Universal fault annunciator for panel mounting

USM - Universal fault annunciator for panel mounting (2nd generation)

23.09.2024

Manual

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1 Validity

The description applies to all USMs from software version 4.4.x with the following options:

59	U	x	x	x	x	x	x	x	x	x	
											Number of reporting channels
		A									8 Alarm inputs
		B									16 Alarm inputs
		W									16 signal inputs in wide housing (96 x 192 mm)
		C									24 Alarm inputs
		D									32 alarm inputs
		Y									32 signal inputs in wide housing (96 x 287 mm)
		E									40 incoming alarms
		F									48 Incoming alarms
											Operating voltage
			1								24 V AC/DC
			2								24 – 48 V AC, 24-60 V DC
			5								110 - 220 V AC/DC
											Signaling voltage
				1							24 V AC/DC
				S							24 V AC/DC (internally generated)
				3							48 - 60 V AC/DC
				4							110 V AC/DC
				H							125 V AC/DC
				5							220 V AC/DC
				W							50 - 250 V AC/DC (wide range)
											IT security **functionality**
					S						IT security according to BDEW guidelines
					P						Port Security, extended security configuration incl. option S
											1. network interface
						W					LAN (RJ45) without IEC 61850
						F					LAN (RJ45) with IEC 61850
											2. network interface
							0				none
							W				LAN (RJ45)
							L				LAN (Fiber optic LC socket)
								R			**LED color** adjustable (red, green, yellow, orange, blue, white)
											Additional cards
									0		none
									R		1:1 relay (for 8, 16, 24, 32 and 40 fault annunciators)
									1		8 relay outputs (independent of the fault annunciator size)
									2		16 relay outputs (independent of the fault annunciator size)
									A		4, 8, 10, 12, 16 or 20 analog inputs (for 8, 16, 24, 32 or 40 fault annunciators)
									3		4 analog inputs (independent of the fault annunciator size)
									4		8 analog inputs (independent of the fault annunciator size)
									5		8 relay outputs + 4 analog inputs (independent of SM size)
									6		16 relay outputs + 4 analog inputs (only for 24 fault annunciators)
									7		8 relay outputs and 8 analog inputs (only for 24 fault annunciators)

Table 1.1: Matrix of device variants of the USM Part 1

59	U	x	x	x	x	x	x	x	x	x	
											Redundant operating voltage
										0	No additional power supply
										1	24 – 48 V AC, 24-60 V DC
										5	110 - 220 V AC/DC

Table 1.2: Matrix of device variants of the USM Part 2

2 General information

2.1 Supplementary instructions

Please note!
These instructions enable the safe and efficient use of the devices of the universal fault annunciator system (hereinafter referred to as "USM, fault annunciator or device"). The instructions are an integral part of the device and must be kept in the immediate vicinity of the device and accessible to personnel at all times.

Personnel must have carefully read and understood these instructions before starting any work. The basic prerequisite for safe working is compliance with all the safety information and instructions in this manual. In addition, the local accident prevention regulations and general safety regulations for the area of use of the appliance apply.

Illustrations in these instructions are for basic understanding and may differ from the actual design.

2.2 Use

These instructions are a prerequisite for both safe installation and safe operation of the product and must be read and understood before installation.

2.3 Target group

These instructions are written for qualified specialist personnel (electricians) who are able to carry out work on electrical systems and independently recognize and avoid potential hazards due to their specialist training, knowledge and experience as well as knowledge of the relevant standards and regulations.

The qualified electrician is specially trained for the working environment in which they work and knows the relevant standards and regulations.

2.4 Explanation of symbols

Safety instructions

Safety instructions in this manual are identified by symbols. The safety instructions are introduced by signal words that express the extent of the hazard.
bring.

Warning!
This combination of symbol and signal word indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.

Please note!
This combination of symbol and signal word indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury.

ENVIRONMENTAL PROTECTION!
This combination of symbol and signal word indicates possible hazards for the environment.

Tips and recommendations

This symbol highlights useful tips and recommendations as well as information for efficient and trouble-free operation.

Further markings

The following designations are used in these instructions to emphasize instructions, results, lists, references and other elements:

Labeling	Explanation
	Step-by-step instructions
	Results of action steps
	References to sections of these instructions and to other applicable documents
	Listings without a fixed order
[Button]	Operating elements (e.g. buttons, switches), display elements (e.g. signal lights)
"Display"	Screen elements (e.g. buttons, assignment of function keys)

Important passage

This symbol indicates particularly important information.

Cross reference

This symbol is used to refer to illustrations and other parts of this documentation or to further literature.

2.5 Safety instructions

2.5.1 Intended use

The universal fault annunciators are intended exclusively for the applications described in these instructions and may only be used under the conditions described in the Technical data chapter. Any use beyond the intended use or any other use is considered misuse.

WARNING!
Danger of misuse!
Misuse of the fault annunciator can lead to dangerous situations.

- Never use the devices in EX areas.
- Never use appliances in areas where there is a risk of interference without observing the special regulations for this.
- The devices must not be opened or modified improperly.

2.5.2 Storage of the instructions

The instructions must be stored within easy reach of the appliance and be accessible to staff.

2.6 Customer service

Our customer service is available for technical information:

Address	Elektra Elektronik GmbH & Co Störcontroller KG Hummelbühl 7-7/1 71522 Backnang
Telephone	+ 49 (0) 7191/182-0
Fax	+49 (0) 7191/182-200
e-mail	info@ees-online.de
Internet	www.ees-online.de

In addition, we are always interested in information and experiences that result from the application and can be valuable for the improvement of our products.

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Use of open source software

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E-Mail:	info@ees-online.de
Phone:	+ 49 (0) 7191/182-0
Fax:	+49 (0) 7191/182-200

3 Functional description

3.1 Basic structure of the USM

The USM universal fault annunciator family was developed for systems networked with Ethernet or fiber optics. The fault annunciators are used to detect and display alarms that are provided by the communication partner (e.g. control system) via galvanic inputs or via the Ethernet interface. The alarms are processed and displayed according to the parameterized fault alarm sequence. In addition, the alarms can be forwarded to higher-level systems via the integrated interfaces and protocols.

The fault annunciators are available with 8, 16, 24, 32, 40 or 48 signal inputs. The alarm inputs are combined in groups of 8 alarms each. The closed front panel contains 4 buttons, 3 status LEDs, an RGB LED for each alarm for which 6 colour variants (red, green, yellow, blue, orange and white) can be parameterized and pockets for the labelling strips.

The fault annunciator has an internal horn. An external horn can be activated via a function relay.

The function inputs are used according to the selected signaling sequence (e.g. external acknowledgement). The integrated function relays are designed as changeover contacts. They implement alarm-specific functions (e.g. collective alarm and activation of an external horn) as well as the signaling of a malfunction via a live contact.

The fault annunciator has a **status memory in the event of a power failure**. If the supply voltage fails, all visual and acoustic signals are switched off and the relays drop out. During the power failure, no new alarms are registered and acknowledgements are not possible. After power is restored, all statuses are immediately restored and the fault annunciator is ready for operating actions and new alarms.

Parameterization can be carried out via the integrated web server with web browser or by importing parameter files. The most common fault alarm sequences, input processing, collective alarm formation and horn controls can be set, and the protocol parameters, IP address and the assignment of information object addresses can be parameterized. A detailed description of the parameterization can be found in the chapter "Parameterization". Customer-specific fault alarm sequences can be implemented ex works if required.

The fault annunciator can have various interfaces (CAN, USB-B, COM, LAN or fiber optic), the function and use of which are described in the following sections.

Many energy systems operate unmanned at times and someone is only on site in the event of maintenance or a fault. Two special functions have been integrated into the fault annunciators for this purpose, which are signaled as an additional operating mode by the Alive LED flashing green.

- **Mute function (Mute)**
  In "Silent" operating mode, the horn is not triggered or is automatically acknowledged after a configurable time. The function is switched on or off using a button parameterized for this purpose. The operating mode can also be activated via a parameterizable function input. In this case, the "Silent" mode is only active as long as a voltage is present at the function input.

- **Unmanned operation (Unmanned)**
  The fault annunciators can be switched between the "manned station" and "unmanned station" operating modes. In the "unmanned station" status, there is no visual or audible output of pending alarms. The internal alarm processing and, if necessary, the activation of relays or the output via an interface remain active. Alarm acknowledgement on the fault annunciator is deactivated.

Two methods can be used to not only display the individual fault alarms visually, but also to forward them in parallel to the input or output via a relay contact (1:1 relay):

1. Integration of additional relay cards (8 NO contacts each) for use as 1:1 outputs. These relays can be freely assigned via parameterization. The relay cards are optional and must be taken into account when ordering.
2. Connection of external relay modules to the system bus. For further information on the expansion modules, please refer to the separate data sheet MSM-EM-DB-UK.

Further information on the integrated fault alarm sequences can be found in the separate documentation "Reporting procedures for EES fault annunciators".

3.2 Additional cards (optional)

Analog input cards and relay cards can optionally be integrated into the fault annunciator. Mixed use of analog input cards and relay cards is also possible.

3.2.1 Analog input cards

Depending on the size of the device, a USM can be equipped with up to 5 analog input cards. Each input card has 4 analog inputs with a common reference ground. Depending on the application, the inputs can be configured as voltage or current inputs. The following options are available:

- 0 ... 10 V
- -10 ... 10 V
- 0 ... 20 mA
- 4 ... 20 mA (with wire break monitoring in the fault annunciator)

The measured values can be forwarded to a higher-level system via Modbus RTU/TCP, IEC 60870-5-101/104 or IEC 61850. The measured values can also be monitored and a fault alarm generated in the event of an error. → Threshold monitoring

The alarm can be parameterized so that it is triggered by one of the following events:

- if the limit value is exceeded
- if the limit value is exceeded
- if the measured value is within a range
- if the measured value is outside a range

3.2.2 Relay cards

The optional relay cards (8 NO contacts each) are independent of the 4 function relays of the fault annunciator and can be used for the following functions:

1. Input or output-parallel multiplication and forwarding of individual alarms directly in the fault annunciator without connecting external relay modules
2. Output of collective alarms and horn control
3. Control of the relays via the IEC interface

The eight relays of each plug-in card have a common root. The control and function of the relays can be individually adapted for each fault annunciator using the integrated web server. You can freely select which input the respective relay follows; the assignment can be 1:1 (one relay follows one input) or n:1 (several relays follow one input).

The output of special functions, such as horn control or the output of a collective alarm on these relays, is also possible. Other parameters are also available, e.g. inversion of the signals and the wipe duration for pulse output.

3.3 Redundant power supply unit (optional)

A second, redundant power supply unit can be integrated into the fault annunciator independently of the primary supply voltage. Two voltage variants are available for this:

- 24 – 48 V AC, 24-60 V DC
- 110 - 220 V AC/DC

The voltage level of the redundant power supply unit can be selected independently of the voltage level of the primary power supply unit.

If the fault annunciator is equipped with a redundant power supply unit, switching between the power supplies takes place automatically without interruption.

Both power supplies can be operated with AC or DC voltage. It is not necessary to specify the voltage type in advance.

Both the primary and the redundant power supply units are included in the fault annunciator's self-monitoring function and faults are output via the alive relay. In addition, the presence of the supply voltage on both power supply units is signaled via an LED (S1 and S2) on the front of the device. The failure of a power supply unit is also reported via the communication interface.

3.4 Internally generated signaling voltage

If the fault annunciator has the "Internally generated signaling voltage" option, it generates a 24 V DC signaling voltage itself, which can then be used to supply the potential-free signaling contacts and to control the function inputs. If this option is used, the signaling and function inputs are automatically set to 24 V.

This option is particularly interesting if redundant power supply units are used, as the 24 V signaling voltage is then generated without interruption from the active operating voltage U_{S1} or U_{S2}.

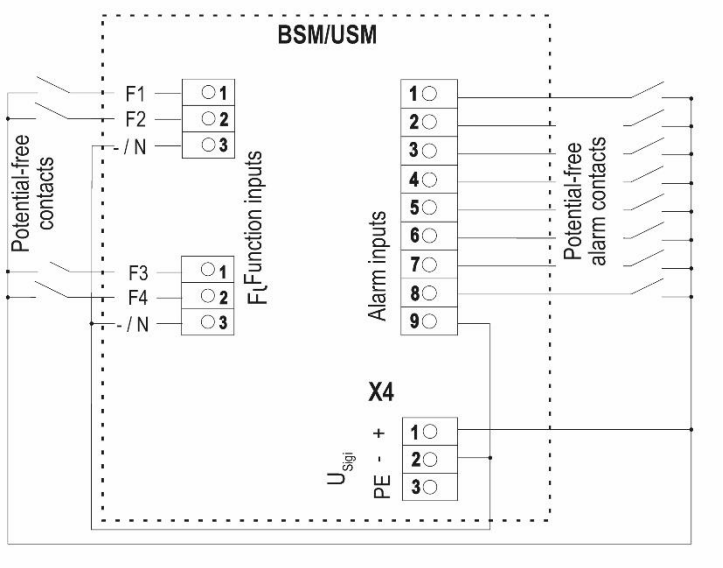


Figure 3.1: Application example for the use of the internally generated signaling voltage

3.5 Cascading of several fault annunciators

Cascading allows one USM and up to 3 BSMs (BSM-C or BSM-P) to be combined to form a fault alarm system. The devices are connected via the system bus provided at the CAN bus sockets using network cables (patch cables). The USM works as the "master" and the connected BSMs as "slaves". This allows systems with a maximum of 192 signal inputs (4*48) to be implemented. Systems formed in this way behave like a (virtual) fault annunciator with common alarm processing (alarm sequence, collective alarm formation, horn control). The alarms of the entire system can be accessed via the interface of the USM.

External MSM relay extension modules cannot be connected when using fault annunciator cascades.

The parameterization of cascaded fault annunciators is only carried out in full in the "master fault annunciator" and is then automatically distributed to the "slave fault annunciators". Cascading multiplies the number of function inputs according to the number of devices. A maximum of 16 function inputs are available.
For information on the BSM, please refer to the separate operating instructions for the BSM.

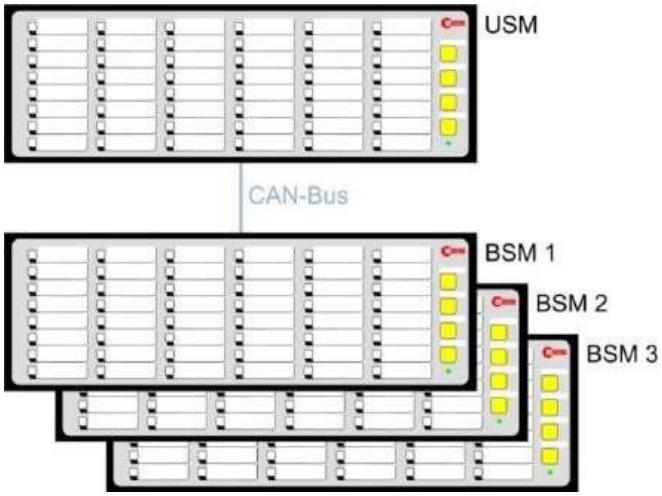


Figure 3.2: Basic structure of a cascaded fault alarm system

3.6 Protocol interfaces and parameter editor

The USM is equipped with various interfaces for communication with higher or lower-level external systems (e.g. process control system or control system). The following interfaces are available:

Standard interfaces

- 1. network interface LAN - Ethernet / RJ45 (parameterization, diagnostics and protocol interface)
- COM - parameterizable RS232 or RS485 / pluggable terminal (serial protocol interface)
- USB-C - factory interface (service interface)
- USB-C - currently not used
- CAN bus / RJ45 (system bus for connecting expansion modules or setting up fault alarm cascades - see also section Cascading)

2. Network interface (optional)

- LAN - Ethernet / RJ45 (protocol interface) alternative
- Optical interface multimode 50-62.5/125 µm @1300 nm; Connector LC-duplex according to standard IEC 60874-13) (protocol interface)

Using the protocol interfaces, the fault annunciators can be connected via the following protocols:

- Modbus RTU/TCP (fault annunciator is Modbus slave)
- IEC 60870-5-101 (fault annunciator is IEC server)
- IEC 60870-5-104 (fault annunciator is IEC server or client)
- Optional IEC 61850 (fault annunciator is IEC server or client)
- SNMP V1, V2, V3 (transmission of status information and device errors)
- Syslog (transmission to up to 2 syslog servers)

A fault annunciator with the IEC 60870-5-101/104 interface, which is operated as a server, can establish a connection to a maximum of 4 clients (multilink). As an IEC client, the fault annunciator IEC-104 can establish connections to a maximum of 32 servers. It is possible to combine several of the above protocols in one fault annunciator. Communication via IEC 61850 is only available on one network interface, regardless of the total number of interfaces of the fault annunciator.

3.6.1 Assignment of the serial protocol interfaces

The serial interface X6 is designed as a pluggable terminal. Depending on the parameterization, it can be used as an RS232 or RS485 interface (see section "Parameterization → System menu → Serial submenu").

Pin no.	Assignment when used as RS232	Assignment for use as RS485
1	not used	+ 5 V maximum 25 mA (only for pull up resistance)
2	RxD incoming data	A (non-inverted signal incoming and outgoing data)
3	TxD outgoing data	B (inverted signal incoming and outgoing data)
4	GND	

Table 3.1: Assignment of the RS232 and RS485 interface

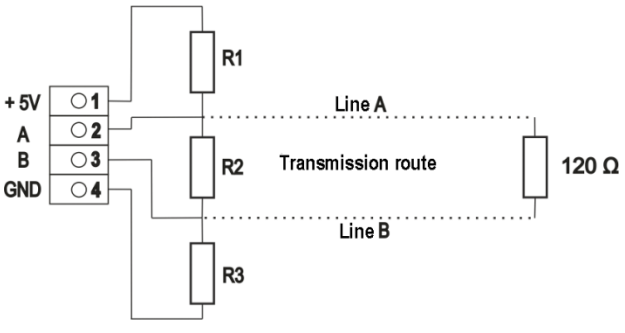
Use of the RS485 as a Modbus RTU interface

With RS485-based Modbus RTU transmission, a maximum of 32 participants can be connected. The twisted pair cables are looped from slave to slave in a line starting at the master. A pair of wires should always be used for A and B. If the interface is not electrically isolated, the common connection must also be included. The interface on the USM is electrically isolated with functional insulation (see technical data).

The data is transmitted via a differential, clocked voltage level between lines A and B. As the data is transmitted bidirectionally on the lines, this method is also known as half-duplex operation. Each receiver or transmitter has an inverted and a non-inverting connection. Line A is therefore the complementary of B and vice versa.
This means that if a "high" signal is transmitted on one line, the other line transmits a "low" signal at the same time. The advantage of this method is that the effect of coupling interference voltages to the lines is minimized, as this causes a symmetrical increase or decrease of the voltages in both lines, and thus the voltage difference between the two lines is only minimally affected.

Bus reflections are one cause of communication faults. To avoid reflections on the bus, the bus line must be fitted with a terminating resistor at the beginning and end that corresponds to the line characteristic impedance.

Another cause of communication faults is a lack of line polarization. This is usually implemented by the Modbus master. If the master device does not have line polarization, a pair of resistors must be connected to the symmetrical lines A and B as shown in the example below. This can be done at one or both ends of the line.



Variant 1:
Polarization at one end of the line
R1 = R3 = maximum 680 Ω
(ideally 470 Ω - 560 Ω)
R2 = 180 Ω

Variant 2:
Polarization at both cable ends
R1 = R3 (on both sides) max. 1.3 kΩ
(ideally 1 kΩ - 1.2 kΩ)
R2 = (on both sides) 180 Ω

Figure 3.3: Connection example with line polarization

The shield should be connected to the local earth or the GND of the USM.

3.6.2 Parameter editor (integrated logic functionality)

The fault annunciators offer integrated logic functionality. The universal parameter editor can be used to create formulas in accordance with the IEC61131-3 ST syntax. Inputs and virtual channels are linked in Boolean expressions with the operators AND, OR, NOT and parentheses.

In the following example, goose signals that were assigned to a virtual channel in a previous configuration step are linked to form a signal. The result of this link is routed to a fault alarm input of the USM and thus processed like a normal physical input in the fault alarm logic.

Example:

%QX0.0.1:= (%IX14.1 AND %IX14.2) OR (%IX14.3 AND %IX14.4)

Activation of the fault alarm input of the master USM channel 1 according to the result of the operation (virtual channel 1 AND virtual channel 2) OR (virtual channel 3 AND virtual channel 4)

→ Further information on parameterizing the logic functionality can be found in the "Parameter editor submenu”(“integrated logic functionality" section)

3.6.3 Alarm states and delay times

The individual states of the channels can be transferred or linked in the protocols and the logic link.

A distinction can be made between the following states of the individual channels:

Alarm status	Meaning
Physical input	Unprocessed input before the response delay is applied.
Undelayed alarm input	Alarm after the application of the response delay (debouncing) and before the application of the alarm delay.
Delayed alarm receipt	Alarm after application of the alarm delay.
Alarms (results according to the parameterized alarm sequence)	**Alarm unacknowledged** Alarm currently present or gone but not yet acknowledged.
	Alarm 1-frequency alarm sequence Alarm stored and pending or 2-frequency alarm sequence Acknowledged saved but not reset

Table 3.1: States of the channels

The drawing below illustrates the signaling states and the mode of operation of the two delays and the flutter suppression in the signaling sequence once again. At the same time, the two options for controlling the 1:1 relays are shown (→ section 1:1 relays).

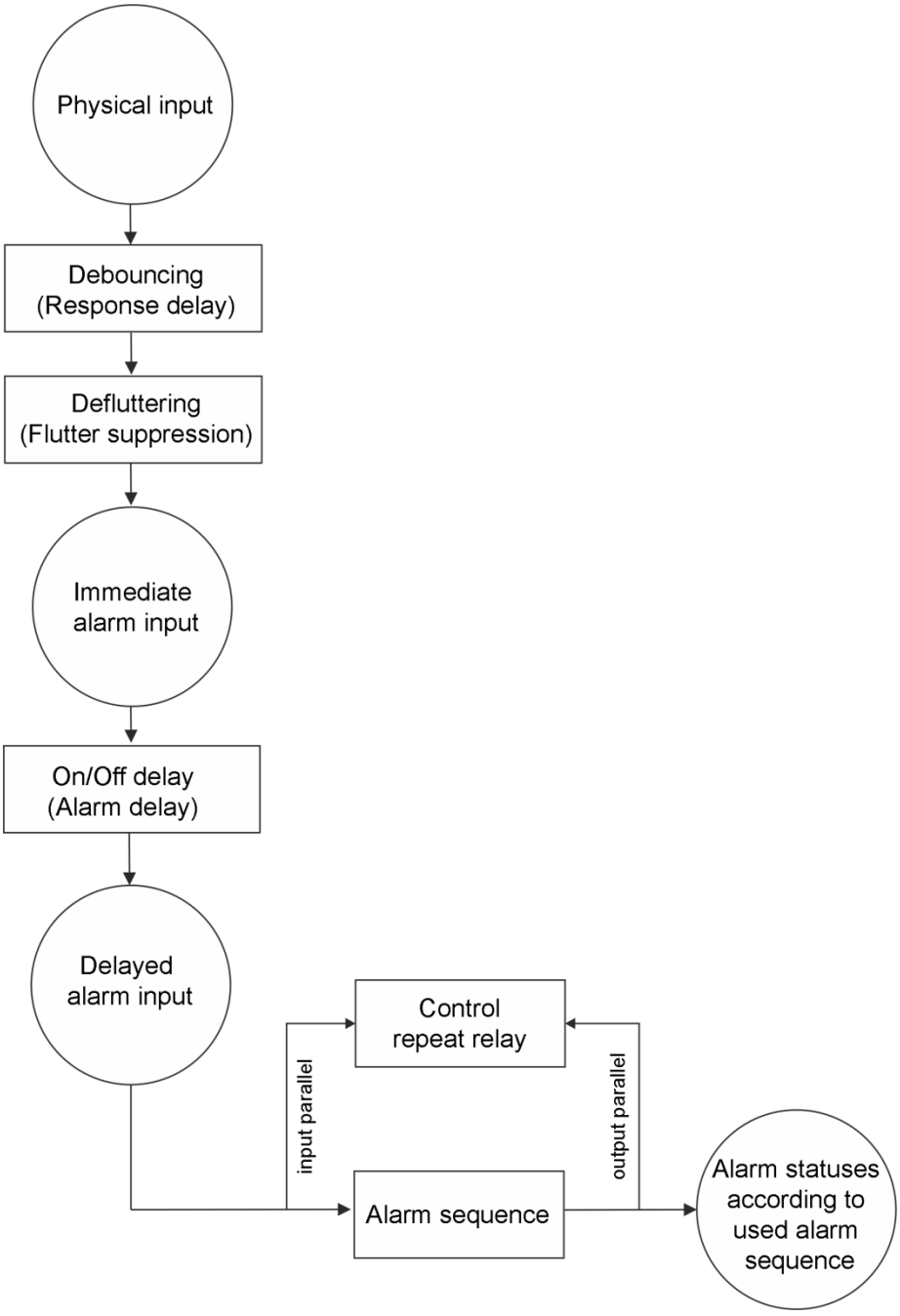


Figure 3.4: Schematic representation of the alarm processing of the USM

Response delay (debounce time)

Closing a contact may result in several edge changes before the contact is permanently closed. Due to the short response time when detecting alarms, several alarms could therefore be generated while the contact is closed. To prevent this, the response delay (debounce time) can be set in 1 ms steps up to a time of 1000 ms. The signal is only recognized as valid if it is continuously present beyond this time period. However, the time stamp is still set with the **first edge** of the signal and not only when the signal is valid.

Alarm delay
The alarm delay delays a permanently pending (debounced and flutter-monitored) alarm before it is displayed, forwarded or deleted. This is intended to suppress error alarms that would occur, for example, if a value is only briefly exceeded or undershot.

Example:
The monitoring contact of a thermostat triggers briefly before the corresponding temperature is reached due to the conditional control loop time. Because this brief overtemperature should not be reported as a fault, the alarm can be suppressed with the alarm delay. Only alarms that are present for longer than the alarm delay are processed in the alarm sequence or output to the output-parallel 1:1 relay.

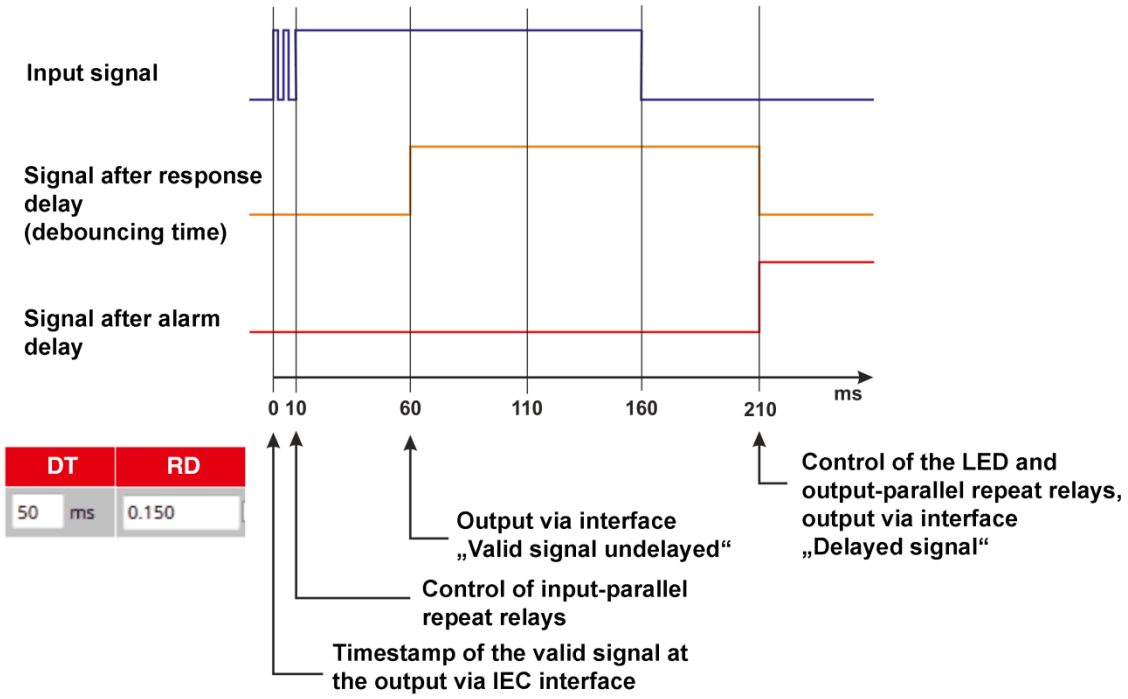


Figure 3.5: Timing diagram with response delay 50 ms and signal delay 150 ms

3.7 Applications for networking fault annunciators

3.7.1 USM as a registration module in IEC 60870-5-101/104 structures

The graphic below shows an application example in which the USMs serve as recording modules that process and signal fault alarms on site. In addition, the alarms are transferred to the control level via an IEC 60870-5-101/104 interface.

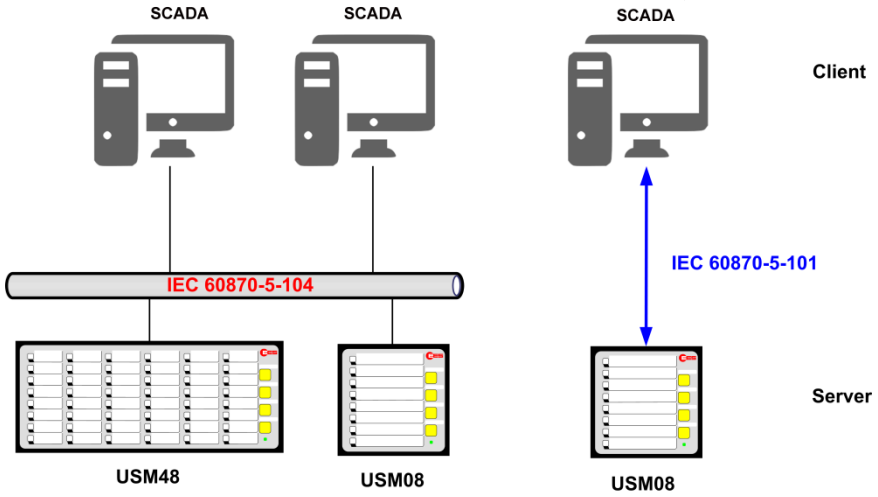


Figure 3.6: Application example for networking USM data acquisition modules (IEC server/slave) with an IEC client/master.

The individual signaling channels can alternatively be controlled via a galvanic input or the IEC interface. Which of these two options is used for each individual channel can be parameterized. Acknowledgement via the IEC interface is also possible.

3.7.2 USM as a display module in IEC 60870-5-104 structures

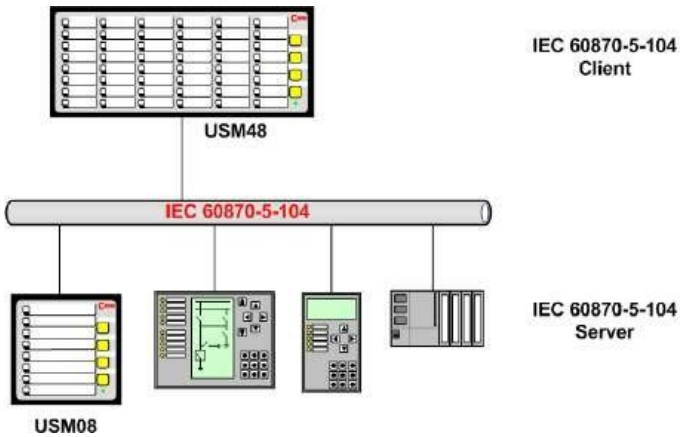


Figure 3.7: Application example USM as output module

In this application example, the USM48 is used to signal faults from various devices that are "collected" via the IEC interface. Additional wiring of the individual fault signaling contacts is therefore not necessary.

3.7.3 Mirroring of individual alarms

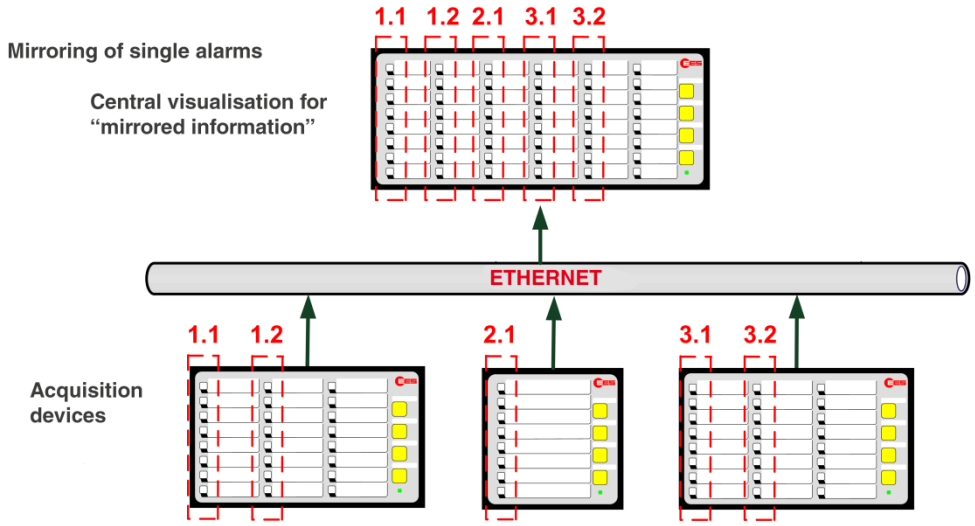


Figure 3.8: Mirroring application example

In the case of large plant areas and complex processes, central points are often
or important individual alarms from the field are required in control rooms. In classic systems, 1:1 relays are used here, which means a high wiring effort. With USM fault alarm systems, this effort can be greatly reduced. 32 USM field stations can send individual alarms to a central USM or another USM field station via a network connection (copper or fiber optic) and thus mirror them. The mirrored alarms do not have to be individually wired or acknowledged "at the mirror", but are always in the status of the alarm of the triggering USM.

3.7.4 IEC 61850 protocol (optional)

The IEC 61850 protocol is used to transmit information from field and protection devices in automated switchgear. In addition, various individual alarms are generated which - depending on the type of alarm - must also be transmitted to the process control system or other devices at field or station level.

With the help of the optionally integrated IEC 61850 interface, the fault annunciators of the USM series take over this "rag picker" function. Individual alarms and, with the help of the optional analog inputs, measured values can also be transmitted. Individual reports and datasets can be easily configured to provide all relevant information about the alarm and device status.

Data is exchanged accordingly:

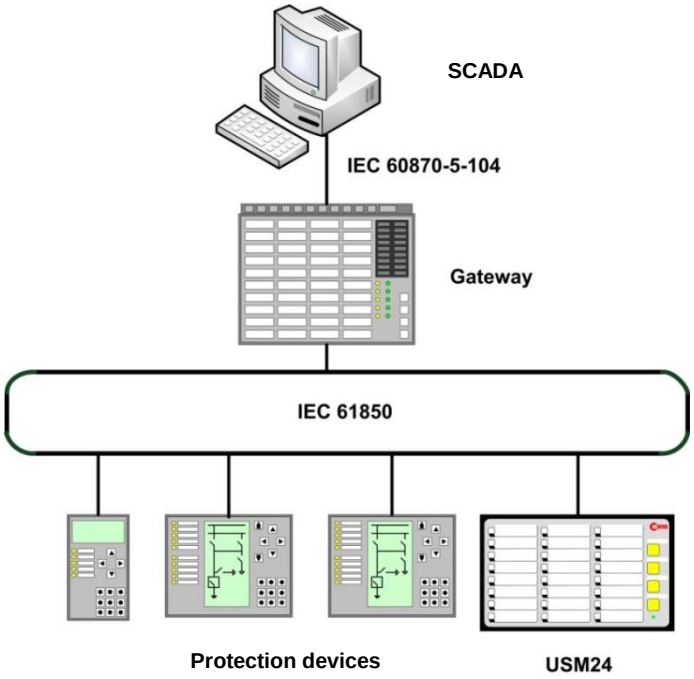
- MMS via GGIO (USM is server)
- GOOSE (USM is server or client)

GOOSE implementation

In accordance with the IEC61850 standard, the USM can send GOOSE alarms both as a publisher - i.e. as a server - and as a subscriber - i.e. as a client. CID files from third-party devices are read in and USM CID files are generated on the USM web interface. Received GOOSE alarms can either be routed directly to fault alarm channels or pre-processed using Boolean logic. Up to 1024 alarms from up to 32 IEDs can be processed.

Watchdog

In addition, the USM can be configured as a 61850 watchdog for third-party devices. In this case, a configurable time is monitored during which the third-party device must periodically report to the USM via an IEC 61850 object. If the time is exceeded, a freely assignable digital input is activated.



With the optional IEC 61850 software license, the USM can be used as a signaling device in IEC 61850 structures.

Figure 3.9: Application example for the integration of a USM in IEC 61850 structures

The individual signaling channels can alternatively be controlled via a galvanic input or the 61850 interface. Which of these two options is used for each individual channel can be parameterized. Acknowledgement via the 61850 interface is also possible.

3.8 IT security in accordance with BDEW guidelines

A white paper with basic security measures for control and telecommunications systems has been developed for companies in the energy industry. The aim is to adequately protect the systems against security threats in daily operation. The following functions serve to fulfill these requirements. For this purpose, the following functions were integrated, which fulfill the status BDEW Whitepaper 2.0 05/2018.

- User administration with password guidelines
  (on delivery, only an administrator with a unique device-specific start password is created)
- Firewall settings
- Certificate management
- File transfer via SFTP (Secure File Transfer Protocol)
- Communication using HTTPS (Hypertext Transfer Protocol Secure)
- If two Ethernet interfaces are available, services can be assigned to both interfaces via the port selection (e.g. productive network and service network).
- Update and rollback function

In addition, the Port Security extension can be integrated as an option, which allows authentication of the fault annunciator in accordance with the IEEE 802.1X protocol.

→ For a detailed description of these IT security functions, please refer to the separate description with the document designation MSM-SEC-BA-DE.

3.9 User administration

The fault annunciator has a user administration function that allows users to be created in 4 groups with different access rights.

- Administrator
  (user administration, firmware updates, security settings (firewall))
- User
  (Authorization to view the non-security-relevant settings)
- Engineer
  (setting up non-safety-related fault alarm parameters, importing and exporting device configurations)
- Operator
  (Authorization to control the device functions via the monitor)

The administrator can define password rules with complexity guidelines and validity periods.

3.10 Event log

An event log is kept in the USM in which the following event groups can be archived with consecutive event numbers and time stamps:

- Alarm events
  (alarm coming, going, acknowledged, reset, horn acknowledged)
- Fault annunciator status events
  (watchdog relay status, IEC connection status, configuration events)
- Log events
  (IEC60870-5-104 client status, IEC61850 error)
- Analog channel error
  (input range over/underrange, 4 ... 20 mA open-circuit detection)
- System events
  (switch-on and power failure events, time synchronization, network connections, event log status)
- Safety-relevant events
  (login attempts, password changes, file system integrity, firmware updates, firewall configuration)

The user can determine which event categories are included in the archive. The events can be displayed on the web server, exported as a CSV file or sent as syslog alarms.

The alarm book is managed as a ring buffer and can hold 100,000 alarms. A fill level warning is issued if the fill level is set, which is adjustable.

The events can be displayed on the web interface, filtered according to various criteria and exported as a CSV file.

It is also possible to parameterize the sending of alarms to a syslog server.

By default, only the system-relevant part of the event log is active. The logging of alarm events must be activated manually.

3.11 Labeling

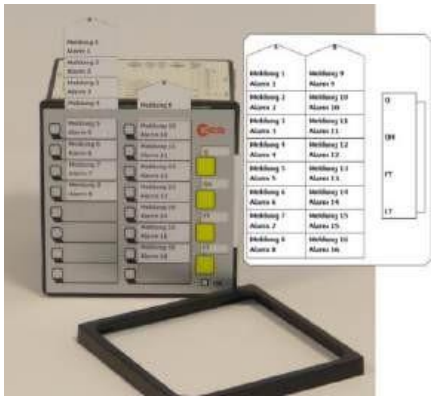


Figure 3.10: Inserting the labeling strips after removing the frame

The USM is labeled using label strips that are slid under the cover film after the front frame has been removed.

The label strips with the alarm texts and button designations can be created and printed directly via the web server using the parameterization interface. Fonts and font sizes can be customized.

Alternatively, Word labeling templates can be downloaded from our website www.ees-online.de and edited manually.

3.12 Annunciator lights, buttons and connections

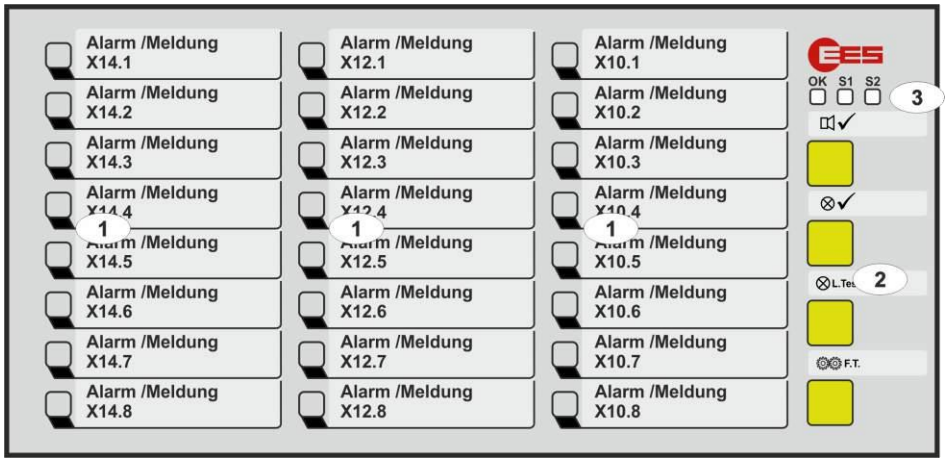


Figure 3.11: Front view of the USM24

[1] Annunciator LED (function depends on the parameterized signalling sequence)
[2] Buttons 1 ... 4 (function depends on the parameterization)
[3] Indication lights

OK - "Operating status"

Steady light green - No error, no alternative operating state
Off - No supply voltage or device defective
Flashing red error → section "Diagnostic functions"
Flashing green Signaling an alternative operating status (see table below)

S1 - Control light Supply voltage 1

Off - No supply voltage 1 and
Continuous red light - Supply voltage 1 error
Continuous green light - Supply voltage 1 error-free

S2 - Control light Supply voltage 2 (redundant supply)

Off - Option redundant supply voltage not integrated
Continuous red light - Supply voltage error 2
Continuous green light - Supply voltage 2 error-free

Flashing sequence	Alternative operating status	Remark
long - short	Mute function active	As long as the operating mode is activated, the horn will not be triggered or sounded after the parameterized time is automatically acknowledged.
long - long - short	Unmanned operation (Unmanned) active	As long as the operating mode is active, there is no visual or acoustic output of pending alarms. The internal alarm processing and, if necessary, the activation of relays or the output of alarms via an interface remain active. The alarm acknowledgement on the fault annunciator is deactivated.

Table 3.2: Signaling of alternative operating states of the USM by green flashing of the "OK" annunciator light

During the initialization process of the fault annunciator after the restart, the three annunciator lights "OK", "S1" and "S2" light up green several times in succession.

The illustration of the USM with 24 signaling channels is shown here only as an example to illustrate the principle. The number of signaling channels and the LED colors of the signaling lights may vary depending on the configuration and size of the fault annunciator.

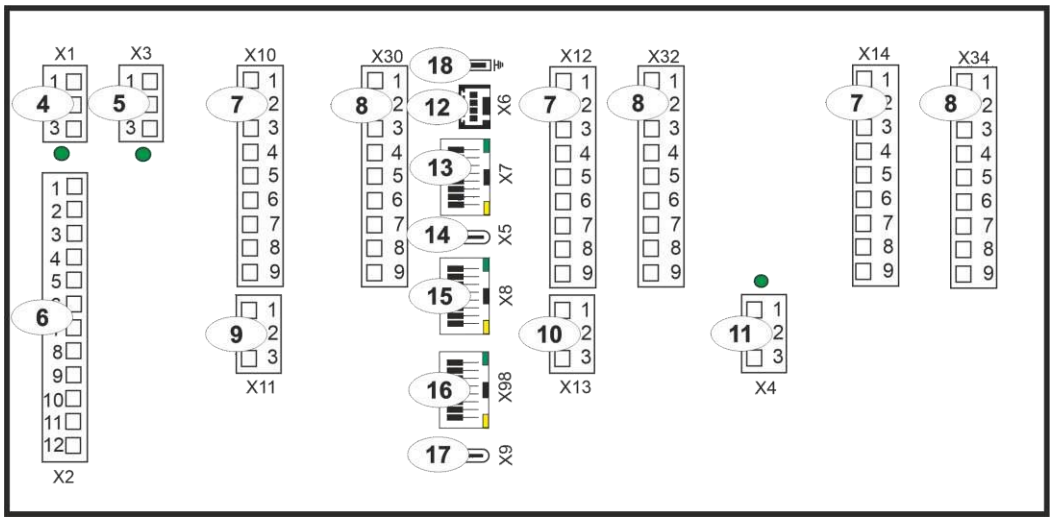


Figure 3.12: Rear view of the USM24

[4] Terminal X1 Supply voltage 1 (green LED indicates voltage present)
[5] Terminal X3 Supply voltage 2 (redundant supply voltage optional) (green LED indicates available voltage)
[6] Terminal X2 Function relay 1 - 4
[7] Terminals X10/12/14 Signal inputs
[8] Terminals X30/32/34 (only if optional additional cards are present)
[9] Terminal X11 Function inputs 1 and 2
[10] Terminal X13 Function inputs 3 and 4 (may not be present)
[11] Terminal X4 Signal voltage generated internally (optional)
[12] Terminal X6 serial interface COM (RS232/485)
[13] Socket X7 (RJ45) System bus (based on CAN bus)
Control light Yellow - lights up for CAN bus communication
Green - lights up for RS232/485 communication
[14] Socket X5 (USB-C) for firmware update with USB stick
[15] Socket X8 (RJ45) LAN connection (Ethernet)
Yellow annunciator light - Speed
from 10 Mbit/s
one 100 Mbit/s
green - Activity
lights up when the Ethernet connection is active
[16] Socket X98 (RJ45) LAN connection (Ethernet) optional
Annunciator light Yellow - Speed
from 10 Mbit/s
one 100 Mbit/s
green - Activity
lights up when the Ethernet connection is active
[17] Socket X9 (USB-C) factory interface (service interface)
[18] PE protective conductor – Functional earth

The rear view of the USM 24 has only been selected here as an example. The rear views of all fault annunciators can be found in the section Front and rear views of the USM.

The PE connection must be connected to a protective conductor system / functional earth

3.13 Diagnostic functions

Various diagnostic information is available for monitoring and assessing the system functions. This includes, for example, the display of errors via the "Operating status" annunciator light, output via relay contacts, display via an alarm channel of the fault annunciator itself or the sending of error information via the protocol interface in the "Error" data object.

The signalling of individual errors via the various signalling channels can be parameterized if required
→ section "Parameterization/Main menu Parameters/System menu/Device error submenu").

3.13.1 Operating status" OK led and live relay

The "Operating status" ok led provides information about the current status of the station or the Systems:

- Permanent — green light - no error
  Flashing green Initialization process or alternative operating status Mute or Unmanned (see Table 3.2)
- Flashing — red - error (see section Error list)
- Off — no power supply

With the USM, an error code can be derived from the flashing sequence and the associated error can be deduced. A flashing sequence consists of:

- Number of long flashes → 1st digit of the error code
- Number of short flashes → 2nd digit of the error code
- Break → Pause

Example: long, short, short, pause = error code 12

If several errors occur at the same time, only the one with the highest priority is displayed.

In addition to the "Operating status" annunciator light, the function relay 4 (live relay) with changeover contact signals the status of the fault annunciator.

Clamp	**Contact us**	**Condition**	**Meaning**
X1	10/11	Closed	Power failure or error
X1	11/12	Closed	No error

3.13.2 Error list

The error numbers listed in the following table correspond to the red flashing sequence of the "Operating status" annunciator light of the USM.

Example:

Error 68 - *Connection to the NTP server disrupted*
Flashing sequence of the annunciator light - *long, long, long, long, long, long, long*
short, short, short, short, short, short, short, short break

The following table lists the error codes of the USM.

Error number	Error	Remark
1	Collection errors	This error is also triggered if any error occurs in the fault annunciator.
11	Parameter Initialization error	If the error occurs again after restarting the device, the device must be sent to EES for inspection.
12	Internal communication error	
13	Overflow alarm buffer	After the occurrence of an alarm surge, intermediate states of alarms may have been lost. The final states are valid.
14	Relay card faulty	If the error occurs again after restarting the device, the device must be sent to EES for inspection.
15	Communication in the fault alarm cascade disrupted	This error can occur in fault alarm cascades. It is displayed if the connection between the USM and at least one configured slave (BSM) is interrupted. Please check the configuration of the slave addresses on the BSM and the Connection cable.
17	Primary voltage $_{UB1}$ missing	Faults in fault annunciators with redundant power supply
18	Secondary voltage $_{UB2}$ missing	
19	Configuration inconsistent	The configuration that has been saved does not match the device (e.g. USM 08 and USM 16).
31	IEC 61850 license error	The 61850 license does not match the device. Has the license been installed in the correct device? Contact customer service.
32	CID file is missing	Import CID file
33	XML configuration file missing	Restore factory settings via web server, then carry out or import parameterization again. Contact customer service if the error persists.
34	XML import incorrect	Import correct file or restore factory settings via web server.
35	CID file incorrect	The imported CID file is not correct. Import a correct file.
41	Extension address incorrect	In cascaded systems The slave generates the error if it is set to address "0". is set.

Table 3.3-1: Error codes of the USM part 1

Error number	Error	Remark
42	Extension address multiple	In cascaded systems • Master generates the error if a slave at address "0" is set • Slave generates the error if another slave with the same address sends. There are two slave devices with the same address.
48	Wire break 4 - 20 mA sensor	If the measuring mode is set to 4 - 20 mA for an analog input, this error is displayed in the event of a wire break. A wire break is detected if the current is less than 3.6 mA.
63	IEC 104 Client connection	A configured IEC server cannot be reached by the client or does not send any data.
64	No Ethernet connection ETH0 (X8)	Ethernet connection faulty - Check the Ethernet cable on the USM and the remote station (switch).
65	No Ethernet connection ETH1 (X98)	
67	IEC104 Client GA not complete	The IEC server can be reached by the client, the general query but returns incomplete data. - Check the configuration in the server.
68	NTP connection	Connection to the NTP server disrupted The error is generated if neither of the two parameterizable NTP servers can be reached within 10 minutes. To make commissioning easier, this error is signaled after 10 s after the voltage has been switched on or a changed parameterization has been accepted.
71	Primary voltage $_{UB1}$ missing	Power supply error in slave 1
72	Secondary voltage $_{UB2}$ missing	
73	Primary voltage $_{UB1}$ missing	Power supply error in slave 2
74	Secondary voltage $_{UB2}$ missing	
75	Primary voltage $_{UB1}$ missing	Power supply error in slave 3
76	Secondary voltage $_{UB2}$ missing	
160 - 191	Connection error to the respective IEC 104 server (link 1 - 32)	If the USM is operated as a client, the following can be selected in the "Parameters/Protocols/IEC160870-5-101/104" links to a maximum of 32 servers can be parameterized. An error alarm is provided for each of these links.

Table 3.3-2: Error codes of the USM Part 2

3.14 Terminal assignments

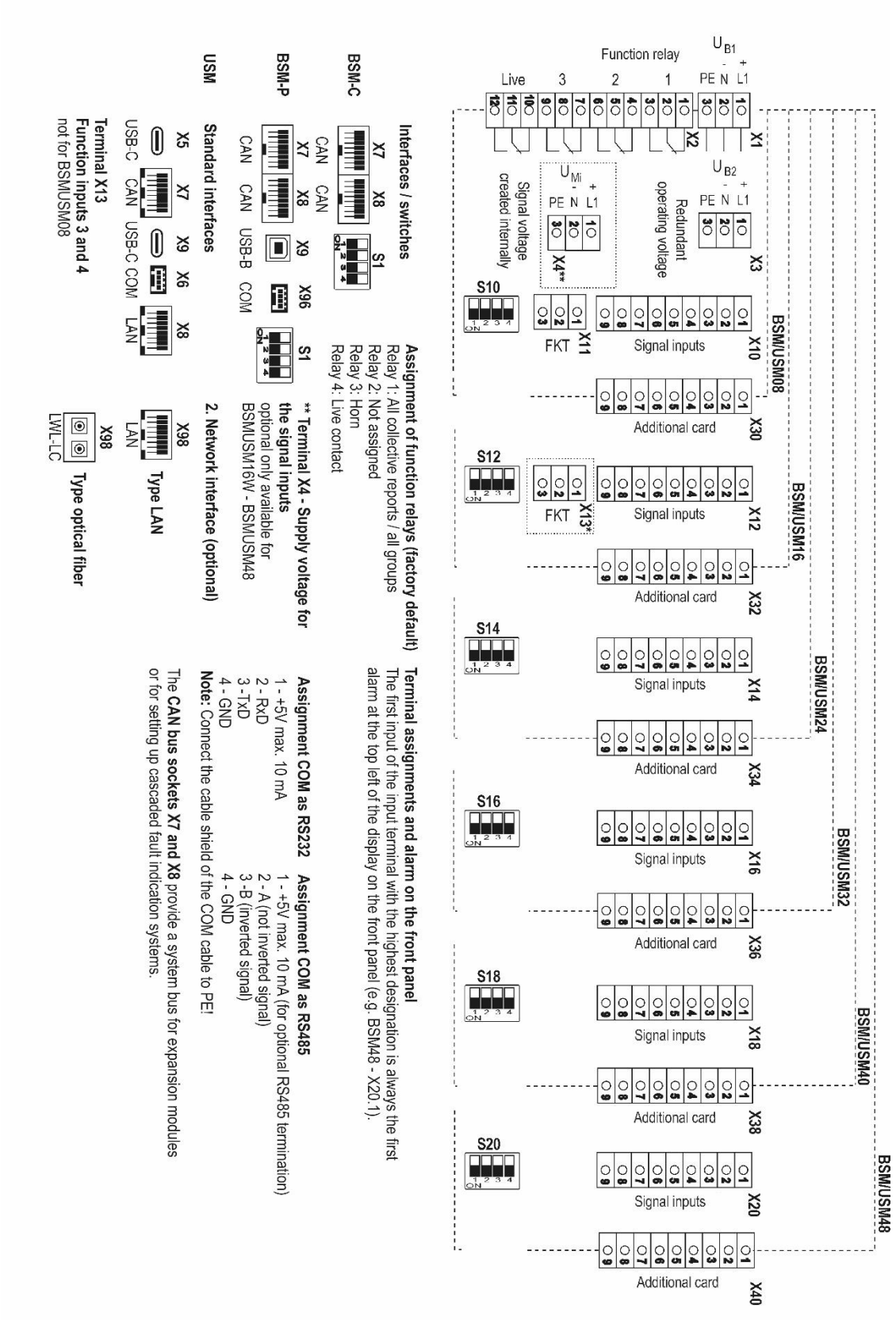


Figure 3.13: Terminal assignment USM

Detailed terminal assignment

Function inputs (X11 and X13)

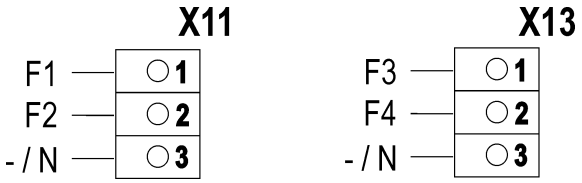


Figure 3.14: Terminal assignment for function inputs

Signal inputs (X10, X12, X14, X16, X18, X20)

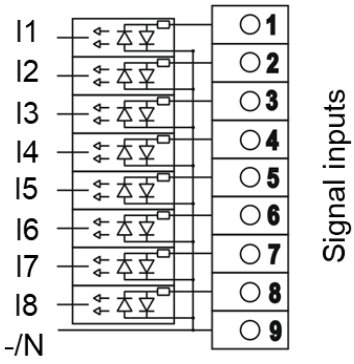


Figure 3.15: Terminal assignment of the signal inputs

Optionally, additional cards with 4 analog inputs and 8 relay outputs can be integrated. Analog input cards have blue terminals for better differentiation. The following sequence is used when arranging the additional cards. Relay cards are always arranged in descending order, starting from the rear on the right (slot with the highest terminal number). Analog input cards are then added to the left in the direction of the (slots with the lowest terminal number).

Example:
If 3 analog input cards and 2 relay cards are installed in a fault annunciator with 40 inputs, the two relay cards are located in slots X38, X36 and the analog input cards in slots X34, X32 and X30.

However, if only 2 analog input cards and 2 relay cards are installed, the two relay cards are located in slots X38, X36 and the analog input cards in slots X34 and X32. Slot X30 is not occupied.

Analog inputs

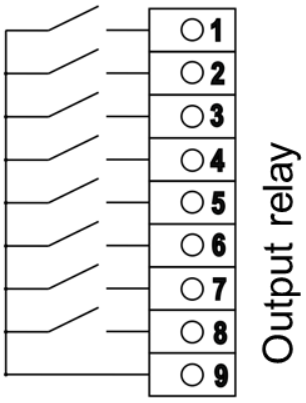


Figure 3.16: Terminal assignment of the analog inputs

Output relay

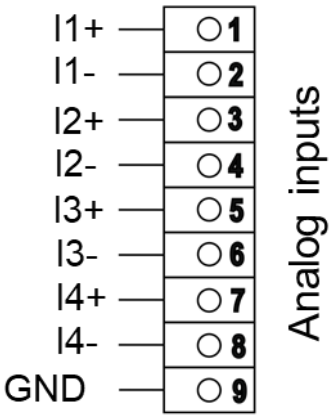


Figure 3.17: Terminal assignment of the output relays

Connection variants of the sensors to analog inputs

Depending on the task and local conditions, the following connection variants can be selected:

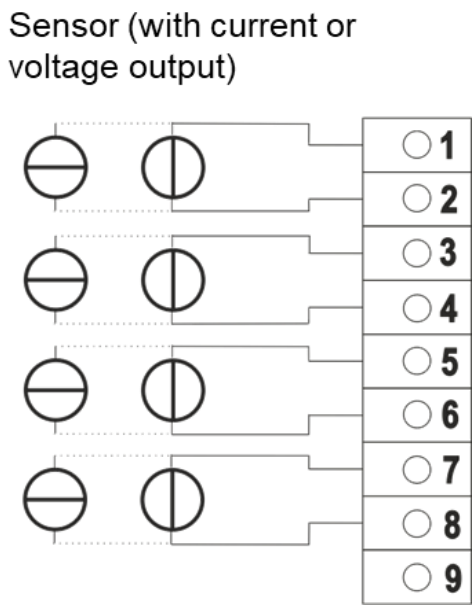


Figure 3.18 Isolated sensors

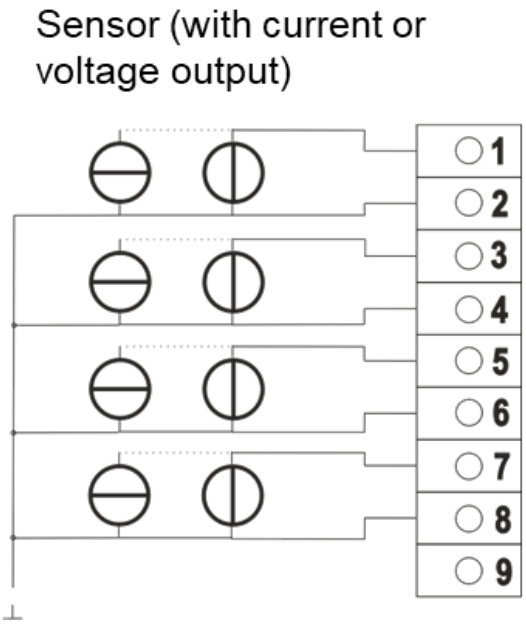


Figure 3.19: Sensors with common reference ground (ground connected to the sensor)

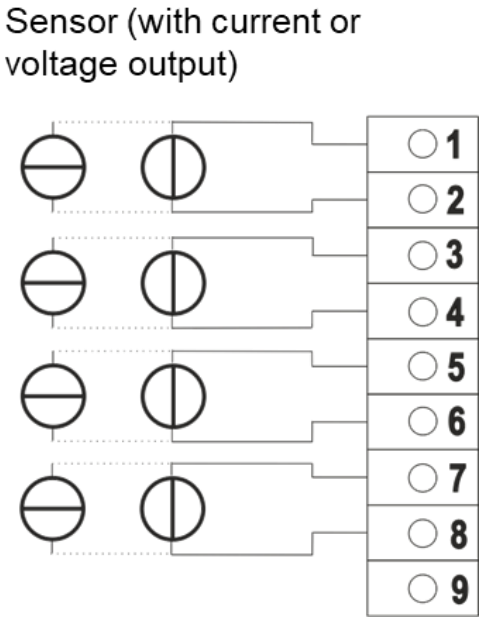


Fig. 3.20 Sensors with common reference ground (ground connected to the input terminals)

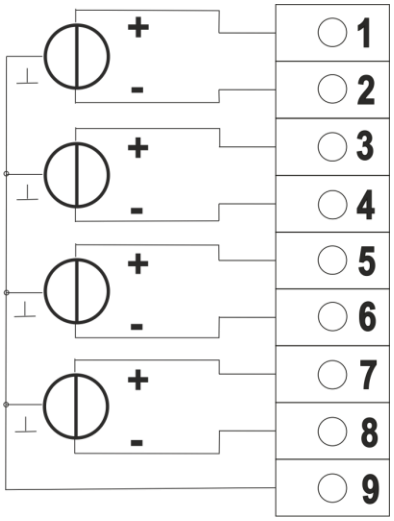


Fig. 3.21 Sensors with differential output

The use of shielded sensor cables is recommended. The cable shield must be connected to PE.

3.15 Front and rear views of the USM

The front and rear views of the fault annunciators are shown on the following pages. Please note the arrangement of the alarm input terminals and their assignment to the displays on the front. The devices are shown with the maximum configuration, i.e. all options. For devices that do not have these options, the corresponding terminals are omitted. With the option
2. network interface in fiber optic version, the socket X96 is replaced by a socket LC-duplex according to standard IEC 60874-13.

3.15.1 USM 08

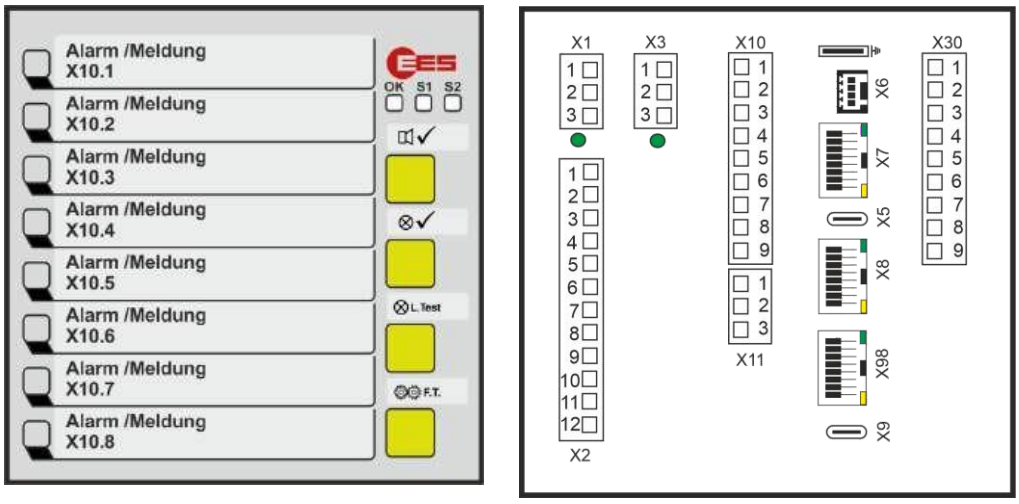


Figure 3.22: Front and rear view of the USM 08

3.15.2 USM 16

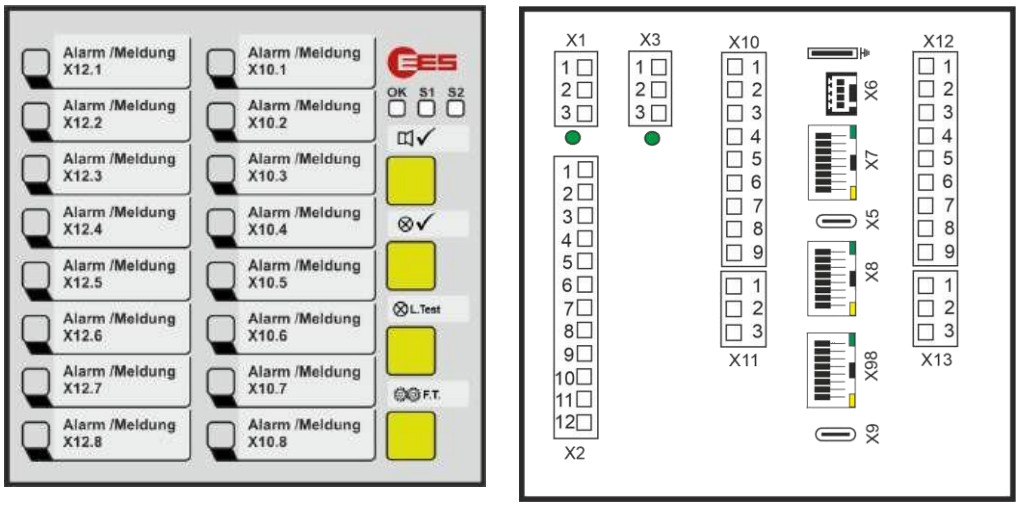


Figure 3.23: Front and rear view of the USM 16 in the 96 x 96 housing

3.15.3 USM 16 in wide housing

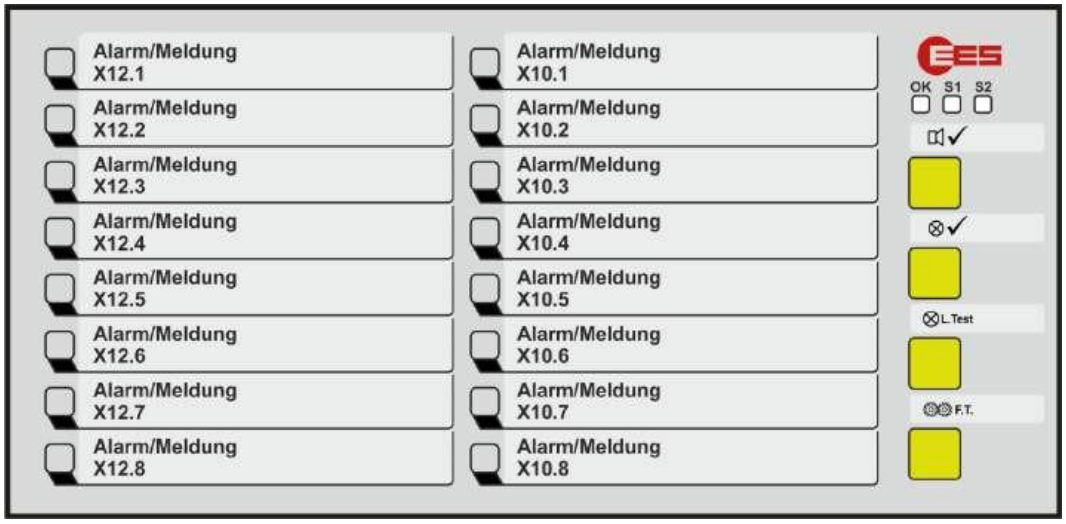


Figure 3.24: Front view of the USM 16W in wide housing 96 x 192

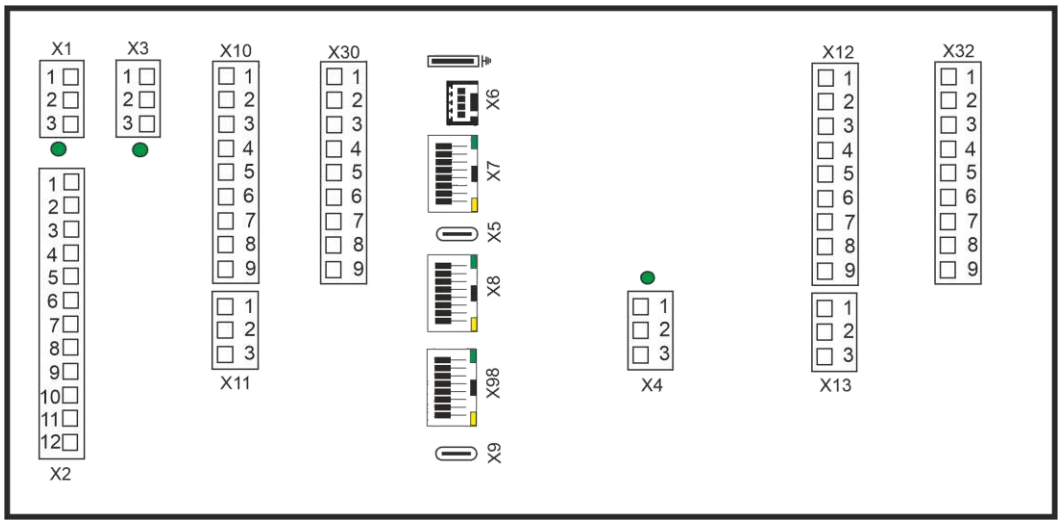


Figure 3.25: Rear view of the USM 16W in wide housing 96 x 192

3.15.4 USM 24

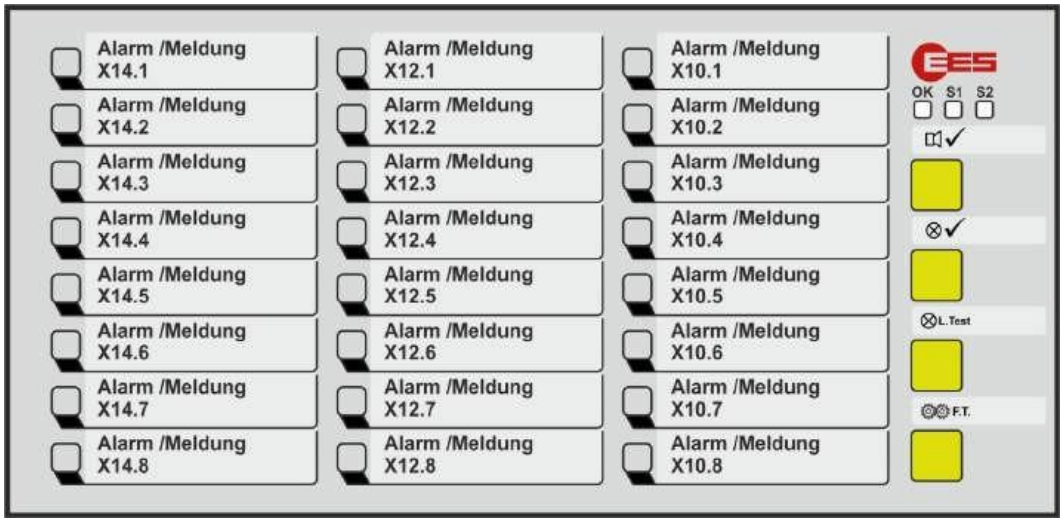


Figure 3.26: Front view of the USM 24

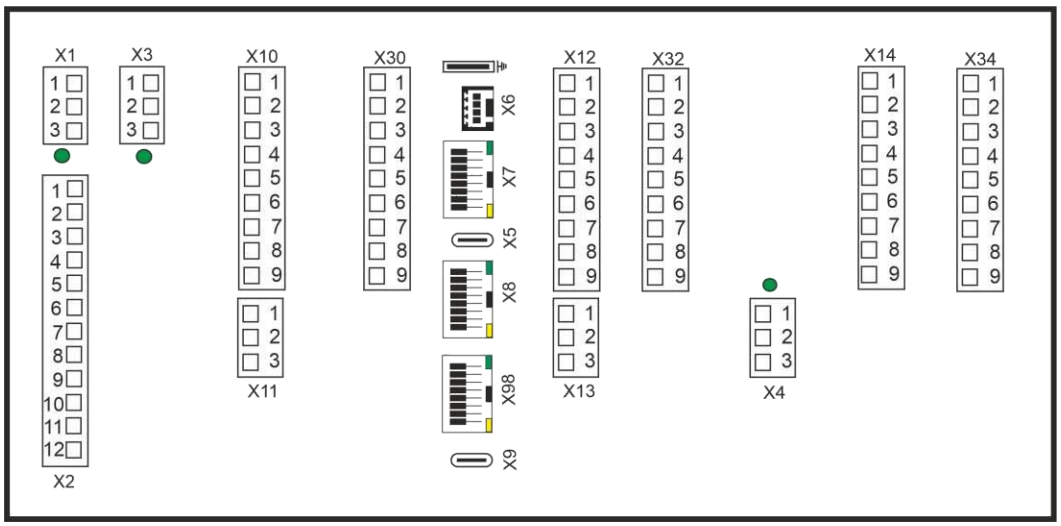


Figure 3.27: Rear view of the USM 24

3.15.5 USM 32

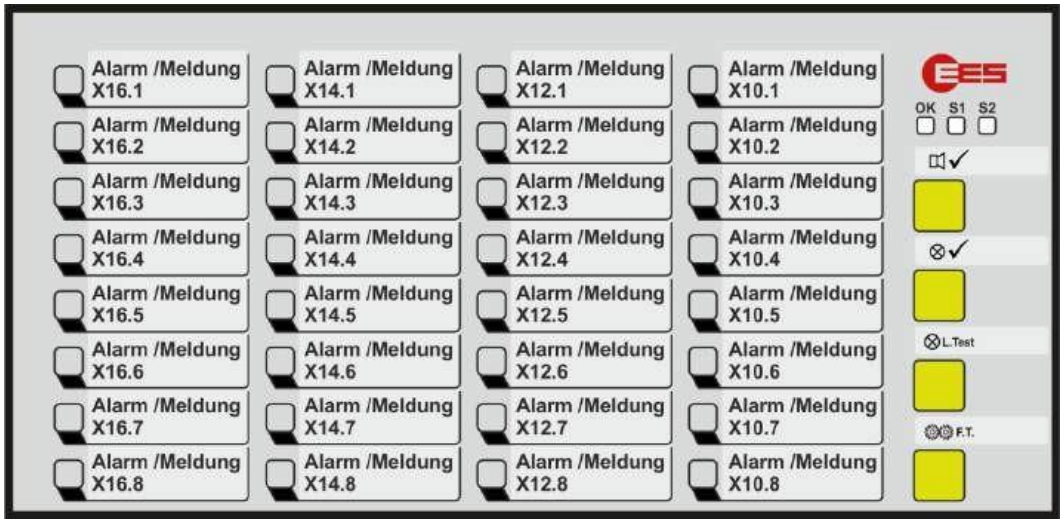


Figure 3.28: Front view of the USM 32

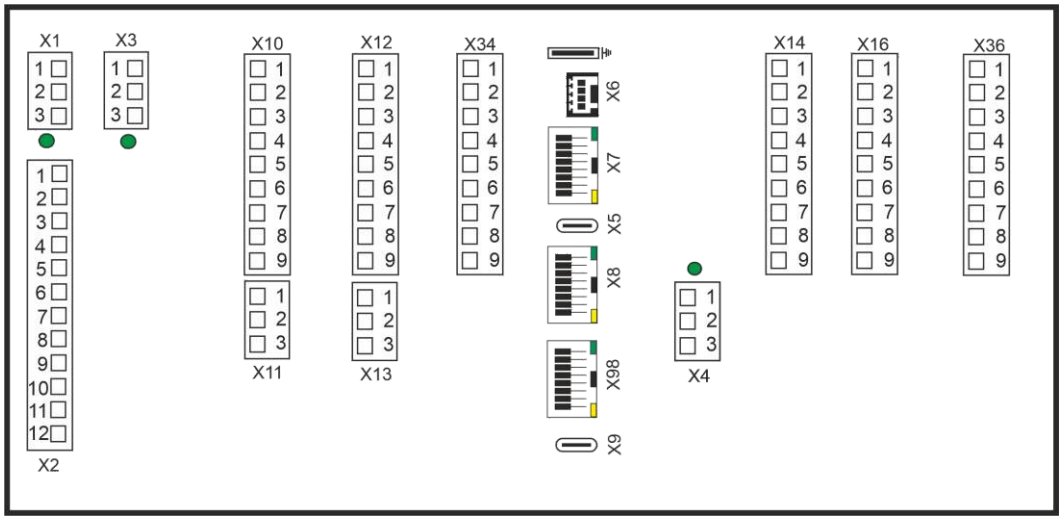


Figure 3.29: Rear view of the USM 32

3.15.6 USM 32 in wide housing

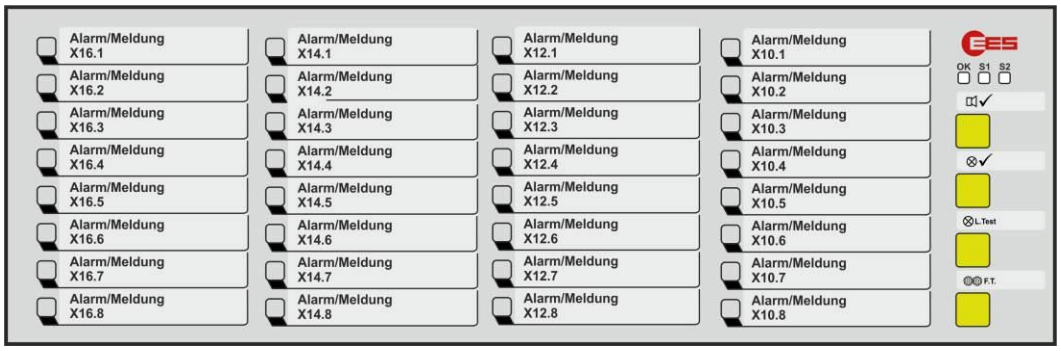


Figure 3.30: Front view of the USM 32 in the Wide housing

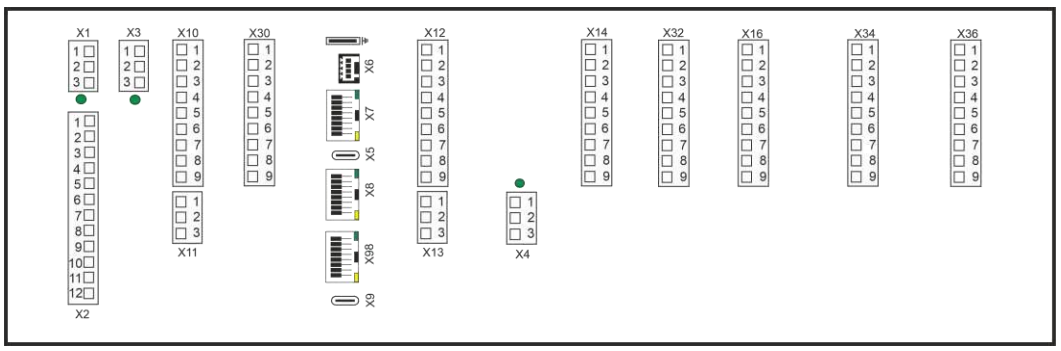


Figure 3.31: Rear view of the USM 32 in the Wide housing

3.15.7 USM 40

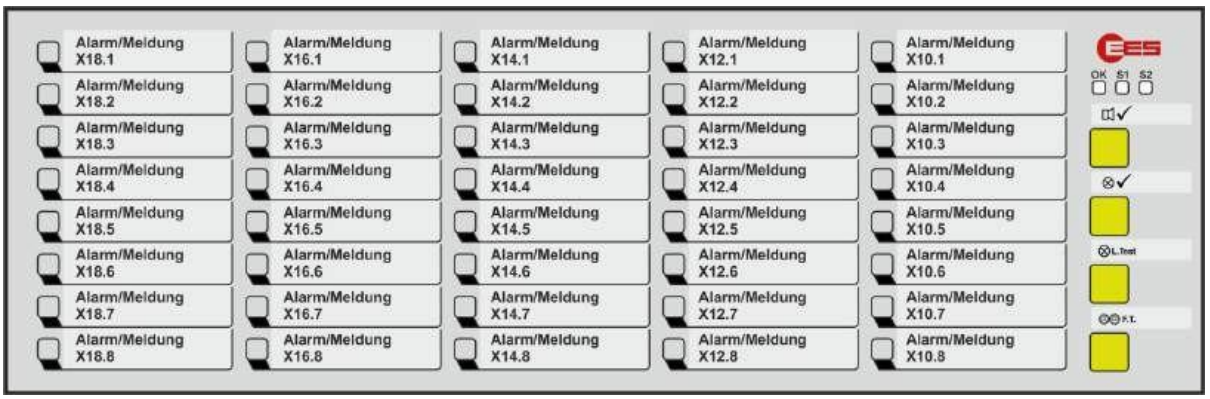


Figure 32: Front view of the USM 40

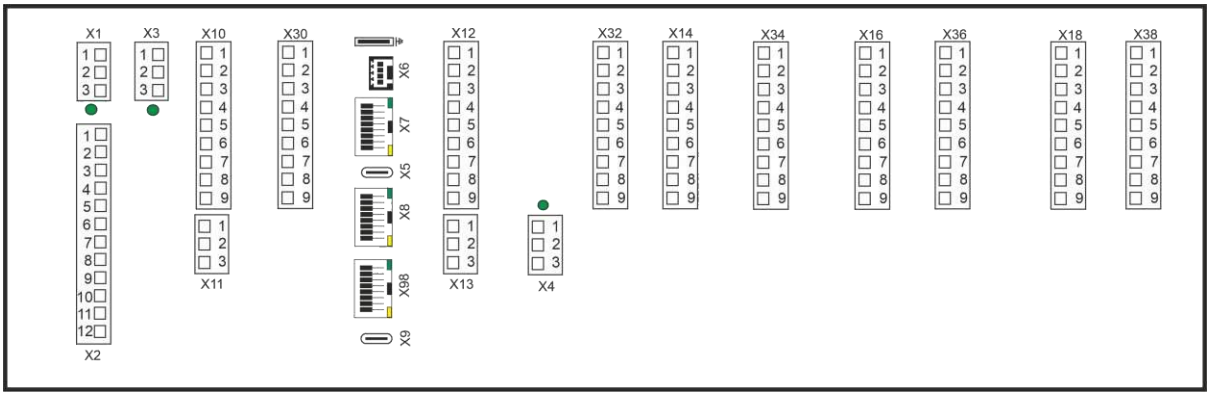


Figure 3.33: Rear view of the USM 40

3.15.8 USM 48

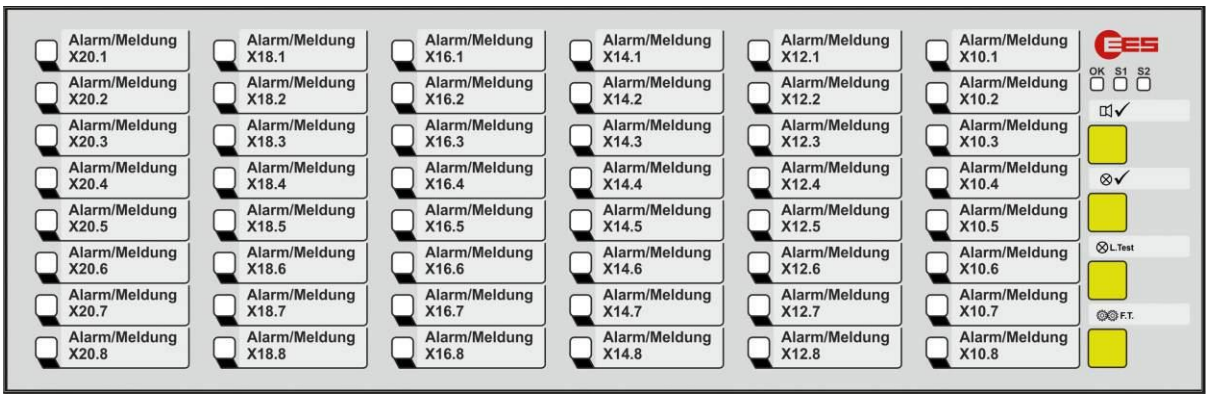


Figure 34: Front view of the USM 48

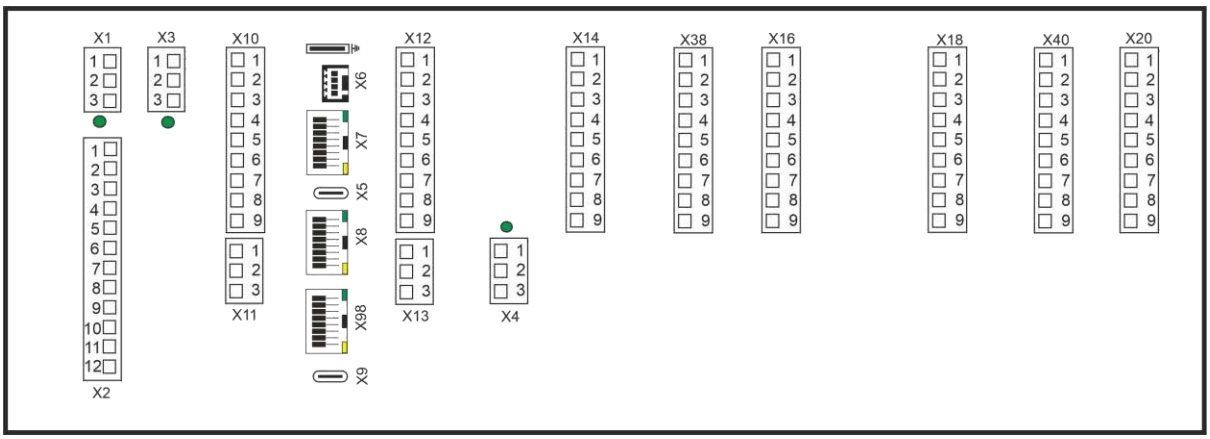


Figure 3.35: Rear view of the USM 48

3.16 Assignment of input and annunciator light

The first input of the input terminal with the highest designation is always the first alarm at the top left of the front panel display. In the following example, this is X14.1. The other assignments of the input terminals are as shown in the individual alarm texts on the front panel in the drawing below.

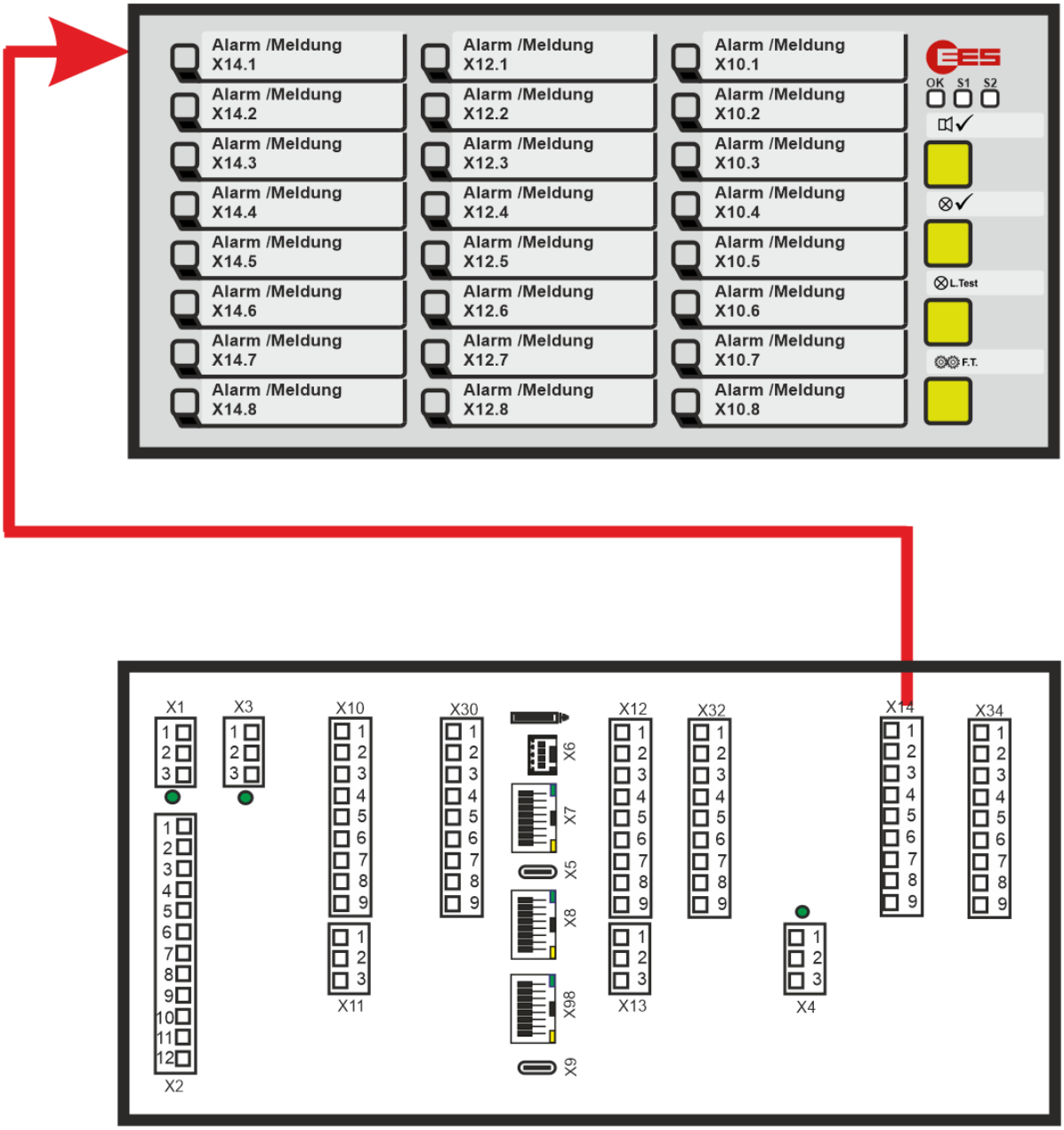


Figure 3.36: Assignment between signal input and LED display using the example of a USM 24

3.17 Technical data

Operating voltage $_{UB}$

Key	Nominal voltage	Voltage range
1	24 V AC/DC	20...37 V DC or 20...26 V AC
2	24-48 V AC and 24V - 60V DC	20...73 V DC or 20...51 V AC
5	110 V AC/DC or 220 V AC/DC	85...370 V DC or 85...264 V AC

Table 3.4: Operating voltage key of the USM

Signaling voltage $_{UM}$ = switching voltage of the function inputs

Key	Rated voltage [V AC/DC]	Switching threshold for alarm		Maximum permissible voltage [V AC/DC]	Input current per input at rated voltage [mA]
		Inactive [V AC/DC]	Active [V AC/DC]		
1	24	11	15	50	2,3
3	48	17	25	75	2,1
	60	17	25	75	2,7
4	110	35	50	150	1,6
H	125	35	50	150	1,8
5	220	100	140	260	1,2
W	50 - 250	25	45	250	1,6

Table 3.5: Alarm voltage key of the USM

The $_{UM}$ voltage specification applies to signal and function inputs.

Internally generated signaling voltage $_{USigi}$

Output	voltage 24V DC +/- 10%
Output	current 125 mA max. continuous
Output	current limitation 200 mA +/- 20%
Integrated protective function	Short-circuit proof, overload voltage
Resistance against	
Internal supply	1500 V DC or 500 V AC for 1 min.

The specifications for AC voltage are given as effective values and refer to a sinusoidal AC voltage with a frequency of 50 / 60 Hz.

Analog inputs

	Resolution12 bit
Measuring tolerance from the measuring range end value	$_{Tamb}$ = -20...60 °C: <= +/-0.5 %
Voltage input	
Measuring range ($_{UDIFF}$)	-10...+10 V (SELV, PELV)
	Overvoltage resistance+/- 26 V
Input resistance ($_{UDIFF}$)	>= 200 kΩ
	Measured value resolution<= 5 mV
Common mode voltage ($_{UCOM}$)	-10...+10V
Current input	
Measuring range ($_{IDIFF}$)	0...20mA (SELV, PELV)
Overvoltage	resistance+/- 10 V
	Input burden<= 100 Ω

	Measured value resolution<= 5 µA
Common mode voltage (U_{COM})	-0.2...+0.2 V

Relay contacts

Load capacity	24 ... 250 V AC 2 A; 110 V DC 0.5 A; 220 V DC 0.3 A

Power consumption

Number of channels	Power consumption [W]	
	without additional cards	with additional cards
8	< 8	< 10
16	< 9	< 13
24	< 10	< 17
32	< 10	< 15*
40	< 11	< 24
48	< 12	< 17*

Table 3.6: Power consumption of the USM

* The power consumption of the 32 and 48-channel fault annunciators with additional relay cards refers to the maximum expansion level with 2 relay cards (16 relays)

General data

Bridging time for	
Failure / short circuit	100 ms
Response delay (flutter suppression)	adjustable (0 ... 1000 ms), factory setting 5 ms
Alarm delay	adjustable (5 ms ... 9 h), factory setting 100 ms
Flashing frequency	
Flashing	2 Hz
Slow flashing	0.5 Hz
System bus	
Connection	RJ45 based on CAN bus
Bus cable	Ethernet patch cable Cat5e IEC11801
Terminating	resistor120 Ω Maximum length 10 m (from device to device)
Maximum	total length 30 m
Ethernet	connection100 Base-T / RJ45
Fiber optic connection (optional)	Multimode 50-62.5/125 µm @1300 nm; Connector SC-duplex according to standard IEC 60874-13

Mechanical data

Type USM	Front frame H x W x D [mm]	Panel cut-out [mm]	Depth with front frame and clamps [mm]	Weight [kg]
08	96 x 96 x 8	92 x 92	100	approx. 0.40
16	96 x 96 x 8	92 x 92	100	approx. 0.45
16 in wide housing 24 32	96 x 192 x 8	92 x 186	100	approx. 0.70
32 in wide housing 40 48	96 x 287 x 8	92 x 282	100	approx. 1.00

Table 3.7: Mechanical data of the USM

Mounting	Panel mounting
Required installation depth	120mm
Minimum horizontal distance of two devices	15 mm
Connection terminals	pluggable
Tightening torque	0.5 ... 0.6 Nm
Conductor cross-section rigid or flexible	
without ferrules	0.2 ... 2.5 mm^2
with wire end ferrules	0.25 ... 2.5 mm^2

Ambient conditions

Ambient operating temperature	-20°C..... +60°C
Storage temperature	-20°C..... +70°C
Duty	cycle 100 %
Protection class front	IP 54
Protection class rear	IP 20
Humidity	Average annual maximum of 75% relative humidity; on 56 days up to 93% relative humidity; Condensation not permitted during operation [test: 40°C,93%rh >4days]

Electrical data

Dielectric strength	
AC dielectric strength	
RS232/RS485 and system bus against	
Digital inputs	4 kV AC / 50 Hz 1 min
Analog inputs	1kV AC / 50Hz 1min (functional isolation)
Relay outputs	4 kV AC / 50 Hz 1 min
Supply (110 / 230V AC/DC)	4 kV AC / 50 Hz 1 min
Supply (12 / 24 / 48 V AC/DC)	2 kV AC / 50 Hz 1 min
Relay outputs against each other	500V / 50 Hz 1 min
Surge voltage resistance	
RS232/RS485 against	
Digital inputs	5 kV; 1.2 / 50 µs; 0.5 J; according to IEC60255-27
Relay outputs	5 kV; 1.2 / 50 µs; 0.5 J; according to IEC60255-27
Supply	5 kV; 1.2 / 50 µs; 0.5 J; according to IEC60255-27
Relay outputs against each other	1 kV; 1.2 / 50 µs; 0.5 J; according to IEC60255-27

EM compatibility	
Interference immunity	DIN EN 61000-4-2 DIN EN 61000-4-3 DIN EN 61000-4-4 DIN EN 61000-4-5 DIN EN 61000-4-6 DIN EN 61000-4-12
Radiated interference in accordance with	DINEN 61000-3-3 DIN EN 55011

The devices are developed and manufactured for use in the power supply sector in accordance with the EMC standard.

Please note!
Incorrect use (e.g. deviations in temperature, supply or signaling voltage from the specified values) can lead to damage to the devices.

Subject to technical changes.

4 Assembly and installation

Warning!
The devices may only be installed by qualified specialists (electricians) with the operating voltage switched off.

1. Unpack all modules in the delivery and check for transport damage. Report any transport damage to the responsible transport company immediately. Please check that the delivery is complete using the delivery bill.

2. Insert the fault annunciator into the prepared panel cut-out and fasten it with the clamps on the side.

3. Connect input and output cables.

   The lengths of the input and output cables should not exceed 3 m.

4. Connect the fault annunciator to the network via the Ethernet socket using an RJ45 patch cable or, if an optional connection is available, via a fiber optic cable.

5. In a system consisting of cascaded fault annunciators, connect additional devices as described in points 2 and 3 and connect them via the system bus (socket X7 on the USM and sockets X7 / X8 on the BSM) using a network cable (patch cable).

6. Connect the power supply and switch on the power supply.

   The maximum length of the supply lines should be 10 m.

7. Parameterize the fault annunciator (see section Parameterization).

8. After switching on, the fault annunciator requires approx. 30 s for the system test and initialization, which is completed with an alternating green flashing of the "OK", "S1" and "S2" annunciator lights.

   The "Operating status" annunciator light lights up continuously - the fault annunciator is ready for operation. If the annunciator light flashes red, there is a fault (see section "Diagnostics").

If the fault annunciators are equipped with a fiber optic connection, the devices and the patch cables have protective caps for the fiber optic cables. Please only remove these just before plugging in the patch cables. Dust deposits on the fiber optic cables or in the sockets can lead to attenuation or, in the worst case, make the data connection impossible.

5 Parameterization

The USM is parameterized via the integrated web server using a web browser. To do this, the network interface (socket X8) of the USM must be connected to the PC.

System requirements

- Internet browser with **Javascript enabled**
  We recommend using the latest versions of Mozilla Firefox (from version 78),
  Google Chrome (from version 79), Microsoft Edge (from version 79) or
  Internet Explorer (from version 11). The functionality of other browsers may be limited.
- Recommended screen resolution from 1280 x 800

The IP address 192.168.1.99 is set on delivery. Please note the network settings on the PC and the configuration of your network.

For initial parameterization, call up the configuration interface in your browser at https://192.168.1.99

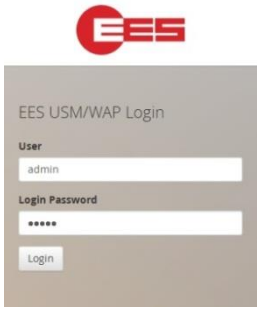


Figure 5.1 Login dialog

In the delivery state, only one user "admin" is set up. When log in, please use the following login data:

User:	admin
Password:	see sticker on the underside of the fault annunciator

In the following you will be prompted to change the password of the admin and to create at least one user "engineers".
After confirming this message with "OK", the user administration pops up.

You can only access the user's access data as a member of the user group "admin" on the "Parameters / System / User administration" dialog page.
Please also refer to the section "User administration submenu".

The individual browsers logged in are identified by a random 32-byte session ID. No cookies are used. Up to 8 sessions (logged-in users) are possible at the same time. The sessions are monitored by a timeout and automatically closed if this time is exceeded.

You are currently logged in as an administrator. As an administrator, you have full rights for user management, firmware updates, changing the security settings and all rights for the "user" group, with which you can view but not change all other settings.

Therefore, create a user with the rights of the "engineers" group. Click on Apply configuration (second of the 5 icons at the top right of the menu bar),
log out and log in with the new user name (the group "engineers") again.

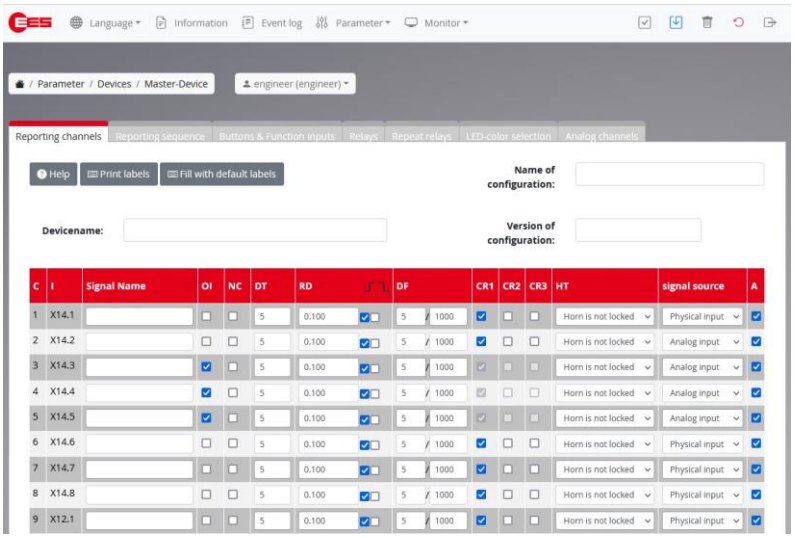


Figure 5.2: Start page of the USM web server after logging in as an engineer

The menu bar next to the EES logo contains the five main menus and a toolbar:

- **Language**
- **Information**
- **Event log**
- **Parameters**
- **Monitor**

and the toolbar consisting of four buttons The buttons have the following meaning:

- **Plausibility check of the parameters**
  (a red cross or a yellow exclamation mark at this point indicates a problem in the configuration)
- **Apply configuration**
  Save and activate the changed parameters in the device currently being edited. **After completing a parameterization, the new parameters must be accepted and permanently saved in the device!**
- **Discard configuration**
  Discard all changes made in the session (since the last "Apply configuration").
  Changes.
- **Restart**
  Restart of the USM
- **Log out**
  Logging out of the USM web server

If you log out without first accepting the configuration, the parameters currently entered are discarded.

The plausibility check can be started by clicking on the corresponding icon. In the factory setting, the plausibility check is carried out automatically each time the configuration is accepted. The results of the plausibility check can be viewed in the main menu Information in the submenu Plausibility check.

The menu path and the user name are visible below the main menu bar.

The "Parameters/Devices/Master device" menu is already open in the main part of the page. You could immediately start parameterizing the fault alarm functionality of the basic device. In these instructions, however, we would like to explain the individual menus in the order in which they appear in the menu bar.

Some dialog pages are structured in the form of tabs and contain additional buttons or text fields. The function of these elements is explained in the description of the respective pages.

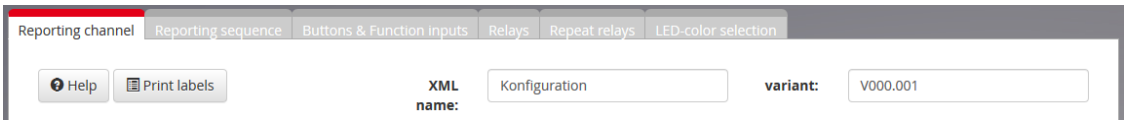


Figure 5.3: Tabs and buttons on the Master device dialog page

When switching between the individual menus or tabs, the changes are saved temporarily but not yet transferred to the current configuration of the fault annunciator. This is only done with the "Apply configuration" action.

5.1 Main menu Language

Here, the web interface of the parameterization can be switched between the two languages German and English.

5.2 Main menu Information

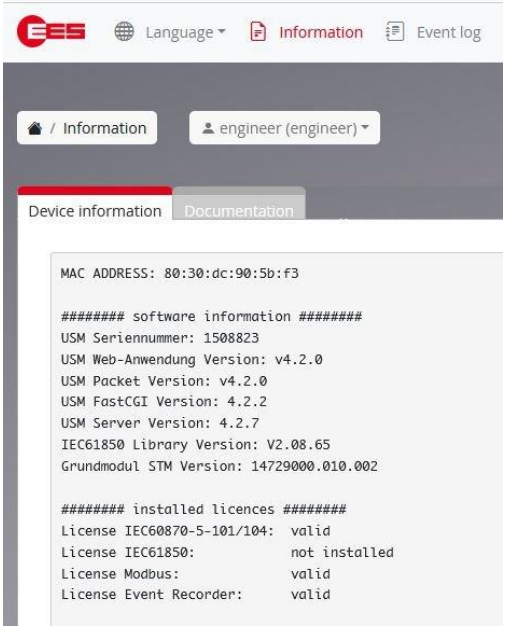


Figure 5.4: The "Information" main menu with 4 tabs

The menu is structured with 4 tabs:

1. Device information submenu
This page displays information on the software status of the individual program components of the USM.

2. Documentation submenu
Here you will find device documentation in PDF format.

3. Diagnostic functions
After entering an IP address (IPV4) or a host name and selecting the network interface, the accessibility of a network node can be checked from the USM using ICMP echo requests.)

4. Plausibility check
The result of the plausibility check can be viewed in this submenu. You can also specify whether the plausibility check is to be carried out each time the configuration is transferred (default setting).

5.3 Main menu Event log

5.3.1 Show events submenu

Figure 5.5: Show events submenu

In the upper part of the dialog, there are 3 additional buttons next to the "Help" button.

Export as CSV" button

The recorded events can be exported via this button as a text file with the name Events.csv in the default download directory of the Explorer used. If a filter is activated in the event table below, this is also applied to the CSV export.

The exported text file contains the recorded events line by line. The individual fields are separated by commas (,) and text fields are enclosed in double quotation marks ("). The first line contains the field name in English.

Field name (CSV)	Field name (online)	Description
Index	Index	Consecutive numbering
Date	Timestamp	Date value of the timestamp (UTC)
time	Timestamp	Time value of the timestamp (UTC)
eventCategory	Category	As a numerical value: Alarm events (1), Fault annunciator status events (2), Log events (3), Analog channel error (4), System events (5), Security events (6)
deviceNumber	Device	As a numerical value: Master device (0), Slave device 1 (1), Slave device 2 (2), Slave device 3 (3)
channelNumber	Channel	Alarm channel (input)
description	Description	Alarm text

Table 5.1: Assignment of events in the generated CSV file

“Local timestamp" button

The "Timestamp" button can be used to switch the timestamp display between Coordinated Universal Time (UTC) and the browser's local time. UTC is always used internally.

"Clear event log" button

The entries in the event log can be deleted using this button. The corresponding confirmation prompt must be confirmed. The deletion of the event log is logged as a system event.

The table with the events follows in the lower part. Each event has the following entries

Index	Internal numbering of the event
Timestamp	Time of occurrence of the event in the format year-month-day hour:minute:second.millisecond
Event category	Assigned event category
Device	Device on which the event occurred, master or slave n (global events are assigned to the master device)
Channel	Channel that triggered the event (Global events are assigned to channel 0)
Description	Description of the event that has occurred

The events can be filtered for a better overview. To do this, the filter dialog can be opened by clicking on the arrow on the right in the "Filter output" bar.

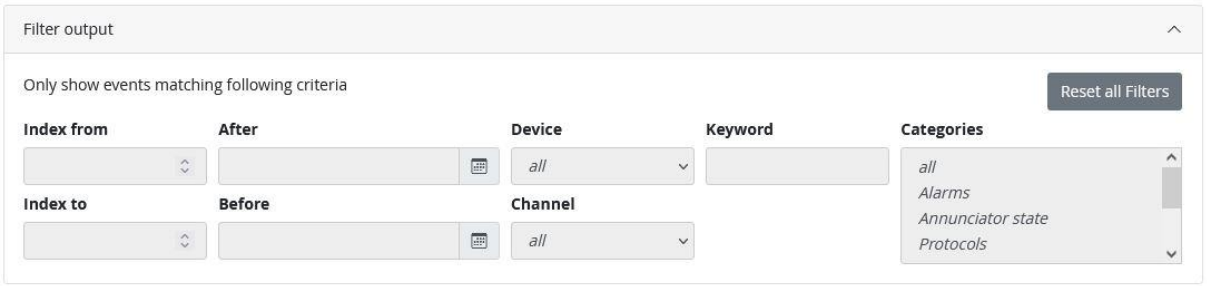


Figure 5.6: Expanded Filter output menu

You can filter according to various criteria that relate to the respective table column

Index from Index - to Index

Timestamp All events before or after a timestamp
The date and time can be selected by clicking on the calendar symbol next to the field.

The filters of the Index and Timestamp fields are each interpreted as inclusive limits. With the filter "From index" 2 "To index" 5, the events with the indices {2, 3, 4 ,5} are therefore output.

Device — Cascaded devices can be filtered according to master or slave devices.

Channel — For alarms, you can filter according to the respective alarm channel of one or all connected devices

Keyword — Here you can filter for a keyword in the “Description column” (e.g. "Logged in")

Categories — Here you can filter by a category to choose from

- All
- Alarms
- Fault alarm status
- Protocols
- Analog channels
- System
- Security

The filter criteria can be combined. In doing so, they are logically linked "AND". The intersection of the filtered events is therefore formed.

The set filter is activated by pressing the "Show events" button. The active filter criteria are also displayed in the descriptive text above the event table.

Figure 5.7: Display of filter criteria with descriptive text above the table

The "Reset all filters" button deletes all filter contents.

The "Number" input field can be used to specify how many events are displayed on a table page.

The "First entries", "Previous entries", "Next entries" and "Last entries" buttons above and below the table can be used to navigate between the pages of the table.

5.3.2 General configuration submenu

This page is used to configure the recording of events in the event log.

Event logging

The "Not active" and "Active" buttons can be used to set whether the system should record events or not.

A warning can be configured via the "Event log fill level warning at" form field if the ring buffer of the event log has reached a certain fill level. This is output as a device error with the blink code 5-1 and can be configured via the Parameters / System / Device error can be parameterized. The device error is deactivated by default. If the threshold is set to the value 0, no warning is issued.

Configure logging

You can specify the categories from which events are to be logged. If the checkbox associated with the category is activated, the corresponding events are recorded.

- **Alarm events**
  Alarm (incoming, outgoing, acknowledged, reset), horn acknowledged
- **Fault annunciator status events**
  Watchdog relay status, IEC connection status, configuration events
- **Log events**
  IEC 60870-104 Client status, IEC 61850 error
- **Analog channel error**
  Input range overrange/underrange, 4...20 mA wire break detection
- **System events**
  Switch-on, power failure events, time synchronization, network connections, event log status
- **Security events**
  Login attempts, password changes, file system integrity, firmware updates, firewall configuration

In the factory setting, only events in the system events and security events categories are recorded.

5.3.3 Syslog submenu

The event alarms can be forwarded to up to two syslog servers. The value of the "Hostname (sender)" field is used as the sender in the syslog packets.

The "Syslog Server 1" and "Syslog Server 2" fields are used to define the external syslog servers to which events are to be forwarded. This can be done as an IPv4 address or host name.

The checkboxes can be used to configure whether events from the individual event categories should be forwarded. This filtering is independent of the setting in the General configuration submenu. Events can therefore only be logged locally in the event log, only on the syslog server or in both places.

The "Severity" selection field can be used to select the severity part of the syslog priority field to be used for events in the category. The syslog protocol defines the following "Severity" values, which can be used according to the users request.

Numerical value	Text
0	Emergency
1	Alert
2	Critical
3	Error
4	Warning
5	Notice
6	Informational
7	Debug

5.4 Main menu Parameters

The main menu is divided into the three subgroups Devices, Protocols and Factory settings.

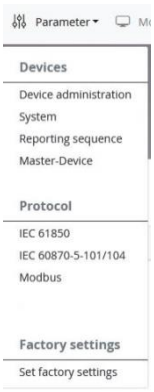


Figure 5.8: Open "Parameters" main menu

Devices subgroup

- Manage devices
  - Creating or deleting devices in a fault alarm cascade
  - Export and import of parameters
  - Documentation of the parameterization as a PDF file
- System
  - System time and synchronization
  - Network settings
  - User administration
  - Activation/deactivation of device error alarms
  - Setting serial interfaces
  - Security settings
  - Firmware updates
  - License management
  - Setting fonts
  - Parameter editor
- Alarm sequence (fault alarm functionality)
  for master device and, in cascaded systems, also for parameterized slaves
  - Reporting channels
  - Reporting procedure
  - Buttons & function inputs
  - Relay (function relay)
  - 1:1 Relay
  - LED color setting
  - Analog channels

Protocols subgroup

- IEC 61850
- IEC 60870-5-101/104
- Modbus
- SNMP

Factory setting

Reset all parameterized devices (including slave devices) to factory settings.

Certain submenus are hidden for certain user groups. For example, a user in the engineer group cannot parameterize or view user administration.

Attention: The factory setting function also resets the IP address of the fault annunciator to the factory setting!

The descriptions of the parameterization of the "Protocols" subgroup are not part of this documentation. Please refer to the separate interface descriptions IEC 60870-5-101/104, Modbus or IEC 61850 or SNMP for this information.

5.4.1 Manage devices menu

After clicking on the "Manage devices" menu in the "Parameters" main menu, a new

Dialog box with 4 submenus.

5.4.1.1 Manage devices submenu

Cascading allows one USM and up to 3 BSMs (BSM-C or BSM-P) to be combined to form a fault alarm system. The devices are connected via the system bus provided at the CAN bus sockets using network cables (patch cables). The USM works as the "master" and the connected BSMs as "slaves". This allows systems with a maximum of 192 signaling inputs (4*48) to be implemented. Systems formed in this way behave like a (virtual) fault annunciator with joint alarm processing (alarm sequence, collective alarm formation, horn control). The alarms of the entire system can be accessed via the interface of the USM.

External MSM relay extension modules cannot be connected when using fault annunciator cascades.

The parameterization of cascaded fault annunciators is only carried out in full in the "master fault annunciator" and is then automatically distributed to the "slave fault annunciators". Cascading multiplies the number of function inputs according to the number of devices. A maximum of 16 function inputs are available.
For information on the BSM, please refer to the separate BSM operating instructions.

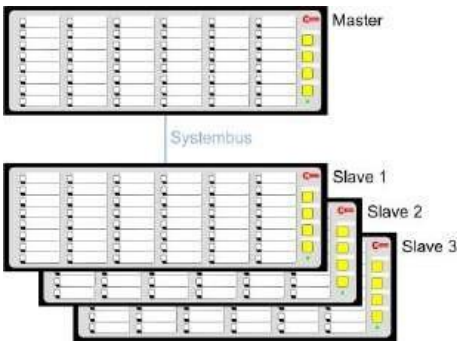


Figure 5.9: Example of a fault alarm cascade

Please note that the slave modules must be configured as slaves using DIP switches and the corresponding slave addresses (1 - 3) must be set.

To create a cascaded fault alarm system, the associated slave devices must first be created.

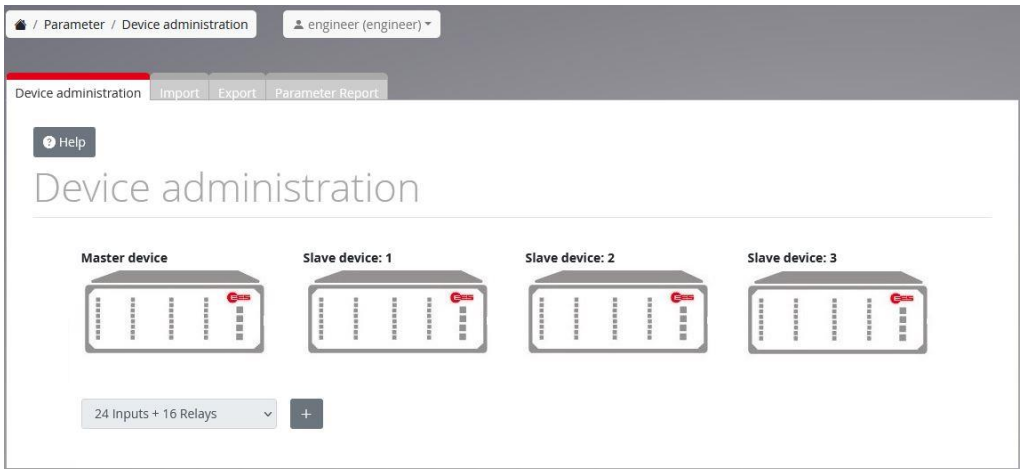


Figure 5.10: Manage devices submenu

After clicking on the "+" button, a new fault annunciator is added. The device type can be selected from a list. The device is then created automatically and appears under the names Slave device 1 to Slave device 3 in the main "Parameters" menu. The menu of a newly created slave fault annunciator corresponds to the menu of the master device. The tab
However, "Alarm sequence" is missing, as the alarm sequences of the slave fault annunciators are identical to those of the master fault annunciator.

A maximum of 3 slave devices can be created in this way. The slave fault annunciators are displayed independently of the parameterized device name in the main menu Parameterization under the name Slave device (1 ... 3). The last device in the cascade can be deleted by clicking on the recycle bin symbol.

The master device can also be determined via the selection list or by clicking on the "Identify device" button.

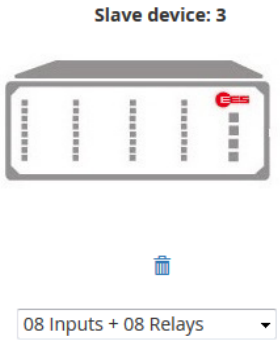


Figure 5.11: Delete symbol of the last fault annunciator in the cascade

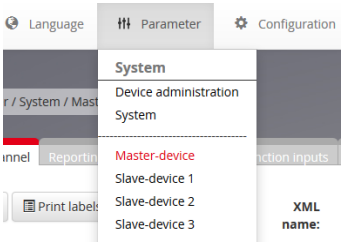


Figure 5.12: The “Slave device 1…3” sub-items added to the menu “Parameters”

5.4.1.2 Import submenu

In this dialog, the parameterization of the fault annunciator can be imported from a file. This file can be available in the following formats:

*. pcfUSM System & device parameterization
*. ucfUSM System & device parameterization
* .xls Excel parameterization

The file extension of the parameter file must not be changed, otherwise it will become unusable.

With USM system and device parameterizations (*.pcf, *.ucf), the USM automatically recognizes which devices and configuration blocks are contained in these after activating the "Import" button. These blocks are displayed at the bottom of the page and can be activated or deactivated. Depending on the software version and the license status of the USM device for which the parameter file was created, the following blocks may be included.

System configuration
Contains the basic configuration of the USM. This includes the parameter groups network, time, user administration, error mask, firewall, IEC 60870, alarm sequence, horn, event log. When importing configurations that were created with USM devices prior to software version V 4.0.0, this block is included in the configuration of the master device.

Device configuration(s) of the individual devices
A separate block is offered for selection for each master and possibly slave 1 - 3 device present in the parameterization. These blocks contain the channel-related configuration of the USM or the possible slave devices. These include signal channels, buttons, function inputs, relays, 1:1 relays*, LED colors, analog inputs*.

IEC 61850 CID file
Contains the IEC 61850 configuration*.

Parameter blocks marked with * are only available for devices with the corresponding device options and versions.

The selection fields in the **"Import block to"** column can be used to select whether the respective block should be imported. In cascaded systems, you can also specify which block is to be imported into which target device, whereby the target device must either have the same configuration as the device in the parameter file or must not yet have been created. In the latter case, you can choose between the following options:

Retain configured device type
The configuration from the file is adopted. The previously configured device type is retained.

Overwrite configured device type
The device type is adopted according to the file and the parameters are imported.
(This function is not available for transferring the parameters to a master device).

Attach new slave device
A new slave device is added to the cascade. The configuration and device type are taken from the file. (Only possible if the cascade has not yet been fully expanded).

By then pressing the "Import" button, the selected blocks are transferred to the system and become active immediately.

Please note that it depends on the respective user authorization which settings can be imported:

- Engineer Parameters except security settings
- Administrator Security settings only.

Import of an Excel parameterization

The parameters can also be imported from an Excel file. This Excel file must have a predefined structure. A template can be downloaded from the EES homepage (www.ees-online.de).

The English designations in line 2 are mandatory in order to recognize the corresponding type. Columns that are not required can be deleted for a better overview, empty columns are ignored. The IEC objects for IEC101/104 are created with the respective IEC settings and can be viewed and edited in the corresponding menu.

Important!
The file must be saved in .xls format (Excel 97-2003 version), the .xlsx format cannot be processed.

→ Further information on this can be found in the section Parameterization via Excel list.

5.4.1.3 Export submenu

With the "Export" button, the entire system configuration (including slave devices and IEC 61850 CID file, if applicable) is summarized and exported in the EESsystem.pcf file. The file is stored in a directory according to the default settings of your browser. By default, this is the Downloads folder in most browsers. The PCF file is protected and cannot be read. The configuration currently saved in the device is exported. Changes made on the web interface must first be saved in the device by clicking "Apply configuration" before they can be exported.

5.4.1.4 Parameterization report submenu

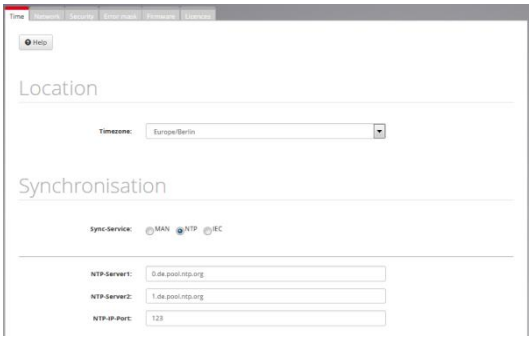
With the "Generate" button, the configuration currently saved in the device can be generated in the form of a readable report in PDF format and saved or opened in the browser.

The file is stored in a directory according to the default settings of your browser. By default, this is the Downloads folder in most browsers.

5.4.2 System menu

Various system functions can be parameterized in the System menu.

5.4.2.1 Time submenu



The time zone and the type of time synchronization are set on the "Time" dialogue page. The internal real-time clock of the fault annunciator can be set manually or synchronized cyclically via the NTP server or the IEC interface.

Figure 5.13: Time submenu

Manual time synchronization

Use the "Set selected time" button to transfer the manually entered time to the USM. The "Set current time" button is used to transfer the PC time to the USM.

Synchronization via NTP

Two alternative NTP servers can be used for synchronization. The server name or IP address and the port number of the service must be set for this. Please note that the DNS servers must also be parameterized in the "Network" submenu.

Synchronization via IEC

Alternatively, the time can be synchronized with the control system connected via the IEC 60870-5-101/104 interface.

5.4.2.2 Network submenu

The USM has a network interface at terminal X8 (network 0). Optionally, the fault annunciator can have an additional network interface at terminal X98 (network 1). Both interfaces are completely separate and must be located in two different networks. They are equivalent and can be used, for example, for communication with a control system or for parameterization. The IP address, subnet mask and gateway IP address can be parameterized for both interfaces.

If the USM has two network interfaces, the two network interfaces must be connected to each other.
IP addresses are located in two different subnets. Otherwise, the USM may no longer be accessible via the network.

IP address

IP address of the fault annunciator on the respective network, i.e. the IP address with which the fault annunciator itself is registered on the network.

The address entered here must be outside the address range to be assigned.
IP range of any existing DHCP server (router).

When changing this parameter, please note that the connection to the fault annunciator is interrupted when the IP address is accepted by "Accept configuration" and must be re-established with the new IP address.

Subnet mask

Please enter the subnet mask for the network used here.

IP gateway

The gateway is used to reach network addresses outside the local network. The use of the gateway can be activated via the "active" radio button. For USM devices with two network interfaces, only one gateway can be activated.

IEC 61850 interface

If an IEC 61850 interface is to be used, the network to be used must be selected here. Communication via IEC 61850 is only possible via one of the two network interfaces. When importing a CID file, the IP address of the selected interface is set to the value from the CID file.

MTU length 0

MTU (Maximum Transfer Unit) - Length of the data packet in a TCP/IP telegram. The default setting of 1500 bytes also corresponds to the maximum length. The value can be reduced if, for example, telegrams have to be routed via routers.

DNS server

DNS server for name resolution of a server (e.g. NTP server: 0.de.pool.ntp.org). If the DNS server option is activated, two alternative DNS servers can be entered.

5.4.2.3 User administration submenu

This submenu is only available to users who **have administrator rights**.

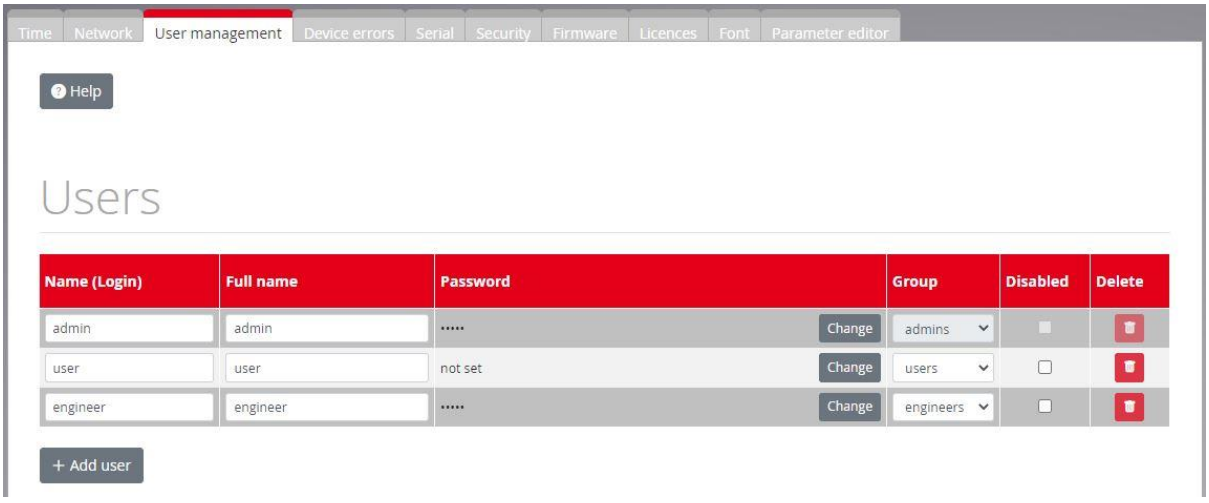


Figure 5.14: User administration submenu

The USM distinguishes between 4 authorization levels.

admin — Administrator
Authorized for user administration, firmware updates, security settings

user — User
Authorization to view, but not change, non-security settings.

engineer — Engineer
Authorized to parameterize all non-safety-related settings of the fault annunciator.

operator — Operator
Authorized to control the device functions via the monitor.

The following user groups are defined by default (one for each user and each authorization level). The "admins" group is specially protected so that it cannot be deleted and the "admin" authorization level cannot be withdrawn.

Name	Assigned authorization levels			
	user	engineer	admin	operator
admins	x		x	
users	x			
engineers	x	x		x
operators	x			x

Table 5.2 Assignment of authorization levels to users (factory setting)

In the User groups table (under the Users table), additional authorization levels can be assigned to the user groups by checking the boxes. New user groups can be created by clicking on the "+Add group" button.

User Username
Login name of the user. This may consist of a maximum of 16 characters (a - z, A - Z, 0 - 9 and _).

Full name
This free text field can contain the user's full name, for example.

Password
After clicking on the Change button, the password can be changed. The new password must be entered twice and is saved with the "Set" button. The "X" button deletes the password for this user.

Group
Definition of the user group to which this user belongs.

Deactivated
By ticking the box in this column, the user is deactivated and it is no longer possible for them to log in.

Delete
The user is deleted by clicking on the recycle bin icon.

New users can be created by clicking on the "+Add user" button:

The first user "admin" is specially protected. His group cannot be and the user cannot be deleted or deactivated.

Password guidelines

In this section, the administrator can define rules for the use of passwords. Whether a password fulfills the rules of the password policy is checked live during input and displayed below the input field.

The radio buttons "not active" and "active" can be used to completely deactivate or activate the password policy. If the password policy is deactivated, users have no guidelines when choosing their password.

The rules under "Length requirement" and "Required character classes" apply to the users for logging on to the configuration interface as well as to SNMPv3 users and the SFTP user.

The rules under "Password expires" and "Reusing the same password" only apply to logging in to the configuration interface.

Length requirement
The "Minimum length" input field can be used to specify the minimum length of a password in the range between 0 and 128 characters. The length 0 deactivates this requirement. For SNMPv3, a minimum length of 8 characters applies even for smaller values.
The "Maximum length" input field can be used to specify the maximum length of a password in the range between 1 and 128 characters.

Required character classes
The input fields can be used to force a minimum number of characters from certain character classes. The value 0 means that the use of this character class is not necessary.
The following character classes can be requested:
Lower case
: Latin lowercase letters {a,b,c,d,e,f,g,h,i,j,k,l,m,n,o,p,q,r,s,t,u,v,w,x} Capital letters
Latin capital letters {A,B,C,D,E,F,G,H,I,J,K,L,M,N,O,P,Q,R,S,T,U,V,W,X}

Digits
: Arabic numerals {0,1,2,3,4,5,6,7,8,9}

Special characters
: All other (Unicode) characters outside the above classes

Password expires
The "Expire after (days)" input field can be used to specify that passwords expire after a certain number of days. The value 0 means that passwords do not expire.
The "Action on expiry" selection field can be used to specify what should happen when the password expires:

Warn users
: (The user receives a warning when logging in with a request to make changes. However, this can be ignored and work can continue as normal).

Force change
: (The user is directed to the password change dialog when logging in. It is not possible to continue working without changing the password).

Lock user
: (The user is locked when the password expires. Another user with the "Admin" authorization must set a new password. The initial user "admin" is never locked).

A warning with a certain number of days before the password expires can be activated via the "Note before expiry (days)" field.

Reuse of the same password

The "Number of saved old passwords" input field can be used to specify how many of a user's old passwords should be saved in the range between 0 (deactivated) and 5. Saved passwords may not be used, so that (direct) reuse of the same password can be prevented.

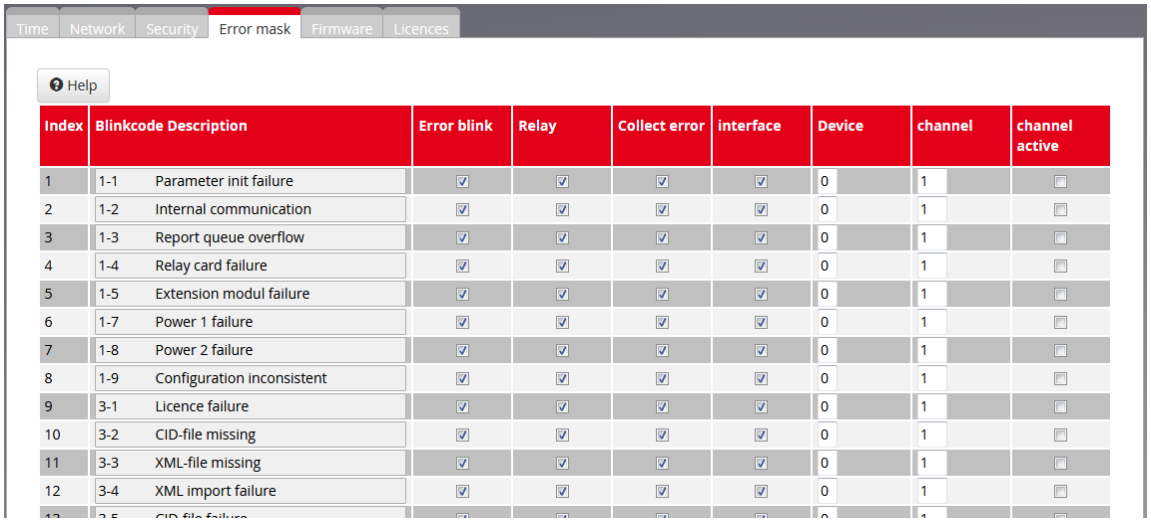
SFTP user

The SFTP user password is required for the parameter import via SFTP.

Parameters can only be imported via SFTP if the password is activated. To activate the password, it must first be entered twice and the "Change" button pressed.

If the status is "deactivated", parameters cannot be imported via SFTP. Setting a password activates access. The status can be switched using the "Activate" or "Deactivate" button. "Activate" is only possible if a password has already been set.

5.4.2.4 Device error submenu



Index	Blinkcode	Description	Error blink	Relay	Collect error	interface	Device	channel	channel active
1	1-1	Parameter init failure	☑	☑	☑	☑	0	1	☐
2	1-2	Internal communication	☑	☑	☑	☑	0	1	☐
3	1-3	Report queue overflow	☑	☑	☑	☑	0	1	☐
4	1-4	Relay card failure	☑	☑	☑	☑	0	1	☐
5	1-5	Extension modul failure	☑	☑	☑	☑	0	1	☐
6	1-7	Power 1 failure	☑	☑	☑	☑	0	1	☐
7	1-8	Power 2 failure	☑	☑	☑	☑	0	1	☐
8	1-9	Configuration inconsistent	☑	☑	☑	☑	0	1	☐
9	3-1	Licence failure	☑	☑	☑	☑	0	1	☐
10	3-2	CID-file missing	☑	☑	☑	☑	0	1	☐
11	3-3	XML-file missing	☑	☑	☑	☑	0	1	☐
12	3-4	XML import failure	☑	☑	☑	☑	0	1	☐

Figure 5.15: Device error submenu

This menu is used to parameterize the handling of the individual device errors of the USM. If the respective checkbox is activated, the corresponding error is output via the relevant medium.

Blink code and description
The blink code and the associated error are listed in this field, which cannot be changed. The first 30 errors listed are device errors. These can be included, for example, in the display of errors via the "Operating status" annunciator light, the output via live relay contact, display via an alarm channel of the fault annunciator itself or the sending of error information via the protocol interface in the "Error" data object.

The flashing code of the "Operating status" annunciator light is made up of long and short pulses. The first digit of the flashing code is the number of long pulses and the second digit is the number of short pulses. The error "1-4 relay card faulty", for example, is signaled by a long flashing pulse and 4 short flashing pulses → section Diagnostic functions).

The other 32 faults 160 to 191 each signal a faulty connection to an IEC104 client, can only be reported via the IEC interface and signaled on an alarm channel of the fault annunciator. All 32 client faults are summarized in the collective fault 6-3, which can be output as a blink code that is forwarded to the watchdog relay and included in the collective alarm.

Error flashing
If the checkbox is activated, the error is signaled by the OK LED "Operating status" flashing.

Watchdog relay
The error activates the alive relay (function relay 4) ☎→ section Diagnostic functions).

Collection errors
The error is included in the collective error alarm, which can be forwarded via the IEC interface.

Interface
If the checkbox is activated, the error is reported via the IEC interface if the corresponding information object is parameterized.

Alarm activated
If this checkbox is activated, the alarm is assigned to an alarm channel of a fault annunciator. To do so, select a device and a channel in the following two columns. In cascaded systems, each connected device (master or slave) can be selected.

In order to use an alarm channel of a fault annunciator for the fault alarm, "Device fault" must also be selected in the "Parameter / Alarm sequence" menu in the Alarm channels tab in the Signal source column.

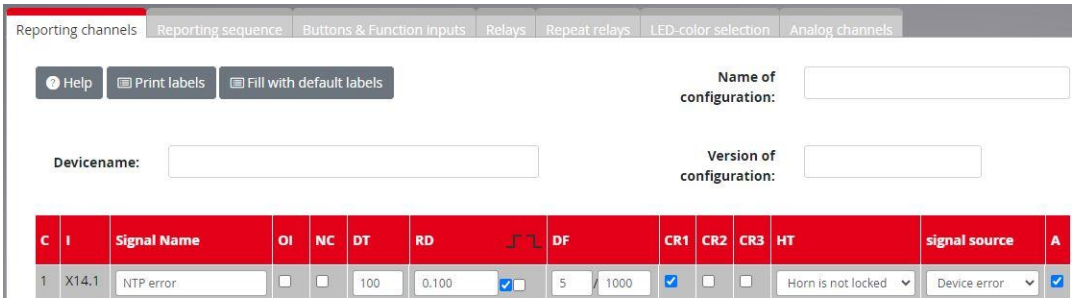


Figure 5.16: Parameterization of channel 1 of a fault annunciator for signalling a device fault

5.4.2.5 Serial submenu

This menu is used to set the serial interface (X6) for the IEC 60870-5-101 and Modbus RTU protocols.

The following parameters can be set:

Baud	rate- 110, 300, 600, 1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200 baud
	Parity- none, even, odd
Transceiver-	RS232 and RS485

5.4.2.6 Security submenu

This submenu is only available to users who **have administrator rights**.

Firewall

The firewall function can be used to allow or block the available IP ports. This can be done separately for incoming and outgoing connections.

For devices with a second network interface, the firewall can also be configured individually for each interface.

Protocol	Protocol type	Port	Description
HTTPS	TCP	443	Port for secure browser access
HTTP*	TCP	80	Port for browser access
SFTP/SSH	TCP	22	Port for SFTP and SSH access
NTP	UDP/TCP	123	Port for NTP access (USM as NTP server for other devices)
IEC61850	TCP	102	Port for IEC61850 protocol
Ping	ICMP		Allow or block ping packets (ICMP ECHO)
ICMPv6	ICMPv6		Auxiliary protocol for IPv6 (experimental)
SNMP	UDP	161	Port for SNMP protocol
Modbus TCP	TCP	configurable	Modbus TCP protocol
IEC 60870-5-104 Server Link 1-4	TCP	configurable	Port for IEC 60870-5-104 server links

Table 5.3: Ports for incoming connections

Unencrypted HTTP access must also be permitted by ticking the box below the table.

Protocol	Protocol type	Port	Description
DNS:	UDP/TCP	53	Name resolution via the Domain Name System (DNS)
NTP	UDP/TCP	123	Port for NTP time synchronization
Ping:	ICMP		Allow or block ping packets (ICMP ECHO)
DHCPv6:	UDP	547	DHCP protocol for IPv6 (experimental)
Syslog:	UDP	514	Syslog protocol for forwarding alarms
SNMP Notifications (TRAPs)	UDP		SNMP notifications (TRAPs)
IEC 60870-5-104 Client Link 1-32:	TCP	configurable	IEC 60870-5-104 Client Links

Table 5.4: Ports for outgoing connections

The protocols IEC61850, SNMP and the individual links for IEC 60870-5-104 are shown as inactive until they are activated in the corresponding menus for the protocols. In the example below, this is only server link 1 for IEC 60870-5-104. Only users with the Engineer authorization level can edit the parameters in the menus for the protocol settings.

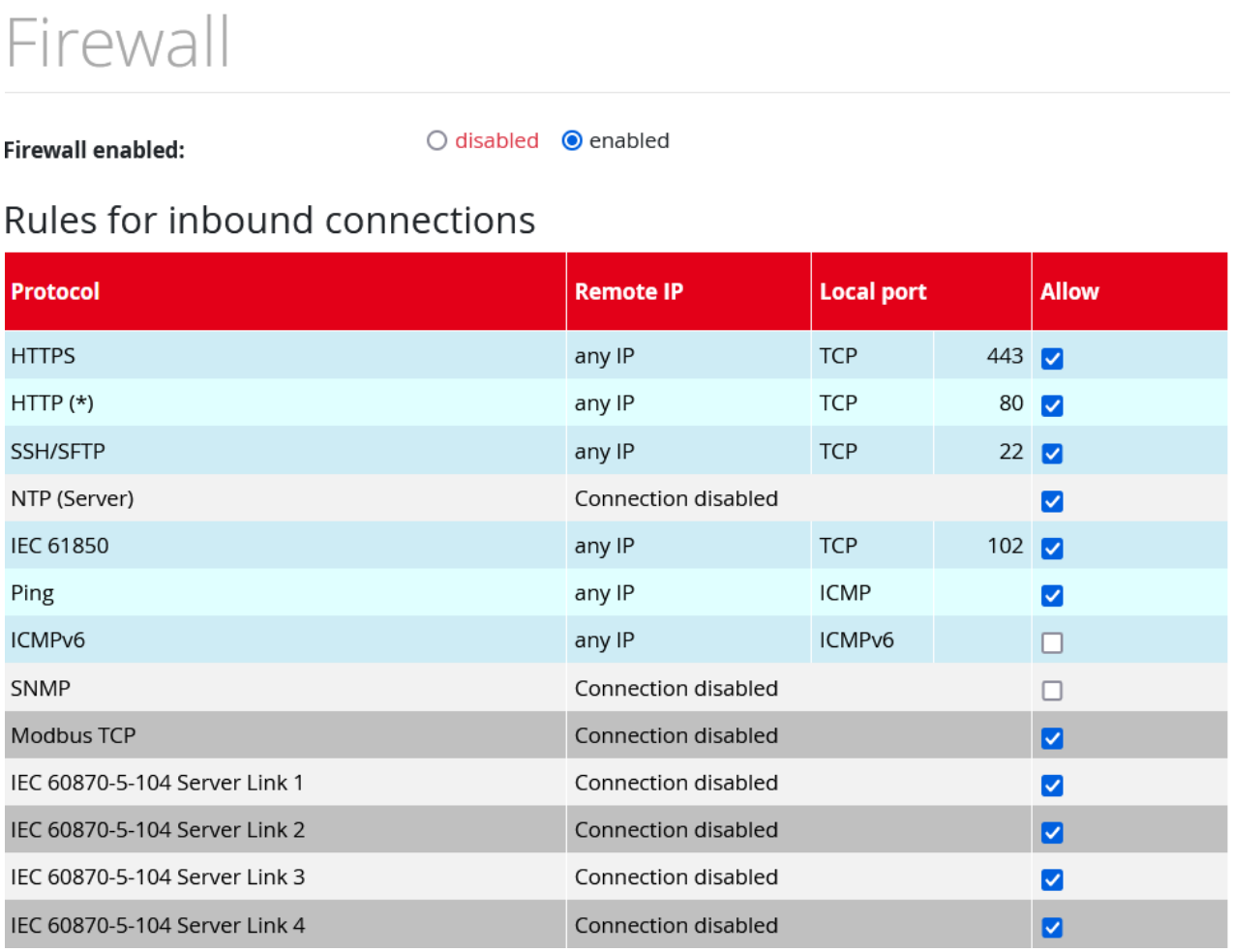


Figure 5.17: Rules for incoming connections

Import certificate

This function can be used to update the certificate for the HTTP server. The certificate is selected using the "Browse" button and can now be loaded into the device using the "Update" button. After successful loading, the device needs to be restarted.

5.4.2.7 Firmware submenu

This submenu is only available to users who **have administrator rights**.

Firmware update

A software package file (ees-usm-package*.fwu) is selected via the "Browse" button and can now be loaded into the device using the "Update" button. The update process can no longer be interrupted once the confirmation prompt has been confirmed. The device must not be disconnected from the power supply while the update is running. Once the update has been successfully installed, the device restarts automatically.

Rollback

The rollback function can be used to reset the device to the previous software version for certain updates. The target version must first be detected using the "Detect target version" button. This checks whether a rollback is possible.
If a valid target version is detected, this is displayed under "Rollback target version" and the rollback can be started using the "Execute rollback" button. After the rollback, the device restarts automatically.

If you want to update from a firmware version lower than 4.0.0, a special procedure with an additional USB memory stick is required.
There are separate update instructions for this. In this case, please contact our customer service.

5.4.2.8 Licenses submenu

This function can be used to retrofit licenses that were not supplied ex works.

A license is selected using the "Browse" button and can now be loaded into the device using the "Update" button. After loading the license, the USM is restarted to activate the license.

5.4.2.9 Font submenu

The standard formatting for printing the labeling strips can be defined in this submenu.

Font

The default font can be defined via the "Font" selection field. Additional fonts can be added in the "Additional fonts" text field. These are then added to the "Font" selection list. Enter one font per line. In order to be displayed or printed correctly, the font must be installed on the computer used to access the USM web server.

Style
The style of the label can be set accordingly using the buttons - "**Bold**", - "*Italic*" and/or - "Underline".

Preview
In addition to the control elements for font and style, a preview field is displayed that simulates the set standard formatting.

5.4.2.10 Parameter editor submenu (integrated logic functionality)

In this menu, parameters predefined by EES for which there is not (yet) a separate dialog with user guidance can be edited directly and the integrated logic functionality with the syntax according to IEC 61131 ST can be used. The individual sub-items are only displayed if corresponding parameters have been defined.

Incorrect parameter entries can cause the device to malfunction. Therefore, please only change this in consultation with our technical support.

The first time the page is called up, a warning alarm appears, after confirmation via the "Accept warning - allow editing" to load the parameter editor.

A collapsible bar is displayed for each editable parameter group. Click on the bar to expand or collapse it. When the bar is expanded, a table opens in which the parameters can be edited.

Each row in the table corresponds to a parameter. The meaning of the individual columns is explained below.

Index
: Number of the respective entry starting from 0 (e.g. channel, interface)

key
: Name of the parameter

Data type
: Internal type of the parameter

Value
: Parameter value

For some parameter groups, additional entries can be added using the "New entry" button. Entries can be deleted using the button with the recycle bin symbol. Which parameter groups are available depends on the device version, hardware and configuration of the factory settings.

Parameter group Full logic functions

Programmable logic processing can be set up in this parameter group.
The following operators are available for this purpose. Operators that are higher up in the table are evaluated before operators further down.

//	The text following the operator is ignored during evaluation (comment)
(...)	The enclosed expression is evaluated before outer expressions.
NOT	The right-sided expression is logically negated.
AND	The left-sided expression is logically and linked with the right-sided expression.
OR	The left-sided expression is logically linked to the right-sided expression or.
TRUE, FALSE	Constant expressions for logical TRUE and FALSE
:=	The result of the right-sided expression is assigned to the left-sided reference.

Inputs, signal states, functions, relays and variables are available as sources, which are described in the following tables.

The letter "d" in the variable designation must be replaced by the respective device number and the letter "n" by the channel number.

d = 0 Master
d = 1 Slave device 1
d = 2 Slave device 2
d = 3 Slave device 3

Designation	Type	Channel number (n)	Description
%IX0.d.n	Physical inputs	1 ... 48	Input Channel 1 ... Channel 48
%IX1.d.n	Undelayed alarm input	1 ... 48	Channel 1 ... Channel 48
%IX2.d.n	Delayed alarm receipt	1 ... 48	Input after expiry of the signal delay Channel 1 ... Channel 48
%IX3.d.n	Alarm unacknowledged	1 ... 48	Alarm present or gone but not yet acknowledged Channel 1 ... Channel 48
%IX4.d.n	Alarm	1 ... 48	Alarm saved and pending Channel 1 ... Channel 48
%IX6.n	Collective alarm	1 ... 3	Collective alarm 1 ... 3
%IX7.n	Horn	1 ... 2	Horn 1 or 2
%IX8.d.n	button	1 ... 4	Button 1 ... 4
%IX9.d.n	Function input	1 ... 4	Function input 1 ... 4
%IX10.n	System functions	1	Lamp test active
		2	Acknowledgement group 1
		3	Acknowledgement group 2
		4	Acknowledgement group 3
		5	Reset group 1
		6	Reset group 2
		7	Reset group 3
		8	Horn 1 acknowledgement
		9	Horn 2 acknowledgement
		10	Function test triggered
		11	Mute function active
		12	Function Unmanned active
		13	Acknowledgement unassigned
		14	Reset unassigned
%IX11.d.n	Relay	1 ... 4	Function relay 1 ... 4
	1:1 Relay	9 ... 48	1:1 Relay 1 ... 40
%IX14.n	Virtual channels IEC 61850	1 ... 1024	Virtual channel 1 ... 1024

Table 5.5: Designation and meaning of the input variables

Designation	Type	Channel number (n)	Description
%IX12.n	Device error	1	the overall device error was triggered
		18	Parameter Error initialization
		19	Internal communication error
		20	Overflow alarm buffer STM board
		21	Relay card faulty
		22	Communication with slave devices
		24	Primary power supply failure
		25	Secondary power supply failure
		26	Configuration inconsistent
		50	IEC61850 license error
		51	CID file is missing
		52	XML configuration file missing
		53	XML import incorrect
		54	CID file incorrect
		55	IEC61850 Watchdog triggered
		66	Extension address incorrect
		67	Extension address multiple defined
		73	4-20mA sensor wire break
		82	Event log warning fill level
		100	IEC104 Client total error
		101	Ethernet connection ETH0
		102	Ethernet connection ETH1
		104	IEC104 Client GA not complete
		105	NTP server not available
		114	Primary power supply failure - slave 1
		115	Secondary power supply failure - Slave 1
		116	Primary power supply failure - slave 2
		117	Secondary power supply failure - slave 2
		118	Primary power supply failure - Slave 3
		119	Secondary power supply failure - slave 3
		120	Redundant signaling voltage failed
		161 ... 192	IEC104 Connection to client station 1 ... 32

Table 5.6: Device errors as logical input variables

Designation	Type	Channel number (n)	Description
%QX0.d.n	Set alarm input	1 ... 48	Set input Channel 1 ... Channel 48
%QX1.n	Activate system functions	1	Acknowledgement group 1
		2	Acknowledgement group 2
		3	Acknowledgement group 3
		4	Reset group 1
		5	Reset group 2
		6	Reset group 3
		7	Horn 1 acknowledgement
		8	Horn 2 acknowledgement
		9	Lamp test
		10	Function test triggered
		11	Mute function active
		12	Function unmanned active
		13	Acknowledgement ungrouped
		14	Reset ungrouped
%QX2.d.n	Relay	1 ... 4	Function relay 1 ... 4
	1:1 Relay	9 ... 48	1:1 Relay 1 ... 40
%IX14.n	Virtual channels IEC 61850	1 ... 1024	Virtual channel 1 ... 1024

Table 5.7: Designation and meaning of the output variables

Examples:
%QX0.0.8 := %QX1.0.1 OR %QX1.0.2
Alarm channel 8 of the master is assigned the result of the ***or link*** *of channel 1 and channel 2 of the master.*

%QX0.0.9 := %QX3.1.3 AND %QX3.1.4
Alarm channel 9 of the master is assigned *the result of the* ***and link of*** *the* unacknowledged alarms *from channel 3* and channel 4 of slave 1.

%QX2.0.3 := NOT %IX12.101
Function relay 3 is assigned if device error 6-4 (Ethernet connection error ETH0) ***does not occur****.*
is active

%QX0.0.10 := %QX1.0.1 AND (%QX3.0.3 OR %QX3.0.4)
OR expression inside the brackets is executed before the outer AND expression.

// A comment
Text after // is not evaluated

Signal channels (%QX0.d.n) that are to be used for output must be parameterized to signal source "Logic". For function relays or 1:1 relays (%QX2.d.n), "Interface" or "IEC interface" must be checked.

Parameter group Logic functions (OR)

In this parameter group, simple OR links can be parameterized, which were previously only available via Excel parameterization. Up to 16 logic formulas can be entered here.

A logic formula is structured as follows. First, the number of the alarm channel used for the output is specified. The channels to be included in the logical OR function are specified, separated by vertical bars "|" (pipe symbol).

The channel numbers are numbered consecutively starting from channel 1 of the master device in the full expansion of the cascade (4 x 48 channels).

Channel	Master	Slave 1	Slave 2	Slave 3
1	1	49	97	145
2	2	50	98	146
⋮	⋮	⋮	⋮	⋮
48	48	96	144	192

Table 5.8: Channel numbers in cascaded systems

The alarm channels that are to be used for output must be selected in the submenu "reporting channels" must be parameterized to signal source "Logic".

Example:
In the example, the result of the OR link of channels 1 and 2 of the master device is to be output on channel 8 of the master device.

Logic formula: 8|1|2

The pipe symbol "|" can be replaced on keyboards on Windows PCs by the key combination "AltGr" and "<" can be generated.

NTP monitoring parameters

The parameters of the integrated monitoring of the NTP time synchronization can be changed in this parameter group.

NTP server start timeout
Time in seconds within which the NTP server must be reached after the start. Otherwise, device error 6-8 "NTP server not available" is triggered.

NTP server timeout
Maximum time in seconds after which an NTP server must have been reached again. Otherwise, device error 6-8 "NTP server not available" is triggered.

NTP unsynchronized Offset
Maximum time offset to the NTP server in seconds at which the device clock is still recognized as synchronized.

NTP unsynchronized Timeout
If the device clock is not synchronized for longer than the specified period of time in seconds, an entry is made in the event log ("NTP time synchronization lost")

IPv6 Settings

This parameter group can be used to activate experimental IPv6 support.

5.4.3 Fault annunciator menu (master device / slave device 1...3)

For the master device and each device created in the "Manage devices" submenu (slave device 1 ... 3) has its own menu in which the actual function of the respective fault annunciator is parameterized. This includes the submenus:

- Reporting channels
- Alarm sequence *(master device only)*
- Buttons and function inputs
- Relays (function relay)
- Repeat Relays (1:1 relays)
- LED color setting
- Analog channels

5.4.3.1 Alarm channels submenu

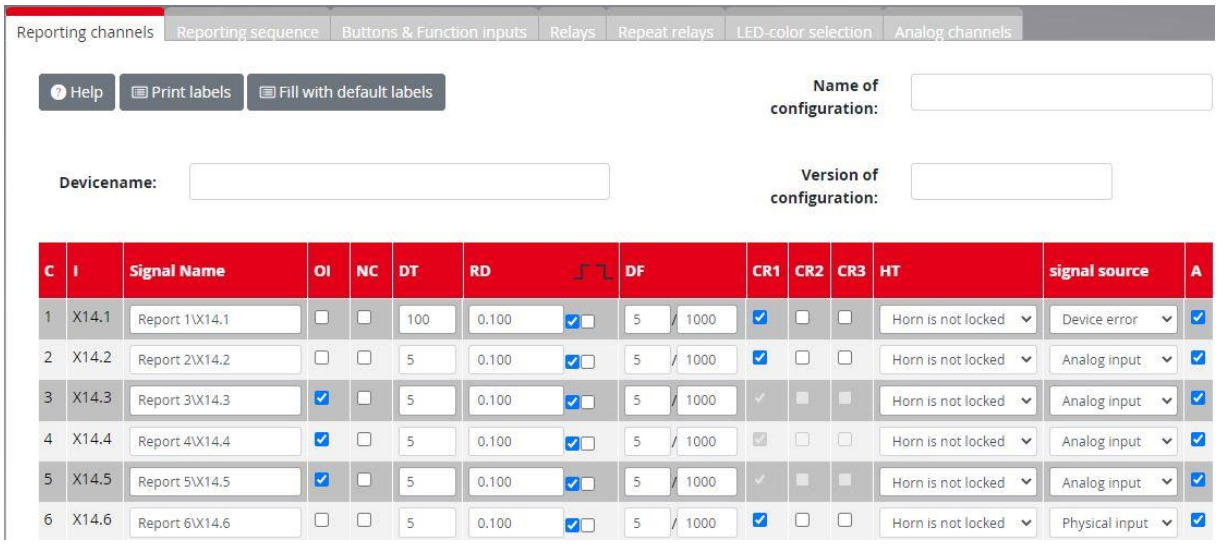


Figure 5.18: Alarm channels submenu

Name of the configuration and version number
Information on the name/version of the respective parameterization can be entered here. This information is saved in the parameter file and in the device.

Device name
A device name consisting of 40 ASCII characters can be assigned here. This is used to identify the device, is transferred to the device during parameterization and is saved there. It is displayed on the parameterization interface and inserted for identification purposes when the label strip is printed, but is not transferred to the CID file as a designation when using the IEC 61850 interface.

Labeling strips
Clicking on the "Labeling strips" button opens a window with the labeling strips. If a label is too long, the corresponding line is displayed in red and should be corrected, otherwise only the visible text is printed. Clicking on a text in the label strip opens a dialog for editing the text. The paper format DIN A4 landscape must be selected on the printer. Please also ensure that the page is printed in its original size, i.e. do not adjust, reduce or enlarge it.

Fill in with standard labeling
If no label has been stored in the device, predefined labels can be used with this button. The standard labeling is two lines (alarm x in the top line and the assigned terminal in the bottom line).

Attention: This function overwrites any previously defined designations of the signaling channels.

The following parameters can be set for each individual signaling channel in the table.

Field designation	Meaning
C	**Channel number** (fixed)
I	**Input terminal** (fixed)
Signal name	**Designation of the respective channel** This designation is also used when printing the labeling strip. The labeling can be executed in two lines, the lines are separated by "\" entered (e.g. transformer1\short-circuit breaker).
OI	**Operating input** If this checkbox is activated, the alarm is treated as a status display. If the checkbox is deactivated (factory setting), the alarm is sent according to the set fault alarm sequence (→ submenu Alarm sequence). The LED color of the channel is automatically changed by parameterization as an operating or fault alarm. The color is set on the "LED color setting" dialog page. Factory setting: Operating alarm green, fault alarm red.
NC	Normally closed current principle **of the inputs** (when the checkbox is activated) Normally open principle - The application of a voltage triggers an alarm. Normally closed principle - An alarm is triggered when the voltage drops. Factory setting: deactivated – Normally open priciple.
DT	**Debounce time** The response delay is the period of time for which an alarm must be present without interruption before it is registered. This prevents the input from triggering several alarms when a switch is pressed. Time 0 ms ... 1000 ms, adjustable in increments of 1 ms.
RD _|¯ ¯|_	**Response / Alarm delay** The alarm delay delays a permanently pending (debounced and flutter-monitored) alarm before it is processed. This is intended to suppress error alarms that would occur, for example, if a value is only briefly exceeded or undershot. The time span is significantly longer than the response delay (debounce time). The time is adjustable from 0...32400 ms (9 h), in two grids (values < 30 s in the 1 ms grid and for values > 30 s in 1 s grid). The value can be entered in three formats: 1. Pure numerical value e.g. 100 interpretation in seconds → 100 s 2. .xxx e.g. .100 Interpretation in ms → 100 ms 3. mmm:ss.xxx Interpretation in minutes, seconds and milliseconds e.g. 111:22.0 → 111 minutes and 22 seconds The two checkboxes for rising and falling edges _|¯ ¯|_ can be used to specify the direction in which the delay acts. _|¯ activated - Delay takes effect with incoming alarm ¯|_ activated - Delay is effective for outgoing alarm
DF	**Defluttering.** The **flutter suppression** is intended to prevent an input from always being switched on and off (e.g. due to a loose contact) and thus the alarm constantly changing. The flutter suppression acts after the response delay (debounce time). If an input changes more often than the specified number of edges within the specified flutter time, flutter suppression takes effect and identifies the signaling channel as faulty. Number of edges- 0 ... 255 Flutter time- 0 ms ... 65535 ms, ~1 min, 1 ms grid Factory setting - 5/1000

Table 5.8a: Parameters of the reporting channels

Field designation	Meaning
CR1, CR2, CR3	**Assignment to the collective reports** If one of these checkboxes is activated, the alarm triggers the corresponding collective alarm. Multiple assignment is possible. All of a collective alarm assigned alarms form a group. This assignment is also important for alarm acknowledgement and RESET.
HT	**Horn triggering** None- alarm does not trigger the horn with interlock alarm triggers the horn. Horn acknowledgement is only possible after alarm acknowledgement without locking - alarm triggers the horn. Horn can always be acknowledged
Signal source	**Control of the signaling channel** This checkbox can be used to define the source of the alarm for each channel. Input: Alarm via the physical input Interface: Alarm via interface command (e.g. IEC101/104 or IEC61850) Display: Alarm is sent via interface command and is only displayed (LED), it is not included in the fault alarm sequence (No horn control and no collective signaling etc.) Logic: Alarm via internal logical link (can currently only be made via an EXCEL list to be imported) → "Parameterization via Excel list" section) Device error: Control of the channel due to a device error according to the Parameterization in the "System menu \ "Device error" Analog input: Alarm is formed from an analog input (threshold montoring) Watchdog: Alarm is formed from the watchdog object function for monitoring IEC 61850 communication.
A	**Activation of the signaling channel** If this field is deactivated, the channel input is not processed. The alarm is ignored throughout the system. Factory setting: Channel activated

Table 5.8b: Parameters of the signaling channels

→ Detailed explanations of the delay times can be found in the section "Alarm states and delay times".

To use the settings of one line in another or all other lines, the line contents can be copied and pasted at the desired position. Pressing the right mouse button on a selected line opens a context menu with the content:

Copy
Paste
Use for all

The latter selection fills all lines with the corresponding content.

All characters from A...Z and 0...9 are permitted for the station name and channel name. The special characters " { } | $ & # ; " are not permitted. For channel names, the "\" (backslash) is used as a field separator to start a new line.

5.4.3.2 Alarm sequence submenu (master device only)

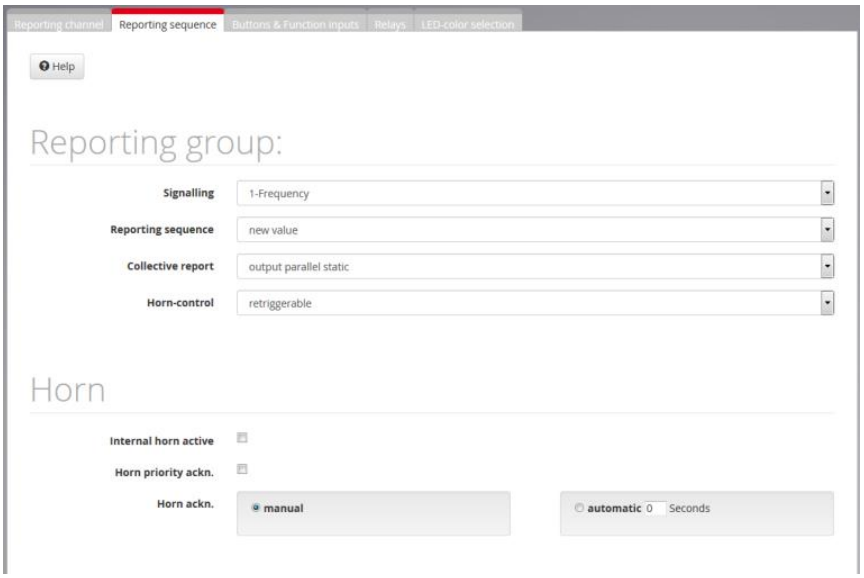


Figure 5.19: Alarm sequence submenu

The alarm sequence and the horn controls are parameterized in this submenu. In cascaded systems, the same signaling sequence applies to all devices, which is why this submenu is only available on the master device. In order to be able to adapt the sequences as flexibly as possible to the respective requirements, they are made up of individual components.

Reporting procedure

Designation	Selection options	Note
Signaling	1-Frequency	1-frequency flashing light
	2-Frequency	2-frequency flashing light
	Status display	Self-clearing alarm: Alarm is displayed immediately as an acknowledged alarm and disappears when the associated input is no longer present.
Reporting procedure	New value	New value processing
	First-up value	First value processing
	Steady-steady light	Only selectable in conjunction with 2-frequency
Collective alarm	Input parallel static	The collective alarm is set with the first incoming alarm and receds with the last alarm, regardless of the acknowledgement. alarm.
	Input parallel static dynamic	The collective alarm is set with the first incoming alarm. With each subsequent alarm, the collective alarm is deleted for approx. 0.8 s and then set again. When all alarms have left, the Collective alarm permanently deleted.
	Output parallel static	The collective alarm is set with the first incoming alarm. The collective alarm is only deleted once all alarms have been sent **and** acknowledged.
	Output parallel static dynamic	The collective alarm is set with the first incoming alarm. With each subsequent alarm, the collective alarm is deleted for approx. 0.8 s and then set again. When all alarms have been sent and acknowledged, the collective alarm is permanently deleted.
	dynamic	The collective alarm is activated for approx. 0.8 s with each incoming alarm.
	Input parallel static acknowledgeable	The collective alarm is set with the first incoming alarm and goes out with the last outgoing alarm or when all alarms have been received. alarms were acknowledged.
	Output parallel static acknowledgeable	The collective alarm is set with an upcoming alarm. The collective alarm is deleted when the alarm is acknowledged, even if alarms are still pending.
Horn control	Horn retriggerable	The horn is activated again with the next alarm, even if alarms have already are pending.
	Horn not retriggerable	The horn is only activated again for subsequent alarms if no alarms are pending.

Table 5.9: Alarm sequence dialog box

Further information on the reporting processes and their names can be found in the separate document "Description of the reporting procedures" with the document designation "SM-MA-ZI-DE".

Horn function

The USM has 2 horn functions. In the parameterization, you can specify which collective alarms or non-grouped alarms control the respective horn functions (**horn assignment**).

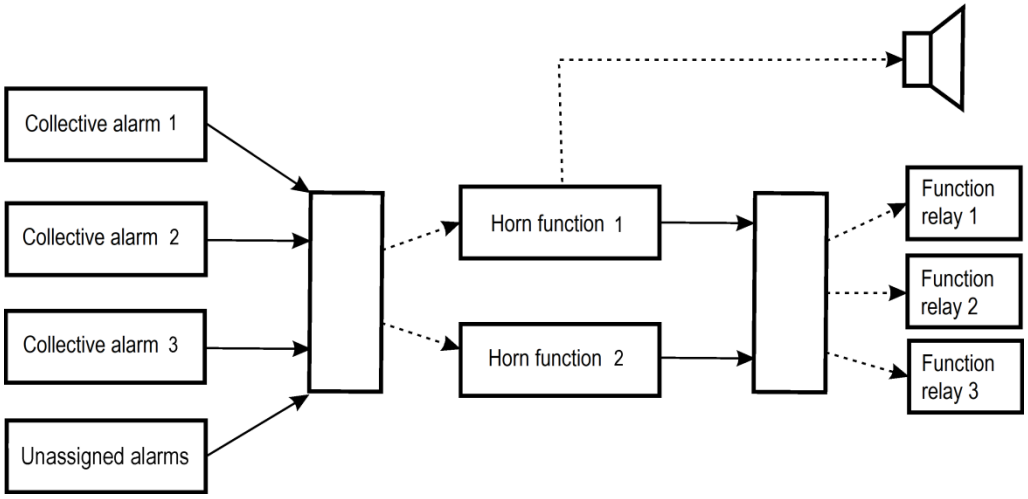


Figure 5.20: Principle representation of the horn functionality

In a second step, the parameters of the two horn functions can be defined. which relay is controlled by a horn function.

Function	Designation	Meaning
Internal horn active (can only be activated for horn function 1)	Active	Internal horn for horn function 1 activated
	Inactive	Internal horn deactivated
Horn priority acknowledgement (can be set separately for both horn functions)	Inactive	Horn can always be acknowledged.
	Active	The alarm can only be acknowledged if the horn has already been acknowledged.
Horn acknowledgement (can be set separately for both horn functions)	Manual	Horn is acknowledged manually via push-button or function input.
	Automatic	The horn is automatically acknowledged after the set time. Manual acknowledgement via push-button, function input or via a interface is possible at any time, if parameterized.
Horn mute (can be set separately for both horn functions)	Horn does not sound when mute function triggered	If the mute function is activated, the horn is not activated.
	Automatic acknowledgement	If the mute function is activated, the horn is triggered but automatically after the set time acknowledged.

Table 5.10: Parameters of the dialog boxes for the two horns

Please note the relationship between the "Horn priority acknowledgement" parameter and the "Horn activation" parameter in the "reporting channels" submenu, which can be set individually for each channel. The "Horn priority acknowledgement" parameter applies to all reporting channels and has the higher priority. If it is set to "active", the alarm can only be acknowledged after the horn has been acknowledged.

5.4.3.3 Buttons and function inputs submenu

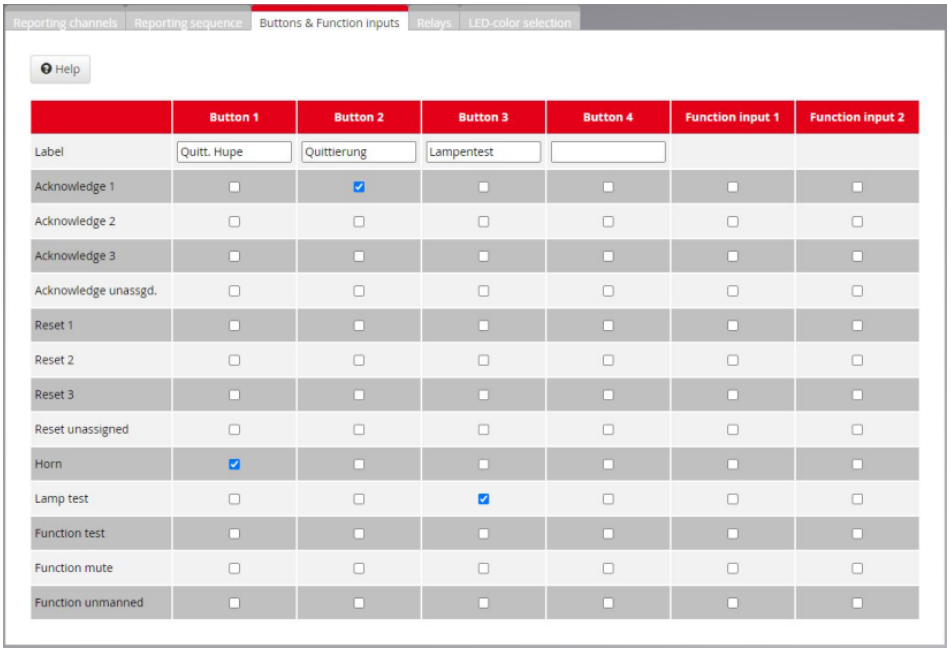


Figure 5.21: Submenu assignment of the buttons and function inputs

On this dialog page, the fault annunciator functions listed below are assigned to buttons T1 ... T4 and the function inputs 1 and 2. Multiple assignments are possible.

The texts entered in the "Label" line are printed by pressing the "Print labels" button in the "Reporting channels" submenu together with the labels of the Reporting channels.

Function	Meaning
Acknowledgement 1, 2, 3, unassigned	Optical acknowledgement for alarms of groups 1, 2, 3 or unassigned alarms
Reset 1, 2, 3, unassigned	Reset for alarms of collective alarm groups 1, 2 or 3 or ungrouped alarms
Horn	Acoustic acknowledgement (horn)
Lamp test	Lamp test
Function test	Simulation of the excitation of all inputs
Mute function (Mute)	As long as this operating mode is activated, the horn is not triggered or automatically acknowledged after the parameterized time.
Unmanned function	As long as this operating mode is active, there is no visual or audible output of pending alarms. The internal alarm processing and, if necessary, the activation of relays or the output of alarms via an interface remain active. The alarm acknowledgement on the fault annunciator is deactivated.

Table 5.11: Assignment of buttons and function inputs

The assignment is made via a matrix whose rows represent the functions and whose columns represent the buttons and function inputs. Realized links are marked with a tick.

A group is formed by all alarms that are included in the same collective alarm.
Unassigned alarms are alarms that are not linked to a collective alarm.

5.4.3.4 Relay submenu (function relay)

In this submenu, the 4 function relays are assigned to the individual fault alarm functions, buttons or function inputs. Several events can be defined for a relay, e.g. the grouping of collective alarms. As soon as one of these events occurs, the relay switches. When the last triggering event has passed, the relay drops out again. For each relay, a tick in the "Inverted" field can be used to specify whether the switching function or its negation is executed. For example, the relay is then de-energized when the collective alarm occurs.

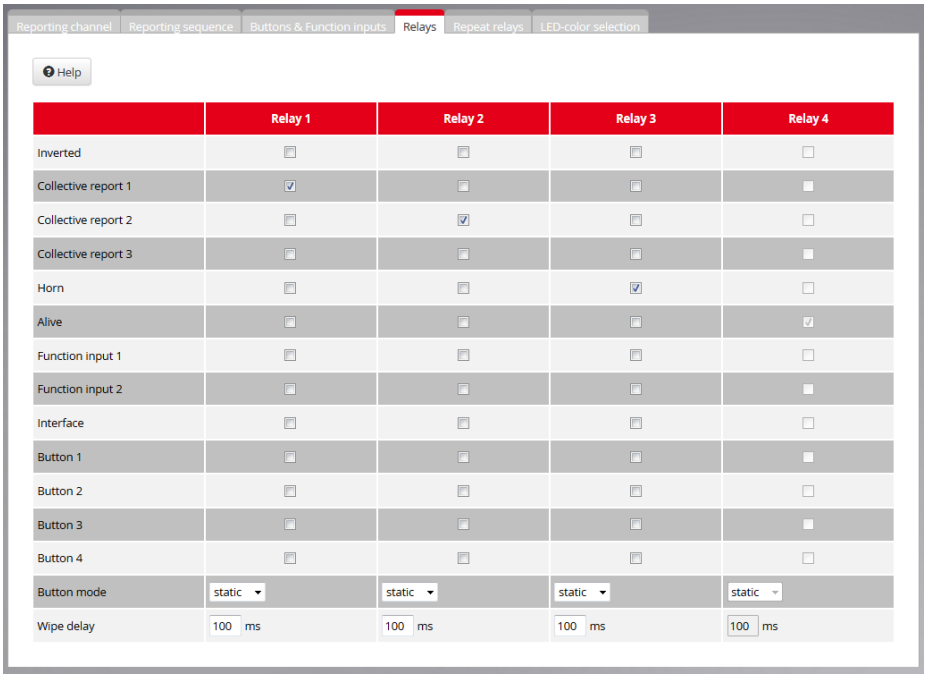


Figure 5.22: Relay dialog page

The assignment is made via a matrix whose rows represent the triggering events (e.g. button press) and whose columns represent the relays. Realized links are marked with a tick.

Function	Meaning
Inverted	If the checkbox is activated, the negation of the switching function is executed.
Collective report 1, 2, 3	The relay is activated by collective report 1, 2 or 3.
Horn	Horn control
Alive	Live contact for self-monitoring (permanently assigned to relay 4)
Function input 1, 2	Function input controls relay output
Interface	Control via an interface (IEC 60870-5-101/104 or IEC 61850). Pulse output with set wipe duration is possible.
Button 1 ... 4	Button controls relay output
Button mode	Relay function when activated via a button or the interface Static - The relay is energized as long as the button remains pressed. Toggle - The bistable relay changes its state with each excitation (flip-flop function) Wiping - Relay switches each time it is energized and drops out again after the wiping time (10 ms ... 10 000 ms).

Table 5.12: Function assignment of the relays

5.4.3.5 Submenu 1:1 Relay

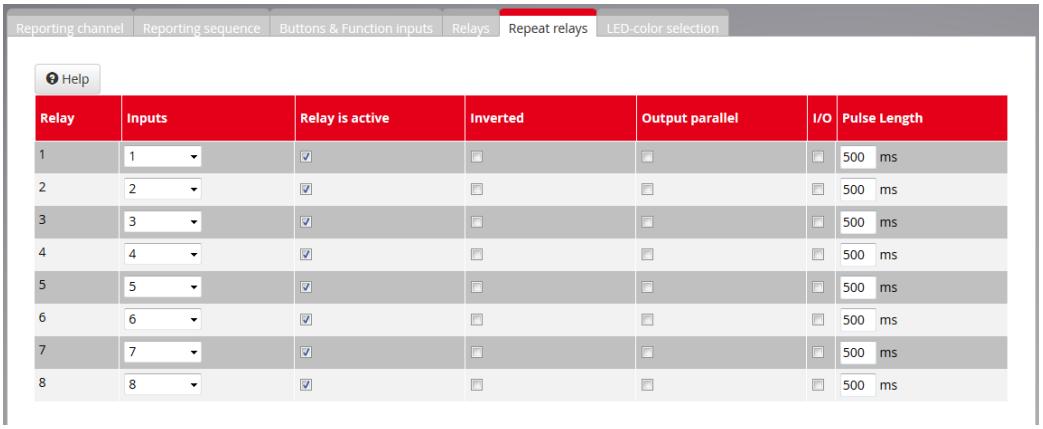


Figure 5.23: Submenu 1:1 Relay

The optional relay cards (each with 8 NO contacts) are independent of the 4 function relays described in the previous section. Only the available relay groups are displayed during parameterization. For each relay (channel), you can specify whether it is controlled via a device input, a device function or the interface. The following specifications can be made.

Activation via a signal input or a device function Inputs

This is where the relay is controlled. The following options are available:

- Functions collective alarm 1, 2 or 3
- Horn control function 1 or 2
- Available galvanic signal inputs

Relay is activated

By unchecking the box, the control of the relay by the above-mentioned functions and inputs can be deactivated. Deactivation does not affect control via the interface.

Inverted

If this box is ticked, the negation of the respective function is executed, e.g. the relay drops out when the collective signal occurs and picks up when no collective signal is present. This option is also effective for control via the interface.

Output parallel

If the relay is activated by an alarm input, you can specify whether it follows this input directly (check mark not set) or remains activated until the alarm has been acknowledged (check mark set) - signaling of the saved alarm.

Control via an IEC interface

If the relay is to be controlled via an interface (IEC 60870-5-101/104, IEC 61850 or Modbus), this box must be checked. In this case, the status of the respective galvanic signal input is ignored. Make sure that the relay is assigned a corresponding IEC object in the protocol settings or that the intended Modbus register is used. Further information can be found in the corresponding interface descriptions.

Wiping time
If a relay is controlled with an IEC pulse command as described above, the pulse duration can be set in the range of 10 ... 10,000 ms. This time is ignored for IEC continuous commands. The wipe duration is also irrelevant for Modbus commands.

5.4.3.6 LED color setting submenu

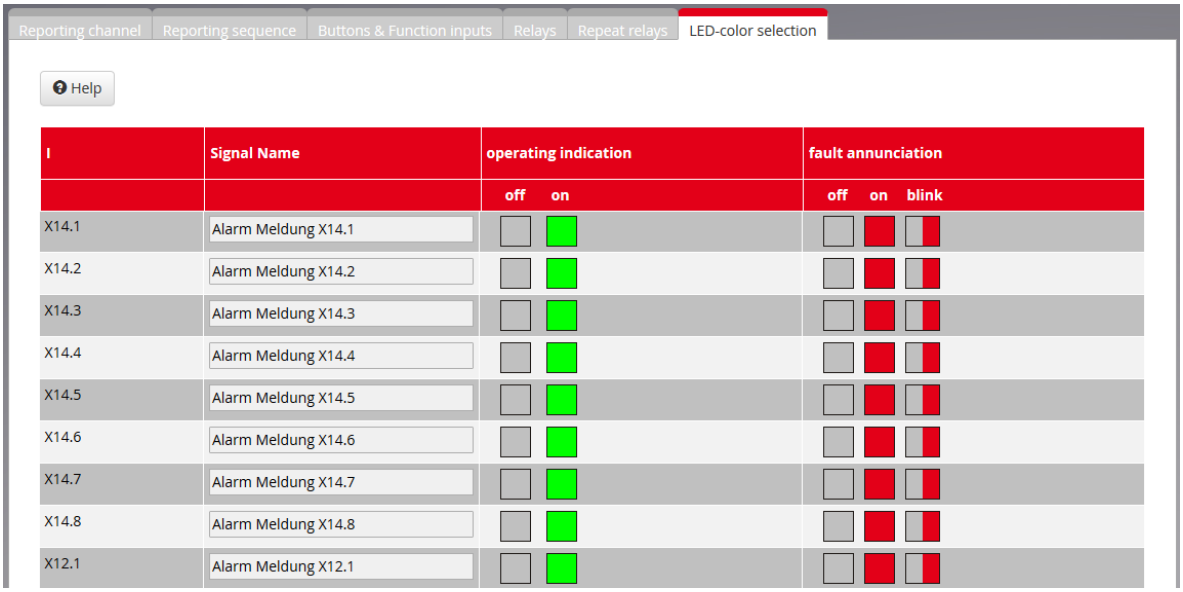


Figure 5.24: LED color setting submenu

On this dialog page, the LED colors for operating and fault alarms can be set for each channel. The following color variants can be selected:

- LED off (gray box)
- Red
- Green
- Yellow
- Blue
- Orange
- White

Operating alarm
The colors for operating alarms can be set for two states “On” or “Off”.

Fault alarm
For the fault alarm, one of the above colors is used for the "Off", "On" and "Off" states.
"Flashing" is set.

Please note that the "Off" or "On" status of an LED is always different color settings are necessary.

5.4.3.7 Analog channels submenu

Depending on the size of the device, a USM can be equipped with up to 5 analog input cards. Each input card has 4 analog inputs. The submenu is only displayed if analog cards are integrated in the fault annunciator. The parameters are divided into the 4 dialog pages, which are displayed by clicking on the corresponding buttons.

- Alarms
- Customization
- Sensor
- Transmission

The currently edited dialog is preceded by a "-" in the button. The other dialogs have a leading "+" in the button.

Figure 5.25: Analog channels submenu for a fault annunciator with 2 analog cards with 4 inputs each

Dialog alarms

Parameters	Meaning
AC	Connection terminal of the analog value
Signal name	The signal name consisting of ASCII characters is used to identify the value and is also displayed in the diagnostic monitor (see section Main menu Monitor).
Measuring mode	Depending on the application, the inputs can be configured as voltage or current inputs. The following options are available: • 0 ... 10 V • -10 ... 10 V • 0 ... 20 mA • 4 ... 20 mA In 4 ... 20 mA mode, open-circuit monitoring is active. If the current value is below 4 mA, the device error "4-8" is generated. Further processing of the error is described in the submenu "Parameters / System / Device error". In the "Monitor" main menu, the corresponding analog input is indicated by an orange display.
Filter	The measured values are filtered after acquisition in order to suppress unwanted short-term interference. The filter is implemented as a first-order low-pass filter. The parameterizable time constant defines the time after which, in the event of a sudden change in the input value, the filtered value has reached 62% of the input value. The time constant is specified in seconds.

Table 5.13: Basic settings of the analog inputs

If the analog values change, alarms can be generated in the fault annunciator during one of the following processes.

- if the limit value is exceeded
- if the limit value is exceeded
- if the measured value is outside a range
- if the measured value is within a range

Parameters	Meaning
Alarm channel	Channel on which a alarm is generated if this results from the following parameters.
Evaluation	The analog values can be monitored using the methods mentioned above. The evaluation method must be defined in this parameter: • above limit value • below limit value • from area • in area
Lower value	Lower limit value
Upper value	Upper limit value
Hysteresis	A hysteresis can be defined to prevent the generation and deletion of fault alarms in the event of small changes in the analog value. A fault is only generated or deleted when the measured value exceeds the exceeds limit value + (hysteresis / 2) or falls below limit value - (hysteresis / 2).
EA	This checkbox can be activated to prevent the generation of a fault alarm for the "out of range" evaluation method if the sensor value is still outside the range when the system is started up. The Fault alarm processing is only activated once the analog value has entered the range once.

Table 5.14: Limit value formation of analog inputs

Dialog adjustment

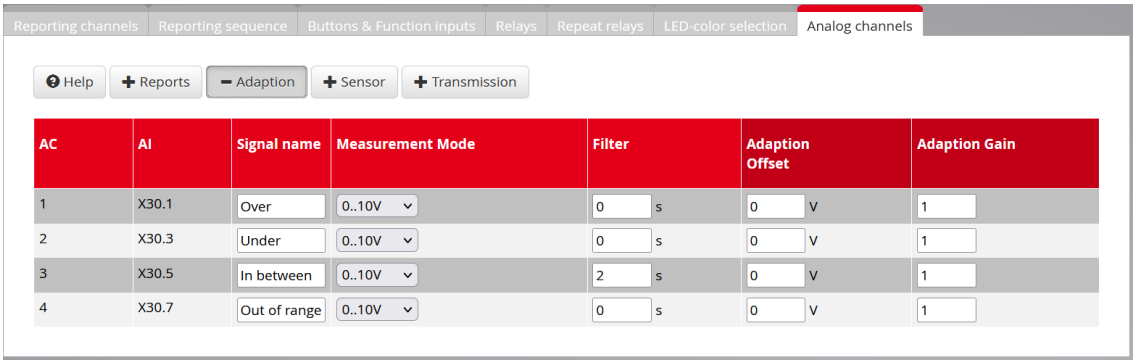


Figure 5.26: Analog channels submenu - Adjustment dialog

The measured value recording has an accuracy of better than 0.5% in the delivery state. If it is necessary to adjust the measured value recording, e.g. for a line adjustment of the sensor, two parameters can be used for readjustment.

The first 5 columns are taken from the previous dialog, but can be changed.

Parameters	Meaning
Offset adjustment	The offset is added to the measured value. (The addition only takes place after the value has been multiplied by the gain). The unit of the offset is automatically adapted to the measurement mode and displayed as volts or mA. Factory setting: 0
Adjustment Amplification	The measured value is multiplied by the gain. Only then is the offset added. Factory setting: 1

Table 5.15: Adaptation of analog inputs

Dialog Sensor

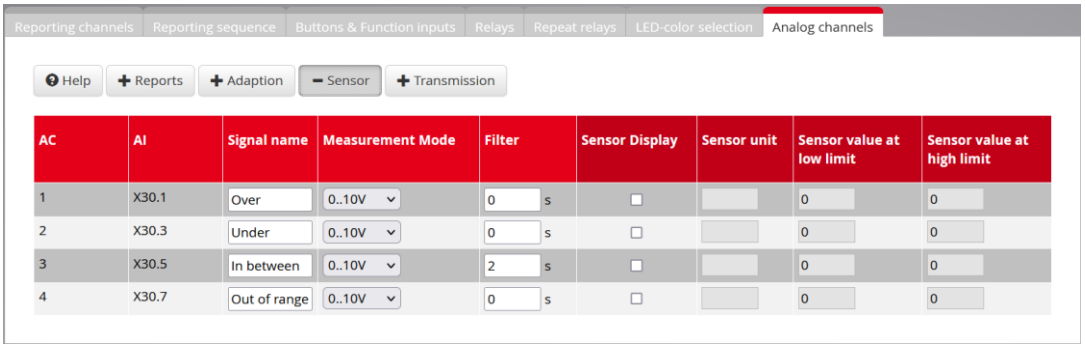


Figure 5.27: Analog channels submenu - Sensor dialog

This dialog is used to parameterize the display of the analogue values in the "Monitor" main menu. The first 5 columns are taken from the previous dialog, but can be changed.

Parameters	Meaning
Sensor display	**Option not activated** The display is shown as a current or voltage value depending on the parameterized measuring mode. The unit is displayed accordingly in V or mA. **Option activated** This enables the following 3 columns for parameterization in order to display a scaled value with the physical unit.
Sensor unit	Physical unit of the analog value e.g. kV, °C or bar
Sensor value lower and upper limit	To scale the sensor output signal to the physical value, the physical value is specified at the lowest sensor value (0 V, 0 mA or 4 mA) and at the highest possible sensor value (10 V or 20 mA).

Table 5.20: Scaling of analog values

Dialog transmission

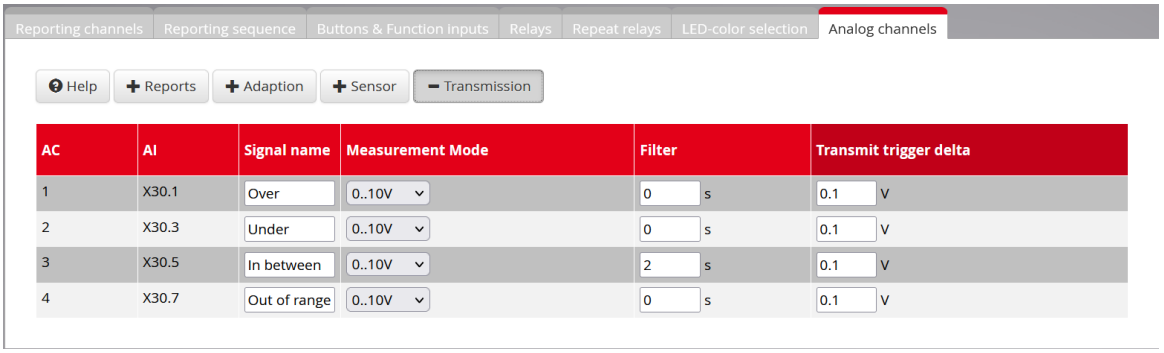


Figure 5.28: Analog channels submenu - Transmission dialog

The first 5 columns are taken from the previous dialog, but can be changed.

The measured values can be forwarded to a higher-level system via the Modbus RTU, IEC 60870-5-101/104 or IEC 61850 interface. With the network protocols IEC 60870-5-101/104 and IEC 61850, it can be specified that values are only transferred as spontaneous values or reports in the event of a change. In order to limit the data transfer, a minimum difference between two values can be defined (delta), from which the value is to be transferred.

This difference relates to the respective current or voltage value and can be set in steps of 0.001.

5.5 Monitor main menu

The monitor is a diagnostic aid for the USM and any slave devices connected in the cascade. This display shows the LEDs of the fault annunciator with their statuses (flashing, on and off).

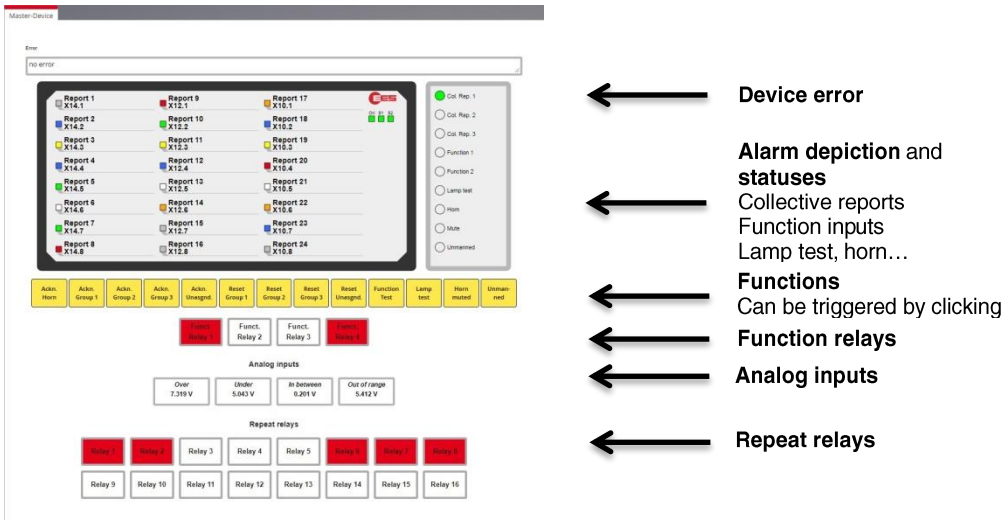


Figure 5.29: Monitor - a diagnostic aid

For each device created in "Parameters / Manage devices" (master or slave 1...3), a separate monitor image can be called up via the associated tabs.

The 13 buttons shown in yellow symbolize functions and can be "activated" by clicking the mouse to trigger the corresponding action (acknowledgement, function test, etc.).

The states of the 4 function relays and, if available, the 1:1 relays are also displayed (red energized, white idle state).

Relays that are parameterized for control via the interface are marked with a thinner black border. The status of these relays can be switched by clicking the left mouse button. Relays with a thick, gray border cannot be switched by clicking the mouse.

5.5.1 Advanced submenu

This tab contains 3 subgroups that can be opened with a mouse click.

State of the physical inputs (StatePhysicalInput Channels)
The statuses of the inputs, not the saved alarm, are shown here by set or unchecked checkmarks. It is not possible to change the statuses via the web interface.

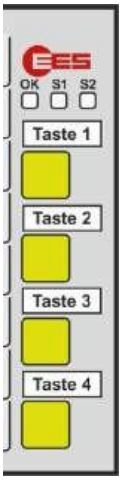
Command inputs (CommandInput Channels)
If an input is controlled via the interface (signal channel is parameterized to signal source interface), the status is displayed here. In contrast to the physical inputs, these channels can be set or reset with a mouse click.

Virtual variables (VirtualIEC61850 Channels)
This display shows the virtual variables (virtual channels) that can be created using the logic functionality. These variables can also be set or reset with a mouse click.

5.6 Reset to factory settings

The fault annunciators can be reset to the factory settings using the buttons on the front of the device.

To restore the factory settings, please proceed as follows:



1. Press buttons 1 and 4 simultaneously for approx. 2 seconds.

2. Annunciator light 1 at the top of the left-hand column lights up orange, annunciator light 2 below it lights up red or green and the internal horn is briefly activated. The "OK" LED above the buttons flashes red-green. The fault annunciator is now in parameterization mode.

3. By pressing button 3 several times, the second annunciator light in the left-hand column can be switched between the colors red and green. The LED color indicates which action is being carried out in the following step:
   Red - retain current configuration
   Green - reset to factory setting.

4. In the next step, the selected action is confirmed by pressing button 4.

5. If the action "Reset to factory settings" (green annunciator lamp 2) has been selected, the fault annunciator requires a few seconds to carry out the action, which is completed with the annunciator lamps "OK", "S1" and "S2" flashing green alternately. The fault annunciator is then in the factory default set-up.

6. After a power reset, the configuration interface of the fault annunciator can be called up again under the **IP address 192.168.1.99**.

When resetting to factory settings, the security-relevant settings (port settings, passwords) are also reset to the factory settings.

6 Parameterization via Excel list

In some cases, some of the information to be parameterized is already available in the form of Excel lists. In these cases, it may be useful to insert this information automatically or manually into a template and then import it into the USM. EES provides such a template parameterization file. This Excel file can be used to import the parameters for the channels, relays and IEC objects into the USM. The remaining parameters must still be set separately via the web interface.

The default structure of the Excel file must not be changed, the English designations in line 2 are mandatory and must not be removed. For a better overview, columns that are not required can be deleted. Empty columns are not processed during import.

The file consists of 3 spreadsheets with which the respective parameter ranges are set:

EES_Input	- Alarm channels and IEC objects
EES_Relay	- 1:1 relay
EES_Collective	- Logic links for 16 collective alarms

If the Excel file contains parameters for other devices (slaves within a cascaded fault annunciator system), the parameters can only be imported if these devices were previously created in the parameterization of the master fault annunciator.

The Excel file must be in .xls format, other Excel formats cannot be processed.

6.4 Signaling channels and IEC objects

The name of the spreadsheet "EES_Input" must not be changed, otherwise the sheet will not be processed during import.

Further information on the parameters can be found in the "Signaling channels submenu" sections

6.4.1 Alarms

Index (idx)
The index is a consecutive number that ensures that the original sequence can be traced when sorting the table according to certain column contents.

Device number and input (device number und input)
The **device** number column (0 ... 3) specifies which device is addressed (master station (0) or one of the up to three slave stations (1...3)).
The input on the corresponding device is entered in the **Input** column. Both columns must contain consistent values.

Labeling 1 and 2
The content of these two fields is used for the "Labeling" parameter of the signalling channels in the parameterization interface. In order to obtain a 2-line labeling, the 2. label field, another line can be created by inserting a "\".

Operating alarm / quiescent current
The corresponding function is activated with "x" or "X". Empty cells mean that the respective function is not active.

Alarm setting

"Response delay "	0 - 1000 ms
"Flutter count"	0 - 255
"Flutter time "	0 - 65535 ms
"Alarm delay "	Time from 0ms ... 32400s (9h), up to 30s in 1ms increments, above in a grid of 1s. Format: mmm:ss.xxx (xxx indicates the value in milliseconds). If no separators are entered, the value entered is interpreted in seconds.

These cells must not be empty.

Selection functions

For other parameters that can be activated or deactivated, the function in the respective column is activated by "x" or "X":

Input edges -	- "incoming", "outgoing",	(combinable)
Collective signal 1 - 3	- "Collective1 - Collective3"	(combinable)
Horn control:	- "none" "without interlock" "with interlock"	(cannot be combined)
Input control:	- "input", "interface", "display", "logic"	(cannot be combined)

Empty cells mean that the respective function is not active.

6.4.2 IEC objects of the signaling channels

An IEC object is created for each channel. The objects all have the same structure and the same parameters.

Object parameter integer

"ASDU"	- integer value 0 - 65535 or structured xx-xx (e.g. 11-22).
"IOA"	- integer value 0 - 16777215 or structured xx-xx-xx (e.g. 11-22-33).
"IEC type"	- integer value with the corresponding IEC types from the standard:

1	Single alarm without time
2	Single alarm short time
3	Double entry without time
4	Double alarm short time
5	Step alarm without time
6	Step alarm short time
7	32-bit alarm without time
8	32-bit alarm short time
30	Single alarm long time
31	Double alarm for a long time
32	Long time step alarm
33	32-bit alarm for a long time
45	Single command without time
46	Double command without time
47	Step command without time
58	Single command long time
59	Double command for a long time
60	Step command long time

The value is set to 0 for empty cells.

Object parameters Selection functions

The respective function is selected using "x" or "X".

"Link1 - Link4" - defines on which link the object is output

"blocked"	- the object is blocked, i.e. no output on the IEC interface
"double"	- the object is addressed as a double command

Empty cells mean that the respective function is not active.

Object types
There are 2 object types for the server function (station) and the client function (master)
Object types Server function:

undelayed	- Physical response of the input delayed - Input after the alarm delay has elapsed
unacknowledged	- alarm present/gone (not acknowledgedstored)
acknowledged	- alarm stored and present (output parallel)
Status (status)	- status of the alarm is output with status 1... 4.
Status set (status set)	- Status of the alarm is set with status 1... 4.
set (input) (input set)	- Alarm is set

The value is set to 0 for empty cells.

Object types Client function
The information objects of the client function are identical to the information objects of the server function.

6.5 IEC objects and 1:1 relays

The name of the spreadsheet "EES_Relay" must not be changed, otherwise the sheet will not be processed during import.

6.5.1 Relay

Index (idx)
The index is a consecutive number that ensures that the original sequence can be traced when sorting the table according to certain column contents.

Device number and relay (device number und relay)
The **device number** (0 ... 3) indicates which device is addressed (master station (0) or one of the up to three slave stations (1...3)).
Relay denotes the respective relay output of the 1:1 relay on the corresponding device. Both columns must contain consistent values.

Input (input)
"Input" refers to the input that triggers the relay. Inputs 1 - 24 can currently be linked to a relay. In addition, the horn ("h", "H") and the collective signals 1 - 3 ("s1 - s3", "S1 - S3") can also be assigned. Input and relay must be on the same device.
These cells must not be empty.

Wipe duration (pulse length)
The wipe duration is an integer value between 10 and 10000 in ms.
These cells must not be empty.

Selection functions
In the columns "Active", "Inverted" "Output parallel" "IEC command", the respective function is selected by "x" or "X". Empty cells mean that the respective function is not active.

6.5.2 IEC objects of the 1:1 relays

An IEC object is created for each relay and IEC type for the IEC settings. The objects all have the same structure and the same parameters.

Object parameter integer
"ASDU" - integer value 0 - 65535 or structured xx-xx (e.g. 11-22)
"IOA" - integer value 0 - 16777215 or structured xx-xx-xx (e.g. 11-22-33)
"IEC type" - integer value with the corresponding IEC types from the standard:

1	Single alarm without time
2	Single alarm short time
3	Double entry without time
4	Double alarm short time
5	Step alarm without time
6	Step alarm short time
7	32-bit alarm without time
8	32-bit alarm short time
30	Single alarm long time
31	Double alarm for a long time
32	Long time step alarm
33	32-bit alarm for a long time
45	Single command without time
46	Double command without time
47	Step command without time
58	Single command long time
59	Double command for a long time
60	Step command long time

The value is set to 0 for empty cells.

Object parameters Selection functions
The respective function is selected using "x" or "X".

"Link1 -Link4" - defines on which link the object is output.
"blocked" - the object is blocked, i.e. no output on the IEC interface
"double" - the object is addressed as a double command

Empty cells mean that the respective function is not active.

Object types
There are 2 object types for the server function (station) and the client function (master)
Object types Server function:
Relay (relay) - Display relay status
Set relay (relay set) - Set relay status

Object types Client function
The information objects of the client are identical to the information objects of the server function.

6.6 Simple logic function

The EES_Collective table can be used to parameterize a simple logic link for 16 collective alarms whose inputs are linked with "or". The designations in line 2 are mandatory so that the corresponding types are recognized during import.

Index (idx)
Index of the collective alarm, or link 1 - 16.

Output device (device)
This value specifies the device on which the corresponding input is triggered when the link is fulfilled. Device 0 - 3.

Outgoing alarm number (alarm)
This value specifies which alarm or input is triggered on the corresponding device when the link is fulfilled. Alarm 1 -48.

Triggering inputs (E1 - E192)
An "x", "X" in the respective column indicates that this input is the triggering input in the logic operation is used for the respective alarm.

Logic inputs
In the parameterization in the "Fault annunciator -> Signalling channels -> I/O" menu, the inputs designated as outputs in the Excel parameterization are designated as logic inputs and marked with "L".

These designations are retained even if the inputs are no longer used as outputs in a later Excel parameterization and must be reset manually in the "Fault annunciator / Signalling channels / I/O" menu.

7 Use and product life cycle

7.4 Maintenance

To ensure a long service life of the product, regular maintenance activities are required, which are limited exclusively to cleaning and care activities for the devices used. These may also only be carried out by trained specialist personnel. Improperly performed maintenance work can lead to partial or complete failure of the product.

Warning!
Only carry out maintenance work when the appliance is de-energized!

7.5 Repair

In the event of partial or complete failure of the product, repair work may be required which, due to the complexity of the device, may only be carried out by the manufacturer. Improperly carried out repair work will invalidate any guarantee or warranty claims. Please contact our customer service department.

Technical service:
Elektra Elektronik GmbH & Co Störcontroller KG
Hummelbühl 7-7/1
71522 Backnang
Tel.: + 49 (0) 7191/182-0
Fax: +49 (0) 7191/182-200
E-mail: info@ees-online.de

7.6 Decommissioning

In the event of temporary or permanent decommissioning of the product, proceed in accordance with the instructions below. These may only be carried out by trained specialist personnel. Improperly performed activities can lead to partial or complete failure of the product.

Warning!
Only carry out decommissioning work when the appliance is de-energized!

Decommissioning:

- De-energize the device
- Disconnect wiring
- Release the retaining clips and remove the appliance forwards from the front panel or door.

Proper storage until recommissioning or until dispatch to the manufacturer's customer service department requires suitable premises in accordance with the storage conditions in the "Technical data" section.

In the event of complete decommissioning, proceed in accordance with section 7.6 "Disposal".

In the event of recommissioning, proceed in accordance with point 4 "Assembly and installation".

7.7 Packaging and transportation

If the product needs to be transported for repair purposes or relocation, appropriate packaging and transport conditions must be ensured so that the device is not impaired in any way during transportation.

Packaging instructions:
Please ensure that you use suitable shipping packaging (original packaging if possible). Please observe country-specific regulations for the shipment of electronic products.

7.8 Spare parts

The partial or complete failure of the product can, if necessary, be prevented by appropriate repair work using suitable spare parts, which may only be carried out by the manufacturer due to the complexity of the device. Please contact our customer service department.

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7.9 Waste disposal

The disposal of defective products or old appliances can have potentially negative effects on health and the environment, which is why they must be disposed of in a harmless and environmentally friendly manner in accordance with the regional legal disposal regulations. Alternatively, a return delivery to the manufacturer should be considered.

Disposal instructions:
Returning packaging to the material cycle reduces the amount of waste and saves raw materials. Dispose of packaging materials that are no longer required at the regional collection points for the dual recycling system. If possible, keep the packaging during the warranty period so that you can pack the appliance properly in the event of a warranty claim.

Disposal of the appliance itself falls under the scope of e-waste. If necessary, contact your local waste disposal company for information on suitable disposal methods. Do not dispose of electrical appliances with household waste, but use the regional collection points. If electrical appliances are disposed of in an uncontrolled manner, hazardous substances can enter the groundwater and thus the food chain during decomposition or poison flora and fauna for years.

8. List of amendments

Issue	Amendment	Date	Name
V003	Changes to software version 3.5.0 incorporated: • Unmanned operation (unmanned) • Alarms cannot be assigned to a collective alarm • Analog inputs • RGB LED • IEC61850 Edition 2.0 and 2.1 supplemented • IEC61850 object for acknowledging/resetting all groups • IEC61850 Watchdog object for communication monitoring • RS232/RS485 switchover via software • Display of the hardware configuration • Display of the configuration download	20.03.20	R. Schöner
V004	• Chapter Assignment of input and annunciator light added • Corrections	26.06.20	R. Schöner
V005	Changes to software version 4.0.0 incorporated: • User administration • Report book • Update and rollback • Parameter import	30.11.21	R. Schöner
V006	Changes to software version 4.4.2 incorporated	02.06.24	R. Schöner

Contact us

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