SIEMENS

SIMATIC

TeleControl - RTU
RTU3030C

Operating Instructions

Legal information

Warning notice system

This manual contains notices you have to observe in order to ensure your personal safety, as well as to prevent damage to property. The notices referring to your personal safety are highlighted in the manual by a safety alert symbol, notices referring only to property damage have no safety alert symbol. These notices shown below are graded according to the degree of danger.

> ⚠ **DANGER**
>
> indicates that death or severe personal injury **will** result if proper precautions are not taken.

> ⚠ **WARNING**
>
> indicates that death or severe personal injury **may** result if proper precautions are not taken.

> ⚠ **CAUTION**
>
> indicates that minor personal injury can result if proper precautions are not taken.

> **NOTICE**
>
> indicates that property damage can result if proper precautions are not taken.

If more than one degree of danger is present, the warning notice representing the highest degree of danger will be used. A notice warning of injury to persons with a safety alert symbol may also include a warning relating to property damage.

Qualified Personnel

The product/system described in this documentation may be operated only by **personnel qualified** for the specific task in accordance with the relevant documentation, in particular its warning notices and safety instructions. Qualified personnel are those who, based on their training and experience, are capable of identifying risks and avoiding potential hazards when working with these products/systems.

Proper use of Siemens products

Note the following:

> ⚠ **WARNING**
>
> Siemens products may only be used for the applications described in the catalog and in the relevant technical documentation. If products and components from other manufacturers are used, these must be recommended or approved by Siemens. Proper transport, storage, installation, assembly, commissioning, operation and maintenance are required to ensure that the products operate safely and without any problems. The permissible ambient conditions must be complied with. The information in the relevant documentation must be observed.

Trademarks

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Disclaimer of Liability

We have reviewed the contents of this publication to ensure consistency with the hardware and software described. Since variance cannot be precluded entirely, we cannot guarantee full consistency. However, the information in this publication is reviewed regularly and any necessary corrections are included in subsequent editions.

Preface

CAUTION

To prevent injury, read the manual before use.

Validity of this manual

This manual is valid for the following product:

SIMATIC RTU3030C
Article number: 6NH3112-3BA00-0XX0
Hardware product version 1
Firmware version 2.0

The RTU is used to monitor and control outlying stations that are geographically distributed and not connected to a power supply network. The RTU can store process data and transfer it via mobile wireless or via the LAN interface and an external router to a master station.
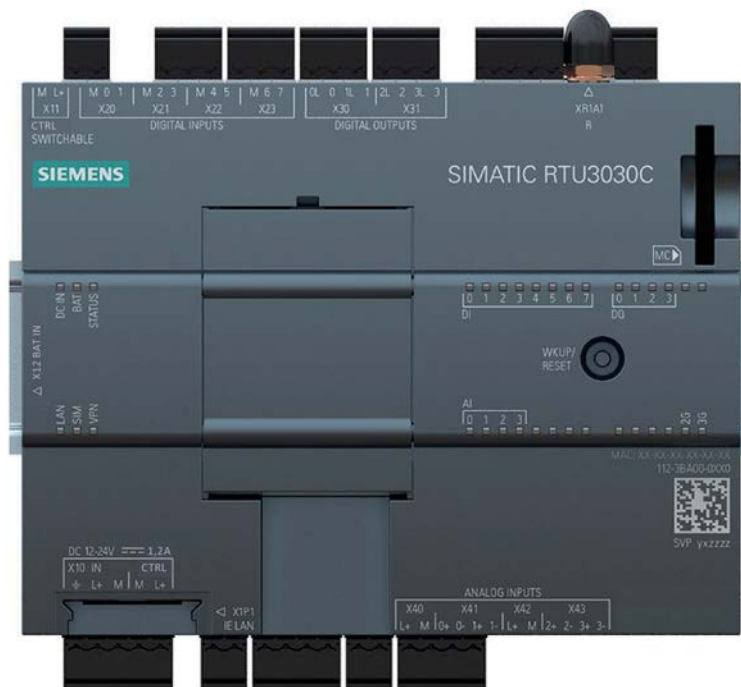

Figure 1   SIMATIC RTU3030C

You will find the the article number of the device on the front right of the housing

You will find the hardware product version of the device printed as a placeholder "X" on the right of the device (for example X 2 3 4). In this case, "X" would be the placeholder for hardware product version 1.

You will find the the MAC address of the device on the front right of the housing

You will find the IMEI (International Mobile Equipment Identity) on the right had-side of the housing.

Purpose of the manual

This manual describes the properties of this device and shows application examples.

The manaul supports you when installing, connecting up and commissioning the device.

The required configuration steps for the device are described.

You will also find instructions for operation and information about the diagnostics options.

Required experience

To install, commission and operate the device, you require experience in the following areas:

- General electrical engineering
- Automation engineering
- Data transfer via mobile wireless networks and Internet

Abbreviations/acronyms

This manual often uses the following abbreviations/acronyms:

- **RTU**

  The name "RTU" (Remote Terminal Unit) is used instead of the full product name "RTU3030C".

- **WBM**

  "WBM" the acronym for the "Web Based Management" of the Web pages of the RTU for configuration and diagnostics data.

- **TCSB**

  Acronym for the control center software "TeleControl Server Basic" which is installed on a PC, the telecontrol server.

New in this release

- New battery expansion module for the accessories program of the RTU
- New firmware version with the following new functions:
  - Support of the telecontrol protocol "SINAUT ST7"
  - FTP client
  - Connection to SINEMA Remote Connect
  - new program blocks:

    FTP file transfer, analog value processing, difference threshold value switch, flow totalizer, flow calculation rectangular weir, silo volumes, wiping relay, time relay
  - New functions of the WAN interface: DynDNS, HTTPS
  - New functions of LAN interface: Router, HTTPS, DHCP client, DNS
  - Further functions, including: TeleService SMS with dedline, OpenVPN key with password

● Editorial revision

For the product notices on the Internet see:
Link: (https://support.industry.siemens.com/cs/ww/en/ps/21767/pm)

Replaced edition

Release 07/2016

Current manual release on the Internet

You will also find the current version of this manual on the Internet pages of Siemens Industry Online Support:

Link: (https://support.industry.siemens.com/cs/ww/en/ps/21767/man)

Cross references

In this manual there are often cross references to other sections.

To be able to return to the initial page after jumping to a cross reference, some PDF readers support the command <Alt>+<left arrow>.

Sources of information and other documentation

You will find an overview of further reading and references in the Appendix of this manual.

License conditions

Note
Open source software

Read the license conditions for open source software carefully before using the product.

You will find the license conditions as a loadable file on the WBM pages of the device. You will find the description of opening and loading loading license conditions in the section General functions of the WBM (Page 75).

You will find the packed file with the license conditions for Open Source software under the following name:

● OSS_RTU30xxC_86.zip

Firmware

The firmware is signed and encrypted. This ensures that only firmware created by Siemens can be downloaded to the device.

Security information

Siemens provides products and solutions with industrial security functions that support the secure operation of plants, systems, machines and networks.

In order to protect plants, systems, machines and networks against cyber threats, it is necessary to implement – and continuously maintain – a holistic, state-of-the-art industrial security concept. Siemens' products and solutions only form one element of such a concept.

Customer is responsible to prevent unauthorized access to its plants, systems, machines and networks. Systems, machines and components should only be connected to the enterprise network or the internet if and to the extent necessary and with appropriate security measures (e.g. use of firewalls and network segmentation) in place.

Additionally, Siemens' guidance on appropriate security measures should be taken into account. For more information about industrial security, please visit
Link: (http://www.siemens.com/industrialsecurity)

Siemens' products and solutions undergo continuous development to make them more secure. Siemens strongly recommends to apply product updates as soon as available and to always use the latest product versions. Use of product versions that are no longer supported, and failure to apply latest updates may increase customer's exposure to cyber threats.

To stay informed about product updates, subscribe to the Siemens Industrial Security RSS Feed under
Link: (http://www.siemens.com/industrialsecurity).

Recycling and disposal

The product is low in pollutants, can be recycled and meets the requirements of the WEEE directive 2012/19/EU "Waste Electrical and Electronic Equipment".

Do not dispose of the product at public disposal sites. For environmentally friendly recycling and the disposal of your old device contact a certified disposal company for electronic scrap or your Siemens contact.

Keep to the local regulations.

You will find information on returning the product on the Internet pages of Siemens Industry Online Support:
Link: (https://support.industry.siemens.com/cs/ww/en/view/109479891)

SIMATIC NET glossary

Explanations of many of the specialist terms used in this documentation can be found in the SIMATIC NET glossary.

You will find the SIMATIC NET glossary on the Internet at the following address:

Link: (https://support.industry.siemens.com/cs/ww/en/view/50305045)

Training, Service & Support

You will find information on training, service and support in the multilanguage document "DC_support_99.pdf" on the Internet pages of Siemens Industry Online Support:

Link: (https://support.industry.siemens.com/cs/ww/en/view/38652101)

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Application and functions   1

1.1   Application and use of the RTU

Applications

The RTU is intended for monitoring and controlling small outlying stations without a connection to a power supply network.

In telecontrol networks, the RTU is used to connect the outlying stations to the master station via mobile wireless or via the LAN interface of the RTU and an optional external router.

Core functions

The RTU supports the following core functions:

* **Energy-saving operation**

   Thanks to the energy-saving operation with various operating modes (see below), the RTU is predestined for use in geographically distributed outlying stations, measuring points and other applications without connection to a power supply network.

   The RTU can be supplied with auxiliary power via the following power sources:

   – Battery modules

      Battery modules are available as accessories, see Appendix Battery module (Page 275)

   – External power source e.g. solar modules

* **Process connection**

   For the process connection, the RTU is equipped with inputs and outputs:

   – 8 x DI (digital inputs)

   – 4 x DQ (digital outputs)

   – 4 x AI (analog inputs)

* **Controller**

   For simple control tasks, the process data can be linked via program blocks.

* **Storing process data (Logging)**

   The RTU provides the option of storing the process data of the connected sensors and the values of some internal parameters on an SD card.

   Use this option when there is no communications partner in the master station for the RTU.

   If you transfer the process data via mobile wireless to the master station, you can also use the function (optional).

● **Communication with the control room**

If a communications partner is available in the master station, the RTU can send process data to the control room. The data is transferred either via the mobile wireless service GPRS or UMTS or via LAN (optionally with an external router).

● **Telecontrol protocols**

For communication with the master station, the RTU supports the following protocols:

– TeleControl Basic

– SINAUT ST7

– DNP3

– IEC 60870-5-104

You will find detailed information about the protocols in the section Communications services (Page 23).

Configuration examples

You will find configurations of the RTU in the section Configuration examples (Page 14).

Configuration and programming of the RTU in the WBM

Configuration

You configure the parameters of the RTU itself, its inputs and outputs, control functions and communication parameters conveniently in the Web Based Management (WBM). The WBM consists of Web pages stored on the RTU. From a configuration PC you connect to the WBM.

Programming

You program in the WBM with the following actions:

● Keyboard entries

● Selection of options in drop-down lists

● Enabling check boxes

● Working with buttons ("Apply", "Add", "Load", "Search" etc.)

1.2 Configuration examples

Below, you will find configuration examples for applications of the RTU3030C.

You will find references to the configuration of individual communications functions in the section Communications services (Page 23).

You will find a diagram of the configuration of the configuration PC that accesses the WBM of the RTU using HTTP and OpenVPN in the section Establishing a connection to the WBM of the RTU (Page 81).

SMS / E-mail / FTP
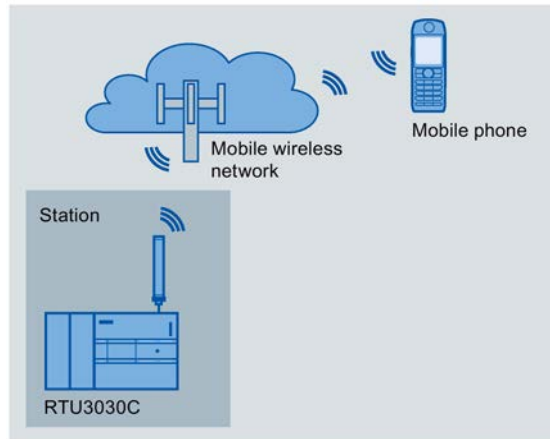
Figure 1-1   Sending SMS messages by the RTU

Sending SMS messages / e-mail

The RTU can send messages (SMS / e-mails) for configurable events via program blocks or using the logging function.

After a request from a mobile telephone, a diagnostics SMS message can be sent.

In the attachment of e-mails, you have the option of transferring the process image, the diagnostics buffer or the current log file.

Receiving SMS messages

The RTU can be wakened out of the sleep mode by the telecontrol server or by the SMS message of a mobile telephone or by SINEMA Remote Connect to establish a connection to the communications partner

All mobile phones that are permitted to send a wake-up SMS message or the request for a diagnostics SMS message to the RTU, must be enabled with the phone number of every user in the WBM of the RTU ("Wake-up call allowed").

FTP file transfer

The RTU can transfer files to an FTP server in the LAN or reachable via the Internet via an FTP block. The current log file, the entire process image or the diagnostics buffer can be transferred.

Telecontrol with the "TeleControl Basic" protocol

In the following example the RTU uses the "TeleControl Basic" protocol and communicates via the mobile wireless network and the Internet with the teleconrol server (TCSB) in the master station.

Using its integrated OPC server, the telecontrol server exchanges data with the OPC client of the control center.
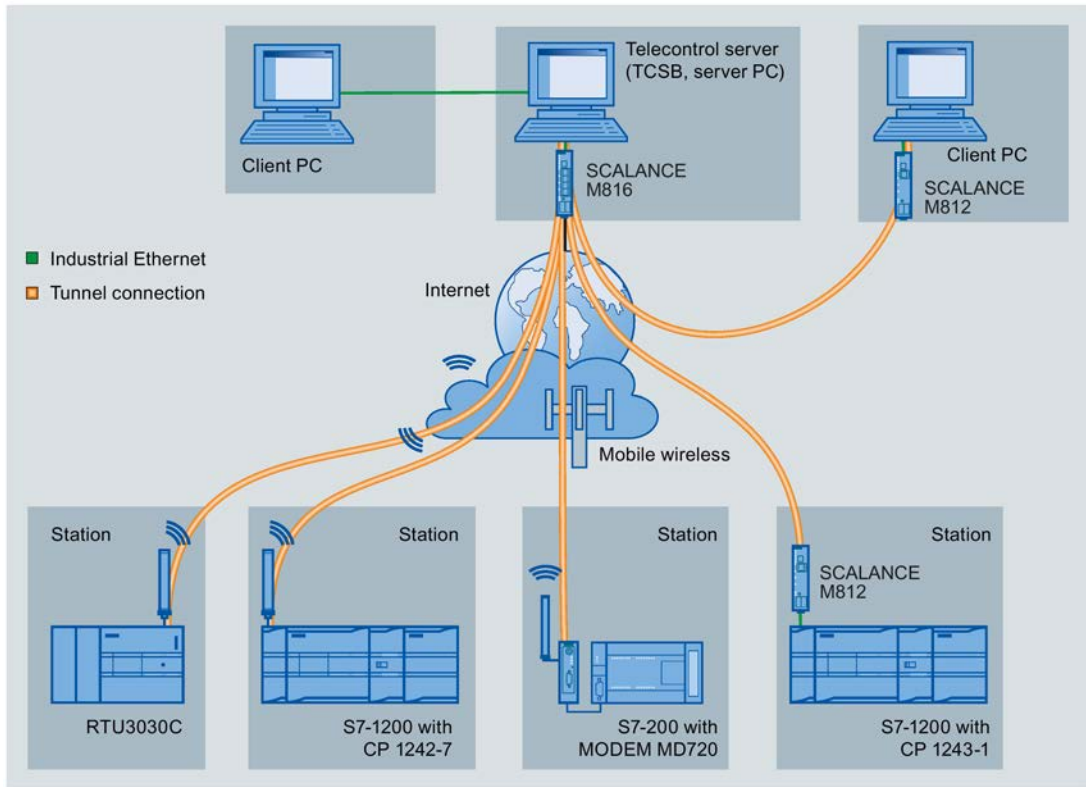
Figure 1-2   Communication of the RTU and other station types with a master station

Telecontrol with the "ST7" protocol

In the following example the RTU communicates using the telecontrol protocol SINAUT ST7. For secure communication, the RTU uses the transport protocol "MSCsec".

The figure includes two alternative connections:

● RTU3010C with connection via the Internet

● RTU3030C with connection via mobile wireless and Internet

A connection via LAN or only via the Internet would also be possible.
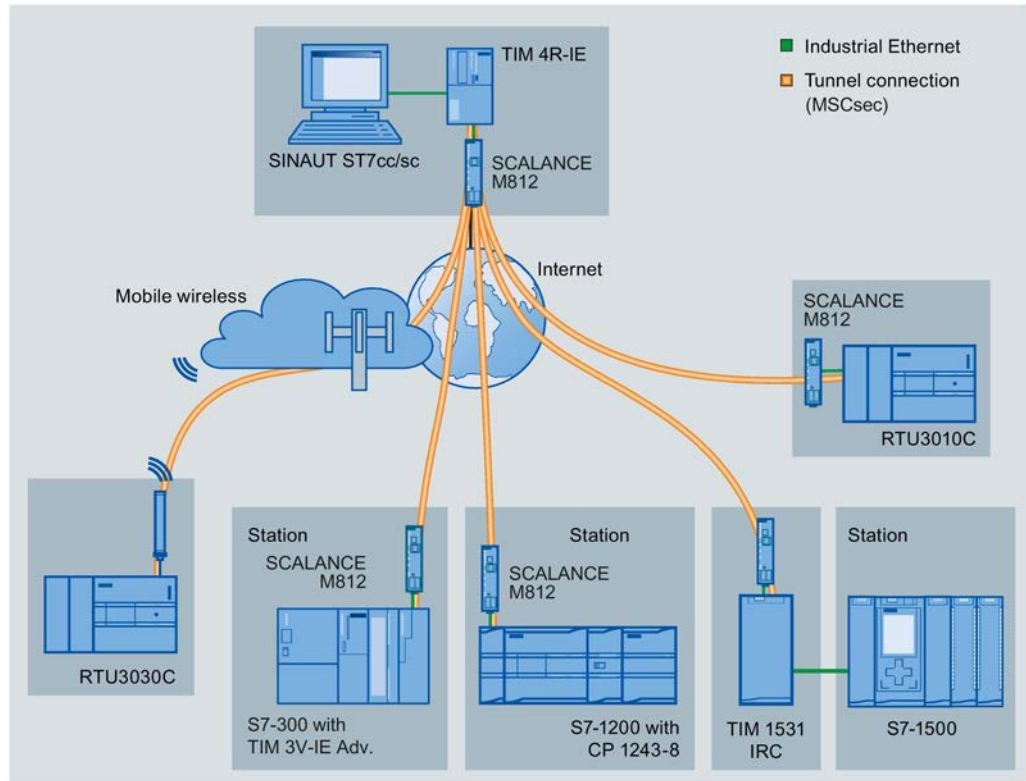
Figure 1-3   Communication of the RTU3010C and RTU3030C with a master station TIM

Telecontrol with the "DNP3" protocol

The following example contains a configuration with stations that communicate with the master via the mobile wireless network and the Internet.

In this example, the master is redundant. The two redundant devices of the master are addressed by the RTU using one DNP3 address but two different IP addresses.

The connections between stations and master are via an OpenVPN server "SINEMA Remote Connect".

When using the DNP3 protocol, for example, SIMATIC PCS 7 TeleControl or the system of a third-party provider can be used as the master. If you use SIMATIC PCS 7 TeleControl as the DPN3 master, you require the necessary DPN3 driver.
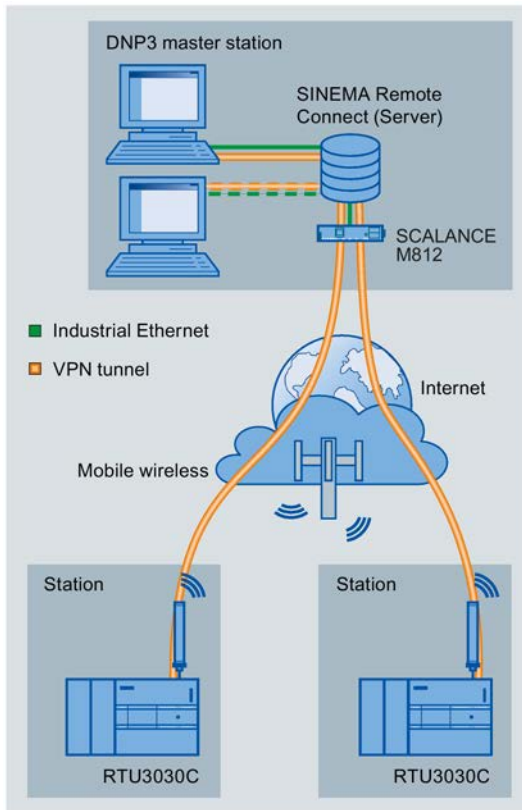
Figure 1-4   Communication of the RTU with a DNP3 master station

Telecontrol with the IEC protocol

The following example contains a configuration with stations that communicate with the master via the mobile wireless network and the Internet.

The connections between stations and master are via an OpenVPN server "SINEMA Remote Connect".
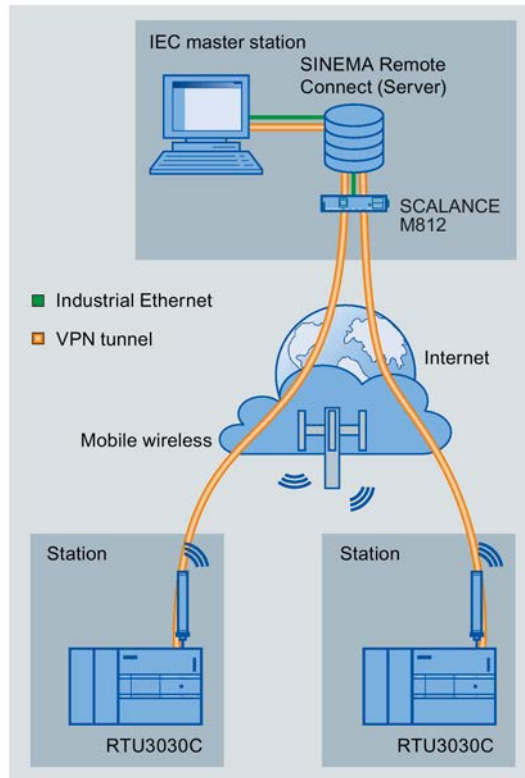
Figure 1-5   Communication of the RTU with an IEC master station

Even when using the IEC protocol the RTU can communicate with a redundantly designed master.

1.3   Modes and operating modes

Modes

The modes of the RTU are not configured explicitly but result from the configuration of the communications partner and the existence of an SD card.

The RTU can be operated one or both of the following modes:

TeleControl

In the "TeleControl" mode, the RTU can send process data via the mobile wireless network or via the LAN interface and an external router to a master station (see also "Communication mode" below).

This mode is adopted when a communications partner (master station) is configured.

As an option, process data can be stored on an SD card. To do this logging must be enabled in the WBM in "Operating mode".

Logging

In the "Logging" mode the RTU has no communications partner in the master station. Instead, the RTU stores the process data.

This operating mode is adopted when logging must be enabled in the WBM in "Operating mode".

In the "Logging" mode, the RTU requires an SD card where it can store the process data.

The stored process data can be read out from the SD card or sent via the mobile wireless network or the LAN interface and an external router. Cyclic sending is possible by e-mail or FTP. You can load the data on a PC via the WBM.

Operating modes

The RTU can adopt the following operating modes:

- Sleep mode
- Update mode
- Communication mode
- Service mode

Sleep mode

In the energy-saving standard operating mode the updating of the inputs and outputs, the communications functions, the LEDs and the self check function (see section Other services and properties (Page 30)) of the RTU are turned off.

The RTU interrupts the sleep mode in the following situations:

- Pressing the button "WKUP" and changing to the service mode
- Configured change to the update mode (WBM > Operating mode)"

  With the inputs, other specific update cycles can be configured (WBM > "Tags").
- Configured change to the communication mode (WBM > Operating mode)"
- Pending diagnostics message with configured change to the communication mode (WBM > "Diagnostics" > "Notifications")

- Cyclic interruption of the sleep mode to fetch a wake-up SMS (WBM > "Operating mode")

- Occurrence of certain events:

  - Creating a new log file with a configured change to the communication mode to transfer the old log file

  - Further events, refer to the section "Update mode".

In the "TeleControl" mode, the RTU in sleep mode has the greatest energy-saving potential when using the "TeleControl Basic" protocol.

Update mode

The update mode is controlled by the configurable update cycle, refer to the section Operating modes (Page 138).

In the Update mode, the RTU runs through the following steps:

- Reading the inputs configured for the current cycle.

- Processing of the program blocks

- Writing the outputs

- Saving the process data in the send buffer when telecontrol communication is enabled

- Saving the process data data on the SD card (with Logging activated)

After updating, the RTU returns to sleep mode, or changes to the communication mode if this is configured. The update cycle and communication cycle can also run independently of each other.

In addition to the configured update cycle, the RTU changes from the sleep mode to the update mode when configurable events occur. The following events can be configured:

- Value change at the analog input "AI0"

- Edge change at a digital input

- Triggering of timers of program blocks, for example with a pulse generator or with the on/off delay.

Note that configured events lead to higher current consumption.

Communication mode

In the Communication mode, the RTU performs the following tasks:

- Activating the internal mobile wireless modem or the LAN interface and an external router (via configurable control outputs of the RTU)

- Sending the data messages to the configured communications partner in the master station

- Sending stored messages / data (SMS messages, e-mails, FTP file transfer)

- Synchronization of the time of day if configured.

- Diagnostics

  In addition to the tasks listed above, in the communication mode a connection can be established to the WBM of the RTU by the telecontrol server or the configuration PC. This makes diagnostics of the RTU and maintenance work possible.

The times of the changeover to the communication mode can be configured as a cycle and on the occurrence of events. After transferring data, the RTU returns to the sleep mode. As long as there is no update cycle running.

Connection establishment as a result of receiving a wake-up SMS message from the telecontrol server or from a mobile phone can be configured. Remember that this increases the current consumption of the RTU. For more detailed information, refer to the section Wake-up call / wake-up SMS (Page 192).

Service mode

The service mode is enabled by briefly pressing the (< 1 s) of the "WKUP" button.

The changeover to the Service mode as the following effect:

● Turning on the LEDs that were turned off in the other operating modes to reduce energy consumption.

● Activation of the LAN interface

  With the LAN interface of the RTU activated, a configuration PC can access the Web pages (WBM) of the RTU.

The Service mode is intended for commissioning and for service purposes on site, for example, to replace the battery.

The service mode can be active parallel with the update mode and communication mode.

The service mode can also be activated permanently. Remember that this increases the energy consumption of the RTU significantly.

1.4   Process connection - inputs / outputs

Inputs, outputs

The RTU provides the following inputs and outputs for the process connection:

● 8 digital inputs

  The first two digital inputs can also be configured as fast counter inputs up to 5 kHz.

● 4 digital outputs

● 4 analog inputs

  The input AI0 can also be monitored in sleep mode.

You will find details in the section Interfaces and connectors (Page 43).

1.5 Control functions

Control functions

The control functions of the RTU are implemented by creating a user program made up of program blocks. The blocks are displayed graphically and programmed on integrated Web pages (WBM), see section Program (Page 168).

The linking with inputs and outputs and the programming of function values is performed conveniently with drop-down lists or by entering values.

The following groups of program blocks are available:

● Logical functions

  Logical AND / OR, NOT (inverter), exclusive OR

● Timer functions

  Delay blocks, pulse generator, timer block

● Analog value functions

  Threshold value and comparator blocks, arithmetic functions etc.

● Counter and summation blocks

  Counter, flow, summation and volume blocks

● Blocks for messages

  Sending by SMS, e-mail and FTP

● Relay blocks

  Latching relays, current impulse relays, wiping relays, time relays

For a description of the program blocks, refer to the section Programming (Page 195).

1.6 Communications services

Interfaces for communication

With firmware version V1, the RTU supports communication via mobile wireless (WAN interface).

As of firmware version V2, the RTU also supports communication via LAN, optionally with an external router. For the following communications services the interface (LAN/WAN) can be set separately: Telecontrol, e-mail, FTP, NTP.

Exception: Connections to an OpenVPN server (or SINEMA RC) and DynDNS are always via mobile wireless.

You will find a selection of routers in the appendix Router SCALANCE M (Page 286).

Protocols for communication with a master station

Depending on the loaded firmware variant, the RTU supports one of the following protocols for communication with a master station:

- **TeleControl Basic**

  This is a proprietary protocol of Siemens for telecontrol applications.

  The IP-based communications protocol is used to connect the RTU to the application TCSB. TCSB is installed on a PC in the master station, the telecontrol server. For the version, see section Scope of delivery, accessories, requirements (Page 33).

  Via the OPC-DA or OPC-UA server of TCSB, and OPC client can access the process data of the RTU. For the TCSB manual, see /4/ (Page 296).

  Apart from the RTU, several S7-1200 CPs also support the protocol. It allows especially energy-saving operation since communications connections are only established temporarily stop

- **SINAUT ST7**

  The RTU uses the ST7 protocol for communication with a master station TIM.

  For communication with a PC application in the master station, the connection must run via the master station TIM.

  When communicating with a TIM module, the RTU uses the transfer protocol "MSCsec" on the network layer (OSI layer 3). The MSC protocol cannot be used for communication with a master station application.

- **DNP3**

  The RTU functions as a DNP3 station (Outstation).

  Communication is based on the DNP3 SPECIFICATION Version 2.x (2007/2009).

  The RTU is certified for the DNP3 conformity levels Level 1 and 2, but also supports higher conformity levels.

  For secure communication via mobile wireless with the master, the RTU establishes a VPN tunnel using OpenVPN, see section Security functions for communication (Page 28).

  When using the LAN interface select suitable means to make sure that there is secure communication with the master, for example by using SCALANCE M routers.

  According to the specification "Supplement to Volume 2 - SECURE AUTHENTICATION", the RTU supports secure authentication, see section DNP3 (Page 175).

  You will find a detailed overview of the attributes and properties specified in the DNP3 protocol and supported by the RTU in the DNP3 device profile, see /2/ (Page 295).

  You will find the supported object groups and variations in the section Data points (Page 183).

Communications partners (DNP3 masters) of the RTU can be:

– SIMATIC PCS 7 TeleControl

– SIMATIC WinCC TeleControl

– A TIM module with DNP3 capability (TIM 3V IE DNP3 / TIM 4R IE DNP3)

For the manual of the TIM module see /8/ (Page 296).

– Third-party systems that support the DNP3 specification named above.

● **IEC 60870-5**

The RTU functions as a substation (slave).

Communication is based on the specification IEC 60870-5 Part 104 (2006).

Communications partners of the RTU can be all master systems that support the specification named above.

Along with the IEC protocol, the RTU uses the security mechanisms of "OpenVPN", see section Security functions for communication (Page 28).

You will find a detailed overview of the attributes and properties specified in the IEC specification and supported by the RTU in the IEC device profile, see /3/ (Page 296).

You will find the supported IEC type identifiers as in the section Data points (Page 183).

When it ships, the RTU is loaded with the firmware variant for the "TeleControl Basic" protocol.

Firmware for the protocols DNP3, IEC and ST7

To use these telecontrol protocols, you need to load the corresponding firmware variant on the RTU.

You can obtain the suitable firmware file from Siemens Industry Online Support:

● Link: (http://www.automation.siemens.com/aspa_app/)

Here, you will find a contact.

● Link: (https://support.industry.siemens.com/cs/ww/en/ps/21766/dl)

With this page, you can download the firmware.

The firmware version for the "TeleControl Basic" protocol loaded when the device was delivered is then overwritten.

For information on loading firmware files, see section Loading firmware (Page 257).

Other communication services

The RTU can send messages and data for configured event classes (diagnostics buffer entries) either as SMS messages or as e-mails.

- **SMS (receive)**

  The following SMS messages can be received:

  – Wake-up SMS message configured in the Configuration and Monitoring Tool (CMT) of TCSB for establishing a connection to the telecontrol server

  – Manually triggered wake-up SMS message from the Web server of TCSB for establishing a connection to a PC (via the telecontrol server)

  – Wake-up SMS from SINEMA Remote Connect

  – Manual TeleService SMS message with deadline

  – SMS message as request for a diagnostics SMS message

  You enable receipt of SMS messages in the WBM, refer to the section SMS (Page 116).

- **SMS (sending)**

  The following SMS messages can be sent:

  – SMS message if diagnostics messages occur, refer to the section Notifications (Page 98).

  – SMS message with event-related process data via program blocks, refer to the section Sending SMS messages (Page 241).

  – Diagnostics SMS message, refer to the section Diagnostics options (Page 253).

  – SMS messages if certain events occur relating to the SD card or battery module

  – SMS when the IP address changes on the WAN interface

- **E-mail (sending)**

  The following e-mails can be sent:

  – E-mail if diagnostics messages occur, refer to the section Notifications (Page 98).

  – E-mail with event-related process data via program blocks, refer to the section Send e-mail (Page 242).

  – E-mails with process data (log file) using the logging function, refer to the section Logging (Page 140).

  – E-mails if certain events occur relating to the SD card or battery module

  – E-mail when the IP address changes on the WAN interface

  In the attachment of an e-mail, there is the option of transferring the current process image, the log file or the entire diagnostics buffer. The attachment is transferred uncompressed or compressed as a ZIP archive.

  You configure the access data and general settings for using the e-mail service in the WBM, refer to the section E-mail (Page 120).

  For information on the configurable security option "STARTTLS" when sending e-mails, refer to the section Security functions for communication (Page 28).

You configure further parameters of notifications on the following WBM pages:

- Recipient of the messages, refer to the section User / Recipient (Page 133).

- Message texts, refer to the section Texts (Page 166).

- For information on selecting the attachment of the e-mail, see section Notifications (Page 98).

- **FTP (sending)**

  Transfer of FTP files via a program block to an FTP server reachable via LAN or the Internet

  The function corresponds to the FTP command "PUT".

  An FTP file transfer is possible for the following data:

  - Current log file

    See section Logging (Page 140).

  - The entire process image

  - The entire diagnostics buffer

  The file can be transferred uncompressed or compressed as a ZIP archive. For uncompressed transfer, the file transfer can also be performed with the "Append" function. When this is used, when the file being transferred arrives at the destination location, the FTP server appends the file to an existing file of the same name instead of overwriting it.

  For information on the program block see section FTP file transfer (Page 243).

  For information on the configurable security option when using FTP transfer see section Security functions for communication (Page 28).

- **HTTP / HTTPS**

  The communications partners always connect to the WBM of the RTU. HTTP/HTTPS is used for the following connections of the RTU:

  - Connection of the configuration PC via the LAN interface of the RTU, optionally via an external router.

  - HTTP/HTTPS connection of the configuration PC via mobile wireless (via an OpenVPN tunnel)

  - HTTPS connection of the configuration PC via mobile wireless if the RTU has a publically reachable IP address.

    You will find information on usage in the section Establishing a connection to the WBM of the RTU (Page 81).

  - Connection of a service PC to the RTU via the Web server of TCSB more

● OpenVPN

OpenVPN must be used for mobile wireless connections of the RTU to a DNP3 or IEC partner.

OpenVPN can also be used for mobile wireless connections of the RTU to the telecontrol server, an ST7 partner, to a configuration PC or for the FTP fie transfer.

You will find further information on using OpenVPN in the section Security functions for communication (Page 28).

1.7   Security functions for communication

Security functions for SMS messages, e-mails and FTP

As general protection the RTU supports the following functions:

● **Configuration of authorized phone numbers on the RTU**

To authorize subscribers that are allowed to establish connection with the RTU by SMS message or phone call, the phone numbers of the individual subscribers are configured on the RTU.

● **Encryption**

For the secure transfer of e-mails and for FTP file transfer the following optional methods can be used.

– STARTTLS (for e-mails)

– TLS (for FTP)

With both options a certificate is required.

Ask your service provider which options are supported.

When using VPN connections or when using a security module SCALANCE S/M, the encryption of the protocol is turned off. If as of the endpoint of the tunnel, the connection leads over further routers make sure that you secure this communication with a security module.

Security functions of the "TeleControl Basic" protocol

The protocol contains the following Security functions:

● **Encrypted communication with the Telecontrol server**

As an integrated security function, the telecontrol protocol encrypts the data for transfer between the RTU and telecontrol server.

The interval for the key exchange between RTU and telecontrol server is set to 1 hour.

● **Telecontrol password**

For authentication of the RTU at the telecontrol server

Security functions of the "SINAUT ST7" protocol

The RTU uses the transfer protocol "MSCsec" for secure communication.

Security functions of the "DNP3" protocol

The protocol provides encrypted authorization.

OpenVPN

For different connections, the RTU uses the VPN technology of OpenVPN. Between the RTU and the connection partner a VPN tunnel is established via an open VPN server and the RTU is the OpenVPN client.

The RTU uses the security functions of the "OpenVPN" service for the following connections:

● Connections of the RTU to a DNP3 master

● Connections of the RTU to an IEC master

● Optional: Connections of the RTU to an ST7 partner

● Optional: Connections der RTU with the telecontrol server

● Optional: FTP file transfer

● Optional: Connections of a configuration PC to the RTU via the Internet (only HTTP) and the mobile wireless network

 For the connection of a service PC to the RTU via the Web server of TCSB no OpenVPN is required.

● Optional: SNTP

To establish the connections listed above an OpenVPN server is required (see below).

OpenVPN is implemented on the RTU as a TUN device (routing mode). The following security functions are supported:

● Encryption

 The data to be transferred is encrypted with the CBC method. As standard, AES-256 or BF (Blowfish in Cipher Block Chaining) can be used.

 Note: BlowFish is no longer considered secure and is currently only supported for reasons of compatibility.

● Authentication of the connection partner

 As hash algorithms for authenticating the user data SHA-1, SHA-224 or SHA-256 can be used.

They RTU uses OpenVPN version V2.3.11.

OpenVPN server

The OpenVPN server must support the following functions:

● OpenVPN V2.3.11 or higher

● OpenSSL with TLS as of version 1.2

- Configuration of the server for TLS version 1.2 four

- Use of "tls-version-min 1.0" in the OpenVPN configuration

As an option you can configure the following OpenVPN servers:

- An OpenVPN server of your choice

- The Siemens application "SINEMA Remote Connect - Server" (SINEMA RC Server) as of version V1.3

  If SINEMA RC Server is used as the OpenVPN server, the RTU and the communications partner of the RTU must be configured in SINEMA RC Server as an OpenVPN client. The RTU and the communications partner of the RTU log on as OpenVPN clients with SINEMA RC Server.

  For the manuals see /5/ (Page 296) and /7/ (Page 296).

SINEMA RC Server is recommended.

Configuring the OpenVPN functions

- You will find details on using HTTP for connections between the configuration PC and RTU in the section Establishing a connection to the WBM of the RTU (Page 81).

  There you will also find instructions on establishing an open VPN connection from the configuration PC.

- For a description of the configuration of the OpenVPN properties of the RTU, refer to the section VPN (Page 126).

1.8   Other services and properties

Other services and properties

- **Installation**

  The RTU is mounted on a standard DIN 35 mm rail.

  For installation outdoors, and optional protective housing is available, refer to the section Scope of delivery, accessories, requirements (Page 33).

- **Data point configuration**

  The process data is configured via inputs and outputs and stored in the operand areas input, output and bit memory. The individual operands are mapped and addressed as data points for the communication. The individual data points are processed one-to-one in the control system.

- **Management of users and user groups**

  To control access to the WBM, the RTU has a user management. The users authorized for WBM access are configured in the WBM.

  By setting up different recipient groups for certain types of SMS message and e-mails sent by the RTU, the messages can be assigned to different groups, for example operation, service etc.

- **IP configuration**

  The essential features of IP configuration are as follows:

  – VLAN interface and the WAN interface of the RTU support IP addresses according to IPv4.

  – Address assignment of the LAN interface

  The IP address and the subnet mask can be set manually in the configuration.

  The IP address can also be assigned automatically by the DHCP client function of the RTU.

  If the DHCP server function of the RTU is enabled, for the configuration PC to be connected the IP address is assigned by the RTU in the network (normally the next free address).

  – Address assignment for the default router and DNS servers

  The addresses can be assigned manually or automatically with the DHCP client function of the RTU. The RTU informs the DHCP server of its own station name so that it can register the name with its DNS server if this is supported (DynDNS).

- **Time-of-day synchronization**

  The RTU has the following options for time-of-day synchronization:

  – NTP

  Time-of-day synchronization using NTP is practical only when no telecontrol communication is configured.

  – By mobile wireless network

  Possible if no telecontrol communication is configured the network provider supports the NITZ procedure (Network Identity and Time Zone).

  – By telecontrol master station

  If the RTU has a communications partner in the master station, it always obtains its local time of day from the partner.

  In most cases, the time of day is transferred as UTC time.

  When using the ST7 protocol the time of day is transferred as the local time of the control center. In this case the time zone and the daylight saving / standard time switchover is disabled on the RTU because the control center handles this.

  PCS 7 as master transfers the time of day with the DNP3 protocol as UTC and with the IEC protocol as the local time of the PCS 7 PC.

  For more information, refer to the section System time (Page 93).

  For information on the format of the time stamp, refer to the section Overview (Page 149).

1.9 Performance data

Program blocks of the controller

For control tasks, 38 types of program blocks are available.

In total, a maximum of 32 program blocks can be created in up to eight networks..

For a description of the blocks, refer to the section Control functions (Page 23).

Number of communications connections for productive data transfer

- Configurable connections

  The following number of connections can be configured as an alternative:

  – 1 connection to the telecontrol server

  – 1 connection to an ST7 master station (or node station)

  – 1 connection to a DNP3 server

    As an option, you can configure the connection to a second master of a redundancy combination.

  – 1 connection to an IEC master

    As an option, you can configure the connection to a second master of a redundancy combination.

  Also:

  – 1 connection to an OpenVPN server

    As an option, a substitute server can be configured.

- Productive connections

  In total the following connections can be established at the same time:

  – Max. 1 connection to a telecontrol server, an ST7 TIM, a DNP3 or IEC master

  – Max. 1 connection to the VPN server

Number of HTTP/HTTPS connections for access to the WBM

- Max. 2 HTTP connections at the same time

  No configuration or firmware file can be loaded simultaneously via both WBM sessions.

- Max. 2 HTTPS connections at the same time via LAN

- Max. 1 HTTPS connection at one time via WAN

User data and time stamps of data

The individual process values of the inputs/outputs are transferred to the master station in data frames with a time stamp. You will find details in the section System time (Page 93).

Frame memory (send buffer)

The RTU has a send buffer for the values of data points configured as an event.

The RAM area for the send memory has a size of 256 KB. Due to the different frame sizes with the various communications protocols, the maximum capacity of the send buffer differs for the protocols.

Maximum number of data frames in the send buffer:

- TeleControl Basic: Max. 9345 data frames
- ST7: Max. 7696 data frames
- DNP3: Max. 10907 data frames
- IEC: Max. 5037 data frames

Memory space for process data in the "Logging" operating mode

Memory space for process data in the "Logging" operating mode is only limited by the size of the plugged in SD card.

Due to the restriction of the FAT32 file system a single log file can have a maximum size of 4 GB.

Texts for messages (SMS / emails)

Up to 20 texts can be configured in the WBM for sending by e-mail or SMS.

Every text can contain up to 6 placeholders for process data.

Buffer for messages and files

The RTU stores up to 12 e-mails, up to 12 FTP transfer files and up to 12 SMS messages that should not or cannot be sent immediately.

The RTU can change to the communication cycle when a configurable number of stored messages is reached, refer to the WBM pages "WAN" > "SMS" or "Services > "E-mail / FTP".

1.10 Scope of delivery, accessories, requirements

Components supplied with the RTU

The following positions ship with the RTU:

- RTU3030C
- Terminal blocks for the electrical connections of the RTU
- Slide for SIM card (inserted in the compartment of the SIM card)
- Instruction sheet with important information

Required accessories and requirements

Apart from the RTU the following accessories are necessary and do not ship with the product:

- Power supply

  You require a power supply for the RTU, optionally:

  – External power supply (provided on-site)

    and /or

  – Battery modules (see section "Optional accessories")

- LAN cable

  For the connection of the configuration PC or an external router to the LAN interface of the RTU, you require an ITP cable Cat 5.

Requirements for the configuration PC

- Web browser

  To configure the RTU you require access to the integrated Web pages (WBM) of the RTU. For this you require a configuration PC with one of the following Web browsers, at least in the specified version:

  – Apple Safari Version 9

  – Google Chrome Version 56.0

  – Microsoft Edge Version 39.14986

  – Microsoft Internet Explorer Version 11.0.0.0

  – Mozilla Firefox Version 51.0.1

  Note

  Number of connections with HTTPS

  Even when using HTTPS, Mozilla Firefox and Apple Safari establish only one connection to the partner.

- OpenVPN server for access to the WBM of the RTU via the mobile wireless network

  You will find the requirements and a description of the procedure in the section Establishing a connection to the WBM of the RTU (Page 81).

Optional accessories

Apart from the RTU the following accessories may be necessary and do not ship with the RTU:

- **Battery module**

  If no power supply is available locally in the area of the station (RTU), you require one or two battery modules with suitable batteries.

  In pure battery operation the use of two battery modules is strongly recommended since only then is interrupt-free operation and full use of the battery capacity possible.

  The battery modules are available as accessories, refer to the appendix Battery module (Page 275).

- **Battery expansion modules**

  To increase the capacity of the battery modules, you can add one or two battery expansion modules to the standard battery module. The battery expansion modules are available as accessories, see appendix Battery module and battery expansion module (Page 275).

- **Protective housing**

  With higher requirements for the protection of the RTU, you require a suitable protective housing.

  Two suitable protective housings are available in the accessories program of the RTU, see appendix Aluminum protective housing (Page 288).

- **SD card**

  For the "Logging" mode you require an SD card.

  If you need to replace the RTU, you can also use the SD card to transfer the configuration data stored on the RTU being replaced to the new device. Every change to the configuration data is saved on a plugged in SD card.

  You can also use the SD card to copy the configuration data of an RTU to other RTUs. This is particularly useful in large projects with many stations because only the station-specific data needs to be adapted for each RTU.

  You will find information on using the SD card in the section Slots for SIM card and SD card (Page 48).

Note

Operation with SD card

It is strongly recommended that you only operate the RTU with an SD card, in particular because an SD card is required in the following situations:
- Logging if an error occurs
- Upgrading the firmware version

Master station / communications partners

To use the ST7, DNP3 or IEC protocols you require the relevant firmware variant for the RTU, see section Communications services (Page 23).

When using the "TeleControl Basic" protocol

- Master station PC with accessories

- Router e.g. SCALANCE M812

- TCSB software:

  – For RTU3030C:

    TeleControl Server Basic V3.0 + SP2 (or higher)

  You will find information on this in the manual, see /4/ (Page 296).

When using the "SINAUT ST7" protocol

- TIM module as communications partner

- STEP 7 for configuring communications partners

When using the DNP3 or IEC protocol

- Master station

  – PC with accessories

  – The relevant master application

  – Security module SCALANCE S

- OpenVPN server

  To use the DNP3 and IEC protocols you need to use the OpenVPN protocol. You require:

  – An OpenVPN server or SINEMA RC, see section Security functions for communication (Page 28).

  – The CA certificate of the server

  – The configuration of the client on the OpenVPN server

  Importing the files for authentication of the RTU is described in the section VPN (Page 126).

Accessories for mobile wireless communication

The following accessories are necessary if the RTU communicates with a master station using mobile wireless, if data of the station is to be sent by SMS or e-mail or if the RTU is to synchronize its time of day via the mobile wireless network (also via NTP).

- **Antenna**

  Only use antennas from the accessories program for the RTU, refer to the section Antennas and accessories (Page 282).

- **Cabinet feedthrough for the antenna and flexible connecting cable for the protective housing**

  See appendix Antenna accessories, screw connections (Page 284).

- **Mobile wireless contract / SIM card**

  If the RTU is to communicate with a partner in the master station using the mobile wireless network, you require a suitable mobile wireless contract with associated SIM

card. Depending on the contract, the RTU receives a dynamic or fixed IP address assigned by the mobile wireless network provider.

If you want to access the RTU directly with HTTPS, the RTU needs a public IP address.

If the RTU is to transfer not only messages, but also process data, the wireless contract must support the sending of data.

● **Communications partner**

Depending on the protocol you are using, you require a suitable communications partner for the RTU:

– Telecontrol server (TCSB)

– ST7-TIM:

– DNP3 master

– IEC master

The communications partner must be reachable from the LAN or Internet via a router, for example SIMATIC NET SCALANCE M812.

With the DNP3 and IEC protocols make sure you have suitable security mechanisms for the connection.

LEDs, connectors, buttons, card slots

2

2.1 Appearance of the device
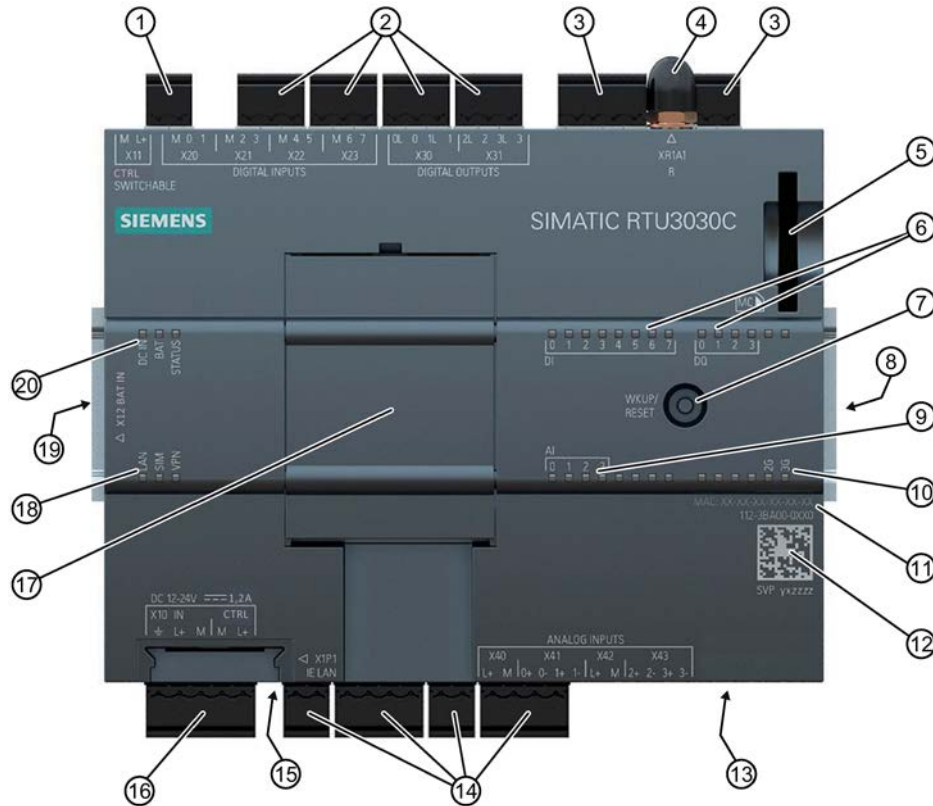
Figure 2-1   Location of the LEDs, connectors, buttons, card slots

Table 2- 1   Meaning of the number symbols

①	X11: Control output to supply sensors and actuators	⑪	MAC address
②	X20..X23: Terminals for digital inputs	⑫	Serial number as (2D matrix code, alphanumeric)
③	X30..X31: Terminals for digital outputs	⑬	◀SIM: Receptacle for SIM card (underside)
④	XR1A1 R: SMA socket for the antenna	⑭	X40..X43: Terminals for analog inputs
⑤	MC▶: Receptacle for SD card	⑮	X1P1: Ethernet interface RJ-45 (underside)
⑥	DI / DQ: Status LEDs for digital inputs/outputs	⑯	X10 IN: Input for external power supply X10 CTRL: Control output to supply sensors and actuators
⑦	WKUP/RESET: button	⑰	*Slot for signal boards - not currently required*
⑧	*Service interface (on the side) - not required*	⑱	Connection status LEDs "LAN", "SIM", "VPN"
⑨	AI: Status LEDs for analog inputs	⑲	X12 BAT IN: Connector for battery module (on the side)
⑩	Wireless status LEDs	⑳	RTU status LEDs "DC IN", "BAT", "STATUS"

2.2 LEDs

LEDs of the device

To reduce current consumption, the LEDs are turned off during operation of the RTU. The LEDs are only turned on in service mode.

The current statuses of the LEDs are always visible in the WBM of the RTU.

To signal the various statuses of the RTU, its inputs and outputs and the communications properties, the RTU has the following LEDs:

Table 2- 2   Overview of the LED groups

Name	Possible colors	Meaning
RTU status		
DC IN	green / yellow	Status of the external power supply
BAT	green / yellow	Use of the battery modules
STATUS	green / red	Display of the mode, operating mode and errors
Connection status		
LAN	green / yellow	Status of the LAN interface:
SIM	green / red	Status of the wireless interface and the SIM card
VPN	green	Status of the tunnel connection
Status of the digital inputs (DI) and digital outputs (DQ)		
DI 0 ... 7 DQ 0 ... 3	green	Status of the digital inputs and outputs
Status of the analog inputs (AI)		
AI 0 ... 3	red	Status of the analog inputs and the connected sensors
Wireless status		
2G 3G	green / yellow	Status of the data transfer and signal quality of the wireless link

Information on the tables

LED symbols

The LED symbols in the following tables have the following significance:

Table 2- 3   Meaning of the LED symbols

Symbol	□	🟥🟩🟨	(flashing icons)
LED status	OFF	ON (steady light)	Flashing

"Meaning" column

If a cell in the "Meaning" column has several entries with bullets, all or only individual meanings may apply.

RTU status LEDs

Table 2- 4   RTU status LEDs

Name	Color	Meaning
DC IN	☐	External power OFF
	🟨	External voltage ON, voltage value in the range 10.8 ... 28.8 V, but not configured
	🟩	External voltage ON, voltage value in the range 10.8 ... 28.8 V
BAT	☐	No power supply from battery modules
	🟩	Power supply from battery module 1 (directly on the RTU)
	🟨	Power supply from battery module 2 (to the left of battery module 1)
STATUS	☐	No error and sleep mode or service mode or update mode
	🟩 flashing green	• Start-up after power ON • Configuration data is changed. • Resetting to factory settings initiated
	🟩 green	Communication mode
	🟥 red	• Fault in the power supply – Battery supply that is not configured. – Battery supply with the configuration of an external power supply – Critical battery capacity – External power supply that is not configured. • Mobile wireless error – Connection error – Error accessing the SIM card – Incorrect PIN • Time-of-day synchronization failed • Error in Logging – SD card does not exist – Access error For diagnostics, refer to the messages in the diagnostics buffer.
	🟥 flashing red	• No configuration • Duplicate IP address • No IP lease received from DHCP server (when the IP address is obtained automatically) • Overload at one of the voltage outputs: X10 CTRL / X11 CTRL / X40 / X42

Connection status LEDs

Table 2- 5   Connection status LEDs

Name	Color	Meaning
LAN	☐	• No connection to the LAN • LAN interface disabled
	🟩	Connection to the LAN
	🟨 (flashing)	Data transfer on the LAN
SIM	☐	SIM card has not yet been checked
	🟥 red	SIM card error
	🟥 (flashing) flashing red	Wrong PIN configured
	🟩 green	PIN was accepted.
VPN	☐	No VPN tunnel established
	🟩	VPN tunnel established

Wireless status LEDs

Table 2- 6   Wireless status LEDs

Name	Color	Meaning
2G / 3G	☐	• No communication mode • No reception or very bad wireless link quality (< -97 dBm) • 2G or 3G disabled in the configuration
	🟨	Medium wireless link quality (-95 ... -81 dBm)
	🟨 (flashing)	Data transfer with medium wireless link quality (-95 ... -81 dBm)
	🟩	Good wireless link quality (> -79 dBm)
	🟩 (flashing)	Data transfer with good wireless link quality (> -79 dBm)

Status LEDs of the inputs (DI, AI) and outputs (DQ)

Table 2- 7   IO status LEDs

Name	Color	Meaning
DI	☐	• Last read status of the "OFF" input • DI0 / DI1 configured as counters • Input not configured:
	🟩	Last read status of the "ON" input
DQ	☐	• Last read status "OFF" (relay open) • Output not configured:
	🟩	Last read status "ON" (relay closed)
AI	☐	• No error • Input not configured:
	🟥	Errors: • Measured value outside the measuring range (overshoot, undershoot) • Cable break (with 4...20 mA signal) • Overload of the measuring amplifier of the RTU

LEDs with a firmware update

After activating a new firmware file, the following LEDs are lit briefly when the RTU restarts:

- Red: STATUS
- Green: DC IN, BAT, SIM, VPN

2.3   Interfaces and connectors

You will find the location of the individual RTU connectors in the section Appearance of the device (Page 39).

You will find the pinning of the terminal blocks and the connector plans in the section Connecting up the RTU (Page 61).

You will find the electrical data of the connectors in the section Technical data (Page 261).

You configure the power supply of the RTU itself and the control outputs of the RTU in the WBM, refer to the section Power supply (Page 142).

Note

Output voltage

The voltage at the terminals X10, X11, X40 and X42 of the RTU can be set in the WBM for all control outputs to 12 or 24 VDC.

Maximum cable lengths:

The maximum length of all cables connected to the RTU is 30 m.

Design of the connectors as plug-in terminals

The connectors are designed as plug-in screw terminals located side by side on the top and bottom of the device. By removing the terminals you can wire the individual connectors even when there is little space and then plug them in again even if the device is already in a protective housing.

Reverse polarity protection

All terminals are designed so that they can only be plugged into one position. This provides constructional reverse polarity protection.

The connector X10 IN to the external power supply of the RTU also has electronic reverse polarity protection.

X10: Voltage input of the RTU and control output for actuators and sensors

X10 is a connector with a 5-pin terminal.

- **X10 IN**

  The RTU is supplied with an external voltage via the connector X10 IN. Voltage sources with a voltage range of 12 to 24 VDC are possible.

  Note

  Safety extra-low voltages (SELV)

  The RTU may only be supplied with safety extra-low voltage (SELV) with limited power (Limited Power Source, LPS) according to IEC 60950-1 / EN 60950-1 / VDE 0805-1 or the power supply unit for supplying the device must comply with NEC Class 2 according to National Electrical Code (r) (ANSI / NFPA 70).

  If you use battery modules at the same time as an external voltage source, the RTU switches from battery operation to the external voltage supply as soon as there is an adequate voltage at X10 IN.

- **X10 CTRL**

  X10 CTRL can be configured using the WBM as a 12/24 V control output to control an external router or to supply sensors and switches of actuators connected to the RTU.

  The voltage value for X10 and X11 (12 or 24 V) can be configured.

  X10 CTRL is regulated; in other words the voltage is independent of X10 IN. Voltage fluctuations of the external power supply are not passed on to X10 CTRL.

  X10 is not designed for the power supply of powerful actuators. Remember the maximum permitted power in the section Technical data (Page 261).

X11: Output for controlling and supplying sensors and switches

X11 is an output for controlling an external router or for controlling and supplying sensors and switches of actuators connected to the RTU.

X11 can be configured in the WBM as a 12/24 V control output. The voltage value for X10 and X11 (12 or 24 V) can be configured.

X11 is a regulated control output with a two pin terminal. On X11, voltage is only applied during the update cycles and only when this is configured.

X11 is not designed for the power supply of powerful actuators. Remember the maximum permitted power in the section Technical data (Page 261).

Configuring the inputs / outputs

The individual connectors X20... / X30... / X40... are activated and configured in the WBM (active / not active):

● X20 .. X23: 8 digital inputs

   The first two inputs (DI0, DI1) can be configured as counter inputs.

● X30 .. X31: 4 digital outputs

● X40 .. X43: 4 analog inputs

The input and output properties such as signal type, measuring range etc. are configured in the WBM.

X20 .. X23: Digital inputs / counter inputs

The eight connectors X20 .. X23 are intended for the two signal wires of the sensors. They can also be used to monitor an external router.

The sensors can be supplied with voltage via the connectors X10 or X11 of the RTU.

The digital inputs are designed as Schmitt trigger inputs with a pull-up resistor. They can be switched via open drain transistors, relays or switches.

When closed, no current is used at the inputs. This means that the current consumption of the RTU does not depend on whether sensors with NO or NC contacts are connected.

The two inputs DI0 and DI1 can be configured alternatively as counter inputs (max. 5 kHz).

X30 .. X31: Digital outputs

The four connectors are intended for the control inputs of actuators or relays. They can also be used to control an external router.

When necessary, actuators can be supplied with voltage via the control outputs X10 or X11 of the RTU.

The digital outputs are designed as bistable relays that retain their current status even in the sleep mode of the RTU.. In the open status, no current flows by the two terminals of the individual outputs.

X40 .. X43: Analog inputs

Up to four analog sensors can be connected.

The RTU supports the following output signals:

- Current / voltage (measuring transducer with auxiliary power)
  - 0/4 ... 20 mA
  - 0 ... 10 V
  - 0 ... 5 V
- Temperature, Pt1000 (sensor sensor in 2-wire technology)

  -80 ... +140 °C / -112 .. +284 °F

  The cable resistances can be specified in the WBM to correct the temperature measured values. As an alternative, the cable resistances can be calculated on the RTU by specifying specific table data.

The signal types of the inputs are configured in the WBM of the RTU.

The inputs X41/0 and X41/1 measure at the same time, the inputs X43/0 and X43/1 following this and one after the other. Refer to the notes in section Analog inputs (Page 155).

The input AI0 can also be monitored for changes in sleep mode.

X1P1: Ethernet interface

X1P1 is the LAN connector of the RTU.

Note

No connection to the Internet

The LAN connector is not suitable for direct connection of the RTU to the Internet. To do this, an external router with suitable security mechanisms must be connected.

XR1A1 R: Antenna connector

An antenna is connected to the SMA socket if communication via the mobile wireless network is intended.

X12 BAT IN: Connector for battery module (on the side)

Here, you connect one or two optional battery modules along with up to two battery expansion modules.

2.4 The button "WKUP/RESET"

Functions of the button

The "WKUP/RESET" button has the following functions:

- **Set the RTU to the service mode**

  Setting the RTU to the service mode activates the LEDs and the LAN interface "X1P1".

  For a period that can be configured in the WBM, the connection of a configuration computer to the LAN interface and the call of the WBM are therefore enabled. This allows the configuration of the RTU to be changed locally during operation.

- **Shut down to safe status**

  When it shuts down to a safe status the RTU books out of the mobile wireless network and completes all writes to the SD card.

  You can then disconnect the device from the power supply. You require shutting down to the safe status for the following situations:

  – Replacing the SIM card

  – Replacing the SD card

  – Replacing a battery when you only use a single battery module (with or without battery expansion modules) and no external power supply.

  – Taking the RTU out of operation

- **Resetting to factory settings**

  By resetting to factory settings, the RTU is reset to the status as it was delivered from the factory. This deletes all the configured settings.

  For the precise effects of resetting, refer to the section Resetting to factory settings (Page 257).

Pressing the button

By pressing the button in different ways, the functions described above are triggered:

Duration of pressing the button (seonds)	Function
0 .. < 5 s	**Wake up (service mode)** When woken, the following are activated: • LEDs • LAN interface • DHCP client of the RTU (if configured)
> 5 .. < 10 s	**Shut down to safe status** When it shuts down to a safe status the RTU books out of the mobile wireless network and completes all writes to the SD card.
≥ 10 s	**Resetting to factory settings** If you press the button continuously, a reset is initiated and the "STATUS" LED flashes green.

2.5   Slots for SIM card and SD card

"◀SIM": Slot for the SIM card

On the underside of the RTU there is a slot marked "◀SIM" for the SIM card you obtain from the network provider of your mobile wireless contract

Compatible cards

The card slot and the RTU are compatible with the following card formats:

- Mini SIM card, 25 x 15 mm (ISO/IEC 7810 ID-000)

    If applicable, Micro SIM card, 15 x 12 mm (ETSI TS 102 221 V9.0.0) if an adapter exists.

Card errors / diagnostics

Card errors are indicated by the "SIM" LED and entries in the diagnostics buffer.

Inserting the card

Inserting the SIM card is described in the section Inserting the SIM card and SD card (Page 56).

"MC▶": Slot for an optional SD card

At the top right on the front of the RTU there is a slot for an SD card marked "MC ▶". You have the option of using the SD card as an exchangeable storage medium for storing configuration and process data (log files) as well as diagnostics data.

An SD card does not ship with the RTU.

Compatible cards

You will find a list of compatible SD cards in the appendix SD card / SMC (Page 281).

Card errors / diagnostics

Card errors are indicated by entries in the diagnostics buffer.

Inserting the card

Inserting the SD is described in the section Inserting the SIM card and SD card (Page 56).

Retentive storage of important data on the SD card

The SD card is an exchangeable storage medium for storing various data safe from power failure.

Note

Operation with SD card

It is strongly recommended that you only operate the RTU with an SD card, in particular because an SD card is required in the following situations:

- Logging if an error occurs
- Upgrading the firmware version

The following data can be stored on the SD card.

- **Configuration data**

  The configuration data is backed up on the SD card following every change in a configuration file. Storing configuration data on the card serves the following purposes:

  – Copying configuration data to other RTUs

    The configuration file can be edited and can be used to copy configuration data to different RTUs, refer to the section Configuration (Page 99).

  – Device replacement without configuration PC

    If an RTU needs to be replaced for maintenance purposes, by transferring the SD card from the old to the new RTU, the configuration data can be made available to the new RTU. In this case, you do not need a configuration PC.

- **Process data**

  If the Logging function is activated in the WBM. process data acquired by the RTU is saved up on the SD card.

  Certain or all process data can be stored on the card for a certain time or until the maximum storage capacity of the SD card is reached.

- **Diagnostics buffer entries**

  In the WBM you can configure that diagnostics buffer entries for serious events are saved on the SD card.

  The entire diagnostics buffer of the RTU can be saved manually on the SD card.

Connecting up, installation, commissioning 3

3.1 Important notes on using the device

Safety notices on the use of the device

Note the following safety notices when setting up and operating the device and during all associated work such as installation, connecting up or replacing the device.

> ⚠ **WARNING**
>
> **Safety requirements for installation**
>
> The devices are "open equipment" according to the standard IEC 61010-2-201 or UL 61010-2-201 / CSA C22.2 No. 61010-2-201. To fulfill requirements for safe operation with regard to mechanical stability, flame retardation, stability, and protection against contact, the following alternative types of installation are specified:
> - Installation in a suitable cabinet.
> - Installation in a suitable enclosure.
> - Installation in a suitably equipped, enclosed control room.

> ⚠ **WARNING**
>
> If the device is installed in a cabinet, the inner temperature of the cabinet corresponds to the ambient temperature of the device.

3.1.1 Notices on use in hazardous areas

> ⚠ **WARNING**
>
> The device may only be operated in an environment with pollution degree 1 or 2 (see IEC 60664-1).

> ⚠ **WARNING**
>
> **EXPLOSION HAZARD**
>
> The device must not be opened.

⚠ **WARNING**

EXPLOSION HAZARD

Do not press the button "WKUP RESET" if there is a potentially explosive atmosphere.

⚠ **WARNING**

Power supply

The equipment is designed for operation with Safety Extra-Low Voltage (SELV) by a Limited Power Source (LPS).

This means that only SELV / LPS complying with IEC 60950-1 / EN 60950-1 / VDE 0805-1 must be connected to the power supply terminals. The power supply unit for the equipment power supply must comply with NEC Class 2, as described by the National Electrical Code (r) (ANSI / NFPA 70).

⚠ **WARNING**

EXPLOSION HAZARD

DO NOT CONNECT OR DISCONNECT EQUIPMENT WHEN A FLAMMABLE OR COMBUSTIBLE ATMOSPHERE IS PRESENT.

⚠ **WARNING**

EXPLOSION HAZARD

DO NOT OPEN ENCLOSURE OR REPLACE BATTERY WHEN A FLAMMABLE OR COMBUSTIBLE ATMOSPHERE IS PRESENT.

⚠ **WARNING**

Battery replacement

Always replace both batteries of a battery holder with new batteries. Do not mix new with used batteries. Do not mix different manufacturers' batteries. Properly discard old batteries, not for recharge or reuse.

⚠ **WARNING**

EXPLOSION HAZARD

SUBSTITUTION OF COMPONENTS MAY IMPAIR SUITABILITY FOR CLASS I, DIVISION 2 OR ZONE 2.

Note

You must not install the device on a wall in hazardous areas.

⚠️ **WARNING**

EXPLOSION HAZARD

The equipment is intended to be installed within an enclosure/control cabinet. The inner service temperature of the enclosure/control cabinet corresponds to the ambient temperature of the module. Use cables with a maximum permitted operating temperature of at least 20 °C higher than the maximum ambient temperature.

⚠️ **WARNING**

When used in hazardous environments corresponding to Class I, Division 2 or Class I, Zone 2, the device must be installed in a cabinet or a suitable enclosure.

3.1.2 Notices on use in hazardous areas according to ATEX / IECEx

⚠️ **WARNING**

To comply with EC Directive 2014/34/EU (ATEX 114) or the conditions of IECEx, this enclosure or cabinet must meet the requirements of at least IP54 in compliance with EN 60529.

⚠️ **WARNING**

If the cable or conduit entry point exceeds 70 °C or the branching point of conductors exceeds 80 °C, special precautions must be taken. If the equipment is operated in an air ambient in excess of 50 °C, only use cables with admitted maximum operating temperature of at least 80 °C.

⚠️ **WARNING**

Take measures to prevent transient voltage surges of more than 40% of the rated voltage. This is the case if you only operate devices with SELV (safety extra-low voltage).

> ⚠ **WARNING**
>
> **DIN rail**
>
> In the ATEX and IECEx area of application only the Siemens DIN rail 6ES5 710-8MA11 may be used to mount the RTU and the battery modules.

3.1.3 Notices regarding use in hazardous areas according to UL HazLoc

> ⚠ **WARNING**
>
> **EXPLOSION HAZARD**
>
> DO NOT DISCONNECT WHILE CIRCUIT IS LIVE UNLESS AREA IS KNOWN TO BE NON-HAZARDOUS.

This equipment is suitable for use in Class I, Division 2, Groups A, B, C and D or non-hazardous locations only.

This equipment is suitable for use in Class I, Zone 2, Group IIC or non-hazardous locations only.

3.2 Requirements for commissioning

Prior to commissioning

The following requirements must be met before you commission the RTU:

- **Configuring the RTU**

  For the communication of the RTU with a configuration computer via the LAN interface, you need to set the interface of the configuration computer according to the subnet parameters of the RTU, refer to section LAN (Page 107). As an alternative, you can activate the DHCP functionality of the RTU on the WBM page "LAN".

  With the factory setting the RTU is set to manual IP address assignment with IP 192.168.0.3.

- **Formatted SD card (optional)**

  If you want to use an SD card, make sure that the card is correctly formatted, see also the section SD card / using and formatting SMC (Page 55).

Requirements for using mobile wireless services

- **Configuring the RTU**

  For the communication of the RTU with a master station via mobile wireless at least the following parameters must be configured:

  – Activation of the mobile wireless interface with suitable parameters on the WBM page "WAN".

  – Configuration of the protocol-specific parameter on the WBM page "Telecontrol".

  – If you use communication via the DNP3 or IEC protocol, an OpenVPN server must exist and the RTU must be configured accordingly, refer to the WBM page "OpenVPN client".

- **Mobile wireless contract**

  You require a suitable contract with a mobile wireless network provider, refer to the section Scope of delivery, accessories, requirements (Page 33).

- **Plugged-in SIM card**

  The SIM card belonging to the mobile wireless contract is plugged into the RTU.

  When possible, insert the SIM card in the RTU prior to mounting and connecting up, see section Inserting the SIM card and SD card (Page 56).

  With contracts with a PIN, the PIN must be configured, refer to the section Mobile wireless settings (Page 111).

- **Locally available mobile wireless network**

  Make sure that a configured mobile wireless network is available in the area of the station, refer to the section Mobile wireless settings (Page 111).

3.3 SD card / using and formatting SMC

Formats of the memory cards

If you want to use a card as an exchangeable storage medium, the formatting must meet the requirements of the RTU:

- **SIMATIC Memory Card (SMC)**

  Directly from the factory an SMC is already correctly formatted and can be used in the RTU without any further preparation.

- **Standard SD card**

  File format FAT32

Using an SMC in a card reader

If you use an SMC in a commercially available card reader under Windows, the card must always be disabled using the "Eject" or "Safely remove hardware" function before you take the card from the card reader. Otherwise loss of data may result.

Formatting an SD card or SMC

When formatting an SD card or an SMC that has already been used, note that all the data on the card is deleted when you format.

- **Formatting a standard SD card**

  If the card is not formatted in the file format FAT32, format the card as described in the manual of the card or the card reader.

- **Use of an SMC**

  An SMC must not be formatted like a standard SD card otherwise it cannot be used. You will find instructions on repairing and formatting on the pages of the Siemens Industry Online Support in the following FAQ:

  Link: (http://support.automation.siemens.com/WW/view/en/69063974)
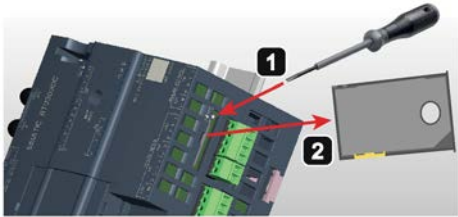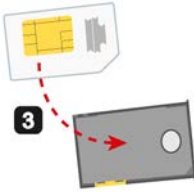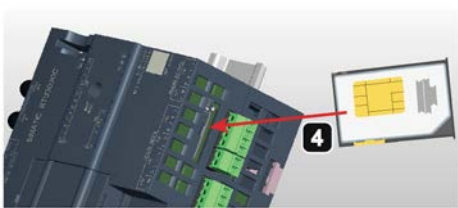
3.4 Inserting the SIM card and SD card

Inserting the SIM card

Recommendation: Insert the SIM card in the RTU before you install it. After installing and connecting up the answer you, the space for inserting the SIM card may be very restricted.

Before inserting or changing the SIM card make sure that the power supply is turned off.

Step	Execution	Notes and explanations
①	Release the slide for the SIM card on the bottom of the RTU by gently pressing the release pin beside the slot "◀ SIM".	
②	Remove the slide from the housing.	
③	Insert the SIM card in the slide as illustrated.	
④	Push the slide back into the housing, where it locks gently in place.	

Removing the SIM card

> **Note**
>
> **Pulling the SIM card**
>
> Do not remove the SIM card while the device is operating. First shut the RTU down to the safe status, refer to the section Operating status (Page 103).

Remove the SIM card as described above.

Inserting an SD card

If you use an SD card (optional), make sure that it is correctly formatted.. For information on formatting refer to the section SD card / using and formatting SMC (Page 55).

Before inserting the SD card make sure that the power supply is turned off.

Insert the card in the slot "MC▶" until it locks gently in place. Make sure that the card is in the correct position.

Removing the SD card

> **Note**
>
> **Pulling the SIM card**
>
> Do not remove the SD card while the device is operating. First shut the RTU down to the safe status, refer to the section Operating status (Page 103).

With slight pressure on an inserted card, you release this again from the locking mechanism in the slot.

3.5   Installing an RTU

Prior to installation

Refer to the information in the section Requirements for commissioning (Page 54) before you start to install the RTU.

You will find the device dimensional is in the section Dimension drawings (Page 273).

Installation location

NOTICE
Installation location - Dependency of the temperature range
The module must be installed so that its upper and lower ventilation slits are not covered, allowing adequate ventilation. Above and below the device, there must be a clearance of 25 mm to allow air to circulate and prevent overheating.
Remember that the permitted temperature ranges depend on the position of the installed device. You will find the permitted temperature ranges in the section Technical data (Page 261).

Installation of the rack	Installation position of the RTU
Horizontal installation of the rack (DIN rail)	
Vertical installation of the rack (DIN rail)	

Installing the RTU

Note

Protecting the battery modules from slipping on the DIN rail

When mounting in the protective housing that can be ordered as an accessory, there are two end retainers that are fitted to both ends of the group of devices. The end retainers prevent the RTU and battery module from separating under mechanical load.

If you do not mount the RTU or the battery module in a protective housing from the accessories program, prevent the battery module from slipping with a suitable clamping device, e.g. a Siemens end retainer 8WA1808.

When using the device in the areas of application ATEX or IECEx, note the information on the DIN rail being used in section Notices on use in hazardous areas according to ATEX / IECEx (Page 53).

- If you use a battery module, start at step 1.

- If you do not use a battery module, start at step 2.

Table 3- 1   Procedure for installation

Step	Execution	Notes and explanations
1	Remove the covers on the left-hand side of the RTU. When using more than one battery module remove the covers of all battery modules with the exception of the cover of the battery module on the far left. 1. Insert the tip of a slotted screwdriver in the gap above the cover. 2. Lever the cover carefully out of its holder. 3. In every battery module you use insert the supplied 12-pin adapter in the right socket. **Note:** At this time do not put any batteries in the battery modules. See section Commissioning and starting up the RTU (Page 66) for information on this.	Recommendation: Store the covers in a safe place in case they need to be used later.
2	Secure the DIN rail in the protective housing.	Use a 35 mm DIN rail.
3	Snap the RTU and the battery modules to the left of the RTU onto the DIN rail.	
4	Push the battery modules (left) and RTU (right) together carefully until the side contacts between the RTU and all battery modules are fully closed.	

3.6 Grounding and overvoltage protection

Ground/chassis ground concept

⚠ CAUTION
Grounding by trained specialist personnel
Have trained specialist personnel create a grounding and chassis ground concept.
Only allow trained specialist personnel to perform the ground connection on the system.
Keep to the local regulations and those that apply to the system. However it is installed, the housing of the RTU must be grounded to comply with the local electrotechnical regulations that apply in the relevant country. The most effective grounding method is a direct connection to ground with minimum resistance.

Do not ground the RTU using the grounding terminal X10.

Instead ground the protective housing at the connector intended for this. Ground the housing with a maximum of 1 ohm resistance from the protective housing to ground. For information on grounding, refer also to the appendix Protective housing (Page 288).

Overvoltage protection

NOTICE
Protection of the RTU and the system
Via cables, leaving the RTU, the coupling in of strong electromagnetic pulses on the supply cables is possible, for example, resulting from lightning strikes.
The connectors of the RTU are not protected against strong electromagnetic pulses. For this, external overvoltage protection modules are required.
Have trained specialist personnel create and overvoltage concept that meets the electrotechnical regulations in the relevant country.

Cables at risk

The RTU is at risk via the following cables:

- The supply cables of the optional external power supply of the RTU.

- All signal cables and cables to the power supply of sensors, switches and other devices connected to the RTU.

- The antenna cable. If the antenna is installed outside the protective housing of the RTU.

Protection with overvoltage protection modules

The overvoltage protection modules listed in the appendix or technically equivalent modules, provide additional protection against overvoltage, refer to the section Overvoltage protection modules (Page 292).

3.7 Connecting up the RTU

Description of the connectors and technical specifications

For a description connectors and connectable devices, refer to the section Interfaces and connectors (Page 43).

You will find the terminal sizes, maximum torque and technical details of the connectors in the section Technical data (Page 261).

Order of the work

> **Note**
> **Connection only with power off**
> 1. First wire all the connectors of the RTU.
> 2. Turn the power supply on only after the RTU has been completely wired and connected.

Connecting the antenna (XR1A1)

If you use communication via mobile wireless, connect the antenna to the SMA socket of the RTU.

Protect the antenna connector with a suitable overvoltage protection module if you install the antenna outdoors. See section Grounding and overvoltage protection (Page 60) for information on this.

An antenna cable is not supplied with the device. You will find the compatible antenna in the appendix Antenna ANT794-4MR (Page 283).

Connecting up the digital inputs X20 ... X23

You can connect two sensors to each of the 4 terminal blocks of the digital inputs. In total, up to 8 sensors can be connected.

Assignment of the contacts based on the example of terminal block X20 for digital outputs 0 and 1:

- **M** Reference potential for inputs 0 and 1
- **0** Input 0
- **1** Input 1

The terminal blocks X21 .. X23 are assigned accordingly, for digital inputs 2...7.
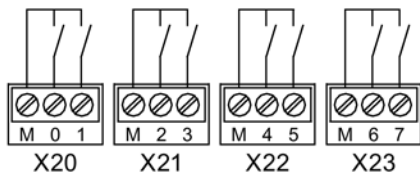
Figure 3-1   Wiring of digital inputs X20 ... X23

For the power supply of the sensors, you can use the control outputs X10 or X11 of the RTU.

Connecting the digital outputs X30 ... X31

The outputs are designed as relays that switch through the signal of the relevant connector 0 / 1 / 2 / 3 (reference potential) to the output 0L / 1L / 2L / 3L.

The terminals 0 / 1 / 2 / 3 can be supplied with voltage via the control outputs X10/X11 of the RTU if this is configured. You specify the voltage value of control outputs X10/X11 in the WBM ("Operating mode" > "Power supply") for the outputs X10, X11, X40 and X42 together.

You can connect two actuators to each of the two terminal blocks of the digital outputs. In total, up to 4 actuators can be connected.

Assignment of the contacts based on the example of terminal block X30 for digital outputs 0 and 1:

- **0L / 0**   Output 0
- **1L** / 1   Output 1

Terminal block X31 is assigned accordingly, for digital outputs 2+3.
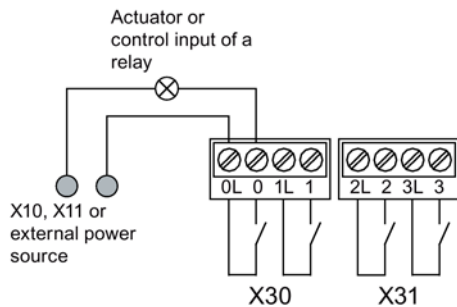
Figure 3-2   Wiring of digital outputs X30 ... X31

For the power supply of the connected actuators, you can use the control outputs X10 or X11 of the RTU.

Connecting up the analog inputs X40 ... X43

You can connect up to 4 analog measuring transducers to the RTU.

The terminal blocks X40 and X42 each serve to control and supply 2 sensors. You specify the voltage value (12 or 24 V) in the WBM ("Operating mode" > "Power supply").

The terminal blocks X41 and X43 are each used to connect the signal wires of two sensors.

Assignment of the contacts based on the example of terminal block X40 and X41:

- **X40**
  - **L+** Control output output for sensors 0 and 1
  - **M** Ground for sensors 0 and 1
- **X41**
  - **0+** Input "+" of sensor 0
  - **0-** Input "-" of sensor 0
  - **1+** Input "+" of sensor 1
  - **1-** Input "-" of sensor 1

The terminal blocks X42 and X 43 are assigned accordingly for sensors 2 and 3.
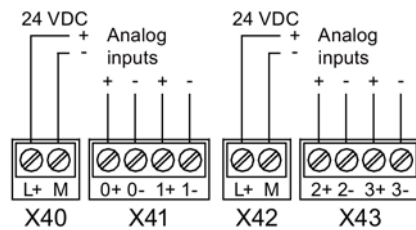
Figure 3-3   Wiring of the analog inputs X40 ... X43

Depending on the measuring transducer type, make the connections as shown below.

As an example the figures show the connection of a measuring transducer at terminal block X41 (analog input "0").

Connecting a 2-wire measuring transducer
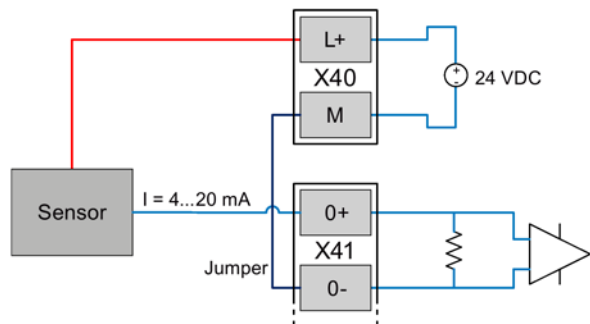
Figure 3-4   Connecting a 2-wire measuring transducer

Terminal "M" of the terminal block X40 and terminal "0-" of terminal block X41 need to be bridged.

Connecting a 3-wire measuring transducer
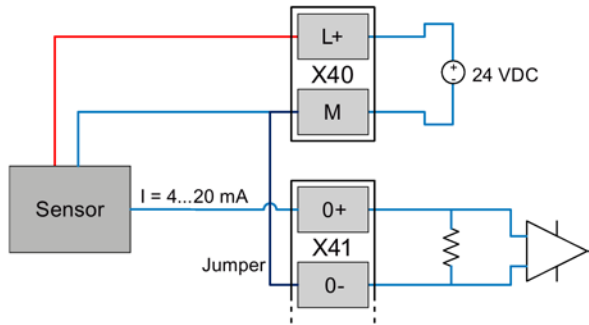
Figure 3-5   Connecting a 3-wire measuring transducer

The terminal "M" of the terminal block X40 and terminal "0-" of terminal block X41 need to be bridged.

Connecting a 3-wire measuring transducer with external power supply
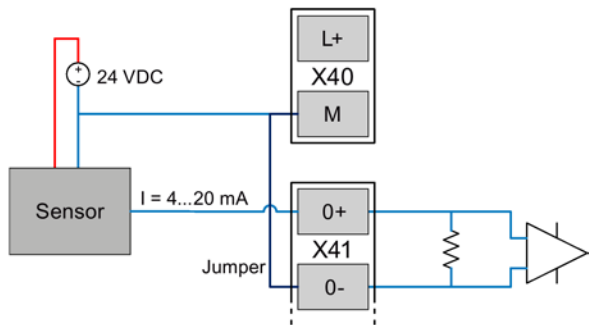
Figure 3-6   Connecting a 3-wire measuring transducer with external power supply

The terminal "M" of the terminal block X40 and terminal "0-" of terminal block X41 need to be bridged.

Connecting a 4-wire measuring transducer
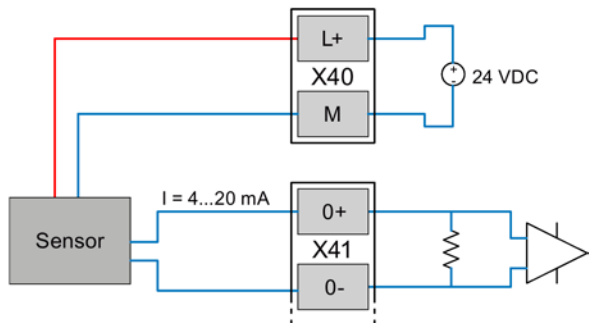
Figure 3-7   Connecting a 4-wire measuring transducer

Connecting a 4-wire measuring transducer with external power supply
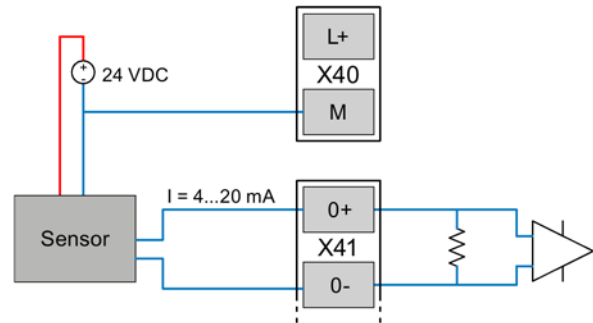
Figure 3-8   Connecting a 4-wire measuring transducer with external power supply

Connecting a temperature sensor
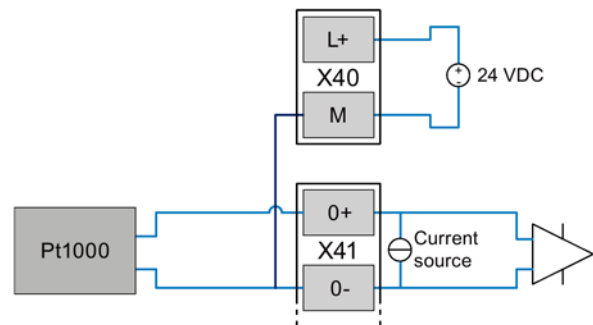
Figure 3-9   Connecting a temperature sensor

Connecting the 12/24 V control output X11 to sensors and switches

Connect the power supply for sensors and/or switches to terminal block X11.

- **M**   Reference potential
- **L+** Voltage 12/24 VDC

This connector is not suitable for the power supply of powerful actuators. Note the maximum power consumption in the section Technical data (Page 261).

You specify the voltage value (12 or 24 V) in the WBM ("Operating mode" > "Power supply").

Connecting the 12/24 V control output X10 CTRL to sensors and switches

To supply sensors, actuators and switches of actuators connected to the RTU, you can connect these to the control output X10 CTRL.

- **X10 CTRL**
  - **L+** Voltage 12/24 VDC

    You specify the voltage value (12 or 24 V) in the WBM ("Operating mode" > "Power supply").
  - **M**   Reference potential

Connecting the external power supply to X10 IN

Finally connect the external power supply (voltage input) of the RTU to terminal block X10 IN.

Only connect safety extra-low voltages (SELV), refer to the section Interfaces and connectors (Page 43).

- **X10 IN**
  - ⏚ Functional ground

    Do not use the functional ground for grounding the RTU. For grounding the system, refer to the section Grounding and overvoltage protection (Page 60).

  - **L+** Voltage input 18.8 ... 28.8 VDC

  - **M** Reference potential

Note the maximum power consumption in the section Technical data (Page 261).

3.8 Commissioning and starting up the RTU

> **Note**
>
> **Startup with an SD card that is not brand new**
>
> If the RTU starts up with an SD card that is not brand new, observe the behavior of the RTU in terms of the configuration file used, refer to the section Configuration (Page 99).

Requirements for commissioning

Prior to commissioning the RTU, make sure that the following conditions are met:

- The system is completely installed:

  RTU, if applicable battery modules, protective housing, relevant sensors/actuators, if applicable antenna, if applicable external power supply

- The RTU and the sensors/actuators belonging to it are completely wired.

- The communications partner - if configured - is reachable.

- The configuration data is loaded on the RTU.

> **Note**
>
> **Copying the configuration data to other RTUs**
>
> If you install a lot of RTUs which use a lot of identical configuration data, you can transfer the configuration data of one RTU to the other RTUs using the configuration file. For information on this refer to the WBM > "Maintenance".

- When mobile wireless communication is intended: The SIM card is plugged in.

- When logging of the process data is intended: The SD card is plugged in.

- The power supply is not yet turned on or connected.

Note

Connecting the power supply:

- With power supply via battery modules:

  The batteries have not yet been put in the battery modules.

- With external power supply

  The external power supply is connected, but not yet turned on.

See also section Requirements for commissioning (Page 54).

Commissioning the RTU

Commission the RTU by supplying the RTU with voltage. The startup behavior of the RTU is described below.

Depending on the type of power supply, follow the steps below:

Supply of the RTU only via external power supply

Turn on the external power supply.

The RTU starts up.

Supply of the RTU only via battery modules

NOTICE
Do not place the battery holders on a conductive surface.
Never place the battery holders on an electrically conductive surface (e.g. the outer housing).
The battery contacts can establish a short-circuit connection in the battery via a conductive surface causing the battery to be destroyed.
Only use undamaged batteries
Use only undamaged batteries. A battery with a damaged casing can cause a short-circuit through the metal clips.

Note

Battery types

Only use the batteries described in the Appendix of the manual. Correct battery operation is only ensured with these battery types.

If you use two battery modules or one battery module with battery expansion modules, start with the first battery module.

For information on the location and labeling of the battery modules and battery expansion modules, refer to the appendix Battery module and battery expansion module (Page 275).

1. Take the battery holder out of the battery module.

2. Insert the batteries in the battery holder.

3. Put the battery holder in the battery module.

4. Plug the connector of the battery holder in the socket X10 BATTERY of the battery module.

If applicable, perform the same steps for the battery expansion modules and for the second battery module including its expansion modules.
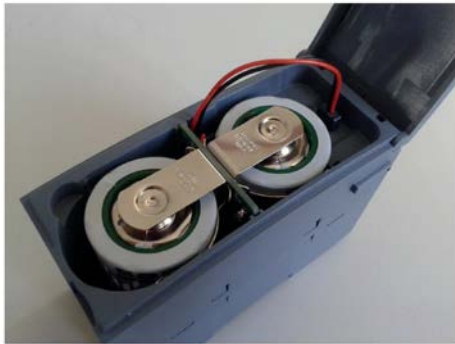
Figure 3-10   Battery module (not mounted) with inserted battery holder, cable connected.

Note

Starting battery operation

The RTU only starts up when there are two batteries with adequate voltage and capacity in the main battery module. The RTU cannot start up with the other battery modules.

Note

Battery switchover only when a configuration exists.

The RTU only switches between battery module 1 and 2 if you have configured battery modules in the WBM and have connected them in the WBM. For configuration and changing batteries, refer to the section Power supply (Page 142).

Supply of the RTU via battery modules and external power supply

1. Turn on the external power supply.

    The RTU starts up.

2. Connect the batteries as described above.

Startup behavior of the RTU

During startup the RTU behaves as follows:

- The LED "STATUS" flashes green.

- If an SD card is plugged in, the RTU searches for the configuration data stored on the card.

  – When it has found the configuration data on the card, the RTU reads in the configuration data.

  – If the configuration data is not found on the card, the RTU uses the configuration data in its internal memory.

    If the RTU does not find any configuration data in its internal memory it remains in service mode. The STATUS LED flashes red.

- The RTU changes to update mode:

  – All connected and configured inputs are read.

  – The read data is processed if programmed.

  – The data is saved.

  – The outputs are updated if programmed.

- If communication is configured and the requirements for data transfer are met, the RTU connects to its communications partner for the first time.

  The following requirements must be met:

  – The inputs are configured, refer to the section Tags (Page 149).

  – The tags are processed by the program, refer to the section Programming (Page 195).

  – The data points have been created, refer to the section Telecontrol (Page 169).

  – The RTU has a connection to the mobile wireless network, refer to the section LEDs (Page 40) (wireless status LEDs) or via the LAN interface and an external router, the RTU has access to the Internet.

- When the data transfer is complete, or if no communication is configured, the RTU changes to sleep mode.

Checking the antenna position

If the RTU is in communication mode, based on the signal strength displayed in the WBM, you can check the optimum alignment of the antenna in different positions. For more on the display of the signal strength refer to the section Wireless cell (Page 115).

Configuration (WBM)

<div style="text-align: right; font-size: 2em;">4</div>

4.1 Security recommendations

Keep to the following security recommendations to prevent unauthorized access to the system.

General

- You should make regular checks to make sure that the device meets these recommendations and other internal security guidelines if applicable.

- Evaluate your plant as a whole in terms of security. Use a cell protection concept with suitable products.

- Keep the firmware up to date. Check regularly for security updates of the firmware and use them.

- Check regularly for new features on the Siemens Internet pages.

    - Here you will find information on industrial security:
      Link: (http://www.siemens.com/industrialsecurity)

    - Here you will find information on security in industrial communication:
      Link: (http://w3.siemens.com/mcms/industrial-communication/en/ie/industrial-ethernet-security/Seiten/industrial-security.aspx)

    - You will find a publication on the topic of network security (6ZB5530-1AP02-0BA5) here:
      Link: (http://w3app.siemens.com/mcms/infocenter/content/en/Pages/order_form.aspx?nodeKey=key_518693&infotype=brochures)
      Enter the following filter: 6ZB5530

Physical access

Restrict physical access to the device to qualified personnel.

Security functions of the product

Use the options for security settings in the configuration of the product. These include among others the following security function of the communication:

- Enable the security functions of the device.

  Think about the services you want to allow access to the station via public networks.

- Use secure protocol variants such as HTTPS or STARTTLS.

- Use the secure communication via OpenVPN.

Passwords

- Define rules for the use of devices and assignment of passwords.

- Regularly update the passwords to increase security.

- Only use passwords with a high password strength. Avoid weak passwords for example "password1", "123456789" or similar.

- Make sure that all passwords are protected and inaccessible to unauthorized personnel.

- Do not use one password for different users and systems.

Protocols

Secure and non-secure protocols

- Only activate protocols that you require to use the system.

- Use secure protocols when access to the device is not prevented by physical protection measures.

  The HTTP protocol provides a secure alternative with HTTPS.

Port tables

The following tables provide you with an overview of the open ports on this device.

- **Protocol / function**

  Protocols that the device supports.

- **Port number (protocol)**

  Port number assigned to the protocol.

  An asterisk (*) after the number means that the port can be set in the WBM of the RTU.

- **Default of the port**

  – Open

    The port is open at the start of the configuration.

  – Closed

    The port is closed at the start of the configuration.

- **Port status**

  – Open

    The port is always open and cannot be closed.

  – Open according to configuration

    The port is open if it has been configured.

- **Authentication**

  Specifies whether or not the protocol authenticates the communications partner during access.

Table 4- 1   Server ports of the LAN interface

Protocol / function	Port number (pro-tocol)	Default of the port	Port status	Authentication
HTTP	80 (TCP)	Open	Open after configuration	Yes
HTTPS	443 (TCP)	Open	Open	Yes
DNS	53 (UDP)	Open	Open	No
DHCP	67 / 68 (UDP)	Open	Open after configuration	No
DNP3	20000 * (TCP/UDP)	Closed	Open after configuration	Yes, when secure authentication is ena-bled.
IEC	2404 * (TCP)	Closed	Open after configuration	No

Table 4- 2   Server ports of the WAN interface

Protocol / function	Port number (pro-tocol)	Default of the port	Port status	Authentication
HTTPS	443 (TCP)	Closed	Open after configuration	Yes

Table 4- 3   Server ports in the tunnel of the VPN interface

Protocol / function	Port number (pro-tocol)	Default of the port	Port status	Authentication
HTTP	80 (TCP)	Open	Open after configuration	Yes
HTTPS	443 (TCP)	Open	Open	Yes
DNP3	20000 * (TCP)	Closed	Open after configuration	Yes, when secure authentication is ena-bled.
IEC	2404 * (TCP)	Closed	Open after configuration	No

Ports of the PC, of communications partners and routers

Make sure that you open the required client ports in their firewalls in your configuration PC, the communications partners of the RTU and in intermediary routers.

This can be:

- TeleControl Basic / 55097 * (TCP)
- ST7 / 26382 * (TCP)
- FTP / 21 * (TCP) (and dynamically decided by the server, passive mode)
- DHCP / 67, 68 (UDP) (only LAN)
- NTP / 123 (UDP)
- SMTP / 25 * (TCP) (only LAN and WAN)
- DNS / 53 (UDP) (only LAN and WAN)
- DynDNS / 443 (TCP) (only WAN)
- SINEMA RC Autoconfiguration / 443 * (TCP) (only WAN)
- SINEMA RC and OpenVPN / 1194 * (UDP) (only WAN)

4.2 Range of functions of the WBM

Web Based Management (WBM)

The RTU is configured using the Web Based Management (WBM) of the RTU.

The WBM consists of integrated Web pages of the RTU that can be called up in the Web browser of a connected configuration PC.

For information on the Web browsers that can be used on the configuration PC, see section Scope of delivery, accessories, requirements (Page 33).

Overview of the functions of the WBM

With the WBM, the following functions are available to you:

User management

Via HTTP/HTTPS you connect to the RTU from a configuration PC.

In the open WBM of the RTU, you specify individual users that may access the WBM of the RTU with a user name and password.

Configuration functions

Using the WBM, configure the following functions of the RTU:

- Device-internal functions, such as the time of day or IP address
- Settings of the operating modes of the RTU
- Inputs and outputs of the sensors and actuators connected to the RTU
- Communications functions of the RTU
- Logging of system events

Programming the program blocks for the controller

In the WBM, you program the program blocks for the control tasks of the RTU using a graphic user interface.

Maintenance functions

- Loading and storing the configuration data
- Downloading new firmware versions
- Resetting the RTU to the factory settings

Diagnostics

- Viewing, reading out or saving the diagnostics messages in the diagnostics buffer
- Sending messages (SMS, e-mails) for configurable events

Saving and re-using the configuration file

The configuration data you create in the WBM is saved on the RTU.

If you want to back up the data as well, you can also save the configuration data in the WBM area. "Maintenance" on the configuration PC or on a plugged in SD card, refer to the section Configuration (Page 99).

If you install a lot of RTUs which use a lot of identical configuration data, you can copy the configuration file of one RTU, if necessary adapt it manually in a text editor and then transfer it to another RTU. You can also adapt the data later in the second RTU.

First access to the WBM
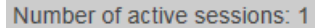
The first time you call up the WBM, you need to establish the connection between the configuration PC and RTU initially via the LAN interface of the RTU, refer to the section User data for the first login to the WBM (Page 85).

When you have configured the required data of the WAN interface, you can also access the RTU later via the mobile wireless network.

4.3 General functions of the WBM

Symbols of the title bar

The symbols in the title bar have the following significance:

Symbol	Function
2015-01-28 14:30:37	Date and time of the last page update of the WBM in the local time of the RTU (yyyy-mm-dd hh:mm:ss)
English	Drop-down list for setting the WBM language
User: 1	Name of the currently logged in user
Log out	Logout of the user
Number of active sessions: 1	Number of connections to configuration PCs
Start	Execution of the user program is turned off. Program execution is started by clicking on the text.
Stop	Execution of the user program is turned on. Program execution is stopped by clicking on the text.
	Shows that the automatic updating of the WBM user interface is enabled. The data is called up at 5 second intervals.
	Shows that the automatic updating of the WBM user interface is disabled.
Turn on	Switches on the automatic updating of the WBM. Only on pages on which no entries can be made.

Symbol	Function
Turn off	Switches off the automatic updating of the WBM.
	Only on pages on which no entries can be made.
Update	Updates the current display on WBM pages on which entries can be made.
	During the update a progress bar is visible.
?	Opens the Internet page of the RTU in the Siemens Industry Online Portal.
	Here, you will find all entries for the product.
	Open / save Open Source software license conditions of the RTU

Entering and saving

Confirm all your entries by clicking the "Apply" button. Your settings are then adopted by the device. With some parameters this can take a few seconds. This is visible thanks to a progress bar.

Grayed out boxes are preset by the system and cannot be changed.

Note

Data loss when changing the WBM page without saving

If you do not save your input with the "Apply" button, your input will be discarded without a prompt for confirmation when you change WBM pages.

Incorrect entries in the configuration

In many input boxes of the WBM, the content is checked for missing content or consistency when you save. Boxes with detected errors or illegal characters are marked with a red border.

192.168.0.999
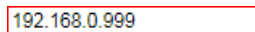
Figure 4-1   Example of an input box with a detected incorrect entry

With some incorrect entries an additional message is also displayed. The settings are only applied after the error has been corrected.

4.4   Permitted characters and parameter lengths

Note

Leading and following spaces

Leading and following spaces are not permitted. These result in an error message in the WBM indicating an incorrect entry.

Exception: Comments and SMS message texts.

Use of special characters

When using special characters, the maximum character length cannot be guaranteed.

When configuring user data, passwords, device parameters etc. ASCII character sets are often specified. Below you will find ASCII character sets with their hexadecimal code and the corresponding character.

Standard characters

- 0x30 .. 0x39

    0 1 2 3 4 5 6 7 8 9

- 0x41 .. 0x5A

    A B C D E F G H I J KL M N O P Q R S T U V W X Y Z

- 0x61 .. 0x7A

    a b c d e f g h i j k l m n o p q r s t u v w x y z

Special characters

- 0x21 .. 0x2F

    ! " # $ % & ' ( ) * + , - . /

- 0x3A .. 0x40

    : ; < = > ? @

- 0x5B .. 0x60

    [\ ] ^ _ `

- 0x7B .. 0x7E

    { | } ~

Special characters ≥ 0x80

- 0x80, 0xA3, 0x8A, 0x9A, 0x8E, 0x9E, 0xB5

    € £ Š š Ž ž µ

- 0xC0 .. 0xFF

    À Á Â Ã Ä Å Æ Ç È É Ê Ë Ì Í Î Ï Ð Ñ Ò Ó Ô Õ Ö × Ø Ù Ú Û Ü Ý Þ ß à á â ã ä å æ ç è é ê ë ì í î ï ð ñ ò ó ô õ ö ÷ ø ù ú û ü ý þ ÿ

Table 4- 4   **Characters and formats of the strings that can be entered in the WBM**

Parameter	String length		Permitted characters / format
	Min.	**Max.**	
Names (except for server names)	1	20	All the characters listed above
System			
Station name	1	20	According to the rules for DNS names with a combination of: • 0x2D .. 0x2E • 0x30 .. 0x39 (no digits alone) • 0x41 .. 0x5A • 0x61 .. 0x7A
Station description	1	20	All the characters listed above
Server names: (NTP, telecontrol, mail-, VPN server, FTP server)	1	63	Standard characters, period, dash (DNS name according to RFC 1035 and RFC 1123): • 0x2D • 0x2E • 0x30 .. 0x39 • 0x41 .. 0x5A • 0x61 .. 0x7A
WAN			
PIN	4	8	0x30 .. 0x39
APN	1	63	Standard characters and period (DNS name according to RFC 1035 and RFC 1123): • 0x2E • 0x30 .. 0x39 • 0x41 .. 0x5A • 0x61 .. 0x7A
APN user name APN password	0 0	63 32	• 0x21 .. 0x2F • 0x30 .. 0x3F • 0x40 .. 0x4F • 0x50 .. 0x5F • 0x60 .. 0x6F • 0x70 .. 0x7E
Users / groups			

Parameter	String length		Permitted characters / format
	Min.	Max.	
Phone numbers	0	20	Format: +<country code><target phone number>
			Entry as digits and few special characters
			• 0x30 .. 0x39
			• 0x2B Plus character: Placeholder for the trunk prefix before the country code
			• 0x2A asterisk at the end: Placeholder for extension numbers
			• 0x2F, 0x28, 0x29 / ( ) as the delimiter
			• 0x32 space
Names of users and groups	1	20	All the characters listed above
Companydepartment/position, group description	1	50	All the characters listed above
User name	1	32	• 0x2D (-) .. 0x2E (.)
			• 0x30 .. 0x39
			• 0x40 (@)
			• 0x41 .. 0x5A
			• 0x5F (_)
			• 0x61 .. 0x7A
Password	8	20	• 0x30 .. 0x39
			• 0x41 .. 0x5A
			• 0x61 .. 0x7A
			• 0x21 .. 0x2F
			• 0x3A .. 0x40
			• 0x5B .. 0x60
			• 0x7B .. 0x7E
Tags and program blocks			
Data point name	1	20	Standard characters + special characters (< 0x80) with the following exceptions.
			The following are not permitted: 0x27 ('), 0x2E (.), 0x2F (/), 0x5B ([ ), 0x5D ( ]), 0x5C (\ ), 0x7C (	)
Tag names / network names	1	20	All the characters listed above
Comments on networks and program blocks	1	64	All the characters listed above
Telecontrol			
Telecontrol password	8	29	All the characters listed above (standard characters + special characters < 0x80)

Parameter	String length		Permitted characters / format
	Min.	Max.	
Messages			

Message texts including up to 6 placeholders for process values with formatting instructions.
 	
The placeholders in the message are replaced by the current value.
	0	160	• 0x30 .. 0x39
			• 0x41 .. 0x5A
			• 0x61 .. 0x7A
			• 0x21 .. 0x2F
			• 0x3A .. 0x40
			• Umlauts (ä, ü etc) and ß: 0xC4, 0xE4, 0xD6, 0xF6, 0xDC, 0xFC, 0xDF
			Square brackets (0x5B, 0x5D) are reserved for placeholders.
			The following formats are permitted for placeholders:
			• [V]
			  Decimal value of a tag. V is the placeholder for the tag name.
			  Signal names must not contain square brackets (0x5b, 0x5D).
			• [DATE]
			  Current date. Format: yyyy-mm-dd
			• [TIME]
			  Current time. Format: hh:mm:ss
			• [V.T] or [V.T2]
			  Placeholder for a numeric value that is output as a period of time.
			• [DEVNAME]
			  Placeholder for own station name

4.5 Establishing the connection between RTU and configuration PC

4.5.1 Address data of the RTU

Address data of the RTU

To connect to the WBM of the RTU from the configuration PC, you require the address data of the RTU.

In the factory the following address data is set as default for the RTU:

Address data	Subnet mask
Default host name of the RTU	simatic.rtu
Default IP address of the RTU	192.168.0.3
Default subnet mask	255.255.255.0

4.5.2 Establishing a connection to the WBM of the RTU

Using the HTTP/HTTPS protocol

You can establish a connection between the configuration PC and RTU using the HTTP protocol:

- LAN connection

  With a local connection from the configuration PC to the RTU you can connect directly. If the RTU is in sleep mode, you need to change it to service mode by briefly pressing the button.

- Connection via WAN (Internet/mobile wireless)

  With HTTP connections via the Internet / mobile wireless network you need to use the security protocol "OpenVPN", refer to the next section.

  When no OpenVPN server exists and is configured, no HTTP connection between the PC and RTU is established via the WAN. In this case no message is output when there are unsuccessful connection attempts.

  As an alternative you can use an HTTPS connection if you enable HTTPS in the configuration and the RTU can be reached via a public IP address.

For the connection of a service PC to the RTU via the Web server of TCSB no OpenVPN is required.

OpenVPN for HTTP connections from the configuration PC to the RTU via WAN

If you want to establish an HTTP connection to the WBM of the RTU from your configuration PC via mobile wireless, you need to use OpenVPN. This requires the following:

- A configured OpenVPN server

  – First set up an OpenVPN server.

    "SINEMA Remote Connect - Server", Is recommended, see /5/ (Page 296).

  – Configure the OpenVPN clients you require in the VPN network (configuration PC, RTUs).

- Installed OpenVPN client on the configuration PC

  – Install an open VPN client on the configuration PC.

    If you use "SINEMA Remote Connect - Server" as the server, you can use the "SINEMA Remote Connect - Client" application for the PC, see /6/ (Page 296). You will find a Getting Started for the server and client in /7/ (Page 296).

  – Before establishing the connection to the RTU, you need to connect the OpenVPN client of the PC to the OpenVPN server.

- Activated OpenVPN client on the RTU

    – Configure the OpenVPN client of the RTU, see section VPN (Page 126).

    – Importing certificates into the RTU

      When using "SINEMA Remote Connect server" Use the configuration alternative "SINEMA Remote Connect" on the RTU, the RTU then calls up the VPN certificates directly from the server.

      When using a standard OpenVPN server: The certificates created for the clients on the OpenVPN server must have been exported there and imported in the WBM of the RTU from the configuration PC via a LAN connection.

The VPN connection is established from the configuration PC via the VPN server to the RTU.
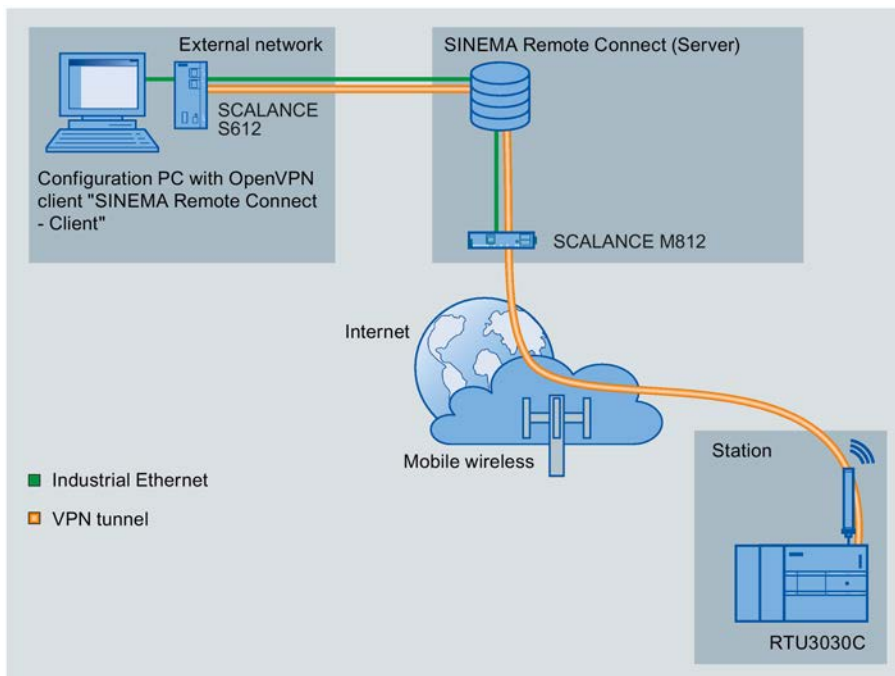
Figure 4-2   Connection between the configuration PC and RTU via WAN using OpenVPN

Preparing the PC interface

Follow the steps below to prepare the interface of the configuration PC for the connection to the RTU.

1. Open the Control Panel of the PC with the menu command "Start" > "Control Panel".

2. Click on the "Network and Sharing Center" group.

3. At the top left in the Network and Sharing Center , click on the entry "Change adapter settings".

4. Select the entry for the LAN connection and from the shortcut menu (right mouse button) select the menu command "Properties" (as administrator).

5. In the properties dialog of the LAN connection, select the entry "Internet protocol version 4 (TCP/IPv4)" in the "Network" tab.

6. Click "Properties".
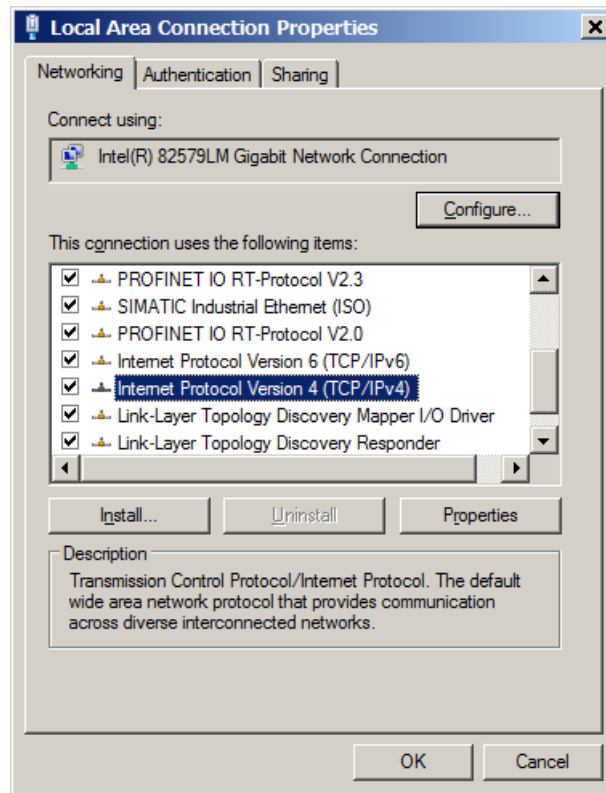
In the properties dialog that opens, the settings depend on whether you have activated the DHCP server function of the RTU, refer to section LAN (Page 107).

Make the settings according to the DHCP configuration, refer to the following sections.

7. Confirm the dialogs with "OK" and close the Control Panel.

DHCP server of the RTU enabled (default setting of the RTU in the factory)

The DHCP client function of the RTU is disabled.

1. Select the option to obtain the IP address automatically..

2. Select the option to obtain the address of the DNS server automatically to be also able to reach the RTU on the LAN interface via the host name.

This is the more convenient setting. During connection establishment, the RTU assigns an IP address to the configuration PC via the DHCP server. The RTU can then be reached on the LAN interface using the host name.

DHCP server of the RTU disabled

Requirements: On the RTU the "Specify IP address manually" option was enabled earlier. There is no DHCP server in the local network.

1. Select the option to assign an IP address.

2. Enter the following values:

   – IP address: 192.168.0.4

   – Subnet mask: 255.255.255.0

   The address of the PC must be located in the subnet of the LAN interface of the RTU.

Establishing a connection to the RTU

1. Connect the configuration PC.

   – With a LAN connection: Connection to connector X1P1 of the turned on RTU

     Continue at point 3.

   – With a WAN connection: Connection to the router connected to the Internet

     Continue at point 2.

2. Only with WAN connection: Start the OpenVPN client and connect to the OpenVPN server.

3. Call up the Web browser on the configuration PC.

4. Enter the address (IP address or host name) in the address line of the Web browser:

   http://<Address>

   As default the following is preset for the LAN Interface:

   – IP address: 192.168.0.3

   – Host name: simatic.rtu

   When using OpenVPN, the IP address and if applicable the host name of the RTU are configured via the OpenVPN server.

   When doing this note that the IP address on the LAN interface and the IP address of the RTU in the Open VPN network must be located in different subnets.

5. Press the Enter key.

   In some situations when you log in a warning message is displayed indicating that the Web page is unsafe or that the certificate is not trustworthy. If you are sure that you have entered the correct address, ignore the message. Also add the connection to the exceptions in your Web browser (depending on the browser).

The login page of the WBM is opened.

4.6 User data for the first login to the WBM

Standard user data

In the factory the following login data is set as default.

Note

With the following user data you can log in the first time to the WBM.

User data	Default values set in the factory
User name	admin
Password	admin

Note

Changing standard user data

For security reasons, the factory set default password of the standard user must be changed when you log in the first time.

For security reasons, it is recommended that you create another user after the first login. You will find the description in the section User (Page 133).

Loss of changed standard user data
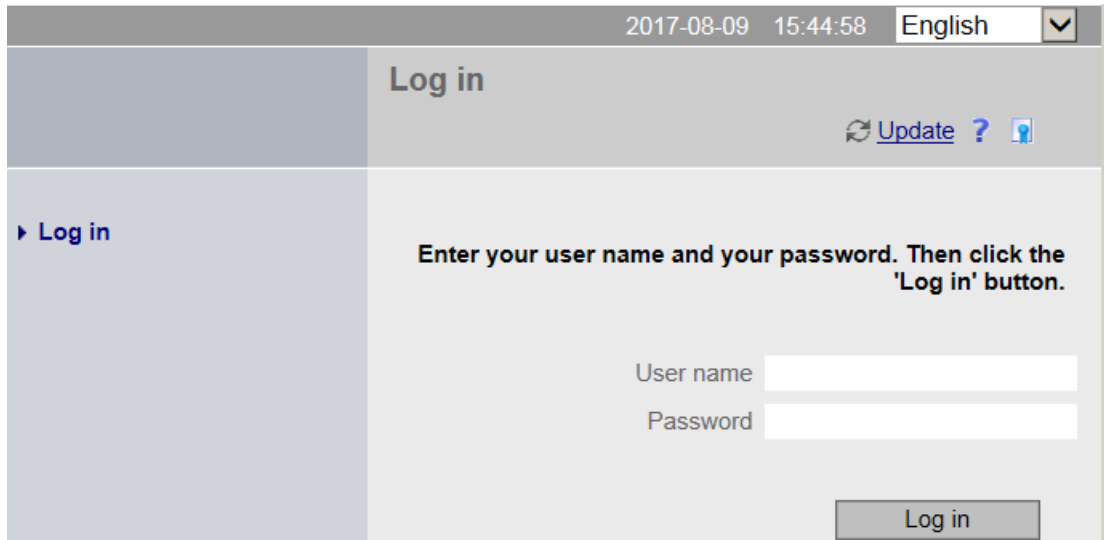
Note changed or newly assigned user names and passwords.

If you change user data of the standard user, lose the changed user data and have not created a second user, you no longer have access to the WBM of the RTU. In this case, you can only access the WBM of the RTU after resetting to the factory settings. When you reset the configuration data is lost.

4.7 Logging in

Logging in

After establishing a connection between the configuration PC and the RTU, the WBM opens with the page for the user to log in.

Enter the user name and the password.

Note

User data

When you log in the first time note to the information in the section User data for the first login to the WBM (Page 85).

You will find instructions on changing user data and on the loss of access data (user name, password) in section User (Page 133).

After clicking the "Log in " button the start page of the WBM is opened..

Note

Max. 2 connections to the WBM

If two connections are established to the WBM, note that changes cannot be made at the same time on both connections.

4.8 Start page

4.8.1 Overview

After logging in to the WBM, the start page appears.

In the title bar of the Browser tab, the station name of the RTU is displayed that you configure in "System".

In the title bar of the window apart from the user name (left) and the general buttons for the WBM (right) you will find the following information:

- Next communication cycle (configured / assigned)

  – Configured communication cycle (interface)

    The next communication cycle specified in the WBM configuration, see section Operating modes (Page 138), and in brackets the activated interface.

  – Assigned communication cycle (interface)

    The next communication cycle assigned by a TeleService SMS message, see section Wake-up call / wake-up SMS (Page 192), and in brackets the activated interface.

- Next SMS check in sleep mode

  See section Operating modes (Page 138) for information on this.

On the left there is the navigation area with the main levels of the WBM.

At the bottom right there are the tabs "Overview" and "Status". Change to the various tabs by clicking the tab name.
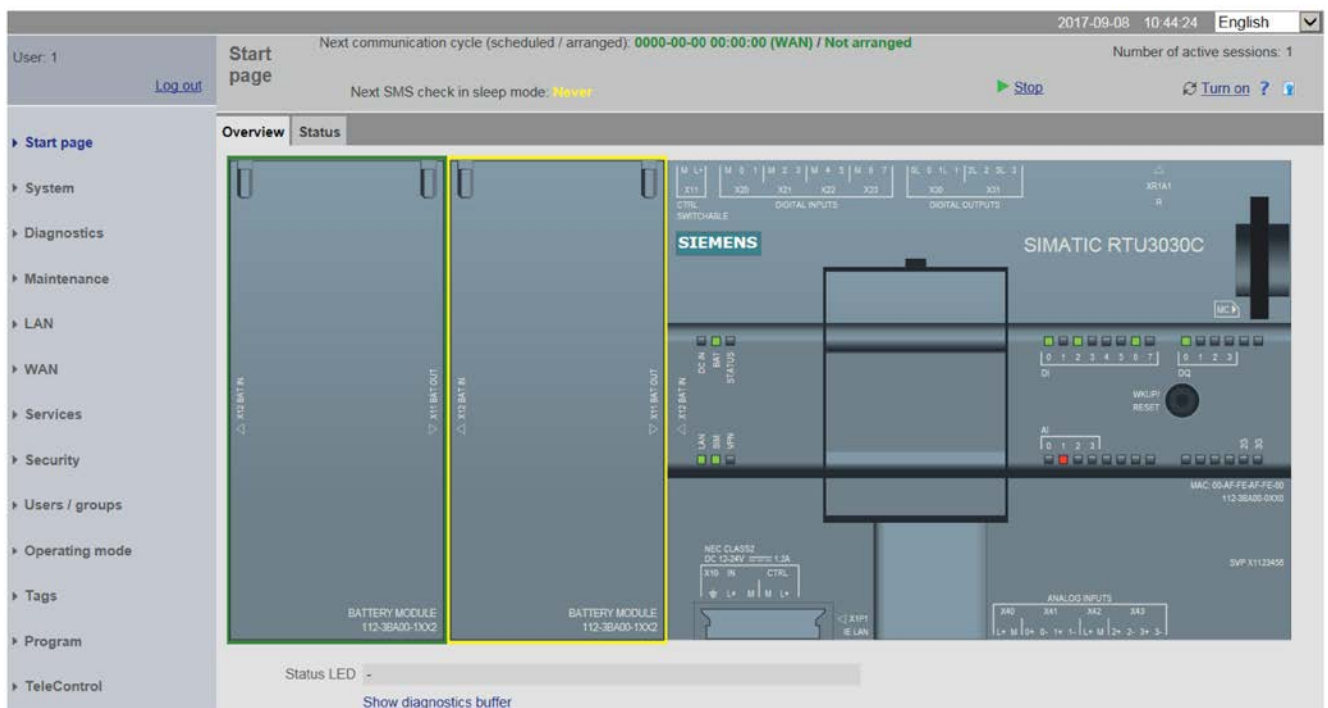
Figure 4-3   Start page of the WBM with the open tab "Overview"

The "Overview" tab

The "Overview" tab shows a picture of the RTU. When you are connected to the operating RTU, the LED symbols shown in the WBM reflect the original status of the LEDs on the RTU.

- **Status LED**

  If an error occurs (the "STATUS" LED is lit or flashes red) a message text is output in this line.

- **Show diagnostics buffer**

  You can jump directly to the page of the diagnostics buffer via the link and check the diagnostics messages.

Navigation in the WBM

By clicking on an entry in the navigation area on the left open the WBM page you want for further information or on which you want to configure or program.

The WBM opens the first tab of the entry.

4.8.2 Status

The tab provides an overview of important status data of the RTU. Some of the display parameters are commented on below.

Note on navigation:
By clicking on the titles (bold and underlined) of the parameter groups you jump directly to the relevant WBM page.

General

Information on the device and the configuration data of the station

- **Program execution**

  Runtime status of the program (controller)

- **Station name**

  The station name configured in "System" > "General".

- **System runtime (dd:hh:mm:ss)**

  Runtime of the RTU since commissioning or since the last restart

Power supply

Information about the battery module being used or about the external power supply

- **Day of the last battery change**

  Time of the last changeover of the battery currently being used (when one battery module is empty and there was a changeover to the other one).

Ethernet interface

Information on the LAN interface

Logging

Information on logging and the SD card

Mobile wireless interface

Information on the configuration data and the current status of the mobile wireless interface

* Connected since (dd:hh:mm:ss)

  Time since last booking into the mobile wireless network.

* Data connection since (dd:hh:mm:ss)

  The time since the connection to the data service of the mobile wireless network.

OpenVPN connection

Information on the configuration data and the connection status of the OpenVPN configuration

When the OpenVPN client of the RTU is not configured, the default server name is displayed here.

Telecontrol status

Information about the communication configuration. "Protocol type" shows the communications protocol, being used.

4.9 System

4.9.1 General

Note the characters permitted for the input boxes, see section Permitted characters and parameter lengths (Page 77).

General	Device info	SD card	System time	

Station name	Station01
Station description	Plant_1

Location

Latitude	49.000000
Longitude	8.290000

End session after inactive period (minutes) 5

Apply

- **Station name**

  Assign the station name of the RTU.

  The station name of the RTU provides structural information within you system.

  Note
  Host name (DNS)

  The station name is used as the host name of the RTU for DNS and DynDNS servers.

  You configure the protocol-specific addressing data in the "TeleControl" tab.

- **Station description**

  Optional: Enter a free description of the station (max. 20 characters).

Location

Enter the latitude and longitude of the RTU location as degrees.

60 min corresponds to 1 degree. The first two decimal places of the input boxes are the minutes.

60 seconds correspond to 0.01 degrees. The 3rd and 4th decimal places of the input boxes are the seconds.

- **Latitude**

  Range of values: -90.0000 .. 90.0000

  Positive values for north, negative values for south

- **Longitude**

  Range of values: -180.0000 .. 180.0000

  Positive values for east, negative values for west

- **End session after inactive period (minutes)**

  From the drop-down list, select the time, after which a session in the WBM is closed automatically if no user input is detected.

  After closing s session, you need to log in again with user name and password.

  As long as a user is logged in, the RTU does not change to sleep mode.

4.9.2 Device info

Displayed data

- System runtime (dd:hh:mm:ss)

  Time since the RTU last started up

- Article number

- Serial number

- Hardware product version

4.9.3 SD card

SD card

Displayed data

- **SD card inserted**
- **Total free memory space (kB)**

  Here the free (still available) and the entire memory on the SD card that can be used by the user are displayed.

  If the free space on the SD card is used up, on the page "Operating mode" > "Logging" you can make the setting as to whether the oldest process data is overwritten by new data (FIFO principle) or the logging is stopped.

Notifications

- **Notifications**

  Here you specify whether the events that can be configured later cause a message (SMS message or e-mail) to be sent or not.

- **Change immediately to communication mode**

  If the option is enabled if one of the events configured later occurs, the RTU changes to communication mode and sends the message.

  If the option is disabled, the RTU sends the message only the next time a mobile wireless connection is established.

- **Recipient group**

  Here, enter the recipient group for message. You configure recipient groups on the WBM page "Recipient / Groups".

- **When when free memory space falls below the limit**

  Here you specify whether a message is sent when a value falls below a configurable limit value (next parameter). The check for free memory space only takes place when logging is enabled and for at least one variable.

- **Limit value (KB)**

  If the value falls below the limit value, the RTU sends a message if the option above was enabled.

- **Subject and text**

  Here, you enter the text and subject of the message. You configure the texts on the WBM page "Tags" > "Texts".

- **When the SD card is full**

  Here you specify whether a message is sent if there is no longer any free on the SD card. The check for free memory space only takes place when logging is enabled and at least one variable has been logged.

- **Subject and text**

  Here, you enter the text and subject of the message.

Loading files

- **Load new file**

  After selecting a file stored on the configuration PC using the "Search" button, the file name is displayed here.

- **Search**

  Searches the file system of the configuration PC for a file saved there that is intended to be loaded on the RTU.

- **Load on device**

  By clicking the button, you download the selected file to the RTU.

  Successful loading is displayed.

Savable files below the parameter area

Below the parameter area, the names of the files saved on the SD card are displayed. By clicking on the file name, you can save the file from the SD card to the file system of your PC.

Naming conventions for the file names

Files that were written to the SD card from the RTU, meet the DOS format:
<1...8 characters>.<1...3 characters>

The file names are structured according to the following scheme:

- **Configuration files**

  Files with configuration data of the RTU:

  *.CFG

  – The file "default.cfg" is created automatically by the RTU and updated with every change to the configuration.

  – The file "user.cfg" is a file created manually by users ("Maintenance" > "Configuration").

- **Log files**

  Files of the RTU with process data

  - Files created daily:

    <XXX><yy><ddd>.LOG

  - Files created weekly:

    <XXX><yy>w<ww>.LOG

  - Files created monthly:

    <XXX><yy>m<mm>.LOG

  The components have the following meaning:

  - <XXX>: Prefix of the file name that is configured on the WBM page "Operating mode" > "Logging".

  - <yy>: Placeholder for the year (the two last places of the year)

  - <ddd>: Placeholder for the day in the year (1...365)

  - w: Identifier for weekly log files

  - <ww>: Placeholder for the week in the year (1...52)

  - m: Identifier for monthly log files

  - <mm>: Placeholder for the month in the year (1...12)

- **Diagnostics buffer file**

  File with the diagnostics buffer entries of the RTU:

  diagbuf.txt

- **Other files**

  Files that you yourself save on the SD card:.

  .* .*

4.9.4 System time

Buffering of the time

The internal RTU clock is maintenance free and buffered by a capacitor, to be able to bridge the duration of a battery change. With this, the simultaneous failure of the battery module and the external power supply can be bridged for 3 hours (at room temperature).

System time

In this tab, you configure the time and time-of-day synchronization of the RTU.

Note

Time-of-day synchronization

With applications that require time-of-day synchronization, you should synchronize the time of day of the RTU. If you do not synchronize the time of day of the RTU regularly, there may be deviations of several seconds a day between the time of day of the RTU and the time-of-day of the master station.

Note

Year dates ≥ 2000

The RTU only accepts year dates ≥ 2000

Note

Settings with the ST7 and IEC protocols

If you use a partner with daylight saving time changeover, you should select the following settings for the RTU:

- Specify a time zone.
- Select the "Automatic daylight saving time switch" option.

As the synchronization method, the option "By the telecontrol master" is the default

The RTU then adopts the time of day from the partner. The partner calculates the time offset of the daylight saving time from the time stamps of the data frames received from the RTU.

Local time zone

- **Time Zone**

  Set the time zone in which the RTU is located either by entering it manually or selecting an entry from the drop-down list.

- **Automatic daylight saving time switch**

  If you sent the time zone manually, you can enable the automatic changeover of daylight saving time and standard time and set the parameters for this.

- **Enable time-of-day synchronization**

  By enabling the option, you enable synchronization of the RTU time of day.

  The time of day is synchronized each time the RTU changes to communication mode.

  As an option, at the bottom of this WBM page you can set the time of day of the RTU manually or adopt it from the configuration PC.

Time-of-day synchronization

- **Active**

  Enable the option if the time of day of the RTU is to be synchronized.

- **Synchronization method**

  You can enable synchronization of the RTU time of day , according to one of the following methods.

  When you enable the telecontrol function the option "By telecontrol master" is adopted automatically.

  – **NTP**

    The RTU supports the SNTP (Simple Network Time Protocol) method.

    If you want to use this option, make sure that the specified NTP server can be reached via the relevant interface.

    The time-of-day synchronization method SNTP with which you access a time-of-day server in the network can also be used with OpenVPN.

  – **By mobile wireless network**

    The RTU adopts the time of day from the mobile wireless network.

    The RTU supports the NITZ (Network Identity and Time Zone) service on the wireless interface. Check with your network provider to find out whether this function is supported in your mobile wireless network.

  – **By telecontrol master**

    The RTU adopts the time of day from the communications partner (telecontrol server or master).

NTP settings

- **Interface**

  Select the interface via which the RTU will be synchronized.

- **IP address or DNS name of the NTP server**

  Assign the address of the NTP server.

- **Accept time of day from non-synchronized NTP servers**

  If the option is enabled, the RTU also accepts the time-of-day from non-synchronized NTP servers with stratum ≥ 15.

  If the option is disabled, the time-of-day of the RTU is not set by NTP servers with stratum ≥ 15. In this case the RTU uses the last accepted time of day.

Diagnostics messages

- **Check time-of-day synchronization**

  If synchronization is via the mobile wireless network the option cannot be activated.

  If this option is enabled, the RTU checks whether its time of day has been set according to the settings made.

  – If the time of day was set, the RTU enters a diagnostics message of the class. "INFO" in the diagnostics buffer.

  – If the time of day could not be set, the RTU enters a diagnostics message of the class. "ERROR" in the diagnostics buffer.

  The diagnostics messages are entered incoming/outgoing; in other words, only the last message is entered in the diagnostics buffer.

- **Reduction factor for communication cycle**

  By selecting an entry from the drop-down list, you specify the reduction factor for the cycle in which the RTU checks the time of day synchronization.

  The basis for the checking cycle is the basic cycle of the communication mode that you configure on the WBM page "Operating mode".

  If you select a reduction factor of 1, the acceptance of the time of day is checked with each change to the communication mode.

  If you select a higher reduction factor, the cycle is increased according to the displayed value.

Set system time manually

Select one of these options if you want or need to reduce communication via mobile wireless.

The system time set here is kept by the internal clock of the RTU. For information on the accuracy, see section Technical data (Page 261).

- **New system time**

  Here, enter the current time of day manually.

  When making your entry, keep to the specified format.

  Month, day, and hour can also be entered as single digits. Example: March is accepted as "03" or as "3".

  If you click the Apply new time of day button the RTU adopts the entered time of day.

- **Adopt PC time**

  If you click the Adopt PC time button the RTU adopts the time of day from the configuration PC.

Time-of-day format and time stamps

System time of the RTU

The RTU keeps its time-of-day as UTC. The time of day and includes the time difference since 01.01.1970 in milliseconds.

Time stamp of the data frames

If the communications services are activated, the time stamps of the data frames are transferred depending on the protocol being used:

- **TeleControl Basic**

  Transfer of the time stamps in UTC format (48 bits)

- **ST7**

  Refer to the information on time stamps in the manual of the communications partner.

- **DNP3**

  Transfer of the time stamps in UTC format (48 bits)

- **IEC 60870-5**

  Transfer of the time stamps in the "CP56Time2a"format

  Keep to the recommended settings in the note above.

4.10 Diagnostics

4.10.1 Diagnostics buffer

Diagnostics buffer

The diagnostics buffer receives diagnostics messages for internal events and errors. It can hold a maximum of 200 entries. When the maximum number is exceeded, the oldest entries are overwritten.

The entries in the diagnostics buffer contain a consecutive number, a classification, a time stamp and the message text.

Below you will find several examples of events that are entered in the diagnostics buffer:

- RTU startup
- Change to the configuration
- Establishment/abort of the communications connection
- Time-of-day synchronization
- Power failure

The diagnostics messages are classified as follows:

- INFO

  Information about a special event

- WARNING

  Warning of a possibly unwanted event

- ERROR

  Error. The RTU continues to run.

- FATAL

  Serious error that impairs or interrupts the operation of the RTU.

Copy of the diagnostics buffer

You have the following options for saving the entire diagnostics buffer:

- **Save on SD card**

  Manual saving on the SD card

- **Save to PC**

  Manual saving in the file system of the configuration PC

- **Save a copy of the diagnostics buffer if serious errors occur...**

  By activating the option you can ensure that if errors of the class FATAL occur, the diagnostics buffer is automatically backed up on the SD card.

Error identifiers for the transfer of e-mails and FTP files

You will find possible error identifiers for transfer errors that can be included in the diagnostics buffer entries in the section Error identifiers for e-mails and FTP (Page 254).

4.10.2 Notifications

- **Send notifications**

  Here, you set whether the RTU sends a notification by SMS message or e-mail if an event (message) occurs.

  The plain text of the message is sent in English.

- **Message class**

  Here, you set the message class.

- **Change immediately to communication mode**

  If you select the option, the RTU changes immediately to communication mode as soon as an event triggers the sending of the notification.

- **Recipient group**

  Here you specify configured groups as recipients of the notification in "Users / groups".

  Only with when sending e-mails:

- **Attachment**

  Here, select the attachment that will be sent with the e-mail.

- **Attachment zipped**

  If you enable the option, the attachment is sent compressed as a ZIP archive.

For information on encryption and decryption of archives sent as an attachment, see section E-mail (Page 120).

4.11 Maintenance

4.11.1 Configuration

In this tab you can save the configuration data of the RTU in a configuration file and load it again.

Configuration files have the file format *.cfg

Note

RTU3010C and RTU3030C not compatible

Note that configurations of RTU3010C and RTU3030C are not compatible.

Configuration

Load configuration

With this function a configuration file created previously and saved on the PC is loaded on the RTU.

- **File**

  After selecting a configuration file stored on the configuration PC using the "Search button, the file name is displayed here.

- **Search**

  Searches the file system of the configuration PC for a configuration file saved there that is intended to be loaded on the RTU.

- **Load on device**

  Loads the configuration file shown under "File" on the RTU.

  Note

  On completion of loading, the configuration data of the loaded configuration file is used immediately by the RTU.

- **Load from SD card**

  Loads the configuration file located on the SD card on the RTU.

  Note

  On completion of loading, the configuration data of the loaded configuration file is used immediately by the RTU.

  Note the behavior of the RTU when there are several configuration files on the SD card, refer to the section "Startup of the RTU with configuration files" below.

Save configuration

With this function the current configuration data of the RTU is saved in a configuration file.

● **Save on SD card**

Saves the current configuration file under the name "user.cfg" on the SD card.

● **Compress and encrypt file (optional)**

If you enable the option, the configuration file is saved and encrypted compressed as a ZIP archive.

● **Password for optional encryption**

Input box for the password for encryption of the configuration file

The following requirements apply to the password to be entered:

– Length: At least 1 character, maximum 16 characters.

– Permitted characters

Digits, lowercase letters, uppercase letters and special characters from the ASCII character set 0x20 .. 0x7e

See also section Permitted characters and parameter lengths (Page 77).

– Required characters: Free combination of the permitted characters

● **Save to PC**

Saves the current configuration file under the name "user.cfg" on the configuration PC.

Names of the configuration files

You can save different configuration files on the SD card.

Automatic saving in the configuration file "default.cfg"

When using an SD card if the configuration data of the RTU is automatically stored in the file "default.cfg".

When changed configuration data is adopted the file "default.cfg" is automatically updated on the SD card.

Manual saving in the configuration file "user.cfg"

When you save manually using the WBM, the configuration data is stored on the SD card in a file with the default name "user.cfg".

In addition to this, with each change to the configuration data the file "default.cfg" is automatically updated.

Startup of the RTU with configuration files

If you store different configuration files on an SD card and plug this into an RTU, the RTU always runs with the internal configuration data.

If an SD card with the file "default.cfg" is inserted in a brand-new RTU or an RTU reset to the factory settings, the RTU always starts with the file "default.cfg".

Editing configuration files

You can edit and change a configuration file saved on the PC with a text editor.

Make sure that you make the changes consistently. Do not change any data if you are not sure that it does not contradict settings at another location. Example: Activated telecontrol communication along with the time-of-day synchronization method NTP is inconsistent.

Inconsistent configuration files are rejected by the RTU.

Note

No editing of encrypted entries

Encrypted entries of a configuration file, entries such as passwords or the OpenVPN key must not be changed.

If encrypted parts are changed, the RTU rejects the configuration file when you try to load it.

Note

Editing configurations with a text editor

When editing a configuration file with a text editor, make sure that you do not use any special characters but only characters of the following ASCII character sets:

- 0x30 .. 0x39 (0 .. 9)
- 0x41 .. 0x5A (A .. Z)
- 0x61 .. 0x7A (a .. z)
  See also section Permitted characters and parameter lengths (Page 77).

If you use special characters you need to save the file in the UTF-8 format.

4.11.2   Firmware

This page displays the most important version data of the firmware currently being used.

If a new firmware version is available, you can download the firmware file from the configuration PC to the RTU via this WBM page.

Note

Digitally signed and encrypted firmware prevents manipulation by third parties

To be able to check the authenticity of the firmware, the firmware is digitally signed by Siemens. This allows manipulation by third parties to be detected and prevented.

The encryption of the firmware is intended to prevent re-engineering.

Firmware status

The following information is shown:

- Station name

  Station name that you assigned on the "System" Web page.

- Activated firmware version

- Activated on

  The activation date of the firmware

- Bootstrap version

  The bootstrap version of the firmware

- IfMobile wireless module version

  The version of the mobile wireless module of the RTU

Firmware update

If a new firmware version is available for the RTU, you will find this on the Internet pages of Siemens Industry Online Support:

Link: (https://support.industry.siemens.com/cs/ww/en/ps/15920)

Firmware files have the file format *.sfw

Download the firmware file to the file system of your configuration PC.

- **File**

  After selecting a firmware file stored on the configuration PC using the "Search button, the file name is displayed here.

- **Search**

  Searches the file system of the configuration PC for a firmware file saved there that is intended to be loaded on the RTU.

- **Load on device**

  By clicking the button, download the selected firmware file to the RTU.

Following the download the firmware is not yet used. The following properties of the new firmware file are displayed:

- Status

  Shows whether the firmware file was downloaded free of errors or with errors.

- Signature status

  Shows the result of the signature check.

- Description

  Shows a brief description of the firmware file.

- Version

  Version of the loaded firmware file

If If you do not want to use the loaded firmware file, you can remove this again with the "Delete" button.

- **Activate and restart**

  If you want to use the downloaded firmware file, click the "Activate and restart" button.

  Note that updating the firmware can take a while.

  Note
  No configuration during activation

  During activation until the RTU restarts, the WBM is not locked.

  Do not make any settings during this time. It is not possible to establish whether settings are correctly adopted during this time.

  Note
  Do not switch off the RTU

  During activation of the firmware do not switch off the RTU. This avoids the occurrence of inconsistent statuses.

  Note
  Restarting the RTU

  When the new firmware is activated, the RTU runs a restart. You can recognizes the current status based on the LED picture, see section LEDs (Page 40).

- **Delete**

  Deletes a loaded and not yet activated firmware file from the RTU.

4.11.3   Operating status

Operating statuses

Apart from using this WBM page you can also execute the functions described below using the button on the RTU, see section The button "WKUP/RESET" (Page 47).

The three buttons on this tab have the following functions:

- **Shut down to safe status**

  Shutting down to a safe status has the effect that the RTU books out of the mobile wireless network and ends all writes to the SD card. This is a requirement for changing a SIM card or an SD card.

  If you want to change the battery (when using only one battery module), you can then disconnect the device from the power supply.

- **Run a restart**

  When restarting, existing connections are interrupted and cyclic processing stops. The RTU restarts.

- **Reset to factory settings**

  Resets the RTU to the factory settings. During this all parameters are reset to the initial statuses as shipped and the RTU restarts.

Note

Note the effects of resetting

Note the effects described below before you start the reset.

Effects of resetting to factory settings

When you reset to factory settings, almost all the data on the RTU is deleted. Among other things, the following are deleted:

- User names and passwords
- PIN of the SIM card being used
- Diagnostics buffer
- All configuration data, including preset configuration data on the SD card

The following are not deleted:

- Configuration files saved manually on the SD card
- Log files on the SD card

Note

RTU not reachable via the mobile wireless network

After resetting to factory settings, the RTU can no longer be reached via the mobile wireless network.

If an SD card is plugged in, the following are also deleted:

- The automatically saved configuration file default.cfg
- The diagnostics buffer file

After the reset the RTU is restarted.

Following startup the RTU can only be reached via the Ethernet interface with the address data preset in the factory, refer to the section Address data of the RTU (Page 80).

Backing up configuration data prior to resetting

If you do not want to discard configuration data of the RTU, you can back up the data prior to resetting as follows:

● Configuration data on the SD card

When using an SD card, you can remove the SD card prior to resetting and use it again after the reset. Since you cannot change the SD card during operation, you need to follow the steps below:

 – Shut down the RTU to the safe status

 – Remove the SD card

 Refer to the section Inserting the SIM card and SD card (Page 56) for this.

 – Reset to factory settings

 – After the restart when shut down the RTU to the safe status

 – Insert the SD card

● Saving on the configuration PC

As an alternative you can save the configuration file on the configuration PC and following the reset and subsequent restart download it to the RTU, refer to the section Configuration (Page 99).

4.11.4   Online support

Here you can call up the Internet pages of Siemens Industry Online Support.

Online support

Link to the Internet portal of Siemens Industry Online Support

Click on "Siemens Industry Online Support" to connect to the Internet pages of Siemens Online Support.

There, you can search for information on the product or send a query to product support.

Configuration of the logging

In some cases, product support can send you a logging file of the type *.sup to log events. You save this logging file in the file system of the configuration PC. On this WBM page you download the file to the RTU.

For logging you require an SD card with at least 8 MB free space.

● File

After selecting a logging file stored on the configuration PC with the "Search" button, the file name is displayed here.

● Search

Searches the file system of the configuration PC for a logging file saved there that is intended to be loaded on the RTU.

- **Load on device**

  By clicking the button, download the selected logging file to the RTU.

- **Standard settings**

  Loads the default logging file preset in the factory instead of a file for logging made available by Product Support.

- **Delete**

  Deletes a no longer required logging file from the RTU.

  After deleting the logging file, logging is disabled again.

Enable logging

After loading the logging file, logging must be actively enabled.

- **Enable logging and save the file on the SD card**

  By enabling the option logging is started as soon as you click the "Apply" button.

  The log file is saved on the SD card and updated during operation if relevant events occur.

Use of the logging

You should only use logging of events. If you have problems with the RTU that you cannot solve yourself.

Note

Protecting the SD card by disabling logging

To avoid shortening the working life of the SD card too much, logging should be disabled during normal operation of the RTU.

When logging is enabled, during runtime the RTU continuously saves information about important events that have occurred. The saved data contains information on the configuration, active procedures and error situations.

The data is saved on the SD card in a log file with the name "support.bin". The information in this file is encrypted and can only be read by Siemens Industry Online Support. On completion of logging sent the log file back to your contact at Siemens Industry Online Support.

4.12 LAN

4.12.1 Configuration

The Ethernet interface X1P1 of the RTU is used for local connection of the configuration PC or an external router for communication with the master station. It is not suitable for connecting larger networks.

Configuration of the Ethernet interface

In this tab you will find the most important data of the Ethernet interface:

- **MAC address**
- **Connection status**

  Connection status to the Ethernet network

- **Transmission properties**

  Transmission speed and direction dependency (default: 100 Mbps, full duplex)

- **Connected since (dd:hh:mm:ss)**
- **IP address**

  Shows the preset, last configured or the last IP address to be obtained from the DHCP server.

- **Subnet mask**

  Shows the preset, last configured or the last subnet mask to be obtained from the DHCP server.

- **Default router**

  Shows the configured IP address of the router being used or the one last obtained with DHCP.

- **DNS server**

  Shows the configured IP addresses of the DNS servers in the network or last obtained with DHCP (max. 2).

Note

No address check

The RTU does not check the address bands. If If a duplicate IP address is detected, the STATUS LED flashes red and the RTU is no longer reachable via the Ethernet interface.

Network settings when using OpenVPN

If you use OpenVPN, make sure that the LAN subnet of the RTU and the OpenVPN subnet do not overlap otherwise no connection can be established to the RTU via OpenVPN.

Since the network settings of the OpenVPN server are not always precisely known, we recommend that you set the LAN subnet to 255.255.255.0 when using OpenVPN.

Control of the external router in the communication mode

- **Activate the LAN interface in communication mode**

  If the option is activated for the communication mode the LAN interface of the RTU is activated for data transfer.

  – Control of external routers

    If you use a router for data transfer, with this option you can turn on the router for the next communication cycle with a signal from the RTU. The router can then establish a tunnel connection to the communications partner.

    If you use a router, from the drop-down list select a control output of the RTU (X10 CTRL / X11 CTRL) or a digital output (DQx) as the signal source. The signal must be activated in the WBM!

    If you do not use a router, select the option "Not used".

  – Lead time (s)

    Here you can specify a lead time for the router before the communication cycle that the router needs to start up.

  – Monitoring of external routers

    If the router has a status output "Ready for data transfer", you can apply the signal to a digital input of the RTU to evaluate the router status.

    If you do not want to monitor the router, select the option "Not used".

IP parameter

Note

DHCP client function

The DHCP client function of the RTU is activated when the following conditions are met:

- The "Specify IP address manually" option is disabled.

In this case, the DHCP server of the RTU cannot be activated.

The IP address of the RTU and optionally of the router and the addresses of up to two DNS servers are obtained from a DHCP server in the network.

As the host name, the DHCP server has the station name of the RTU configured in the "System" tab transferred to it.

If the option "Specify DNS server addresses manually" is enabled the entries obtained from the DHCP server are overwritten.

If the option "Use router" is enabled the entries obtained from the DHCP server are overwritten.

- **Specify IP address manually**

  If the option is activated you configure the parameters manually.

  – IP address

    Enter the IP address.

  – Subnet mask

    Enter the subnet mask.

- **Specify DNS server addresses manually**

  If the option is activated, you can configure one or two DNS servers for the LAN.

  – Preferred DNS server

    Enter the IP address of the preferred server.

  – Alternative DNS server

    Enter the IP address of a substitute server.

    If no substitute server is available, enter the address of the preferred server.

  Any addresses obtained from a DHCP server are overwritten.

- **Use router**

  If you use a router, activate the option.

  – Router address

    Enter the router IP address.

  An address obtained from a DHCP server is overwritten.

- **DHCP server active**

  If the option is active the RTU assigns the IP address and the DND server to the configuration PC to be connected.

  As default the DHCP server function of the RTU is activated.

  Note

  IP addresses of the configuration PC

  When using a DHCP server you do not need to specify the addressing on the configuration PC to be connected. When the PC is connected to the RTU, the RTU assigns the PC an IP address. This is the next higher address after the RTU's own address.

  If the option is deactivated, you will need to assign a fixed IP address in the same subnet as the RTU to the connected configuration PC manually.

4.13 WAN

4.13.1 Overview

The following information on the mobile wireless connection of the RTU is displayed in the Overview.

Mobile wireless connection

- **Status of the SIM card**
    - Check mark on a green background

      Indicates that the entered PIN is identical with the PN on the SIM card.

      The PIN was saved successfully on the device.
    - Cross of a red background

      Shows that an incorrect PIN was entered or that the SIM card is not plugged in.

- **Connection established**

  Connection status to the mobile wireless network

- **Connected since (dd:hh:mm:ss)**

  Duration of the existing mobile wireless connection

- **Connection to data service established**

  Status of the connection to the data service GPRS or UMTS

- **Data connection since (dd:hh:mm:ss)**

  Duration of the existing connection to the data service

- **Signal strength CSQ (dbm)**
    - CSQ = 0 .. 8 (-112 .. ≤ -97 dBm): No reception possible
    - CSQ = 9 .. 16 (-95 .. -81 dBm): Medium signal quality
    - CSQ = 17 .. 31 (≥ -79 dBm): Good signal quality
    - CSQ = 99 (≤ -113 dBm): No signal detectable

- **APN used**

  Name of the APN

- **IMEI**

  International Mobile Equipment Identity of the manufacturer

- **IMSI**

  International Mobile Subscriber Identity of the mobile wireless network provider

- **IP address**

  IP address of the RTU assigned by the mobile wireless network provider.

- **DNS server**

  IP address of the DNS server assigned by the mobile wireless network provider

Statistics

- **SMS sent**

  Number of SMS messages that the RTU has sent.

- **SMS in send queue**

  Number of SMS messages ready to be sent, but that have not yet been sent.

- **Sending the SMS failed**

  Number of SMS messages that were ready to be sent on the RTU that could, however, not be sent due to disruptions.

- **SMS received**

  Number of received SMS messages

- **SMS discarded**

  Number of received SMS messages that were discarded due to errors.

- **data sent**

  Data sent in kilobytes

- **Data received**

  Data received in kilobytes

- **Reset statistics**

  Resets all the counters on this page to zero.

4.13.2 Mobile wireless settings

Note

Costs of a connection via the mobile wireless network

When attempting to establish a connection and when receiving a connection via the mobile wireless network frames are exchanged. Depending on the contract with the mobile wireless network provider costs may arise.

Mobile wireless settings

Here you configure the mobile wireless connection of the RTU.

- **Enable mobile wireless interface**

  Activates the mobile wireless interface of the RTU.

  If the mobile wireless interface is deactivated, the RTU can no longer be reached using mobile wireless.

- **PIN of the SIM card**

  The PIN protects the mobile wireless contract partner from unauthorized use of the SIM card.

  The SIM card plugged into the RTU is a requirement for successful entry of the PIN.

  Enter the PIN for your SIM card that you received from your mobile wireless network provider in the input box.

  If you use a SIM card without a PIN, leave the input box empty.

  Note

  Locking if an incorrect PIN is entered three times

  If you enter the PIN incorrectly three times in sccession, the SIM card will be locked. For information on unlocking, see below.

  An incorrectly entered PIN is not saved on the RTU.

- **Allow roaming**

  Roaming is dialing in to the mobile wireless network of a third-party provider when the mobile wireless network of your contracted mobile wireless network provider cannot be reached.

  – Option enabled:

    The RTU dials with highest priority into the mobile wireless network of the contracted network provider set on the SIM card. If a dialing up the contract network fails, the RTU dials up another mobile wireless network with which the network provider has a roaming contract and whose access data is stored on the SIM card.

  – Option disabled (no roaming):

    The RTU only dials up the mobile wireless network of the contract network provider whose SIM card is plugged into the RTU.

- **Selection of the mobile wireless standard**

  Here you specify the mobile wireless standard that the RTU is to use. The following options are available:

  – Automatic

    The mobile wireless network with the higher standard (UMTS) is selected automatically.

    Fallback behavior of the RTU
    If the establishment of a connection via a mobile wireless network with the UMTS

standard fails, the RTU attempts to dial in to an available network with the next lower mobile wireless standard (GSM).

– Only GSM/GPRS

The RTU attempts to establish a connection only in a GSM network (GPRS).

– Only UMTS

The RTU attempts to establish a connection only in a UMTS network.

- **Enable data service in the mobile wireless network**

Enable this option if you want to send data. In this case, make sure that your mobile wireless contract allows the use of IP-based data services.

If the option is disabled, the RTU can only receive and send SMS messages, receive time of day frames and receive wake-up calls. The sending of data and e-mails is then only possible via the LAN interface.

- **APN**

When using data services, an access point is required as the gateway from the mobile wireless network to the Internet. The APN (Access Point Name) is the name of the gateway you receive from your mobile wireless network provider.

Enter the APN in the input box.

- **User name**

Enter the user name for the APN. You obtain access data from your mobile wireless network provider.

If your mobile wireless network provider does not require access data, leave the boxes for user name and password empty.

- **Password**

Enter the password for the APN. You obtain access data from your mobile wireless network provider.

- **Authentication method**

Select one of the following authentication methods according to which the user name and password of the APN will be transferred:

– No authentication

– PAP

Password Authentication Protocol

Authentication protocol with unencrypted transfer of user name and password

– CHAP

Challenge Handshake Authentication Protocol

Authentication protocol with encrypted transfer of user name and password

- **Specify DNS server addresses manually**

  If the option is activated, you can configure one or two DNS servers for the network of the mobile wireless interface.

  – Preferred DNS server

    Enter the IP address of the preferred server.

  – Alternative DNS server

    Enter the IP address of a substitute server.

    If no substitute server is available, enter the address of the preferred server.

  As the host name, the station name of the RTU configured in the "System" tab is used.

- **Notifications**

  Here you specify whether a message (SMS or e-mail) is sent to a configured group of recipients if the IP address changes (with dynamic assignment).

  This function represents a simple alternative to the DynDNS service. To do this you do not require a DynDNS provider.

- **Change immediately to communication mode**

  If the option is enabled, the RTU changes immediately to communication mode.

  If the option is disabled, the RTU changes to communication mode only at the next configured time or the time assigned by an SMS message.

- **Recipient group**

  Here, enter the recipient group for the message. You configure recipient groups on the WBM page "Recipient / Groups".

Unlocking the SIM card

If you have entered the PIN incorrectly three times , the SIM card will be locked and you then need to unlock the SIM card:.

1. Remove the SIM card only when the power supply the RTU is turned off, refer to the section Inserting the SIM card and SD card (Page 56).

2. Insert the removed SIM card in a mobile phone.

3. Unlock the SIM card by entering the PUK or the Super PIN.

   You will have received the PUK or super PIN from your mobile wireless network provider along with the SIM card.

4. Place the unlocked card back in the RTU.

5. After restarting the RTU enter the correct PIN via this WBM page.

4.13.3 Wireless cell

Note

Updating the data

The data on this page is updated at 1 second intervals.

Calling up this page means that the RTU uses more energy.

- Wireless cell identifier (CI)
- Signal strength CSQ (dbm)

  Signal strength of the mobile wireless network as CSQ (Cell Signal Quality) and as received signal strength RSSI [dBm]

  CSQ and RSSI correspond as follows:

  – CSQ = 0 .. 8 (-112 .. ≤ -97 dBm): No reception possible

  – CSQ = 9 .. 16 (-95 .. -81 dBm): Medium signal quality

  – CSQ = 17 .. 31 (≥ -79 dBm): Good signal quality

  – CSQ = 99 (≤ -113 dBm): No signal detectable

- Signal quality

  Signal quality as a percentage

- Location Area Code

  Location identifier

- Mobile wireless standard of the wireless cell

- Network type

- Network name

- PLMN

  Public Land Mobile Network

  Worldwide unique identifier of mobile wireless networks consisting of:

  – MCC (Mobile Country Code)

  – MNC (Mobile Network Code) of the network provider

  Example: PLMN 26276 is made up of MCC = 262 and MNC = 76.

4.13.4 SMS

In this tab you can allow or block receipt of SMS messages by the RTU.

- **Allow receipt of SMS messages**

    If the option is enabled, the RTU can receive SMS messages.

    To allow further evaluation the received messages must correspond to the codings GSM 3.38 or UCS.

    The following SMS messages are accepted:

    – Wake-up SMS to change the RTU from the sleep mode to the communication mode

    For information on the configuring wake-up SMA messages, refer to the section Wake-up call / wake-up SMS (Page 192).

    – SMS message as trigger for the sending of a diagnostics SMS message

    For diagnostics SMS messages, refer to the section Diagnostics options (Page 253).

    If the option is disabled, the RTU does not fetch any SMS messages from the SMSC.

- **Acknowledgment of wake-up SMS messages**

    If you enable the option, receipt of an SMS message is acknowledged by the RTU.

- **Additional communication cycle at a number of buffered SMS messages**

    The RTU stores up to 12 SMS messages that should not or cannot be sent immediately. When this number is reached and further messages are generated, the messages generated last are lost.

    Here, you can enter the number of stored SMS messages as of which the RTU runs through an additional communication cycle. This ensures that both all stored messages are sent and all messages from communications partners are received.

    Range of values: 0 ... 12

    If "0" is entered, the memory for data SMS messages is limited to 11 and there is no change to the communication mode. If there are already 11 data SMS mesages stored and further data SMS messages are generated, the messages generated last are discarded. This allows the sending of at least one SMS message which has the attribute "Change immediately to communication mode".

    SMs messages that bring about an immediate change to the communication mode can be configured on the following pages:

    – System > SD card

    – Diagnostics > Notifications

    – Operating mode > Power supply

    – Program > Block "Send SMS" > parameter "Send immediately"

Test SMS

Here, for example, you can send a test SMS message during commissioning.

- **Recipient group**

  Here, enter the recipient group for the message. You configure recipient groups on the WBM page "Recipient / Groups".

- **Subject**

  Here, you enter the subject of the message. You configure the subject on the WBM page "Tags" > "Texts".

- **Text**

  Here, you enter the configured text of the message. You configure the texts on the WBM page "Tags" > "Texts".

- **Send test e-mail**

  Triggers the sending of the test SMS message.

4.13.5 DynDNS

In this tab you can enable the use of address assignment by dynamic DNS (DynDNS) on the mobile wireless interface. To do this you require one of the service providers that can be selected below and the corresponding access data.

DynDNS is recommended when using HTTPS.

Note

DynDNS only with a public IP address

DynDNS can be used only with a public IP address. Check this with your network provider.

If you log the RTU on to a DynDNS service, the device can be reached from the Internet under a host name, for example "myName.dyndns.org".

Generally the RTU will not have a fixed IP address on the mobile wireless interface. By using a dynamic domain name system (DynDNS) it can however be reachable on the Internet. The public IP address is then made known by the DynDNS service.

With each dial in to the data network and if the IP address is changed on the mobile wireless interface, the DynDNS server is informed of the received IP address via HTTPS. An entry with the IP address is written to the diagnostics buffer.

The reachability of the IP address from the Internet must be enabled by the service provider.

- **Active**
    - If the option is enabled, the use of DynDNS is enabled.
    - If the option is disabled, the use of DynDNS is not enabled.

- **DynDNS provider**

    You can select the following service providers:
    - DynDNS

        Address: http://www.dyndns.org/
    - No-IP

        Address: http://www.noip.com/

- **Host**

    Host name of the RTU that you agreed with your service provider (DynDNS) or that you select yourself (No-IP).

    The station name configured in the "System" tab is used as the host name of the RTU for DNS and DynDNS servers.

- **User name**

    User name assigned by the service provider (DynDNS) or that you select yourself (No-IP).

- **Password**

    Password assigned by the service provider (DynDNS) or that you select yourself (No-IP).

CA certificate

The CA certificate of the DynDNS service provider serves to authenticate the service provider with the RTU.

Certificates are not absolutely necessary for oeration.

Depending on the service provider, the following certificate is required:

- DynDNS

    DigiCert CA

- No-IP

    Geo Trust Global CA

Request the relevant valid certificate from your provider.

- **Currently used file**

    Display of the file name of the currently used certificate file

- **Delete**

    With the button, you delete the currently used file.

    The file is deleted only after you click "Apply" button.

- **File used after applying**

  After loading the certificate, the name of the loaded file is displayed here.

- **Load new file**

  After selecting a file stored on the configuration PC using the "Search" button, the file name is displayed here.

- **Search**

  Searches the file system of the configuration PC for a certificate file saved there that is intended to be loaded on the RTU.

- **Load on device**

  With the button "Load on device" load the selected file on the RTU.

4.14　Services

4.14.1　Overview

Statistics since restart

The following information on transfer jobs since the last restart of the RTU is displayed in the Overview.

- **E-mails sent**

  Number of e-mails that the RTU has sent.

- **E-mails in send queue**

  Number of e-mails ready to be sent, but that have not yet been sent.

- **Sending e-mail failed**

  Number of e-mails that were ready to be sent on the RTU that could, however, not be sent due to disruptions.

- **Transfer FTP jobs**

  Number of FTP jobs that the RTU has transferred.

- **FTP jobs in send queue**

  Number of FTP jobs ready to be sent, but that have not yet been sent.

- **FTP jobs failed**

  Number of FTP jobs that were ready to be sent on the RTU that could, however, not be sent due to disruptions.

- **Reset statistics**

  Resets all the counters on this page to zero.

4.14.2 E-mail

In this tab you make these settings for sending e-mails. You will find the various types of e-mail in the section Communications services (Page 23).

The following data must be configured:

- **Active**

  If the option is activated, the RTU can send e-mails.

- **NTP server name**

  Name of the SMTP server. You will receive the data from your service provider.

- **Port number**

  Port number of the SMTP server. You will receive the data from your service provider.

- **Interface**

  Interface for transferring e-mails

- **Connection security**

  Here, select from the following options:

  - Only STARTTLS

    With this setting, e-mails are only sent when STARTTLS is supported by the service provider.

    STARTTLS uses ports no. 25 and 587.

    To use STARTTLS a certificate is required.

  - STARTTLS, if possible

    With this setting, e-mails are also sent when STARTTLS is not supported by the service provider. In this case the transfer can also be unencrypted.

    If the service provider supports STARTTLS and TLS is negotiated, the certificate of the service provider is trusted and encrypted.

- **Own e-mail address**

  E-mail address of the RTU. You will receive the data from your service provider.

- **User name**

  User name required by the SMTP server. You will receive the data from your service provider.

- **Password**

  Password name required by the SMTP server. You will receive the data from your service provider.

CA certificate

Here, you have the option of configuring the CA certificate or intermediate certificate of the mail server or the individual server certificate for sending e-mail with STARTTLS.

- **Currently used file**

  Shows the name of the certificate file currently being used by the RTU..

- **File used after applying**

  Shows the name of the last certificate file to be loaded on the RTU (on clicking the"Load on device" button).

- **Load new file**

  After selecting a certificate file stored on the configuration PC using the "Search button, the file name is displayed here.

- **Search**

  Searches the file system of the configuration PC for a certificate file saved there that is intended to be loaded on the RTU.

- **Load on device**

  By clicking the button, download the selected certificate file to the RTU.

- **Encrypt zipped attachments**

  If you enable the option, the attachments of the e-mails compressed as a ZIP archive are transferred encrypted.

  Use tools such as WinZip or 7Zip to extract the encrypted archives.

- **Password**

  Password for the encryption of the e-mail attachments.

  The attachments can only be decrypted with this password.

- **Additional communication cycle at a number of buffered e-mails**

  Here, you can enter the number of stored e-mails as of which the RTU runs through an additional communication cycle. This ensures that all stored messages are sent.

  The RTU stores up to 12 e-mails that should not or cannot be sent immediately for example because the connection to the SMTP server is disrupted. When this number is reached and further messages are generated, the messages generated last are discarded.

  Range of values: 0 ... 12

  If "0" is entered, the memory for data e-mails is limited to 11 and there is no change to the communication mode. If there are already 11 data e-mails stored and further data e-mails are generated, the messages generated last are discarded. This allows the sending of at least one e-mail which has the attribute "Change immediately to communication mode".

  E-mails that bring about an immediate change to the communication mode can be configured on the following pages:

  - System > SD card

  - Diagnostics > Notifications

  - Operating mode > Logging

  - Operating mode > Power supply

  - Program > Block "Send e-mail" > parameter "Send immediately"

Test e-mail

Here, for example, you can send a test e-mail during commissioning.

- **Recipient group**

  Here, enter the recipient group for message. You configure recipient groups on the WBM page "Recipient / Groups".

- **Subject**

  Here, you enter the subject of the message. You configure the subject on the WBM page "Tags" > "Texts".

- **Text**

  Here, you enter the configured text of the message. You configure the texts on the WBM page "Tags" > "Texts".

- **Send test e-mail**

  Triggers the sending of the test e-mail.

4.14.3 FTP

In this tab you make the settings for the transfer (PUT function) of files to an FTP server.

The function is made possible by the program block "FTP file transfer".

In "Operating mode > Logging" you can still configure the transfer of the previous log file when a new log file is created.

The following data must be configured:

- **Active**

  If the option is activated, the RTU can use the FTP service.

- **FTP server name**

  Name of the FTP server. You will receive the data from your service provider.

- **Port number**

  Port number of the FTP server. You will receive the data from your service provider.

- **Interface**

  Interface for FTP file transfer

- **Connection security**

  Here, select from the following options:

  – TLS

    With this setting only files encrypted with TLS are transferred.

    To use TLS a certificate is required.

    With TLS the FTP client uses control port 21. The data port is negotiated with the server.

  – No encryption

    With this setting the files are transferred unencrypted.

- **User name**

  User name required by the FTP server. You will receive the data from your service provider.

- **Password**

  Password required by the FTP server. You will receive the data from your service provider.

CA certificate

Here, you have the option of configuring the CA certificate or intermediate certificate of the FTP server or the individual server certificate of the FTP server.

- **Currently used file**

  Shows the name of the certificate file currently being used by the RTU..

- **File used after applying**

  Shows the name of the last certificate file to be loaded on the RTU (on clicking the"Load on device" button).

- **Load new file**

  After selecting a certificate file stored on the configuration PC using the "Search button, the file name is displayed here.

- **Search**

  Searches the file system of the configuration PC for a certificate file saved there that is intended to be loaded on the RTU.

- **Load on device**

  By clicking the button, download the selected certificate file to the RTU.

- **Encrypt zipped files**

  If you enable the option, the files compressed as a ZIP archive are transferred encrypted.

  Use tools such as WinZip or 7Zip to extract the packed and encrypted archives.

- **Password**

  Password for the encryption of the transfer

  The transferred files can only be decrypted and opened with this password.

- **Additional communication cycle with the number of buffered FTP transfers**

  Here, you can enter the number of stored files as of which the RTU runs through an additional communication cycle. This ensures that all files waiting for transfer are sent.

  If the connection to the FTP server is disrupted, the RTU stores up to 12 files for transfer. When this number is reached and further files are generated, the files generated last are lost.

  Range of values: 0 ... 12

  If "0" is entered, the memory for data files is limited to 11 and there is no change to the communication mode. If there are already 11 data files stored and further data files are generated, the files generated last are discarded. This allows the transfer of at least one file which has the attribute "Change immediately to communication mode".

  Files that bring about an immediate change to the communication mode can be configured on the following pages:

  – Operating mode > Logging

  – Program > Block "FTP file transfer" > parameter "Send immediately"

Paths of the FTP server

If you do not want to save the files in the standard directory of the server, you can specify optional paths here.

The configured paths must correspond to the path names on the server. If the paths do not exist, they are created by most servers when the first transfer is made.

4.15 Security

4.15.1 Overview

OpenVPN connection

- **Connection exists to the OpenVPN server**

  Connection status to the OpenVPN server

- **IP address**

  Shows the last IP address assigned by the OpenVPN server.

- **Subnet mask**

  Shows the last subnet mask assigned by the OpenVPN server.

Note

Network settings when using OpenVPN

If you use OpenVPN, make sure that the LAN subnet of the RTU and the OpenVPN subnet do not overlap otherwise no connection can be established to the RTU via OpenVPN.

For information on the LAN settings, refer to the section LAN (Page 107).

- **Active OpenVPN server**

  Name or IP address of the OpenVPN server

- **Connected since (dd:hh:mm:ss)**

  Duration of the existing connection to the OpenVPN server

Statistics of the current connection

The numbers apply to the currently established connection.

For the meaning of the parameters, see below.

Statistics since restart

The numbers apply to all connections that were established since the last restart of the RTU.

- **Bytes received**

  Number of bytes that the RTU has received.

- **Frames received**

  Number of frames that the RTU has received.

- **Received frames lost**

  Number of frames received by the RTU that it could not process..

- **Bytes sent**

  Number of bytes that the RTU has sent.

- **Frames sent**

  Number of frames that the RTU has sent.

- **Frames to be sent lost**

  Number of frames, which were ready to send on the RTU that could, however, not be sent.

4.15.2 VPN

For the requirements for using OpenVPN, refer to the following section:

- Scope of delivery, accessories, requirements (Page 33)
- Security functions for communication (Page 28)

For VPN tunnels the following alternatives can be configured:

- **SINEMA Remote Connect**

  SINEMA RC is the recommended Siemens application for OpenVPN tunnels.

- **OpenVPN**

  With this option configure a freely selectable OpenVPN server.

SINEMA Remote Connect

- **Active**

  Select the relevant option from the drop-down list to enable secure communication via SINEMA Remote Connect.

  You will find the address data in the configuration of SINEMA RC.

- **SINEMA Remote Connect-Server**

  IP address or host name of the SINEMA RC Server

- **Port number**

  Port number of the SINEMA RC Server

- **Device ID**

  Device ID that was assigned to the RTU in the SINEMA RC Server configuration.

- **Password**

  Password that was assigned to the RTU in the SINEMA RC Server configuration.

- **Fingerprint currently being used**

  The fingerprint currently being used by the RTU

- **Fingerprint**

  Here enter the fingerprint that was assigned to the RTU in the SINEMA RC Server configuration.

  The RTU supports SHA-1 and SHA-256.

VPN

- **Active**

  Select the option "OpenVPN" from the drop-down list to enable secure communication via a freely selectable OpenVPN server.

  With the following parameters make sure that these match the settings of the OpenVPN server.

- **OpenVPN server**

  IP address or host name of the OpenVPN server

  Separated by a space: Port number of the server (UDP port). The default port has the number 1194.

  Example:
  192.168.234.1 1194

- **Substitute OpenVPN server (optional)**

  IP address or host name of an optional substitute OpenVPN server

  Separated by a space: Port number of the server (UDP port)

- **Verification of the server certificate necessary**

  The function is optional but for security reasons is, however, recommended.

  If this option is enabled during connection establishment, the client checks whether the certificate of the server is actually a server certificate based on the purpose of the certificate. This ensures that no other client can pretend to be a server with its valid client certificate.

- **Cipher**

  The following encryption standards are available:

  – AES-256_CBC

  – BF_CBC
    (BlowFish)

    Note: BlowFish is no longer considered secure and is currently only supported for reasons of compatibility.

  The parameter must be set the same on the server and client.

  To encrypt the data, the method CBC is always used.

- **Hash method**

  As hash algorithms for authenticating the user data the following can be used:

  – SHA-1

  – SHA-224

  – SHA-256

  The parameter must be set the same on the server and client.

- **Key exchange time (s)**

  Maximum time for the TLS key exchange after initializing the handshake.

  Permitted range: 0 to 65535 s. Default: 60 s. If you enter 0 (zero), the function is deactivated.

  Note that 60 seconds with bad connection quality may not be adequate.

- **Keepalive monitoring time (s)**

  If the partner does not respond to the keep alive frame of the RTU or another frame within the keepalive monitoring time, the RTU aborts the connection and attempts to reestablish it.

  If the OpenVPN server is reached using its DNS name then along with the monitoring frame a new DNS resolution is performed. In particular when the server uses a DynDNS service and occasionally changes the IP address increasing the monitoring time can make sense.

- **Renewal interval for session key (s)**

  Interval (seconds) at which the session key is exchanged with the server.

  Permitted range: 0 to 65535 s. Default: 3600 s. If you enter 0 (zero), the function is deactivated.

  This interval can be set on the server and client. If the configured values differ the shorter interval is used.

- **Compression procedure LZO**

  To increase the transmission speed in the VPN tunnel with compression, you can select the following options:

  – None

    There is no compression is used.

  – LZO

    Compression procedure that compresses all data.

  – Adaptive

    Adaptive compression with which the OpenVPN stack regularly checks the compression. When the effect of the compression is slight, the compression is turned off and activated again in a later check.

Below you can load the certificates and keys individually or alternatively as a common PEM file from the OpenVPN server.

CA certificate

Here you import the CAA certificate generated by the certification authority (CA).

Make sure that the files for the CA certificate, the client certificate and for the key are not in a common pkcs 12 file but separate. A pkcs12 file cannot be imported.

- **Currently used file**

  Display of the file name of the currently used file

- **File used after applying**

  After loading the file, the name of the loaded file is displayed here.

- **Load new file**

  After selecting a file stored on the configuration PC using the "Search button, the file name is displayed here.

- **Search**

  Searches the file system of the configuration PC for a certificate file saved there that is intended to be loaded on the RTU.

- **Load on device**

  By clicking the button, you download the selected file to the RTU.

Own certificate

Here, you import the client certificate for the RTU.

- **Currently used file**

  Display of the file name of the currently used file

- **File used after applying**

  After loading the file, the name of the loaded file is displayed here.

- **Load new file**

  After selecting a file stored on the configuration PC using the "Search button, the file name is displayed here.

- **Search**

  Searches the file system of the configuration PC for a certificate file saved there that is intended to be loaded on the RTU.

- **Load on device**

  By clicking the button, you download the selected file to the RTU.

Own key

Here you import the file of the private key generated by the assigned OpenVPN server.

A private key without password must be used.

- **Currently used file**

  Display of the file name of the currently used file

- **Password**

  Here, enter the password if the key password is protected.

- **File used after applying**

    After loading the file, the name of the loaded file is displayed here.

- **Load new file**

    After selecting a file stored on the configuration PC using the "Search button, the file name is displayed here.

- **Search**

    Searches the file system of the configuration PC for a key file saved there that is intended to be loaded on the RTU.

- **Load on device**

    By clicking the button, you download the selected file to the RTU.

Load PEM file

If you want to load the two certificates and the key from the OpenVPN server as a common PEM file, then enable this option.

- **Password**

    Enter the password specified with the OpenVPN server if you exported the key password-protected.

- **File used after applying**

    After loading the file, the name of the loaded file is displayed here.

- **Load new file**

    After selecting a file stored on the configuration PC using the "Search button, the file name is displayed here.

- **Search**

    Searches the file system of the configuration PC for a certificate file saved there that is intended to be loaded on the RTU.

- **Load on device**

    By clicking the button, you download the selected file to the RTU.

4.15.3   HTTPS

The requirement for using HTTPS via the Internet / mobile wireless network is a publically accessible IP address of the RTU.

Note

Connections with HTTPS access via the mobile wireless interface

The RTU makes precisely one connection available on the mobile wireless interface. You should therefore use browsers that also only operate with one connection (Mozilla Firefox, Apple Safari). With browsers that require at least two connections (e.g. Internet Explorer 11, Edge, Chrome) no functioning connection will be established or the Web pages will not be displayed correctly.

Note

Updating pages with HTTPS access

Use the following options to update and reload a Web page:

- The WBM button "Update"
- Click on the link of the required page in the navigation on the left in the browser window
- Repeat the entry in the address line

Avoid updating pages using the standard browser mechanisms ("Reload page" or F5).

Depending on the device and the mobile wireless network, the setup of the pages can take several seconds and with a bad connection or cell change be interrupted.

HTTPS

The following settings apply for access via LAN and via mobile wireless.

- **Allow only HTTPS access**

  If the option is activated, connections can only be established to the WBM of the RTU with HTTPS. Non secure connections with HTTP are not permitted

  If you connect to the RTU via an HTTP connection, activate and save this option, the existing HTTP connection between the PC and RTU can no longer be used. After activating and saving this option the new HTTPS URL of the RTU is displayed as a link at the top of the page. Click on the link to remain connected to the RTU without an interruption.

  Note

  HTTP connection attempt

  If you deactivate the option "Allow only HTTPS access" when an HTTPS connection to the RTU exists, you must first close the browser and reopen it to be able to connect via HTTP.

- **Enable HTTPS on the mobile wireless interface**

  Select the option to enable secure communication with the RTU via the internet and the mobile wireless network using HTTPS. To achieve this port 443 on the WAN interface is opened.

  HTTPS is always enabled on the LAN interface.

Own certificate

In the factory settings the RTU uses a self-issued server certificate for authentication with the communications partner (client). In the browser of the PC from which you want to connect to the RTU, in this case a message is displayed when establishing the connection.

Note

Warning message regarding the certificate (HTTPS)

When you establish the connection via HTTPS when you log in a warning message is displayed indicating that the Web page is unsafe or that the certificate is not trustworthy. If you are sure that you have entered the correct address, ignore the message. Also add the connection to the exceptions in your Web browser (depending on the browser).

As an alternative you can import a third-party certificate, for example a certificate issued by the client application.

- **Currently used file**

   Display of the file name of the currently used file

- **Delete**

   With the button, you delete the currently used file. The file is deleted only after you click "Apply" button.

   After deleting an imported certificate, the RTU once again uses the self-issued certificate from the factory settings.

- **File used after applying**

   After loading the certificate, the name of the loaded file is displayed here.

- **Load new file**

   After selecting a file stored on the configuration PC using the "Search button, the file name is displayed here.

- **Search**

   Searches the file system of the configuration PC for a certificate file saved there that is intended to be loaded on the RTU.

- **Load on device**

   With the button "Load on device" load the selected file on the RTU.

Own key

In the factory settings the RTU uses a self-generated private key for encryption of the data to be transferred via SSL/TLS.

As an alternative you can import a third-party key, for example a private key. A private key without password must be used.

- **Currently used file**

  Display of the file name of the currently used file

- **Delete**

  With the button, you delete the currently used file.

  The file is deleted only after you click "Apply" button.

- **File used after applying**

  After loading the key file, the name of the loaded file is displayed here.

- **Load new file**

  After selecting a key file stored on the configuration PC using the "Search" button, the file name is displayed here.

- **Search**

  Searches the file system of the configuration PC for a key file saved there that is intended to be loaded on the RTU.

- **Load on device**

  With the button "Load on device" load the selected file on the RTU.

4.16 User / Recipient

4.16.1 User

Incorrect entry / loss of the user name or passwords

Note

With the following user data you can log in the first time to the WBM.

User data	Default values set in the factory
User name	admin
Password	admin

Note

Changing the password

For security reasons, the factory set default password of the standard user must be changed when you log in the first time.

Note

Loss of changed standard user data

Note changed or newly assigned user names and passwords.

If you change user data of the standard user, lose the changed user data and have not created a second user, you no longer have access to the WBM of the RTU. In this case, you can only access the WBM after resetting the RTU to the factory settings. Resetting to factory settings involves the loss of the configuration data, refer to the section Operating status (Page 103).

Note

Entering the wrong user name or password

After entering an incorrect user name or incorrect password three times a lockout time of 5 seconds begins after which you can log in again.

User

A total of 20 users can be created.

You will find a description of the rights of the users in the section "Rights of the users".

Table

The table shows all users and their configured data.

- **Add**

  Creates a new user.

  When you create a new user, you need to assign the name, the user name and the password. . You can leave the other data boxes empty and complete them later.

- **Delete**

  Deletes the user selected in the table above.

  When you click the "Delete" button, two buttons are displayed as a prompt for confirmation:

  – Delete

    Deletes the selected user once and for all.

  – Cancel

    Cancels the deletion and the normal picture of the WBM page is shown again.

  All users except at least one can be deleted.

You configure the individual users below the table.

Change user

The following data can be configured optionally. Some data is necessary for the communication functions of the RTU.

Select a user in the table with the mouse.

- **Name**

  Name of the user (not the user name)

- **Companydepartment/positiion**

  Here, you can configure organizational characteristics of the user.

- **Phone number**

  The phone number of the user configured here is the authorized telephone number for waking the RTU and for receiving SMS messages by the RTU.

  For these functions the user requires a phone with the number entered here. The telephone must support the CLIP function (transfer of its own call number).

  Configuring the phone number

  – You will find the characters permitted in the section Permitted characters and parameter lengths (Page 77).

  – An asterisk (*) after the body of the telephone number gives the right to establish a connection to all phones that have a phone number that includes the phone number body (e.g. body + extension number).

    Example: The entry +49-123456* entitles the following phone numbers:

    +49-123456-0, +49-123456-1, +49-123456-2 ...

    +49-123456-100, +49-123456-101 ...

  – If only an asterisk (*) is entered in the input box , the RTU wake-ups / SMS messages from all senders.

    Remember that with this option, the authorization is lost and due to incorrect calls costs for connection establishment attempts may result.

- **Wake-up call allowed**

  Only when this option is enabled does the RTU allow receipt of a wake-up call by this user.

  You will find further notes on waking the RTU in the section Wake-up call / wake-up SMS (Page 192).

- **Allow receipt of SMS messages**

  Only when this option is enabled does the RTU evaluate wake-up SMS messages or request SMS messages for a diagnostics SMS message from this user.

  Make sure that the receipt of SMS messages by the RTU is enabled on the WBM page "WAN" > "SMS".

- **E-mail address**

  E-mail address of the user for receiving e-mails sent by the RTU.

To change the access data (user name, password), you need to select the "Change login data" check box. The input boxes can then be edited.

- ● **Change login data**

  When this option is enabled, you can change user data.

  You will find a description of the rights of the users in the section "Rights of the users".

- ● **User name**

  Enter the new user name.

- ● **Password**

  Enter the new password.

- ● **Repeat password**

  Repeat the new password.

By clicking "Apply" the changed data is saved and needs to be entered at the next login.

Rights of the users

All created users have the same rights to create new users or delete them and to make settings on all WBM pages.

- ● All users can change their own data, including access data (user name, password).
- ● All users can change the user names and passwords of the other users.
- ● No user can read the password of another user.

This means that every user has administrator rights.

4.16.2 Recipient groups

Recipient groups

Here you specify the recipient groups for messages (SMS messages / e-mails) of the RTU.

When configuring the individual message types, you always specify a recipient group in the WBM as the recipient of the messages.

With the recipient groups you specify which message types are received by which groups of users. For example with a group concept. You can specify that certain messages are received by employees active in operation and other message types by service employees.

Every user can be assigned to any number of the maximum 10 groups.

Table

The table shows all recipient groups and their configured data.

- **Add**

    Creates a new group.

    When creating a new group, you need to assign the name and select the group type. You can leave the description empty and complete it later.

    You must assign at least one user to be able to save the new group.

- **Delete**

    Deletes the group selected in the table above.

    When you click the "Delete" button, two buttons are displayed as a prompt for confirmation:

    – Delete

    Deletes the selected group irrevocably.

    – Cancel

    Cancels the deletion and the normal picture of the WBM page is shown again.

You configure the individual groups below the table.

Change group

Select a group in the table with the mouse.

- **Name**

    Enter the group new name.

- **Description**

    As an option, you can enter a description of the group.

- **Group type**

    Using the drop-down list, you specify which message type the group will receive:

Specifying group members

Using the list of all configured users at the bottom of the page, you specify the members of the group selected in the table above.

Select the check box to the left of the user name to assign this user to the recipient group.

4.17 Operating mode

4.17.1 Operating modes

You will find the description of the Operating modesin the section Modes and operating modes (Page 19).

Note

Power consumption

Note that frequent update and communication cycles increase the power consumption of the RTU greatly. This applies in particular when permanently booked into the mobile wireless network and when the LAN interface is activated often.

Update mode

- **Basic cycle**

  From the drop-down list, specify the basic cycle (1 s .. 7 d) for updating the inputs and outputs.

  In every cycle, the RTU interrupts the sleep mode, reads the inputs, processes the program blocks and updates the outputs.

- **Start time of the update cycle**

  Synchronizes the update cycle with this time of day.

- **Start day of the update cycle**

  Synchronizes the update cycle with this day.

  The option is only available if "7 days" is configured as the basic cycle.

- **Additional update cycles**

  Using the drop-down list you specify whether in addition to every configured basic cycle 1 to 3 additional update cycles are run through to execute the program. In the additional cycles the program is executed.

  Reading the inputs and setting the outputs does not take place in the additional cycles but only after the basic cycle has elapsed.

  If you select "0" only the basic cycle is used.

Communication mode

In the cycle configured here, the RTU activates all the interfaces and services used, establishes a connection to its communications partner and sends all buffered messages and files. In every cycle, the RTU interrupts the sleep mode.

You configure the communications partner on the WBM page "TeleControl". There you will find further parameters for the transfer settings on the page of the protocol, being used.

A connection is always established by the RTU. With the DNP3 and IEC protocol the master instigates connection establishment.

The time-of-day synchronization is performed with the communication cycle.

- **Always remain connected**

  If you enable this option, the RTU remains permanently in the communication mode and connected to the communications partner.

- **Basic cycle**

  From the drop-down list, specify the basic cycle (3 minutes ... 7 days) for communication.

- **Start time of the communication cycle**

  Synchronizes the communication cycle with this time of day.

  The communication mode starts with a lead time so that the RTU is reachable at the configured times. The lead time of the RTU is made up of the following times:

  - 15 seconds (basic lead time for the configured mobile wireless interface)

  - + 10 seconds with activated DHCP client

  - + 45 seconds with data service configured

  - + 45 seconds with OpenVPN service configured

  When using a router the lead time configured there applies, see section LAN (Page 107).

  If shortly before expiry of the minimum duration the connection still needs to remain established (e.g. sending an e-mail), the communication mode is extended by the required time.

- **Start day of the communication cycle**

  Synchronizes the communication cycle with this day.

  The option is only available if "7 days" is configured as the basic cycle.

- **Minimum duration**

  After connection establishment, the RTU first sends its stored data (messages, event-related process data) to the partner. Under certain circumstances in mobile wireless networks it can take a while for a response from the partner to reach the RTU.

  So that the RTU does not terminate the connection too early without having received new data from the partner or without the OpenVPN connection being established, you can configure a waiting time here (30 s ... 10 min).

  The RTU maintains the connection for the configured Minimum duration as of the configured start time.

  If you select "No" the RTU terminates the connection after sending its own data and receiving the acknowledgement from the partner, however at the earliest at the configured start time.

- **Start test communication mode**

  By clicking the button you can turn on the communication mode for test purposes, for example during commissioning.

Sleep mode

- **Turn on mobile wireless interface regularly and check for receipt of wake-up SMS message?**

  Using the drop-down list, you specify whether the RTU dials into the mobile wireless network in addition to the communication cycle to fetch any existing SMS messages. The following options are available:

  – No

  The RTU does not turn on the mobile wireless interface between the communication cycles.

  – 10 Minutes .. 24 h

  Check cycle in which the RTU books into the mobile wireless network to fetch SMS messages.

  – Check permanently

  The RTU remains permanently booked into the mobile wireless network. Only with this setting can the RTU accept wake-up calls in sleep mode.

- **Start time of checking cycle**

  Time at which the checking cycle begins. Afterwards the checking cycles take place according to the setting of the parameter above.

Service mode

- **Duration**

  Using the drop-down list, you specify how long the RTU remains in service mode after pressing the "WKUP" button.

  When the last user has logged out of the WBM, the Service mode is ended earlier.

In service mode the LAN interface and the LEDs are enabled.

Note

Power consumption

Note that in Service mode the power consumption of the RTU increases considerably.

4.17.2 Logging

You will find the naming conventions of the log files in the section SD card (Page 91).

- **Active**

  Selecting the check box turns on logging. A further requirement is a plugged in SD card.

- **Log file creation**

  Here you specify the cycle in which new log files are created: Daily, weekly, monthly

- **Response when insufficient memory space on SD card**

  Here you specify the response if there is no longer enough memory space on the SD card for new log files:

  - Delete older log files

    The process data continues to be acquired. When the SD card is full, with the creation of new log files the oldest log files are successively deleted (FIFO principle).

  - Stop logging

    Already stored process data is retained. When the SD card is full, saving new process data is suspended until data is deleted manually from the SD card.

- **Separator**

  Here, you specify the separate between the individual blocks of data in the log file: Comma, colon or semicolon

- **Log file name prefix**

  Here you can enter a name prefix with a maximum of three characters that is placed at the beginning of the file name of the log file.

- **Maximum number of Log files**

  Here you specify the maximum number of log files that will be saved on the SD card: Max. 999999

- **Send last log file by e-mail when a new one is created.**

  If the option is enabled, the last log file is sent as an attachment of an e-mail as soon as a new log file is created.

  - **Recipient group**

    Here you select the recipient group for the e-mails with the log files.

    Configuration of the recipient groups in "Users / groups"

  - **Subject**

    Here, select the subject of this e-mail.

    Configure the subject in "Tags" > "Texts"

  - **Text**

    Here, select the text for this e-mail.

    Configure the text in "Tags" > "Texts"

  - **Attachment zipped**

    If you enable the option, the attachment is sent as a compressed ZIP archive.

  - **Change immediately to communication mode**

    If you select the option, the RTU changes immediately to communication mode as soon as a new log file is ready for sending.

- **Transfer last log file using FTP when a new one is created.**

    If the option is enabled, the last log file is sent to the FTP server as soon as a new log file is created.

    – **Server path**

    Here you have the option of selecting a path that you configured in "Services > FTP".

    – **Append**

    If the option is enabled, the transferred file will be appended to the FTP server. On the server no file of the same name will be overwritten.

    – **Transfer file as ZIP archive**

    If you enable the option, the file is transferred as a compressed ZIP archive.

    – **Change immediately to communication mode**

    If you select the option, the RTU changes immediately to communication mode as soon as a new log file is ready for sending.

4.17.3 Power supply

Power supply

Here you configure the various options for the power supply of the RTU, changing battery modules, the power outputs of the RTU and possibly notifications.

Designation of the battery modules

- Battery module 1 is the right module which along with its battery expansion modules is connected directly to the RTU.

- Battery module 2 is the left module which along with its battery expansion modules is connected to the left of module 1.

For information on the location and labeling of the battery modules and battery expansion modules, refer to the appendix Battery module and battery expansion module (Page 275).

Note

Battery modules in the WBM

In the WBM a battery module (module 1 or module 2) along with its battery expansion modules forms a common logical unit.

A battery module can only be connected or disconnected in its entirety in the WBM. This includes the supply via the relevant expansion modules.

External power supply

- **Connected**

    Enable the option if you supply the RTU with an external source of power.

Battery moduel 1 / Battery module 2

- **Connected**

  Enable the option if you supply the RTU with the relevant battery module (with or without expansion modules).

  Enable the two following options only if you use optional battery expansion modules.

- **Expansion module 1 connected**

  Enable the option for the first battery expansion module.

- **Expansion module 2 connected**

  Enable the option for the second battery expansion module.

- **Connect battery**

  By clicking the button, you connect the plugged in battery module and its expansion modules logically with the RTU.

  Without the connection on this WBM page, the RTU does not access the physically plugged in battery module.

  When connecting the RTU checks the voltage level of the batteries in the battery module. It detects empty or defective batteries as well as incorrect physical connections of the batteries. You should therefore check the feedback in the WBM to make sure that the batteries have been accepted by the RTU.

- **Disconnect battery**

  Note

  Disconnection necessary for battery replacement

  Without the disconnection in the WBM, the RTU continues to access the physically plugged in battery module.

  By clicking the button, you disconnect the plugged in battery module and its expansion modules logically from the RTU.

  The RTU checks whether a disconnection is permitted in the current operating situation. Disconnection is only possible if the RTU is supplied either via the external power supply or via the other battery module at this point in time.

  If at the time of disconnection another battery module with an adequate voltage level is connected, the RTU switches internally to the other battery module and releases the module to be disconnected for a battery change.

Battery switchover

- **Use default setting:**

  Enable the option if the RTU is to use the preset voltage value of 80% as the signal for switching over the battery modules.

  As default the RTU switches over to the second battery module when the voltage value of the first module falls below 80% of the nominal voltage of 7.2 volts, this means a threshold value of ≤ 5.76 V.

  When this option is disabled, you can enter a different threshold value manually. In rare cases, this can be practical, for example when connected sensors put heavy load on the battery with high current peaks.

Control outputs

- **Output voltage (X10 CTRL, X11, X40, X42)**

  From the drop-down list select the voltage (12 VDC or 24 VDC) at the voltage outputs of the RTU.

  The outputs X40 and X42 are always supplied with the voltage configured here.

  With the next three check boxes enable the voltage of outputs X10 and X11.

- **Supply X10 CTRL with voltage**

  If the option is enabled, X10 CTRL has the voltage configured above applied to it.

  If an external power supply exists and is available, the output CTRL X10 is always supplied by the external source.

- **Supply X10 CTRL from battery if external voltage fails.**

  If the option is enabled, X10 CTRL is supplied from the battery modules if the external power source fails. Note that this can involve a considerable shortening of the lifetime of the battery.

  If the option is disabled, no voltage is applied to X10 CTRL if the external power source fails.

- **Supply X11 CTRL with voltage in update mode**

  If the option is enabled, X11 CTRL is supplied with the voltage configured above in update mode. Note that this involves increased power consumption.

  If the RTU is not in update mode, the outputs have no voltage applied.

  If the option is disabled, X11 CTRL never has a voltage applied.

- **X11: Lead time before update cycle (ms)**

  Here enter a value (ms) for a period during which the output X11 has voltage applied to it before the RTU changes to update mode. This value serves to damp down any voltage fluctuations at the inputs of the RTU when turning on X11.

- **Notifications**

  Using the drop-down list, select whether or not the RTU sends notifications as SMS messages or e-mails.

  Messages can be sent after the following events:

  – Reaching a configurable operating time of the battery

  – After changing over the battery module

- **Change immediately to communication mode**

  If you select the option, the RTU changes immediately to communication mode as soon as a named events occurs.

- **Recipient group**

  Here you select the recipient group for the messages.

  Configuration of the recipient groups in "Users / groups"

- **After battery operating time of:**

  If the option is enabled, a message is sent when the configured value of the operating time of the active battery module is reached after being activated by the RTU.

- **Runtime (days)**

  Enter a value for the number of days after which the message is sent.

  If you enter 0, the function is deactivated.

- **Text**

  Here, select the text for this message.

  Configure the text in "Tags" > "Texts"

- **After battery changeover**

  This option only makes sense when using two battery modules.

  If the option is enabled, a message is sent when the RTU changes from one battery module (including optional expansion modules) to the other battery module. The RTU changes from the active module to the second battery module (substitute module) when the voltage value of the active module sinks below the critical threshold value.

  The advantage of this is that the active module can be completely emptied before switching to the second battery module and a message being sent. After sending the message there is normally enough time for a battery change and the capacity of the batteries is used to the best effect.

- **Text**

  Here, select the text for this message.

  Configure the text in "Tags" > "Texts"

Changing batteries

Note

Battery type

Only use the batteries described in the Appendix of the manual. Correct battery operation is only ensured with these battery types.

Changing both batteries

Always replace both batteries of a battery holder with new batteries.

If you only replace one battery this can destroy the new battery. In this case, correct battery operation of the RTU could not be guaranteed.

Changing all batteries of a module

If you add one or two battery expansion modules to a battery module, we strongly recommend that you replace all batteries of a unit (battery module + battery expansion modules).

To change the batteries, you first need to disconnect the battery module being used in the configuration. Follow these steps:

1. In the WBM, open the page. "Power supply".

2. Disconnect the battery module currently being used in the parameter group. "Battery module 1" / "Battery module 2".

NOTICE

Remove the battery only after disconnecting

Pull the connector of the battery holder in the battery module only when the battery is displayed as "disconnected" in the WBM.

---

3. Shut down the RTU to the safe status if you only use a single battery module (including any expansion modules) and no external power supply. See section Operating status (Page 103) for information on this.

   If you use two battery modules or an external power supply, skip this point.

4. Open the battery module whose battery you want to change.

   For a battery change you do not need to separate the battery module from the RTU and do not need to take it from the DIN rail.

   Lift up the cover on the front of the module. To ensure a secure grip, there is a recess on the right-hand underside.

5. Pull the connector of the battery holder and remove the battery holder from the battery module.

NOTICE

Do not place the battery holders on a conductive surface.

Never place the battery holders on an electrically conductive surface (e.g. the outer housing).

The battery contacts can establish a short-circuit connection in the battery via a conductive surface. This can destroy the battery.

---

6. Change the batteries and place the battery holder back in the battery module.

7. Plug the connector of the battery holder in the correct position in the socket X10 BATTERY of the battery module. To protect against voltage reversal, the connector is coded.

8. Close the battery module.

9. Finally, connect the battery module in the WBM on the page "Power supply", see above.

Note the information on handling used batteries in the section Batteries: Replacement, recycling and disposal (Page 259).

4.17.4 Batteries: Estimating the working life

Working life of the batteries

The power consumption of the RTU depends on many factors, the connected consumers, changing outdoor temperatures and above all on the frequency of configured events such as limits of measured values being exceeded. A precise calculation of the power consumption of the RTU is therefore not possible.

To estimate the power consumption of the RTU, you can list the frequency of the individual operating modes expected by you or configured and derive a rough value for the daily power consumption of the RTU from the specific consumptions.

You will find the electrical data in the section Technical data (Page 261).

The procedure in principle, is shown in the two following tables.

Note

Real values can significantly deviate from these.

Note that the numbers shown as an example below can deviate significantly from the real behavior of the RTU in daily use.

Calculate an adequate reserve.

Table 4- 5   Estimation of the power consumption of the RTU per day

1	2	3	4	5	6
Status	Current consumption (mA)	Capacity used per minute (Ah / min) *	Number of cycles per day	Status duration (minutes) per day	Ampere hours per day (Ah / d) **
Sleep mode (basic consumption)	0.28	0.00000467		1421	0.0066
Update mode (assumption 0.5 minutes per cycle)	71	0.00118	24	12	0.0142
Communication mode (assumption 1.5 minutes per cycle)	208	0.00347	2	3	0.0104
Reserve (e.g. for service mode or events)	100	0.00167		4	0.0067
Sum of the capacity used per day (Ah / d)					**0.038**

* Value column 2 divided by (1000 times 60)

** Value column 3 times value column 5 - rounded

Table 4- 6   Estimation of the working life of a battery module

Status	Value
Assumed capacity (Ah) of six batteries (1 battery module with two battery expansion modules) at the time of starting (3*13 Ah)	39
Sum of the capacity used per day (Ah/d) (Value from the table above)	0.038
Estimated working life in days (39 / 0.035)	**1029**

When a configured working life of the battery is reached, you can have the RTU send a message, see section Power supply (Page 142).

4.18 Tags

4.18.1 Overview

Overview

Table

In the overview table all tags are shown as symbols with identifiers. By clicking on a symbol. You can directly to the WBM page for configuring this tag type.

Symbols of unconfigured tags are gray, symbols of configured tags are green with different information.
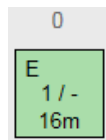
Figure 4-4   Example of the symbol of digital input 0

The information has the following meaning:

- Identifier
    - E = configured as an event counter (only digital input 0 or 1)
    - C = configured as consumption counter (only digital input 0 or 1)
    - L = Logging enabled

    In the example (graphic): Configured as an event counter, logging not enabled.

- x / y

    Frequency of the use of the address in the user program:
    - x = Use as an input
    - y = Use as an output

        Digits show the frequency of use.

        The minus sign means that no use as an output is possible.

    In the example (graphic): used once as input / cannot be used as output

    Among other things you can see here when an address is not used at all in the program.

- Update cycle

    The individually configured update cycle as the product of the basic cycle and reduction factor is displayed.

    In the example (graphic): 16 minutes

Update cycle

- Basic cycle

  The basic update cycle is displayed at the top right on the WBM page.

Copy of the process image

- **Save to PC**

  By clicking the button, you can save the current process image as a CSV file on the configuration PC.

4.18.2　　Configuration of the tags , general parameters

Structure of the WBM pages for tags

The following WBM pages for the tags show a table at the top of the page with all available tags of the relevant type. The most important parameters are displayed for the configured tags.

Exceptions: For the internal temperature and the external power supply, you can only create one tag in each case. On these pages there is no table.

When you open a page in the lower area the parameters of the first tag are shown that you configure by making entries and selecting options.

Enabling and configuring tags

1. Click on a row in the table at the top of the WBM page

2. Assign the tag a meaningful name in the "Name" input box.

3. Configure the other necessary parameters and save your entries.

General parameters

Some often repeated parameters on the WBM pages of the tags are only described at this point.

Enabling and names of the tags

You need to configure the two following parameters for all tags except the tags for texts:

- **Active**

  If the option is enabled, the tag for productive operation is enabled.

  Unless it is enabled, the tag will not be processed in productive operation. (The tags for texts are always enabled.)

  To disable tags that are already enabled and integrated in the program, you first need to delete the use of the tag in the user program.

- **Name**

  Assign the tag a unique name.

  When using the communication protocol "TeleControl Basic" the tag names are included in the addressing of the OPC items.

  Note:
  In the listing of the data points (WBM page "TeleControl" > "Data points") an abbreviation for the tag type and the consecutive number are added to the tag name in brackets.
  Example of analog input 0:   Fill level 1 (AI0)
  Example of digital input 2:   High alarm 1 (DI2)

Logging

In the "Logging" parameter group, you specify whether and when the process data of the tags is stored on the SD card.

- **Logging**

  Options:

  - OFF

    The process data is never saved to the SD card.

  - Always

    The process data is saved with each update cycle

  - On change

    Process data is saved only when the signal changes

  - In the basic cycle

    Saving the process data in the individual basic cycle of the relevant tag

    Example:
    - basic cycle = 10 s
    - Reduction factor for basic cycle = 2
    Result: The process value is saved every 20 seconds.

Format

The parameters in the parameter group. "Format" are optional and can be left empty.

Here, you specify texts for the individual tags, which are used when writing the process values to the SD card and for transferring process values in messages (SMS / e-mails).

- **Parameters for digital tags (except counters):**
  - **Text for "ON"**

    Enter a text that replaces the value "1" of the process value (for example, "ON").
  - **Text for "OFF"**

    Enter a text that replaces the value "0" of the process value (for example, "OFF")

- **Parameters for analog tags and counters (inputs and memory bits):**
  - **Unit**

    Enter a text for the physical unit (for example, "l/s").
  - **Format**

    Here, you specify the format of the value to be written to the SD card or to be transferred with the message.

    With analog inputs the box has the default [V.2].

    With counters the box has the default [V].

    Note the following rules:

    The square brackets and the letter V R placeholders for the tag name. They must not be changed.

    The period and the digit following it indicate the number of decimal places (max. 4). If you write the values of a tag to the SD card only with 1 decimal point or want to transfer them with a message, configure the parameter as follows: [V.1]

    Example:
    In a message text the placeholder for the current value of analog input 3 with one decimal place would appear as follows: [Analog3.1]

  For information on programming messages with process values, refer to the section Blocks for messages (Page 241).

Syntax

Separate decimal places in input boxes with a period.

Note the characters permitted for the input boxes, see section Permitted characters and parameter lengths (Page 77).

4.18.3 Digital inputs

In total, you can configure eight digital inputs.

Digital input 0 and 1 for counter inputs

Of the eight digital inputs only the first two can be configured as fast counter inputs up to 5 kHz. These two inputs have a fixed filter time of 0.2 milliseconds.

Digital input 2 to 7 for binary inputs

If you use the two inputs for binary digital inputs, note that under certain circumstances this can lead to bouncing effects. For binary digital inputs you should preferably use digital inputs 2 to 7.

Parameters

Depending on the configuration of the tags as counters or binary inputs, the parameters differ.

- **Active**

- **Name**

- **Type**

    Assign the tags to one of the following types:

    – Binary input

    The tag type is intended for binary inputs.

    Format: Bool (1 bit)

    – Event counter (max. 5kHz)

    The tag type is intended for counter inputs.

    Format: Integer without sign (32 bits)

    – Usage meter (max. kHz)

    The tag type is intended for usage metering in the positive range.

    Format: Floating-point number with sign (32 bits)

- **Initial value**

    Only with counters: Enter an initial value that the tag uses as a basic value.

- **Counter type**

    Only with event counters

    – Incremental

    – Decremental

- **Pulse weighting: amount**

    With usage meters, the parameter is used for the calculation to convert the sensor value to the process value (number of pulses per physical unit).

    Enter the amount that corresponds to the number of pulses specified in the row below.

- **Pulse weighting: number of pulses**

    With usage meters, the parameter is used for the calculation to convert the sensor value to the process value (number of pulses per physical unit).

    Enter the number of pulses to which the amount specified in the row above corresponds.

- **Current value**

    With event counters and binary inputs: Display of the value of the input

- **Current sensor value**

  Only with usage meters: Display of the value of the input

- **Current process value**

  Only with usage meters: Display of the physical value after converting the pulse weighting

- **Read**

  Click on the button to display the current value of the input.

- **Preset value**

  Optional with counters: You can write the the count value entered here to the tag.

- **Write**

  Optional with counters: Click the button to write the entered count value to the tag.

Update cycle

- **Reduction factor for basic cycle**

  The reduction factor lowers the update cycle for this input.

  With a factor for example of 2, the update cycle of this input is halved: The input is read only half as often as configured in the basic cycle. You configure the basic cycle in "Operating mode.

- **Additional update cycle on value change**

  Only with binary inputs

  – No

    The input is read only in the configured update cycle.

  – Yes, also in sleep mode

    The input is also read during the sleep mode.

    If the option is enabled, if a value changes during the sleep mode all digital inputs are read, the program is run through and the outputs updated.

    Note that with this setting, frequently changing signals can significantly increase power consumption.

Format

With counters:

- **Unit**
- **Format**
- **Logging**

With binary inputs:

- **Text for ON**
- **Text for OFF**
- **Logging**

See section Configuration of the tags , general parameters (Page 150).

4.18.4 Digital outputs / Digital memory bits

Digital outputs / Digital memory bits

Parameters

- **Active**

- **Name**

- **Current value**

  Display of the value of the output / memory bit

- **Initial value**

  Only with digital bit memory

  Preset value that the tag will use as the basic value.

- **Read**

  Click on the button to display the current value.

- **Preset value**

  Optional: You can write the the value entered here to the tag.

- **Write**

  Click the button to write current preset value to the tag.

Format

- **Text for ON**

- **Text for OFF**

- **Logging**

See section Configuration of the tags , general parameters (Page 150).

4.18.5 Analog inputs

Analog inputs

The tags can be used for various analog signals (see "Measured variable / measurement type")

Data format: Floating-point number with sign (32 bits)

For the analog input AI0 it is possible to configure running through additional update cycles during the sleep mode of the RTU, see parameter "Update on value change in sleep mode".

The inputs X41/0 and X41/1 measure at the same time, the inputs X43/0 and X43/1 following this and one after the other. It is recommended to place measurements with large settling times on connectors X41/0 and X41/1 to keep the update time and the power consumption of the RTU low.

Parameters

- **Active**

- **Name**

Measure

- **Measured variable / measurement type**

    and

- **Output signal / measuring range**

    Select the required measured variable (measurement type) and the required output signal or the temperature measuring range:

    – Voltage

        0 .. 5 V

        0 .. 10 V

    – Current (2-wire connector)

        4 .. 20 mA

    – Current (4-wire connector)

        0 .. 20 mA

        4 .. 20 mA

    – Temperature (Pt1000)

        -80 .. +140 °C

        -112 .. +284 °F

- **Power supply**

    If you want to supply the sensor with voltage from the RTU, select the option "ON". The voltage X40 and X42 can only be turned on with a lead time before every update cycle. The lead time is formed from the settling time and integration time times the smoothing factor.

    With current sensors the option is preset with "ON".

- **Settling time of the sensor (ms)**

    The settling time is the time the sensor requires to return a stable measured value after turning on the power supply.

    Range of values: 0 .. 30000 ms

    The sum of the settling time and integration time multiplied by the smoothing factor must not exceed the time of the update cycle (basic cycle multiplied by reduction factor).

- **Integration time of the sensor (ms)**

  The integration time is used to match the sampling time of the input of the RTU with the conversion of time of the sensor.

  From the drop-down list, select a time that comes closest to the integration time (or conversion time) of the sensor. If you do not know the integration time of the sensor, select the lowest value.

  Note that high integration times increase the power consumption of the RTU.

  Range of values:

  – 40 ms

  – 100 ms

  – 250 ms

  Note the effect of the integration time on the formation of the output signal of the tag, see "Smoothing".

- **Smoothing**

  With this parameter the signal read in is smoothed in every update cycle by reading the applied signal several times. The individual values are read at intervals of the integration time configured above.

  The selectable smoothing degrees (see range of values) correspond to different smoothing factors. The smoothing factor decides how often the analog value is read in every update cycle. Example: With smoothing degree. "Weak" the input is read four times.

  From the individually read values, the mean value is formed which is written to the process image via the output parameter of the tag. This value is then used for further processing by the program and for saving or transfer to the communications partner.

  Range of values:

  – None

    Smoothing factor 1

  – Weak

    Smoothing factor 4

  – Medium

    Smoothing factor 16

  – Strong

    Smoothing factor 32

- **Current sensor value**

  Display of the value of the input signal

- **Read**

  Click on the button to display the current value of the input.

- **Current process value**

  Display of the physical value that is calculated after configuration of the measuring range (see below).

- **Cable error correction**

  Only for temperature measurement

  Select an option from the drop-down list:

  – No

    The measured value is not corrected by the cable resistance.

  – Indication of the resistance

    If you select this option, an input box for entering the cable resistance is displayed.

    Enter the measured or calculated cable resistance. Based on the cable resistance entered, the RTU corrects the measured value. More

  – Indication of the cable data

    If you select this option, three input boxes for entering the following parameters of the laid cable are displayed.

    - Specific resistance (Ω*mm^2/m)

    - Cable length (m)

      (simple length)

    - Cable cross section (mm^2)

    Based on this information, the RTU calculates the cable resistance and corrects the measured value.

Specification of the measuring range

To specify the measuring range enter the lower interpolation point (interpolation point 1) and the upper interpolation point (interpolation point 2) for the input signal (sensor value) and the corresponding physical value (process value).

- **Sensor value (interpolation point 1)**

  Low value of the input signal

- **Process value (interpolation point 1)**

  Corresponding low value of the physical value

- **Sensor value (interpolation point 2)**

  High value of the input signal

- **Process value (interpolation point 2)**

  Corresponding high value of the physical value

- **Process value, range**

  Displays the configured process value range

Logging

See section Configuration of the tags , general parameters (Page 150).

The option whether and when process data of the signal is saved on the SD card, also applies here for saving the mean value, if mean value formation was enabled in the parameter group. "Additional value".

Additional value

- **Mean value generation**

  Select a degree of mean value generation over several update cycles:

  – None

  No mean value generation

  – Weak

  Mean value generation over 2 cycles

  – Medium

  Mean value generation over 4 cycles

  – Strong

  Mean value generation over 8 cycles

Diagnostics messages

- **Wire break**

  If wire break is detected at life-zero inputs, if the option is enabled a message is entered in the diagnostics buffer

  With other measured variables, the option has no effect.

- **Outside the measuring range**

  If the option is enabled, a message is entered in the diagnostics buffer when under/overvoltage or under overcurrent is detected.

  With temperature measurements, the option has no effect.

  For over/undershoot ranges or over/underflow, refer to the section "Measuring ranges".

Regardless of configured diagnostics messages, the LED of an input (Aix) is lit red with wire break, over/undervoltage or under/overcurrent.

Update cycle

- **Reduction factor for basic cycle**

  The reduction factor lowers the frequency of the update cycle for this input. The interval between the update cycles is therefore increased.

  Example: With a basic cycle of 10 seconds and a reduction factor of 2, the frequency of the update cycle for this input is halved, the input is read only every 20 seconds.

  You configure the basic cycle in "Operating mode.

  Note the comments made about the parameters "Settling time" and "Integration time".

- **Update on value change in sleep mode**

  Only with analog input AI0.

  – Deactivated

     The input is read only in the configured update cycle.

  – Activated

     The input is also read during the sleep mode if the value at the input changes (see "Value change"). If AI0 is read, the analog inputs configured as counters will be read at the same time. With every cycle, the inputs mentioned earlier are read, the program is executed and the outputs are set.

     After reading the outputs of these tags are written, the program is run through and the outputs updated. Note that with this setting, frequently changing signals increase power consumption.

  The difference of the value change as of which an additional update cycle is run through is configured following this.

- **Value change(%)**

  Amount of the change (2.5.. 50%) of the currently red value compared with the process value range (100% of the process value). If this amount is exceeded, and additional update cycle is run through.

Downsizing of the reduction factor

With these options, you can reduce or increase the duration of the update cycle by a factor in certain situations. The following factor applies only in the following situations.

The factor is configured independently of the reduction factor for the usual operation ("Reduction factor for basic cycle", see above). As soon as the value of the analog input no longer meets the following conditions, there is a changeover to the standard reduction factor again.

The change of the reduction factor is made possible in the following situations;

- Process value lower than low limit value

- Process value higher than high limit value

- Change of the process value higher than "Threshold"

  The Threshold is the configurable change as a percentage compared with the last value read.

The factor for the duration of the update cycle is configured in the following. One, two or all three conditions can be configured.

- **Activate limit value**

  When you enable the option, you enable a limit value 'high' or 'low' for reducing the duration of the basic cycle. You can enable the conditions independently of each other.

  – **Lower limit value (process value)**

    If the process value falls below the low limit value, the basic cycle is run with the reduction factor that can be configured below instead of with the standard reduction factor.

  – **Upper limit value (process value)**

    If the process value exceeds the high limit value, the basic cycle is run with the reduction factor that can be configured below instead of with the standard reduction factor.

- **Activate threshold**

  If the option is enabled a threshold is monitored as the change of the process value compared with the last acquired value.

  – **Value change**

    Percentage change compared with the last read value as of which the basic cycle runs with the factor that can be configured below instead of with the standard reduction factor.

- **Change to:**

  Factor for reducing (or increasing) the reduction factor for the previously activated situations

- **Changed update cycle**

  Here the basic cycle and the resulting Cycle of the input are displayed when the reduction factor has changed.

Format

- **Unit**

- **Format**

See section Configuration of the tags , general parameters (Page 150).

Measuring ranges

The analog inputs have a resolution of 12 bits.

In the presentation of the measuring range, the RTU distinguishes between:

- Nominal range

  Range of the upper calibrated measuring range

- Overshoot range / undershoot range

  Measuring range exceeded / undershot with diagnostics message "INFO"

- Overflow range / underflow range

  Error ranges that cause a diagnostics message "WARNING" for example, if there is a wire break in life zero inputs.

Range	Measuring range (sensor)					Measuring range (percentage)
	0 .. 5 V (unipolar)	**0 .. 10 V** (unipolar)	**0 .. 20 mA** (unipolar)	**4 .. 20 mA** (life zero)	Temperature	
Overflow	≥ 5.25 (max.5.399)	≥ 10.5 (max.10.799)	≥ 21 (max.21.027)	≥ 21 (max.21.027)	≥ 151 °C ≥ 303,8 °F	≥ 105 %
Overshoot range	> 5 .. < 5.25	> 10 .. < 10.5	> 20 .. < 21	> 20 .. < 21	140.1 .. < 151 °C 284.1 .. < 303.8 °F	100.025 .. < 105 %
Nominal range	0 .. 5	0 .. 10	0 .. 20		-80 .. +140 °C -112 .. +284 °F	0 .. 100 %
Nominal range				4 .. 20		20 .. 100 %
Undershoot range	-	-	-	< 4 .. > 1		< 20 .. > 5 %
Undershoot range	-	-	-		-80.1 .. -91 °C -112.1 .. -131.8 °F	-0.025 .. -5 %
Underflow range / wire break	-	-	-	≤ 1		≤ 5 %
Underflow range	-	-	-		≤ -91 °C ≤ -131.8 °F	≤ -5 %

4.18.6 Analog memory bits

Note the characters permitted for the input boxes, see section Permitted characters and parameter lengths (Page 77).

Analog memory bits

Parameters

- Active
- Name

- **Type**

  Assign the tags to one of the following types:

  - Analog value

    The tag type is intended for analog signals.

    Formats of the tags: Floating-point number with sign (32 bits)

  - Counter

    The tag type is intended for counter inputs.

    Formats of the tags: Integer without sign (32 bits)

- **Initial value**

  Optional: Enter an initial value that the tag uses as a basic value.

- **Current value**

  Display of the current value of the tag

- **Read**

  Click on the button to display the current value of the tag.

- **Preset value**

  Optional: You can write the the value entered here to the tag.

- **Write**

  Click the button to write current preset value to the tag.

Format

- **Unit**

- **Format**

- **Logging**

See section Configuration of the tags , general parameters (Page 150).

4.18.7 Temperature (Internal)

Note the characters permitted for the input boxes, see section Permitted characters and parameter lengths (Page 77).

Temperature (Internal)

Parameters

- **Active**

- **Name**

- **Temperature unit**

  Select the physical unit for the internal temperature.

- **Current value**

  Display of the value of the tag

- **Read**

  Click on the button to display the current value of the tag.

Update cycle

- **Reduction factor for basic cycle**

  The reduction factor lowers the frequency of the update cycle for this input, the intervals between update cycles increase.

  You configure the basic cycle in "Operating mode.

Diagnostics messages

If the internal temperature of the RTU exceeds a configurable high limit or undershoots a low limit, a message "WARNING" is entered in the diagnostics buffer.

You will find the permitted range for the ambient temperature of the RTU in the section Technical data (Page 261).

- **Low limit**

  Enable the option if undershooting a low limit should cause a diagnostics message to be generated. Enter the limit in the input box.

- **High limit**

  Enable the option if exceeding a high limit should cause a diagnostics message to be generated. Enter the limit in the input box.

- **Logging**

  See section Configuration of the tags , general parameters (Page 150).

4.18.8 Power supply (external)

Note the characters permitted for the input boxes, see section Permitted characters and parameter lengths (Page 77).

Power supply (external)

Parameters

- **Active**

- **Name**

- **Current value**

  Display of the value of the tag

- **Read**

  Click on the button to display the current value of the tag.

Update cycle

- **Reduction factor for basic cycle**

  The reduction factor lowers the frequency of the update cycle for this input, the intervals between update cycles increase.

  You configure the basic cycle in "Operating mode.

Diagnostics messages

If the voltage value of the external power supply of the RTU undershoots a configurable minimum permitted value, a message "WARNING" is entered in the diagnostics buffer.

- **Minimum voltage**

  Enable the option if undershooting a low voltage limit should cause a diagnostics message to be generated. Enter the value in the input box.

  The minimum permitted voltage value of the RTU is 10.8 V.

- **Logging**

  See section Configuration of the tags , general parameters (Page 150).

4.18.9   Battery

Note the characters permitted for the input boxes, see section Permitted characters and parameter lengths (Page 77).

You configure the sending of messages if a configurable operating time of the battery is exceeded on the WBM page "Operating mode" > "Power supply".

Battery

Parameters

- **Active**
- **Name**
- **Current value**

  Display of the value of the tag

- **Read**

  Click on the button to display the current value of the tag.

Update cycle

- **Reduction factor for basic cycle**

  The reduction factor lowers the frequency of the update cycle for this input, the intervals between update cycles increase.

  You configure the basic cycle in "Operating mode.

- **Logging**

  See section Configuration of the tags , general parameters (Page 150).

4.18.10 Texts

Note the characters permitted for the input boxes and the syntax of the placeholders, see section Permitted characters and parameter lengths (Page 77).

Texts

Up to 20 texts can be configured.

- **Add**

  Click the button to create a new text tag.

- **Delete**

  First select a text in the table and then click "Delete" to delete this text tag.

  A prompt for confirmation appears.

  – Delete

    Click "Delete" to delete the tag irrevocably.

  – Cancel

    Click "Cancel" if you do not want to delete the tag. The normal view of the WBM page appears again.

Change text

- **Name**

  Name of the tag

- **Text**

  Enter the text here that will be transferred with the message.

- **Number of characters**

  Shows the current number of characters being used in the text

Notes on the texts

Maximum text length

The text length is limited to 160 characters. Spaces and line breaks count as characters.

If you enter more than 160 characters in the input box, when you save ("Apply") an error message will be output and you need to shorten the text.

Using placeholders for process data

Within a text, you can use up to six placeholders for current values of tags. In the body of the text of the message, the current values are transferred.

The placeholders are identified by square brackets.

The following placeholders are available:

- [V.x]

  Placeholder for the decimal value of a tag.

  - V is the placeholder for the tag name.

    "V" must be replaced in the text by the configured name of the tag.

  - The period and the digit following it are optional indicate the number of decimal places.

  Examples of placeholders in the message text:

  - The placeholder for the value of analog input AI3 with the name "Flow" without decimal places would appear as follows: [Flow]

  - The placeholder for the value of analog input AI4 with the name "Fill level" with one decimal place would appear as follows: [Fill level.1]

- [DATE]

  Current date. Format: yyyy-mm-dd

- [TIME]

  Current time. Format: hh:mm:ss

- [V.T]

  Placeholder for a counted value that is output as a period of time. (Resolution: seconds)

  Format: hhhh:mm:ss

- [V.T2]

  Placeholder for a counted value that is output as a period of time. (Resolution: hundredths of seconds)

  Format: hhhh:mm:ss.ss

- [DEVNAME]

  Placeholder for own station name

SMS: Text length when using the placeholders for process data

With SMS messages, note that the process values can consist of more characters than the placeholders in the configured text.

If due to the embedding of process data, the text of the SMS message to be transferred exceeds the maximum length of 160 characters, the SMS text is truncated to 160 characters and the rest of the text is sent in a second SMS message.

Texts for e.mails

With e-mails, the use of text tags for the subject and for the message text is different.

● **Different texts for subject and message text**

If you want to use different texts for the subject and the message text, and if this is supported by the configurations, you can create two text tags.

The use of different texts for subject and message text is supported in the following situations:

– Programming e-mails via program blocks (WBM page "Program" > "Send e-mail")

– The sending of e-mails with log files (WBM page "Operating mode" > "Logging")

● **Same texts for subject and message text**

For the following e-mails only one text tag can be used both for the subject and for the message text:

– Notifications about the operating time of a battery or changing over battery modules (WBM page "Operating mode" > "Power supply")

Configuration options:

If after a couple of words you insert a line break (<Enter>) and continue writing in the next line, this has the following effect:

– In the subject of the e-mail the line break is replaced by a blank:

– In the message text of the e-mail, the entire text, including the line break is transferred.

4.19 Program

4.19.1 Creating the user program using program blocks

Creating the program using program blocks

For the control tasks of the RTU, you will find prewritten program blocks that you can create and program here in the WBM in up to 8 networks.

For a description of the blocks, refer to the section Programming (Page 195).

4.20 Telecontrol

4.20.1 Overview

Overview

The Overview displays the most important parameters of communication with the partner and statistical data on the send buffer of the RTU.

Telecontrol status

The following information is shown:

- **Protocol type**

  Protocol used for the connection to the communications partner in the master station

- **Connection to the master station / to the master**

  Indicates whether or not a connection to the communications partner exists.

- **Connection exists to the master PLC**

  Only for ST7: Indicates whether or not a connection is established to the CPU of the master station TIM.

- **Address of the master station**

  Configured IP address or host name of the communications partner in the master station

- **Connected since (dd:hh:mm:ss)**

  Duration of the existing connection to the communications partner

Send buffer

Here, data on the memory occupation of the send buffer (frame memory) of the RTU is displayed.

The values of tags configured as an event are saved in the send buffer. You specify whether a tag is transferred as an event on the page. "TeleControl" > "Data points" with the "Type of transfer"

- **Send buffer - current level**

  Current fill level of the send buffer

- **Send buffer - average level**

  Average fill level of the send buffer over the last 16 communication cycles

  Data transferred by events is not taken into account here

- **Send buffer - highest level**

  Highest fill level of the send buffer reached since the last startup of the RTU.

- **Number of lost data frames**

  Number of data frames that due to connection disruptions or a full send buffer could not be sent since the last startup of the RTU.

- **Reset statistics**

  Resets all the counters on this page to zero.

4.20.2 TeleControl Basic

Here you configure the data of the communications partner of the RTU (telecontrol server) and the transfer settings for connection establishment.

Parameters

The following data needs to be configured:

- **Active**

  Enable the option to enable the communication between the RTU and its communications partner.

- **IP address or DNS name of the telecontrol server**

  IP address or host name of the communications partner in the master station

- **Interface**

  Selection of the interface for the telecontrol communication:

  – LAN

    If LAN or WAN (mobile wireless) is selected, the data is encrypted using the mechanism of the telecontrol protocol.

  – WAN

  – VPN

    If VPN is selected, the data is not encrypted using the mechanism of the telecontrol protocol but by VPN mechanisms.

    If after the VPN tunnel, the connection continues via routers and further links, make sure that the data is protected by suitable measures, e.g. by security modules SCALANCE S/M.

- **Port number**

  IPT listener port of TCSB

  Range of values: 1024 .. 65535

  With TCSB the port number 55097 is preset but can be changed.

- **Project number**

  Number of the TCSB project

  Range of values: 1 .. 2000

- **Station number**

    Number of the connection in TCSB

    Range of values: 1 .. 8000

    Range of values in TCSB: 1...8000 (throughout the entire TCSB system)

    With connections between different RTUs and TCSB, the station number within a project must be different for every RTU.

- **Telecontrol password**

    Password for authentication of the RTU with TCSB. Is configured in TCSB for every station.

    Rules: 8 .. 29 characters from the ASCII character set 0x20.. 0x7E

- **Allow HTTP/S access via TeleControl Basic**

    If the option is enabled this makes connection establishment possible from a PC to the Web server of the RTU via HTTP/S and the TeleControl Basic tunnel. The connection depends on the settings for HTTPS in "Security".

Transmission settings

A connection establishment for example via the mobile wireless network can take several seconds. This depends on the particular network, on the current network load and on any maintenance work of the network provider.

If the telecontrol server is unreachable, the RTU repeats its attempts to establish a connection to the telecontrol server.

- **Connection establishment delay**

  The parameter decides the intervals between attempts to establish the connection if the partner is unreachable. The parameter is set permanently to 10 seconds. This value counts as a basic value for the waiting time before the next connection establishment attempt.

  The number of connection establishment attempts depends on the parameter "Always remain connected" that is configured in the settings of the operating mode.

  – Parameter "Always remain connected" enabled

    Starting at the basic value of 10 seconds, the current waiting time is doubled after every 3 unsuccessful retries up to a maximum value of 900 s.

    This results in the following waiting times for connection establishment attempts:

    Three times 10 s

    Three times 20 s

    Three times 40 s

    Three times 80 s

    etc. up to max. 900 s

  – Parameter "Always remain connected" disabled

    If the option "Always ready to receive" is disabled, within a basic cycle a maximum of three connection establishment attempts with a fixed waiting time of 10 seconds are performed.

- **Send timeout**

  Time for the arrival of the acknowledgment from the communications partner (telecontrol server) after sending spontaneous data. The time is started after sending a spontaneous data frame. If no acknowledgement has been received from the partner when the connection monitoring time elapses, the data frame is repeated up to three times. After three unsuccessful attempts, the connection is terminated and re-established.

  The parameter is set permanently to 30 seconds.

- **Key exchange interval**

  This is the interval in hours after which the key is exchanged again between the RTU and the communications partner (TCSB). The key is a security function of the protocol "TeleControl Basic" used by the RTU and TCSB.

  The parameter is set permanently to 1 hour.

- **Discard events as long as the time of day is invalid.**

  If the option is enabled the values of data points configured as an event will be discarded until the time of day of the RTU is synchronized or set.

  This may be the case, for example, during startup of the RTU.

4.20.3　ST7

The transmission protocol MSCsec

When using the telecontrol protocol SINAUT ST7 the RTU always uses the secure transmission protocol "MSCsec". MSCsec supports authentication of the communications partners with a user name and password and data encryption. In addition to this, the shared automatically generated key is renewed between the communications partners at a configurable key exchange interval.

STEP 7 configuration of the communications partner

For communication with the partner a substitute must be configured for the RTU in the STEP 7 project that must be supplied with the required address data and with which a telecontrol connection needs to be created. As the substitute for the RTU configure a "CP 1243-8".

- STEP 7 V5.5

  You will find the proxy in the catalog in "SIMATIC 300 > SINAUT ST7 > TIM IE".

- STEP 7 Basic V14.0 + SP1

  You will find the CP 1243-8 in the catalog in "Controller" > "SIMATIC S7-1200" > "Communications Modules" > "Industrial Remote Communication" > "CP 1243-8 IRC"

The RTU (or the CP) has the network node type "MSC station" in the STEP 7 configuration.

The partner of the RTU (or CP) has the network node type "MSC master station".

Parameters

Here you configure the address data of the RTU, of the communications partner of the RTU and the transfer settings.

The following data needs to be configured:

- **Active**

  Enable the option to enable the communication between the RTU and its communications partner.

- **Interface**

  Selection of the interface for the telecontrol communication:

  - LAN
  - WAN
  - VPN

  The data is always encrypted by the mechanism of the "MSCsec" protocol.

- **IP address or URL of the master station TIM**

  IP address or URL of the communications partner (TIM)

- **MSC port of the TIM**

  MSC port of the master station TIM or of the router of the master station

  (can be configured in the master station: 1024 .. 65535; standard port: 26382)

- **Subscriber number master station TIM**

  Subscriber number of the communications partner (TIM)

- **Subscriber number master station CPU**

  Subscriber number of the CPU of the communications partner

- **Own subscriber number (RTU)**

  RTU's own subscriber number

- **Subscriber number of the CPU (RTU)**

  Even if the RTU doe not have a separate CPU, this information is required for the connection configuration on the partner. Enter the value of an as yet unused subscriber number.

- **User name**

  MSC user name for identification of the RTU by the MSC master station

  A different user name must be configured for each MSC station.

- **Password**

  MSC password for identification of the RTU by the MSC master station

  A different password must be configured for each MSC station.

Transmission settings

A connection establishment for example via the mobile wireless network can take several seconds. This depends on the particular network, on the current network load and on any maintenance work of the network provider.

If the telecontrol server is unreachable, the RTU repeats its attempts to establish a connection to the telecontrol server.

- **Key exchange interval**

  Interval in hours after which the key is exchanged again between the RTU and the communications partner. The key is a security function of the transmission protocol "MSCsec".

  The parameter has a default value of 1 hour.

- **Discard events as long as the time of day is invalid.**

  If the option is enabled the values of data points configured as an event will be discarded until the time of day of the RTU is synchronized or set.

  This may be the case, for example, during startup of the RTU.

4.20.4 DNP3

Parameters

Here you configure the data of the communications partner (master) and the transfer settings for connection establishment.

- **Active**

  Enable the option to enable the communication between the RTU and its communications partner.

- **IP address partner**

  IP address of the master

- **IP address of the redundant partner**

  - If you use a redundant master, here configure the IP address of the second device of the redundancy combination.

  - If you do not use a redundant master, here configure the IP address of the master.

- **Port number**

  Number of the listener port of the RTU

  Range of values: 1024 .. 65535

  Default: 20000:

- **Station address**

  Outstation number of the RTU

  Range of values: 0 .. 65519

- **Master station address**

  Station address of the master

  Range of values: 0 .. 65519

- **Interface**

  Selection of the interface for the telecontrol communication:

  - LAN

  - VPN

- **IP protocol**

  Selection of the transport protocol:

  – TCP/UDP

  Allows operation both with TCP and UDP.

  – Only UDP

- **Partner monitoring time (seconds)**

  If the RTU does not receive a sign of life from the master within the configured time, it interprets this as a disruption of the master. The RTU aborts the connection and attempts to re-establish it.

Save values acc. to event classes

- **Class 1 / Class 2 / Class 3**

  Here you specify how the values of data points assigned as an event of class 1, 2 or 3 are saved.

  The following options are available for each of the three classes:

  – All values chronological

  Every value change is saved chronologically in the send buffer.

  – Only current value

  Only the current value at the time the tag is read is saved in the send buffer and overwrites the last saved value there.

  You configure the data points as an event of a specific class on the WBM page Data points (Page 183).

Send buffer

- **Class 1 / Class 2 / Class 3**

  Here, for each of the three event classes you specify the maximum number of events that can be stored in the send buffer before they are sent to the communications partner.

  Range of values: 0 .. 255

  If you enter zero, the function is deactivated for the relevant class. As many events can be stored for the class as the overall size of the send buffer or a configured Delay time for events allows.

  Note the overall size of the send buffer, refer to the section Performance data (Page 32).

Delay time for events

- **Class 1 / Class 2 / Class 3**

  Here, for each of the three event classes you specify the maximum time the events can be stored in the send buffer before they are sent to the communications partner. Time in seconds.

  If you enter zero, the function is deactivated for the relevant class. As many events can be stored for the class as the overall size of the send buffer or a configured buffer for events allows.

If the value zero is set for the buffer for events and for the delay time for events, both functions are disabled and no events are transferred unsolicited.

Other parameters

- **DNP3 level**

  Specifies the DNP3 conformity level supported by the master (DNP3 Application Layer Protocol Level)

  – Level 2

  – Extended

  The RTU supports level 2 and other functions that go beyond DNP3 conformity level 2.

- **Max. time between Select and Operate**

  Max. duration (seconds) between Select and Operate. For a Select command to be transferred to the controller and to take effect, no other command may be sent to the station between Select and Operate.

  Permitted range: 1..65535.

  If the RTU receives two commands within the configured period, both commands are ignored.

- **Connection confirmation**

  Condition for the RTU to request a connection confirmation from the master (never, always, only with segmented data frames).

- **Frame repetitions**

  Number of frame repetitions at the Data Link Layer if no acknowledgement is received from the master. Permitted range: 0 ... 255

  If you enter 0 (zero), the function is disabled.

- **Connection monitoring time**

  Time (in seconds) within which an acknowledgement is expected from the master.

  Permitted range: 0 to 65535

  If you enter 0 (zero), the function is disabled.

- **Max. number of spontaneous frames**

  Maximum number of repetitions of spontaneous data frames if no acknowledgement is received from the communications partner .

  Permitted range: 0...255

- **Monitoring time for spontaneous frames**

  Time (in seconds) within which an acknowledgement of spontaneous data frames is expected from the master.

  Permitted range: 1...65535

- **Event transfer mode**

  Mode with which DNP events are transferred to the communications partner.

  – Block transfer

    Transfer of collected data per data point as a block.

  – Single transfer

    Chronological transfer of individual data frames

Discard events as long as the time of day is invalid.

If the option is enabled the values of data points configured as an event will be discarded until the time of day of the RTU is synchronized or set. This may be the case, for example, during startup of the RTU.

DNP3 SA

Here, you can enable and configure secure authentication according to the DNP3 specification.

- **Activate Secure Authentication**

  Enable the option if you want to use the secure authentication.

- **IKE mode**

  Selection of the mode for key exchange. Range of values:

  – Main Mode

    The Main Mode is the standard mode.

  – Aggressive Mode

    The Aggressive Mode is somewhat faster but transfers the identity unencrypted.

  Default setting: Aggressive Mode

- **SHA-1 interlock**

  Setting to select whether the RTU may use the secure hash algorithm SHA-1 if "SHA-256" was configured as the Secure hash algorithm and the master does not support SHA-256.

  Range of values:

  – SHA-1 not allowed

    The RTU may not use SHA-1. If the master does not support SHA-256, no connection will be established.

  – SHA-1 allowed

    The RTU can use SHA-1 if the master does not support SHA-256.

  Default setting: SHA-1 not allowed

- **Secure hash algorithm (SHA)**

  Selection of the Secure Hash Algorithm (SHA)

  Range of values:

  – SHA-1

  – SHA-256

  Default setting: SHA-256

- **Key wrap algorithm**

  Selection of the Advanced Encryption Standard (AES)

  Range of values:

  – AES-128

  – AES-256

  Default setting: AES-128

- **Key length**

  Specifies the length of the pre-shared key in bytes.

  The following lengths are pre-selected depending on the configured key wrap algorithm.

  – For AES-128: 16

  – For AES-256: 32

- **Max. number of statistics queries**

  If the configured number of statistics queries of the master is exceeded within the key exchange interval, the RTU enters a message in the diagnostics buffer.

  Range of values: 2...255 Default setting: 5

- **Authentication requests before key exchange**

  Maximum number of authentication requests of the RTU with the master. When this number is reached, the session key is renewed.

  Range of values: 1...10000 Default setting: 1000

  Recommendation: Set the number for the RTU twice as high as for the master.

- **Key exchange interval (min)**

  Period after which the key is exchanged again between the RTU and the master. The interval must be matched up on both communications partners.

  Range of values: 0...65535 min. at 0 (zero), the key is never changed (function disabled). Default setting: 15 min.

  Recommendation: Set the key exchange interval for the RTU twice as high as for the master.

- **Authentication timeout**

    Maximum waiting time for the response from the master to an authentication request of the RTU.

    Exceeding the waiting time is evaluated as an error by the RTU. In this case, the RTU generates a security event and sends this to the master.

    Range of values: 1... 65535 s Default setting: 5

- **Import pre-shared key**

    The pre-shared key can either be imported as a file or configured manually.

    The output box displays the name of the last imported key file.

    Import the pre-shared key from the file system of the configuration PC if the key was generated by the master or another system.

    Import the key into the RTU with the "Import" button.

- **Pre-shared key**

    Here you can configure the pre-shared key manually. Enter the pre-shared key as hexadecimal values.

    The pre-shared key of the RTU must be identical to the pre-shared key of the master.

4.20.5   IEC 60870-5-104

IEC 60870-5-104

Here you configure the data of the communications partner of the RTU (master) and the transfer settings for connection establishment.

Parameters

The following data needs to be configured:

- **Active**

    Enable the option to enable the communication between the RTU and its communications partner.

- **Interface**

    Selection of the interface for the telecontrol communication:

    – LAN

    – VPN

- **IP address partner**

    IP address of the master

    If you configure "0.0.0.0" the RTU accepts a master with any IP address.

- **IP address of the redundant partner**

  If a second master exists (optional): IP address of the second master

  If the address of the master is configured with 0.0.0.0, the address of the second master must also be configured with 0.0.0.0.

- **Port number**

  Number of the listener port of the RTU

  Range of values: 0 .. 65535

  Default: 2404:

- **Common ASDU address**

  Station address of the RTU

Transmission settings

Note

Settings on the master

When configuring the monitoring times t_1 and t_2 make sure that you make the corresponding settings on the master so that there are no unwanted error messages or connection aborts.

- t_1

  Message monitoring time:

  Monitoring time for the acknowledgement of data sent by the RTU by the master. The monitoring time applies to all data sent by the RTU in I, S and U format.

  If the partner does not send an acknowledgment during the monitoring time, the RTU terminates the connection to the partner.

  Permitted range: 1 .. 65535 s

  Default setting: 15 s

- t_2

  Monitoring time for S and U frames

  Monitoring time for the acknowledgment of data frames of the master by the RTU.

  After receiving data from the master, the RTU acknowledges the received data as follows:

  – If the RTU sends data to the master itself within t_2, it acknowledges the data received from the master during t_2 at the same time along with the sent data frame (I format).

  – The RTU sends an acknowledgment frame (S format) to the master of the latest when t_2 elapses.

  Permitted range: 0 .. 65535 s

  Default setting: 10 s

  If you enter 0 (zero), the function is deactivated.

  The value of t_2 must be less than that of t_1.

Note

Values for the frame monitoring time and monitoring time for S and U frames

With a high encryption depth of the VPN connection higher values for t_1 - t_2 (e.g. 60 s) may be necessary if the communication mode "Always remain connected" is configured.

- t_3

  Idle time for test frames

  Monitoring time during which the RTU has not received any data from the master. This parameter is intended for situations in which longer idle periods occur; in other words, times when there is no data traffic.

  When t_3 elapses, the RTU sends a test/control frame (U format) to the master and enters a message in its diagnostics buffer.

  Permitted range: 0 .. 65535 s

  Default setting: 30 s

  If you enter 0 (zero), the function is deactivated.

  The value of t_3 should be higher than that of t_1.

- w

  Maximum number of received data frames (I-APDUs), after which the oldest received data frame must be acknowledged.

  Permitted range: 1 .. 65535

  Default setting: 8

- k

  Maximum number of unacknowledged data frames (I-APDUs)

  If k is reached and t_1 has not yet elapsed, the RTU does not send any data until all sent data has been acknowledged by the master.

  When k is reached and t_1 has elapsed, the TCP connection is terminated.

  Permitted range: 1 .. 12

  Default setting: 12

- **Discard events as long as the time of day is invalid.**

  If the option is enabled the values of data points configured as an event will be discarded until the time of day of the RTU is synchronized or set.

  This may be the case, for example, during startup of the RTU.

Acknowledgment

Mechanism:

With each sent data frame, the RTU sends a continuous send sequence number. The data frame remains initially stored in the send buffer.

When it receives the data frame, the master sends the send sequence number from this or (if several data frames are received) the last data frame as an acknowledgement to the RTU. The RTU saves the send sequence number returned by the master as a receive sequence number and uses it as an acknowledgement.

Data frames whose send sequence number is equal to or lower than the current receive sequence number are evaluated as having been successfully transferred and are deleted from the send buffer of the RTU.

Recommendations of the specification:

w should not be higher than 2/3 of k.

Recommended value for k: 12

Recommended value for w: 8

4.20.6 Data points

In the table "Data points" all configured tags are shown as data points grouped according to tag types.

- **Data points for the read direction**

  - Digital inputs

    Apart from the configured process tags, here you will find two status tags for error messages (STATUS_ERROR) and for the operating status of the RTU (STATUS_RUN) that can be read by the communications partner.

  - Analog inputs

  - Counter inputs

    These are event counters (DI0 and/or DI1) and analog memory bits configured as counters.

    Here you will also find the status bit for the next communication cycle (NEXT_COM_CYCLE).

- **Data points for the write direction**

  For the values that the communications partner writes in the process direction, the following tag types are available:

  - Digital outputs

  - Aanalog memory bits configured as an analog value.

  Analog memory bits configured as counters cannot be written.

The data points of the protocols TeleControl Basic, ST7 and "IEC" can be used both in the read direction (in) and the write direction (out).

Processing of process data

Data points

When processing process data, the inputs and outputs are processed by the program and saved in the address areas input, output and bit memory of the RTU. The individual addresses are mapped and addressed as data points for the communication. The data points are processed one-to-one in the control system.

In the IEC protocol, the data point corresponds to an information object.

Below you will find a table with the data types of the addresses and the assigned data point types.

There are two classes of data points:

- Static data points

    The values of these data points are saved in the image memory of the RTU.

    A newly read in value of a tag overwrites the last value saved. The values are only transferred after being called up by the communications partner.

- Events

Saving and transferring the events

The values of events are saved in the send buffer (frame memory). Note the overall size of the send buffer, refer to the section Performance data (Page 32).

The send buffer works chronologically: The oldest data is sent first (FIFO principle) and deleted from the send buffer if the transfer was successful.

If data cannot be transferred for a longer period of time and the send buffer is threatening to overflow, the protocol-dependent response is as follows:

- Telecontrol Basic, ST7

    The forced image mode

    If the send buffer reaches a fill level of 80%, the RTU changes to the forced image mode. New values from data points are no longer additionally saved but rather they overwrite older existing values.

    When the connection to the communications partner returns, the module changes back to the send buffer mode as soon as the fill level of the send buffer has fallen below 50%.

- DNP3 / IEC

    If a send buffer fill level of 100% is reached, no further values are saved until the fill level falls below 100% again.

The saving of the values is triggered by configurable conditions, see the section "Trigger" below.

The transfer of the events to the communications partner can be triggered immediately (spontaneously) or after intermediate buffering. This is controlled by the "Transfer mode", see below.

Type of transmission

With this parameter you specify whether the values of the data point are configured as an event.

The following option is available with all protocols:

- **Only internal use**

    The values of the data point are not transferred to the communications partner.

The other options specify the event class of the data point. They differ depending on the protocol used.

TeleControl Basic / ST7

- **Transfer after call**

    The current value of the data point is saved in the image memory (process image) of the RTU. New values of a data point overwrite the last stored value.

    Only after being called up by the communications partner or at the configured times of the communication mode is the value current at this time transferred.

- **Event (only current value)**

    Only the current value is saved in the send buffer and overwrites the last value saved there.

- **Event (every value)**

    All values that differ from the last saved value are saved in chronological order in the send buffer.

DNP3

- **Class 0**

    Static data point (not an event)

- **Class 1 / Class 2 / Class 3**

    Configuration of the data point as an event of class 1, 2 or 3

The characteristics of classes 1, 2 and 3 are specified within the DNP3 system. The evaluation of the class of the data sent by the station is handled by the master.

IEC

- **Static**

    Static data point (not an event). The current value is only transferred after being called up by the partner.

- **Event (every value)**

    Each value change is saved in chronological order.

- **Event (only current value)**

    Only the current value at the time it was acquired is saved and overwrites the last value saved there.

Name and data point type

- **Name**

  Configured name of the tag

  After the tag name, there is an abbreviation for the tag type and the consecutive number of the tag added in brackets, for example (AI0) or (DQ3).

- **Data point name**

  Only with the "TeleControl Basic" protocol:

  The data point name is part of the addressing by the communications partner (addressing of the OPC items).

- **Data point type**

  – TeleControl Basic

    Type of the data point.

  – ST7

    Type of the data point (object). According to the two transmission directions, the names in send objects with the ending "_S" and in receive objects with the ending "_R". differ from each other.

  – DNP3

    Object class and variation

  – IEC

    Type identification

  You will find an overview table of the data point types further below.

Index

Use with TeleControl Basic, DNP3, IEC

Depending on the protocol used, the index has a different meaning.

The value has a default in the system, but can be changed. Doubly assigned indexes (addresses) and indexes outside the permitted range of values are signaled as errors during the consistency check and prevent saving.

For the configuration the following rules apply.

- **TeleControl Basic**

  The data point index serves as an internal classification criterion.

  Range of values: 0 .. 65535

  The indexes must be unique for every data point over all data points (digital inputs, digital outputs, analog inputs etc.).

- **DNP3**

    The data point index is used for addressing.

    Range of values: 0 .. 65534

    – A data point must have the same index in the station and in the master.

    – The indexes of two data points in different object groups can be identical.

    – Data point indexes must be unique within one of the following object groups:

        - Binary Input / Binary Input Event

        - Binary Output / Binary Command

        - Counter / Counter Event

        - Analog Input / Analog Input Event

        - Analog Output

- **IEC**

    The data point index is used for addressing. it corresponds to the Address of the information object of the specification.

    Range of values: 0 .. 16777215

    The indexes must be unique for every data point over all data points (digital inputs, digital outputs, analog inputs etc.).

Object number, Object channel, Partner object number, Bit no.

Use with ST7

The data to be transferred is configured with SINAUT objects.

- **Object number**

    The object number serves the unique addressing of the send and receive objects corresponding between the communications partners.

- **Object channel**

    The SINAUT objects process several process values of the same type.

    The object channels of the individual objects address the individual process values, e.g. the individual bits of a command byte.

- **Bit no.**

    With this parameter you address one of the eight command bits (0 .. 7) in the byte of the command objects "Bin08X_S" and "Bin08X_R".

- **Partner object number**

    Object number of the corresponding object on the communications partner

Trigger and Threshold

- **Trigger**

  The saving of the values of data points configured as an event can be triggered by the following conditions:

  – Change

  A change of the process value triggers saving.

  With digital data points, each change is handled as an event.

  With analog data points the change is triggered by a threshold value trigger ("Threshold").

  If the amount of the value change of an analog signal does not exceed the threshold, the value is not saved.

  – Cyclic

  The process value is saved in every update cycle of the RTU.

  Note the individual update cycle of each tag from the configuration of "Basic cycle" and "Reduction factor".

  – Both

  The process value is saved when one (or both) of the conditions named above is met.

- **Threshold**

  The threshold is the difference between the currently read value and the last saved value of a data point that is configured as an event. With the trigger option "Change" the current value is saved when the threshold value is reached.

  You can configure the threshold value as a percentage (%) or as an absolute value (abs.).

  If you make an entry in one of the two boxes (% or Abs.) the other box is shown with an underlying color. This serves as a request to check the entered or changed value. When you save, the underlying color is removed.

  – Threshold (%)

  Threshold value as a percentage of the measuring range

  Example:
  Analog input (AI) 4-20 mA
  Scaling; 4 mA = 200 m, 20 mA = 1000 m (measuring range = 800 m)
  2% of the measuring range = 16 m

  – Threshold (abs.)

  Threshold value as an absolute value

  With digital inputs and analog memory bits configured as counters, no threshold can be configured.

  With the usage meters (DI), the threshold can only be specified as an absolute value because the range of values is unknown..

Transmission mode

- **TeleControl Basic, ST7, IEC**

  The parameter serves to specify whether the values of a data point that is configured as an event are buffered until the next transfer or sent spontaneously (immediately) to the partner.

  The following options are available:

  – Spontaneous

  The values are transferred immediately. With cyclic communication if the condition is met, there is a direct change to the communication mode.

  – Buffered / conditional spontaneous

  The values are buffered and transferred to the partner only in the next communication cycle.

  If the communication of the RTU on the page "Operating mode > Operating modes" is configured with "Always" the values are buffered and transferred in the next communication cycle.

  With data points with the Type of transmission "Transfer after call" (TeleControl Basic / ST7) or "Static" (IEC) the boxes are grayed out because these values must not be sent spontaneously.

- **DNP3**

  With the DNP3 protocol a spontaneous transfer is configured by entering 0 (zero) on the "DNP3" page for the parameter "Send buffer", see section DNP3 (Page 175).

  Values of data points of class 0 are never sent spontaneously.

Signal types, data types and data point types of the RTU

Table 4- 7   Signal types, data types, data point types

Signal type	Data type (bit)	Supported data point types			
		TeleControl Basic	ST7 (Data points per object)	DNP3 Object group [variation] *	IEC <type identification>
Digital input	Bool (1)	Digital input 1 Bit		Binary Input 1 [1, **2**] Binary Input Event 2 [1, **2**, 3]	M_SP_TB_1 <30>
Digital input	Byte (8)		Cmd01B_S (1 x 8 Commands) Bin04B_S (4 x 1 Byte) Bin08X_S (8 x 1 Bit)		
Digital output	Bool (1)	Digital output 1 Bit		Binary Output 10 [1, 2] Binary Output Event 11 [1, 2] Binary Command 12 [1, 2, 3]	C_SC_NA_1 <45>

Signal type	Data type (bit)	Supported data point types			
		TeleControl Basic	ST7 (Data points per object)	DNP3 Object group [variation] *	IEC <type identification>
Digital output	Byte (8)		Cmd01B_R (1 x 8 Commands) Bin04B_R (4 x 1 Byte) Bin08X_R (8 x 1 Bit)		
Digital input (event counter)	Integer without sign (32)	Counter input 32 Bit Unsigned	Cnt01D_S (1 x 32 Bit) Cnt04D_S (4 x 32 Bit)	Counter 20 [**1**, 2] Frozen Counter 21 [1, 2, **5**, 6] Counter Event 22 [1, 2, **5**, 6] Frozen Counter Event 23 [1, 2, **5**, 6]	M_IT_TB_1 <37>
Digital input (usage meter)	Floating-point number with sign (32)	Analog input 32 Bit Float	Ana04W_S (4 x 16 Bit) Mean04W_S (4 x 16 Bit) Set01W_S (1 x 16 Bit) Ana04R_S (4 x 32 Bit)	Analog Input 30 [1, 2, **5**] Analog Input Event 32 [1, 2, 3, 4, 5, **7**]	M_ME_TF_1 <36>
Analog input	Floating-point number with sign (32)	Analog input 32 Bit Float	Ana04W_S (4 x 16 Bit) Mean04W_S (4 x 16 Bit) Set01W_S (1 x 16 Bit) Ana04R_S (4 x 32 Bit)	Analog Input 30 [1, 2, **5**] Analog Input Event 32 [1, 2, 3, 4, 5, **7**]	M_ME_NA_1 <9> M_ME_TF_1 <36>
Temperature (internal), Power supply (external), Battery					M_ME_TF_1 <36>
Analog input (counter)	Integer without sign (32)	Counter input 32 Bit Unsigned	Cnt01D_S (1 x 32 Bit) Cnt04D_S (4 x 32 Bit)	Counter Static 20 [**1**, 2] Frozen Counter 21 [1, 2, **5**, 6] Counter Event 22 [1, 2, **5**, 6] Frozen Counter Event 23 [1, 2, **5**, 6]	M_IT_TB_1 <37>
Analog input (analog memory bit)	Floating-point number with sign (32)	Analog input 32 Bit Float	Ana04W_S (4 x 16 Bit) Mean04W_S (4 x 16 Bit) Set01W_S (1 x 16 Bit) Ana04R_S (4 x 32 Bit)		M_ME_TF_1 <36>

Signal type	Data type (bit)	Supported data point types			
		TeleControl Basic	ST7 (Data points per object)	DNP3 Object group [variation] *	IEC <type identification>
Analog output (analog memory bit)	Floating-point number with sign (32)	Analog output 32 Bit Float	Ana04W_R (4 x 16 Bit)	Analog Output Status 40 [1, 2, 3]	C_SE_NC_1 <50>
			Set01W_R (1 x 16 Bit)	Analog Output 41 [1, 2, 3]	
			Ana04R_R (4 x 32 Bit)	Analog Output Event 42 [1, 2, 3, 4, 5, 7]	

* DNP3: The variations in bold print are the standard variations preferably used by the RTU.

4.20.7 Status IDs of the data points

Status IDs of data points

With the values of the data points, the RTU sends 1 byte with status IDs. The status IDs can be evaluated by the partner.

Below you will find tables with the status IDs of the three communications protocols.

The "meaning" (second row of the table) relates to the specified "bit status" (third row of the table).

Status IDs - TeleControl Basic

Table 4- 8   Byte assignment of the status byte for data points

Bit	7	6	5	4	3	2	1	0
Flag name	-	NON_ EXISTENT	SB Substituted	LOCAL_ FORCED	CY CARRY	OVER_ RANGE	RESTART	ONLINE
Meaning	-	Data point does not exist or S7 address unreacha-ble	Substitute value	Local oper-ator control	Counted value over-flow before reading the value	Analog value: Val-ue range exceeded	Value not updated after start	Value is invalid
Bit status	*not sup-ported (always 0)*	1	*not sup-ported (always 0)*	*not sup-ported (always 0)*	*not sup-ported (always 0)*	1	1	1

Status IDs - DNP3

The status IDs correspond to the following elements of the specification:

OBJECT FLAGS - DNP3 Specification, Volume 6, Data Object Library-Part 1

Table 4- 9   DNP3: Bit assignment of the status byte for DNP3 data points

Bit	7	6	5	4	3	2	1	0
Flag name	-	-	-	LOCAL_ FORCED	DISCONTI NUITY	OVER_ RANGE	RESTART	ONLINE
Meaning	-	-	-	Local oper-ator control	Counted value over-flow before reading the value	Value range ex-ceeded, analog value	Value not updated after start	Value is invalid
Bit status	*not sup-ported (always 0)*	*not sup-ported (always 0)*	*not sup-ported (always 0)*	*not sup-ported (always 0)*	*not sup-ported (always 0)*	1	1	1

Status IDs - IEC

The status IDs correspond to the following elements of the specification:

Quality descriptor - IEC 60870 Part 5-101

Table 4- 10   IEC: Bit assignment of the status byte for IEC data points

Bit	7	6	5	4	3	2	1	0
Flag name	-	-	SB substituted	-	CY carry	OV overflow	NT not topical	IV invalid
Meaning	-	-	Substitute value	-	Counted value-overflow before reading the value	Value - range ex-ceeded, analog value	Value not updated	Value is invalid
Bit status	*not sup-ported (always 0)*	*not sup-ported (always 0)*	*not sup-ported (always 0)*	*not sup-ported (always 0)*	*not sup-ported (always 0)*	1	1	0

4.20.8   Wake-up call / wake-up SMS

Waking the RTU from sleep mode

The RTU can be woken out of the sleep mode with a wake-up call from a mobile phone.

When using the communications protocol "TeleControl Basic", the RTU can also be woken by a wake-up SMS message that can be generated by TCSB. For other communications protocols the SINEMA Remote Connect server can also send a wake-up SMS message.

Requirements

The most important requirements for the wake up are:

- **Authorization of the phone number**

  The phone number of the mobile phone that calls or sends a wake-up SMS to the RTU must be configured, see section User (Page 133).

  The authorized numbers are configured in the WBM of the RTU for the individual users in the group. "Users / groups".

- **Readiness of the RTU to receive**

  To receive a wake-up SMS message promptly, you need to configure the operating modes of the RTU so that the RTU regularly books into the mobile wireless network to check whether SMS messages have been sent, see section Operating modes (Page 138).

  Receiving a wake-up call in sleep mode is only possible if the parameter "Turn on mobile wireless interface regularly and check for receipt of wake-up SMS message? in the "Sleep mode" parameter group has the setting "Check permanently".

Wake up

When woken the RTU changes to the communication mode and handles all associated tasks, for example including sending messages.

The RTU establishes a connection to the communications partner.

Texts for wake-up SMS messages

For wake-up SMS messages, you need to use the following text in the message:

- `TELESERVICE`

Texts for wake-up SMS messages with deadline specified

You can also add a specified deadline to a wake-up SMS message. At exactly the time you send with the SMS message, the RTU establishes a connection to its communications partner.

This time is shown in the WBM as the second (assigned) value of the display "Next communication mode (configured / assigned)".

Texts for messages with specified deadline:

- Texts with deadline specified

    – `TELESERVICE YYYY-MM-DD hh:mm:ss`

        or without specifying the seconds:

    – `TELESERVICE YYYY-MM-DD hh:mm`

        If the seconds are not specified, the RTU uses "00" for the seconds.

    If the time is specified without a time zone (time offset) the RTU uses its local time.

- Text with specified deadline when there is a time offset between the sender of the SMS message and the RTU

    If the mobile phone and the RTU are in different time zones, you need to add the time zone of your mobile phone according to UTC notation. The specification of the time zone of the mobile phone must include "+" or "-" and the two digit hours and minutes part.

    Permitted values for the UTC offset are "-12:00" to "+14:00" in minutes resolution.

    The RTU connects at the time specified in the SMS message plus/minus the time offset.

    Examples:

    – `TELESERVICE YYYY-MM-DD hh:mm:00+02:00`

        The mobile phone is located in central Europe (+ 1 h) in daylight saving time (+ 1 h). The time offset adds up to + 2 hours.

    – `TELESERVICE YYYY-MM-DD hh:mm:00-08:00`

        The mobile phone is located in Canada (- 8 h) without a switchover to daylight saving time.

Programming 5

5.1 Block overview

For the control tasks of the RTU you will find ready-made program blocks that you create and program in the "Program" entry in the WBM.

The following program blocks are available

- **Blocks for logical functions**
  - Logical AND (Page 200)
  - Logical OR (Page 201)
  - Exclusive OR (XOR) (Page 202)
  - Logical NOT (Page 203)
- **Blocks for basic types of calculation**
  - Addition (Page 203)
  - Subtraction (Page 204)
  - Multiplication (Page 205)
  - Division (Page 206)

  Blocks for time functions
  - On delay (Page 207)
  - Off delay (Page 208)
  - On / Off delay (Page 210)
  - Retentive on delay (Page 211)
  - Pulse generator (Page 213)
  - Random on/off delay (Page 213)
  - Year timer (Page 214)
  - Week timer (Page 217)
  - Astronomical clock (Page 218)
- **Blocks for analog value functions**
  - Triggered saving (Page 219)
  - Limit value switch (Page 220)
  - Difference limit switch (Page 222)
  - Analog value comparator (Page 224)
  - Analog value monitoring (Page 226)
  - Min. /Max. /Mean value (Page 227)
  - Analog value processing (Page 228)

- **Counter and summation blocks**
  - Counters (Page 230)
  - Elapsed time counter (Page 231)
  - Frequency calculation (Page 232)
  - Flow calculation (Page 233)
  - Flow totalizer (Page 235)
  - Flow calculation rectangular weir (Page 237)
  - Silo volume calculation (Page 239)
- **Blocks for messages**
  - Sending SMS messages (Page 241)
  - Send e-mail (Page 242)
  - FTP file transfer (Page 243)
- **Switch and relay blocks**
  - Latching relays (Page 245)
  - Current impulse relay (Page 247)
  - Wiping relay (Page 249)
  - Time relay (Page 251)

5.2 Programming the blocks

Programming the program blocks for the control tasks

Networks

For control tasks of the RTU you can create up to 8 networks for program blocks.

Every network is shown in a tab of the WBM. In the top line of the tab, you can assign a name to the network (max. 20 characters).

In the second line of the tab, you can enter a comment for this network (max. 64 characters).

When you open the WBM "Network 1" is already created.

Representation and programming the networks and blocks

The blocks are represented graphically.
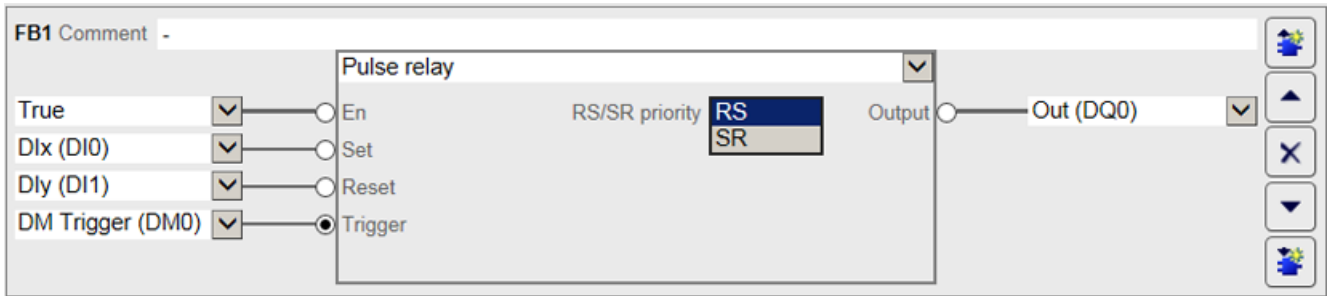
Figure 5-1   Representation of a program block, here with an inverted input parameter "Trigger"

After creating a program block, you can select the block type from the drop-down list of the block name (as shown: "Pulse relay").

At the top of the block, you can enter an optional comment for the block (max. 64 characters).

The input parameters on the left and the output parameters on the right are assigned using the drop-down lists from the previously configured tags of the RTU.

Function parameters in the middle of the block icon are programmed by entering with the keyboard or by selecting a value from a drop-down list. "RS/SR priority").

Buttons

	Creates a new network or deletes the select network.
	Creates a new program block above.
	Moves the selected program block up.
	Deletes the selected program block. If
	Moves the selected program block down.
	Creates a new program block below.
	Inverted input/output with contact symbol filled with black (here parameter "En")

Inverting inputs and outputs

You can invert the values of digital (binary) inputs and outputs by clicking on the round symbol at the input or output. The symbol is filled with black, see table.

Example:

- A non-inverted digital input is processed with the input signal 1.

- An inverted digital input is processed with the input signal 0.

In the block shown (see above), the input parameter "Trigger" is inverted.

Entry of decimal numbers

In all input boxes of parameters in which fractional decimal numbers can be entered, the decimal places are separated by a period.

5.3 Often used parameters

Enabling parameter "En"

Every program block contains the input parameter "En".

The processing (call) of the blocks is enabled via the input parameter "En". The possible values of the parameter have the following meaning:

- **True**

  Default setting when creating a new block

  With this setting, the enable is permanently activated. The block is processed in the configured update cycle.

- **False**

  With this setting, the enable is permanently deactivated. The block is not processed.

- **Digital input / digital output / digital memory bit**

  The block is called by the cyclic program if a 1 is present at the configured input.

  If the input is inverted, the block is called when there is a 0 at the input.

- **STATUS_ERROR**

  The block is only called by the cyclic program if a diagnostics message of the class "ERROR" or "FATAL" is generated.

Input parameter "Trigger"

Input parameters of the type "Trigger" start the relevant program block with the edge change $0 \rightarrow 1$. The input must be reset to 0 by the by the user program. In the inverted form, a trigger starts block processing with the edge change $1 \rightarrow 0$.

The possible values of the parameter have the following meaning:

- **True**

  With this setting, the trigger starts block processing only in the first cycle. The block is processed only once.

- **False**

  With this setting, the block is not processed.

- **STATUS_ERROR**

  The block is only called on an edge change, this means if a diagnostics message of the class "ERROR" or "FATAL" is generated.

Input parameter "Reset"

The input parameter resets a digital input and and resets the output of the block to zero or the start value.

With the exception of the latching relay the input parameter "Reset" is optional.

The possible values of the parameter have the following meaning:

- **True**

  With this setting the other inputs are ignored. The block is not processed.

- **False**

  The block is processed in every cycle.

- **STATUS_ERROR**

  The block is only called on an edge change, this means if a diagnostics message of the class "ERROR" or "FATAL" is generated.

Output parameter "Error"

The output parameter "Error" is set in the following situations:

- In an analog value block, the value is outside the range of values.

  This occurs when the value calculated by the block is outside the permitted range of values of the tag type of the output.

- A message generated by a block cannot be saved because the maximum number of messages to be saved has been reached (transfer buffer full).

When the output parameter "Error" is set, other output parameters are not updated but retain the last values before the error occurred.

Recurring settings of parameters

With most program blocks there are default settings of the input and output parameters that are explained here.

Settings of input parameters

Many blocks have recurring parameters which will be described in advance here. The settings described below mainly involve parameters for digital tags (except "En").

- *- empty (no entry) -*

  Default for required inputs of a block

  If the input is not configured, the configuration cannot be adopted.

- **Unused**

  Default for optional parameters of a newly created block

  Inputs with the setting "Unused" are not evaluated.

  If all inputs of a block use this setting, the block will not be processed (e.g. "Logical OR").

- **True**

  With this setting, the value 1 is always used for block processing.

- **False**

  With this setting, the value 0 is always used for block processing.

- **STATUS_ERROR**

  The input is only evaluated in block processing when a diagnostics message of the class "ERROR" or "FATAL" is generated.

  When the cause of the error has been eliminated, the value of the input is reset to zero.

Settings of output parameters

- *- empty (no entry) -*

  Default for required outputs of a block

  If the output is not configured, no value is output during block processing.

- **Unused**

  Default for optional or alternative outputs of a block

  If the output is not configured, the configuration cannot be adopted.

5.4 Blocks for logical functions

5.4.1 Logical AND

Function

At least two inputs must be activated so that the block is processed.

The output of the block is set to 1, when all configured inputs are set to 1 at the same time.

If one or more activated inputs is set to 0, the output is set to 0.

Circuit diagram with several NO contacts in series
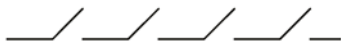
Inputs that are not activated count as closed NO contacts.

Parameters

Parameters	Range of values	Description
Input parameters		
En		Enable parameter, see section Often used parameters (Page 198).
Input 1 ... Input 4	• Digital input / output / bit memory • True / False • STATUS_ERROR	The values of the inputs are processed by the block function.
Output parameters		
Output	• Digital output / bit memory	Tag in which the value calculated by the block is output.

5.4.2 Logical OR

Function

At least one input must be activated so that the block is processed.

The output of the block is set to 1, when at least one configured input is set to 1.

If no input is set to 1, the output is set to 0.

Circuit diagram with several NO contacts in parallel
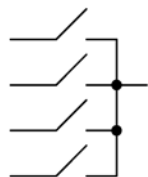
Inputs that are not activated count as open NO contacts.

Parameters

Parameters	Range of values	Description
Input parameters		
En		Enable parameter, see section Often used parameters (Page 198).
Input 1 ... Input 4	• Digital input / output / bit memory • True / False • STATUS_ERROR	The values of the inputs are processed by the block function.
Output parameters		
Output	• Digital output / bit memory	Tag in which the value calculated by the block is output.

5.4.3   Exclusive OR (XOR)

Function

The output of the block is set to 1 when the two inputs have different values; in other words, when precisely one of the two inputs is set to 1.

If both inputs have the same value (0 or 1), the output is set to 0.

Parameters

Parameters	Range of values	Description
Input parameters		
En		Enable parameter, see section Often used parameters (Page 198).
Input 1 ... Input 2	• Digital input / output / bit memory • True / False • STATUS_ERROR	The values of the inputs are processed by the block function.
Output parameters		
Output	• Digital output / bit memory	Tag in which the value calculated by the block is output.

5.4.4 Logical NOT

Function

Inverter: The block inverts the input signal.

If the input is set to 0, the output of the block is set to 1.

If the input is set to 1, the output of the block is set to 0.

Parameters

Parameters	Range of values	Description
Input parameters		
En		Enable parameter, see section Often used parameters (Page 198).
Input	• Digital input / output / bit memory • True / False • STATUS_ERROR	The value of the input is processed by the block function.
Output parameters		
Output	• Digital output / bit memory	Tag in which the value calculated by the block (the inverted value of the input) is output.

5.5 Blocks for basic types of calculation

5.5.1 Addition

Function

The block adds the values of up to four analog inputs. The sum is written to the output.

Parameters

Parameters	Tag type / range of values	Description
Input parameters		
En		Enable parameter, see section Often used parameters (Page 198).
Input 1 .. Input 4	Analog input / bit memory	The values of the activated inputs are used for the addition.
	Event counter / usage meter	Inputs with the setting "Input unused" are not evaluated.
Output parameters		
Sum	Analog memory bit • Configured as a floating-point number: 3.402823 e-38 .. 3.402823 e+38 • Configured as a counter: 0 .. 4294967295	Tag in which the calculated sum is output.
Error	Digital output / bit memory	Error display: • 0: Block processing completed without errors • 1: Block processing aborted with an error For the meaning, see Often used parameters (Page 198).

5.5.2 Subtraction

Function

The block subtracts the values of one to three inputs (Input 2 + Input 3 + Input 4) from the value of the input "Input 1". The difference is written to the output.

Parameters

Parameters	Tag type / range of values	Description
Input parameters		
En		Enable parameter, see section Often used parameters (Page 198).

Parameters	Tag type / range of values	Description
Input 1	Analog input / bit memory Event counter / usage meter	Minuend. The values of the inputs 2 ..4 are subtracted from this input.
Input 2 .. Input 4	Analog input / bit memory Event counter / usage meter	Subtrahends The sum of the values of the activated inputs 2 to 4 is subtracted from the value of Input 1. Inputs with the setting "Input unused" are not evaluated.
Output parameters		

Difference	Analog memory bit
	
	• Configured as a floating-point number:
	
	  3.402823 e-38 .. 3.402823 e+38
	
	• Configured as a counter:
	
	  0 .. 4294967295
		Tag in which the calculated difference is output.

Error	Digital output / bit memory	Error display: • 0: Block processing completed without errors • 1: Block processing aborted with an error For the meaning, see Often used parameters (Page 198).

5.5.3 Multiplication

Function

The block multiplies the values of up to four analog inputs. The product is written to the output.

Parameters

Parameters	Tag type / range of values	Description
Input parameters		
En		Enable parameter, see section Often used parameters (Page 198).
Input 1 .. Input 4	Analog input / bit memory Event counter / usage meter	The values of the activated inputs are used for the multiplication. Inputs with the setting "Input unused" are not evaluated.

Parameters	Tag type / range of values	Description
Output parameters		
Product	Analog memory bit • Configured as a floating-point number: 3.402823 e-38 .. 3.402823 e+38 • Configured as a counter: 0 .. 4294967295	Tag in which the calculated product is output.
Error	Digital output / bit memory	Error display: • 0: Block processing completed without errors • 1: Block processing aborted with an error For the meaning, see Often used parameters (Page 198).

5.5.4 Division

Function

The block divides the value of the input "Dividend" by the value of the input "Divisor". The quotient is written to the output.

Parameters

Parameters	Tag type / range of values	Description
Input parameters		
En		Enable parameter, see section Often used parameters (Page 198).
Dividend	Analog input / bit memory Event counter / usage meter	The value of the input is is used as a dividend.
Divisor	Analog input / bit memory Event counter / usage meter	The value of the input is is used as a divisor. The value 0 is not permitted.

Parameters	Tag type / range of values	Description
Output parameters		
Quotient	Analog memory bit • Configured as a floating-point number: 3.402823 e-38 .. 3.402823 e+38 • Configured as a counter: 0 .. 4294967295	Tag in which the calculated quotient is output.
Error	Digital output / bit memory	Error display: • 0: Block processing completed without errors • 1: Block processing aborted with an error For the meaning, see Often used parameters (Page 198).

5.6 Blocks for time functions

> **Note**
> **Higher energy consumption due to additional update cycles**
>
> Time functions can generate additional update cycles to update the outputs of the function. Additional update cycles can significantly increase power consumption.

5.6.1 On delay

Function

When there is an edge change 0 → 1 at the "Trigger" input, the configurable time of the On delay is started. After the On delay has elapsed, the output is set to 1.

If "Trigger" changes back to 0 before the On delay has elapsed, the On delay is stopped and the output remains set to 0.

If "Trigger" is reset to 0 before the On delay (Q = 1) has elapsed, the output (Q) is reset to 0.

Tr   Trigger

Ton   On delay

Q   Output
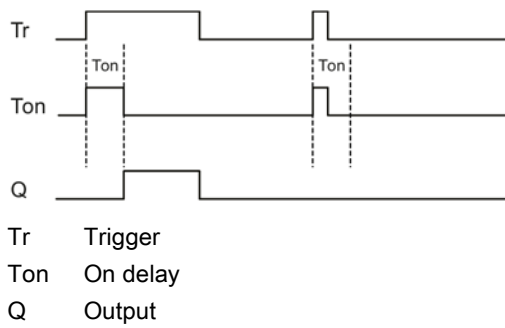
Figure 5-2   Circuit diagram of a block. "On delay"

Parameters

Parameters	Range of values	Description
Input parameters		
En		Enable parameter, see section Often used parameters (Page 198).
Trigger	- True / False - Digital input / output / bit memory - STATUS_ERROR	When there is an edge change 0 → 1 the On delay is started. When there is an edge change 1 → 0 the output is reset to 0. With the setting "True" the trigger is always active. With the setting "False" the block is never processed.
Function parameters		
On delay (ms)	100 .. 999999999	Delay in milliseconds
Output parameters		
Output	Digital output / bit memory	Tag in which the value calculated by the block is output.

5.6.2 Off delay

Function

When there is an edge change 0 → 1 at the "Trigger" input, the output is set to 1 and the configurable time of the Off delay is started. While the delay time is running the output remains set to 1. The output is only set to 0 again after the delay time has elapsed.

When there is an edge change 0 → 1 at the input "Reset" the Off delay and the output are reset to 0.

Tr   Trigger

Toff   Off delay

R   Reset

Q   Output
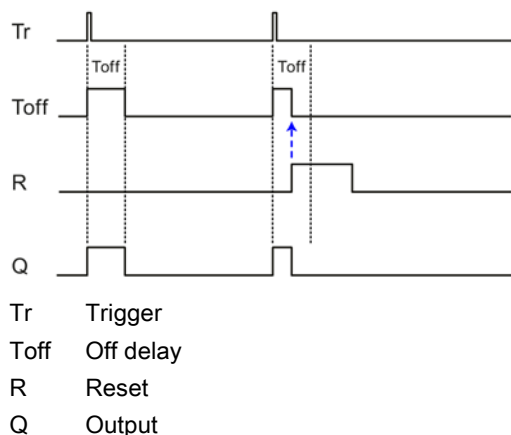
Figure 5-3   Circuit diagram of a block. "Off delay"

Parameters

Parameters	Range of values	Description
Input parameters		
En		Enable parameter, see section Often used parameters (Page 198).
Trigger	• True / False • Digital input / output / bit memory • STATUS_ERROR	When there is an edge change 0 → 1 the Off delay is started. After the Off delay has elapsed, the output is set to 0. With the setting "True" the trigger is always active. With the setting "False" the block is never processed.
Reset	• True / False • Digital input / output / bit memory • STATUS_ERROR	When there is an edge change 0 → 1 Off delay is stopped and the output is set to 0. As long as "Reset" is set to 1, the value of "Trigger" is ignored. When there is an edge change 1 → 0 the block can be processed again. With the setting "True" the input is always active and the block is actually turned off . With the setting "False" the Off delay is never reset.
Function parameters		
Off delay (ms)	100 .. 999999999	Delay in milliseconds
Output parameters		
Output	• Digital output / bit memory	Tag in which the value calculated by the block is output.

5.6.3 On / Off delay

Function

When there is an edge change 0 → 1 at the "Trigger" input, the configurable time of the On delay is started. After the On delay has elapsed, the output is set to 1. If "Trigger" changes back to 0 before the On delay has elapsed, the delay time is stopped and the output remains set to 0.

When there is an edge change 1 → 0 at the "Trigger" input, the configurable time of the Off delay is started. After the Off delay has elapsed, the output is set to 0. If "Trigger" changes back to 1 before the Off delay has elapsed, the output is set to 0. At the same time the running of the On delay is restarted and the Off delay is stopped.

When there is an edge change 0 → 1 at the input "Reset" the On / Off delay is suppressed and the output remains set to 0.
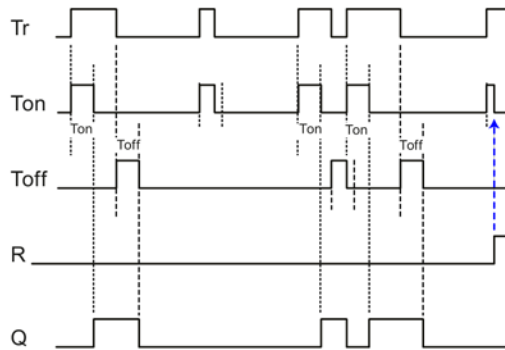
Tr	Trigger
Ton	On delay
Toff	Off delay
R	Reset
Q	Output

Figure 5-4   Circuit diagram of a block. "On / Off delay"

Parameters

Parameters	Range of values	Description
Input parameters		
En		Enable parameter, see section Often used parameters (Page 198).
Trigger	• True / False • Digital input / output / bit memory • STATUS_ERROR	When there is an edge change 0 → 1 the On delay is started. When there is an edge change 1 → 0 the Off delay is started. With the setting "True" the trigger is always active. With the setting "False" the block is never processed.

Parameters	Range of values	Description
Reset	• True / False • Digital input / output / bit memory • STATUS_ERROR	When there is an edge change 0 → 1 the On / Off delay is stopped and the output is set to 0. As long as the input is set to 0, the value of "Trigger" is ignored. When there is an edge change 1 → 0 the block can be processed again. With the setting "True" an edge change 0 → 1 at "Trigger" is permanently ignored. The "Off delay " function is therefore also turned off. With the setting "False" the input is never active.
Function parameters		
On delay (ms)	100 .. 999999999	On delay in milliseconds After the On delay has elapsed, the output is set to 1.
Off delay (ms)	100 .. 999999999	Off delay in milliseconds After the Off delay has elapsed, the output is set to 0.
Output parameters		
Output	• Digital output / bit memory	Tag in which the value calculated by the block is output.

5.6.4 Retentive on delay

Function

When there is an edge change 0 → 1 at the "Trigger" input, the configurable time of the On delay is started. After the delay time has elapsed, the output is set to 1.

With this program block, if "Trigger" changes back to 0 before the delay time has elapsed, the On delay is not stopped.

When there is an edge change 0 → 1 at the "Reset" input during the On delay, the On delay is stopped and the output remains set to 0.

When there is an edge change 0 → 1 at the "Reset" input after the On delay has elapsed the output is reset to 0.

Tr   Trigger

Ton   On delay

R   Reset

Q   Output
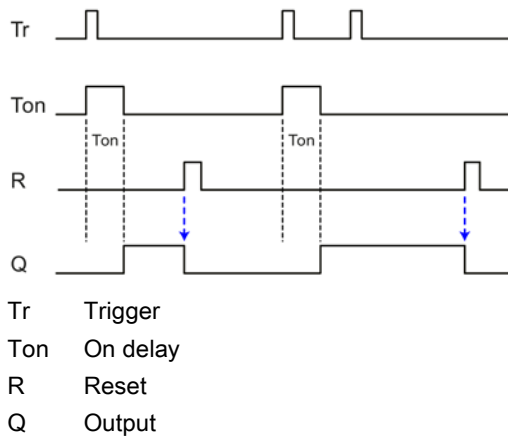
Figure 5-5   Circuit diagram of a block. "Retentive on delay"

Parameters

Parameters	Range of values	Description
Input parameters		
En		Enable parameter, see section Often used parameters (Page 198).
Trigger	• True / False • Digital input / output / bit memory • STATUS_ERROR	When there is an edge change 0 → 1 the time of On delay is started. With the setting "True" the trigger is always active. With the setting "False" the block is never processed.
Reset	• True / False • Digital input / output / bit memory • STATUS_ERROR	When there is an edge change 0 → 1 at the "Reset" input after the On delay (= 1) has elapsed the output is reset to 0. With the setting "True" the input is always active and the output is set to 0 immediately. The function is therefore actually turned off. With the setting "False" the input is never active.
Function parameters		
On delay (ms)	100 .. 999999999	On delay in milliseconds After the time of the On delay has elapsed, the output is set to 1.
Output parameters		
Output	• Digital output / bit memory	Tag in which the value calculated by the block is output.

5.6.5 Pulse generator

Function

A regularly clocked pulse is output at the output. The cycle length is specified for the duration of the 0 and 1 signal using the function parameters.

Parameters

Parameters	Range of values	Description
Input parameters		
En		Enable parameter, see section Often used parameters (Page 198).
Function parameters		
Pulse duration (ms)	500 .. 999999999	Time (milliseconds) in the clock cycle during which the output = 1.
Interpulse period (ms)	500 .. 999999999	Time (milliseconds) in the clock cycle during which the output = 0.
Output parameters		
Output	• Digital output / bit memory	Tag in which the pulses generated by the block are output.

5.6.6 Random on/off delay

Function

When there is an edge change 0 → 1 at the "Trigger" input, the random time of the On delay is started (within the configured limits). After the On delay has elapsed, the output is set to 1. If "Trigger" changes back to 0 before the On delay has elapsed, the delay time is stopped and the output remains set to 0.

When there is an edge change 1 → 0 at the "Trigger" input, the random time of the Off delay is started (within the configured limits). After the Off delay has elapsed, the output is set to 0. If "Trigger" changes back to 1 before the Off delay has elapsed, the output is set to 0. At the same time the running of the On delay is restarted and the Off delay is stopped.

When there is an edge change 0 → 1 at the input "Reset" the On delay is suppressed and the output remains set to 0.

For the diagram, refer to On / Off delay.

Parameters

Parameters	Range of values	Description
Input parameters		
En		Enable parameter, see section Often used parameters (Page 198).
Trigger	• True / False • Digital input / output / bit memory • STATUS_ERROR	When there is an edge change 0 → 1 the On delay is started. When there is an edge change 1 → 0 the Off delay is started. With the setting "True" the trigger is always active. With the setting "False" the block is never processed.
Reset	• True / False • Digital input / output / bit memory • STATUS_ERROR	When there is an edge change 0 → 1 On delay is stopped and the output is set to 0. As long as the input is set to 0, the value of "Trigger" is ignored. When there is an edge change 1 → 0 the block can be processed again. With the setting "True" an edge change 0 → 1 at "Trigger" is permanently ignored. The "Off delay " function is therefore also turned off. With the setting "False" the input is never active.
Function parameters		
On delay (ms)	100 .. 999999999	Minimum time in the clock cycle during which the output = 1.
On delay max. (ms)	100 .. 999999999	Maximum time in the clock cycle during which the output = 1.
Off delay min (ms)	100 .. 999999999	Minimum time in the clock cycle during which the output = 0.
Off delay max. (ms)	100 .. 999999999	Maximum time in the clock cycle during which the output = 0.
Output parameters		
Output	• Digital output / bit memory	Tag in which the pulses generated by the block are output.

5.6.7 Year timer

Requirement

Requirement for a precise calculation is the time-of-day synchronization of the RTU.

Function

Year timer

For the year timer a time per calendar year and/or per month can be specified in the function parameters during which the output is set to 1.

The turn on and off times are entered in the format "yyyy-mm-dd hh:mm:ss". Dates can be entered in the range from January 2000 to December 2099.

By selecting the "Yearly" and "Monthly" check boxes, you specify whether the programmed times are evaluated yearly or monthly.

If you select the "Pulse" option, at the turn on time only a single pulse with the length of an update cycle is set at the output instead of being permanently ON.

Switching variants from the function parameters "Yearly", "Monthly" and "Pulse"

The options for activating the function parameters result in the following switching variants. Four typical switching variants are explained below based on examples.

- Example 1

  - Date/time ON: 2015-06-15 12:00:00

  - Date/time OFF: 2017-08-31 12:00:00

  - "Yearly" disabled

  - "Monthly" disabled

  - "Pulse" disabled

  Since the options "Yearly" and "Monthly" are both disabled, the settings produce a single time during which the output is set to 1 . The time begins on June 15 2015 and ends on August 31 2017.
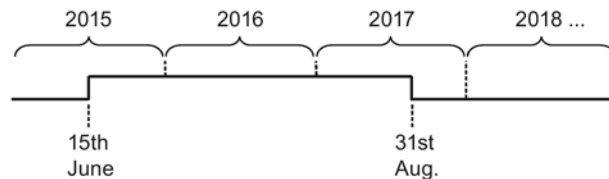
- Example 2

  - Date/time ON: 2015-03-15 12:00:00

  - Date/time OFF: 2018-08-31 12:00:00

  - "Yearly" disabled

  - "Monthly" disabled

  - "Pulse" enabled

  Since the options "Yearly" and "Monthly" are both disabled, the settings produce a single pulse on March 15, 2015..
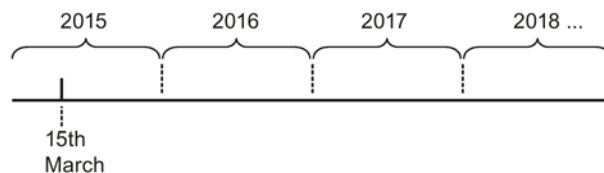
- **Example 3**
  - Date/time ON: 2015-05-15 12:00:00
  - Date/time OFF: 2099-08-31 12:00:00
  - "Yearly" enabled
  - "Monthly" disabled
  - "Pulse" disabled

  The settings result in yearly time periods during which the output is set to 1.
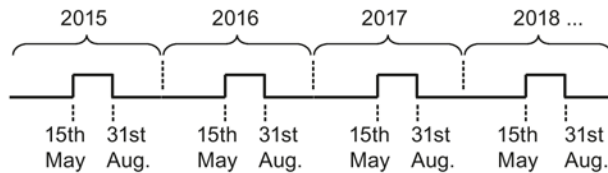
- **Example 4**
  - Date/time ON: 2015-08-15 00:00:00
  - Date/time OFF: 2099-12-15 00:00:00
  - "Yearly" enabled
  - "Monthly" enabled
  - "Pulse" enabled

  The settings result in continuous monthly pulses on the 15th of the month at the time 00:00.

Parameters

Parameters	Range of values	Description
Input parameters		
En		Enable parameter, see section Often used parameters (Page 198).
Function parameters		
Date/time ON	[yyyy-mm-dd hh:mm:ss]	Turn on time
Date/time OFF	[yyyy-mm-dd hh:mm:ss]	Turn off time
Pulse	ON / OFF	The enabled option only sets pulses at the output instead of permanently ON.
Yearly	ON / OFF	Repeats the switching points annually.
Monthly	ON / OFF	Repeats the switching points monthly.
Output parameters		
Output	• Digital output / bit memory	Tag in which the value calculated by the block is output.

5.6.8 Week timer

Requirement

Requirement for a precise calculation is the time-of-day synchronization of the RTU.

Function

For the week time, three times (cams) can be specified per week using the function parameters during which the output is set to 1.

If you select the "Pulse" option, at the turn on time only a single pulse with the length of an update cycle is set at the output instead of being permanently ON. When the "Pulse" option is selected, the behavior applies to all three cams.

The switching status of the week timer depends on the status of all three cams.

The three cams can overlap in time. If on and off times overlap, this will cause a conflict. In this case, the earliest on and off times have priority. Example:

Table 5- 1   Example of overlapping cams

Cam	On time	Off time
1	1:00 h	2:00 h
2	1:10 h	1:50 h
3	1:20 h	1:40 h

In this example the working time is 1:00 h to 1:40 h.

Parameters

Parameters	Range of values	Description
Input parameters		
En		Enable parameter, see section Often used parameters (Page 198).
Function parameters		
M T W T F S S	ON / OFF	Check box for specifying the weekdays (three periods of time)
		Select the active weekdays by clicking on the day check box.
ON1 .. ON3	[hh:mm]	Input boxes for three turn on times
OFF1 .. OFF3		Input boxes for three turn off times
Pulse	ON / OFF	The enabled option only sets pulses at the output instead of permanently ON.
Output parameters		
Output	• Digital output / bit memory	Tag in which the value calculated by the block is output.

5.6.9 Astronomical clock

Requirement

Requirement for a precise calculation is the time-of-day synchronization of the RTU.

Function

With this function, the output is set to 1, when the system time of the RTU is between the time of sunrise and sunset.

The RTU calculates these times based on its current system time (including daylight saving/standard time) and its geographical position.

If you select "System location" for "Position", the RTU uses the geographical position configured on the "System" page in the WBM. With the setting "Manual" you can set position values for the block.

Parameters

Parameters	Range of values	Description
Input parameters		
En		Enable parameter, see section Often used parameters (Page 198).
Function parameters		
Position	• System location • Manual	Option for setting the geographic coordinates: • Manual: Specification by entering the coordinates in the input fields for "Latitude" nd "Longitude". • System location: Use of the coordinates configured for the RTU.
Latitude	-90 .. 0 .. +90	Latitude Enter the value for the latitude if you have selected the setting "Manual" for the "Position". Entry only as a number: Degrees with 4 decimal places North = positive, south = negative
Longitude	-180 .. 0 .. +180	Longitude Enter the value for the longitude if you have selected the setting "Manual" for the "Position". Entry only as a number: Degrees with 4 decimal places East = positive, west = negative
Output parameters		
Output	• Digital output / bit memory	Tag in which the value calculated by the block is output. Switching: • At sunrise: 1 • At sunset: 0

5.7 Blocks for analog value functions

5.7.1 Triggered saving

Function

The block saves the current value of an analog input when a programmable event (Trigger) occurs. With an edge change 0 → 1 of "Trigger" the value of the input is written to the output.

The "Reset" input resets the output to 0. As long as "Reset" is set to 1, the "Trigger" input is ignored.

Parameters

Parameters	Tag type / range of values	Description
Input parameters		
En		Enable parameter, see section Often used parameters (Page 198).
Trigger	True / False Digital input / output / bit memory STATUS_ERROR	With an edge change 0 → 1 block processing is started and the value of "Input" is saved in the "Output". With the setting "True" an edge change 0 → 1 of the trigger is evaluated in the first update cycle. The block is processed only once. With the setting "False" the block is never processed.
Reset	True / False Digital input / output / bit memory STATUS_ERROR	When there is an edge change 0 → 1 the output is reset to 0. With the setting "TRUE" the function is actually turned off. With the setting "False" the output is never reset.
Input	Analog input / bit memory Event counter / usage meter	The current value of the input parameter is processed by the block as described above.

Parameters	Tag type / range of values	Description
Output parameters		
Output	Analog memory bit • Configured as a floating-point number: ±3.402823 e-38 .. ±3.402823 e+38 • Configured as a counter: 0 .. 4294967295	Tag in which the value calculated by the block is output.
Error	Digital output / bit memory	Error display: • 0: Block processing completed without errors • 1: Block processing aborted with an error For the meaning, see Often used parameters (Page 198).

5.7.2 Limit value switch

Function

An analog input is monitored for two values and a digital output signal is set that depends on the function of the block.

From the arrangement of the two function parameters "Limit value 1" and "Limit value 2" the function provides:

• **Limit value with hysteresis**

Limit value 1 > Limit value 2

The limit value is given a hysteresis for example to control a pump.

Two applications are possible:

– **Limit value** ^{high} **with negative hysteresis**

When the input signal exceeds "Limit value 1" the output is set to 1.

When the input signal falls below "Limit value 2" the output is set to 0.

Figure 5-6   Operating diagram of an example of limit value ^{high} with negative hysteresis

    – **Limit value low with positive hysteresis**

      You can monitor the input signal for a limit value low with positive hysteresis if you invert the input signal (x) using the black contact symbol (1/x).

      For information on inverting, see section Programming the blocks (Page 196).

● **Window (range monitoring)**

    Limit value 1" < Input signal < "Limit value 2

    A range of the analog value (window) between "Limit value 1" and "Limit value 2" is monitored.

    – **Output = 1, when input signal is within the window.**
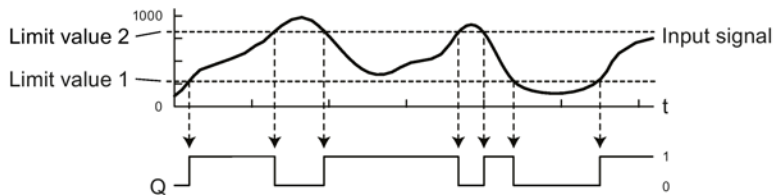
Figure 5-7   Operating diagram of an example of the window function

    – **Output = 0, when input signal is within the window.**

      For this functionality you need to invert the "Output" using the black contact symbol.

Parameters

Parameters	Tag type / range of values	Description
Input parameters		
En		Enable parameter, see section Often used parameters (Page 198).
Input	Analog input / bit memory Event counter / usage meter	The value of the input is monitored by the block with the two functions described above.
Function parameters		
Limit value 1	3.402823 e-38 .. 3.402823 e+38 Max. 19 characters, display of max. 4 decimal places.	Limit value 1 (absolute value)
Limit value 2	3.402823 e-38 .. 3.402823 e+38 Max. 19 characters, display of max. 4 decimal places.	Limit value 2 (absolute value)

Parameters	Tag type / range of values	Description
Output parameters		
Output	Digital output / bit memory	Tag in which the value calculated by the block is output.
Error	Digital output / bit memory	Error display: • 0: Block processing completed without errors • 1: Block processing aborted with an error For the meaning, see Often used parameters (Page 198).

5.7.3 Difference limit switch

Function

An analog input is monitored for two values and a digital output signal is set that depends on the function of the block.

Functions of the block:

- **Limit value with hysteresis**
- **Window (range monitoring)**

The function results from the position of the threshold value decided by the programming of the "Function" parameter.

The functions of this block correspond to those of the block "Limit value switch". With Difference limit switch the position of the monitored values relative to each other is specified, while with Limit value switch the position is absolute.

Calculation of the threshold value

The threshold value is calculated with the three function parameters:

- "Limit value"
    - Is the first of the values of the input signal to be monitored.
    - Is the basis for calculating the threshold value.
- "Function"

    Decides the position of the threshold value compared with the limit value:
    - Positive: Threshold value > Limit value
    - Negative: Threshold value < Limit value

    The position of the threshold value decides the function of the block, see below.
- "Amount of difference"

    Decides the amount of the threshold value compared with the limit value.

The absolute value of the threshold value is calculated as follows:

● "Limit value" + "Amount of difference" ("function" = positive)

   or

● "Limit value" - "Amount of difference" ("function" = negative)

Block functions

The two functions of the block depend on the position of the threshold value compared with the Limit value:

● **Window (range monitoring)**

   "Function" = "+ (window)"

   Limit value < Input signal < Threshold value

   A range of the analog value (window) between limit value and threshold value is monitored.

   Two applications are possible:

   – **Output = 1, when input signal is within the window.**

      For the operating diagram see Limit value switch.

   – **Output = 0, when input signal is outside the window.**

      For this functionality you need to invert the "Output" using the black contact symbol.

● **Limit value with hysteresis**

   "Function" = "+ (hysteresis)"

   Threshold value < Limit value

   The limit value is given a hysteresis for example to control a pump.

   Two applications are possible:

   – **Limit value ^{high} with negative hysteresis**

      When the input signal exceeds the limit value the output is set to 1.

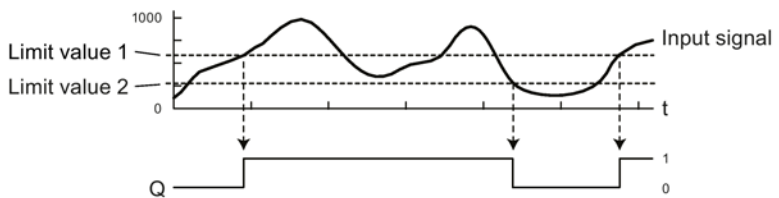   When the input signal falls below the threshold value the output is set to 0.

   – **Limit value $_{low}$ with positive hysteresis**

      You can monitor the input signal for a limit value $_{low}$ with positive hysteresis if you invert the input signal (x) using the black contact symbol (1/x).

Parameters

Parameters	Tag type / range of values	Description
Input parameters		
En		Enable parameter, see section Often used parameters (Page 198).

Parameters	Tag type / range of values	Description
Input	• Analog input / bit memory • Event counter / usage meter	The value of the input is monitored for the limit value and a threshold value by the block.
Function parameters		
Limit value	3.402823 e-38 .. 3.402823 e+38 Max. 19 characters, max. 4 decimal places.	Limit value to be monitored (absolute value) The parameter is included in the calculation of the threshold value.
Function	• + (Window) • - (Hysteresis)	The parameter is included in the calculation of the threshold value and decides the functionality of the block: • + (Window) Output set to 1 when the input signal is within the window between limit value and threshold value. • - (Hysteresis) When the input signal exceeds the "Limit value" the output is set to 1. When the input signal falls below the threshold value the output is set to 0. For information on inverting the input signal see above.
Amount of difference	0 ... 3.402823e+38 Max. 19 characters, display of max. 4 decimal places	Amount of the difference value The parameter is included in the calculation of the threshold value.
Output parameters		
Output	Digital output / bit memory	Tag in which the value calculated by the block is output.

See also

Limit value switch (Page 220)

5.7.4 Analog value comparator

Function

The values of two analog inputs are compared by forming the difference. If the difference of two programmable limit values is overshot or undershot, a digital output signal is set.

The difference of "Input 1" minus "Input 2" is monitored for the two limit values "Limit value 1" and "Limit value 2":

By setting different values for the function parameter (Limit value 1 > Limit value 2) a hysteresis can be programmed.

In the table note the different behavior when "Limit value 1" is lower or higher than "Limit value 2".

Parameters

Parameters	Tag type / range of values	Description
Input parameters		
En		Enable parameter, see section Often used parameters (Page 198).
Input 1	Analog input / bit memory Event counter / usage meter	The value of the input is processed as a minuend by the block function.
Input 2	Analog input / bit memory Event counter / usage meter	The value of the input is processed as a subtrahend by the block function.
Function parameters		

Limit value 1	3.402823 e-38 .. 3.402823 e+38
	
	Max. 19 characters, display of max. 4 decimal places
		Turn on limit value (absolute value)
		• Limit value 1 ≥ Limit value 2:
		  When the difference of "Input 1" minus "Input 2" exceeds the value "Limit value 1", the output is set to 1.
		• Limit value 1 < Limit value 2
		  When "Limit value 1" ≤ ("Input 1" minus "Input 2") < "Limit value 2", the output is set to 1.

Limit value 2	3.402823 e-38 .. 3.402823 e+38 Max. 19 characters, display of max. 4 decimal places	Turn off limit value (absolute value) • Limit value 1 ≥ Limit value 2: If the difference of "Input 1" minus "Input 2" undershoots the value "Limit value 2" the output is set to 0.
Output parameters		
Output	Digital output / bit memory	Tag in which the value calculated by the block is output.

5.7.5 Analog value monitoring

Function

The analog value of the input is monitored for positive and negative change when the "Trigger" input is activated.

The values for a positive change ($\Delta+$) and a negative change ($\Delta-$) can be programmed.

When the "Trigger" input is set, the current value of the input (A_{Trg}) is saved and the block processing started. As soon as the value of the analog input has reached the value of the negative change ($A_{Trg} + \Delta-$) or the value of the positive change ($A_{Trg} + \Delta+$) the output is set to 1.

As soon as the value of the analog input is once again between the values $A_{Trg} + \Delta-$ and $A_{Trg} + \Delta+$ the output is set to 0 again.

Parameters

Parameters	Tag type / range of values	Description
Input parameters		
En		Enable parameter, see section Often used parameters (Page 198).
Trigger	True / False Digital input / output / bit memory STATUS_ERROR	With an edge change 0 → 1 block processing is started (if En = 1) and the current value of the analog input (A_{Trg}) is saved. With the setting "True" the trigger is always active. With the setting "False" the block is never processed.
Input	Analog input / bit memory Event counter / usage meter	The value (A_{Trg}) of the input at the time of the edge change of "Trigger" is monitored by the block function for positive and negative change.
Function parameters		
Positive change	3.402823 e-38 .. 3.402823 e+38 Max. 19 characters, display of max. 4 decimal places	Absolute value of the positive change ($\Delta+$)
Negative change	3.402823 e-38 .. 3.402823 e+38 Max. 19 characters, display of max. 4 decimal places	Absolute value of the negative change ($\Delta-$)
Output parameters		
Output	Digital output / bit memory	Tag in which the value calculated by the block is output: • 1 = "Positive change" overshot or "Negative change " undershot • 0 = "Positive change" not overshot and "Negative change " not undershot

5.7.6 Min. /Max. /Mean value

Function

With the values from a minimum of one and a maximum of four analog inputs, the block can perform the functions minimum, maximum and mean value generation. The result of the calculation is written to the relevant output.

To activate the individual functions, the output in question must be programmed.

- Minimum

    From the activated analog inputs, the minimum value is determined in each update cycle and written to the output.

- Maximum

    From the activated analog inputs, the maximum value is determined in each update cycle and written to the output.

- Mean value

    From the activated analog inputs, the mean value is generated in each update cycle and written to the output.

Parameters

Parameters	Tag type / range of values	Description
Input parameters		
En		Enable parameter, see section Often used parameters (Page 198).
Input 1 .. Input 4	Analog input / bit memory	The values of the configured inputs are processed by the three types of calculation.
	Event counter / usage meter	Inputs with the setting "Input unused" are not evaluated.
Output parameters		
Minimum	Analog memory bit • Configured as a floating-point number: 3.402823 e-38 .. 3.402823 e+38 • Configured as a counter: 0 .. 4294967295	Tag in which the obtained minimum value is output.

Parameters	Tag type / range of values	Description
Maximum	Analog memory bit • Configured as a floating-point number: 3.402823 e-38 .. 3.402823 e+38 • Configured as a counter: 0 .. 4294967295	Tag in which the obtained maximum value is output.
Mean value	Analog memory bit • Configured as a floating-point number: 3.402823 e-38 .. 3.402823 e+38 • Configured as a counter: 0 .. 4294967295	Tag in which the calculated mean value is output.
Error	Digital output / bit memory	Error display: • 0: Block processing completed without errors • 1: Block processing aborted with an error For the meaning, see Often used parameters (Page 198).

5.7.7   Analog value processing

Function

The block has the following functions:

• Smoothing

    The function reads in the analog signal at the input according to the number of "Sampling cycles" and outputs the mean value.

As an option the value output can be scaled with the following functions:

• Gain factor

• Zero point offset

In the program a total of up to 4 of these blocks can be used.

Parameters

Parameters	Tag type / range of values	Description
Input parameters		
En		Enable parameter, see section Often used parameters (Page 198).
Input	• Analog input / bit memory • Event counter / usage meter	Analog signal to be processed
Function parameters		
Sampling cycles	1 .. 16	The number of "Sampling cycles" specifies how many values of the analog signal are acquired for one processing cycle of the block. One sampling cycle corresponds to one update cycle. In every update cycle, the RTU acquires one value. The number of update cycles is the same as the number of "Sampling cycles".
Gain	3.402823 e-38 .. 3.402823 e+38 Max. 19 characters, display of max. 4 decimal places.	This value is multiplied by the calculated mean value.
Zero point offset	3.402823 e-38 .. 3.402823 e+38 Max. 19 characters, display of max. 4 decimal places.	This value is added to the product of mean value and gain.
Output parameters		
Output	• Analog memory bit Configured as a floating-point number: 3.402823 e-38 .. 3.402823 e+38	Tag in which the value calculated by the block is output.
Status	True / False	Setting "False" when the number of sampled values is below the number set for sampling.
Error	True / False	Overshoot or undershoot occurred.

5.8 Counter and summation blocks

5.8.1 Counters

Function

The block counts the positive edges at the input parameter "Trigger".

Only via the input parameter "Reset", is the counter reset to 0 or the Initial value.

If the output should not start at the value 0, you can specify a different start value using the function parameter "Initial value".

With the "Direction" function parameter you specify the count direction:

● Incremental (forwards)

● Decremental (backwards)

The current total counted value is output at the "Counted value" output as an unsigned 32-bit value.

Using the function parameter "Turn on threshold", the value for the counted value can be configured and when it is overshot or undershot, the output "Counter status" is set.

Parameters

Parameters	Tag type / range of values	Description
Input parameters		
En		Enable parameter, see section Often used parameters (Page 198).
Trigger	Digital input / output / bit memory STATUS_ERROR	Counter input The block counts the positive edges (0 → 1) at the input and outputs the total (including the Initial value) at the output. **Inverted parameter:** The block counts the negative edges (1 → 0) at the input and outputs the total (including the Initial value) at the output.
Reset	True / False Digital input / output / bit memory STATUS_ERROR	Resets the counter to 0 or the Initial value on a positive edge (0 → 1). With the setting "True" the counter is continuously reset and the output remains permanently set to 0 or the initial value. With the setting "Input unused" or "False", the count is not reset.
Function parameters		
Initial value	0 .. 4294967295	Start value

Parameters	Tag type / range of values	Description
Turn on threshold	0 .. 4294967295	Threshold value for the counted value. Switches the "Counter status" output depending on the count direction. • Incremental counting: If "Turn on threshold" is reached (exceeded), the "Counter status" output is set to 1. • Decremental counting: If "Turn on threshold" is reached (undershot), the "Counter status" output is set to 1.
Direction	• Decremental • Incremental	• Count down • Count up
Output parameters		
Counted value	Analog memory bit 0 .. 4294967295	Tag in which the totaled counted value is output. If there is overflow (4294967295) the counter starts again at zero.
Counter status	Digital output / bit memory	Tag that is set to 1 if the value of "Turn on threshold" is overshot or undershot. The output is reset to 0 if the following events occur: • Incremental counting: Reset if "Turn on threshold" is undershot or if the "Reset" input = 1 or if the counter overflows (value = 0) • Decremental counting: Reset if "Turn on threshold" is overshot

5.8.2 Elapsed time counter

Function

The block counts the operating time after the positive edge change at the "Trigger" input parameter.

Only via the input parameter "Reset", is the counter reset to 0 or the Initial value.

If the output should not start at the value 0, you can specify a different start value using the function parameter "Initial value".

The current total counted value is output at the output as an unsigned 32-bit value in every update cycle.

Parameters

Parameters	Tag type / range of values	Description
Input parameters		
En		Enable parameter, see section Often used parameters (Page 198).
Trigger	Digital input / output / bit memory STATUS_ERROR	Counter input After the first edge change 0 → 1 and continuous value 1 of "Trigger" the block begins to count the operating time.
Reset	True / False Digital input / output / bit memory STATUS_ERROR	Resets the counter to 0 or the Initial value on a positive edge (0 → 1). With the setting "True" the counter is continuously reset and the output remains permanently set to 0. With the setting "Input unused" or "False", the count is not reset. If there is overflow (4294967295) the counter starts again at zero or at the initial value.
Function parameters		
Initial value (100 ms)	0 .. +4294967295	Start value Unit: [100 ms]
Output parameters		
Operating time (100 ms)	Analog memory bit 0 .. +4294967295	Tag in which the totaled value of the operating time is output. If there is overflow (4294967295) the counter starts again at zero. Unit: [100 ms]

5.8.3   Frequency calculation

Function

Each time it is run through the block forms the difference of the current value at the "Counter value" input and the value from the previous run through.

This difference divided by the time (s) between the current and last run through produces the current "Frequency" that is output in Hz (1/s).

The output "Value valid" is set to 1 as soon as the block has been run through twice and the difference could be calculated once.

Via the "Reset" input parameter, the output parameters are reset to 0.

Parameters

Parameters	Tag type / range of values	Description
Input parameters		
En		Enable parameter, see section Often used parameters (Page 198).
Reset	True / False Digital input / output / bit memory STATUS_ERROR	Resets the two outputs to 0 on a positive edge (0 → 1). With the setting "True", the outputs remain permanently at 0.
Counter value	Analog input / bit memory Event counter / usage meter	Counter input. Can, for example, be the output of the "Counter" block. For information on processing see above.
Output parameters		
Frequency	Analog memory bit • Configured as a floating-point number: 3.402823 e-38 .. 3.402823 e+38 • Configured as a counter: 0 .. 4294967295	Tag in which the calculated frequency value is output.
Value valid	Digital output / bit memory	Tag in which the the validity identifier of the frequency value calculated by the block is output: • 1 = The calculated value is valid and can be used. • 0 = The calculated value is invalid.
Error	Digital output / bit memory	Error display: • 0: Block processing completed without errors • 1: Block processing aborted with an error For the meaning, see Often used parameters (Page 198).

5.8.4 Flow calculation

Function

Each time it is run through the block forms the difference of the current value at the "Counter value" input and the value from the previous run through.

This difference divided by the time (s) between the current and last run through produces the current "Flow" (volume flow) as amount per time unit (Q/t) that is included in the calculation of the "Pulse weighting" parameters.

The output "Value valid" is set to 1 as soon as the block has been run through twice and the difference could be calculated once.

Via the "Reset" input parameter, the output parameters are reset to 0.

Parameters

Parameters	Tag type / range of values	Description
Input parameters		
En		Enable parameter, see section Often used parameters (Page 198).
Reset	True / False	Resets the output "Flow" to 0 on a positive edge (0 → 1).
	Digital input / output / bit memory	If "True" is set constantly the output remains permanently reset to 0.
	STATUS_ERROR	With the setting "Not used" or "False", the output is not reset.
Counter value	Analog input / bit memory	Counter input. Can, for example, be the output of the "Counter" block.
	Event counter / usage meter	For information on processing see above.
Function parameters		
Pulse weighting: number of pulses	1 .. +4294967295	Number of pulses (n) included in the required value for the pulse weighting (Q/n). *****
Pulse weighting: amount	3.402823 e-38 .. 3.402823 e+38 Max. 19 characters, display of max. 4 decimal places.	Amount (Q) included in the required value for the pulse weighting (Q/n). *****
Output parameters		

Flow	Analog memory bit
	
	• Configured as a floating-point number:
	
	  3.402823 e-38 .. 3.402823 e+38
	
	• Configured as a counter:
	
	  0 .. 4294967295
		Tag in which the calculated flow value is output.

Parameters	Tag type / range of values	Description
Value valid	Digital output / bit memory	Tag in which the the validity identifier of the flow value calculated by the block is output: • 1 = The calculated value is valid and can be used. • 0 = The calculated value is invalid or the calculation is not yet completed.
Error	Digital output / bit memory	Error display: • 0: Block processing completed without errors • 1: Block processing aborted with an error For the meaning, see Often used parameters (Page 198).

* Note: The values of the two parameters of the pulse weighting are limited together to 50000. A maximum of 50 Hz are processed over 10 seconds.

5.8.5 Flow totalizer

Function

The function integrates the value at the "Volume flow" input over time.

In every update cycle, the function reads the analog signal at the "Volume flow" input and multiplies the value with the time difference since the last update cycle. Seen mathematically this forms the integral of the volume flow over time or the area below the curve of the volume flow over time.

Parameters

Parameters	Tag type / range of values	Description
Input parameters		
En		Enable parameter, see section Often used parameters (Page 198).
Reset	True / False Digital input / output / bit memory STATUS_ERROR	When there is an edge change 0 → 1 the volume added together up to now is reset to 0. As long as "Reset" is set to 1, the added volume remains = 0. When there is an edge change 1 → 0, the adding is started and the time of the current update cycle is taken as the start time for the calculation in the next cycle. With the setting "True" the input is always active and the block is essentially turned off . With the setting "False" the added volume is never reset. The addition begins with the first update cycle.

Parameters	Tag type / range of values	Description
Volume flow	Analog input / bit memory	The volume flow to be integrated over time (volume per time unit)
		The volume unit at the input corresponds to the volume unit at the output.
		The time unit must correspond to a unit listed in "Time base".
Function parameters		
Time base	• 1/s • 1/min • 1/h	The time base must correspond to the time unit of the volume flow applied to the input.
		If the volume flow, for example, is created as m^3/h in the block, 1/h must be selected as the time base.
Negative values	• Allow • Ignore • Add amount	Specifies how to handle negative values at the "Volume flow" input.
		• Allow. Negative values reduce the volume value.
		• Ignore: Negative values are not included in the addition.
		• Add amount Negative values are added to the volume without a sign.
Output parameters		
Volumes	Analog memory bit configured as a floating-point number: 3.402823e-38 .. 3.402823e+38	Tag in which the volume added together by the block is output.
		The volume unit at the input corresponds to the volume unit at the output.
Error	True / False	Overshoot or undershoot occurred.

5.8.6 Flow calculation rectangular weir

Function

The block calculates the amount of water (volume flow) flowing over a rectangular overflow weir depending on the measured flow over height according to the formula of Poleni (see also DIN 19557).

$$Q = \frac{2}{3} \mu\, b\, \sqrt{2g}\ h^{\frac{3}{2}}$$

Q   Flow amount [m³/s]

μ   Flow coefficient (without dimension without including g)

b   Width of the inflow [m]

g   Gravitational acceleration [m/s²]

h   Flow over height (water level in the head water - weir height) [m]

Figure 5-8   Formula from Poleni for flow calculation of rectangular weirs

The formula applies only to the complete flow without influence of bottom water on the flow amount (backwater).

The formula contains no reduction factor that takes into account influent speed, stream in form and direction or constructions features. Note that such influences can result in significant deviations between the calculated result and the actual flow.

The flow coefficient μ is the correction value for the deviations between the actual and calculated flow, For rectangular weirs the following values are specified depending on the shape of the weir crest:

Table 5- 2   Flow coefficient μ for horizontal rectangular weirs *

Crest shape	Illustration	μ
Wide, sharp-edged		0.49 .. 0.51
Wide, rounded edges		0.50 .. 0.55
Completely rounded wide flow Tilted back weir flap with rounded edges of the weir body		0.65 .. 0.73
Sharp-edged with ventilation of the stream		0.62 .. 0.64
Rounded, vertical upstream slope, inclined downstream slope (standard profile)		0.75
Roof-shaped, rounded crest		0.79

* Schröder, Euler, Schneider, Knauf: Grundlagen des Wasserbaues, Hydrologie, Hydraulik und Was-serrecht; Werner-Verlag Düsseldorf (1994)

Enter the gravitational acceleration g for your location. For central Europe the value is approximately 9.81. On the Internet you will find tables and programs for specifying g for many places.

Parameters

Parameters	Tag type / range of values	Description
Input parameters		
En		Enable parameter, see section Often used parameters (Page 198).
Height (h)	Analog input / bit memory	Measured height in meters [m] With a negative value the output "Error" is set to 1.
Reset	True / False • Digital input / output / bit memory • STATUS_ERROR	When there is an edge change 0 → 1 the flow added together up to now is reset to 0. As long as "Reset" is set to 1, the added flow remains = 0. When there is an edge change 1 → 0, the adding is started and the time of the current update cycle is taken as the start time for the calculation in the next cycle. The input has no influence on "Drainage (Q)". If "True" is set permanently the addition is turned off. If "False" is set permanently the added up amount of flow is never reset. The addition begins with the first update cycle of the RTU.
Function parameters		
Width (b)	0 .. 10000 Display of max. 4 decimal places.	Flow width in meters [m]
Flow coefficient (µ)	0.0000 .. 0.9999 Display of max. 4 decimal places.	Flow coefficient depending on the crest shape
Gravitational acceleration (g)	9.0000 .. 9.9999 Display of max. 4 decimal places.	Effective gravitational acceleration [m/s^2]
Limit value	0 .. 3.402823e+38 Max. 19 characters, display of max. 4 decimal places	Drainage limit value (high) in m^3/h If the limit value is exceeded the output "Alarm" is set to 1. As soon as the limit value is undershot the output "Alarm" is set to 0.
Output parameters		
Drainage (Q)	Analog memory bit configured as a floating-point number: 3.402823e-38 .. 3.402823e+38	Tag to which the current drainage (m^3/h) calculated by the block is output.

Parameters	Tag type / range of values	Description
Flow volume	Analog memory bit configured as a floating-point number: 3.402823e+38	Calculated added flow volume (m^3) since the last reset.
Alarm	Digital output / bit memory	Alarm display • 0: Current drainage Q lower than the drainage limit value. • 1: Current drainage Q equal to or higher than the drainage limit value. You can for example use the Alarm to display flooding (incomplete flow) or other evaluations.
Error	Digital output / bit memory	Error display: • 0: Block processing completed without errors • 1: Negative height

5.8.7 Silo volume calculation

Function

From the fill level the function block calculates the volume depending on the silo geometry.

The length units at the "Fill height" input and at the three dimension function parameters must be identical. If, for example, the fill height is specified in meters. the diameter and the two heights must also be specified in meters (m). In this case, the result is output in cubic meters (m^3).

As an option two limit values can be programmed for a full or empty message.

Parameters

Parameters	Tag type / range of values	Description
Input parameters		
En		Enable parameter, see section Often used parameters (Page 198).
Fill height	Analog input / bit memory	The value of the input is included in the calculation of the fill volume. The fill height must be between 0 and the sum of the height of the cylindrical section and the height of the cone-shaped section of the silo. Otherwise the Error output is set and the result of the calculation cannot be used. Make sure you have the same length unit at the input and in the function parameters.

Parameters	Tag type / range of values	Description
Function parameters		
Diameter	0 .. 3.402823e+38 Max. 19 characters, Display of max. 4 decimal places	Diameter of the silo Make sure you have the same length unit at the input and in the function parameters.
High cylinder	0 .. 3.402823e+38 Max. 19 characters, Display of max. 4 decimal places	Height of the cylindrical section of the silo Make sure you have the same length unit at the input and in the function parameters.
High cone	0 .. 3.402823e+38 Max. 19 characters, Display of max. 4 decimal places	Height of the conical section of the silo Make sure you have the same length unit at the input and in the function parameters.
Volume "full" [%]	0 .. 100	If this value is exceeded (percentage of the max. silo volume) the output "Full" is set to 1. Below this value the "Full" output = 0. The value of "Volume full" must be higher then the value of "Volume empty".
Volume empty [%]	0 .. 100	If this value is undershot (percentage of the min. silo volume) the output "Empty" is set to 1. Above this value the "Empty" output = 0. The value of "Volume full" must be higher then the value of "Volume empty".
Output parameters		
Fill volume	Analog memory bit configured as a float-ing-point number: 3.402823e-38 .. 3.402823e+38	Tag in which the fill volume calculated by the block is output. The unit is the third power of the length unit of the input and the function parameters.
Full	Digital output / bit memory	When the fill volume reaches or exceeds the percentage "Volume full" the "Full" output is set to 1. Below this the "Full" output = 0.
Empty	Digital output / bit memory	When the fill volume reaches or undershoots the percentage "Volume empty" the "Empty" output is set to 1. Above this the "Empty" output = 0.
Error	Digital output / bit memory	Error display: • 0: Block processing completed without errors • 1: The fill height is not between 0 and the sum of the height of the cylindrical and the cone-shaped section of the silo.

5.9 Blocks for messages

5.9.1 Sending SMS messages

Function

When a configurable event occurs, transfers an SMS message for sending.

Parameters

Parameters	Tag type / range of values	Description
Input parameters		
En		Enable parameter, see section Often used parameters (Page 198).
Trigger	True / False Digital input / output / bit memory STATUS_ERROR	Event (edge change 0 → 1), that triggers the creation of the message. The input must be reset to 0 by the user.
Send Immediately	True / False Digital input / output / bit memory STATUS_ERROR	When there is an edge change 0 → 1 the message is transferred for sending. With the setting "True", the message is always transferred immediately for sending. With the setting "Input unused" or "False", the message is transferred for sending when the RTU establishes the next mobile wireless connection. The input parameter must be reset to 0 by the program.
Function parameters		
Recipient	"Recipient group"	Selection of the user groups configured in "Users / groups"
Text	"Texts"	Selection of a message text configured in "Tags" > "Texts"
Output parameters		
Done	Digital output / bit memory	Status display: • 0: Message could not be transferred to the transfer buffer. The buffer is possibly full. • 1: Message could be transferred successfully to the transfer buffer.
Error	Digital output / bit memory	Error display: • 0: Block processing completed without errors • 1: Block processing aborted with an error SMS message could not be saved. See also section Often used parameters (Page 198).

5.9.2 Send e-mail

Function

When a configurable event occurs, transfers an e-mail message for sending.

Parameters

Parameters	Tag type / range of values	Description
Input parameters		
En		Enable parameter, see section Often used parameters (Page 198).
Trigger	True / False Digital input / output / bit memory STATUS_ERROR	Event that triggers the creation of the message.
Send Immediately	True / False Digital input / output / bit memory STATUS_ERROR	When there is an edge change 0 → 1 the message is transferred for sending. With the setting "True", the message is always transferred immediately for sending. With the setting "Not used" or "False", the message is transferred for sending when the RTU establishes the next connection to the partner. The input parameter must be reset to 0 by the program.
Function parameters		
Recipient	"Recipient group"	Selection of the user groups configured in "Users / groups"
Text	"Texts"	Selection of a message text configured in "Tags" > "Texts"
Attachment	• No attachment • Entire diagnostics buffer • Current log file • Current process image	You have the option of attaching a file stored on the RTU to the e-mail.
Anhang gezippt	ON / OFF	Adds the file to the attachment as a compressed zip archive.
Output parameters		
Done	Digital output / bit memory	Status display: • 0: Message could not be transferred to the transfer buffer. The buffer is possibly full. • 1: Message could be transferred successfully to the transfer buffer.

Parameters	Tag type / range of values	Description
Error	Digital output / bit memory	Error display:
		• 0: Block processing completed without errors
		• 1: Block processing aborted with an error
		E-mail could not be saved.
		See also section Often used parameters (Page 198).

5.9.3   FTP file transfer

Function

When a configurable event occurs ("Trigger" input), the function block enters an FTP file transfer in a transferlist. This transfer list can hold up to 12 FTP transfers.

Before using the block, you need to configure the FTP server and the server path on the WBM page "Services > FTP". Only one FTP server can be configured.

Each block can use one of up to 8 different server paths, so that the data can be saved in a structured form on the FTP server for further evaluation.

Parameters

Parameters	Tag type / range of values	Description
Input parameters		
En		Enable parameter, see section Often used parameters (Page 198).
Trigger	True / False • Digital input / output / bit memory • STATUS_ERROR	Event that triggers the entry of the FTP transfer in the transfer list. When there is an edge change 0 → 1 the transfer job is entered in the transfer list as long as there is still room for it. The input parameter needs to be reset to 0 by the program.
Send Immediately	True / False • Digital input / output / bit memory • STATUS_ERROR	With the setting "True" when entering an FTP transfer in the transfer list the communication mode is started immediately if the RTU is not already in the communication mode. The transfer list is processed immediately. FTP transfers saved previously in the transfer list are also processed. With the setting "Not used" or "False", the FTP transfer is kept in the transfer list until the RTU is in the communication mode for some other reason. This can be a planned communication mode or another FTP transfer with the setting "Send immediately" = TRUE).

Parameters	Tag type / range of values	Description
Function parameters		
File	• Entire diagnostics buffer • Current log file • Current process image	This parameter specifies which data is transferred to the FTP server during the FTP transfer.
Compressed and en-crypted	ON / OFF	Transfers the file as a compressed ZIP archive. As an option, the ZIP archive can also be encrypted (see WBM: "Services > FTP").
Server path	Path 1 .. 8	Selection of one of the FTP server paths". specified in "Services > FTP If you do not make a selection (not used) the stand-ard path of the FTP server will be used.
Append	ON / OFF	With the setting "ON" the transferred file is append-ed to an existing file of the same name on the serv-er. With the setting "OFF" an existing file that may be on the FTP server is replayed. If the file is transferred as a ZIP archive, the option "Append" cannot be used.
Output parameters		
Done	• Digital output / bit memory	Status display: • 0: FTP transfer could not be entered in the transfer list. The list is possibly full. • 1: FTP transfer successfully entered in the transfer list.
Error	• Digital output / bit memory	Error display: • 0: Block processing completed without errors • 1: Block processing aborted with an error. FTP transfer could not be saved. See also sec-tion Often used parameters (Page 198).

5.10 Switch and relay blocks

5.10.1 Latching relays

Function

The input parameters "Set" and "Reset" set the output to 1 or 0:

- Set

  A positive edge (0 → 1) sets the output to 1.

- Reset

  A positive edge (0 → 1) sets the output to 0.

The parameters "Set" and "Reset" both have a latching function.

When "Set" and "Reset" have the same value (both = 0 or both = 1) the switching of the output is controlled by the function parameter "RS/SR priority":

- SR: The output is set to 1.

- RS: The output is set to 0.

Table 5- 3   Status table:

RS/SR priority	Value of "Reset"	Value of "Set"	Value of the output	Remark
RS / SR	0	0	-	The value of the output remains unchanged.
RS / SR	1	0	0	Value of the output regardless of RS/SR priority
RS / SR	0	1	1	Value of the output regardless of RS/SR priority
RS	1	1	0	
SR	1	1	1	

Diagrams

The two following diagrams in which the RS/SR priority is programmed differently are examples showing the effect on the output.

The blue arrows indicate value changes of the output Q that are caused by the programming of the RS/SR priority.

S   Set
R   Reset
Q   Output
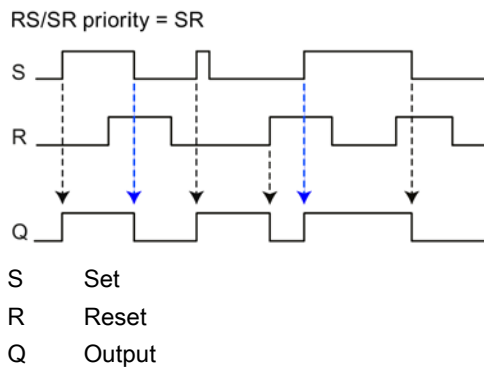
Figure 5-9   Switching diagram of a block "Latching relay", RS/SR priority = SR

S   Set
R   Reset
Q   Output
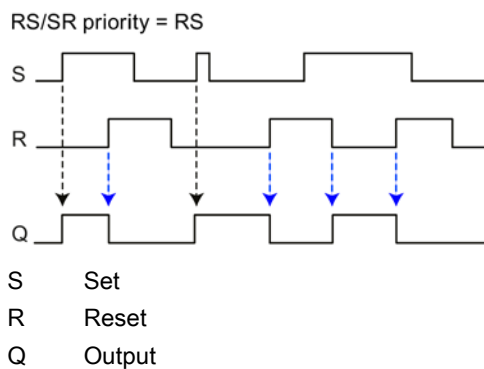
Figure 5-10   Switching diagram of a block "Latching relay", RS/RS priority = RS

Parameters

Parameters	Tag type / range of values	Description
Input parameters		
En		Enable parameter, see section Often used parameters (Page 198).
Set	True / False Digital input / output / bit memory STATUS_ERROR	Sets the output to 1 on a positive edge (0 → 1). With the setting "True", the output remains permanently at 1. Resetting via the "Reset" input is then only possible when "RS/SR priority" = RS.
Reset	True / False Digital input / output / bit memory STATUS_ERROR	Resets the "Set" input to 0 on a positive edge (0 → 1). With the setting "True", "Set" is permanently reset if the "RS/SR priority" = RS. The output remains permanently set to 0. With the setting "True", "Set" is processed if the "RS/SR priority" = SR. With the setting "unused" or "False", the "Set" input is not reset.

Parameters	Tag type / range of values	Description
Function parameters		
RS/SR priority	• SR • RS	• SR If "Set" and "Reset" have the same value, "SR" causes the output to be set to 1. • RS If "Set" and "Reset" have the same value, "RS" causes the output to be set to 0.
Output parameters		
Output	Digital output / bit memory	Tag for the output.

5.10.2 Current impulse relay

Function

The input parameters "Set" and "Reset" set the output to 1 or 0:

* Set

  A positive edge (0 → 1) sets the output to 1.

* Reset

  A positive edge (0 → 1) sets the output to 0.

As with the latching relay (see above) the parameters "Set" and "Reset" both have a latching function.

When "Set" and "Reset" have the same value (both = 0 or both = 1) the switching of the output is controlled by the function parameter "RS/SR priority":

* SR: The output is set to 1.

* RS: The output is set to 0.

The "Trigger" input causes a status change at the output regardless of its previous status.

* Output = 0: A positive edge at the "Trigger" input sets the output to 1.

* Output = 1: A positive edge at the "Trigger" input sets the output to 0.

The "Trigger" input has the function of a button. A tag can be connected to its input that generates short pulses (current impulses).

Diagram

The following diagram shows an example of the effect on the output.

The blue arrow indicates a value change of the output Q that is caused by the programming of the RS/SR priority.

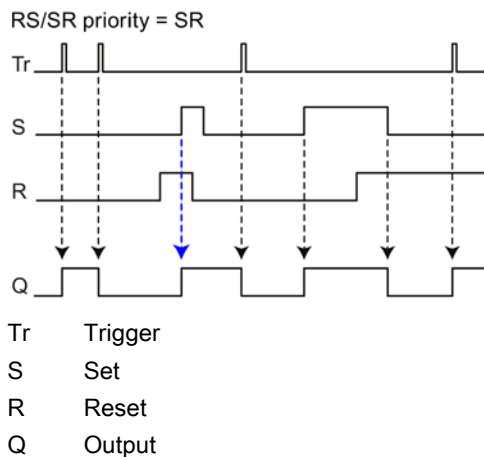Tr   Trigger
S   Set
R   Reset
Q   Output

Figure 5-11   Switching diagram of a block "Current impulse relay", RS/SR priority = SR

Parameters

Parameters	Tag type / range of values	Description
Input parameters		
En		Enable parameter, see section Often used parameters (Page 198).
Set	True / False Digital input / output / bit memory STATUS_ERROR	Sets the output to 1 on a positive edge (0 → 1). With the setting "True", the output remains permanently at 1. Resetting via the "Reset" input is then only possible when "RS/SR priority" = RS. With the setting "Unused" or "False", the output is only controlled by the inputs "Reset" and "Trigger".
Reset	True / False Digital input / output / bit memory STATUS_ERROR	On a positive edge (0 → 1) resets the output to 0 when "Set" = 0 or when the "RS/SR priority" = RS. With the setting "True" "Set" is permanently reset and the output remains permanently set to 0. With the setting "unused" or "False", the "Set" input is not reset. With the setting "Unused" or "False", the output is only controlled by the inputs "Reset" and "Trigger".
Trigger	True / False Digital input / output / bit memory STATUS_ERROR	The edge change 0 → 1 of "Trigger" has the following effect: • When "Set" and "Reset" = 0, the output is set to 1. • When "Set" and "Reset" = 1 and the "RS/SR priority" = SR, the output is set to 1. • When "Set" and "Reset" = 1 and the "RS/RS priority" = RS, the output is set to 0. • If only "Set" = 1, the output remains at 1. • If only "Reset" = 1, the output remains at 0. The edge change 1 → 0 of "Trigger" has no effect:

Parameters	Tag type / range of values	Description
Function parameters		
RS/SR priority	• SR • RS	• SR If "Set" and "Reset" have the same value, "SR" causes the output to be set to 1. • RS If "Set" and "Reset" have the same value, "RS" causes the output to be set to 0.
Output parameters		
Output	Digital output / bit memory	Tag for the output.

5.10.3 Wiping relay

Function

When there is an edge change 0 → 1 at the "Trigger" input, at the output a signal of selectable duration is generated.

Two types of function can be programmed:

- Start value = "Pulse"

  A change from 0 to 1 at the "Trigger" input starts the first pulse and the output is set to 1.

  When the time set in the parameter "Pulse duration" is reached, the output is reset to 0.

  If the number of cycles is > 1, the time "Interpulse period" starts to run and when it is completed a new pulse begins again.

  Depending on the setting "End", the pulse sequence runs as long as the "Trigger" signal is set or the pulse sequence has been completely processed.

- Start value = "Pause"

  A change from 0 to 1 at the "Trigger" input starts the pulse pause and the output is set to 0.

  After the "Interpulse period" has elapsed, the "Pulse duration" time is started and the output is set to 1.

  After the "Pulse duration" has elapsed, the output is reset to 0.

  If the number of cycles is > 1, the time "Interpulse period" starts again followed by a new pulse.

  Depending on the setting "End", the pulse sequence runs as long as the "Trigger" signal is set or the pulse sequence has been completely processed.

Parameters

Parameters	Tag type / range of values	Description
Input parameters		
En		Enable parameter, see section Often used parameters (Page 198).
Trigger	True / False Digital input / output / bit memory STATUS_ERROR	When there is an edge change 0 → 1 a new pulse sequence begins. With the setting "True", the pulse sequence set in the parameters runs precisely once after the RTU starts up or after a new configuration has been adopted. With the setting "False" the output is never set.
Function parameters		
Pulse duration (ms)	100 .. 999999999	Pulse duration in milliseconds
Interpulse period (ms)	0 .. 999999999	Pause between two pulses in milliseconds If the number of pulses is > 1 or the Start value "Pause" is selected, the Interpulse period must be ≥ 100 ms.
Cycles	1 .. 999999999	Specifies the number of pause/pulse cycles (pulse sequence).
Start value	• Pulse • Pause	• With "Pulse" the pulse sequence starts with a "1" at the output. • With "Pause" the pulse sequence starts with a "0" at the output.
End	• Trigger • Time	• With "Trigger" the pulse sequence ends as soon as the "Trigger" input changes to 0. • With "Time" the pulse sequence ends when it has run completely.
Output parameters		
Output	Digital output / bit memory	Tag in which the value calculated by the block is output.

5.10.4 Time relay

Function

The block has the function of a time relay. Application example: Staircase light switch
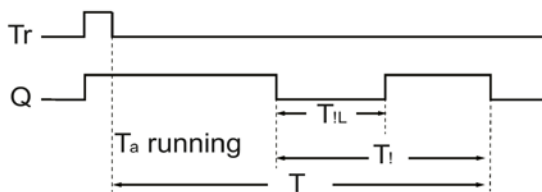
Tr	Trigger
Q	Output
T_a	Current time
T	Off delay
$T_!$	Prewarning
$T_{!L}$	Interruption

Figure 5-12 **Operating diagram**

With the input signal "Trigger" (0 → 1) block processing is started edge triggered. If the trigger changes 1 → 0 (for example due to releasing a button) the output of the block is set to 1 and the "Off delay" begins to run.

After the "Off delay" has elapsed, the output is reset.

With the signal "Reset" the output can be reset to 0 before the "Off delay" has elapsed.

As an option before the Off delay elapses a warning signal can be output via the "Prewarning" parameter. This indicates the turning off of the output by resetting the output from 1 to 0 for the duration of the "Interruption".

The prewarning time is calculated from "Off delay" minus "Prewarning" ($T - T_!$)

The optional output "Warning" is set to 1 at the time of the "Prewarning". The "Prewarning" has no influence on the "Warning" output.

Parameters

Parameters	Tag type / range of values	Description
Input parameters		
En		Enable parameter, see section Often used parameters (Page 198).

Parameters	Tag type / range of values	Description
Trigger	True / False • Digital input / output / bit memory • STATUS_ERROR	If there is an edge change 0 → 1 the output is set to 1. When there is an edge change 1 → 0 the Off delay is started. After the Off delay has elapsed, the output is set to 0. With the setting "True" the output is always active. With the setting "False" the output is never set.
Reset	True / False • Digital input / output / bit memory STATUS_ERROR	When there is an edge change 0 → 1 Off delay is stopped and the output is set to 0. As long as "Reset" is set to 1, the value of "Trigger" is ignored. When there is an edge change 1 → 0 the block can be processed again. With the setting "True" the input is always active and the block is essentially turned off . With the setting "False" the Off delay is never reset.
Function parameters		
Off delay (ms)	100 .. 999999999	Delay in milliseconds
Prewarning (ms)	0 .. 999999999	Time of the Prewarning in milliseconds The sum of Prewarning and Interruption must be lower than the Off delay.
Interruption (ms)	0 .. 999999999	Duration of the interruption in milliseconds The sum of Prewarning and Interruption must be lower than the Off delay. If the Prewarning = 0, the Interruption must also be = 0. An Interruption of 0 is only allowed when the "Warning" output is connected.
Output parameters		
Output	• Digital output / bit memory	Tag in which the value calculated by the block is output.
Warning	• Digital output / bit memory	The optional output is set to 1 at the start of the prewarning. Along with "Output" changes to 0.

Diagnostics and maintenance 6

6.1 Diagnostics options

The following diagnostics options are available:

LEDs of the module

For information on the LED displays, refer to the section LEDs (Page 40).

Web Based Management (WBM)

To do this, you need to connect your PC to the RTU either locally, via a router or via the mobile wireless network.

In the WBM area Diagnostics", you will find the diagnostics messages and the setting options for sending messages if errors occur (see below).

On the following WBM pages you obtain information on the status of the RTU:

● You will find general information on the status of the RTU on the start page of the WBM, refer to the section Status (Page 88).

● You will find information about the system load of the RTU on the WBM page for the system, refer to the section Device info (Page 90).

● You will find the diagnostics messages on the diagnostics page of the WBM, refer to the section Diagnostics buffer (Page 97).

Diagnostics messages

When important events occur, the RTU writes diagnostics messages to its diagnostics buffer. The diagnostics messages are divided into 4 classes, see section Diagnostics buffer (Page 97).

You can read out or transfer diagnostics messages using the following mechanisms:

● Reading out the diagnostics buffer using the WBM

   For details, see section Diagnostics buffer (Page 97).

● Transferring diagnostics messages relating to errors by SMS message or e-mail

   Errors can be sent as a message (SMS or e-mail). You will find the description in the section Notifications (Page 98).

Diagnostics SMS message

Apart from the configurable sending of the diagnostics buffer, the RTU can send standardized diagnostics SMS messages on request. A diagnostics SMS message is sent to a telephone with an unauthorized phone number if it receives an SMS message with the following text from this phone:

`DIAG?`

The diagnostics SMS message contains the following data:

- Station name

- Firmware version of the RTU

- Status of the mobile wireless network connection (connected / not connected)

- Mobile wireless standard

- Duration of the last mobile wireless connection

  The data is specified in the following format: "Attached for ddd:hh:mm:ss"

  If the last attempted dial-in to the mobile wireless network was not successful, "Attached for -" is sent.

- IP address of the RTU

- IP addresses of the DNS server

- Signal strength of the mobile wireless network and the RSSI (received field strength at the station)

  Indication of the signal strength:

  – good: Good signal quality (≥ -79 dBm)

  – medium: Medium signal quality (-95 .. -81 dBm)

  – weak: Bad signal quality (≤ -97 dBm)

    Values ≤ -97 dBm do not allow reception.

  Indication of the RSSI (Received Signal Strength Indication): [0 ... 31]; 99 = signal cannot be measured.

If the data to be sent exceeds the default size of an SMS message, several SMS messages are sent.

6.2 Error identifiers for e-mails and FTP

Information in diagnostics buffer entries about e-mails and FTP

If an error occurs when transferring e-mails or file with FTP, a diagnostics buffer entry is generated.

The diagnostics buffer entry can contain the following information:

- Internal error identifier
- Last response of the server
- Number of attempts

Internal error identifiers

The following internal error identifiers are possible:

- 1: Error in certificate check.

  Check the certificates of the relevant service.

- 2: Connection monitoring time exceeded

  Check the reachability of the relevant service.

- 3: Other error

Last response of the server

The error codes of the e-mail or FTP server have the following meaning:

Table 6- 1   SMTP (e-mail)

Code	Meaning
421	Service not available. Connection is terminated (often lack of resources of the service provider)
450	Action not executed: Mailbox not available / unreachable. Try again later.
451	Action aborted - error in execution
452	Action aborted - not enough system memory
500	Syntax error: Command unknown.
501	Syntax error Check the configuration data.
502	Command not implemented
503	Wrong order of the commands
504	Parameter unknown or not implemented
521	The domain does not accept the e-mail.
530	Access denied For access using STARTTLS encryption is necessary.
535	SMTP authentication incomplete Check "Services" > "E-mail" in the configuration: • "User name" and "Password" • "Connection security"

Code	Meaning
550	Syntax error - recipient e-mail address or domain unknown. Check "Users / groups" > "Groups" in the configuration: • E-mail address of the recipient
551	Mailbox not local Try forwarding
552	Action aborted - error in memory assignment The e-mail could not be transferred because the size of the e-mail exceeds the maximum set by the administrator.
553	Action not executed - mailbox name not allowed (syntax incorrect) See error 535.
554	Transfer failed - no SMTP service available.
5xx	Other error message from the e-mail server The status corresponds to the three-digit error number of the SMTP protocol.

Table 6- 2   FTP

Code	Meaning
400 - 499: Non execution of the command (temporary error)	
421	Service not available, control connection will be terminated.
425	Data connection cannot be established.
426	Connection terminated. Transfer aborted.
450	Requested file procedure was not executed. File not available.
451	Requested procedure aborted. Local error during processing.
452	Requested procedure not executed; not enough memory space on the system.
500 - 599: Non execution of the command Check necessary	
500	Syntax error - command not recognized.
501	Syntax error in the parameters
502	Command not implemented
503	Invalid command sequence
504	Command not implemented for this parameter
530	Not logged on
532	Logon is necessary to save files.
550	Requested file procedure was not executed. File not available.
551	Requested procedure aborted. Unknown page type.
552	Requested file procedure aborted: Not enough space in the current directory or data record.
553	Requested procedure not executed: Illegal file name.

6.3 Loading firmware

New firmware versions

If a new firmware version is available for the module, you will find this on the Internet pages of Siemens Industry Online Support under the following ID:

Link: (https://support.industry.siemens.com/cs/ww/en/ps/15920/dl)

Save the firmware file on the PC with the configuration data of the RTU.

Downloading new firmware files

You load a new firmware file from the configuration PC on the RTU via the WBM.

You will find a description of establishing the connection to the RTU from the configuration PC in the section Establishing a connection to the WBM of the RTU (Page 81).

You will find a description of loading a firmware file via the WBM of the RTU in the section Firmware (Page 101).

6.4 Resetting to factory settings

Resetting to factory settings: Effect

Note

Data on the RTU will be deleted

With the functions for resetting to factory settings described here, all configuration data and process data on the RTU is deleted!

Note

RTU no longer reachable via VPN or HTTPS

When you reset to factory settings, the VPN configuration is deleted and the RTU is no longer reachable via VPN or HTTPS.

- **Deleted data**

  The following data is deleted by resetting to factory settings:

  – IP address of the LAN interface configured by the user

    It is reset to the default factory set IP address 192.168.0.3.

  – All other configuration data in the memory of the RTU

  – All process data in the memory of the RTU

  – Configuration data on a plugged in SD card. The file "default.cfg" on the SD card is deleted.

- **Data not deleted**

    The following data is not deleted by resetting to factory settings:

    – MAC address of the LAN interface:

    – Process data on the SD card

    – A manually created configuration file "user.cfg" on the SD card

Executing the "Reset to factory settings" function

Two methods are available for resetting to factory settings:

- **Resetting using the WBM**

    For a description of the procedure, refer to the section Operating status (Page 103).

- **Resetting using the "WKUP/RESET" button**

    For the number of times and duration of pressing the button, refer to the section The button "WKUP/RESET" (Page 47).

For the LED reactions during resetting and restarting, refer to the section LEDs (Page 40).

Reaction after resetting to factory settings

After the reset, the RTU starts up again automatically. The remaining behavior depends on the use of an optional SD card:

- **Startup without SD card**

    – If you do not use an SD card, the RTU remains in service mode without configuration data. The STATUS LED flashes red.

    – The RTU is reachable locally via the following default IP address set in the factory 192.168.0.3 or the DNS name "simatic.rtu".

    – The DHCP client function is enabled.

    – The RTU starts up without configuration data.

        Generally, the defaults apply during the first commissioning, refer to the section Establishing a connection to the WBM of the RTU (Page 81).

- **Startup with SD card**

    If an SD card is plugged in, the RTU searches the SD card for the configuration file "default.cfg" which was deleted during the reset.

    A configuration file "user.cfg" saved on the SD card by the user is not used.

    The RTU remains in service mode. The STATUS LED flashes red.

    If you turn off the RTU after the reset, and then start it up with an SD card plugged in with a configuration file "default.cfg", the RTU uses the configuration file "default.cfg". See also section Commissioning and starting up the RTU (Page 66).

6.5 Replacing the RTU

Replacing the RTU

> ⚠ **WARNING**
>
> **Read the safety notices**
>
> Before changing the RTU, read the safety notices in the section Important notes on using the device (Page 51).
>
> While working on the device make sure that the power supply is turned off.

When replacing the RTU follow the steps described in the section Connecting up, installation, commissioning (Page 51).

When replacing the RTU, remember to take the SIM card from the old device and insert it in the new one.

Transferring the configuration data to the new RTU

The procedure for transferring the configuration data to the RTU depends on whether you use an SD card in the RTU:

- **Device replacement without SD card**

  If you do not use an SD card, transfer the configuration data from the configuration PC to the new RTU before replacing the device.

  When you create the configuration data using the WBM of the RTU, you have the option of saving the configuration data on the configuration PC.

- **Device replacement with SD card**

  If you have used an SD card in the old RTU, after turning off the power supply remove the card from the old RTU and insert it in the new RTU before connecting up and installing it.

  When it restarts, the RTU reads the configuration data from the SD card.

6.6 Batteries: Replacement, recycling and disposal

The RTU can be operated optionally with one or two battery modules, optionally supplemented in each case by one or two battery expansion modules, see appendix Battery module (Page 275).

Handling batteries

⚠ WARNING
Risk of explosion and danger of release of harmful substances!
Do not throw batteries into a fire, do not solder the body of the cell, do not open batteries, do not short-circuit batteries, do not reverse the polarity of batteries, do not heat batteries above 100 °C.
Protect batteries from direct sunlight, dampness and condensation.
Dispose of batteries according to the regulations.

NOTICE
Do not place the battery holders on a conductive surface.
Never place the battery holders on an electrically conductive surface (e.g. the outer housing).
The battery contacts can establish a short-circuit connection in the battery via a conductive surface causing the battery to be destroyed.

Replacing batteries

⚠ WARNING
Replacement by trained personnel
Batteries must only be replaced by trained service technicians.

To replace batteries you first need to disconnect the battery module from the RTU in the WBM configuration. After replacing the batteries you need to connect the module again in the WBM. For a description of the procedure, refer to the section Power supply (Page 142).

You will find information on the recommended intervals for changing the batteries in the section Batteries: Estimating the working life (Page 147).

For a description of mounting the battery modules, refer to the section Installing an RTU (Page 57).

Recycling / disposal

Batteries and rechargeable batteries can be recycled. Their components can be used as raw materials for new batteries/rechargeable batteries or other products. Effective recycling procedures are only possible if batteries of the used batteries of the same type are collected together.

Note

Regulations for disposal of batteries

Keep to the local regulations for the recycling and disposal of batteries.

Technical data

<div style="text-align: right; font-size: 3em;">7</div>

Table 7- 1   SIMATIC RTU3030C

Technical specifications - RTU3030C		
Article number	6NH3112-3BA00-0XX0	
CPU		
Number of program block types	38	
Number of configurable program blocks	Max. 32	
Internal memory for user and configuration data	Type:	Flash EEPROM
Internal memory for process data	Type:	SRAM
Optional: External memory for process, diagnostics and configuration data	SD card not included with the product, see accessories.	
Internal clock of the RTU		
Clock type	RTC	
Accuracy	54 s per month (+ deviation due to aging of 8 s per year)	
Can be synchronized using:	• Mobile wireless service NITZ • SNTP • Communications partner of the RTU	
Cable lengths		
Permitted cable lengths	All cables for: • Power supply • Inputs • Outputs • LAN (Ethernet connection) • Antenna	Max. 30 m in each case
Power supply, current consumption and power loss		
Power supply from external source via terminal block X10	Power supply	12 .. 24 VDC, max. 1.2 A
	Permitted range	10.8 .. 28.8 V
	Design	Connector with terminal block, 5 terminals, protected against reverse polarity: • 1 input X10 IN (L+, M) • 1 output X10 CTRL (L+, M)
	Possible cable cross-section • Minimum • Maximum	• 0.2 mm² (28 AWG) • 1.5 mm² (16 AWG)

Technical specifications - RTU3030C		
	Max- tightening torque of the screw terminals	0.56 .. 0.79 Nm (5 .. 7 in lbs)
Power supply from the battery module *	Battery modules are not supplied with the device. See Accessories, section Battery module (Page 275).	
Current consumption (without connected consumers with minimum configuration)	In "sleep mode"	• With battery operation (7.2 VDC): 0,28 mA (typ.) • With ext. supply (24 VDC): 14 mA (typ.)
	In "update mode"	• With battery operation (7.2 VDC): 71 mA (typ.) • With ext. supply (24 VDC): 35 mA (typ.)
	In "communication mode"	• With battery operation (7.2 VDC): 208 mA (typ.) • With ext. supply (24 VDC): 83 mA (typ.)
Effective power loss (without connected consumers with minimum configuration)	In "sleep mode"	• With battery operation (7.2 VDC): 2 mW (typ.) • With ext. supply (24 VDC): 340 mW (typ.)
	In "update mode"	• With battery operation (7.2 VDC): 510 mW (typ.) • With ext. supply (24 VDC): 850 mW (typ.)
	In "communication mode"	• With battery operation (7.2 VDC): 1500 mW (typ.) • With ext. supply (24 VDC): 2000 mW (typ.)
Control output (X10)		
Control and supply of external devices	Regulated, short-circuit proof, can be configured alternatively, for all outputs: • 12 VDC • 24 VDC	
Maximum Power	See below (power)	
Control output (X11)		
Control and supply of sensors / switches for digital inputs / out-puts	Regulated, short-circuit proof, can be configured alternatively, for all outputs: • 12 VDC • 24 VDC	
Maximum Power	See below (power)	
Digital inputs (X20, X21, X22, X23)		
Quantity	8	
Type and material	Schmitt trigger input with an internal pull-up resistor. Can be switched via open drain transistors, relays or switches.	
Connection type	2-wire technology	
Level logical = 1 when:	Contact closed (≤ 0.4 V)	
Level logical = 0 when:	Contact open	

Technical specifications - RTU3030C

Configurable input types	• Binary input
	– Minimum pulse length for binary input: 2 ms Minimum pulse length in sleep mode or with logging activated: 100 ms
	– Filter time: 40 µs
	• Counter input
	– Input clock frequency: 1 .. 5000 Hz
	A debounced signal transmitter is necessary.

Digital outputs (X30, X31)

Quantity	4
Type and material	Relay, silver/nickel gold plated
Connection type	2-wire technology
Level logical = 1 when:	Contact closed
Level logical = 0 when:	Contact open
Maximum switching frequency	1 Hz
Limit permanent current	300 mA
Max. switched current	300 mA
Max. switching voltage	• 60 VDC • 30 VAC effective (42.2 V peak voltage with non-sine-shaped voltage)
Max. switching capacity	18 W (at 60 VDC)
Mechanical lifetime of the contacts (typ.)	10^8 switching cycles
Electrical lifetime of the contacts (typ.)	• At 12 V / 10 mA: • 5×10^7 switching cycles • At 6 V / 100 mA: • 1×10^7 switching cycles • At 60 V / 300 mA: • 5×10^5 switching cycles

Analog inputs (X41, X43)

Quantity	4
Connection type	2-/3-/4-wire technology (L+, M, X+, X-)
Configurable input signals (typ, range)	• Current • 0/4 .. 20 mA • Voltage • 0 .. 5/10 V • Temperature (Pt1000) • -80 ... +140 °C / -112 .. +284 °F
Accuracy	• Current • +/- 1 % • Voltage • +/- 1 % • Temperature • +/- 1.8 %
Resolution	12 bits (0 .. 4095)
Input resistance	• 580 kΩ (voltage measurement) • 243 Ω (current measurement)

Technical specifications - RTU3030C		
Analog inputs - 12/24 V control output for sensors (X40, X42)		
Power supply at terminal L+	Regulated, short-circuit proof, can be configured alternatively, for all outputs: • 12 VDC • 24 VDC	
Maximum Power	See below (power)	
Power		
Maximum power of all outputs (X10 + X11 + X40 + X42)	Alternative: • 7.2 W at 24 V • 3.6 W at 12 V With a total of max. 300 mA over all outputs	
Antenna connector / wireless interface (XR1A1)		
Frequency bands	UMTS	Band 1 (2100 MHz) Band 2 (1900 MHz) Band 4 (1900 MHz) Band 5 (850 MHz) Band 6 (800 MHz) Band 8 (900 MHz) Band 19 (800 MHz)
	GSM	GSM (850/900 MHz) DCS (1800 MHz) PCS (1900 MHz)
Antenna connector	Quantity	1
	Design	SMA socket
	Nominal impedance	50 Ω
Maximum transmit power	WCDMA FDD (B1/2/4/5/6/8/19)	+24 dBm (Class 3)
	EDGE 1800/1900 MHz	+26 dBm (Class E2)
	EDGE 850/900 MHz	+27 dBm (Class E2)
	DCS 1800, PCS 1900	+30 dBm (Class 1)
	GSM 850/900	+33 dBm (Class 1)
HSPA (UMTS)	Transmission speed (maximum)	• Downlink (HSDPA): 42 Mbps • Uplink (HSUPA): 5.76 Mbps
EDGE (GSM)	Properties	• Multislot class 10 end device class B coding scheme 1 to 9 (GMSK)
	Transmission speed	• Downlink: 236.8 kbps • Uplink: 236.8 kbps
GPRS (GSM)	Properties	• Multislot class 10 end device class B coding scheme 1 to 4 (GMSK)

Technical specifications - RTU3030C		
	Transmission speed	• Downlink: 85.6 kbps • Uplink: 85.6 kbps
SMS	Mode outgoing	MO (mobile originated)
	Service	Point-to-point

Attachment to Industrial Ethernet (X1P1)	
Quantity	1
Design	RJ-45 jack
Properties	100BASE-TX, IEEE 802.3-2005, half duplex/full duplex, autocrossover, autonegotiation, galvanically isolated
Transmission speed	10 / 100 Mbps

Permitted ambient conditions		
Ambient temperature	During operation with the DIN rail installed horizontally	• At an operating height ≤ 2000 m: -40 °C .. +70 °C • At an operating height ≤ 3000 m: -40 °C .. +65 °C
	During operation with the DIN rail installed vertically	• At an operating height ≤ 2000 m: -40 °C .. +60 °C • At an operating height ≤ 3000 m: -40 °C .. +55 °C
	During storage	-40 °C .. +70 °C
	During transportation	-40 °C .. +70 °C
Relative humidity	During operation	≤ 95% at 30 °C, no condensation
	During storage	≤ 95% at 25/55 °C, no condensation

Design, dimensions and weight (without battery modules and protective housing) **	
Design	Compact module for DIN rail mounting
Degree of protection	IP20
Weight	370 g
Dimensions (W x H x D) (without terminal blocks of the connectors)	130 x 100 x 75 mm
Installation options	Standard 35 mm DIN rail

* You will find the technical specifications of the battery module and the battery expansion module in the appendix Battery module (Page 275).

** You will find the technical specifications of the protective housing in the appendix Protective housing (Page 288).

You will find additional functions and performance data of the RTU in the section Application and functions (Page 13).

You will find information on the underrange/overrange and underflow/overflow of the analog inputs in the section Analog inputs (Page 155).

Approvals

<div align="right">A</div>

Approvals issued

Note

Issued approvals on the type plate of the device

The specified approvals apply only when the corresponding mark is printed on the product. You can check which of the following approvals have been granted for your product by the markings on the type plate.

EC declaration of conformity

 $C\epsilon$

The RTU meets the requirements and safety objectives of the following EC directives and it complies with the harmonized European standards (EN) for programmable logic controllers which are published in the official documentation of the European Union.

- **2014/34/EU (ATEX explosion protection directive)**

  Directive of the European Parliament and the Council of February 26 2014 on the approximation of the laws of the Member States concerning equipment and protective systems intended for use in potentially explosive atmospheres

- **2014/53/EU (Radio equipment directive)**

  Directive of the European Parliament and of the Council of April 16, 2014 on the harmonization of the laws of the member states relating to placing radio equipment on the market and to cancel the directive 1999/5/EU

- **2011/65/EU (RoHS)**

  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

The EC Declaration of Conformity is available for all responsible authorities at:

Siemens Aktiengesellschaft
Process Industries and Drives
Process Automation
DE-76181 Karlsruhe
Germany

You will find the EC Declaration of Conformity for this product on the Internet at the following address:

Link: (https://support.industry.siemens.com/cs/ww/en/ps/21767/cert)

> "EC Declaration of Conformity"

IECEx

The product meets the requirements of explosion protection according to IECEx.

IECEx classification: Ex nA IIC T4 Gc

The product meets the requirements of the following standards:

- EN 60079-0

  Hazardous areas - Part 0: Equipment - General requirements

- EN 60079-15

  Explosive atmospheres - Part 15: Equipment protection by type of protection 'n'

The current versions of the standards can be seen in the currently valid version of the IECEx certificate DEK 14.0086X.

ATEX

The RTU meets the requirements of the EC directive 2014/34/EU "Equipment and Protective Devices for Use in Potentially Explosive Atmospheres".

Applied standards:

- EN 60079-0

  Hazardous areas - Part 0: Equipment - General requirements

- EN 60079-15

  Explosive atmospheres - Part 15: Equipment protection by type of protection 'n'

The current versions of the standards can be seen in the EC Declaration of Conformity, see above.

ATEX approval: II 3 G Ex nA IIC T4 Gc

Test number: KEMA 03ATEX1228 X

Over and above this, the following conditions must be met for the safe deployment of the RTU according to the section Notices on use in hazardous areas according to ATEX / IECEx (Page 53).

You should also note the information in the document "Use of subassemblies/modules in a Zone 2 Hazardous Area" that you will find on the Internet at the following address:

Link: (https://support.industry.siemens.com/cs/ww/en/view/78381013)

Radio equipment directive

The RTU meets the requirements of the EC directive 2014/53/EU (Radio equipment) according to the requirements of article 3 (1) a, 3 (1) b and 3 (2).

Article 3 (1) a - Health and Safety

Harmonized standards:

- EN 60950-1+A1+A2+A11+A12

  Information technology equipment - Safety - Part 1: General requirements

- EN 62311

  Assessment of electronic and electrical equipment related to human exposure restrictions for electromagnetic fields (0 Hz ... 300 GHz)

Art. 3 (1) b - EMC

Harmonized standards:

- ETSI EN 301 489-1 V1.9.2

  Electromagnetic compatibility and radio spectrum matters (ERM) - Electromagnetic compatibility for radio equipment and services - Part 1 : Common technical requirements

- ETSI EN 301 489-7 V1.3.1

  Electromagnetic compatibility and radio spectrum matters (ERM) - Electromagnetic compatibility for radio equipment and services - Part 7 : Specific conditions for mobile and portable radio and ancillary equipment of digital cellular radio telecommunications systems (GSM and DCS)

- ETSI EN 301 489-24 V1.5.1

  Electromagnetic compatibility and radio spectrum matters (ERM) - Electromagnetic compatibility for radio equipment and services - Part 24 : Specific conditions for mobile and portable IMT-2000 CDMA Direct Spread (UTRA) radio and ancillary equipment

- EN 61000-6-2+AC

  Electromagnetic compatibility (EMC) - Part 6-2: Generic standards - Immunity for industrial environments

Art. 3 (2) Measures for efficient use of the frequency spectrum

Harmonized standards:

- ETSI EN 301 511 V9.0.2

  Global system for mobile communication (GSM). Harmonized standard for mobile phones in the GSM 900 and GSM 1800 bands covering essential requirements of article 3.2 of the R&TTE directive.

- ETSI EN 301 908-1 V6.2.1

  IMT cellular networks - Harmonized standard covering the essential requirements of article 3.2 of the R&TTE directive. Part 1: Introduction and common requirements

- ETSI EN 301 908-2 V6.2.1

  IMT cellular networks. Harmonized standard covering the essential requirements of article 3.2 of the R&TTE directive. Part 2: CDMA Direct Spread (UTRA FDD) User Equipment (UE)

The current versions of the standards can be seen in the EC Declaration of Conformity, see above.

Maximum antenna gain

Users and installers must be provided with antenna installation instructions and transmitter operating conditions that must be followed to avoid exceeding the permitted RF exposure.

In this respect, note the technical specifications of the antenna, see appendix Antennas and accessories (Page 282).

RoHS

The RTU meets the requirements of the EC directive 2011/65/EU on the restriction of the use of certain hazardous substances in electrical and electronic equipment.

Applied standard:

● EN 50581:2012

cULus

Underwriters Laboratories Inc. meets

● Underwriters Laboratories, Inc.: UL 61010-1 (Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use - Part 1: General Requirements)

● IEC/UL 61010-2-201 (Safety requirements for electrical equipment for measurement, control and laboratory use. Particular requirements for control equipment)

● Canadian Standards Association: CSA C22.2 No. 61010-1-12 / CSA-IEC 61010-2-201

cULus HAZ.LOC.

Underwriters Laboratories Inc. meets

● ISA 12.12.01 (Nonincendive Electrical Equipment for Use in Class I and II, Division 2 and Class III, Divisions 1 and 2 Hazardous (Classified) Locations)

● CSA C22.2 No. 213 (Hazardous Location)

APPROVED for Use in:

● Cl. 1, Div. 2, GP. A, B, C, D T4; Ta = -40 °C...+70 °C

● Cl. 1, Zone 2, GP. IIC T4; Ta = -40 °C...+70 °C

FM

Factory Mutual Research (FM)
Approval standard class number 3600 and 3611
Approved for use in:

● Class I, Division 2, Group A, B, C, D, Temperature Class T4, Ta = 70 °C

● Class I, Zone 2, Group IIC, Temperature Class T4, Ta = 70 °C

RCM

The RTU meets the requirements of the AS/NZS 2064 standards (Class A).

National wireless approvals

To operate the device in certain countries approvals for wireless operation must exist, the agreed marking must be present on the type plate and special instructions for the particular country must be adhered to. Some of the national approvals and instructions are shown below.

Australia / New Zealand

Australian Communications and Media Authority, for compliance levels 1, 2 and 3 in Australia and levels of conformity 1, 2 and 3 in New Zealand. As required by notices under:

- section 182 of the Australian *Radiocommunications Act 1992*;

- section 407 of the Australian *Telecommunications Act 1997*; and

- section 134 of the New Zealand *Radiocommunications Act 1989*.

Canada

CONTAINS IC: 5131A-HE910

IC statement:

This device complies with part 15 of the FCC Rules and Industry Canada license-exempt RSS standard(s). 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.

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes :
(1) l'appareil ne doit pas produire de brouillage, et
(2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi,
même si le brouillage est susceptible d'en compromettre le fonctionnement.

Mexico

La operación de este equipo está sujeta a las siguientes dos condiciones:

(1) es posible que este equipo o dispositivo no cause interferencia perjudicial y

(2) este equipo o dispositivo debe aceptar cualquier interferencia, incluyendo la que pueda causar su operación no deseada.

USA

CONTAINS FCC-ID: RI7HE910

FCC statement:
"This device complies with part 15 of the FCC Rules. 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.
Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment."

Additional statement for Digital Devices / Computer Peripheral Devices
FCC §15.105 statement:
"This equipment has been tested and found to comply with the limits for a Class B 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."

Country-specific mobile wireless approvals of SIMATIC NET devices

You will find an overview of the mobile wireless approvals of the SIMATIC NET devices for specific countries here:
Link: (www.siemens.com/mobilenetwork-approvals)

You can obtain further information on mobile wireless approvals of SIMATIC NET devices from Siemens Industry Online Support:
Link: (http://www.siemens.de/automation/support-request)

Current approvals

SIMATIC NET products are regularly submitted to the relevant authorities and approval centers for approvals relating to specific markets and applications.

If you require a list of the current approvals for individual devices, consult your Siemens contact or check the Internet pages of Siemens Industry Online Support:

Link: (https://support.industry.siemens.com/cs/ww/en/ps/21767/cert)

Dimension drawings

Note

All dimensions in the dimension drawings are in millimeters.

Figure B-1   Front view
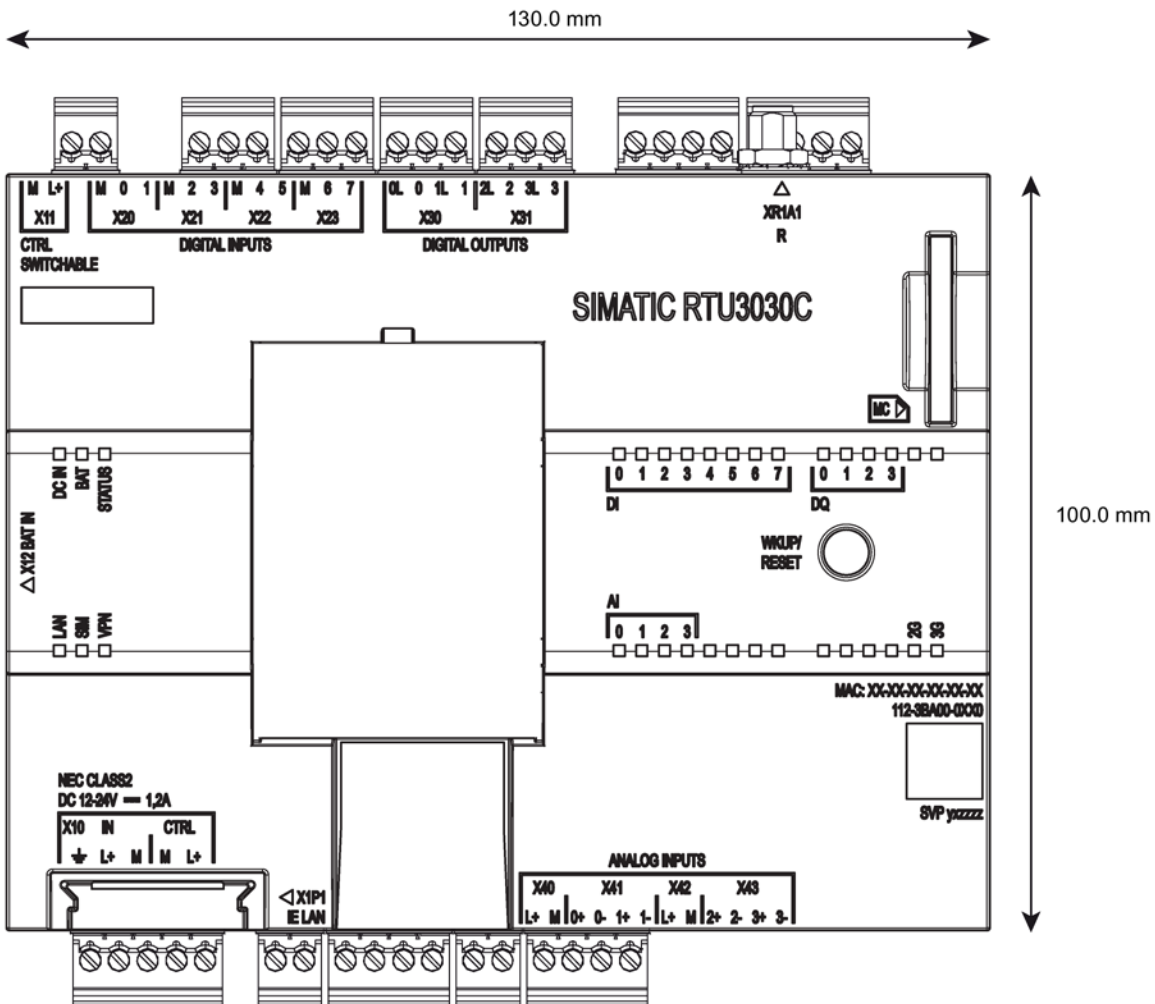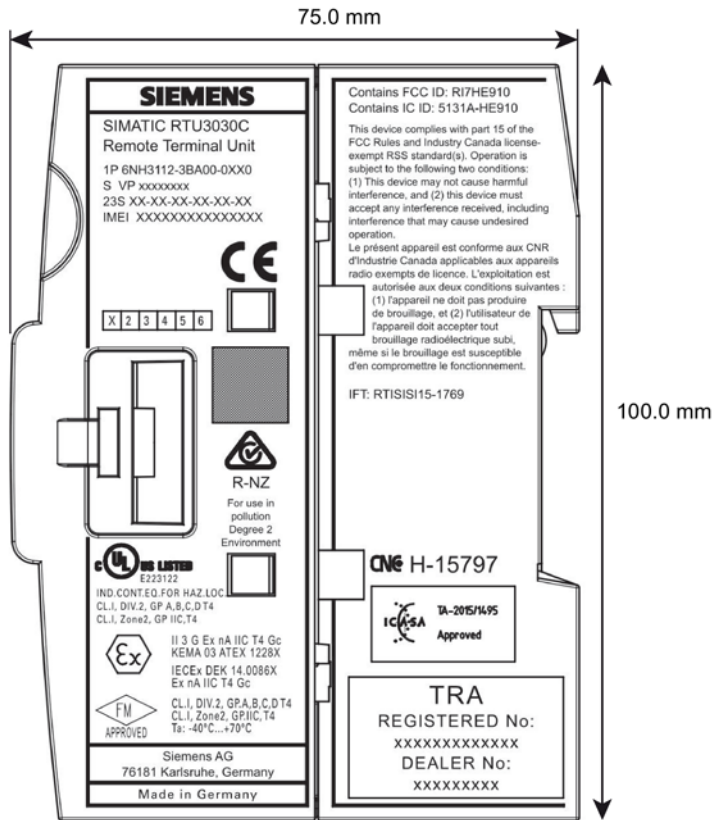
Figure B-2   Side view

Accessories

<div style="text-align: right">C</div>

C.1 Battery module

C.1.1 Battery module and battery expansion module

Battery modules and battery expansion modules

For the power supply of the RTU the following optional accessories are available that do not ship with the RTU.

- Battery module

  One or two battery modules can be connected to the RTU. The battery modules can be used as an alternative or in addition to an external power supply.

  Each battery module is equipped with two batteries.

- Battery expansion module

  Each battery module can have one or two expansion modules added to increase the capacity.

  Each expansion module is equipped with two batteries.

The battery module, the battery expansion module and the batteries can be used for all RTU models of the RTU3000 product family.
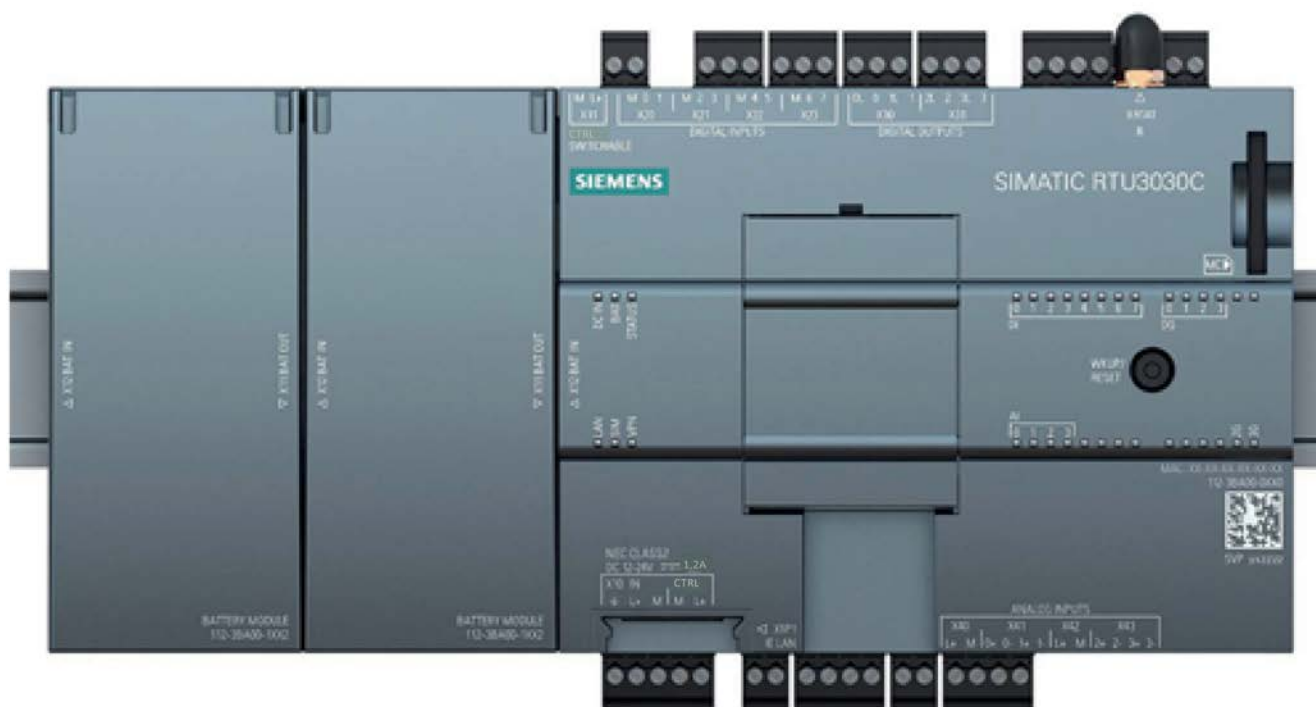

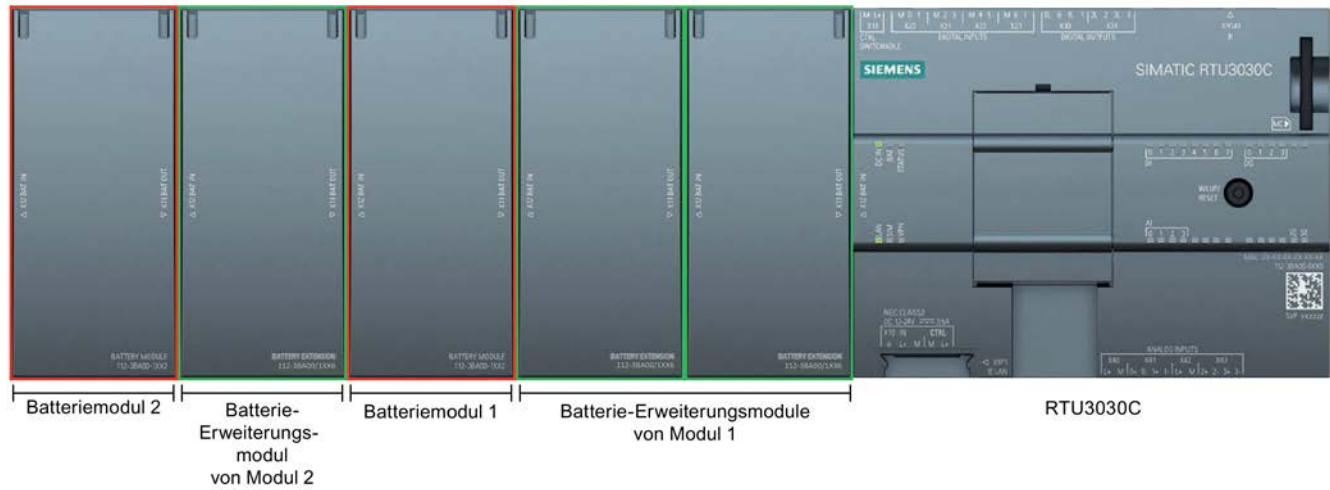Figure C-1   RTU3030C with two battery modules

Figure C-2   RTU3030C with two battery modules (framed in red) and a total of three expansion modules (framed in green)

In the second figure battery module 1 has had two expansion modules added. Battery module 2 has only had one expansion module added

A completely equipped battery module with its full fittings is made up of the following components:

- Battery module including battery holder and connector (see below)

- Two battery expansion modules including battery holder and connector (see below)

- Six batteries (2 for the battery module + 2 x 2 for the expansion modules)

  For information on the batteries refer to the appendix Battery (Page 279).

Module changeover

When two battery modules are used, module 1 initially supplies the RTU (in the figures the right-hand module).

When a critical voltage value in module 1 is reached, the RTU switches automatically to battery module 2 (on the left in the figures).

After replacing the batteries of module 1, the RTU can switch back to module 1 after a critical voltage value status is reached in module 2. This guarantees that the batteries of a module are always completely emptied before switching to the other module.

Note

Reduced power output with high current and low temperatures

With a high current in conjunction with very low temperatures the power output at the 12/24 V outputs is reduced because the battery voltage drops considerably at very low temperatures. Under these conditions it is recommended to add at least one battery expansion module to each battery module.

This increases the battery capacity and reduces the disturbance caused by high current peaks particularly at low temperatures.

Ordering data, drawings, technical specifications

| Name	Article number	Explanation
Battery module	6NH3112-3BA00-1XX2	**Battery module** Module for power supply to the RTU Including battery holder for two batteries, with connecting cable and connector. Suitable design for direct connection to the RTU or an expansion module (see below) on the DIN rail with a plug-in connection via the supplied connector.
Battery expansion module	6NH3112-3BA00-1XX6	**Expansion module** Battery expansion module to supplement a battery module Including battery holder for two batteries, with connecting cable and connector. Suitable design for direct connection to a battery module on the DIN rail with a plug-in connection via the supplied connector. The battery expansion module can only be used in conjunction with the battery module (see above). It has the same mechanical design as the battery module.
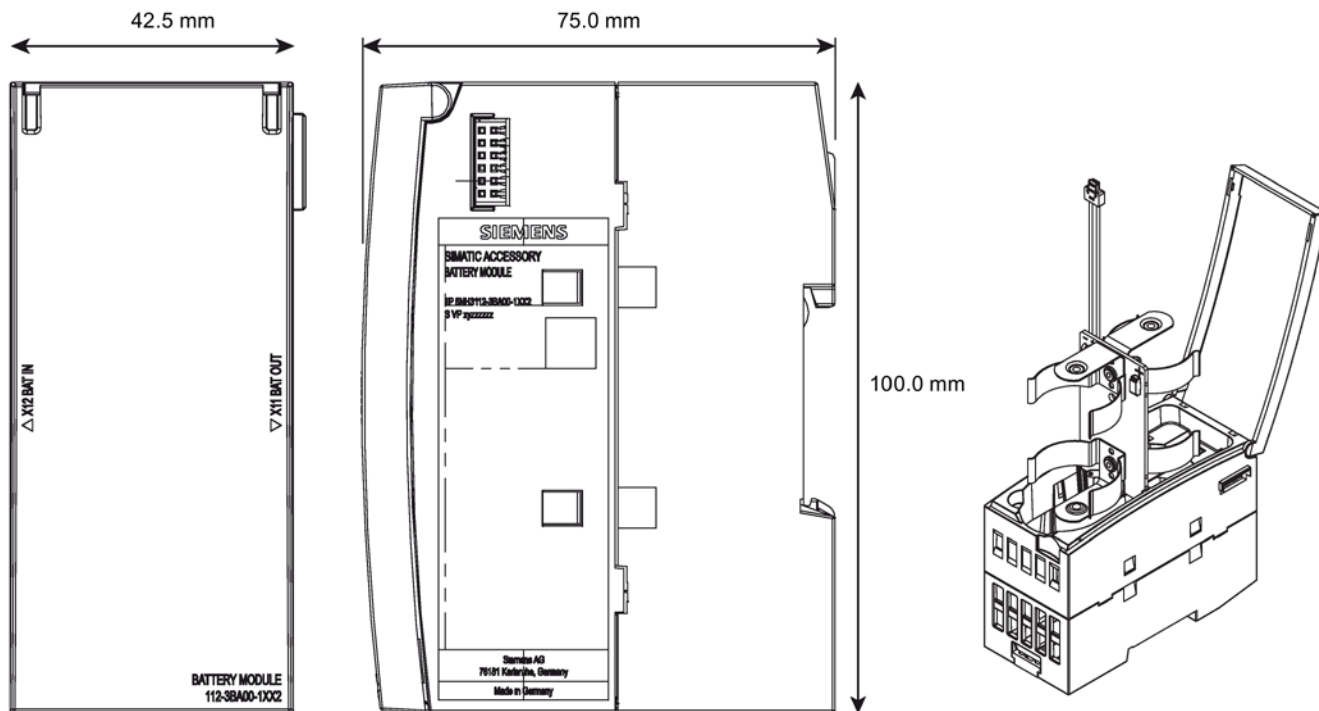
Figure C-3   Battery module. Front view (left), side view (center), housing with battery holder (right)
(The expansion module has the same design but different labeling.)

Figure C-4   Battery holder with batteries inserted

Table C- 1   Battery module / battery expansion module

Technical specifications - battery module / battery expansion module		
Article numbers		
• Battery module	• 6NH3112-3BA00-1XX2	
• Expansion module	• 6NH3112-3BA00-1XX6	
Permitted ambient conditions		
Ambient temperature	During operation with the DIN rail installed horizontally	-40 °C ... +70 °C
	During operation with the DIN rail installed vertically	-40 °C ... +60 °C
	During storage	-40 °C ... +70 °C
	During transportation	-40 °C ... +70 °C
Relative humidity	During operation	≤ 95% at 30 °C, no condensation
	During storage	≤ 95% at 25/55 °C, no condensation
Design, dimensions and weight		
Design	Compact module for DIN rail mounting	
Material battery module housing	Plastic	
Material battery holder	Spring steel, nickel plated	
Degree of protection	IP20	
Weight without batteries		
• Battery module	• 132 g	
• Expansion module	• 125 g	
Dimensions (W x H x D)	45 x 100 x 75 mm	
Installation options	Standard 35 mm DIN rail	
	The battery module and the expansion module are installed on the same DIN rail as the RTU. *	

* For the installation position see figure above.

C.1.2   Battery

Requirements

For use in the battery module or in the battery expansion module of the RTU, high current resistant lithium metal batteries (primary cells, cannot be recharged) are required.

The batteries must meet the following requirements:

- Electrical data
    - Nominal voltage (V_{nom}): 3.6 V
    - Min permanent current:1800 mA
    - Min. pulsed current:4000 mA
    - **Important:**

      Fuse against short-circuit (overheating protection): Fuse or temperature-dependent resistor
- Geometric data
    - Size acc. to ANSI: D (Mono)
    - Maximum diameter: 33.4 mm
    - Maximum height: 61.5 mm

Allowed battery types

Saft, LSH 20

Technical specifications - LSH 20	
Brand and battery type	
Vendor	Saft
Type	LSH 20
Battery type:	D cell, lithium thionyl chloride ($LiSOCl_2$)
Electrical data	
Voltage (nominal)	3.6 V

Technical specifications - LSH 20		
Capacity (at 15 mA, 2 V, 20 °C)	13 Ah	
Max. current pulse	4000 mA (100 ms)	
Max. continuous current	1800 mA	
Fuse against short-circuit	Fuse 5 A	
Permitted ambient conditions		
Ambient temperature	During operation in the battery module or battery expansion module	With the DIN rail installed horizontally: -40 °C ... +70 °C
		With the DIN rail installed vertically: -40 °C ... +60 °C
	During storage and transportation	Recommended: < +30 °C, dry
Relative humidity	During operation	< 95 %, no condensation
Dimensions and weight		
Weight	100 g	
Dimensions	• Diameter • Height	• 33.1 mm (± 0.3 mm) • 61.0 mm (± 0.6 mm)
Installation options, installation in:	• Battery module • Battery expansion module	• 6NH3112-3BA00-1XX2 • 6NH3112-3BA00-1XX6

EVE, ER 34615M

Technical specifications - ER 34615M	
Brand and battery type	
Manufacturer	EVE
Type	ER 34615M
Battery type	D cell, lithium thionyl chloride (LiSOCl$_2$)
Electrical data	
Voltage (nominal)	3.6 V
Capacity (at 15 mA, 2 V, 20 °C)	13 Ah
Max. current pulse	4000 mA (100 ms)
Max. continuous current	2000 mA

Technical specifications - ER 34615M		
Fuse against short-circuit	Fuse 5 A	
Permitted ambient conditions		
Ambient temperature	During operation in the battery module or battery expansion module	With the DIN rail installed horizontally: -40 °C ... +70 °C
		With the DIN rail installed vertically: -40 °C ... +60 °C
	During storage and transportation	Recommended: < +30 °C, dry
Relative humidity	During operation	< 95 %, no condensation
Dimensions and weight		
Weight	110 g	
Dimensions	• Diameter • Height	• max. 33.1 mm • max. 61.5 mm
Installation options, installation in:	• Battery module • Battery expansion module	• 6NH3112-3BA00-1XX2 • 6NH3112-3BA00-1XX6

C.2   SD card / SMC

C.2.1   Compatible SD cards

Compatible SD cards

For the "Logging" mode you require an SD card.

The card slot and the RTU are compatible with the following card formats:

- **Standard SD card**

  Format 32 x 24 mm

  Specifications:

  – SD 1.0, 1 GB, FAT32

  – SD 1.1, 2 GB, FAT32

  – SDHC, to 32 GB, FAT32

- **SIMATIC S7 Memory Card (SMC)**

  For information on the available SMC types, refer to the section SIMATIC S7 Memory Card (SMC) (Page 282).

You will find more information on using SD cards in the section Scope of delivery, accessories, requirements (Page 33).

Note

Temperature range of the SD card

When using an SD card, make sure that this is suitable for the temperature range in which the RTU is used.

Quality of the SD card

Make sure that you use quality cards because due to regular switching on and off, the interface of the SD card is subject to greater demands than with other applications.

C.2.2 SIMATIC S7 Memory Card (SMC)

SIMATIC S7 - Memory Card (SMC)

The SMC is available with various capacities. The recommended memory capacity is in the range between 24 MB and 32 GB. SMCs up to 32 GB memory capacity are supported.

Article numbers: 6ES7954-8Lx02-0AA0
x is a placeholder for: F / L / P / T

You will find the cards on the pages of the Siemens Industry Mall using the search term "6ES7954".

C.3 Antennas and accessories

C.3.1 Antenna ANT896-4ME

The following antenna is available for use in mobile wireless networks and can be installed both indoors and outdoors. The antenna must be ordered separately.

Antenna ANT896-4ME

Figure C-5   Antenna ANT896-4ME

Short name	Order no.	Explanation
ANT896-4ME	6GK5896-4ME00-0AA0	Omnidirectional antenna for LTE networks (4G), GSM networks (2G) and UMTS networks (3G); weatherproof for indoor and outdoor areas, IP68, - 40 °.. + 70 °C, N-Connect female incl. toothed washer and nut.

The antenna must be ordered separately, see antenna accessories.

You will find detailed information in the documentation of the device. You will find this on the Internet on the pages of Siemens Industry Online Support at the following address:

Link: (https://support.industry.siemens.com/cs/ww/en/view/100699507)

C.3.2   Antenna ANT794-4MR

The following antenna is available for use in mobile wireless networks and can be installed both indoors and outdoors. The antenna must be ordered separately.

Antenna ANT794-4MR

Figure C-6   Antenna ANT794-4MR

Short name	Order no.	Explanation
ANT794-4MR	6NH9 860-1AA00	Omnidirectional antenna for LTE networks (4G), GSM networks (2G) and UMTS networks (3G); weatherproof for indoor and outdoor areas; IP65, - 40 °.. + 70 °C, 5 m connecting cable connected permanently to the antenna, SMA connector, including installation bracket, screws, wall plugs.

You will find detailed information in the documentation of the device. You will find this on the Internet on the pages of Siemens Industry Online Support at the following address:

Link: (https://support.industry.siemens.com/cs/ww/en/view/23119005)

C.3.3   Antenna accessories, screw connections

Use of the antennas and accessories

The RTU has an SMA socket as the antenna connector.

Depending on the use of the RTU without or with protective housing, different components must be used.

- **RTU without protective housing**

  Use the following components:

  – Antenna ANT794-4MR with SMA plug

- **RTU with protective housing, antenna detached from the housing**

  Use the following components:

  – Antenna ANT896-4ME (N-Connect female)

  – Flexible connecting cable (N-Connect male / SMA male)

  Connection between the SMA socket of the RTU and the protective housing

  – For mounting in the 13.7 x 16.2 mm hole of the protective housing, alternatively:

  - Cabinet feedthrough (N-Connect female / N-Connect female)
    or

  - Overvoltage protection module LP798-1N (N-Connect female / N-Connect female)

  – Flexible connecting cable (N-Connect male / N-Connect male)

  Connection between the cabinet feedthrough or overvoltage protection module and antenna

Antenna accessories

- **Cabinet feedthrough**

  To feed the antenna cable through the wall of the protective housing from the outside, you require the following cabinet feedthrough:

  Cabinet feedthrough for wall thickness max. 4.5 mm, IP68

  N-Connect female/ N-Connect female

  Manufacturer: Siemens AG

  Article number 6GK5 798-2PP00-2AA6

  Link: (https://support.industry.siemens.com/cs/ww/en/pv/6GK5798-2PP00-2AA6/td)

- **Flexible connecting cable for antenna**

  Flexible connecting cable, preassembled Length 0.3 m to connect the RTU to the overvoltage protection module or the cabinet feedthrough

  N-Connect male / SMA male

  Manufacturer: Siemens AG

  Article number 6XV 1875-5LE30

  Link: (https://support.industry.siemens.com/cs/ww/en/pv/6XV1875-5LE30/td)

  Other possible lengths:

  – Length 1 m: 6XV 1875-5LH10

  Link: (https://support.industry.siemens.com/cs/ww/en/pv/6XV1875-5LH10/td)

  – Length 2 m: 6XV 1875-5LH20

  Link: (https://support.industry.siemens.com/cs/ww/en/pv/6XV1875-5LH20/td)

  – Length 5 m: 6XV 1875-5LH50

  Link: (https://support.industry.siemens.com/cs/ww/en/pv/6XV1875-5LH50/td)

- **Overvoltage protection module**

  See section Overvoltage protection module for the antenna cable (Page 292).

- **HF coupling piece**

  Optional for connecting two components with N-Connect female connector

  N-Connect male / N-Connect male

  Manufacturer: Siemens AG

  Article number 6GK5 798-0CP00-1AA0

  Link: (https://support.industry.siemens.com/cs/ww/en/pv/6GK5798-0CP00-1AA0/td)

C.4   Router SCALANCE M

Routers for IP-based communication

To connect a communications module to IP-based infrastructure networks, the following routers are available:

- SCALANCE M812

  ADSL router for wired IP communication via the Internet, VPN, firewall, NAT, 1 RJ-45 Ethernet interface,1 digital input, 1 digital output, ADSL2T or ADSL2+

  – ADSL2T (analog phone connection - Annex A)
      Article number: 6GK5812-1AA00-2AA2

  – ADSL2+ (ISDN connection - Annex B)
      Article number: 6GK5812-1BA00-2AA2

- SCALANCE M816

  ADSL router for wired IP communication via the Internet, VPN, firewall, NAT, 1 RJ-45 Ethernet interface with 4-port switch,1 digital input, 1 digital output, ADSL2T or ADSL2+

  – ADSL2T (analog phone connection - Annex A)
      Article number: 6GK5816-1AA00-2AA2

  – ADSL2+ (ISDN connection - Annex B)
      Article number: 6GK5816-1BA00-2AA2

- SCALANCE M826-2

  SHDSL router for IP communication via 2- and 4-wire cables, ITU-T standard G.991.2 / SHDSL.biz, SHDSL topology: Point-to point, bonding, line bridge mode; routing mode with VPN, firewall, NAT,1 Ethernet interface with 4-port switch, 1 digital input, 1 digital output
  Article number 6GK5826-2AB00-2AB2

- SCALANCE M874-2

  2.5G router for wireless IP communication via 2.5G mobile wireless, VPN, firewall, NAT, 1 RJ-45 Ethernet interface with 2-port switch, SMA antenna connector, 1 digital input, 1 digital output
  Article number: 6GK5874-2AA00-2AA2

- SCALANCE M874-3

  3G router for wireless IP communication via 3G mobile wireless HSPA+, VPN, firewall, NAT, 1 RJ-45 Ethernet interface with 2-port switch, SMA antenna connector, 1 digital input, 1 digital output
  Article number: 6GK5874-3AA00-2AA2

- SCALANCE M876-3

  3G router for wireless IP communication via 3G mobile wireless HSPA+/EV-DO, VPN, firewall, NAT, 1 RJ-45 Ethernet interface with 4-port switch, SMA antenna connector, antenna diversity,1 digital input, 1 digital output
  Note network provider approvals!

  – International version
    Article number: 6GK5876-3AA02-2BA2

  – Version for Korea
    Article number: 6GK5876-3AA02-2EA2

- SCALANCE M876-4

  4G router for wireless IP communication via LTE mobile wireless, VPN, firewall, NAT, 1 RJ-45 Ethernet interface with 4-port switch, 2 SMA antenna connectors, MIMO technology, 1 digital input, 1 digital output

  – Version for Europe
    Article number: 6GK5876-4AA00-2BA2

  – Version for North America
    Article number: 6GK5876-4AA00-2DA2

Information on the devices can be found on the Internet pages of Siemens Industry Online Support:
Link: (https://support.industry.siemens.com/cs/ww/en/ps/15982)

C.5 Protective housing

C.5.1 Aluminum protective housing

Aluminum protective housing

Name	Article number	Explanation
Aluminum protective housing	6NH3112-3BA00-1XX3	Properties • Material: Aluminum (AlSi 12), powder-coated, gray ((RAL 7001)) • Degree of protection IP68 • Resistant to salt water • Lid with hinges and 4 front screws (stainless steel, PIN Torx M6x30) lid seal chloroprene • With mounted 35 mm DIN rail, suitable for the RTU • 7 holes for cable gland M 16 • 2 ventilation nozzles M12 with NBR flat seal (top/bottom) with DAE membrane, watertight, dust proof, permeable for steam • Resistance to impact 10 J (ATEX 7J) Supplied accessories: • 2 DIN rail brackets • Documentation Grounding via lightning protector or cable gland

Table C- 2   Accessories to be ordered separately

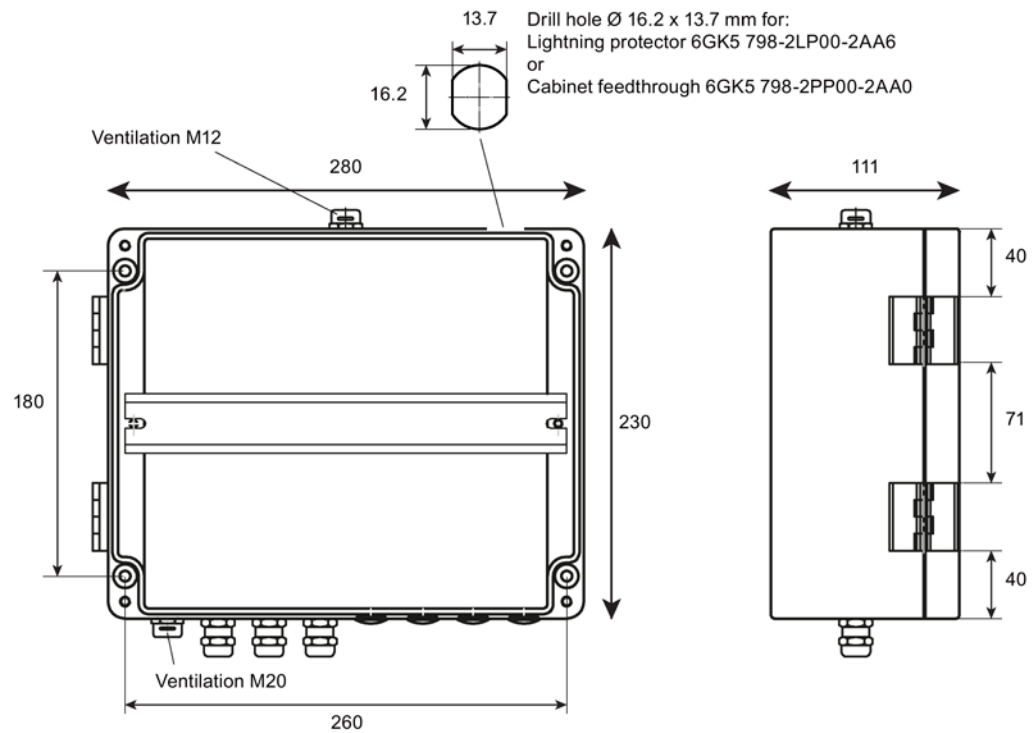| Accessories	Article number
Cable gland M 16 (10-14 mm), brass nickel plated, IP68 Packaging unit 2	6NH3112-3BA00-1XX4
Sealing plug M 16, brass, IP68 Packaging unit 2	6NH3112-3BA00-1XX5

Figure C-7   Aluminum protective housing: Front view (left), side view (right)
            Here with several mounted cable glands and sealing plugs (do not ship with the product)

Table C- 3   Aluminum protective housing

Technical specifications		
Article number	6NH3112-3BA00-1XX3	
Permitted ambient conditions		
Ambient temperature	During operation	-40 °C ... +80 °C
	During storage	-40 °C ... +80 °C
	During transportation	-40 °C ... +80 °C
Relative humidity	During operation	≤ 95% at 30 °C, no condensation
	During storage	≤ 95% at 25/55 °C, no condensation
Design, dimensions and weight		
Material	Aluminum	
Degree of protection	IP68 *****	
Weight	3395 g	
Dimensions (W x H x D)	280 x 230 x 111 mm	
Installation options	Standard 35 mm DIN rail	

* Please note the following:

Note

Mounting note for IP68 protection

The degree of protection IP68 is only ensured when the lid screws are tightened with the designated torque and all drill holes in the housing are closed with the intended accessories (cable gland or sealing plug and cabinet feedthrough or lightning protection element).

Keep to the following torques:

- Lid screws: 2.5 Nm
- Cable gland M16 adapter: 3.5 .. 4.5 Nm
- Sealing plugs M16: Fit hand-tight with a tool: 2.5 .. 3.5 Nm
- Pressure equalization element M12 (premounted): 1.5 Nm
- Cabinet feedthrough/lightning protection element 1.5 Nm

C.5.2 Stainless steel protective housing

Stainless steel protective housing

Name	Article number	Explanation
Stainless steel protective housing	6NH3112-3BA00-1XX1	Properties • Material: Stainless steel 1.4301 • Degree of protection IP68 • Lid with four screws (stainless steel, PIN torx M6x15) • Lid seal silicon • With mounted 35 mm DIN rail, suitable for the RTU • 7 holes for cable gland M 16 • 2 ventilation nozzles M12 with NBR flat seal (top/bottom) with DAE membrane, watertight, dust proof, permeable for steam • Resistance to impact 10 J (ATEX 7J) • Premounted: Grounding bolts M10, brass Supplied accessories: • 2 DIN rail brackets • Documentation Grounding via grounding bolts or cable gland

Table C- 4   Accessories to be ordered separately

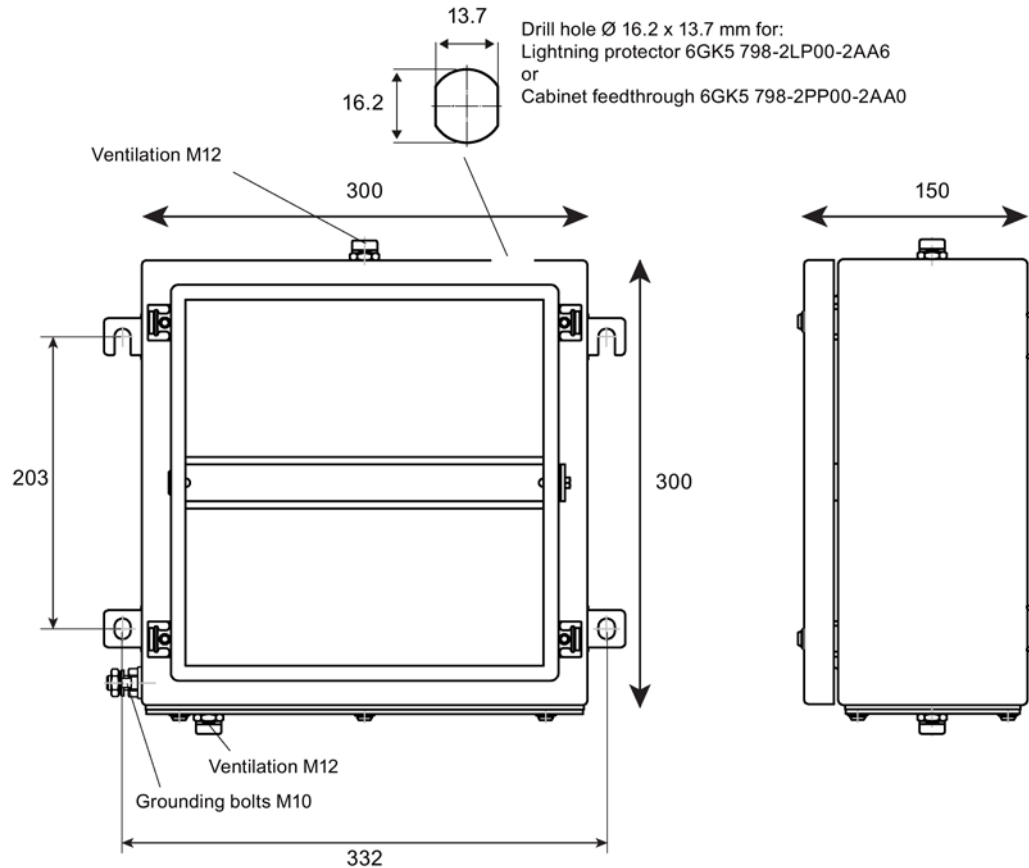| Accessories	Article number
Cable gland M 16 (10-14 mm), brass nickel plated, IP68 Packaging unit 2	6NH3112-3BA00-1XX4
Sealing plug M 16, brass, IP68 Packaging unit 2	6NH3112-3BA00-1XX5

Figure C-8   Stainless steel protective housing Front view (left), side view (right)

Table C- 5   Stainless steel protective housing

Technical specifications		
Article number	6NH3112-3BA00-1XX1	
Permitted ambient conditions		
Ambient temperature	During operation	-60 °C ... +135 °C
	During storage	-60 °C ... +135 °C
	During transportation	-60 °C ... +135 °C
Relative humidity	During operation	≤ 95% at 30 °C, no condensation
	During storage	≤ 95% at 25/55 °C, no condensation

Technical specifications	
Design, dimensions and weight	
Material	Stainless steel
Degree of protection	IP68 *****
Weight	5960 g
Dimensions (W x H x D)	300 x 300 x 150 mm
Installation options	Standard 35 mm DIN rail

* Please note the following:

Note

Mounting note for IP68 protection

The degree of protection IP68 is only ensured when the lid screws and the screws of the premounted flange plate are tightened with the designated torque and all drill holes in the housing are closed with the intended accessories (cable gland or sealing plug and cabinet feedthrough or lightning protection element).

Keep to the following torques:

- Lid screws and screws of the premounted flange plate: 2.5 Nm
- Cover nut of the cable gland M16: 3.5 .. 4.5 Nm
- Cover nuts of sealing plugs M16: Fit hand-tight with a tool: 2.5 .. 3.5 Nm
- Pressure equalization element M12 (premounted): 1.5 Nm
- Cabinet feedthrough/lightning protection element 1.5 Nm

C.6 Overvoltage protection modules

C.6.1 Overvoltage protection module for the antenna cable

Overvoltage protection module for the antenna

The following or a technically equivalent module are suitable to protect the system from looping in overvoltages via an antenna cable. Degree of protection IP68

Lightning Protector LP798-1N

Article number 6GK5798-2LP00-2AA6

Manufacturer: Siemens AG

Link: (https://support.industry.siemens.com/cs/ww/en/pv/6GK5798-2LP00-2AA6/td)

C.6.2   Overvoltage protection modules for supply and signal cables

Overvoltage protection modules for supply and signal cables

The following or technically equivalent modules are suitable to protect the system from looping in overvoltages via supply or signal cables:

Manufacturer: DEHN + SÖHNE GmbH + Co. KG

http://dehn.de

- For power supply cables

    Blitzductor BVT AVD 24,

    Article number 918 422

Documentation references

<div style="text-align: right">D</div>

Where to find Siemens documentation

- Article numbers

  You will find the article numbers for the Siemens products of relevance here in the following catalogs:

  – SIMATIC NET - Industrial Communication / Industrial Identification, catalog IK PI

  – SIMATIC - Products for Totally Integrated Automation and Micro Automation, catalog ST 70

  You can request the catalogs and additional information from your Siemens representative. You will also find the product information in the Siemens Industry Mall at the following address:

  Link: (https://mall.industry.siemens.com)

- Manuals on the Internet

  You will find SIMATIC NET manuals on the Internet pages of Siemens Industry Online Support:

  Link: (https://support.industry.siemens.com/cs/ww/en/ps/15247/man)

  Go to the required product in the product tree and make the following settings:

  Entry type "Manuals"

- Manuals on the data medium

  You will find manuals of SIMATIC NET products on the data medium that ships with many of the SIMATIC NET products.

/1/

SIMATIC
RTU3000C
Operating instructions
Siemens AG
Link: (https://support.industry.siemens.com/cs/ww/en/ps/21767/man)

/2/

SIMATIC
RTU3000C
DNP3 Device Profile
Siemens AG
Link: (https://support.industry.siemens.com/cs/ww/en/view/109481154)

/3/

SIMATIC
RTU3000C
Interoperability list IEC 60870-5-104
Siemens AG
Link: (https://support.industry.siemens.com/cs/ww/en/view/109481299)

/4/

SIMATIC NET
TeleControl Server Basic (Version V3)
Operating Instructions
Siemens AG
Link: (https://support.industry.siemens.com/cs/ww/en/ps/15918/man)

/5/

SIMATIC NET
SINEMA Remote Connect - Server
Operating Instructions
Siemens AG
Link: (https://support.industry.siemens.com/cs/ww/en/ps/21816/man)

/6/

SIMATIC NET
SINEMA Remote Connect - Client
Operating Instructions
Siemens AG
Link: (https://support.industry.siemens.com/cs/ww/en/ps/21816/man)

/7/

SIMATIC NET
SINEMA Remote Connect
Getting Started
Siemens AG
Link: (https://support.industry.siemens.com/cs/ww/en/ps/21816/man)

/8/

SIMATIC NET
TIM DNP3
System manual
Siemens AG
Link: (https://support.industry.siemens.com/cs/ww/en/ps/15940/man)

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SIMATIC NET
TIM 1531 IRC
Operating instructions
Siemens AG
Link: (https://support.industry.siemens.com/cs/ww/en/ps/24710/man)

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