        <DIGITAL_VALUE DIGITAL_VALUE_TYPE="SINGLE" HIERARCHICAL_NAME="CASDU_257_IOA_65793" TELEGRAM_ADDRESS="65793" />
        <DIGITAL_VALUE DIGITAL_VALUE_TYPE="SINGLE" HIERARCHICAL_NAME="CASDU_257_IOA_65794" TELEGRAM_ADDRESS="65794" />
      </LRU_TM1703mic >
    </RTU>
  </SUBSTATION>
```


Parameter check

During the generation of the XML file the configured data points and assigned IL elements are checked.

The XML file can be downloaded, if the following conventions are fulfilled:

- CASDU1 and CASDU2 of signals are corresponding to the setting on Master Module
- Signals assigned to the hardware pins of a DO with TI 45…TI 50
  - must use “Select before execute” in the same way
- Signals assigned to the hardware pins of an AO with TI 48…TI 50
  - must use “Termination” in the same way
- Signals from the application program with TI 45…TI 50 are treated as directly executed
  - if any signal is imported from the application program, all other signals from any source with the same type identifier have to be configured as directly executed
- Signals from the application program with TI 48…TI 50 are treated as terminated
  - if any command signal is imported from the application program, all other signals from any source with the same type identifier have to be configured as terminated

In case of error, the error indication is written into the XML file. This is stored on the SD card in the directory *\System\Downloads*.

In order to read the XML file you must remove the SD card from the target device and put it into a card reader installed on your engineering PC.

Note

When replugging the SD card into the target device, a startup will be performed.

Example for a configuration (with error)


```
<?xml version="1.0" encoding="UTF-8"?>
- <SUBSTATION>
  - <RTU RTU_NAME="Testanlage">
    - <NETWORK_CONNECTION TIMEOUT_T3="20" TIMEOUT_T2="10" TIMEOUT_T1="15" TIMEOUT_T0="5"
      MAX_NUM_UNRECEIPTED_SEND_TELEGRAMS="12" MAX_NUM_UNRECEIPTED_RECEIVED_TELEGRAMS="8" IP_ADDRESS="168366318">
        <LRU_LINK LRU_NAME="Station 2"/>
      </NETWORK_CONNECTION>
    - <LRU_TM1703mic LRU_NAME="Station 2" TEL_WITH_ORIGINATOR="YES" SETPOINT_FLOAT_SEL_BEFORE_EXE="DIRECT"
      SETPOINT_SCALED_SEL_BEFORE_EXE="DIRECT" SETPOINT_NORMALIZED_SEL_BEFORE_EXE="DIRECT" TAP_CMD_SEL_BEFORE_EXE="DIRECT"
      DOUBLE_CMD_SEL_BEFORE_EXE="DIRECT" SINGLE_CMD_SEL_BEFORE_EXE="DIRECT" SEND_CMD_END_TERMINATION="YES"
      INFO_OBJ_ADR_LENGTH="3" ASDU_ADDRESS_LENGTH="2" ASDU_ADDRESS="00257" ABSOLUTE_TIME_STAMP="YES">
        --->>> ERROR: Cannot read properties from IO-modules --->>> ERROR: Cannot read properties from IO-modules --->>> ERROR:
        Cannot read properties from IO-modules --->>> ERROR: Cannot read properties from IO-modules --->>> ERROR: Cannot read
        properties from IO-modules --->>> ERROR: Cannot read properties from IO-modules --->>> ERROR: Cannot read properties from
        IO-modules --->>> ERROR: Cannot read properties from IO-modules
        <DIGITAL_VALUE TELEGRAM_ADDRESS="1324923" HIERARCHICAL_NAME="001_015" DIGITAL_VALUE_TYPE="SINGLE"/>
        <DIGITAL_VALUE TELEGRAM_ADDRESS="3475988" HIERARCHICAL_NAME="CASDU_257_IOA_3475988"
            DIGITAL_VALUE_TYPE="DOUBLE"/>
        <DIGITAL_VALUE TELEGRAM_ADDRESS="983316" HIERARCHICAL_NAME="CASDU_257_IOA_983316" DIGITAL_VALUE_TYPE="DOUBLE"/>
        <DIGITAL_VALUE TELEGRAM_ADDRESS="65586" HIERARCHICAL_NAME="CASDU_257_IOA_65586" DIGITAL_VALUE_TYPE="SINGLE"/>
        <DIGITAL_VALUE TELEGRAM_ADDRESS="65596" HIERARCHICAL_NAME="CASDU_257_IOA_65596" DIGITAL_VALUE_TYPE="SINGLE"/>
        <DIGITAL_VALUE TELEGRAM_ADDRESS="65616" HIERARCHICAL_NAME="CASDU_257_IOA_65616" DIGITAL_VALUE_TYPE="SINGLE"/>
        <ANALOG_VALUE TELEGRAM_ADDRESS="131132" HIERARCHICAL_NAME="CASDU_257_IOA_131132" ANALOG_VALUE_TYPE="SCALED"/>
        <ANALOG_VALUE TELEGRAM_ADDRESS="131152" HIERARCHICAL_NAME="CASDU_257_IOA_131152" ANALOG_VALUE_TYPE="SCALED"/>
        <ANALOG_VALUE TELEGRAM_ADDRESS="196668" HIERARCHICAL_NAME="CASDU_257_IOA_196668" ANALOG_VALUE_TYPE="FLOAT"/>
        <ANALOG_VALUE TELEGRAM_ADDRESS="196688" HIERARCHICAL_NAME="CASDU_257_IOA_196688" ANALOG_VALUE_TYPE="FLOAT"/>
        <DIGITAL_VALUE TELEGRAM_ADDRESS="65793" HIERARCHICAL_NAME="CASDU_257_IOA_65793" DIGITAL_VALUE_TYPE="SINGLE"/>
        <DIGITAL_CONTROL TELEGRAM_ADDRESS="65795" HIERARCHICAL_NAME="CASDU_257_IOA_65795" OUTPUT_TIME2="10000"
            OUTPUT_TIME1="5000" OUTPUT_TIME0="0" DIGITAL_CONTROL_TYPE="SINGLE"/>
        <DIGITAL_VALUE TELEGRAM_ADDRESS="65794" HIERARCHICAL_NAME="CASDU_257_IOA_65794" DIGITAL_VALUE_TYPE="SINGLE"/>
        <DIGITAL_CONTROL TELEGRAM_ADDRESS="65796" HIERARCHICAL_NAME="CASDU_257_IOA_65796" OUTPUT_TIME2="10000"
            OUTPUT_TIME1="5000" OUTPUT_TIME0="0" DIGITAL_CONTROL_TYPE="SINGLE"/>
        <DIGITAL_VALUE TELEGRAM_ADDRESS="65798" HIERARCHICAL_NAME="CASDU_257_IOA_65798" DIGITAL_VALUE_TYPE="DOUBLE"/>
        <DIGITAL_CONTROL TELEGRAM_ADDRESS="65799" HIERARCHICAL_NAME="CASDU_257_IOA_65799" OUTPUT_TIME2="10000"
            OUTPUT_TIME1="5000" OUTPUT_TIME0="0" DIGITAL_CONTROL_TYPE="DOUBLE"/>
        <DIGITAL_VALUE TELEGRAM_ADDRESS="65793" HIERARCHICAL_NAME="CASDU_257_IOA_65793" DIGITAL_VALUE_TYPE="SINGLE"/>
        <DIGITAL_VALUE TELEGRAM_ADDRESS="65794" HIERARCHICAL_NAME="CASDU_257_IOA_65794" DIGITAL_VALUE_TYPE="SINGLE"/>
        --->>> ERROR: Note! Signals from instruction list have been imported. In case of indicated errors, please note the following general
        restrictions. --->>> ERROR: - For commands in instruction list only direct executing is possible. Please configure all other
        commands also for direct execution. --->>> ERROR: - Commands in instruction list are terminated. Please configure all other
        commands also as to be terminated.
      </LRU_TM1703mic>
    </RTU>
  </SUBSTATION>
```


Parameters for the SICAM PAS coupling

XML field	Parameter
RTU_NAME	Plant name
LRU_NAME	Device name
ASDU_ADDRESS	CASDU2 x 256 + CASDU1
NETWORK_CONNECTION IP_ADDRESS	Own IP address X1/X4
TIMEOUT_T0 TIMEOUT_T1 TIMEOUT_T2 TIMEOUT_T3	Timeout connection setup t0 Timeout transmit t1 Timeout transmit acknowledge t2 Timeout connection check t3
MAX_NUM_UNRECEIPTED_SEND_TELEGRAMS	Max. no. of APDUs until acknowledgement (k)
MAX_NUM_UNRECEIPTED_RECEIVED_TELEGRAMS	number of APDUs until acknowledgement (w)
SINGLE_CMD_SEL_BEFORE_EXE	select_execute_t for TI 45 (0 = direct)
DOUBLE_CMD_SEL_BEFORE_EXE	select_execute_t for TI 46 (0 = direct)
TAP_CMD_SEL_BEFORE_EXE	select_execute_t for TI 47 (0 = direct)
SETPOINT_NORMALIZED_SEL_BEFORE_EXE	select_execute_t for TI 48 (0 = direct)
SETPOINT_SCALED_SEL_BEFORE_EXE	select_execute_t for TI 49 (0 = direct)
SETPOINT_FLOAT_SEL_BEFORE_EXE	select_execute_t for TI 50 (0 = direct)
SEND_CMD_END_TERMINATION	Termination_t for TI 48…TI 50 (0 = terminated)

Signals for the SICAM PAS coupling

Process-technical settings	Signal
DIGITAL_VALUE, DIGITAL_VALUE_TYPE = SINGLE	TI 30
DIGITAL_VALUE, DIGITAL_VALUE_TYPE = DOUBLE	TI 31
ANALOG_VALUE, ANALOG_VALUE_TYPE = NORMALIZED	TI 34
ANALOG_VALUE, ANALOG_VALUE_TYPE = SCALED	TI 35
ANALOG_VALUE, ANALOG_VALUE_TYPE = FLOAT	TI 36
COUNTER_VALUE	TI 37
DIGITAL_CONTROL, DIGITAL_CONTROL_TYPE = SINGLE	TI 45
DIGITAL_CONTROL, DIGITAL_CONTROL_TYPE = DOUBLE	TI 46
ANALOG_CONTROL, ANALOG_CONTROL_TYPE = NORMALIZED	TI 48
ANALOG_CONTROL, ANALOG_CONTROL_TYPE = SCALED	TI 49
ANALOG_CONTROL, ANALOG_CONTROL_TYPE = FLOAT	TI 50
OUTPUT_TIME0 [1)] OUTPUT_TIME1 [2)] OUTPUT_TIME2 [3)]	TI 45, TI 46, TI 47
TELEGRAM_ADDRESS	(IOA3 x 65536) + (IOA2 x 256) + IOA1
HIERARCHICAL_NAME	Signal name if available, else CASDU_*<casdu>*_IOA_*<ioa>*
DIGITAL_CONTROL, DIGITAL_CONTROL_TYPE = SINGLE	TI 45

1) single command: `Output_t`, double command: `output_t0`, `output_t1`

2) `AU common settings | Short pulse duration`

3) `AU common settings | Long pulse duration`

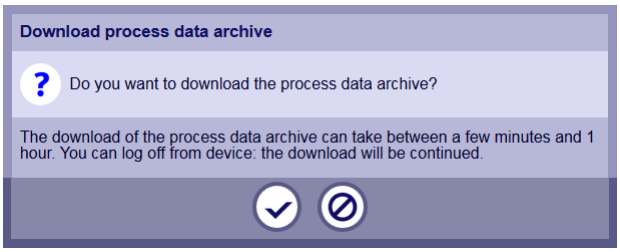
9.3.6 Download Process Data Archive

The data which is stored in the process data archive can be downloaded as CSV file and be stored on the engineering PC. This file can be subsequently read as a table.

The file contains those binary information items, measured values and integrated totals, that have been parameterized for the record in the process data archive (see 9.1.11.2.1, Configurable Logging and Display of Signal States).

Select thereto the submenu `Download process data archive` .

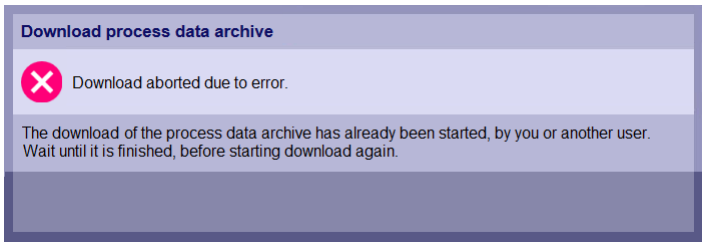
The following dialog will appear:



You have the possibility to abort the procedure.

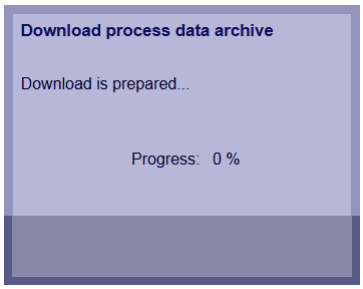
- Confirm the procedure with

If the download – probably in another session – has already been started but not yet been terminated, the following dialog will appear:

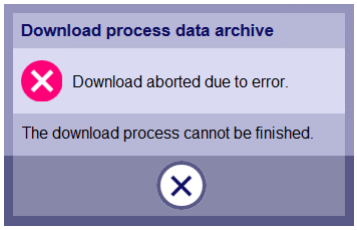


You have to abort the procedure and await the completion of the previous download.

If the settings have been saved, the target device starts with the generation of the archive file. The progress is thereby displayed by the web server. This procedure can take a few minutes.



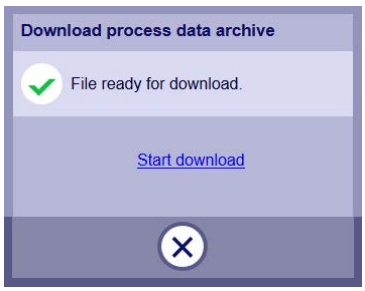
If due to an error the archive file cannot be produced, the following dialog appears:



A cause may be for instance a bad communication connection or the memory usage in the target device.

You have to abort the procedure and try again. If the error is persistent, check the communication and/or – if possible – trigger a startup of the target device.

When the generation of the archive file has finished successfully, the following dialog appears:



- Click on Start download

The storing procedure may vary dependent on the used web browser and may take some time, depending on the file size (max. 1 GB) and transmission rate. Follow the instructions of your web browser. The file name is put together of PROC_ARCHIVE<*date*>_<*time*>.*csv*.

- Click on in order to close the dialog

You now can log off from the target system, or continue with the work in the current session. The download keeps on running in the background until it is terminated.

The download can be aborted at any time by means of:

- Cancel function via web browser
- Closing the web browser

Example for an Archive File

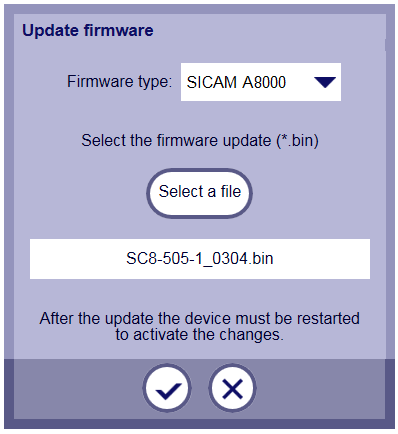
	A	B	C	D	E	F	G	H	I	J	K	L
1	Name	104-Address	TI	Process text	Value	Minimum	Maximum	Quality	Unit	Timestamp		
2	DI_0	1-1-6-1-1	31	Q0_feeder1	intpos					2017-04-25T15:14:59.787+02:00		
3	DI_0	1-1-6-1-1	31	Q0_feeder1	on					2017-04-25T15:14:27.290+02:00		
4	DI_0	1-1-6-1-1	31	Q0_feeder1	intpos					2017-04-25T15:14:24.675+02:00		
5	DI_0	1-1-6-1-1	31	Q0_feeder1	off					2017-04-25T15:14:20.367+02:00		
6	SI_1	1-1-2-1-1	30	Q2_feeder1	on					2017-04-25T09:30:37.962+02:00		
7	SI_1	1-1-2-1-1	30	Q2_feeder1	off					2017-04-25T09:30:34.080+02:00		
8	SI_0	1-1-1-1-1	30	Q1_feeder1	on					2017-04-25T09:30:34.080+02:00		
9	SI_0	1-1-1-1-1	30	Q1_feeder1	off					2017-04-24T17:38:10.468+02:00		
10	SI_1	1-1-2-1-1	30	Q2_feeder1	on					2017-04-24T16:08:58.842+02:00		
11	DI_0	1-1-6-1-1	31	Q0_feeder1	intpos					2017-04-24T16:08:55.080+02:00		
12	SI_1	1-1-2-1-1	30	Q2_feeder1	off					2017-04-24T16:08:55.080+02:00		
13	EOF											
14												

PROC_ARCHIVE2017-04-25T15_15_32

9.3.7 Update Firmware

With this function you are able to load the most recent firmwares into the target device.

Select thereto the submenu `Update firmware`.



You have the possibility to abort the procedure.

- Click `Select a file` in order to open the selection dialog
- Select the source directory and the source file (the file type must be *.*bin*)
- Click on the button

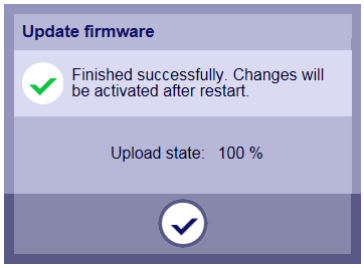
The target device starts the loading procedure. The duration of the loading procedure depends on the file size and the used communication connection.

Note

During loading procedures the website must not be left. The selection of another website may lead to the occurrence of undefined states.

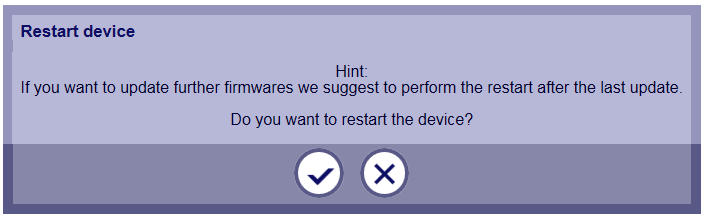
Subsequently the file is checked upon validity. If the data is valid, it is written on the SD card of the target device. Otherwise, an error information is displayed.

After successful upload the following dialog appears:



- Click on the button

Subsequently the following dialog appears:



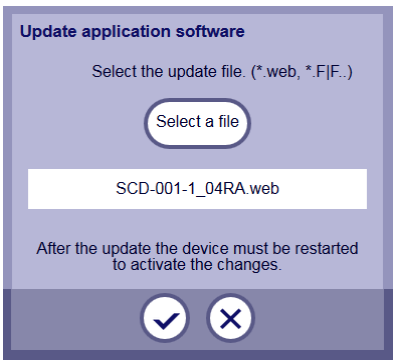
You have the possibility to abort the restart of the device and to update further firmware.

- Click on the button in order to restart the device

9.3.8 Update SICAM WEB

This function gives you the possibility of using the most recent software for the SICAM WEB application.

Select thereto the submenu `Update application software`.



You have the possibility to abort the procedure.

- Click `Select a file` in order to open the selection dialog
- Select the source directory and the source file (the file type must be *.*web*)
- Click on the button

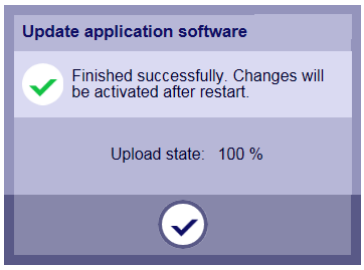
The target device starts the loading procedure. The duration of the loading procedure depends on the file size and the used communication connection.

Note

During loading procedures the website must not be left. The selection of another website may lead to the occurrence of undefined states.

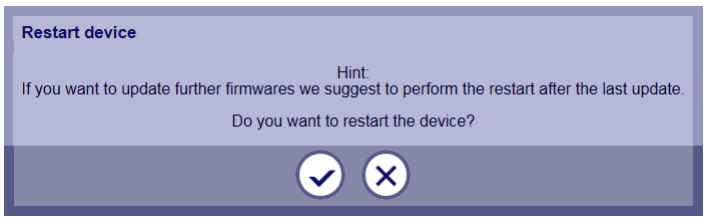
Subsequently the file is checked upon validity. If the data is valid, it is written on the SD card of the target device. Otherwise, an error information is displayed.

After successful upload the following dialog appears:



- Click on the button

Subsequently the following dialog appears:



You have the possibility to abort the restart of the device and to update further firmware.

- Click on the button in order to restart the device

9.3.9 Install Language Package

This function gives you the possibility of installing additional languages for the graphical user interface.

You have the possibility to abort the procedure.

- Click Select a file in order to open the selection dialog
- Select the source directory and the source file (the file type must be *. *nls*)
- Click on the button

The target device starts the loading procedure. The duration of the loading procedure depends on the file size and the used communication connection.

Note

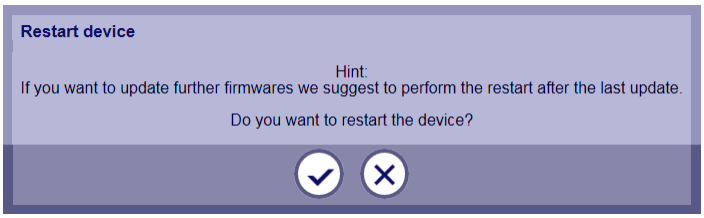
During loading procedures the website must not be left. The selection of another website may lead to the occurrence of undefined states.

Subsequently the file is checked upon validity. If the data is valid, it is written on the SD card of the target device. Otherwise, an error information is displayed.

After successful upload the following dialog appears:

- Click on the button

Subsequently the following dialog appears:



You have the possibility to abort the restart of the device and to update further firmware.

- Click on the button in order to restart the device

The newly installed language is available in the dropdown list of the *Logon* dialog.

Note

Apart from the standard languages English and German, presently no language packages are defined.

10 Engineering via SICAM Device Manager

Contents

10.1 General Information 494

10.1 General Information

The SICAM Device Manager is the intuitive engineering software for SICAM A8000 series.

- Project- and device administration
- Multiply devices
- Online connection to devices via SICAM WEB

You will find the instructions for this tool in the document *SICAM Device Manager User Manual* (D51-003).

11 Service

Contents

11.1 Maintenance, Cleaning and Disposal 496
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11.9 Remote Maintenance 557

This chapter describes the internal checks and displays of the devices CP-8000/CP-802*x*, which diagnosis options are available, what is to be considered with the exchange of the system or external modules, and how functional updates can be loaded into the system.

11.1 Maintenance, Cleaning and Disposal

- Maintenance
  - The device is maintenance-free.
  - With handling on the bus – or its vicinity – a sufficient ESD protection must be considered.
- Cleaning
  - If necessary, wish the device with a clean, dry, soft and fluff-free cotton cloth.
  - Detergents may cause damage. Do not use a detergent.
  - Humidity and wetness may impair the functionality of the components. Make sure that humidity or wetness does not enter into the device.
- Disposal
  - For the disposal of the device it is necessary to observe the local and national directives.

Note

A device that is defective can be recognized by the fact, that after a restart of the target device the yellow RY-LED and the red ER-LED do not light up. An access with the SICAM TOOLBOX II is no longer possible in this case.

In this case please consult our Customer Support Center.

Modules must not be opened or repaired by the user.

11.2 Environmental Protection Hints

Disposal of Old Equipment and Batteries (Applicable only for European Union and Countries with a Recycling System)

The disposal of our products and possible recycling of their components after decommissioning has to be carried out by an accredited recycling company, or the products/components must be taken to applicable collection points. Such disposal activities must comply with all local laws, guidelines and environmental specifications of the country in which the disposal is done. For the European Union the sustainable disposal of electronic scrap is defined in the respective regulation for "waste electrical and electronic equipment" (WEEE).

The crossed-out wheelie bin on the products, packaging and/or accompanying documents means that used electrical and electronic products and batteries must not be mixed with normal household waste.

According to national legislation, penalties may be charged for incorrect disposal of such waste.

By disposing of these products correctly you will help to save valuable resources and prevent any potential negative effects on human health and the environment.

Note

Our products and batteries must not be disposed of as household waste. For disposing batteries it is necessary to observe the local national/international directives.

Disposal of Mobile Storage Devices (e.g. USB Sticks and Memory Cards)

When disposing of/transferring mobile storage devices, using the **format** or **delete** functions only changes the file management information and does not completely delete the data from your mobile storage device. When disposing of or transferring a mobile storage device, Siemens strongly recommends physically destroying it or completely deleting data from the mobile storage device by using a commercially available computer data erasing software.

REACH/RoHS Declaration

You can find our current REACH/RoHS declarations at the following website:

https://www.siemens.com/global/en/home/products/energy/ecotransparency/ecotransparency-downloads.html

Note

You can find more information about activities and programs to protect the climate at the EcoTransparency website:

https://www.siemens.com/global/en/home/products/energy/ecotransparency.html

11.3 Operation and Display Elements

The following section shows the arrangement of the operation and display elements on the front of the respective housing and describes the states and meaning of the single elements.

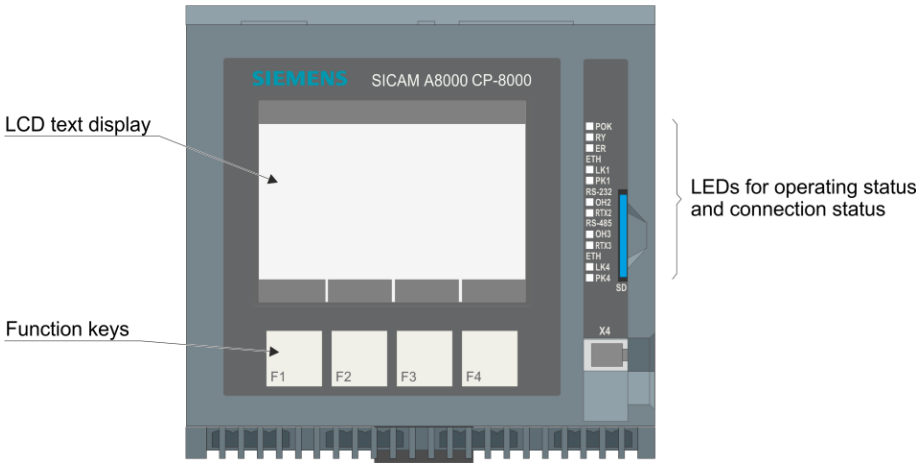
Note
LEDs don't guarantee zero potential connectors.

11.3.1 Description of the LED Display

11.3.1.1 Master Module CP-8000

CP-8000 provides

- 3 LEDs which indicate the operating status of the module
  - POK (Power Ready LED, yellow)
  - RY (Ready LED, yellow)
  - ER (Error LED, red)
- 8 LEDs which indicate the connection status of the communication interfaces X1 to X4 (dependent on the configured protocol elements)
- an LCD text display
- 4 function keys



CP-8000

Operating Status

Status of the POK LED	Meaning
Dark	• Sum error (voltage failure, power supply defective, etc.) • Startup
Lights up	Power supply without error

Status of the RY LED	Meaning
Dark	• System or specific module not ready
Lights up	System ready
Flashes regularly	• Loading of parameters into the Flash PROM • Loading of firmware into the Flash PROM
Flashes irregularly	• Startup

Status of the ER LED	Meaning
Dark	No error
Lights up	• Sum error (internal error, external error, warning, module failure, system failure; inclusive I/O Master Module) • Startup

Connection Status

LED	Status X1	Meaning
LK1	Lights up	Physical connection to the Ethernet Hub
	Dark	• Startup Connection not established • Startup
PK1	Flickers	Activity (TCP frame sent/received)
	Dark	Startup

LED	Status X2	Meaning
OH2	Flickers	Sending message
	Lights up	Connection with minimum one physical partner set up (dial-up traffic)
	Dark	• Connection not established • Startup
RTX2	Flickers	Activity on send/receive line
	Dark	Startup

LED	Status X3	Meaning
OH3	Flickers	Sending message
	Lights up	Connection with minimum one physical partner set up (dial-up traffic)
	Dark	• Connection not established • Startup
RTX3	Flickers	Activity on send/receive line
	Dark	Startup

LED	Status X4	Meaning
LK4	Lights up	Physical connection to the Ethernet Hub
	Dark	• Startup Connection not established • Startup
PK4	Flickers	Activity (TCP frame sent/received)
	Dark	Startup

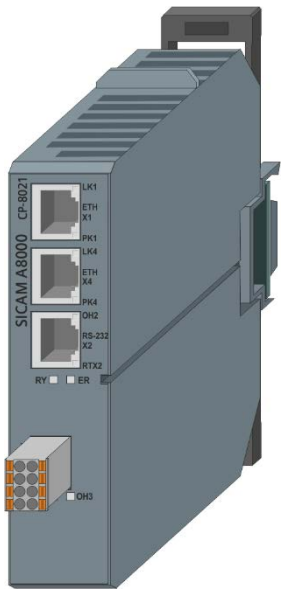
11.3.1.2 Master Module CP-802*x*

CP-8021 provides

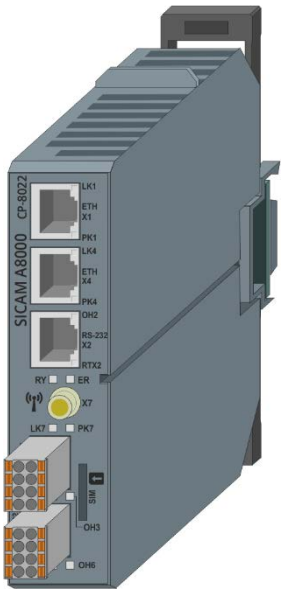
- 2 LEDs which indicate the operating status of the module
  - RY (Ready LED, yellow)
  - ER (Error LED, red)
- 8 LEDs (yellow) which indicate the connection status of the communication interfaces X1 to X4 (dependent on the configured protocol elements)

CP-8022 provides

- 2 LEDs which indicate the operating status of the module
  - RY (Ready LED, yellow)
  - ER (Error LED, red)
- 12 LEDs (yellow) which indicate the connection status of the communication interfaces X1 to X4, X6, X7 (dependent on the configured protocol elements)



CP-8021



CP-8022

Operating Status

Status of the RY LED	Meaning
Dark	• System or specific module not ready
Lights up	System ready
Flashes regularly	• Loading of parameters into the Flash PROM • Loading of firmware into the Flash PROM
Flashes irregularly	• Startup

Status of the ER LED	Meaning
Dark	No error
Lights up	• Sum error (internal error, external error, warning, module failure, system failure; inclusive I/O Master Module) • Startup

Connection Status

LED	Status X1	Meaning
LK1	Lights up	Physical connection to the Ethernet Hub
	Dark	• Startup Connection not established • Startup
PK1	Flickers	Activity (TCP frame sent/received)
	Dark	Startup

LED	Status X2	Meaning
OH2	Flickers	Sending message
	Lights up	Connection with minimum one physical partner set up (dial-up traffic)
	Dark	• Connection not established • Startup
RTX2	Flickers	Activity on send/receive line
	Dark	Startup

LED	Status X3	Meaning
OH3	Flickers	Sending message
	Lights up	Connection with minimum one physical partner set up (dial-up traffic)
	Dark	• Connection not established • Startup
RTX3	Flickers	Sending or receiving message
	Dark	Startup

LED	Status X4	Meaning
LK4	Lights up	Physical connection to the Ethernet Hub
	Dark	• Startup Connection not established • Startup
PK4	Flickers	Activity (TCP frame sent/received)
	Dark	Startup

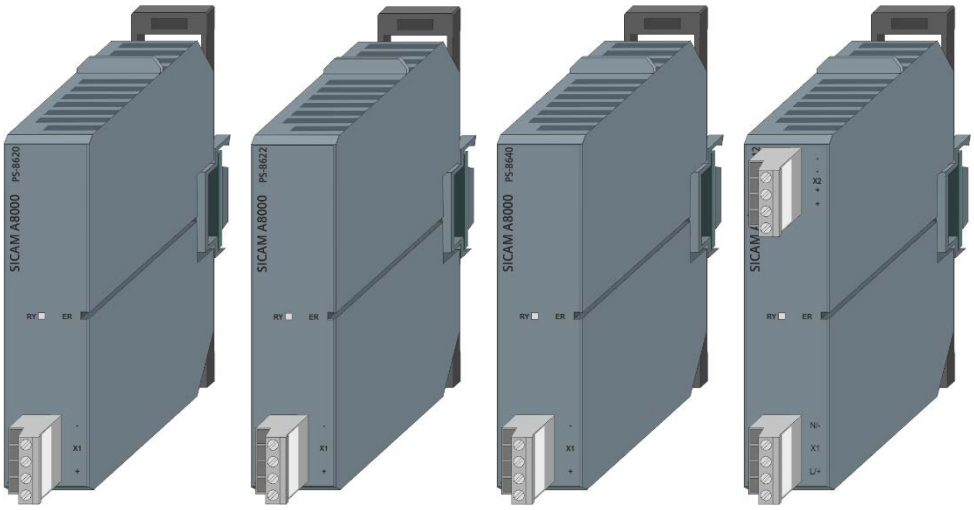
LED	Status X6	Meaning
OH6 *)	Flickers	Sending message
	Lights up	Connection with minimum one physical partner set up (dial-up traffic)
	Dark	• Connection not established • Startup
RTX6 *)	Flickers	Sending or receiving message
	Dark	Startup

LED	Status X7	Meaning
LK7 *)	Lights up	Connection established
	Flashes regularly	0.5 s: net search, not registered, turning off 1 s: registered to mobile network 2 s: error (SIM, registration, IPsec, …)
	Dark	• Connection not established • Startup
PK7 *)	Flickers	Data exchange with GPRS modem
	Dark	Startup

*) only CP-8022

11.3.1.3 Power Supply Modules

PS-862*x* and PS-864*x* provide one display element RY (Ready LED, yellow) which indicates the operating status of the module.



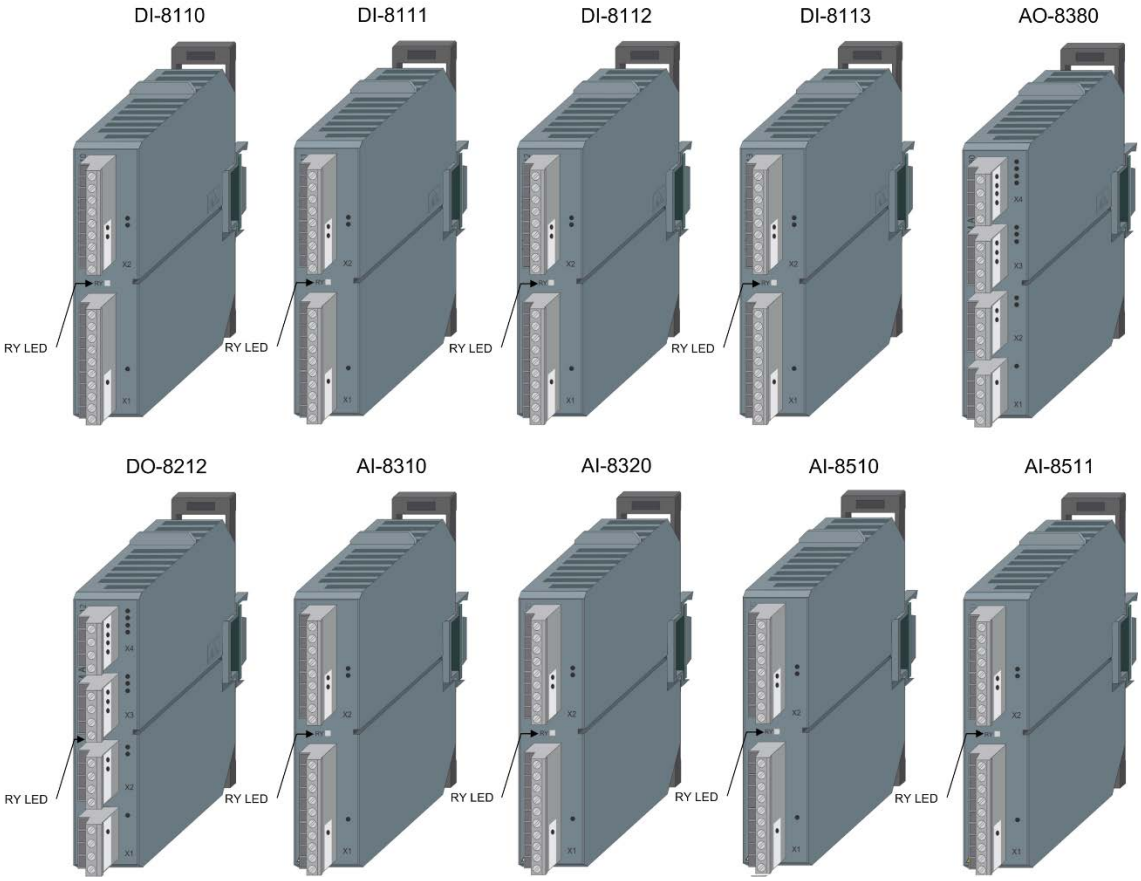
PS-8620 PS-8622 PS-8640 PS-8642

Operating Status

Status	Meaning
Dark	• Sum error (voltage failure, power supply defective, at least one of the monitored voltages smaller than setpoint value) • Startup
Lights up	Module ready
Flashes	• 1 s interval: PS in boot loader (startup) • 0.3 s interval: Connection to CP-802*x* interrupted • 0.1 s interval: Loading of firmware into the Flash PROM

11.3.1.4 SICAM I/O Modules

The SICAM I/O Modules provide one display element RY (Ready LED, yellow) which indicates the operating status of the module.



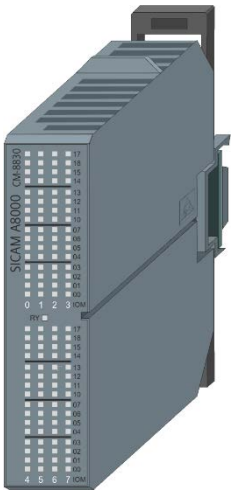
Operating Status

Status of the RY LED	Meaning
Dark	• Sum error (voltage failure, defective) • Startup
Lights up	Module ready

11.3.1.5 LED Module

The LED Module CM-8830 provides

- one display element RY (Ready LED, yellow) which indicates the operating status of the module
- display elements (Ready/Error LEDs, bicolor) which indicate the process status of the SICAM I/O Modules



CM-8830

Operating Status

Status of the RY LED	Meaning
Dark	Module not ready or failed
Lights up	Module ready

The various LEDs indicate the following operating states. For information on LED state, refer to section 5.7.2.9, CM-8830.

Process Status of SICAM I/O Modules (RY/ER LED, bicolor)

The IOM LEDs (IOM 0 to 3 and IOM 4 to 7) are the bicolor LEDs which indicate the operating status and the process errors of SICAM I/O Modules in a SICAM A8000 I/O row.

Status of the IOM LEDs	Meaning	How to Read the LED Sequence
Dark	• Respective I/O module not ready • Respective I/O module not detected or in error state	• Left to right (IOM 0 to 3) • Left to right (IOM 4 to 7)
Lights up (yellow)	• Respective I/O module ready, monitoring active • No process error	
Lights up (red)	• Respective I/O module monitoring active and • I/O module process error indication	

Process Status of the I/O (LEDs, yellow)

The LEDs (00 to 07 and 10 to 17) indicate the process status signals of the SICAM I/O module digital inputs/outputs and analog inputs/outputs.

Status of the I/O Process Status LEDs	Meaning	How to Read the LED Sequence
Dark	Respective I/O module not ready and/or channel active	Bottom to top (00 to 07 and 10 to 17) of IOM 0 to 7
Lights up	Respective I/O module ready, channel active	

- The I/O process status of DI and AI I/O Modules is displayed on the LED module without engineering the SICAM A8000 system.
- The I/O process status (for DO and AO) and the I/O process error (for DI and AI) are displayed on the LED module only when SICAM A8000 system is engineered.
- The I/O process status for AI-8320 and AO-8380 modules is displayed on the LED module when the measured input is > 3 % and LEDs are dark when the measured input is < 3 %.
- The I/O process status for the AI-8310 module is displayed on the LED module only when the measured input is between 20 Ω to 4075 Ω.

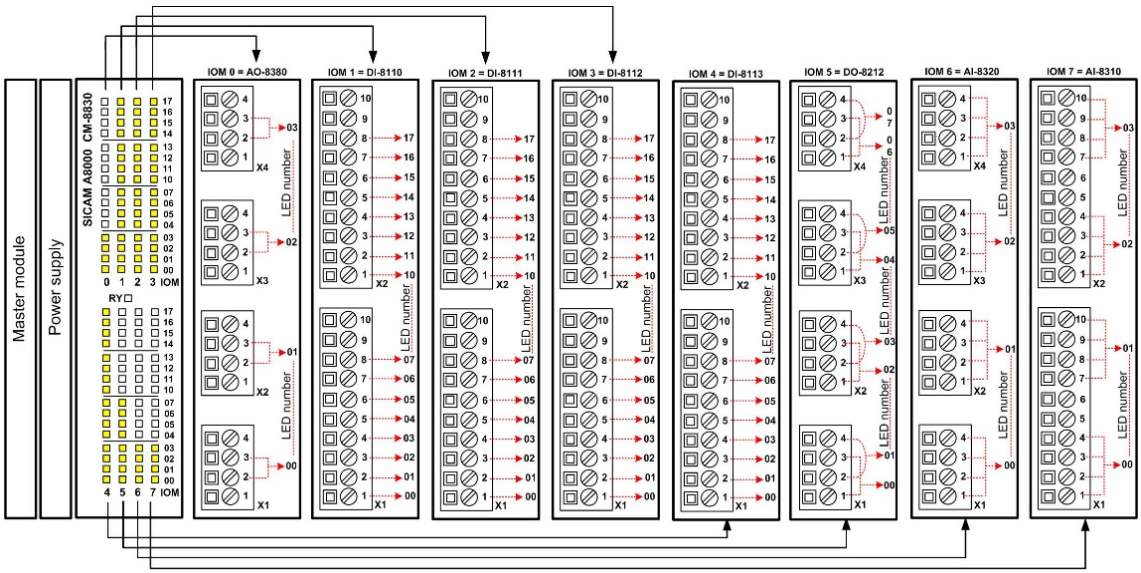
Process Status Visualization on the LED Module

I/O Module	Process Signal	Process Status Visualization
DI-811x	IN D00 to IN D07 and IN D10 to IN D17	Bottom to top (00 to 07 and 10 to 17)
DO-8212	OUT D00 to OUT D03 and OUT D04 to OUT D17	Bottom to top (00 to 03 and 04 to 07)
AI-8310	IN V0 to IN V3	Bottom to top (00 to 03)
AI-8320	IN V0 to IN V3	Bottom to top (00 to 03)
AO-8380	OUT V00 to OUT V03	Bottom to top (00 to 03)

Process Error Visualization on the LED Module

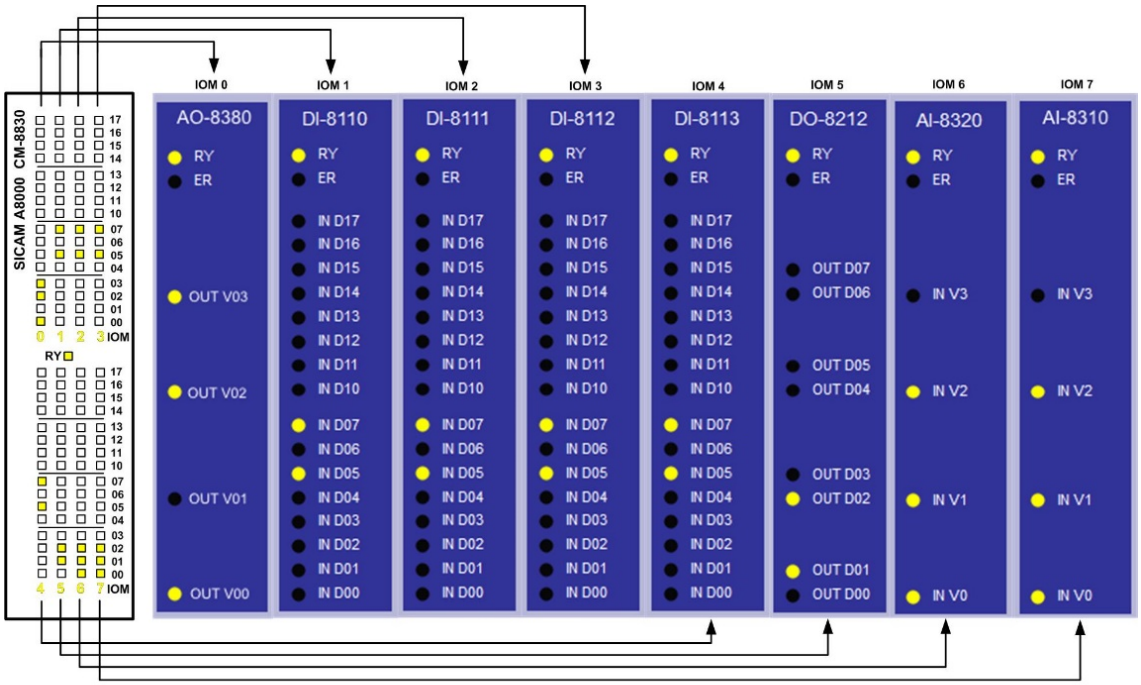
I/O Module	Process Error Visualization
DI-811x	Power monitoring error
AI-8320	Live-zero suppression error

The following figure explains the mapping of I/O modules pinout and LEDs display on the LED module:



The mapping shown above is for illustration purpose only, the actual display mapping and system setup can vary from configuration to configuration.

The following figure explains the SICAM A8000 I/O signal mapping with LED module when compared to SICAM WEB I/O monitoring:



The mapping shown above is for illustration purpose only, the actual display mapping and system setup can vary from configuration to configuration.

11.3.2 Description of the LCD Display (only CP-8000)

The LCD display comprises

- Device Information
- Configuration
- Monitoring
- Alarms

Overview of the menu structure:

Main menu	**1.0** **Device information**	**2.0** **Configuration**	**3.0** **Monitoring**	**4.0** **Alarms**
Submenu	1.1 Device	2.1 I/O Modules	3.1 Events	(Alarm List)
		2.1.1 IOM0 2.1.2 IOM1 … 2.1.8 IOM7	3.1.1 All Events 3.1.2 DEF Events 3.1.3 DIA Events	
	1.2 Language	2.2 Protocols	3.2 Alarms	
		2.2.1 PRE0 2.2.2 PRE1 2.2.3 PRE2 2.2.4 PRE3	3.3 Cockpit	
	1.3 Display	2.3 Version		
	1.4 Startup page		3.4 I/O Modules	
			3.4.1 IOM0 3.4.2 IOM1 … 3.4.8 IOM7	

Note

Consider the notes in section 4.3, Climatic Ambient Conditions.

11.3.2.1 Navigation

The navigation within the menus is done via the function keys F1 to F4. Their current function is shown in the bottom row of the display.

Name	Function	Meaning
F1	ESC	• Back to the previous menu • Reject entry
F2	▲	Selection up (circulating list)
	+	Value +1
F3	▼	Selection down (circulating list)
	-	Value -1
F4	MENU	Back to the previous menu
	ENTER	• Open submenu • Open list
	EDIT	Edit value
	OK	Accept

11.3.2.2 Device Information

The menu itemt Device information is devided in the submenus

- Device
- Language
- Display
- Startup page

11.3.2.2.1 Device

Information on the device itself can be found in the submenu Device.

Submenu	Submenu	Display/settings	Meaning/range
1.1 Device	–	Article number	
		Serial number	
		MAC address(es)	1 or 2 according to parameter
		IP address	
		Hardware/firmware identification	

11.3.2.2.2 Language

In the submenu Language you can select the language of the display. All available languages are listed in alphabetical order.

With the function keys ▲ and ▼ you can select a language.

Press the function key OK to activate the selected language.

Submenu	Submenu	Display/settings	Meaning/range
1.2 Language	–	Deutsch	
		English	

Language settings have no impact on

- labels of the function keys
- parameterized name and state of events (appear as they have been parameterized)
- parameterized name and state of alarms (appear as they have been parameterized)
- name and state of diagnosis events (fixed in english)
- name and state of diagnosis alarms (fixed in english)

11.3.2.2.3 Display

In the submenu Display you can change the display settings (e.g. brightness, contrast).

With the function keys ▲ and ▼ you can select a parameter.

Press the function key EDIT to edit the selected parameter.

For changing press the function key + or – and accept with OK.

Submenu	Submenu	Display/settings	Meaning/range
1.3 Display	–	Contrast	1…9
		Backlight level	1…3
		Backlight dimmed	0…2
		Time until dimmed	0…99
		Invert display	☐◀▶☑
		Display test	

11.3.2.2.4 Start Page

In the submenu `Startup page` you can select that page which shall be displayed after a startup.

With the function keys ▲ and ▼ you can select a page.

Press the function key OK to activate the selected page.

After the next startup of the target device the selected page is displayed.

Submenu	Submenu	Display/settings	Meaning/range
1.4 Startup page	–	Main menu	
		I/O Modules	1
		I/O Modules	2
		:	:
		I/O Modules	8
		All Events	
		DEF Events	
		DIA Events	
		Alarms	
		Cockpit	1
		Cockpit	2
		:	:
		Cockpit	32

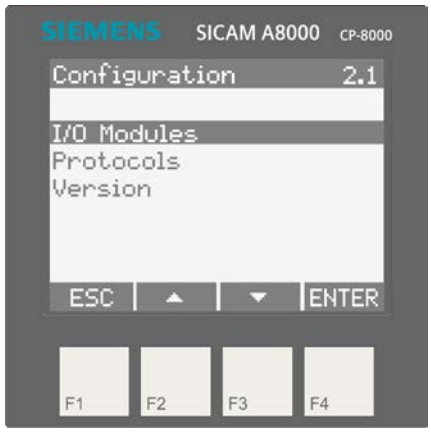
Note

If the selected page is not existing, then the superior menu will be displayed.
Example: selection of an I/O Module that is not equipped.

11.3.2.3 Configuration

The menu item Configuration is devided in the submenus

- I/O Modules
- Protocols
- Version

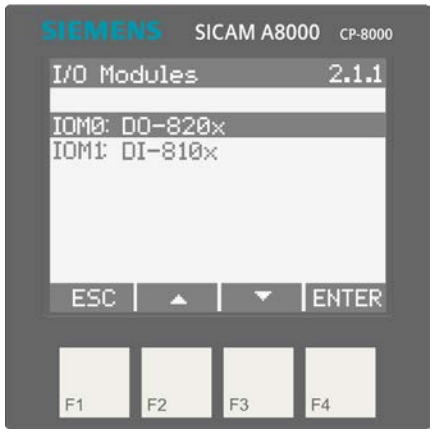


11.3.2.3.1 I/O Modules

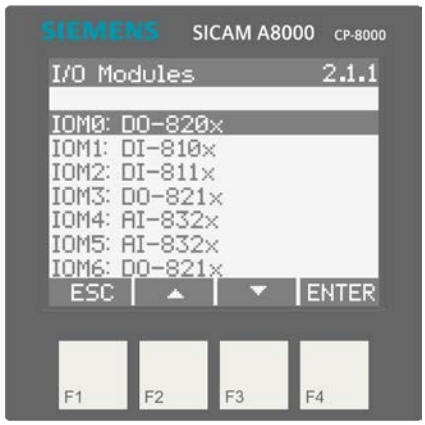
In the submenu I/O Modules you can select the status display of the internal and – if used – external I/O Modules (only with equipped I/O Master Module).

You may also view equipped I/O Modules in the Monitoring | I/O Modules submenu.

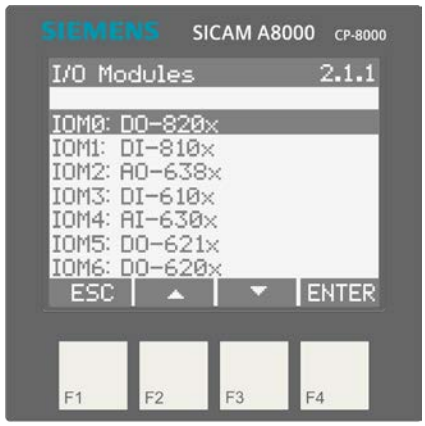
The image besides shows the standard submenu.



Menu with external SICAM I/O Modules (example)



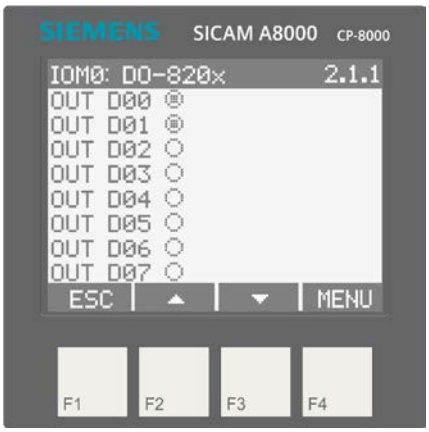
Menu with external SICAM TM I/O Modules (example)



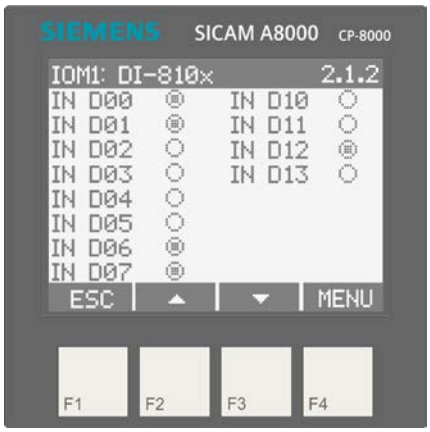
With the function keys ▲ and ▼ you can select an I/O Module.

With the function key ENTER you get to the status display of the selected I/O Module.

Status of digital outputs (example)



Status of digital inputs (example)



With the function keys ▲ and ▼ you can switch directly between the I/O Modules.

Submenu	Submenu	Function	Status	Meaning
2.1 I/O Modules	2.1.1 IOM0: DO-820*x*	OUT D00… OUT D07	●	DI: activated
			○	DI: not activated
	2.1.2 IOM1: DI-810*x*	IN D00…IN D07 IN D10…IN D13	●	DO: activated
			○	DO: not activated
	2.1.3 IOM2:	1)	<*Value*>	AI: input value 2)
			<*Value*>	AO: output value 2)
	2.1.4 IOM3:	1)		
	2.1.5 IOM4:	1)		
	2.1.6 IOM5:	1)		
	2.1.7 IOM6:	1)		
	2.1.8 IOM7:	1)		

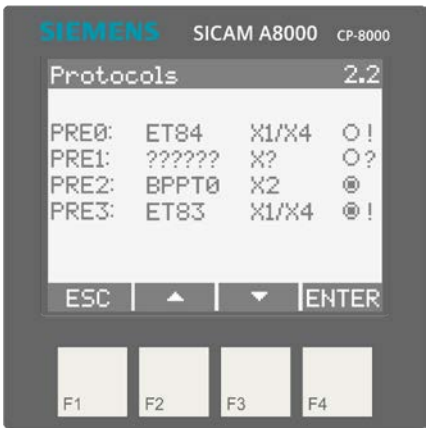
1) dependent on the respective module

2) percentage of the measuring range of the respective module

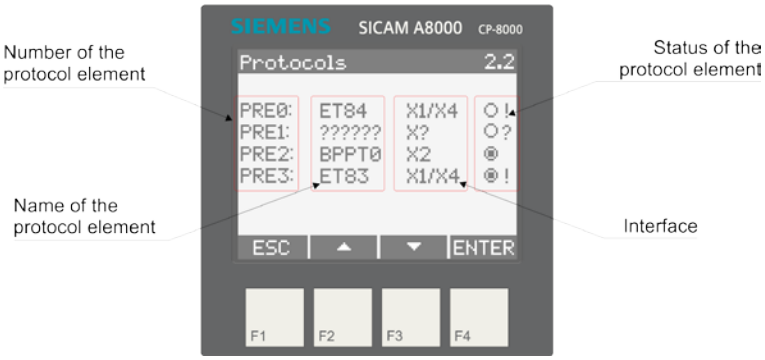
11.3.2.3.2 Protocols

In the submenu Protocols the status of the individual communication connections is displayed (only with configured protocol).

The image besides shows an example without configured PRE1.



Meaning of the status symbols in the Protocols menu:



Submenu	Submenu	Function	Status	Meaning
2.2 Protocols	2.2.1 PRE0:	<*Firmware*>	●	(All) connection(s) established
	2.2.2 PRE1:	<*Firmware*>	●!	Not all connections established
	2.2.3 PRE2:	<*Firmware*>	○!	No connection established
			○	Connection not established
	2.2.4 PRE3:	<*Firmware*>	○?	No detailed information available for this protocol
			X?	No interface is assigned to this protocol

Examples:

This example is valid for LAN/multi-point traffic-master and dial-up traffic-master.

- Only parametrized connections are displayed.
- If there are more connections available as can be shown on one page, these will be displayed on the next page.

Meaning of the status symbols:

● Connection is established

○ Connection is not established

This example is valid for point-to-point or multi-point traffic-slave.

Meaning of the status symbols:

● Connection is established

○ Connection is not established

This information is displayed if there are no details available for this protocol.

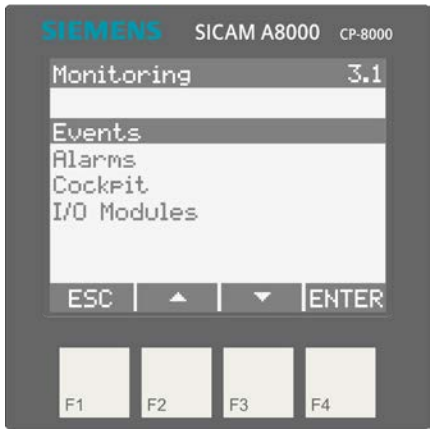
11.3.2.3.3 Version

In the submenu Version the version numbers of the individual firmwares are displayed.

11.3.2.4 Monitoring

The menu item Monitoring is devided in the submenus

- Events
- Alarms
- Cockpit
- I/O Modules



The submenu Events | ALL Events displays a list with max. of 4000 process and diagnosis events.

The submenu Alarms displays a list with max. of 4000 process and diagnosis alarms (you may also view the alarm list from the main menu item Alarms).

The submenu Cockpit displays up to 32 configurable groups with up to 255 signals each.

The submenu I/O Modules displays the signal states at the inputs and outputs of the equipped I/O Modules.

The following signals can be defined by means of parameter as process event and/or process alarm (refer to 9.1.11.2.1, Configurable Logging and Display of Signal States):

Type of signal	Designation	Type identifier (TI)	Process event	Process alarm
Single point information	SI	TI 30	✓	✓
Double point information	DI	TI 31	✓	✓
Single command	SC	TI 45	✓	
Double command	DC	TI 46	✓	

The following diagnosis events and diagnosis alarms (sum errors) are generated by the device and entered in the list. These diagnosis events cannot be parameterized:

Event process text	Meaning	Diagnosis event	Diagnosis alarm
Dia IntError	Internal error	✓	✓
Dia ExtError	External error	✓	✓
Dia ComError	Communication error	✓	✓
Dia Test	Test	✓	✓
Dia Warning	Warning	✓	✓
Dia BoardFail	Board failure	✓	✓
Dia Restart	Restart	✓	✓

11.3.2.4.1 Events | ALL Events

The submenu Events is devided in the submenus

- All Events
- DEF Events (process events)
- DIA Events (diagnosis events)

In the submenu All Events all process events and diagnosis events are displayed in chronological order (most recent entry first).

In the header you can see which entry you have selected and the amount of all entries.

After opening the list, the most recent entry is automatically selected.

You can navigate through the entire list via function keys ▼ and ▲.

In the selected entry you can see detailed information on the selected entry (date, timestamp, etc.).

Using the function key TOP, you go to the beginning of the list (and select the first entry).

The oscillating function key TOP shows that a new event is active.

- Press the oscillating function key TOP to refresh the entire list

The function key TOP will not be oscillating if you did select the first entry and a new event occurs. In this case, however, the list will be refreshed.

Submenu	Submenu	Display/settings	Meaning/range
3.1 Events	3.1.1 All Events	Event name	• Freely parameterizable text (applies for process events) • Always beginning with “Dia” (applies for diagnosis events)
		Status	• Freely parameterizable text (applies for process events) • Coming, going (applies for diagnosis events)
		Quality bit	Applies for process events (TI 30 and TI 31) only: ?: not topical !: invalid #: blocked $: substituted
		Date	Date of the selected event
		Time stamp	Timestamp of the selected event
		Time quality bit	!: invalid (optional)
		Indication of daylight-saving time	S: daylight-saving time (optional)

11.3.2.4.2 Events | DEF Events

The submenü `Events | DEF Events` shows exclusively process events in a list.

For a more detailed description of the display and navigation, refer to section 11.1.2.4.1, Events | ALL Events.

Submenu	Submenu	Display/settings	Meaning/range
3.1 Events	3.1.2 DEF Events	Event name	Freely parameterizable text (applies for process events)
		Status	Freely parameterizable text
		Quality bit	Valid for process-events (TI 30 and TI 31) only: ?: not topical !: invalid #: blocked $: substituted
		Date	Date of the selected event
		Time stamp	Timestamp of the selected event
		Time quality bit	!: invalid (optional)
		Indication of daylight-saving time	S: daylight-saving time (optional)

11.3.2.4.3 Events | DIA Events

The submenü `Events | DIA Events` shows exclusively diagnosis events in a list.

For a more detailed description of the display and navigation, refer to section 11.1.2.4.1, Events | ALL Events.

Submenu	Submenu	Display/settings	Meaning/range
3.1 Events	3.1.3 DIA Events	Event name	Freely definable text
		Status	Freely definable text
		Date	Date of the selected event
		Time stamp	Timestamp of the selected event
		Time quality bit	!: invalid (optional)
		Indication of daylight-saving time	S: daylight-saving time (optional)

11.3.2.4.4 Alarms

After opening the list, the most recent entry is automatically selected.

In the header you can see which entry you have selected and the amount of all entries.

In the submenu Alarms alarms are displayed in chronological order (most recent entry first).

In the header you can see which entry you have selected and the amount of all entries.

After opening the list, the most recent entry is automatically selected.

You can navigate through the entire list via function keys ▼ and ▲.

In the selected entry you can see detailed information on the selected entry (date, timestamp, etc.).

Using the function key TOP, you go to the beginning of the list (and select the first entry).

The oscillating function key TOP shows that a new alarm is active.

- Press the oscillating function key TOP to refresh the entire list

The function key TOP will not be oscillating, if you did select the first entry and a new alarm occurs. In this case, however, the list will be refreshed.

Submenu	Submenu	Display/settings	Meaning/range
3.2 Alarms	–	Alarm name	Freely definable text (applies for process alarms) Always beginning with “Dia” (applies for diagnosis alarms)
		Status	• Freely definable text (applies for process alarms) • Coming (applies for diagnosis alarms) *)

*) no historical alarms

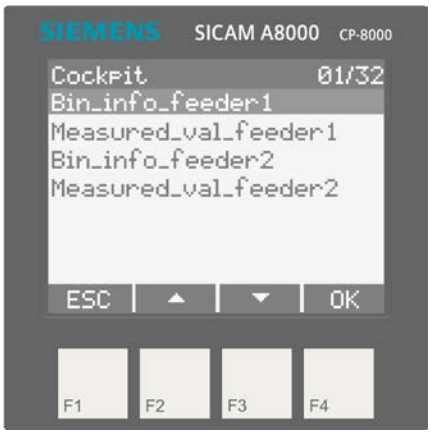
11.3.2.4.5 Cockpit

The submenu Cockpit is devided in freely definable groups.

Under each group, the status of signals assigned to the group can be read:

- Binary information (process data message)
- Measured values (process data measured value)

The groups and their assigned signals are defined via the engineering tool (SICAM WEB: refer to section 9.1.11.2.1, Configurable Logging and Display of Signal States).



You can navigate through the entire list via function keys ▼ and ▲

You can open the selected group with the function key OK.

Under the opened group the respectively assigned signals appear with the status display.

Example: binary information items

In this example, 3 binary information items are assigned to the group positions 1, 3 and 4.

Position 2 is not assigned.

Example: measured values

In this example, 2 measured values are assigned to the group positions 1 and 5.

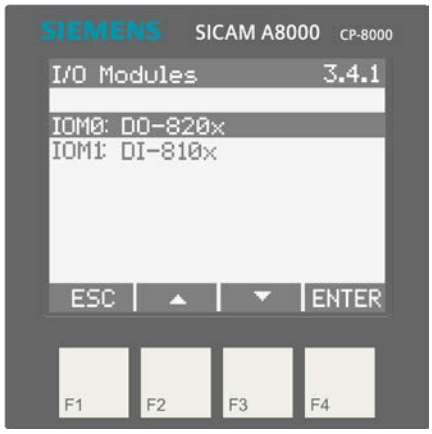
Positions 2, 3 and 4 are not assigned.

Submenu	Submenu	Display/settings	Meaning/range
3.3 Cockpit	*<Group 1>* *<Group 2>* *<Group 3>* : *<Group 32>*	Signal name	Freely definable text
		Status	Freely definable text (applies for binary information)
		Value	Freely definable text (applies for analog information)
		Unit	Freely definable text (applies for analog information)
		Quality bit	Valid for process-events (TI 30 and TI 31) only: ?: not topical !: invalid #: blocked $: substituted

11.3.2.4.6 I/O Modules

In the submenu `I/O Modules` you can select the status display for the individual I/O Modules (only with equipped I/O Master Module).

The image besides shows the standard submenu.



The menu structure and the display corresponds with the submenu `Configuration | I/O Modules` (see section 11.1.2.3.1, I/O Modules).

11.4 Checks and System Display

The single system elements carry out checks of the hardware and software. If an error is detected, this leads

- to a signaling on the LED display
- dependent of the severeness of the error possibly
  - to an abort of the startup
  - in operation to a shutdown of the modules or firmware

After an errorless startup of a system element further checks are carried out.

11.4.1 Checks during Startup

Startup (step)	RY	ER	Error/reaction
Power-up or reset	dark	lights up	Start startup
		dark	• Module defective • Massive error in the program memory
Check of the code memory (flash PROM)	dark	lights up	PROM error (code) • Module is shut down • Startup is aborted
Check of the data memory (RAM) with address error check	dark	lights up	RAM error (data) • Module is shut down • Startup is aborted
Check whether SD card is present	dark	lights up	SD card not present
Check of the checksum of all parameter files and firmware files on the SD card	dark	lights up	Checksum error on the SD card • Diagnosis information is set
Check whether all parameters on the SD card are present	dark	lights up	Parameter files incomplete • Firmware is shut down • Startup is aborted
Check whether all firmware files on the SD card are present	dark	lights up	Firmware code incomplete
Check whether the firmware code of the subordinate system elements (protocol elements, I/O Master Module) is current	dark	lights up	If not, Load firmware code at a later time
Revision check of the parameters in the parameter memory	dark	lights up	If the parameters are not current, they are loaded from the SD card
Check parameter memory (flash-PROM)	dark	lights up	Checksum error of the parameters • Firmware is shut down • startup is aborted
Initiate the startup of the subordinate system elements	dark	lights up	
Check for accordance of the parameterized HW configuration with the mechanical configuration (I/O Modules)	dark	lights up	Configuration error • the wrongly configured or defective module is not operational • successional modules are not operational
Check of the configuration for pulse command output	dark	lights up	Configuration error • Pulse command output is locked for all modules

Startup (step)	RY	ER	Error/reaction
Loading the parameters to the subordinate system elements	dark	lights up	Too little memory on the protocol element or I/O Master Module • Firmware on the protocol element or I/O Master Module is shut down
Check of the parameter contents	dark	lights up	Parameter error
Startup completed (OK)	lights up	dark	
Startup completed (Fehler)	lights up	lights up	

Error (startup aborted)	RY	ER	Note
Module defective	dark	dark	Replace system/external module
PROM error (code)	dark	lights up	Replace system/ external module
RAM error (data)	dark	lights up	Replace system/ external module
Parameter files incomplete	dark	lights up	• Read diagnosis • Initialize automation unit
Checksum error of the parameters	dark	lights up	• Read diagnosis • Initialize automation unit
Parameter error	dark	lights up	Read diagnosis

Error (startup continued)	RY	ER	Note
No SD card present	lights up	lights up	• Read diagnosis • Insert SD card • Initialize automation unit
Firmware code incomplete	lights up	lights up	• Read diagnosis • Lod firmware newly
Configuration error	lights up	lights up	Read diagnosis
Too little memory on the protocol element or I/O Master Module	lights up	lights up	Read diagnosis
Parameter error	lights up	lights up	Read diagnosis (depending on type of error)

Note

“Firmware shut down” means that all functions with exception of those, which are necessary for the communication with the engineering tool in the local operating mode, are halted. In this state all outputs are terminated.

By means of the lighted display this state can not be identified clearly. On occurrence of this state, a diagnostic information is set with an error code. This state can now only be ended with a Power up or Reset. The reset can be initiated both by the SICAM TOOLBOX II as well as with SICAM WEB.

Note

“Module shut down” means that all activities of the hardware and firmware are halted. In this state all outputs are terminated.

By means of the lighted display this state can not be identified clearly. This state can now only be ended with a Power up or Reset. The reset can be initiated by the SICAM TOOLBOX II as well as with SICAM WEB.

11.4.2 Checks after Startup

Cyclic operation	RY	ER	Error/reaction
Check of the communication connections	lights up	lights up	Communication error • Communication failure • Communication fault
Communication connections set up (OK)	lights up	dark	
Function check of the I/O Modules over the TM bus	lights up	lights up	I/O Module error • Periodical information for the open-/closed-loop control function • Diagnosis information
I/O Modules operational (OK)	lights up	dark	

Error	RY	ER	Note
Communication failure	lights up	lights up	• Diagnosis • Check communication lines • Check remote station
Communication error	lights up	lights up	Diagnosis
I/O Module error	lights up	lights up	• Diagnosis • Replace system (if internal module) • Replace I/O Module (if external module)

Load firmware code	RY	ER	Error/reaction
System element is shut down and the firmware code is loaded from the SD card	lights up	lights up	
Initiate startup of the Master Module for new loaded system elements (protocol element, I/O Master Module)	lights up	lights up	
startup completed (OK)	lights up	dark	
startup completed (error)	lights up	lights up	

11.4.3 Behavior of the Process Outputs upon Startup and Failure

With failure of the supply voltage and during startup of the system all the process outputs are terminated.

After startup of the Master Module the periodical information items for the *open-/closed-loop control function* are initialized with the value **0** and a status "faulty" dependent on the I/O Module.

After startup of the I/O Master Module all periodical information items from faultless inputs are written with the current preprocessed value, and the corresponding status "faulty" is reset.

The behavior of outputs upon communication failure is dependent on the I/O Module and can be defined for each output selectively with the parameter `Fail_behav`.

For binary information outputs the following behavior can be selected:

- **terminate** (default)
- **keep**

For current and voltage outputs the following behavior can be selected:

- **keep** (default)
- **substitute value**

If the substitute value is selected, in the following cases the value defined via parameter `fail_subst_value` is output:

Event	Description	Action
Power-on	Return of the supply voltage after failure	As long as no setpoint value was received, the parameterized substitution value is calculated and transferred as active value into the process image
Startup	Startup possible via • Remote command • Operation	With a remote startup the value is reset to the last value, independent of the parameterization; if a value never was received, the substitution value is output
Communication failure Master Module		Substitution value is output
Failure Master Module		Substitution value is output

11.5 Diagnosis

11.5.1 Distinction of the Error Types

The following listing explains the different error types and their logging.

- System errors
  - Supervision of the system, communication, time synchronization by the firmware of the configured system elements
    - Logging in the online diagnosis
    - Activation of the red error LED on the Master Module
- Parameterization errors (telecontrol function)
  - Supervision by the engineering tool
    - Specific conventions or plausibility checks
    - Indication upon entry or prevention of the transfer
  - Supervision online by the firmwares of the configured system elements
    - Logging in the online diagnosis
    - Activation of the red error LED on the Master Module

  If in the target device a parameterization is loaded that does not match with the mechanical present system elements, this leads to the indication of a hardware error.
- Programming errors (*open-/closed-loop control function*)
  - Supervision by CAEx *plus* (engineering via SICAM TOOLBOX II)
    - Specific conventions or plausibility checks
    - Indication upon entry or prevention of the transfer
  - Supervision by the CAEx *plus* compiler (engineering via SICAM TOOLBOX II)
    - Logging in the "Error state viewer"
  - Supervision by the ASCII-Compiler during startup (engineering via SICAM WEB)
    - Logging in the PLC diagnosis
  - Supervision online by the firmware of the Master Module
    - Logging in the online diagnosis
- Operator errors

  Are largely excluded due to plausibility checks or queries by the engineering tool (additional hints see Appendix C.1, Errors with the Engineering via SICAM WEB).

Note

Naturally, all operator inputs, such as for example the loading of parameters or the online testing, are subject to the responsibility of the user.

Profound knowledge of the automation technique in general, as well as the documents mentioned in the Preface is presumed.

Errors that are recorded in the online diagnosis are devided in diagnosis classes and contain further indications about the possible error cause, as well as hints for the error elimination (“cause“, “remedy“).

You find the meaning of the diagnosis classes in the manual *SICAM RTUs Common Functions System and Basic System Elements, chapter „System Services“, section „Diagnostic and Signaling“*.

You find the error indications recorded in the online diagnosis in the *SICAM TOOLBOX II Online Help, chapter "Parameter Documentation and Diagnosis Info", section "Diagnosis Information"*, under the respective firmware.

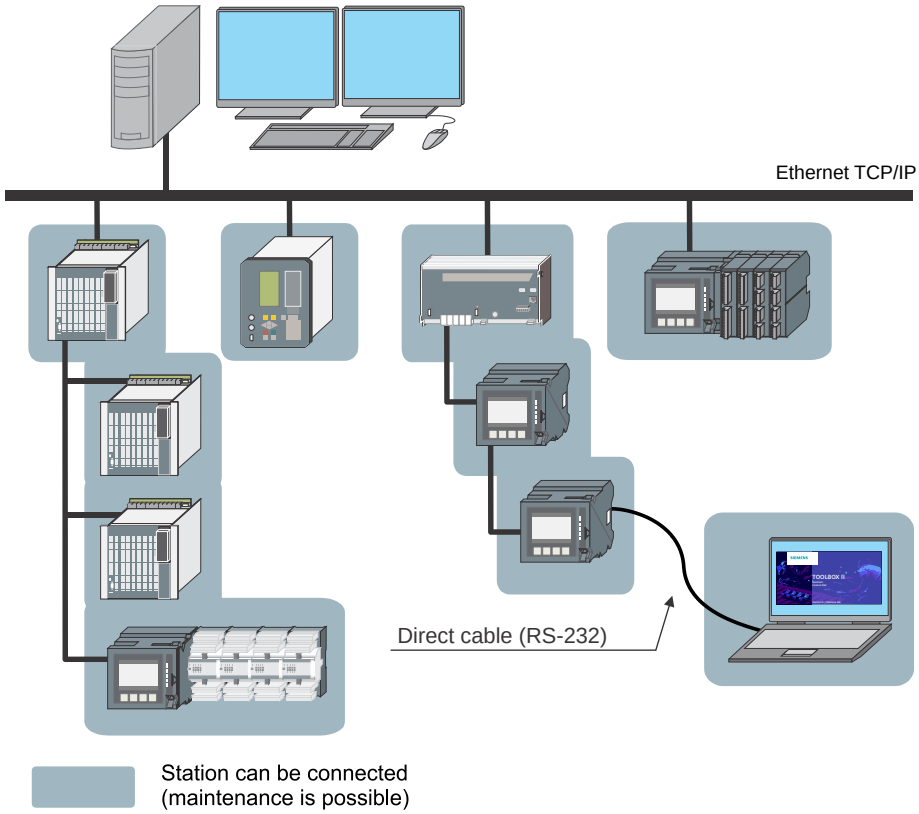
11.5.2 SICAM TOOLBOX II

11.5.2.1 Connection Possibilities for the Diagnosis

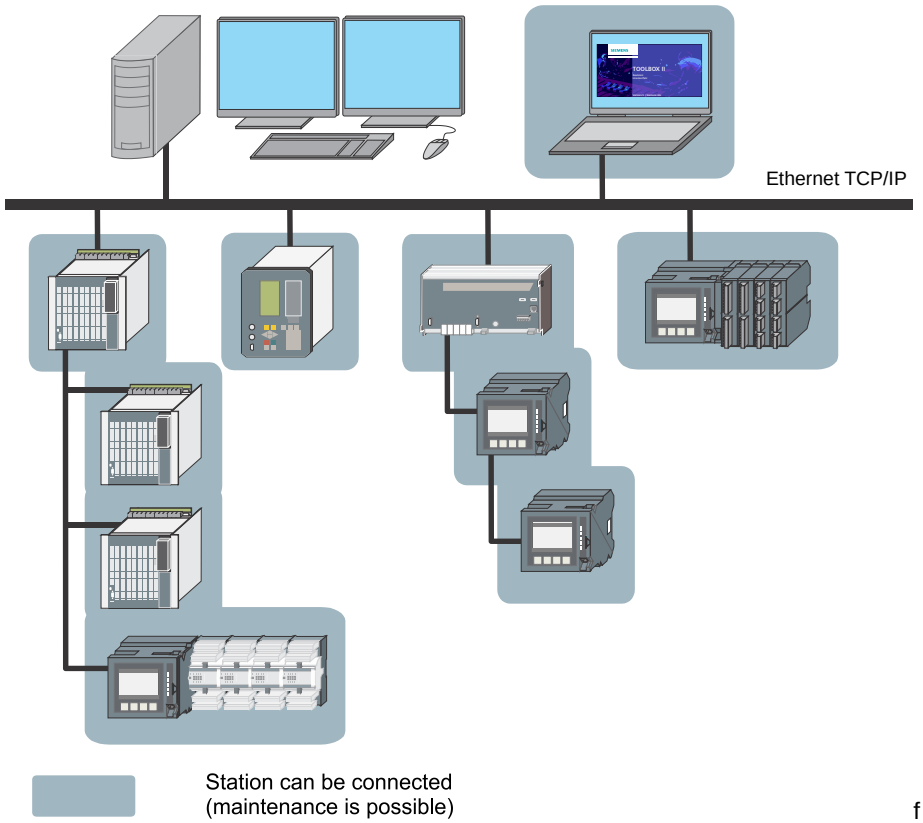
For the access to the diagnosis data of CP-8000/CP-802*x*, an online connection of the engineering PC to the target device is required. Reading access is at the same time possible locally and from the distance. Writing access (example: startup request to the target device) is only exclusively possible.

You find the basic connection possibilities in section 7.7.1, SICAM TOOLBOX II. Following you find some application examples.

Direct connection

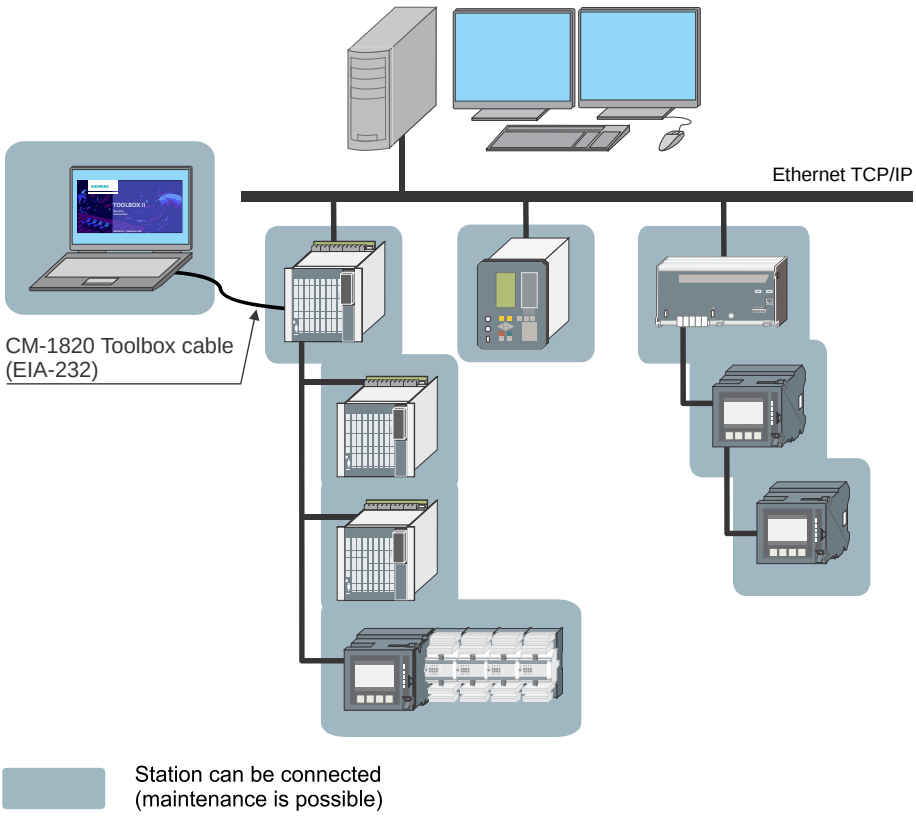


Connection via Ethernet



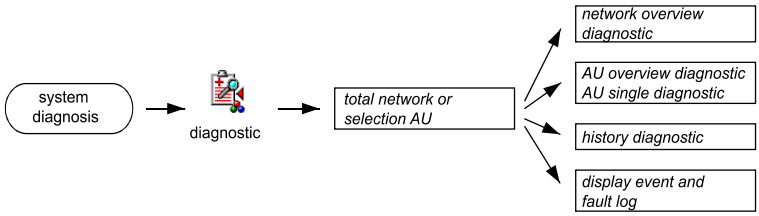
f

Remote connection via further automation units



11.5.2.2 Diagnosis Overview

CP-8000/CP-802*x* contains extensive diagnosis functions for monitoring the system. Since the firmware executes the appropriate error monitoring routines automatically, no settings by the user are necessary thereto.



With the tool "Diagnostic" (TOOLBOX II | Service Programs | Diagnostic), system states and error information items can be read, and printed out if required.

The following functions are available:

- Network overview diagnosis
  The error entries of all automation units in the network are output in a report window via the menu Network overview diagnostic (sum information).
- Acknowledge network
  Via the button Acknowledge network, the error entries of all automation units located in the network are deleted, insofar as they are no longer present.
- AU overview diagnosis
  The error entries of all automation units in the network are output in a report window via the menu AU overview diagnostic (sum information for each system element able to report).
- AU individual diagnosis
  The error entries of each system element in the AU are output in a report window via double-click on the respective AU.
- History Diagnosis
  The time dependent course of error entries is output in a report window via the menu History Diagnosis .
- Clear history diagnosis
  Via the button Clear, all error entries located in the history diagnostis are deleted, insofar as they are no longer present.
- Automatic diagnosis
  An overview of the error entries of all automation units in a network as well as their system elements is output in a report window via the menu Automatic diagnosis . The outputs are structured hierarchically in
  - Network overview diagnosis
  - AU overview diagnosis
  - AU single diagnosis
  - History (if preset)

Automatic Diagnosis (Example)

```
Autom. diagnosis

2012-10-02,15:31:05

Determine disturbed or failed AU from: R#015/C#000  1.

                              Network overview diagnosis
                              ==========================

AU          AU short t.                 Int  Ext  Comm CheckWarn BgA  Fail High User
-------------------------------------------------------------------------------------
015/000/--  CMIC 1                      I         C         W    B         H

=====================================================================================

                              AU overview diagnosis
                              =====================

015/000/--  CMIC 1

System element                                  Failure   Fault
-------------------------------------------------------------
M-CPU                : CP-8000/CPC80 Rev:01                 S
M-CPU    /PRE/0      : SM-3499/UMPST0 Rev:04.04             S
M-CPU    /PRE/1      : SM-3499/UMPMT0 Rev:--        A

=====================================================================================

                              AU individual diagnosis
                              =======================

015/000/--  CMIC 1

CPU detailed diagn.  CP-8000/CPC80 Rev:01  M-CPU

I    Internal error

 Error__rec 01 (01H): Basic system
 Error_bit 12:        Firmware code files missing

                      Cause:
                        - not all firmwares were loaded with this SD card
                      Solution:
                        - load firmware for automation unit

W    Warning

 Error__rec 51 (33H): Time synchronisation
 Error_bit 07:        Clock in the automation unit not set

                      Clock of the automation unit runs since reset with relative
                      time


B    Board failure

 Error__rec 70 (46H): Protocol element
 Error_bit 01:        Protocol element 01 failed
 Error_status 02 :    Protocol element not equipped or defective
                      Solution:
                      - Equip or exchange protocol element


H   Startup

Stop   Print   Close
```

You find further details on the diagnosis functions in the *SICAM TOOLBOX II Online Help, chapter "Diagnosis"*.

You find the d description of the diagnosis functions in the manual *SICAM RTUs Common Functions System and Basic System Elements, chapter "System Services", section "Diagnosis"*.

11.5.2.3 System Performance

Information on the system performance of a selected automation unit can be interrogated with the tool "Online Maintenance Function".

The following functions are available:

- Display equipped system elements
- Read serial numbers
- Display/delete data flow routing
- Shut down selected system elements
- Shut down selected automation unit
- Startup selected system elements
- Startup automation unit
- Display time
- Memory check
- Data processing capacity
- Control- and bus runtime

You find further details on the maintenance functions in the *SICAM TOOLBOX II Online Help, chapter “Service Programs”, section “Special Programs | Service Function Online"*.

11.5.2.4 Diagnosis of the Open-/Closed-Loop Control Function

With the tool "CAEx *plus*" the following status information can be displayed for each task with the function `ONLINE Test` :

- Parameterized cycle time
- Current runtime
- Minimum/maximum runtime
- Number of runtime time-outs
- Bus runtime

You find further information in the manual *SICAM RTUs Common Functions System and Basic System Elements, chapter "Automation", section "Open-/Closed-loop Control Function", section "Display Status Information"*.

Errors that can occur with the creation of the function diagram (for example the linking of a binary signal to an analog input of a function) are displayed in a separate report window ("POU error check"):

- Automatic upon incorrect input
- Manually with the function `Early error detection` (pop-up menu in the function diagram)

You find the exact details in the *CAEx plus Online Help, chapter "Editors", section "FBD Editor", section "Operation in FBD Editor"*.

Errors with Engineering

Errors that can occur with engineering are displayed centrally in the "Error-state viewer" of "CAEx *plus*". It essentially concerns thereby

- Indications of the installation
- Indications of the export/import
- Indications of the project management
- Indications of the FBD editor
- Indications of the code generation
- Object-related indications
- Indications of the object assistant
- Indications of the typical import
- Indications of the signal list
- Indications of hardware signal data bases

The indications are created after the initiation of a function (for instance "code generation").

You find the exact details in the *CAEx plus Online Help, chapter "Additional Products", section "Error-State Viewer"*.

Errors with the Target Device Connection

Errors that can occur with the target device connection are displayed centrally in the "Error-state viewer" of "CAEx *plus*". It concerns thereby notofications

- of the target device connection
- of the code generator
- of the control panel
- of the online applications
- of the "Open Operating System"
- of the target device integration in the project management
- of the "openPLC"

You find the exact details in the *CAEx plus Online Help, chapter "Target System Connection", section "Program Messages for Target System Connection"*.

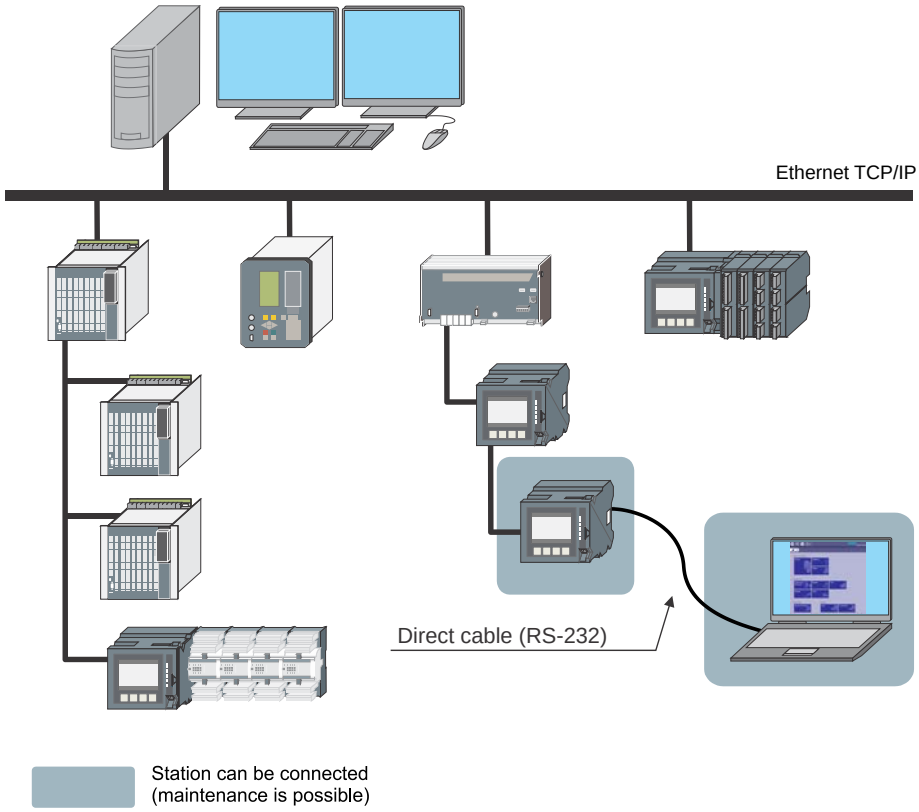
11.5.3 SICAM WEB

11.5.3.1 Connection Possibilities for the Diagnosis

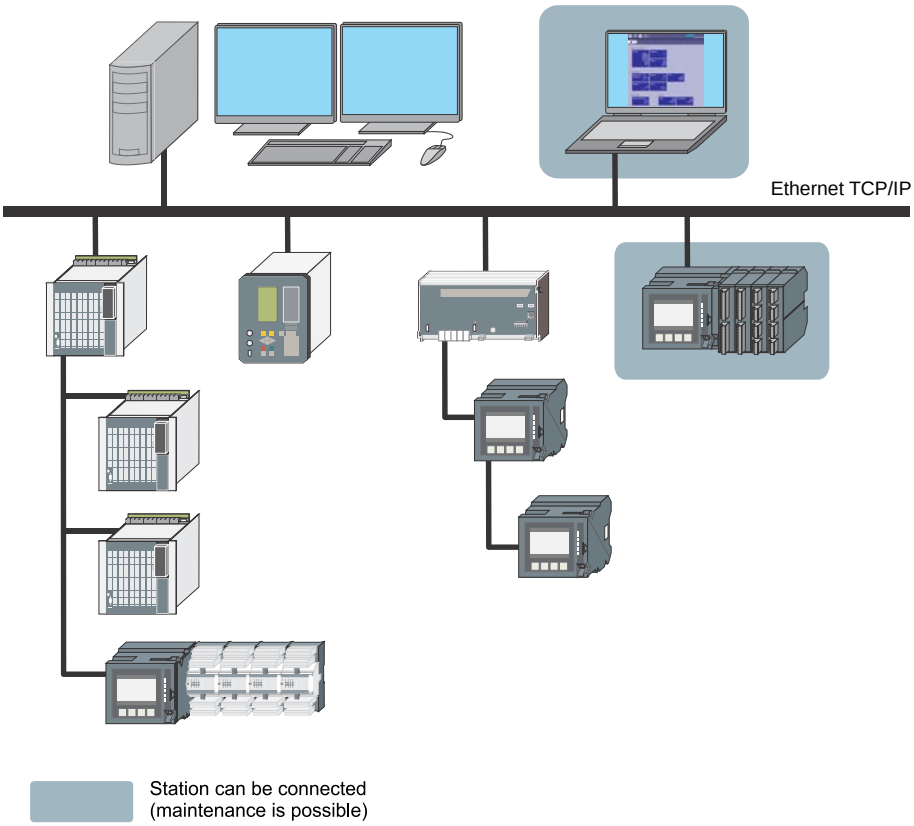
For the access to the diagnosis data of CP-8000/CP-802*x*, an online connection of the engineering PC to the target device is required. Reading access is also possible if the target device was engineered via the SICAM TOOLBOX II. Writing access (example: startup request to the target device) is only exclusively possible.

You find the basic connection possibilities in section 7.7.2, SICAM WEB. Following you find some application examples.

Direct Connection



Connection via Ethernet



11.5.3.2 Diagnosis Overview

CP-8000/CP-802*x* provides an automatic diagnosis system. This recognizes ocurring errors, and generates corresponding indications.

The system diagnosis can be read out in different menus:

- Device information
- Diagnosis indications
  - Diagnosis status
  - Diagnosis logbook

The recorded indications are differentiated in:

- Errors with the hardware (modules and wiring)
- Errors with the communication
- Errors with the parameter setting
- Errors with the application program

Note

Error indications may contain additional statements about the possible error cause and notes for the error removal.

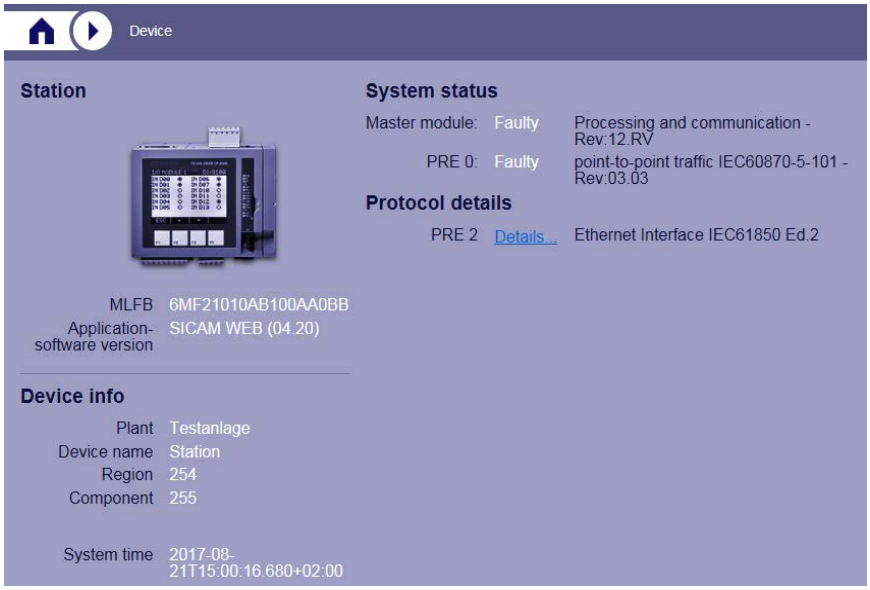
11.5.3.3 Device Information

- Menu `Home | Device`

On the device page, you can see the specific information of the target device:

- Device view
- Article number
- Application software and revision level
- Device information according to settings
- System time

Example for CP-8000

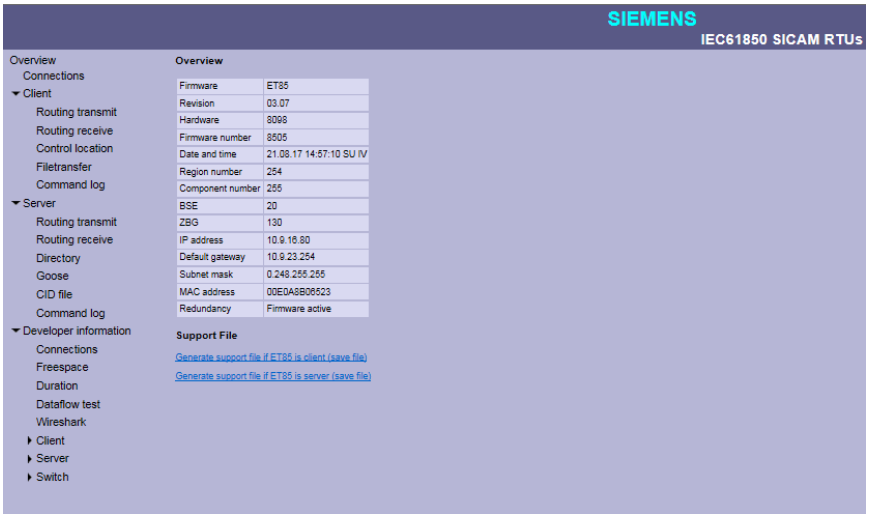


Under **System status** you will see those system elements of the target device with the loaded firmware that are <u>not</u> in the *OK* state:

- System element (Master Module, I/O Master Module, I/O Module, protocol element)
- Status: Faulty (system element in the *OK* state are not displayed)
- Designation of the system element
- Revision level of the loaded firmware

Under **Protocol details** resides in case of a protocol according to IEC 61850 a hyperlink to the webserver of the protocol element. Prerequisite is that the web server has been activated (in the directory tree under **SICAM A8000 CP-80xx | Master module | PRE** *<0…3>***: Ethernet Interface IEC61850 Ed.2 | HTTP web server** = **enabled**).

To connect with the IEC 61850 web server click on Details…, the protocol details will be opened in a new tab of the web browser:

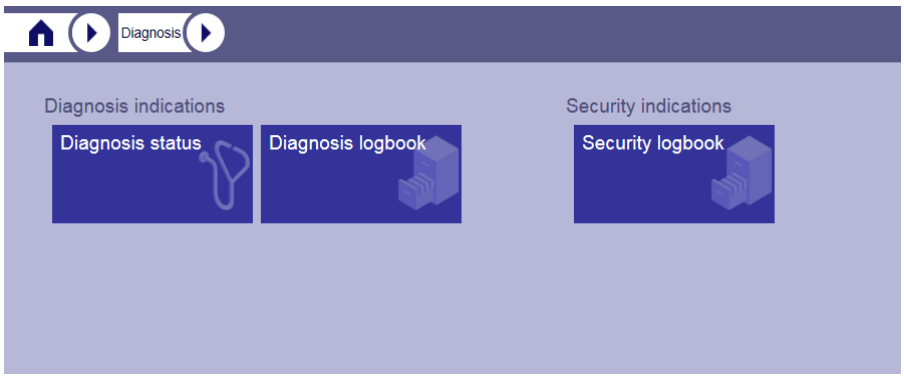


You find further information for that in the manual *SICAM RTUs Common Functions Protocol Elements, chapter "LAN Communication (61850)", section "Web Server"*.

Example for CP-8022

11.5.3.4 Diagnosis

- Menu Home | Diagnosis

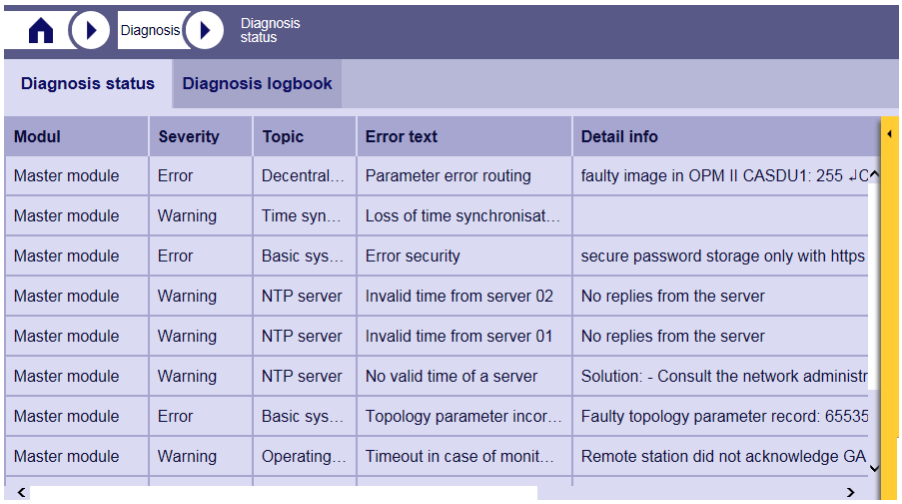


11.5.3.4.1 Diagnosis Status

When opening the diagnosis status page, the currently existing errors will be read from the target device and will be listed in a table as plain text.

Note

The reading of all diagnosis indications may take some time depending on the communication connection. The process cannot be aborted.



Modul	Severity	Topic	Error text	Detail info
Master module	Error	Decentral...	Parameter error routing	faulty image in OPM II CASDU1: 255 JC
Master module	Warning	Time syn...	Loss of time synchronisat...	
Master module	Error	Basic sys...	Error security	secure password storage only with https
Master module	Warning	NTP server	Invalid time from server 02	No replies from the server
Master module	Warning	NTP server	Invalid time from server 01	No replies from the server
Master module	Warning	NTP server	No valid time of a server	Solution: - Consult the network administr
Master module	Error	Basic sys...	Topology parameter incor...	Faulty topology parameter record: 65535
Master module	Warning	Operating...	Timeout in case of monit...	Remote station did not acknowledge GA

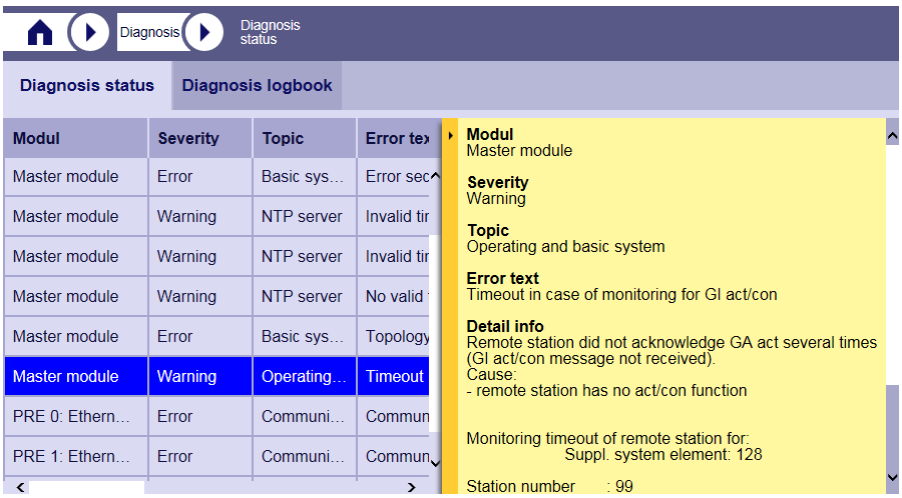
The diagnosis shows all current errors in the target device. The display takes place in plain text in chronological order.

The content of each column (exception: Detail info) can be sorted descending or ascending.

The table contains the following columns:

Column Name	Designation
Module	Name of the system element
Severity	Informational Warning Error
Topic	for easy navigation, e.g.:: operating system, , startup, communication to station xy, protocol element and so on
Error text	Short description
Detail info	Detailed description
Error class	Board failure Communication Intern Startup Warning Event
Error ID	Failure ID

If you select a row of the table, an area with more detailed information is opened on the right side.



Note

When reopening the diagnosis status page within the same session, the displayed diagnosis status indications will not be refreshed.

This is how to update diagnosis status indications:

- Click on the general button for reading again all diagnosis status indications from the device

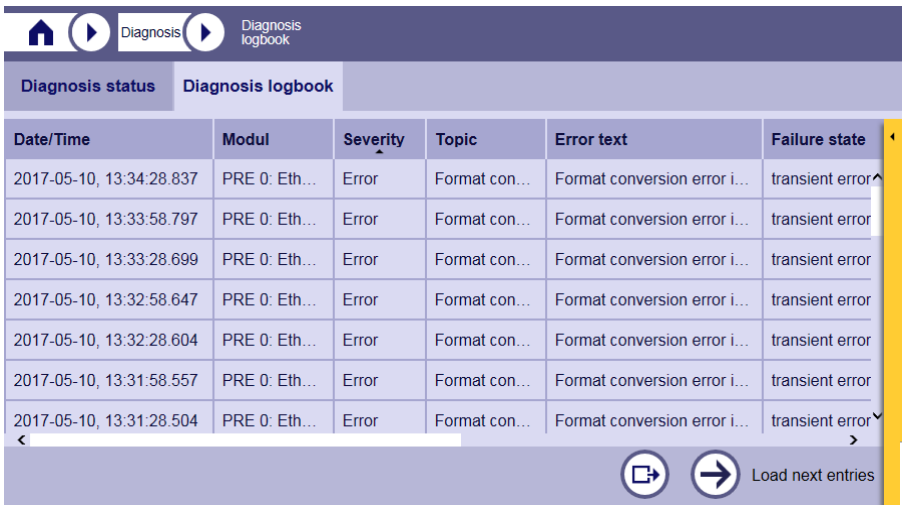
The existing table will be deleted and all detail information will be read out completely from the device and will be listed in a table.

11.5.3.4.2 Diagnosis Logbook

When opening the diagnosis logbook page, the recorded indications will be read from the target device and will be listed in a table as plain text.

Note

The reading of all diagnosis logbook indications may take some time depending on the communication connection. The process cannot be aborted.



The diagnosis logbook shows the chronological sequence of all coming and going errors in the target device. The display takes place in plain text in chronological order (resolution 1 ms).

The content of each column (exception: detail info) can be sorted descending or ascending.

The table contains the following columns:

Column Name	Designation
Date/time	Time stamp of the diagnosis entry
Module	Name of the system element
Severity	Informational Warning Error
Topic	for easy navigation, e.g.: operating system, startup, communication to station xy, protocol element and so on
Error text	Short description
Error state	Raising or cleared error
Detail info	Detailed description
Error class	Board failure Communication Intern Startup Warning Event
Error ID	Failure ID

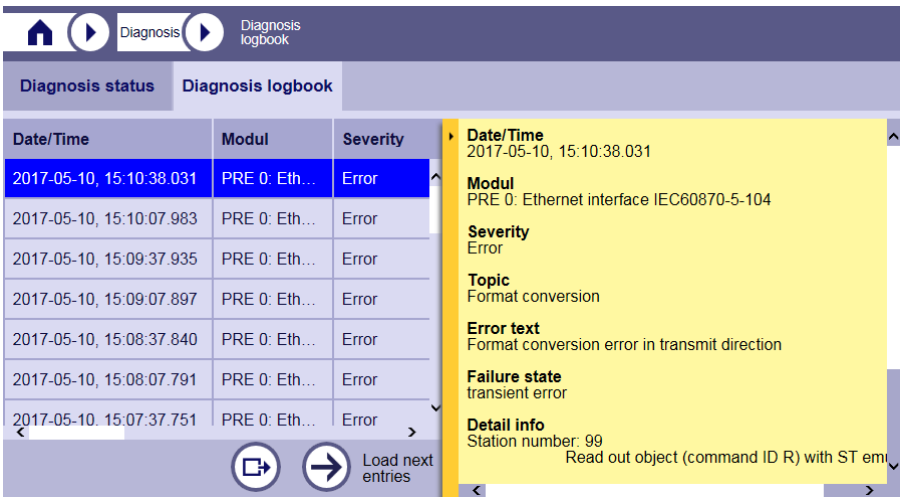
With the initial reading in a session, the 30 most current entries are displayed.

- Click on the button , if you want to see entries with an earlier timestamp

Thereupon, the next older indications are loaded and displayed. As long as not all indications have been loaded, the button remains activated.

The error table captures up to 10000 entries and is stored non-volatile. If the error table is full, the respective oldest entry will be overwritten with the most current one (ring buffer).

If you select a row of the table, an area with more detailed information is opened on the right side.



- Click on the sidebar right beside the table, if you want to hide the detailed description of the selected entry

Note

When reopening the diagnosis logbook page within the same session, the displayed indications will not be refreshed.

This is how to update diagnosis logbook indications:

- Click on the general button for reading again all diagnosis logbook indications from the device

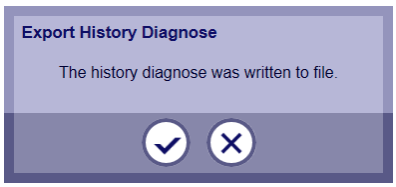
The existing table will be deleted and only those entries which have been created by the device since the last reading procedure will be read out from the device and will be listed in a table.

11.5.3.4.3 Export Diagnosis Logbook

With the export function you can save the diagnosis entries which are recorded in the ring buffer in a file on your PC.

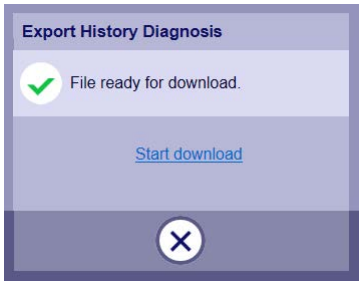
- Click on the button

The target system saves the records in a file.



- You can abort the procedure by clicking on
- Click on the button in order to start the export

After the export, the file is provided for the download (format *.csv*). A dialog is opened with the link Start download.



- Click with the right mouse button on the link

A dialog for the selection of the saving path is opened. The default file name can be changed, if needed. Follow the instructions of your web browser.

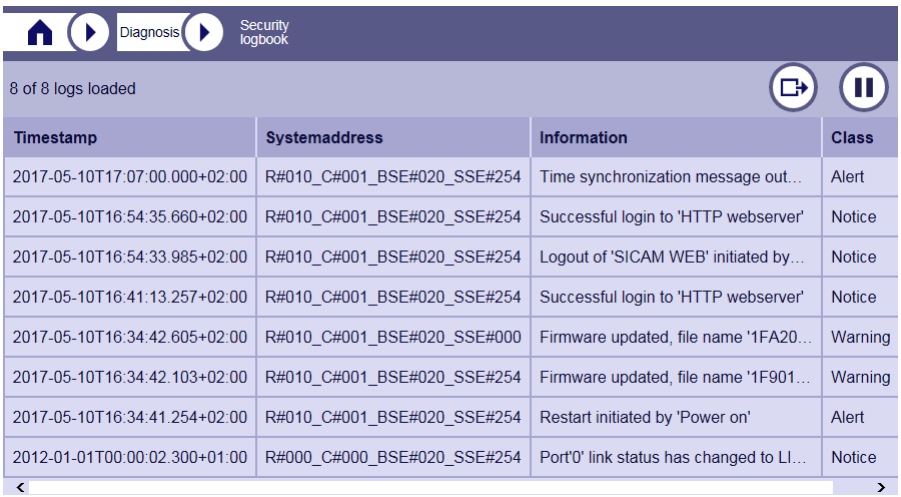
- You can abort the procedure by clicking on

11.5.3.4.4 Security Logbook

When opening the security logbook page, the recorded indications will be read from the target device and will be listed in a table as plain text.

Note

The reading of all security logbook indications may take some time depending on the communication connection. The process cannot be aborted.



Timestamp	Systemaddress	Information	Class
2017-05-10T17:07:00.000+02:00	R#010_C#001_BSE#020_SSE#254	Time synchronization message out...	Alert
2017-05-10T16:54:35.660+02:00	R#010_C#001_BSE#020_SSE#254	Successful login to 'HTTP webserver'	Notice
2017-05-10T16:54:33.985+02:00	R#010_C#001_BSE#020_SSE#254	Logout of 'SICAM WEB' initiated by...	Notice
2017-05-10T16:41:13.257+02:00	R#010_C#001_BSE#020_SSE#254	Successful login to 'HTTP webserver'	Notice
2017-05-10T16:34:42.605+02:00	R#010_C#001_BSE#020_SSE#000	Firmware updated, file name '1FA20...	Warning
2017-05-10T16:34:42.103+02:00	R#010_C#001_BSE#020_SSE#254	Firmware updated, file name '1F901...	Warning
2017-05-10T16:34:41.254+02:00	R#010_C#001_BSE#020_SSE#254	Restart initiated by 'Power on'	Alert
2012-01-01T00:00:02.300+01:00	R#000_C#000_BSE#020_SSE#254	Port'0' link status has changed to LI...	Notice

The security logbook shows the chronological sequence of all coming and going errors in the target device. The display takes place in plain text in chronological order (resolution 1 ms).

The table contains the following columns:

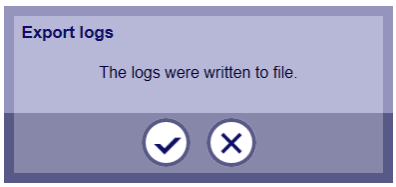
Column Name	Designation
Time stamp	Time stamp of the security-relevant information
System address	Address of the corresponding hardware
Information	Region number Component Master Module address Supplementary Module address
Class	Notice Warning Alert

11.5.3.4.5 Export Security Logbook

With the export function you can save the diagnosis entries which are recorded in the ring buffer in a file on your PC.

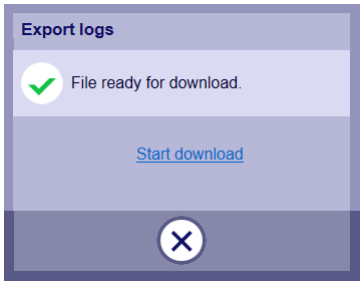
- Click on the button

The target system saves the records in a file.



- You can abort the procedure by clicking on
- Click on the button in order to start the export

After the export, the file is provided for the download (format *.csv*). A dialog is opened with the link Start download.



- Click with the right mouse button on the link

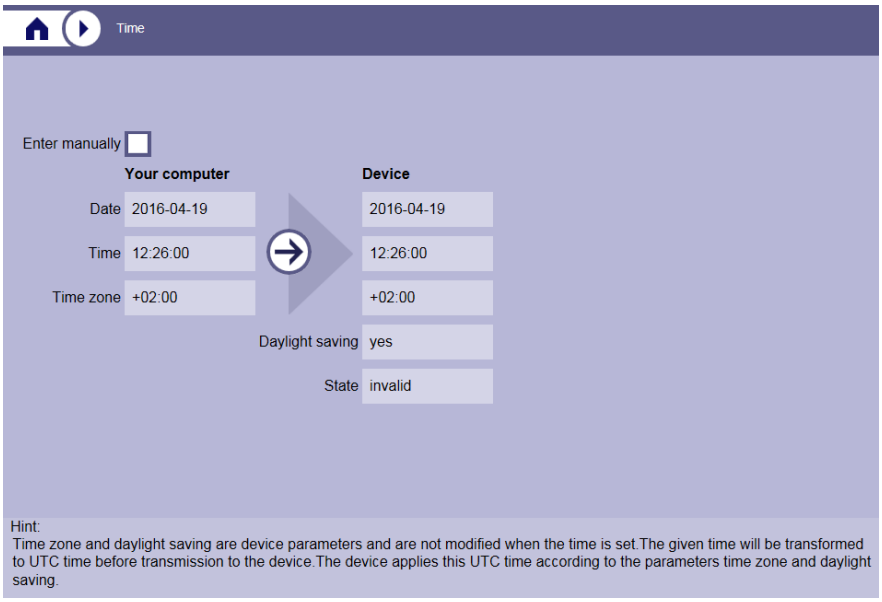
A dialog for the selection of the saving path is opened. The default file name can be changed, if needed. Follow the instructions of your web browser.

- You can abort the procedure by clicking on

11.5.3.5 Diagnosis of the Time

Via the menu Time you get to the time diagnosis. Here the time state is displayed.

The time state indicates whether the time has a daylight saving offset and is valid.



Errors with the time synchronization are recorded in the Diagnosis status and in the Diagnosis logbook.

11.5.3.6 Diagnosis of the Open-/Closed-Loop Control Function

For the supervision of the *open-/closed-loop control function* several diagnosis functions are available.

Errors due to the logic operations or by means of external influence are displayed in the Diagnosis logbook. The corresponding supervision routines are performed automatically, no user settings are required therefore.

Errors due to the syntax or program size are recognized automatically after the loading and displayed in the status log (see section 9.2.2.1.1, Import Application Program).

If the IL was loaded offline (via storage in the root directory of the SD card), you can start the syntax check manually in the menu Logic .

- Click on the button

The check result is displayed in the bottom tool bar. In case of error the details are displayed in the status log.

- Click on the global button , if you want to read the status log

11.6 Maintenance of the Hardware

11.6.1 Recognition of Hardware Errors

11.6.1.1 Internal Modules

With startup and during the operation CP-8000/CP-802*x* supervises the hardware. A faulty or failed module is notified by means of the error LED on the system and, if accasion arises, on the faulty I/O Module. Further, a record in the online diagnosis takes place.

If a hardware error exists, a replacement of the respective device is required.

11.6.1.2 SD Card

CP-8000/CP-802*x* accesses with each startup the SD card and checks it. The following cases lead to errors with the SD card:

- SD card not available
- SD card defective
- Wrong type of SD card
- SD card empty
- SD card not formatted
- Checksum error with firmware codes
- Checksum error with parameter files

Possible causes for a checksum error are power failure or write error during a loading processes on the SD card.

Upon startup with erroneous SD card the supplementary system elements are not started, hence for instance no remote communication is possible.

CP-8000/CP-802*x* accesses also during operation the SD card due to operator control actions or loading processes. With missing SD card loading processes are blocked. With engineering via SICAM WEB the access is blocked, with loading of web pages (change of the menu) the web browser notifies an error. The target device performs an automatic logoff. The logon is only possible again with inserted SD card.

Warning

Inserting the SD card during operation leads to a restart of the relevant target device!

11.6.2 Replacement of a Module

Warning

The removal and attachment of energized modules is not allowed.

For modules that operate with voltages >60 V, care must be taken that manipulation on the peripheral connectors may only be carried out in a de-energized state.

The display (LCD, LED) of the modules do not grant a guarantee that the peripheral connectors are de-energized.

When replacing a module by the same type (same revision level), the engineering data (parameters and application program) stored on the SD card can be applied automatically for the new module.

If the relevant type is no longer available, then the appropriate successor product is to be used. When replacing a module by another type, an anew parameterization is necessary. This applies in particular, if something in the functionality of a module (firmware) was changed, or a module was removed or added. In this case, the corresponding firmware update must be loaded before the parameter-setting takes place (see section 11.5, Firmware Update).

The replacement of a module is achievable without a special tool. Please consider the instructions in the sections 6.4, Mounting of CP-8000 and 6.5, Mounting of CP-802x.

After the replacement of a system, this is operational after a startup.

Master Module

- Detach the terminals from the module
- Detach the communication cables from the module
- Remove the module from the DIN rail
- Before replacing the Master Module, you can unlock and withdraw the SD card through pressing, and then insert it easily in the new Master Module
- Put the new module in place of the withdrawn system on the DIN rail
- Attach the communication cables at the module
- Attach the terminals at the module

Note

With CP-8000, internal modules cannot be exchanged.

I/O Modules

The connection of the process signals takes place by means of withdrawable screw terminals. Since these screw terminals carry the wiring, you do not need to loosen any wires upon module exchange.

- Detach the terminals from the module
- Remove the module from the DIN rail
- Put the new module in place of the withdrawn system on the DIN rail
- Attach the terminals at the module

11.6.3 Adapt New Equipped I/O Modules in the Parameterization

- Remove the I/O Master Module in the parameterization and click on the button
- After request, carry out a startup of the target device
- Add the I/O Master Module again and click on the button
- After request, carry out a startup of the target device

CP-8000/CP-802*x* "learns" thereby the new equipped I/O Modules.

Note

Please consider that with the removal of the I/O Master Module the existing parameterization (configuration and settings of the I/Os) is lost.

With startup the parameterization of the learnt I/Os is built up newly with the default values.

11.6.3.1 Adding I/O Modules

Additionally equipped I/O Modules are recognized by CP-8000/CP-802*x* and "learnt“ upon startup, without notifying an error thereby. With parameterization via SICAM WEB, new modules are added automatically in the directory tree.

11.6.4 Replacement of the SD Card

New SD cards can be ordered at Siemens, see appendix A.9, Memory Cards.

You find the hints for the replacement of the SD card in section 6.6.1, SD Card.

Caution

Insert or remove the SD card only in the de-energized Master Module. The contents of a SD card can become invalid if it is removed during a running write procedure. If occasion arises, the contents of the SD card must be deleted and written newly again.

You find further technical information in the manual *SICAM RTUs Common Functions System and Basic System Elements, chapter "System Services", section "Data Storage on Flash Card"*.

11.6.4.1 Initialization of the Firmware

With use of a suitable, still empty SD card, you must download the Firmwares from the website http://www.siemens.com/sicam and copy it into the root directory of the SD card.

- *CPC80*
- optionally firmware for protocols
- optionally firmware for periphery
- *SWEB00* in case of parameterization via SICAM WEB

When the required files are stored on the SD card, insert the SD card into the de-energized target device and switch that on. During startup the firmwares are configured in the target device.

Note

The startup may last up to 15 minutes (depending on the number of firmwares).

11.6.5 Replacement of the SIM Card (only CP-8022)

When signing a new mobile radio contract or whith change of the mobile network provider you will be supplied with a new SIM card.

For the activation of the GPRS communication you must replace the hitherto used SIM card by the new one.

You find the hints for the replacement of the SD card in section 6.6.2, SIM Card.

Note

Removing or inserting the SIM card is allowed only in the de-energized device!

Subsequently, the access data must be adapted in the parameterization, see 9.1.2.6, Settings for Internal GPRS Modem (CP-8022).

11.7 Firmware Update

In CP-8000/CP-802*x*, a new system element or the functionality of a system element can be updated in need. For each system element, an individual loadable firmware is provided. You find information thereto in section 7.3, Loadable Firmwares.

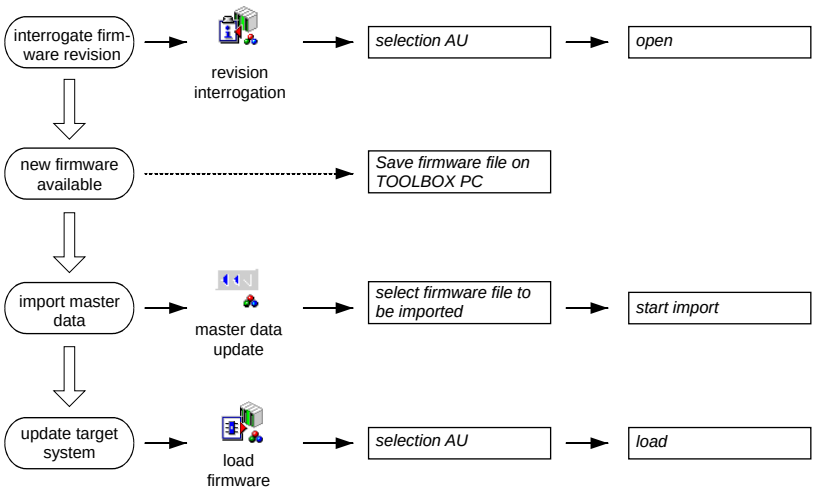
For the accomplishment of firmware updates different methods are possible:

- Engineering via SICAM TOOLBOX II
  - online
  - offline
- Engineering via SICAM WEB
  - online
  - offline

11.7.1 SICAM TOOLBOX II

The SICAM TOOLBOX II contains after its installation all current firmware revisions (based on the date of issue of the installed version).

Procedure for the Update of System Elements



11.7.1.1 Interrogation of the Firmware Revision

The firmware revisions of all configured system elements (Master Module, I/O Master Module, protocol elements) can be displayed and printed with the tool "Revision Interrogation and Display" for a selected automation unit.

You find further details on the tool in the *SICAM TOOLBOX II Online Help, chapter "Service Programs", section "Revision Interrogation and Display"*.

11.7.1.2 Importing Master Data into the SICAM TOOLBOX II

New firmware codes can be loaded into the SICAM TOOLBOX II with the tool "Master Data Update". Thereto belong

- Libraries for the tool OPM II
- Firmwares of SICAM RTUs system elements

You find the details thereto in the *SICAM TOOLBOX II Online Help, chapter "OPM II", section "Master Data Update"*.

An additional option provides the tool "Live Update". You find the information thereto in the *SICAM TOOLBOX II Online Help, chapter "Service Programs", section "Live Update"*.

11.7.1.3 Loading Firmware Codes into the Target Device

Firmware codes that are stored in the SICAM TOOLBOX II can be loaded into a target device.

11.7.1.3.1 Loading Firmware Online

For the accomplishment the engineering PC must be connected with the target device, and a suitable SD card must be inserted in the target device. The configuration options listed in section 7.7.1, SICAM TOOLBOX II apply.

Note

A serial connection via modem is not supported.

With the tool "Load Firmware" (`TOOLBOX II` | `Service Programs`) you can load firmware codes into the target device. The following options are available:

- Load intelligent
  The latest firmware revision available in the SICAM TOOLBOX II is loaded, if it is more current than that one on the corresponding system element
- Load unconditional
  The latest firmware revision available in the SICAM TOOLBOX II is loaded

You find the instructions thereto in the *SICAM TOOLBOX II Online Help, chapter "Service Programs", section "Load Firmware"*.

11.7.1.3.2 Loading Firmware Offline

For the accomplishment a SD card reader/writer must be connected on the Toolbox PC, and a suitable SD card must be inserted.

With the tool "OPM II" you can select the corresponding AE via the menu `Tools` | `System technique` . Via the context menu of the automation unit `Flashcard` | `create files...` you can transfer firmware files on a SD card.

You find the details thereto in the *SICAM TOOLBOX II Online Help, chapter "OPM II", section "System technique | SICAM RTUs | Load Flashcard"*.

Insert the SD card afterwards in the de-energized target device, and then switch on the power supply. The target device performs a startup (duration up to 15 minutes depending on number and size of the loaded files) and loads thereby the firmwares of the corresponding modules.

11.7.2 SICAM WEB

11.7.2.1 Loading Firmware Codes into the Target Device

With engineering via SICAM WEB, updated firmware codes that are provided on the website http://www.siemens.com/sicam can be loaded into a target device in a simple manner.

Note

SICAM TOOLBOX II firmware updates can not be loaded via SICAM WEB.

11.7.2.1.1 Loading Firmware Online

For the accomplishment the engineering PC must be connected with the target device, and a suitable SD card must be inserted in the target device. The configuration options listed under section 7.7.2, SICAM WEB apply.

Via the menu `Upload/Download` you can load each time 1 firmware file directly into the target device. You find the instruction thereto in the section 9.3.7, Update Firmware.

With loading the firmware is stored on the SD card in the target device. Afterwards the target device performs a startup, whereby the belonging module is updated (if already configured). Not yet configured system elements appear now in the selection in the menu `Configuration` .

Note

For the loading via SICAM WEB an already running firmware *CPC80* and *SWEB00* must exist in the target device. This is already loaded on the SD card equipped in the target device ex works.

11.7.2.1.2 Loading Firmware Offline

For the accomplishment a SD card reader/writer must be connected on the engineering PC, and a suitable SD card must be inserted.

- Copy now the required firmware files from the PC into the root directory of the SD card
- Insert the SD card afterwards in the de-energized target device
- Then switch the power supply on

The target device performs a startup (duration up to 15 minutes depending on number and size of the loaded files) and loads thereby the firmwares of the corresponding modules (if already configured).

11.7.3 Errors with Loading of Firmware

For a perfect functioning of the Master Module, it is absolutely necessary that the loading process completes without errors.

If the loading process is terminated with an error, cancel it. Afterwards, start the loading process again and attempt to complete without error. If an error occurs again, check the record in the diagnosis and the lighted display on the Master Module.

The following reasons lead to a malfunction of the Master Module:

- Voltage failure
- Premature abortion by the user
- Failure (defect, shutdown) of the engineering PC
- Abortion due to hardware error
- Abortion or excessively long fault of the communication connection between engineering PC and target device

You find further technical information in the manual *SICAM RTUs Common Functions System and Basic System Elements, chapter "System Services", sections "Loading Operation" and "Firmware Shut Down"*.

11.8 Secure Factory Reset

With a Secure Factory Reset, the device is set to the same state as a new one on delivery from the factory. This means that the following security-relevant information is deleted from the customer system or set to its factory settings:

- All applications (firmwares), except CPC80, SWEB00
- All configurations (parameters, user management, users, passwords, keys, certificates)
- All logging and diagnostic information (diagnostic logbook, security log)
- All data on the SD card

When is a Secure Factory Reset necessary?

- The device is defective and should be returned to the factory.
- Using the role concept and secure configuration, all interfaces were configured as secure (no more access possible) and the admin password was forgotten/lost.

Procedure as of *CPC80* V14

- Format the SD card On the SD card
- Place a text file named *FactoryReset.txt* in the root directory.

Contents of the file: FactoryReset

- Insert the SD card into the Master Module and switch on the device.
- Wait until the RY LED lights up (may take up to 15 minutes)

Procedure until *CPC80* V13

- Format the SD card
- By SICAM TOOLBOX II:
  - Create a new AE and use this configuration to create the SD card
- By means of SICAM WEB:
  - Copy the file *SC8-080-1_13.bin* to the SD card
- Insert the SD card into the Master Module and switch on the device
- Wait until the RY LED lights up (can take up to 15 minutes)

Compare Factory Settings to Default Settings

The following table shows the points affected by a Secure Factory Reset and their configuration after the reset in the "Factory Settings" column. In addition, the "Default Settings" of these items are listed in the next column for comparison.

As of *CPC80* V14

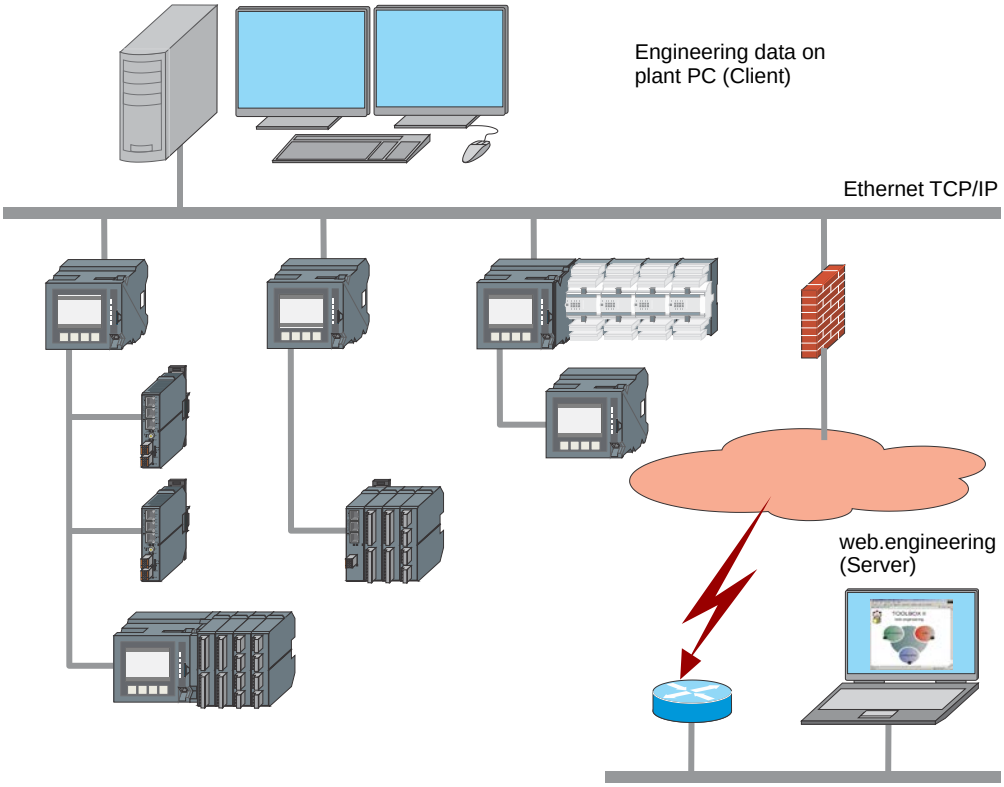
Item	**Factory settings**	**Default settings → new AU, configured via SICAM TOOLBOX II**
Firmwares/applications	*CPC80*, *SWEB00* (version according to the latest loaded version)	*CPC80*, *SWEB00* (version according to the latest loaded version)
Region number	249	Is defined with creating of the AU
Component number	254	Is defined with creating of the AU
X1 TCP/IP address	172.16.0.3	172.16.0.3
Remote operationa	disabled	Disabled
Web browser for SICAM WEB (https)	enabled via …	Enabled via …
Serial connection with SICAM TOOLBOX II	enabled via …	Enabled via …
Standard user	Administrator (no password set)	Administrator (no password set)
Mode of the SD card	Spare part concept	Spare part concept

Until *CPC80* V13

Item	**Factory settings**	**Default settings → new AU, configured via SICAM TOOLBOX II**
Firmwares/applications	*CPC80*, *SWEB00* (version according to the latest loaded version)	*CPC80*, *SWEB00* (version according to the latest loaded version)
Region number	249	Is defined with creating of the AU
Component number	254	Is defined with creating of the AU
X1 TCP/IP address	172.16.0.3	172.16.0.3
Remote operationa	disabled	Disabled
Web browser for SICAM WEB (https)	enabled via …	Enabled via …
Serial connection with SICAM TOOLBOX II	enabled via …	Enabled via …
Standard user	Administrator (no password set)	Administrator (no password set)

11.9 Remote Maintenance

With the help of the "web.engineering" option, you can remotely operate (remote maintenance session) a remote SICAM TOOLBOX II that can be reached via a data connection (Modem, ISDN, LAN/WAN) with a controlling PC (remote maintenance center).



With "web.engineering" all SICAM TOOLBOX II clients work with a central web server which is running the SICAM TOOLBOX II. The SICAM TOOLBOX II is operated thereby in the web browser.

11.9.1 Configuration of Server and Clients

Install on the web server Microsoft Windows with "Terminal Services Web Access" (TS Web Access). After that install the SICAM TOOLBOX II on this server.

On the clients is no installation required, the access to the web server takes place via the Microsoft Internet Explorer (as of version 5.0).

You find a detailed description of the configuration in the *SICAM TOOLBOX II Online Help, chapter "web.engineering"*.

A Order Information

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A.8 Cables and Plugs ... 573
A.9 Memory Cards ... 575
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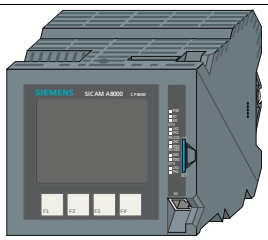
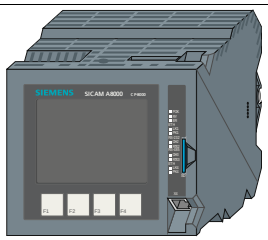
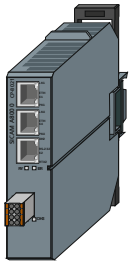
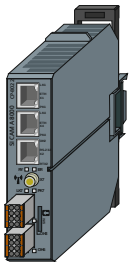
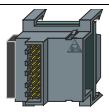
A.1 Basic Units

	Designation	MLFB
	CP-8000 Master Module with I/O Temperature range -25 to +70°C	6MF2101-0AB10-0AA0
	CP-8000 Master Module with I/O Temperature range -40 to +70°C	6MF2101-1AB10-0AA0
	CP-8021 Master Module Temperature range -40 to +70°C Note: External power supply module required	6MF2802-1AA00
	CP-8022 Master Module Temperature range -40 to +70°C Note: External power supply module required	6MF2802-2AA00

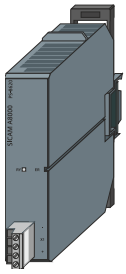
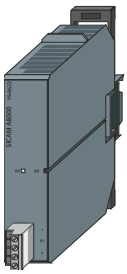
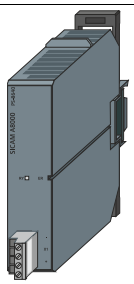
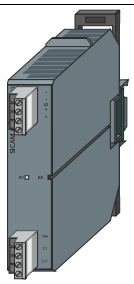
Note

With delivery, the respective system is already equipped with an SD card.

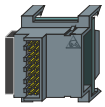
Spare Part

	Designation	MLFB
	CM-8812 Bus Connector SICAM I/O Set with 10 pcs. (included with CP-802x modules)	C53207-A5812-D481-3
	Locking Hook CP-8000 Set with 10 pcs.	C53207-A520-D4-1
	Locking Hook SICAM A8000 3cm Module Set with 10 pcs.	C53207-A5014-D481-1

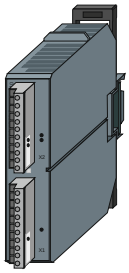
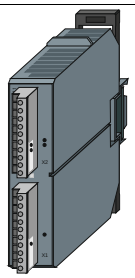
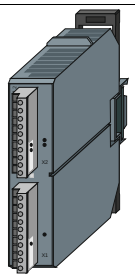
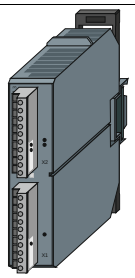
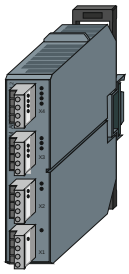
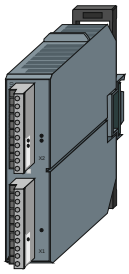
A.2 Power Supply Modules

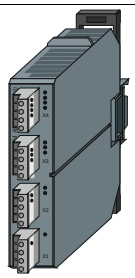
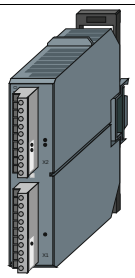
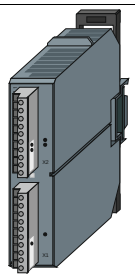
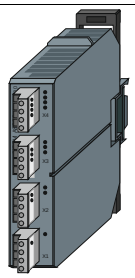
	Designation	MLFB
	PS-8620 Power Supply DC 24 to 60 V Note: Only for CP-802x	6MF2862-0AA00
	PS-8622 Power Supply DC 110 to 220 V Note: Only for CP-802x	6MF2862-2AA00
	PS-8640 Power Supply DC 24 to 60 V Note: Only for CP-802x	6MF2864-0AA00
	PS-8642 Power Supply DC or AC 100 to 240 V Note: Only for CP-802x	6MF2864-2AA00

Spare Part

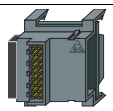
	Designation	MLFB
	CM-8812 Bus Connector SICAM I/O Set with 10 pcs. (included with all PS-862x and PS-864x modules)	C53207-A5812-D481-3
	Locking Hook SICAM A8000 3cm Module Set with 10 pcs.	C53207-A5014-D481-1

A.3 SICAM I/O Modules

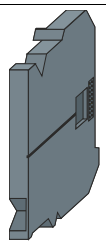
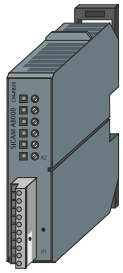
	Designation	MLFB
	DI-8110 Digital Input 2x8, DC 24 V	6MF2811-0AA00
	DI-8111 Digital Input 2x8, DC 48/60 V	6MF2811-1AA00
	DI-8112 Digital Input 2x8, DC 110 V	6MF2811-2AA00
	DI-8113 Digital Input 2x8, DC 220 V	6MF2811-3AA00
	DO-8212 Digital Output Relay 8x DC 24 to 220 V/AC 230 V	6MF2821-2AA00
	AI-8310 Analog Input 2x2 Pt100/Pt1000	6MF2831-0AA00

	Designation	MLFB
	AI-8320 Analog Input 4x ±20 mA/±10 V	6MF2832-0AA00
	AI-8510 Analog Input 3x U (240 V), 3x I (LoPo) Note: CM-8820 is required for the current measurement!	6MF2811-6AA00
	AI-8511 Analog Input 3x U (LoPo), 3x I (LoPo)	6MF2851-1AA00
	AO-8380 Analog Output 4x ±20 mA/±10 V	6MF2838-0AA00

Spare Part

	Designation	MLFB
	CM-8812 Bus Connector SICAM I/O Set with 10 pcs. (included with all SICAM I/O Modules)	C53207-A5812-D481-3
	Locking Hook SICAM A8000 3cm Module Set with 10 pcs.	C53207-A5014-D481-1

A.3.1 Accessory

	Designation	MLFB
	CM-8811 Coupling Module for SICAM I/O Modules Note: Only for SICAM I/O Modules at CP-8000	6MF2881-1AA00
	CM-8820 CT-Adapter 3xI 1 A_5 A/225 mV Note: Only for AI-8510	6MF2882-0AA00
	CM-8830 SICAM I/O Module LED Unit	6MF2883-0AA00

A.4 SICAM TM I/O Modules

	Designation	MLFB
	DI-6100 Digital Input 2x8, DC 24 to 60 V	6MF1113-0GB00-0AA0
	DI-6101 Digital Input 2x8, DC 110/220 V	6MF1113-0GB01-0AA0
	DI-6102 Digital Input 2x8, DC 24 to 60 V 1 ms	6MF1113-0GB02-0AA0
	DI-6103 Digital Input 2x8, DC 110/220 V 1 ms	6MF1113-0GB03-0AA0
	DI-6104 Digital Input 2x8, DC 220 V	6MF1113-0GB04-0AA0
	DO-6200 Digital Output Transistor 2x8, DC 24 to 60 V	6MF1113-0GC00-0AA0

	Designation	MLFB
	DO-6212 Digital Output Relays 8x DC 24 to 220 V/AC 230 V	6MF1113-0GC12-0AA0
	DO-6220 Command Out Basic Module	6MF1113-0GC20-0AA0
	DO-6221 Command Out Basic Module Measurement	6MF1113-0GC21-0AA0
	DO-6230 Command Output Relay Module	6MF1113-0GC30-0AA0
	AI-6300 Analog Input 2x2 ±20 mA/±10 V	6MF1113-0GD00-0AA0
	AI-6307 Analog Input 2x2 ±2.5 mA/±5 mA/±10 V	6MF1113-0GD07-0AA0

	Designation	MLFB
	AI-6308 Analog Input 2x2 ±1 mA/±2 mA/±10 V	6MF1113-0GD08-0AA0
	AI-6310 Analog Input 2x2 Pt100/Ni100	6MF1113-0GD10-0AA0
	AO-6380 Analog Output 4x ±20 mA/±10 mA/±10 V	6MF1113-0GD80-0AA0

A.4.1 Accessory

	Designation	MLFB
	CM-6811 Coupling SICAM TM I/O Modules Note: Only for SICAM TM I/O Modules at CP-8000	6MF1113-0GJ11-0AA0
	CM-6812 Coupling SICAM TM I/O Modules Note: Only for SICAM TM I/O Modules at CP-802*x*	6MF1113-0GJ12-0AA0
	Bus Termination for TM housing Note: The bus termination for TM housing (TC6-050) is part of this item	6MF1313-0GA50-0AA0

A.5 Interface Modules

	Designation	MLFB
	CM-0819 Converter RS-232/RS-485 insulated	6MF1111-2AJ10-0AF0
	CM-0821 Fieldbus Interface Ring (3x FO, 1x el.)	6MF1111-0AJ21-0AA0
	CM-0822 Fieldbus Interface Star (4x FO)	6MF1111-0AJ22-0AA0
	CM-0823 Fieldbus Interface Ring (3x FO,1x RS-485)	6MF1111-0AJ23-0AA0
	CM-0829 Converter RS-232/RS-422; RS485	6MF1111-2AJ20-0AA0
	CM-0847 Fiberoptic Interface (el.-FO)	6MF1113-0AJ47-0AA0

A.6 Transmission Facilities

	Designation	MLFB
	CE-0700 V.23 Leased Line Modem for DIN rail installation, 400 mW	6MF1102-0BC00-0AA0
	CE-0701 WT Channel Modem for DIN rail installation, 2,0 W	6MF1102-0CA81-0AA0
	SCALANCE M874-2 GPRS Router for the wireless IP communication of Ethernet-based automation devices via 2.5G mobile radio VPN, firewall, NAT; 2-port switch https://mall.industry.siemens.com/mall/de/WW/Catalog/Products/10224648	6GK5874-2AA00
	MD741-1 GPRS Router	6NH9741-1AA00
	RUGGEDCOM RX1400 Ethernet switch and TCP/IP router	6ZB5531-0AL01
	Siemens Converter LWE - RS232 Details siehe: http://w3.siemens.com/smartgrid/global/en/products-systems-solutions/protection/accessories/communication-equipment/pages/7xv5652.aspx	7XV5652
	Siemens Mini Starcoupler Details siehe: http://w3.siemens.com/smartgrid/global/en/products-systems-solutions/protection/accessories/communication-equipment/pages/7xv5450.aspx	7XV5450

	Designation	MLFB
	ANT 794-4MR Antenna LTE (4G), UMTS (3G), GSM (2G)	6NH9860-1AA00

A.6.1 Recommended Third-Party Products

	Designation	Internet link
	TP Radio WDM 8000 Multi-point traffic	www.tpradio.com
	SATELLINE 2ASxE Multi-point traffic	www.satel.com
	Westermo TD-36AV (AC 22 to 264 V/DC 18 to 300 V) Westermo TD-36LV (AC 10 to 30 V/DC 10 to 60 V) Dial-up traffic analog	www.westermo.com
	Westermo IDW-90 Dial-up traffic ISDN	www.westermo.com
	Cinterion MC52iT dualband modem GSM 900/1800 MHz incl. mounting set for DIN rail and connection cable (1.5 m)	www.cinterion.com
	MC Technologies MC55iw quadband modem GSM 850/900/1800/1900 MHz	www.mc-technologies.net

	Designation	Internet link
	Dr. Neuhaus Tainy EMOD-V2-IO or Dr. Neuhaus Tainy EMOD-L1-IO	www.neuhaus.de
	REEL K70ZCR GSM 850/900/1800/1900 MHz + UMTS + WLAN 2400 MHz	www.reel-gmbh.de
	PHOENIX PSM-ME-RS232/RS485-P Interface converter	www.phoenixcontact.com Order number: 2744416

A.7 Recommended Upstream Power Supply Devices

	Bezeichnung	Internet link
	MTM Power HSA50 S24 AC 90 to 264 V or DC 120 to 340 V Output DC 24 V, 2,1 A	www.mtm-power.com
	SYKO EWS 01 U.06.05.20 AC 82 to 264 V Output 5 V, 2 A SYKO EWS 01 U.06.24.05 DC 36 to 350 V Output 24 V, 0,5 A	www.syko.de

A.8 Cables and Plugs

	Designation	MLFB
	Industrial Ethernet TP Cord RJ45/RJ45, CAT 6A, TP cable 4x 2 (–25°C to 80°C *)), length 1 m 2 m 3 m 4 m 6 m 10 m	 6XV1870-3QH10 6XV1870-3QH20 6XV1870-3QH30 6XV1870-3QH40 6XV1870-3QH60 6XV1870-3QN10
	Industrial Ethernet TP XP Cord RJ45/RJ45, CAT 6A, crossed TP cable 4x 2 (–25°C to 80°C *)), length 1 m	6XV1870-3RH10
	Industrial Ethernet TP Cord RJ45/RJ45, CAT 6A, crossed TP cable 4x 2 (–25°C to 80°C *)), length 0.5 m	6XV1870-3QE50
	CM-6810 TM I/O modules extension cable	6MF1113-0GJ10-0AA0

*) –40 to 80°C in fixed installation

A.8.1 Recommended Third-Party Products

	Designation	Internet link
	Connection CM-8820 → AI 8510 HSLCH FRNC (7x 0,75 mm²)	www.meinhart.at
	Connection CM-8820 → AI 8510 ÖLFLEX FD 855 CP (7 G 0,5 mm²)	www.lappkabel.de
	D-Sub/RJ45 Adapter (female) MHDA9-SMJ8-M-K Order no. 382-2695	http://at.rs-online.com/web/p/products/3822695/
	D-Sub/RJ45 Adapter (male) MHDA9-PMJ8-M-K Order no. 382-2689	http://at.rs-online.com/web/p/products/3822689/
	FTDI Chip US232R-10 (RS 429-274) with 10 cm cable	http://at.rs-online.com/web/p/products/0429274/
	FTDI Chip US232R-100-BLK (RS 687-7806) with 1 m cable	http://at.rs-online.com/web/p/products/6877806/

A.9 Memory Cards

	Designation	MLFB
	SD Card 512 MB Temperature range -40°C to 70°C (spare part)	6MF1213-2GA05-0AA0
	SD Card 2 GB Temperature range -25°C to 70°C (spare part)	6MF1213-1GA05-0AA0

A.10 RJ45 Port Lock

	Designation	MLFB
	RJ45 Port Lock Lock with key for mechanical locking of RJ45 ports 1 package = 1 pc.	6GK1901-1BB50-0AA0

A.11 Engineering Tools

A.11.1 SICAM TOOLBOX II

Note

Please note that CP-8000/CP-802*x* is supported by the SICAM TOOLBOX II as of version 6.01.

	Designation	Item number
	SICAM TOOLBOX II V6 License Catalog, License Ordering	D30-017-6
	SICAM TOOLBOX II	S38-100

The SICAM TOOLBOX II is supplied on an USB stick. For the usage of the single tools software licenses are required.

You find the exact order information in the document *SICAM TOOLBOX II V6 License Catalog, License Ordering*.

A.11.2 SICAM WEB

	Designation	Item number
	SWEB00	SCD-001-1
	Sicam_first_startup	SC8-900-1

A.11.3 SICAM Device Manager

	Designation	Item number
	SICAM Device Manager	S51-000

The SICAM Device Manager is supplied on a DVD. For the usage of the tool a software license is required. The license key is supplied on a USB stick

B Examples for Instruction Lists (IL)

Contents

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B.1 Transfer an Input to a Signalling Output and to a Command Output

The first digital input of the Master Module (with default address and type identification `I_030_002_000_000.VALUE`) is loaded into the accumulator. In the next line the loaded value is transferred to the outputs `O_030_008_000_000.VALUE` and `O_045_009_000_000.VALUE`.

Changing the input type from single command to single message with the engineering tool (webbrowser), the relay at the output `D00` picks up when the input becomes logical **1**. Otherwise this output address will be sent to the communication because it is not existing within the periphery. The default address of the command is `D01`.

```
PLC_RESET:

PLC_INIT:

PLC_START:
LD   I_030_002_000_000.VALUE   (*IN00 TI:30 IOA1:002 IOA2:000 IOA3:000*)
ST   O_030_008_000_000.VALUE   (*store at output as binary information*)
ST   O_045_009_000_000.VALUE   (*store at output as command*)
```

B.2 Combine two Inputs with AND

The cycle time is set to 50 ms. The first two inputs of the Master Module will be combined by logical AND. The result is transferred to a flag and additional to a digital output. The type identification of the output is single message.

```
PLC_RESET:
LD   50                          (*load value 50*)
ST   PLC_CYCLETIME               (*store at system variable for cycle*)
                                 (*time in ms*)

PLC_INIT:

PLC_START:
LD   I_030_002_000_000.VALUE     (*read input IN00*)
ST   AND.IN0                     (*store at input 0 for AND function*)
LD   I_030_003_000_000.VALUE     (*read input IN01*)
ST   AND.IN1                     (*store at input 1 for AND function*)
CAL  AND                         (*call function*)
ST   M_BOOL_TESTFLAG             (*store in a flag*)
ST   O_030_008_000_000.VALUE     (*store as single command output*)
```

B.3 Linear Adaptation with Value Selection

Two analog values are compared and the higher one is selected (MAX). With this one an adaptation kx+d is performed. The processed value receives a new address (O_036_032_001_001.VALUE). The constants for k (M_REAL_CONSTANTforK) and d (M_REAL_CONSTANTforD) are defined with initial values in the programm sequence PLC_INIT.

```
PLC_RESET:
LD   10
ST   PLC_CYCLETIME             (*cycle time in ms*)

PLC_INIT:
LD   10
ST   M_REAL_CONSTANTforK       (*constant for k*)
LD   -5
ST   M_REAL_CONSTANTforD       (*constant for d*)

PLC_START:
LD   I_036_032_000_000.VALUE   (*input 1*)
ST   MAX.IN0
LD   I_036_033_000_000.VALUE   (*input 2*)
ST   MAX.IN1
CAL  MAX                       (*the greater value of both is used*)
ST   M_REAL_MAXVALUE           (*serves for reading which value will*)
ST   MUL.IN0                   (*be used*)
LD   M_REAL_CONSTANTforK
ST   MUL.IN1
CAL  MUL                       (*the selected value is multiplicated*)
ST   ADD.IN0                   (*with the constant and results as "kx"*)
LD   M_REAL_CONSTANTforD
ST   ADD.IN1
CAL  ADD                       (*after the multiplication add "d"*)
ST   O_036_032_001_001.VALUE   (*selected adapted value*)
```

B.4 Operating Hours Counter

A clock pulse generator (TCLK_PULSE) is running with a frequency of 30s logical 1 and 30s logical 0. The edge change from 0 to 1 is switched to the CU Input of the upward-counter (CTU_COUNTER.CU) and the counter will be incremented with 1 per minute.

The sum of the operating hours results of two values:

- Current counter score (CTU_COUNTER.CV)
- Counter score before the last power down (MR_DINT_MINUTES)
  The score will be saved in a retaining flag (M_DINT_MINUTESOLD). This means, after a power down (startup) the counter will continue with incrementing based on the last value.

The hours result by minutes devided by 60. The hours always will be recalculated based on the minutes, the same after a power down.

```
PLC_RESET:
LD   10
ST   PLC_CYCLETIME             (*cycle time in ms*)

PLC_INIT:
LD   MR_DINT_MINUTES           (*load power-fail safe value*)
ST   M_DINT_MINUTESOLD         (*freeze in a flag as old value*)

PLC_START:

(*Operating hours counter*)
LD   PLC_SYSTIME.SEC           (*fetch second value of the system time*)
ST   M_DINT_SEC                (*and store in variable*)
LD   M_DINT_SEC                (*current second*)
EQ   0                         (*compare with second 0*)
ST   CTU_COUNTER.CU            (*HIGH always at the second 0, required*)
                               (*edge detection is implemented within*)
                               (*the counter*)
CAL  CTU_COUNTER               (*increments the counter*)
LD   CTU_COUNTER.CV            (*load current counter score*)
ST   ADD.IN0                   (*store at input 0 for ADD function*)
LD   M_DINT_MINUTESOLD         (*load old value*)
ST   ADD.IN1                   (*store at input 1 for ADD function*)
CAL  ADD                       (*call ADD function*)
ST   MR_DINT_MINUTES           (*store sum of operating minutes in a*)
                               (*retaining flag, after startup the*)
                               (*old value will be added to the*)
                               (*current counter score*)
ST   DIV.IN0                   (*store at input 0 for DIV function*)
LD   60                        (*load constant for 60 minutes*)
ST   DIV.IN1                   (*store at input 1 for DIV function*)
CAL  DIV                       (*call DIV function*)
ST   M_DINT_HOURS              (*sum of operating hours = minutes*)
                               (*divided by 60*)
```

To reset the counter score it is necessary to reset the counter (CTU_COUNTER.R) as well as the flag with the retained value (M_DINT_MINUTESOLD).

This could be executed by a subroutine before PLC_RESET. With RET the subroutine will be left.

```
(*SUBROUTINE*)
ResetCounter:
LD   0                        (*the old value for operating minutes*)
ST   M_DINT_MINUTESOLD        (*is set to "0"*)
ST   M_BOOL_RESET             (*reset the flag for running this*)
                              (*subroutine*)
LD   1
ST   CTU_COUNTER.R            (*reset counter by input R*)
RET
(*END SUBROUTINE*)
```

The call of the subroutine could be executed at the end (after ST M_DINT_HOURS). Therefore the flag (M_BOOL_RESET) must be set to 1. Instead of the flag an input address could be used, for instance a command.

Reaching the command CALC the call of the subroutine will be executed. In the subroutine the flag (M_BOOL_RESET) will be reset to 0, otherwise the counter would last at 0 as long as the flag will be reset to 0.

```
LD   0                        (*besides reset of the time the*)
ST   CTU_COUNTER.R            (*counter input R is set to "0"*)

LD   M_BOOL_RESET             (*if the flag is set to "1"*)
CALC ResetCounter             (*call the subroutine ResetCounter*)
```

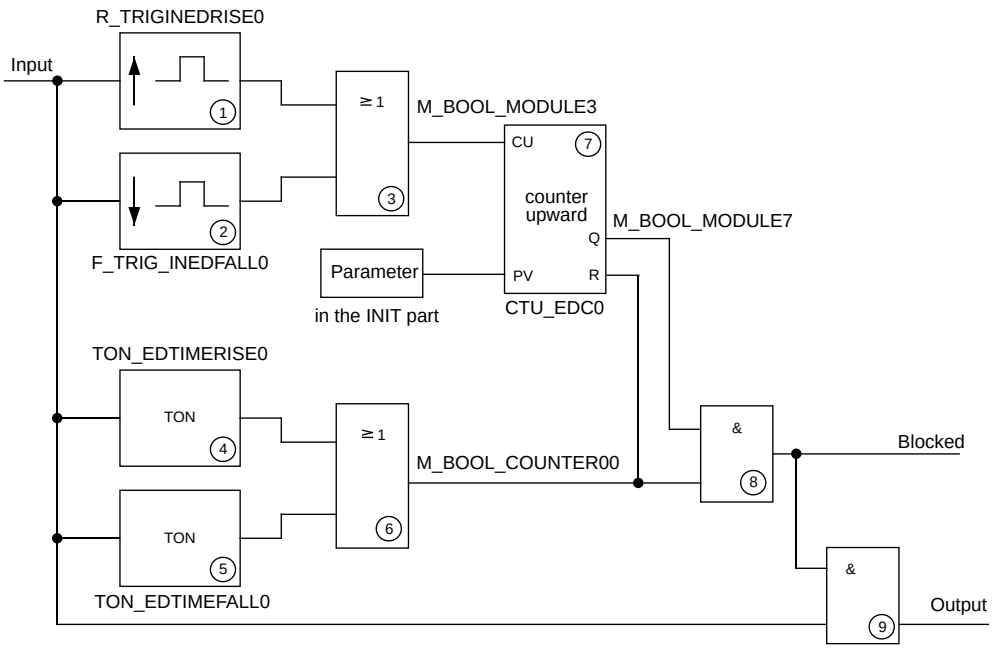
B.5 Bounce Suppression

If an input signal is bouncing, the blocked bit (BL) is set. The number of state changes until the BL bit is set, as well as the monitoring time during which the information must be static until the BL bit is reset, are adjustable via constants. An output is set to 0 during the BL bit is set.

With an edge detection for the rising edge (R_TRIG_INEDRISE0) and the falling edge (F_EDTIMEFALL0) the counter (CTU_EDC0) will be incremented by 1. At the same time the R input of the counter is reset via an ON delay for the rising edge (TON_EDTIMERISE0) as well as for the falling edge (TON_EDTIMEFALL0). With this function all state changes of the input will be integrated by the counter (started with the first edge and triggered by each following one).

As soon as a state change of the input happens the flag (M_BOOL_COUNTER00) is reset and the input of an AND (module 8) is set (inverted). If the sum of state changes is greater as or equal to a defined number (CV>=PV) the counter output is set as well, and the BL bit is set. With the set BL bit the output is reset by another AND (module 9).

After termination of the monitoring time the R input of the counter is set again, and the counter is reset. If the BL bit is set, it will be reset as well (output of module 8 is 0).



In the procession sequence the R input of the counter must be reset first, because only afterwards the positive edge at the CU input of the counter causes an increment. Therefore the application program handles the R input before the CU input of the counter.

Example: number of state changes >= 5
monitoring time of the stability of the input = 10 s

```
PLC_RESET:
LD  20
ST  PLC_CYCLETIME              (*cycle time in ms*)

PLC_INIT:
LD  5                          (*number of transients until*)
ST  CTU_FLZ0.PV                (*information is set bouncing*)

(*once detected as bouncing, the input signal must last statical "1" for
a preset time until the blocked bit will be reset again*)
LD  10000                      (*load constant for 10s*)
ST  TON_EDTIMERISE0.PT         (*ON delay rising edge*)
ST  TON_EDTIMEFALL0.PT         (*ON delay falling edge*)

PLC_START:
(*Modules 4,5,6,7 – if there are no more state changes of the input, the
counter will be reset when the preset monitoring time has expired*)
LD  I_030_002_000_000.VALUE    (*input*)
ST  M_BOOL_INPUT00
ST  TON_EDTIMERISE0.IN         (*rising edge - module 4*)
STN TON_EDTIMEFALL0.IN         (*falling edge - module 5*)
CAL TON_EDTIMERISE0.IN         (*call module 4*)
ST  OR.IN0
CAL TON_EDTIMEFALL0            (*call module 5*)
ST  OR.IN1
CAL OR                         (*call module 6*)
ST  M_BOOL_COUNTER00           (*also in graphic*)
ST  CTU_EDC0.R                 (*reset input of counter - module 7*)

(*Modules 1,2,3,7 – rising and falling edge of the input are combined
with an OR and put to the CU input of the counter – each change will be
added*)
LD  M_BOOL_INPUT00
ST  R_TRIG_INEDRISE0.CLK       (*rising edge - module 1*)
ST  F_TRIG_INEDFALL0.CLK       (*falling edge - module 2*)
CAL R_TRIG_INEDRISE0           (*call module 1*)
ST  OR.IN0
CAL F_TRIG_INEDFALL0           (*call module 2*)
ST  OR.IN1
CAL OR                         (*call module 3*)
ST  CTU_EDC0.CU                (*count up input of counter - module 7*)
ST  M_BOOL_MODULE3             (*only for graphic*)

(*Modules 7,8 – with the first edge change the monitoring time will be
started. If the number of edges is greater then the number of transients
within this time, the output of the AND (module 8) is set = blocked*)
CAL CTU_EDC0                   (*call module 7*)
ST  M_BOOL_MODULE7             (*only for graphic*)
ST  AND.IN0
LDN M_BOOL_COUNTER00
ST  AND.IN1
CAL AND                        (*call module 8*)
ST  M_BOOL_BOUNCING00          (*is set if the input is bouncing*)
ST  O_030_002_000_000.BL       (*set blocked bit of the input*)

(*Module 9 - the output is reset during the input is detected as
bouncing*)
LD  M_BOOL_INPUT00
ST  AND.IN0
LD  M_BOOL_BOUNCING00
STN AND.IN1
CAL AND                        (*call module 9 – if bouncing, then "0"*)
ST  O_030_002_000_000.VALUE    (*output of input information*)
```

B.6 Setpoint Command

```
PLC_RESET:
LD   20
ST   PLC_CYCLETIME             (*cycle time in ms*)

PLC_START:

(*Mapping inputs to flags*)

LD   I_050_171_105_000.S_E     (*setpoint command select/execute*)
ST   M_BOOL_NyttBVCmL45
LD   I_030_008_004_000.VALUE   (*single-point information input*)
ST   M_BOOL_OmkHandL45
LD   I_036_018_039_000.VALUE   (*measured value float input*)
ST   M_REAL_CmL45
LD   I_050_171_105_000.VALUE   (*setpoint command float input*)
ST   M_REAL_BvCmL45DC

(*Temporary test variables*)

LD   I_050_171_105_000.S       (*check for a rising edge, otherwise*)
ST   R_TRIG_PosFlank1.CLK      (*create a confirmation each cycle*)
CAL  R_TRIG_PosFlank1          (*if you have no setpoint the logic*)
JMPN HOPP90                    (*will jump over the COT procedure*)

LD   I_050_171_105_000.S_E
ST   O_050_171_105_000.S_E     (*here you have to add the select*)
                               (*before execute procedure*)

ST   M_BOOL_NyttBVCmL45        (*setpoint command select/execute*)

LD   I_050_171_105_000.VALUE
ST   O_050_171_105_000.VALUE   (*setpoint command float output*)
ST   M_REAL_BvCmL45DC

(*Example for select before execute*)

LD   7                         (*7 = confirmation, 10 = termination,*)
ST   O_050_171_105_000.COT     (*if you set 0, the confirmation would*)
                               (*be created here, and the termination*)
                               (*in the following cycle*)
LD   1
ST   O_050_171_105_000.S       (*setpoint command spontaneous*)
HOPP90:
```

B.7 Speed Comparison

```
PLC_RESET:
LD   100
ST   PLC_CYCLETIME             (*cycle time in ms*)

PLC_INIT:
LD   1000                      (*drop off delay in ms*)
ST   TOF_FLAENDSTEIG0.PT
ST   TOF_FLAENDFALL0.PT

PLC_START:

(*Check speed value on change*)
LD   I_034_016_000_000.S       (*load spontaneous bit speed value*)
JMPN NO_CHANGE                 (*jump if no change of value*)

(*Change of speed value present*)
LD   I_034_016_000_000.VALUE   (*load speed value*)
ST   M_REAL_WERTNEU            (*current speed value to flag*)
ST   SUB.IN0
LD   M_REAL_WERTALT            (*load old speed value*)
ST   SUB.IN1
CAL  SUB                       (*form difference value*)
ST   M_REAL_WERTDIF            (*difference value to flag*)

(*Take over change of value*)
LD   M_REAL_WERTNEU            (*load current value*)
ST   M_REAL_WERTALT            (*save current value for next *)
                               (*change of value*)

(*Value comparison speed ascending*)
LD   M_REAL_WERTDIF            (*load diff. value*)
ST   GT.IN0
LD   0
ST   GT.IN1
CAL  GT                        (*diff. value > 0: speed ascending*)
ST       M_BOOL_DZST           (*set flag speed ascending*)

(*Value comparison speed descending*)
LD   M_REAL_WERTDIF            (*load diff. value*)
ST   LT.IN0
LD   0
ST   LT.IN1
CAL  LT                        (*diff. value < 0: speed descending*)
ST   M_BOOL_DZFA               (*set flag speed descending*)

NO_CHANGE:                     (*jump mark if no change of value*)

(*Drop-off delay speed ascending*)
LD   M_BOOL_DZST               (*load flag speed ascending*)
ST   TOF_FLAENDSTEIG0.IN
CAL  TOF_FLAENDSTEIG0          (*drop-off delay*)
LD   TOF_FLAENDSTEIG0.Q
ST   O_030_048_000_000.VALUE   (*reset output*)

(*Drop-off delay speed descending*)
LD   M_BOOL_DZFA               (*load flag speed descending*)
ST   TOF_FLAENDFALL0.IN
CAL  TOF_FLAENDFALL0           (*drop-off delay*)
LD   TOF_FLAENDFALL0.Q
ST   O_030_049_000_000.VALUE   (*set binary output*)

(*Reset flags for speed ascending, descending*)
LD   0
ST   M_BOOL_DZST               (*reset flag speed ascending*)
ST   M_BOOL_DZFA               (*reset flag speed descending*)
```

C Error Handling

Contents

C.1 Errors with the Engineering via SICAM WEB 590

C.1 Errors with the Engineering via SICAM WEB

The following table shows a variety of possible operating errors which can occur with engineering via SICAM WEB. It does not lay claim to completeness, since depending on the used connection, system configuration and web browser different conditions can occur.

There is also no warranty that the described remedies really always lead to the desired goal.

Characteristic		Possible cause	Remedy
After entry of the IP address of a target device in the web browser the indication "web page not available"		• There is no connection to the selected target device • Target device is switched off • IP address is wrong	• Anew call of the IP address in the web browser resp. “Refresh” • Check whether target device is switched on and connected with the PC • With operation via Ethernet and without router the network addresses of the target device and PC must fit (dependent on the subnet mask)
After an update in the web browser (by selection of a menu or by transfer of a parameter) the logon page appears		• Tthe session was already terminated by means of the internal watchdog • The session was terminated by means of logon by another user	• Avoid extended pauses (> 15 min) during the operation or parameterization procedure • Store changed parameters by clicking on the apply button
After loading of an IL the web browser tries to refresh over long time (> 1 min) or no return information from the loading process occurs at all		• The IL to be loaded is too large (> 128kByte) • Generally a loading process takes longer the larger the IL is	• Cancel loading process (stop function in the web browser) • Check whether errors are recorded in the Diagnosis • Load a smaller IL • When the target device responds after the loading process, check whether the IL is applied
After loading of an IL web pages are faulty or empty; possibly the red ER LED is lighting		• An invalid IL (wrong file or file format) has been loaded • During the transmission a connection fault may have been occurred	• Read error display in the diagnosis • Check whether the correct source file is loaded • Check whether the file which contains the IL is a text file (ASCII format) • Check whether the correct control code is in the text file
After startup of the system the application program remains stopped		There is a syntax error	• Check whether errors are recorded in the Diagnosis • Correct the IL in the indicated line number
After loading of an IL no automatic restart is requested		• An invalid program code has been loaded • A connection fault may be occurred during the transmission	• Follow error indication • Evaluate diagnosis
After loading of the parameters the target device can be selected no longer from the web browser; possibly the red ER LED is lighting		• In the loaded parameterization an invalid or unknown IP address is set • An invalid parameter file has been loaded • During the transmission a connection fault may have been occurred	• Set again a valid IP address with *Sicam_first_startup* on the target device; enter this address after successful transmission in the web browser to get access to the target device • Otherwise detach the SD card from the target device and overwrite it again with valid parameters offline

Characteristic		Possible cause	Remedy
After loading of a firmware the loaded firmware revision does not appear in the configuration page		Firmware code not loaded/configured completely due to communication fault or operating error (e.g. menu was quitted prematurely)	• Start a new loading process • Observe progress display • Loading process is completed correctly when the indication UPLOAD SUCCESSFUL appears, with hyperlink to the target device

D Set Up Dial-Up Connection on Engineering PC

Contents

D.1 Settings in Microsoft Windows 8 594
D.2 Settings in Microsoft Windows 7 604
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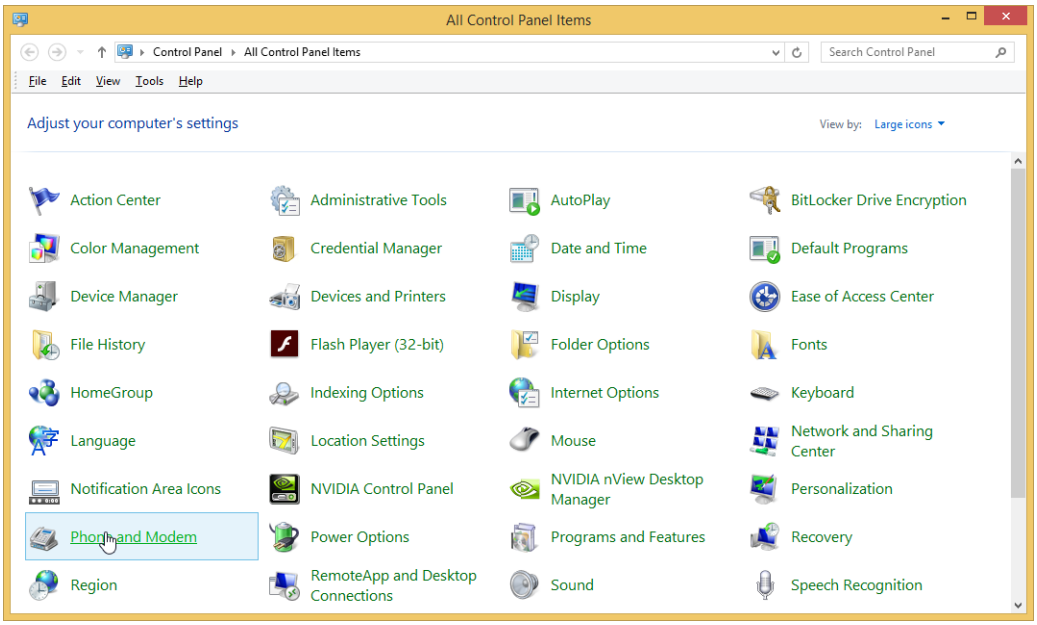
D.1 Settings in Microsoft Windows 8

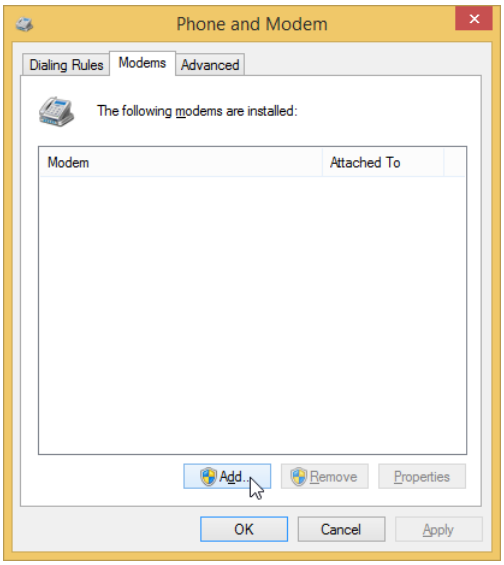
D.1.1 Modem Installation

Select via the Start menu the item Control Panel.

By way of a double-click on the symbol PHONE AND MODEM open the settings. If you have to enter location information, write arbitrary numbers and click OK.

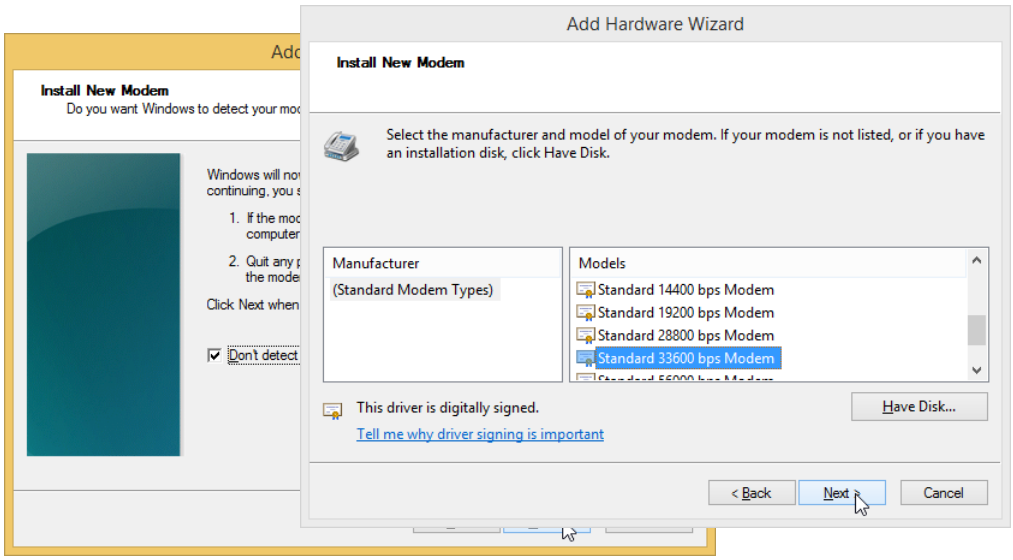


Click on the tab Modems and click on

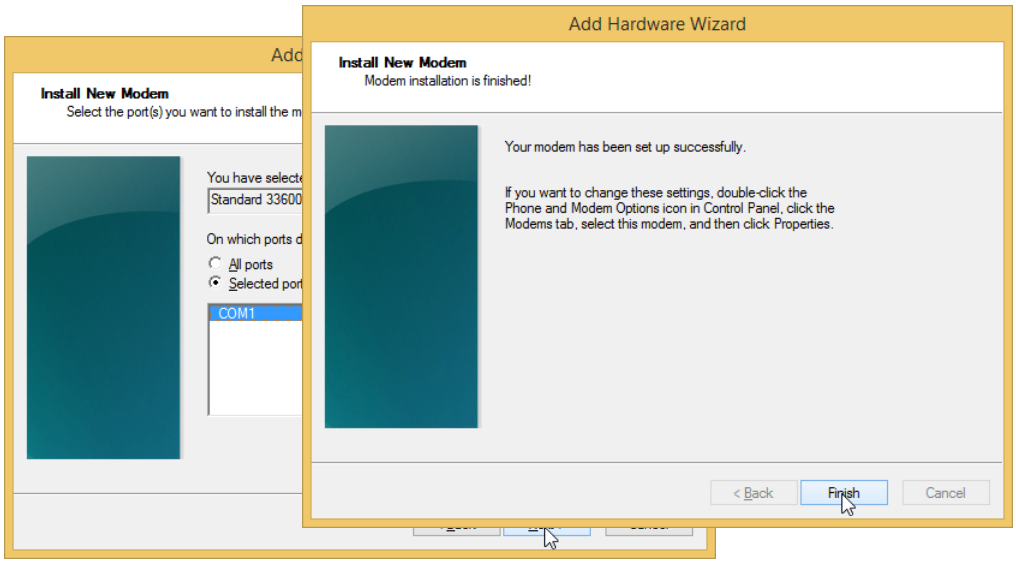


The Hardware Wizard starts, which guides you comfortably through the installation. Place a tick in the box DON'T DETECT MY MODEM; I WILL SELECT IT FROM A LIST and click Next>.

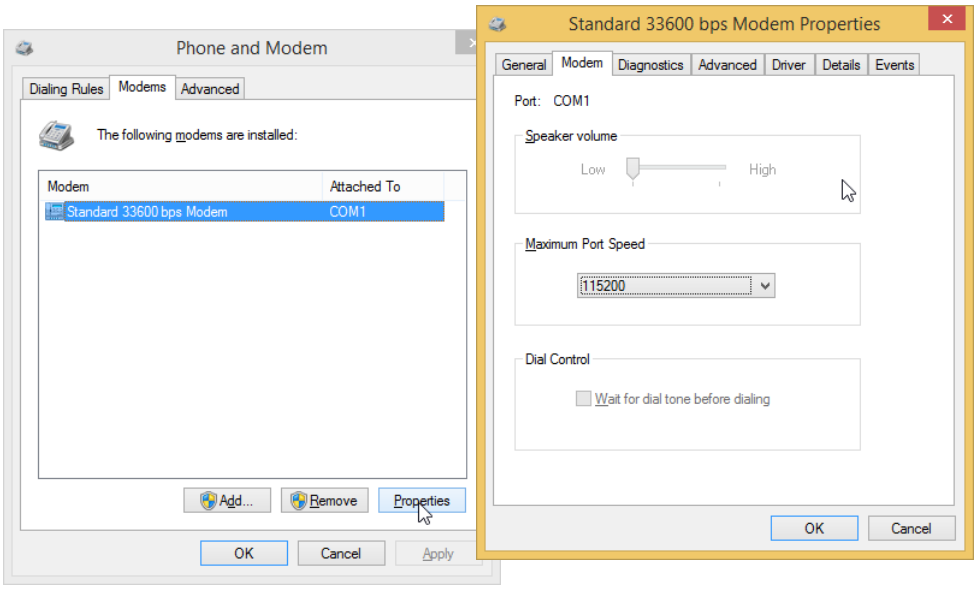
Under MANUFACTURERS: select `(Standard Modem Types)` and under MODELS: select a STANDARD 33600 BPS MODEM, then click `Next>`.



In this window mark the wanted port and confirm the input with `Next>`. Complete the modem installation in the next window with the button `Finish`.



Now select the button Properties in the register tab MODEMS and check the MAXIMUM PORT SPEED of 115200, as shown in the lower window. If this setting shows another value, please correct it and confirm with OK.

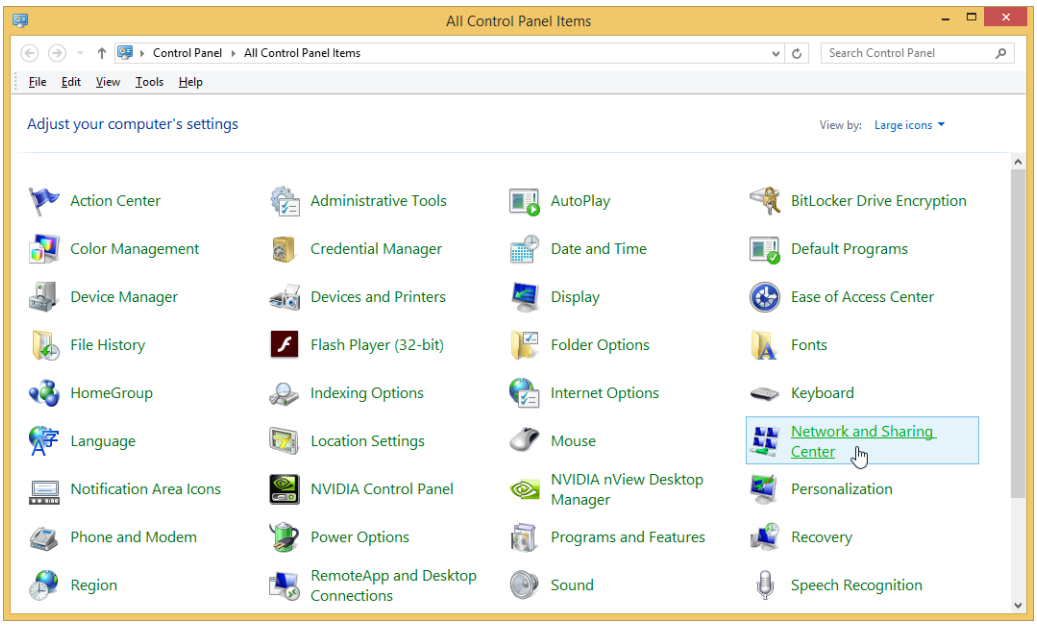


The modem installation is now complete!

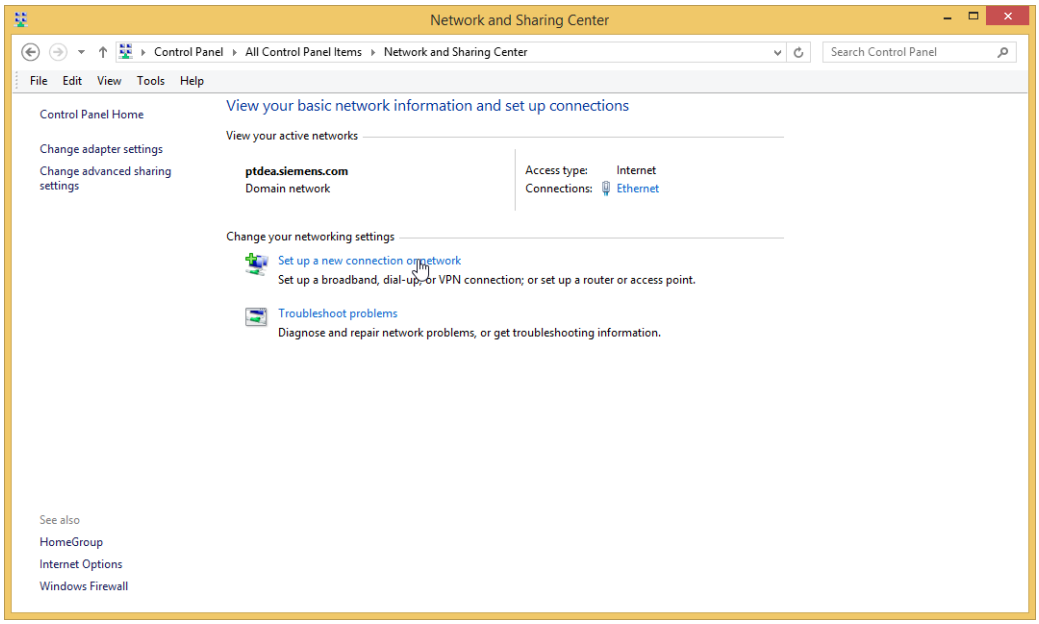
D.1.2 Network Configuration

To establish a new data-communication connection, select via the Start menu the item Control Panel.

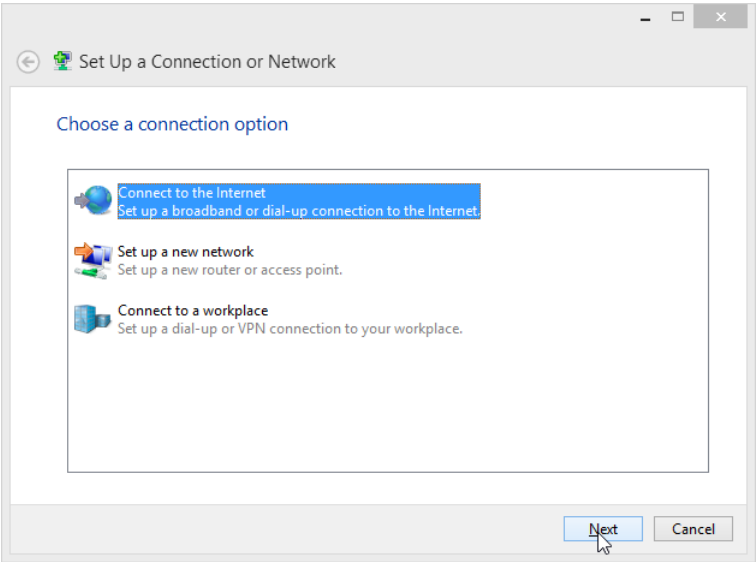
Double-click on the symbol *Network and Sharing Center*.



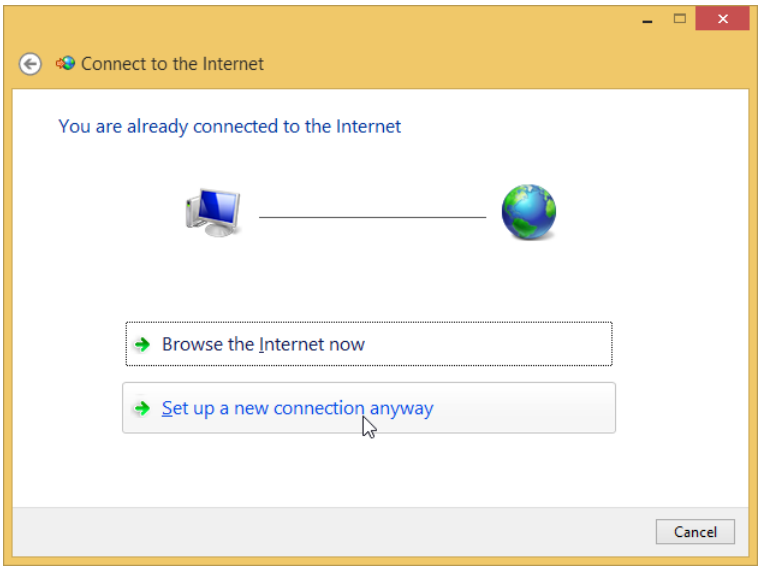
Click on SET UP A NEW CONNECTION OR NETWORK.



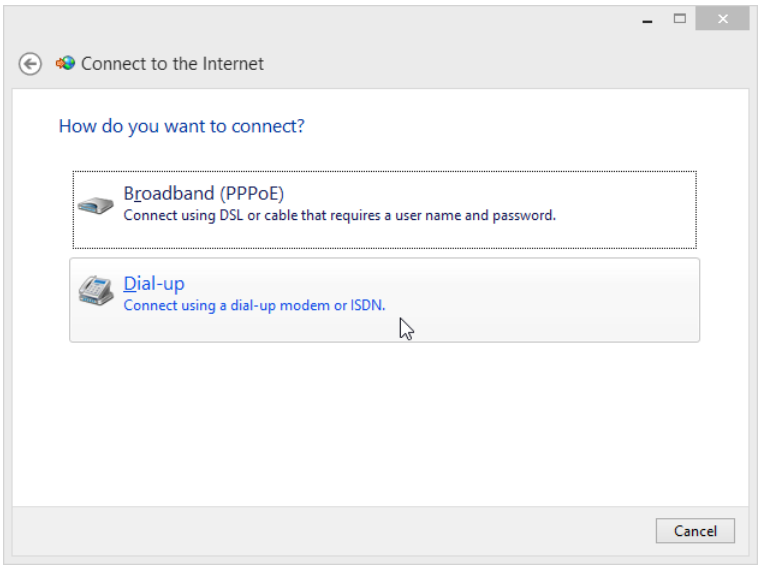
In the following window, as Network Connections Type select the item CONNECT TO THE INTERNET. Then go to Next>.



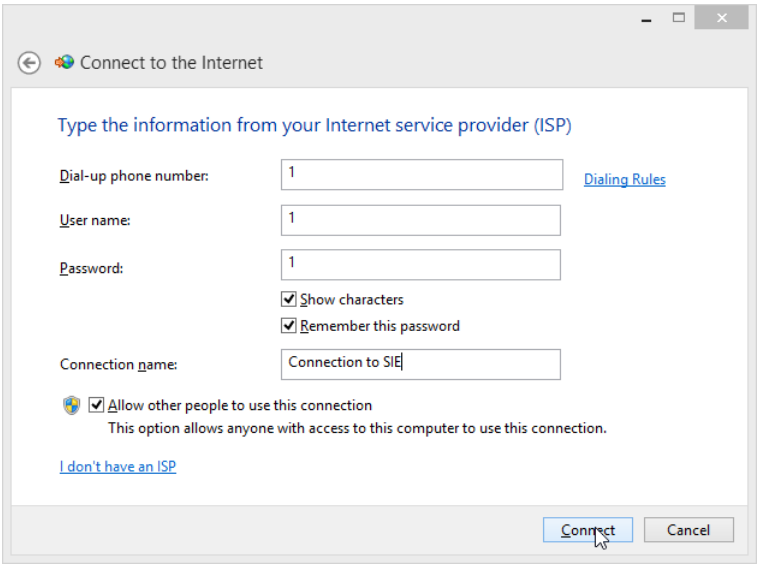
If an Internet connection is already existing, the following windows appears. Select SET UP A NEW CONNECTION ANYWAY, and continue.



As next step you have to select CONNECTION MANUALLY. Please click on DIAL-UP CONNECTION and continue.



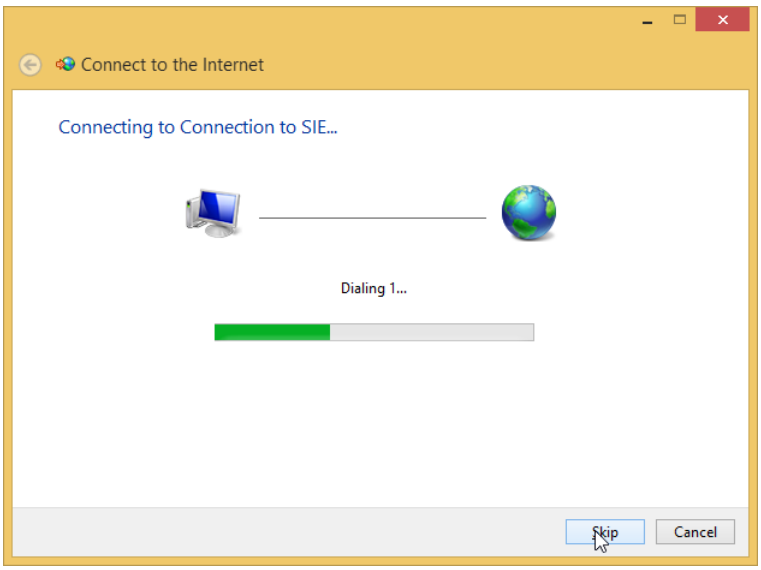
In the next step, enter an optional CONNECTION NAME, and an optional numerical value in the field DIAL UP PHONE NUBMER. Furthermore enter a USER NAME and a PASSWORD. When you have carried out these steps, confirm each time with Next>.



Pay attention to the ticks in the boxes. Finally, click on Connect.

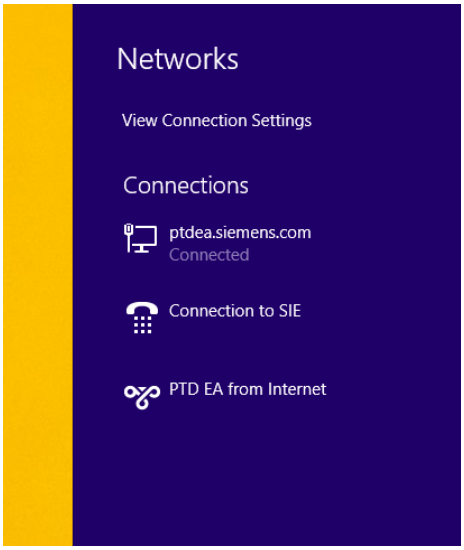
A window appears with the connection test, that you can abort.

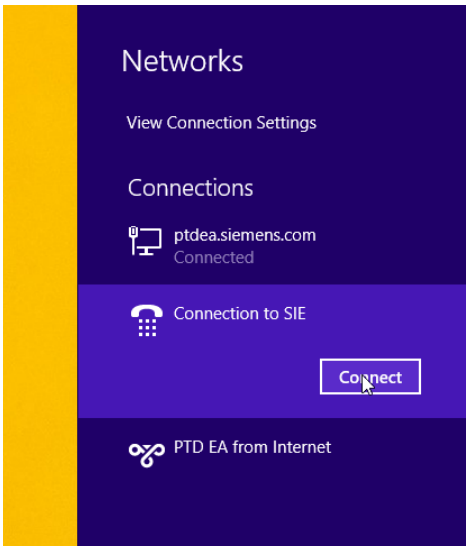
Then select SET UP THE CONNECTION ANYWAY.



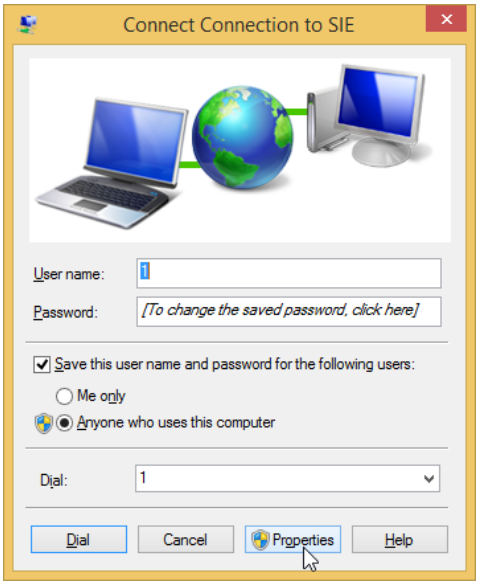
Click now on the network icon in the notification area of the Taskbar.

Now a view of all available networks opens. Select hereby the new dial-up connection and click on Connect.

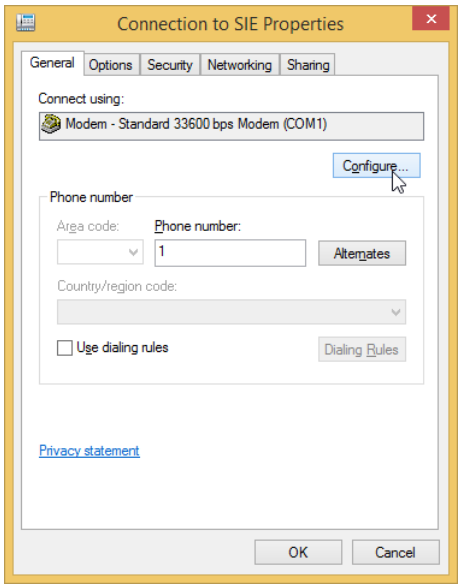


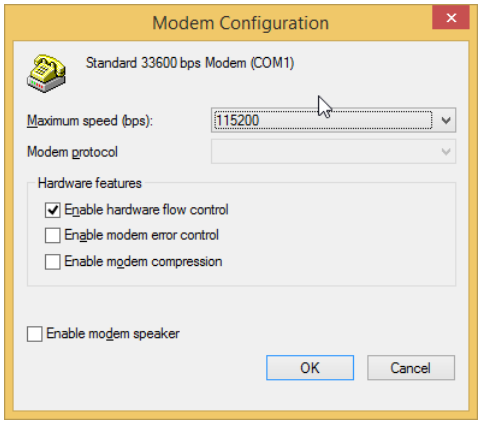


Click in the window “Connect …” on the button Properties.



Check the settings and if necessary correct them. Then confirm with OK.

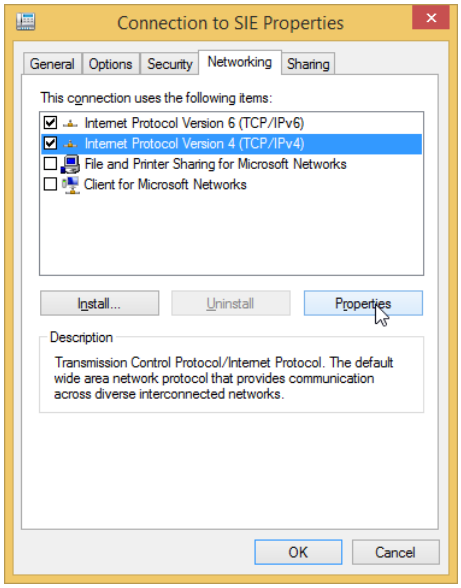


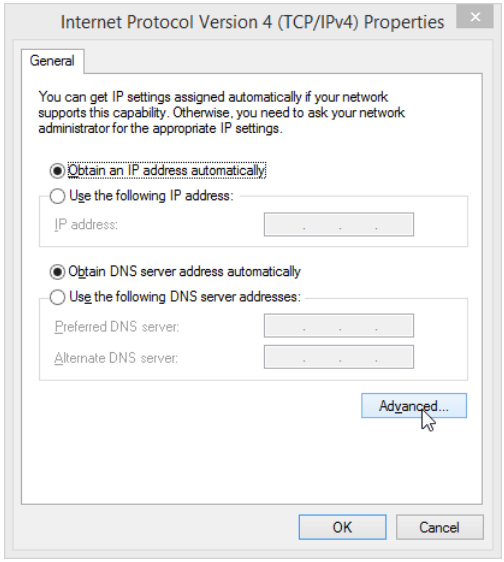


Now select the tab NETWORKING.

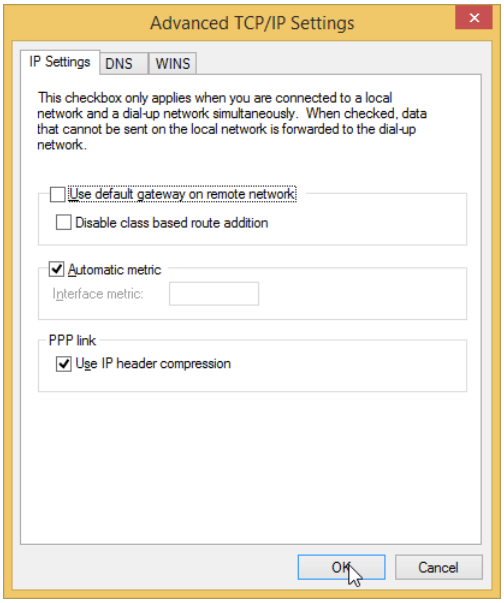
Mark the line `Internet Protocol Version 4 (TCP/IPv4)` and then click on Properties.

In this window the items OBTAIN AN IP ADDRESS AUTOMATICALLY and OBTAIN DNS SERVER ADDRESS AUTOMATICALLY must be selected. Continue with Advanced...



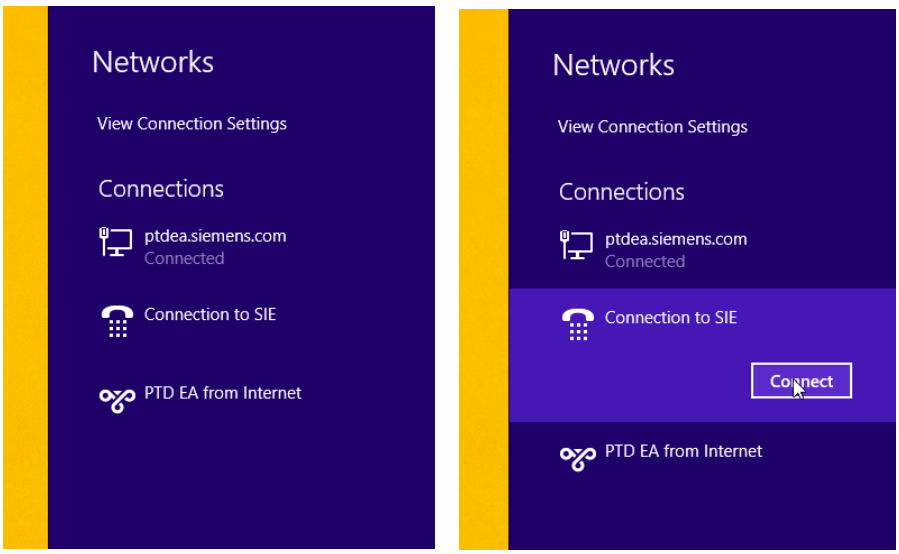


In the last window of the settings, under the register tab IP SETTINGS, the box USE DEFAULT GATEWAY ON REMOTE NETWORK must not be ticked. Confirm the inputs in each window with OK.

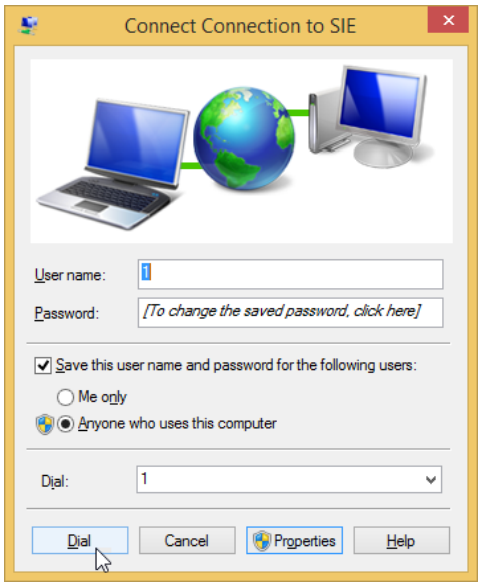


Click now on the network icon in the notification area of the Taskbar.

Now a view of all available networks opens. Select hereby the new dial-up connection and click on Connect.



Click in the window „Connect …“ on the button Dial.



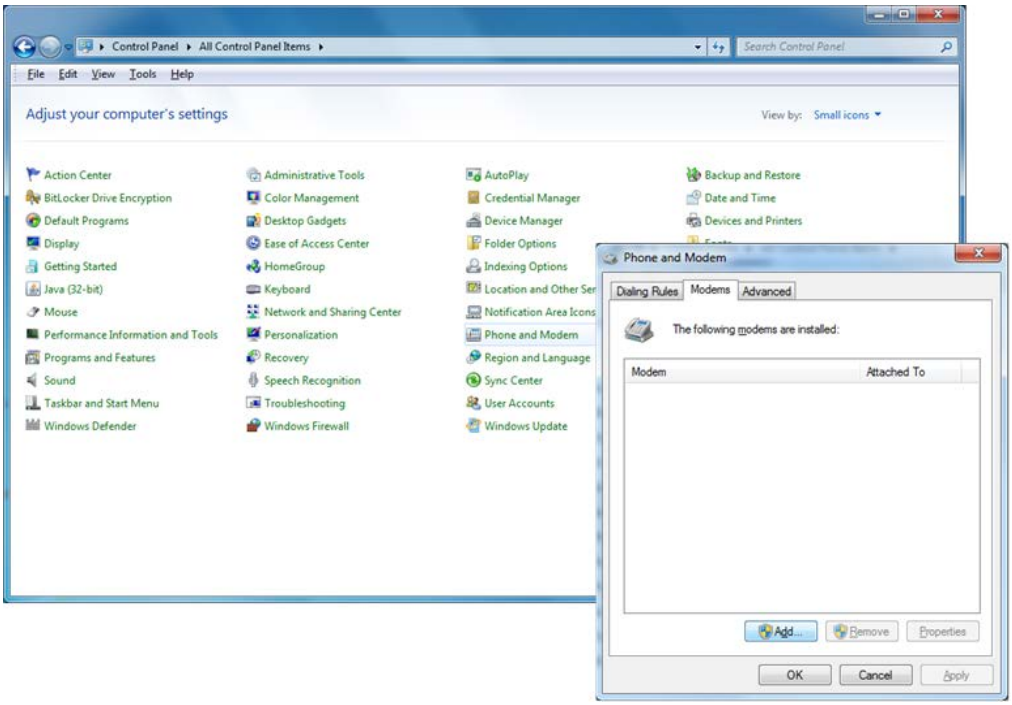
The installation and configuration are thereby complete!

D.2 Settings in Microsoft Windows 7

D.2.1 Modem Installation

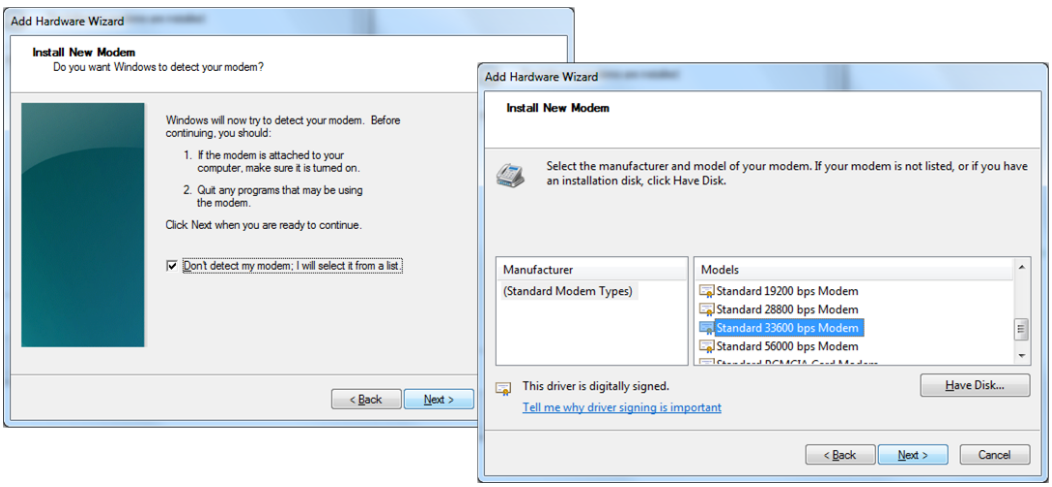
Select via the Start menu the item `Control Panel`.

Open the modem-group with a double-click on the symbol PHONE AND MODEM. Go to the index tab MODEMS and click on ADD… to install the modem.

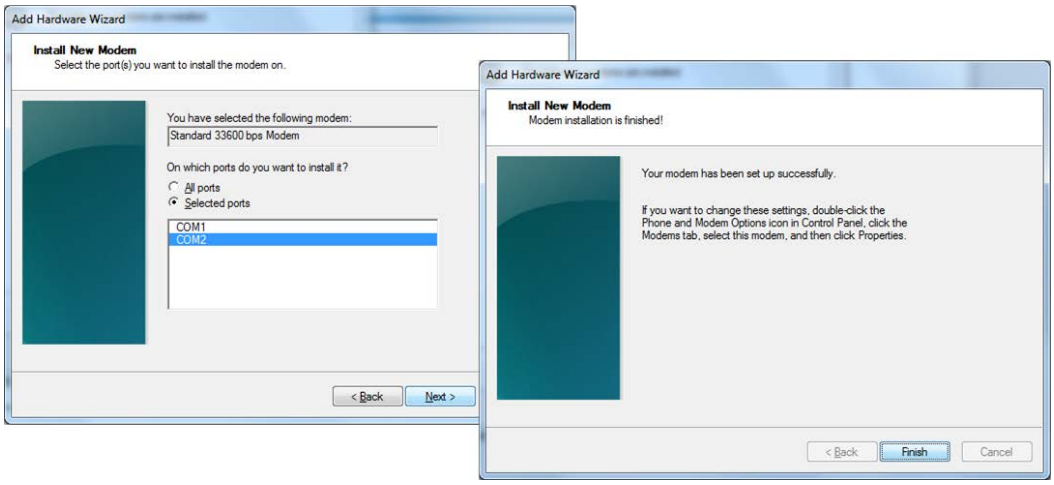


The Hardware Wizard starts, which guides you comfortably through the installation. Place a tick in the box DON'T DETECT MY MODEM; I WILL SELECT IT FROM A LIST and click `Next>`.

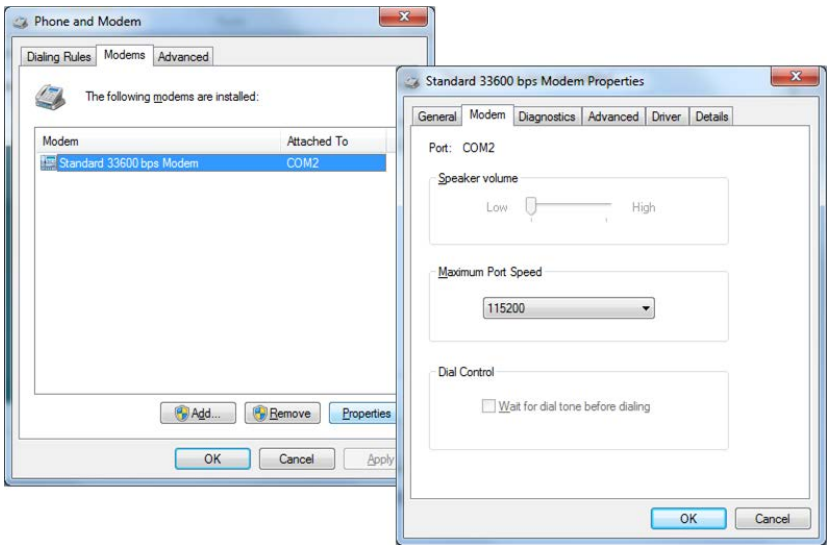
Under MANUFACTURERS: select `(Standard Modem Types)` and under MODELS: select a STANDARD 33600 BPS MODEM, then click `Next>`.



In this window mark the wanted port and confirm the input with Next>. Complete the modem installation in the next window with the button Finish.



Now select the button Properties in the register tab MODEMS and check the MAXIMUM PORT SPEED of 115200, as shown in the lower window. If this setting shows another value, please correct it and confirm with OK.

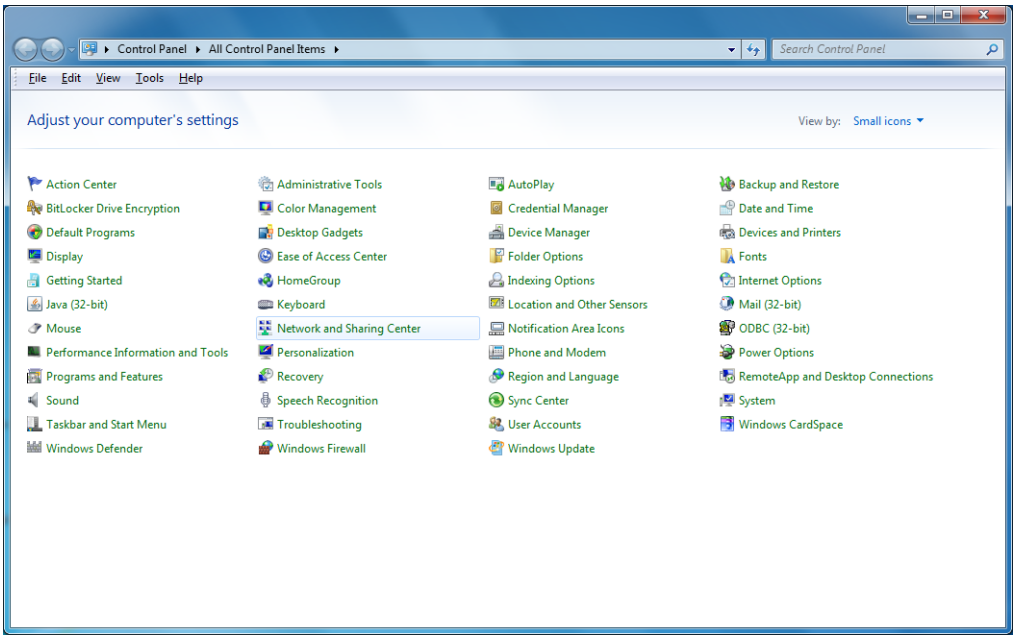


The modem installation is now complete!

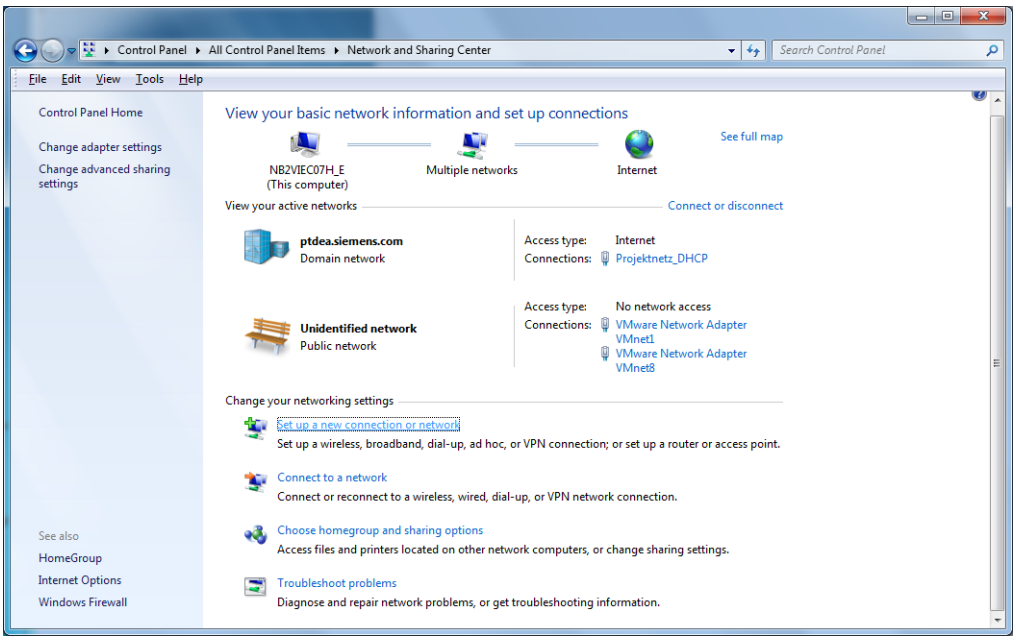
D.2.2 Network Configuration

To establish a new data-communication connection, select via the Start menu the item Control Panel.

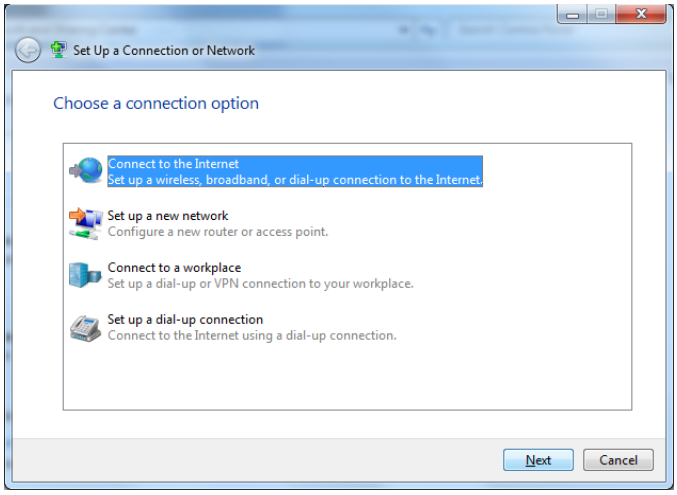
Double-click on the symbol *Network and Sharing Center*.



Click on SET UP A NEW CONNECTION OR NETWORK.

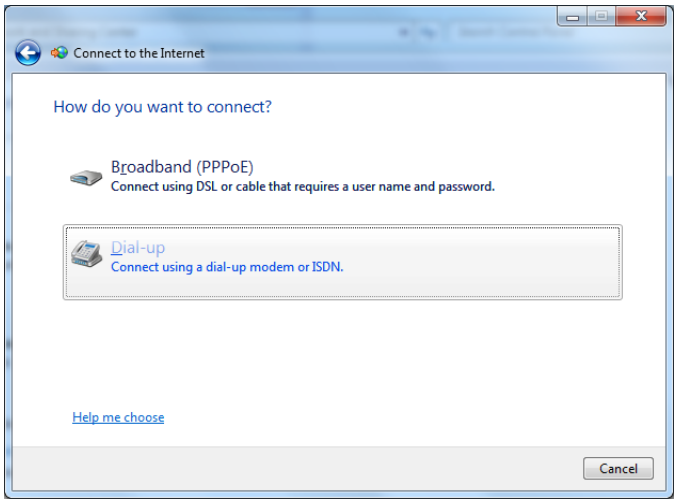


In the following window, as Network Connections Type select the item CONNECT TO THE INTERNET. Then go to Next>.

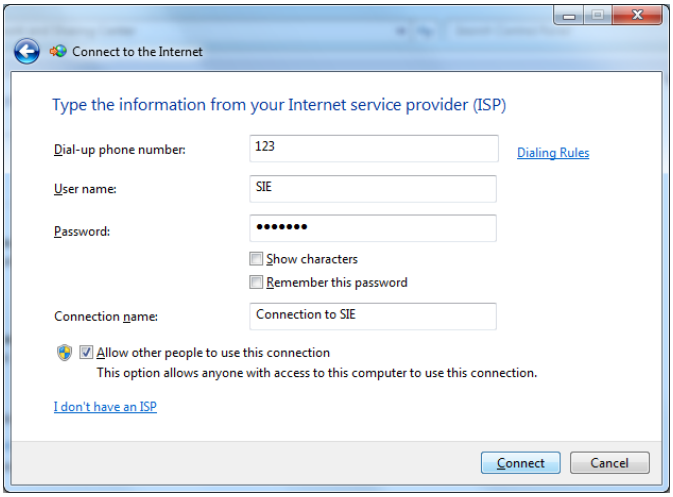


As next step you have to select CONNECTION MANUALLY.

Click on DIAL-UP CONNECTION and continue.



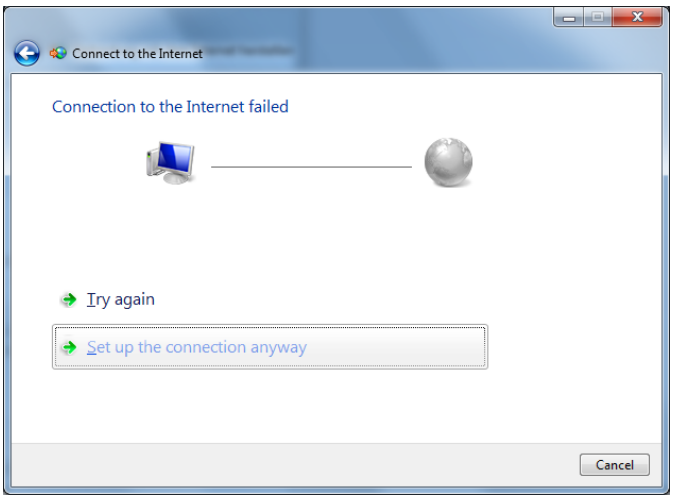
In the next step, enter an optional name for your CONNECTION, and an optional numerical value in the field DIAL UP PHONE NUBMER. Furthermore, enter a USER NAME and a PASSWORD. When you have carried out these steps, confirm each time with Next>.



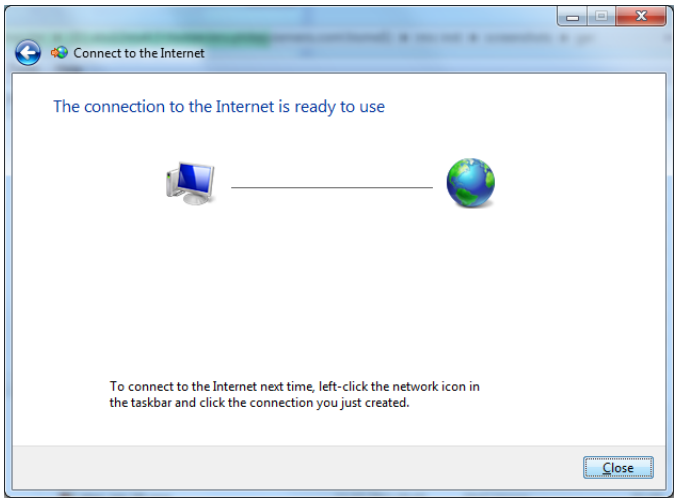
Pay attention to the ticks in the boxes. Finally, click on Connect.

A window appears with the connection test, that you can abort.

Then select SET UP THE CONNECTION ANYWAY.

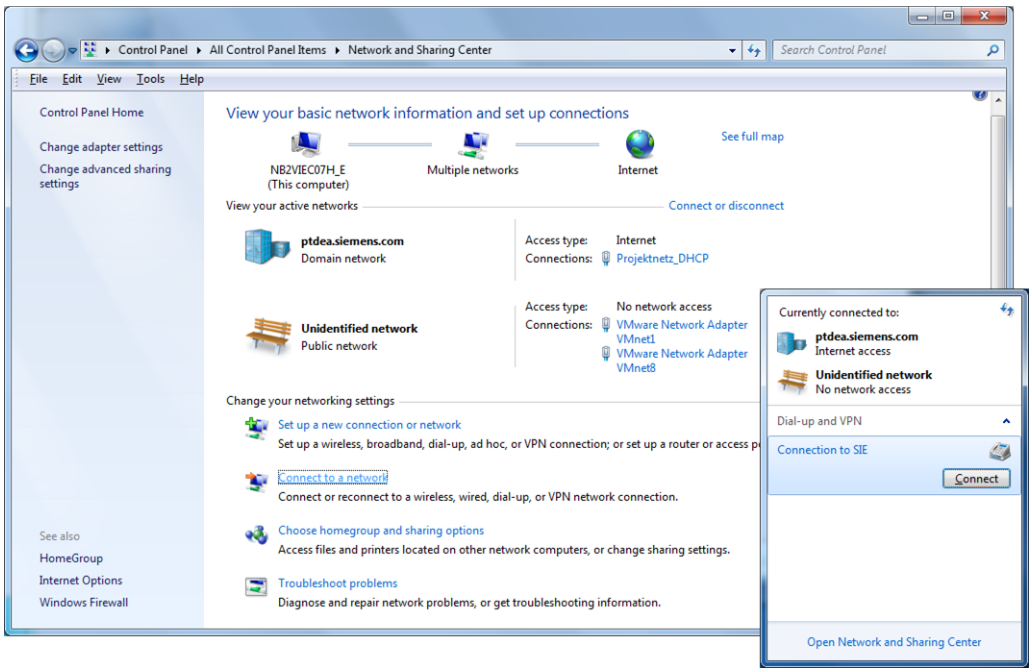


Finally, click on CLOSE.

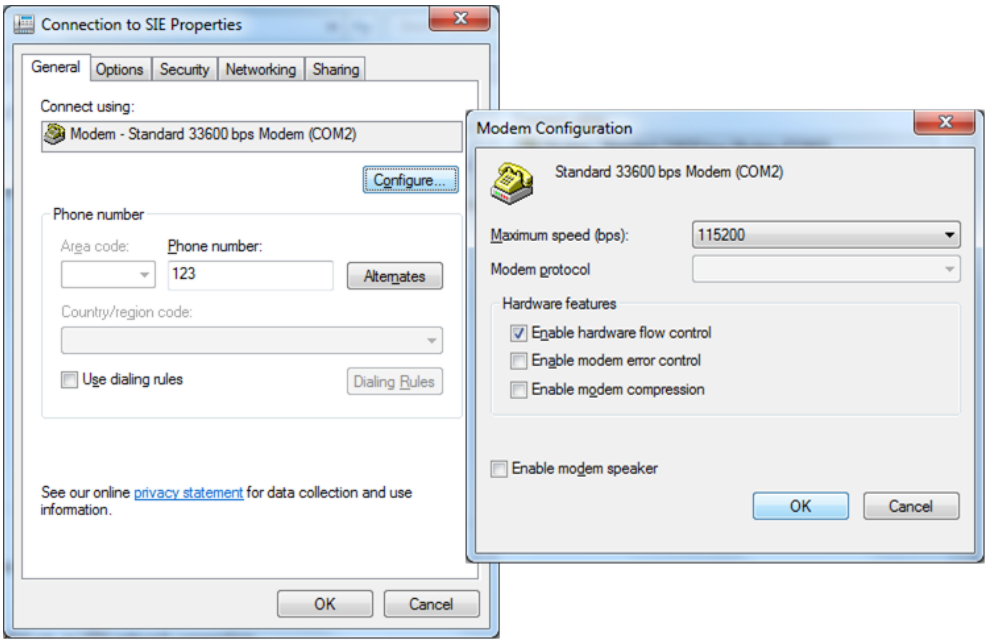


For advanced settings of the new dial-up connection, click in the *Network and Sharing Center* on CONNECT TO A NETWORK.

In the following window, the available networks are listed. Click with the right mouse button on the new connection and select Properties.

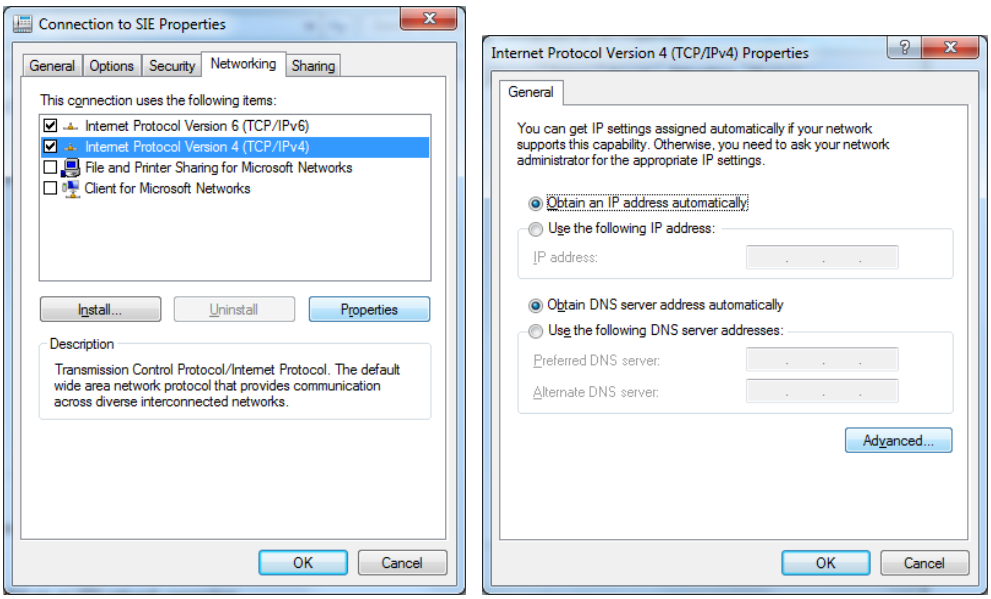


Check the settings and if necessary correct them. Then confirm with OK.

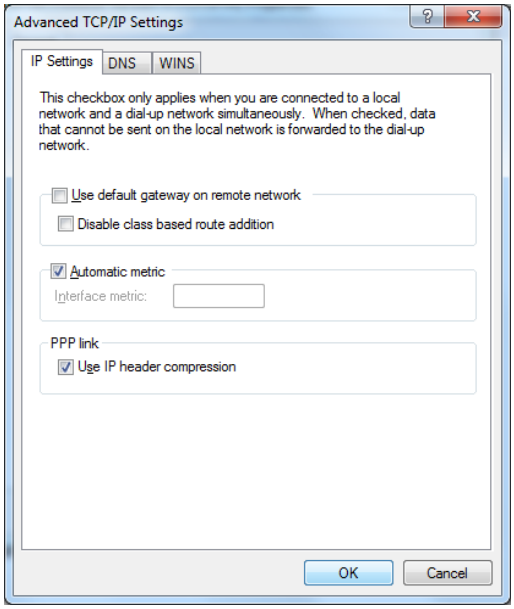


Mark the line `Internet Protocol Version 4 (TCP/IPv4)` and then click on Properties.

In this window the items OBTAIN AN IP ADDRESS AUTOMATICALLY and OBTAIN DNS SERVER ADDRESS AUTOMATICALLY must be selected. Continue with Advanced...

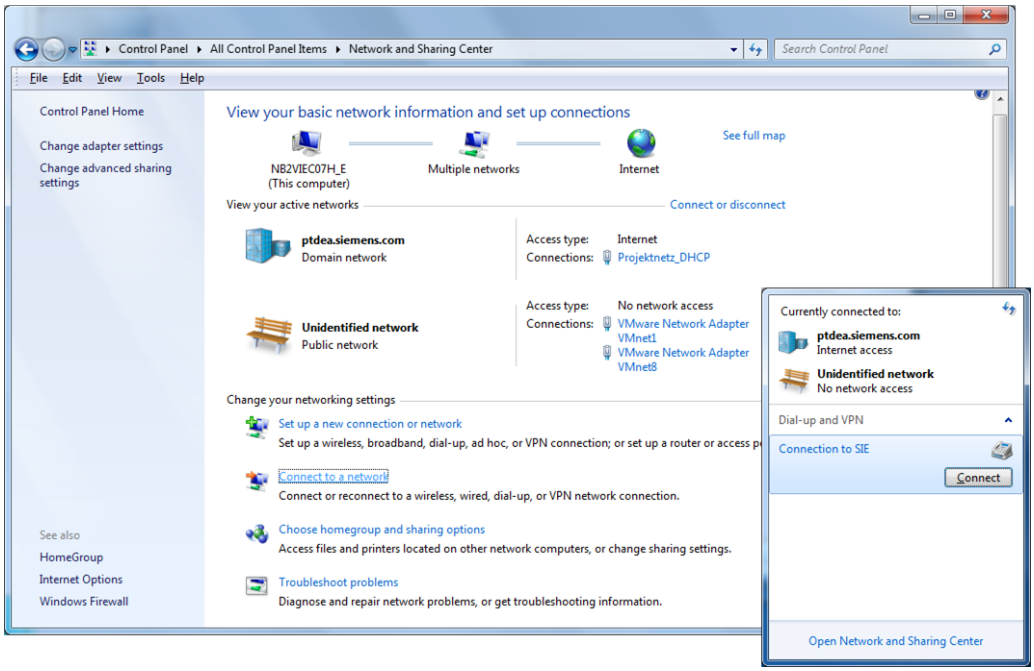


In the last window of the settings, under the register tab IP SETTINGS, the box USE DEFAULT GATEWAY ON REMOTE NETWORK must not be ticked. Confirm the inputs in each window with OK.

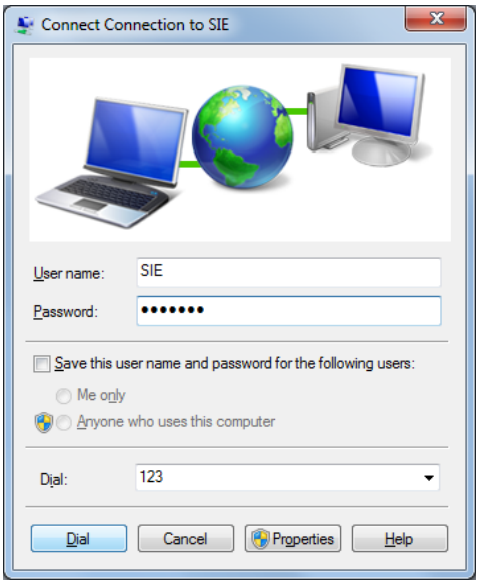


In order to set up a connection, select via the Start menu the item Control Panel.

Click on CONNECT TO A NETWORK in the *Network and Sharing Center*. Select the new connection and click on the button Connect.



Click in the window "Connect …" on the button Dial.



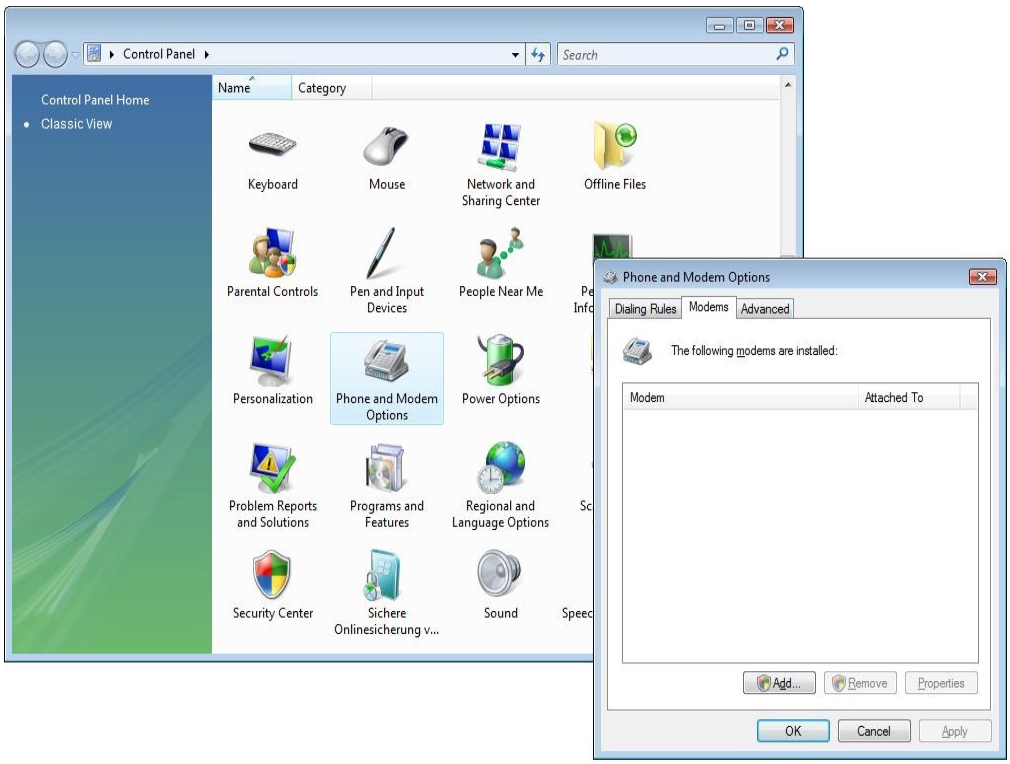
The installation and configuration are thereby complete!

D.3 Settings in Microsoft Windows Vista

D.3.1 Modem Installation

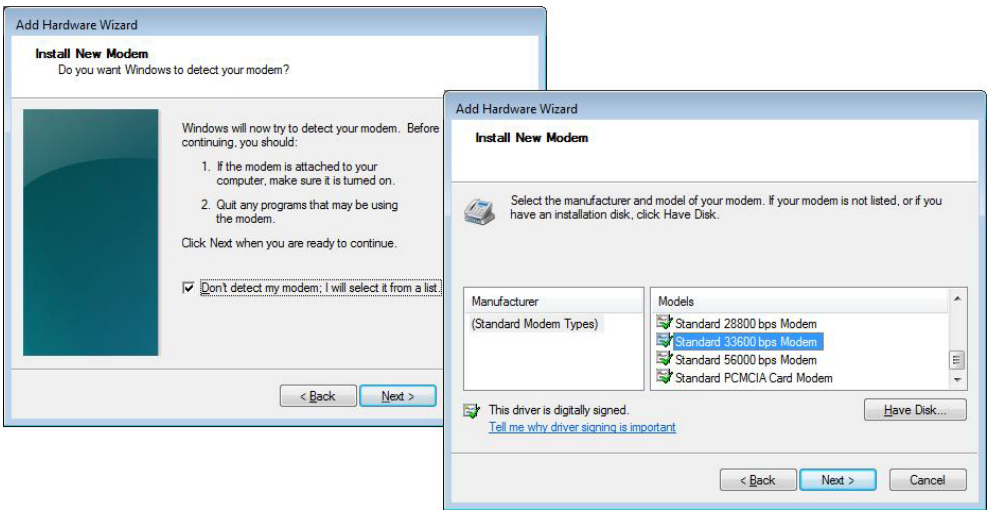
Select via the Start menu the item Control Panel.

Open the modem-group and double-click on the symbol *Phone and Modem Options*. Click on the tab MODEMS and click on Add... to install the modem.

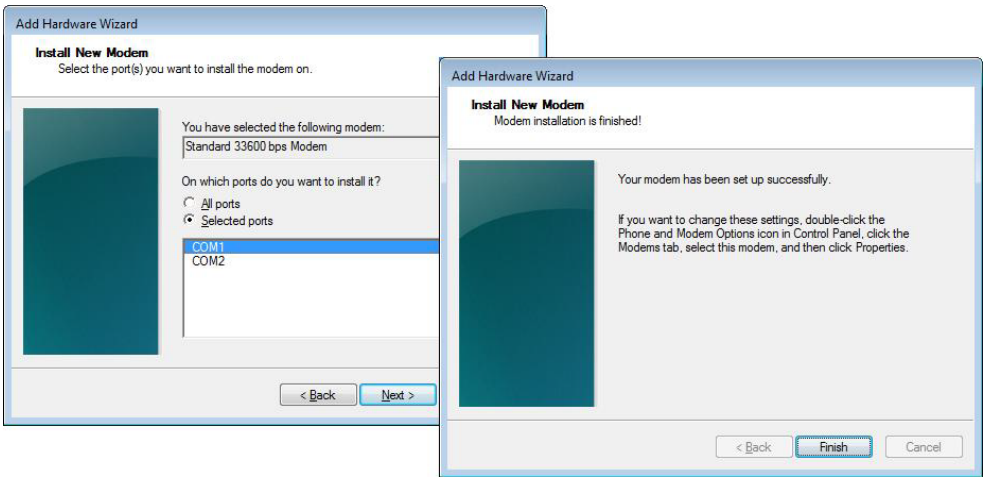


The Hardware Wizard starts, which guides you comfortably through the installation. Place a tick in the box DON'T DETECT MY MODEM; I WILL SELECT IT FROM A LIST and click on Next>.

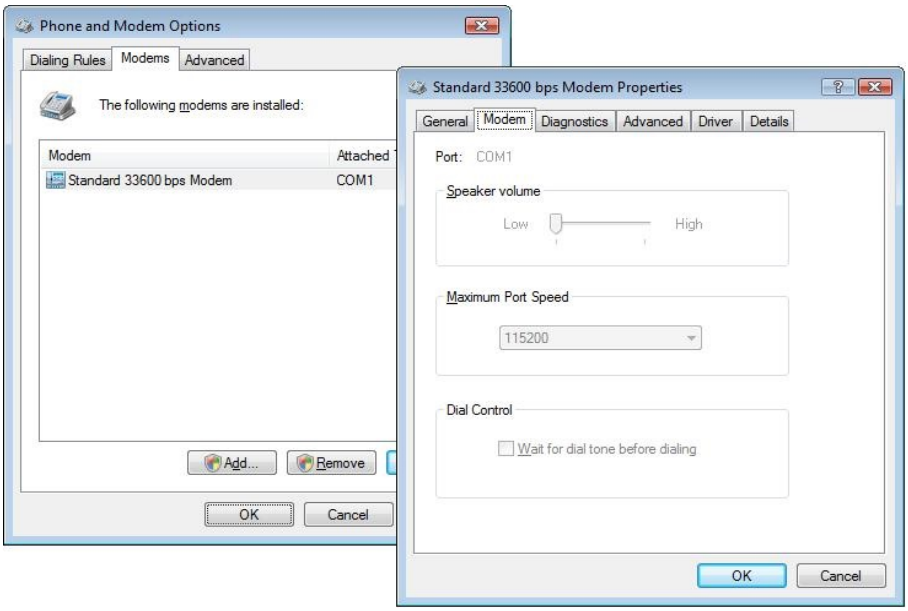
Under MANUFACTURERS select `(Standard Modem Types)` and under MODELS select `Standard 33600 bps Modem`, then click `Next>`.



In this window mark the wanted port and confirm the input with `Next>`. Complete the modem installation in the next window with the button `Finish`.



Now select the button Properties in the register tab MODEMS and check the MAXIMUM PORT SPEED of 115200, as shown in the lower window. If this setting shows another value, please correct it and confirm with OK.

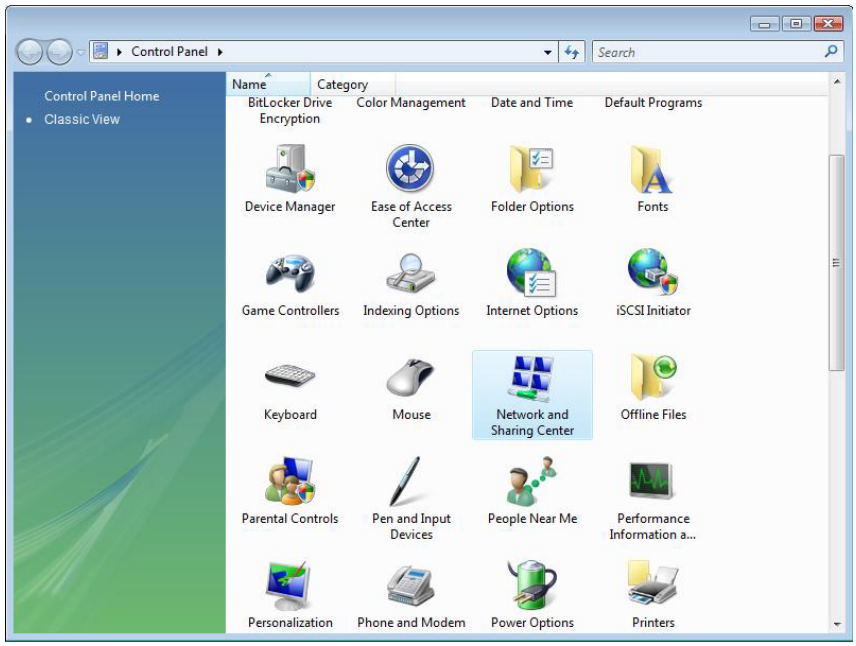


The modem installation is now complete.

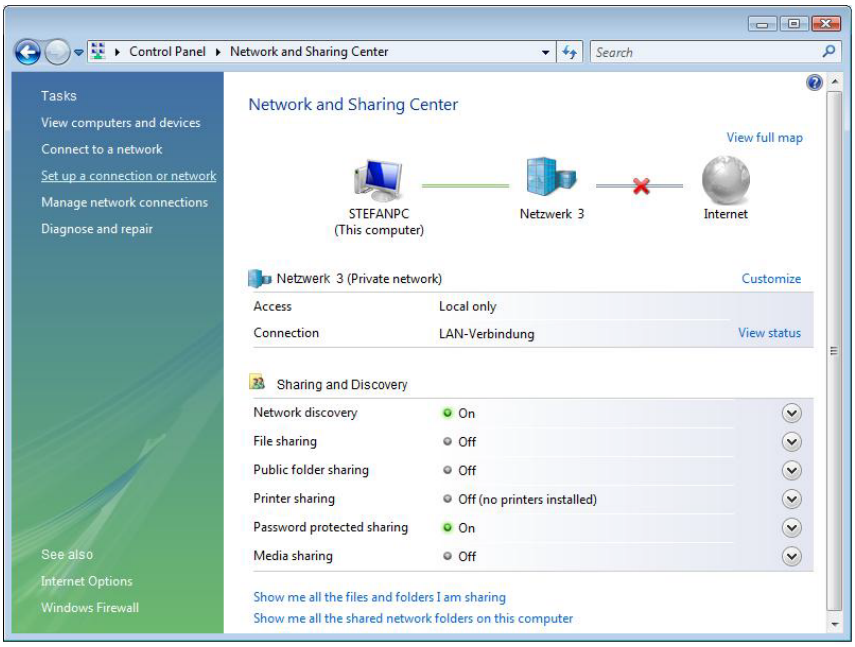
D.3.2 Network Configuration

To set up a new data-communication connection, select via the Start menu the item Control Panel.

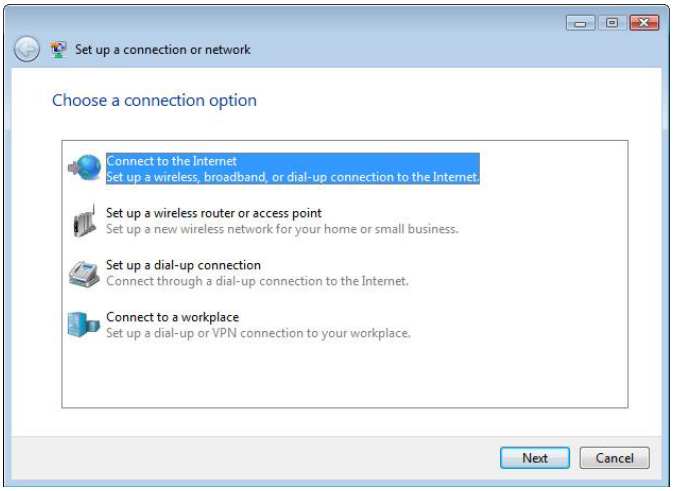
Double-click on the symbol *Network and Sharing Center*.



Go to SET UP A CONNECTION OR NETWORK.

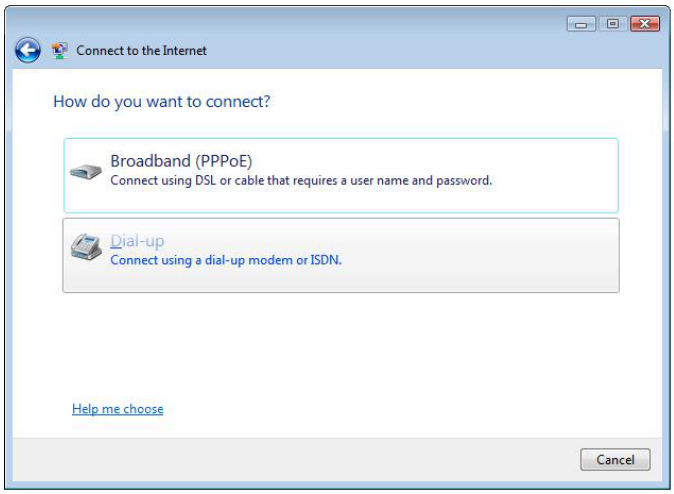


In the following window select the item CONNECT TO THE INTERNET as network connection type. Then continue with Next>.



As next step you have to select the connection type.

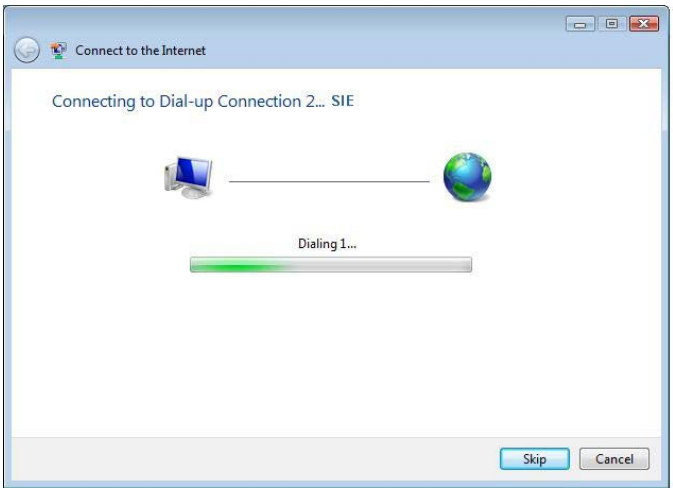
Click on DIAL-UP and continue.



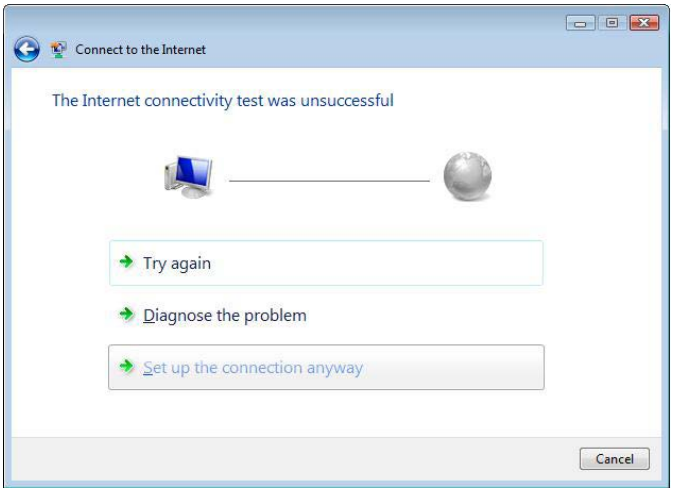
In the next step, enter an optional CONNECTION NAME and an optional numerical value in the field DIAL-UP PHONE NUMBER. Furthermore, enter a USER NAME and a PASSWORD.

Pay attention to the ticks in the boxes. Finally, click on Connect.

Then a window appears with the connection test, that you can abort.

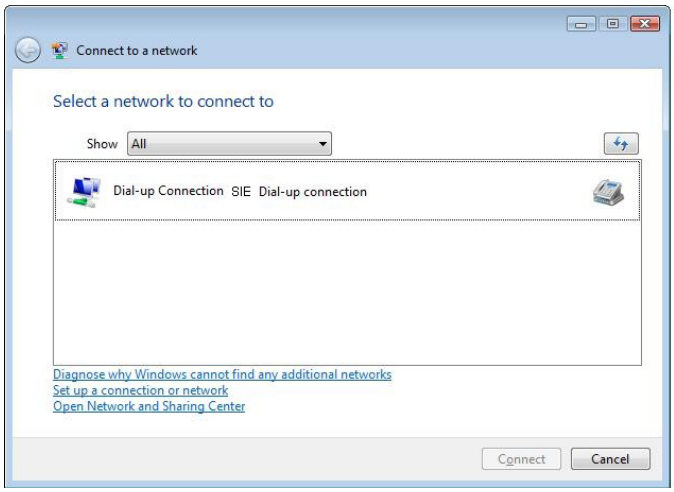


Then select SET UP THE CONNECTION ANYWAY.

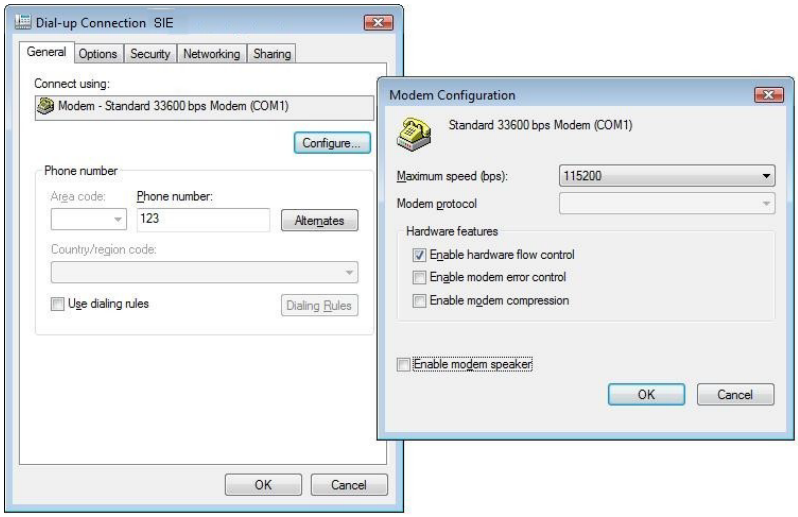


To finish click on Cancel.

For advanced settings and to check the new dial-up connection click with the right mouse button on the new Dial-up Connection and select the menu item Properties.

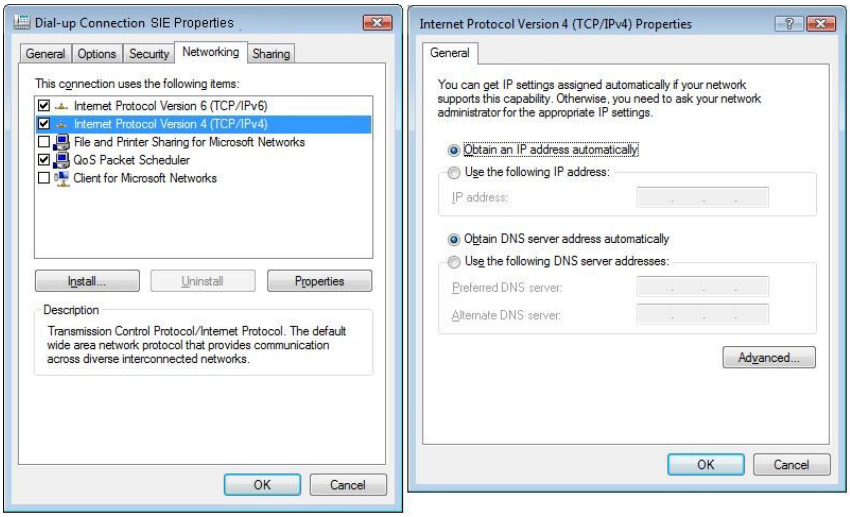


Check the settings and if necessary correct them. Then confirm with OK.

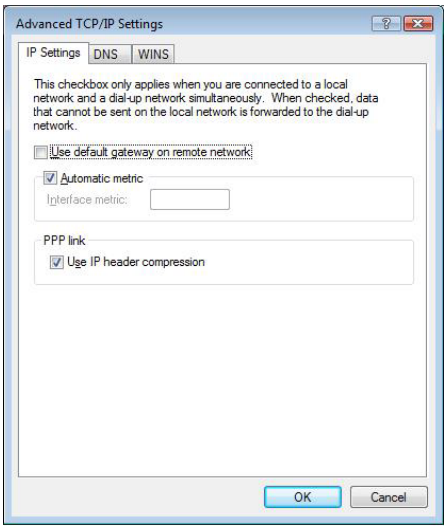


Mark the line `Internet Protocol (TCP/IPv4)` and then click on Properties.

In this window the items OBTAIN AN IP ADDRESS AUTOMATICALLY and OBTAIN DNS SERVER ADDRESS AUTOMATICALLY must be selected. Continue with Advanced...

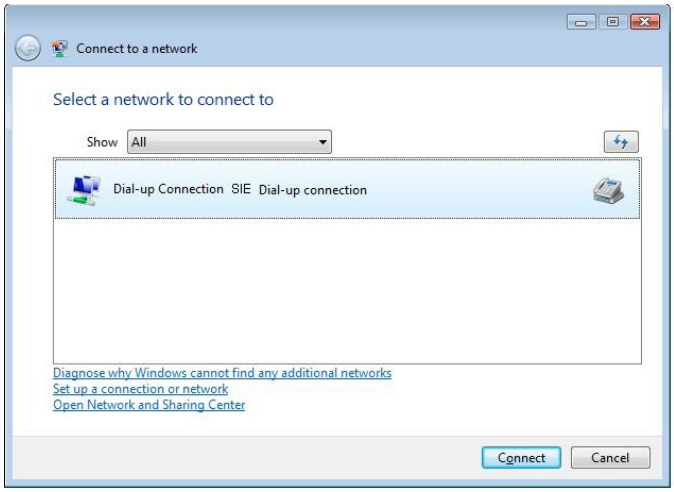


In the last window of the settings, under the register tab GENERAL, the box USE DEFAULT GATEWAY ON REMOTE NETWORK must not be ticked. Confirm with OK.



In order to set up a connection, select via the Start menu the item `Connect to` and select *Dial-up Connection SIE*.

Or you can set up the connection via this window, if it is still open, by clicking the button Connect.



Click in the window "Connect …" on the button Dial.

The installation and configuration are thereby complete.

D.4 Restore Settings for the Internet Use

Note

The new dial up connection is now the default connection which is activated if the web browser is called. If the web browser was used before for browsing the internet, this does not work now any more.

In order to use the web browser further for browsing the internet, you must modify the new dial up connection as follows (the following steps are exemplary and depend on the respective operating system of the engineering PC):

- Open via the start menu the Control Panel
- Depending on the display select *Network and Internet*, and then *Internet Options*
- Select the register tab CONNECTIONS
- Mark the option NEVER DIAL A CONNECTION and confirm with OK

Now you can use the web browser again for browsing the internet.

Note

In order to set up a connection to SICAM MIC now, you must start at first the new dial up connection manually, and afterwards you can connect with the respective target device.

E Use Cases

Contents

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E.2 Usage as Telecontrol Substation with Node Function (Protocol Converter) ... 625
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This chapter shows the network structure of typical applications of CP-8000/CP-802*x*.

Note

The IP-addresses and subnet maks shown in these examples are exemplary and serve only for better understanding. These must be adopted according to your application.

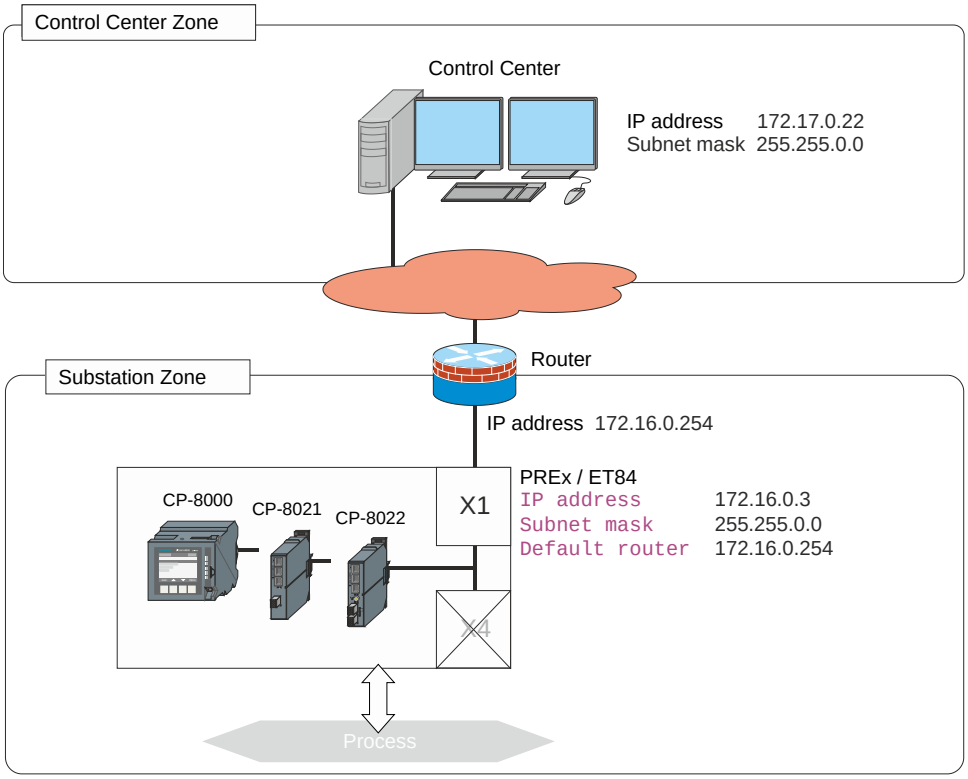
E.1 Usage as Telecontrol Substation

Features

- Communication with the control system via IEC 60870-5-104
- 1 IP address
- 1 subnet mask
- 1 default router
- Communication to the process with local peripherals or serial communications protocols (e.g. MODBUS, …)
- Parameter `Network settings | IP address | Mode of Ethernet ports` = **1 IP address (connected ports in switch mode)**

  (in this case both Ethernet interfaces use the MAC address of X1)

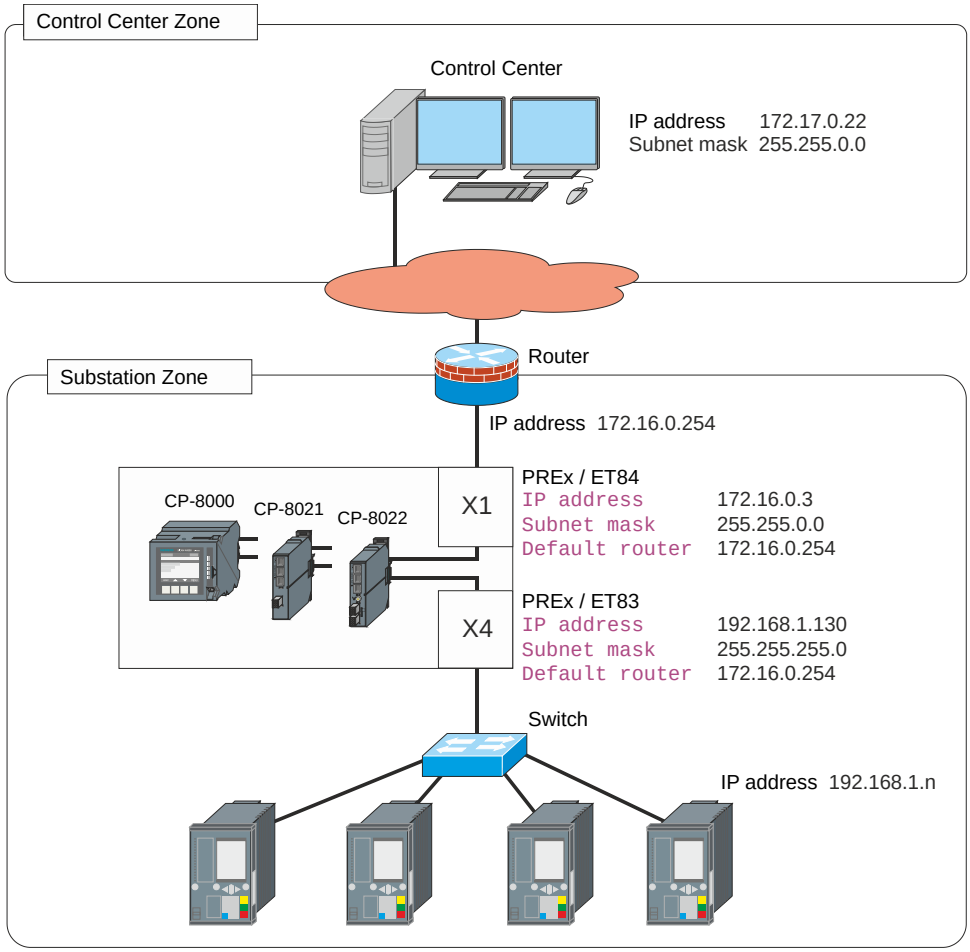
  In this configuration CP-8000, CP-8021 or CP-8022 can be reached with the set IP address via both Ethernet interfaces (X1 or X4). The unused port is not deactivated.



E.2 Usage as Telecontrol Substation with Node Function (Protocol Converter)

Features

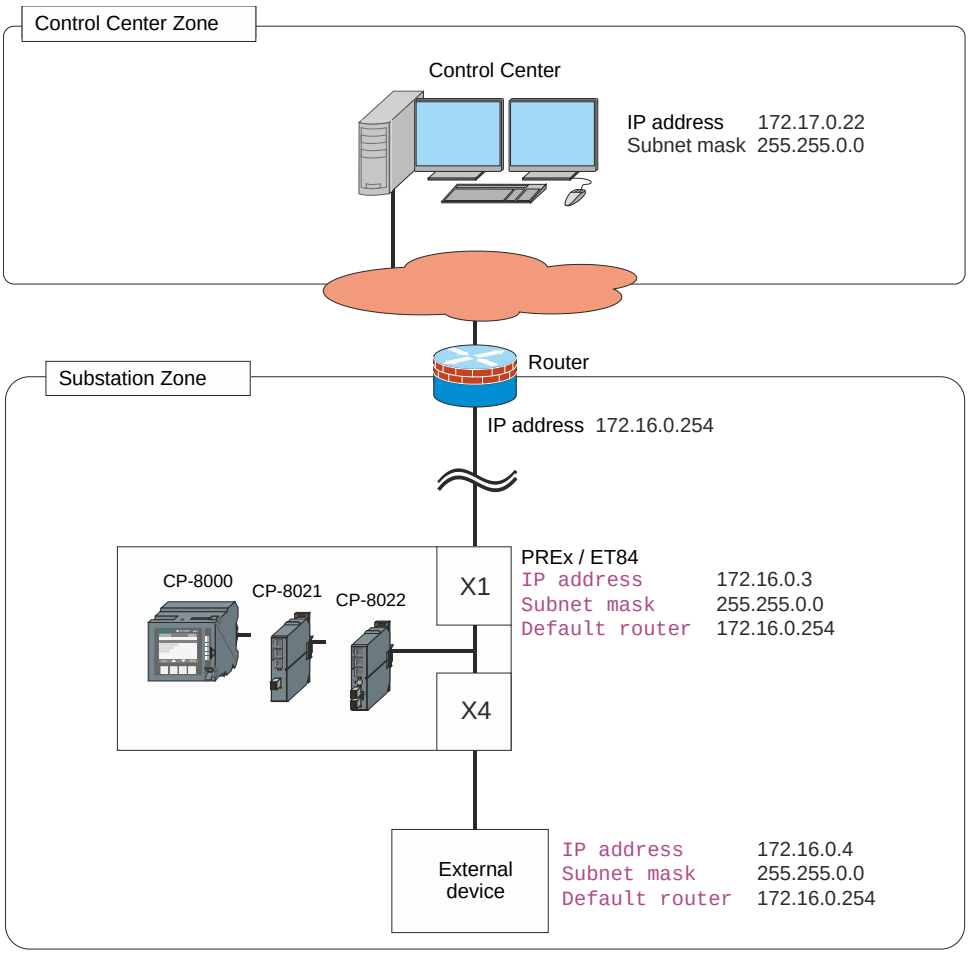
- Communication with the control system via IEC 60870-5-104
  (Ethernet interface, X1 or X4, can be set by parameter)
- Communication with the protective devices via IEC 61850
  (Ethernet interface, X1 or X4, can be set by parameter)
- 2 IP addresses
- 2 logically separated subnets
  - Communication only visible on the LAN within the subnet
  - Data exchange between subnets only via SICAM A8000 application function
- 1 default router
- Parameter `Network settings | IP adress | Mode of Ethernet Ports` = **2 IP addresses (independent ports)**
  (in this case both Ethernet interfaces have different MAC addresses)



E.3 Usage as Telecontrol Substation with Integrated Switch for External System Connection

Features

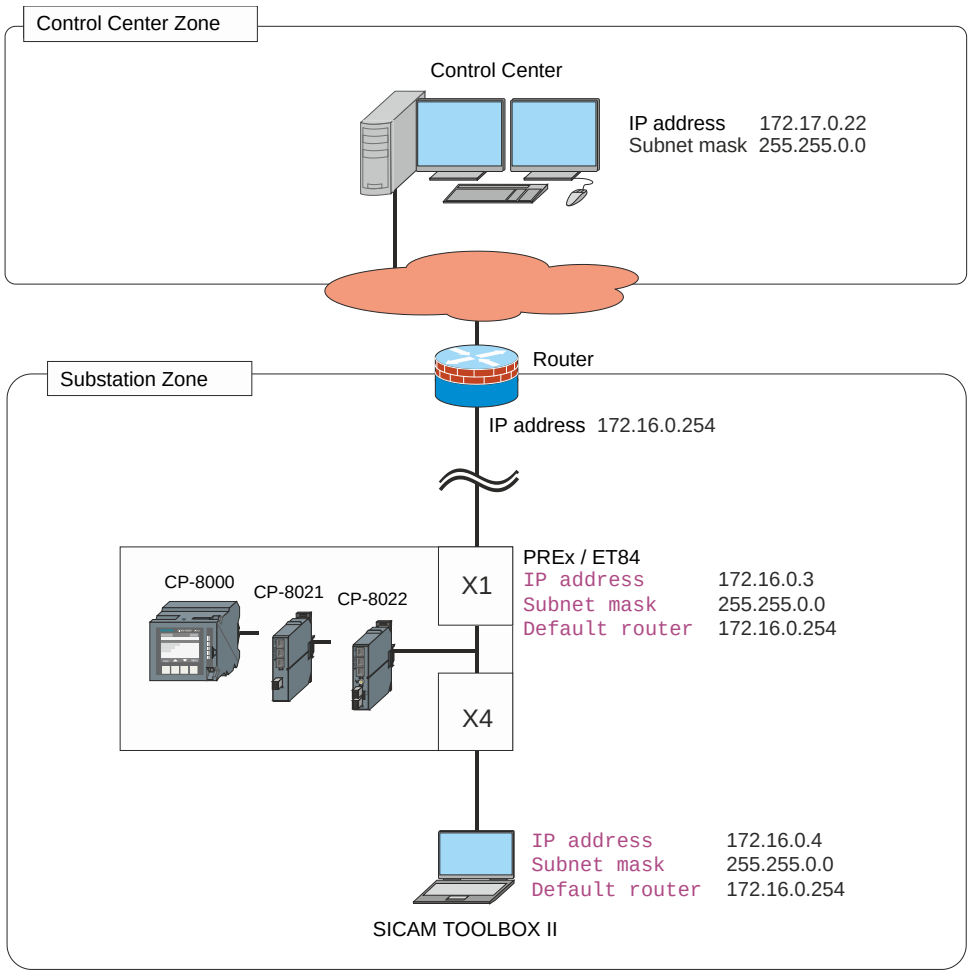
- Communication with the control system via IEC 60870-5-104 (Ethernet-Interface, X1 or X4, can be set by parameter)
- Communication with the external system via IEC 60870-5-104 (Ethernet interface, X1 or X4, can be set by parameter)
- CP-8000, CP-8021 or CP-8022 is used as switch between control system and external system
- 1 IP address
- 1 subnet mask
- 1 default router
- Parameter `Network settings | IP address | Mode of Ethernet Ports` = **1 IP address (connected ports in switch mode)**
  (in this case both Ethernet interfaces use the MAC address of X1)



E.4 Usage as Telecontrol Substation with Integrated Switch for SICAM TOOLBOX II Connection

Features

- Communication with the control system via IEC 60870-5-104
  (Ethernet interface, X1 or X4, can be set by parameter)
- Communication with SICAM TOOLBOX II via http/https
  (Ethernet interface, X1 or X4, can be set by parameter)
- CP-8000, CP-8021 or CP-8022 serves as switch between control system and SICAM TOOLBOX II
  By means of SICAM TOOLBOX II, which is connected via the integrated switch, it is possible to reach the local SICAM A8000 and further SICAM RTUs components via the “Control Center Zone“. It depends on the network configuration which can be reached.
- 1 IP address
- 1 subnet mask
- 1 default router
- Parameter `Network settings | IP adress | Mode of Ethernet Ports` = **1 IP address (connected ports in switch mode)**



E.5 Usage with Static Routes

E.5.1 General

Static routing is based on a fixed definition of the path of data packages between two end systems. This definition is written down by administrators in a routing table. This kind of routing serves for security, respectively is used in network configurations, if several default gateways are used.

Because of the big effort for the manual maintaining of the tables the number of routes is restricted.

- Number of static routes: 10
- Parameter of static routes:
  - `Source IP address`
  - `Destination IP address`
  - `Gateway IP address`
  - `Subnet mask`
- Interfaces: X1, X4

E.5.2 Configuration

Activation of the „static routes“

Parameter `Network settings | IP address | advanced parameters | Enable static routes` = **YES**.

Definition of the routing table

Parameter `Network settings | IP address | advanced parameters | static routes` = **Number of lines x** (max. 10).

Mode of the Ethernet Ports

Parameter `Network settings | IP address | Mode of ethernet ports` = **1 IP address (connected ports in switch mode)**:

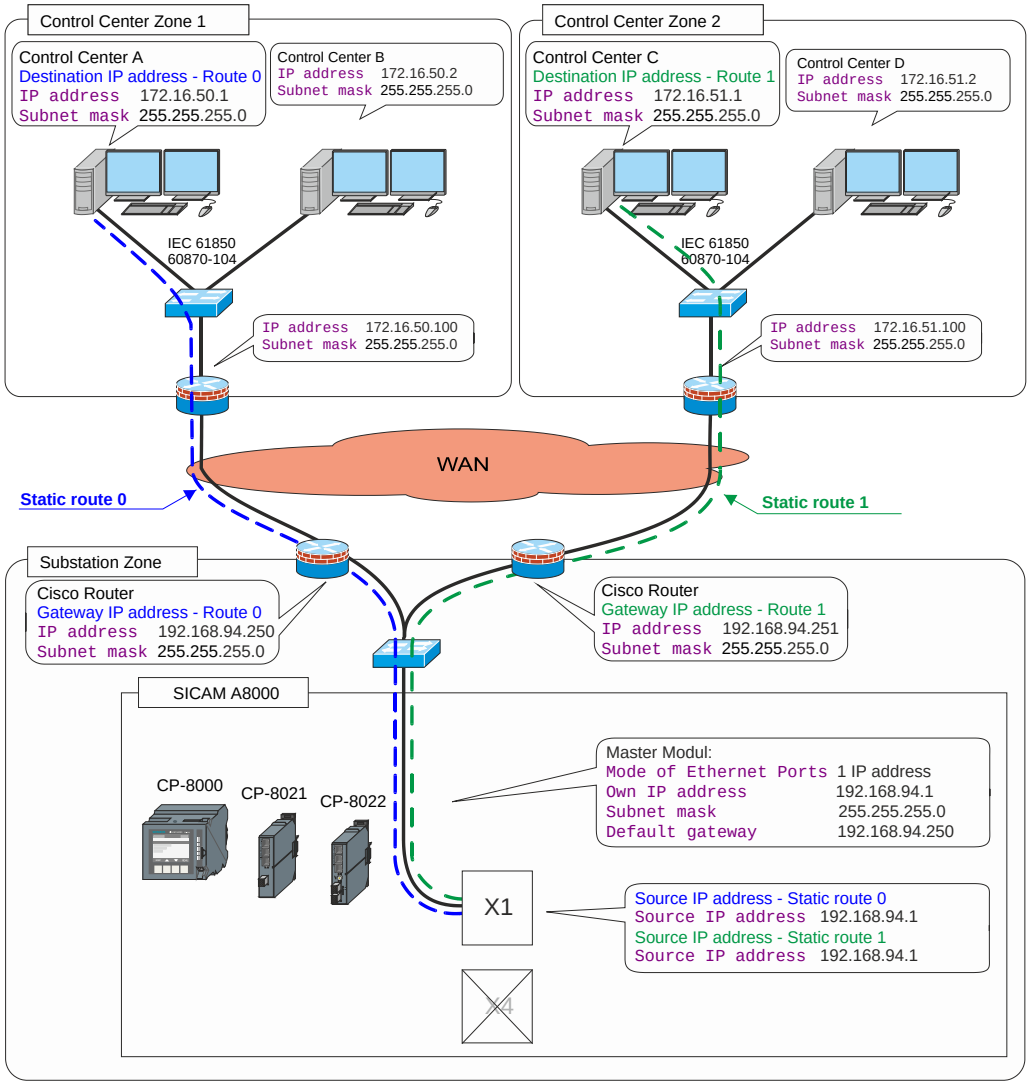
The data packages are sent via the interfaces X1 and X4.

Parameter `Network settings | IP address | Mode of ethernet ports` = **2 IP addresses (independent ports)**:

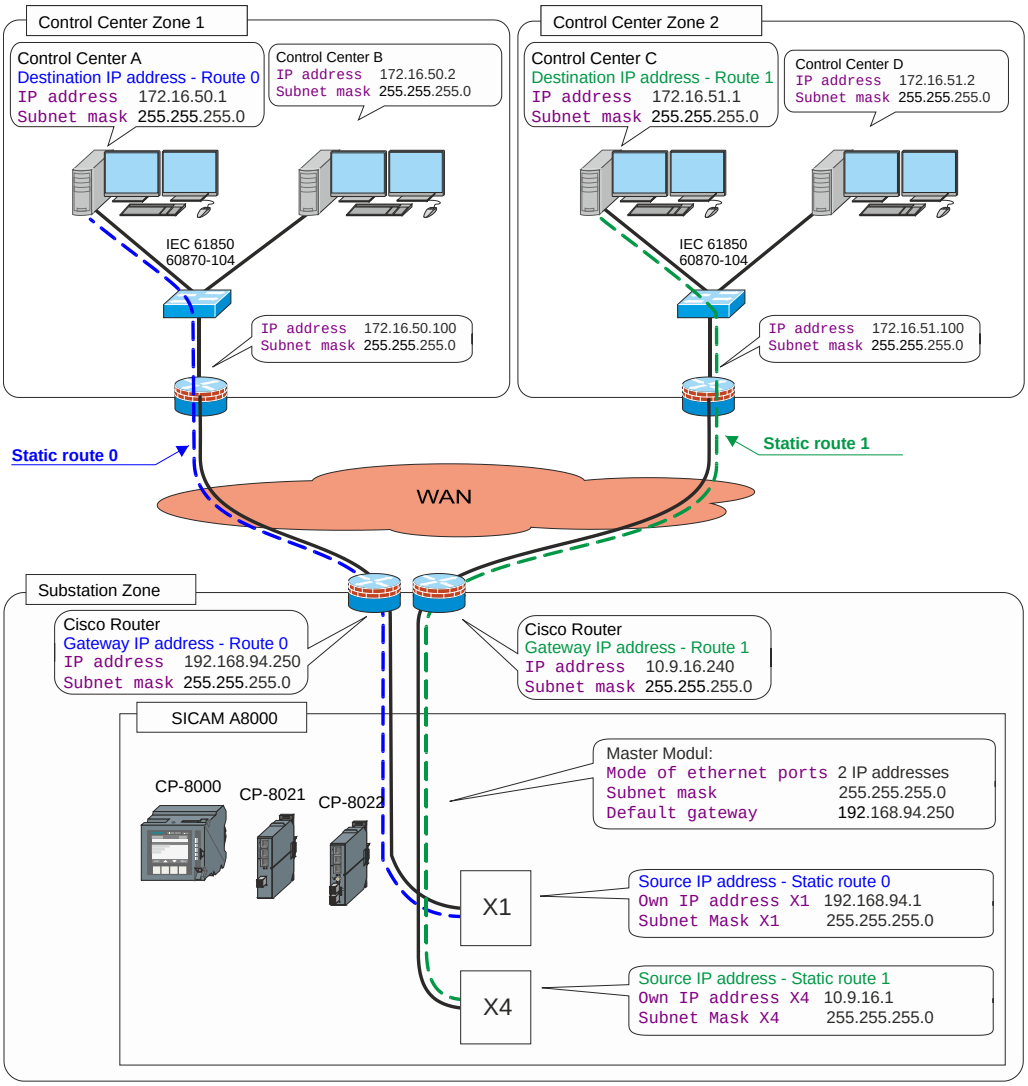
The data packages are sent via that interface (X1 or X4) to which the respective source IP address (`Own IP address X0` or `Own IP address X1`) is assigned.

Example A

This example shows the usage of 2 static routes from CP-8000, CP-8021 or CP-8022 via 2 gateways to control center in different IP networks.



Example B


Control Center Zone 1
Control Center A
Destination IP address - Route 0
IP address 172.16.50.1
Subnet mask 255.255.255.0
Control Center B
IP address 172.16.50.2
Subnet mask 255.255.255.0
IEC 61850
60870-104
IP address 172.16.50.100
Subnet mask 255.255.255.0
Control Center Zone 2
Control Center C
Destination IP address - Route 1
IP address 172.16.51.1
Subnet mask 255.255.255.0
Control Center D
IP address 172.16.51.2
Subnet mask 255.255.255.0
IEC 61850
60870-104
IP address 172.16.51.100
Subnet mask 255.255.255.0
Static route 0
Static route 1
WAN
Substation Zone
Cisco Router
Gateway IP address - Route 0
IP address 192.168.94.250
Subnet mask 255.255.255.0
Cisco Router
Gateway IP address - Route 1
IP address 10.9.16.240
Subnet mask 255.255.255.0
SICAM A8000
CP-8000
CP-8021
CP-8022
Master Modul:
Mode of ethernet ports 2 IP addresses
Subnet mask 255.255.255.0
Default gateway 192.168.94.250
X1
Source IP address - Static route 0
Own IP address X1 192.168.94.1
Subnet Mask X1 255.255.255.0
X4
Source IP address - Static route 1
Own IP address X4 10.9.16.1
Subnet Mask X4 255.255.255.0

E.6 Usage with IPSec VPN

Features

- Communication with the control system via IEC 60870-5-104 (Ethernet interface X1 or X4 can be set by parameter)
- 1 or 2 IP addresses
- 1 subnet mask
- 1 default router
- `Network settings | Security | IP security enabled` = **YES**

  Afterwards, the parameters which are required for the configuration of the IPSec connection, are available under `Network settings | Security | IP security`:

  ```
  ICMP ping reply
  IPSec VPN tunnel 1 enabled
  IPSec VPN tunnel 2 enabled
  ```

  ```
  Local site | Identifier (local ID)
  Local site | VPN client IP address
  Local site | VPN client default gateway
  Local site | VPN client subnet mask
  ```

  ```
  Remote site 1 | Identifier (remote ID)
  Remote site 1 | IP-Address
  Remote site 1 | Subnet IP address
  Remote site 1 | Subnet mask
  ```

  ```
  IKE security associations 1 | Internet key exchange (IKE) version
  IKE security associations 1 | SA lifetime (timeout)
  IKE security associations 1 | Auto-selection of authentication &
  encryption *)
  ```

  ```
  IPSec authentication | Pre-shared Key
  ```

  ```
  IPSec security associations 1 | SA lifetime (timeout)
  IPSec security associations 1 | SA lifetime (data size limit)
  IPSec security associations 1 | Auto-selection of authentication &
  encryption *)
  ```

  ```
  IPSec tunnel supervision by ping 1 | Ping enabled
  IPSec tunnel supervision by ping 1 | Ping cycle time
  IPSec tunnel supervision by ping 1 | Ping peer IP address
  ```

---

*) if **NO**:
```
Encryption algorithm
Authentication algorithm
Diffie Hellman group
```

Note

CP-8000, CP-8021, CP-8022 and the remote station must be configured in different networks when IPSec VPN is used.

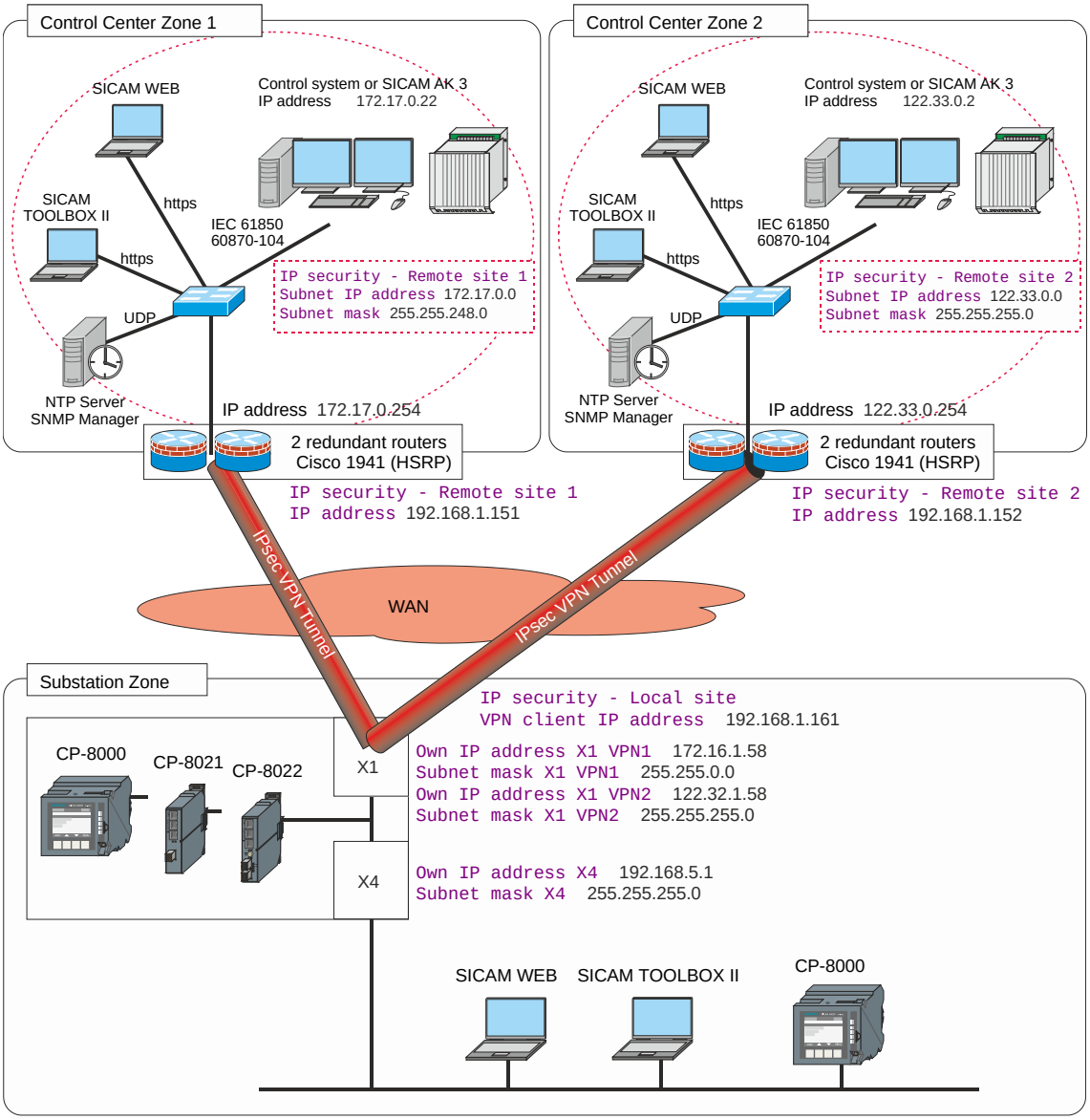
The parameters `Remote site <x> |Subnet IP address` and `Remote site <x> |Subnet mask` are necessary for the SICAM A8000 internal router function.

The certificate *SHA256* must be used (obsolete: *SHA1*).

In Google Chrome the cache must be deleted before the logon with SICAM WEB via https://.

For routing in 2 tunnels it is necessary to define both remote stations (Remote site 1 and Remote site 2).

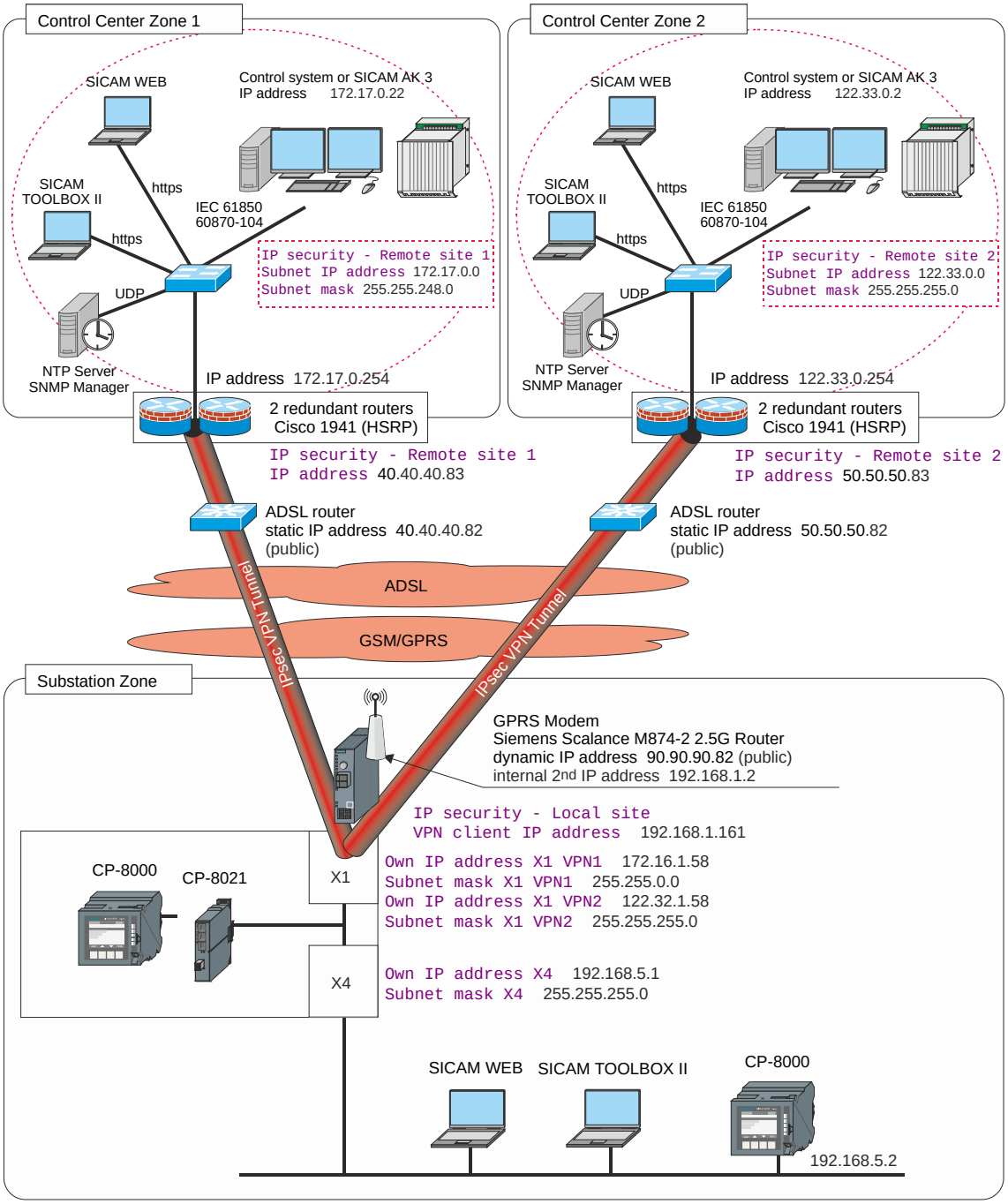
E.6.1 Usage as Telecontrol Substation with IPSec VPN via fixed Network



Note

The default gateway under `Local site | VPN client default gateway` must be the external visible IP address of the router, in this example **192.168.1.151**.

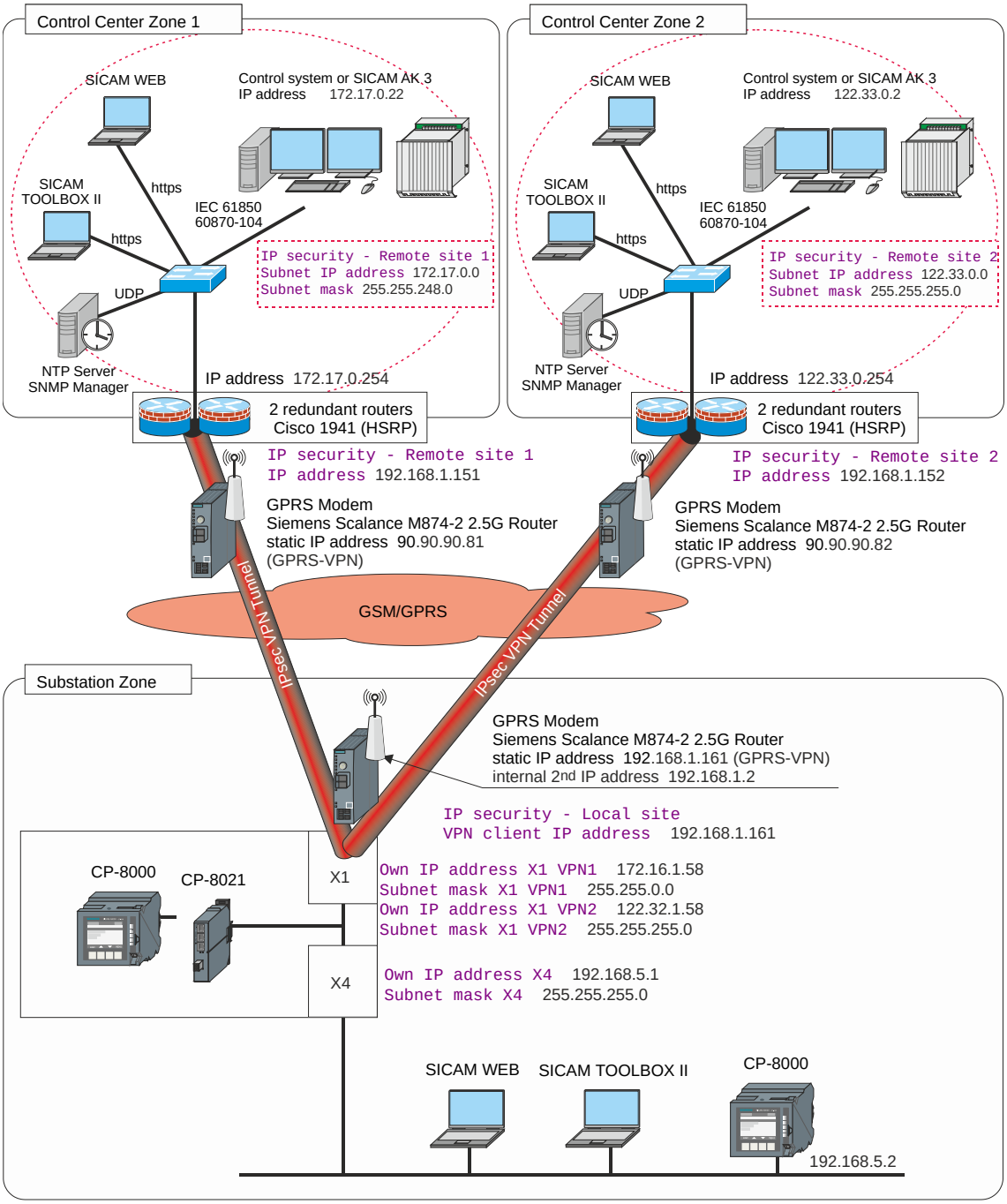
E.6.2 Usage as Telecontrol Substation with IPSec VPN via GPRS Router and ADSL Network



Note

The default gateway under `Local site | VPN client default gateway` must be the external visible IP address (=2nd IP address) of the GPRS router, in this example **192.168.1.2**.

E.6.3 Usage as Telecontrol Substation with IPSec VPN via GPRS Network



Note

The default gateway under `Local site | VPN client default gateway` must be the external visible IP address (=2nd IP address) of the GPRS router, in this example **192.168.1.2**.

E.7 Usage of the Internal GPRS Modem (CP-8022)

Features/Settings for Application without IPsec VPN

- Communication with the control system via IEC 60870-5-104 (GPRS interface X7)
- The default router is in this case the GPRS network and that is adjusted internally with connection setup. It can not be parameterized.
- `Network settings | GPRS | enable GPRS communication` = **YES**

Features/Settings for Application with IPsec VPN

- Communication with the control system via IEC 60870-5-104 (GPRS interface X7)
- `Network settings | Security | IP security enabled` = **YES**

  Afterwards, the parameters which are required for the configuration of the IPSec connection, are available under `Network settings | Security | IP security` :

  ```
  ICMP ping reply
  IPSec VPN tunnel 1 enabled
  IPSec VPN tunnel 2 enabled
  ```

  ```
  Local site | Identifier (Local ID)
  ```

  ```
  Remote site 1 | Identifier (Remote ID)
  Remote site 1 | IP-Address
  Remote site 1 | Subnet IP-Address
  Remote site 1 | Subnet mask
  ```

  ```
  IKE security associations 1 | Internet key exchange (IKE) Version
  IKE security associations 1 | SA lifetime (timeout)
  IKE security associations 1 | Auto-selection of authentication &
  encryption *)
  ```

  ```
  IPSec authentication | Pre-shared key
  ```

  ```
  IPSec security associations 1 | SA lifetime (timeout)
  IPSec security associations 1 | SA lifetime (data size limit)
  IPSec security associations 1 | Auto-selection of authentication &
  encryption *)
  ```

  ```
  IPSec tunnel supervision by ping 1 | Ping enabled
  IPSec tunnel supervision by ping 1 | Ping cycle time
  IPSec tunnel supervision by ping 1 | Ping peer IP-address
  ```

---

*) if **NO**:
```
Encryption algorithm
Authentication algorithm
Diffie Hellman group
```

Note for network configuration

CP-8022 and the remote station must be configured in different networks when IPSec VPN is used.

The parameters `Remote site <x> |Subnet IP address` and `Remote site <x> |Subnet mask` are necessary for the SICAM A8000 internal router function.

The certificate *SHA256* must be used (obsolete: *SHA1*).

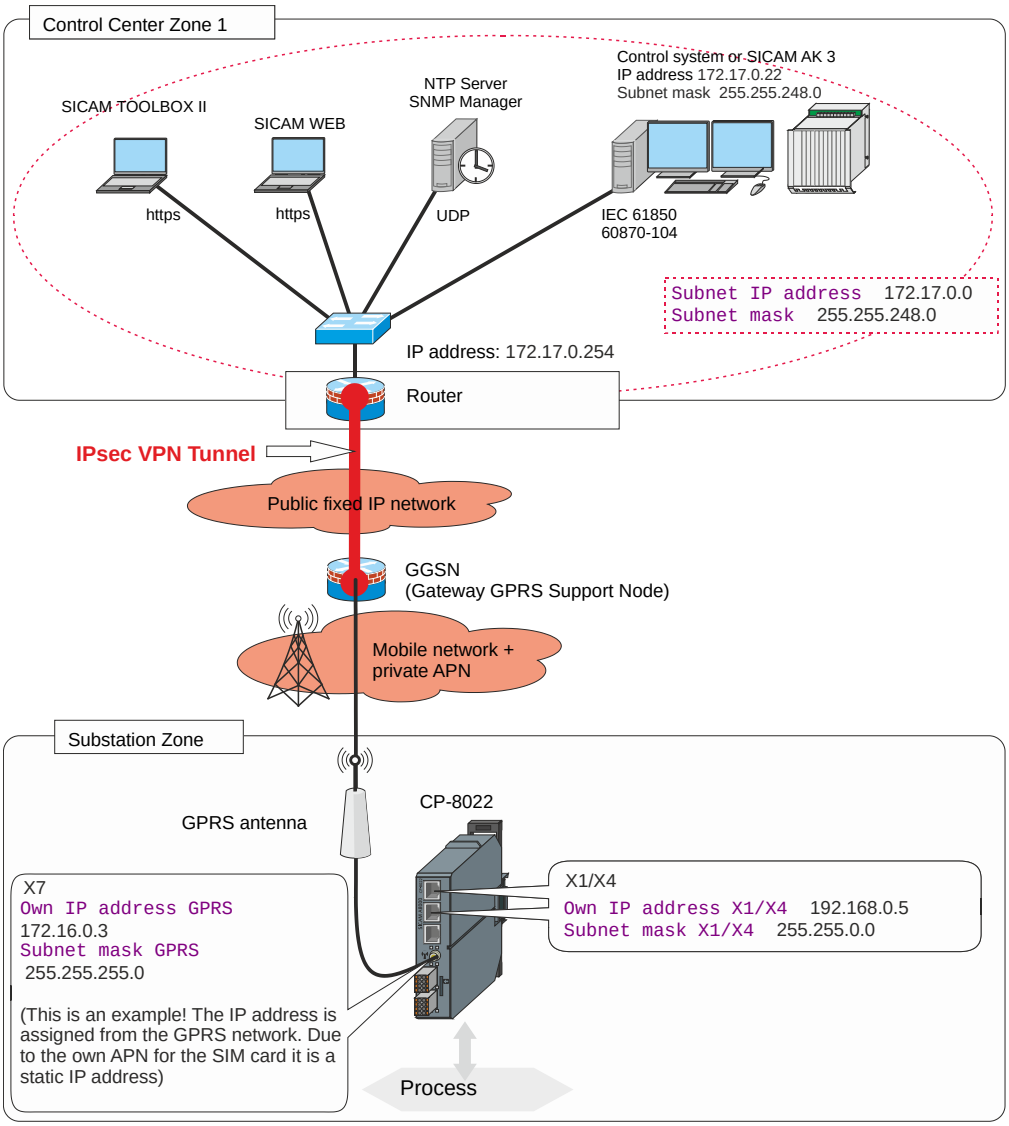
In Google Chrome the cache must be deleted before the logon with SICAM WEB via https://.

For routing in 2 tunnels it is necessary to define both remote stations (remote site 1 and remote site 2).

E.7.1 GPRS Communication without IPSec VPN

CP-8022 does not establish a VPN tunnel with this application. The advantage of this application is that with deployment of multiple CP-8022 substations the VPN gateway router does not have to maintain a VPN tunnel to each CP-8022 substation.

Disadvantage is that this application is based on a relatively weak authentication and encryption of the mobile network. Further, a special contract with the mobile radio provider or service provider is necessary and a transitional security does not exist.



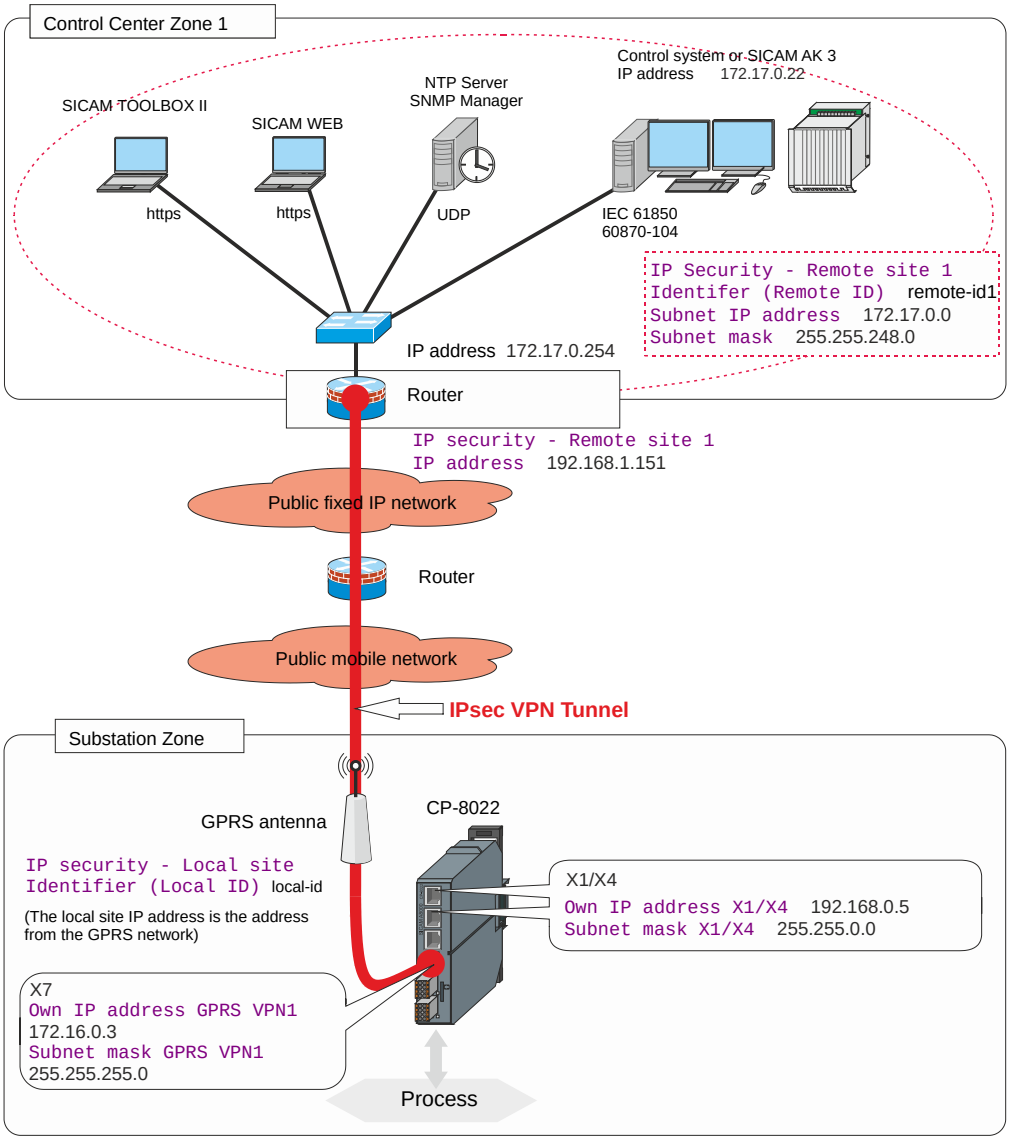
Note

Siemens recommends with this configuration the parameterization of an IP address for the local LAN interfaces X1/X4 as a precaution. Thereby you can prevent a “lockout” due to an erroneous GPRS configuration.

When GPRS is activated, the local LAN interfaces X1 and X4 are operated in switch mode.

The static private IP address (from the mobile radio provider) must be parameterized also in the device (parameter `Own IP address GPRS`).

E.7.2 GPRS Communication with 1 IPSec VPN Tunnel

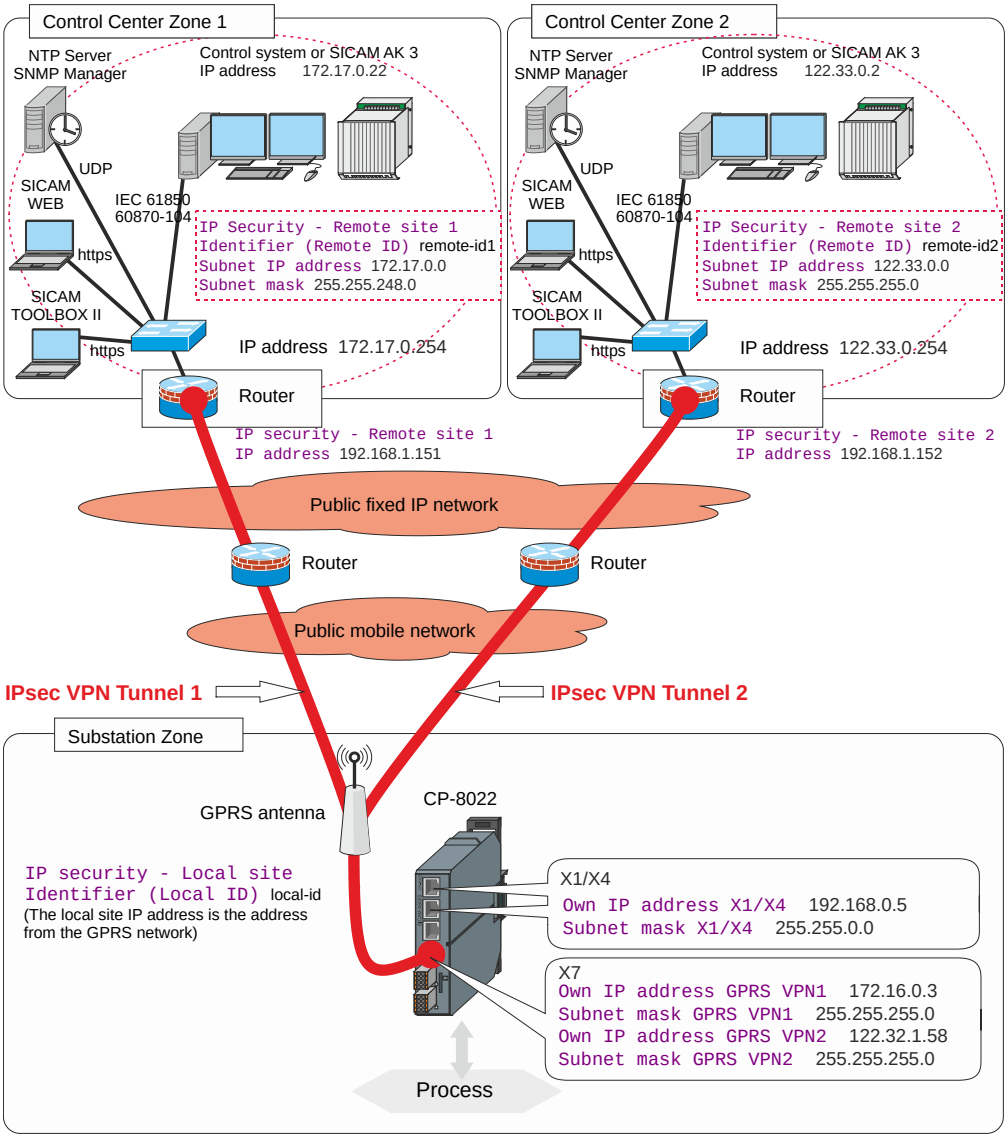


Note

Siemens recommends with this configuration the parameterization of an IP address for the local LAN interfaces X1/X4 as a precaution. Thereby you can prevent a “lockout” due to an erroneous GPRS configuration.

When GPRS is activated, the local LAN interfaces X1 and X4 are operated in switch mode.

E.7.3 GPRS Communication with 2 IPSec VPN Tunnels



Note

Siemens recommends with this configuration the parameterization of an IP address for the local LAN interfaces X1/X4 as a precaution. Thereby you can prevent a “lockout” due to an erroneous GPRS configuration.

When GPRS is activated, the local LAN interfaces X1 and X4 are operated in switch mode.

Glossary

A

Adress type

The address type defines if a system-technical or a process-technical address is entered as address of a datapoint in a message

Analog input

Hardware for the acquisition of an analog signal via measuring transformer (measured value via current, voltage, temperature, resistance)

Analog input module

Module (submodule, I/O Module, etc.) to acquire analog signals. Task of an "analog input" is the evaluation of analog signals, and consequently the recuperation of the analog process information items. Depending on the comprehension of the term, the adaptation is also included or not.

Analog output

Hardware for the output of an analog signal to a display equipment (measured value) or to the setpoint-value input to an actuator (current, voltage)

Analog output module

Module (submodule, I/O Module, etc.) for the output of analog signals. Task of an "analog output" is the transformation of arithmetical values to currents or voltages, and consequently for the output of analog process information items.

Application program

Logical arrangement of all program language elements and constructs, that are required for the intended signal processing for the control of a machine or of a process with a PLC system (acc. to IEC 61131-12.1).

With CAEx *plus* application programs for open-/closed-loop control functions are created. An application program comprises the task(s) and the related program instances and type instances. An application program is executed by a resource (→ CPU).

Application service data unit

The application service data unit (ASDU) is composed of a data unit identifier and a information object. The data unit identifier has always the same structure for all ASDUs and consists of 4 octets. Its structure is as follows:

- Type identification
- Variable structure qualifier
- Cause of transmission
- Common address of ASDU

The common address of ASDU shall normally be identical to the address used in the link layer. The information object consists of an information object identifier, a set of information elements and, if present, a time tag. The information object identifier consists of 2 octets. Its structure is as follows:

- Function type
- Information number

ASDU

→ Application Service Data Unit

Assign

Linking of datapoint-related information with the object, with that the functions process such information. At data sources and data sinks of a data stream, datapoint-related information is inserted to or extracted from the datastream by means of messages. At a source, this information is provided by a function, at a sink it is utilized by a function.

AU

→ Automation Unit

Automation unit

An automation unit is a modular structured device for the acquisition, processing and output of process information. It communicates in automation networks via a serial or Ethernet protocols with other automation units or control center systems.

An automation unit consists of at least 1 mounting rack or 1 DIN rail (depending on system), 1 power supply and 1 Master Module, as well as optional I/O Master Modules and optional protocol elements.

Automatic dataflow routing

The routing of individual process information items is not necessary. Simply only the direction (monitoring direction, control direction, both directions) the messages are to be transmitted must be parameterized. The type identification of each message gives information about to which class a message belongs and with which methods it is to be distributed.

Messages with process information in monitoring direction are distributed by means of an entry in the topology. Messages with process information in control direction are distributed to their target that is determined by their CASDU and via interfaces that are defined in the topology. The CASDU is interpreted as target address.

Ax Bus

Enables the secured (hamming distance 4), serial, system-internal communication between the Master Module and the I/O Master Module

B

Binary

Representation of information by means of 2 different states or 2 discreet values (=digital)

Binäry signal

Electrical signal that is used for the transport of a binary process information; as well as the digital signal, 2 different and not coherent ranges of the electrical signals are defined, for each a status/value that the binary process information can receive. Therefore, in the technical data of digital inputs that are designed for the acquisition of binary signals, voltage ranges for "logical 0" and "logical 1", the universal designation for the both states/values.

Binary input

Designation for a module, a submodule, an I/O Module etc. for the acquisition of binary signals; task of a "binary input" is the evaluation of binary signals and therefore the recovery of the binary process information

Binary input

Hardware for the acquisition of a binary signal (single-point information, double-point information)

Binary output

Hardware for the output of a binary signal (information or command)

Binary process information

Process information of type → binary, e.g. circuit breaker position ON/OFF

BSE

Basic System Element (→ Master Module)

C

CAEx *plus*

Tool for the creation of application programs (Computer Aided Engineering), based on the tool logi.CAD ® from the company logi.cals

CASDU

Common Adress of the → ASDU, that part of the ASDU, that is common for all ASDUs of a station

Cause of transmission

Spontaneous transmission, general interrogation data, periodical data, command preparation, command command activation (acc. to IEC 60870-5-101)

Class 1 data

If several data points are to be transmitted to the central station (spontaneous or on request) at the same time, the Class 1 data will be sent before the Class 2 data (priority).

With dial-up traffic, data of the Class 1 lead to a spontaneous connection setup and data transmission.

Class 2 data

If several data points are to be transmitted to the central station (spontaneous or on request) at the same time, the Class 2 data will be sent after the Class 1 data.

With dial-up traffic, the connection setup and the data transmission takes place only upon interrogation by the central station.

Command direction

Transmission facility from the central station to a substation

Command return information

The command return information is an additional information for the double-point information, displays the reason for the status change (breaker tripping or switching operation in progress)

Configuration

Configuration is used in a multiple meaning:

a) engineering of the configuration of an automation unit in the engineering tool

b) physical aligning and mounting of the configured hardware

– plugging in the slot defined by the configuration (slot addressing), or
– setting the address defined by the configuration, and plugging in an arbitrary slot (adjustable address)

COT

→ Cause of Transmission

CPU

Central Processing Unit

CTS

Clear to Send, handshake control line of an RS-232 interface

Cyclic transmission

Periodical transmission according to the scan rate of the application program

D

Data class

This assignment is specified in the standard IEC 60870-5-101/-104, and serves for the priorization of information objects for the transmission by the communication function:

→ Class 1 data
→ Class 2 data

Dataflow routing

Functions and methods for distribution of messages to ist targets:

→ Automatic data flow routing
→ Selective data flow routing

Datapoint

Analog or binary information (process data point, System data point)

Data stream

Transports a sequence of data-point related information through the telecontrol system from a source to one or more sinks.

There are spontaneous and periodical data streams. (spontaeous data strems transport information in telegrams)

Datentransporter and system message router

System-internal distribution point for application data and system data messages from and to the single systemfunctions resp. application; application data is distributed by means of routing, system data by means of target addressing to the data sinks

DCD

Data Carrier Detect; control line of a RS-232 interface for the evaluation of the receive signal level

DCE

Data Communications Equipment; for example a modem

DDC

Data Distribution Center; Tool for the export, import and/or administration of SICAM TOOLBOX II data

Detailed diagnostic record

Comprises 16 diagnostic bits (of a system diagnostic class) that commonly belong logically together

Detailed diagnostic table

Contains all diagnostic bits recognized by the system elements

DI

→ Digital input

DI

→ Double-point Information

Digital input

→ Binary input

Digital output

→ Binary output

DMS

Digital Multiplex System

DO

→ Digital output

Double command

A pair of commands each of which is used to cause operational equipment to change to one of two determined states.

Double-point information

Monitored information represented by two bits characterizing two determined states and two states of operational equipment.

DSR

Data Set Ready; control line of an RS-232 interface

DTR

Data Terminal Ready; control line of an RS-232 interface

E

EM II

Confiugration tool of SICAM TOOLBOX II (Engineering Manager II)

Ethernet

Wired local network according to IEEE 802.3

External error

Error that is detected through monitoring the information from sensors and actuators.

Can concern the I/O Master Module, the wiring, and sensors or actuators, insofar as the source of error can not be unequivocally localized to the I/O Master Module; otherwise it would be an internal error.

Externally managed parameter

Parameter that is required on a module (e.g. supplementary module), however, is managed and stored on the higher-level module

F

FAT

File system on storage media (File Allocation Table); FAT16 up to 2 GB, FAT32 as of 32 GB capacity

Fieldbus interface processor

The fieldbus interface processor serves for the serial connection of SICAM RTUs systems to a Profibus (Profibus Master); Profibus Slaves are connected acc. to EN 50170-2

FIP

→ Fieldbus interface processor

Firewall

Blockage of a local network or computer against not allowed access from a supraregional network. Function for the filtering of data from the internet for the protection against invaders and malicious software.

Firmware

Program that is not changeable by the user, that adds a predefined and parameter-settable functionality to the hardware

FPU

Floating Point Unit

FUD

→ Function diagram

Function diagram

Graphical program for open-/closed-loop control functions according IEC 61131-3

FW

Firmware

G

Global parameter

Parameter that is managed and stored on the system element (central system function) but used also on other system elements of the automation unit

GPRS

Global Package Radio Service. Data rates up to 171 kbps, usually up to 85 kbps. Package-oriented connection based on TCP/IP and UDP/IP. Billing usually according to data volume. Network expansion area-wide.

GSM

Global System for Mobile Communication with the services speech, SMS, direct data connections

H

I

ICD

IED Capability Description; defines the entire possibilities of an IED type and serves as template for the system or IED configurator

IED

Intelligent Electronical Device

IID

Instantiatede IED Description

IL

→ Instruction list

Instruction list

Line-oriented program for open-/closed-loop control functions acc. to IEC 61131-3

Internal errors

Internal errors are errors which are unambiguously caused by the system element

IOA

Information Object Address

I/O Master Module

Supplementary system element for process data acquisition and/or control of actuators that comunicates via the Ax Bus with the Master Module

ISDN

Integrated Standard for Digital Network

K

L

LAN

Local Area Network

Load share operation

Redundant communication via 2 interfaces, whereby the messages are partitioned in undisturbed operation on both interfaces according to particular rules (dependent on load or priority)

Local parameter

Parameter that is managed on the own module (firmware) and is used only there

M

Master Module

System element for processing of information according to different criterions (e.g. automation, telecontrol, etc.) and for the administration of system functions (e.g. parameter, diagnosis, etc).

MDI

Media-Dependent Interface, adaptation to the cable type

MIB

Management Information Base; description file for SNMP

Modem

Data transmission device for connecting date end devices to the telephone network

Module

Hardware that is equipped in a mounting rack or on a carrier module; hardware of a system element

Module failure

Signals that the internal communication with a module is no more possible and is commonly replicated by the supervising Master Module

Module number

System-technical identification of a system element within an automation unit, part of the IOA in a message with system-technical addressing. The other parts of the IOA are the value number and the subaddress.

Mounting rack

Device wherein that modules and instruments are installed

N

Network interface processor

The network interface processor serves for the connection of SICAM systems to the Ethernet LAN according to IEEE 802.3

NIP

→ Network interface processor

Non-volatile

Function: also with/after voltage failure further available (no defect); information in a memory: not transient, undetachably

Normally open contact

Relay contact that is open when the relay is not activated; the contact closes when the relay is activated

O

OPM II

Central SICAM TOOLBOX II configuration tool (Object-oriented Processdata Manager)

Output active

If the output pulse is set and a command output (binary output) is already selected (relay activated), the command is output to the process

P

PBA

Peripheral Board Address; used in systems with multiple I/O Master Modules (to be set via a hardware switch on the respective I/O Master Module)

PCM

Puls Code Modulation

Peridocal control circuit check

The periodical control circuit check detects if the command circuits are ready to function correctly, without activating the actuator.Control circuits are checked one by one, by activating all its relays, one by one, thus closing the control circuit with high restistance.

Periodical datapoint

A periodical datapoint is used for the exchange of a process signal or a derived information between the I/O Master Module and the higher-level open-/closed-loop control function.

Periodical information

A periodical information has a deterministic transmission behavior and is used for the exchange of a process signal or a derived information between the I/O Master Module and the higher-level open-/closed-loop control function.

A periodical information is always transmitted in groups and consequently with the transmission already have a chronologically consistent interrelationship.

Periodical transmission

Exchange of a process signal or a derived information between the I/O Master Module and the higher-level open-/closed-loop control function.

PLC

→ Programmable Logic Controller

PRE

→ Protocol Element

Programmable logic controller

Digitally operating electronic system, designed for use in an industrial environment, which uses a programmable memory for the internal storage of user-oriented instructions for implementing specific functions such as logic, sequencing, timing, counting and arithmetic, to control, through digital or analog inputs and outputs, various types of machines or processes. Both the PC (PLC) and its associated peripherals are designed so that they can be easily integrated into an industrial control system and easily used in all their intended functions (acc. to IEC 61131-1, chapter 2.50).

Protocol element

Supplementary system element for communication with other automation units or control systems that comunicates via the internal bus (ZBG-Bus) with the Master Module

PSR

SICAM TOOLBOX II configuration tool

PSTN

Public Switched Telephone Network

PT 100

Temperature-dependent resistance element with PT 100 characteristic

Q

R

RADIUS

Remote Authentication Dial-In User Service

Client-Server protocol that serves for the central administration of authentication, authorization and for the accounting (AAA) for users which connect to a network. RADIUS is used with dial-up connections via modem, ISDN, VPN, WLAN (IEEE 802.1X) and DSL. The RADIUS Server provides for the service the authentication (check of user name and password).

Routing

Routing of data streams: Messages are "routed" from their sources to their sinks. This works similar to directing railroad cars by setting track switcher. Messages contain data point related information.

Retained variables

Variables in a non-volatile memory. The value of the variable is retained during a power failure.

Router

Network device for connecting two independent network segments as internet and LAN

RS-232

Standard for serial data transmission

RS-485

Standard for serial data transmission

RTS

Request to Send (switch on transmit device), control line of an RS-232 interface

S

SCD

Substation Configuration Description; description of the entire substation

SD card

Secure Digital Memory Card; up to 2 GB storage capacity

SD-HC

Secure Digital High Capacity Memory Card; up to 32 GB storage capacity

SD-XC

Secure Digital Extended Capacity Memory Card; up to 2 TB storage capacity

Selective dataflow routing

Routing of individual process information items. In simple applications the messages are distributed by means of an entry in the topology. For more complex applications, the messages can be distributed selectively by means of dataflow filters: for each communication interface, band-pass filters or blocking filters can be set. Also wildcards can be used for all address attributes of the message, to direct the dataflow very specific.

SI

→ Single-point information

Serial interface module

Hardware of a protocol element that can be installed on a Master Module

Serial interface processor

The serial interface processor serves for the serial connection of SICAM RTUs systems via a transmission facility or via a direct connection

SIM

→ Serial interface module

SIP

→ Serial interface processor

Single command

A command used to cause a change of state of operational equipment in one direction

Single-point information

Monitored information represented by only one bit characterizing two determined states of operational equipment

SMS

Short Message Service, transmission of up to 160 characters

SNTP

Simple Network Time Protocol

Spontaneous datapoint

Binary information that is transmitted upon change spontaneously in a message. It is always transmitted individually, and usually has a time tag in order to be able to establish a chronologically consistent interrelationship afterwards.

With the current, voltage and counting pulse acquisition a spontaneous transmission of the information takes place threshold value controlled (exception:class 2 data with dial-up traffic).

Spontaneous information object

A spontaneous information object that is transmitted upon change spontaneously in a message, and is used for the exchange of a process signal or a derived information (including status) between the I/O Master Module and the particular automation unit, another automation unit or a control system.

A spontaneous information object is always transmitted individually and normally has a time stamp, in order to be able to establish a chronologically consistent interrelationship later.

Spontaneous transmission

Serves for the exchange of a process signal or a derived information (inclusive status) between the I/O Master Module and the own automation unit, another automation unit or a control center system

SSE

→ Supplementary system element

SSM

Tool for the administration of SICAM TOOLBOX II data (Siemens Stammdaten Manager); reserved for developer of Siemens AG.

Supplementary system element

Supplementary system elements are situated hierarchically below the Master Module; there are I/O Master Modules, and protocol elements

Switch

Network device for connetion and distribution in ethernet

System element

Functional unit consisting of hardware and firmware

System-internal information

Information that is used exclusively for the exchange of control information between I/O Master Modules and system functions, and that is not available to the user. It can be transported through the system like a → periodical information or like a → spontaneous information object.

A system-internal information is only mentioned in order to explain the behavior of the described functions.

T

TAP

Telocator Alphanumeric Protocol

TCP/IP

Transmission Control Protocol/Internet Protocol

TETRA

Terrestrial trunked radio, universal platform for different mobile radio services, time multiplex system with 4 time slots

TM

Terminal Module; Module for mounting on a DIN-rail

TM bus

Bus between peripheral control module (Master) and I/O Module (Slave)

SICAM TOOLBOX II

PC-based set of tools for configuration and service of SICAM automation units

U

User diagnostic classes

Serve for the classification of the individual diagnosis information items additionally to the system diagnostic classes. The are freely allocatable (maximal 8 classes).

User diagnostic records

Diagnosis information items, that are formed by means of application-specific routings from the diagnosis bits of the detailed diagnostic table. Maximal 8 user diagnostic classes can be allocated.

V

VAC

Volts of Alternating Current

VDC

Volts of Direct Current

VPN

Virtual Private Network (logical connection for secure transmission of data via internet)

W

WAN

Wide Area Network

Web services

Web standard for function calls between independent devices

X

Z