SIEMENS

SICAM 7KG85X

Power Monitoring Device SICAM P850

Power Quality Device SICAM P855

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SICAM
Power Monitoring Device and Power Quality Device
SICAM P850/P855 7KG85X

V3.10

Manual

E50417-H1040-C482-B1

NOTE

For your own safety, observe the warnings and safety instructions contained in this document, if available.

Document version: E50417-H1040-C482-B1.02

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Version of the product described: V3.10

Preface

Purpose of the Manual

This manual describes the application, functions, installation, commissioning, and operation of the Class S Power Quality Instrument and Power Monitoring Device SICAM P850/P855.

Target Audience

This manual is intended for all engineers configuring, parameterizing, and operating a SICAM P850/P855 device.

Scope

This manual is valid for the Class S Power Quality Instrument and Power Monitoring Device SICAM P850/P855.

Indication of Conformity

CE

This product complies with the directive of the Council of the European Communities on harmonization of the laws of the Member States relating to electromagnetic compatibility (EMC Directive 2014/30/EU) and concerning electrical equipment for use within specified voltage limits (Low Voltage Directive 2014/35/EU).

This conformity has been proved by tests performed according to the Council Directive in accordance with the generic standards EN 61000-6-2 and EN 61000-6-4 (for EMC directive) and with the product standard EN 61010-1 (for Low Voltage Directive) by Siemens AG.

The device is designed and manufactured for application in an industrial environment.

The product conforms with the international standards of EN 62586 and the German standard VDE 0415.

Standards

<table>
<tr><td colspan="2">This product is UL-certified to Standard UL 61010-1, third edition, based on the Technical data.
(UL File No.: E228586)</td></tr>
<tr><td>c UL us LISTED
IND. CONT. EQ.
69CA</td><td>Open-type Measuring Equipment
2UD1</td></tr>
<tr><td colspan="2">For further information see UL database on the Internet: http://ul.com.
Select Online Certifications Directory and insert E228586 under UL File Number.</td></tr>
</table>

Additional Support

For questions about the system, contact your Siemens sales partner.

Customer Support Center

Our Customer Support Center provides a 24-hour service.

Siemens AG
Smart Infrastructure – Protection Automation
Customer Support Center

Tel.: +49 911 2155 4466
E-Mail: *energy.automation@siemens.com*

Training Courses

Inquiries regarding individual training courses should be addressed to our Training Center:

Siemens AG
Siemens Power Academy TD
Humboldtstraße 59
90459 Nuremberg
Germany

Phone: +49 911 9582 7100
E-mail: *poweracademy@siemens.com*
Internet: *www.siemens.com/poweracademy*

Notes on Safety

This document is not a complete index of all safety measures required for operation of the equipment (module or device). However, it comprises important information that must be followed for personal safety, as well as to avoid material damage. Information is highlighted and illustrated as follows according to the degree of danger:

DANGER

DANGER means that death or severe injury **will** result if the measures specified are not taken.

✧ Comply with all instructions, in order to avoid death or severe injuries.

WARNING

WARNING means that death or severe injury **may** result if the measures specified are not taken.

✧ Comply with all instructions, in order to avoid death or severe injuries.

CAUTION

CAUTION means that medium-severe or slight injuries **can** occur if the specified measures are not taken.

✧ Comply with all instructions, in order to avoid moderate or minor injuries.

NOTICE

NOTICE means that property damage **can** result if the measures specified are not taken.

✧ Comply with all instructions, in order to avoid property damage.

NOTE

Important information about the product, product handling or a certain section of the documentation which must be given attention.

Qualified Electrical Engineering Personnel

Only qualified electrical engineering personnel may commission and operate the equipment (module, device) described in this document. Qualified electrical engineering personnel in the sense of this document are people who can demonstrate technical qualifications as electrical technicians. These persons may commission, isolate, ground and label devices, systems and circuits according to the standards of safety engineering.

Proper Use

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

Problem-free and safe operation of the product depends on the following:

- Proper transport
- Proper storage, setup and installation
- Proper operation and maintenance

When electrical equipment is operated, hazardous voltages are inevitably present in certain parts. If proper action is not taken, death, severe injury or property damage can result:

- The equipment must be grounded at the grounding terminal before any connections are made.
- All circuit components connected to the power supply may be subject to dangerous voltage.
- Hazardous voltages may be present in equipment even after the supply voltage has been disconnected (capacitors can still be charged).
- Operation of equipment with exposed current-transformer circuits is prohibited. Before disconnecting the equipment, ensure that the current-transformer circuits are short-circuited.
- The limiting values stated in the document must not be exceeded. This must also be considered during testing and commissioning.

Selection of Used Symbols on the Device

No.	Symbol	Description
1		Direct current, IEC 60417, 5031
2		Alternating current, IEC 60417, 5032
3		Direct and alternating current, IEC 60417, 5033
4		Earth (ground) terminal, IEC 60417, 5017
5		Protective conductor terminal, IEC 60417, 5019
6		Caution, risk of electric shock
7		Caution, risk of danger, ISO 7000, 0434
8		Protective Insulation, IEC 60417, 5172, Safety Class II devices
9		Guideline 2002/96/EC for electrical and electronic devices

No.	Symbol	Description
10	EAC	Guideline for the Eurasian Market
11		Mandatory Conformity Mark for Electronics and Electrotechnical Products in Morocco

OpenSSL

This product includes software developed by the OpenSSL Project for use in OpenSSL Toolkit (*http://www.openssl.org/*).

This product includes software written by Tim Hudson (*tjh@cryptsoft.com*).

This product includes cryptographic software written by Eric Young (*eay@cryptsoft.com*).

Table of Contents

1 Introduction

1.1 User Information

Application

SICAM P850/P855 is a multifunctional device with power quality class S accuracy.

The device is characterized by the following properties:

- Power Quality instrument - Class S for normative IEC 61000-4-30
- Class 0.5S for energy, complying with IEC 62053-22, IEC 62053-23, and IEC 62053-24
- Web browser for parameterization and evaluation, full PQ analysis, and easy-to-read analysis according to EN 50160 standards
- Cybersecurity features such as HTTPS
- Fixed installed, indoor
- For application in EMC environment, Class G

The device measures voltages up to 480 V in 1-phase systems and in 3-wire and 4-wire systems (with neutral phase). The input circuits for voltage measurement can be used in IT, TT and TN networks. To ensure galvanic separation for current measurements, the lines connected to the current measurement inputs are galvanically separated from the current transformers.

If external voltage and current transformers are not used, the device can process rated input alternating voltages of up to V_{Ph-N} = 400 V (347 V for UL condition), V_{Ph-Ph} = 690 V (600 V for UL condition) and rated input alternating currents up to 5 A.

The energy management functions also allow determining load profiles . In addition to the measuring function, the device provides records of the measured values and the load profile in programmable time intervals. Long-term data and events are analyzed and output as report according to voltage-quality standards, for example EN 50160.

The integrated Web Server can be used to set the parameters and display the measured values on HTML pages of the connected computer. With the graphic display on the front panel, a limited parameterization via softkeys can be carried out and measured values are shown at display.

To communicate with control systems and other process automation equipment and to transmit, for example, operational measured values, metered values, indications, and load profiles, the device provides 1 configurable Ethernet interface and 1 optional RS485 interface for serial communication.

To transmit data files for power quality in PQDIF (IEEE 1159.3) and waveforms in COMTRADE, the device uses the Ethernet interfaces via the IEC 61850 protocol. For example, the data files in PQDIF and COMTRADE can be transmitted to the SICAM PQS system and SICAM PQ Advisor software.

The device has 2 binary outputs internally. You can use the binary output to give indications or use the binary output as an energy pulse output.

Security

Security features are:

- HTTPS
- Automatic logout after a timeout of no action
- Firmware with digital signature
- Simple Network Management Protocol v3 (SNMPv3)
- Modbus TCP as read only

Measured Quantities

The following measured quantities can be recorded or calculated:

- Power frequency
- Magnitude of supply voltage

- Flicker
- Supply voltage dips, swells, and interruptions
- Voltage unbalance
- Voltage harmonics
- Current magnitude
- Current harmonics
- Current unbalance
- Active, reactive, and apparent power
- Active, reactive, and apparent energy
- Power factor and active power factor
- Voltage and current THDS (Subgroup Total Harmonic Distortion)
- Phase angles

The uncertainty of operational measured quantities is compliant to the IEC 62586-1 product standard, class S, the IEC 61000-4-30, Ed. 3 power quality standard.

For detailed information on measured values and measured quantities, see chapter *2.5.4 Measurands* and the Technical data in chapter *12 Technical Data*.

Functionality of Records

The device can record measured values, events, and load profiles in parameterizable time intervals. The following types of records are used:

- Measurement records (only SICAM P855):
  Recording of PQ measured quantities acc. to IEC 61000-4-30 (for example, frequency and voltage magnitude) and non-PQ measured quantities (for example, currents and power) as well as parameterized periods, for example, 10-second frequency, voltage aggregation, current, and power
- Trend records (only SICAM P855):
  Long-term recording and monitoring of the voltage-change history within a parameterized time period in programmable tolerance ranges; 1/2 cycle RMS values
- Waveform records:
  Recording of voltage and current sampled values with (at 50 Hz, about 204 samples per system period) using programmable triggers
- Event records:
  Recording of voltage events (acc. to IEC 61000-4-30: swells, dips, interruptions)
- Load-profile records:
  Recording of load profiles determined on the basis of 10/12 cycles (50 Hz/60 Hz)

The device hosts a 2 GB micro SD card for storing the records.

Energy Management

As part of the energy management, the device records load profiles according to the *Fixed Block* or *Rolling Block* method for all power quantities. Additionally, it is possible to calculate up to 8 tariffs (TOU = Time of Use). Synchronization is processed with external or internal triggers.

Communication

The device has 1 Ethernet port which can be used as the Ethernet interface or as the integrated Ethernet switch (in 1 network). Ethernet supports the device parameterization, transmission of measured values, metered values, load profiles, and indications/events and the time synchronization with NTP. The supported Ethernet communication protocols are HTTPS, IEC 61850, Modbus TCP, and SNMPv3.

The optional RS485 interface allows Modbus RTU and IEC 60870-5-103 protocols.

Time Synchronization

During operation, the device needs the date and time for all time-relevant processes. This ensures that a common time basis exists when communicating with peripheral devices and enables time stamping of the process data.

The following types of time synchronization can be executed:

- External time synchronization via Ethernet NTP (preferred)
- External time synchronization via fieldbus
- Internal time synchronization via RTC (if external time synchronization is not available)

Parameterization

Parameters are set using an internal Web browser with HTML pages from the connected computer (preferred).

In addition, a parameterization of the device is possible with use of the 4 softkeys and display on the front of the device. Not all parameters can be changed.

Comparison of the SICAM P850 and P855 Features

Function	Feature		P850	P855
Measured values	Basic values	U, I, f, u2, I2, PF, etc.	x	x
	Power	P, Q, S	x	x
	PQ values	THDs Voltage harmonics (1-40th) Harmonic currents (1-40th) Flicker	x	x
Basic functions	Language (US/DE/CN)		x	x
	Group indications		x	x
	Binary outputs		x	x
	Limit violations		x	x
Energy	Energy		x	x
	Frozen energy		x	x
	Load profile		x	x
	Tariffs		x	x
Records	Event records		x	x
	Waveform records		x	x
	Measurement records		-	x
	Trend records		-	x
	EN 50160 report		-	x
Communication	IEC 61850		x	x
	Modbus TCP/RTU		x	x
	IEC 60870-5-103		x	x
	SNMPv3		x	x
	Ethernet switch		x	x
Security	Web logon		x	x
	Firmware signature		x	x
	HTTPS		x	x
	Customer support functions		x	x
	Fallback mode		x	x

1.2 Device Overview

It is a multifunctional device for detection, calculation, recording, evaluation, display, and transmission of measured electrical quantities with the following properties:

Device Properties

All devices consistently provide the following properties:

- Device type:
  - Class S Power Quality Instrument and Power Monitoring Device with a 2 GB micro SD card
  - Plastic case 96 mm/3.78 inch x 96 mm/3.78 inch x 100 mm/3.94 inch (W x H x D)
  - Web server for parameterization, visualization, and data management
  - Transmitting measured values using communication protocols
  - Degree of protection:
    - Front: IP20 for DIN rail devices without display; IP40 or IP51 for panel flush mounting devices with display
    - Terminals: IP2x
- Input and output circuits:
  - 4 inputs for alternating voltage measurements
  - 3 inputs for alternating current measurements
  - 2 binary outputs
- Measurement acc. to standard IEC 61000-4-30 Ed. 3, class S
- Measured quantities:
  - Voltage V
  - Current I
  - Phase angle φ
  - System frequency f (fundamental)
  - 10-s frequency
  - Active power P
  - Reactive power Q
  - Apparent power S
  - Energy measured values W
  - Active power factor cos φ
  - Power factor PF
  - Voltage and current harmonics up to 40th
  - THDS
  - Flicker acc. to IEC 61000-4-15
- Measurements for evaluation and supervision
  - Minimum/mean/maximum values
  - Event detection: voltage dips, voltage swells, voltage interruptions
  - Limit violations
  - Energy management (load profiles)

- Communication interfaces
  - Communication via Ethernet:
    - Only Modbus TCP protocol
    - Modbus TCP protocol and IEC 61850 server protocol
  - Serial communication via RS485
    - Protocol Modbus RTU slave
    - Protocol IEC 60870-5-103
- Data export
  - PQDIF data
    IEEE1159.3: PQDIF for PQ records (events, measurements, records)
  - COMTRADE data
    IEC 60255-24/IEEE Std C37.111: Measuring relays and protection equipment – Part 24: Common format for transient data exchange (COMTRADE for power systems) for fault records
- Internal Ethernet switch
- Certificates
  - CE certification
  - UL certification

Variants

SICAM P850/P855 is available in different variants:

- Device type:
  - Panel flush mounting device with display for measured values and parameterization
  - DIN rail device without display
- Communication via Ethernet
  - Only Modbus TCP protocol
  - Modbus TCP protocol or IEC 61850 server protocol
- Serial communication
  - With RS485 interface:
    - with Modbus RTU protocol
    - with Modbus RTU protocol and IEC 60870-5-103 protocol
  - Without RS485 interface
- Degree of protection of front
  - IP20 for DIN rail devices without display
  - IP40 or IP51 for panel flush mounting devices with display

SICAM P850/P855 Variant, DIN Rail Device

[ph_DIN_rail_device_front, 1, --_--]

Figure 1-1 SICAM P850/P855 as DIN Rail Device, DIN Rail Side

[ph_DIN_rail_device_rear, 1, --_--]

Figure 1-2 SICAM P850/P855 as DIN Rail Device, Terminal Side with RS485 Interface

SICAM P850/P855 Variant with Graphic Display without Cover, Panel Flush Mounting

[ph_panel_flush_mounting_display, 1, --_--]

Figure 1-3 SICAM P850/P855 for Panel Flush Mounting, Display Side

[ph_panel_flush_mounting_terminal, 1, --_--]

Figure 1-4 SICAM P850/P855 for Panel Flush Mounting, Terminal Side, with RS485 Interface

SICAM P850/P855 Variant with Graphic Display and Cover, Panel Flush Mounting

[ph_panel_flush_mounting_cover, 1, --_--]

Figure 1-5 SICAM P850/P855 for Panel Flush Mounting, Display Side

[ph_panel_flush_mounting_cover_terminal, 1, --_--]

Figure 1-6 SICAM P850/P855 for Panel Flush Mounting, Terminal Side, with RS485 Interface

Characteristics of Specification

Function Symbols	Function	Class acc. to IEC 61000-4-30	Range	Additional Information
f	Power frequency	S	50 Hz (±15 %): 42.5 Hz to 57.5 Hz 60 Hz (±15 %): 51.0 Hz to 69.0 Hz	Magnitude of the supply > 2 V required
U	Magnitude of the supply voltage	S	10 % to 150 % U_{din}[1]	–
P_{st}, P_{lt}	Flicker	S	P_{st}: 0.2 to 10	Acc. to IEC 61000-4-15

1 For example, an instrument specified for range of U_{din} = [100 V to 400 V] shall meet the uncertainty requirement for at least 20 V to 480 V for class S.

Function Symbols	Function	Class acc. to IEC 61000-4-30	Range	Additional Information
U_{dip}, U_{swl}	Supply voltage dips and swells	S	–	–
U_{int}	Supply voltage interruptions	S	–	–
u_2	Supply voltage unbalance	S	0.5 % to 5.0 %	–
U_h	Voltage harmonics	S	10 % to 200 % of Class 3 of IEC 61000-2-4	–
Under/over	Under/over deviation	–	–	–
I	Magnitude of current	S	10 % FS to 150 % FS	–
i_2	Current unbalance	S	–	–
I_h	Harmonic currents	S	–	–

Ordering Information

You can obtain the order information for the device from the catalog **SICAM – Power Quality and Measurements** with an order key or from *https://new.siemens.com/global/en/products/energy/energy-automation-and-smart-grid/power-quality-measurement.html*.

NOTE

This document describes all functions and features available in the device with a maximum equipment. You can find the individual equipment of your device in the ordering variant or the catalog mentioned above.

Scope of Delivery

The delivery comprises the following components depending on the ordering code:

- A device according to the ordering code (see catalog)
- Battery (insulated in the battery compartment of the device)
- A 2 GB micro SD card
- Assembly elements
- Product Information

Accessories

You can order the following accessories:

- Device manual, download available at *https://new.siemens.com/global/en/products/energy/energy-automation-and-smart-grid/power-quality-measurement.html*
- RS485 bus terminating plug 220 Ω in a 9-pin D-sub connector plug
- Connectors for alternating voltage inputs
- Various cables as listed in the following tables:

Table 1-1 Cable Length

Cable Type	Cable Length
Ethernet Patch Cable (Double Shielded (SFPT), LAN Connector Plugs on Both Sides)	0.5 m
	1.0 m
	2.0 m
	3.0 m
	5.0 m
	10.0 m
	15.0 m
	20.0 m
RS485-Y Bus Cable (2-Wire, Shielded, with 9-Pin D-sub Connector Plugs)	1.0 m
	3.0 m
	5.0 m
	10.0 m
RS485 Bus Extension Cable (2-Wire, Shielded, with 9-Pin D-sub Connector Plugs)	10.0 m
	20.0 m
	30.0 m
	40.0 m
	50.0 m

1.3 Device Design

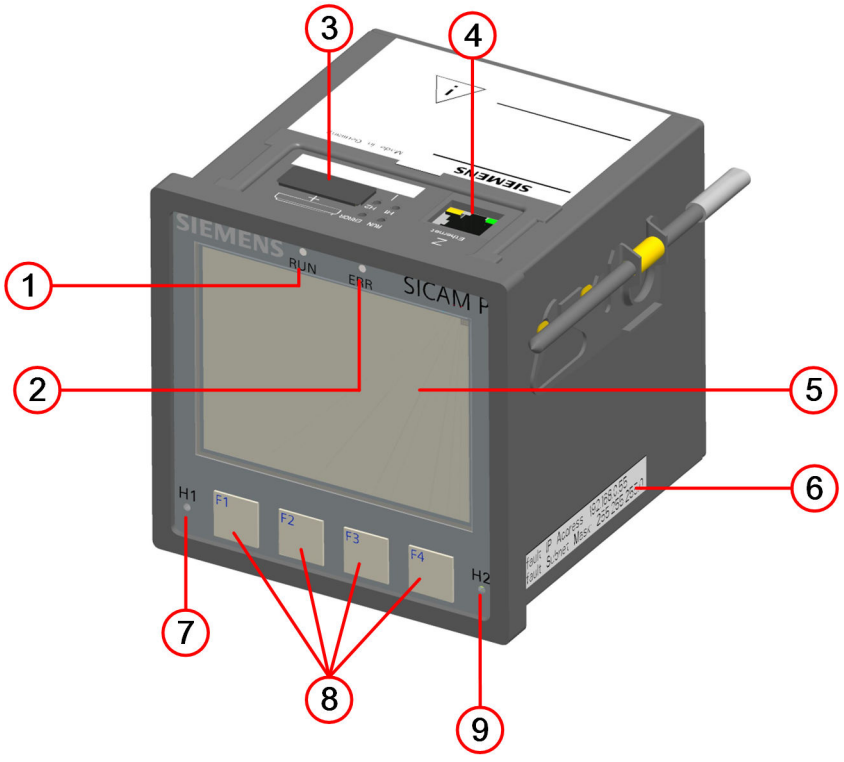
Mechanical Design

The electrical modules are installed in a plastic case with the dimensions (W x H x D) 96 mm (3.78 inch) x 96 mm (3.78 inch) x 100 mm (3.94 inch).

In panel flush mounting devices, the display side accommodates the display, 4 softkeys located below, and 4 LEDs of which the H1, H2, and ERROR LEDs can be parameterized. The ERROR LED can only be parameterized for error messages.

The device top side holds the RJ45 Ethernet plug connector with 2 LEDs. 4 additional LEDs are identical to the LEDs on the display side. At the cover of the battery compartment there is a labeling strip for the configurable LEDs H1/H2 and a battery symbol that indicates the polarity. The label is also located on the top side and provides among other information the most important rated data of the device. A lithium battery is located under the removable cover of the battery compartment.

The device can also contain a D-sub connector plug as RS485 interface (see *Figure 1-8*).



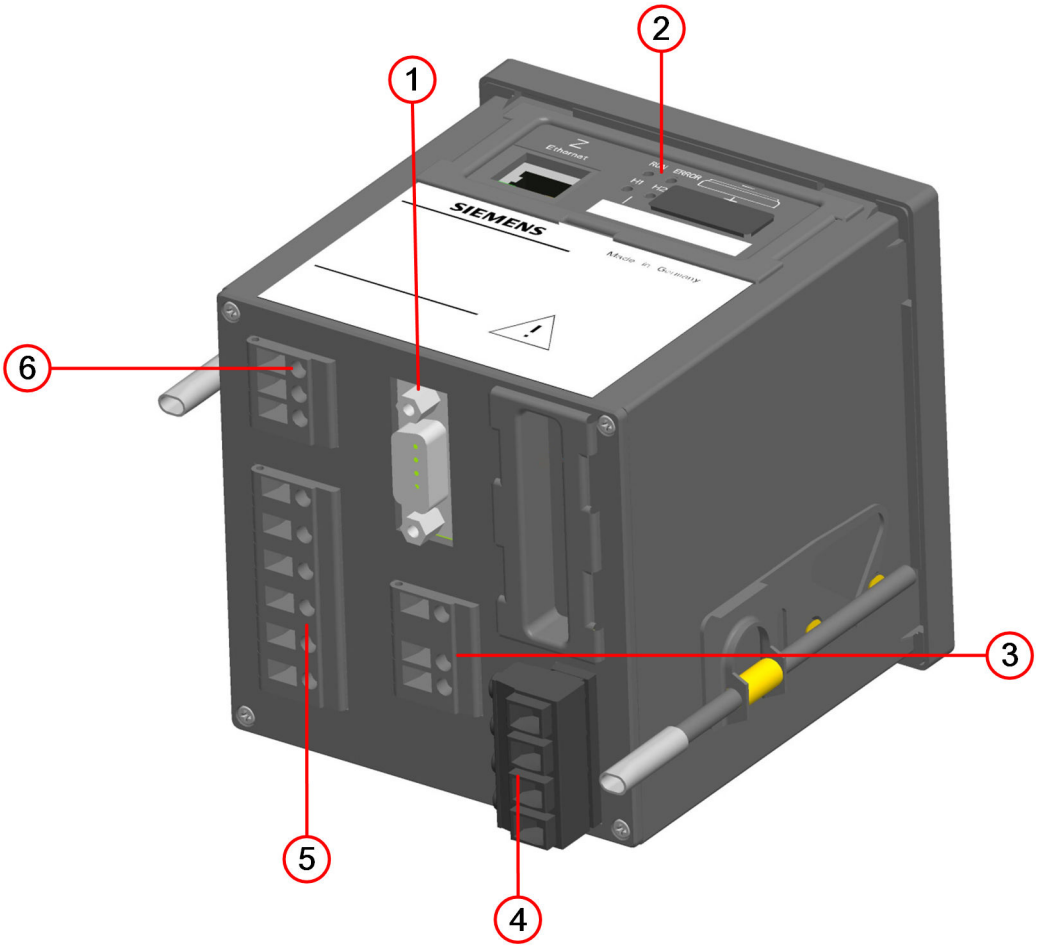
[le_P85X_front side, 1, --_--]

Figure 1-7 Layout of P850/P855 – Front Side

(1) LED RUN
(2) LED ERROR for error configuration
(3) Battery compartment
(4) RJ45 with 2 LEDs
(5) Display
(6) Default IP address and default subnet mask
(7) LED H1 for free configuration
(8) Softkeys F1 to F4
(9) LED H2 for free configuration

NOTE

DIN rail devices have a DIN rail support instead of the display. Therefore, this device side is referred to as the DIN rail side.

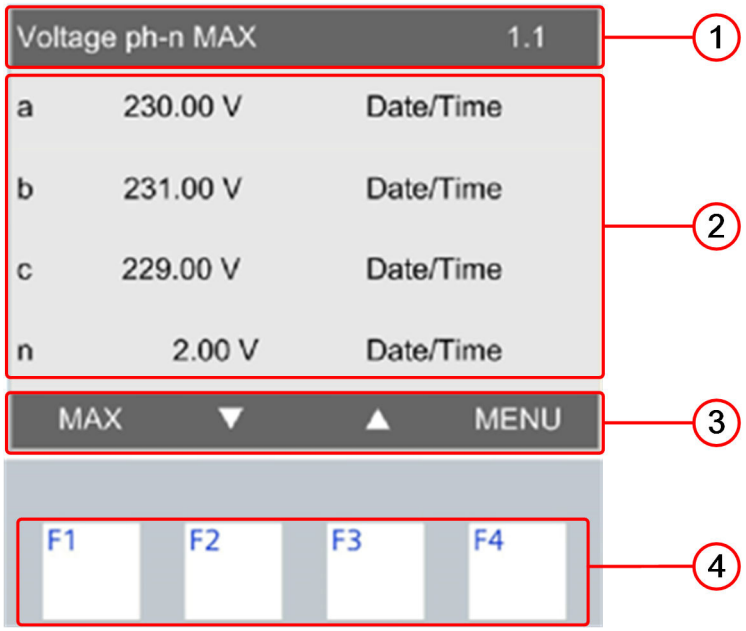


[le_P85X_rear-side, 1, – –]

Figure 1-8 Layout of SICAM P850/P855 – Rear Side

(1) Serial interface RS485
(2) LEDs
(3) Terminal block for power supply
(4) Terminal block for voltage measurement
(5) Terminal block for current measurement
(6) Terminal block for binary outputs

Display and Softkeys

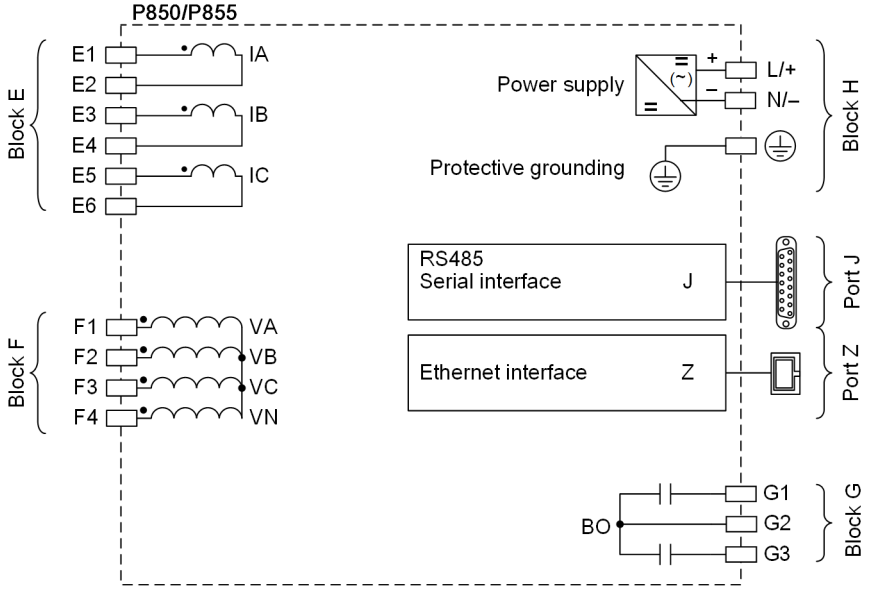


[le_Q100_HMI_front side, 1, --_--]

Figure 1-9 Display and Softkeys

(1) **Title**: Shows the name of the current display
(2) **Display**: Shows parameter settings, measured values, and diagrams
(3) **Current functions of the softkeys**
(4) **Softkeys**: Selects screens or settings at the device

Terminal Diagram of the Rear Plate



[dw_overview_p85x, 1, en_US]

Figure 1-10 Terminal Diagram of the Rear Plate

NOTE

DIN rail devices have a DIN rail support instead of the display. Therefore, this device side is referred to as the DIN rail side.

2 Basic Functions

2.1 Activation and Cancel of the Configuration Change

When you have changed the configuration via Web pages, you must either enable it as the active set of parameters or cancel it.

NOTE

If you have finished the configuration, click **Send** in the respective dialog.

Activating the Set of Parameters

To activate the configuration change in the **Configuration** tab, proceed as follows:

- In the navigation window, click **Activation and cancel**.

[sc_activation_p85x, 1, en_US]

Figure 2-1 Configuration Tab, Activation

- Enter the activation password (refer to *Table 2-3*).
- Click **Activation**.
  If the configuration causes the device to restart, reconnect to the device after the restart.
  The modified set of parameters is loaded as the active set of parameters into the device and the new parameters take effect immediately.
  The active and passive set of parameters are listed in the **Activation** window in the **Set** column for your information.

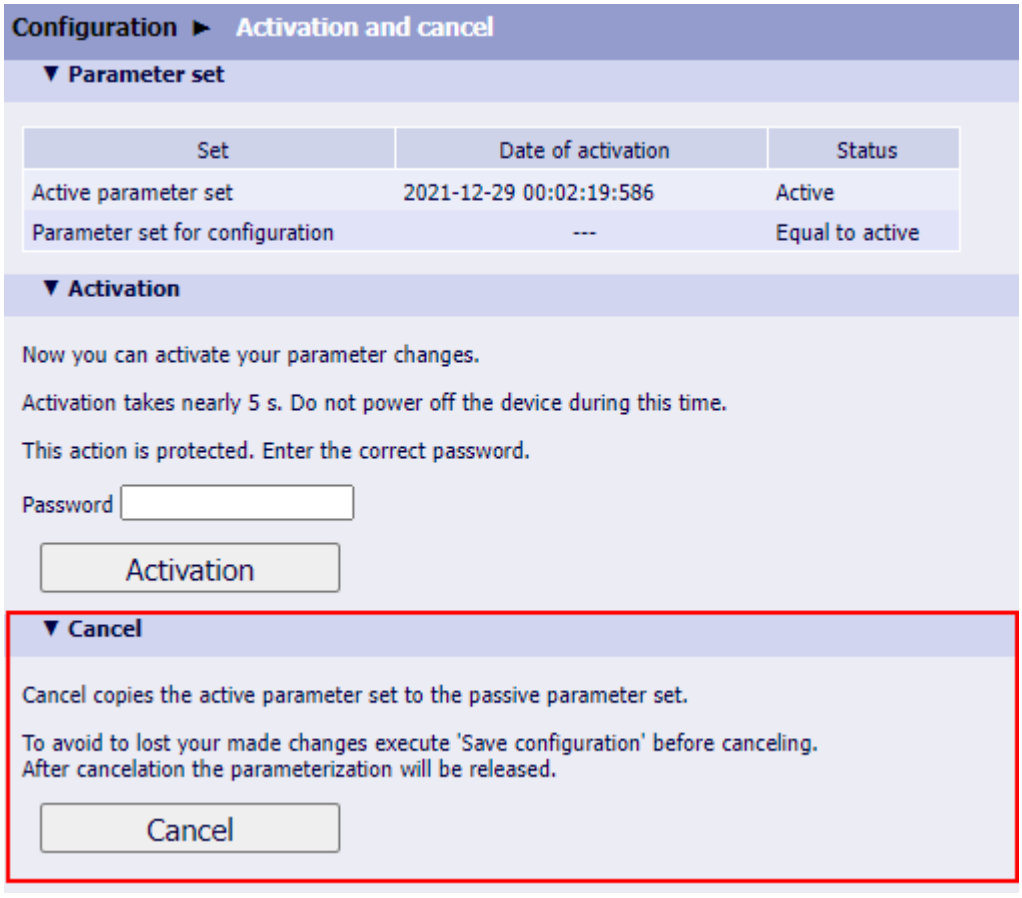
NOTE

Keep the device powered on for at least 30 s after clicking **Activation**.

Cancel

To cancel the configuration change in the **Configuration** tab, proceed as follows:

- In the navigation window, click **Activation and cancel**.



[sc_cancel_p85x, 1, en_US]

Figure 2-2 Configuration Tab, Cancel

NOTE

After clicking **Cancel**, the parameterization is released and can be run from a different computer if necessary.

2.2 Device and Language

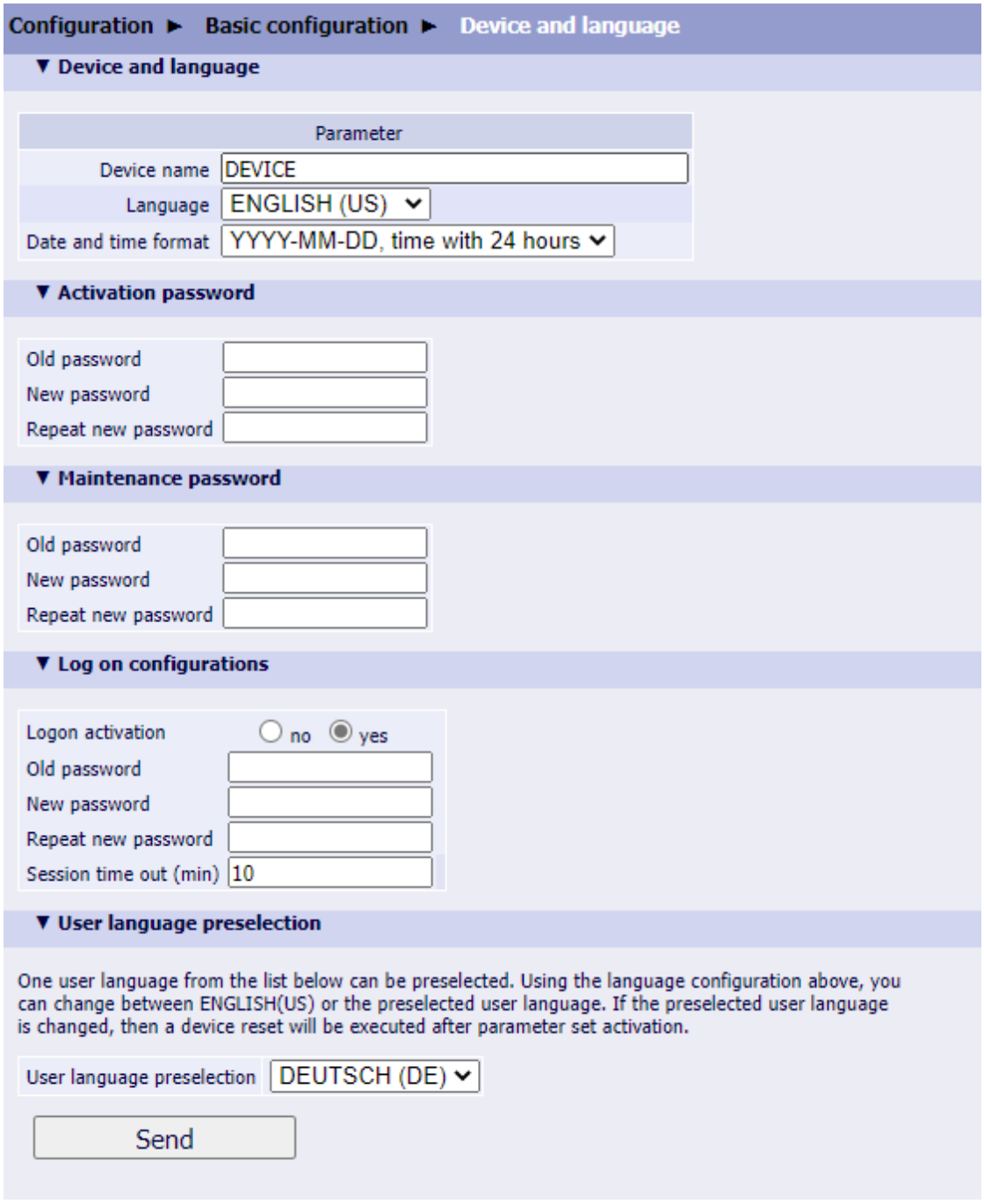
2.2.1 Device and Language

2.2.1.1 Configuration via Web Pages

Configuration of Device and Language

To configure the **Device name**, **Language**, **Date and time format** in the **Configuration** tab, proceed as follows:

- In the navigation window, click **Device and language**.



[sc_device_and_language_P85x, 1, en_US]

Figure 2-3 Configuration Tab, Device and Language

- Configure the respective parameters according to the following table.

Table 2-1 Settings for Device and Language

Parameter	Default Setting	Setting Range
Device name	DEVICE	Max. 31 ASCII characters
Language	English (US)	ENGLISH (US) User language according to **User language preselection**: DEUTSCH (DE) or CHINESE (CN)
Date/time format	YYYY-MM-DD, time with 24 hours	YYYY-MM-DD, time with 24 hours YYYY-MM-DD, time 12 h AM/PM DD-MM-YYYY, time with 24 hours DD-MM-YYYY, time 12 h AM/PM MM/DD/YYYY, time with 24 hours MM/DD/YYYY, time 12 h AM/PM

- After the parameterization, click **Send**.
- In the navigation window, click **Activation and cancel**.
- Enter the activation password (refer to *Table 2-3*).
- Click **Activation**.

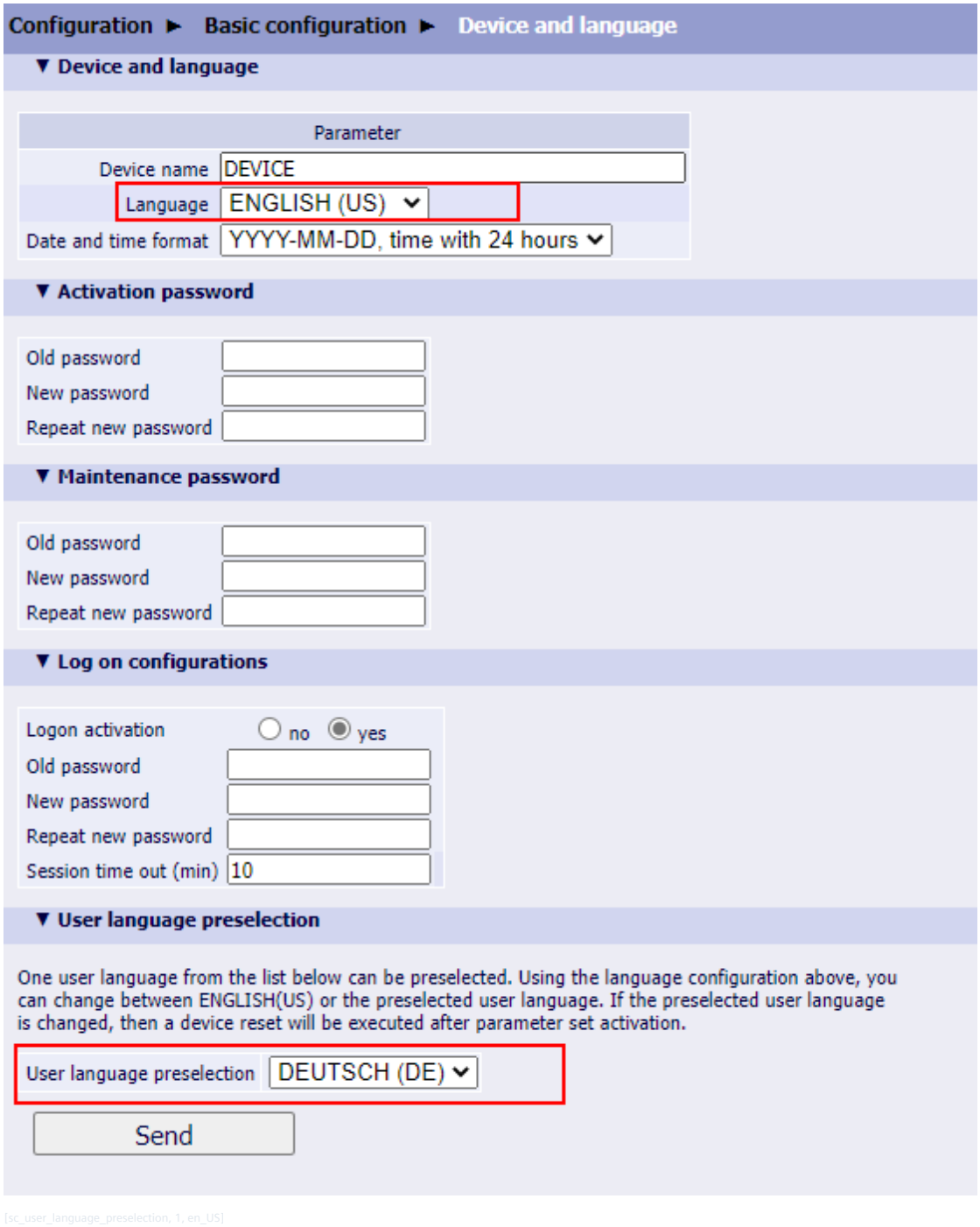
Configuration of the User Language Preselection

NOTE

The user language can be preset, for example when starting the user interface for the first time. DEUTSCH (DE) is set by default.

To configure the **User language preselection** in the **Configuration** tab, proceed as follows:

- In the navigation window, click **Device and language** under **Basic configuration**.



[sc_user_language_preselection, 1, en_US]

Figure 2-4 Configuration Tab, User Language Preselection

- Configure the respective parameters according to the following table.

Table 2-2 Settings for User Language Preselection

Parameter	Default Setting	Setting Range
User language preselection	DEUTSCH (DE)	**Option User language preselection**: *CHINESE (CN)* You can select the following **Languages**: • ENGLISH (US) or • CHINESE (CN) **Option User language preselection**: *DEUTSCH (DE)* You can select the following **Languages**: • ENGLISH (US) or • DEUTSCH (DE)

- After the parameterization, click **Send**.
- In the navigation window, click **Activation and cancel**.
- Enter the activation password (refer to *Table 2-3*).
- Click **Activation**.

NOTE

If you change the user language, the device will restart after clicking the **Send** button and subsequently activating the settings.

[sc_language_restart, 2, en_US]

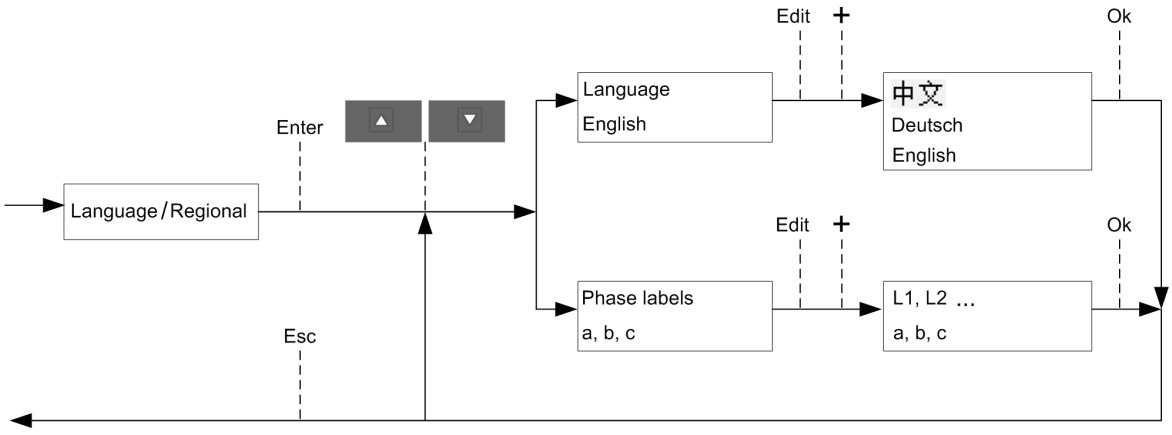
Figure 2-5 Restart Information

- After a successful restart, connect to the device again.
- Enter the password.
- Click the **Log on** button.

2.2.1.2 Configuration via Display

Submenu Device and Language

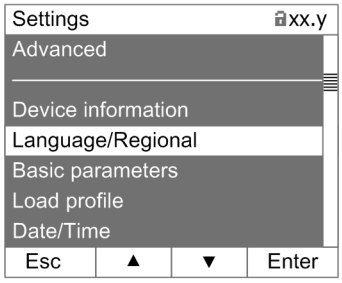
In the main menu, select **Settings** → **Language/Regional**. The displayed number is 80.2.



[dw_submenu_language_regional, 1, en_US]

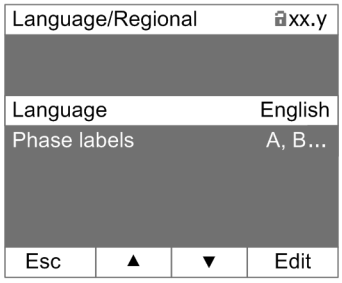
Figure 2-6 Configuration Language/Regional

The following interface displays are available:



[dw_display_language_regional, 1, en_US]

Figure 2-7 Language/Regional



[dw_display_language, 1, en_US]

Figure 2-8 Language

2.2.2 Password Management

To set up passwords in the **Configuration** tab, click **Device and language** in the navigation window first (see *Figure 2-3*).

Changing the Activation Password

- Enter the old activation password in the **Old password** field.
- Enter the new activation password (any 6 to 14 characters) into the **New Password** field.
- Repeat the new activation password in the **Repeat new Password** field.
- Click the **Send** button.
  After clicking the **Send** button, the parameters are transmitted to the device and take effect.

Table 2-3 Settings for the Activation Password

Parameter	Default Setting	Setting Range
Activation Password	000000	Any, 6 to 14 characters

Changing the Maintenance Password

- Enter the old maintenance password in the **Old password** field.
- Enter the new maintenance password (any 6 to 14 characters) into the **New password** field.
- Repeat the new maintenance password in the **Repeat new Password** field.
- Click the **Send** button.
  After clicking the **Send** button, the parameters are transmitted to the device and take effect.

Table 2-4 Settings for the Maintenance Password

Parameter	Default Setting	Setting Range
Maintenance Password	311299	Any, 6 to 14 characters

Changing Logon Configurations

- Select to activate the Web logon function or not.
- Enter the old logon password in the **Old password** field.
- Enter the new logon password (any 6 to 14 characters of the keyboard) into the **New password** field.
- Repeat the new logon password in the **Repeat new Password** field.
- Set the **Session timeout**.
- Click the **Send** button.
  After clicking the **Send** button, the parameters are transmitted to the device and take effect.

Table 2-5 Settings for Logon Configurations

Parameter	Default Setting	Setting Range
Logon activation	yes	To disable the logon function, select ***no*** To enable the logon function, select ***yes***
Logon password	000000	Any, 6 to 14 characters
Session timeout (min)	10 min	0 min (no timeout) to 1440 min (1 day) If 0 is selected, after the device starts up, you only have to log on once.

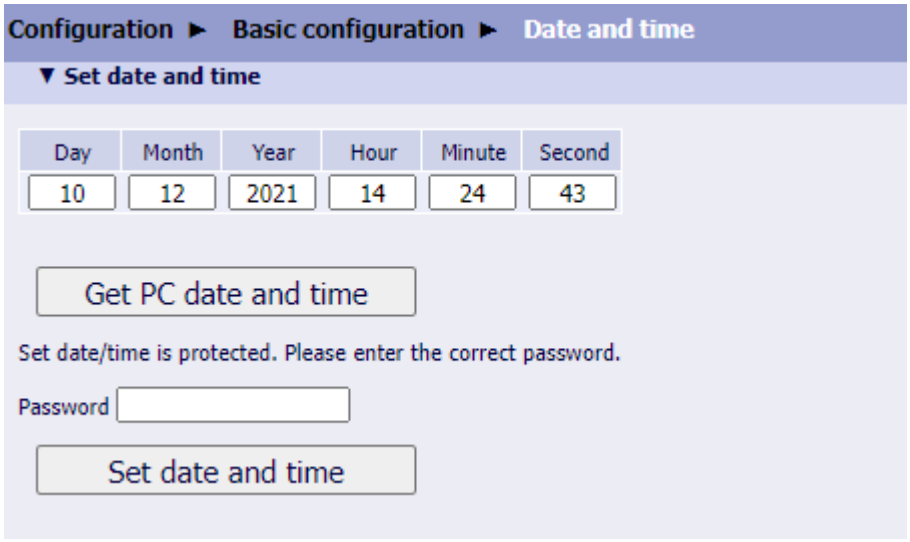
2.3 Date/Time

2.3.1 Configuration via Web Pages

Setting Date/Time

To change the date/time settings in the **Configuration** tab, proceed as follows:

- In the navigation window, click **Date and time**.



[sc_config_date_and_time_p85x, 1, en_US]

Figure 2-9 Configuration Tab, Date and Time

- You can either get the date and time from the connected computer or adjust it manually.

Getting the PC Date and Time

- Click **Get PC date and time**.
  The computer time is displayed in the fields of the window and applied in the device.

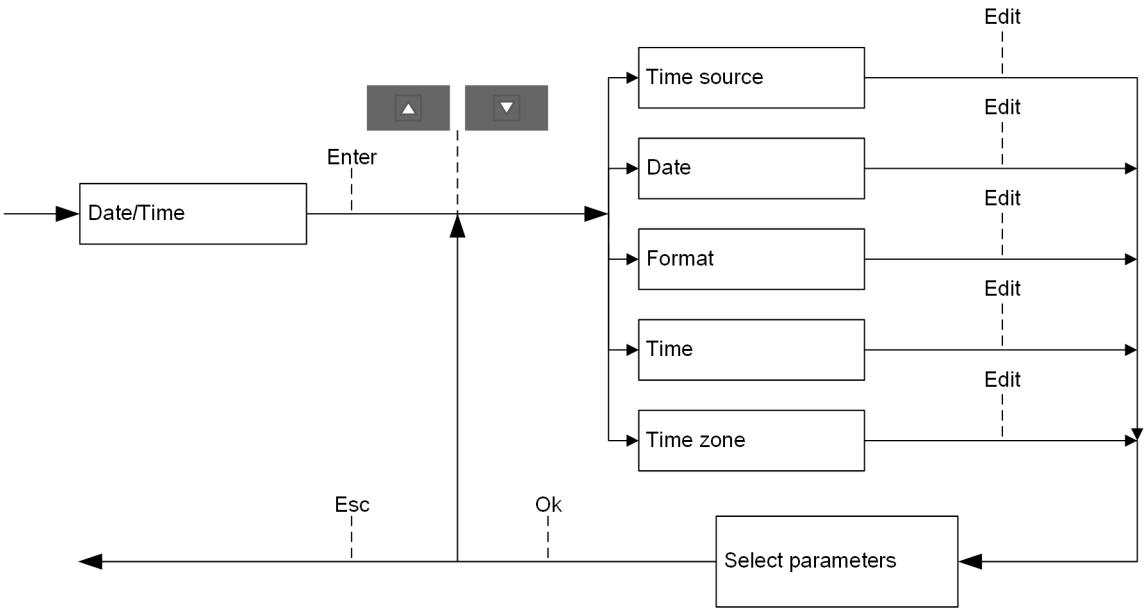
Setting the Date and Time Manually (24-hour format)

- Enter the desired time into the fields **Day** (format dd), **Month** (format mm), **Year** (format yyyy), **Hour** (format hh), and **Minute** (format mm).
- Enter the password.
- Click **Set Date and time**.
  The time you have entered is displayed in the fields of the window and applied in the device.

The **Action was successful** indication is displayed on the status bar.

2.3.2 Configuration via Display

Submenu Date/Time



[dw_submenu_date-time, 2, en_US]

Figure 2-10 Submenu Date/Time

2.4 Time Synchronization

2.4.1 Function Description

General

During operation, the device needs the date and time for all time-relevant processes. The term time is used throughout this section to refer to both the date and the time.

The time synchronization in the device is necessary to guarantee a common time basis for the communication with peripheral devices and time stamping of the process data.

The device supports both external and internal time synchronization. The type of time synchronization is specified during the parameterization. The external time synchronization from an NTP server is preferred.

NOTE

The time format is described in detail in the RFC 5905 (Request for Comments 5905 for NTP).

Internal Time Keeping

Time Format

The internal time is kept in UTC (Universal Time Coordinated) from 01.01.2000, 00:00 to 31.12.2099, 23:59.

To display the local time, for example on the HTML pages, you can configure a local time correction factor and the automatic adjustment to daylight saving time during parameterization.

FAIL Status Bit

The **FAIL** status bit implemented in the the device signals with **0** that the time is **valid** and with **1** that the time is **invalid**.

The status of the FAIL bit corresponds to the **Clock error** operational indication, see chapter *13 Operational Indications and Operating Parameters*.

The following table lists the time stamps of events or indications for the displayed operational, error, and audit logs according to status bit set/not set using the example of date *2016-09-26, time 13:49.35246*:

Table 2-6 FAIL Status Bit for Time Synchronization via NTP Server

FAIL	Output
0	2016-09-26 13:49.35:246
1	2016-09-26 13?49?35?246

DST Status Bit

With **1**, the DST status bit implemented in the device signals that the local daylight saving time is active. The operational indication **Daylight saving time** is displayed.

External Time Synchronization per NTP

General

To synchronize the time via an external source, the device is equipped with an SNTP Client (SNTP = Simple Network Time Protocol) that can be connected to 2 NTP servers (NTP = Network Time Protocol), the primary and the secondary (redundant) NTP server.

NTP is used for external time synchronization via Ethernet. The SNTP client sends a time request to the NTP server once a minute. The time synchronization error is ±5 ms referred to UTC time of the NTP server.

The time stamp of the NTP server has a 64-bit format. Counting is accomplished in seconds and fractions of seconds.

Time-Synchronization Procedure

The device was set to external time synchronization **(Ethernet NTP)** during parameterization. After switching on or resetting the device, the FAIL bit is first set to **1** (= invalid). The device sends a time request to the NTP server. After receiving the time information from the NTP server via Ethernet, the FAIL bit is set to **0** (= valid) and the internal timer (RTC) is updated. The SNTP client repeats the time request to the NTP server cyclically once every minute.

If the primary NTP server fails (for example, no response to a request twice or one of the criteria at **Redundant NTP server** satisfied) and if the secondary NTP server is operational (always polled in parallel), the device switches to the secondary NTP server. The FAIL bit remains = 0. In this case, the operational indication **Primary NTP Server Error** is displayed, see chapter *13 Operational Indications and Operating Parameters*.

If the secondary NTP server is also invalid, the FAIL bit will be set to 1 after the programmable timer **error indication after** has expired, and the **Clock Error** indication is output.

Redundant NTP Servers

The time synchronization supports a primary and a secondary NTP server. Different IP addresses are set for both of the NTP servers.

The device cyclically polls both NTP servers once every minute, but during normal operation it is synchronized by the primary NTP server. The device automatically switches to the secondary NTP server if one of the following criteria is met:

- No response from the primary NTP server to 2 successive requests
- **Alarm** indication is set in the time information of the primary NTP server
- Primary NTP server responds with 0
- Message runtime in the network is > 5 ms
- Stratum of the primary NTP server is 0 (unknown) or > 5

Switching to the secondary NTP server is prevented if:

- The secondary server does not provide better time information (see criteria that initiate the switch from the primary to the secondary NTP server; **Secondary NTP Server Error** indication was already output)
- The secondary server has recently been available for less than 10 minutes.

In these cases, the device is not externally synchronized anymore. The device uses the internal clock (on milliseconds time basis) and the last valid drift. After the programmable time delay, the device reports **Clock Error** (see chapter *13 Operational Indications and Operating Parameters*).

Switching Back from the Secondary to the Primary NTP Server

While the device is synchronized by the secondary NTP server, it continues to cyclically poll the primary NTP server. The device will only switch back to the primary NTP server if it receives correct time information and if none of the criteria for **Redundant NTP Servers** are fulfilled anymore.

External Time Synchronization via Fieldbus

The external time synchronization via fieldbus is used if the device is connected to the systems control via the protocol **Modbus RTU or IEC 60870-5-103** using the RS485 interface.

The time information can also be transmitted from the systems control via **Modbus TCP** or **IEC 61850** using Ethernet interfaces. When using the Ethernet connection, Siemens recommends to synchronize the device from an NTP server.

When using the external time synchronization via fieldbus, the client should send a message containing the time information to the device in 1-minute cycles.

The time synchronization error using the Modbus RTU protocol or IEC 60870-5-103 is ±20 ms maximum.

Internal Time Synchronization via RTC

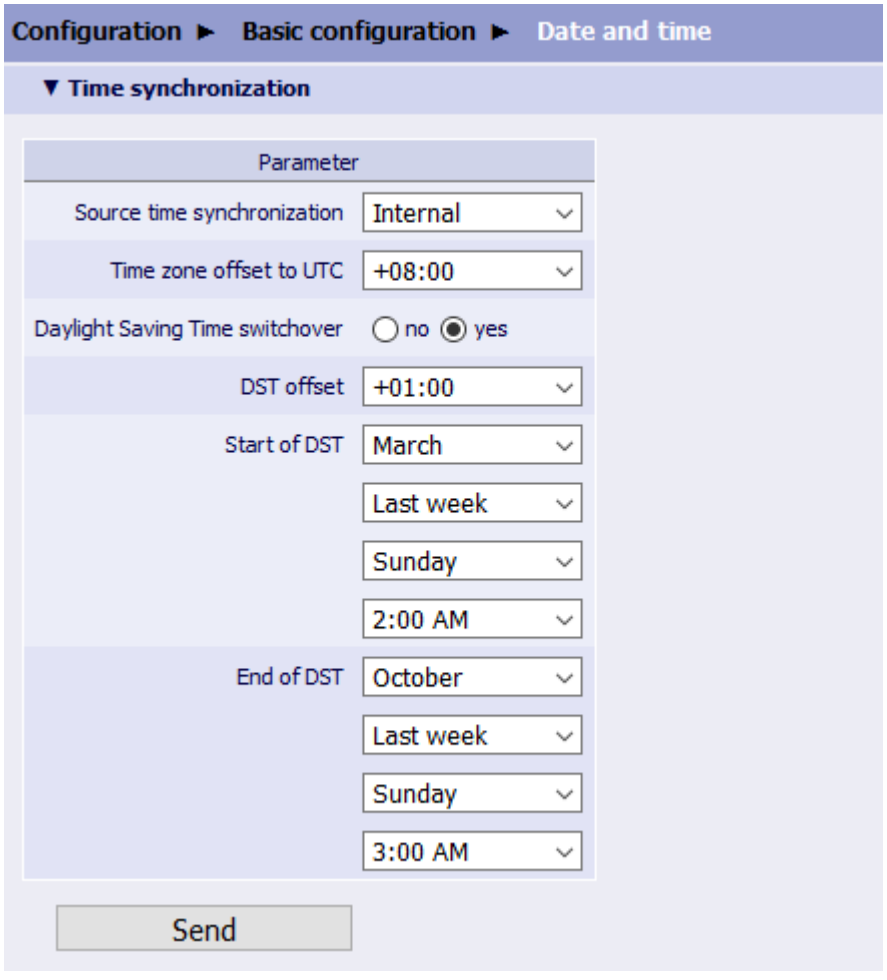
Besides the external time synchronization, the internal time synchronization is also possible using the battery-buffered RTC (Real-Time Clock). Due to the reduced accuracy, RTC should only be used in case of a failure or of the unavailability of the external time synchronization.

2.4.2 Configuration via Web Pages

Configuration of the Time Synchronization

To change the time synchronization settings in the **Configuration** tab, proceed as follows:

- In the navigation window, click **Date and time**.



[sc_admin_Time_sync, 2, en_US]

Figure 2-11 Configuration Tab, Time Synchronization

- Configure the respective parameters according to the following table.

Table 2-7 Settings for Time Synchronization

Parameter	Default Setting	Setting Range
Source time synchronization	Internal	Internal Ethernet NTP Fieldbus
Time zone offset to UTC	+00:00	-12:00 to +13:00 (hours) (in increments of 0.5 h)
Daylight Saving Time switch-over	yes	no yes
DST offset	+01:00	0:00 to +2:00 (hours) (in increments of 0.5 h)
Start of DST	March Last week	January to December First week Second week Third week Fourth week Last week
	Sunday 2:00 AM	Sunday to Saturday 12:00 AM to 11:00 PM (in increments of 1 h)
End of DST	October Last week	January to December First week Second week Third week Fourth week Last week
	Sunday 3:00 AM	Sunday to Saturday 12:00 AM to 11:00 PM (in increments of 1 h)
Additional Parameters if the Source is Ethernet NTP (Communication Ethernet bus protocol is set to Modbus TCP or IEC 61850)		
Primary NTP server IP Address	0.0.0.0	Any No polling of the NTP server if 0.0.0.0 is entered
Secondary NTP server IP Address	0.0.0.0	Any No polling of the NTP server if 0.0.0.0 is entered
Error indication after	10 min	2 min to 120 min
Additional Parameters if Source is Fieldbus		
Error indication after	10 min	2 min to 120 min

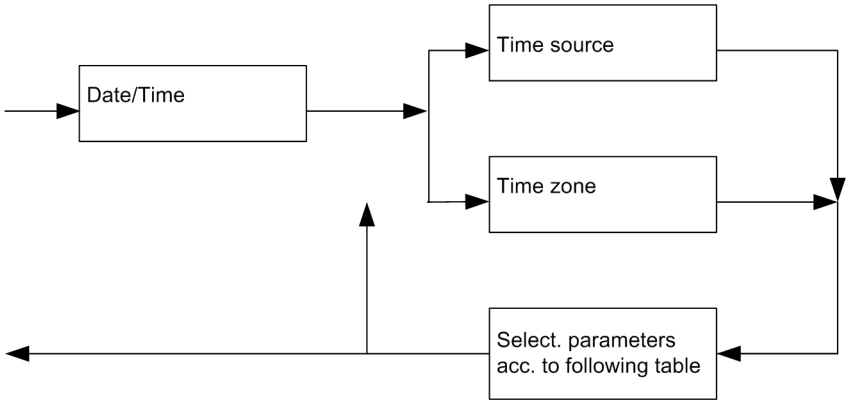
- After the parameterization, click **Send**.
- In the navigation window, click **Activation and cancel**.
- Enter the activation password (refer to *Table 2-3*).
- Click **Activation**.

NOTE

NTP protocol: The SNTP client in the device is activated or deactivated during configuration of the time synchronization. **Ethernet NTP** can be selected as **Source time synchronization**. Associated IP addresses of the NTP servers can be entered.

2.4.3 Configuration via Display

Submenu Time Synchronization



[dw_submenu_time_synchronization, 1, en_US]

Figure 2-12 Submenu Time Synchronization

Table 2-8 Settings for Time Synchronization

Parameter	Default Setting	Setting Range
Time source	internal	internal Ethernet NTP Fieldbus
Time zone	00:00	-12 to +13 (hours) (in increments of 0.5 h)

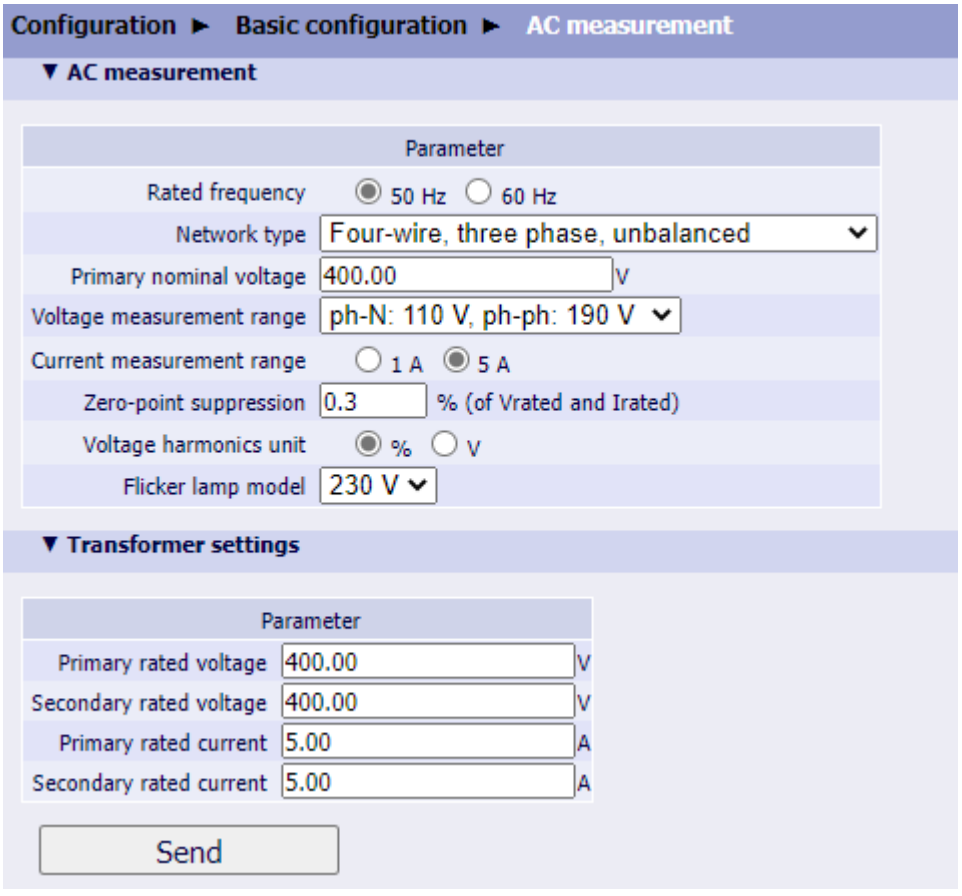
2.5 AC Measurement

2.5.1 Configuration via Web Pages

Configuration of the AC Measurement

To change the AC measurement settings in the **Configuration** tab, proceed as follows:

- In the navigation window, click **AC measurement**.



[sc_config_ac_measurement_p85x, 1, en_US]

Figure 2-13 Configuration Tab, AC Measurement

- Configure the respective parameters according to the following table.

Table 2-9 Settings for AC Measurement

Parameter	Default Setting	Setting Range
AC measurement		
Rated frequency	50 Hz	50 Hz 60 Hz

Parameter	Default Setting	Setting Range
Network type[2]	4-wire, 3-phase, unbalanced	1-phase network 3-wire, 3-phase balanced 3-wire, 3-phase, unbalanced (2 * I) 3-wire, 3-phase, unbalanced (3 * I) 4-wire, 3-phase, balanced 4-wire, 3-phase, unbalanced
Primary nominal voltage	400.0 V	1.0 V to 1 000 000.0 V , depending on the setting range in the selected network type (see *Table 2-10*)
Current measurement range	5 A	1 A 5 A
Zero-point suppression[3]	0.3 % (of Vrated, Irated)	0.0 % to 10.0 %
Voltage harmonics unit	%	% V
Flicker lamp model	230.0 V	230.0 V 120.0 V
Transformer settings		
Primary rated voltage	400.0 V	1.0 V to 1 000 000.0 V
Secondary rated voltage	400.0 V	1.0 V to 690.0 V
Primary rated current	5.0 A	1.0 A to 100 000.0 A
Secondary rated current	5.0 A	1.0 A to 10.0 A

NOTE

If you change one of the following parameters, the device restarts:

- Rated frequency
- Network type

- After the parameterization, click **Send**.
- In the navigation window, click **Activation and cancel**.
- Enter the activation password (refer to *Table 2-3*).
- Click **Activation**.

Depending on the parameterized **Primary nominal voltage**, the following **Voltage measurement** ranges are set automatically and the following network types are possible:

2 In the case of contradictory parameter settings, **Primary nominal voltage** is indicated as faulty (red) and **Network type** as not adjustable (gray). Moreover, the **Send** button is disabled.

3 Voltage and current values smaller than/equal to the setting referred to 100 % are not included in the calculation and display.

Table 2-10 Settings for Primary Nominal Voltage

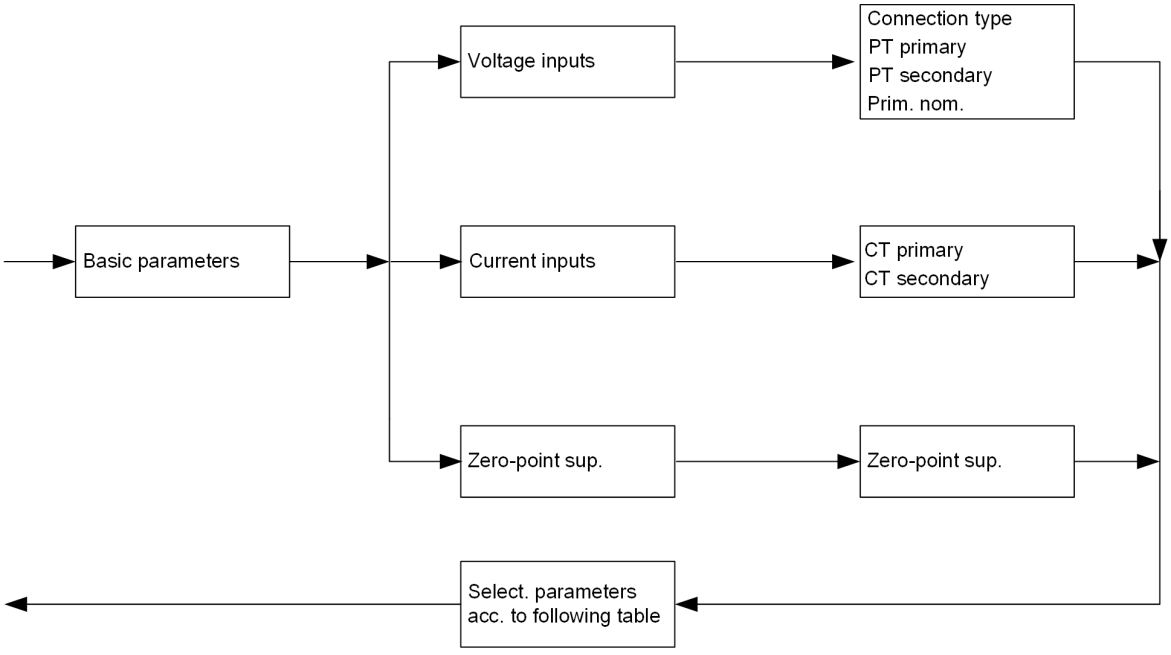
Primary Nominal Voltage	Selection of the Voltage Measurement Range	Selectable Network Types
AC 230.0 V	ph-N: 230.0 V, ph-ph: 400.0 V All other voltage measurement ranges are disabled.	all
AC 380.0 V (> AC 230.0 V * 1.2)	ph-N: 400.0 V, ph-ph: 690.0 V All other voltage measurement ranges are disabled.	all
> AC 480.0 V (> AC 400.0 V * 1.2)	ph-N: 400.0 V, ph-ph: 690.0 V All other voltage measurement ranges are disabled.	all three-wire network types

NOTE

If you change the **Network type** during ongoing operation, check settings, measured values, and limiting values for inconsistencies. Check also the ICD/IID file which is suitable for the network type. If there are any invalid measured values and limiting values or a wrong ICD file, restart the device.

2.5.2 Configuration via Display

Submenu Basic Parameters



[dw_p85x_submenu_basic_settings, 1, en_US]

Figure 2-14 Submenu, Basic Parameters

Table 2-11 Basic Parameter Settings

Parameter	Default Setting	Setting Range
Voltage Inputs		
Connection type	3P4W	1P2W (1-phase system) 3P3WB (3-wire, equal load) 3P3W_2I (3-wire, any load (2*I)) 3P3W_3I (3-wire, any load (3*I)) 3P4WB (4-wire, equal load) 3P4W (4-wire, any load)
PT primary	400.0 V	1.0 V to 1 000 000.0 V
PT secondary	400.0 V	1.0 V to 600.0 V
Prim. nom.	400.0 V	1.0 V to 1 000 000.0 V (depending on the setting of **PT primary**) IEC 61000-4-30 Class A: • Up to 230 V: 200 % overvoltage • > 230 V to 400 V: 200 % to 15 % overvoltage UL conditions: • Up to 170 V: 200 % overvoltage • > 170 V to 300 V: 200 % to 15 % overvoltage
Current Inputs		
CT primary	5.0 A	1.0 A to 100 000.0 A
CT secondary	5.0 A	1.0 A to 10.00 A
Zero-Point Suppression		
Zero-point suppression (in % of Vrated and Irated)	0.3 %	0.0 % to 10.0 %

2.5.3 Measuring System

The device measures the power quality according to IEC 61000-4-30 Ed. 3 in 1-phase or polyphase energy supply systems.

The basic measuring interval for calculation of the following values is 10 cycles in 50-Hz systems or 12 cycles in 60-Hz systems:

- Voltage RMS values
- Voltage harmonics
- Voltage unbalance
- Currents
- Current harmonics

NOTE

Depending on parameter settings, the browser displays the measured values with the corresponding unit or indications in a table that is updated every 15 s. Harmonics can be represented in a table or in a diagram.

The measuring functions are divided into the following parts:

- PQ measurements
- Operational measurements
- Energy management and counter functions

An overview of the measured quantities demanded according to IEC 61000-4-30 Ed.3, their measurement uncertainty and measuring ranges are represented in the following tables.

Measured Quantities and Operational Measurement Uncertainty acc. to IEC 62586-1 Product Standard Class S and Standards IEC 61000-4-30 Ed. 3, IEC 61000-4-7, and IEC 61000-4-15

Table 2-12 Measured Quantities and Their Operational Measurement Uncertainty

Measured Quantity	Unit	Measuring Range	Operational Measurement Uncertainty acc. to IEC 62586 Class S, IEC 61000-4-30 Ed. 3, IEC 61000-4-7, IEC 61000-4-15
Frequency f	Hz	50 Hz (±15 %): 42.5 Hz to 57.5 Hz 60 Hz (±15 %): 51.0 Hz to 69.0 Hz	±50 mHz Power-system voltage > 2 V required
Voltage $V_{ph-N/PE}$ (star)	V	0 % to 120 % Udin	±0.2 % Udin
		AC 63.5 V AC 110 V AC 230 V AC 400 V UL conditions： AC 347 V	
Voltage V_{ph-ph} (delta)	V	0 % to 120 % Udin	±0.2 % Udin
		AC 110 V AC 190 V AC 400 V AC 690 V UL conditions: AC 600 V	
Flicker Pst, Plt	–	Pst, Plt: 0.4 to 4	Acc. to class S, IEC 61000-4-30: Pst: ±10 % Plt: ±10 %
Undervoltages (dips) and overvoltages (swells) of the power-system voltage	V, s	–	Amplitude: ±0.2 % of Udin Duration: ±1 cycle
Voltage interruptions of the power-system voltage	V, s	–	Duration: ±1 cycle
Voltage unbalance	%	–	±0.15 %
Harmonics of voltage H_xV_{ph}	% or V	10 % to 100 % acc. to IEC 61000-2-4, class 3	IEC 61000-4-7, Class II: Condition: Um ≥ 3 % of Udin Maximum error: ±5 % of Um
			Condition: Um < 3 % of Udin Maximum error: ±0.15 % of Udin

Measured Quantity	Unit	Measuring Range	Operational Measurement Uncertainty acc. to IEC 62586 Class S, IEC 61000-4-30 Ed. 3, IEC 61000-4-7, IEC 61000-4-15
Harmonics of Current H_xI	% or A	Im ≥ 10 % Inom Im < 10 % Inom	±5 % Im ±0.5 % Inom
Magnitude of current	%	10 % FS to 100 % FS	0.2 %
Udin: Primary nominal voltage, corresponding to the primary rated voltage Um: Measured value u2: Value of negative-sequence system component V FS: Full scale Im: Measured value Inom: Primary nominal current			

NOTE

The frequency measurement is carried out as software frequency measurement (V_{a-N} , V_{b-N} , V_{c-N} > 2 V).

The frequency will be measured first at the measuring circuit V_{a-N}.

If the voltage V_{a-N} is < 2 V, the measurement is performed automatically at the measuring circuit V_{b-N}.

If the voltage V_{b-N} is < 2 V, the measurement is performed automatically at the measuring circuit V_{c-N}.

If none of the voltages is > 2 V, the frequency measurement is invalid.

Measured Quantities and Their Operational Measuring Accuracy

Table 2-13 Measured Quantities and Operational Measuring Accuracy according to IEC 61557-12

Measured Quantity	Unit	Rated Value	Measurement Range	Accuracy Class
Current I Acc. to parameterization	A	AC 1 A AC 5 A	20 % to 200 % I_{rated}	0.2
Current unbalance I_{unbal}	%	–	0 % to 100 % I_{rated}	0.2
Active power P + demand, - supply	W	–	20 % to 200 % I_{rated}	0.5
Reactive power Q inductive, capacitive	var	–	20 % to 200 % I_{rated}	2
Apparent power S	VA	–	20 % to 200 % I_{rated}	0.5
Power factor PF	–	–	0.5 inductive to 0.8 capacitive	1
Active power factor cos ϕ	–	–	-1 to +1	1
Phase angle ϕ	Degree	–	-180° to +180°	±2°
Active energy WP + demand, - supply	Wh	–	20 % to 200 % I_{rated}	0.5 Class 0.5S acc. to IEC 62053-22
Reactive energy WQ inductive, capacitive	varh	–	20 % to 200 % I_{rated}	2 Class 2 acc. to IEC 62053-23
Apparent energy WS	VAh	–	20 % to 200 % I_{rated}	0.5

Measured Quantity	Unit	Rated Value	Measurement Range	Accuracy Class
Subgroup Total harmonics distortion of voltage THDS V_{ph}	%	–	0 % to 100 %	0.5
Subgroup Total harmonics distortion of current THDS I_{ph}	%	–	0 % to 100 %	0.5
Harmonics of current H_xI_{ph}	A	–	–	Condition: $I_m \geq 10\ \% I_{rated}$ Maximum error: ±5 % I_m Condition: $I_m < 10\ \% I_{rated}$ Maximum error: ±0.5 % I_{rated}

2.5.4 Measurands

2.5.4.1 Operational Measured Quantities Depending on the Connection Types

Table 2-14 Operational Measured Quantities Depending on the Connection Types in Power Systems (10/12 cycles)

Measured Quantity	Circuit	1-Phase System	3-Wire Network (Delta) Balanced (1I)	3-Wire Network (Delta) Unbalanced (3I)	3-Wire Network (Delta) Unbalanced (2I)	4-Wire Network (Star) Balanced (1I)	4-Wire Network (Star) Unbalanced (3I)
Voltage							
Va	a-N	x	–	–	–	x	x
Vb	b-N	–	–	–	–	–	x
Vc	c-N	–	–	–	–	–	x
Vab	a-b	–	x	x	x	–	x
Vbc	b-c	–	x	x	x	–	x
Vca	c-a	–	x	x	x	–	x
V_N	a+b+c	–	–	–	–	–	x
Vavg	a-N b-N c-N	–	–	–	–	–	1/3 Σ V_{ph-n}
Vavg	a-b b-c c-a	–	1/3 Σ V_{ph-ph}			–	–
Vunbal	a-b b-c c-a	–	x	x	x	–	x
Current							
Ia	a	x	x	x	x	x	x
Ib	b	–	–	x	x	–	x
Ic	c	–	–	x	x	–	x
I_N	a+b+c	–	–	–	–	–	x

Measured Quantity	Circuit	1-Phase System	3-Wire Network (Delta) Balanced (1I)	3-Wire Network (Delta) Unbalanced (3I)	3-Wire Network (Delta) Unbalanced (2I)	4-Wire Network (Star) Balanced (1I)	4-Wire Network (Star) Unbalanced (3I)
Iavg	a+b+c	–	–	x	x	–	1/3 Σ I_{ph}
Iunbal	a+b+c	–	–	x	x	–	x
Fundamental Power Factor							
cos φ(a)	a	x	–	–	–	–	x
cos φ(b)	b	–	–	–	–	–	x
cos φ(c)	c	–	–	–	–	–	x
cos φ	a+b+c	–	x	x	x	x	1/3 Σ cos φ_{ph}
Power Factor							
PFa	a	x	–	–	–	–	x
PFb	b	–	–	–	–	–	x
PFc	c	–	–	–	–	–	x
PF	a+b+c	–	x	x	x	x	1/3 Σ PF_{ph}
Phase Angle							
φa	a	x	–	–	–	x	x
φb	b	–	–	–	–	–	x
φc	c	–	–	–	–	–	x
φVI	a+b+c	–	x	x	x	x	1/3 Σ φVI_{ph}
Frequency							
System frequency	a	x	x	x	x	x	x

2.5.4.2 Harmonics

Table 2-15 Harmonics Depending on the Connection Types in Power Systems

Measured Quantity (x = 1 to 40) x = 1: Fundamental	Circuit	1-Phase System	3-Wire Network (Delta) (Balanced (1I)	3-Wire Network (Delta) Unbalanced (3I)	3-Wire Network (Delta) Unbalanced (2I)	4-Wire Network (Star) Balanced (1I)	4-Wire Network (Star) Unbalanced (3I)
Magnitude of Voltage Harmonics							
H_Va-x	a-N	x	–	–	–	x	x
H_Vb-x	b-N	–	–	–	–	–	x
H_Vc-x	c-N	–	–	–	–	–	x
Magnitude of Harmonic Currents							
H_Ia-x	a	x	x	x	x	x	x
H_Ib-x	b	–	–	x	x	–	x
H_Ic-x	c	–	–	x	x	–	x
THDS, Voltage							
THDS_Va	a-N	x	–	–	–	x	x
THDS_Vb	b-N	–	–	–	–	–	x
THDS_Vc	c-N	–	–	–	–	–	x
THDS_Vab	a-b	x	–	–	–	x	x
THDS_Vbc	b-c	–	–	–	–	–	x
THDS_Vca	c-a	–	–	–	–	–	x

Measured Quantity (x = 1 to 40) x = 1: Fundamental	Circuit	1-Phase System	3-Wire Network (Delta) (Balanced (1I)	3-Wire Network (Delta) Unbalanced (3I)	3-Wire Network (Delta) Unbalanced (2I)	4-Wire Network (Star) Balanced (1I)	4-Wire Network (Star) Unbalanced (3I)
THDS, Current							
THDS_Ia	a	x	x	x	x	x	x
THDS_Ib	b	–	–	x	x	–	x
THDS_Ic	c	–	–	x	x	–	x

2.5.4.3 Measured Quantities of Power Depending on the Connection Types

Table 2-16 Measured Quantities of Power Depending on the Connection Types in Power Systems

Measured Quantity	Circuit	1-Phase System	3-Wire Network (Delta) (Balanced (1I)	3-Wire Network (Delta) Unbalanced (3I)	3-Wire Network (Delta) Unbalanced (2I)	4-Wire Network (Star) Balanced (1I)	4-Wire Network (Star) Unbalanced (3I)
Active Power							
Pa	a	x	–	–	–	–	x
Pb	b	–	–	–	–	–	x
Pc	c	–	–	–	–	–	x
P	a+b+c	–	x	x	x	x	$\sum P_{ph}$
Reactive Power							
Qa	a	x	–	–	–	–	x
Qb	b	–	–	–	–	–	x
Qc	c	–	–	–	–	–	x
Q	a+b+c	–	x	x	x	x	$\sum Q_{ph}$
Apparent Power							
Sa	a	x	–	–	–	–	x
Sb	b	–	–	–	–	–	x
Sc	c	–	–	–	–	–	x
S	a+b+c	–	x	x	x	x	$\sum S_{ph}$
Reactive Power (Fundamental)							
Q1a	a	x	–	–	–	x	x
Q1b	b	–	–	–	–	–	x
Q1c	c	–	–	–	–	–	x
Q1	a+b+c	–	–	–	–	x	$\sum Q1_{ph}$

2.5.4.4 Measured Quantities of Energy Depending on Connection Types

Table 2-17 Measured Quantities of Energy Depending on Connection Types in Power Systems (Intervals (Cycle): 10/12 Cycles)

Measured Quantity	Circuit	1-Phase System	3-Wire Network (Delta) (Balanced (1I)	3-Wire Network (Delta) Unbalanced (3I)	3-Wire Network (Delta) Unbalanced (2I)	4-Wire Network (Star) Balanced (1I)	4-Wire Network (Star) Unbalanced (3I)
Active Energy/Export							
WPa_exp	a	x	–	–	–	–	x
WPb_exp	b	–	–	–	–	–	x
WPc_exp	c	–	–	–	–	–	x
WP_exp	a+b+c	–	x	x	x	x	x
Active Energy/Import							
WPa_imp	a	x	–	–	–	–	x
WPb_imp	b	–	–	–	–	–	x
WPc_imp	c	–	–	–	–	–	x
WP_imp	a+b+c	–	x	x	x	x	x
Reactive Energy/Inductive							
WQa_ ind	a	x	–	–	–	–	x
WQb_ ind	b	–	–	–	–	–	x
WQc_ ind	c	–	–	–	–	–	x
WQ_ ind	a+b+c	–	x	x	x	x	x
Reactive Energy/Capacitive							
WQa_ cap	a	x	–	–	–	–	x
WQb_ cap	b	–	–	–	–	–	x
WQc_ cap	c	–	–	–	–	–	x
WQ_ cap	a+b+c	–	x	x	x	x	x
Apparent Energy							
WSa	a	x	–	–	–	–	x
WSb	b	–	–	–	–	–	x
WSc	c	–	–	–	–	–	x
WS	a+b+c	–	x	x	x	x	x
Frozen Active Energy/Export							
WPa_exp	a	x	–	–	–	–	x
WPb_exp	b	–	–	–	–	–	x
WPc_exp	c	–	–	–	–	–	x
WP_exp	a+b+c	–	x	x	x	x	x
Frozen Active Energy/Import							
WPa_imp	a	x	–	–	–	–	x
WPb_imp	b	–	–	–	–	–	x
WPc_imp	c	–	–	–	–	–	x
WP_imp	a+b+c	–	x	x	x	x	x
Frozen Reactive Energy/Inductive							
WQa_ ind	a	x	–	–	–	–	x
WQb_ ind	b	–	–	–	–	–	x
WQc_ ind	c	–	–	–	–	–	x
WQ_ ind	a+b+c	–	x	x	x	x	x

Measured Quantity	Circuit	1-Phase System	3-Wire Network (Delta) (Balanced (1I)	3-Wire Network (Delta) Unbalanced (3I)	3-Wire Network (Delta) Unbalanced (2I)	4-Wire Network (Star) Balanced (1I)	4-Wire Network (Star) Unbalanced (3I)
Frozen Reactive Energy/Capacitive							
WQa_ cap	a	x	–	–	–	–	x
WQb_ cap	b	–	–	–	–	–	x
WQc_ cap	c	–	–	–	–	–	x
WQ_ cap	a+b+c	–	x	x	x	x	x
Frozen Apparent Energy							
WSa	a	x	–	–	–	–	x
WSb	b	–	–	–	–	–	x
WSc	c	–	–	–	–	–	x
WS	a+b+c	–	x	x	x	x	x

NOTE

All measurements with intervals: 10 or 12 cycles

2.5.4.5 Flicker Depending on Connection Types

Table 2-18 Flicker Depending on Connection Types in Power Systems

Measured Quantity	Circuit	1-Phase System	3-Wire Network (Delta) (Balanced (1I)	3-Wire Network (Delta) Unbalanced (3I)	3-Wire Network (Delta) Unbalanced (2I)	4-Wire Network (Star) Balanced (1I)	4-Wire Network (Star) Unbalanced (3I)
Short-Term Flicker							
Pst (a-n)	a-N	x	–	–	–	x	x
Pst (b-n)	b-N	–	–	–	–	–	x
Pst (c-n)	c-N	–	–	–	–	–	x
Pst (a-b)	a-b	–	x	x	x	–	–
Pst (b-c)	b-c	–	x	x	x	–	–
Pst (c-a)	c-a	–	x	x	x	–	–
Long-Term Flicker							
Plt (a-n)	a-N	x	–	–	–	x	x
Plt (b-n)	b-N	–	–	–	–	–	x
Plt (c-n)	c-N	–	–	–	–	–	x
Plt (a-b)	a-b	–	x	x	x	–	–
Plt (b-c)	b-c	–	x	x	x	–	–
Plt (c-a)	c-a	–	x	x	x	–	–
Instantaneous Flicker Sensation							
Pinst (a-n)	a-N	x	–	–	–	x	x
Pinst (b-n)	b-N	–	–	–	–	–	x
Pinst (c-n)	c-N	–	–	–	–	–	x
Pinst (a-b)	a-b	–	x	x	x	–	–
Pinst (b-c)	b-c	–	x	x	x	–	–
Pinst (c-a)	c-a	–	x	x	x	–	–

2.5.5 AC Operational Values

2.5.5.1 Function Description

Basic AC operational values are gathered during measurement and shown both on the Web pages (see *Figure 2-15*) and numerically on the display.

2.5.5.2 Value View of the Basic Values via Web Pages

To display the basic values in the **Value view** tab, proceed as follows:

- In the navigation window, click **Basic values**.

Value view ► Operational values ► Basic values

▼ Frequency

Measurement	Unit	Value	Min value		Max value	
f	Hz	***	49.997	2022-03-02 23:57:02:208	50.041	2022-03-02 23:52:08:605

▼ Voltage and current

Measurement	Unit	Value	Min value		Max value	
Va	V	1.099	0.000	2022-03-03 00:04:51:805	229.956	2022-03-02 23:45:06:226
Vb	V	1.200	0.000	2022-03-03 00:04:51:805	229.939	2022-03-02 23:44:45:027
Vc	V	1.007	0.000	2022-03-03 00:04:51:805	230.014	2022-03-02 23:50:28:407
Vab	V	0.000	0.000	2022-03-03 00:04:51:805	398.277	2022-03-02 23:51:57:206
Vbc	V	0.000	0.000	2022-03-03 00:04:51:805	397.678	2022-03-02 23:47:23:009
Vca	V	0.000	0.000	2022-03-03 00:04:51:805	398.892	2022-03-02 23:45:06:226
Ia	A	0.0151	0.0000	2022-03-03 00:04:52:005	4.9998	2022-03-02 23:45:06:226
Ib	A	0.0000	0.0000	2022-03-03 00:04:52:205	5.0009	2022-03-02 23:52:09:005
Ic	A	0.0000	0.0000	2022-03-03 00:04:52:005	5.0006	2022-03-02 23:50:28:407
VN	V	3.264	0.000	2022-03-03 00:04:51:805	3.302	2022-03-03 00:05:58:405
Vavg	V	1.102	0.000	2022-03-03 00:04:51:805	229.875	2022-03-02 23:44:50:628
Vavg ph-ph	V	0.311	***	***	***	***
IN	A	0.0236	0.0000	2022-03-03 00:04:52:205	0.0497	2022-03-02 23:53:53:799
Iavg	A	0.0134	0.0000	2022-03-03 00:04:52:205	4.9984	2022-03-02 23:50:28:607

▼ Angle

Measurement	Unit	Value	Min value		Max value	
φab V	°	***	0.000	2022-03-03 00:04:51:805	121.480	2022-03-03 00:04:51:605
φca V	°	***	0.000	2022-03-03 00:04:51:805	120.515	2022-03-02 23:57:02:208
φab I	°	***	0.000	2022-03-03 00:04:51:805	121.523	2022-03-03 00:04:51:605
φca I	°	***	0.000	2022-03-03 00:04:51:805	120.436	2022-03-02 23:52:09:405
φUIa	°	***	-0.588	2022-03-03 00:04:51:605	9.473	2022-03-02 23:57:02:208
φUIb	°	***	-10.113	2022-03-02 23:57:02:208	7.748	2022-03-02 23:52:02:205
φUIc	°	***	-0.662	2022-03-02 23:52:08:405	9.558	2022-03-02 23:57:02:208
φUI	°	***	-0.355	2022-03-03 00:04:51:605	7.900	2022-03-02 23:52:02:205

▼ Unbalance

Measurement	Unit	Value	Min value		Max value	
Neg. seq. comp. V	%	***	0.000	2022-03-03 00:04:51:805	1.554	2022-03-03 00:04:51:605
Neg. seq. comp. I	%	***	0.000	2022-03-03 00:04:51:805	1.571	2022-03-03 00:04:51:605

▼ Power factor

Measurement	Unit	Value	Min value		Max value	
cos φ (a)	-	***	0.986	2022-03-02 23:57:02:208	1.000	2022-03-02 23:54:30:409
cos φ (b)	-	***	0.984	2022-03-02 23:57:02:208	1.000	2022-03-02 23:48:41:207
cos φ (c)	-	***	0.986	2022-03-02 23:57:02:208	1.000	2022-03-02 23:45:31:223
cos φ	-	***	0.986	2022-03-02 23:57:02:208	1.000	2022-03-02 23:46:18:600
PFa	-	***	0.986	2022-03-02 23:57:02:208	1.000	2022-03-02 23:54:30:409
PFb	-	***	0.984	2022-03-02 23:57:02:208	1.000	2022-03-02 23:48:41:207
PFc	-	***	0.986	2022-03-02 23:57:02:208	1.000	2022-03-02 23:45:31:223
PF	-	***	0.986	2022-03-02 23:57:02:208	1.000	2022-03-02 23:46:18:600

▼ Deviation (GB/T 19862-2016)

Measurement	Unit	Value
f	-	***
Va	%	-99.522
Vb	%	-99.478
Vc	%	-99.562
Vab	%	-100.000
Vbc	%	-100.000
Vca	%	-100.000

[sc_value_view_basic_values, 1, en_US]

Figure 2-15 Value View Tab, Basic Values

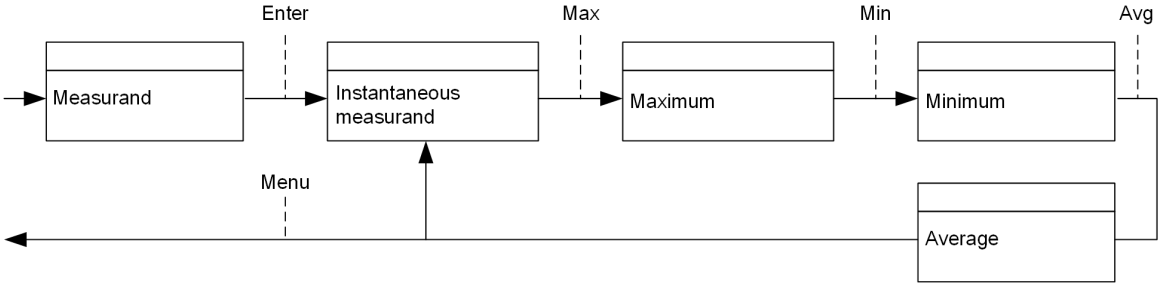
NOTE

If *** is displayed instead of a value, this value is invalid.
If ^^^ is displayed instead of a value, this value overflows.

2.5.5.3 Value View via Display

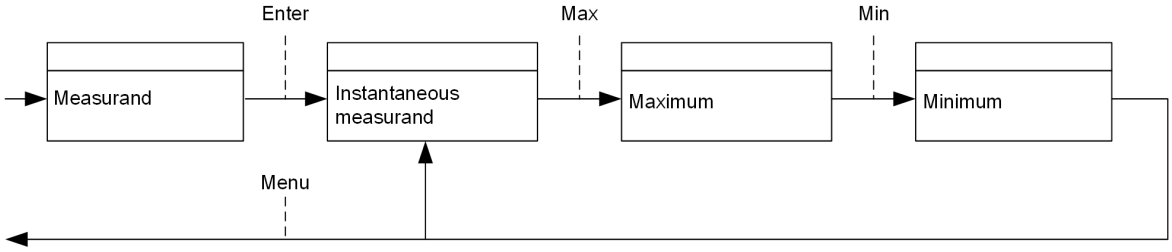
Submenu Various Measured Quantities

- Voltage Vph-n, Voltage Vph-ph
- Current I
- Power factor PF, Tot. Pwr.factor PF tot
- cos φ
- Frequency f



[dw_ac_power_2, 1, en_US]

Figure 2-16 Submenu Various Measured Quantities: Vph-n; Vph-ph; I



[dw_ac_power, 2, en_US]

Figure 2-17 Submenu Various Measured Quantities: PF, PF tot; cos φ; f

2.5.5.4 Clearing of Min/Max Values

To clear the min/max values in the **Maintenance** tab, proceed as follows:

- In the navigation window, click **Min/Max values**.

[sc_clear_Min_Max_values, 1, en_US]

Figure 2-18 Maintenance Tab, Clear Min/Max values

- Enter the maintenance password (refer to *Table 2-4*).
- Click **Clear Min/Max values**.
  The min/max values are cleared. The **Action was successful** indication is displayed on the status bar.

2.5.6 AC Power and Energy

2.5.6.1 Function Description

The following AC power and energy values are gathered during measurement and shown both on the Web pages and numerically on the display:

- Power values P, Q, Q1, S
- Energy values WP (imp, exp), WQ (imp, exp, ind, cap), WS
- Frozen energy (for more information, refer to *5.2 Energy Freeze*)

2.5.6.2 Value View of the AC Power and Energy via Web Pages

To display the AC-power and energy values in the **Value view** tab, proceed as follows:

- In the navigation window, click **AC power** or **Energy**.

Value view ► Operational values ► Power ► AC power

▼ **Power**

Measurement	Unit	Value	Min value		Max value	
Pa	W	500 237 200.00	500 185 750.00	2022-07-21 13:03:53:353	500 276 250.00	2022-07-21 13:03:46:753
Pb	W	500 085 400.00	500 084 400.00	2022-07-21 13:04:09:152	500 176 450.00	2022-07-21 13:04:28:952
Pc	W	500 160 500.00	500 072 050.00	2022-07-21 13:04:20:552	500 181 800.00	2022-07-21 13:04:02:753
P	W	1 500 483 125.00	1 500 463 000.00	2022-07-21 13:03:45:554	1 500 485 875.00	2022-07-21 13:04:28:952
Qa	var	35 822.43	- 208 287.88	2022-07-21 13:04:21:752	40 330.10	2022-07-21 13:04:05:553
Qb	var	-46 188.16	- 151 852.19	2022-07-21 13:04:28:952	-41 181.20	2022-07-21 13:04:19:952
Qc	var	-44 934.59	- 195 444.55	2022-07-21 13:03:46:753	9 255.98	2022-07-21 13:03:53:353
Q	var	-55 300.32	- 498 443.90	2022-07-21 13:04:05:953	-41 921.97	2022-07-21 13:03:48:553
Q1a	var	-24 412.80	-31 972.28	2022-07-21 13:04:22:152	-15 320.32	2022-07-21 13:04:05:753
Q1b	var	-57 201.11	-57 535.81	2022-07-21 13:04:01:153	-30 334.06	2022-07-21 13:03:45:154
Q1c	var	-32 367.74	-55 945.09	2022-07-21 13:04:11:152	-29 168.53	2022-07-21 13:03:55:353
Q1	var	- 113 981.65	- 117 712.06	2022-07-21 13:04:06:353	- 100 531.52	2022-07-21 13:03:51:353
Sa	VA	500 237 750.00	500 186 100.00	2022-07-21 13:03:53:353	500 274 950.00	2022-07-21 13:03:46:753
Sb	VA	500 085 500.00	500 084 250.00	2022-07-21 13:04:09:152	500 175 550.00	2022-07-21 13:04:28:952
Sc	VA	500 160 300.00	500 071 050.00	2022-07-21 13:04:20:552	500 182 000.00	2022-07-21 13:04:02:753
S	VA	1 500 483 625.00	1 500 463 625.00	2022-07-21 13:03:45:554	1 500 484 625.00	2022-07-21 13:04:34:151

[sc_evaluation_ac power, 2, en_US]

Figure 2-19 Value View of the AC Power

Value view ► Operational values ► Energy ► Energy

▼ **Energy**

Measurement	Energy					CO_2 emissions	
	Unit	Total	A	B	C	Unit	Value
WP_imp	Wh	10 463.83	3 498.07	3 496.27	3 498.27	t	0.000000
WP_exp	Wh	0.00	0.00	0.00	0.00	t	0.000000
WQ_imp	varh	2 600.33	864.73	868.87	866.63	--	--
WQ_exp	varh	163.33	54.47	54.40	54.47	--	--
WQ_ind	varh	2 600.33	864.73	868.87	866.63	--	--
WQ_cap	varh	163.33	54.47	54.40	54.47	--	--
WS	VAh	10 598.40	3 541.07	3 540.33	3 546.67	--	--

[sc_eva_energy, 2, en_US]

Figure 2-20 Value View of the Energy

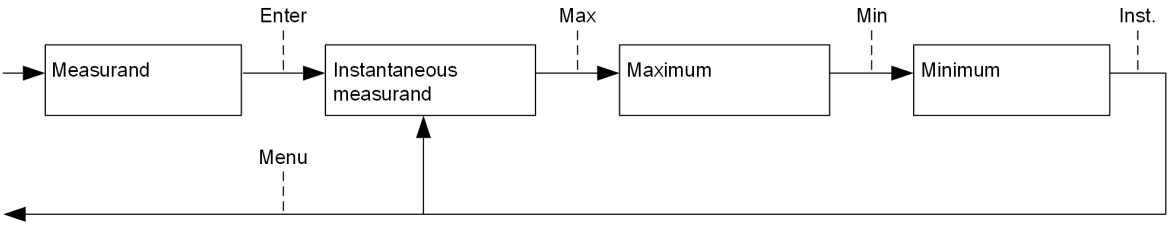
NOTE

If *** is displayed instead of a value, this value is invalid.
If ^^^ is displayed instead of a value, this value overflows.

2.5.6.3 Value View via Display

Submenu Various Measured Quantities

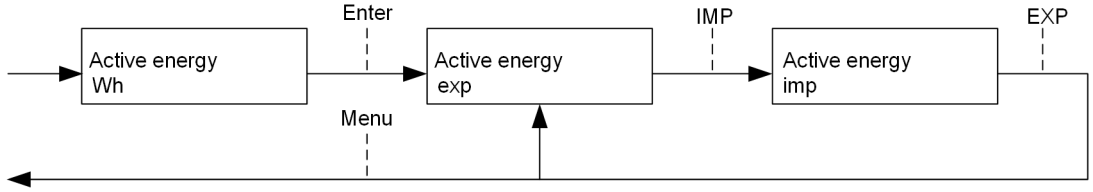
- Voltage Vph-n, Voltage Vph-ph
- Current I
- Active Power P, React. Power Q, App. Power S, Total Power P, Q, S
- Power factor PF, Tot. Pwr.factor PF tot
- cos φ
- Frequency f
- Phase unbal. Vnb, Inb



[dw_measured quantities, 2, en_US]

Figure 2-21 Submenu Various Measured Quantities

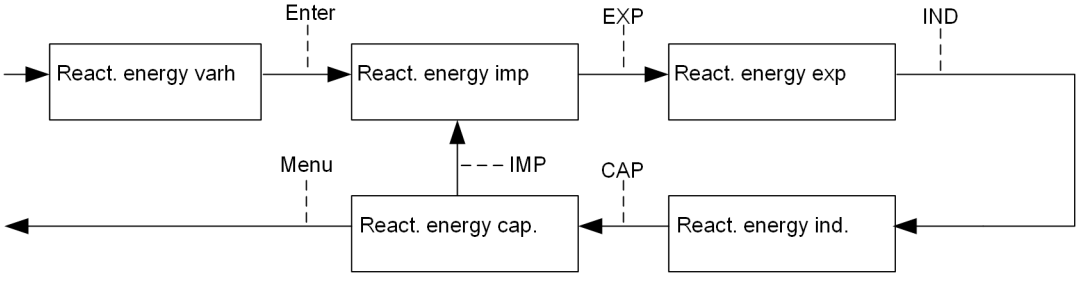
Submenu Active Energy



[dw_active_energy, 4, en_US]

Figure 2-22 Submenu Active Energy

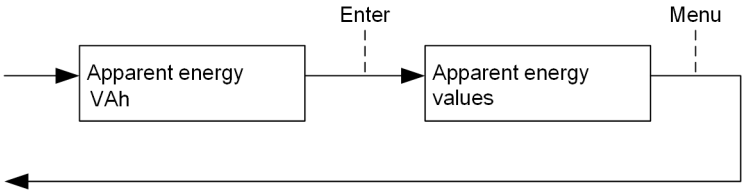
Submenu Reactive Energy



[dw_reactive_energy, 3, en_US]

Figure 2-23 Submenu Reactive Energy

Submenu Apparent Energy



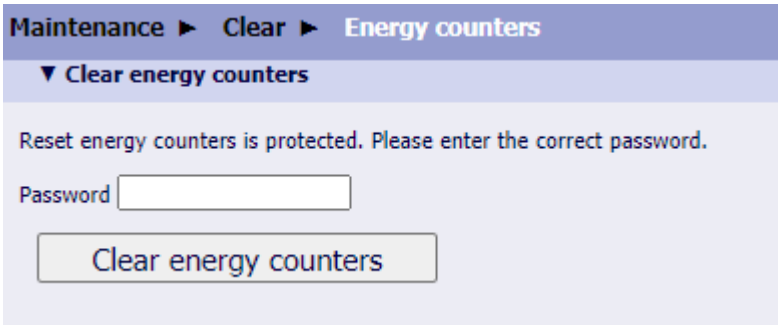
[dw_apparent_energy, 2, en_US]

Figure 2-24 Submenu Apparent Energy

2.5.6.4 Clearing of Energy Counters

To clear the energy counters in the **Maintenance** tab, proceed as follows:

- In the navigation window, click **Energy counters**.



[sc_clear_energy_counters, 1, en_US]

Figure 2-25 Maintenance Tab, Clear Energy Counters

- Enter the maintenance password (refer to *Table 2-4*).
- Click **Clear energy counters**.
  The energy counters are cleared. The **Action was successful** indication is displayed on the status bar.

NOTE

The cleared energy counters include the following values:

- Energy values
- Frozen-energy values
- Tariff values

2.6 Ethernet Communication

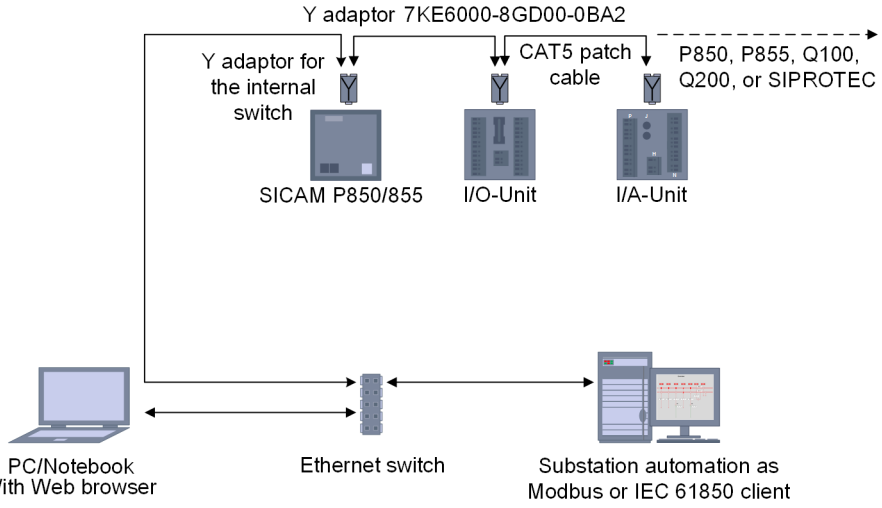
2.6.1 Ethernet

2.6.1.1 Function Description

The device has a 100Base-T Ethernet port (RJ45 connectors) at the top side of the device. The Ethernet port can be configured to be an Ethernet network with 1 MAC and 1 IP address.

Internal Ethernet Switch

SICAM P850/P855 is equipped with an internal Ethernet switch. 2 devices with Ethernet interface can be connected via a Y bus cable (Y adapter 7KE6000-8GD00-0BA2). Cascading of several devices is possible (Daisy chain) like shown in the following figure. The internal two-port switch function from SICAM P850/P855 must be activated during the device parameterization.



[dw_ethernet_switch_p85x, 1, en_US]

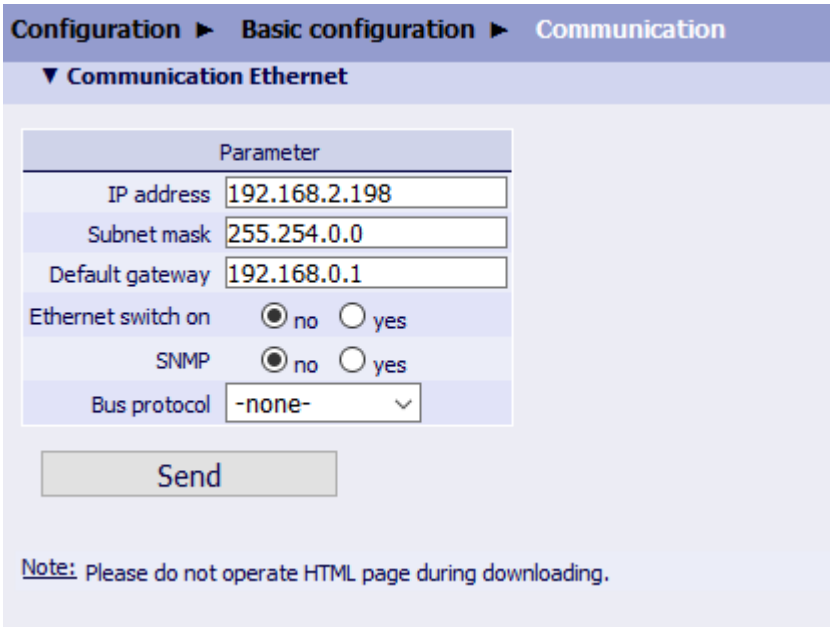
Figure 2-26 Cascade Connection

2.6.1.2 Configuration via Web Pages

Configuration of the Communication Ethernet

To change the Ethernet communication settings in the **Configuration** tab, proceed as follows:

- In the navigation window, click **Communication Ethernet**.



[sc_P85x_communication ethernet, 1, en_US]

Figure 2-27 Configuration Tab, Ethernet Settings

- Configure the respective parameters according to the following table.

Table 2-19 Settings for Communication Ethernet

Parameter	Default Setting	Setting Range
Communication Ethernet		
IP address[4]	192.168.0.55	Any 0.0.0.0 = DHCP
Subnet mask[4]	255.255.255.0	Any
Default gateway[4]	192.168.0.1	Any
Ethernet switch on	no	no yes
Enable SNMP	no	no yes
Bus protocol	Modbus TCP	-None- Modbus TCP IEC 61850

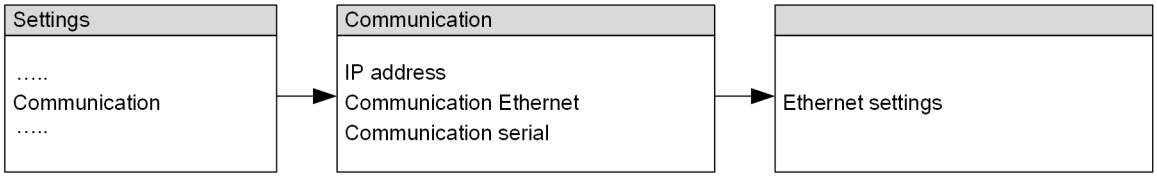
- After the parameterization, click **Send**.
- In the navigation window, click **Activation and cancel**.
- Enter the activation password (refer to *Table 2-3*).
- Click **Activation**.

2.6.1.3 Configuration via Display

Submenu Ethernet Settings

The operation is carried out with the softkeys F1 to F4.

4 After the parameter changes have been enabled, the device will restart.



[dw_p85x_display_communication_ethernet, 2, en_US]

Figure 2-28 Submenu Communication via Ethernet

NOTE

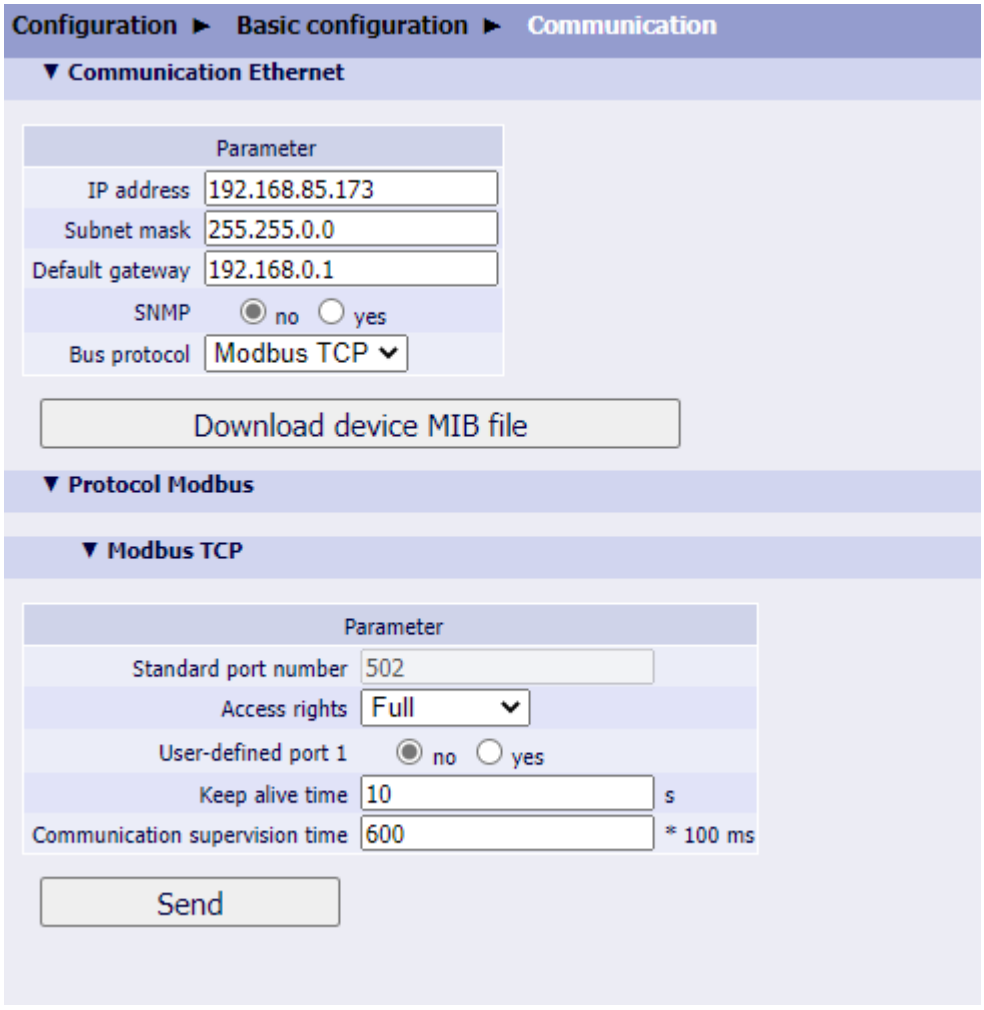
The MAC address is shown on the display but cannot be edited.
For this purpose, a prompt is displayed which you must acknowledge with **Ok**.

2.6.2 Modbus TCP Server

2.6.2.1 Configuration via Web Pages

To change the settings of the Modbus TCP in the **Configuration** tab, proceed as follows:

- In the navigation window, click **Communication Ethernet**.
- Select **Modbus TCP** as the **Bus protocol**.



[sc_communication_modbus_TCP, 1, en_US]

Figure 2-29 Configuration Tab, Modbus TCP Settings

- Configure the respective parameters according to the following table.

Table 2-20 Settings for Modbus TCP

Parameter	Default Setting	Setting Range
Standard port number	502	502 Not settable
Access rights	Full	Full Read only
User-defined port 1	no	no yes
Port number[5]	503	503 to 65 535
Access rights[5]	Read only	Full Read only
Port number	504	503 to 65 535
Access rights	Read only	Full Read only

5 This parameter is available only if **User-defined port 1** is set to **yes**.

Parameter	Default Setting	Setting Range
Keep alive time	10 s	0 s = switch off 1 s to 65 535 s
Communication supervision time	600 (* 100 ms)	0 s = none 100 ms to 6 553 400 ms

NOTE

The 2 port numbers must be different from each other.

- After the parameterization, click **Send**.
- In the navigation window, click **Activation and cancel**.
- Enter the activation password (refer to *Table 2-3*).
- Click **Activation**.

Number of Connections (not configurable)

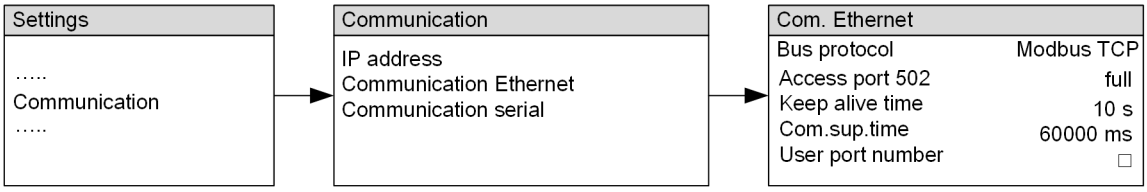
Up to 5 TCP connections are possible:

- Without user-defined port 1: 4 connections via the standard port 502
- With user-defined port 1: 2 connections via the standard pot 502 and 2 connections via the configured port number

2.6.2.2 Configuration via Display

Submenu Modbus TCP Settings

The operation is carried out with the softkeys F1 to F4.



[dw_p85x_display_communication_Modbus_TCP, 1, en_US]

Figure 2-30 Submenu Communication via Modbus TCP

2.6.2.3 Diagnosis of the Modbus TCP

The diagnosis for the Modbus TCP allows analyzing parameters and communication as well as resetting the diagnostic counters.

NOTE

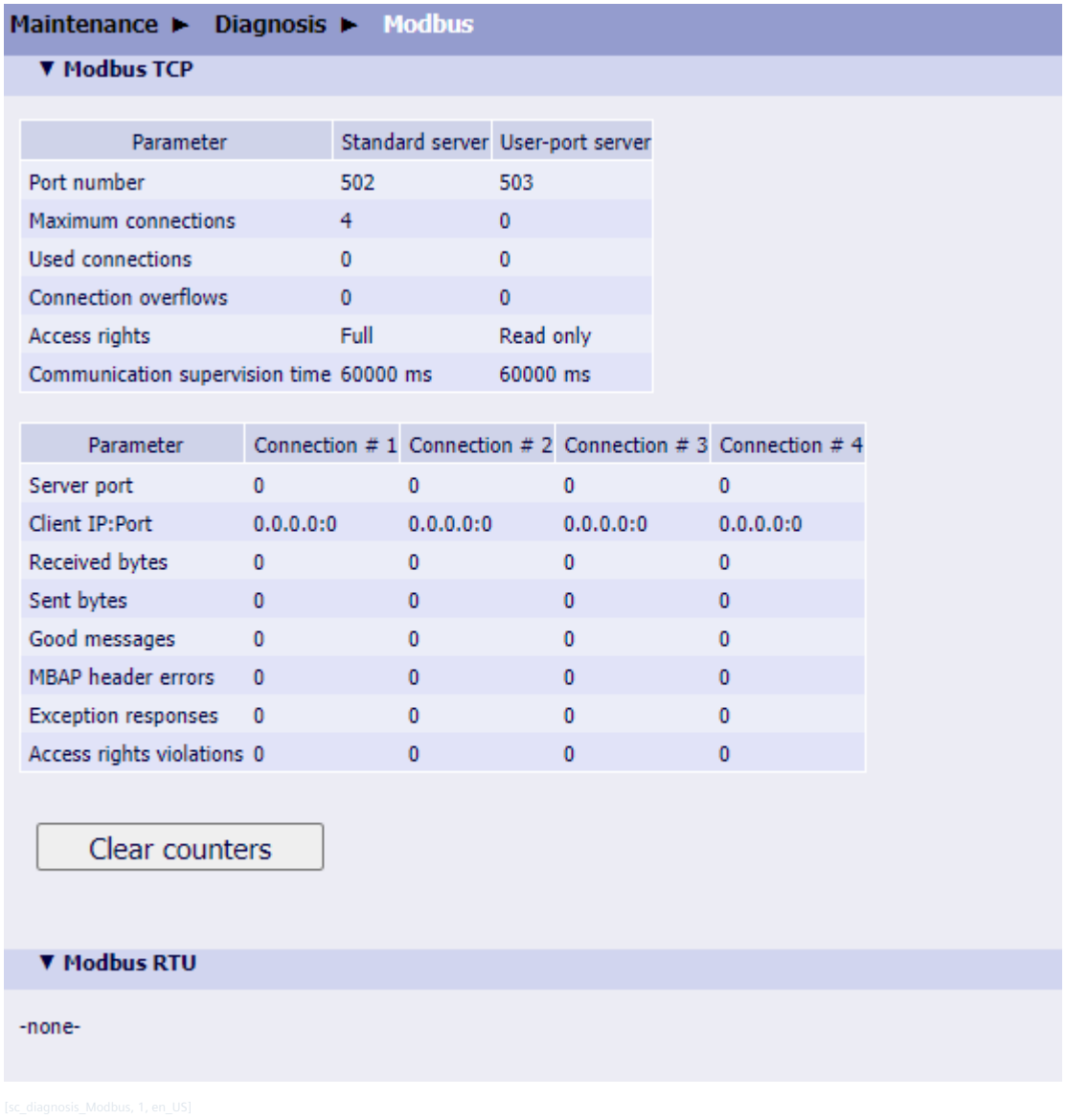
The diagnostic data of **Modbus TCP** are displayed only if the bus protocol has been selected in the tab **Configuration → Basic configuration → Communication Ethernet**.

If the protocol has not been selected, the **Diagnosis Modbus TCP** window displays **-none-**.

For the diagnosis of the protocol Modbus TCP in the **Maintenance** tab, proceed as follows:

- In the navigation window, click **Modbus**.

  The **Modbus** window opens and the **Modbus TCP** protocol is displayed. For Modbus TCP the **Standard server**, the **User-port server** and the **Connection** data are analyzed.



[sc_diagnosis_Modbus, 1, en_US]

Figure 2-31 Maintenance Tab, Diagnosis Modbus TCP

- To clear the counters for Modbus TCP, click **Clear counters**.
  All counters for Modbus TCP are reset to 0.

Diagnostic Information for Standard Server and User-Port Server

- Port number:
  Standard port 502 and configured user port
- Maximum connections:
  For user port number 502: 4 connections via the standard port 502
  For other user port numbers: A total of 4 connections via the standard port 502 and the user port
- Used connections:
  Number of connections that are actually used

- Connection overflows:
  Counter of the attempts to establish more connections than allowed;
  Number of allowed connection attempts:
  For user port number 502: ≥ 4 connection attempts via the standard port 502
  For other user port numbers: ≥ 3 connection attempts via standard port 502 and/or ≥ 3 connection attempts via user port
- Access rights: as configured
- Communication supervision time: as configured

Diagnostic Information of Connections

- Server port:
  Server port number of the current connection in the respective column; if 0 is displayed, the connection is inactive or down
- Client IP:Port:
  Last or current IP address and port number of the client
- Received bytes:
  Total number of bytes received by the TCP port
- Sent bytes:
  Total number of bytes sent to the TCP port
- Good messages:
  Total number of messages received that were detected as valid Modbus messages
- MBAP header errors:
  Error in the MBAP header: incorrect protocol ID or implausible length of data
- Exception responses:
  Counters of the transmitted exception response messages
- Access rights violations:
  Total number of write accesses received if the parameter **Access rights for port xxx** is set to **Read only** of the associated TCP port (for example 502) in the **Communication Ethernet** input/output window. For more information, refer to chapter *2.6.1.2 Configuration via Web Pages*.

2.6.3 IEC 61850

2.6.3.1 Function Description

The IEC 61850 protocol is also used for communication via the Ethernet interface. The IEC 61850 specification with a detailed explanation of the protocol is given in the International Standard IEC 61850. The device supports IEC 61850, Edition 2.
The device supports 6 input configurations:

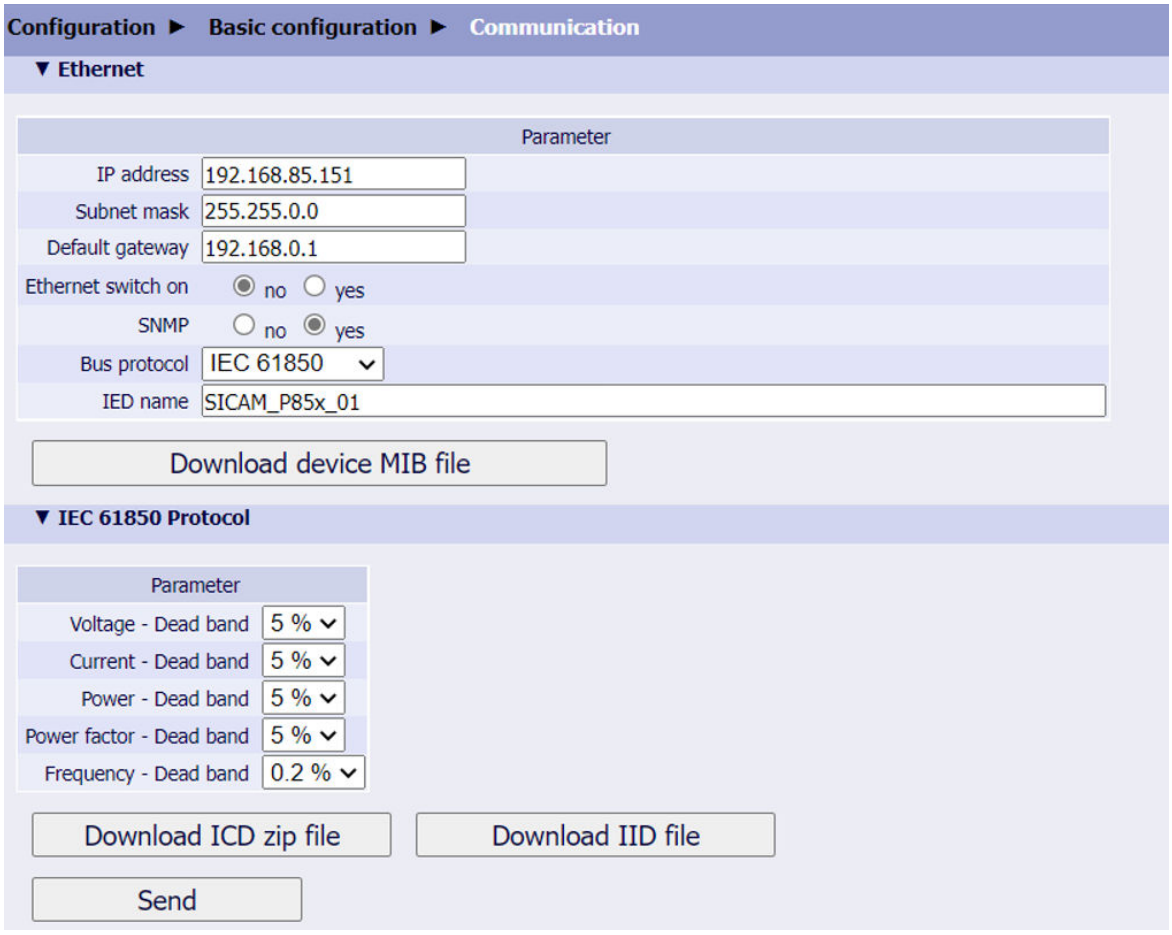
- 1-phase system
- 3-wire network – balanced (1I)
- 3-wire network – unbalanced (3I)
- 3-wire network – unbalanced (2I)
- 4-wire network – balanced (1I)
- 4-wire network – unbalanced (3I)

2.6.3.2 Configuration via Web Pages

Configuration of the IEC 61850 Protocol

To change the IEC 61850 settings in the **Configuration** tab, proceed as follows:

- In the navigation window, click **Communication Ethernet**.
- Select **IEC 61850** as the **Bus protocol**.



[sc_communication_IEC_61850, 1, en_US]

Figure 2-32 Configuration Tab, IEC 61850 Settings

- Configure the respective parameters according to the following table.

Table 2-21 Settings for IEC 61850

Parameter	Default Setting	Setting Range
IED Name	SICAM_P850/P855_01	Max. 60 characters Only a-z, A-Z, _, 0-9 are permitted. The first character must be an alpha character.
Voltage - Dead band	5 %	1 % to 5 %, in 1 % steps
Current - Dead band	5 %	1 % to 5 %, in 1 % steps
Power - Dead band	5 %	1 % to 5 %, in 1 % steps
Power factor - Dead band	5 %	2 % to 5 %, in 1 % steps

Parameter	Default Setting	Setting Range
Frequency - Dead band	0.2 %	0.2 %
Angle - Dead band	0.5 %	0.2 % 0.5 % 1 % 2 %

- After the parameterization, click **Send**.
- In the navigation window, click **Activation and cancel**.
- Enter the activation password (refer to *Table 2-3*).
- Click **Activation**.

Download IID File

The Instantiated IED Description (IID) file contains the data of the currently parameterized network type, for example: 4-wire, any load (3P4W), the currently parameterized IP address, the subnet mask, the default gateway, and the IED name.

This file is of the.iid format.

- Click **Download IID file**.
  The IID file is downloaded to a folder you selected.

Download ICD Zip File

The IED Capability Description (ICD) file contains the data of the currently parameterized network type, the currently parameterized IP address, the subnet mask, and the default gateway. The IED name is always TEMPLATE.

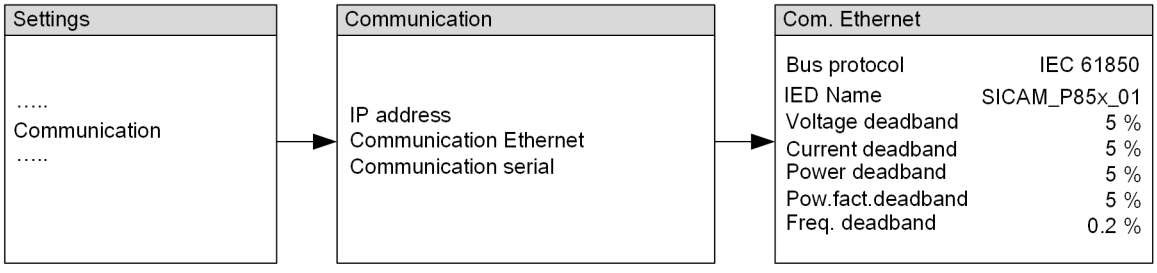
This file is of the .icd format.

- Click **Download ICD zip file**.
  The ICD file is downloaded to a folder you selected.

2.6.3.3 Configuration via Display

Submenu IEC 61850 Settings

The operation is carried out with the softkeys F1 to F4.



[dw_p85x_display_communication_IEC61850, 1, en_US]

Figure 2-33 Submenu Communication via IEC 61850

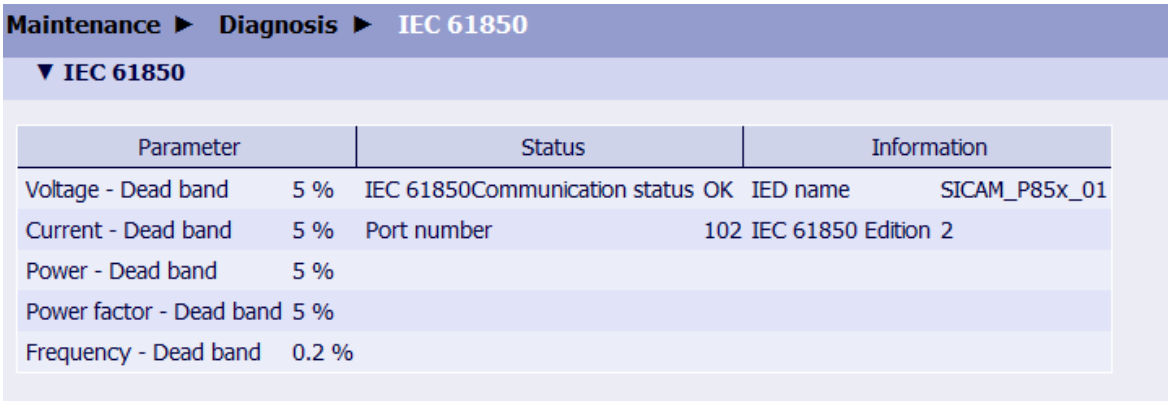
2.6.3.4 Diagnosis of IEC 61850

NOTE

The diagnosis of IEC 61850 is only available and displayed if the IEC 61850 protocol has been selected as the **bus protocol** in **Configuration** > **Basic configuration** > **Communication Ethernet**.

For the diagnosis of the IEC 61850 protocol in the **Maintenance** tab, proceed as follows:

- In the navigation window, click **IEC 61850 protocol**.



[sc_diagnosis_IEC 61850, 1, en_US]

Figure 2-34 Maintenance Tab, Diagnosis IEC 61850

Parameter

With IEC 61850, the following parameters are displayed:

- Voltage – Dead band: 5 % by default
- Current – Dead band: 5 % by default
- Power – Dead band: 5 % by default
- Power factor – Dead band: 5 % by default
- Frequency – Dead band: 0.2 % by default
- Angle – Dead band: 0.5 % by default

Status

With IEC 61850, the following status is displayed:

- IEC 61850 Communication status: OK or Fail
- Port number: Set port number, for example 102

Information

With IEC 61850, the following information is displayed:

- IED Name: SICAM
- IEC 61850 Edition: 2

2.6.4 Ethernet Security

2.6.4.1 Function Description

HTTPS

The secure HTTPS protocol is used for access to Internet sites of the device. Internally, the device uses the open source library Mbed TLS for the encrypted communication.

For certificate handling in your browser, follow the instructions from the Application Note. You can find this Application Note on the Internet site *http://www.siemens.com/gridsecurity* under **Downloads > Downloads Cyber Security General > Application Notes**.

SNMPv3

You can find a detailed description of functions and conditions for SNMPv3 in chapter *2.6.4.2 Simple Network Management Protocol v3 (SNMPv3)*.

2.6.4.2 Simple Network Management Protocol v3 (SNMPv3)

The SNMPv3 security mechanism in the device is also responsible for the RFC3414 (Request for Comments: User-based Security Model (USM)).
The following functions and conditions are supported by SNMPv3:

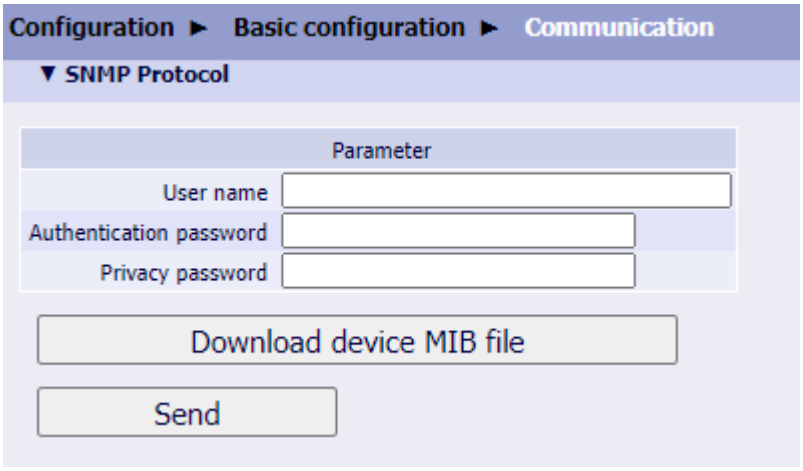
- Only 1 user is possible, adding or removing of extra users is not possible
- User name is set via parameterization
- User name and passwords must be entered before the first access
  Default settings for user name and passwords are empty.
- 2 passwords are necessary (can be configured via parameterization)
  - Authentication password
  - Privacy password
- The valid character range for user name and passwords is limited to:
  - Numbers (0-9)
  - Latin characters (A-Z, a-z)
  - Basic special characters in the ASCII-character code range (33 to 126)
- Maximum length of a user name is 32 characters.
- Maximum length of a SNMPv3 password is 24 characters.
  Passwords must be at least 8 characters long.
- Authentication with MD5 algorithm, encryption with DES algorithm
- SNMP must be enabled via parameterization.
- Only read access is allowed.
- RFC1213 MIB and the device-specific MIB are supported.

2.6.4.3 Configuration via Web Pages

Parameterization of SNMP Protocol

Precondition: The SNMP protocol must be enabled.
To change the SNMPv3 settings in the **Configuration** tab, proceed as follows:

- In the navigation window, click **SNMP protocol**.



[sc_q100_snmp, 3, en_US]

Figure 2-35 Configuration Tab, SNMPv3 Settings

- Configure the respective parameters according to the following table.

Table 2-22 Settings for SNMPv3

Settings	Default Setting	Setting Range
User name (User name for SNMPv3 access)	Empty, for example: not set	Up to 32 characters • Numbers 0 to 9 • Small and capital Latin letters • Basic special characters
Authentication password		8 to 24 characters • Numbers 0 to 9 • Small and capital Latin letters • Basic special characters
Privacy password		

- Click **Send**. The changed passwords are immediately valid.

In order to change the password, you have to be aware of the following:

- Changes of SNMPv3 settings are only possible via the Web browser, not via the device display.
- With the default values (all are empty), access via SNMPv3 is not possible. The parameters above must be set before accessing data via SNMP.
- Only one, multiple or all passwords can be changed at once. If a password should not be changed then the associated text box must remain empty.

  All 3 parameters must have correct values in order to enable access via SNMPv3. If not both of the passwords have been entered the access via SNMPv3 is not possible.
- If an empty user name is set the access via SNMPv3 is not possible furthermore. Passwords then also are set to their defaults (empty).
- If during user name or password change on the HTML page a password input remains empty and a valid SNMP configuration is already activated, the currently set password is not changed.

Download Device MIB File

NOTE

The SNMP protocol is implemented in SICAM P850/P855 in order to be able to retrieve manufacturer-specific information. To retrieve information via SNMP, a MIB browser and the SICAM P.mib file are required. The MIB browser allows the displaying of SNMP information objects and their content.

- Click **Download device MIB file**.
- Click **Save**.
  The **Save As** dialog opens and you can save the SICAM P.mib file in any folder and use it in an MIB browser.

2.7 Serial Communication

2.7.1 Modbus RTU Slave

2.7.1.1 Function Description

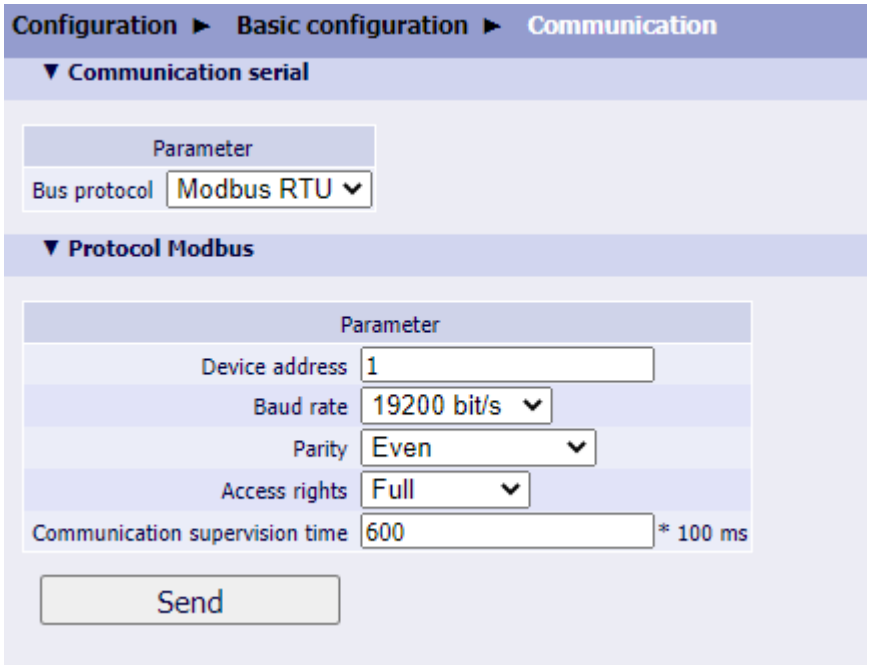
The serial communication using Modbus RTU (slave) with the device is executed via the RS485 interface.

2.7.1.2 Configuration via Web Pages

Configuration of the Serial Communication with Modbus RTU (Slave) via RS485 Interface

Precondition: The **Modbus RTU** protocol must have been activated for the RS485 interface.
To change the Modbus RTU (slave) settings in the **Configuration** tab, proceed as follows:

- In the navigation window, click **Communication serial** and select **Modbus RTU** as the **Bus protocol**.



[sc_config_Modbus_RTU, 1, en_US]

Figure 2-36 Configuration Tab, Modbus RTU (Slave)

- Configure the respective parameters according to the following table.

Table 2-23 Settings for Communication Serial, Modbus RTU (Slave)

Parameter	Default Setting	Setting Range
Bus protocol	Modbus RTU	None **Modbus RTU** *(slave)* IEC 60870-5-103
Device address	1	1 to 247
Baud rate	19 200 bit/s	1200 bit/s, 2400 bit/s, 4800 bit/s, 9600 bit/s, 19 200 bit/s, 38 400 bit/s, 57 600 bit/s, 115 200 bit/s

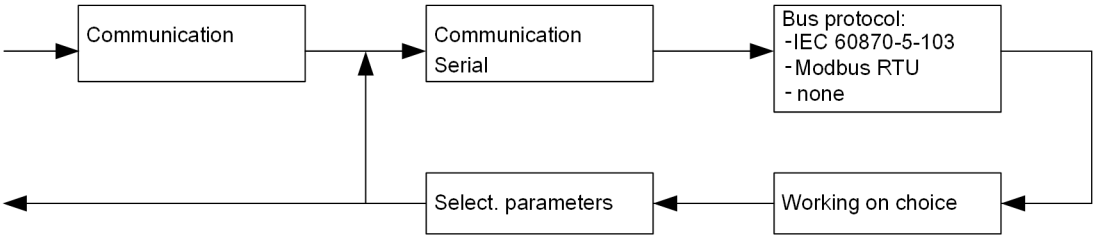
Parameter	Default Setting	Setting Range
Parity	Even	None, 1 stop bit Even Odd None, 2 spot bit
Access rights	Full	Full Read only
Communication supervision time	600 * 100 ms	0 s = none 100 ms to 6 553 400 ms

- After the parameterization, click **Send**.
- In the navigation window, click **Activation and cancel**.
- Enter the activation password (refer to *Table 2-3*).
- Click **Activation**.

2.7.1.3 Configuration via Display

Submenu Modbus RTU (Slave) Settings

The operation is carried out with the softkeys F1 to F4.



[dw_submenu_serial_communication_p85x, 1, en_US]

Figure 2-37 Submenu Communication via Modbus RTU Slave

Table 2-24 Settings for Communication Serial, Modbus RTU (Slave)

Parameter	Default Setting	Setting Range
Bus protocol	Modbus RTU	None **Modbus RTU** *(slave)* IEC 60870-5-103
Device address	1	1 to 247
Baud rate	19 200 bit/s	1200 bit/s, 2400 bit/s, 4800 bit/s, 9600 bit/s, 19 200 bit/s, 38 400 bit/s, 57 600 bit/s, 115 200 bit/s
Parity	Even	None, 1 stop bit Even Odd None, 2 spot bit
Access rights	Full	Full Read only
Communication supervision time	600 * 100 ms	0 s = none 100 ms to 6 553 400 ms

2.7.1.4 Diagnosis of the Modbus RTU Slave

NOTE

The diagnostic data of Modbus RTU (slave) is displayed only if **Modbus RTU** has been selected as a bus protocol in **Configuration** > **Basic configuration** > **Communication serial**.

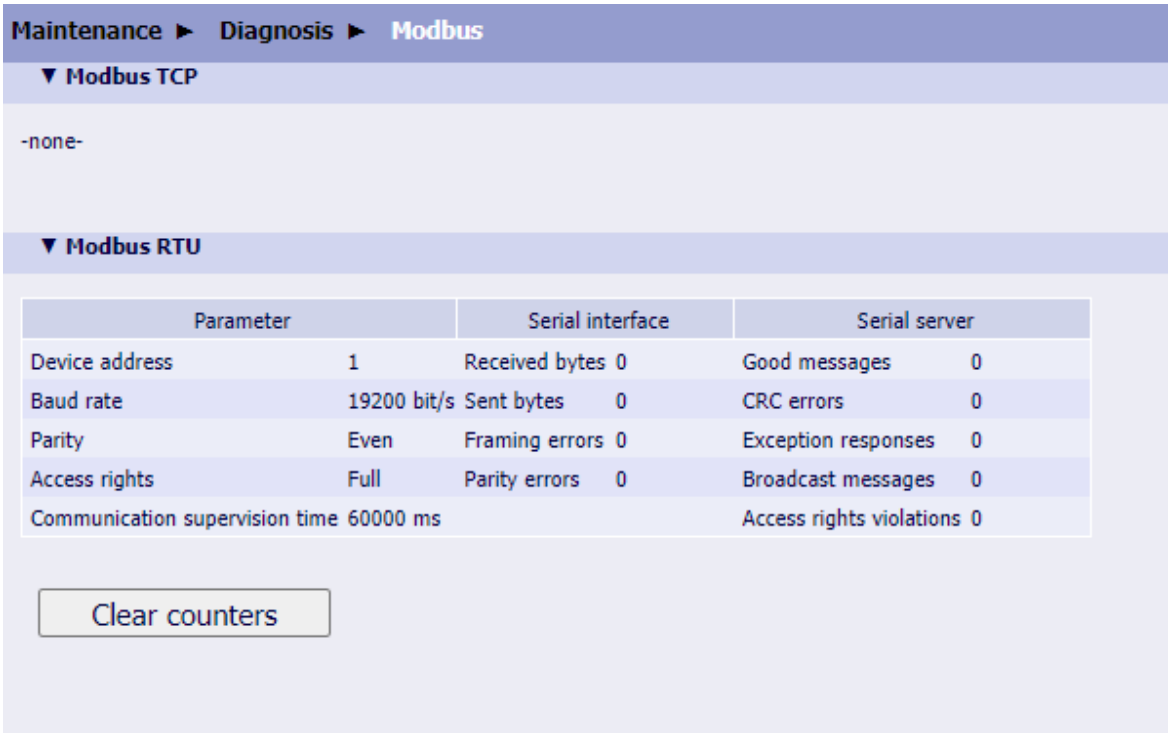
If the Modbus RTU (slave) has not been selected, the menu option for selecting the Modbus RTU diagnostic data is not available.

To view the diagnosis of the protocol Modbus RTU (slave) in the **Maintenance** tab, proceed as follows:

- In the navigation window, click **Modbus**.

The diagnosis of **Modbus RTU** (slave) provides the following information:

- Serial interface
- Serial server



[sc_diagnosis_Modbus_RTU, 1, en_US]

- To clear the counters for Modbus RTU (slave), click **Clear counters**.
  All counters for Modbus RTU (slave) are reset to 0.

Serial Interface

Table 2-25 Description of the Parameters in the Serial Interface

Parameter	Description
Received bytes	Total number of bytes received by the RS485 interface
Sent bytes	Total number of bytes sent to the RS485 interface
Framing errors	Number of detected frame errors (invalid stop bit, for example if the baud rate is wrong)
Parity errors	Number of detected parity errors (wrong parity)

Serial Server

Table 2-26 Description of the Parameters in the Serial Server

Parameter	Description
Good messages	Total number of messages received that were detected as valid Modbus messages
CRC errors	Total number of messages received in which CRC errors were detected
Exception responses	Counters of the transmitted exception response messages
Broadcast messages	Total number of the broadcast messages received with the server address 0
Access rights violations	Total number of write accesses received if the parameter **Access rights** is set to **Read only** in the Communication serial window.

2.7.2 Bus Protocol IEC 60870-5-103

2.7.2.1 Function Description

The serial communication using the IEC 60870-5-103 protocol is executed via the RS485 interface.

2.7.2.2 Configuration via Web Pages

Configuration of the Serial Communication with IEC 60870-5-103 via RS485 Interface

To change the IEC 60870-5-103 settings in the **Configuration** tab, proceed as follows:

- In the navigation window, click **Communication serial** and select **IEC 60870-5-103** as the **Bus protocol**.
- Configure the respective parameters according to the following table.

Settings for Communication Serial, IEC 60870-5-103

Parameter	Default Setting	Setting Range
Bus protocol	Modbus RTU	None Modbus RTU **IEC 60870-5-103**
Device address	1	1 to 254
Baud rate	9600 bit/s	9600 bit/s 19 200 bit/s 38 400 bit/s
Measured value range	120 % equivalent to a measured value range from -4096 to +4095 (-120 % to +120 %)	120 % 240 % equivalent to a measured value range from -4096 to +4095 (-120 % to +120 % or -240 % to +240 %)
Transmit energy	No	Yes (every minute) No
Transmission of the 1st to 40th harmonics HV and HI	No	No Yes
Cyclic sending period	50 * 100 ms	30 * 100 ms to 600 * 100 ms
Communication supervision time	600 * 100 ms	0 s = none 100 ms to 6 553 400 ms

NOTE

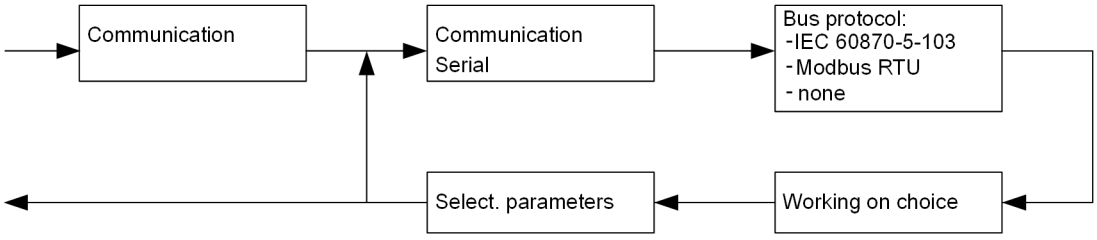
For the serial communication with IEC 60870-5-103, the parity is permanently set to **even**.

- After the parameterization, click **Send**.
- In the navigation window, click **Activation and cancel**.
- Enter the activation password (refer to *Table 2-3*).
- Click **Activation**.

2.7.2.3 Configuration via Display

Submenu IEC 60870-5-103 Settings

The operation is carried out with the softkeys F1 to F4.



[dw_submenu_serial_communication_p85x, 1, en_US]

Figure 2-38 Submenu Communication via IEC 60870-5-103

Settings for Communication Serial, IEC 60870-5-103

Parameter	Default Setting	Setting Range
Bus protocol	Modbus RTU	None Modbus RTU **IEC 60870-5-103**
Device address	1	1 to 254
Baud rate	9600 bit/s	9600 bit/s 19 200 bit/s 38 400 bit/s
Measured value range	120 % equivalent to a measured value range from -4096 to +4095 (-120 % to +120 %)	120 % 240 % equivalent to a measured value range from -4096 to +4095 (-120 % to +120 % or -240 % to +240 %)
Transmit energy	No	Yes (every minute) No
Transmission of the 1st to 40th harmonics HV and HI	No	No Yes
Cyclic sending period	50 * 100 ms	30 * 100 ms to 600 * 100 ms
Communication supervision time	600 * 100 ms	0 s = none 100 ms to 6 553 400 ms

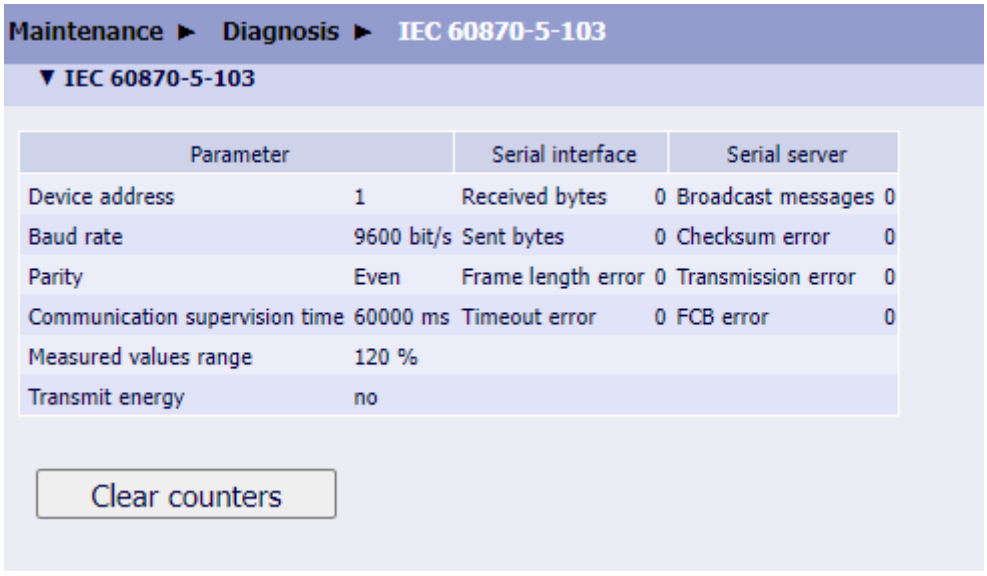
2.7.2.4 Diagnosis of the IEC 60870-5-103

NOTE

The diagnostic data of IEC 60870-5-103 is only displayed if **IEC 60870-5-103** has been selected as a bus protocol in **Configuration** > **Basic configuration** > **Communication serial**. If the IEC 60870-5-103 protocol has not been selected, the menu option for selecting the IEC 60870-5-103 diagnostic data is not available.

To view the diagnosis of the protocol IEC 60870-5-103 in the **Maintenance** tab, proceed as follows:

- In the navigation window, click **IEC 60870-5-103**.
  The diagnosis of **IEC 60870-5-103** provides the following information:
  - Serial interface
  - Serial server



[sc_diagnosis_IEC 60870-5-103, 1, en_US]

Figure 2-39 Maintenance Tab, Diagnosis IEC 60870-5-103 Input/Output Window

- To clear the counters for IEC 60870-5-103, click **Clear counters**.
  All counters for IEC 60870-5-103 are reset to 0.

2.8 Message Logs

2.8.1 Function Description

Operational Log

The **Operational log** is shown in the **Information** tab (see chapter *9.11.2.8 Starting the Web Page during Operation*) and in the **Maintenance** tab. It can be deleted in the **Maintenance** tab (see chapter *2.8.2 Viewing and Clearing of Message Logs*).

NOTE

The last 128 operational indications are displayed, older indications are automatically deleted.

Error Log

The **Error log** is located in the **Maintenance** tab. The Error log entries can also be deleted here.

NOTE

The last 128 error messages are displayed, older messages are automatically deleted.

Error messages are service information that you provide upon request to the service department in case of an error.

2.8.2 Viewing and Clearing of Message Logs

Viewing and Clearing of Operational Logs

To clear the operational logs in the **Maintenance** tab, proceed as follows:

- In the navigation window, click **Operational log**.

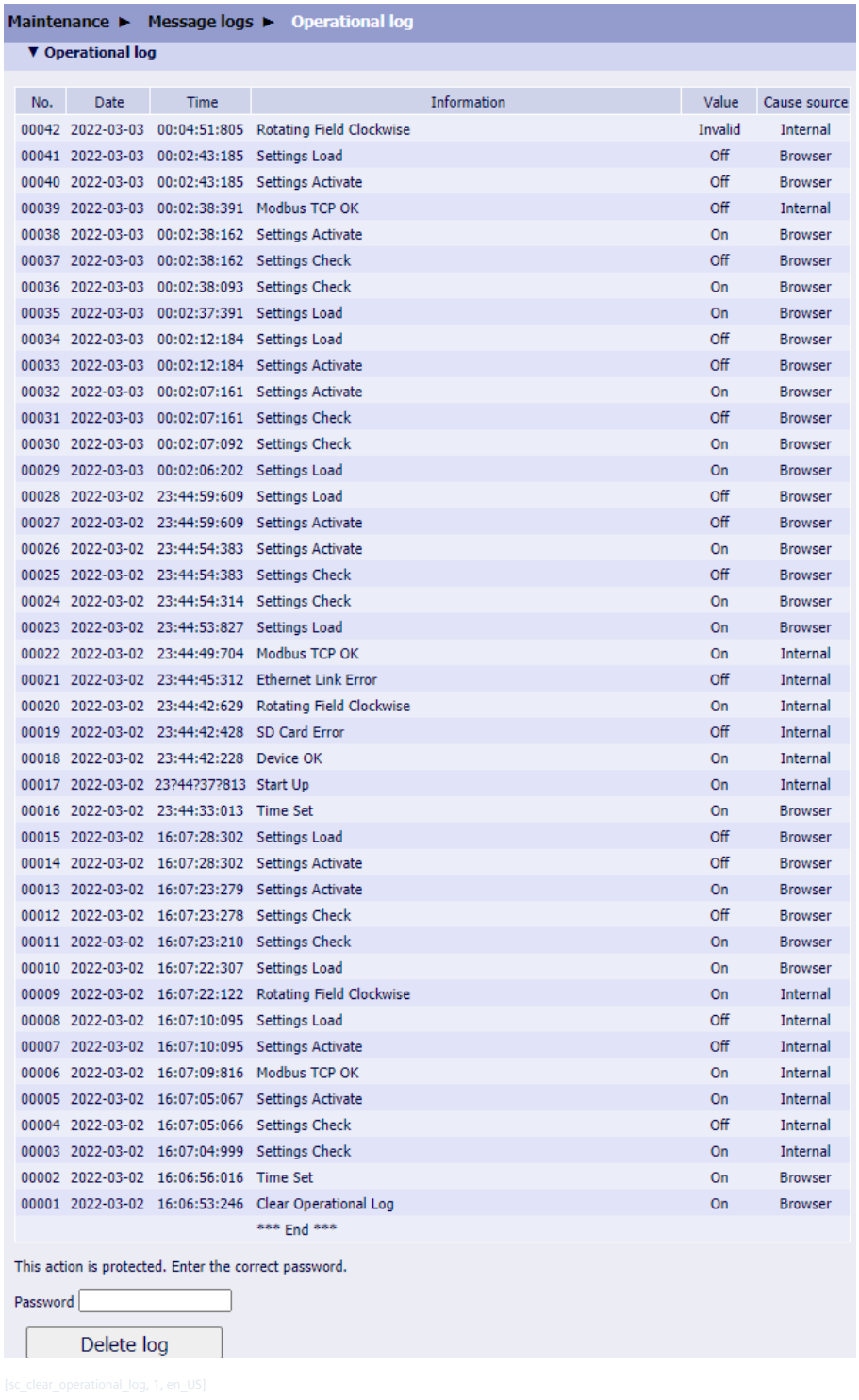


Figure 2-40 Maintenance Tab, Clear Operational Log

- Enter the maintenance password (refer to *Table 2-4*).

- Click **Delete log**.
  All operational indications are deleted without backup. The indication no. 00001 appears in the log list: **Clear Operational Log**.

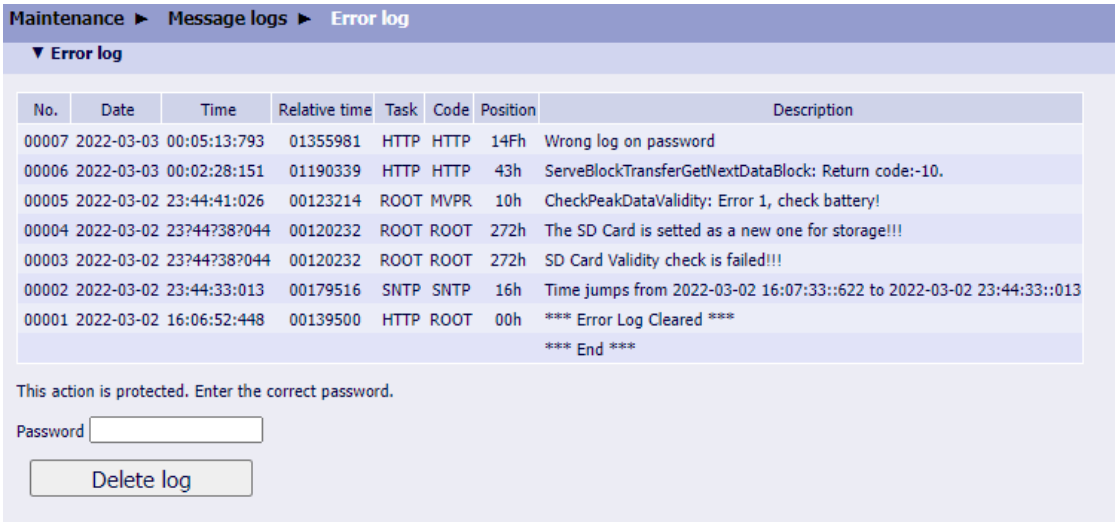
NOTE

If you need the operational indications, for example for subsequent analysis, save or print them out.

Viewing and Clearing of Error Logs

To clear the error logs in the **Maintenance** tab, proceed as follows:

- In the navigation window, click **Error log**.



[sc_clear_error_log, 1, en_US]

Figure 2-41 Maintenance Tab, Clear Error Log

- Enter the maintenance password (refer to *Table 2-4*).
- Click **Delete log**.
  All error logs are deleted without backup. The indication no. 00001 appears in the log list: ***Error Log Cleared***.

The following error messages are listed:

- Serial **No.**
- **Date** of registration
- **Time** of registration
- **Relative time** (referring to the start of operation, output in milliseconds)
- **Task**, **Code** and **Location** are service information for the manufacturer
- **Description** of the error

NOTE

If you need the error messages, for example for subsequent analysis, save or print them out.

3 Process Connections

3.1 General

Before taking measurements, make sure to configure the settings in the **Configuration** tab according to the topology of your device. Select the favored process connections in the navigation window of the **Configuration** tab to see and change the set parameters.

The submenus contain the following connections:

- Binary outputs
- LEDs

3.2 Binary Outputs

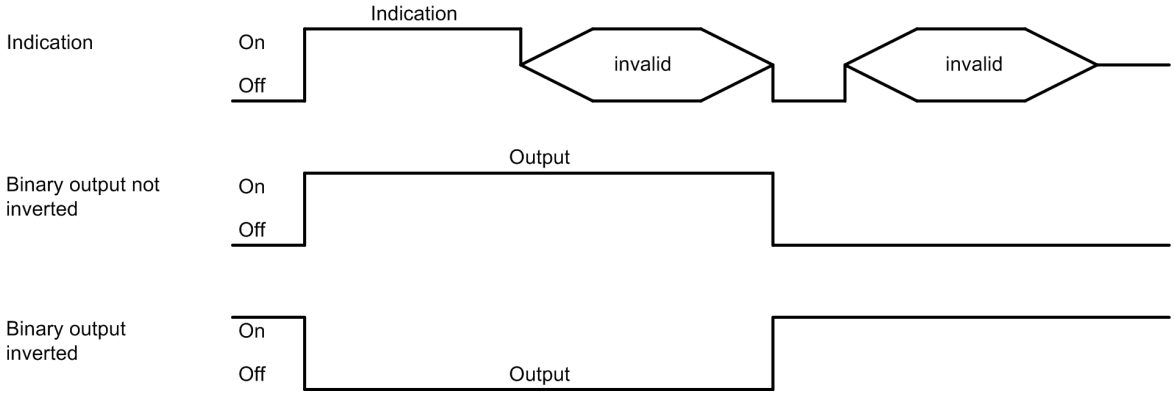
3.2.1 Function Description

The device has 2 binary outputs.
Binary outputs are issued as indications.
4 **Operating modes** are possible:

- Persistent
- Persistent with fail safe
- Pulse
- Pulse with retrigger

Persistent

The binary output has the status ON or OFF. If the indication becomes invalid, the binary output continues to maintain its current status.

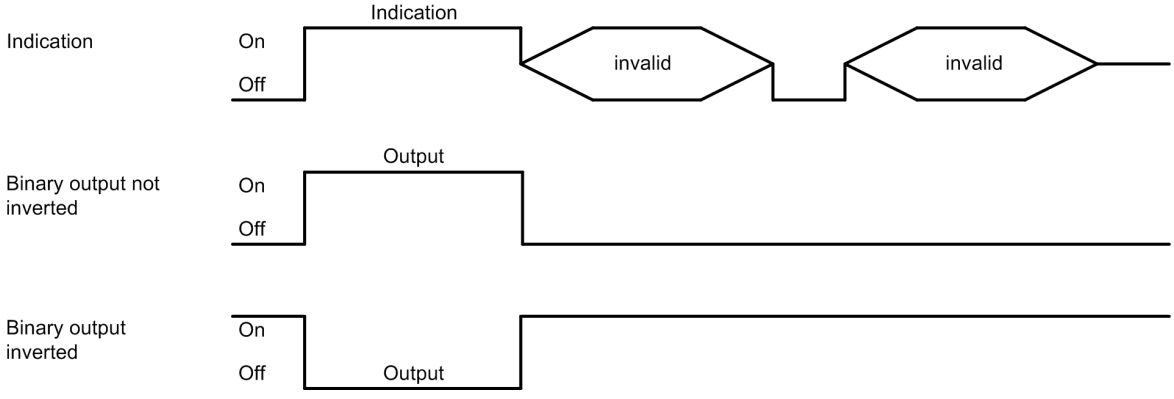


[dw_persistent, 1, en_US]

Figure 3-1 Persistent

Persistent with Fail Safe

If the indication becomes invalid, the binary output switches into the OFF state if **Source inverted = no**, or it switches into the ON state if **Source inverted = yes**.

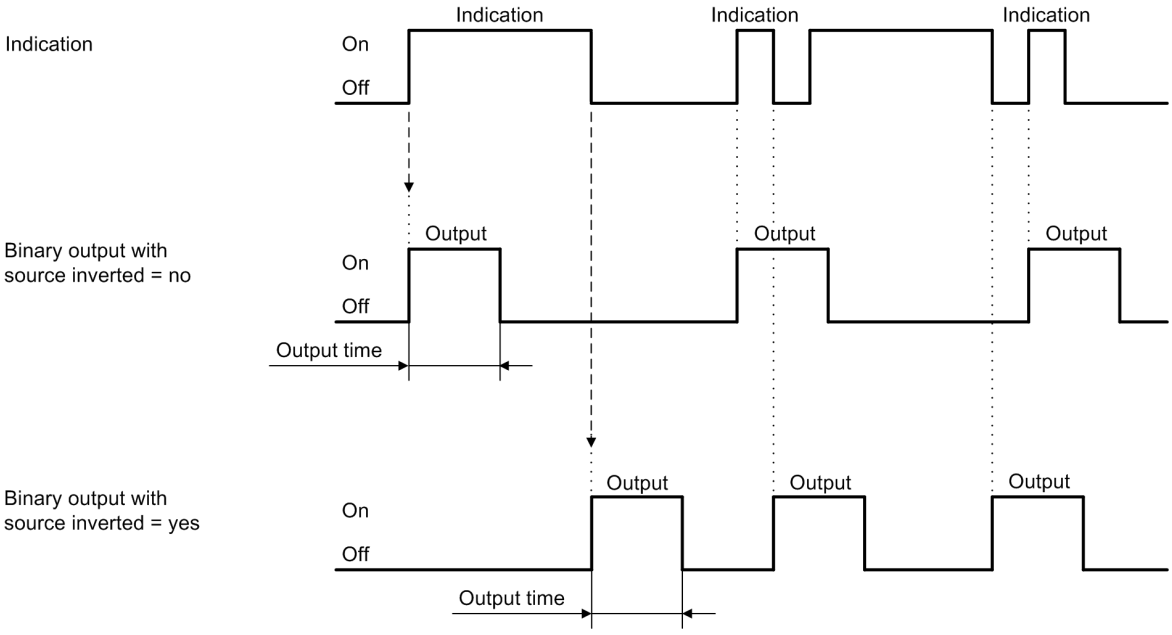


[dw_persistent-with-fail-save, 1, en_US]

Figure 3-2 Persistent with Fail Safe

Pulse

This indication is output as pulse. If the indication changes again while the output pulse is ON, the pulse output time is not restarted. This means that a change of the indication during the pulse output will be ignored.



[dw_pulse-without-retrigger, 1, en_US]

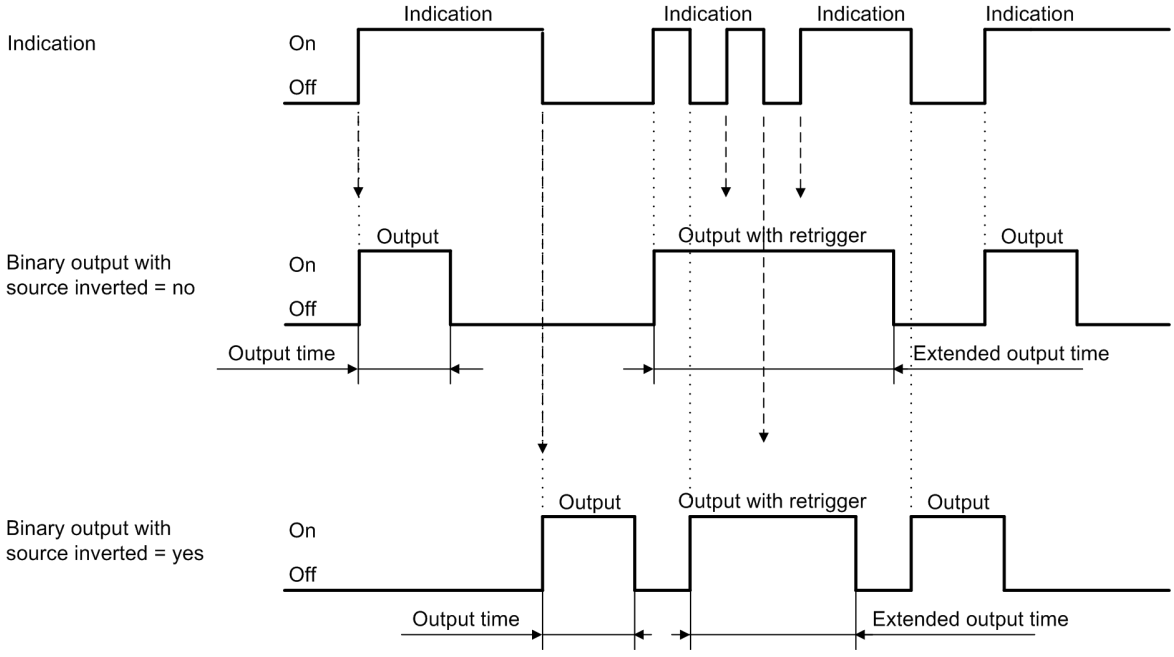
Figure 3-3 Pulse without Retrigger

NOTE

For the indications **Voltage Event Available**, **Voltage Unbalance Event Available**, **Frequency Event Available**, and **Transient Event Available** (refer to *13.1.1 Operational Indications*), if the operating mode is configured as **Persistent**, when an event occurs, the ON state starts and lasts until the start of the next event, and the OFF state is negligible. To automatically trigger the OFF state after configured duration, configure the operating mode as **Pulse**.

Pulse with Retrigger

This indication is output as pulse. The output pulse is retriggered if the indication is changed during the pulse output. This means that the pulse output is extended.



[dw_pulse-with-retrigger, 1, en_US]

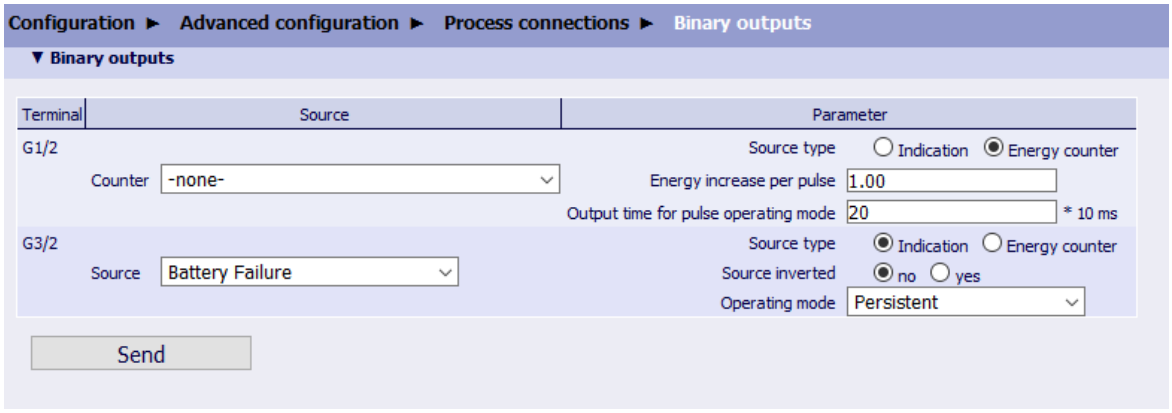
Figure 3-4 Pulse with Retrigger

3.2.2 Configuration and Value View via Web Pages

Configuration of the Binary Outputs

To change the settings of the binary outputs in the **Configuration** tab, proceed as follows:

- In the navigation window, click **Binary outputs**.



[sc_g100_BO_configuration, 2, en_US]

Figure 3-5 Configuration Tab, Binary Outputs

- Configure the respective parameters according to the following table.

Table 3-1 Settings for Binary Outputs

Parameter	Default Setting	Setting Range
Source type	Indication	Indication Energy counter
Source Type Indication		
Indication[6]	-none-	Acc. to list box
Source inverted (can be set individually for all relay outputs)	no	no yes
Operating mode[7] (can be set individually for all relay outputs)	Persistent	Persistent Persistent with fail safe Pulse Pulse with retrigger
Output time for pulse operating mode (setting only possible for operating modes ***Pulse*** and ***Pulse with retrigger***)	20 (* 10 ms)	50 ms to 3 600 000 ms
Source Type Energy Counter		
Energy counter [6]	-none-	Acc. to list box
Energy increase per pulse	1.00 Wh	0.10 Wh/VAh/varh to 1 000 000.00 Wh/VAh/varh
Output time for pulse operating mode	20 * 10 ms = 200 ms	50 ms to 3 600 000 ms

- After the parameterization, click **Send**.
- In the navigation window, click **Activation and cancel**.
- Enter the activation password (refer to *Table 2-3*).
- Click **Activation**.

Behavior when Activating the Set of Parameters after the Set of Parameters was Changed

Persistent: The binary output is set to the new status (ON or OFF) as defined by the current indication.

Pulse: If the binary output is ON in **pulse** mode while activating the parameter set, the binary output is immediately switched to OFF after the parameter set has been activated. This happens even if the parameterized **Output time for pulse operating mode** has not yet elapsed.

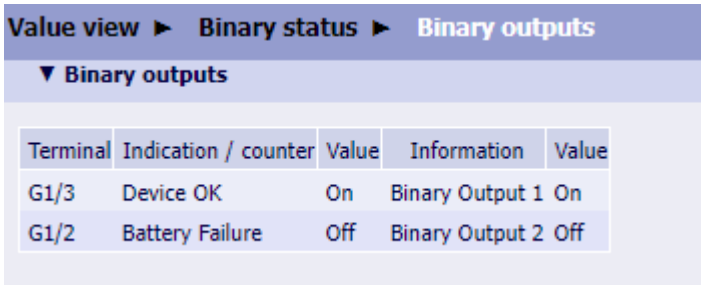
Value View of the Binary Outputs

To display the values of the binary outputs in the **Value view** tab, proceed as follows:

- In the navigation window, click **Binary outputs**.

6 If you select **-none-** as the source of an **indication** or **energy counter**, the corresponding binary output is inactive.

7 If you have selected one of the 2 **Pulse** types in the **Operating mode** list box, enter an output time x (in x *10 ms) in the **Output time for pulse operating mode** field.



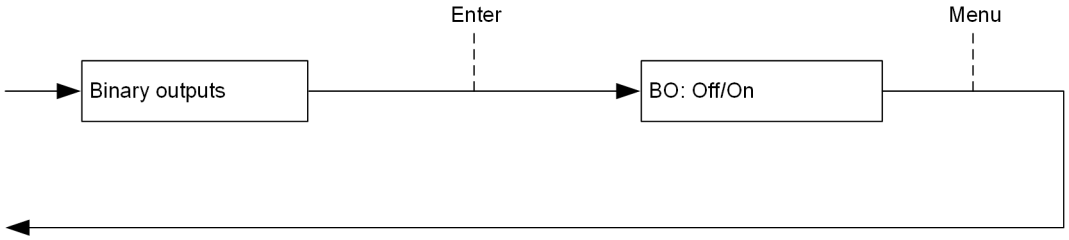
[sc_value_view_BO, 1, en_US]

Figure 3-6 Value View Tab, Binary Status (Binary Outputs)

Depending on the parameterized source type, the indications routed to the binary outputs and energy counters are evaluated.

3.2.3 Value View via Display

Submenu Binary Outputs



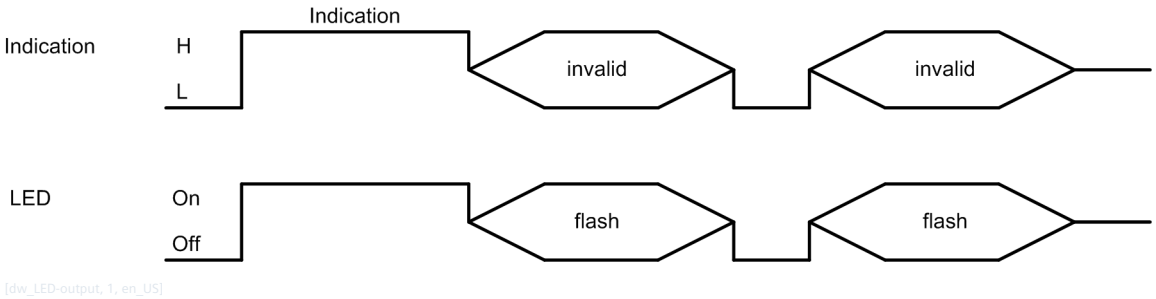
[dw_submenu_binary_outputs, 1, en_US]

Figure 3-7 Submenu Binary Outputs

3.3 LEDs

3.3.1 Function Description

Behavior of the LEDs



[dw_LED-output, 1, en_US]

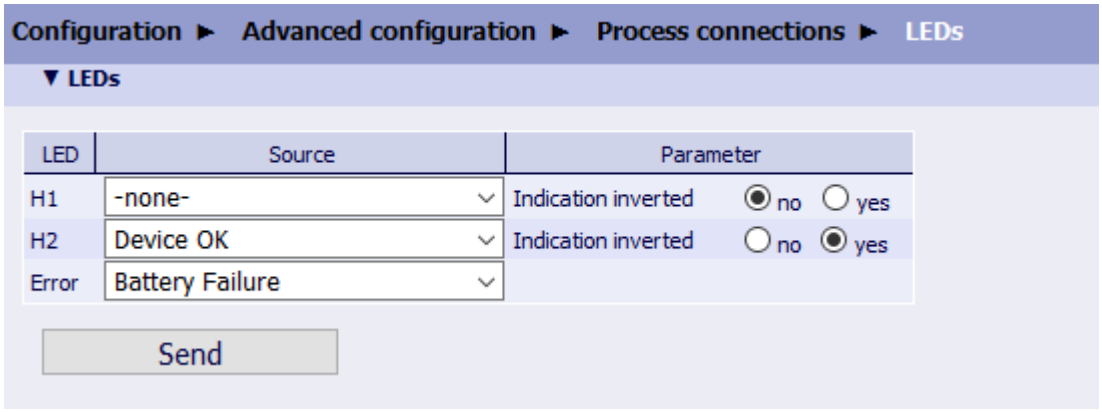
Figure 3-8 Behavior of the LEDs

3.3.2 Configuration via Web Pages

Configuration of the LEDs

To change the LED settings in the **Configuration** tab, proceed as follows:

- In the navigation window, click **LEDs**.



[sc_q100_LED_config, 2, en_US]

Figure 3-9 Configuration Tab, LEDs

- Configure the respective parameters according to the following table.

Table 3-2 Settings for LEDs

Parameter	Default Setting	Setting Range
RUN	Device ready	Not settable
ERROR	-none-	Errors are signaled as parameterized (only error indications can be parameterized). -none- Battery failure Ethernet link error Time synchronization error Primary NTP server error Secondary NTP server SD card error
H1 H2 Only the indications for the parameterization of the binary outputs are displayed which can be used according to the current device settings.	-none-	Acc. to list box Limit violation and Group Indication Designation can be changed during the parameterization.
Indication inverted	no	no yes

- After the parameterization, click **Send**.
- In the navigation window, click **Activation and cancel**.
- Enter the activation password (refer to *Table 2-3*).
- Click **Activation**.

NOTE

Select Indication **-none-** to disable the corresponding LED.

You can find explanations for the LED indications in chapter *10 Troubleshooting, Repair, and Fallback Mode*.

4 Automation Functions

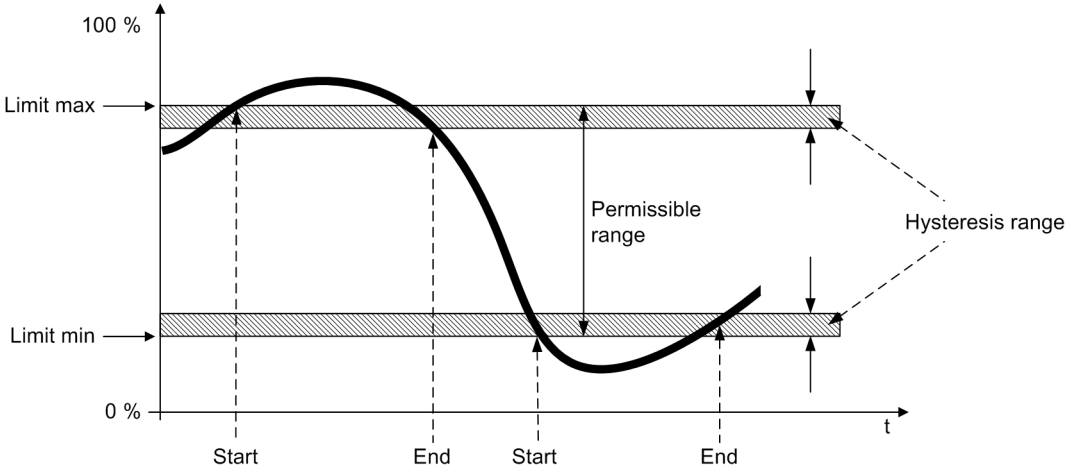
4.1 Limits

4.1.1 Function Description

In the **Select automation functions** menu, you can set upper or lower limits for up to 16 measured values. Limit violations of the upper or lower range of values can be output as indications. Limiting-value violations can be signaled to the device via 2 binary outputs and the LEDs H1 to H2. Furthermore, all 16 limit violations can be sent to peripheral devices via communication interfaces.

The programmable limits are divided into 2 groups: **Limits 1-8** and **Limits 9-16**. The parameterization is identical for all limits.

Hysteresis of the Limiting-Value Violation



[dw_hysteresis, 1, en_US]

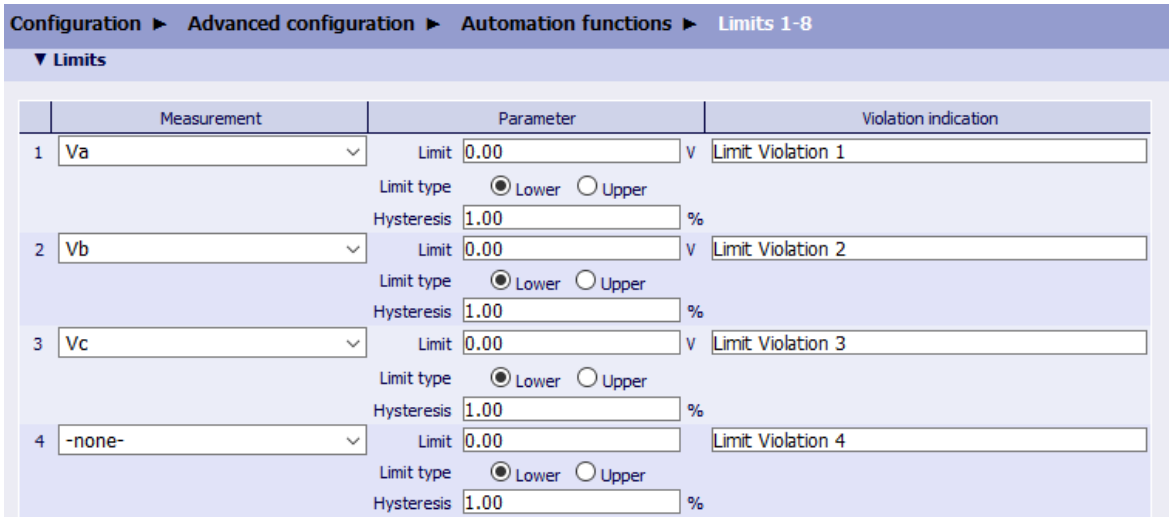
Figure 4-1 Hysteresis (General Representation)

4.1.2 Configuration and Value View via Web Pages

Configuration of the Limits

To change the limit settings in the **Configuration** tab, proceed as follows:

- In the navigation window, click **Limits 1-8** or **Limits 9-16**.



[sc_q100_Limits_configuration, 2, en_US]

Figure 4-2 Configuration Tab, Limits (Example)

- Configure the respective parameters according to the following table.

Table 4-1 Settings for Limits

Parameter	Default Setting	Setting Range
Measurement	-none-	Measured value selection list depending on network type
Limit	0.00[8]	-1 000 000 000.00 to 1 000 000 000.00 (unit)
Limit type	Lower	Lower Upper
Hysteresis (%)	1.00	0.00 to 10.00
Violation indication	Limit Violation x (x = 1 to 16)	The name of the indication is customizable; max. 31 characters.

- After the parameterization, click **Send**.
- In the navigation window, click **Activation and cancel**.
- Enter the activation password (refer to *Table 2-3*).
- Click **Activation**.

NOTE

Select **-none-** for **Measurement** to disable the corresponding limit indication.

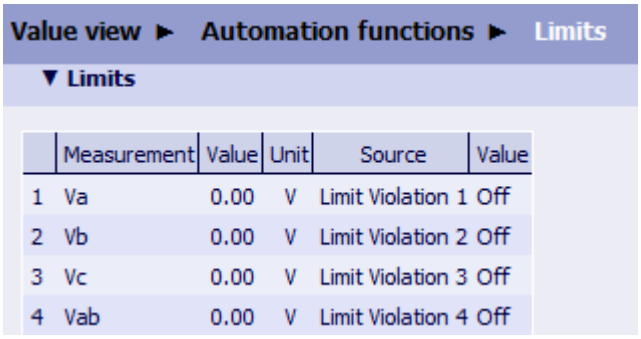
It depends on the configured network type which quantities are offered in the list box of the **Measurement**. The **Network type** is specified in the **Basic configuration** > **AC measurement**.

Value View of the Limits

To display the limits in the **Value view** tab, proceed as follows:

- In the navigation window, click **Limits**.

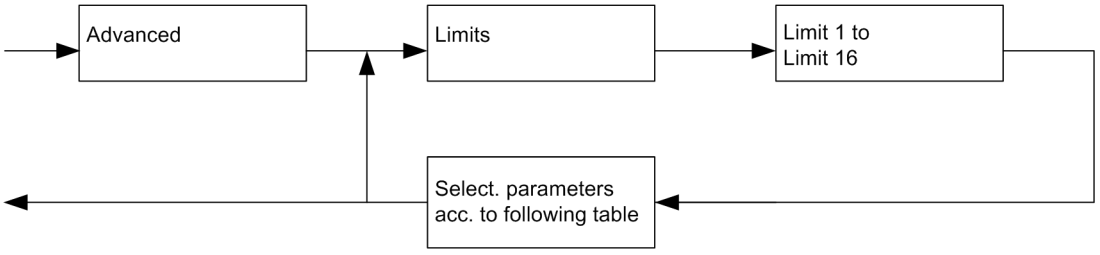
8 The limit value must be the primary value.



[sc_Limits_evaluation, 3, en_US]

Figure 4-3 Value View Tab, Limits

4.1.3 Configuration and Value View via Display



[dw_submenu_limits, 1, en_US]

Figure 4-4 Submenu Limits

Table 4-2 Settings for Advanced

Parameter	Default Setting	Setting Range
Source	-none-	Acc. to the list box
Mode	Lower than	Greater than Lower than
Value	0.00	-1 000 000 000.00 to +1 000 000 000.00 (unit)
Hysteresis	1.0 %	0.0 % to 10.0 %
State	ON	ON OFF (O) Acc. to the current configuration

4.2 Group Indications

4.2.1 Function Description

Up to 4 **Group indications** can be parameterized and each of them can be assigned to up to 4 logically linked single-point indications. The single-point indications can be inverted.

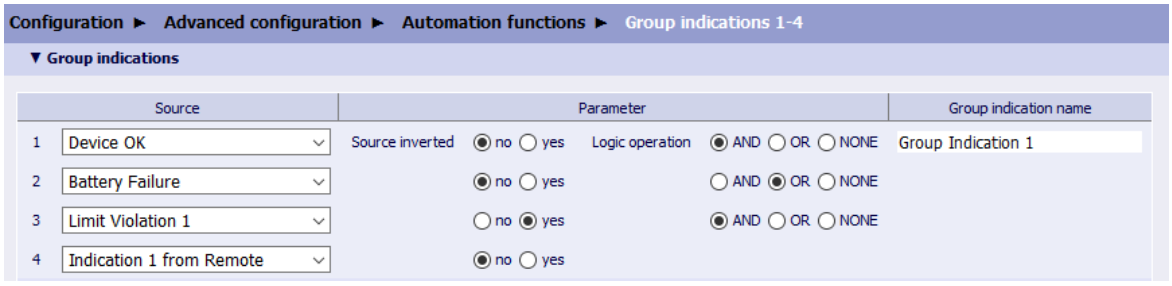
Rule for Linking Indications to a Group Indication

In a group indication, up to 4 indications can sequentially be linked logically. The indications 1 to 4 are always linked successively as follows:

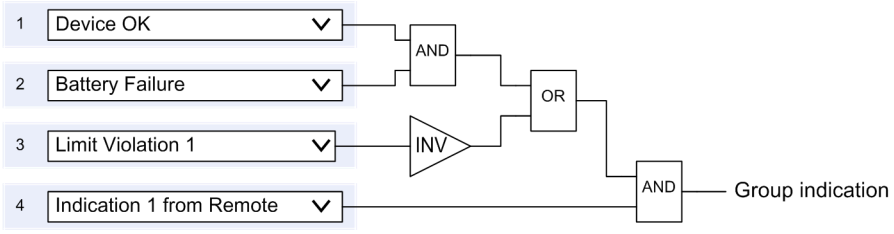
Indication 1 with Indication 2 = Indication 1/2

Indication 1/2 with Indication 3 = Indication 1/2/3

Indication 1/2/3 with Indication 4 = Group indication

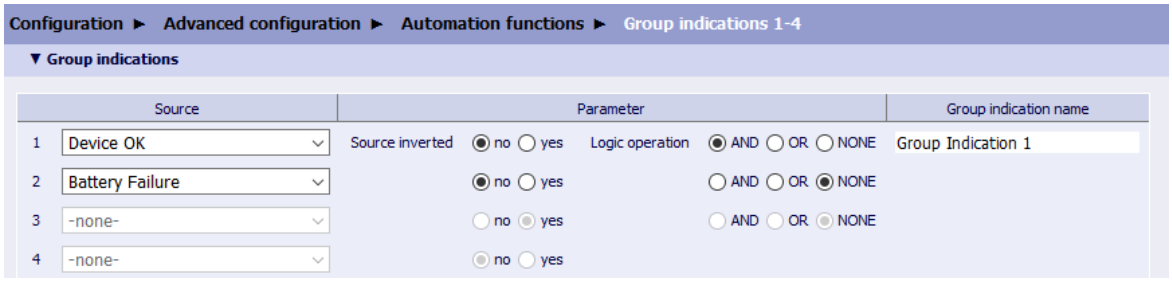


[sc_q200_regular_4x_1, 2, en_US]

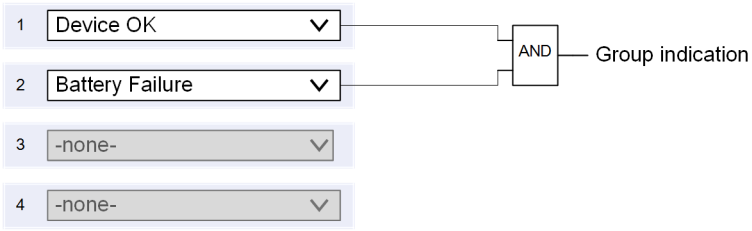


[dw_q200_regular_4x_1, 1, en_US]

Figure 4-5 Example: Linking 4 Indications to a Group Indication



[sc_q200_regular_2x_1, 2, en_US]



[dw_p85x_regular_2x_1, 1, en_US]

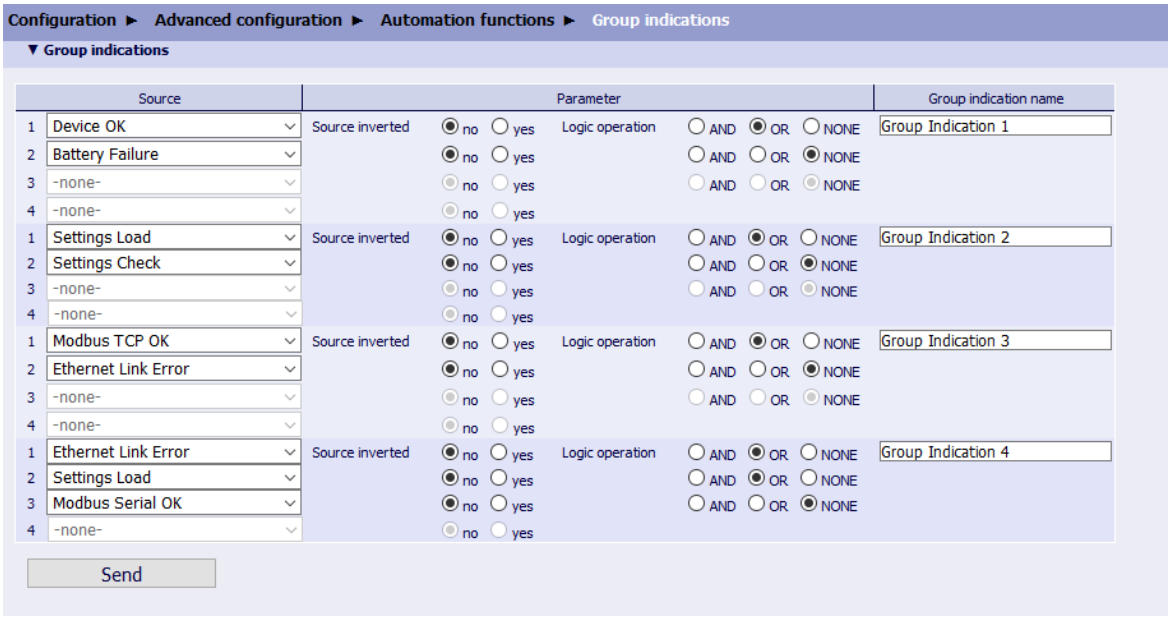
Figure 4-6 Example: Linking 2 Indications to a Group Indication

4.2.2 Configuration and Value View via Web Pages

Configuration of the Group Indications

To change the settings of the group indication in the **Configuration** tab, proceed as follows:

- In the navigation window, click **Group indications 1-4**.



[sc_Group_indication_configuration, 5, en_US]

Figure 4-7 Configuration Tab, Group Indications

- Configure the respective parameters according to the following table.

Table 4-3 Settings for Group Indications

Parameter	Default Setting	Setting Range
Source Only the indications for the parameterization of the binary outputs are displayed which can be used according to the current device settings.	-none-	Acc. to list box Limit violation and group indication: Designation can be changed during the parameterization.
Source inverted	no	no yes

Parameter	Default Setting	Setting Range
Logic operation	NONE	NONE OR AND
Group indication name	Group Indication x (x = 1 to 4)	The name of the indication is customizable; max. 31 characters.

- After the parameterization, click **Send**.
- In the navigation window, click **Activation and cancel**.
- Enter the activation password (refer to *Table 2-3*).
- Click **Activation**.

NOTE

Sources are assigned inside a group indication sequentially from source 1 to source 4.

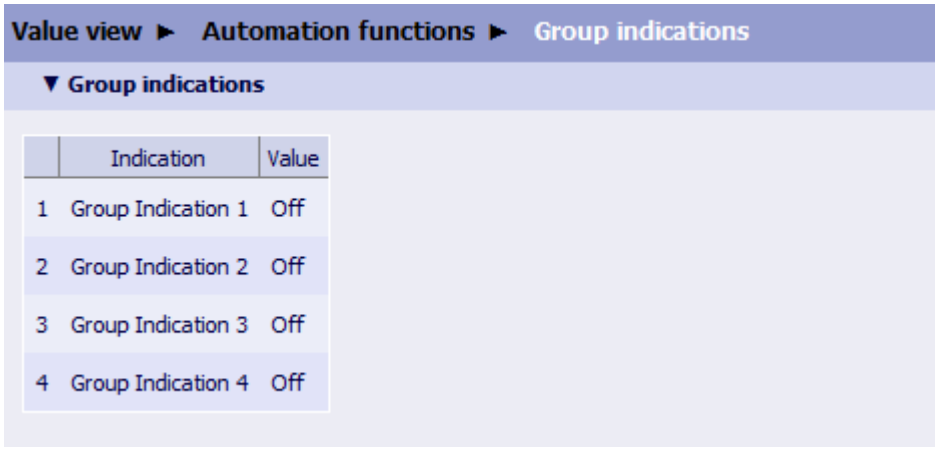
If you select **-none-** at the 1st source in a group indication, you cannot configure further sources in this group indication. In this case, the group indication is inactive.

You can also integrate group indications into subordinated group indications, for example group indication 1 into group indication 3.

Value View of the Group Indications

To display the values of group indications in the **Value view** tab, proceed as follows:

- In the navigation window, click **Group indications**.



[sc_Group_indication_evaluation, 2, en_US]

Figure 4-8 Value View Tab, Group Indications

5 Energy Management

5.1 Load Profile

5.1.1 Function Description

General

The load profile reflects the history of the electric power and documents the distribution of power fluctuations and peaks. The load profile is determined on the basis of 10/12 cycles (50 Hz/60 Hz) and saved as average value at the end of a measuring period in the load-profile image.

The device supports 2 methods for the determination of the average power value:

- **Fixed block**
- **Rolling block**

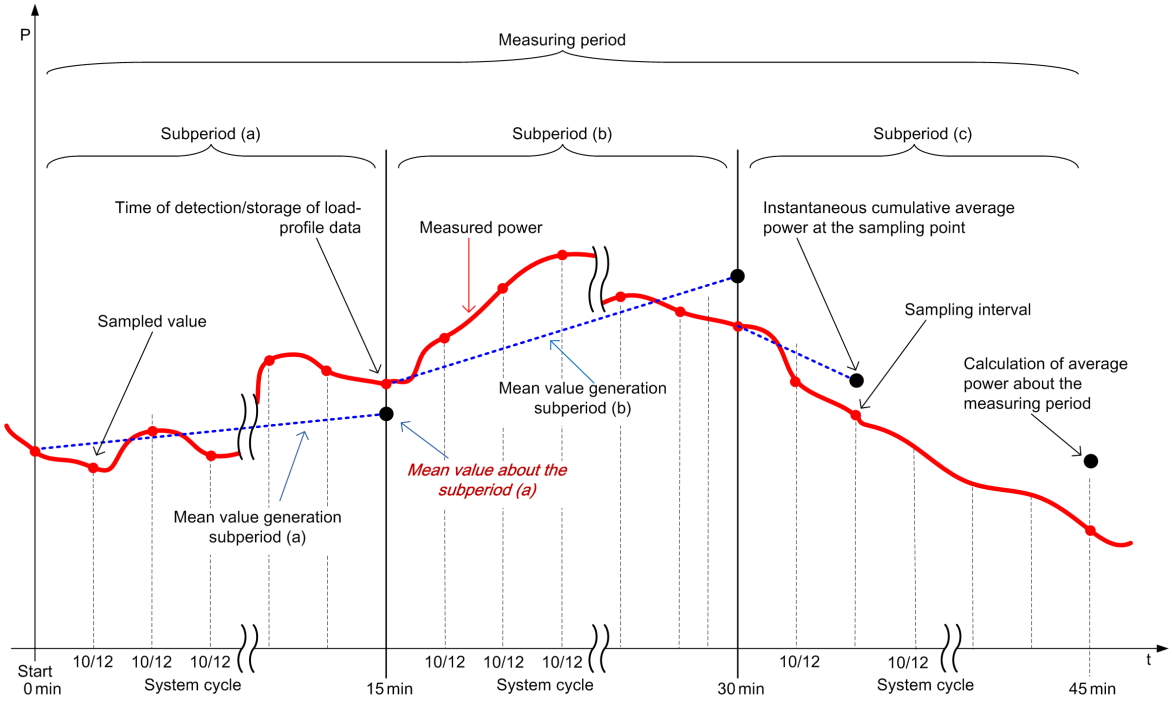
The load profile is stored in the non-volatile ring buffer of the device and provided at the communication interfaces . In addition, it can be output as CSV file.

The load profile can be recorded in synchronized form (time, trigger) or in non-synchronized form. The synchronization is made by external or internal triggers.

The following diagram shows a 45-min measuring period which consists of 3 subperiods of 15 min each (Rolling block).

The measured and calculated load-profile data are stored in the ring buffer at the end of each subperiod. After 3 subperiods, the average power value of the measuring period is calculated from the 3 load-profile data of the subperiods. The values (cumulative values and averages) can be retrieved at any time within a subperiod via the communication. At the end of the 4th subperiod (d) the average power values are calculated from subperiods b, c, and d.

The preset measuring-period length of a subperiod is 15 minutes.



[dw_power-history-15-min, 1, en_US]

Figure 5-1 Power History of a Measuring Period Consisting of Three 15-min Subperiods

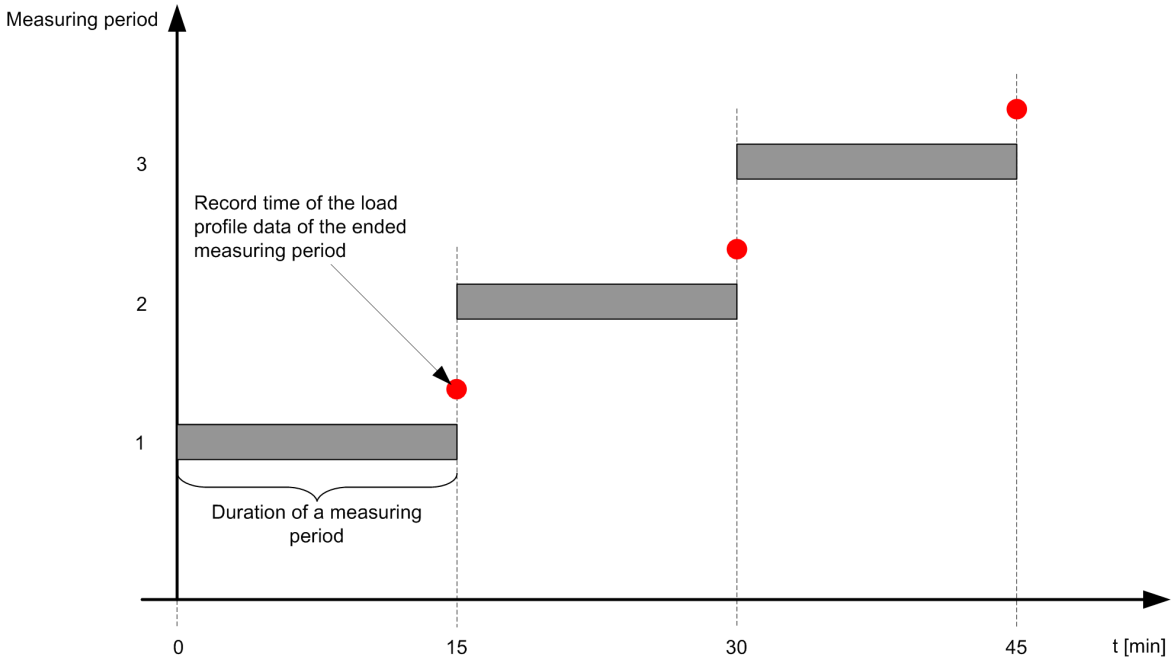
Methods of Load-Profile Determination

The device supports the following load-profile determination methods:

- Fixed block
- Rolling block

Fixed Block

The **Fixed-block** method is characterized by the **number of subperiods** per period that is set to **1**. It means the period length is equal to the length of the subperiod.



[dw_load-profile-fixed-block, 1, en_US]

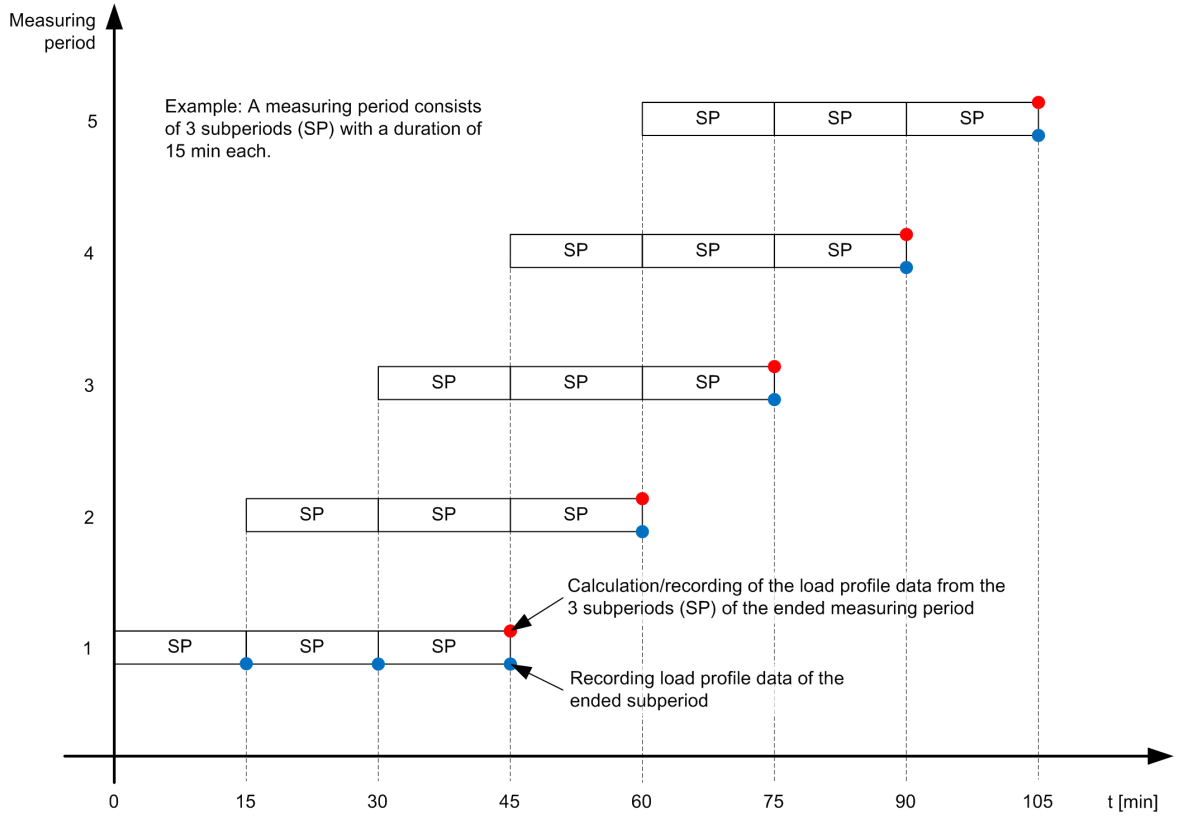
Figure 5-2 Determination of the Load Profile according to the Fixed-Block Method

Rolling Block

A **measuring period** of the **rolling-block** method consists of 2 to 5 **subperiods** depending on the parameterization.

The length of a measuring period is the product of the number of subperiods and the parameterized length of the subperiod. The average power values of the periods are calculated from the total of the average power values of the subperiods and its subperiod times as well as from the total period of time.

The following figure shows the history of the measuring periods during the load-profile determination:



[dw_load-profile-rolling-block, 1, en_US]

Figure 5-3 History of the Measuring Periods for Determination of the Load Profile according to the Rolling-Block Method

Load-Profile Data at the Communication Interface

The following load-profile data are available during a measuring period:

- Average power values for all power quantities during the measuring period, calculated from the average power values at the end of every subperiod (red dots in the figure)
- Average power values for all power quantities during the subperiods (blue dots in the figure)
- Maximum and minimum values for all power quantities within the subperiods
- Cumulated power values for all power quantities at every sampling point within the current subperiod

The arithmetic average power values and the extreme values per subperiod are stored in the ring buffer. The cumulated power values can be retrieved via communication or displayed on the Web pages.

Load-Profile Calculation – Arithmetic average power value:

The calculation of the arithmetic **average power value** of a measuring period refers to the actual duration of the measuring period.

Special case: With constant power consumption or constant power supply, the arithmetic average power value also remains constant in the current measuring period.

Load-Profile Calculation – Cumulated power value:

The **power values** are calculated cumulatively and the calculation refers to the (expected) length of the respective subperiod.

Special case: With constant power consumption or constant power supply, the cumulated power value rises **linearly** in the current measuring period.

Historical Load-Profile Data

The device records the following measurands:

Table 5-1 Historical Load-Profile Data

Measurement	Cumulated Power Values	Arithmetic Average Power Values	Maximum Values	Minimum Values
P_{Import}	x	x	±x	±x
P_{Export}	x	x		
Q_{Import}	x	x	±x	±x
Q_{Export}	x	x		
S	x	x	x	x

Storage of Load-Profile Data

The load-profile data are stored in a ring buffer with up to 4000 datasets. If the ring buffer is full every new dataset overwrites the oldest dataset. Every dataset contains the average power values, minimum/maximum values, a time stamp, and status information for a completed subperiod.

The traceability of the load profile depends on the length of the subperiod:

- Fixed-block method: length of the measuring period = 15 min
- Rolling-block method: length of the subperiod = 15 min

On the condition that all periods correspond to the configured period length, the recording period is longer than 40 days.

Current Load-Profile Data at the Communication Interfaces and on the Web Pages

The load-profile data of the current and last completed periods are output at the communication interfaces.

For information on the data transmission via the communication protocols Modbus TCP, Modbus RTU, and IEC 61850, refer to the Communication manual.

On the Web pages, the load-profile data are displayed in the tab **Value view→ Load profile**.

Types of Synchronization

At the beginning of every subperiod, the device expects a synchronization signal which can either be supplied externally or created internally.

External supply of the synchronization signal:

- Via the communication interfaces

Creation of the internal synchronization signal:

- Creation through the internal clock of the device

Synchronization with External Synchronization Pulses

Synchronization via communication interface

The device checks whether there is a deviation from the set time or whether there are no synchronization pulses. If a set tolerance is exceeded or if the value falls below this tolerance, the measuring period is shortened and marked accordingly.

If the time grid of the incoming pulses is shifted, the device adapts to the changed time grid automatically.

Particularities in the synchronization via communication interface

The synchronization telegram transmitted via Modbus TCP or Modbus RTU contains, among other things, the length of the subperiods in minutes.

If the set length of the subperiods in the device does not correspond to the length in the telegram, the synchronization pulse is ignored. Load-profile data are still recorded though based on the internal clock of the device.

Synchronization via the Internal Clock of the Device

If external synchronization is not possible, for instance, due to no synchronization pulse, the synchronization can be configured with the internal clock of the device. The length of measuring period and subperiod depends only on the internal clock of the device.

The starting time of the subperiod is the previous full hour plus a multiple of the configured length of the subperiod.

Updating the time within the current measuring period or beyond the measuring period causes shortened measuring periods and is given the information **resynchronized** in the time stamp.

Substitute values are not written for any gaps in the history.

Special Conditions and Effects on the Load-Profile at Synchronization

Device Restart

If a functional battery is installed in the device, the existing load-profile records are kept unchanged.

Resetting the Device Clock

Resetting the device clock does not affect the load-profile recording. The historical load profiles with a date in the future do not prevent resetting the device clock.

Failure of the Measuring Voltage:

Failure of the measuring voltage does not affect the load profile.

Failure and Return of the Supply Voltage:

When the supply voltage returns after a temporary failure, the device records shortened measuring periods.

Interpolated values are not determined and written for load-profile data which were not recorded during the period.

Additional Information on the Load-Profile Data

The device determines the following additional information for every period (see Communication manual, Load profile – Management):

- LOADPROFILE_FLAG_QUALITY_SYNC
  The device triggered the period end prematurely due to a synchronization irregularity. As long as the time has not been determined, the flag is set. The time can be undefined if the battery could not buffer the time, for example, due to discharged battery.
- LOADPROFILE_FLAG_QUALITY_AUXPOWER_FAIL
  The device triggered the period end prematurely due to supply-voltage failure.
- LOADPROFILE_FLAG_QUALITY_UNSECURE
  The load-profile data are unsafe. Reasons are:
  - Measuring current or measuring voltage are outside the specified range
  - Type of reactive power was changed

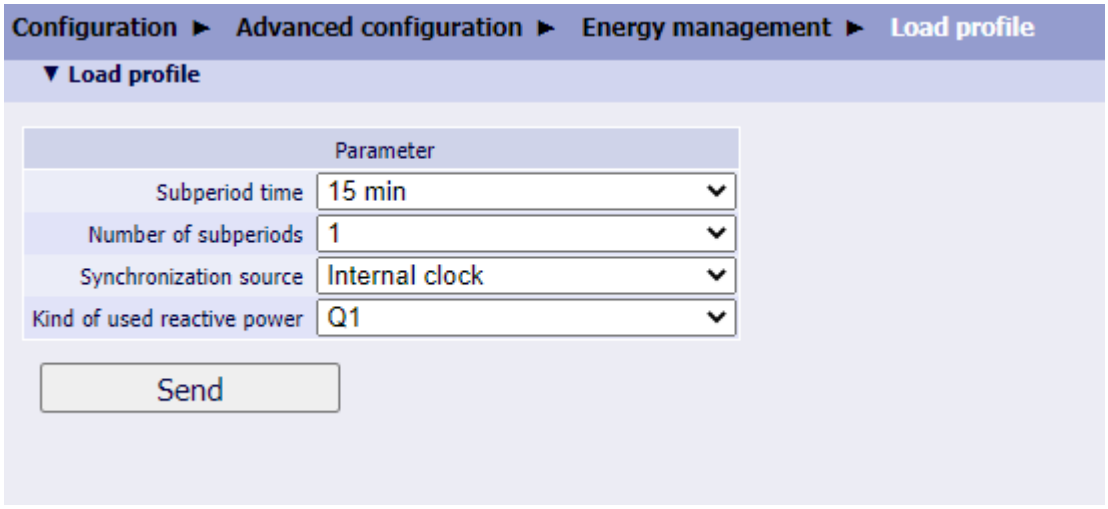
The additional information is stored with the other load-profile data and can be retrieved via the communication interfaces.

5.1.2 Configuration and Value View via Web Pages

Configuration of the Load Profile

To change the settings of the load profile in the **Configuration** tab, proceed as follows:

In the navigation window, click **Load profile**.



[sc_config_load_profile, 1, en_US]

Figure 5-4 Configuration Tab, Load Profile

- Configure the respective parameters according to the following table.

Table 5-2 Settings for Load Profile

Parameter	Default Setting	Setting Range
Subperiod time	15 min	1 min to 6 min in 1-min steps, 10 min, 12 min, 15 min, 20 min, 30 min, 60 min
Number of subperiods[9]	1	1 to 5
Synchronization source	Internal clock	None Protocol Internal clock
Kind of used reactive power	Q1	Q1 Qn Qtot

NOTE

Changing the number and length of the subperiods deletes the load-profile buffer.

- After the parameterization, click **Send**.
- In the navigation window, click **Activation and cancel**.
- Enter the activation password (refer to *Table 2-3*).
- Click **Activation**.

Value View of the Load Profile

To display the values of the load profile in the **Value view** tab, proceed as follows:

- In the navigation window, click **Load profiles**.

9 Number = 1: Fixed Block method: The lengths of the subperiod and of the measuring period are identical; Number = 2 to 5: Rolling Block method; Length of the subperiod: The length of the subperiod is an integer part of a full hour; Length of measuring period: The length of the measuring period cannot be configured directly. It is defined as the product of the length of the subperiod and the number of subperiods: Length of measuring period = n x length of subperiod; n = number of subperiods

[sc_value_view_load_profiles, 2, en_US]

Figure 5-5 Value View Tab, Load Profiles

In the **decimal separator**, you can select whether you want to display the load-profile data with **comma** or **decimal point** after the download.

To download the load profile, proceed as follows:

- Click **Download load profile**.
  The **File Download** dialog opens. You can save the CSV file. For more information, refer to *7.3.3 Single File Download*.

NOTE

The file extension must be .csv.

5.1.3 Configuration via Display

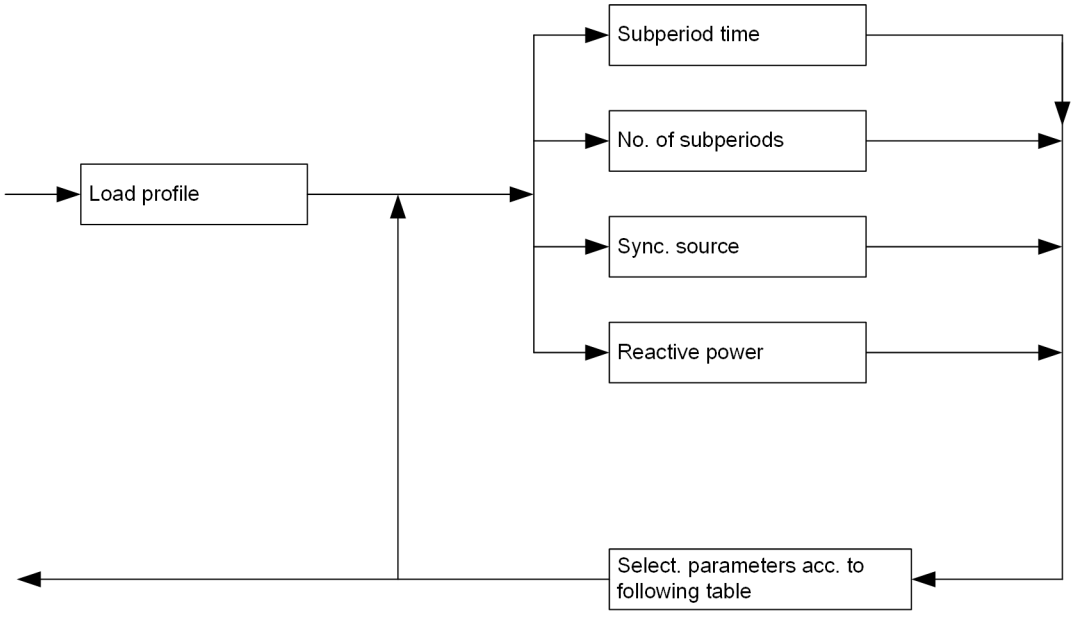
Submenu Load Profile

NOTE

If you select the **Load profile** parameter, the following message is displayed first:

Changing these parameters resets the load profile!

To confirm, press the softkey **F4 (Ok)**.



[dw_submenu_load_profile_Q100, 1, en_US]

Figure 5-6 Submenu Load Profile

Table 5-3 Settings for Load Profile

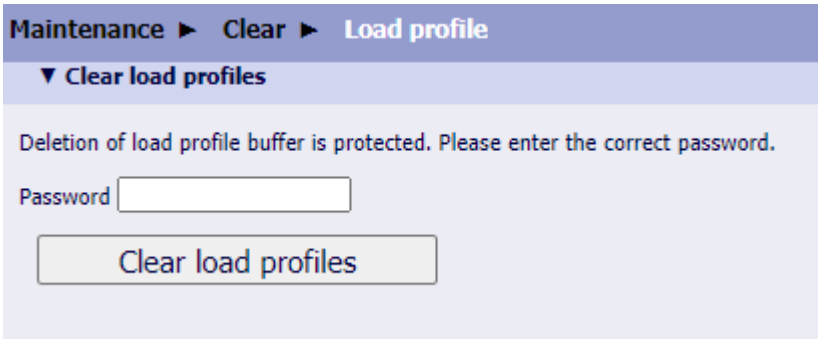
Parameter	Default Setting	Setting Range
Subperiod time	15 min	1 min to 6 min in 1-min steps, 10 min, 12 min, 15 min, 20 min, 30 min, 60 min
Number of subperiods[10]	1	1 to 5
Synchronization source	Internal clock	None Protocol Internal clock
Kind of used reactive power	Q1	Q1 Qn Qtot

5.1.4 Clearing of Load Profiles

To clear the load profiles in the **Maintenance** tab, proceed as follows:

- In the navigation window, click **Load profiles**.

10 Number = 1: Fixed Block method: The lengths of the subperiod and of the measuring period are identical; Number = 2 to 5: Rolling Block method; Length of the subperiod: The length of the subperiod is an integer part of a full hour; Length of measuring period: The length of the measuring period cannot be configured directly. It is defined as the product of the length of the subperiod and the number of subperiods: Length of measuring period = n x length of subperiod; n = number of subperiods



[sc_clear_load_profiles, 1, en_US]

Figure 5-7 Maintenance Tab, Clear Load Profiles

- Enter the maintenance password (refer to *Table 2-4*).
- Click **Clear load profiles**.
  The load profiles are cleared. The **Action was successful** indication is displayed on the status bar.

5.2 Energy Freeze

5.2.1 Function Description

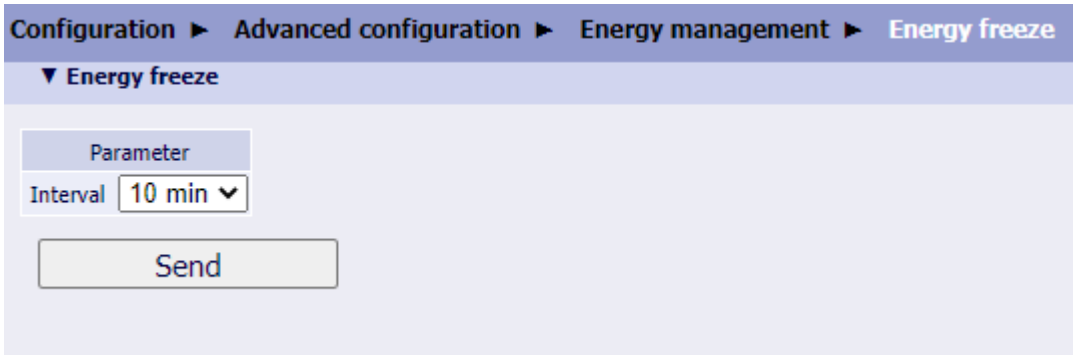
The function of **Energy Freeze** is used to configure the freezing interval for the energy values. After a time interval is configured, the energy values are frozen and not updated during the interval until the next interval starts. The frozen values are transmitted by the report function and the IEC 61850 protocol in the MMTN/MMTR logic node.

5.2.2 Configuration and Value View via Web Pages

Configuration of the Energy Freeze

To change the settings of the energy freeze and reset in the **Configuration** tab, proceed as follows:

- In the navigation window, click **Energy freeze** .



[sc_config_energy_freeze, 1, en_US]

Figure 5-8 Configuration Tab, Energy Freeze

- Configure the respective parameters according to the following table.

Table 5-4 Settings for Energy Freeze

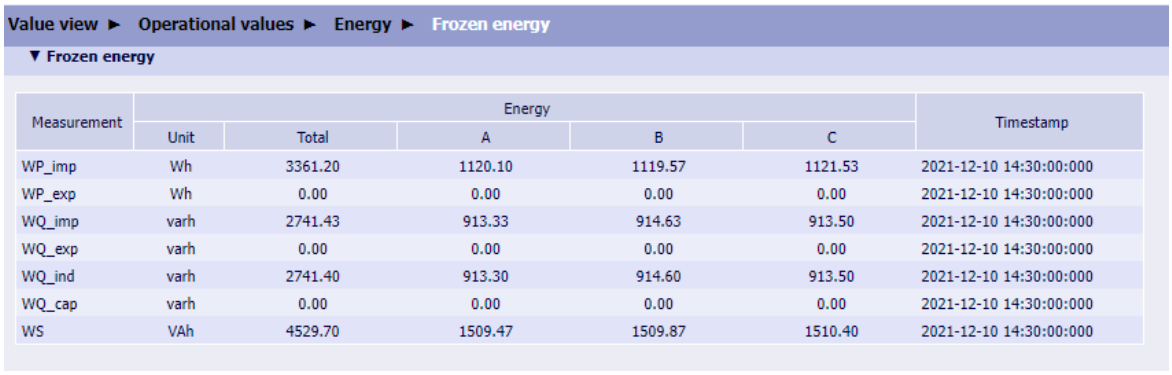
Parameter	Default Setting	Setting Range
Interval	10 min	10 min, 15 min, 30 min, 60 min

- After the parameterization, click **Send**.
- In the navigation window, click **Activation and cancel**.
- Enter the activation password (refer to *Table 2-3*).
- Click **Activation**.

Value View of the Frozen Energy

To display the values of the frozen energy in the **Value view** tab, proceed as follows:

- In the navigation window, click **Frozen energy**.



Value view ► Operational values ► Energy ► Frozen energy

▼ Frozen energy

Measurement	Energy					Timestamp
	Unit	Total	A	B	C	
WP_imp	Wh	3361.20	1120.10	1119.57	1121.53	2021-12-10 14:30:00:000
WP_exp	Wh	0.00	0.00	0.00	0.00	2021-12-10 14:30:00:000
WQ_imp	varh	2741.43	913.33	914.63	913.50	2021-12-10 14:30:00:000
WQ_exp	varh	0.00	0.00	0.00	0.00	2021-12-10 14:30:00:000
WQ_ind	varh	2741.40	913.30	914.60	913.50	2021-12-10 14:30:00:000
WQ_cap	varh	0.00	0.00	0.00	0.00	2021-12-10 14:30:00:000
WS	VAh	4529.70	1509.47	1509.87	1510.40	2021-12-10 14:30:00:000

[sc_value_view_frozen_energy, 1, en_US]

Figure 5-9 Value View Tab, Frozen Energy

5.3 Tariffs

5.3.1 Function Description

The device supports up to 8 tariffs for energy meters. The 8 tariffs include the supplied or consumed active energy, the reactive energy, and the apparent energy. If the tariff change is controlled via protocol, up to 8 tariffs can be set. If the tariff change is controlled via binary inputs, up to 2 tariffs can be set.

The tariffs are changed via the external interfaces. A time-related tariff changing is only possible by a superordinate system.

Tariff Change with Load-Profile Synchronization

The recorded load profile is always assigned to the current tariff.

If you change the tariff during a running measuring period, for example, from high to low tariff, it has initially no effect on the load-profile recording.

The new tariff becomes effective in the power meters of the device only with the start of the next measuring subperiod.

Tariff Change without Load-Profile Synchronization

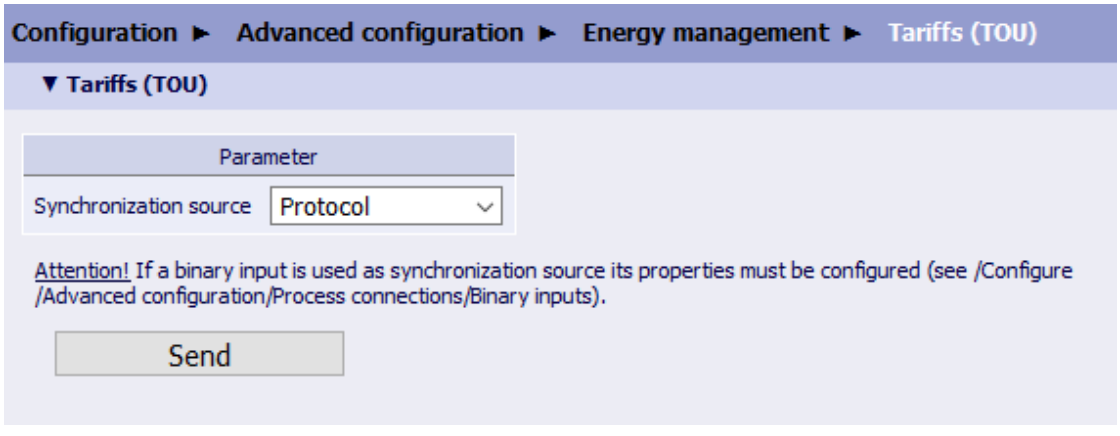
If **-none-** has been selected as synchronization source when parameterizing the load profile, the tariff change becomes effective immediately. For more detailed information, refer to **Default Setting** and **Setting Range** in chapter *5.1.2 Configuration and Value View via Web Pages*.

5.3.2 Configuration and Value View via Web Pages

Configuration of the Tariffs

To change the settings of the tariffs in the **Configuration** tab, proceed as follows:

- In the navigation window, click **Tariffs (TOU)**.



[sc_tariffs_configure, 2, en_US]

Figure 5-10 Configuration Tab, Tariffs (TOU)

- Configure the respective parameters according to the following table.

Table 5-5 Settings for Tariffs (TOU)

Parameter	Default Setting	Setting Range
Synchronization source	Protocol	Protocol[11] Calendar
The following parameters are available only when **Synchronization source** is set to **Calendar**.		
Season 1 Start	01-01	01-01 to 12-31
Season 1 End	06-30	01-01 to 12-31
Season 2 Start	07-01	Not settable The rest days of the full year
Season 2 End	12-31	
Weekend Setting	Thursday and Friday	Sunday to Saturday, max. 2 days
Season x (x = 1 or 2) Tariff y (y = 1 to 8) Period 1 Start	00:00	00:00 to 23:45
Season x (x = 1 or 2) Tariff y (y = 1 to 8) Period 1 End	24:00	00:15 to 24:00
Season x (x = 1 or 2) Tariff y (y = 1 to 8) Period 2 Start	00:00	00:15 to 23:45
Season x (x = 1 or 2) Tariff y (y = 1 to 8) Period 2 End	24:00	00:30 to 24:00
Season x (x = 1 or 2) Tariff y (y = 1 to 8) Period 1 Active	no[12]	yes no
Season x (x = 1 or 2) Tariff y (y = 1 to 8) Period 2 Active	no	yes no
Season x (x = 1 or 2) Tariff y (y = 1 to 8) Workday/ Weekend Selection	Every Day	Every Day Workday Weekend
Coverage Check		Pass Fail (with gap) Fail (with overlap)

- After the parameterization, click **Send**.
- In the navigation window, click **Activation and cancel**.
- Enter the activation password (refer to *Table 2-3*).
- Click **Activation**.

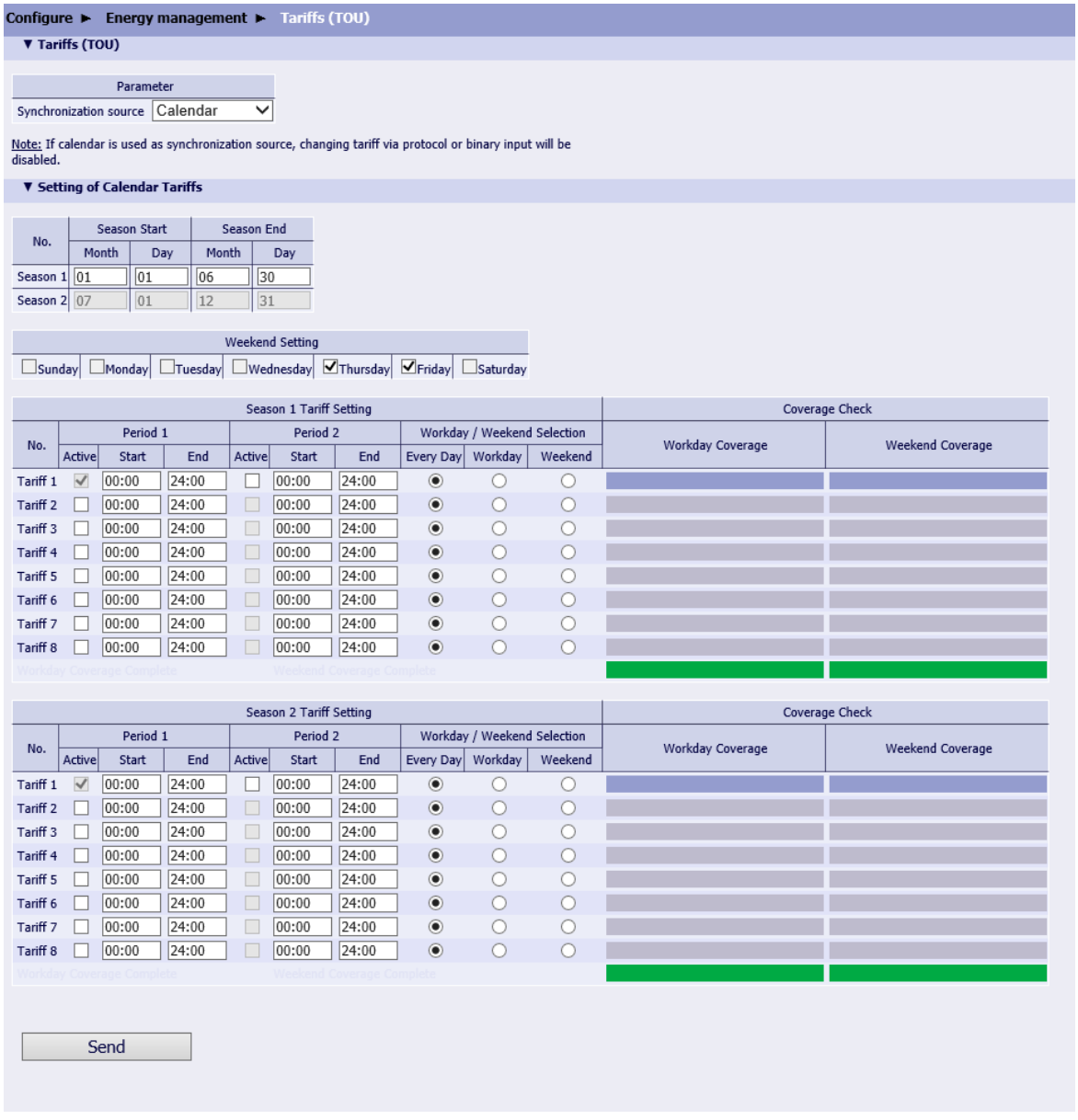
Synchronization Source = Calendar

When **`Synchronization source`** is set to ***`Calendar`***:

- If the coverage check passes, all the coverage check bars are show in green, see *Figure 5-11*.
- If the coverage check fails, the coverage check bars are show in other colors, see *Figure 5-12*. The button **Send** is disabled. You must reconfigure the parameters.

11 In this case, the protocol Modbus TCP can control tariff 1 to tariff 8.

12 The default settings of Tariff 1 Period 1 Active for 2 seasons are checked.



[sc_tariff_calendar, 1, en_US]

Figure 5-11 Configuration Tab, Synchronization Source: Calendar, Pass

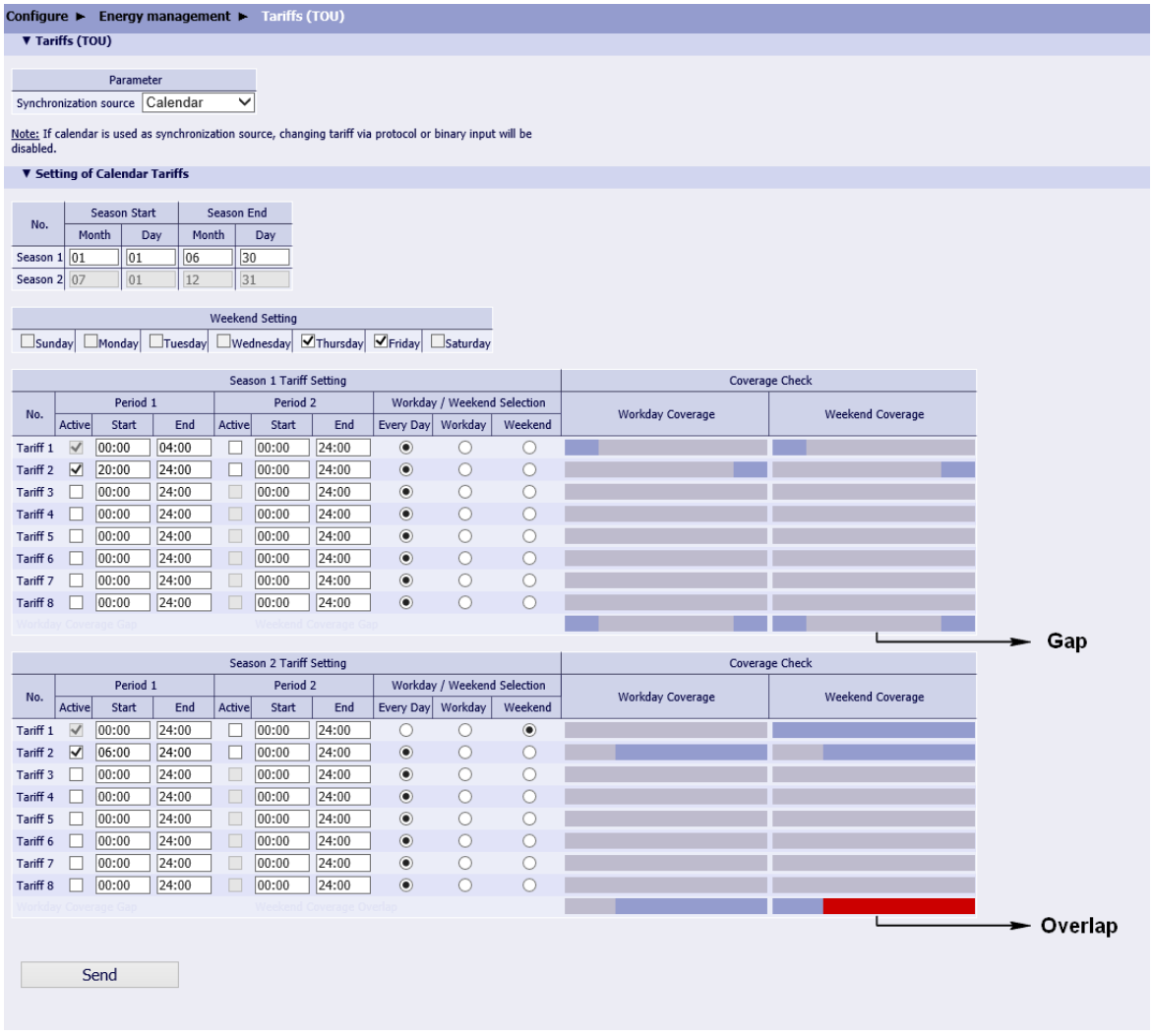
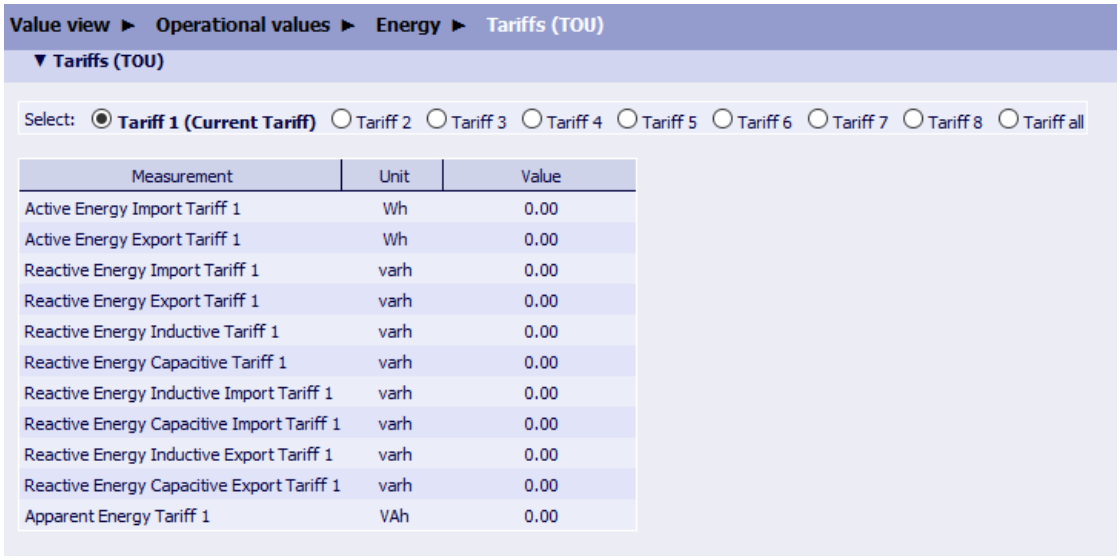


Figure 5-12 Configuration Tab, Synchronization Source: Calendar, Fail with Gap or Overlap

Value View of the Tariffs (TOU)

You can determine 8 tariffs for all energy types. To display the **Tariff** values in the **Value view** tab, proceed as follows:

- In the navigation window, click **Tariffs (TOU)**.



[sc_Q100_tariffs_evaluation, 2, en_US]

Figure 5-13 Value View Tab, Tariffs (TOU)

After data transmission, the values are further processed in the peripheral devices.

5.3.3 Clearing of Tariff Values

Refer to chapter *2.5.6.4 Clearing of Energy Counters*.

6 Power Quality

6.1 Harmonics

6.1.1 Function Description

Recording and Evaluation

Table 6-1 Recording and Evaluation of the Harmonics

Measured Quantity (x = 1 to 40) x = 1: Fundamental	Measurement Records AVG PQDIF	Measurement Records Max. Value PQDIF	Measurement Records Min. Value PQDIF
Magnitude of Voltage Harmonics			
H_Va-x	x	x	–
H_Vb-x	x	x	–
H_Vc-x	x	x	–
H_Vab-x	x	x	–
H_Vbc-x	x	x	–
H_Vca-x	x	x	–
Magnitude of Current Harmonics			
H_Ia-x	x	x	–
H_Ib-x	x	x	–
H_Ic-x	x	x	–
THDS, Voltage			
THDS_Va	x	x	x
THDS_Vb	x	x	x
THDS_Vc	x	x	x
THDS_Vab	x	x	x
THDS_Vbc	x	x	x
THDS_Vca	x	x	x
THDS, Current			
THDS_Ia	x	x	x
THDS_Ib	x	x	x
THDS_Ic	x	x	x

Interfaces: protocols IEC 61850 (PQDIF depending on the measuring interval) and Modbus

6.1.2 Configuration and Value View via Web Pages

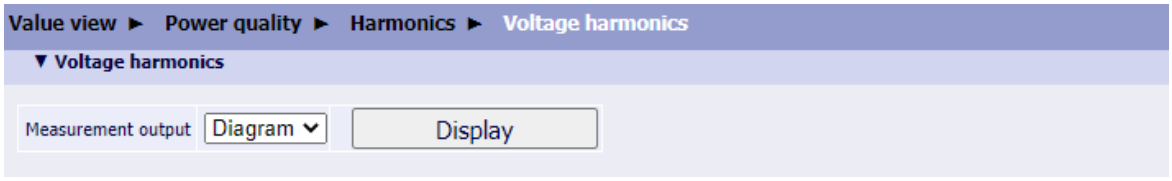
Configuration of the Harmonics

The required settings for gathering the harmonics and THDS are set in the main settings (see chapter *2.5.1 Configuration via Web Pages*) and in the recorder settings (see chapter *6.6.2 Configuration and Value View via Web Pages*).

Value View of the Voltage Harmonics

To display the measured values in the **Value view** tab, proceed as follows:

- In the navigation window, click **Voltage harmonics**.



[sc_config_voltage_harmonics, 1, en_US]

Figure 6-1 Value View Tab, Voltage Harmonics

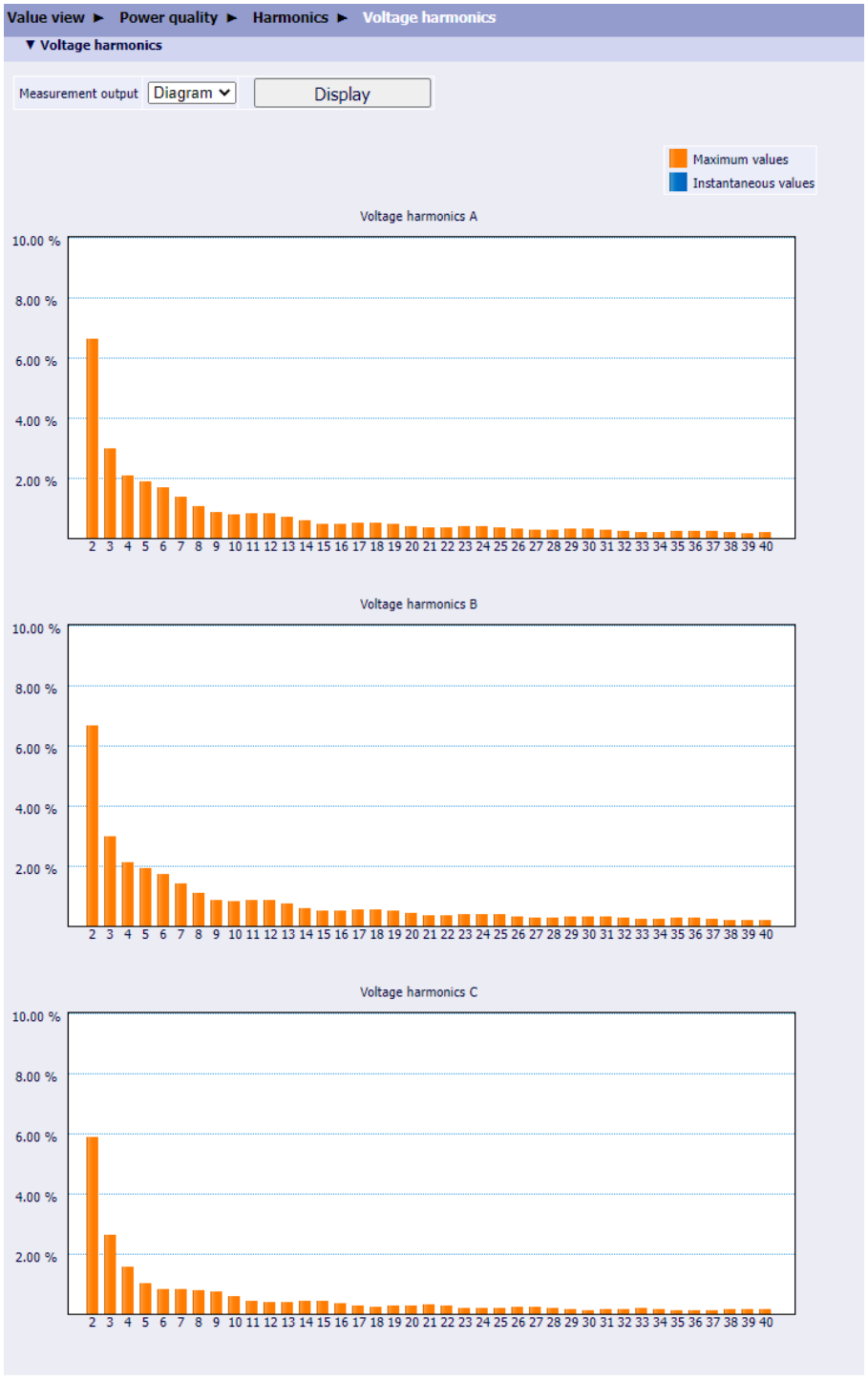
- Configure the respective parameters according to the following table.

Table 6-2 Settings for the Value View of Voltage Harmonics

Parameter	Default Setting	Setting Options
Measurement output	Diagram	Table Diagram

- Click **Display**.
  The detailed results are displayed in tables or in diagrams. The instantaneous values and the maximum values are both presented.

View in Diagrams:



[sc_value_view_voltage_harmonics_diagram, 1, en_US]

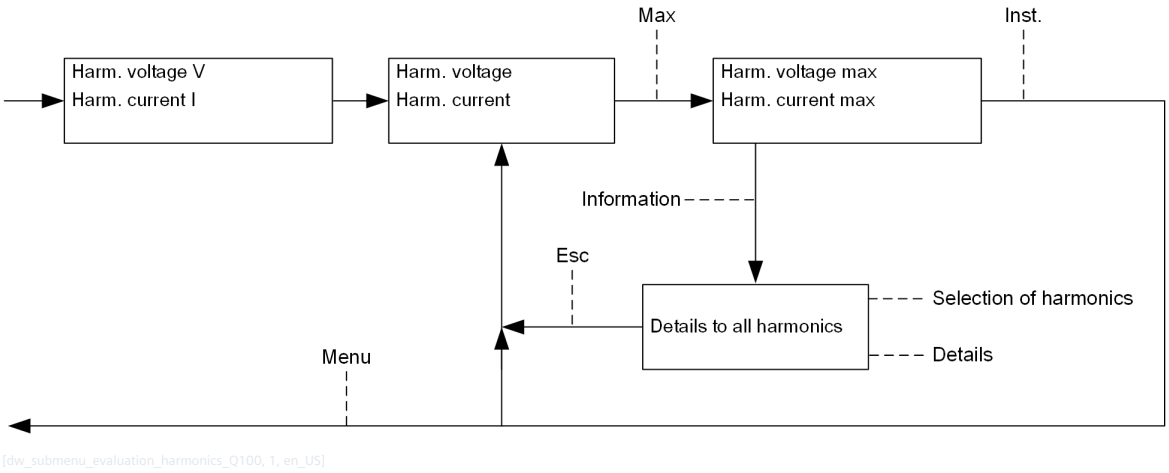
Figure 6-2 Value View Tab, Voltage Harmonics, Diagram

Value View of the Harmonic Currents

The operation to view the harmonic currents is similar to the voltage harmonics. For more information, refer to *Value View of the Voltage Harmonics, Page 122*.

6.1.3 Value View via Display

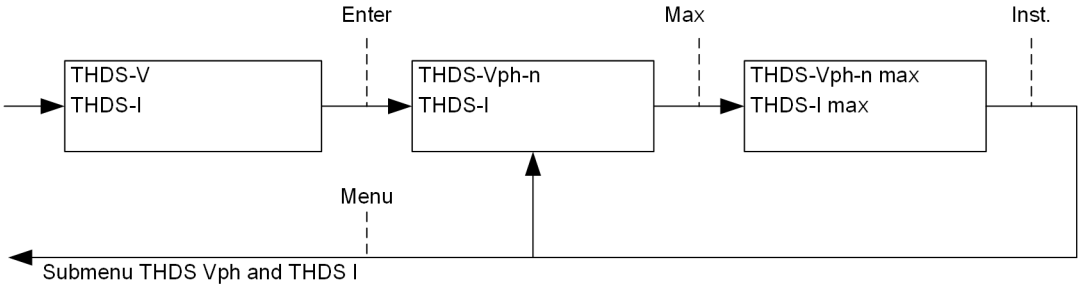
Submenu Voltage Harmonics V and Current Harmonics I (Bar Charts)



[dw_submenu_evaluation_harmonics_Q100, 1, en_US]

Figure 6-3 Submenu Harmonic Voltage and Harmonic Current

Submenu THDS



[dw_submenu_THDS2_Q100, 1, en_US]

Figure 6-4 Submenu THDS V and THDS I

6.2 Flicker

6.2.1 Function Description

The flicker is measured according to IEC 61000-4-15.

The short-term flicker value (Pst) and the long-term flicker value (Plt) are determined for phase-to-ground voltages and delta voltages. The flicker is measured on all 3 voltage channels.

Flickers appear with a frequency from 0.005 Hz to 35 Hz.

The device measures the following flicker types:

- Short-term flicker values (Pst)
  Determined by 10 min (short-term flicker), fixed
- Long-term flicker values (Plt)
  Over 2 h (12 Pst values), fixed

Table 6-3 Recording of the Flicker

Measured Quantities	Measurement Records PQDIF (Only in SICAM P855)
Short-Term Flicker	
P_{st} (a-n)	x
P_{st} (b-n)	x
P_{st} (c-n)	x
P_{st} (a-b)	x
P_{st} (b-c)	x
P_{st} (c-a)	x
Long-Term Flicker	
P_{lt} (a-n)	x
P_{lt} (b-n)	x
P_{lt} (c-n)	x
P_{lt} (a-b)	x
P_{lt} (b-c)	x
P_{lt} (c-a)	x

Interfaces: protocols IEC 61850 (PQDIF depending on the measuring interval) and Modbus TCP

The measurement range and accuracy are specified according to the standard IEC 61000-4-15.

Table 6-4 Test Specifications for the Flickermeter Classifier

Rectangular Changes per Minute (CPM)	Voltage Fluctuation %			
	120-V Lamp 50-Hz System	120-V Lamp 60-Hz System	230-V Lamp 50-Hz System	230-V Lamp 60-Hz System
1	3.178	3.181	2.715	2.719
2	2.561	2.564	2.191	2.194
7	1.694	1.694	1.450	1.450
39	1.045	1.040	0.894	0.895
110	0.844	0.844	0.722	0.723
1620	0.545	0.548	0.407	0.409
4000	3.426	Test not required	2.343	Test not required

Rectangular Changes per Minute (CPM)	Voltage Fluctuation %			
	120-V Lamp 50-Hz System	120-V Lamp 60-Hz System	230-V Lamp 50-Hz System	230-V Lamp 60-Hz System
4800	Test not required	4.837	Test not required	3.263
Note 1: If the CPM is 1620, the modulation frequency of the rectangular square wave is 13.5 Hz. Note 2: For tests according to this table, the first voltage change is applied within 5 s after the P_{st} evaluation is started. Flickermeters having a pretest time to charge the filters, indicate when the P_{st} evaluation starts. With the indication, the testing authority can determine when to start the rectangular modulation pattern.				

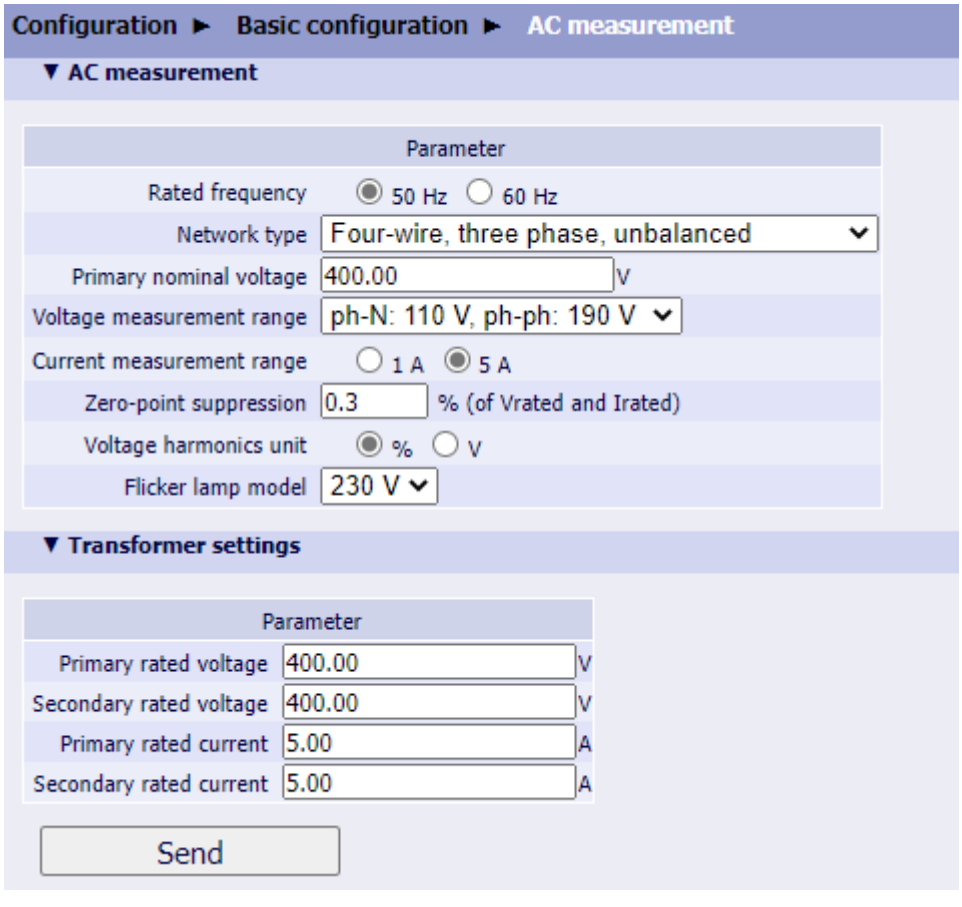
All the voltage fluctuation values in *Table 6-4* are multiplied with a fixed factor k. P_{st} is determined by the factor k. Siemens specifies the working range of the classifier as $0.2 \leq k \leq 10$. The corresponding value P_{stk} is within ± 5 % or ± 0.05 of the factor k, depending on which value is greater.
The rectangular modulation must be applied with a duty cycle of 50 % ± 2 %, and the transition time from one voltage level to the next must be less than 0.5 ms.

6.2.2 Configuration and Value View via Web Pages

Configuration of the Flicker

To configure the **Flicker lamp model** in the **Configuration** tab, proceed as follows:

- In the navigation window, click **AC measurement**.



[sc_config_ac_measurement_p85x, 1, en_US]

Figure 6-5 Configuration Tab, Flicker

- Select a **Flicker lamp model** according to the following table.

Table 6-5 Settings for Flicker

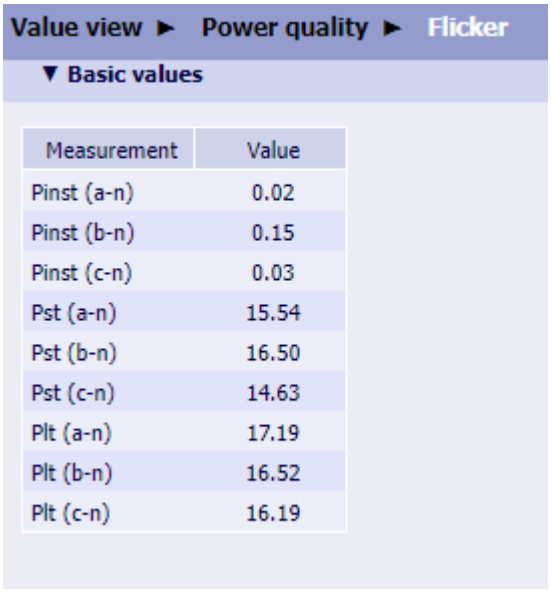
Parameter	Default Setting	Setting Options
Flicker lamp model	230 V	230 V 120 V

- After the parameterization, click **Send**.
- In the navigation window, click **Activation and cancel**.
- Enter the activation password (refer to *Table 2-3*).
- Click **Activation**.

Value View of the Flicker

To display the flicker values in the **Value view** tab, proceed as follows:

- In the navigation window, click **Flicker**.



[sc_value_view_flicker, 1, en_US]

Figure 6-6 Value View Tab, Flicker

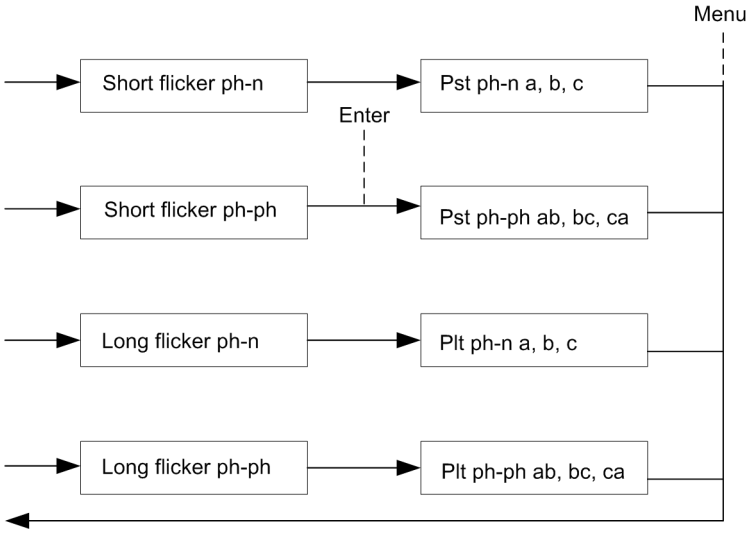
To display the aggregation values of the flicker in the **Value view** tab, proceed as follows:

- In the navigation window, click **Records**.
- Configure the respective parameters according to *6.6.2 Configuration and Value View via Web Pages*.
- Select **Long term flicker** or **Short term flicker** as the **Measurement source**.

6.2.3 Value View via Display

Submenu Flicker

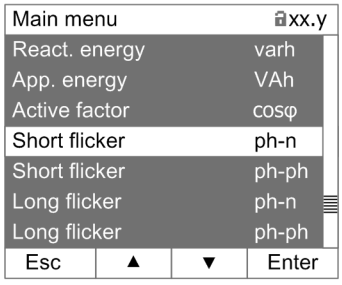
In the main menu, click **Short flicker ph-n**, **Short flicker ph-ph**, **Long flicker ph-n**, or **Long flicker ph-ph**.



[dw_submenu_flicker_display, 1, en_US]

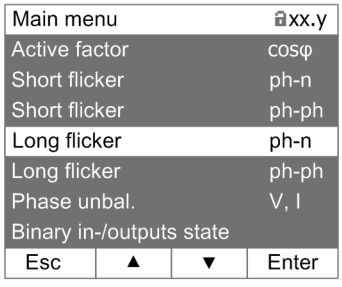
Figure 6-7 Submenu Flicker

The following interface displays are available:



[dw_display_short_flicker, 1, en_US]

Figure 6-8 Short Flicker



[dw_display_long_flicker, 1, en_US]

Figure 6-9 Long Flicker

6.3 Recording System

The device provides different recording options for the load profile and for monitoring and analyzing the power quality.

Table 6-6 Recording Measured Values

Recording	Measurands	Storage Interval/Storage Method	Application
Measured values (measurement records) (only SICAM P855)	Power frequency	10 s (fixed)	Long-time monitoring of the power quality, for example according to EN 50160
	Magnitude of supply voltage	10 min (1 min, 10 min)	
	Supply-voltage unbalanced		
	Voltage harmonics		
	Flicker	• P_{st} determined over 10 min • P_{lt} determined over 2 h (12 P_{st} values)	Monitoring of the flicker severity according to IEC 61000-4-15
	Magnitude of current	10 min (1 min, 10 min)	Long-time monitoring of current- and power-related values
	Current harmonics		
	Current unbalanced		
	Additional data (for example, power values, phase angles, min/max/AVG values)		
Voltage events (event records)	• Voltage dips • Voltage interruptions	Residual voltage V_{rms} (1/2-cycle) and time stamps (duration)	Long-time monitoring of the power quality according to EN 50160 (only SICAM P855), classification of voltage events
	Voltage swells	Maximum voltage magnitude V_{rms} (1/2-cycle) and time stamps (duration)	
Long-term recording and monitoring (trend records) (only SICAM P855)	V_{rms} (1/2-cycle)	2h (2h, 24h)	Subsequent analysis of the power quality with any grid codes
Fault records (waveform records)	• Voltages • Currents	• Voltage and current variations • Storage of sampled values (default 2.2 s, max. 3.0 s) and indication values	Analyzing the causes of power-quality problems
Load-profile records	Load profile	Method **Fixed Block** or method **Rolling Block**	Determining the load profile for supply and consumption of electric power

The respective measuring interval of the recording is time-stamped to enable a correct time evaluation.

6.4 Event Records

6.4.1 Function Description

Using the device you can record the following events:

- Voltage events
- Frequency events
- Voltage unbalance events

Table 6-7 Recording and Evaluation

Measured Quantities	Values
Va	x
Vb	x
Vc	x
Vab	x
Vbc	x
Vca	x

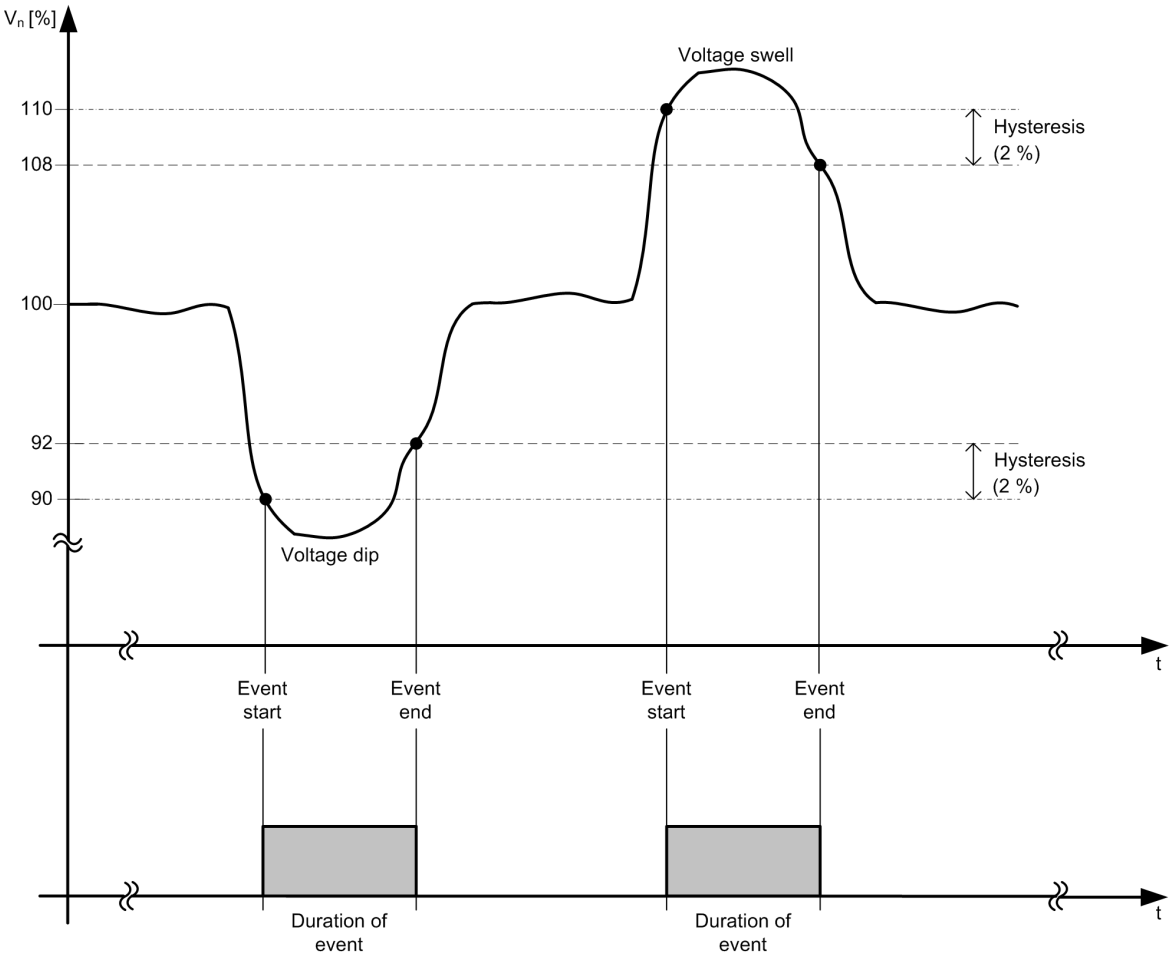
- Interfaces: protocols IEC 61850 and Modbus TCP, HTML, display determining overvoltage, undervoltage and voltage interruption according to EN 50160 (only SICAM P855), for example.

6.4.2 Voltage Events

6.4.2.1 Function Description

The device detects voltage events (dips, swells, interruptions) based on 1/2-cycle RMS values according to IEC 61000-4-30 Edition 3.0.
The device works as follows:

- It determines the start of events with the threshold value.
  All thresholds are related to the primary nominal voltage.
- It determines the end of voltage events with the voltage considering the hysteresis of the preset threshold.



[dw_event_recorder_detection, 1, en_US]

Figure 6-10 Example of Voltage Event Detection with Primary Nominal Voltage

The settings are as follows on the Web page:

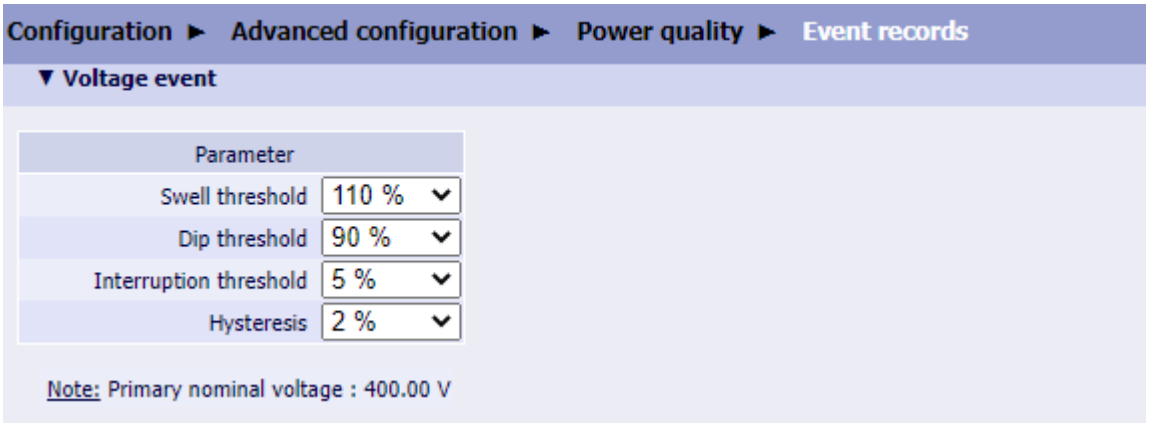
- Swell threshold: 110 %
- Dip threshold: 90 %
- Hysteresis: 2 %

6.4.2.2 Configuration and Value View via Web Pages

Configuration of the Voltage Event

To configure the settings of the voltage event in the **Configuration** tab, proceed as follows:

- In the navigation window, click **Event records**.



[sc_config_event_records, 1, en_US]

Figure 6-11 Configuration Tab, Event Records, Voltage Event

- Configure the respective parameters according to the following table.

Table 6-8 Settings for Voltage Events

Parameter	Default Setting	Setting Range
Voltage Event		
Swell threshold[13]	110 %	105 % to 140 %, increments of 5 %
Dip threshold[13]	90 %	75 % to 95 %, increments of 5 %
Interruption threshold	5 %	1 %, 2 %, 3 %, 5 %, 8 %, 10 %
Hysteresis	2 %	1 % to 6 %, increments of 1 %

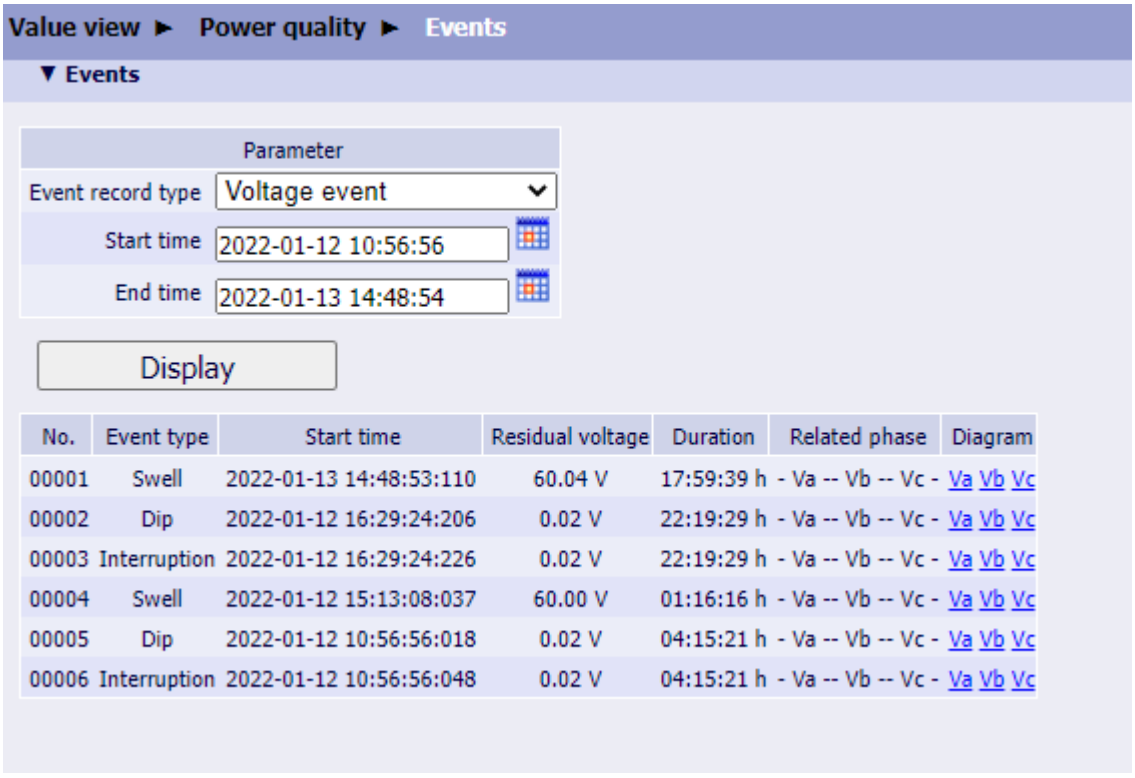
- After the parameterization, click **Send**.
- In the navigation window, click **Activation and cancel**.
- Enter the activation password (refer to *Table 2-3*).
- Click **Activation**.

Value View of the Voltage Events

To display the values of the voltage events in the **Value view** tab, proceed as follows:

- In the navigation window, click **Events**.
  The information of the latest 20 voltage events is shown without query.

13 According to the EN 50160 standard in the PQ report, the default setting of dip and swell (90 % and 110 %) is recommended.



[sc_value_view_vol, 1, en_US]

Figure 6-12 Value View Tab, Voltage Events

- Configure the respective parameters according to the following table.

Table 6-9 Settings for Value View of the Voltage Events

Parameter	Default Setting	Setting Range
Event record type	Voltage event	Voltage event Frequency event Voltage unbalance event
Start time	One hour before the current date/time	You can edit the text box directly or select the start time from the calendar.
End time	Current date/time	You can edit the text box directly or select the end time from the calendar.

Event Diagram

You can view the voltage-event diagram via the Web browser.

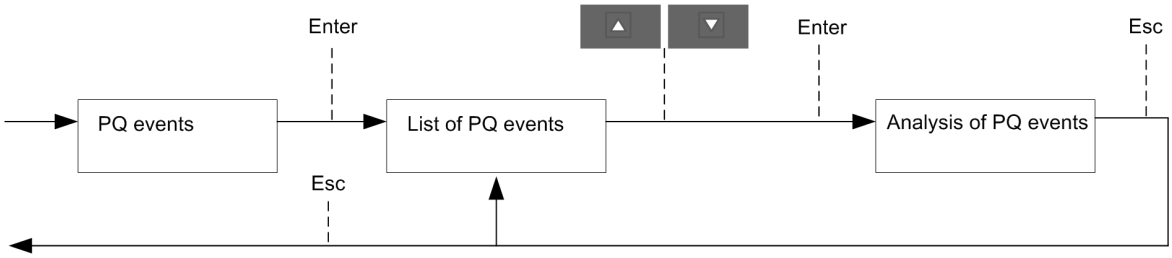
6.4.2.3 Value View via Display

Submenu Power Quality (PQ) events

In the main menu, select **PQ events**.

NOTE

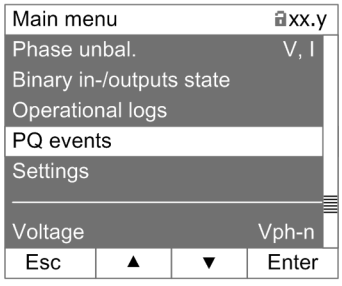
You can query the latest 10 events via HMI screen.



[dw_submenu_voltage_events, 2, en_US]

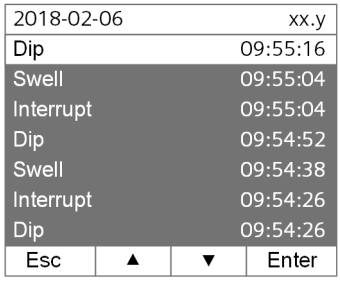
Figure 6-13 Submenu PQ Events

The following interface displays are available:



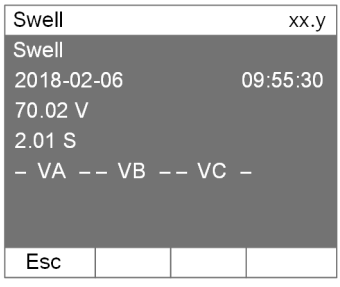
[dw_display_PQ_events, 1, en_US]

Figure 6-14 PQ Events



[dw_q100_display_dip, 1, en_US]

Figure 6-15 List of PQ Events



[dw_q100_display_swell, 1, en_US]

Figure 6-16 Analysis of PQ Events

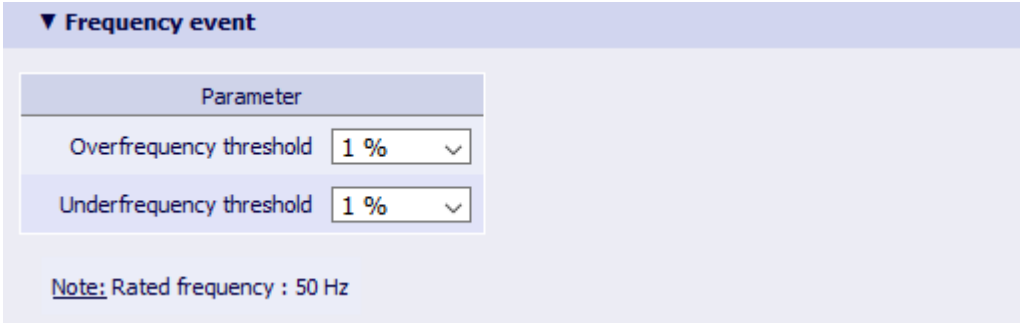
6.4.2.4 Clearing of Voltage Events

Refer to chapter *6.4.5 Clearing of Events*.

6.4.3 Frequency Events

6.4.3.1 Configuration and Value View via Web Pages

Configuring the Frequency Events



[sc_Param frequency events, 2, en_US]

Figure 6-17 Configuration Tab, Frequency Events

To change the frequency event settings in the **Configuration** tab, proceed as follows:

- In the navigation window, click **Event records**
- Configure the respective parameters according to the following table.

Table 6-10 Settings for Frequency Events

Parameter	Default Setting	Setting Range
Underfrequency threshold	1 %	0.1 % to 1.0 %, increments of 0.1 % 1.0 % to 5.0 %, increments of 1.0 %
Overfrequency threshold	1 %	0.1 % to 1.0 %, increments of 0.1 % 1.0 % to 5.0 %, increments of 1.0 %

- After the parameterization, click **Send**.
- In the navigation window, click **Activation and cancel**.
- Enter the activation password (refer to *Table 2-3*).
- Click **Activation**.

Value view of the Frequency Events

To display the frequency event values in the **Value view** tab, proceed as follows:

- In the navigation window, click **Events**.
- Configure the respective parameters according to the following table.

Table 6-11 Settings for Viewing the Frequency Events

Parameter	Default Setting	Setting Range
Event record type	Frequency event	Voltage event **Frequency event** Voltage unbalance event
Start time	One hour before the current date/ time	You can edit the text box directly or select the start time from the calendar.

Parameter	Default Setting	Setting Range
End time	Current date/time	You can edit the text box directly or select the end time from the calendar.
Measurement output	Table	Table

6.4.3.2 Value View via Display

Refer to *6.4.2.3 Value View via Display*.
This submenu lists some frequency events.

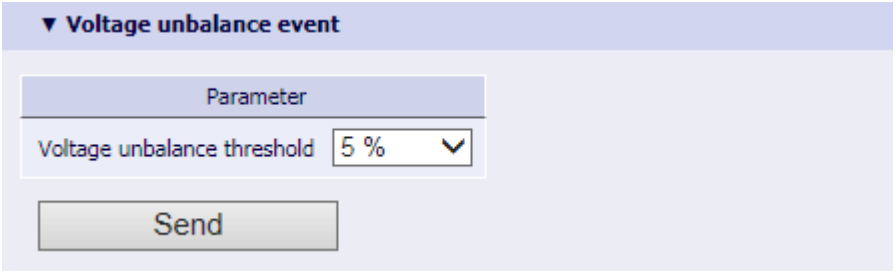
6.4.3.3 Clearing of Frequency Events

Refer to chapter *6.4.5 Clearing of Events*.

6.4.4 Voltage-Unbalance Events

6.4.4.1 Configuration and Value View via Web Pages

Configuring the Voltage-Unbalance Events



[sc_Param unbal events, 1, en_US]

Figure 6-18 Configuration Tab, Voltage Unbalance Events

To change the voltage unbalance event setting in the **Configuration** tab, proceed as follows:

- In the navigation window, click **Event records**.

Table 6-12 Settings for Voltage-Unbalance Events

Parameter	Default Setting	Setting Range
Voltage unbalance threshold	5 %	1 % to 5 %, increments of 1 %

- After the parameterization, click **Send**.
- In the navigation window, click **Activation and cancel**.
- Enter the activation password (refer to *Table 2-3*).
- Click **Activation**.

Value View of the Voltage-Unbalance Events

To display the voltage-unbalance events in the **Value view** tab, proceed as follows:

- In the navigation window, click **Events**.
- Configure the respective parameters in the list boxes according to the following table.

Table 6-13 Settings for Viewing the Voltage-Unbalance Events

Parameter	Default Setting	Setting Range
Event record type	Voltage unbalance event	Voltage event Frequency event **Voltage unbalance event**
Start time	Current date/time	Any with calendar function Time format: depends on date/time format config.
End time	Current date/time	
Measurement output	Table	Table

- Click **Display**.
  The detailed results are displayed in a **Find result** table. In multi-paged tables, you can navigate forward and back in the pages using the **>>** and **<<** buttons.

6.4.4.2 Value View via Display

Refer to *6.4.2.3 Value View via Display*.
This submenu lists some voltage unbalance events.

6.4.4.3 Clearing of Voltage-Unbalance Events

Refer to chapter *6.4.5 Clearing of Events*.

6.4.5 Clearing of Events

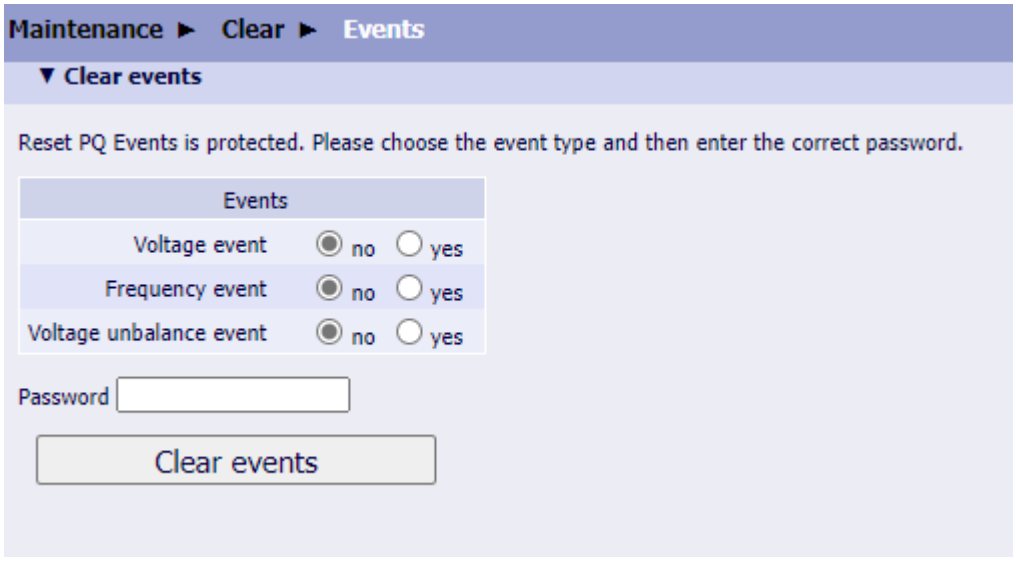
You can clear the following PQ events respectively:

- Voltage event
- Frequency event
- Voltage unbalance event

Clearing the Events

To clear the PQ events in the **Maintenance** tab proceed as follows:

- In the navigation window, click **Events**.



[sc_clear_events, 1, en_US]

Figure 6-19 Maintenance Tab, Clear Events

- Select the event type that you want to clear.
- Enter the maintenance password (refer to *Table 2-4*).
- Click **Clear events**.
  The selected events are deleted. The **Action was successful** indication is displayed on the status bar.

6.5 Waveform Records

6.5.1 Function Description

When a trigger function is activated, a waveform recorder records the following values:

- Voltages
- Currents

The following table shows all trigger sources of the waveform recorder, as well as the corresponding measurement time base and trigger conditions.

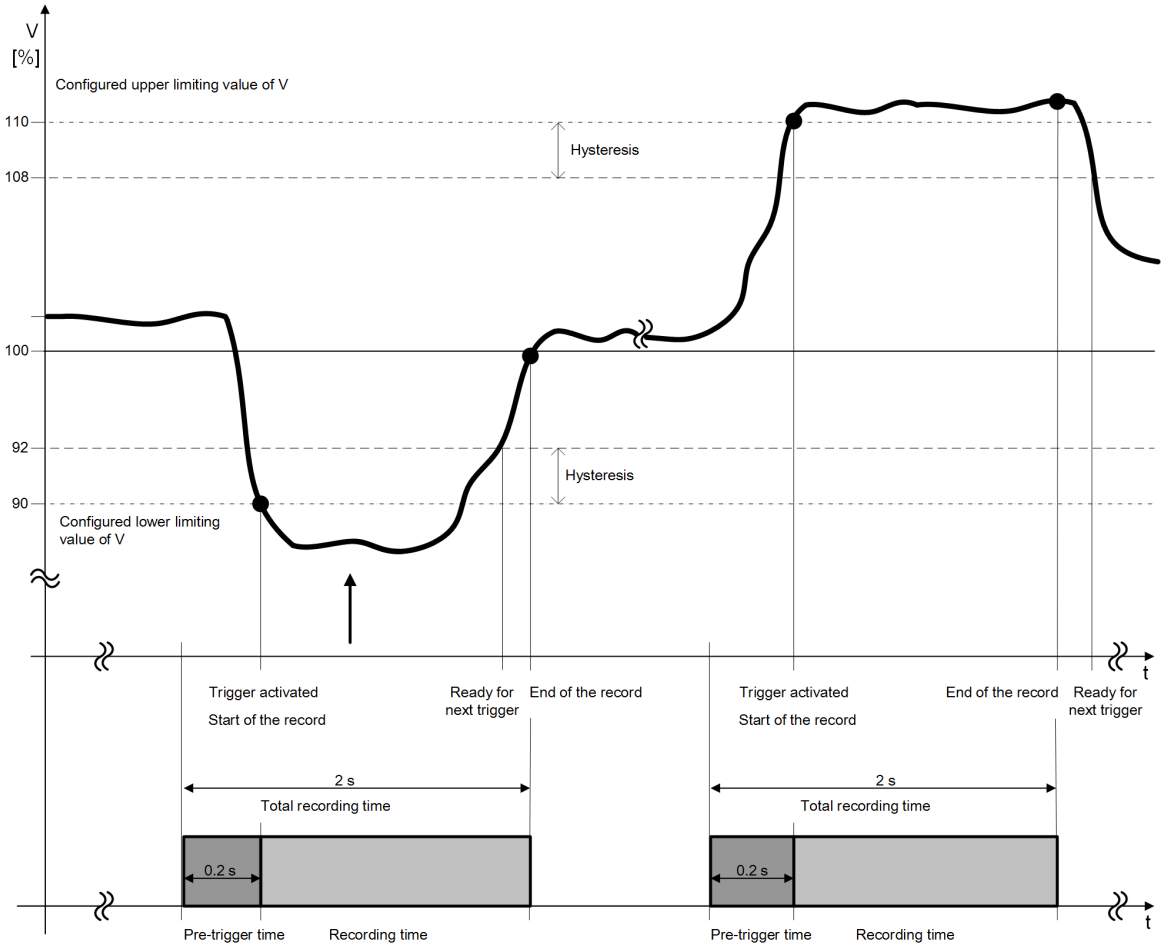
Table 6-14 Triggers of the Waveform Recorder

Trigger Source	Measurement Time Base	Trigger Conditions
Voltage trigger	1/2 cycle	The trigger starts if one of the following conditions is met: • The measured value > the upper threshold • The measured value < the lower threshold • A voltage event occurs.
Current trigger	1/2 cycle	The trigger starts if one of the following conditions is met: • The measured value > the upper threshold • The measured value < the lower threshold

You can parameterize the trigger sources and switch them on/off separately. If the trigger is switched off, recording cannot be initiated.

Finishing of the waveform recording depends on the configured recording duration. The waveform record is written to the SD card for subsequent evaluation.

The nominal sampling rate for the waveform recorder is 10 240 samples per second, that is 204 samples per cycle for the 50-Hz system.



[dw_q100_Waveform_example, 1, en_US]

Figure 6-20 Example of Waveform Recording

The following table shows which measured quantities can be recorded in COMTRADE files when a corresponding trigger function is activated.

Table 6-15 Recording and Evaluation

Recorder Routing	Measured Quantities	COMTRADE
Voltage[14]	Va	x
	Vb	x
	Vc	x
	Vab	x
	Vbc	x
	Vca	x
	V_N	x
Current[15]	Ia	x
	Ib	x
	Ic	x

14 For the 3-wire, 3-phase network type, voltage in the phase-to-phase channel is recorded; for the 4-wire, 3-phase network type, voltage in the phase-to-neutral channel is recorded.

15 Current channels can be recorded when the current trigger is activated.

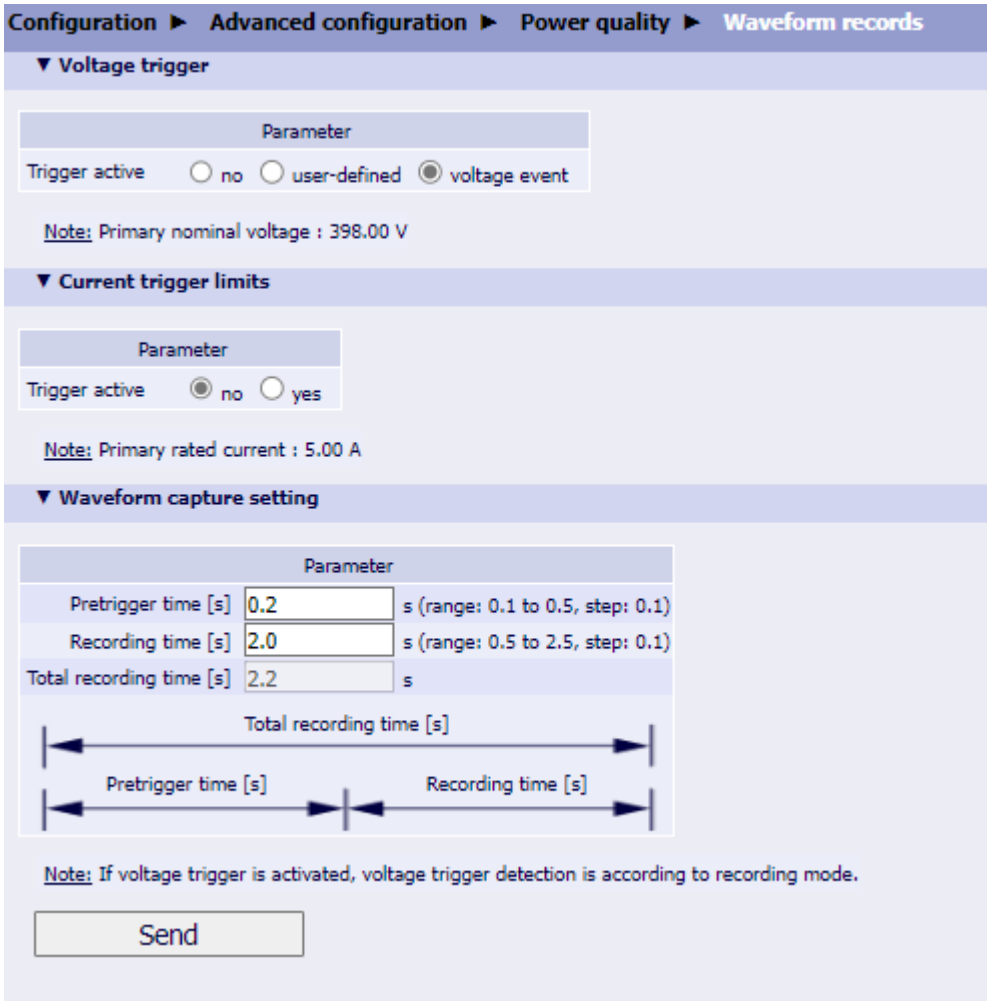
For more information on the **Configuration**, refer to the chapter *6.5.2 Configuration and Value View via Web Pages*.

6.5.2 Configuration and Value View via Web Pages

Configuration of the Waveform Records

To configure the settings of the waveform records in the **Configuration** tab, proceed as follows:

- In the navigation window, click **Waveform records**.



[sc_config_waveform_records, 2, en_US]

Figure 6-21 Configuration Tab, Waveform Records

- Configure the respective parameters according to the following table.

Table 6-16 Settings for the Waveform Records

Parameter	Default Setting	Setting Range
Voltage trigger limits		
Trigger active	voltage event	no user-defined voltage event
Tolerance unit	Percentage	Percentage Numerical

Parameter	Default Setting	Setting Range
Upper threshold	110.00 % of the primary nominal voltage	100.0 % to 120.0 % of the primary nominal voltage
Lower threshold	90.00 % of the primary nominal voltage	0.00 % to 99.99 % of the primary nominal voltage
Hysteresis	2.00 % of the primary nominal voltage	0.0 % to 50.0 % of the primary nominal voltage
Current trigger limits		
Trigger active	no	no yes
Tolerance unit	Percentage	Percentage Numerical
Upper threshold	110.00 % of nominal current	5.0 % to 200.0 % of the nominal current
Lower threshold	90.00 % of nominal current	0.00 % to 99.99 % of the nominal current
Hysteresis	2.00 % of the nominal current	0.0 % to 50.0 % of the nominal current
Waveform capture setting		
Pretrigger time	0.2 s	0.1 s to 0.5 s, increments of 0.1 s
Recording time	2.0 s	0.5 s to 2.5 s, increments of 0.1 s
Total recording duration	2.2 s	max. 3.0 s

- After the parameterization, click **Send**.
- In the navigation window, click **Activation and cancel**.
- Enter the activation password (refer to *Table 2-3*).
- Click **Activation**.

Error Information

If the set value is out of the range, a red error message **Note: Please consider the setting ranges!** appears and the value changes back to the default setting.

If the set values do not follow the setting rules, a red error message **Note: Consider setting rules: 'upper threshold > lower threshold' and (upper threshold - lower threshold) > 2 * hysteresis** appears and the value changes back to the previous setting.

Value View of the Waveform Records

You cannot view the waveform records triggered by the other sources via the Web browser, but you can download them. For more information, refer to chapter *7.3 File Download*.

During the download progress, the selected files are stored by the browser. You can use the software SIGRA to display the transmitted record data. For more information on SIGRA, contact the Siemens Hotline.

6.5.3 Clearing of Waveform Records

To clear waveform records, refer to chapter *7.2 Clearing of Data*.

6.6 Measurement Records

6.6.1 Function Description

NOTE

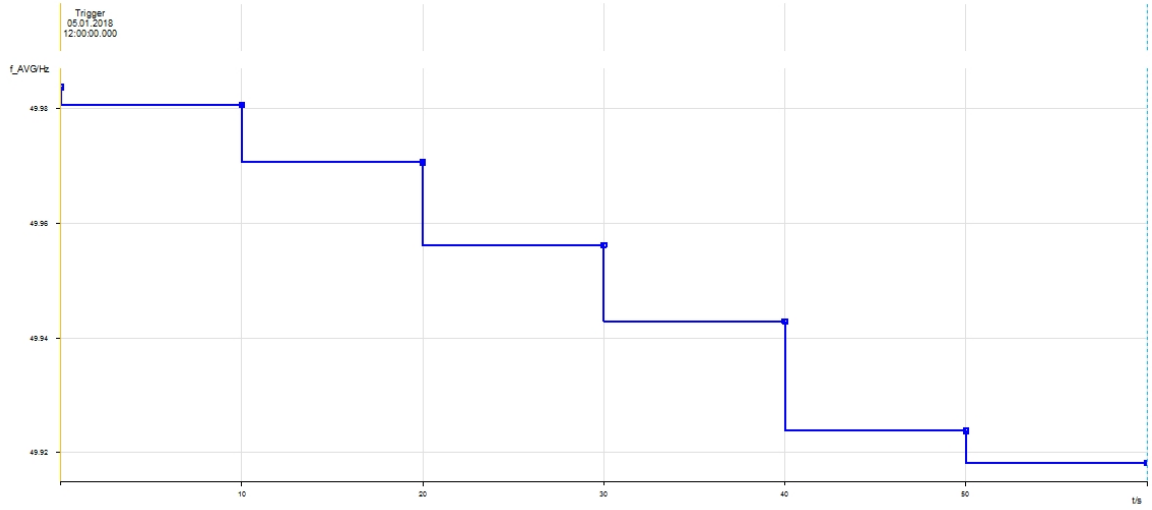
This function is only available in SICAM P855.

The measurement recorder continuously records average values and for some parameters also minimum and maximum values over parameterized periods. The average values are calculated according to IEC 61000-4-30 Edition 3.0. The power quality evaluation is according to EN 50160 (for examples voltage magnitude, 10 second frequency).

Additionally, non-power quality data are recorded, for example:

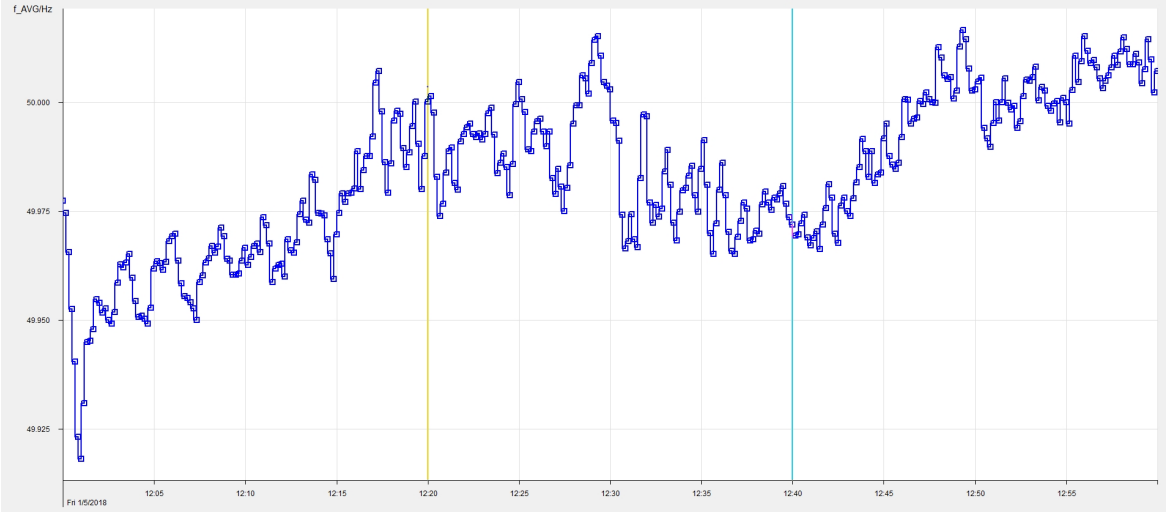
- Power
- Power factor
- Angles

In the configuration, you can select the aggregation interval and the file-generation interval. The files are recorded in the device and are available for download as PQDIF for transmission via IEC 61850.



[sc_freq_meas_2min, 1, en_US]

Figure 6-22 Example 1 for Measurement Records, Frequency Measurement of 10 Seconds, and Record Duration of 1 Minute



[sc_freq_meas_20min, 1, en_US]

Figure 6-23 Example 2 for Measurement Records, Frequency Measurement of 10 Seconds, and Record Duration of 1 Hour

Recording and Evaluation of the Measured Quantities

NOTE

The voltage is recorded in the following network types:

- 1-phase network
- 3P4W (3 phases/4 wires): balanced and unbalanced
- 3P3W (3 phases/3 wires): balanced, unbalanced (2 * I), and unbalanced (3 * I)

Table 6-17 Recording and Evaluation of the Measured Quantities

Measured Quantities	AVG	Max. Value	Min. Value
	PQDIF		
Frequency			
10 s freq (fixed 10 s freq.)	x[16]	–	–
f (system frequency based on 10/12 cycles)	x	x	x
f (system frequency based on 10 s)	x	x	x
Voltage (measurement intervals 1 min, 10 min)			
Va	x	x	x
Vb	x	x	x
Vc	x	x	x
V_N	x	x	x
Vavg	x	–	–
Vavg ph-ph	x	–	–
Vab	x	x	x
Vbc	x	x	x

16 According to IEC 61000-4-30, the frequency is permanently defined with 10 s mean-value recording.

Measured Quantities	AVG	Max. Value	Min. Value
	PQDIF		
Vca	x	x	x
Current			
Ia	x	x	x
Ib	x	x	x
Ic	x	x	x
I_N	x	–	–
Iavg	x	–	–
Active Power			
Pa	x	x	x
Pb	x	x	x
Pc	x	x	x
P	x	x	x
Reactive Power			
Qa	x	x	x
Qb	x	x	x
Qc	x	x	x
Q	x	x	x
Apparent Power			
Sa	x	x	x
Sb	x	x	x
Sc	x	x	x
S	x	x	x
Active Power Factor			
cos φ(a)	x	x	x
cos φ(b)	x	x	x
cos φ(c)	x	x	x
cos φ	x	x	x
Power Factor			
PFa	x	x	x
PFb	x	x	x
PFc	x	x	x
PF	x	x	x
Phase Angle			
φUIa	x	x	x
φUIb	x	x	x
φUIc	x	x	x
φUI	x	x	x
φab V	x	–	–
φca V	x	–	–
φab I	x	–	–
φca I	x	–	–
Unbalance			
Neg.seq.comp.V	x	x	x
Neg.seq.comp.I	x	x	x
Power Reactive Fundamental			
Q1a	x	x	x

Measured Quantities	AVG	Max. Value	Min. Value
	PQDIF		
Q1b	x	x	x
Q1c	x	x	x
Q1	x	x	x
Further Measured Quantities			
Flicker	See chapter *6.2 Flicker*		
Harmonics	See chapter *2.5.4.2 Harmonics*		

- Interfaces: protocols IEC 61850 (PQDIF depending on the measuring interval) and Modbus TCP

Intervals of Aggregation Data and PQDIF Files

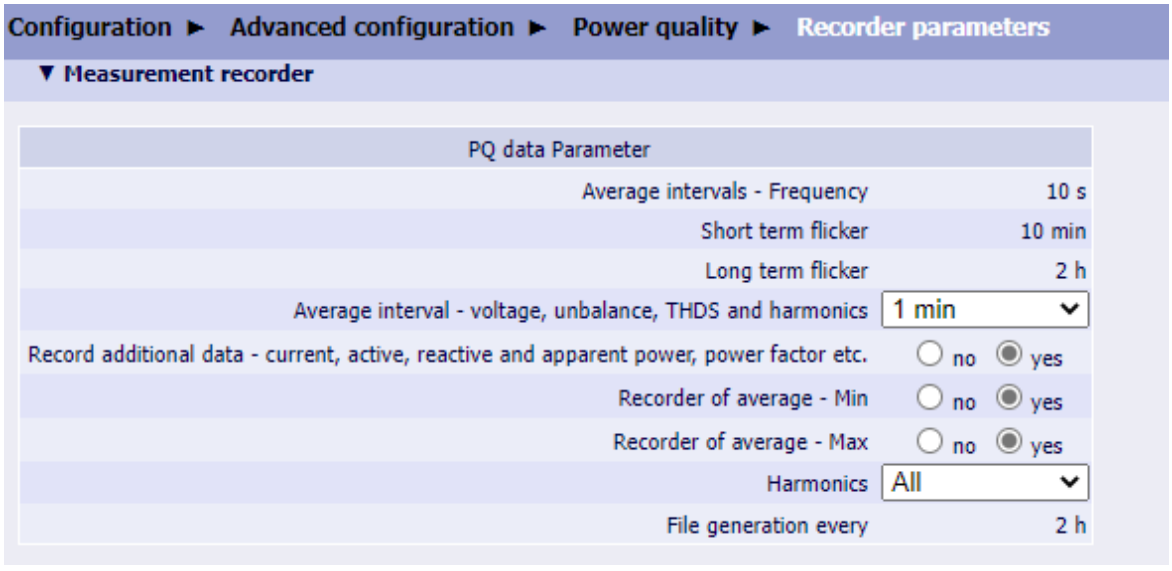
The intervals of aggregation data are defined according to the parameter **Aggregation interval**. The intervals of PQDIF files are defined according to the parameter **File generation interval**.

6.6.2 Configuration and Value View via Web Pages

Configuration of the Measurement Records

To change the settings of the measurement records in the **Configuration** tab, proceed as follows:

- In the navigation window, click **Recorder parameters**.



[sc_config_recorder_parameters, 1, en_US]

Figure 6-24 Configuration Tab, Measurement Records

NOTE

The voltage is recorded in the following network types:

- 1-phase network
- 3P4W (3 phases/4 wires): balanced and unbalanced
- 3P3W (3 phases/3 wires): balanced, unbalanced (2 * I), and unbalanced (3 * I)

- Configure the respective parameters according to the following table.

Table 6-18 Settings for Measurement Records (only SICAM P855)

Parameter	Default Setting	Setting Range	
Average intervals - Frequency	10 s	fixed	
Short term flicker	10 min	fixed	
Long term flicker	2 h	fixed	
Average interval - Voltage / Unbalance / THDS / Harmonics	10 min	1 min 10 min	
Record additional data (I, P, Q, S etc.)	no	no yes	
Recorder of average - Min	no	no yes	
Recorder of average - Max	no	no yes	
Harmonics	Odd	Even Odd All	
File generation every: (corresponds to the setting of the Average interval parameter) The created PQDIF files can be downloaded via the Web pages or the IEC 61850 protocol.	24 h	**At average interval:**	**File generation every:**
		1 min	2 h (fixed)
		10 min	2 h 24 h

- After the parameterization, click **Send**.
- In the navigation window, click **Activation and cancel**.
- Enter the activation password (refer to *Table 2-3*).
- Click **Activation**.

Value View of the Measurement Records

To display the measurement records in the **Value view** tab, proceed as follows:

- In the navigation window, click **Records**.
- Configure the respective parameters in the list boxes according to the following tables.

Table 6-19 Settings for Viewing the Measurement Records

Parameter	Default Setting	Setting Range
Record type	Measurement records	Trend records Measurement records
Measurement Records		
Start time	Current time	Any with calendar function Time format: depends on date/time format config.
End time	Not settable One hour after **Start time**	
Measurement source	Frequency 10 s	Acc. to list box
Measurements	f - 10 s	The selectable **Measurements** depend on the selected **Measurement Source**.

Parameter	Default Setting	Setting Range
Aggregation Type (The aggregation type is not displayed if the frequency is 10 s and flicker)	AVG	AVG MIN (not for harmonics) MAX
Measurement output	Table	Table Diagram

- Select one of the following **Measurement output** options:
  - **Table**
    If you select **Table**, click **Display**.
    The determined results are displayed in a table. In the multi-page tables, you can show the forward and backward pages with the **>>** and **<<** buttons. If you want to view a certain page, enter the page number at the bottom and click **show**.
  - **Diagram**
    If you select **Diagram**, click **Display**.

6.6.3 Clearing of Measurement Records

To clear the measurement records, refer to *7.2 Clearing of Data*.

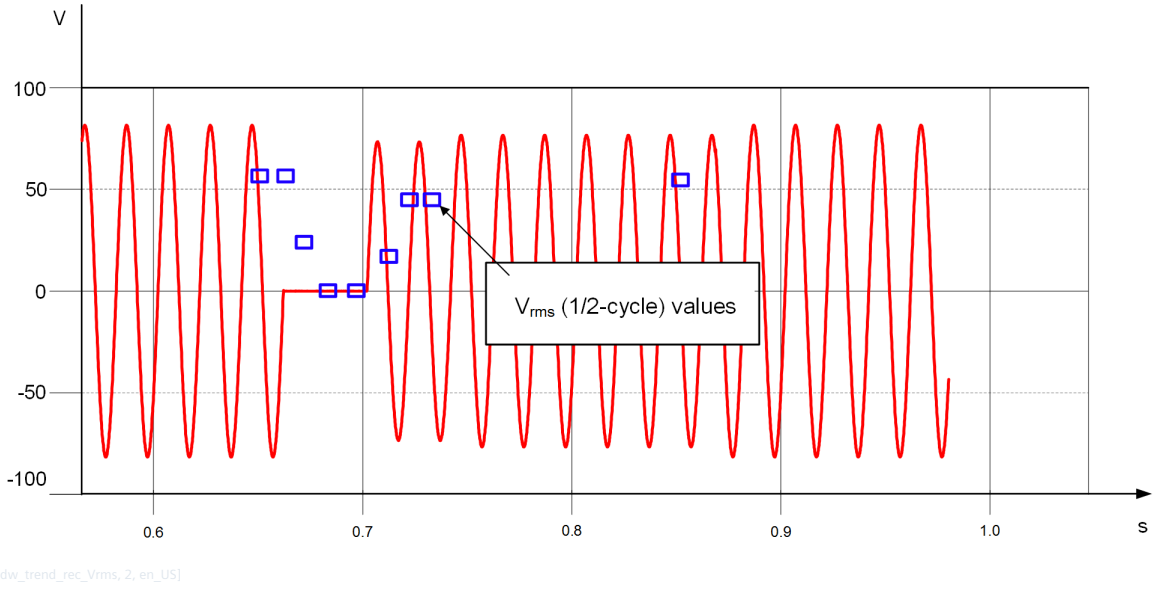
6.7 Trend Records

6.7.1 Function Description

NOTE

This function is only available in SICAM P855.

The function **Trend records** ensures the acquisition and long-term monitoring of the voltage V_{rms} (1/2-cycle) values during voltage changes. The function **Trend records** compares the 1/2-cycle RMS value calculated from measured value with last recorded 1/2-cycle RMS value in every 1/2 cycle. If the difference exceeds or falls below the **Tolerance number**, the new 1/2-cycle RMS value is recorded.



[dw_trend_rec_Vrms, 2, en_US]

Figure 6-25 Example for Voltage Changes

Once the measuring interval ends, the next measuring interval starts automatically. You can set the following parameters via the Web pages:

- Tolerance number
- Maximum recording interval

Table 6-20 Recording and Evaluation

Measured Quantities	PQDIF
Va	x
Vb	x
Vc	x
Vab	x
Vbc	x
Vca	x

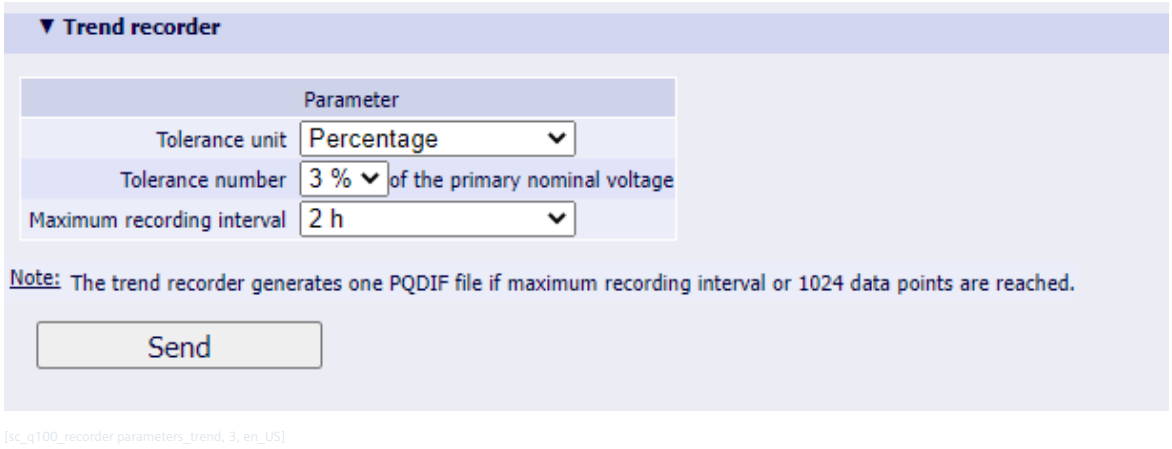
- Interfaces: protocols IEC61850, HTML
- Conditions: 1/2 cycle, RMS values

6.7.2 Configuration and Value View via Web Pages

Configuration of the Trend Records

To change the settings of the **Trend records** in the **Configuration** tab, proceed as follows:

- In the navigation window, click **Recorder parameters**.



[sc_q100_recorder parameters_trend, 3, en_US]

Figure 6-26 Configuration Tab, Trend Recorder

- Configure the respective parameters according to the following table.

Table 6-21 Settings for Trend Records (only SICAM P855)

Parameter	Default Setting	Setting Range
Tolerance unit	Percentage	Percentage Numerical
Tolerance number	Percentage: 3 % of the primary nominal voltage Numerical: 0.5 V	1 % to 5 %, increments of 1 % 0.2 V to 500.0 V
Maximum recording interval	2 h	2 h 24 h

- After the parameterization, click **Send**.
- In the navigation window, click **Activation and cancel**.
- Enter the activation password (refer to *Table 2-3*).
- Click **Activation**.

File Generation of the Trend Records

The trend records can be displayed via the Web pages or saved as PQDIF files. The PQDIF files of the trend records can be sent to the PQS and the Analyzer for the event evaluation via the IEC 61850 protocol.

The trend values are recorded when they exceed or fall below the configured **Tolerance number**. The associated generation of a PQDIF file starts after the configured **Maximum recording interval** reaches, for example, 24 h.

Value View of the Trend Records

To display the trend records in the **Value view** tab, proceed as follows:

- In the navigation window, click **Records**.
- Configure the respective parameters according to the following table.

Table 6-22 Settings for Viewing the Trend Records

Parameter	Default Setting	Setting Range
Record type	Measurement records	Trend records Measurement records
Trend Records		
Query method (only for trend records query)	By time	By time By event
By time		
- Start time	Current time	Any with calendar function Time format: depends on date/time format config.
- End time	Not settable 1 h after **Start time**	
By event		
- Event list	Selection of a displayed event	
Measurement Source	Voltage	Voltage
Measurements	Va	Va, Vb, Vc, Vab, Vbc, Vca
Measurement output	Table	Table Diagram

- Select one of the following **Measurement output** options:
  - **Table**

    If you select **Table**, click **Display**.

    The determined results are displayed in a table. In the multi-page tables, you can show the forward and backward pages with the **>>** and **<<** buttons. If you want to view a certain page, enter the page number at the bottom and click **show**.
  - **Diagram**

    If you select **Diagram**, click **Display**.

6.8 EN 50160 Report

6.8.1 Function Description

NOTE

This function is only available in SICAM P855.

The device generates an **EN 50160 report** automatically or manually. According to the standard EN 50160, the device generates the report by analyzing the measurand including power frequency, supply voltage magnitude, flicker, voltage unbalance, harmonics, and events.

The **EN 50160 report** provides 2 templates and 1 user-defined mode:

- **EN 50160 LV&MV** and **EN 50160 HV**
  For the 2 templates, the limiting values are fixed, and the threshold values are referred to the standard EN 50160: 2010.
- **User-defined**
  In this mode, you can configure the limiting values.

When the events happen, the data is flagged in red in the measurement records.

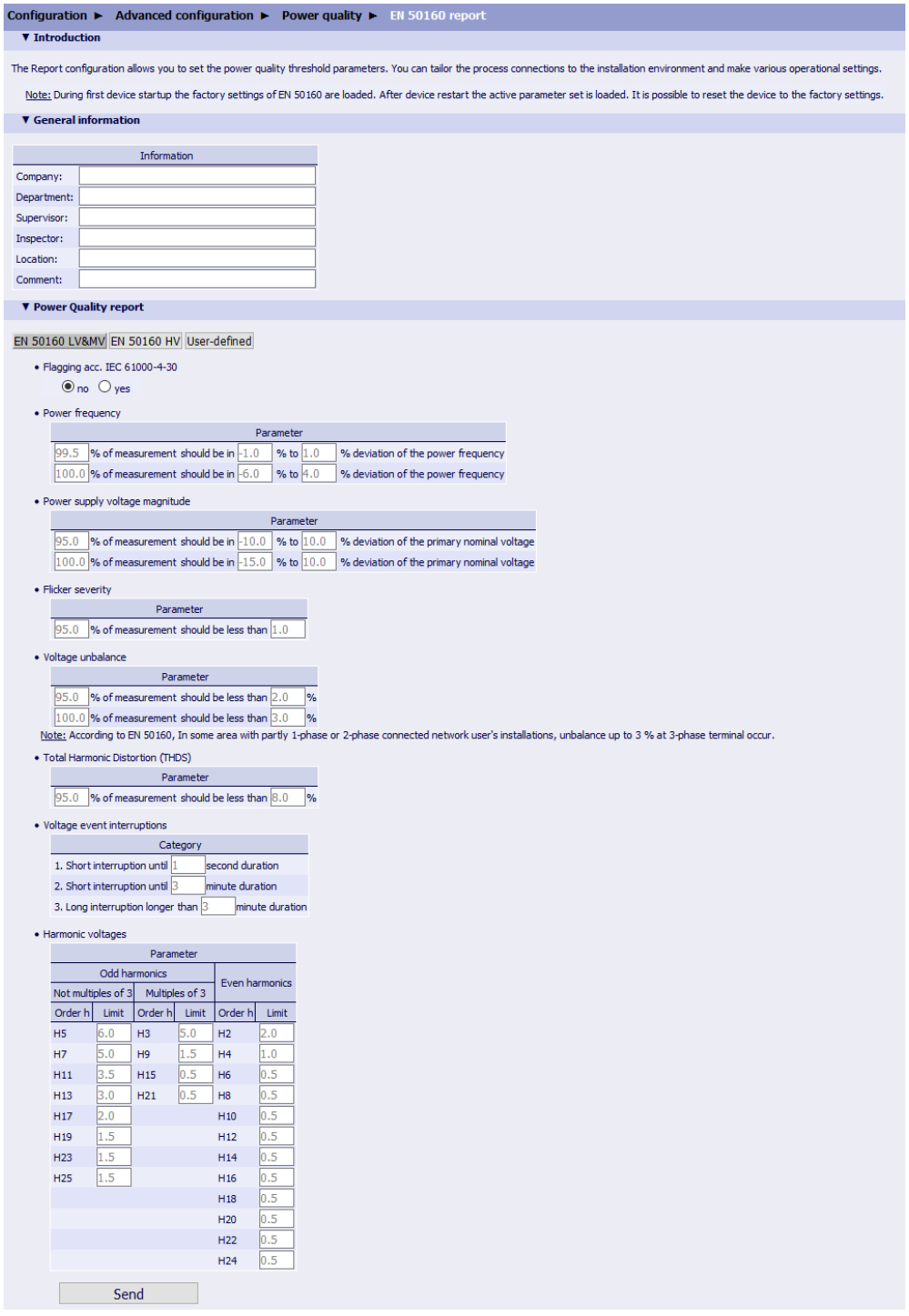
If the **Flagging acc. IEC 61000-4-30** is set as *yes*, the device hides flagged data in the EN 50160 report.

6.8.2 Configuration and Value View via Web Pages

Configuration of the EN 50160 Report

To configure the settings of the **EN 50160 report** in the **Configuration** tab, proceed as follows:

- In the navigation window, click **EN 50160 report**.



[sc_q100_report configuration, 2, en_US]

Figure 6-27 Configuration Tab, EN 50160 Report

- Configure the respective parameters according to the following table.
  For the **General information**, you can edit the text box directly.

Table 6-23 Settings for EN 50160 Report

Parameter		Default Setting	Setting Options
General Information			
Company: Department: Supervisor: Inspector: Location: Comment:		–	Any text displayed in the printout of the power-quality report Max. 32 characters
Power Quality Report			
Evaluation mode according to		EN 50160 LV&MV	• EN 50160 LV&MV • EN 50160 HV • User-defined
Flagging acc. to IEC 61000-4-30		no	no yes
Power frequency		99.5 % of the measurement should be within a deviation of -1.0 % to 1.0 %	The settings are fixed for the template of EN 50160 LV&MV and EN 50160 HV. You can edit the limiting values in the text box directly under the user-defined evaluation mode.
		100 % of the measurement should be within a deviation of -6.0 % to 4.0 %	
Power supply voltage magnitude		95 % of the measurement should be within a deviation of -10.0 % to 10.0 %	
		100 % of the measurement should be within a deviation of -15.0 % to 10.0 %	
Flicker severity		95 % of the measurement should be less than 1.0 %	
Voltage unbalance[17]		95 % of the measurement should be less than 2.0 %	
		100 % of the measurement should be less than 3.0 %	
Total harmonic distortion (THDS)		95 % of the measurement should be less than 8.0 %	
Voltage event interruptions		Short interruption until 1-second duration	
		Short interruption until 3-minute duration	
		Long interruption longer than 3-minute duration	
Harmonic voltages for the template of EN 50160 LV&MV	Odd harmonics	H3: 5.0, H5: 6.0, H7: 5.0, H9: 1.5, H11: 3.5, H13: 3.0, H15: 0.5, H17: 2.0, H19: 1.5, H21: 0.5, H23: 1.5, H25: 1.5	
	Even harmonics	H2: 2.0, H4: 1.0, H6: 0.5, H8: 0.5, H10: 0.5, H12: 0.5, H14: 0.5, H16: 0.5, H18: 0.5, H20: 0.5, H22: 0.5, H24: 0.5	
Harmonic voltages for the template of EN 50160 HV	Odd harmonics	H3: 3.0, H5: 5.0, H7: 4.0, H9: 1.3, H11: 3.0, H13: 2.5, H15: 0.5, H17: u.c.[18], H19: u.c., H21: 0.5, H23: u.c., H25: u.c.	
	Even harmonics	H2: 1.9, H4: 1.0, H6: 0.5, H8: 0.5, H10: 0.5, H12: 0.5, H14: 0.5, H16: 0.5, H18: 0.5, H20: 0.5, H22: 0.5, H24: 0.5	

17 According to the EN 50160, up to 3 % unbalance can occur in 3-wire networks in areas with many 1-wire and 2-wire connections.

18 Short for "under consideration"

- After the parameterization, click **Send**.
- In the navigation window, click **Activation and cancel**.
- Enter the activation password (refer to *Table 2-3*).
- Click **Activation**.

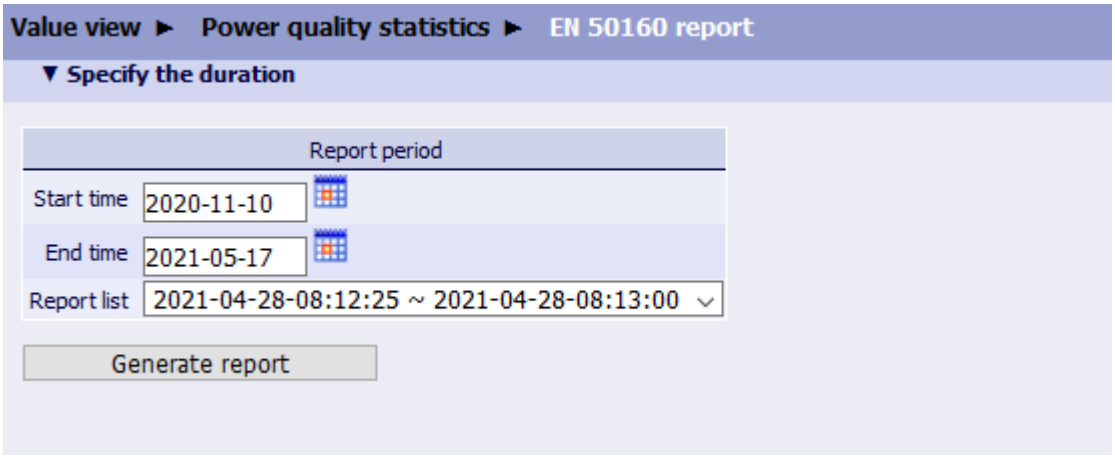
NOTE

The factory settings are based on EN 50160. If you have changed the settings, the set parameters are applied after a device restart. It is possible to reset to the factory settings.

Value View of the EN 50160 Report

To display the EN 50160 report in the **Value view** tab, proceed as follows:

- In the navigation window, click **EN 50160 report**.

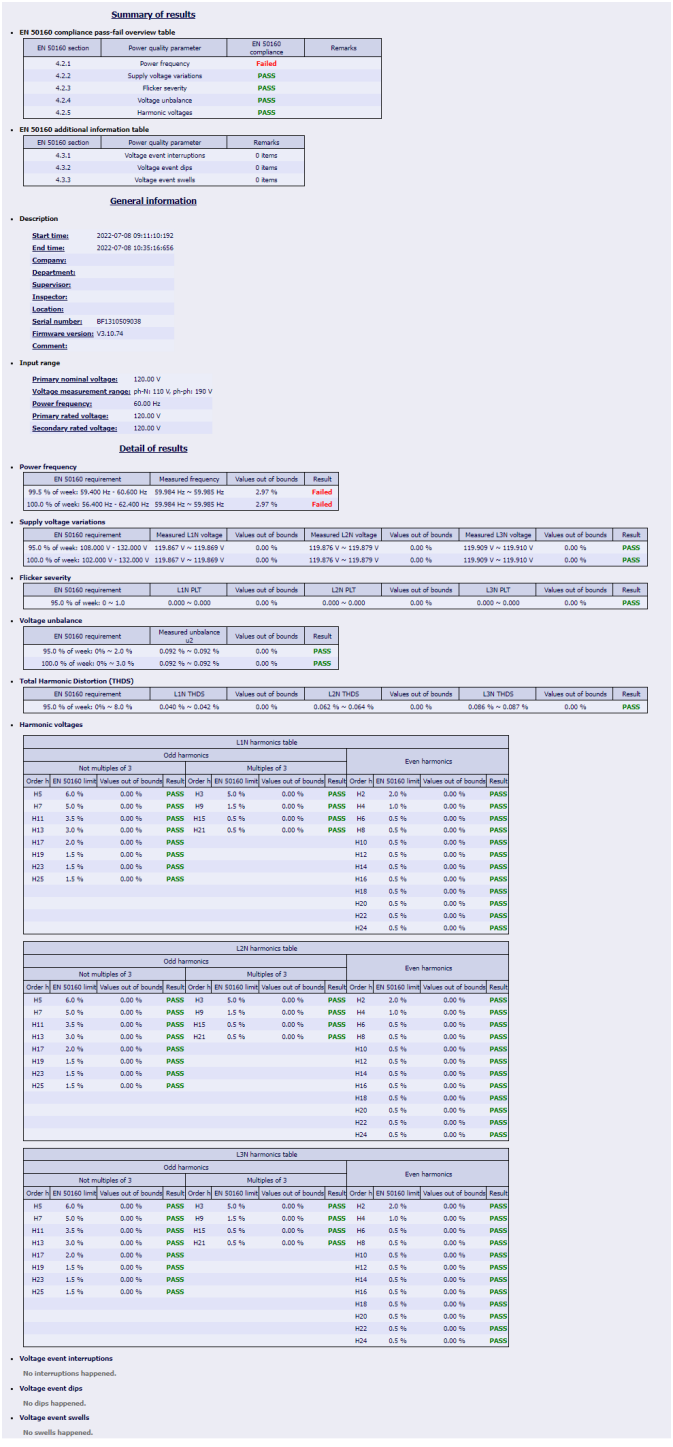


[sc_q200_PQ_Report_evalu, 3, en_US]

Figure 6-28 Value View Tab, EN 50160 Report

- Edit the text box directly or select the **Start time** and **End time** from the calendar.
- Select a report from the **Report list**.
- Click **Generate report**.

The report is displayed in a separate window and can be printed out or saved.



Summary of results

- **EN 50160 compliance pass-fail overview table**

EN 50160 section	Power quality parameter	EN 50160 compliance	Remarks
4.2.1	Power frequency	Failed	
4.2.2	Supply voltage variations	PASS	
4.2.3	Flicker severity	PASS	
4.2.4	Voltage unbalance	PASS	
4.2.5	Harmonic voltages	PASS	

- **EN 50160 additional information table**

EN 50160 section	Power quality parameter	Remarks
4.3.1	Voltage event interruptions	0 items
4.3.2	Voltage event dips	0 items
4.3.3	Voltage event swells	0 items

General information

- **Description**

Start time:	2022-07-08 09:11:10:192
End time:	2022-07-08 10:35:16:656
Company:	
Department:	
Supervisor:	
Inspector:	
Location:	
Serial number:	BP1310509038
Firmware version:	V3.10.74
Comment:	

- **Input range**

Primary nominal voltage:	120.00 V
Voltage measurement range:	ph-N: 110 V, ph-ph: 190 V
Power frequency:	60.00 Hz
Primary rated voltage:	120.00 V
Secondary rated voltage:	120.00 V

Detail of results

- **Power frequency**

EN 50160 requirement	Measured frequency	Values out of bounds	Result
99.5 % of week: 59.400 Hz - 60.600 Hz	59.984 Hz ~ 59.985 Hz	2.97 %	Failed
100.0 % of week: 56.400 Hz - 62.400 Hz	59.984 Hz ~ 59.985 Hz	2.97 %	Failed

- **Supply voltage variations**

EN 50160 requirement	Measured L1N voltage	Values out of bounds	Measured L2N voltage	Values out of bounds	Measured L3N voltage	Values out of bounds	Result
95.0 % of week: 108.000 V - 132.000 V	119.867 V ~ 119.869 V	0.00 %	119.876 V ~ 119.879 V	0.00 %	119.909 V ~ 119.910 V	0.00 %	PASS
100.0 % of week: 102.000 V - 132.000 V	119.867 V ~ 119.869 V	0.00 %	119.876 V ~ 119.879 V	0.00 %	119.909 V ~ 119.910 V	0.00 %	PASS

- **Flicker severity**

EN 50160 requirement	L1N PLT	Values out of bounds	L2N PLT	Values out of bounds	L3N PLT	Values out of bounds	Result
95.0 % of week: 0 ~ 1.0	0.000 ~ 0.000	0.00 %	0.000 ~ 0.000	0.00 %	0.000 ~ 0.000	0.00 %	PASS

- **Voltage unbalance**

EN 50160 requirement	Measured unbalance u2	Values out of bounds	Result
95.0 % of week: 0% ~ 2.0 %	0.092 % ~ 0.092 %	0.00 %	PASS
100.0 % of week: 0% ~ 3.0 %	0.092 % ~ 0.092 %	0.00 %	PASS

- **Total Harmonic Distortion (THDS)**

EN 50160 requirement	L1N THDS	Values out of bounds	L2N THDS	Values out of bounds	L3N THDS	Values out of bounds	Result
95.0 % of week: 0% ~ 8.0 %	0.040 % ~ 0.042 %	0.00 %	0.062 % ~ 0.064 %	0.00 %	0.086 % ~ 0.087 %	0.00 %	PASS

- **Harmonic voltages**

L1N harmonics table

Odd harmonics								Even harmonics			
Not multiples of 3				Multiples of 3							
Order h	EN 50160 limit	Values out of bounds	Result	Order h	EN 50160 limit	Values out of bounds	Result	Order h	EN 50160 limit	Values out of bounds	Result
H5	6.0 %	0.00 %	PASS	H3	5.0 %	0.00 %	PASS	H2	2.0 %	0.00 %	PASS
H7	5.0 %	0.00 %	PASS	H9	1.5 %	0.00 %	PASS	H4	1.0 %	0.00 %	PASS
H11	3.5 %	0.00 %	PASS	H15	0.5 %	0.00 %	PASS	H6	0.5 %	0.00 %	PASS
H13	3.0 %	0.00 %	PASS	H21	0.5 %	0.00 %	PASS	H8	0.5 %	0.00 %	PASS
H17	2.0 %	0.00 %	PASS					H10	0.5 %	0.00 %	PASS
H19	1.5 %	0.00 %	PASS					H12	0.5 %	0.00 %	PASS
H23	1.5 %	0.00 %	PASS					H14	0.5 %	0.00 %	PASS
H25	1.5 %	0.00 %	PASS					H16	0.5 %	0.00 %	PASS
								H18	0.5 %	0.00 %	PASS
								H20	0.5 %	0.00 %	PASS
								H22	0.5 %	0.00 %	PASS
								H24	0.5 %	0.00 %	PASS

L2N harmonics table

Odd harmonics								Even harmonics			
Not multiples of 3				Multiples of 3							
Order h	EN 50160 limit	Values out of bounds	Result	Order h	EN 50160 limit	Values out of bounds	Result	Order h	EN 50160 limit	Values out of bounds	Result
H5	6.0 %	0.00 %	PASS	H3	5.0 %	0.00 %	PASS	H2	2.0 %	0.00 %	PASS
H7	5.0 %	0.00 %	PASS	H9	1.5 %	0.00 %	PASS	H4	1.0 %	0.00 %	PASS
H11	3.5 %	0.00 %	PASS	H15	0.5 %	0.00 %	PASS	H6	0.5 %	0.00 %	PASS
H13	3.0 %	0.00 %	PASS	H21	0.5 %	0.00 %	PASS	H8	0.5 %	0.00 %	PASS
H17	2.0 %	0.00 %	PASS					H10	0.5 %	0.00 %	PASS
H19	1.5 %	0.00 %	PASS					H12	0.5 %	0.00 %	PASS
H23	1.5 %	0.00 %	PASS					H14	0.5 %	0.00 %	PASS
H25	1.5 %	0.00 %	PASS					H16	0.5 %	0.00 %	PASS
								H18	0.5 %	0.00 %	PASS
								H20	0.5 %	0.00 %	PASS
								H22	0.5 %	0.00 %	PASS
								H24	0.5 %	0.00 %	PASS

L3N harmonics table

Odd harmonics								Even harmonics			
Not multiples of 3				Multiples of 3							
Order h	EN 50160 limit	Values out of bounds	Result	Order h	EN 50160 limit	Values out of bounds	Result	Order h	EN 50160 limit	Values out of bounds	Result
H5	6.0 %	0.00 %	PASS	H3	5.0 %	0.00 %	PASS	H2	2.0 %	0.00 %	PASS
H7	5.0 %	0.00 %	PASS	H9	1.5 %	0.00 %	PASS	H4	1.0 %	0.00 %	PASS
H11	3.5 %	0.00 %	PASS	H15	0.5 %	0.00 %	PASS	H6	0.5 %	0.00 %	PASS
H13	3.0 %	0.00 %	PASS	H21	0.5 %	0.00 %	PASS	H8	0.5 %	0.00 %	PASS
H17	2.0 %	0.00 %	PASS					H10	0.5 %	0.00 %	PASS
H19	1.5 %	0.00 %	PASS					H12	0.5 %	0.00 %	PASS
H23	1.5 %	0.00 %	PASS					H14	0.5 %	0.00 %	PASS
H25	1.5 %	0.00 %	PASS					H16	0.5 %	0.00 %	PASS
								H18	0.5 %	0.00 %	PASS
								H20	0.5 %	0.00 %	PASS
								H22	0.5 %	0.00 %	PASS
								H24	0.5 %	0.00 %	PASS

- **Voltage event interruptions**

No interruptions happened.

- **Voltage event dips**

No dips happened.

- **Voltage event swells**

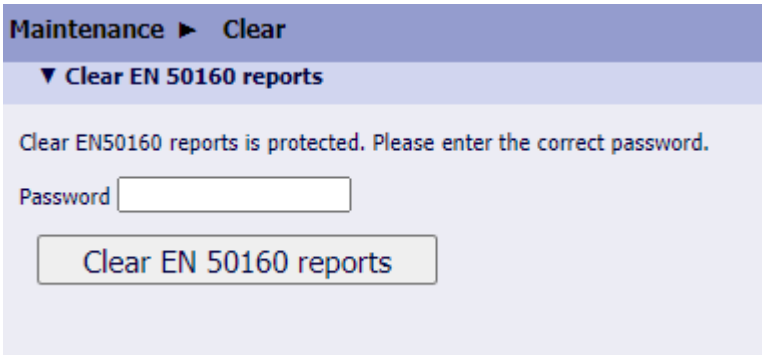
No swells happened.

[sc_EN 50160_report, 2, en_US]

6.8.3 Clearing of EN 50160 Reports

To clear the EN 50160 reports in the **Maintenance** tab, proceed as follows:

- In the navigation window, click **EN 50160 Reports**.



[sc_clear_EN 50160_reports, 1, en_US]

Figure 6-29 Maintenance Tab, Clear EN 50160 Reports

- Enter the maintenance password (refer to *Table 2-4*).
- Click **Clear EN 50160 reports**.
  The EN 50160 reports are cleared. The **Action was successful** indication is displayed on the status bar.

7 Display and Other Functions

7.1 Display and Display Settings

7.1.1 Function Description

In the **Configuration** tab, you can view and edit the display settings under the HMI menu. The menu includes 2 parts:

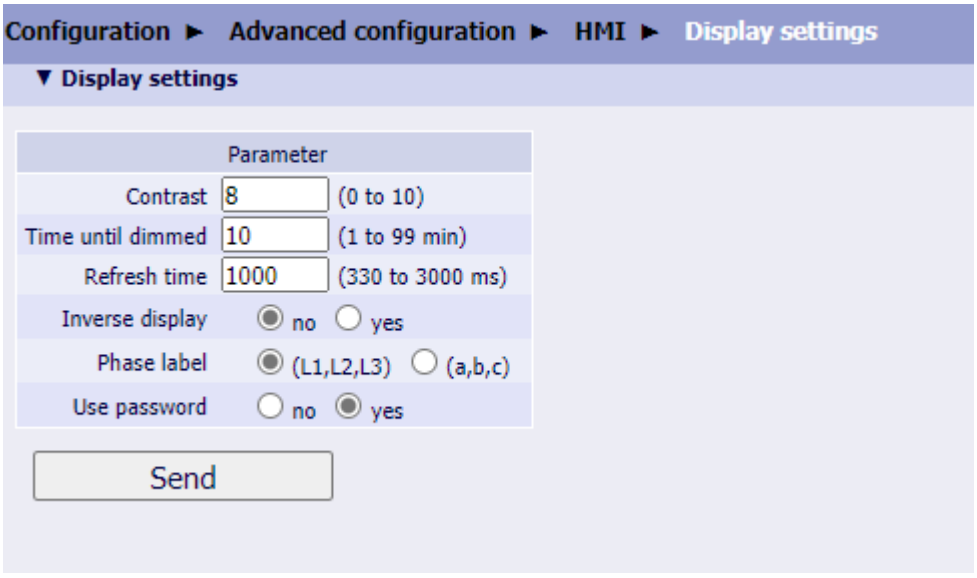
- Display settings
- User-defined screen

7.1.2 Configuration via Web Pages

Configuration of Display Settings

To configure the display settings in the **Configuration** tab, proceed as follows:

- In the navigation window, click **Display settings**.



[sc_display_settings, 1, en_US]

Figure 7-1 Configuration Tab, Display Settings

- Configure the respective parameters according to the following table.

Table 7-1 Settings for Display

Parameter	Default Setting	Setting Range
Contrast	8	0 to 10
Time until dimmed	10	1 min to 99 min
Refresh time	1000	330 ms to 3000 ms
Inverse display	no	no yes
Phase label	(L1, L2, L3)	(L1, L2, L3) (a, b, c)

- After the parameterization, click **Send**.
- In the navigation window, click **Activation and cancel**.

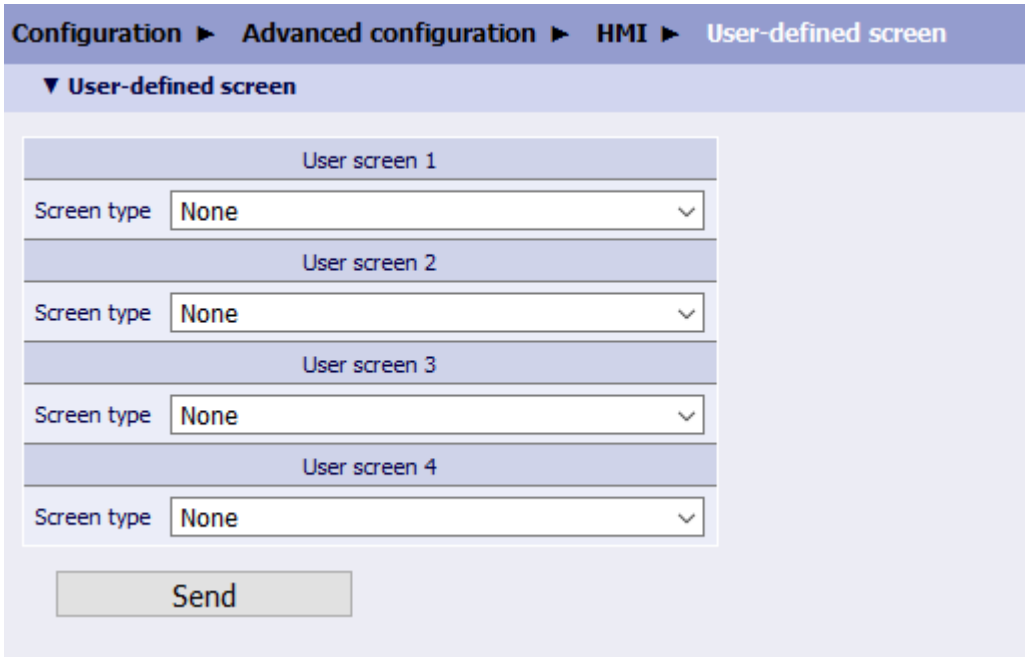
- Enter the activation password (refer to *Table 2-3*).
- Click **Activation**.

Configuration of the User-Defined Screen

In the **User-defined screen** dialog, you can parameterize up to 4 different **User screens**. Each screen type allows you to select whether to display the measured values numerically (2 or 4 measured values) or graphically and numerically (2 or 3 measured values). To select which of the 4 screens are presently displayed on the device, use the device softkeys and the Web browser.

To configure the **User-defined screen** values in the **Configuration** tab, proceed as follows:

- In the navigation window, click **User-defined screen**.



[sc_user-defined_configuration, 2, en_US]

Figure 7-2 Configuration Tab, User-Defined Screen

- Configure the respective parameters according to the following table.

Table 7-2 Settings for User-Defined Screen

Parameter	Default Setting	Setting Range
Screen type	None[19]	None 2 measured values, numerical 4 measured values, numerical 2 measured values, graphical + numerical 3 measured values, graphical + numerical
Screen name	USER_SCREEN_x (x = 1 to 4)	You can update and edit it directly. Max. 18 characters Only English and German letters, numbers, and special characters are permitted.

19 If you have not made any selection, the displays explained in the following do not exist.

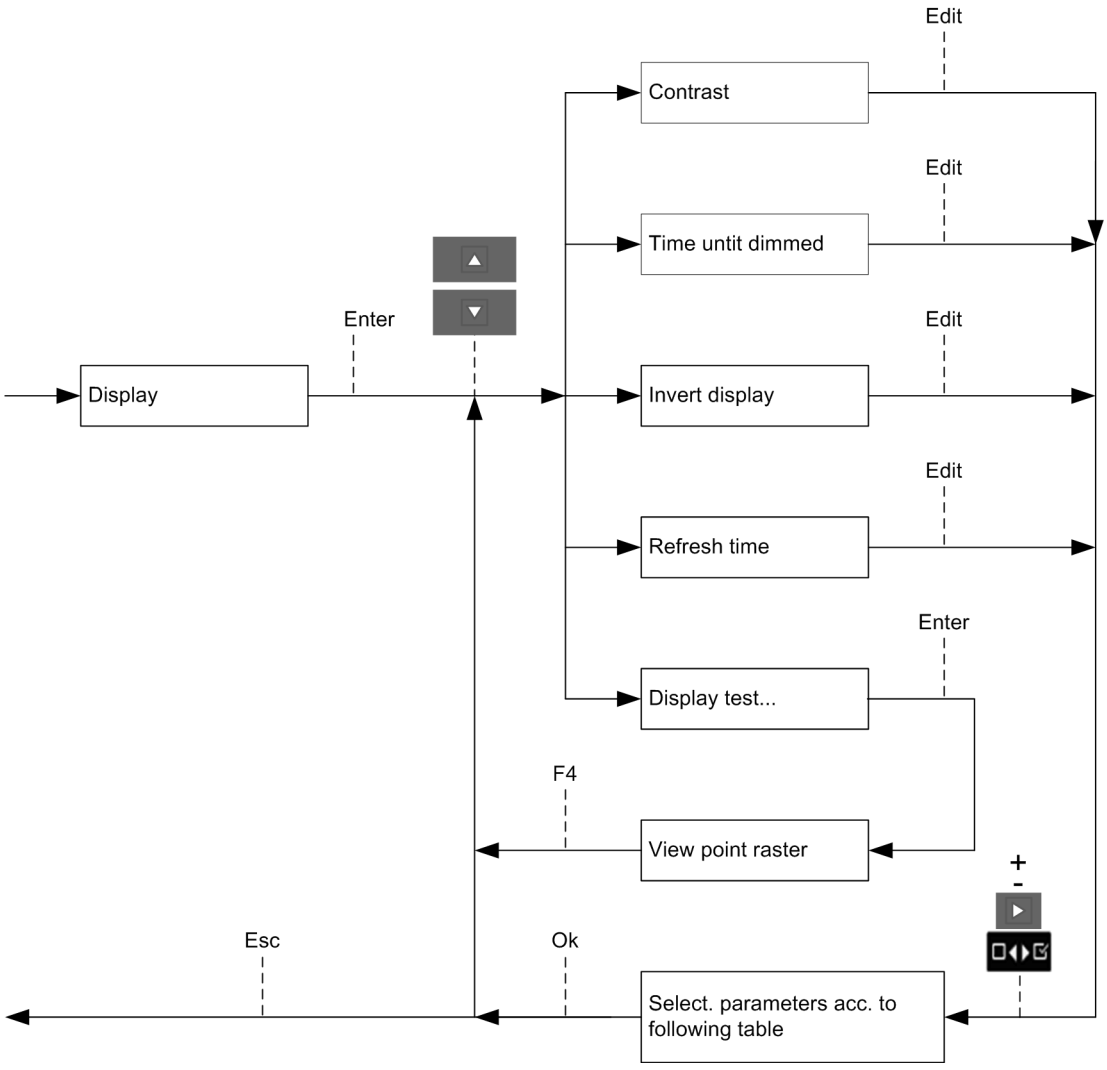
Parameter	Default Setting	Setting Range
2 measured values, numerical: • Display 1, numerical • Display 2, numerical	-not assigned-	The selection of measured values depends on the network type. Designation can be changed during the parameterization.
4 measured values, numerical: • Display 1, numerical • Display 2, numerical • Display 3, numerical • Display 4, numerical	-not assigned-	
2 measured values, graphical, and numerical: • Display 1, graph./num. • Display 2, graph./num.	-not assigned-	
3 measured values, graphical, and numerical: • Display 1, graph./num. • Display 2, graph./num. • Display 3, graph./num.	-not assigned-	
Display x, graph./num. (x = 1 to 3) • Min value • Max value	Unit according to measured value 1.0 10.0	The selected parameters are used to define the minimum and maximum values.

- After the parameterization, click **Send**.
- In the navigation window, click **Activation and cancel**.
- Enter the activation password (refer to *Table 2-3*).
- Click **Activation**.

7.1.3 Configuration via Display

Submenu Display

In the main menu, select **Settings** → **Display**.



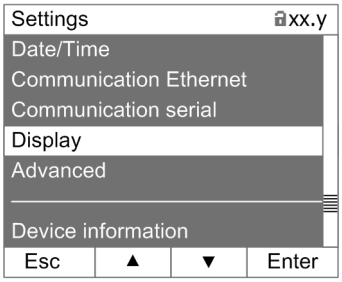
[dw_submenu_display, 1, en_US]

Figure 7-3 Submenu Display

Table 7-3 Settings for Display

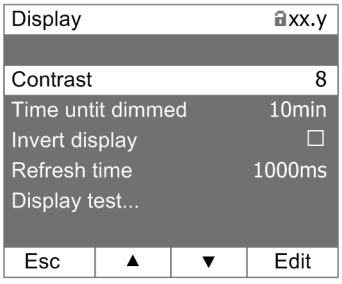
Parameter	Default Setting	Setting Range
Contrast	8	0 to 10
Time until dimmed	10	1 min to 99 min
Invert display	no	no yes
Refresh time	1000	330 ms to 3000 ms
Display test	View point raster	No setting range

The following interface displays are available:



[dw_display_settings, 1, en_US]

Figure 7-4 Display Settings

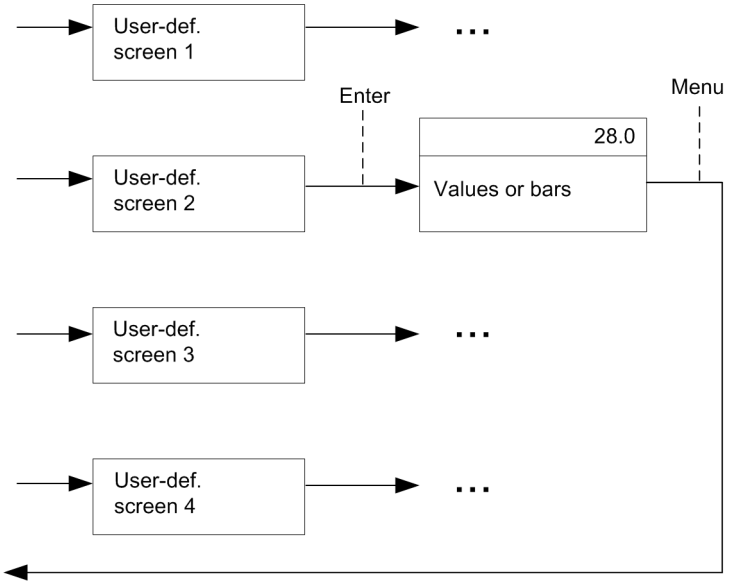


[dw_display_contrast, 1, en_US]

Figure 7-5 Display Content

User-Defined Screens

The user-defined screens are visible on the display only if they were activated via the Web pages (see *Configuration of the User-Defined Screen, Page 161*).



[dw_user-defined_screen, 1, en_US]

Figure 7-6 User-Defined Screens

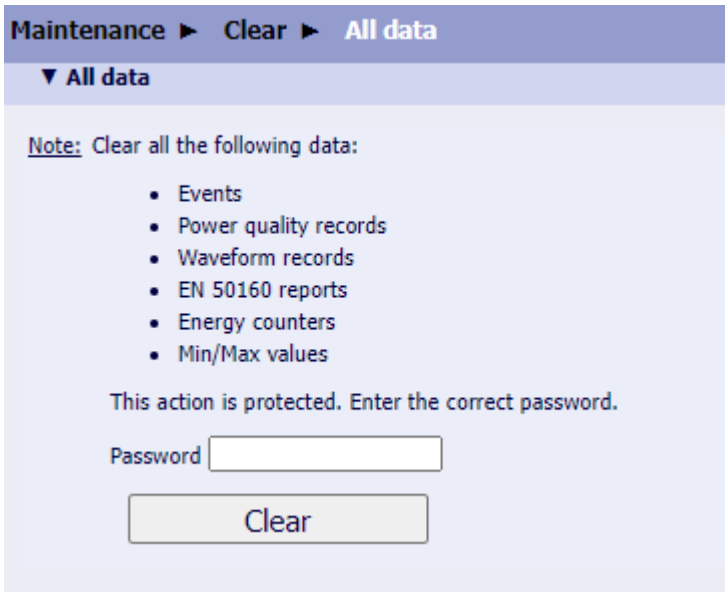
NOTE

Depending on the display type selected, the measured values are displayed numerically or as bars.

7.2 Clearing of Data

If you want to clear all data in the **Maintenance** tab, proceed as follows:

- In the navigation window, click **Clear data**.



[sc_clear_all_data, 1, en_US]

Figure 7-7 Maintenance Tab, Clear Data

- Enter the maintenance password (refer to *Table 2-4*).
- Click **Clear**.

7.3 File Download

7.3.1 Function Description

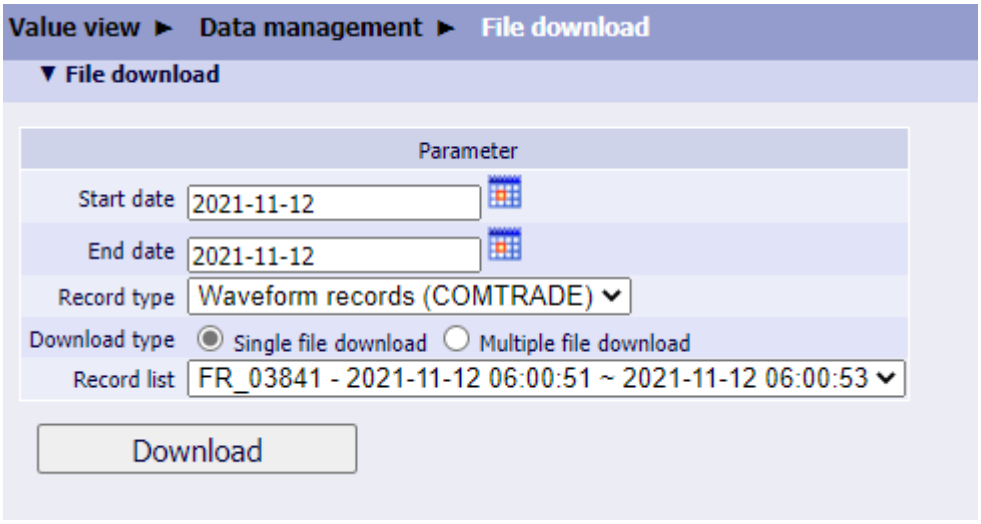
The device provides the file download function. You can download the data in a standard format from the **File download** window. The following data formats are available:

- Trend records (only SICAM P855): PQDIF files
- Measurement records (only SICAM P855): PQDIF files
- Waveform records: COMTRADE files

7.3.2 File Download via Web Pages

To change the settings of the file download in the **Value view** tab, proceed as follows:

- In the navigation window, click **File download**.



[sc_single_file_download, 1, en_US]

Figure 7-8 Value View Tab, File Download

- Configure the respective parameters according to the following table.

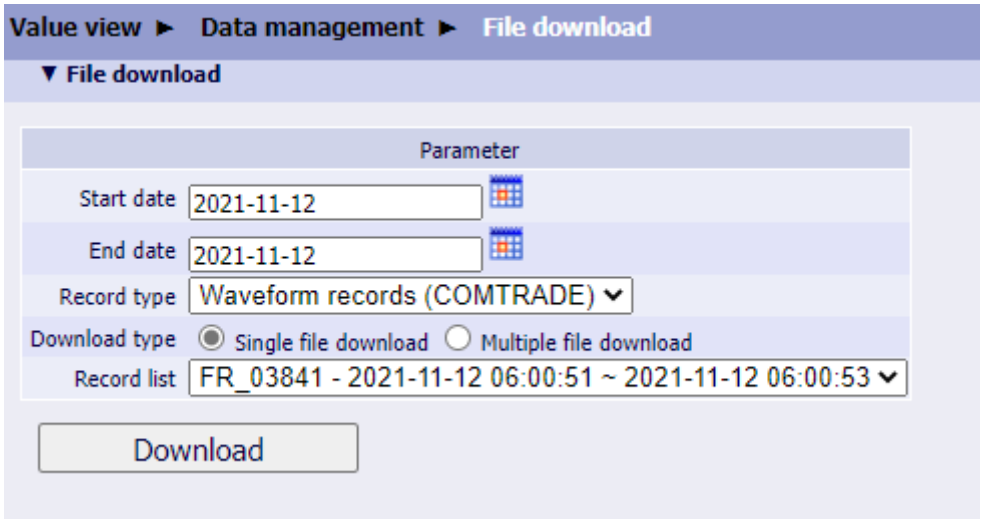
Table 7-4 Settings for File Download

Parameter	Default Setting	Setting Options
Start date	Current date	You can edit the text box directly or select the start date from the calendar.
End date	Current date	You can edit the text box directly or select the end date from the calendar.
Record type	Waveform records (COMTRADE)	• Trend records (PQDIF) (only SICAM P855) • Measurement records (PQDIF) (only SICAM P855) • Waveform records (COMTRADE)
Download type	Single file download	• Single file download • Multiple file download
Record list	None	File list fulfilled the preceding parameters

7.3.3 Single File Download

For a **Single file download**, proceed as follows:

- Select the **Single file download** as the **Download type**.
  All the records during this interval are displayed in the **Record list**.
- Select a record in the **Record list**.



[sc_single_file_download, 1, en_US]

Figure 7-9 Record List – Single File Download

- Click **Download**.
  During the download progress, the selected files are stored in the specified directory. You can use the **SIGRA** software to display the transmitted data of records. Contact the Siemens Hotline for more information, see the chapter *Preface*.
  The **File Download** dialog opens. You can save or open the downloaded file.

NOTE

The button **Download** is displayed only when the **Record list** is available.

File Download > Save

- In the dialog **File download**, click **Save**.
  The **Save As** dialog opens.
- Select the file path in the **Save in** list box.
- Use the file name suggested in the **File name** list box or enter a new file name.
- Click **Save**.
  The **Download complete** dialog opens.
- In the dialog **Download complete**, click **Close**.

7.3.4 Multiple File Download via Internet Explorer

Preparation

NOTE

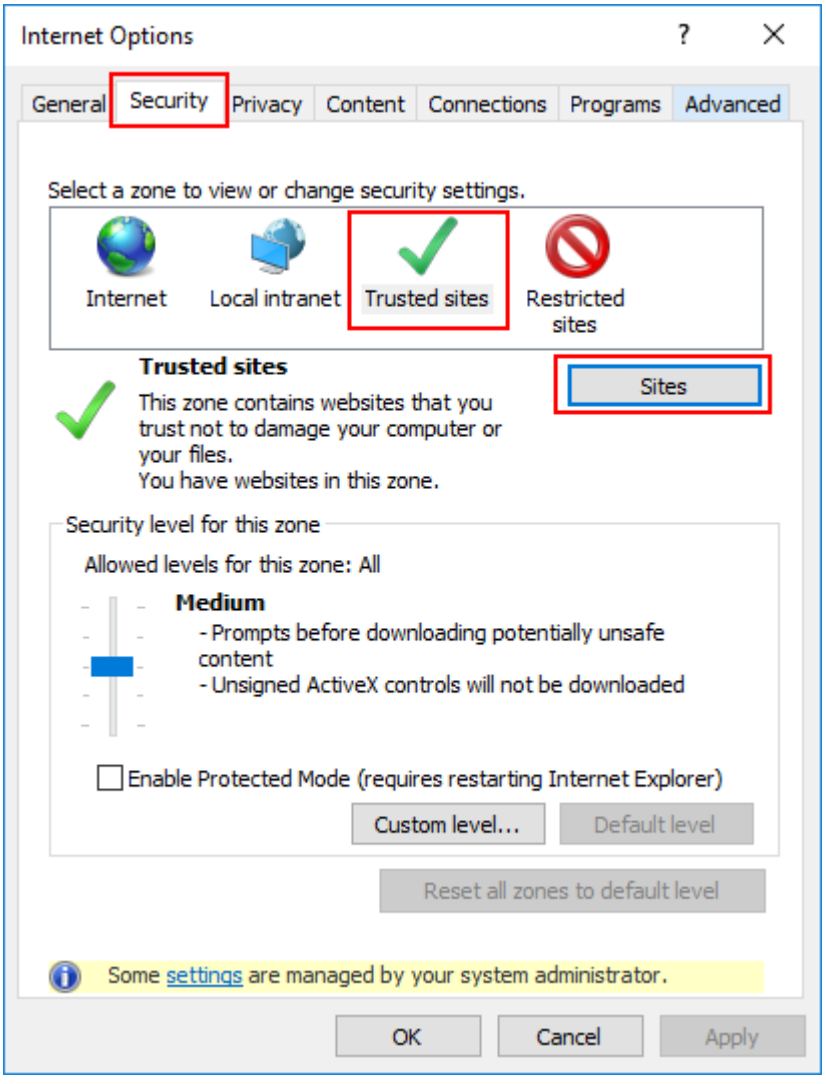
The **Multiple File Download** with Internet Explorer is identical for trend recorder, measurement recorder and waveform recorder.

For a **Multiple file download**, prepare as follows:

- Add the IP address of your device into the **Trusted sites** in the Internet Explorer
- Change the **Security** settings in the Internet Explorer
- Update the system registry

Adding the IP Address of Your Device into the Trusted Sites

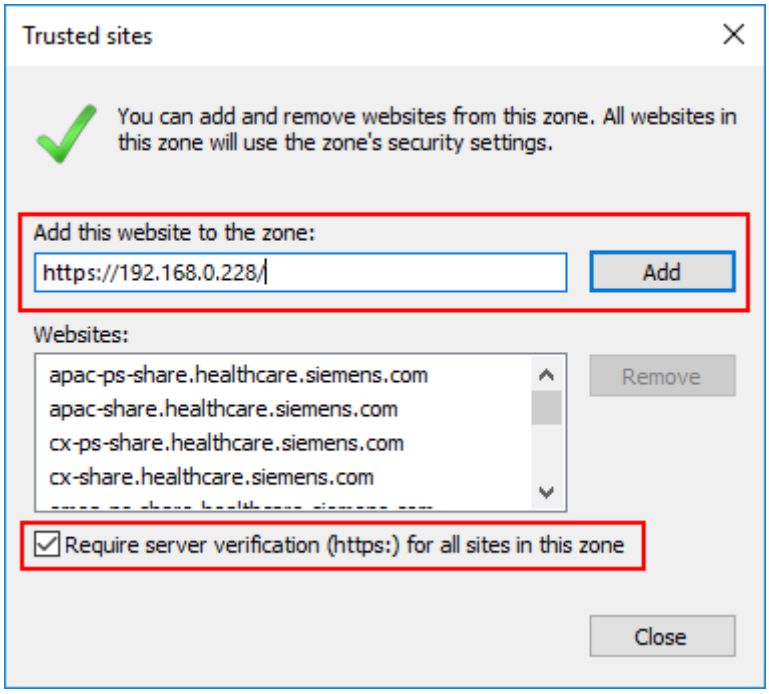
- Open the Internet Explorer, for example, Internet Explorer 11, and select **Tools** → **Internet Options**.
- In the **Security** tab, select **Trusted sites** and click **Sites**.



[sc_multiple download_sites, 1, en_US]

Figure 7-10 Sites

- Enter the IP address of your device and click **Add**.
  Ensure that the IP address of your device is added in the **Websites** list box.



[sc_multiple download_trusted sites, 1, en_US]

Figure 7-11 Trusted Sites

NOTE

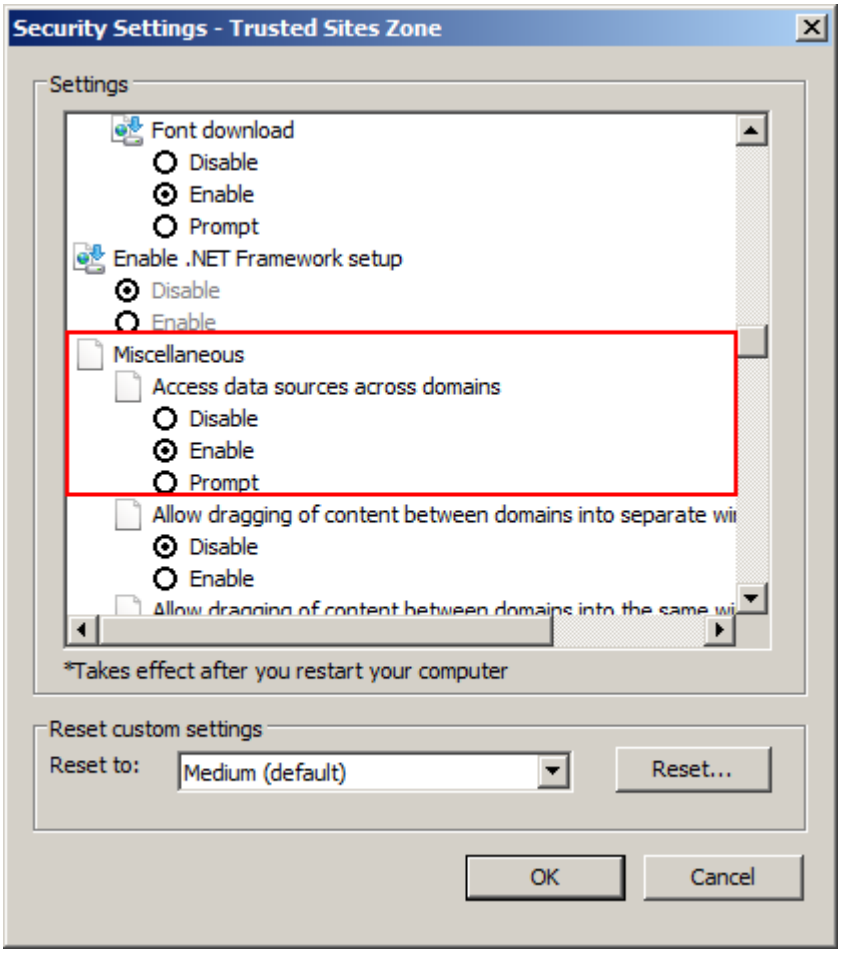
Mark the check box of **Require server verification (https:) for all sites in this zone**.

Changing Security Settings

In the Internet Explorer 10.0 or higher, the following operation is mandatory:

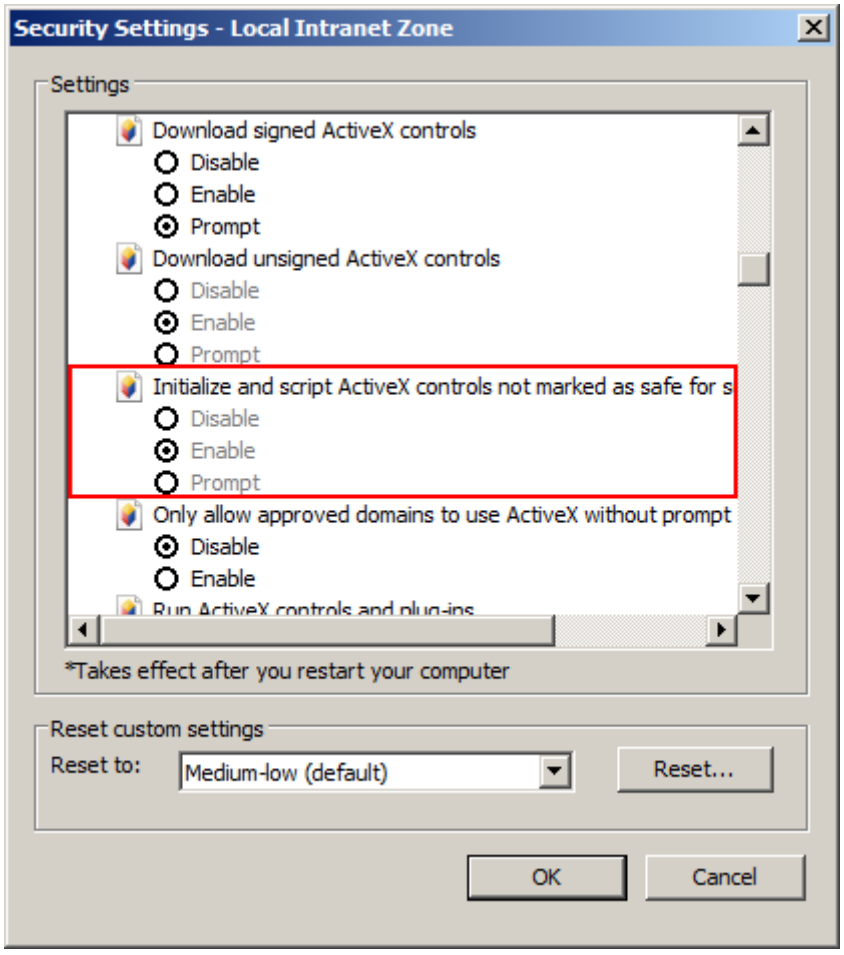
- Select **Tools** → **Internet Options** → **Security**.
- Click **Custom level**.
  The **Security Settings** dialog opens.

- Enable 2 options, the **Access data sources across domains** and the **Initialize and script ActiveX controls not marked as safe for scripting**.



[sc_security_settings, 2, en_US]

Figure 7-12 Changing Security Settings – Miscellaneous



[sc_Security_settings_trusted_site_zone, 3, en_US]

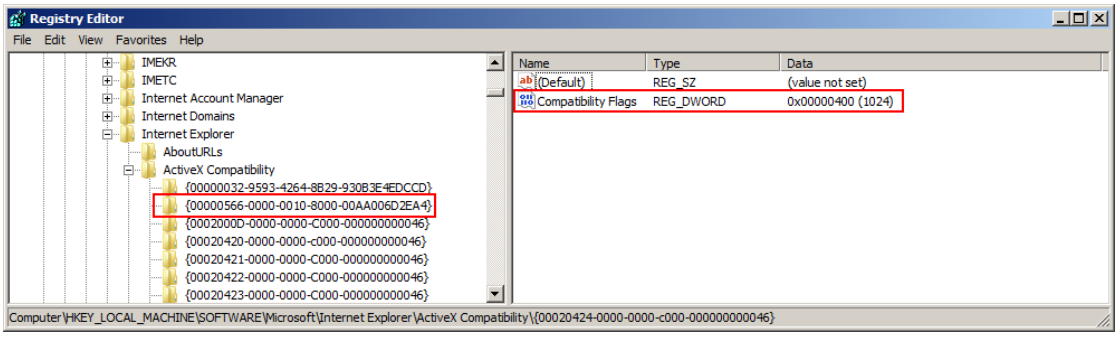
Figure 7-13 Changing Security Settings – ActiveX Controls and Plug-Ins

- Click **OK**.

Updating the System Registry

- Click the **Start** menu on the desktop.
- Enter **regedit.exe** in the **Search** box.
- Press **Enter**.
  The dialog **User Account Control** opens.
- Click **Yes**.
  The **Registry Editor** opens.

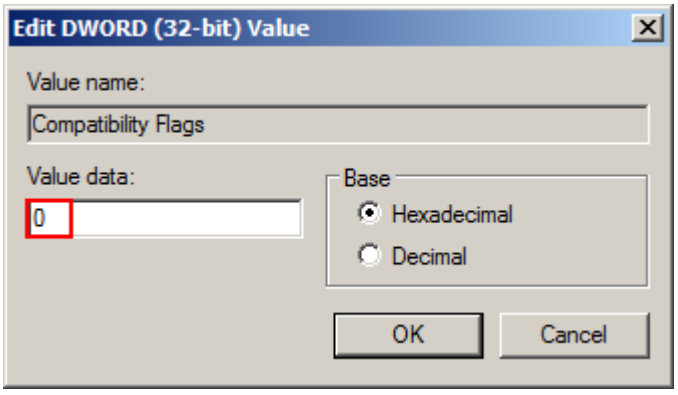
- Navigate to in the directory: HKEY_LOCAL_MACHINE\SOFTWARE\Microsoft\Internet Explorer\ActiveX Compatibility\{00000566-0000-0010-8000-00AA006D2EA4}\Compatibility Flags.



[sc_Registry_editor, 3, en_US]

Figure 7-14 Updated Registry

- Double-click **Compatibility Flags** and set the **Value data** to **0**.



[sc_Value_data, 3, en_US]

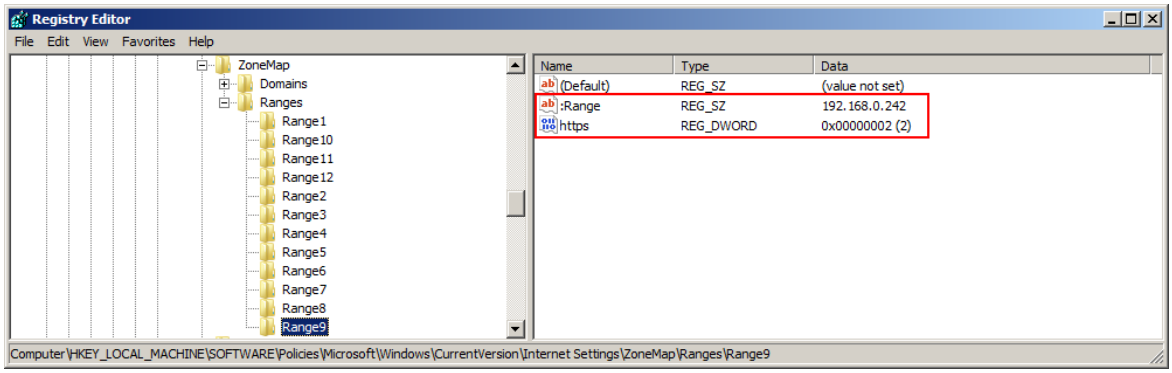
Figure 7-15 Changing the Compatibility Flag Value

- Click **OK**.
- Navigate to the directory: HKEY_LOCAL_MACHINE\SOFTWARE\Policies\Microsoft\Windows\CurrentVersion\Internet Settings\ZoneMap\Ranges.

  If there is no **Ranges** in **ZoneMap**, create a subdirectory with the name **Ranges**.
- Add a new key with the name **Rangex**.

  The key name must be different from the existing one.
- Create the following 2 values in the key:

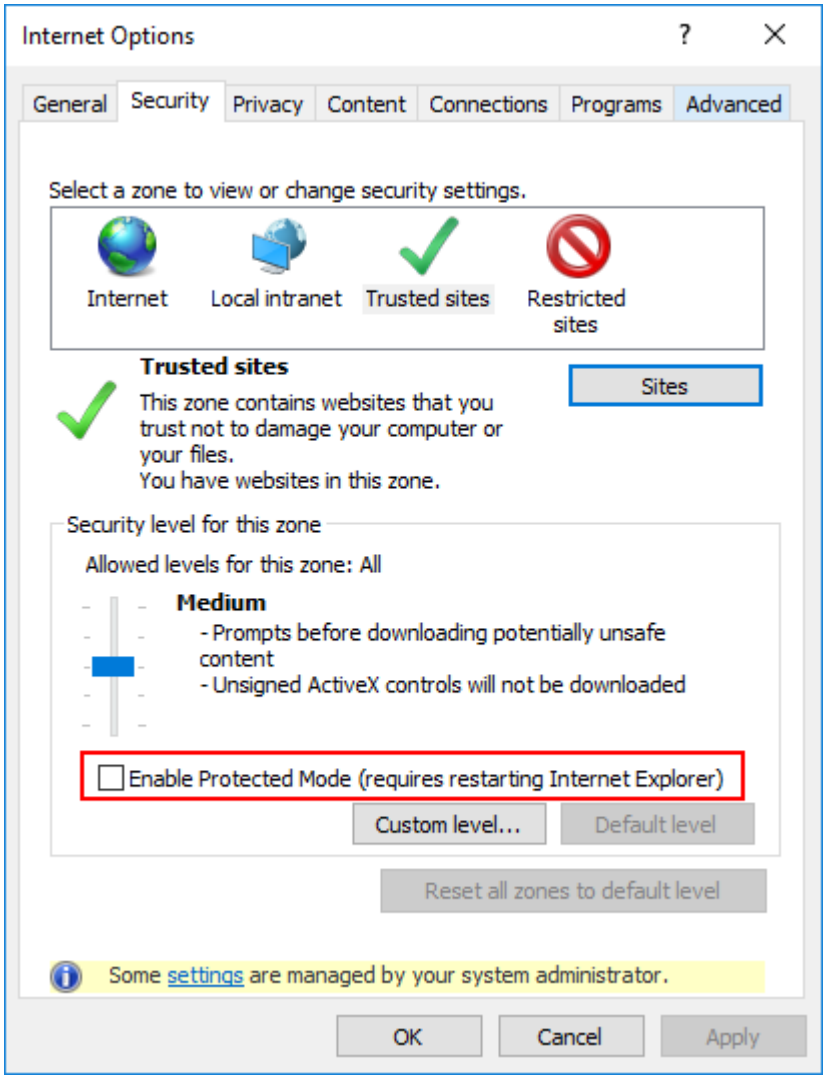
	Name	Type	Data
Type String	:Range	REG_SZ	192.168.0.xx (Same as the IP address of your device)
Type Dword	https	REG_DWORD	2



[sc_Trusted_site_adding, 3, en_US]

Figure 7-16 Example of New Keys

- Close the **Registry Editor**.
  Ensure that the check box of **Enable Protected Mode (requires restarting Internet Explorer)** in **Trusted sites** is unmarked.



[sc_protected mode_disabled, 1, en_US]

Figure 7-17 Protected Mode

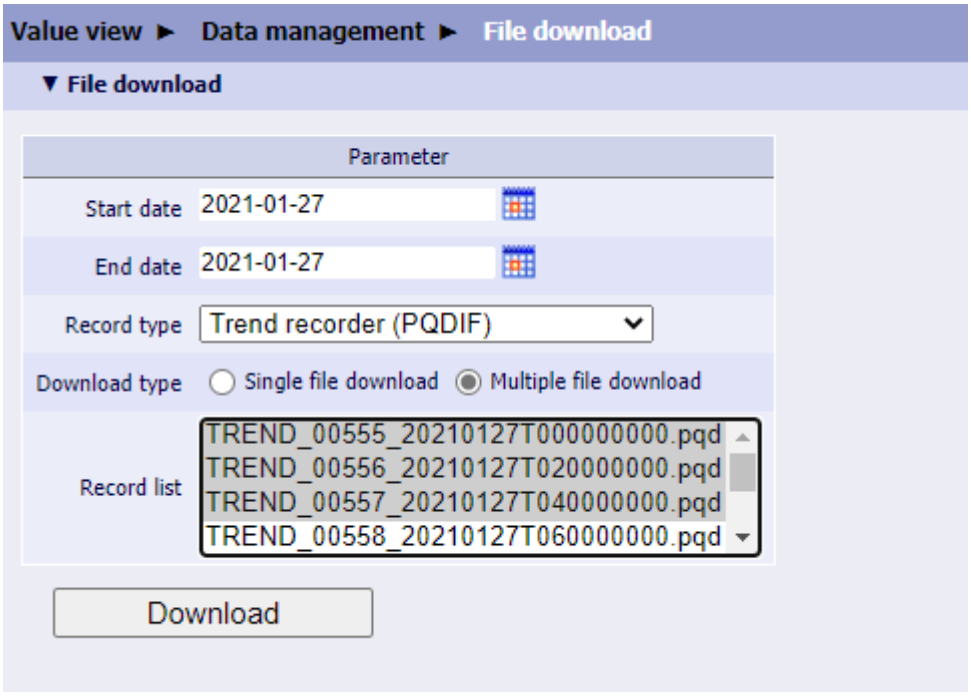
Downloading Multiple Files

NOTE

The **Record List** of **Multiple File Download** with Internet Explorer is identical for trend recorder, measurement recorder and waveform recorder.

To do a multiple file download, execute the same steps as for the single file download, but select the download type **Multiple file download** and proceed further as follows:

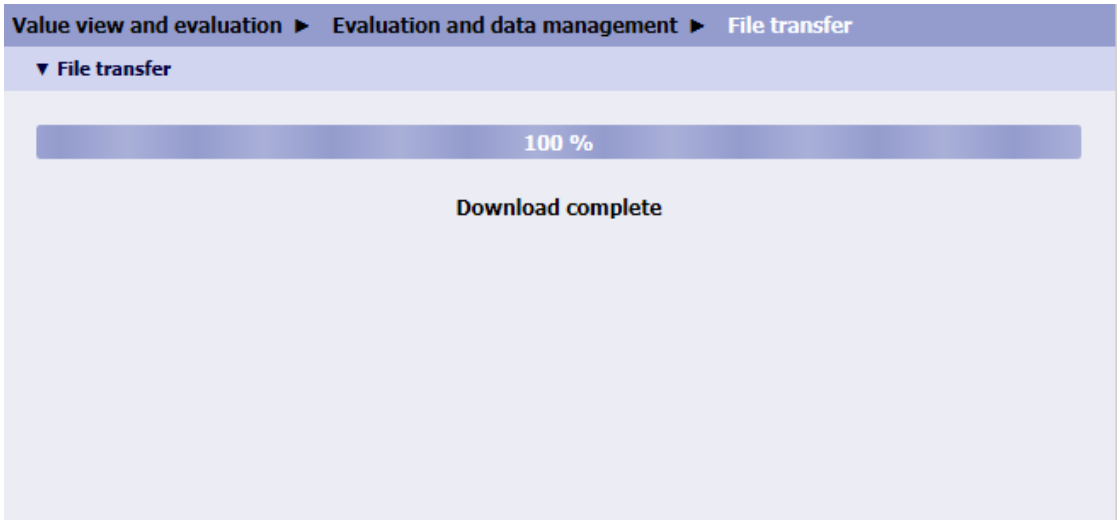
- Select the **Start date**, the **End date**, and the **Record type**.
- Select the **Multiple file** for the **Download type**.
- Select the multiple files in the **Record list**.
- Enter a **Save directory** for the file storage or select a path using the **Select directory** option.



[sc_save_directory, 2, en_US]

Figure 7-18 Value View and Evaluation Tab, Download Multiple Files – Saving Files (for Example Trend Recorder)

- Click **Download**.
  The download progress is indicated and the selected files are stored in the specified directory.



[sc_download_progress, 1, en_US]

Figure 7-19 Status of the Download Progress

- Once the download is finished, check the files.

Visualizing Downloaded Files

You can display the transmitted recorder data with the following programs:

- **SIGRA**: COMTRADE files
- **SIGRAPlugin**: HTML data of the event recorder and the recorder values on the recorder page
- **PQDiffractor**: PQDIF files

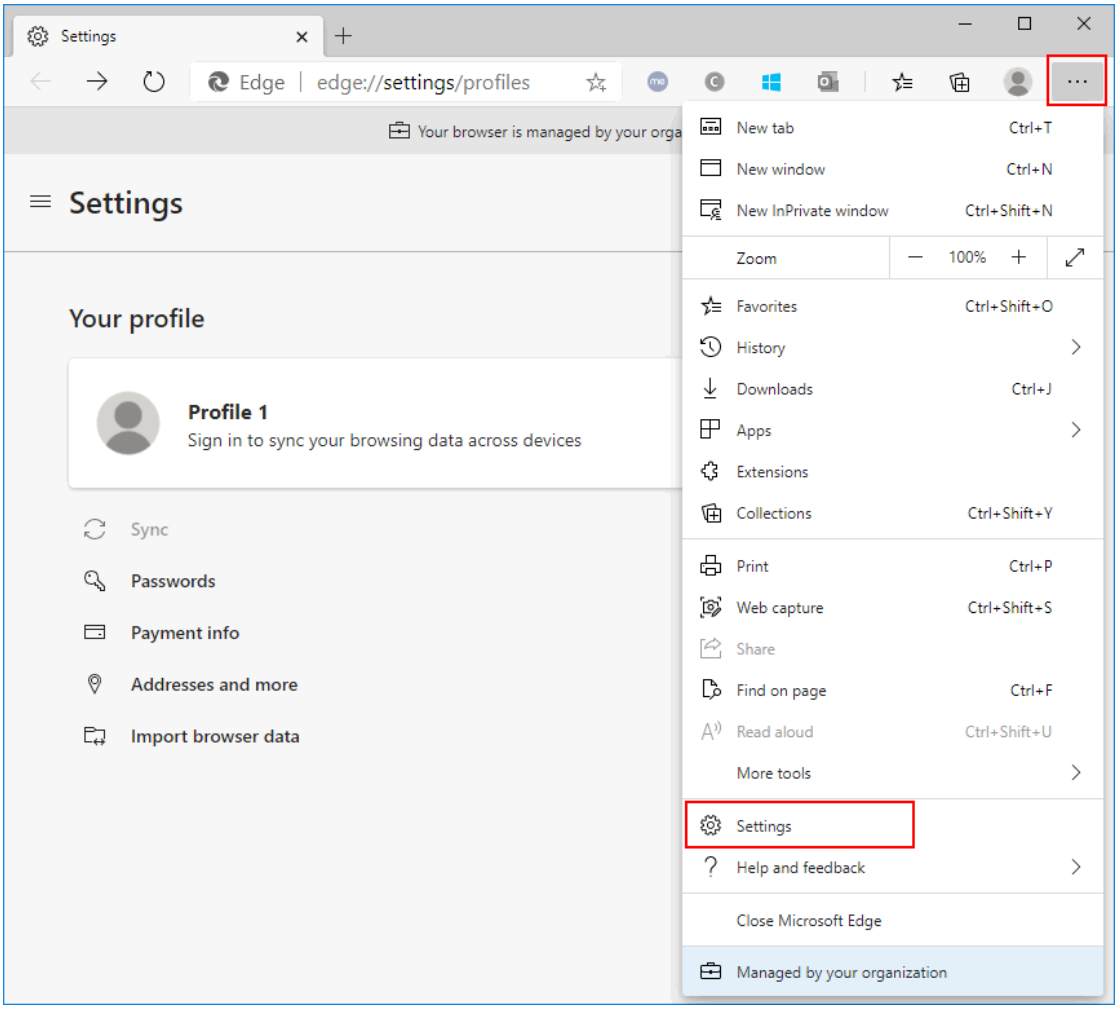
For more information on the programs, contact the Siemens Hotline.

7.3.5 Multiple File Download via Microsoft Edge

The screenshots related with Microsoft Edge in this chapter are taken from Microsoft Edge version 87.0.664.75 (Official build) (64-bit).

Selecting Path via Microsoft Edge

- Start Microsoft Edge.
- Click **Settings and more → Settings**.

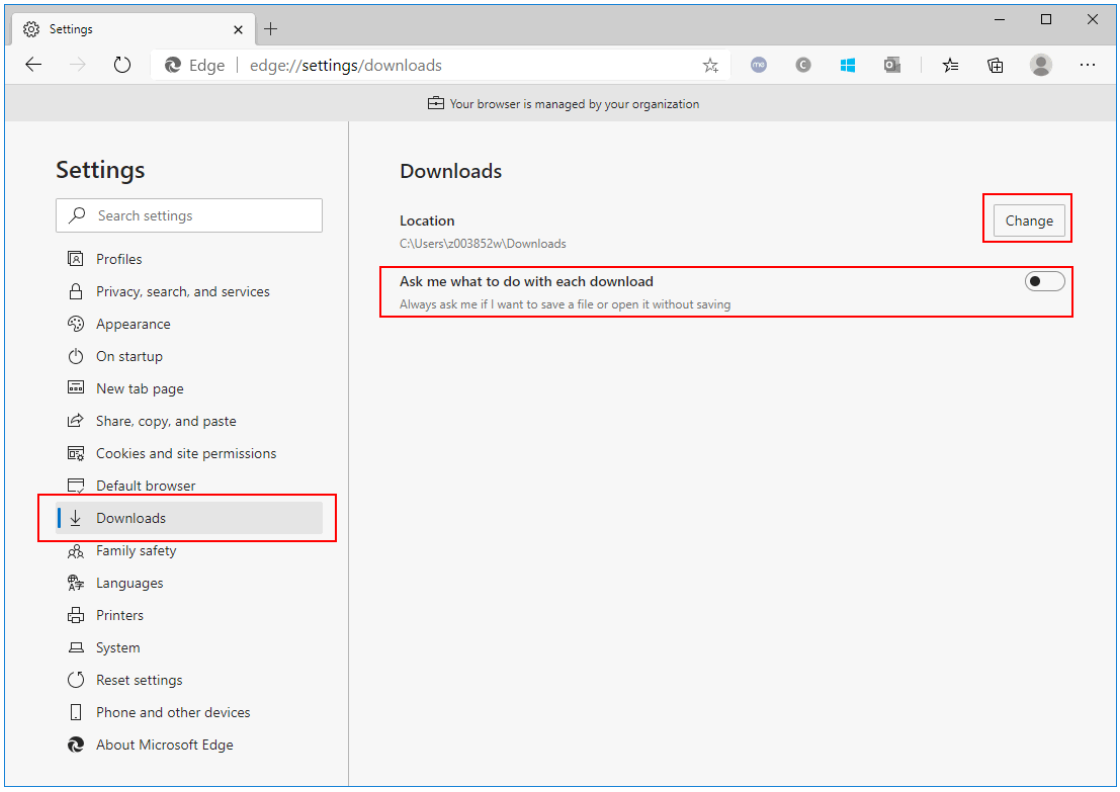


[sc_edge settings, 1, en_US]

Figure 7-20 Microsoft Edge Settings

- Click **Download**.

- Click **Change** to select the path for saving the download file.
  Do not select the **Ask where to save each file before downloading**.



[sc_edge download, 1, en_US]

Figure 7-21 Change Path for Download Files

- Click **Select folder**.

Downloading Multiple Files

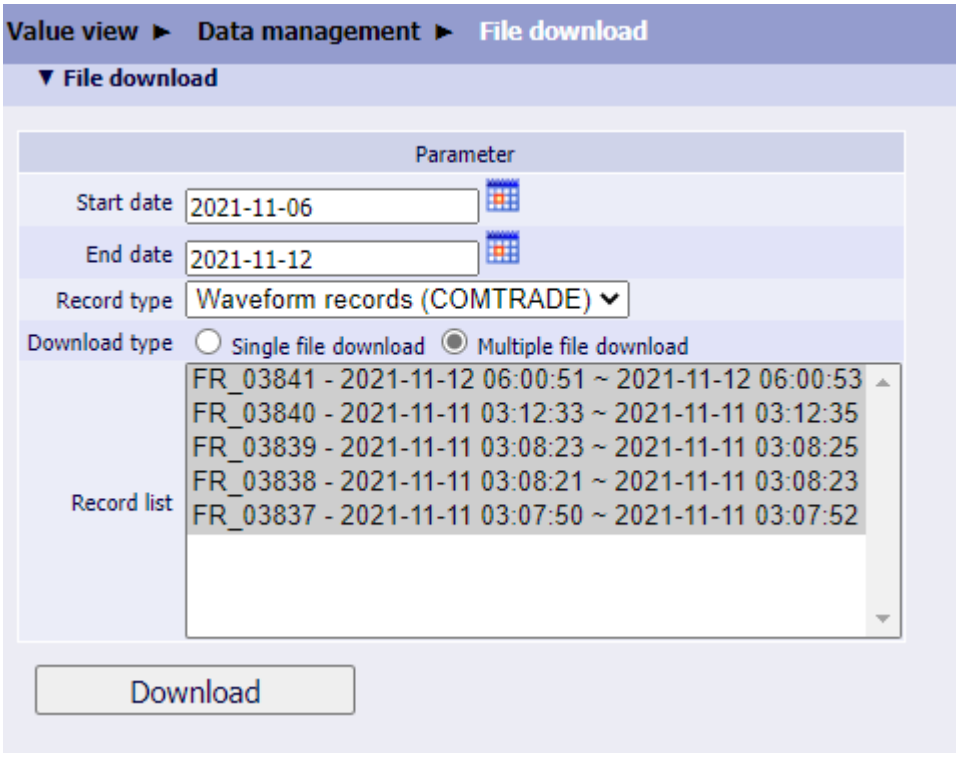
NOTE

The **Record List** of **Multiple File Download** is identical for trend records, measurement records and waveform records.

To do a multiple file download, proceed further as follows:

- Select the **Start date**, the **End date**, and the **Record type**.
- Select **Multiple file download** for the **Download type**.

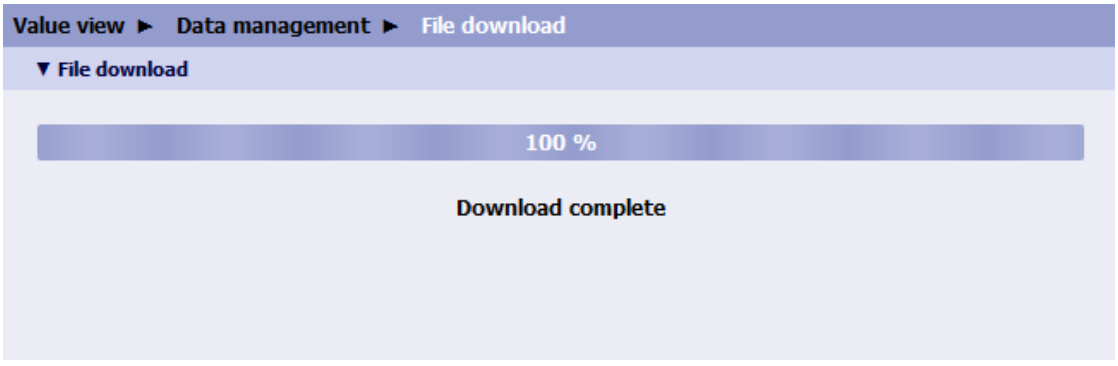
- Select the multiple files in the **Record list**.



[sc_multiple_file_download, 1, en_US]

Figure 7-22 Value View Tab, Multiple File Download

- Click **Download**.
  The download progress is indicated and the selected files are stored in the specified directory.



[sc_download_progress, 2, en_US]

Figure 7-23 Status of the Download Progress

- Once the download is finished, check the files.

Visualizing Downloaded Files

You can display the transmitted data of records with the following programs:

- **SIGRA**: COMTRADE files
- **PQDiffractor**: PQDIF files

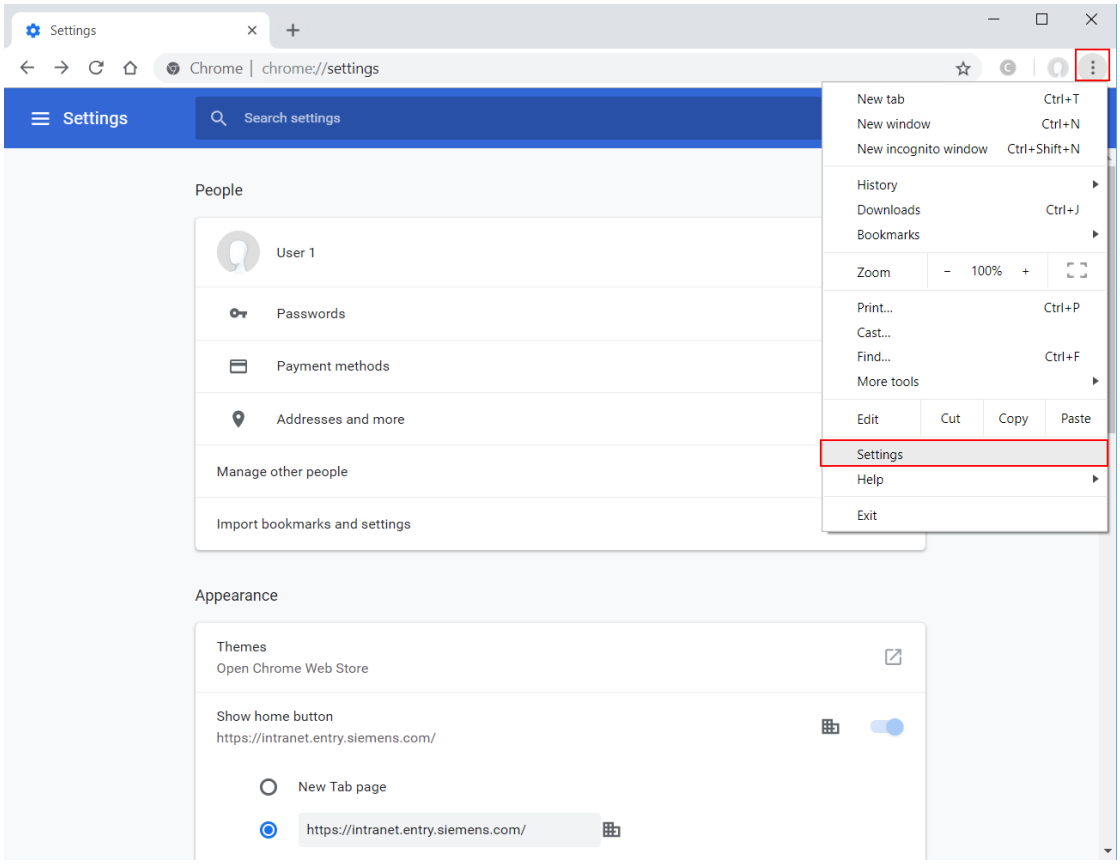
For more information on the programs, contact the Siemens Hotline.

7.3.6 Multiple File Download via Google Chrome

The screenshots related with Google Chrome in this chapter are taken from Google Chrome V71.0.3578.98 (Official Build) (64-bit).

Selecting Path via Google Chrome

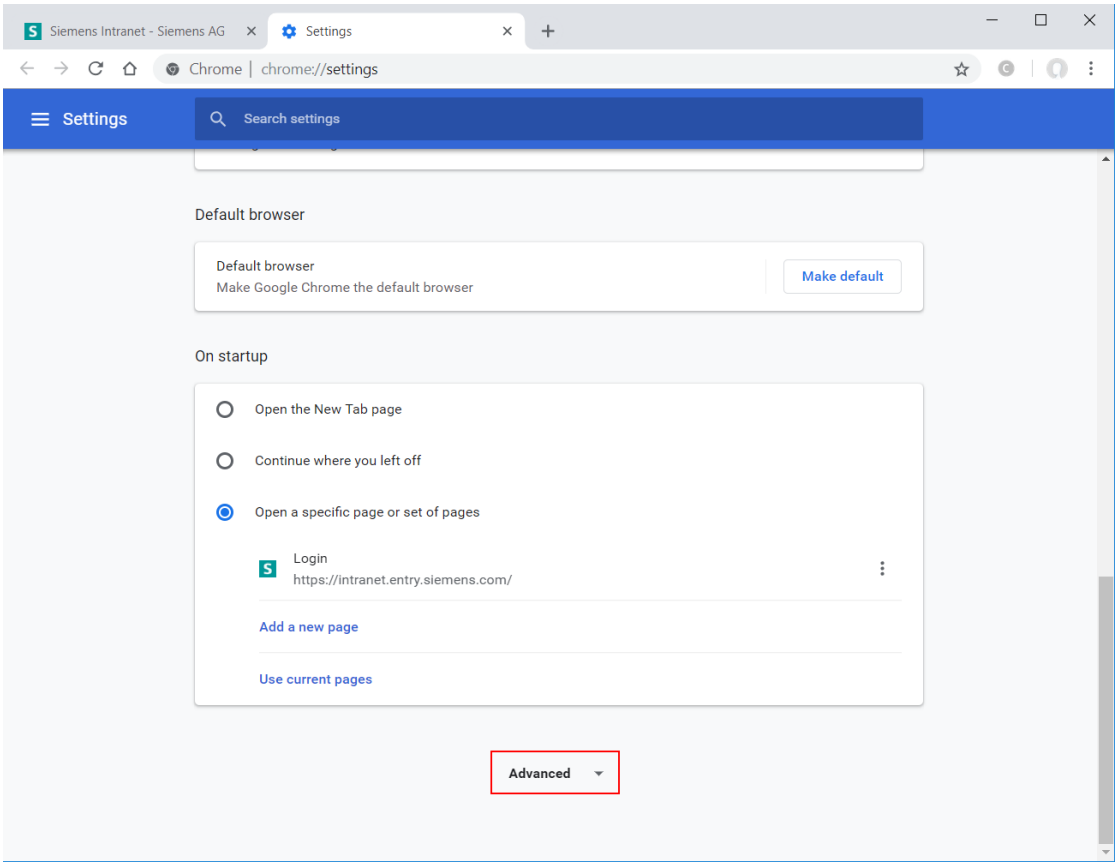
- Start Google Chrome.
- Click **Customize and control Google Chrome → Settings**.



[sc_Chrome_settings, 3, en_US]

Figure 7-24 Chrome Settings

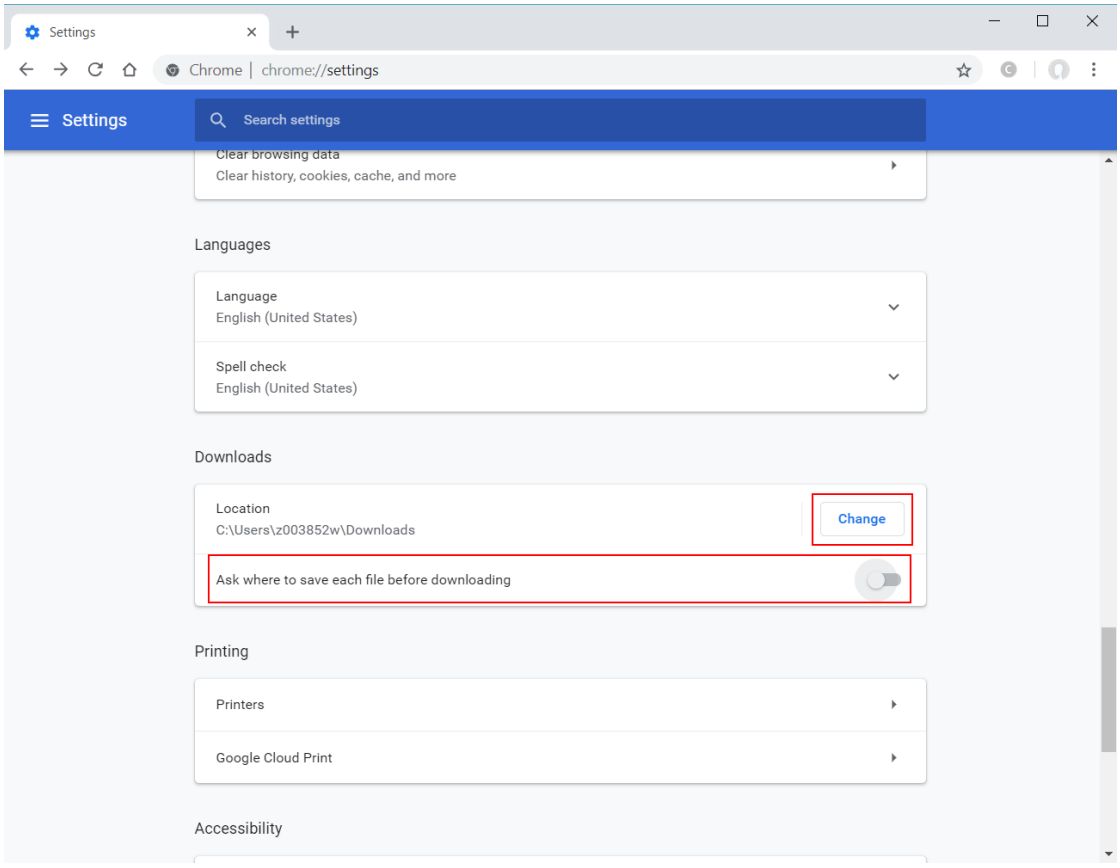
- Click **Show advanced settings...**.



[sc_Chrome_settings_advanced, 3, en_US]

Figure 7-25 Advanced Settings

- Click **Change...** to select the path for saving the download file.
  Do not select the **Ask where to save each file before downloading**.



[sc_Chrome_settings_downloads, 3, en_US]

Figure 7-26 Change Path for Download Files

- Click **OK**.

Downloading Multiple Files

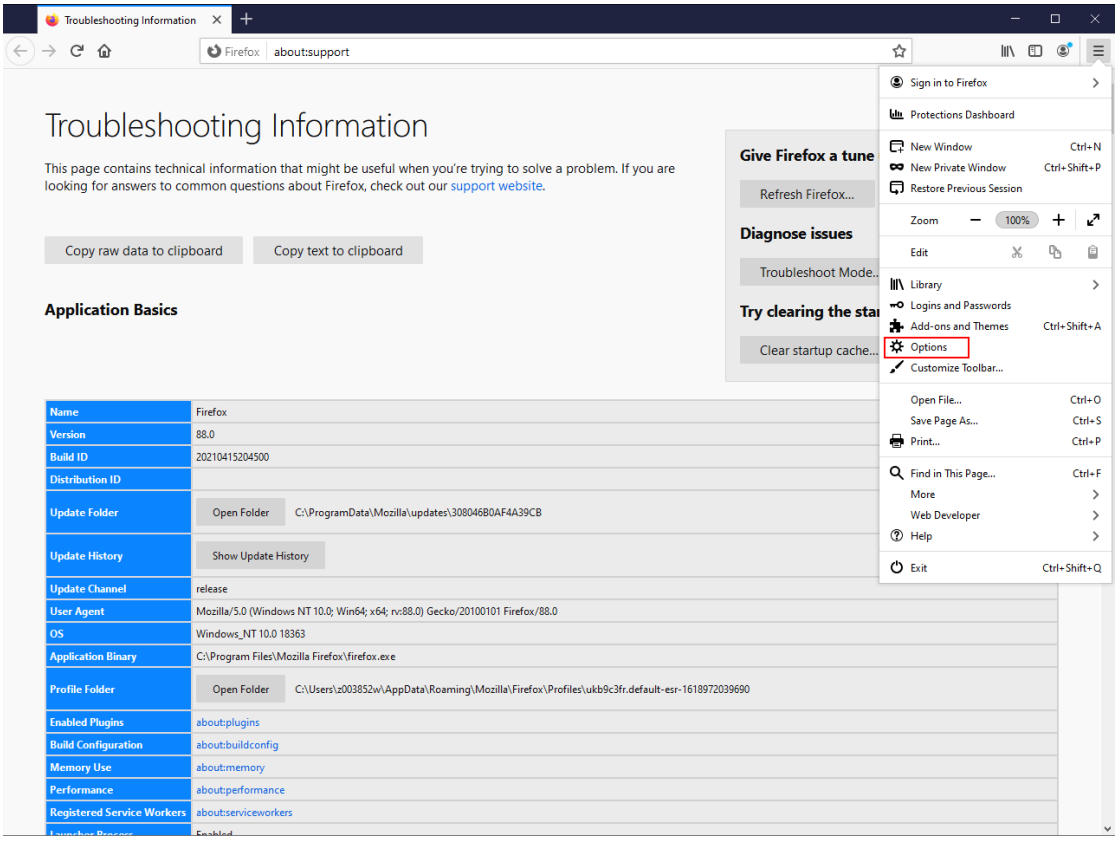
Refer to *Downloading Multiple Files, Page 177*.

7.3.7 Multiple File Download via Mozilla Firefox

The screenshots related with Mozilla Firefox in this chapter are taken from Mozilla Firefox V88.0 (64-bit).

Selecting Path via Mozilla Firefox

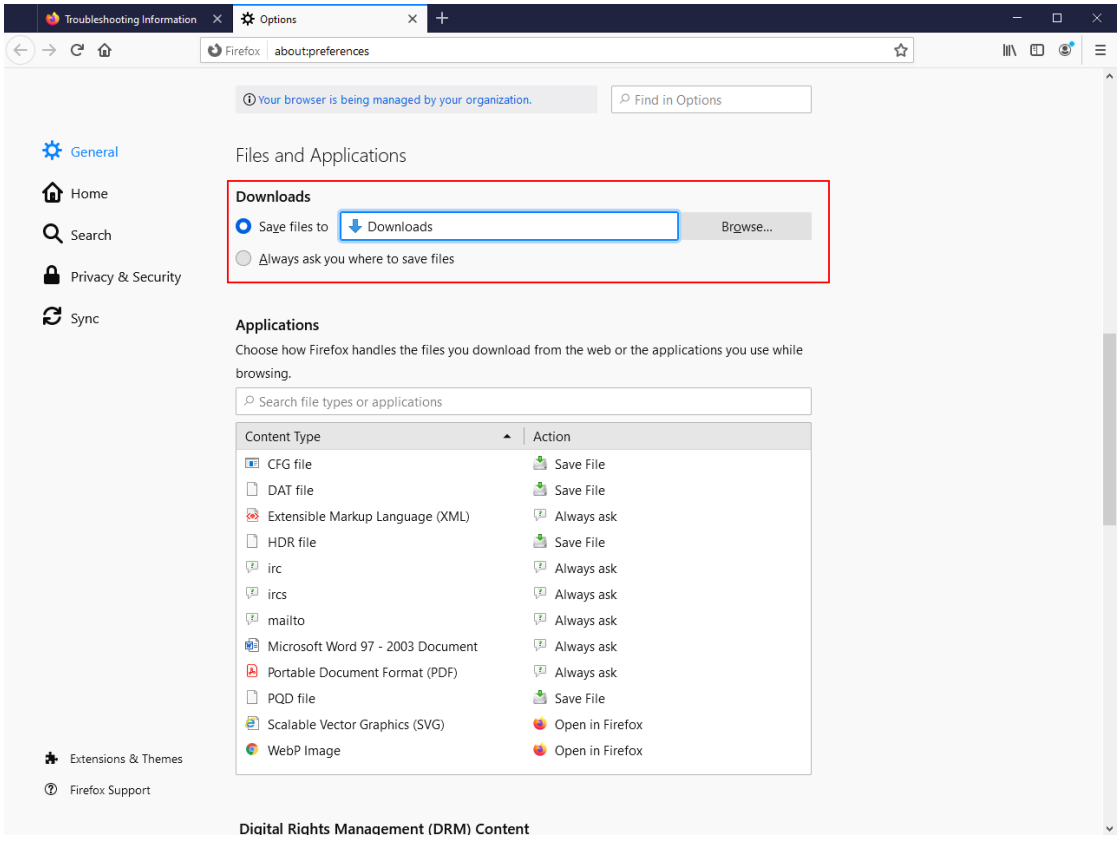
- Start the Mozilla Firefox.
- Click **Application Menu** > **Options**.



[sc_options_Firefox, 3, en_US]

Figure 7-27 Select Options

- Click **Browse...** to select the path for saving the download file.



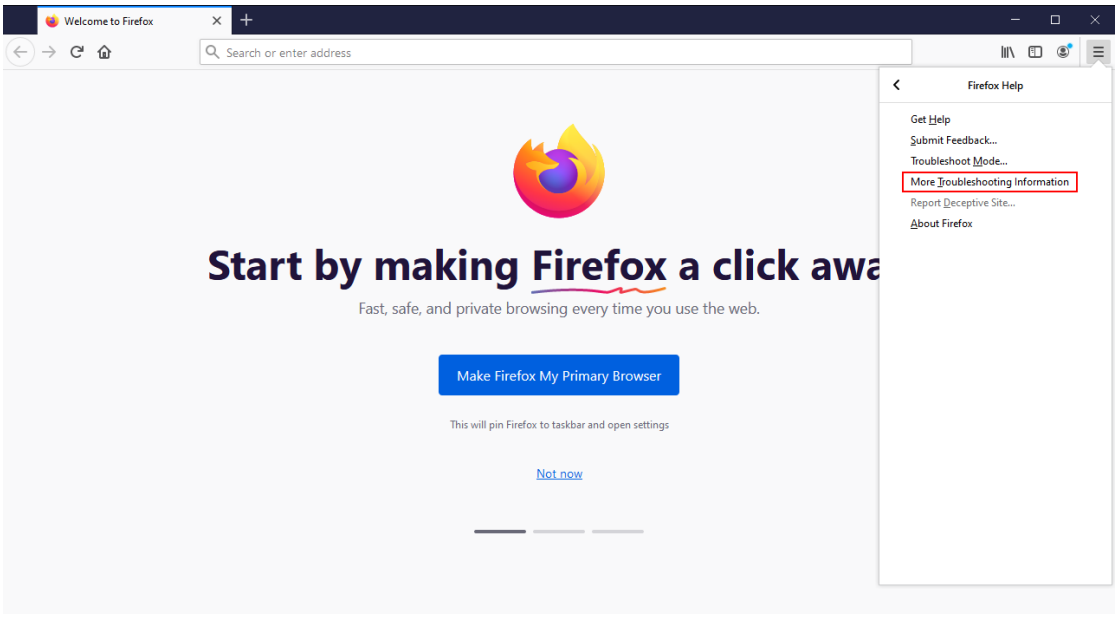
[sc_Firefox_select_path, 3, en_US]

Figure 7-28 Select Path

- Click **Select Folder**.

Setting the Mozilla Firefox

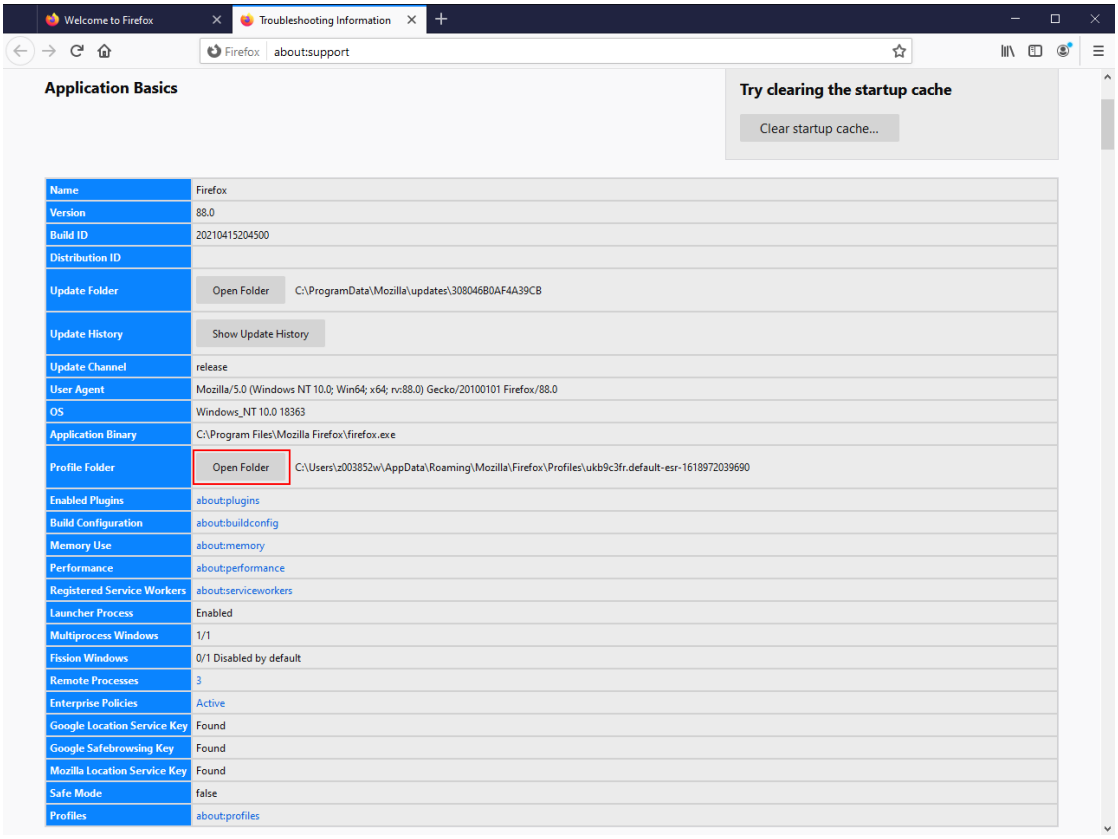
- Click **Application Menu** > **Help** > **More Troubleshooting Information**.



[sc_Troubleshooting, 3, en_US]

Figure 7-29 More Troubleshooting Information

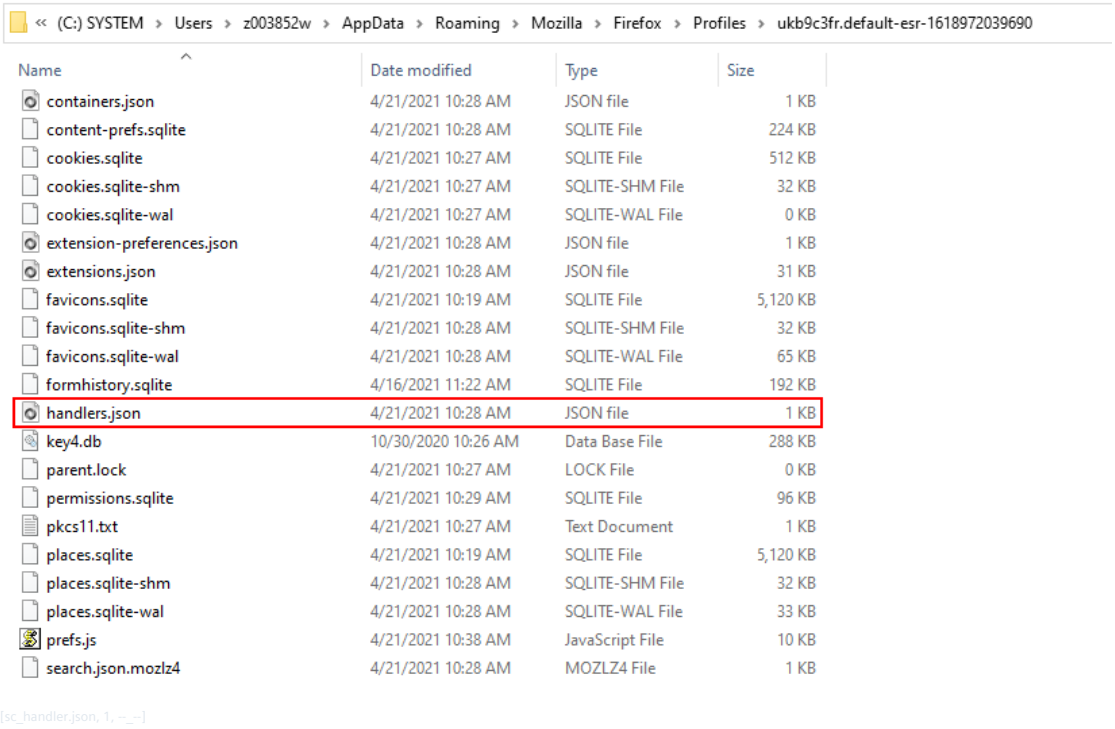
- Click **Open Folder**.



[sc_Show_folder, 3, en_US]

Figure 7-30 Open Folder

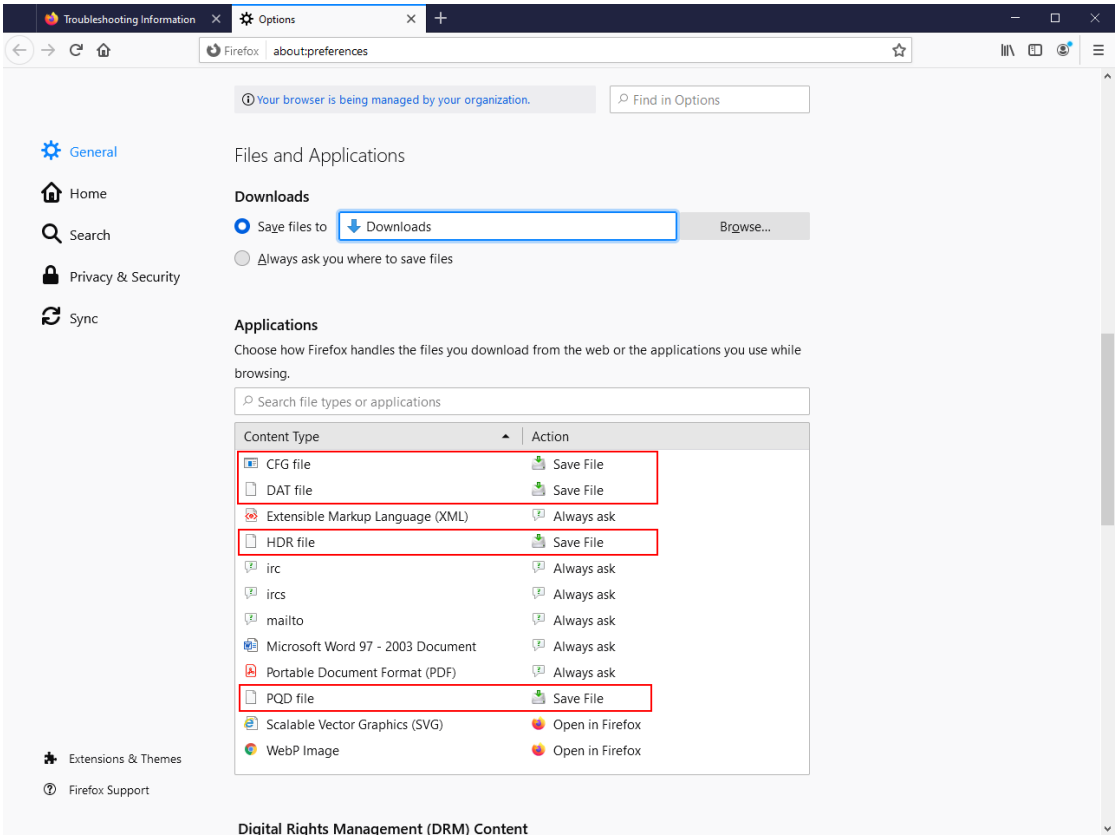
- Open the **handler.json** file with the **Text Editor** in the opened folder.



- Replace the content with the following text and save it.

{"defaultHandlersVersion":{"en-US":4,"zh-CN":4,"en-GB":4},"mimeTypes":{"application/pdf":{"action":2,"extensions":["pdf"],"ask":true},"application/pqd":{"action":0,"extensions":["pqd"]},"application/hdr":{"action":0,"extensions":["hdr"]},"application/dat":{"action":0,"extensions":["dat"]},"application/cfg":{"action":0,"extensions":["cfg"]},"text/xml":{"action":2,"extensions":["xml","xsl","xbl"],"ask":true},"image/svg+xml":{"action":3,"extensions":["svg"]},"image/webp":{"action":3,"extensions":["webp"]},"application/msword":{"action":0,"ask":true,"extensions":["doc"]}},"schemes":{"irc":{"stubEntry":true,"handlers":[null,{"name":"Mibbit","uriTemplate":"https://www.mibbit.com/?url=%s"}]},"ircs":{"stubEntry":true,"handlers":[null,{"name":"Mibbit","uriTemplate":"https://www.mibbit.com/?url=%s"}]},"mailto":{"handlers":[null,{"name":"Yahoo! Mail","uriTemplate":"https://compose.mail.yahoo.com/?To=%s"},{"name":"Gmail","uriTemplate":"https://mail.google.com/mail/?extsrc=mailto&url=%s"}],"action":2,"ask":true}}}

- Restart the Mozilla Firefox.
- Check the 4 files with the red rectangles in the following figure in the **Application Menu** > **Options**.



[sc_check_files, 1, ---_--]

Downloading Multiple Files

Refer to *Downloading Multiple Files, Page 177*.

8 System Functions

8.1 Connection with SICAM PAS/PQS (V8.08 and Higher)

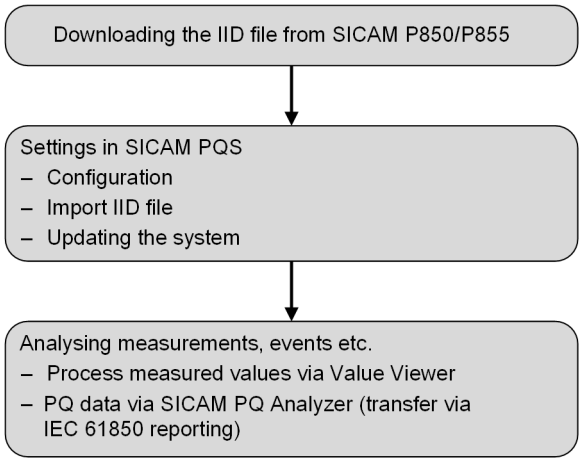
8.1.1 General

The data acquired by the device are stored on the SD card. The data of the measured-value recorder, for example mean values, and of the trend recorder are available in the PQDIF data format. The data of the waveform recorder are saved in the COMTRADE data format. This data can be transferred to the SICAM PAS/PQS using the IEC 61850 Ed.2 protocol.

The **SICAM PAS/PQS software, version V8.08** (available as of October 2016) and higher allows importing the data into the SICAM PAS/PQS archive. Once the data has been transferred into the SICAM PAS/PQS archive, it can be used for the further evaluation and reporting, export, etc.

The SICAM PQ Analyzer allows visualizing of the archived data as well as the result of the evaluation and reporting. For example, evaluations of the records and reports can be performed according to the EN 50160 standard (only SICAM P855) or other grid codes.

The following diagram shows the sequence of the configuration and the analysis:



[dw_workflow-p85x-settings-for-SICAM_PQS, 1, en_US]

NOTE

You can find more information about SICAM PAS/PQS in the manual SICAM PAS, Overview, order number E50417-X8976-C431-B3 and under *http://w3.siemens.com/smartgrid/global/en/products-systems-solutions/substation-automation/substation-automation/pages/sicam-pas.aspx*.

8.2 Connection with PQ Advisor

8.2.1 Connection with PQ Advisor

PQ Advisor Compact

The PQ Advisor Compact is a Web-based application and can be accessed with a URL. It is an application to monitor the power quality in the power system by visualizing the PQ data of all the connected devices. The PQ devices, for example, SICAM Q100, SICAM Q200, and SICAM P855, are automatically scanned and the power quality data are visualized using the PQ Advisor Compact. The functions of the PQ Advisor Compact are available via the dashboard view and the configuration view.

For more information, refer to *https://support.industry.siemens.com/cs/products?search=PQ%20Advisor%20Compact&mfn=ps&o=DefaultRankingDesc&lc=en-WW*.

8.3 Firmware Upload

8.3.1 Function Description

During a firmware update, the device firmware, the default set of parameters, text libraries, HTML files, or parts thereof are updated.

NOTE

Before updating the firmware, Siemens recommends saving the current parameters set as described in *Activating the Set of Parameters, Page 30*.

NOTE

If you have activated the option in your Web browser to transfer the local directory name together with the file name when uploading files, then the total number of characters in the directory and file names may not exceed 126 characters. Otherwise, the firmware in your device will not be updated.

8.3.2 Firmware Upload via Web Pages

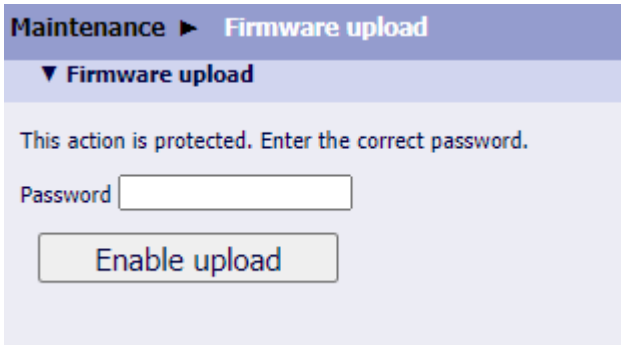
Firmware Upload

NOTE

Do not switch off the supply voltage during the firmware upload process.
If you want to carry out a firmware update, you must stop the recording before manually.

To update the firmware in the **Maintenance** tab, proceed as follows:

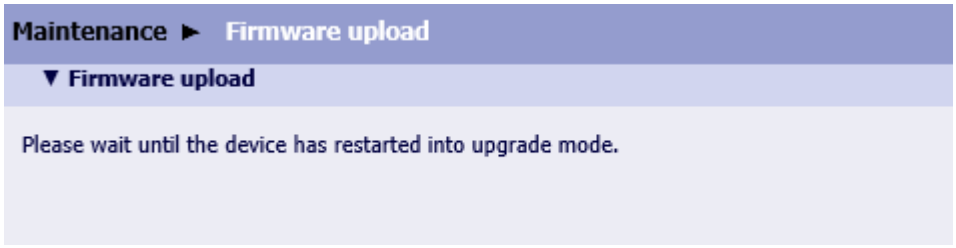
- Select **Firmware upload** in the navigation window.



[sc_firmware_upload, 1, en_US]

Figure 8-1 Enable Firmware Upload

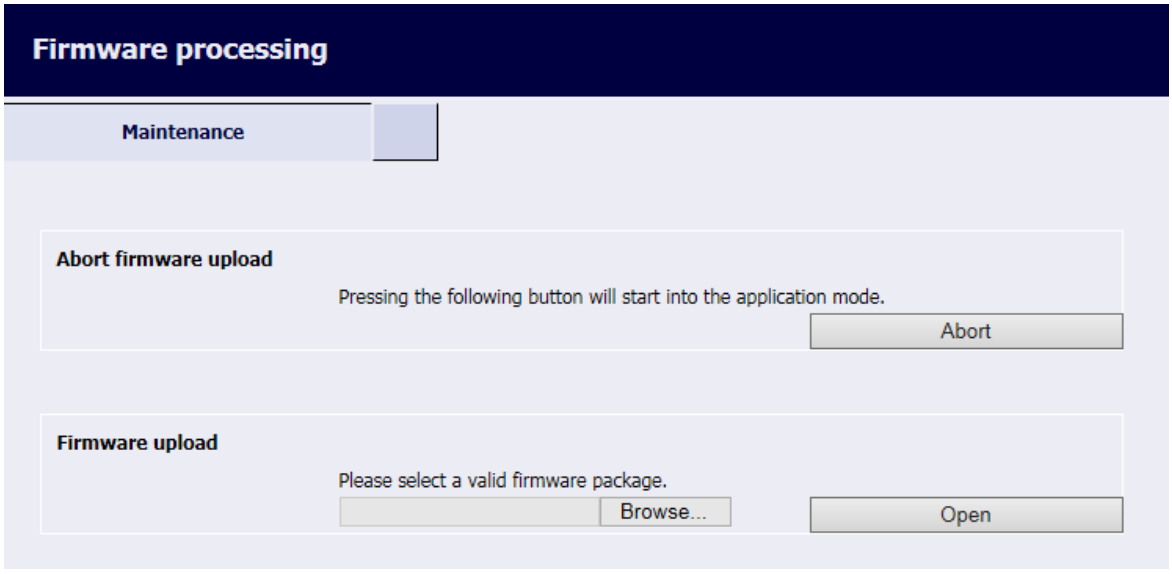
- Enter the password.
- Click **Enable upload**.
- Follow the notes in the following indication:



[sc_q100_upload, 1, en_US]

Figure 8-2 Firmware-Upload Indication

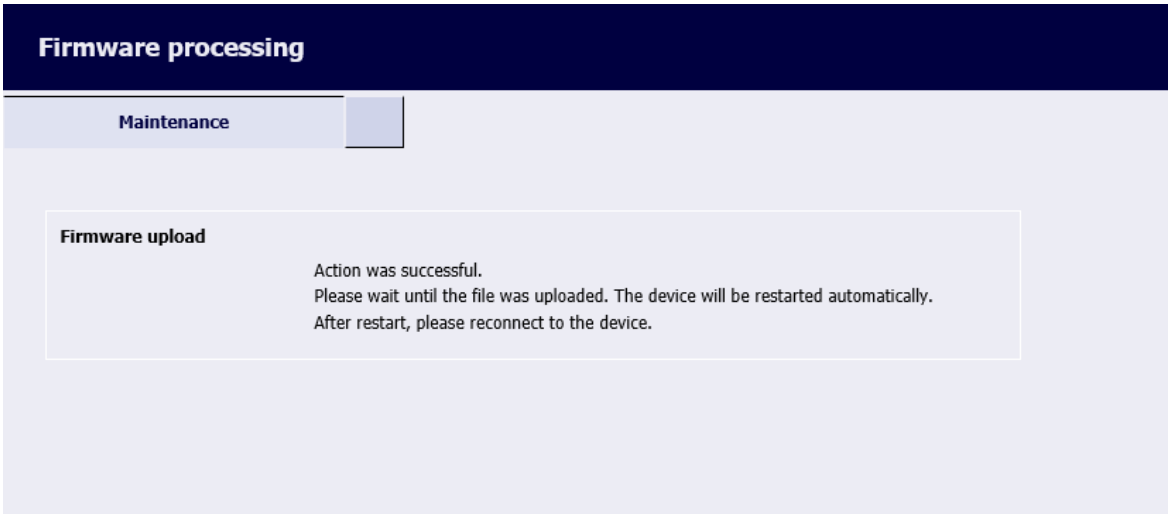
The **Firmware processing** dialog opens.



[sc_Firmware_processing, 2, en_US]

Figure 8-3 Firmware Processing, Firmware Upload

- Click **Browse...** in the section **Firmware upload**.
  The **Choose file** dialog opens.
- Select the desired upload file (extension .pck or .cms depending on the current firmware version) in the directory.
- Click **Open**.
  The selected path is inserted in the **Browse...** field.
- Click **Open**.
  Follow the notes in the following indication:



[sc_q100_Firmware_processing_upload_successful, 1, en_US]

Figure 8-4 Firmware-Upload Indication When Loading a .cms File

After approximately 2 min, the device restarts automatically and the **Log on** tab appears for reconnection with the device.

Device firmware, default set of parameters, text libraries, HTML files, or parts thereof are uploaded.

You can find the upload file in the download area in the Siemens Internet under: *https://support.industry.siemens.com/cs/document/109743621/?en-US* and *https://support.industry.siemens.com/cs/document/109743594/?en-US*. To update the firmware to the latest version, select the following upload file:

- File with extension .cms for update from version V3.00 or later version to the latest version

Abort Firmware Upload

If you do not want to update the firmware, then click **Abort** in the section **Abort firmware upload**.

The device will be restarted after 20 s in application mode.

9 Commissioning and First Steps

9.1 Safety Notes and Access Rights

Safety Notes

DANGER

Hazard due to high voltage

Non-observance will lead to death or serious injury.

Work may only be carried out by trained personnel who are familiar with and observe the safety requirements and precautions.

- ✧ Work may **never** be carried out if there is any hazardous voltage present.
- ✧ De-energize the device.
- ✧ **Isolating device**: Connect a suitable isolating device upstream to de-energize the device. The isolating device must be installed near the device, it must be easily accessible to the user and it must be marked as an isolating device for the device.
- ✧ Secure the supply voltage with an approved (UL/IEC) fuse: 1.6 A, type C.
- ✧ If a melting fuse is used, a suitable approved (UL/IEC) fuse holder has to be used.

NOTE

For electrical installations you have to observe and comply with the national and international provisions concerning the installation of electric power installation and the low-voltage directive 2006/95/EG.

Access Rights

Access Rights for Configuration and Maintenance

To determine access rights, you have to set up passwords when configuring the device. You have to specify an activation password and a maintenance password (see *2.2.2 Password Management*).

The **activation password** is required to enable parameter changes in the device.

The **maintenance** password is required to make changes in the device using the Maintenance tab.

NOTE

If you do not specify new passwords, the factory-set default passwords (see *2.2.2 Password Management*) are valid.

Access Rights for Communication

The access rights for the communication via **Ethernet** with **Modbus TCP** protocol are made for port 502 and for the user port. You can assign either full access rights or read-only authorization (see *Table 2-20*).

You can also determine the access rights for **serial communication** using the **Modbus RTU** protocol. You can assign either full access rights or read-only authorization (see *Table 2-23*).

Communication via **Ethernet** with **IEC 61850 server** protocol and **serial communication** with **IEC 60870-5-103** protocol do not require any access rights.

9.2 Unpacking, Inspecting the Delivery, Installing, and Changing the Battery

Unpacking

The device has been safely packed for transport in the factory. Unpack the device with care and do not use force. Use an appropriate tool if necessary. After unpacking, inspect the device visually for any mechanical defects.

NOTE

If the device has been damaged during transport, do not connect and operate it.

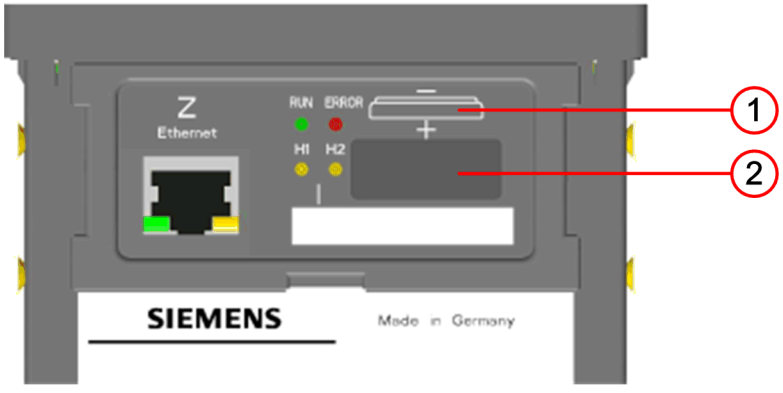
Observe any additional notes enclosed with the packaging.

Keep the transport packaging for future transport.

Inspecting the Delivery

After unpacking, first compare the packing list against your original purchase order to check that the delivered device has the desired rated data and functions and that all necessary and ordered accessories are enclosed.

Installing the Battery



[le_Q100_3D_oben_ok_01, 1, en_US]

Figure 9-1 Battery Compartment

(1) Polarity of battery

(2) Cover of battery compartment

If you want to operate the device immediately after the delivery, first insert the battery before beginning the installation. Upon delivery the battery is insulated in the battery compartment of the device.

If you want to operate the device later, insert the battery only before you intend to use the device.

NOTE

The battery powers the battery-buffered memory (SRAM) and the real-time clock (RTC). But the device can still be operated when no battery is inserted or when the battery is discharged. If, however, the supply voltage is lost, all metered energy values and error reports in the SRAM are deleted (and the real-time clock is reset (2000-01-01 00:00:00:000).

Customer-specific parameters are permanently stored in the Flash-EPROM even without a battery.

To insert the battery, observe the notes in the supplied Product Information and proceed as follows:

- Pull out the battery compartment.
- Take the battery out of the battery compartment.
- Remove the plastic foil.
- Insert the battery into the battery compartment.
- Push the battery compartment back in again.

Replacing a Used Battery

WARNING

Warning of incorrect treatment of the lithium battery (type PANASONIC CR2032 or VARTA 6032 101 501) or the use of an incorrect battery type. In the case of incorrect treatment or the wrong battery type, the battery may burn, explode or trigger a chemical reaction.

See product information for type of battery to be used.

Non-observance may lead to death or serious injury.

- ✧ Installing the battery or replacing it may only be carried out by trained personnel (see Preface) who are familiar with and observe the safety requirements and precautions.
- ✧ Do not reverse the polarity of the battery.
- ✧ Do not short-circuit the contacts. Use non-conducting tools for removing and installing the battery.
- ✧ Do not attempt to open the battery.
- ✧ The battery used in this device may present a fire or chemical burn hazard if mistreated. Do not recharge, disassemble, heat above 100 °C (212 °F) or incinerate.
- ✧ Dispose of used battery promptly. Keep away from children.

Replace the batteries if the battery charge is too low (avoid full discharge). In this case, the **Battery Failure** operation indication is generated. This message can also be parameterized on one of the LEDs H1 to H2/ERROR or switched to one of the binary outputs (see chapter *3.2.2 Configuration and Value View via Web Pages*).

When the **Battery Failure** indication is displayed, replace the battery as follows:

- Pull out the battery compartment.
- Remove the new battery type PANASONIC CR2032 or VARTA 6032 101 501 from the packaging (check the expiry date on the packaging).
- Insert the battery carefully into the battery compartment with the polarity indicated above the battery compartment.
- Push the battery compartment back again.

NOTE

The internal battery test in the device is executed once within 24 hours as well as at the startup of the device. After replacing an empty battery the indication **Battery Failure** is reset only with the next regular internal battery test.

NOTE

Battery Disposal

The battery used in this device contains lithium. It may only be replaced by qualified personnel and disposed of by authorized recycling companies.

Do not dispose of the battery in the regular household waste.

The national and international regulations must be observed when disposing of the battery.

You can find information on the battery life in chapter *12.1.5 General Data*.

9.3 Assembly

General Assembly Notes

Depending on the model, SICAM P850/P855 is designed either for panel flush mounting (device with display) or for DIN rail assembly (device without display).

WARNING

Do not touch any live parts.

Non-observance may lead to death or serious injury.

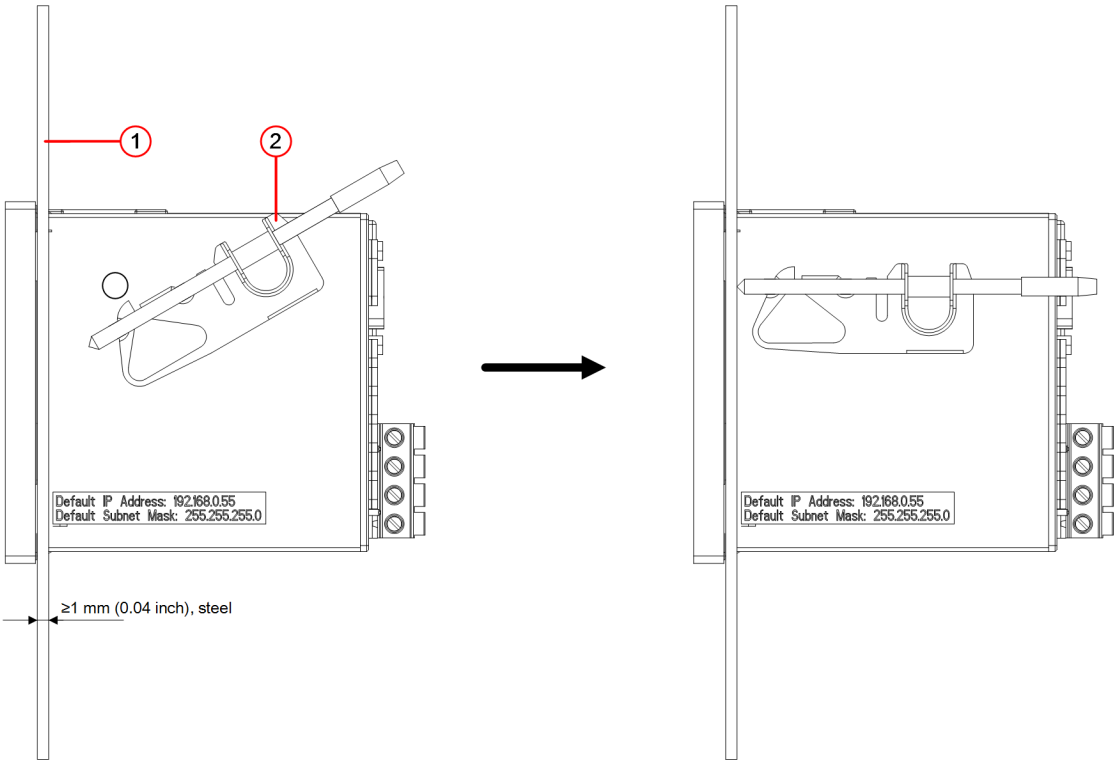
✧ After installation of the device and wiring, close the control cabinet.

- The installation site must be vibration-proof. The permitted ambient temperature must be observed (see also chapter *12 Technical Data*).
- Operating the device outside the permitted operating temperature range can lead to measuring errors and device failure.
- The terminals are designed for wire cross-sections of max. 2.5 mm^2.
- The device must not be exposed to condensation during operation.
- Install the device in a location where it is not exposed to direct sunlight and strong temperature variations.

Assembly: Devices with Display for Panel Flush Mounting

To install the device into a switch panel, proceed as follows:

- Insert the device into the assembly opening until it hits the limit and keep holding it tightly.
- Attach the 2 mounting elements (included with the device) on both sides of the case. You have the possibility to attach the mounting elements as follows:



[dw_assembly, 1, en_US]

Figure 9-2 Attaching the Mounting Elements

(1) Mounting plate
(2) Mounting element

- Swing the mounting element over the rear cone to the position.
- Use a screw driver (0.6 mm x 4.5 mm) to fix the mounting elements until the slipping clutch takes effect.

NOTE

The mounting instructions must be performed correctly to provide sufficient protection against touching live parts.

UL-Certification Conditions

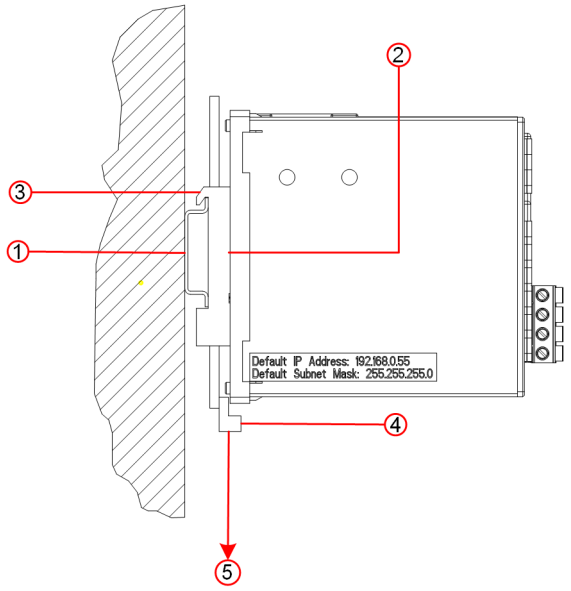
Field wires of control circuits can be separated from other circuits with respect to the end-use requirements.

Assembly: Devices without Display for DIN Rail Mounting

NOTE

The DIN rail must be mounted horizontally.

To mount the device on a DIN rail, proceed as follows:



[dw_DIN_rail_mounting, 1, --_--]

Figure 9-3 Assembly of the DIN Rail Device

(1) DIN rail
(2) Snap-on clip
(3) Guiding of the snap-on clip
(4) Release device
(5) Pulling direction

- Pull down the release device at the snap-on clip and hold it in this position.
- Slide the device with the guiding of the snap-on clip on to one side of the DIN rail.
- Move the device into the desired position on the DIN rail.
- Release the release device. The device is now firmly mounted on the DIN rail.

The snap-on clip is set to a certain height position by default. To change the height position, proceed as follows:

- Lever the release device out of its guiding (no special tool required).
- Move the release device into the desired position.
- Press the release device back into its guiding.

NOTE

The assembly instructions above must be carried out correctly to ensure sufficient protection against touching live parts.

UL-Certification Conditions

Field wires of control circuits can be separated from other circuits with respect to the end-use requirements.

9.4 Environmental Protection Hints

Disposal of Old Equipment and Batteries (Applicable only for European Union and Countries with a Recycling System)

The disposal of our products and possible recycling of their components after decommissioning has to be carried out by an accredited recycling company, or the products/components must be taken to applicable collection points. Such disposal activities must comply with all local laws, guidelines and environmental specifications of the country in which the disposal is done. For the European Union the sustainable disposal of electronic scrap is defined in the respective regulation for "waste electrical and electronic equipment" (WEEE).

The crossed-out wheelie bin on the products, packaging and/or accompanying documents means that used electrical and electronic products and batteries must not be mixed with normal household waste.

According to national legislation, penalties may be charged for incorrect disposal of such waste.

By disposing of these products correctly you will help to save valuable resources and prevent any potential negative effects on human health and the environment.

NOTE

Our products and batteries must not be disposed of as household waste. For disposing batteries it is necessary to observe the local national/international directives.

Disposal of Mobile Storage Devices (e.g. USB Sticks and Memory Cards)

When disposing of/transferring mobile storage devices, using the **format** or **delete** functions only changes the file management information and does not completely delete the data from your mobile storage device. When disposing of or transferring a mobile storage device, Siemens strongly recommends physically destroying it or completely deleting data from the mobile storage device by using a commercially available computer data erasing software.

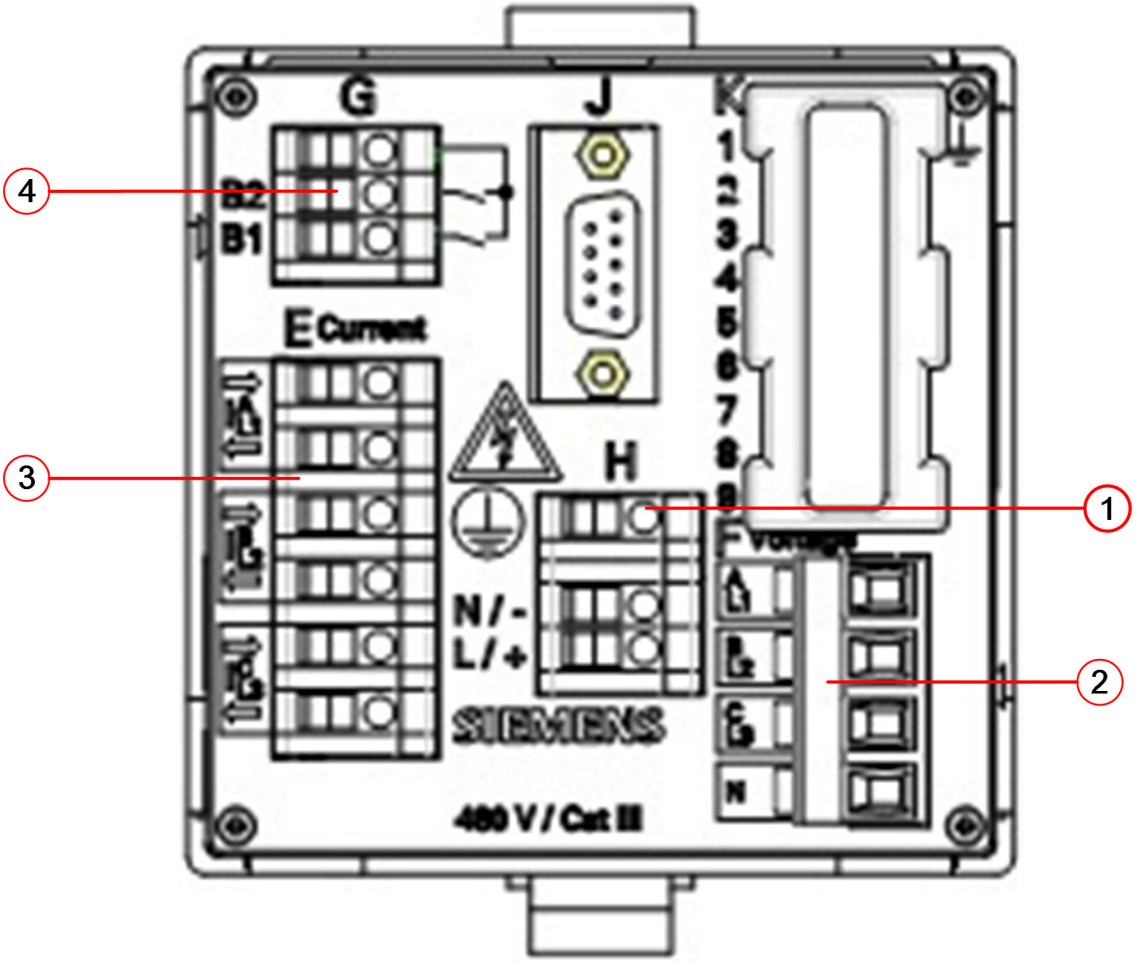
REACH/RoHS Declaration

You can find our current **REACH/RoHS** declarations at:
https://www.siemens.com/global/en/home/products/energy/ecotransparency/ecotransparency-downloads.html

NOTE

You can find more information about activities and programs to protect the climate at the EcoTransparency website:
https://www.siemens.com/global/en/home/products/energy/ecotransparency.html

9.5 Electrical Connection



[le_P85x_electrical connection, 1, --_--]

Figure 9-4 Electrical Connection

(1) Terminal block H for power supply
(2) Terminal block F for voltage measurement
(3) Terminal block E for current measurement
(4) Terminal block G for binary output

NOTE

Be aware of the safety instruction in chapter *Safety Notes, Page 194*.

Power Supply

Connect the cables of the supply voltage on the terminal side of the device at terminal block H as follows:

Supply from the Alternating Voltage System

Terminal N/-: Neutral phase of the supply voltage
Terminal L/+: Phase of the supply voltage
Terminal Earthing: Protective grounding terminal

Supply from a Direct Voltage Source

Terminal N/-: Negative supply voltage
Terminal L/+: Positive supply voltage
Terminal Earthing: Protective grounding terminal

NOTE

Always connect the grounding at the device to the terminal for the protective phase grounding (terminal block H).

Terminals and Conductors

The device has the following terminal blocks:

Terminal Block	Description
E	3 inputs for alternating current measurement
F	4 inputs for alternating voltage measurement
H	Supply voltage
G	2 binary outputs

Terminals for supply voltage (H), inputs for current measurement (E), inputs for voltage measurement (F), and binary outputs (G):

- Conductor cross-section, rigid max.: 2.5 mm^2 (AWG 14)
- Conductor cross-section (conductor with ferrule): 1.5 mm^2 (AWG 16)
- Conductor cross-section (conductor with ferrule, terminal F): 2.5 mm^2 (AWG 14)
- Tightening torque: 0.4 Nm to 0.5 Nm (3.5 in-lb to 4.5 in-lb)
- RS485 interface (J) on the terminal side: RS485 cable with 9-pole D-sub socket
- Ethernet interface (Z) on the top side: Ethernet patch cable or crossover cable

Functions of the Terminals

Terminal	Assigned Function, Measured Value or Indication	Description
E: $I^{A}_{L1}\Rightarrow$	Ia	Phase a, input, current measurement
E: $I^{A}_{L1}\Leftarrow$	Ia	Phase a, output, current measurement
E: $I^{B}_{L2}\Rightarrow$	Ib	Phase b, input, current measurement
E: $I^{B}_{L2}\Leftarrow$	Ib	Phase b, output, current measurement
E: $I^{C}_{L3}\Rightarrow$	Ic	Phase c, input, current measurement
E: $I^{C}_{L3}\Leftarrow$	Ic	Phase c, output, current measurement
F: $^{A}_{L1}$	Van	Phase a, voltage measurement
F: $^{B}_{L2}$	Vbn	Phase b, voltage measurement
F: $^{C}_{L3}$	Vcn	Phase c, voltage measurement
F: N	N	Neutral phase, voltage measurement
G: 1	Binary output 1	Binary output 1
G: 2	Root	Common root for both binary outputs
G: 3	Binary output 2	Binary output 2
H (Earth)	Protective phase	–

Terminal	Assigned Function, Measured Value or Indication	Description
H: N / -	N/-	Neutral phase of the negative supply voltage
H: N / +	ph/+	Phase of the positive supply voltage

Voltage measuring inputs: In the case of a **direct connection** and **transformer connection**, the device has to be safeguarded with a **listed 10-A backup fuse** or a listed 10-A miniature circuit breaker.

NOTE

When using voltage transformers, the secondary connections must never be short-circuited!

9.6 Connection Principle

9.6.1 Using the Device in the Power Systems TT and TN

When using the device in the power systemsTT and TN, no special operating conditions must be observed.

9.6.2 Standard Application, Examples

The following input wiring diagrams are examples. Up to the maximum allowable current and voltage values the device can also be connected without interconnected current and voltage transformers.

Required voltage transformers can be operated in star connection or delta connection.

All input and output terminals that are not needed for measurements remain unwired.

NOTE

The illustration of the consistent ground connection of the instrument transformers is simplified in the following connection examples. The secondary windings of the current transformers installed in a high-voltage power system must be grounded on one side.

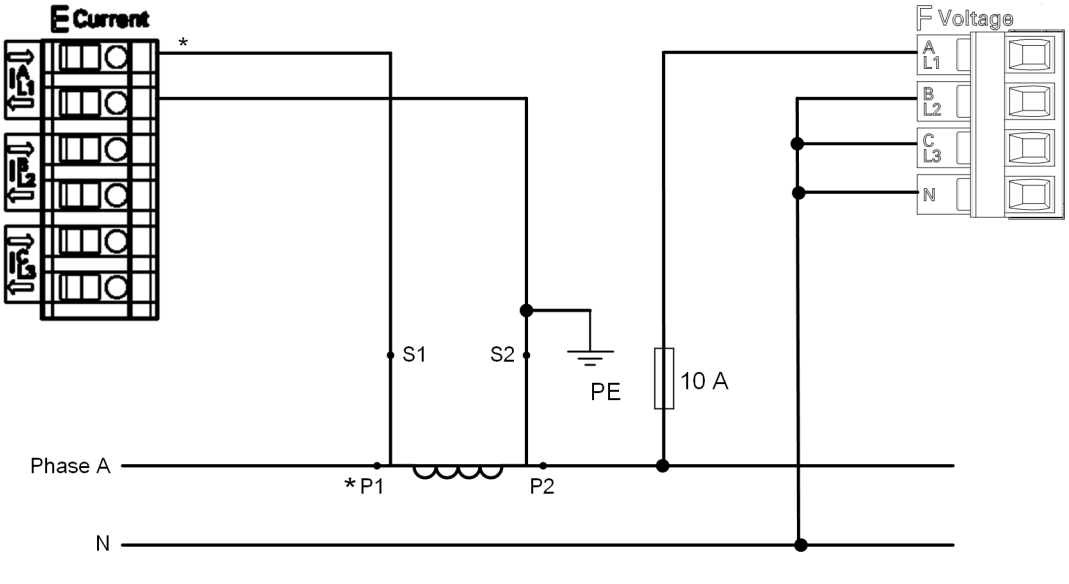
DANGER

Hazard due to high voltages in the event of a breakdown of the winding insulation

Non-observance will lead to death or serious injury.

✧ Ground the secondary windings of the current transformers on one side. They are installed in a high-voltage power system.

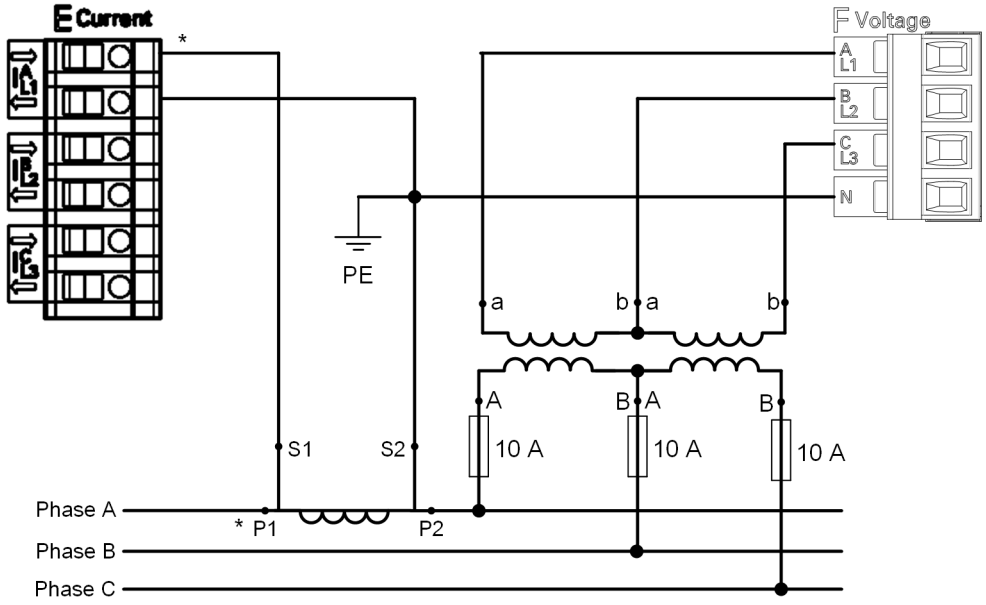
Example: 1-Phase System, No Voltage Transformer



[dw_1ph_0vol, 1, en_US]

Figure 9-5 Example: 1-Phase System, No Voltage Transformer

Example: 3-Wire Network, 2 Voltage Transformers and 1 Current Transformer, Balanced



[dw_3w_2vt_1ct_bln, 1, en_US]

Figure 9-6 Example: 3-Wire Network, 2 Voltage Transformers and 1 Current Transformer, Balanced

NOTICE

The secondary voltage on terminal F (voltage) must not exceed AC 600 V (AC 347 V for UL).

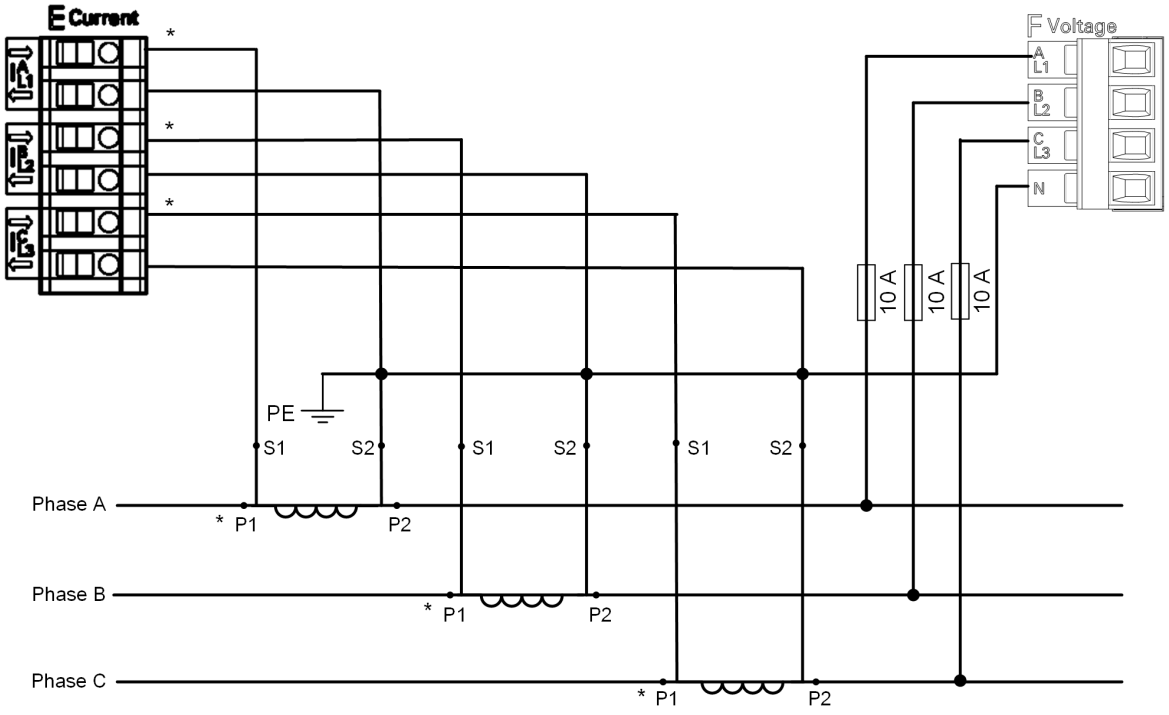
Non-observance can cause material damage.

✧ Make sure that the maximum permissible phase-to-ground voltage (PE) is not exceeded.

NOTE

The electrical connection PE-N is not mandatory.

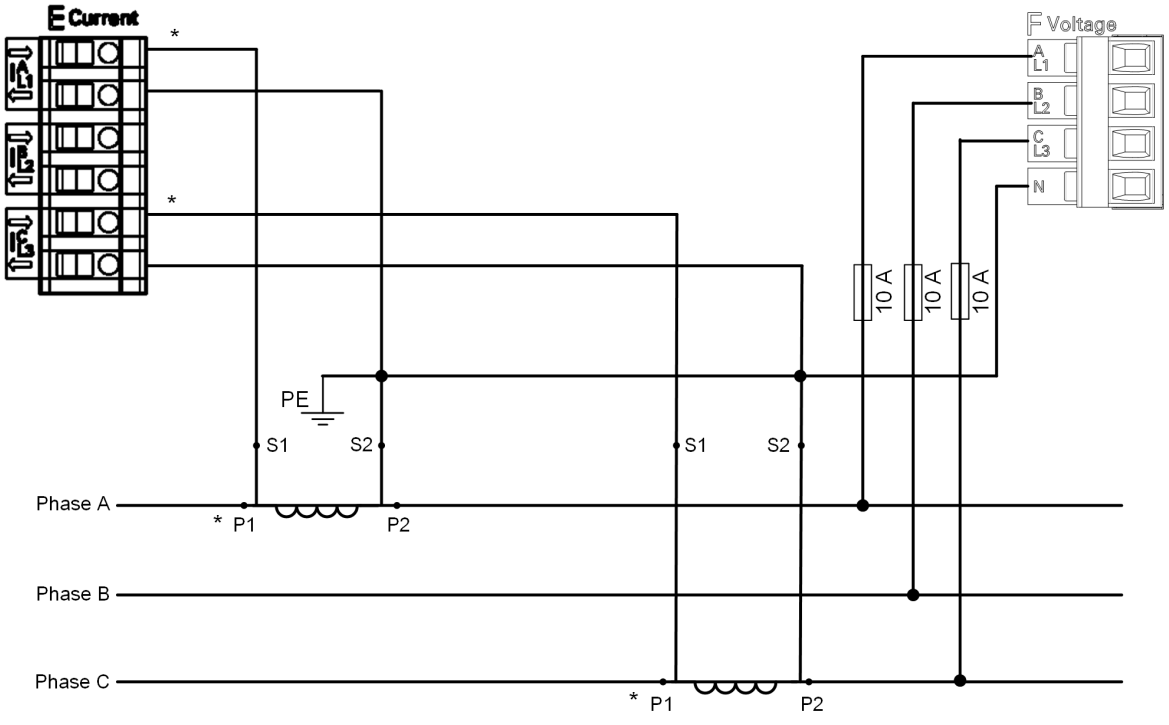
Example: 3-Wire Network, Direct Contact at Low-Voltage Power System, 3 Current Transformers, Unbalanced



[dw_3w_0vt_3ct_unbln, 1, en_US]

Figure 9-7 Example: 3-Wire Network, No Voltage Transformer, 3 Current Transformers, Unbalanced

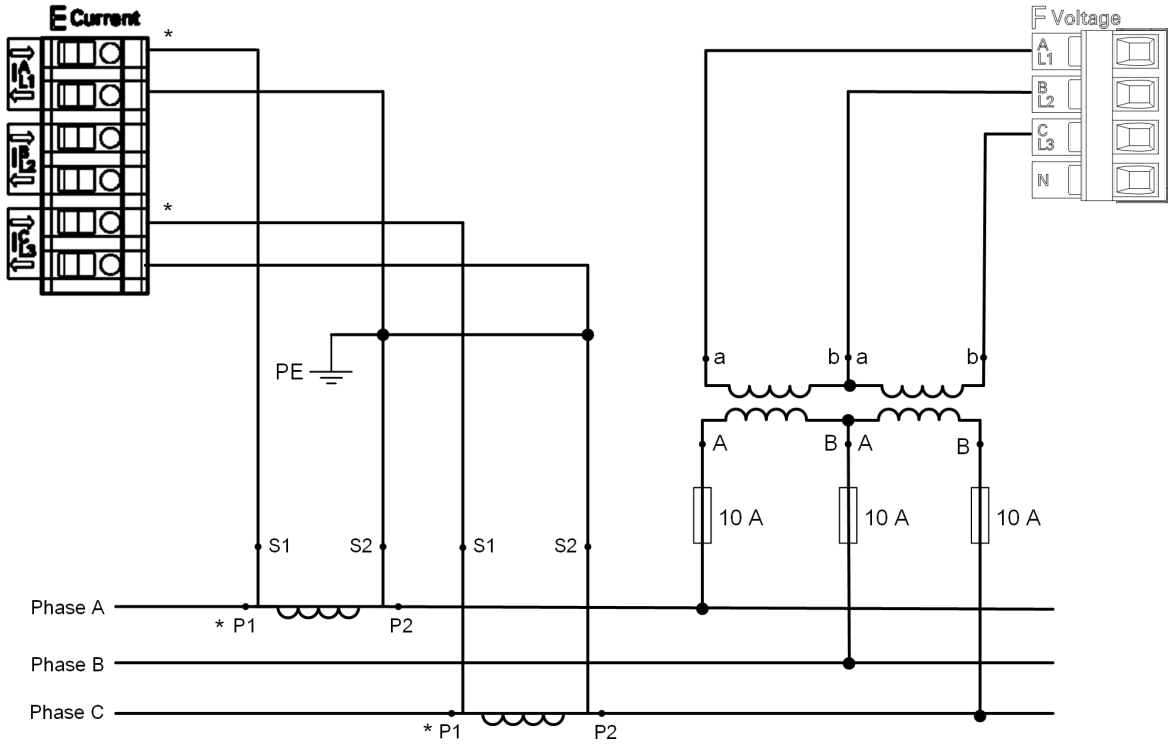
Example: 3-Wire Network, No Voltage Transformer, 2 Current Transformers, Unbalanced



[dw_3w_0vt_2ct_unbln, 1, en_US]

Figure 9-8 Example: 3-Wire Network, No Voltage Transformer, 2 Current Transformers, Unbalanced

Example: 3-Wire Network, 2 Voltage Transformers and 2 Current Transformers, Unbalanced



[dw_3w_2vt_2ct_unbln, 1, en_US]

Figure 9-9 Example: 3-Wire Network, 2 Voltage Transformers and 2 Current Transformers, Unbalanced

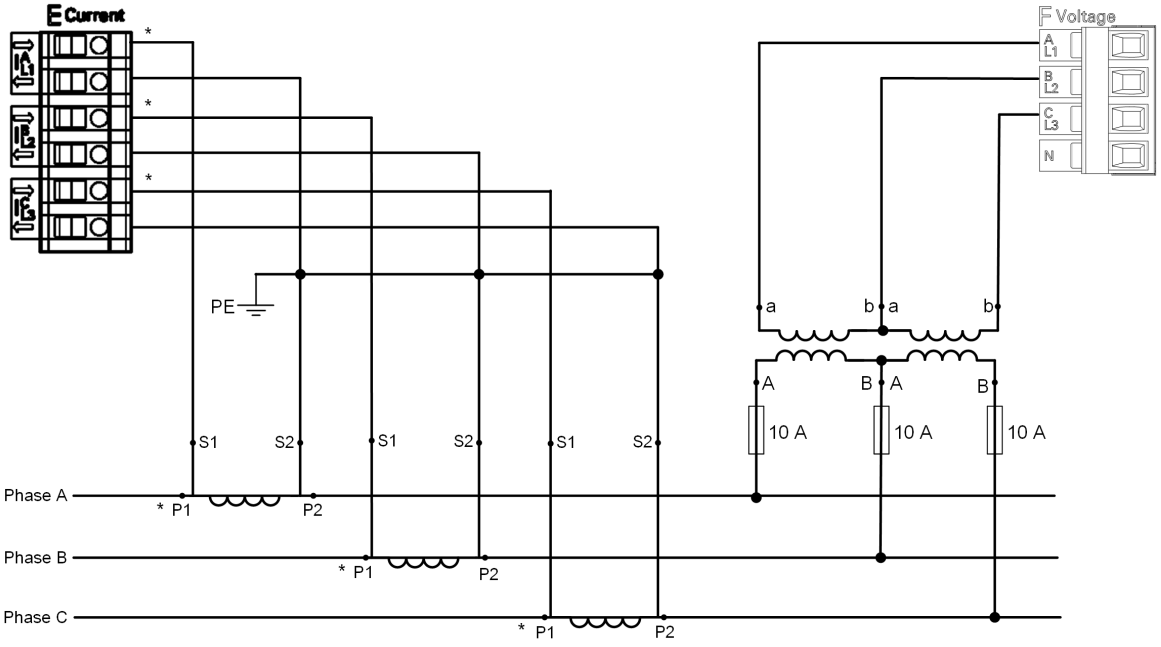
NOTICE

The secondary voltage on terminal F (voltage) must not exceed AC 600 V (AC 347 V for UL).

Non-observance can cause material damage.

✧ Make sure that the maximum permissible phase-to-ground voltage (PE) is not exceeded.

Example: 3-Wire Network, 2 Voltage Transformers and 3 Current Transformers, Unbalanced



[dw_3w_2vt_3ct_unbln, 1, en_US]

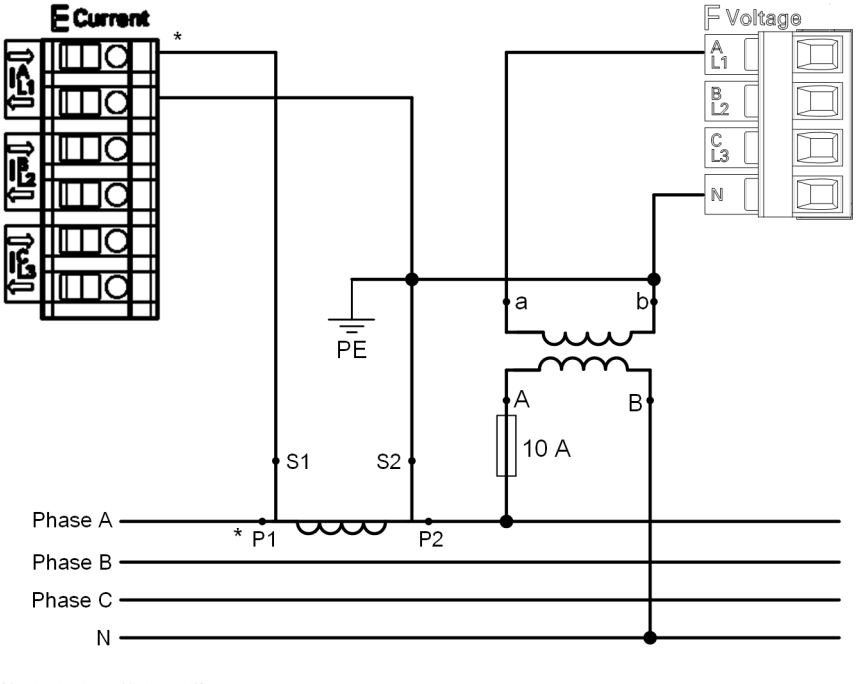
Figure 9-10 Example: 3-Wire Network, 2 Voltage Transformers and 3 Current Transformers, Unbalanced

NOTICE

The secondary voltage on terminal F (voltage) must not exceed AC 600 V (AC 347 V for UL).
Non-observance can cause material damage.

✧ Make sure that the maximum permissible phase-to-ground voltage (PE) is not exceeded.

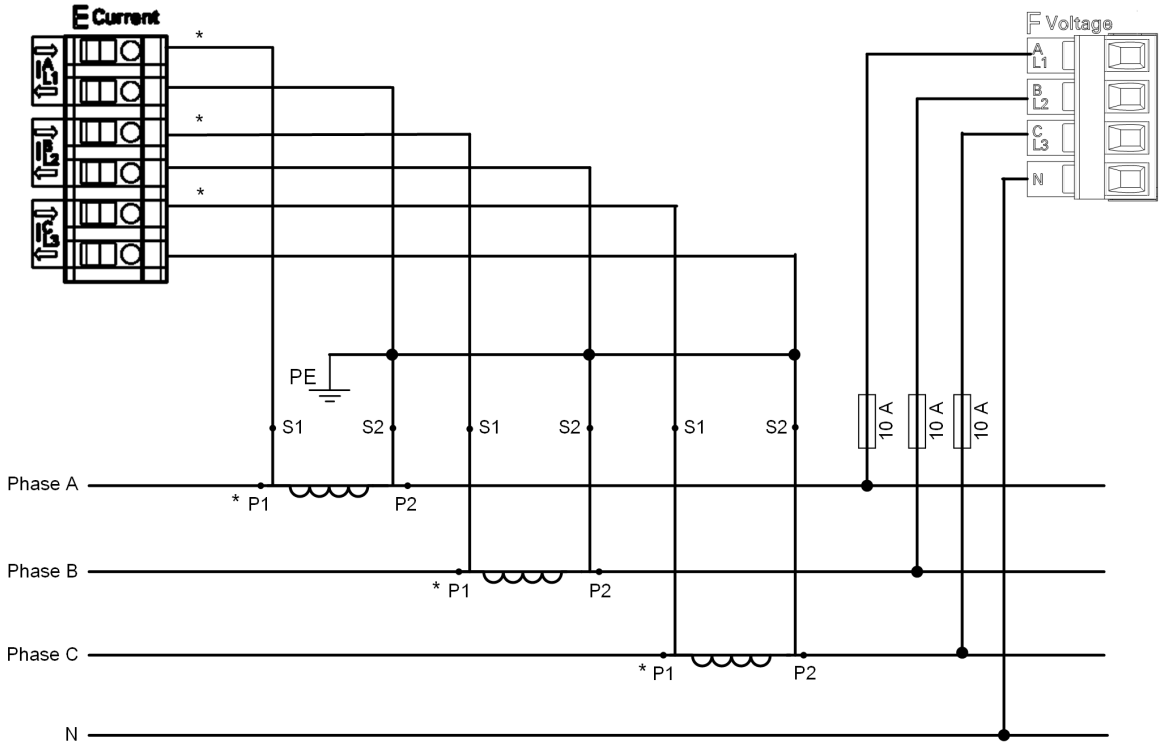
Example: 4-Wire Network, 1 Voltage Transformer and 1 Current Transformer, Balanced



[dw_4w_1vt_1ct_unbln, 1, en_US]

Figure 9-11 Example: 4-Wire Network, 1 Voltage Transformer and 1 Current Transformer, Balanced

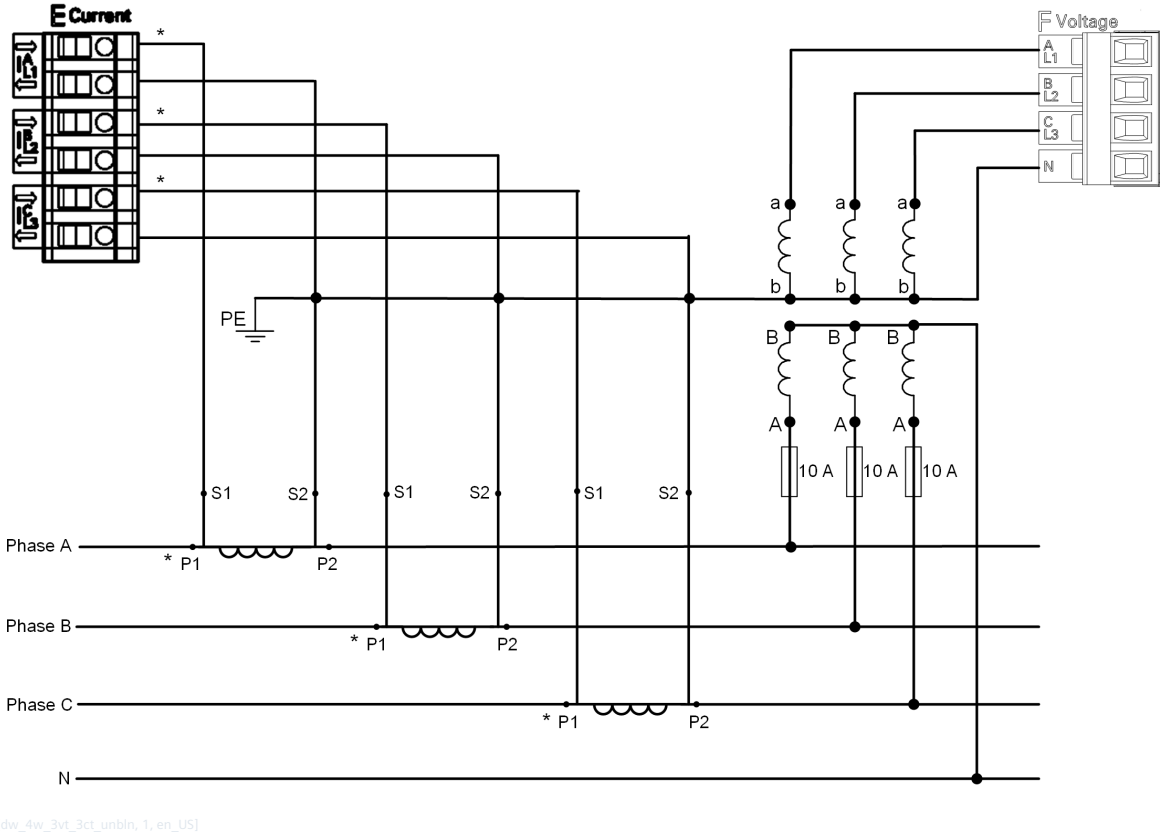
Example: 4-Wire Network, No Voltage Transformer, 3 Current Transformers, Unbalanced



[dw_4w_0vt_3ct_unbln, 1, en_US]

Figure 9-12 Example: 4-Wire Network, No Voltage Transformer, 3 Current Transformers, Unbalanced

Example: 4-Wire Network, 3 Voltage Transformers and 3 Current Transformers, Unbalanced



[dw_4w_3vt_3ct_unbln, 1, en_US]

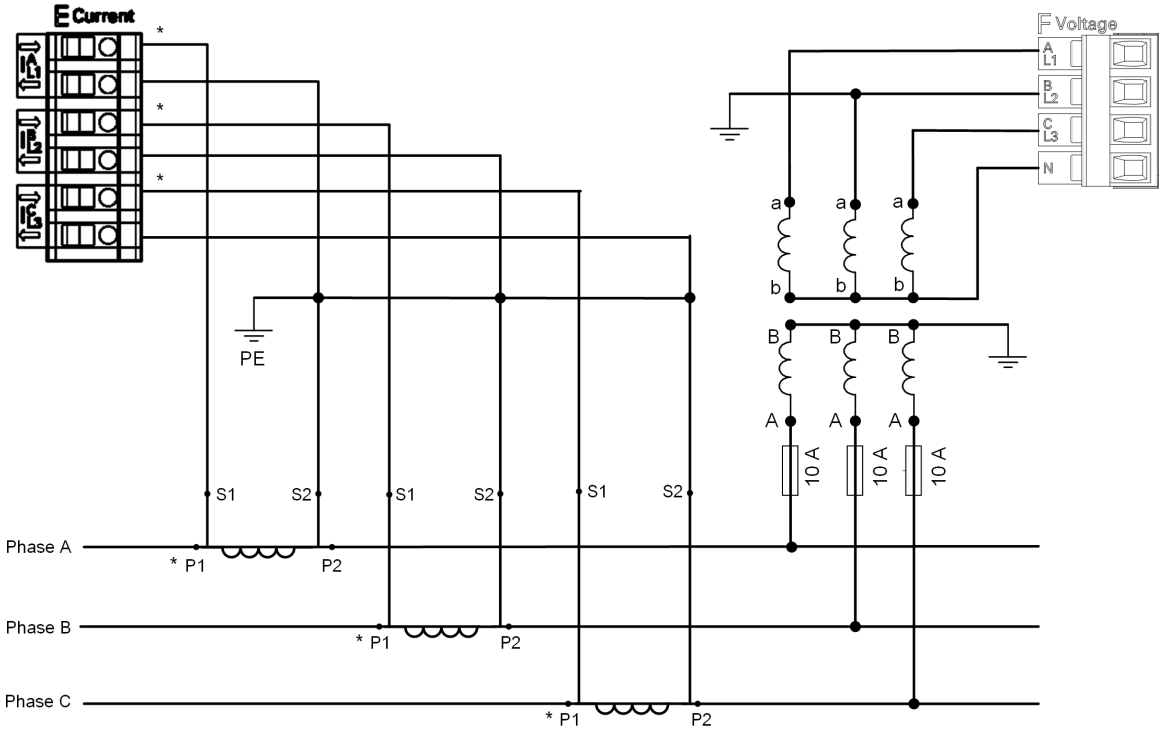
Figure 9-13 Example: 4-Wire Network, 3 Voltage Transformers and 3 Current Transformers, Unbalanced

NOTE

If you need to change the direction of the current connection, you can configure the current inverse for each phase in **Configuration** > **Basic configuration** > **AC measurement**.

9.6.3 Special Application, Example

Example 3-wire Network, 3 Voltage Transformers and 3 Current Transformers, Unbalanced



[dw_3w_3vt_3ct_unbln, 1, en_US]

Figure 9-14 Example 3-wire Network, 3 Voltage Transformers and 3 Current Transformers, Unbalanced

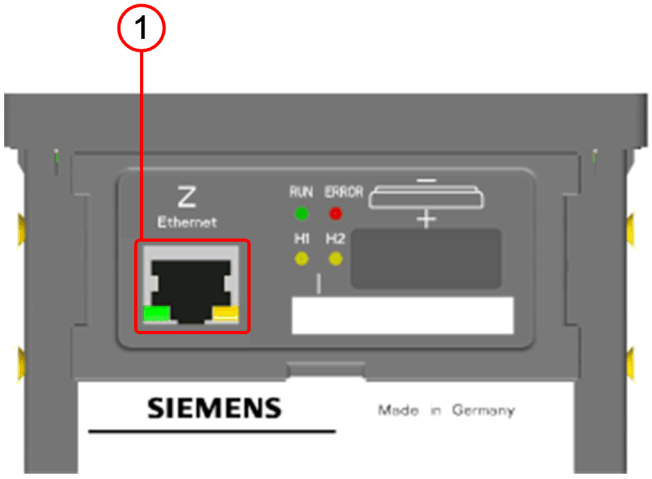
9.7 Communication Connections

NOTE

Be aware of the safety instruction in chapter *Safety Notes, Page 194*.

If you do not connect cables to the communication connectors, Siemens recommends covering the connectors with a cap or dummy plug (not included in the delivery) to prevent the contacts from becoming dirty.

Ethernet Interface



[le_Q100_communication _connections, 1, --_--]

Figure 9-15 Communication Interface, Ethernet Interface

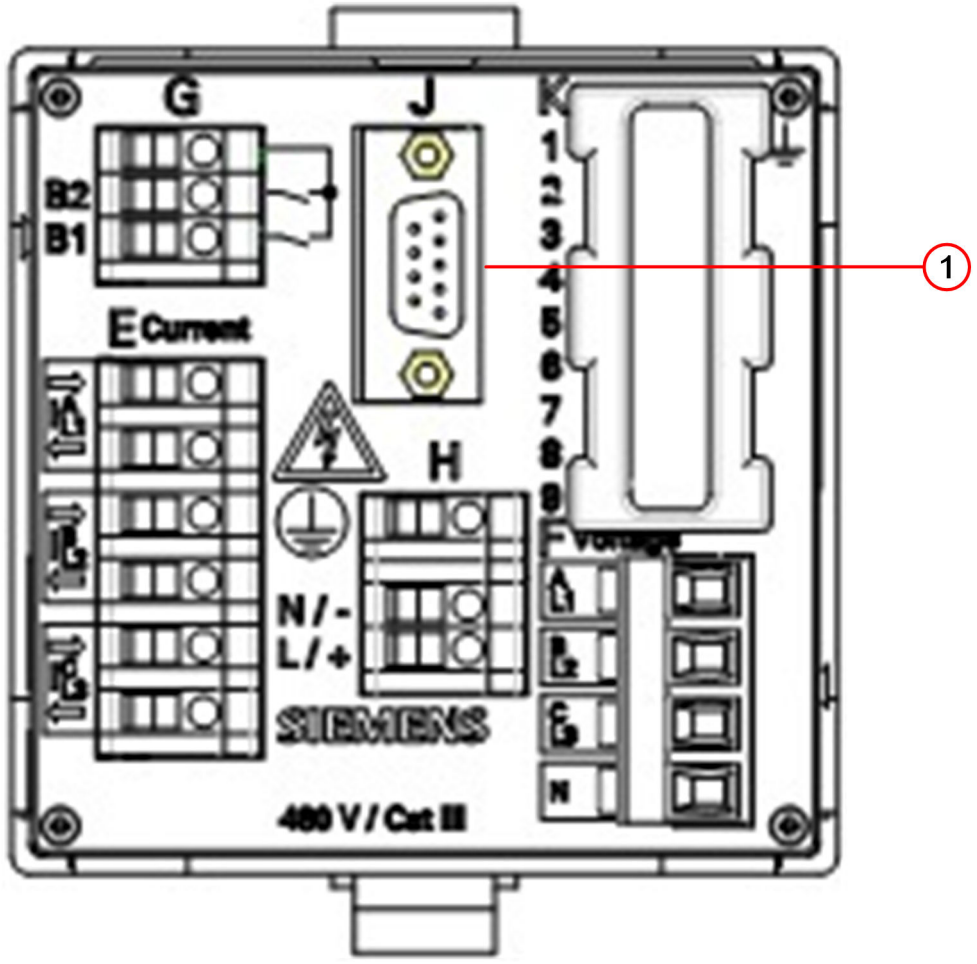
(1) Ethernet interface Z

The device is equipped with 1 Ethernet interface. The data are exchanged via the RJ45 plug connector.

Further Technical data see chapter *12.1.3 Communication Interfaces*.

The device features an internal Ethernet switch. It is therefore possible to connect a Y-cable to the Ethernet interface in order to cascade devices with an Ethernet interface. You can enable or disable the internal Ethernet switch in the parameterization. If you use a Y cable and the internal Ethernet switch, the device can be connected with a SICAM I/O Unit. This device combination can be connected with the process control via the second connector of the Y cable and an external Ethernet switch.

Serial Interface (RS485)



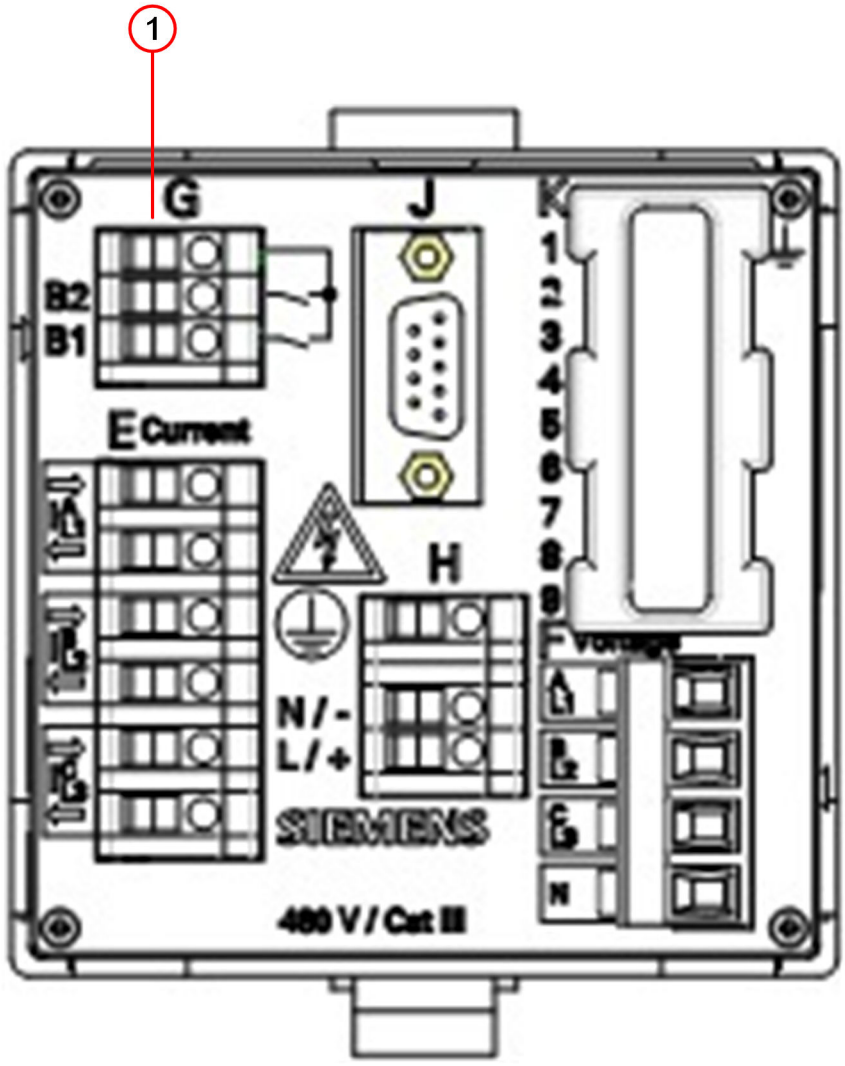
[le_P85x_rear, 1, --_--]

Figure 9-16 Communication Interface, Serial Interface

(1) Serial Interface J (RS485)

The serial interface J (RS485) is located on the terminal side.
Further Technical data see chapter *12.1.3 Communication Interfaces*.

9.8 Binary Connections



[le_binary_connections, 1, –_–]

Figure 9-17 Binary Connections

(1) Binary outputs

Terminals and Conductors

The device has the following terminal blocks:

Terminal Block	Description
G	2 binary outputs

Terminals for binary outputs

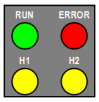
- Conductor cross-section, rigid max.: 2.5 mm^2 (AWG 14)
- Conductor cross-section (conductor with ferrule): 1.5 mm^2 (AWG 16)
- Tightening torque: 0.4 Nm to 0.5 Nm (3.5 in-lb to 4.5 in-lb)

9.9 Meaning of LEDs

LEDs on the Front Side

The device automatically monitors the functions of hardware and software components. The LEDs on the front side of the housing (see *1.3 Device Design*) indicate the current device status.

Table 9-1 Designation of the LEDs on the Front Side

LEDs	Meaning
	RUN: Device active ERROR: Indicates an error according to parameterization H1 to H2: According to parameterization

Depending on the status, the LEDs can be permanently on, flashing, or off. The states are described in chapter *10 Troubleshooting, Repair, and Fallback Mode*.

NOTE

The functions of the LEDs on the display side are the same as the functions of the LEDs on the top of the housing.

LED at the Ethernet Socket

Depending on the status, the LEDs at the Ethernet socket can be permanently on, flashing, or off. The meaning of the LEDs is explained in the following table:

Table 9-2 LEDs at the Ethernet Socket

LED	Meaning
	LED Speed: • On: 100 Mbit/s • Off: 10 Mbit/s
	LED Link/Activity: • LED on: Ethernet link is up. • LED flashing: Ethernet link is up and data is transferred. • LED off: no Ethernet partners is connected.

9.10 Operation via Display

9.10.1 General Operating Instructions

A restricted operation via the display of the device is possible with the softkeys.
The front softkeys F1 to F4 are used to set parameters, select measurands, and enter various settings.
The following table lists the icons which appear on the display when the softkeys are pressed.

Table 9-3 Control Functions of the Softkeys

Softkey Functions	F1	F2	F3	F4
General Softkey Functions				
Displaying the RMS value	RMS			
Canceling an action and returning to the action displayed previously	ESC			
Displaying the maximum value	MAX			
Displaying the minimum value	MIN			
Scrolling up		▲		
Scrolling down			▼	
Menu selection				MENU
Acknowledging the selection				ENTER
Special Softkey Functions				
Displaying the table of the value	Tab			
Displaying the graph	GRAPH			
Displaying additional information		INFO		
Active energy supply	SUP			
Active energy consumption	DMD			
Inductive reactive energy	IND			
Capacitive reactive energy	CAP			
Scrolling left		◀		
Scrolling right			▶	
Displaying the next additional information				↻
Switching to edit mode				EDIT

Softkey Functions	F1	F2	F3	F4
Exiting edit mode				OK
Increasing the displayed value or switching forward in the parameter list in edit mode		+		
Reducing the displayed value or switching backward in the parameter list in edit mode			-	
Switchover the sign		+/-		
Switching between selected and non-selected state (for example, password protection on → password protection off)				

Table 9-4 Icons in the Title Bar of the Display

Icon	Definition
	The device is password-protected.
	The device password was entered correctly and the device is unlocked.

9.10.2 Starting Operation

Before starting the device, the following preconditions must be met:

- Mount the device as described in chapter *9.3 Assembly*.
- Connect the lines for measurement, communication and supply voltage as described in the chapters *9.5 Electrical Connection*, *9.7 Communication Connections*, *9.8 Binary Connections* and observe the safety notes.
- Switch on the devices needed for the measurement.
- Switch on the supply voltage of the device.
- Check whether the LEDs indicate that the device is ready (see chapter *10.1.3 LED Indications*).

Once the device is initialized, the currently selected screen with the measured values is displayed.

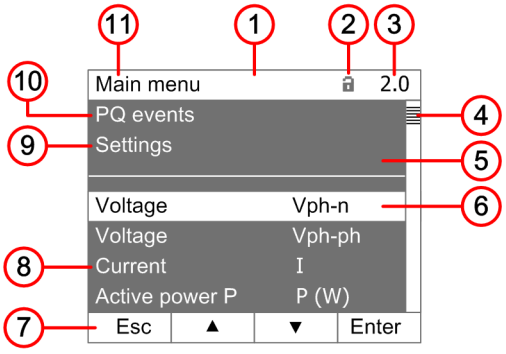
NOTE

The following figures only show the display without the front view of the device.

9.10.3 Display Content

Display of the Menus

In the main menu, all submenus are listed on the display:



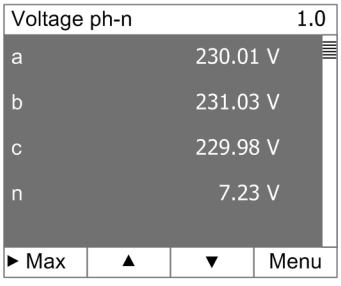
[dw_display_main-menu, 1, en_US]

Figure 9-18 Display Content

(1) Title
(2) Password icon
(3) Display number
(4) Scroll bar
(5) Start/end of the list
(6) Selected display
(7) Current functions of the softkeys
(8) Selectable measurements
(9) Submenu settings
(10) Diagnostics
(11) Menu/submenu

The display can be switched between inverse mode and non-inverse mode (see chapter *7.1.2 Configuration via Web Pages*).

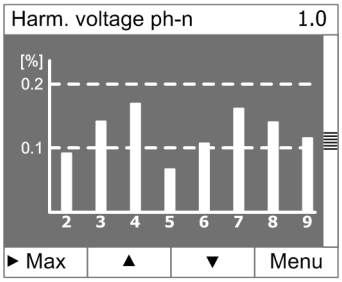
Display of Measured Values



[dw_display_measuremets, 1, en_US]

Figure 9-19 Display of Measured Values

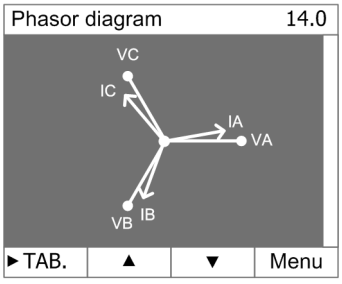
Display of Bar Charts



[dw_display-bar-chart, 1, en_US]

Figure 9-20 Display of Bar Charts

Display of Phasor Diagrams



[dw_display_phasor-diagram, 1, en_US]

Figure 9-21 Display of Phasor Diagrams

9.11 Operation via PC

9.11.1 General Usage Notes

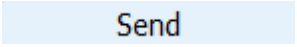
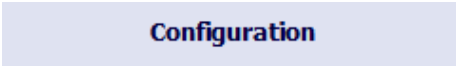
The device can be operated with HTML pages via the connected PC. Additionally, limited operation of the device is possible with softkeys on the display side in connection with the display.

The graphical user interface is stored in the device. To display the user interface, start the Web browser and enter the IP address of the device.

You can navigate via the Web browser using the icons on the toolbar, for example back, forward, print. The user interface itself does not contain any navigation icons.

Operating actions are performed with the mouse. Parameters and text are entered using the keyboard.

Table 9-5 Control Functions

Control Element	Control Function
	Option button: selects one option
	List box: selects an item from a list
	Button: Executing an action by clicking the button, that is the current settings on the Web page are transmitted to the device.
	Active tab (light blue)
	Inactive tab (dark blue)
	Selects and opens the item to be activated, for example a tab

NOTE

At the beginning of the parameterization, first set the **Network type** according to chapter *2.5.1 Configuration via Web Pages*. If you change the **Network type** during operation, check all settings, measured values, and limiting values for inconsistencies after activating the device. Check also the **ICD/IID file** which is suitable for the network type. If there are invalid values or a wrong **ICD/IID file**, restart the device.

NOTE

If you change settings in tabs, click **Send** on each tab to confirm the new setting. The settings have to be activated after the entire parameterization has been completed.

9.11.2 Start and Design of the User Interface

9.11.2.1 Initial Start of the Operation

Before starting the user interface, the following preconditions must be met:

- Assemble the device as described in chapter *9.3 Assembly*.
- Connect the lines for measurement, communication, and supply voltage as described in the chapters *9.5 Electrical Connection*, *9.7 Communication Connections*, and *9.8 Binary Connections*.
- Observe the safety notes.
- Switch on the devices needed for the measurement.

- Switch on the supply voltage of the device.
- Check whether the LEDs indicate that the device is ready (see chapter *10.1.3 LED Indications*).
- Match the IP address and the subnet mask of the network interface card of your computer to the device settings.
- Check on the computer screen whether the LAN connection is active. Activate the LAN connection if it is not activated (see the Windows manual or the Windows online help for more information).
- Start the Web browser.
- Enter the IP address in the Web browser (for example default IP address: https://192.168.0.55) of the device and press **ENTER**.
- Add the self-signed certificates to the certificate trust store of the Web browser. For more information, refer to the document at *http://www.siemens.com/gridsecurity*, **Downloads** > **Downloads Cyber Security General** > **Application Notes**.
- Enter the right password. For more information, refer to chapter *2.2.2 Password Management*.
- Click **Log on**.
  The user interface opens with the **Information** tab → **Show device information**.

NOTE

The device supports the following Web browsers:

- Microsoft Internet Explorer
- Microsoft Edge V41 and above
- Google Chrome V61 and above
- Mozilla Firefox V58 and above

NOTE

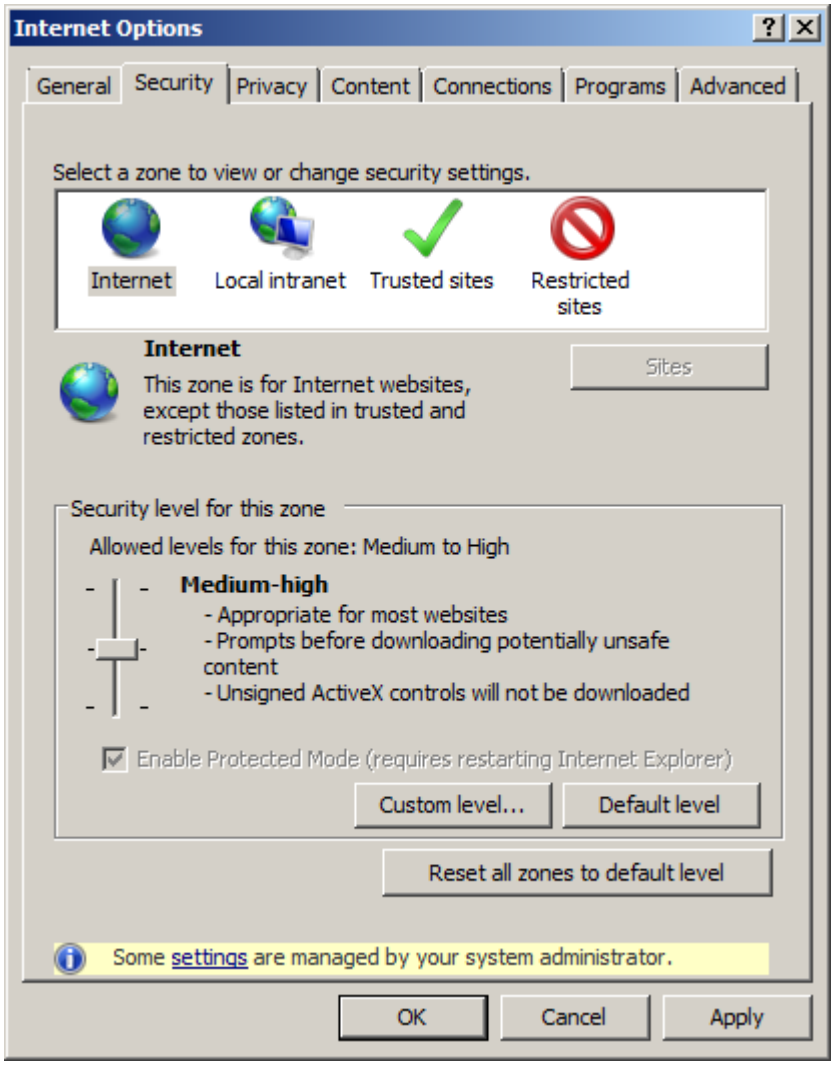
When starting the device for the first time, a set of parameters with factory settings is loaded. You can modify these settings during the parameterization.

To set a different user language for the Web pages, open the **Configuration** tab → **Basic configuration** → **Device and language** and change the language.

9.11.2.2 Enabling JavaScript (only for Microsoft Internet Explorer)

The operation of the Web page requires JavaScript.
Enable JavaScript as follows:

- Start Microsoft Internet Explorer with **Run as administrator**.
- Select **Tools** on the menu bar of Microsoft Internet Explorer.
- Select **Internet options**.
- In the **Internet options** dialog, open the **Security** tab.



[sc_Internet_options_security, 2, en_US]

Figure 9-22 Enabling JavaScript

- In the window of the **Security** tab, select the **Internet** icon.
- On the **Security** tab set **Medium-high**.
- Click **Apply**.
- Click **OK**.

9.11.2.3 Changing the Buffer Mechanism (only for Microsoft Internet Explorer)

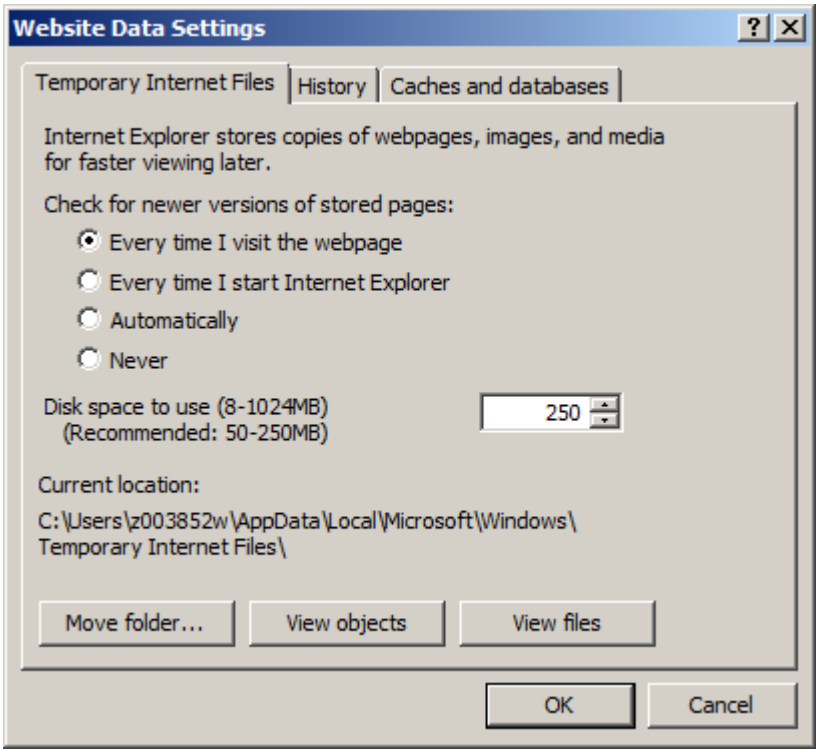
NOTE

Only Microsoft Internet Explorer supports the SIGRAPlugin. Other Web browsers, for example Firefox, do not support the SIGRAPlugin.

The operation of the user interface requires the SIGRAPlugin.
Change the buffer mechanism as follows:

- Start Microsoft Internet Explorer.
- Select the **Tools** menu in the menu bar of the Microsoft Internet Explorer.
- Select **Internet options** from the **Tools** menu.

- In the **Internet options** dialog, open the **General** tab.
- In the dialog of the **General** tab, select the **Settings** icon.



[sc_website_settings_temporary_internet_files, 2, en_US]

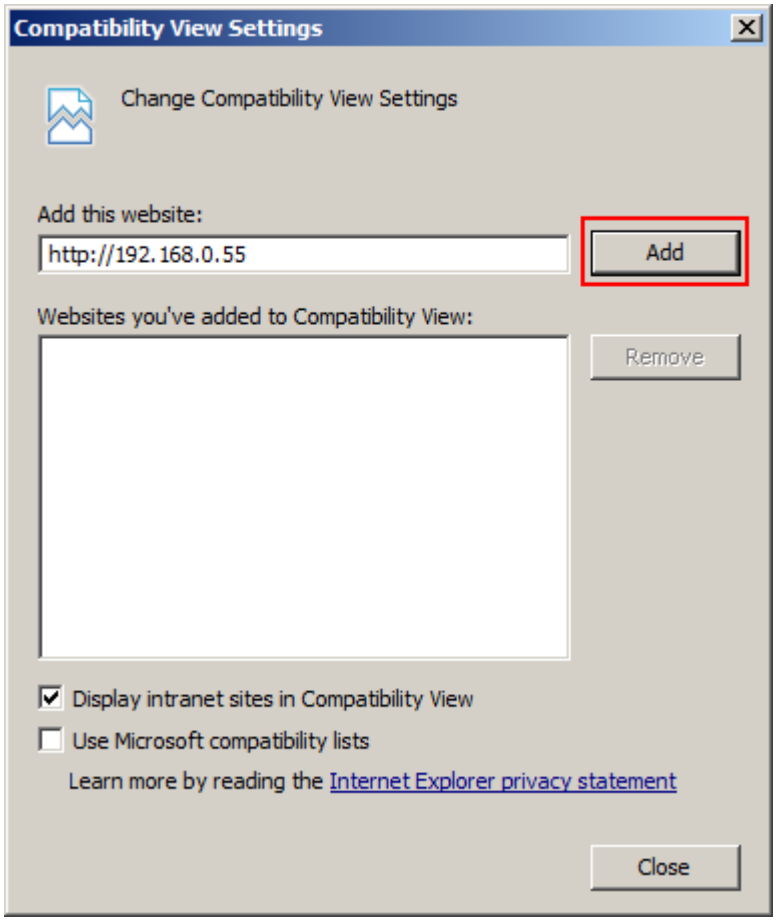
Figure 9-23 Changing the Buffer Mechanism

- In the **Website Data Settings** tab, click the **Every time I visit the webpage** icon.
- Click **OK**.

9.11.2.4 Changing the Compatibility Setting (only for Microsoft Internet Explorer)

In the Internet Explorer 10.0 or higher version, the operation is mandatory.
Change the compatibility setting as follows:

- Start Microsoft Internet Explorer.
- Select the **Tools** menu in the menu bar of Microsoft Internet Explorer.
- Select **Compatibility View Settings** from the **Tools** menu.



[sc_changing_the_compatibility_setting, 1, en_US]

Figure 9-24 Changing the Compatibility Setting

- In the **Compatibility View Settings** dialog, click the **Display all websites in Compatibility View**.
- Enter the IP Address of SICAM P850/P855 device in the **Add this website** box, click **Add**.
- Click **Close**.

9.11.2.5 Changing the Security Setting (only for Microsoft Internet Explorer)

NOTE

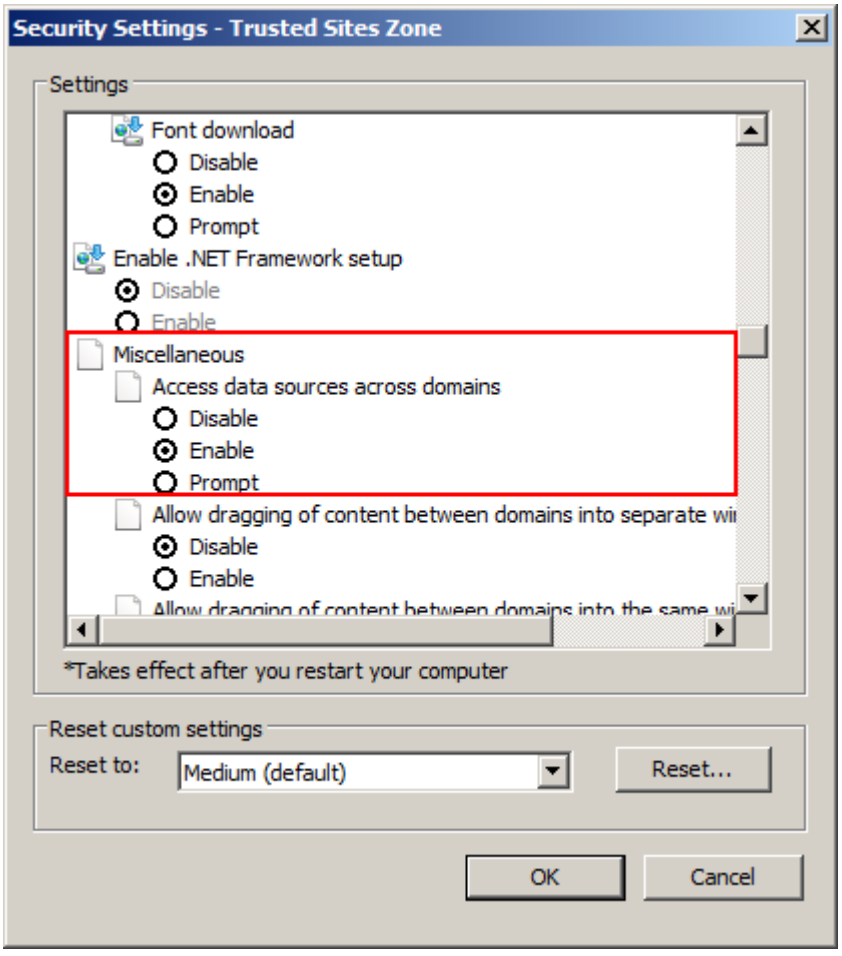
With Microsoft Internet Explorer, version 10.0 or higher, the operation is mandatory if multiple file download is required in chapter *7.3.4 Multiple File Download via Internet Explorer*.

Changing Security Settings

In the Internet Explorer 10.0 or higher, the following operation is mandatory:

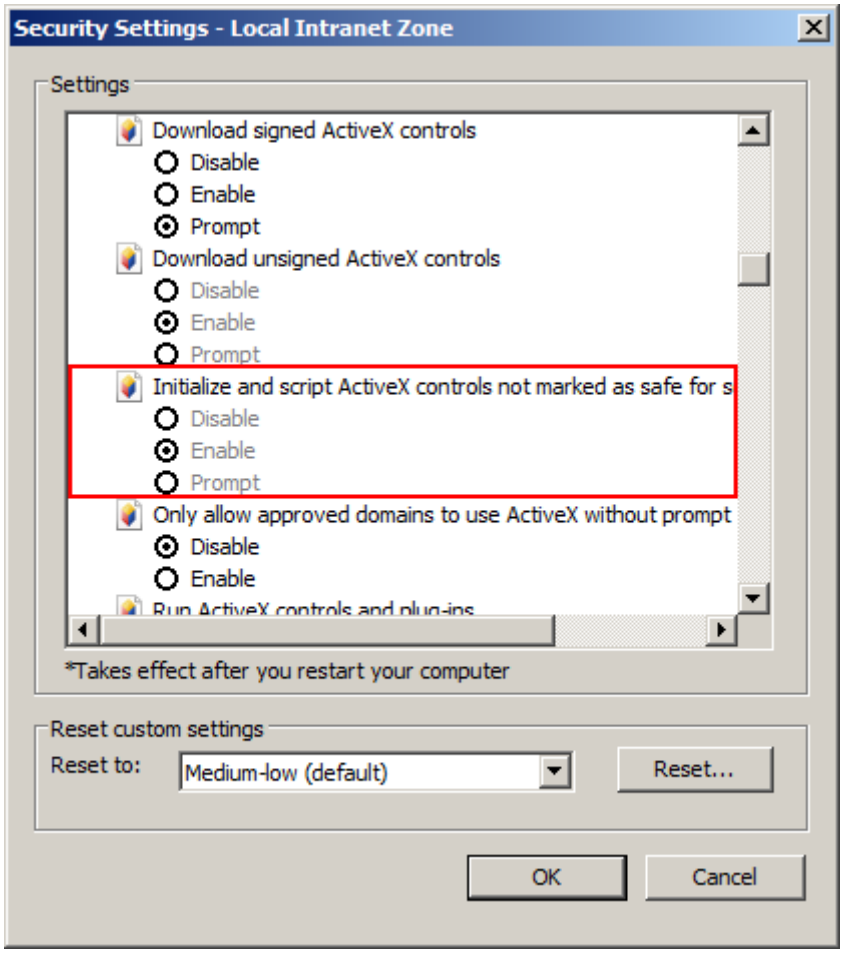
- Select **Tools** → **Internet Options** → **Security**.
- Click **Custom level**.
  The **Security Settings** dialog opens.

- Enable 2 options, the **Access data sources across domains** and the **Initialize and script ActiveX controls not marked as safe for scripting**.



[sc_security_settings, 2, en_US]

Figure 9-25 Changing Security Settings – Miscellaneous



[sc_Security_settings_trusted_site_zone, 3, en_US]

Figure 9-26 Changing Security Settings – ActiveX Controls and Plug-Ins

- Click **OK**.

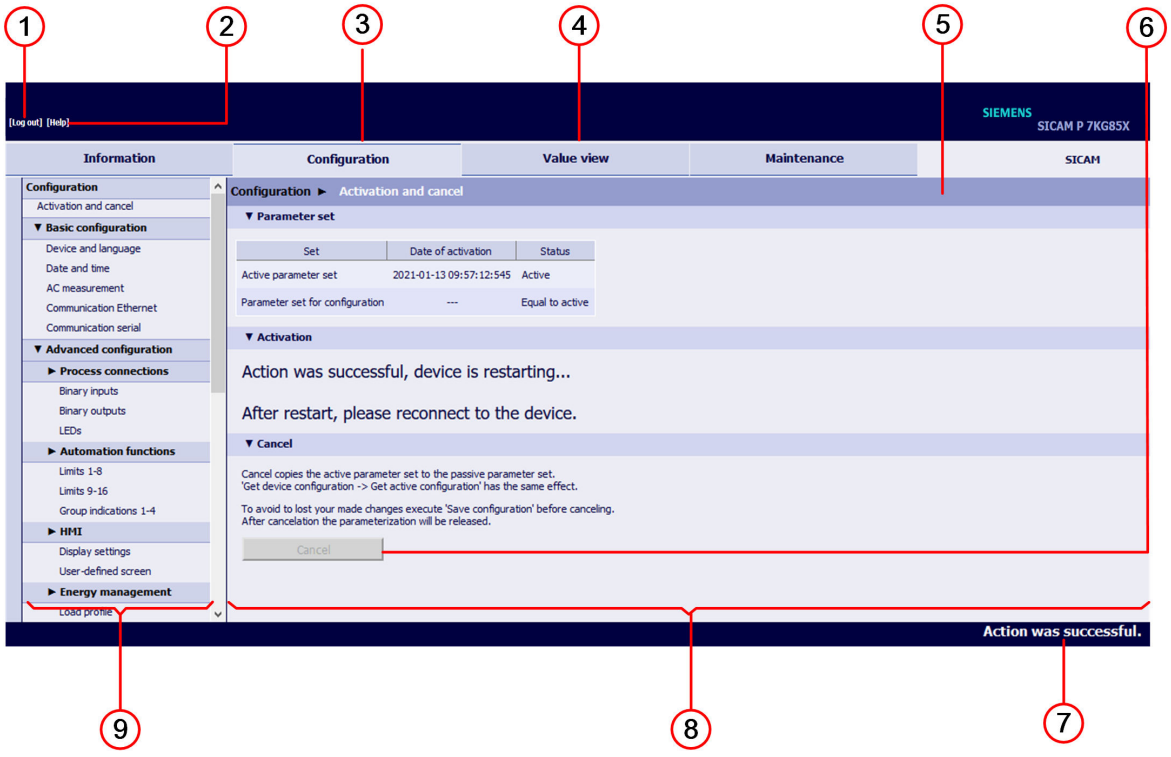
NOTE

If the Windows system is reinstalled, you must reconfigure the settings related to the Microsoft Internet Explorer.

9.11.2.6 Number of Connections via HTML

1 connection is possible via HTML.

9.11.2.7 Layout of the Web Page



[le_layout_user_interface_p85x, 1, en_US]

Figure 9-27 Layout of the Web Page

(1) Logout
(2) Online help
(3) Active tab (light blue)
(4) Inactive tab (dark blue)
(5) Navigation bar
(6) Button
(7) Status bar
(8) Dialog window
(9) Navigation window

9.11.2.8 Starting the Web Page during Operation

To start the Web page, proceed as follows:

- Start the Web browser.
- Enter the IP address in the Web browser (for example the default IP address: 192.168.0.55) and press **ENTER**.
  The Web page opens with the **Log on** tab.
- Enter the logon password (default password is 000000) and click **Log on**.
  The Web page opens with the **Information** tab.

You can click the logout icon (see red marking in *Figure 9-27*) to log off, and the login page will appear.

NOTE

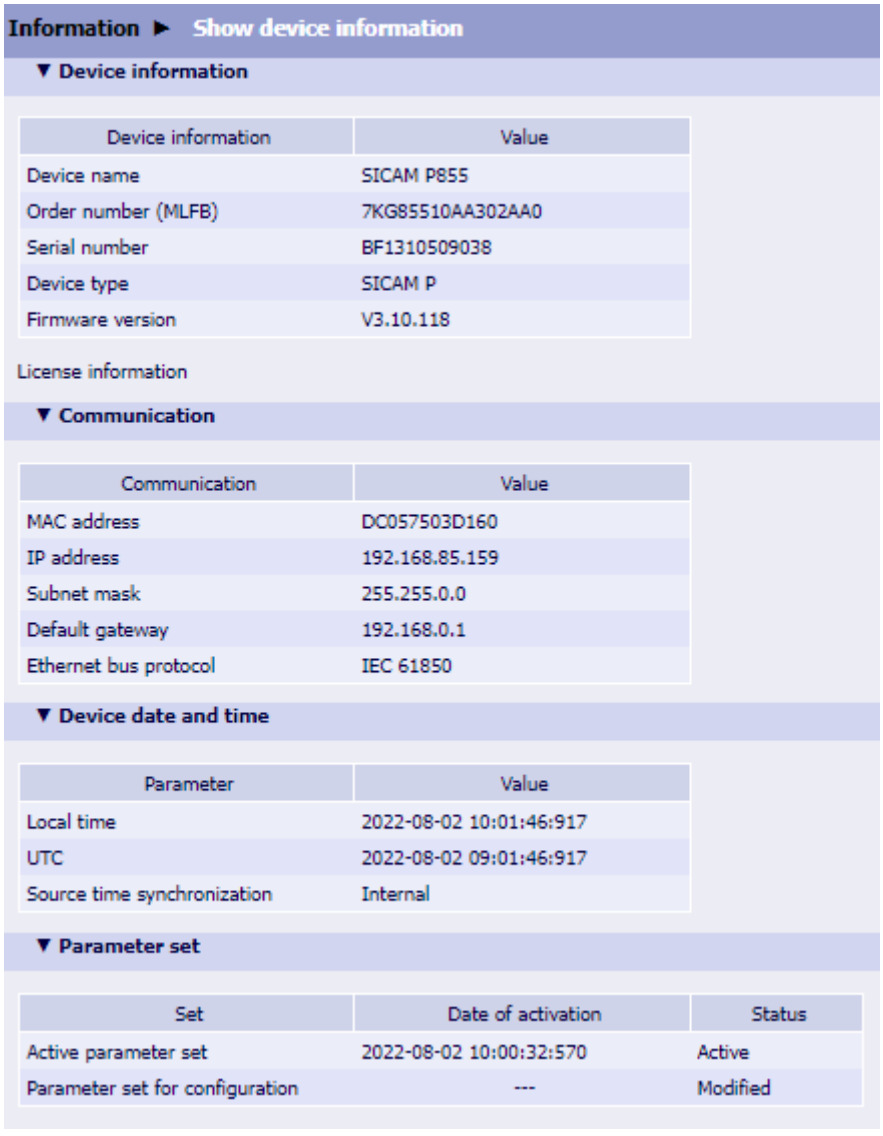
Without user interactions the Web UI will be accessible for 10 minutes (default). You can configure this timeout.

The navigation window of the **Information** tab contains:

- Show device information
- Operational log

Show Device Information

- Click **Show device information** in the navigation window.



[sc_device_information, 2, en_US]

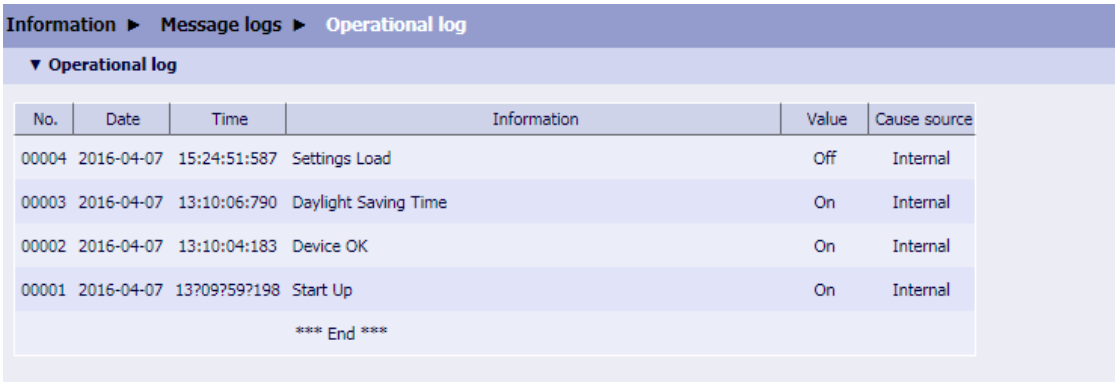
Figure 9-28 Information Tab, Show Device Information

Message Logs Menu – Operational Log

The **Message Logs** menu contains operational indications registered and saved by the device during operation. The device can save up to 128 operational indications. When the storage capacity is exceeded, the oldest indications will be overwritten successively.

To show the operational indications, proceed as follows:

- In the navigation window, click **Operational log**:



[sc_Operational_log, 2, en_US]

Figure 9-29 Information Tab, Operational Log

NOTE

The chapter *2.8.2 Viewing and Clearing of Message Logs* explains how to delete the operational indications manually.

9.11.2.9 Get Default Configuration

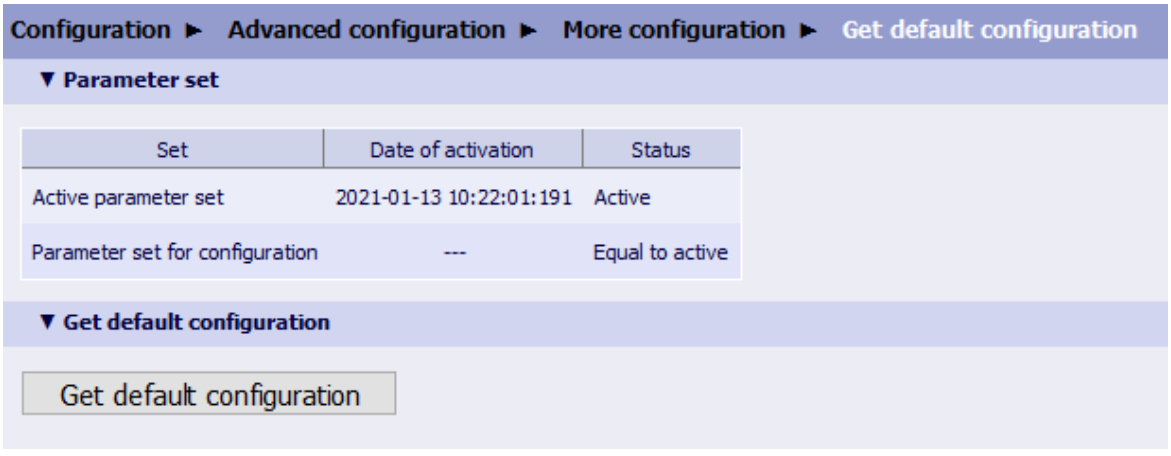
NOTE

The device contains 2 sets of parameters. The set of parameters currently used for device operations is the **active set of parameters**. The inactive set of parameters is called the **passive set of parameters**.

If you have not changed the settings of the parameters since the first start of the device, you use the default settings.

If you have changed the settings of the parameters, and need to get the default configuration that is set at the factory, proceed as follows:

- In the navigation window of the **Configuration** tab, click **Get default configuration**.



[sc_Get_device_configuration, 2, en_US]

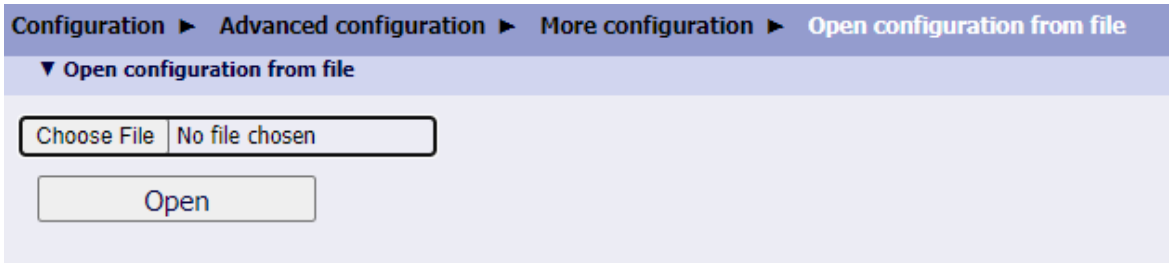
Figure 9-30 Configuration Tab, Get Default Configuration

The factory settings (= passive set of parameters) are restored, and the status of the "parameter set for configuration" changes from "equal to active" to "**modified**".

9.11.2.10 Open Configuration from File

If you have selected **Open configuration from file** in the **Configuration** tab, you can open an existing file in a folder.

Proceed as follows:



[sc_Open-configuration-from-file, 3, en_US]

Figure 9-31 Configuration Tab, Open Configuration from File

- Click **Choose file**.
- Select the desired file (extension .cfg) in the directory.

NOTE

The file name has the following restrictions:

- Maximum 8 characters
- Only containing:
  - Letters: a to z, A to Z
  - Numbers: 0 to 9
  - Hyphen (-) and underline (_)

- Click **Open**.
  The selected path is inserted in the Browse field, *Figure 9-31*.
- Click **Open**.
  The device configuration from the CFG file is loaded.

NOTE

If you have activated the option in your Web browser to transfer the local directory name together with the file name when uploading files, the total number of characters in the directory and file names must not exceed 100 English characters. Otherwise, the CFG file in your device will not be updated.

9.11.2.11 Activation and Cancel of the Configuration Change

Refer to *2.1 Activation and Cancel of the Configuration Change*.

9.11.2.12 Access to the Passive Set of Parameters by Multiple Users

Reading the Passive Set of Parameters

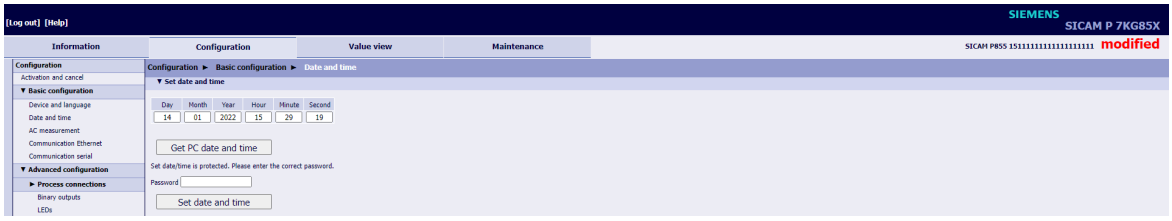
The user interface allows the simultaneous read access of up to 2 users to the passive set of parameters.

Editing the Passive Set of Parameters

The passive set of parameters can only be edited by one user even though multiple users have simultaneous read access.

Once a user changes a parameter on the Web page, the write access is denied for all other users.

If the write access is blocked, **modified** in brackets will be displayed in the upper right corner of the Web page. The user performing the changes will see **modified** without brackets.



[sc_configuration_modified, 1, en_US]

If a user performs changes, the server starts a 20-minute timer. If no further changes to the set of parameters are entered by the time the timer has counted down, write access is released again for all users. In this case, the modified data are discarded and the passive set of parameters is overwritten with the content of the active set of parameters.

If new changes to the passive parameter set are made during the 20-minute countdown, the timer is restarted by each action.

If the user has completed the changes to the passive set of parameters or finished the parameterization by clicking **Cancel**, write access for all users is also released.

9.12 Commissioning

9.12.1 Electrical Commissioning

Before commissioning the device, check that all connections are made properly.

- Connect the protective grounding terminal H (protective-conductor terminal) to the protective conductor of the switch panel or of the control cabinet.
- The secondary connections of interconnected current transformers must be short-circuited before you disconnect the power supply that leads to the device.
- **Voltage measuring inputs**: In the case of a **direct connection** and **transformer connection**, the device has to be safeguarded with a listed 10 A backup fuse or a listed 10 A miniature circuit breaker. When using voltage transformers, their secondary connections must never be short-circuited!
- Check the polarity and the phase assignment at the instrument transformers.

Siemens recommends leaving the device for a minimum of 2 hours in the operating room, before using it to allow temperature equalization and to avoid dimness and condensation.

Initial Commissioning

After you have inserted the battery, assembled the device and connected the supply voltage lines, you can start the device for the first time. Proceed as follows:

- Check that the operational data match the rated data on the label and the technical data of the device (see chapter *12.1.1 Power Supply*). This applies in particular to the supply voltage and to the maximum values of alternating current and alternating voltage.

NOTE

The wiring of the terminals described in the following depends on the type of measurement and analysis of the measuring result. You only have to wire the terminals needed for this purpose.

- Connect the measuring lines that are connected to the measuring objects to the terminal blocks E (Current) and F (Voltage).
- Connect the process connections required for the measurements.
- Connect a cable, for example, for the systems control, to the serial interface J (RS485 interface).
- Connect a LAN cable for the PC or for other devices in the system to the RJ45 socket Z (Ethernet).
- Close the door of the control cabinet to prevent touching live parts.
- Switch on the connected peripheral devices (PC, measuring device or modules) for measurand analysis.
- Switch on the supply voltage of the device.

NOTE

A connection cable for the RS485 interface is not component of the delivery. This cable is available in the specialized trade. The terminal connection of the RJ45 socket see chapter *12.1.3 Communication Interfaces*.

NOTE

The device does not have a power on/off switch. Switch the supply voltage on or off directly at the respective supply cable.

After an operating time of approximately 15 min, the device will stay within the tolerances specified in *12 Technical Data*.

- Switch the alternating voltages and alternating currents to be measured at the measurement object on the measuring lines.
- Enter the IP address (default: 192.168.0.55) in the Web browser.
- Enter the **Password** for the **Web Login**.
- Carry out the measurements.

NOTE

If you change the measurement setup, de-energize the power lines and all measuring lines before opening the control cabinet.

9.12.2 Starting the Device with the Default IP Address

SICAM P850/P855 has the following internal default IP address: **192.168.0.55**.

If you have entered a custom IP address during device configuration, you can temporarily activate the internal default IP address of the device if necessary.

Devices with Display

- Hold down the F4 softkey located in the right part of the display side of the device for at least 3 s.

When you press the softkey F4, SICAM P850/P855 will reset and use the default IP address until you have set a new IP address or switched the device off and on again.

NOTE

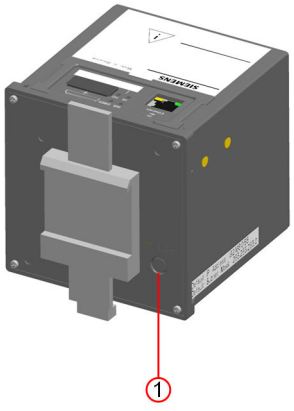
Changing the IP address causes the device to reset and the LEDs signal that the device was started with the default IP address.

In this case, the parameterized IP address and the default IP address are displayed on the **Information** tab, **Device information** menu item (see *9.11.2.8 Starting the Web Page during Operation*).

After starting the device with the default IP address, the factory-set passwords are active, too (see *2.2.2 Password Management*).

DIN Rail Devices

- Press the IP-Addr. push-button on the DIN Rail side for at least 3 s.



[dw_DIN_rail_side_button, 1, en_US]

Figure 9-32 Location of the Push-button for Activating the Default IP Address

When you press the IP-Addr. push-button, SICAM P850/P855 will reset and use the default IP address until you have set a new IP address or switched the device off and on again.

NOTE

Changing the IP address causes the device to reset and the LEDs signal that the device was started with the default IP address.

In this case, the parameterized IP address and the default IP address are displayed on the **Information** tab, **Device information** menu item (see *9.11.2.8 Starting the Web Page during Operation*).

After starting the device with the default IP address, the factory-set passwords are active, too (see *2.2.2 Password Management*).

9.12.3 New Device at Initial Commissioning

Basic Configuration

After logging on to the Web page of the device, you must configure the basic functions. For more information, refer to *2 Basic Functions*.

9.12.4 Firmware Update at Initial Commissioning

NOTE

Check the Siemens Internet site whether a new firmware version is available and update your firmware if necessary.

You can find the manuals and the firmware via the download area in the Siemens Internet under:

http://www.siemens.com/sicam-p850

http://www.siemens.com/sicam-p855

You can find more detailed information on the firmware update in chapter *8.3.2 Firmware Upload via Web Pages*.

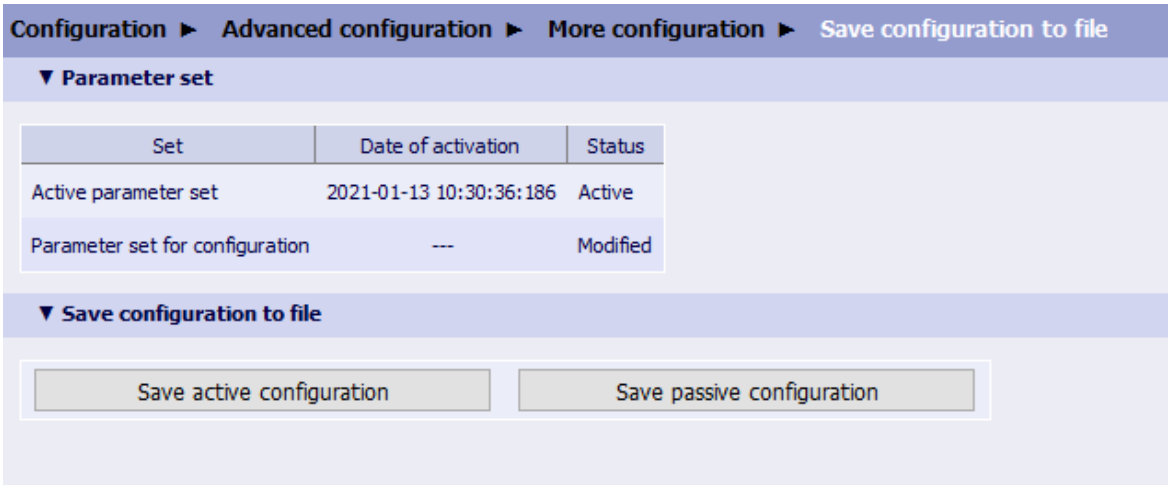
9.12.5 Import and Export of the Configuration File

When configuring many devices, you can export the configuration from 1 device and import it into the other devices.

Export of the Configuration

You can save both the active and the passive configuration to a file in the **Configuration** tab. Proceed as follows:

- In the navigation window, click **Save Configuration to File**.



[sc_Save config to file, 2, en_US]

Figure 9-33 Configuration Tab, Save Configuration to File

- Click either **Save active configuration** or **Save passive configuration**.
  The **File Download** dialog opens. You can save the downloaded configuration. For more information, refer to **File download** > **Save** described in *7.3.3 Single File Download*.

NOTE

The file extension must be .cfg.

NOTE

The file name has the following restrictions:

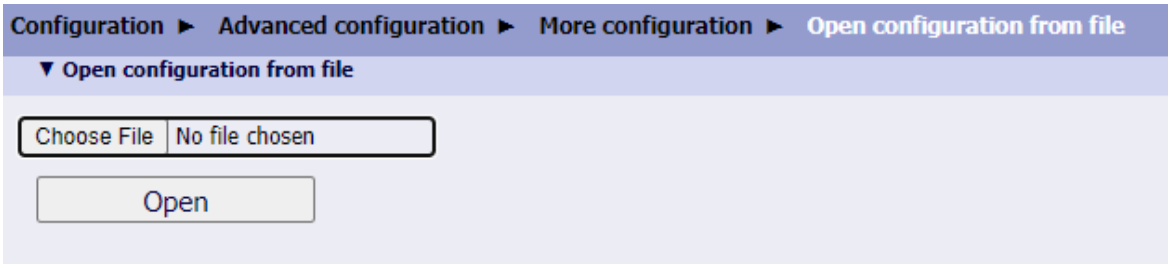
- Maximum 8 characters
- Only containing:
  - Letters: a to z, A to Z
  - Numbers: 0 to 9
  - Hyphen (-) and underline (_)

Import of the Configuration

To import the configuration to the target devices, proceed as follows:

- In the navigation window of the **Configuration** tab, click **Open configuration from file**.

Proceed as follows:



[sc_Open-configuration-from-file, 3, en_US]

Figure 9-34 Configuration Tab, Open Configuration from File

- Click **Choose file**.
- Select the desired file (extension .cfg) in the directory.
- Click **Open**.
  The selected path is inserted in the **Browse** field.
- Click **Open**.
  The device configuration from the CFG file is loaded.

NOTE

If you have activated the option in your Web browser to transfer the local directory name together with the file name when uploading files, the total number of characters in the directory and file names must not exceed 100 English characters. Otherwise, the CFG file in your device will not be updated.

10 Troubleshooting, Repair, and Fallback Mode

10.1 Failures and LED Displays

10.1.1 General Inspection

Visual Inspection

If function failures occur, first check the device visually. Observe the following points when inspecting the device visually:

- Correct installation of the device at the intended location as described in chapter *9.3 Assembly*
- Compliance with the environmental conditions specified in chapter *12.1.4 Environmental Conditions and Climatic Stress Tests*
- Correct connection of supply voltage and grounding conductors according to chapter *9.5 Electrical Connection*
- Correct connection of measuring and communication lines according to chapter *9.5 Electrical Connection*

Function Checks

Additionally, check the following aspects:

- Functioning of the display according to chapter *9.10 Operation via Display* and good visibility of the display
- Correct functioning of peripheral devices (for example connected PC, series-connected current transformers)
- Compliance with the access rights according to chapter *9.1 Safety Notes and Access Rights*
- Compliance with the commissioning sequence of the device according to chapter *9.12 Commissioning*
- Evaluation of the LED failure indications, see chapter *10.1 Failures and LED Displays*

10.1.2 Troubleshooting and Repair

General Troubleshooting

You are not authorized to do troubleshooting for the defective device beyond the measures described in chapter *10.1.1 General Inspection* and make repairs on your own. Special electronic modules are inserted in SICAM P850/P855 which can only be replaced by the manufacturer according to the guidelines for Electrostatic sensitive devices (ESD).

If you suspect any damage on the device, Siemens recommends sending the entire device to the manufacturer. For this purpose, it is best to use the original transport packaging or similar packaging.

Troubleshooting Based on Error Messages

NOTE

Error messages are service information that you provide upon request to the service department in case of an error.

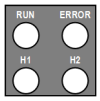
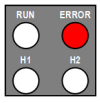
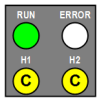
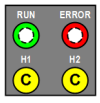
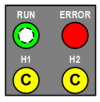
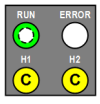
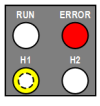
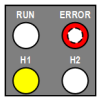
For more information, refer to *Viewing and Clearing of Error Logs, Page 84*.

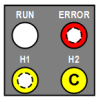
10.1.3 LED Indications

Table 10-1 Meaning of LEDs

LED	Description
	LED is off.
	LED is on.
	LED is flashing (0.2 s on, 0.2 s off).
	LEDs according to configuration If an indication is assigned to an LED (see chapter *13.3.1.2 LEDs*): • Indication off → LED off • Indication on → LED on • Indication invalid → LED is flashing (0.5 s on and 0.5 s off)

Table 10-2 Indication of LEDs

LED Combination	Description
No Operation	
	Device is switched off.
	Device is switched on, but firmware is not loaded or Device is in startup phase.
Normal Operation	
	The device uses the IP address configured by the user or received via DHCP.
	Normal operation with default IP address Default IP address is requested by pressing the **F4** softkey during normal operation.
	Double IP address has been detected in the network. The device is in operation but cannot be reached via Ethernet. Solve this network configuration issue and restart the device. Each device must have a unique IP address.
	An IP address request via DHCP is in progress. **ERR** = off and **H1** to LEDs according to configuration **RUN** LED stops flashing when IP address is received.
Fallback Mode	
	The device uses the IP address configured by the user or received via DHCP. The device runs into the Fallback mode after an unresolvable error in normal operation occurs or by pressing the **F4** softkey during device startup.
	Fallback mode with default IP address Default IP address is requested by pressing the **F4** softkey during fallback mode.

LED Combination	Description
HTTPS Certificate Generation	
	HTTPS certificate is being generated after the IP address is changed.

10.2 Fallback Mode

10.2.1 Function Description

The firmware of the device contains a complete application for the operation of the device and runs in 2 modifications, depending on the operating state:

- Normal operation: complete functional scope
- Fallback mode: minimum functional scope

The fallback mode is started automatically in case of severe system errors during the device start. Once the fallback mode is started, the indication **FALLBACK** appears on the device display.

The user interface **Fallback mode** opens in the browser. You can see and save different device information for fault analysis in the tabs. Furthermore, you can start different maintenance functions.

Fallback Mode during Device Restart

If a severe system error occurs during a manual restart of the device, the device automatically switches to the fallback mode.

Fallback Mode in Normal Operation

In case of an unexpected restart of the device during normal operation, the fallback mode starts only if a severe system error occurs during the restart. Otherwise, the device switches to normal operation immediately.

Manual Start of the Fallback Mode

If necessary, you can start the fallback mode manually using the softkey F4.

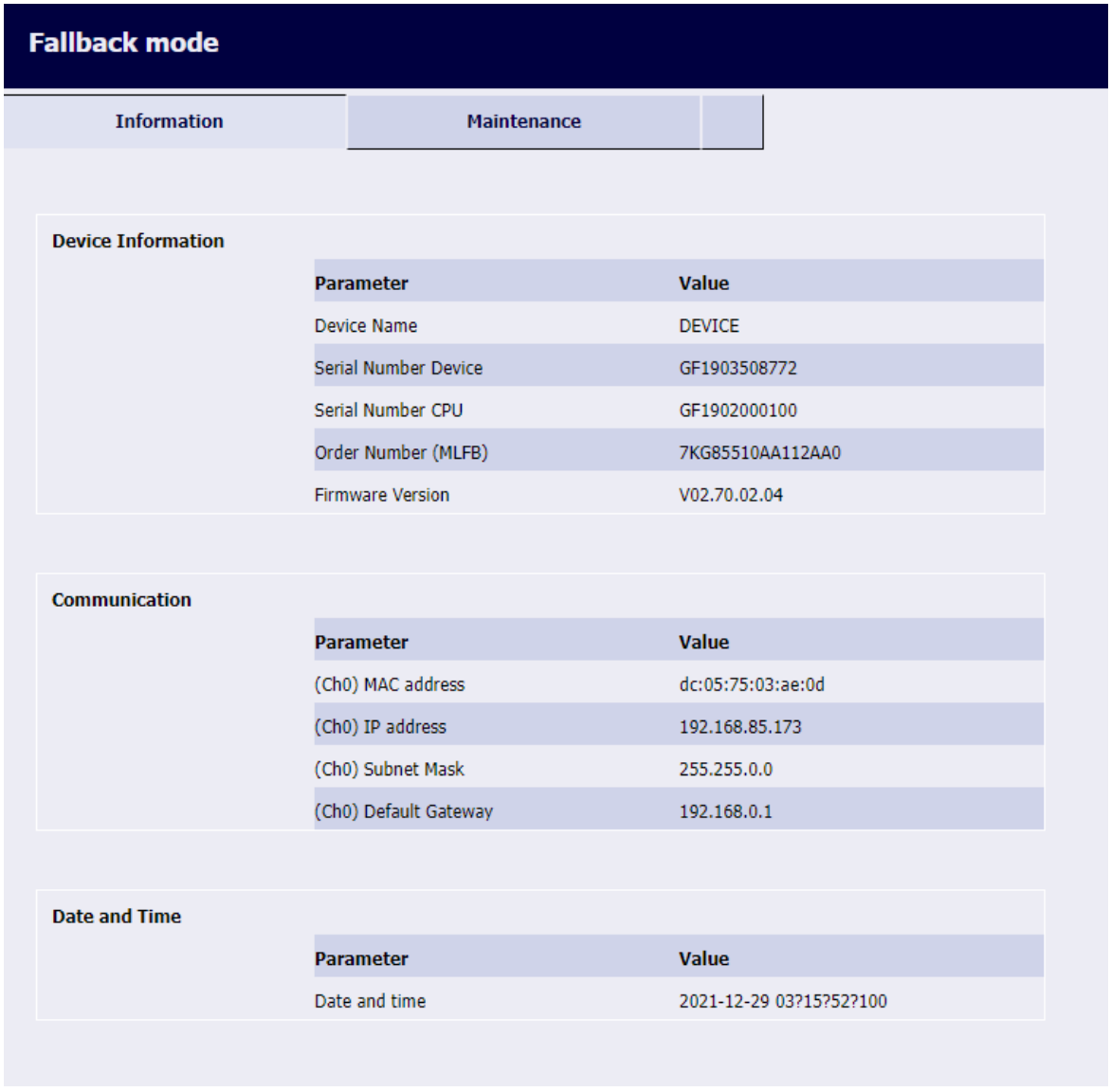
10.2.2 Start and Maintenance of the Fallback Mode

Start of the Fallback Mode

The **Fallback Mode** is started automatically in case of severe system errors during the device start. In this case, the user interface fallback mode with the **Information** and **Maintenance** tabs appears in the open browser once you have entered the IP address. The **Information** tab is opened.

To start the fallback mode manually, proceed as follows:

- Switch off the power supply.
- Press the softkey F4 on the device and switch on the power supply while keeping the softkey F4 pressed.
- Keep the softkey F4 pressed (approx. 10 s) until the display shows **FALLBACK**.
- Release the softkey F4.
  The device starts the fallback mode.
- Refresh the Web page in the browser.
  The user interface **Fallback mode** with the **Information** and **Maintenance** tabs opens in the open browser.
  The **Information** tab is opened with the information on different device properties and available or not available modules.

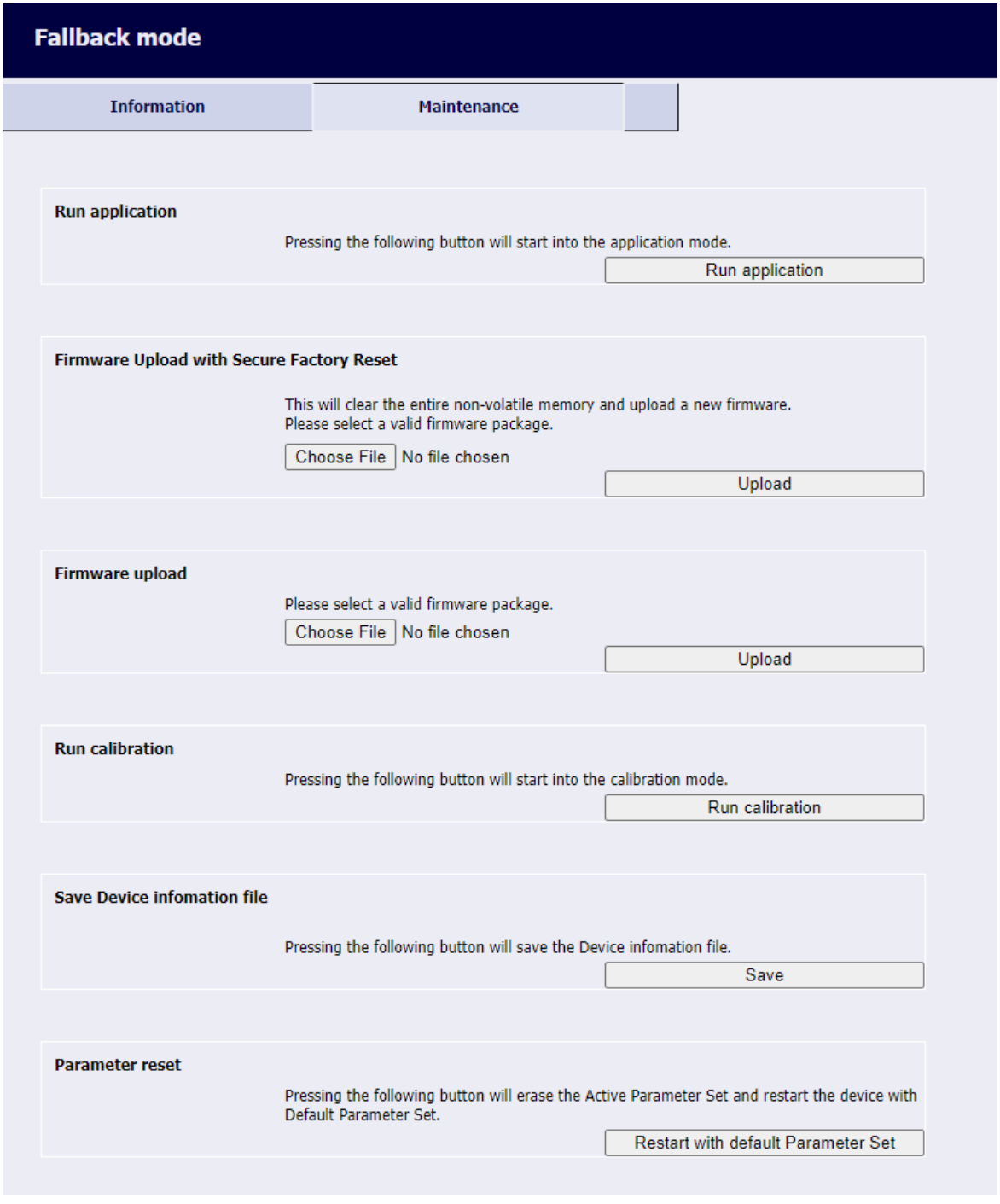


[sc_fallback_mode, 1, en_US]

Figure 10-1 Fallback Mode, Information Tab (Detail)

Maintenance

In the **Maintenance** tab, you can start the application or set the device in the default factory settings state.



[sc_fallback_mode_run_app, 1, en_US]

Figure 10-2 Fallback Mode, Maintenance Tab

Firmware Upload with Secure Factory Reset

If you select a valid firmware package and click **Upload**, the entire internal non-volatile memory is cleared. As a result, all the user settings and sensitive data including audit logs are deleted. After the firmware is uploaded, the device starts with factory default settings. The IP address is changed to the default setting 192.168.0.55.

The progress is shown in the **Status information**, see the following picture.

[sc_q100_FB_upload_status information, 1, en_US]

Figure 10-3 Fallback Mode, Status Information

NOTE

The whole operation takes more than 3 min, and must not be interrupted, for example by a power loss; otherwise, the device cannot recover and must be sent back to the factory.

The **Maintenance** tab also displays the following sections:

- **Firmware upload**
- **Run calibration**
- **Save device information file**
- **Parameter reset**

Firmware upload

This session is available for the user with a role of installer or administrator. You can find more information on uploading the firmware in chapter *8.3.2 Firmware Upload via Web Pages*.

Save device information file

In this section, you can click **Save** to save the ZIP file of the device information to a local file folder.

Parameter reset

In this section, you can restart the device with the default parameter set. It is available for the user with a role of engineer, installer, or administrator.

NOTE

The section **Run calibration** is a service function. This function exclusively is used at the factory.

10.3 Customer Support Functions

10.3.1 Function Description

The firmware is able to execute and provide certain diagnostic and test functions. These functions are deactivated by default. It is only necessary to activate these functions via the diagnostic function if you assume the device is not working as expected and you contacted the Siemens Customer Support Center to get additional diagnostic information on the device status (see chapter *10.3.2 Configuration via Web Pages*).

Activate Diagnostic Function 1 – Diagnosis HTML Server on Port 8080

NOTE

For the analysis of a potential problem or malfunction, contact the Siemens Customer Support Center.

The following table contains URL addresses that can be used if the Siemens Customer Support Center needs to execute a diagnostic analysis.

HTML Page (URL)	Description
/printf	Diagnosis log is shown.
/fehler	Error log is shown.
/memstatistic	Table with runtime and stack usage of all tasks TCP/IP stack dynamic memory statistics, for example, are shown.
/sntp	SNTP diagnosis is shown, for example, responses of NTP servers.
/ethst	Ethernet statistics (Ethernet MAC registers, and statistics) is shown.

Activate Diagnostic Function 2 – Test Functions via Modbus TCP

It is possible to use Modbus TCP to access various test functions via the holding register. With the default settings, these test functions are deactivated. Read/write access to the Modbus register is not allowed. If access to the associated Modbus register is requested, the error exception code 02 returns, stating: **ILLEGAL_DATA_ADDRESS**.

10.3.2 Configuration via Web Pages

Diagnosis

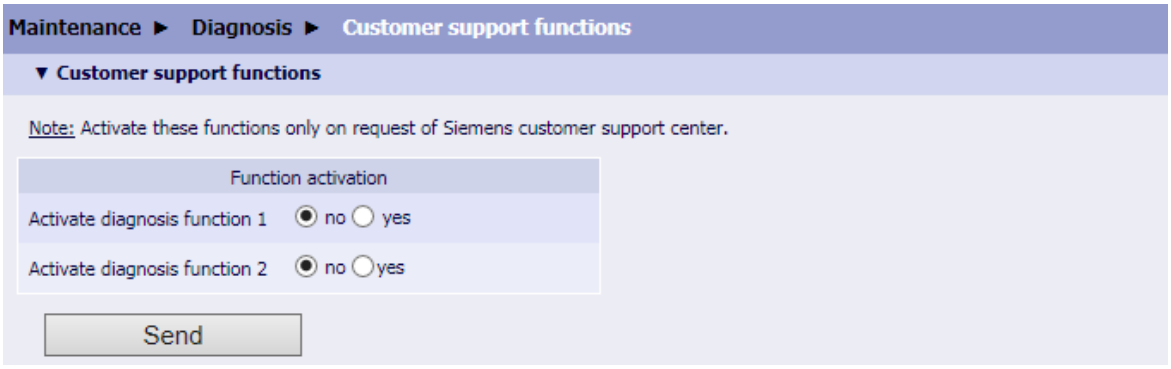
The device is able to execute and provide certain diagnostic and test functions. These functions are deactivated by default. It is only necessary to activate these functions via the diagnostic function if you assume the device is not working as expected and you contacted the Siemens Customer Support Center to get additional diagnostic information on the device status.

NOTE

Activate the following functions only on request of the Siemens Customer Support Center.

To change the **Function activation** settings in the **Maintenance** tab, proceed as follows:

- In the navigation window, click **Customer support functions**.



[sc_Diagnosis_customer-support, 3, en_US]

Figure 10-4 Maintenance Tab, Customer Support Functions

Table 10-3 Settings for Customer Support Functions

Parameter	Default Settings	Setting Range	Description
Activate diagnosis function 1	no	no yes	Activate the HTTP diagnosis server on port 8080 with additional diagnosis pages.
Activate diagnosis function 2	no	no yes	Activate the access to the device test functions for factory internal tests.

- Select **yes** for the **Activate diagnosis function 1** or **2**.
- Click **Send**.
- Read the data via the internal diagnosis server or use the device test functions via Modbus and inform the Siemens Customer Support Center.
- Select **no** for the **Activate diagnosis function 1** and **2**.

11 Maintenance, Storage, Transport

11.1 Maintenance, Storage, and Transport

Maintenance

Except for a battery replacement, the device is maintenance-free.

Wipe the device using a clean, dry and soft cloth if necessary. Do not use solvents.

The battery change is described in chapter *9.2 Unpacking, Inspecting the Delivery, Installing, and Changing the Battery*.

Storage

Store the device in a dry and clean location. Store the device within a temperature range from -40 °C to +70 °C (-40 °F to +158 °F).

The relative humidity must not lead to condensation or ice formation.

To avoid premature aging of the electrolytic capacitors, store the device within the recommended temperature range of +10 °C to +35 °C (+50 °F to +95 °F).

Siemens furthermore recommends connecting the device to supply voltage once a year for 1 to 2 days in order to form the inserted electrolytic capacitors. This procedure should also be carried out before operating the device.

NOTE

In this context, follow the commissioning notes in chapter *9 Commissioning and First Steps*.

Transport

If devices are to be shipped elsewhere, you can reuse the transport packaging. When using different packaging, you must ensure that the transport requirements according to ISO 2248 are adhered to. The storage packing of the individual devices is not adequate for transport purposes.

The Lithium batteries used in Siemens devices are subject to the Special Provision 188 of the UN Recommendations on the Transport of Dangerous Goods Model Regulations and Special Provision A45 of the IATA Dangerous Goods Regulation and the ICAO Technical Instructions. This is only valid for the original battery or original spare batteries.

12 Technical Data

12.1 Technical Data

12.1.1 Power Supply

Direct Voltage

Rated input voltages	24 V to 250 V
Admissible input voltage tolerance	±20 %
Permitted ripple of the input voltage	15 %
Maximum inrush current	
At ≤ 110 V	< 15 A
At 220 V to 300 V	≤ 22 A; after 250 µs: < 5 A
Maximum power consumption	5 W

Alternating Voltage

Rated input voltages	110 V to 230 V
System frequency at AC	50 Hz/60 Hz
Admissible input voltage tolerance	±20 %
Permitted harmonics	2 kHz
Maximum inrush current	
At ≤ 115 V	< 15 A
At 230 V	≤ 22 A; after 250 µs: < 5 A
Maximum power consumption	16 VA

12.1.2 Inputs and Outputs

Inputs for Alternating Voltage Measurements, Connector Block F - Cat III

Rated input alternating voltage range	
Phase-N/PE	63.5 V 110 V 230 V 400 V (347 V for UL)
Phase-phase	110 V 190 V 400 V 690 V (600 V for UL)
Maximum input alternating voltage	
Phase-N/PE	480 V (347 V for UL)
Phase-phase	831 V (600 V for UL)
Input impedances	
a, b, c to N	6.0 MΩ
a-b, b-c, c-a	6.0 MΩ
Further information about the voltage measuring inputs	
Power consumption per input for V_{rated} 400 V	38 mW
Permissible power frequency	42.5 Hz to 69.0 Hz
Measuring error (with calibration) at 23 °C ± 1 °C 50 Hz or 60 Hz	Typically 0.1 % under reference conditions

Inputs for Alternating Current Measurements, Connector Block E - Cat III

Input alternating currents	
Rated input current range	AC 1 A to 5 A (autorange)
Max. input current	AC 10 A
Power consumption per input	
At 1 A	4 mVA
At 5 A	100 mVA
Further information about the current measuring inputs	
Max. rated input voltage	150 V
Measuring error (with calibration) at 23 °C ± 1 °C 50 Hz or 60 Hz	Typically 0.1 % under reference conditions
Thermal stability	10 A continuous 100 A for max. 1 s

Binary Outputs, Connector Block G - Cat III

Maximum contact voltage	
Alternating voltage	230 V
Direct voltage	250 V
Maximum currents	
Maximum continuous contact current	100 mA
Maximum pulse current for 0.1 s	300 mA
Further information about the binary outputs	
Internal impedance	35 Ω
Admissible switching frequency	10 Hz
Number of switching cycles	Unlimited

12.1.3 Communication Interfaces

Ethernet Interface

Connection	RJ45 connector socket 10/100Base-T acc. to IEEE802.3 LED green: • On: Ethernet Link exists • Flashing: Ethernet activity • Off: no connection LED yellow: • On: 100 Mbit/s • Off: no connection
Protocols	Refer to *13.2.4.1 Communication Ethernet*
Voltage strength	DC 700 V
Transmission rate	100 Mbit/s
Cable for 10/100 Base-T	100 Ω to 150 Ω STP, CAT5
Maximum cable length 10/100 Base-T	100 m, if correctly installed

Serial Interface RS485

Connection	Terminal side, 9-pin D-sub socket
Protocol	Refer to *13.2.5.1 Communication Serial*
Baud rate (adjustable)	Modbus RTU (optional): Min. 1200 bit/s Max. 115 200 bit/s IEC 60870-5-103 (optional): Min. 9600 bit/s Max. 38 400 bit/s
Maximum distance of transmission	Max. 1 km (depending on transmission rate)
Transmission level	Low: -5 V to -1.5 V High: +1.5 V to +5 V
Reception level	Low: ≤ -0.2 V High: ≥ +0.2 V
Bus termination	Not integrated, bus termination using plugs with integrated bus terminating resistors.

Pin No.	Assignment
1	Shield
2	Not assigned
3	A RS485 connection pin A
4	Not assigned
5	GND (towards DC +5 V)
6	DC +5 V Supply voltage for terminating resistors (max. 100 mA)
7	RTS Direction control (if required for an external conversion)
8	B RS485 connection pin B
9	Not assigned

12.1.4 Environmental Conditions and Climatic Stress Tests

Environmental Conditions

Temperature data	Operating temperature Devices with display: the legibility of the display is impaired at temperatures < 0 °C (+32 °F)	-25 °C to +55 °C -13 °F to +131 °F
	Temperature during transport	-40 °C to +70 °C -40 °F to +158 °F
	Temperature during storage	-40 °C to +70 °C -40 °F to +158 °F
	Maximum temperature gradient	20 K/h

Air humidity data	Mean relative humidity per year	≤ 75 %
	Maximum relative humidity	95 % 30 days a year
	Condensation during operation	Not permitted
	Condensation during transport and storage	Permitted
Altitude and operation site	Max. altitude above sea level	2000 m
	Operating site	Indoors use

Climatic Stress Tests

Standards: IEC 60068
Dry cold: IEC 60068-2-1 test Ad
Dry heat during operation, storage, and transport: IEC 60068-2-2 test Bd
Damp heat: IEC 60068-2-78 test Ca
Change of temperature: IEC 60068-2-14 test Na and Nb

12.1.5 General Data

Battery	Type	PANASONIC CR2032 or VARTA 6032 101 501
	Voltage	3 V
	Capacity	230 mAh
	Typical life	For operation with permanently applied supply voltage: 10 years
		For operation with sporadically interrupted supply voltage: A total of 2 months over a 10-year period
Internal memory	Capacity	2 GB
Degree of protection		
DIN rail housing	IP20	
Panel flush mounting (front)	IP40 (with display, without door) IP51 (with display and door)	
Terminals	IP2x	

12.2 Test Data

12.2.1 Reference Conditions according to IEC 62586-1 for Determining Test Data

Ambient temperature	23 °C ± 2 °C
Relative humidity	40 % to 60 % RH
Supply voltage	V_{PS} ± 1 %
Phases (3-wire network)	3
External continuous magnetic fields	DC field: ≤ 40 A/m
	AC field: ≤ 3 A/m
DC components V/I	None
Signal waveform	Sinus
Frequency	50 Hz ± 0.5 Hz
	60 Hz ± 0.5 Hz
Voltage magnitude	Udin ± 1 %
Flicker	Pst < 0.1 %
Unbalance (all channels)	100 % ± 0.5 % of Udin
Harmonic	0 % to 3 % of Udin
Interharmonic	0 % to 0.5 % of Udin

12.2.2 Electrical Tests

Standards

Standards	IEC EN 61000-6-2 IEC EN 61000-6-4 IEC EN 61010-1 IEC EN 61010-2-030

Insulation Test according to IEC EN 61010-1 and IEC EN 61010-2-030

Inputs/Outputs	Insulation	Rated Voltage	ISO Test Voltage	Category
Current measurement inputs	Reinforced	150 V	AC 2.3 kV	Cat. III
Voltage measurement inputs	Reinforced	480 V	Surge voltage	Cat. III
			9.76 kV	
Supply voltage	Reinforced	300 V	DC 3.125 kV	Cat. III
Binary outputs	Reinforced	300 V	AC 3.536 kV	Cat. III
Ethernet interface	Function	< 50 V	DC 700 V	–
RS485 interface	Function	< 50 V	DC 700 V	–

EMC Tests for Immunity (Type Tests)

Standards	IEC EN 61000-6-2 For more standards see also individual functions
Electrostatic discharge, Class III, IEC 61000-4-2	6 kV contact discharge 8 kV air discharge, both polarities 150 pF, Ri = 330 Ω with connected Ethernet cable

High frequency electromagnetic field, amplitude-modulated Class III, IEC 61000-4-3	10 V/m 80 MHz to 3 GHz 80 % AM 1 kHz
Fast transient bursts Class III, IEC 61000-4-4	2 kV; 5 ns/50 ns; 5 kHz Burst length: 15 ms Repetition rate: 300 ms Both polarities R_i = 50 Ω Test duration: 1 min
High energy surge voltages (SURGE) Installation class III IEC 61000-4-5	Impulse: 1.2 µs/50 µs
Auxiliary voltage	Common mode: 2 kV; 12 Ω; 9 µF Diff. mode:1 kV; 2 Ω; 18 µF
Measuring inputs and relay outputs	Common mode: 2 kV; 42 Ω; 0.5 µF Diff. mode: 1 kV; 42 Ω; 0.5 µF
Line-conducted high frequencies, amplitude-modulated Class III , IEC 61000-4-6	10 V (150 kHz to 80 MHz); 80 % AM (1 kHz)
Power system frequency magnetic field IEC 61000-4-8, Class IV	30 A/m continuous; 300 A/m for 3 s
1 MHz test Class III, IEC 61000-4-18	2.5 kV (peak); 1MHz; τ = 15 µs 400 Surges per s Test duration: 1 min; R_i = 200 Ω

EMC Test for Noise Emission (Type Test)

Standard	IEC EN 61000-6-4
Disturbance voltage to lines, only auxiliary voltage IEC-CISPR 22	150 kHz to 30 MHz Limit Class A
Disturbance-field strength IEC-CISPR 22	30 MHz to 1 GHz Limit Class A

12.2.3 Mechanical Stress Tests

Vibration and Shock Stress during Stationary Operation

Standards	IEC 60068
Vibration IEC 60068-2-6 test Fc	Sinusoidal 10 Hz to 60 Hz: ±0.075 mm amplitude; 60 Hz to 150 Hz: 1 g acceleration Frequency sweep 1 octave/min 20 cycles in 3 orthogonal axes

Shock IEC 60068-2-27 test Ea	Half-sine resistance 5 g acceleration, duration 11 ms, every 3 shocks in both directions of the 3 axes
Seismic Vibration IEC 60068-3-3 test Fc	Sinusoidal 1 Hz to 8 Hz: ±7.5 mm amplitude (horizontal axis) 1 Hz to 8 Hz: ±3.5 mm amplitude (vertical axis) 8 Hz to 35 Hz: 2 g acceleration (horizontal axis) 8 Hz to 35 Hz: 1 g acceleration (vertical axis) Frequency sweep 1 octave/min 1 cycle in 3 orthogonal axes

Vibration and Shock Stress during Transport

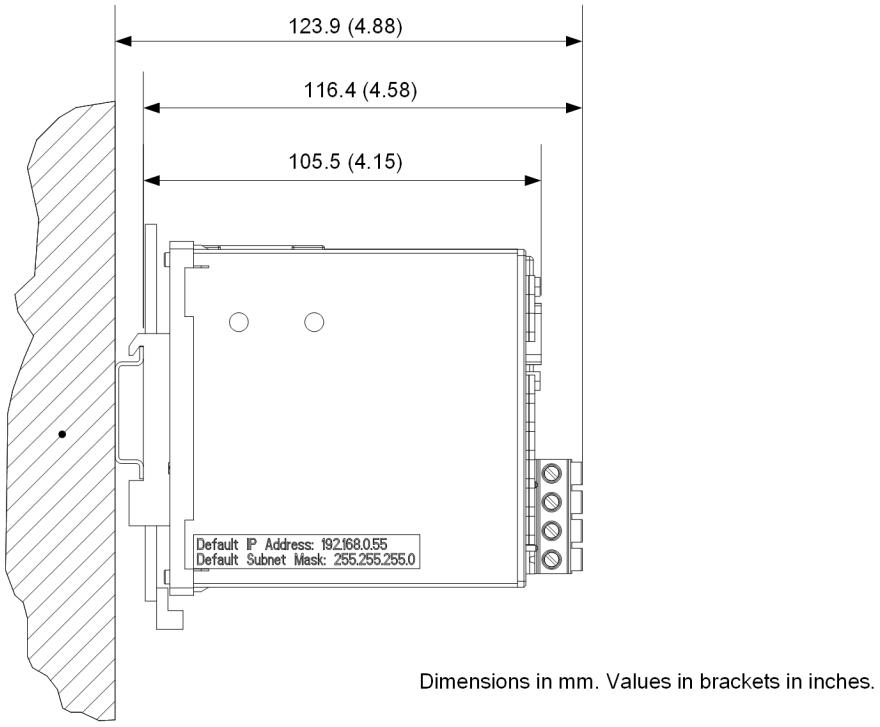
Standards	IEC 60068
Vibration IEC 60068-2-6 test Fc	Sinusoidal 5 Hz to 8 Hz: ±7.5 mm amplitude; 8 Hz to 150 Hz: 2 g acceleration Frequency sweep 1 octave/min 20 cycles in 3 orthogonal axes
Shock IEC 60068-2-27 test Ea	Semi-sinusoidal 15 g acceleration, duration 11 ms, every 3 shocks (in both directions of the 3 axes)
Continuous Shock IEC 60068-2-29 test Eb	Half-sine resistance 10 g acceleration, duration 16 ms, every 1000 shocks (in both directions of the 3 axes)
Free fall IEC 60068-2-32 test Ed	0.5 m

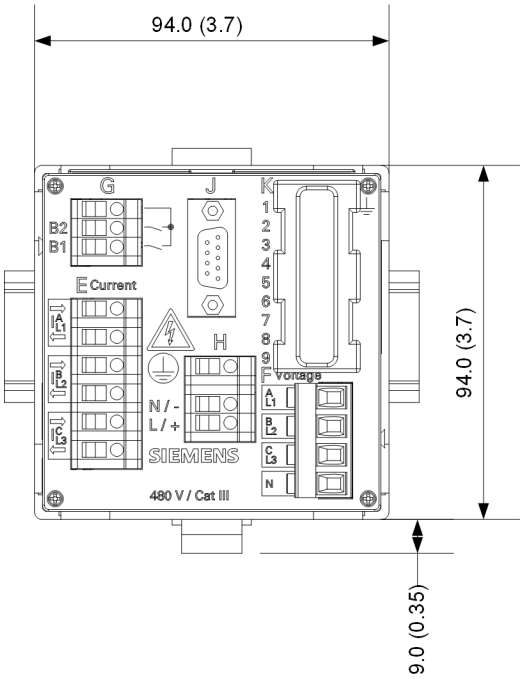
12.2.4 Safety Standards

Standards: EN 61010
IEC EN 61010-1, IEC EN 61010-2-30

12.3 Dimensions

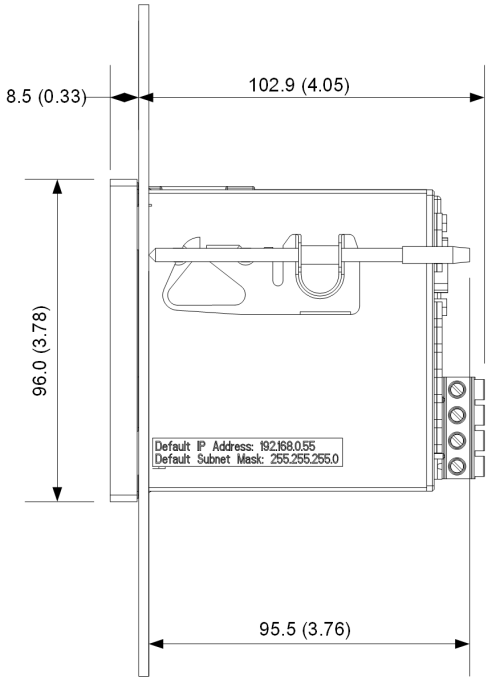
Mass	Device without display: approx. 0.49 kg Device with display, without cover: approx. 0.52 kg Device with display, with cover: approx. 0.6 kg
Dimensions (W x H x D)	96 mm x 96 mm x 103 mm 3.78 inch x 3.78 inch x 4.06 inch



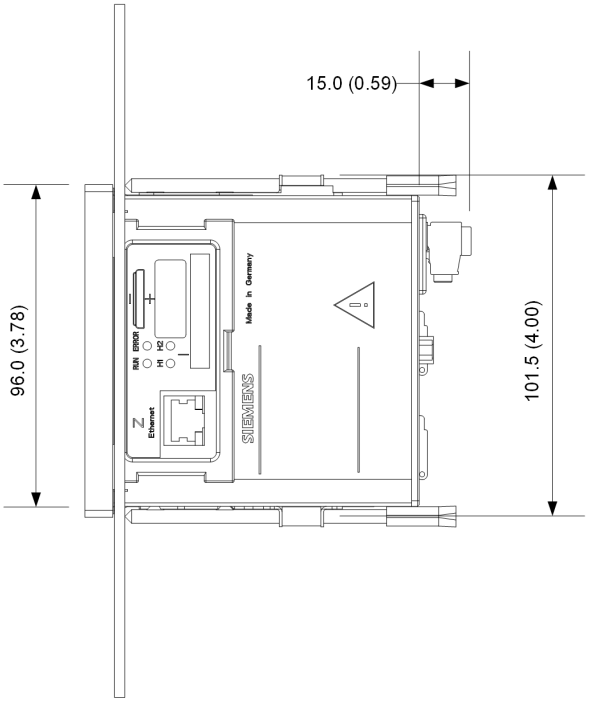


[dw_dimensions_DIN-rail, 1, en_US]

Figure 12-1 Dimensional Drawing of SICAM P850/P855, DIN Rail Device

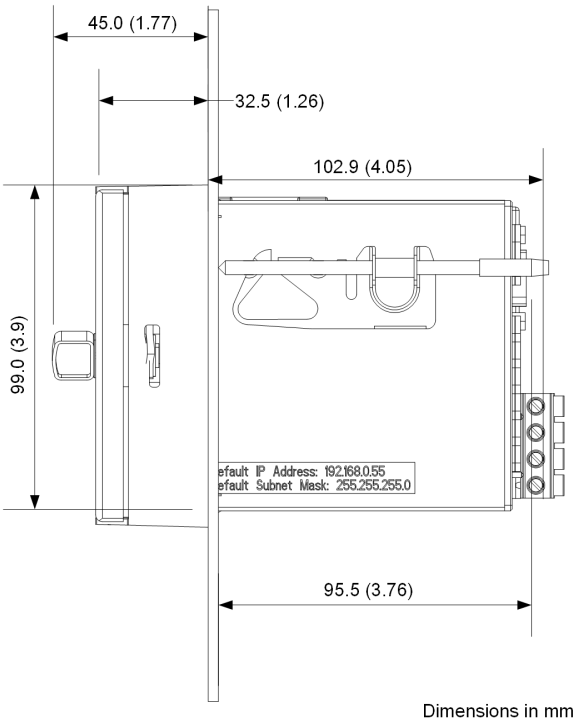


Dimensions in mm. Values in brackets in inches.

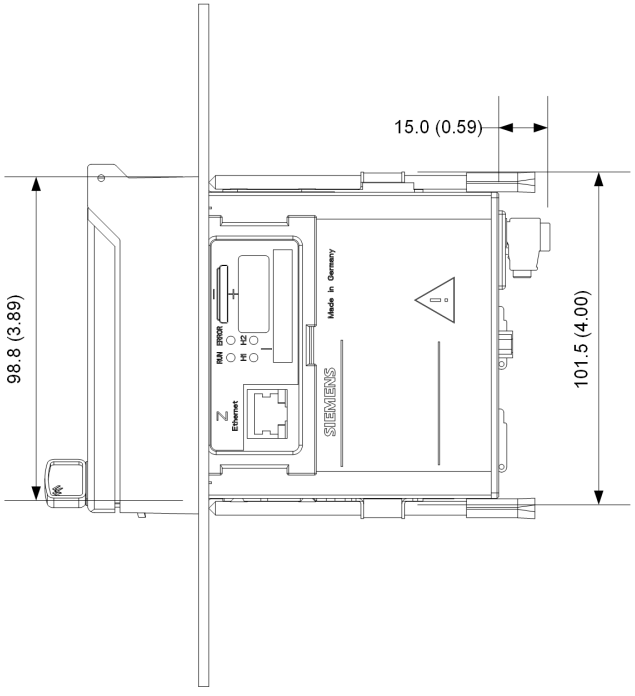


[dw_dimensions_display_p85x, 1, en_US]

Figure 12-2 Dimensional Drawing of SICAM P850/P855 with Display

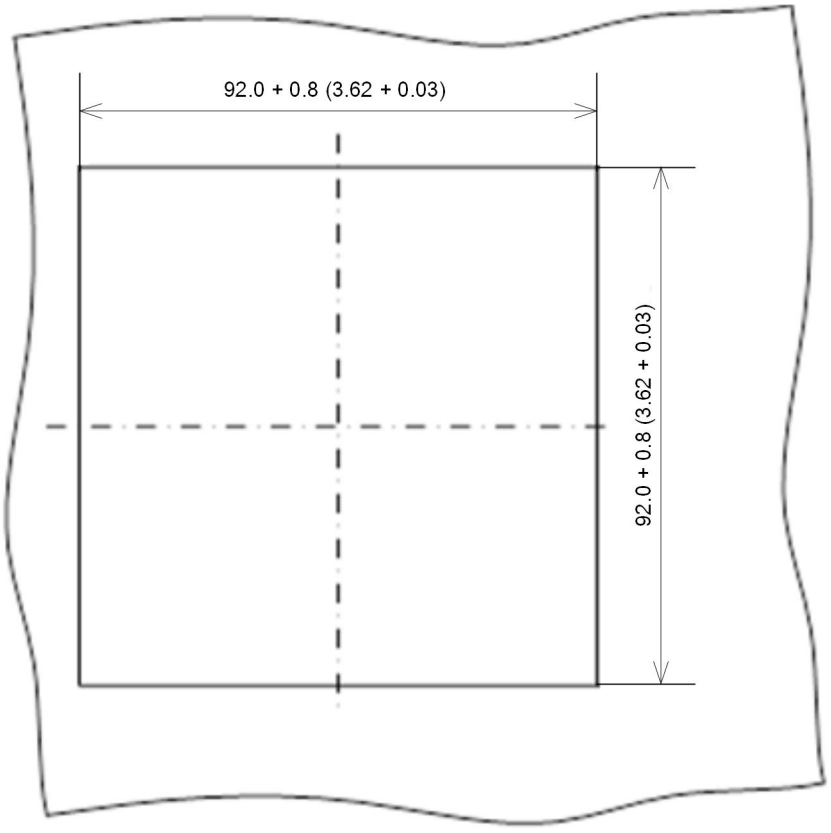


Dimensions in mm. Values in brackets in inches.



[dw_dimensions_display_and_cover_p85x, 1, en_US]

Figure 12-3 Dimensional Drawing of SICAM P850/P855 with Display and Cover



Dimensions in mm. Values in brackets in inches.

[dw_cut-out_q100_p85x, 1, en_US]

Figure 12-4 Cut-Out in Switch Panel

13 Operational Indications and Operating Parameters

13.1 Operational Indications

13.1.1 Operational Indications

Indication	Description	Notes
Device OK	The device startup was successful.	Indication ON: Device ready
Battery Failure	Battery voltage < 2.7 V or no battery inserted	Indication ON: Battery failure
Time Synchronization Error	Error during the time synchronization from the NTP server or fieldbus	Indication OFF: At least 1 time message was received during the set timer (**Error indication after**). The time stamp is set when the first valid time information or time synchronization is received. Indication ON: No time message was received during the set timer (**Error indication after**). The time stamp is set after the **Error indication after** timer has expired and no synchronization message was received. Parameter range: see chapter *13.2.2 Date and Time*. Error sources with NTP or fieldbus: **Error indication after** timer expires and no synchronization message was received
	Error during internal time synchronization	Indication ON: RTC time invalid (during device start in case of battery failure) Indication OFF: After setting the clock via HTML During battery failure at device startup
Default IP Address	The device has started with a default IP address after pressing the push-button for more than 3 s during operation.	Indication ON: The push-button was pressed and default IP is set in the device.
Primary NTP Server Error	Faulty or no response from the primary NTP server	Indication ON: Error Indication OFF: Valid time messages have been received for a configured period. Only for time synchronization via Ethernet NTP
Secondary NTP Server Error	Faulty or no response from the secondary NTP server	Indication ON: Error Indication OFF: Valid time messages have been received for a configured period. Only for time synchronization via Ethernet NTP
Daylight Saving Time	Switching between daylight saving time/standard time	Indication ON: Daylight saving time Indication OFF: Standard time
Ethernet Link Error	Ethernet connection error	Indication ON: Error Indication OFF: Ethernet link recognized
Modbus TCP OK (Modbus TCP Server)	At least 1 Modbus TCP server connection has received Modbus messages.	Indication ON: At least 1 Modbus message was received during the set communication supervision time. The time stamp is set when the first valid message is received. Indication OFF: No Modbus message was received during the set communication supervision time
IEC 61850 Communication OK	Communication via protocol IEC 61850 is correct.	Indication ON: At least one message was received during the set monitoring time. The time stamp is set when the first valid message is received. Indication OFF: No message was received during the set monitoring time.

Indication	Description	Notes
Modbus Serial OK (Modbus RTU (Slave))	The Modbus serial communication has received a valid Modbus message.	Indication ON: At least 1 serial message was received during the set communication supervision time. The time stamp is set when the first valid message is received. Indication OFF: No serial message was received during the set communication supervision time.
IEC 60870-5-103 OK	Communication via protocol IEC 60870-5-103 is correct.	Indication ON: At least 1 serial message was received during the set communication supervision time. The time stamp is set when the first valid message is received. Indication OFF: No serial message was received during the set communication supervision time.
Settings Load	Starting to change the parameters of the passive set of parameters.	Indication ON: Start of changes Indication OFF: Changes complete
Settings Check	The passive set of parameters is to be activated; the internal parameter check is running.	Indication ON: Check started Indication OFF: Check complete
Settings Activate	The passive set of parameters is enabled and the device works with these parameters.	Indication ON: Activation started Indication OFF: Activation complete
Limit Violation x	Indication that a parameterized limiting value has been violated	Indication ON: The limit of the monitored measured value has been violated or no measured value is parameterized as input of the limiting value. Indication OFF: The limit of the monitored measured value is not violated. Message invalid: The monitored measured value is invalid (for example, frequency at V < 15 % of V_{rated}). x = 1 to 16
Indication 1 from Remote	Status of the indications that can be set to control the LEDs and the binary outputs via the communication.	Indication ON: ON Indication OFF: OFF Message invalid: Not yet updated via the communication or again invalid via the communication
Indication 2 from Remote		
Reset Energy	The energy counters were reset.	Indication ON: Energy counters reset
Rotating Field Clockwise	Indication of rotation voltage	Indication ON: Phase sequence Va-Vb-Vc, rotation clockwise Indication OFF: Phase sequence Va-Vc-Vb, (2 phases interchanged); rotation counter-clockwise Indication invalid: Direction of rotation cannot be calculated (for example, no voltage applied)
Group indication x	Up to 4 single-point indications can be linked logically and combined to a group indication.	A total of 4 group indications can be parameterized. x = 1 to 4
Voltage Event Available	Indication of a voltage event	Voltage dip, voltage swell, and voltage interruption
Voltage Event Start	Start of a voltage event	Voltage dip, voltage swell, and voltage interruption
Voltage Dip Start	Start of a voltage dip	Voltage dip
Voltage Swell Start	Start of a voltage swell	Voltage swell
Voltage Interruption Start	Start of a voltage interruption	Voltage interruption
Voltage Unbalance Event Available	Indication of a voltage unbalance event	Voltage unbalance
Voltage Unbalance Event Start	Start of a voltage unbalance event	Voltage unbalance

Indication	Description	Notes
Frequency Event Available	Indication of a frequency event	Overfrequency or underfrequency
Frequency Event Start	Start of a frequency event	Overfrequency or underfrequency
SD Card Error	Indication of an SD card error	SD card defective or read/write error[20]
Load Profile Period Closed	Indication that a period has been closed.	Only **Indication on** is logged.
Load Profile Synchr. Period	Indication that a synchronization signal was received.	Only **Indication on** is logged.
Load Profile Tariff x	Indication that the tariff x has been set.	Only **Indication on** is logged.
Load Profile Reset Buffer	Indication that the load-profile buffer was deleted.	Load-profile buffer was deleted by user's action or parameter change. Only Indication on is logged.

20 The SD card has no contact or is defective; you must not replace the card yourself. The device also works without active SD card. However, data storage when operating the recorders is not possible. In this case, the records can be forwarded and processed only via communication.

13.2 Basic Functions

13.2.1 Device and Language

Table 13-1 Settings for Device and Language

Parameter	Default Setting	Setting Range
Device name	DEVICE	Max. 31 ASCII characters
Language	English (US)	ENGLISH (US) User language according to **User language preselection**: DEUTSCH (DE) or CHINESE (CN)
Date/time format	YYYY-MM-DD, time with 24 hours	YYYY-MM-DD, time with 24 hours YYYY-MM-DD, time 12 h AM/PM DD-MM-YYYY, time with 24 hours DD-MM-YYYY, time 12 h AM/PM MM/DD/YYYY, time with 24 hours MM/DD/YYYY, time 12 h AM/PM

Table 13-2 Settings for User Language Preselection

Parameter	Default Setting	Setting Range
User language preselection	DEUTSCH (DE)	**Option User language preselection**: *CHINESE (CN)* You can select the following **Languages**: • ENGLISH (US) or • CHINESE (CN) **Option User language preselection**: *DEUTSCH (DE)* You can select the following **Languages**: • ENGLISH (US) or • DEUTSCH (DE)

Table 13-3 Settings for the Activation Password

Parameter	Default Setting	Setting Range
Activation Password	000000	Any, 6 to 14 characters

Table 13-4 Settings for the Maintenance Password

Parameter	Default Setting	Setting Range
Maintenance Password	311299	Any, 6 to 14 characters

Table 13-5 Settings for Logon Configurations

Parameter	Default Setting	Setting Range
Logon activation	yes	To disable the logon function, select ***no*** To enable the logon function, select ***yes***
Logon password	000000	Any, 6 to 14 characters
Session timeout (min)	10 min	0 min (no timeout) to 1440 min (1 day) If 0 is selected, after the device starts up, you only have to log on once.

13.2.2 Date and Time

Table 13-6 Settings for Time Synchronization

Parameter	Default Setting	Setting Range
Source time synchronization	Internal	Internal Ethernet NTP Fieldbus
Time zone offset to UTC	+00:00	-12:00 to +13:00 (hours) (in increments of 0.5 h)
Daylight Saving Time switch-over	yes	no yes
DST offset	+01:00	0:00 to +2:00 (hours) (in increments of 0.5 h)
Start of DST	March Last week	January to December First week Second week Third week Fourth week Last week
	Sunday 2:00 AM	Sunday to Saturday 12:00 AM to 11:00 PM (in increments of 1 h)
End of DST	October Last week	January to December First week Second week Third week Fourth week Last week
	Sunday 3:00 AM	Sunday to Saturday 12:00 AM to 11:00 PM (in increments of 1 h)
Additional Parameters if the Source is Ethernet NTP (Communication Ethernet bus protocol is set to Modbus TCP or IEC 61850)		
Primary NTP server IP Address	0.0.0.0	Any No polling of the NTP server if 0.0.0.0 is entered
Secondary NTP server IP Address	0.0.0.0	Any No polling of the NTP server if 0.0.0.0 is entered
Error indication after	10 min	2 min to 120 min

Parameter	Default Setting	Setting Range
Additional Parameters if Source is Fieldbus		
Error indication after	10 min	2 min to 120 min

13.2.3 AC Measurement

Table 13-7 Settings for AC Measurement

Parameter	Default Setting	Setting Range
AC measurement		
Rated frequency	50 Hz	50 Hz 60 Hz
Network type[21]	4-wire, 3-phase, unbalanced	1-phase network 3-wire, 3-phase balanced 3-wire, 3-phase, unbalanced (2 * I) 3-wire, 3-phase, unbalanced (3 * I) 4-wire, 3-phase, balanced 4-wire, 3-phase, unbalanced
Primary nominal voltage	400.0 V	1.0 V to 1 000 000.0 V , depending on the setting range in the selected network type (see *Table 2-10*)
Current measurement range	5 A	1 A 5 A
Zero-point suppression[22]	0.3 % (of Vrated, Irated)	0.0 % to 10.0 %
Voltage harmonics unit	%	% V
Flicker lamp model	230.0 V	230.0 V 120.0 V
Transformer settings		
Primary rated voltage	400.0 V	1.0 V to 1 000 000.0 V
Secondary rated voltage	400.0 V	1.0 V to 690.0 V
Primary rated current	5.0 A	1.0 A to 100 000.0 A
Secondary rated current	5.0 A	1.0 A to 10.0 A

Depending on the parameterized **Primary nominal voltage**, the following **Voltage measurement** ranges are set automatically and the following network types are possible:

21 In the case of contradictory parameter settings, **Primary nominal voltage** is indicated as faulty (red) and **Network type** as not adjustable (gray). Moreover, the **Send** button is disabled.

22 Voltage and current values smaller than/equal to the setting referred to 100 % are not included in the calculation and display.

Table 13-8 Settings for Primary Nominal Voltage

Primary Nominal Voltage	Selection of the Voltage Measurement Range	Selectable Network Types
AC 230.0 V	ph-N: 230.0 V, ph-ph: 400.0 V All other voltage measurement ranges are disabled.	all
AC 380.0 V (> AC 230.0 V * 1.2)	ph-N: 400.0 V, ph-ph: 690.0 V All other voltage measurement ranges are disabled.	all
> AC 480.0 V (> AC 400.0 V * 1.2)	ph-N: 400.0 V, ph-ph: 690.0 V All other voltage measurement ranges are disabled.	all three-wire network types

13.2.4 Ethernet Communication

13.2.4.1 Communication Ethernet

Table 13-9 Settings for Communication Ethernet

Parameter	Default Setting	Setting Range
Communication Ethernet		
IP address[23]	192.168.0.55	Any 0.0.0.0 = DHCP
Subnet mask[23]	255.255.255.0	Any
Default gateway[23]	192.168.0.1	Any
Ethernet switch on	no	no yes
Enable SNMP	no	no yes
Bus protocol	Modbus TCP	-None- Modbus TCP IEC 61850

13.2.4.2 Protocol Modbus TCP

Table 13-10 Settings for Modbus TCP

Parameter	Default Setting	Setting Range
Standard port number	502	502 Not settable
Access rights	Full	Full Read only
User-defined port 1	no	no yes
Port number[24]	503	503 to 65 535

23 After the parameter changes have been enabled, the device will restart.

24 This parameter is available only if **User-defined port 1** is set to **yes**.

Parameter	Default Setting	Setting Range
Access rights[24]	Read only	Full Read only
Port number	504	503 to 65 535
Access rights	Read only	Full Read only
Keep alive time	10 s	0 s = switch off 1 s to 65 535 s
Communication supervision time	600 (* 100 ms)	0 s = none 100 ms to 6 553 400 ms

NOTE

The 2 port numbers must be different from each other.

13.2.4.3 Protocol IEC 61850

Table 13-11 Settings for IEC 61850

Parameter	Default Setting	Setting Range
IED Name	SICAM_P850/P855_01	Max. 60 characters Only a-z, A-Z, _, 0-9 are permitted. The first character must be an alpha character.
Voltage - Dead band	5 %	1 % to 5 %, in 1 % steps
Current - Dead band	5 %	1 % to 5 %, in 1 % steps
Power - Dead band	5 %	1 % to 5 %, in 1 % steps
Power factor - Dead band	5 %	2 % to 5 %, in 1 % steps
Frequency - Dead band	0.2 %	0.2 %
Angle - Dead band	0.5 %	0.2 % 0.5 % 1 % 2 %

13.2.4.4 Protocol SNMP

Table 13-12 Settings for SNMPv3

Settings	Default Setting	Setting Range
User name (User name for SNMPv3 access)	Empty, for example: not set	Up to 32 characters • Numbers 0 to 9 • Small and capital Latin letters • Basic special characters
Authentication password		8 to 24 characters • Numbers 0 to 9 • Small and capital Latin letters • Basic special characters
Privacy password		

13.2.5 Serial Communication

13.2.5.1 Communication Serial

Table 13-13 Settings for Communication Serial, Modbus RTU (Slave)

Parameter	Default Setting	Setting Range
Bus protocol	Modbus RTU	None **Modbus RTU** *(slave)* IEC 60870-5-103
Device address	1	1 to 247
Baud rate	19 200 bit/s	1200 bit/s, 2400 bit/s, 4800 bit/s, 9600 bit/s, 19 200 bit/s, 38 400 bit/s, 57 600 bit/s, 115 200 bit/s
Parity	Even	None, 1 stop bit Even Odd None, 2 spot bit
Access rights	Full	Full Read only
Communication supervision time	600 * 100 ms	0 s = none 100 ms to 6 553 400 ms

Settings for Communication Serial, IEC 60870-5-103

Parameter	Default Setting	Setting Range
Bus protocol	Modbus RTU	None Modbus RTU **IEC 60870-5-103**
Device address	1	1 to 254
Baud rate	9600 bit/s	9600 bit/s 19 200 bit/s 38 400 bit/s
Measured value range	120 % equivalent to a measured value range from -4096 to +4095 (-120 % to +120 %)	120 % 240 % equivalent to a measured value range from -4096 to +4095 (-120 % to +120 % or -240 % to +240 %)
Transmit energy	No	Yes (every minute) No
Transmission of the 1st to 40th harmonics HV and HI	No	No Yes
Cyclic sending period	50 * 100 ms	30 * 100 ms to 600 * 100 ms
Communication supervision time	600 * 100 ms	0 s = none 100 ms to 6 553 400 ms

13.3 Advanced Functions

13.3.1 Process Connections

13.3.1.1 Binary Outputs

Table 13-14 Settings for Binary Outputs

Parameter	Default Setting	Setting Range
Source type	Indication	Indication Energy counter
Source Type Indication		
Indication[25]	-none-	Acc. to list box
Source inverted (can be set individually for all relay outputs)	no	no yes
Operating mode[26] (can be set individually for all relay outputs)	Persistent	Persistent Persistent with fail safe Pulse Pulse with retrigger
Output time for pulse operating mode (setting only possible for operating modes ***Pulse*** and ***Pulse with retrigger***)	20 (* 10 ms)	50 ms to 3 600 000 ms
Source Type Energy Counter		
Energy counter [25]	-none-	Acc. to list box
Energy increase per pulse	1.00 Wh	0.10 Wh/VAh/varh to 1 000 000.00 Wh/VAh/varh
Output time for pulse operating mode	20 * 10 ms = 200 ms	50 ms to 3 600 000 ms

13.3.1.2 LEDs

Table 13-15 Settings for LEDs

Parameter	Default Setting	Setting Range
RUN	Device ready	Not settable
ERROR	-none-	Errors are signaled as parameterized (only error indications can be parameterized). -none- Battery failure Ethernet link error Time synchronization error Primary NTP server error Secondary NTP server SD card error

25 If you select **-none-** as the source of an **indication** or **energy counter**, the corresponding binary output is inactive.

26 If you have selected one of the 2 **Pulse** types in the **Operating mode** list box, enter an output time x (in x *10 ms) in the **Output time for pulse operating mode** field.

Parameter	Default Setting	Setting Range
H1 H2 Only the indications for the parameterization of the binary outputs are displayed which can be used according to the current device settings.	-none-	Acc. to list box Limit violation and Group Indication Designation can be changed during the parameterization.
Indication inverted	no	no yes

13.3.2 Automation Functions

13.3.2.1 Limit Violation 1-8 and 9-16

Table 13-16 Settings for Limits

Parameter	Default Setting	Setting Range
Measurement	-none-	Measured value selection list depending on network type
Limit	0.00[27]	-1 000 000 000.00 to 1 000 000 000.00 (unit)
Limit type	Lower	Lower Upper
Hysteresis (%)	1.00	0.00 to 10.00
Violation indication	Limit Violation x (x = 1 to 16)	The name of the indication is customizable; max. 31 characters.

13.3.2.2 Group Indications 1-4

Table 13-17 Settings for Group Indications

Parameter	Default Setting	Setting Range
Source Only the indications for the parameterization of the binary outputs are displayed which can be used according to the current device settings.	-none-	Acc. to list box Limit violation and group indication: Designation can be changed during the parameterization.
Source inverted	no	no yes
Logic operation	NONE	NONE OR AND
Group indication name	Group Indication x (x = 1 to 4)	The name of the indication is customizable; max. 31 characters.

27 The limit value must be the primary value.

13.3.3 Display

13.3.3.1 Display Settings

Table 13-18 Settings for Display

Parameter	Default Setting	Setting Range
Contrast	8	0 to 10
Time until dimmed	10	1 min to 99 min
Refresh time	1000	330 ms to 3000 ms
Inverse display	no	no yes
Phase label	(L1, L2, L3)	(L1, L2, L3) (a, b, c)

13.3.3.2 User-Defined Screen

Table 13-19 Settings for User-Defined Screen

Parameter	Default Setting	Setting Range
Screen type	None[28]	None 2 measured values, numerical 4 measured values, numerical 2 measured values, graphical + numerical 3 measured values, graphical + numerical
Screen name	USER_SCREEN_x (x = 1 to 4)	You can update and edit it directly. Max. 18 characters Only English and German letters, numbers, and special characters are permitted.

28 If you have not made any selection, the displays explained in the following do not exist.

Parameter	Default Setting	Setting Range
2 measured values, numerical: • Display 1, numerical • Display 2, numerical	-not assigned-	The selection of measured values depends on the network type. Designation can be changed during the parameterization.
4 measured values, numerical: • Display 1, numerical • Display 2, numerical • Display 3, numerical • Display 4, numerical	-not assigned-	
2 measured values, graphical, and numerical: • Display 1, graph./num. • Display 2, graph./num.	-not assigned-	
3 measured values, graphical, and numerical: • Display 1, graph./num. • Display 2, graph./num. • Display 3, graph./num.	-not assigned-	
Display x, graph./num. (x = 1 to 3) • Min value • Max value	Unit according to measured value 1.0 10.0	The selected parameters are used to define the minimum and maximum values.

13.3.4 Energy Management

13.3.4.1 Load Profile

Table 13-20 Settings for Load Profile

Parameter	Default Setting	Setting Range
Subperiod time	15 min	1 min to 6 min in 1-min steps, 10 min, 12 min, 15 min, 20 min, 30 min, 60 min
Number of subperiods[29]	1	1 to 5
Synchronization source	Internal clock	None Protocol Internal clock
Kind of used reactive power	Q1	Q1 Qn Qtot

29 Number = 1: Fixed Block method: The lengths of the subperiod and of the measuring period are identical; Number = 2 to 5: Rolling Block method; Length of the subperiod: The length of the subperiod is an integer part of a full hour; Length of measuring period: The length of the measuring period cannot be configured directly. It is defined as the product of the length of the subperiod and the number of subperiods: Length of measuring period = n x length of subperiod; n = number of subperiods

13.3.4.2 Energy Freeze

Table 13-21 Settings for Energy Freeze

Parameter	Default Setting	Setting Range
Interval	10 min	10 min, 15 min, 30 min, 60 min

13.3.5 Power Quality Functions

13.3.5.1 Event Records

Table 13-22 Settings for Event Records

Parameter	Default Setting	Setting Range
Voltage event		
Swell threshold[30]	110 %	105 % to 140 %, increments of 5 %
Dip threshold[30]	90 %	75 % to 95 %, increments of 5 %
Interruption threshold	5 %	1 %, 2 %, 3 %, 5 %, 8 %, 10 %
Hysteresis	2 %	1 % to 6 %, increments of 1 %
	ph-N	ph-N ph-ph
Frequency event		
Underfrequency threshold	1 %	0.1 % to 1.0 %, increments of 0.1 % 1.0 % to 5.0 %, increments of 1.0 %
Overfrequency threshold	1 %	0.1 % to 1.0 %, increments of 0.1 % 1.0 % to 5.0 %, increments of 1.0 %
Voltage-unbalance event		
Voltage-unbalance threshold	5 %	1 % to 5 %, increments of 1 %

13.3.5.2 Waveform Records

Table 13-23 Settings for the Waveform Records

Parameter	Default Setting	Setting Range
Voltage trigger limits		
Trigger active	voltage event	no user-defined voltage event
Tolerance unit	Percentage	Percentage Numerical
Upper threshold	110.00 % of the primary nominal voltage	100.0 % to 120.0 % of the primary nominal voltage
Lower threshold	90.00 % of the primary nominal voltage	0.00 % to 99.99 % of the primary nominal voltage
Hysteresis	2.00 % of the primary nominal voltage	0.0 % to 50.0 % of the primary nominal voltage
Current trigger limits		
Trigger active	no	no yes

30 According to EN 50160 standard in the PQ report, the default settings of dip and swell (90 % and 110 %) are recommended.

Parameter	Default Setting	Setting Range
Tolerance unit	Percentage	Percentage Numerical
Upper threshold	110.00 % of nominal current	5.0 % to 200.0 % of the nominal current
Lower threshold	90.00 % of nominal current	0.00 % to 99.99 % of the nominal current
Hysteresis	2.00 % of the nominal current	0.0 % to 50.0 % of the nominal current
Waveform capture setting		
Pretrigger time	0.2 s	0.1 s to 0.5 s, increments of 0.1 s
Recording time	2.0 s	0.5 s to 2.5 s, increments of 0.1 s
Total recording duration	2.2 s	max. 3.0 s

13.3.5.3 Measurement Records (only SICAM P855)

Table 13-24 Settings for Measurement Records (only SICAM P855)

Parameter	Default Setting	Setting Range	
Average intervals - Frequency	10 s	fixed	
Short term flicker	10 min	fixed	
Long term flicker	2 h	fixed	
Average interval - Voltage / Unbalance / THDS / Harmonics	10 min	1 min 10 min	
Record additional data (I, P, Q, S etc.)	no	no yes	
Recorder of average - Min	no	no yes	
Recorder of average - Max	no	no yes	
Harmonics	Odd	Even Odd All	
File generation every: (corresponds to the setting of the Average interval parameter) The created PQDIF files can be downloaded via the Web pages or the IEC 61850 protocol.	24 h	**At average interval:**	**File generation every:**
		1 min	2 h (fixed)
		10 min	2 h 24 h

13.3.5.4 Trend Records (only SICAM P855)

Table 13-25 Settings for Trend Records (only SICAM P855)

Parameter	Default Setting	Setting Range
Tolerance unit	Percentage	Percentage Numerical
Tolerance number	Percentage: 3 % of the primary nominal voltage Numerical: 0.5 V	1 % to 5 %, increments of 1 % 0.2 V to 500.0 V
Maximum recording interval	2 h	2 h 24 h

13.3.5.5 EN 50160 Report (only SICAM P855)

Table 13-26 Settings for EN 50160 Report

Parameter		Default Setting	Setting Options
General Information			
Company: Department: Supervisor: Inspector: Location: Comment:		–	Any text displayed in the printout of the power-quality report Max. 32 characters
Power Quality Report			
Evaluation mode according to		EN 50160 LV&MV	• EN 50160 LV&MV • EN 50160 HV • User-defined
Flagging acc. to IEC 61000-4-30		no	no yes
Power frequency		99.5 % of the measurement should be within a deviation of -1.0 % to 1.0 %	The settings are fixed for the template of EN 50160 LV&MV and EN 50160 HV. You can edit the limiting values in the text box directly under the user-defined evaluation mode.
		100 % of the measurement should be within a deviation of -6.0 % to 4.0 %	
Power supply voltage magnitude		95 % of the measurement should be within a deviation of -10.0 % to 10.0 %	
		100 % of the measurement should be within a deviation of -15.0 % to 10.0 %	
Flicker severity		95 % of the measurement should be less than 1.0 %	
Voltage unbalance[31]		95 % of the measurement should be less than 2.0 %	
		100 % of the measurement should be less than 3.0 %	
Total harmonic distortion (THDS)		95 % of the measurement should be less than 8.0 %	
Voltage event interruptions		Short interruption until 1-second duration	
		Short interruption until 3-minute duration	
		Long interruption longer than 3-minute duration	
Harmonic voltages for the template of EN 50160 LV&MV	Odd harmonics	H3: 5.0, H5: 6.0, H7: 5.0, H9: 1.5, H11: 3.5, H13: 3.0, H15: 0.5, H17: 2.0, H19: 1.5, H21: 0.5, H23: 1.5, H25: 1.5	
	Even harmonics	H2: 2.0, H4: 1.0, H6: 0.5, H8: 0.5, H10: 0.5, H12: 0.5, H14: 0.5, H16: 0.5, H18: 0.5, H20: 0.5, H22: 0.5, H24: 0.5	

31 According to the EN 50160, up to 3 % unbalance can occur in 3-wire networks in areas with many 1-wire and 2-wire connections.

Parameter		Default Setting	Setting Options
Harmonic voltages for the template of EN 50160 HV	Odd harmonics	H3: 3.0, H5: 5.0, H7: 4.0, H9: 1.3, H11: 3.0, H13: 2.5, H15: 0.5, H17: u.c.[32], H19: u.c., H21: 0.5, H23: u.c., H25: u.c.	
	Even harmonics	H2: 1.9, H4: 1.0, H6: 0.5, H8: 0.5, H10: 0.5, H12: 0.5, H14: 0.5, H16: 0.5, H18: 0.5, H20: 0.5, H22: 0.5, H24: 0.5	

32 Short for "under consideration"

Glossary

AC

Alternating **C**urrent

Broadcast message

Message in the network where data packets are transmitted to all devices on the network from one point

Client

Device in the communication network that sends data requests or commands to the server devices and receives responses from them

COMTRADE

COMmon format for **TRA**nsient **D**ata **E**xchange

CRC error

Cyclic **R**edundancy **C**heck: The cyclic redundancy check is a method of determining a test value for data (for example, for data transmission in computer networks) with the purpose to detect errors during the transmission or duplication of data.

DC

Direct **C**urrent

DHCP

Dynamic **H**ost **C**onfiguration **P**rotocol enables the network configuration to be assigned to the devices by a DHCP server

DST

Daylight **S**aving **T**ime

Ethernet

Cable-based data network technology for local data networks

Gateway

Enables networks based on different protocols to communicate with each other

Holding register

Area for representing data in Modbus communication

ICD file

IED **C**apability **D**escription file: Contains the standardized description of the device configuration

IEC

International **E**lectrotechnical **C**ommission, standards organization; Communication standard for substations and protection equipment

IED

Intelligent **E**lectronic **D**evice

IID

Instantiated **I**ED **D**escription file: It defines the configuration of one IED for a project and is used as data exchange format from the IED configurator to the system configurator.

Indication off

Status of the indication changes from ON to OFF, that is the indication is deleted

Indication on

Status of the indication changes from OFF to ON, that is the indication is currently present

IP

Internet **P**rotocol

IP address

Addresses in computer networks based on the Internet protocol

LED

Light-**E**mitting **D**iode

Limit violation

A value exceeding or falling under a parameterized limiting value

MBAP

Mod**b**us **A**pplication **P**rotocol

MBAP Header

Header of a Modbus TCP message consisting of these 4 parts: Transaction identifier (2 bytes), protocol identifier (2 bytes), length (2 bytes), unit identifier (1 byte)

Modbus

The Modbus protocol is a communication protocol based on a client-server architecture.

Modbus RTU

Modbus **R**emote **T**erminal **U**nit: Modbus protocol type for transmitting data via serial networks (for example, RS485)

Modbus TCP

Modbus **T**ransmission **C**ontrol **P**rotocol: Modbus protocol type for transmitting data as TCP/IP packets; TCP port 502 is reserved for Modbus TCP.

NTP

Network **T**ime **P**rotocol: Standard for synchronizing clocks in computer systems using packet-based communication networks

Power System TN

The Power transformer is neutral-point grounding and the housing of the electric equipment is protective grounding.

Power System TT

The Power transformer is neutral-point grounding and the housing of the electric equipment connects to the neutral point.

PQ

Power **Q**uality

RJ45

Connector type

RS485

Interface standard for digital, wire-based, differential, serial data transmission

RTC

Real-**T**ime **C**lock

RTU

See Modbus RTU

Server

Sends data upon request by the client

SNMP

Simple **N**etwork **M**anagement **P**rotocol: Serves for monitoring and controlling network elements of a central station

SNTP

Simple **N**etwork **T**ime **P**rotocol: Simplified version of the NTP

STP

Shielded **t**wisted **p**air is the cable for 100Base-T (Ethernet).

Stratum

Each NTP server is synchronized by a high-precision time standard or by another NTP server. The stratum is the position of the NTP server in the hierarchy of NTP servers polled by the device. The best stratum is 1, each further level in the NTP server hierarchy increases the stratum by 1.

Subnet mask

Bit mask in the network protocol that defines how many IP addresses the computer network encompasses. Together with the IP address of a device, the subnet mask defines which IP addresses the device searches in its own network.

TCP/IP

Transmission **C**ontrol **P**rotocol/**I**nternet **P**rotocol: Family of network protocols

UTC

Universal **T**ime **C**oordinated: Universal time standard referred to the time at the prime meridian