Universal fault annunciator for panel mounting

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

20.05.2022

Manual

Table of content

1 Validity

The description applies to all USM blocks from software version 3.5.0 with the following options:

59	U	x	x	x	x	x	x	x	x	x	
											Number of reporting inputs
		A									8 reporting inputs
		B									16 reporting inputs
		W									16 reporting inputs in the wide housing (96 x 192mm)
		C									24 reporting inputs
		D									32 reporting inputs
		Y									32 reporting inputs in wide housing (96 x 192mm)
		E									40 reporting inputs
		F									48 reporting inputs
											Operating voltage
			1								24 V AC/DC
			2								48 - 60 V AC/DC
			5								110 - 220 V AC/DC
											Signal voltage
				1							24 V AC/DC
				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						Security configuration, IT Security acc. to BDEW guidelines
					P						Port Security, enhanced security configuration incl. option S
											1st Interface card
						W					Modbus TCP + IEC60870-5-101/-104
						F					Modbus TCP + IEC60870-5-101/-104 + IEC 61850
											2nd Interface card
							0				none
							W				Modbus RTU/TCP + IEC60870-5-101/-104
							L				Modbus RTU/TCP + IEC60870-5-101/-104, fibre optic interface Type SC
											LED color
								R			parameterizable (red, green, yellow, orange, blue, white)
											Additional cards
									0		none
									R		1:1 relay (for 8 - 48 way fault annunciators)
									1		8 relay outputs (independent of no. of inputs)
									2		16 relay outputs (independent of no. of inputs)
									A		4, 8, 10 or 12 way analog inputs (for 8, 16, 24 or 40 way fault annunciators)
									3		4 analog inputs (independent of the fault annunciator's size)
									4		8 analog inputs (independent of the fault annunciator's size)
									5		8 relay outputs + 4 analog inputs (independent of the fault annunciator's size)
									6		16 relay outputs + 4 analog inputs (only for 24 way fault annunciators)
									7		8 relay outputs + 8 analog inputs (only for 24 way fault annunciators)

Table 1.1: Matrix of USM devices

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

Table 1.2: Matrix of USM devices

2 General notes

2.1 Additional instructions

Note!
This manual provides the safe and efficient use with the devices of the universal fault annunciating system (in the following called „USM, fault annunciator or device) The manual is part of the device and must be stored always accessible for the personnel in direct proximity of the device.

The personnel are supposed to thoroughly read and fully understand this manual prior to starting any works. The major condition for secure handling is to obey to all security and usage procedures described in this manual.
Furthermore the local prevention advices and general security preventions in the installation site are obligatory.

The illustrations included in this manual serve for essential comprehension and are subject to modifications matching the application.

2.2 Usage

This manual is a prerequisite for secure mounting and safe operation of the product and must be read and understood before mounting.

2.3 Target group

This manual was written for qualified personnel which – based on their specific education and knowledge and experience as well as their knowledge of the relevant norms and regulations – are subject to deal with electrical sites and able to recognize and prevent possible hazards.

The qualified personnel is trained especially for the working environment and is familiar with the norms and regulations.

2.4 Symbol definition

Security advice

Security advices are indicated with symbols in this manual. The security advices are expressed through signal words that characterize the extent of the hazard.

Warning!
This combination of symbol and signal word warns of a
hazardous situation which can lead to death or severe injuries if not avoided.

Note!
This combination of symbol and signal word warns of a possibly hazardous situation which can lead to death or severe injuries if not avoided.

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

Tips and recommendations

This symbol accentuates useful tips and recommendations for an efficient and failure-free operation.

Further markings

To accentuate operation instructions, results, listings, cross references and other elements, the following markings are used in this manual:

Marking	Description
	Step-by-step operation instructions
	Results of operation steps
	Cross reference to sections of this manual and to further applicable documents
	Listings without fixed sequence
[Button]	Control elements (e.g. buttons, switches), Indication elements (e.g. signal lamps)
„Display“	Display elements (e.g. push buttons, assignment of function buttons)

Important passage

This symbol accentuates especially important passages.

Cross reference

This symbol refers to figures and other passages in this document or to further reading.

2.5 Safety instructions

2.5.1 Appropriate use

The universal fault annunciator USM is intended for use according to the applications described in this manual only and may only be used according to the conditions as described in the section "Technical Data". Every use that exceeds the appropriate use or unauthorized use is considered as incorrect use.

WARNING!
Hazard of incorrect use!
Incorrect use of the annunciator can lead to hazardous situations.

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

2.5.2 Storage of the manual

The manual must be stored nearby the annunciator and must be accessible for the personnel.

2.6 Customer service

For further technical information please consult our customer service:

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

Furthermore, we are looking forward to receiving feedback and experiences which result from the application and are useful for the improvement of our products.

2.7 Copyright, trademark rights, GNU licenses

Copyright

Usage of open-source-software

Our firmware partly contains source codes which have been produces under the GNU Public License (GPL) by third parties and released for usage by everybody. This software underlies special open-source-software licenses and the copyright of third parties. Every customer can use the open-source-software freely in principle, according to the license provisions of the respective producer. The rights of the customer to use this software for purposes exceeding the scope of our product are regulated in detail in the regarding open-source-software licenses. The customer can use the open-source-software – as regulated in the respectively applicable license – freely, exceeding the scope of the software within our product.
The utilization of the used open-source-software is possible free of charge. We do not charge a user fee or any other comparable charges for the use of the open-source-software contained in our products.
The GPL code as used in our product is published without guarantee and is underlying the copyrights of the respective author. As far as programs contained in our products underlie the GNU General Public License (GPL), GNU Lesser General Public License (LGPL), Clarified Artistic License or another open-source-software license which prescribes that the source code is to be provided and the software has not been provided in source code on a data medium together with the product, we will provide it at any time upon request. If the consignment on a data medium is required, we will provide this against an additional charge of € 10,-. Please channel your request to our customer support.

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Telefax: +49 (0) 7191/182-200

3 Functional description

3.1 Basic setup of the USM

The USM family of universal fault indicators was developed for systems networked with Ethernet. The fault indicators are used to record 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 indicators are available with 8, 16, 24, 32, 40 or 48 signal inputs. The signal inputs are combined in groups of 8 alarms each. The closed front surface up from software level 3.5 contains 4 buttons, 3 status LEDs, one RGB LED for each alarm with which the 6 color variants (red, green, yellow, blue, orange and white) can be parameterized and pockets for the labeling strips.

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

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

The fault annunciator has a **status memory in case 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 voltage recovery, all states are immediately resumed and the fault annunciator is wide for operating actions and new alarms.

The parameterization of the annunciator is done through the integrated web-server with a web-browser and by uploading of parameterization files. By these means the reporting sequence, input processing, assignment to collective reports and horn triggering can be defined and protocol parameters, IP-address and information object addresses can be parameterized. A detailed description of the parameterization can be found in the section “Parameterization”. Customized special reporting sequences can be realized ex-factory upon request.

The fault annunciator USM provides different interfaces (USB, CAN, SDP, COM and LAN), which will be described regarding functionality and usage in the following sections.

Many energy systems work unmanned at times and only in the event of maintenance or faults is someone on site. For this purpose, two special functions have been integrated into the fault indicators, which are indicated as an additional operating mode by green flashing of the alive LED.

- **Mute function**
  In the operating mode "mute", the horn is not triggered or is automatically acknowledged after a parameterizable time. The function is switched on or off with a button that has been parameterized for this purpose. The operating mode can also be activated via a parameterisable function input. In this case, the muted mode is only active as long as a voltage is applied to the input.

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

Two methods can be used to not only display the individual fault alarms optically, but also to transmit them in parallel to the input or output via 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 in the parameterizable fault annunciators. The relay cards are optional and must be considered when ordering.
2. Connection of external relay modules at the CAN bus socket. For further information on the expansion modules, please refer to the separate data sheet MSM-EM-DB-UK.

For further information on the integrated fault alarm sequences, please refer to the separate documentation "Alarm sequences of the EES fault annunciators".

3.2 Additional cards (optional)

Optionally, analog input cards and relay cards can 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. The inputs can be configured as voltage or current inputs depending on the application. 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 the Modbus RTU/TCP, IEC 60870-5-101/104 or the IEC 61850 interface. Furthermore, the measured values can be monitored, and in case of an error a fault alarm is generated.

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

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

3.2.2 Relay cards

The relay cards (8 NO contacts each) are independent from the 4 function relays of the annunciator and can be assigned the following functions:

1. In- or output parallel multiplication and forwarding of single alarms within the annunciator and without the requirement for connection of external MSM relay modules
2. Output of collective alarms and horn control
3. Control of the relays via the IEC interface

The 8 relays of one board have one common root. Triggering and functionality can be adapted individually by means of the parameterization interface on the web-server, e.g. inversion of the signal or wipe duration for pulse commands. It can be freely selected 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). It is also possible to output special functions, such as horn control or output of a collective alarm on the 1:1 relay. In addition, further parameters are available, e.g. the inversion of the signals and the wiping time for pulse output.

3.3 Dual power supply (optional)

Independent from the primary power supply, a second, redundant power supply can be integrated into the fault annunciator. Two different voltage variants are available:

- 24 – 60 V AC/DC
- 110 – 220 V AC/DC

The voltage level of the redundant power supply can be chosen independently from the voltage level of the primary power supply.

If BSM or USM annunciators are equipped with a redundant power supply unit, the switchover between the switch over between the power supplies takes place automatically without interruption. The primary power supply unit (S1) is used preferentially by the annunciator. If no voltage is applied to S1, the automatically switched to the secondary power supply (S2). When the voltage S1 returns, the primary power supply the primary power supply is also automatically used again. Both power supplies can be operated with AC or DC voltage. A specification is not necessary.

Both the primary as well as the secondary power supply are integrated into the self-monitoring of the annunciator and any malfunction is indicated on the live-contact. Additionally, presence of the supply voltage is indicated for both power supplies by an LED (S1 and S2) on the front of the device. Failure of one of the power supplies is communicated via the communication interface.

3.4 Cascading of several fault annunciators

With cascading, one USM and up to 3 BSMs (BSM-C or BSM-P) can be combined to form a fault annunciation system. In this case, the devices are connected via the system bus provided at the CAN bus sockets using network cables (patch cables). The USM operates as a "master" and the connected BSMs as "slaves". Thus, systems with a maximum of 192 signal inputs (4*48) can be realized. Systems formed in this way behave like one (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 modules cannot be connected to cascaded annunciators.

> The parameterization of cascaded annunciator is only fully done in the “master fault annunciator” by means of the web-server and is distributed automatically to the slave devices. Cascading multiplies the number of function inputs according to the number of devices. A maximum of 8 function inputs are available.
> Information to the BSM annunciators can be found in the separate BSM manual.

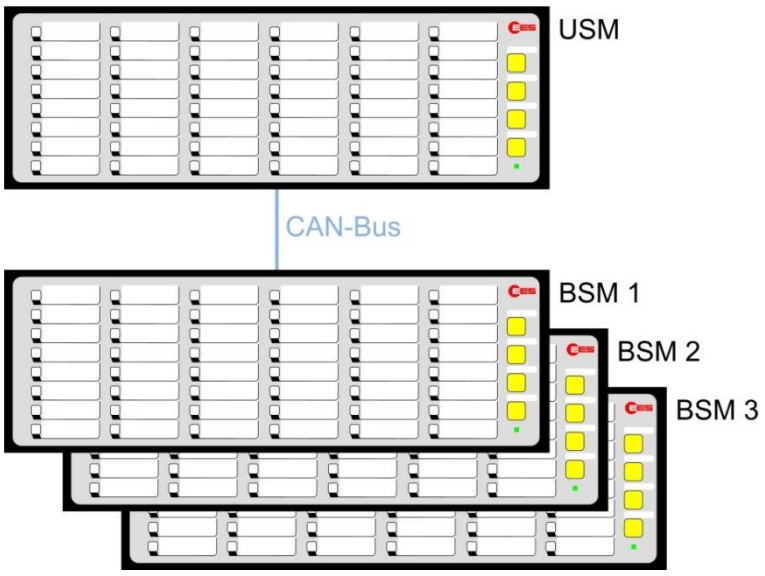


Fig. 3.1: General design of a cascaded fault annunciator system

3.5 Protocol interfaces

For communication to superior or inferior systems (e.g. SCADA or PLC) the USM provides one or two interface cards. Both interface cards contain the following interfaces:

Card 1 (standard)

- 1 x LAN - Ethernet / RJ45 (Parameterization, diagnosis and protocol interface)
- 1 x COM - RS232 / pluggable terminal (serial protocol interface)
- 2 x USB-A
- 1 x CAN-Bus / RJ45 (System bus for connecting expansion modules or setting up fault alarm cascades) - see also section "Cascading"
- 1 x USB-B (factory interface) diagnostic interface

Card 2 (optional)

- 1 x LAN - Ethernet / RJ45 (protocol interface)
  alternatively
  1 x optical interface Multimode 50-62,5/125 µm @1300 nm;
  Connector SC duplex (according to standard IEC 60874-13) (protocol interface)
- 1 x COM - parameterizable RS232 or RS485 / pluggable terminal (serial protocol interface)

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

- Modbus RTU/TCP (fault annunciator is a Modbus slave)
- IEC 60870-5-101 (fault annunciator is an IEC server)
- IEC 60870-5-104 (fault annunciator is an IEC server or client)
- IEC 61850 (fault annunciator is an IEC server) optional

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

3.6 Applications for networking fault annunciators

3.6.1 USM as an acquisition module in IEC 60870-5-101/104 structures

The image below shows an application example where the USM annunciators act as acquisition devices which process and display alarms locally. In addition, the alarms are forwarded to the SCADA level through IEC 60870-5-101 or -104.

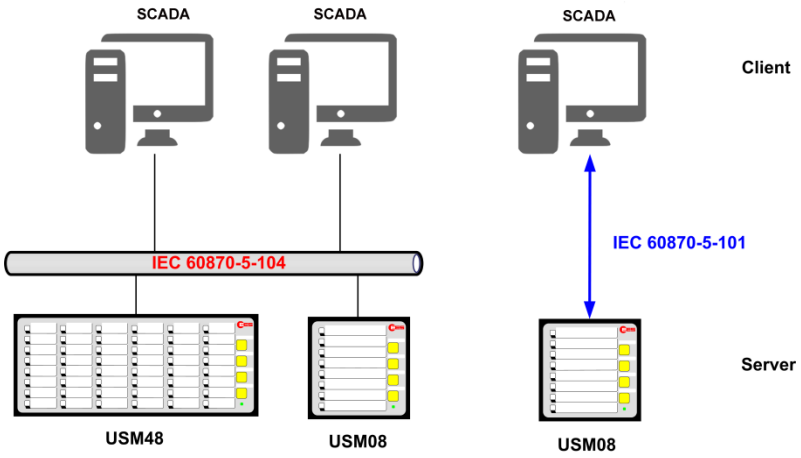


Fig. 3.2: Application example for communication of USM acquisition devices (IEC-Server/Slave) with an IEC-Client/Master.

> The single alarm channels can alternatively be triggered from the galvanic input or from the IEC interface. These options can be chosen individually for each channel. Acknowledgement through the IEC interface is possible as well.

3.6.2 USM as an output module in IEC 60870-5-104 structures

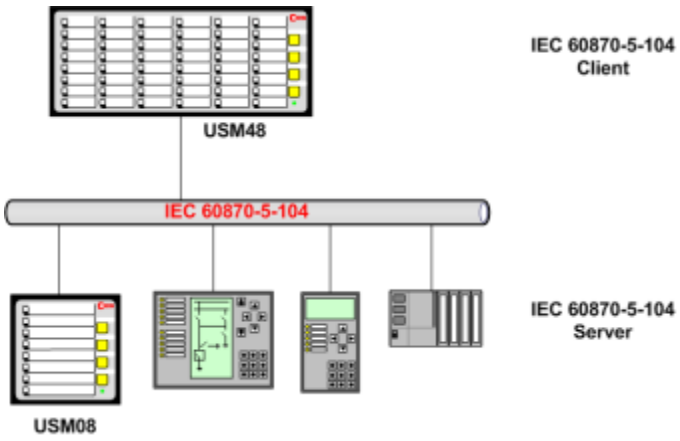


Fig. 3.3: Application example with USM as an output module

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

3.6.3 Mirroring of single alarms

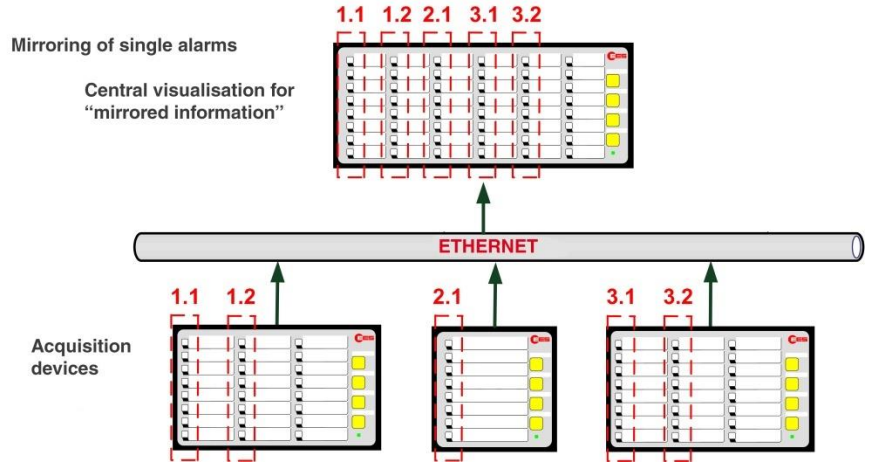


Fig. 3.4: Application example for mirroring

For large plant areas and complex processes, the following are often performed at central points or in control rooms important individual alarms from the field are required. In classic systems, 1:1 relays are used here, which means a high wiring effort. With USM fault indication 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 fibre 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.

3.6.4 Protocol IEC 61850 (optional)

Information from field and protection devices in automated switchgear is transmitted via the IEC 61850 protocol. 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 the field or station level.

With the aid of the optionally integrable IEC 61850 server, the fault indicators of the USM series take on this "rag man" function. Individual alarms and, with the help of the optional analogue inputs, measured values can be transmitted. Individual reports and datasets can be easily configured to provide all relevant information on the alarm and device status. When creating the file, you can choose between editions 1.0, 2.0 and 2.1 of the IEC standard. The data exchange takes place according to MMS via GGIO.

Furthermore, the USM can monitor the IEC 61850 communication (e.g. from the control system to the USM). A configurable time is monitored in which the communication partner must periodically report to the USM. If the time is exceeded, a freely assignable digital input is activated. Furthermore, the USM can also be configured to monitor third-party devices if these can operate as IEC 61850 masters.

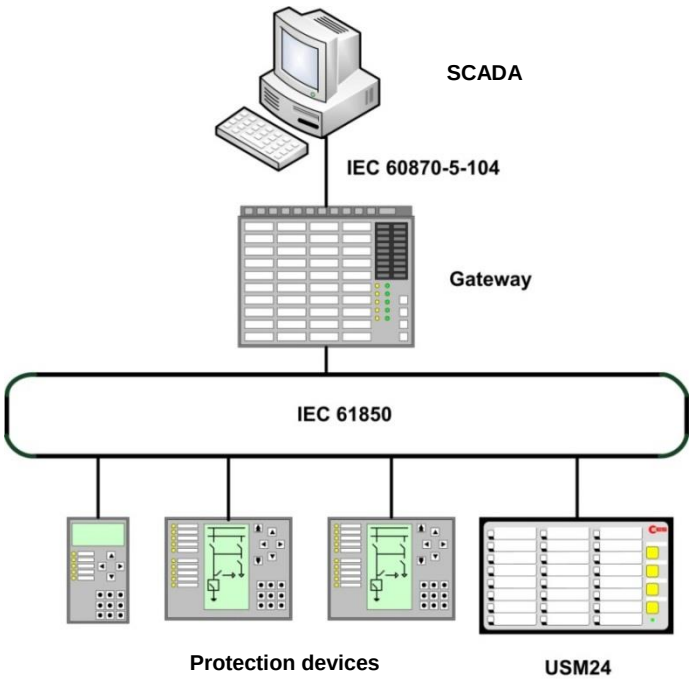


Fig. 3.5: With the optionally available software license IEC 61850 the USM can be integrated into IEC 61850 structures

The individual reporting channels can alternatively be controlled via a galvanic input or the 61850 interface. Which of these two possibilities is used for each individual channel can be parameterized. An acknowledgement via the 61850 interface is possible as well.

3.7 IP security according to BDEW guidelines

A white paper with basic security measures for control and telecommunications systems has been developed for companies in the energy industry. The goal is to adequately protect the systems against security threats in daily operations. This optional function "IP-Security" serves to fulfill these requirements. The following functions have been added or extended for this purpose. For this purpose, the following functions have been integrated that meet the requirements of BDEW Whitepaper 2.0 05/2018.

- User administration (in the delivery state, only an administrator with a unique device-specific start password)
- Firewall settings
- Certificate management
- File transfer via SFTP (Secure File Transfer Protocol)
- Communication using HTTPS (Hypertext Transfer Protocol Secure)

In addition, the optional Port Security extension can be integrated, which allows authentication of the annunciator according to the IEEE802.1X protocol.

For detailed information on the IT security functionalities, please refer to the separate documentation → **MSM-SEC-BA-UK**.

3.8 User management

The fault annunciator has a user administration which allows the creation of users in 3 groups with different access rights.

- Administrator
  (rights of the User group, user administration, updates, security settings (firewall) and import and export of users)
- User
  (Permission to view the non-security settings)
- Engineer
  (rights of the group User, setup of fault alarm parameters, import and export of device configurations)

3.9 Event recorder

A logbook is kept in the USM, in which the following event groups can be archived with consecutive event number and time stamp:

- Alarm events incl. acknowledgement
- System error signals incl. switching on and off of the power supply
- Events of the protocol interface
- Safety-relevant events

Here the user can determine which event categories are included in the archive.
The log can be displayed on the web server and exported as a CSV file.

The alarm log is managed as a ring buffer and can hold 100,000 alarms. In case of overflow of the alarm log, an error signal is output by default (configurable).

> In the delivery state, only the system-relevant part of the event recorder is active.
> The logging of alarm events must be activated manually.

3.10 Labelling

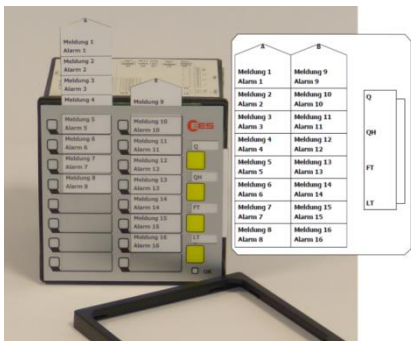


Fig. 3.6: Insertion of labelling strips after removing the front frame

Labelling of the annunciators is done by means of designation strips that can be inserted beneath the cover foil after removing the front frame.

The designation strips with signal names can be created and printed directly from the parameterization interface on the web-server or generated manually from labelling strips in Word-format.

3.11 Monitoring LEDs, buttons and connections

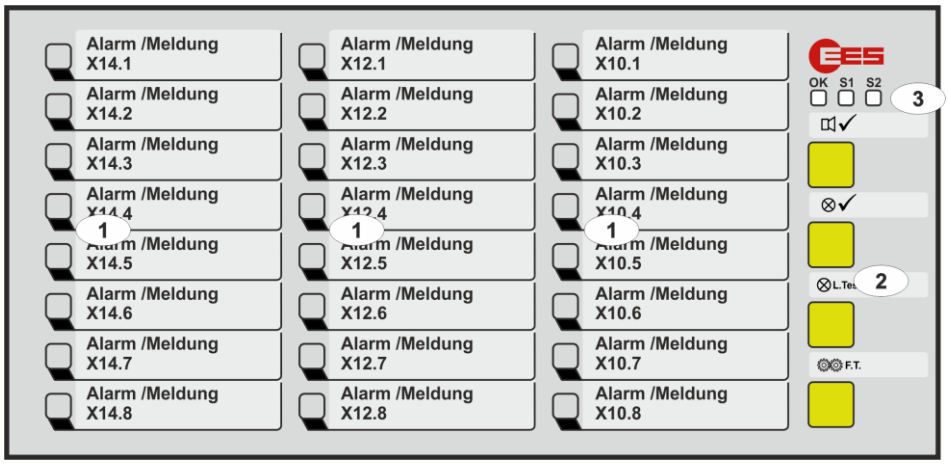


Fig. 3.7: Front view of the USM24

[1] Alarm LEDs (function depending on reporting sequence)
[2] Buttons 1 … 4, (function depending on reporting sequence and parameterization)
[3] Monitoring LEDs

OK – Watchdog LED „Self-monitoring“

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 of an alternative operating state (see table below)

S1 – Watchdog LED supply voltage 1

Off	- No supply voltage 1 and 2
Steady light red	- Error supply voltage 1
Steady light green	- Supply voltage 1 error free

S2 – Watchdog LED supply voltage 2 (redundant supply)

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

Flashing sequence	Alternative operating mode	Note
long – short	Mute function active	As long as the operating mode is activated, the horn is not triggered or automatically acknowledged after the parameterized time.
long – long – short	Unmanned mode	As long as this operation mode is activated, no optical or acoustical output of alarms at issue is triggered. The internal alarm processing as well as triggering of relays and IEC communication stays active though. The alarm acknowledgement on the fault annunciator is deactivated.

Table 3.1: Indication of alternative operating states of the USM by green flashing of the Watchdog LED "OK"

During the initialisation process of the fault indicator after the restart, the three control lamps "OK", "S1" and "S2" light up green several times in succession.

The illustration of the USM with 24 reporting channels is given here only as an example to clarify the principle. The number of reporting channels and the LED colors of the watchdog LEDs may vary depending on the configuration and size of the annunciator.

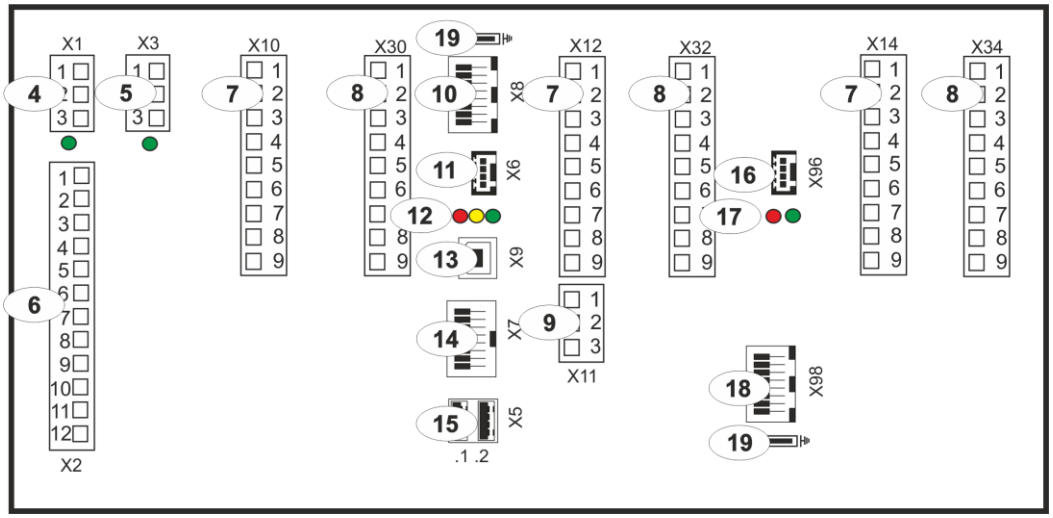


Fig. 3.8: Back view of the USM24

[4] Terminals supply voltage 1 (green LED indicates present voltage)
[5] Terminals supply voltage 2 (redundant supply voltage optional)
(green LED shows present voltage)
[6] Terminals function relays 1 - 4
[7] Terminals alarm inputs
[8] Terminals additional cards (optional)
[9] Terminals function inputs 1 and 2
[10] LAN connection (Ethernet / RJ45)
[11] Terminals serial interface (RS232 optional RS 485)
[12] Watchdog LEDs „Communication“
red - Tx serial interface
green - Rx serial interface
yellow - Can-Bus
[13] Service- and diagnosis interface USB-B (factory interface)
[14] CAN-Bus interface (Systembus / RJ45)
[15] 2 x USB-A interface
[16] Terminals serial interface (RS232 optional)
[17] Watchdog LEDs „Communication“ (optional)
red - Tx serial interface
green - Rx serial interface
[18] LAN connection (Ethernet / RJ45, optional)
[19] Connection for ground potential

On the USM 08, terminal X11 (function inputs) is not located under terminal X12, but under terminal X10.

3.12 Diagnosis

For monitoring and evaluation of the system functions different diagnosis information are available. These are e.g. the signalling of errors on watchdog LEDs or relay contacts or the provision of error information on the protocol interface by means of the data object “error”.

3.13.1 Watchdog-LED „Self-monitoring“ and fault annunciating relays

The watchdog-LED „self-monitoring“ gives information about the current status of the annunciator device or system:

- Steady light green - No error
- Flashing green - Initialisation or alternative operating mode (see section 3.9 “Monitoring LEDs”)
- Flashing red - Error (see section “Error codes”)
- Off - No power supply

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

- Number of long flashing pulses → 1st digit of the error code
- Number of short flashing pulses → 2nd digit of the error code
- Pause

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

If multiple errors are at issue, the LED displays the error with the highest priority.

3.13.2 Error codes

The error codes listed in the following table correspond to the red flashing sequence of the "Operating mode" control LED of the USM.

Example:

Error 68	*- Connection to NTP Server disturbed*
Flashing sequence of OK-LED	*- long, long, long, long, long, long*
	- short, short, short, short, short, short, short, short, pause

In the following table, the error codes of the USM are enlisted.

Error code	Error	Note
1	Collective error	This error is additionally triggered if any error occurs in the fault annunciator.
11	Internal error	If the error still is at issue after restart of the device, the device needs to be returned to EES for inspection.
12	Internal error	
13	Overflow alarm buffer	After a surge of alarms, interstages of alarms can be lost. The final stages of the alarms are valid.
14	Relay cards	If the error still is at issue after restart of the device, the device needs to be returned to EES for inspection.
15	Communication within cascaded annunciator system disturbed	This error can occur in cascaded systems. It will be issued when the connection between the USM and at least one of the slaves (BSM) is disrupted. Please verify the configuration of the slave addresses and the connection cables.
17	Operating voltage 1 missing	This error can occur in annunciators with dual power supply.
18	Operating voltage 2 missing	
19	Configuration inconsistent	The downloaded configuration does not match the hardware of the device (e.g. USM08 and USM16).
31	License error	The IEC 61850 license does not match the device. Has the right license file been downloaded to the device? Please contact customer service.
32	CID-file missing	Please download CID-file to the device.
33	Parameter file missing	Restore factory setting via web server, then perform parameterization again or import. Contact customer service if the error persists.
34	Imported configuration is faulty	Download correct file to the device or restore default setting by means of the web-server.
35	Faulty CID-file	The downloaded CID-file is incorrect. Please download the correct CID-file to the device.
41	Extension address incorrect	In cascaded systems The slave generates the error when it is set to address "0".

Table 3.2-1: Error code of the USM part 1

Error code	Error	Note
42	Extension address multiple	In cascaded systems • Master generates the error when a slave is set to address "0" • Slave generates the error if another slave with the same address transmits. There are two Slave devices with the same address.
48	Wire break 4 – 20 mA sensor	If the measuring mode of an analog input is set to 4 - 20 mA, this error is displayed in case 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	Ethernet connection 1 (X8)	Ethernet connection faulty - Check the Ethernet cable at the USM and the remote terminal (switch).
65	Ethernet connection 2 (X98)	
67	IEC104 Client GA incomplete	The IEC server can be reached by the client, but the general interrogation returns incomplete data. - Check the configuration in the server.
68	NTP connection	Connection to NTP-Server disturbed. The error is generated if neither of the two parameterizable NTP servers is accessible within 10 minutes. To facilitate commissioning, this error is signaled after only 10 seconds after switching on the voltage or accepting a changed parameterization.
160 - 191	Connection error to the respective IEC 104 server (Link 1 – 32)	If the USM is operated as a client, links can be set in the menu "Parameters/Protocols/IEC160870-5-101/104" menu, links to a maximum of 32 servers can be parameterized. For each of these links an error message is provided.

Table 3.2-2: Error codes of the USM part 2

3.14 Terminal assignments

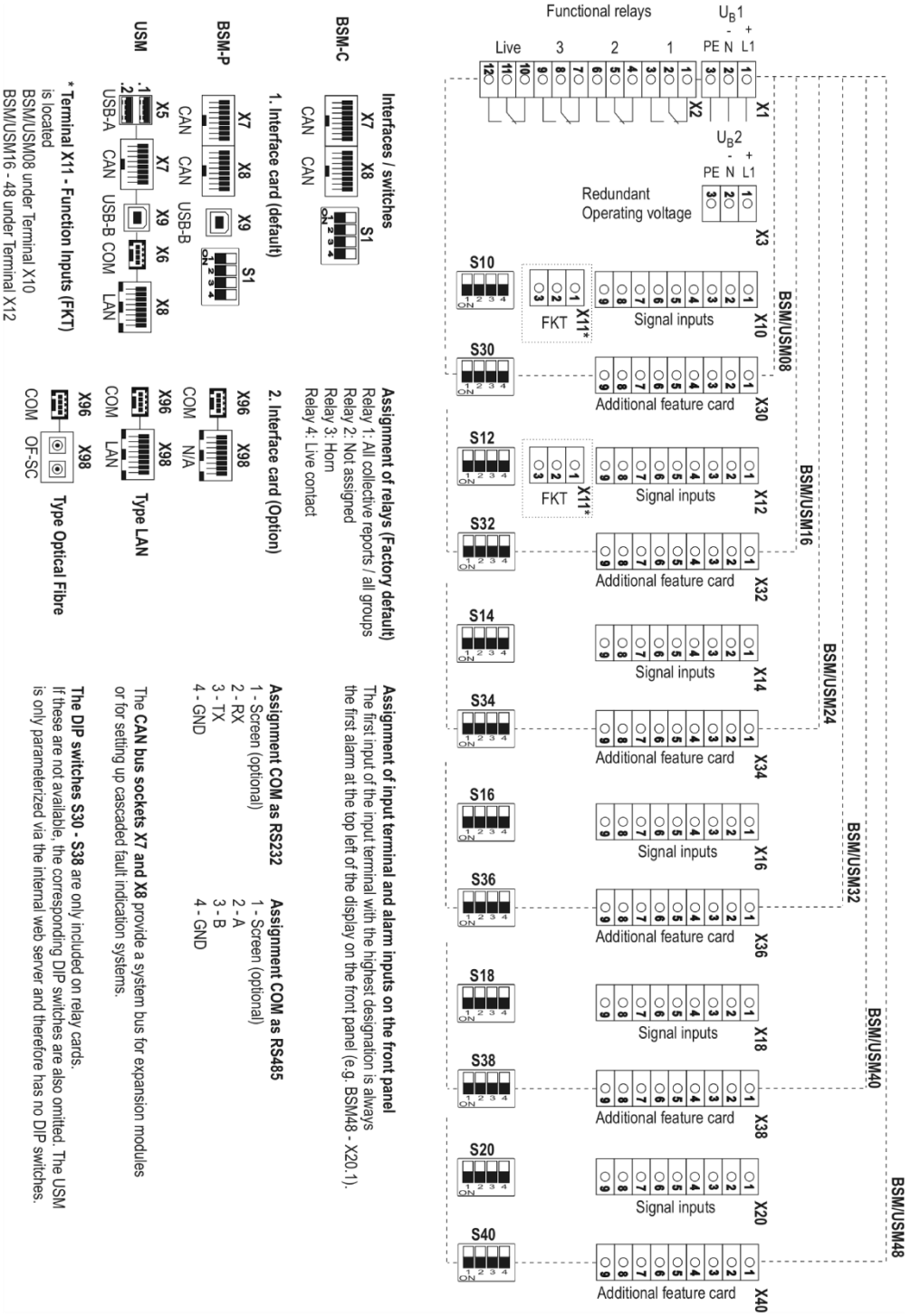


Fig. 3.9: Terminal assignments of the USM

Detailed terminal assignments

Function inputs (X11)

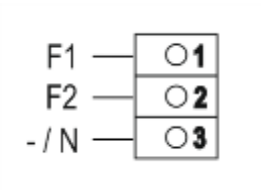


Fig. 3.10: Terminal assignment of the function inputs

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

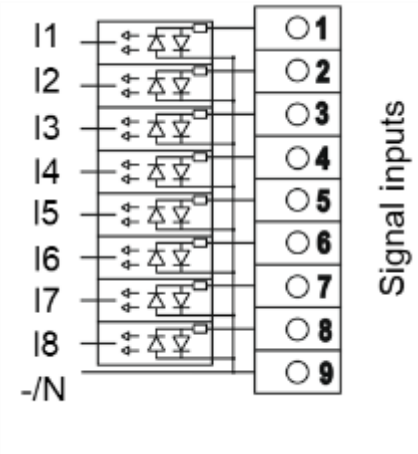


Fig.3.11: Terminal assignment of the signal inputs

Optionally, additional cards can be integrated in the versions 4 analog inputs and 8 relay outputs. Analog input cards have blue terminals for better differentiation. The following sequence is used while arranging the additional cards. Relay cards are always arranged first, starting from the rear on the right (slot with the highest terminal number) in descending order. Analog input cards are then added to the left of them 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 the slots X38, X36 and the analog input cards in the 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 the slots X38, X36 and the analog input cards in the slots X34 and X32. Slot X30 is not occupied.

Analog inputs

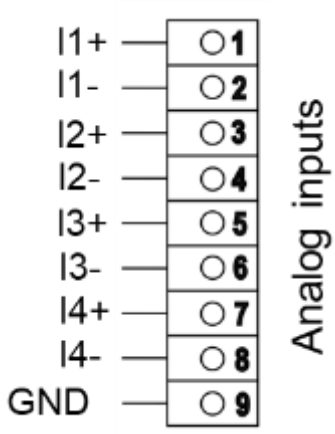


Fig. 3.12: Terminal assignment of the analog inputs

Output relays

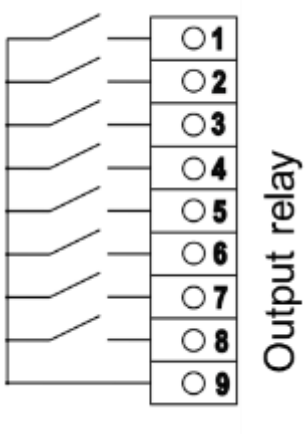


Fig. 3.13: Terminal assignment of the output relays

Connection variants of the sensors to analog inputs

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

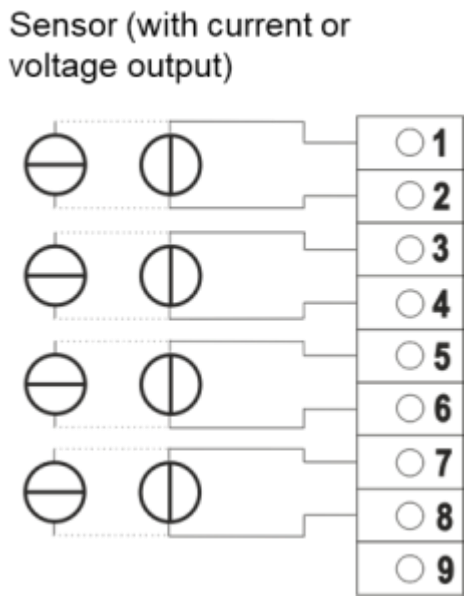


Fig. 3.14 Potential-separated sensors

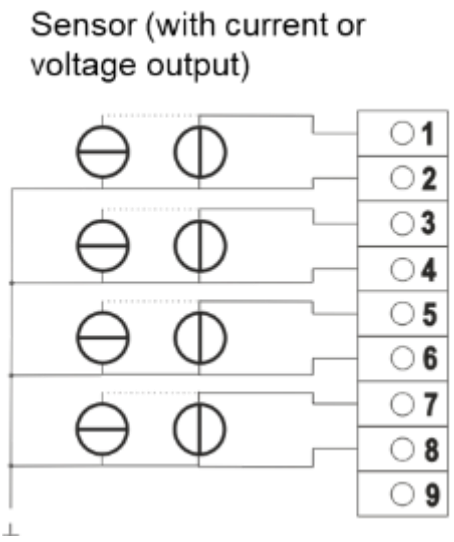


Fig. 3.15: Sensors with common reference ground (Ground connected to sensor)

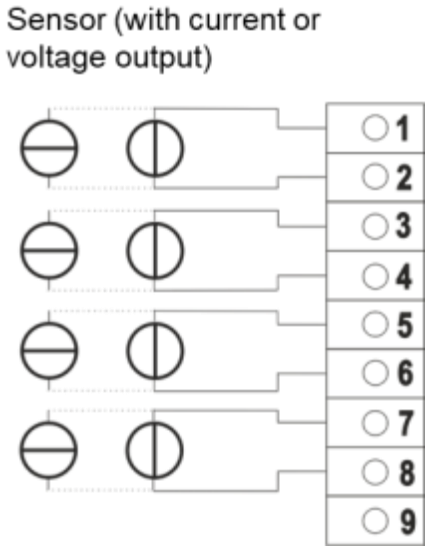


Fig. 3.16 Sensors with common reference ground (Ground connected to the input terminals)

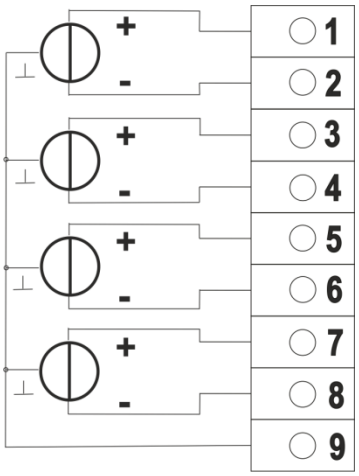


Fig. 3.17 Sensors with differential output

3.15 Front and back views of the USM

3.15.1 USM 08

The following pages show the front and rear views of the fault indicators. Please note the arrangement of the terminals of the signaling inputs and their assignment to the displays in the front. The units are each shown with the maximum configuration, i.e. all options. For units which do not have these options, the corresponding terminals are omitted.

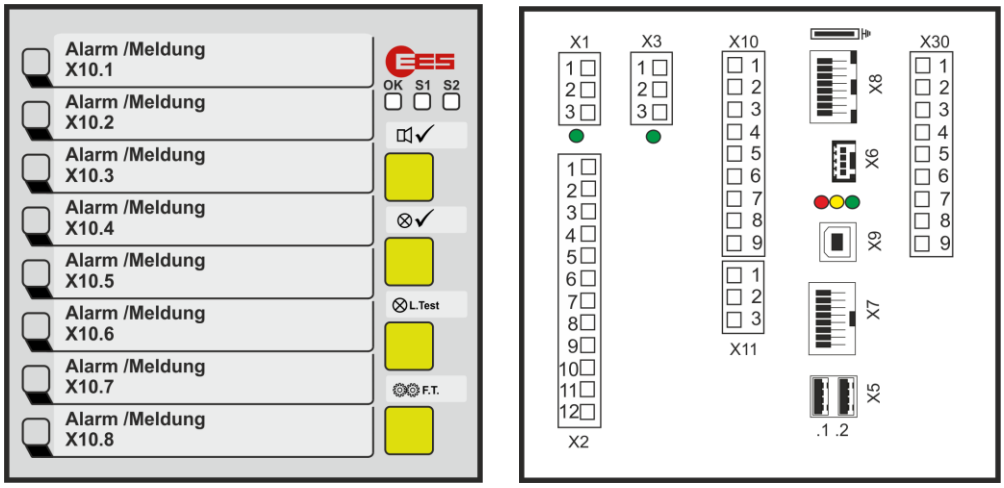


Fig. 3.18: Front and back view of the USM 08

3.15.2 USM 16

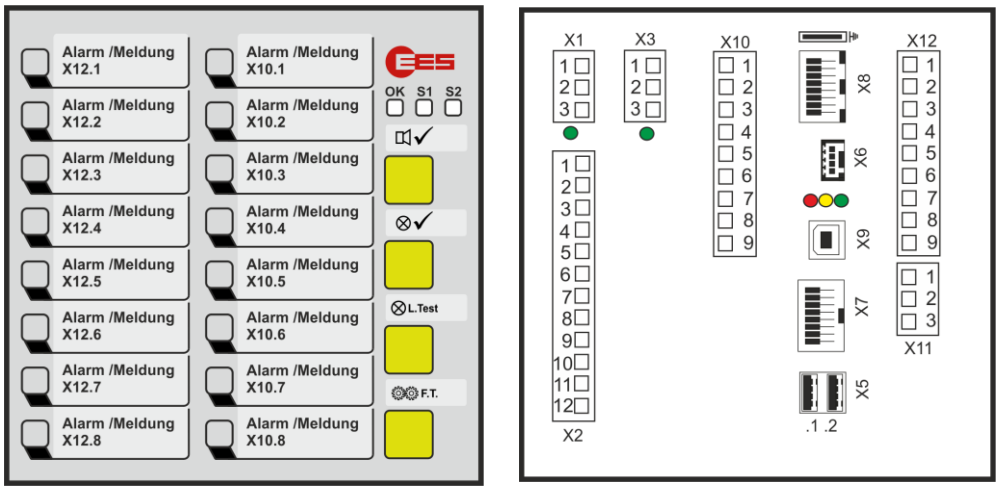


Fig. 3.19: Front and back view of the USM 16 in housing 96 x 96

3.15.3 USM 16 in wide housing

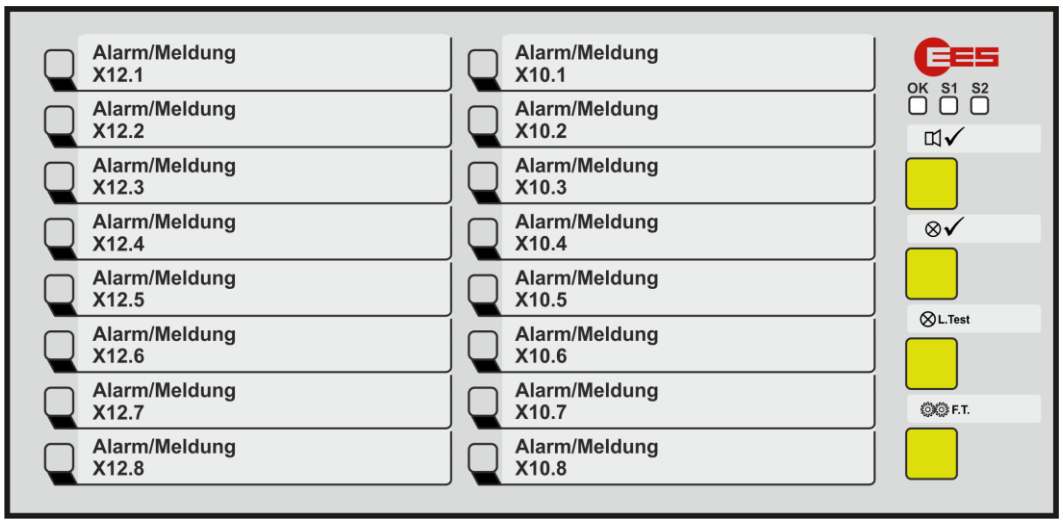


Fig. 3.20: Front view of the USM 16W in wide housing 96 x 192

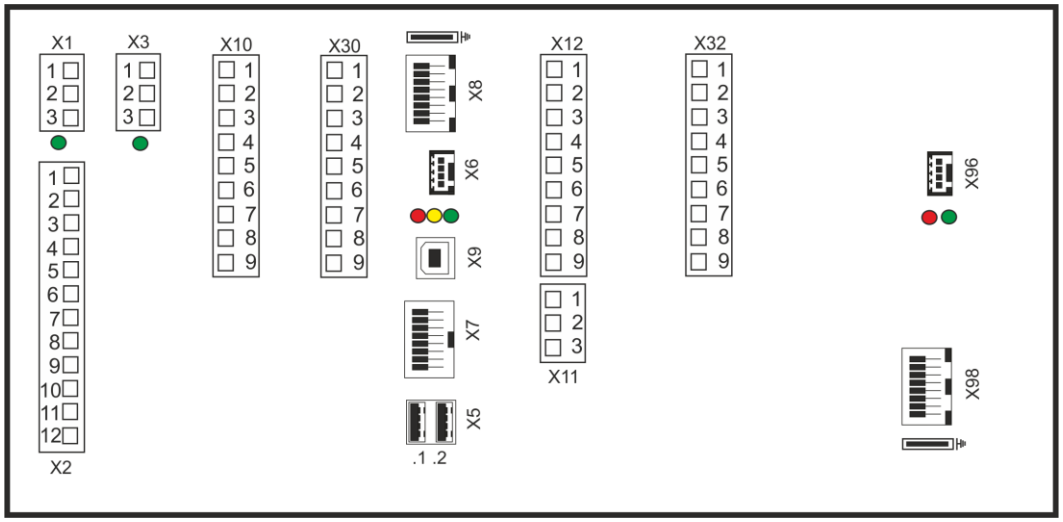


Fig. 3.21: Back view of the USM 16W in wide housing 96 x 192

3.15.4 USM 24

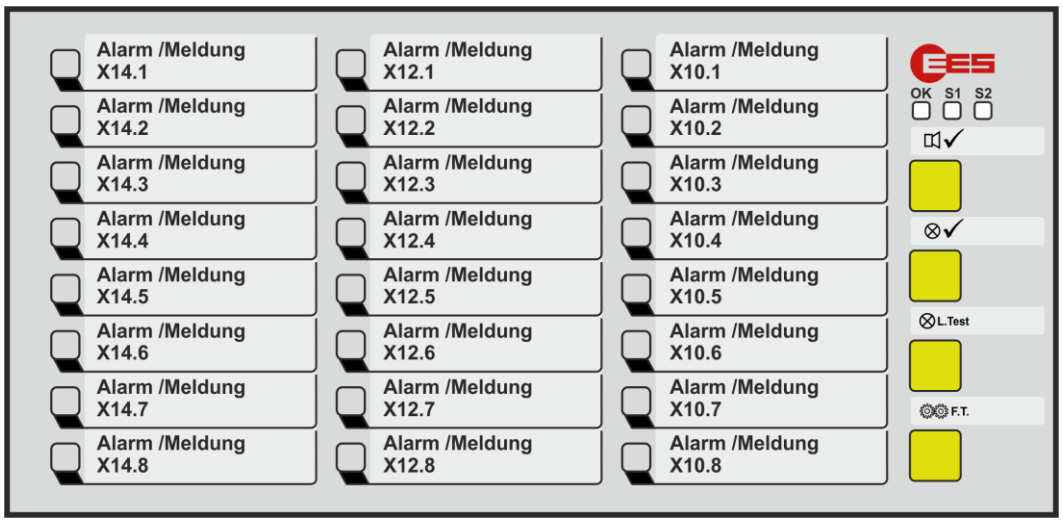


Fig. 3.22: Front view of the USM 24

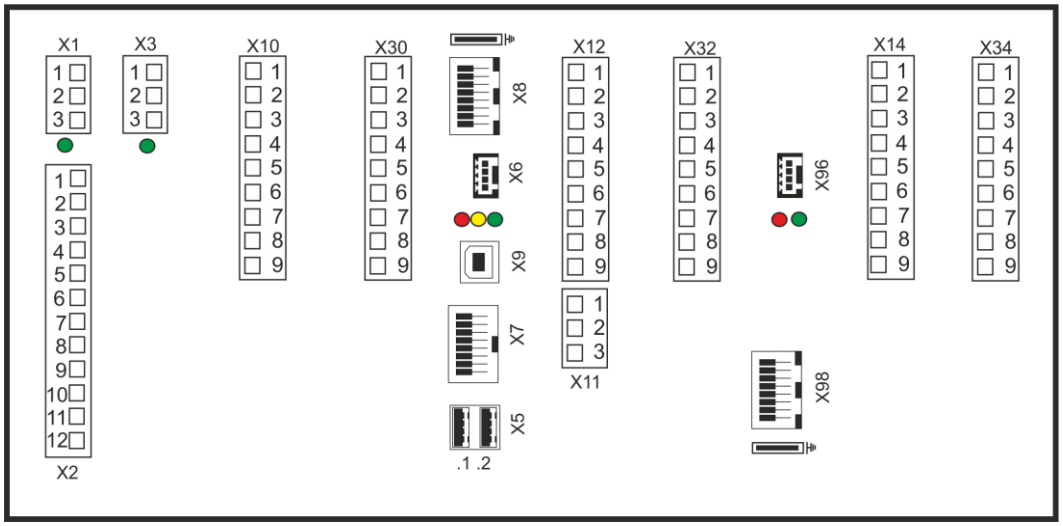


Fig. 3.23: Back view of the USM 24

3.15.5 USM 32

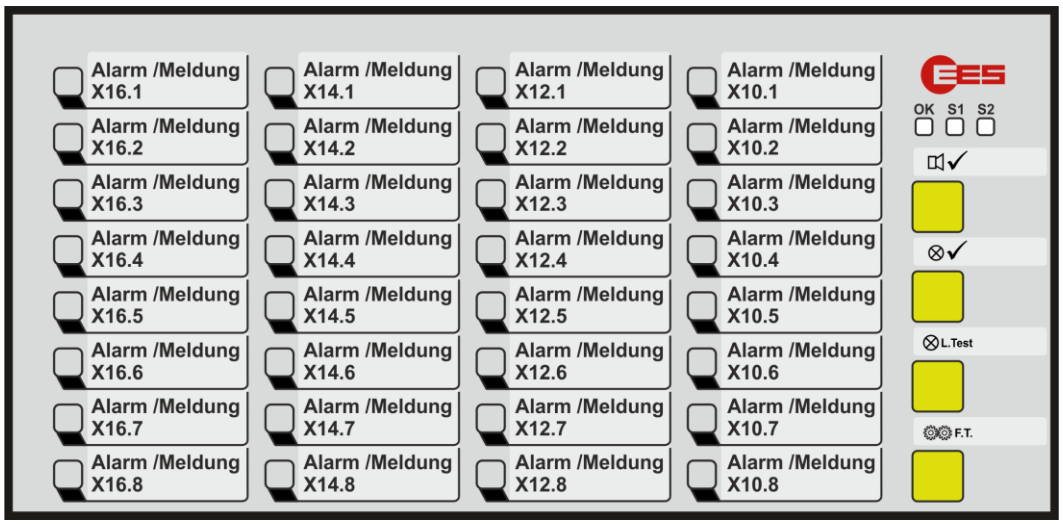


Fig. 3.24: Front view des USM 32

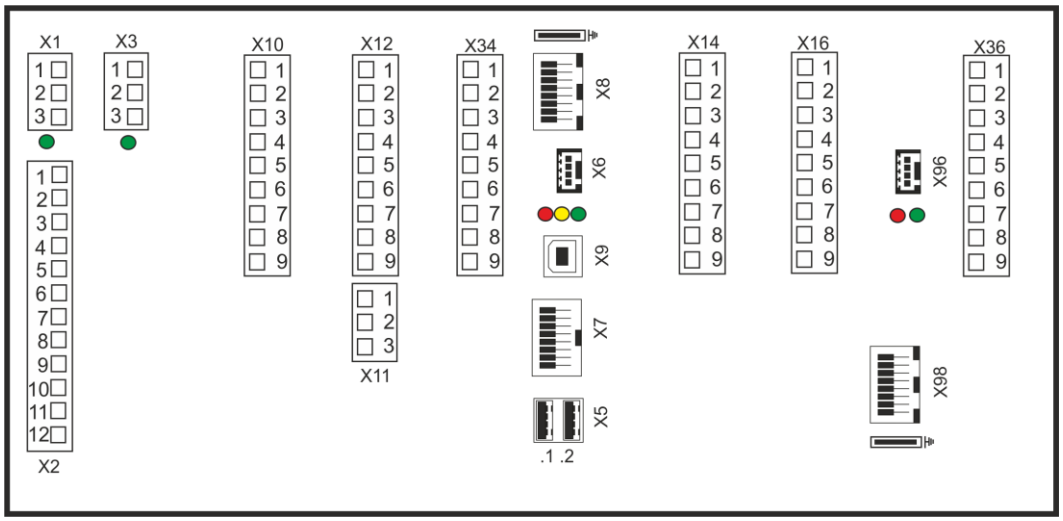


Fig. 3.25: Back view of the USM 32

3.15.6 USM 32 in wide housing

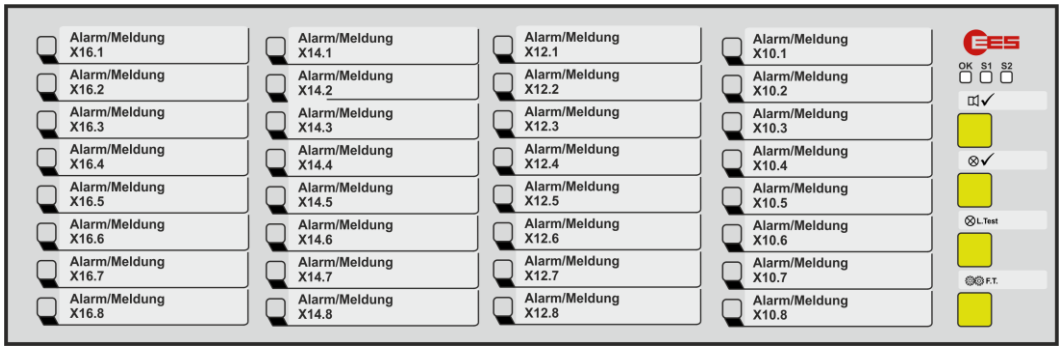


Fig. 3.26: Front view of the USM 32 in wide housing

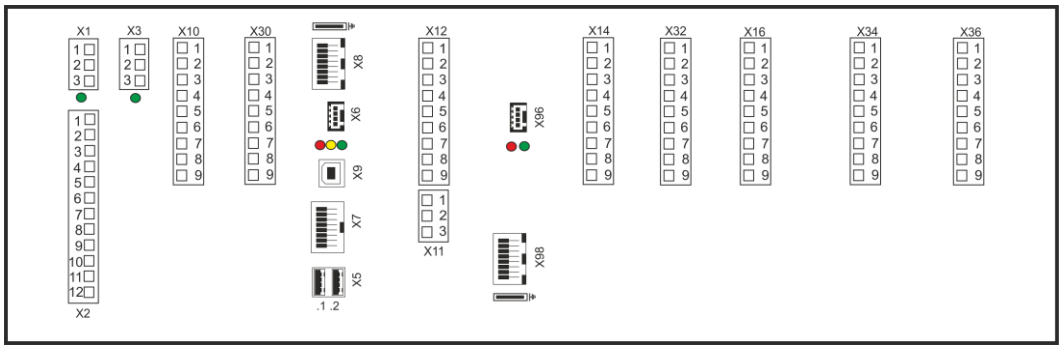


Fig. 3.27: Back view of the USM 32 in wide housing

3.15.7 USM 40

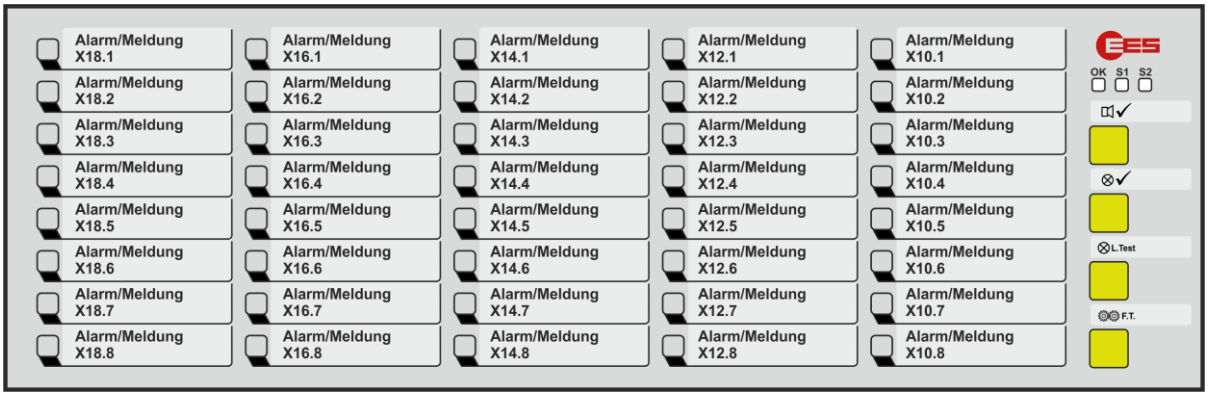


Fig. 3.28: Front view of the USM 40

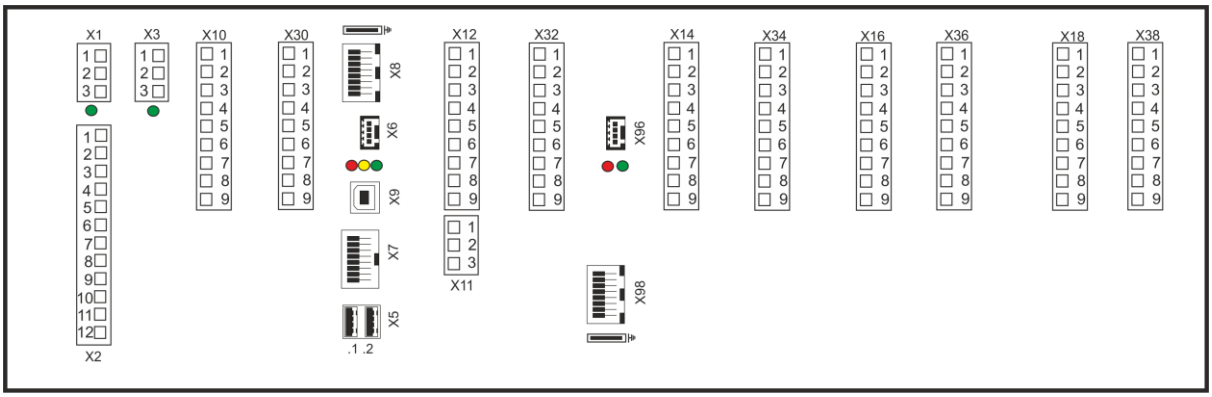


Fig. 3.29: Back view of the USM 40

3.15.8 USM 48

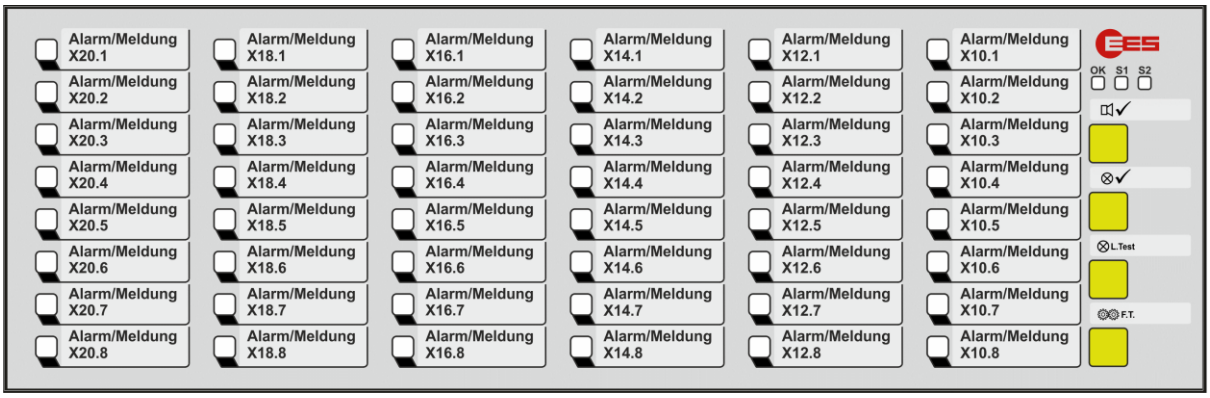


Fig. 3.30: Front view of the USM 48

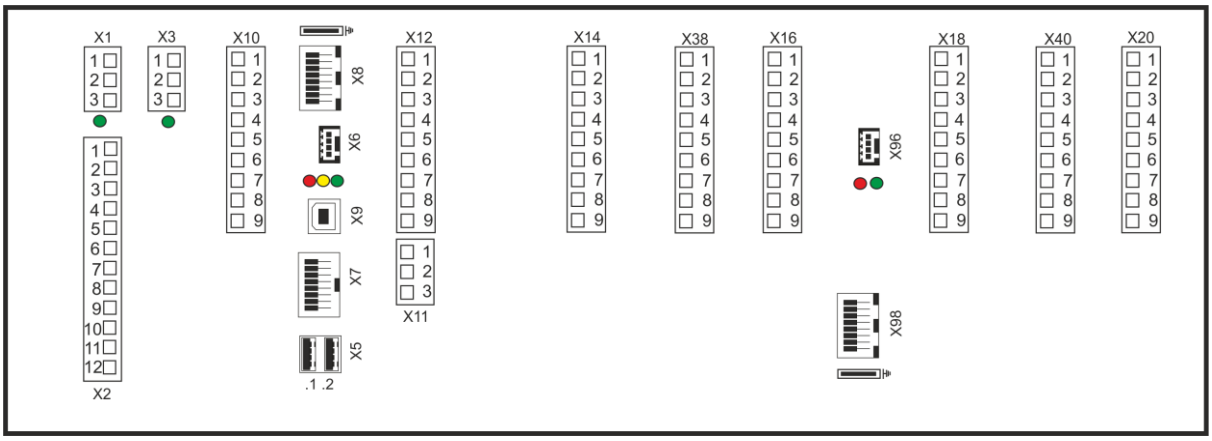


Fig. 3.31: Back view of the USM 48

3.16 Input and LED assignment

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 labels on the front panel in the drawing below.

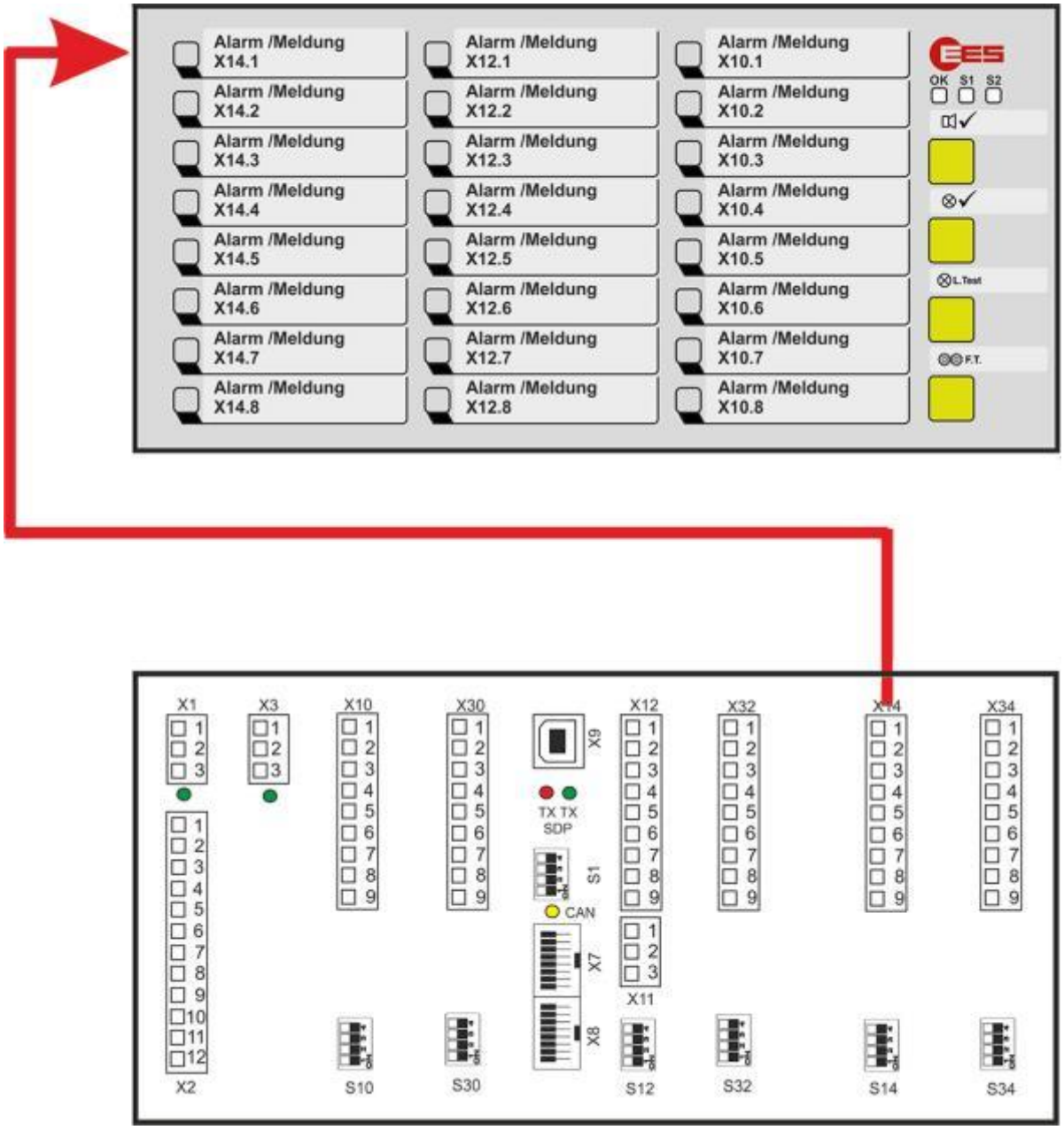


Fig. 3.32: Assignment between alarm input and LED display using the example of a USM 24

3.17 Technical data

Supply voltage U_{Sup}

Key	Rated voltage	Voltage range
1	24 V AC/DC	19…37 V DC or 14…26 V AC
2	48 V AC/DC or 60 V DC	37…73 V DC or 26…51 V AC
5	110 V AC/DC or 220 V AC/DC	85…370 V DC or 85…264 V AC

Table 3.3: Supply voltage keys - USM

Signal voltage U_{Sig}

Key	Rated voltage [V AC/DC]	Threshold for alarm		Maximum permitted voltage [V AC/DC]	Input current per input @ 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
E	60	42	54	75	1,6
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 3.4: Signal voltage keys - USM

The voltage U_{Sig} is valid for signal inputs and function inputs.

If not specified otherwise, the given information for alternating voltage are effective values and refer to a sinusoidal alternating voltage with a frequency of 50/60 Hz.

Analog inputs

Resolution	12 Bit
Measuring tolerance of the measuring range end value	T_{amb} = -20…60 °C: <= +/-0,5 %
Voltage input	
Measuring range (U_{DIFF})	-10…+10 V (SELV, PELV)
Overvoltage resistance	+/- 26 V
Input resistance (U_{DIFF})	>= 200 kΩ
Measured value resolution	<= 5 mV
Common mode voltage (U_{COM})	-10...+10V
Current input	
Measuring range (I_{DIFF})	0...20mA (SELV, PELV)
Overvoltage resistance	+/- 10 V
Input load	<= 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]			
	BSM	BSM with the maximum amount of relay cards	USM	USM with maximum amount of additional cards
8	< 4	< 6	< 8	< 10
16	< 5	< 9	< 9	< 13
24	< 5	< 13	< 10	< 17
32	< 6	< 11	< 10	< 15
40	< 7	< 19	< 11	< 24
48	< 8	< 13	< 12	< 17

Table 3.5: Power consumption - USM

General data

Buffer time in the event of failure / short circuit	100 ms
Response delay (flutter suppression)	adjustable (0 … 1000 ms), factory setting 5 ms
Signaling delay	adjustable (5 ms … 9 h), factory setting 100 ms
Flashing frequency	
Flashing	2 Hz
Slow flashing	0,5 Hz
Ethernet connection (only USM)	100 Base-T / RJ45
Fibre optic connection (optionally USM)	Multimode 50-62,5/125 µm @1300 nm; Plug SC-duplex acc. to norm IEC 60874-13

Mechanical data

Type BSM/USM	Front frame H x W x D [mm]	Panel cut-out [mm]	Depth with front frame and terminals [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 the wide housing variant 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 3.6: Measurements of the USM

Mounting	Panel mounting
Required installation depth	120 mm
Minimum horizontal gap between 2 devices	15 mm
Connection terminals	pluggable
Wire cross section rigid or flexible	
Without wire sleeves	0,2 ... 2,5 mm^2
With wire sleeves	0,25 ... 2,5 mm^2

Environmental conditions

Operating ambient temperature	-20°C .... +60°C
Storage temperature	-20°C .... +70°C
Duty cycle	100 %
Protection class at the front	IP 54
Protection class in the back	IP 20
Humidity	75% r.h. max. on average over the year; up to 93% r.h. during 56 days; condensation during operation not permitted [Test:40°C, 93% r.h. > 4 days]

Electric Data

Dielectric strength	
Alternating voltage strength	
RS232/RS485 interface 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)	3.0 kV AC / 50 Hz 1 min
Supply (12 / 24 / 48 V AC/DC)	1.0 kV AC / 50 Hz 1 min
Relay outputs against each other	500 V / 50 Hz 1 min
Surge voltage strength	
RS232/RS485 against	
Digital inputs	2.5 kV ; 1.2 / 50 µs; 0.5 J; according to IEC60255-27
Relay outputs	2.5 kV ; 1.2 / 50 µs; 0.5 J; according to IEC60255-27
Supply	2.5 kV; 1.2 / 50 µs; 0.5 J; according to IEC60255-27
Relay outputs against each other	500 V; 1.2 / 50 µs; 0.5 J; according to IEC60255-27

Electromagnetic compatibility

Noise immunity acc. to	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
Noise irradiation acc. to	DIN EN 61000-3-3 DIN EN 55011

The devices are designed and manufactured for industrial applications according to EMC-standard.

Note!
Incorrect use (e.g. deviations of temperature, supply or signal voltage from the specified values) can cause damage to the devices.

Subject to technical changes without prior notice

4 Mounting and installation

Warning!
The devices is only allowed to be installed by qualified personnel (electricians) with the operating voltage switched off.

1. Unpack all modules of the delivery and check for possible transport damages. Report any transport damages to the responsible forwarding agent immediately. Please verify the integrity of the delivery according to the shipping documents.

2. Insert the annunciator into the prepared panel cut-out and fix it with the fasteners at the side of the device.

3. Connect the in- and outputs of the annunciator.

   The length of the wires of the in- and outputs should not exceed 3 m.

4. Connect the fault annunciator to the network / LAN by patch cable RJ45.

5. For a cascaded annunciator system, connect slave devices according to steps 2 and 3 and connect the cascaded annunciator to each other by means of a patch cable through the CAN-Bus-interfaces (terminal X7 at the USM and terminals X7/X8 at the BSM).

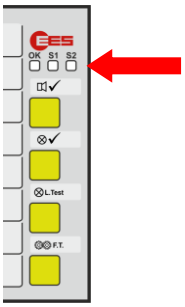
6. Connect the power supply and activate power supply.

   The length of the power supply wires should not exceed 10 m.

7. Parameterize the fault annunciator (refer to section “Parameterization”).

8. After switching on, the fault annunciator requires about 30 s for the system test and initialization, which is completed with alternate green flashing of the "OK", "S1" and "S2" indicator lamps.

   Watchdog LED „Self-monitoring” is in steady light – the fault annunciator is operational. If the Watchdog LED is flashing red, there’s an error (see section “Diagnosis“)



5 Parameterization

The parameterization of the USM is done through the integrated web-server by means of a web-browser. For access to the web-server, the network interface (terminal X8) of the USM has to be connected to the PC.

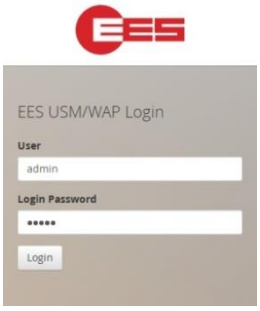
System requirements

- Internet browser with **activated Javascript**
  We recommend to use the most recent versions of Mozilla Firefox (version 78 upwards), Google Chrome (version 79 upwards) or Internet Explorer (version 11 upwards). Usage of other browser tools can lead to limitations in functionality.
- Recommended monitor resolution from 1280 x 800

The IP address 192.168.1.99 is set in the delivery state. Please consider the network settings at your PC and the configuration of the network.

For initial parameterization, call up the configuration interface in your browser

https://192.168.1.99



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.

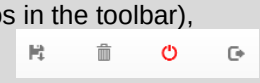
Fig. 5.1 Login window

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

The identification of each logged in browser is done by a random 32 byte session ID. No cookies are being used. Up to 8 sessions (logged-in users) are possible at the same time. The sessions are monitored by a timeout and automatically closed when this time is exceeded.

Currently you are logged in as administrator. As administrator you have full rights for user administration, firmware updates, changing security settings and all rights of 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 (first of the 4 logos in the toolbar),



log out (logo on the right side of the toolbar) and log in with the new user name log in again with the new user name (of the group "engineers").

After logging in, the following page opens up:

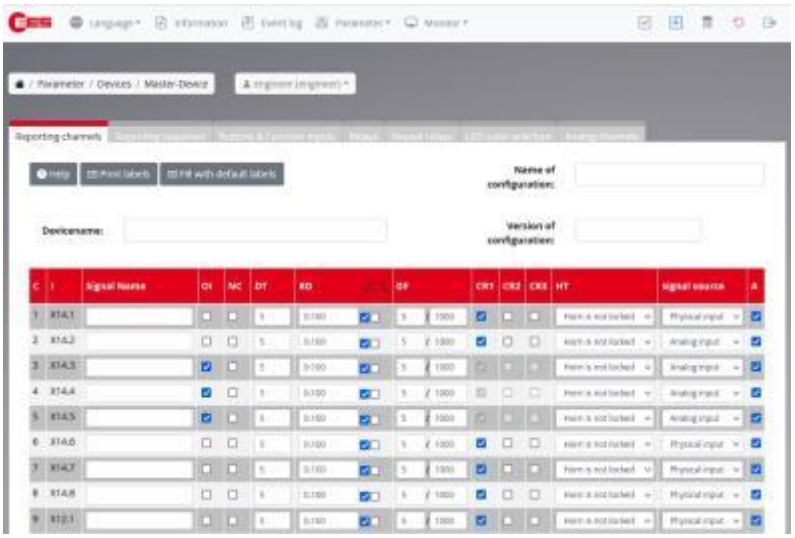


Fig. 5.2: Start page of the USM web server, tab reporting channel after logging in as engineer

The menu bar next to the EES logo contains the four main menus:

- **Language**
- **Information**
- **Event log**
- **Parameter**
- **Monitor**

and the symbol bar consisting of four buttons: 
The buttons have the following functions:

- **Accept configuration**
  Storage and activation of the changed parameters in the fault annunciators. **After finishing the parameterisation, the new parameters have to be accepted and thus stored into the device.**
- **Dismiss configuration**
  Dismissal of all changes done in the session (since last “accept configuration”).
- **Restart**
  Restart of the USM
- **Logoff**
  Logoff from the web-server of the fault annunciator

Upon logoff without accepting the configuration all new entered parameters will be dismissed.

Below the main menu bar the menu path and the user are displayed.

In the main part of the page, the "Parameters/Devices/Master device" menu is already open. It would be possible to start immediately with the parameterization of the fault alarm functionality of the basic device. In this manual, 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 card tabs and contain additional buttons or text boxes. The function of these elements is explained in the description of the respective pages.

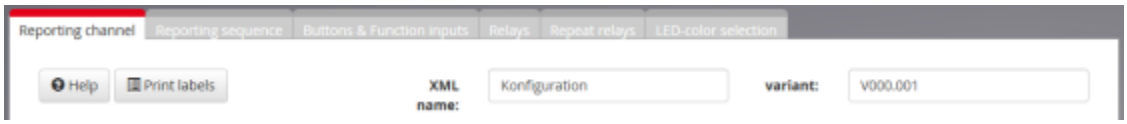


Fig. 5.3: Tabs and buttons on the page „Master device“

When switching between different menus or tabs, the changes will be buffered but not stored to the current configuration of the annunciator. This is only done with the action "Accept configuration".

5.1 Main Menu Language

In this menu, the parameterisation interface can be changed between German and English.

5.2 Main Menu Information

Fig. 5.4: The main menu „Information“ is structured within 2 tabs

The menu is structured into sub-menus within 2 tabs:

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

2. Sub-menu Documentation
Here the device documentation in PDF format can be found.

5.3 Main menu Event Log

5.3.1 Submenu Show events

Fig. 5.5: In the upper part of the dialog there are 3 more buttons besides the "Help" button:

Export as CSV

The recorded events can be exported to a text file via this button. If a filter is activated, it will also be applied to the 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 label in English.

Field description (CSV)	Field description (Online)	Description
index	Index	Consecutive numbering
date	Time stamp	Date value of the time stamp (UTC)
time	Time stamp	Time value of the time stamp (UTC)
eventCategory	Event category	As a numeric value: Signal events (1), Annunciator state events (2), Protocol events (3), Analog channel error (4), System events (5), Security events (6)
deviceNumber	Device	As a numeric value: Master device (0), Slave device 1 (1), Slave device (2), Slave device (3)
channelNumber	Channel	
description	Description	

Time stamp local

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

Clear event protocol

The entries of the event log can be deleted via this button button. To do this, the corresponding security prompt must be confirmed. The deletion of the event log is logged as a system event.

The event table contains the following entries for each event

Index	Internal numbering of the event
Timestamp	Time of occurrence of the event in the format Year-Month-Day Hour:Minute:Second.Millisecond
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 occurred

For better clarity the events can be filtered. For this the filter dialog
can be opened by clicking on the arrow on the right side of the "Filter output" bar.

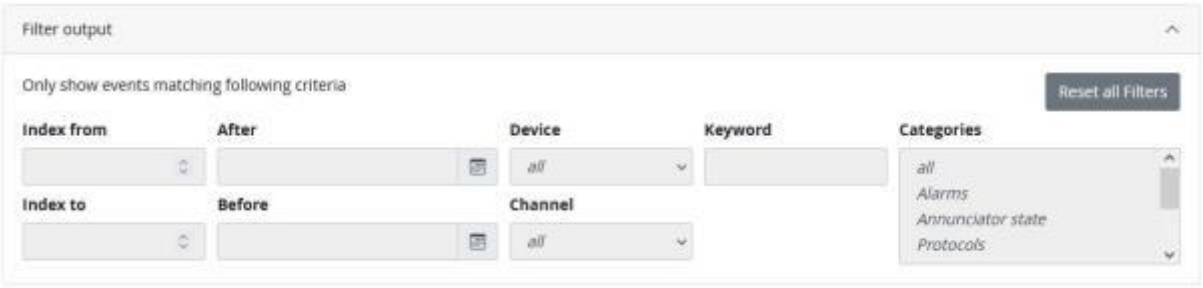


Fig. 5.6: Expanded menu “Filter output”

It is possible to filter according to different criteria, which refer to the respective table column refer to

Index	from index – index
Time stamp	All events before or after a timestamp. By clicking on the calendar icon next to the field, date and time can be selected.

The filters of the Index and Timestamp fields are each interpreted as enclosing boundaries.
With the filter "Index from" 2 "Index to" 5 the events with the indices {2, 3, 4 ,5}
are put out.

Device	In cascaded devices, it is possible to filter by master or slave devices.
Channel	Alarms can be filtered according to the respective alarm channel of one or all connected devices can be filtered.
Keyword	Here you can filter for a keyword in the Description column (e.g. "Logged in")
Categories	Here you can filter for a category to choose from

- All
- Alarms
- Annunciator state
- Protocols
- Analog channels
- System
- Security

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

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

Fig. 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 to be displayed on a table page.

You can navigate between the pages of the table using the "First Entries", "Previous Entries", "Next Entries", "Last Entries" buttons above as well as below the table.

5.3.2 Submenu General Configuration

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

Event logging

With the buttons "not active" and "active" you can set whether the system should record events or not. In addition, it is displayed whether a license for the event log option is available. Without a license only events of the categories system events and security events are recorded.

Configure logging
It is possible to specify from which categories events should be logged. If the check box belonging to the category is activated, corresponding events are logged.

- **Alarm events**
  Alarm (coming, going, acknowledged, reset), horn acknowledged
- **Fault signal state events**
  Watchdog relay state, IEC connection state, configuration events
- **Protocol events**
  IEC 60870-104 client state, IEC 61850 error
- **Analog channel error**
  Input over range / under range, 4..20 mA Wire break detection
- **System events**
  Power-on, power failure events, clock synchronization, network connections, Event log status
- **Security events**
  Login attempts, password changes, file system integrity, firmware updates, firewall configuration

Without the event logging license, only the events of the following categories are recorded System events and Security events are logged. An activation of the different categories is as well necessary, otherwise omitted.

5.4 Main menu Parameter

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

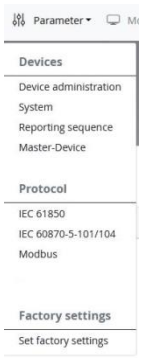


Fig. 5.8 opened main menu "Parameter"

Sub group Devices

- Device administration
  - Create or delete devices of a fault alarm cascade
  - Export and import of parameters
  - Documentation of parameterization as PDF file
- System
  - System time and synchronization
  - Network settings
  - User administration
  - Activation/deactivation of device error messages
  - Setting of serial interfaces
  - Security settings
  - Firmware updates
  - Administration of licenses
- Reporting sequence (fault signal functionality)
  for master device and for cascaded systems also for parameterized slaves
  - Signaling channels
  - Alarm sequence
  - Buttons & function inputs
  - Relay (function relay)
  - 1:1 relay
  - LED color setting
  - Analog channels

Sub group Protocols

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

Factory settings

Reset of all parameterized devices (also slave devices) to factory settings.

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

The descriptions of the parameterization of the subgroup "Protocols" is not part of this documentation. part of this documentation. Please take this information from the IEC 60870-5-101/104, Modbus or IEC 61850.

5.4.1 Menu Device administration

After clicking on the "Manage devices" menu in the "Parameters" main menu, a new dialog box with 4 submenus opens.

5.4.1.1 Submenu Device administration

With cascading, an USM and up to 3 BSMs (BSM-C or BSM-P) can be combined to form one fault indication system. The devices are connected via the system bus provided at the CAN bus sockets are connected with network cables (patch cables). The USM works as a "master" and the connected BSMs as "slaves". This allows systems with a maximum of 192 signal inputs (4*48) can be realized. 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 expansion modules cannot be connected when using fault annunciator cascades.

The parameterization of cascaded fault annunciators is carried out in full only 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 8 function inputs is available. For information on the BSM, please refer to the separate operating manual BSM.

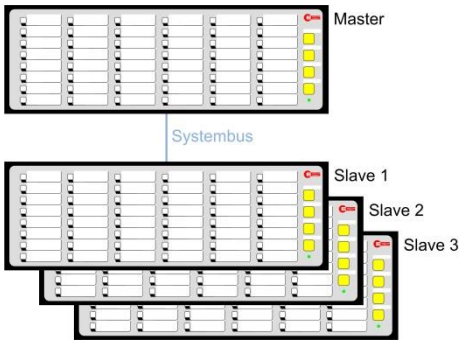


Fig. 5.9: Example of a cascaded annunciator system

Please note that the slave devices need to be configured as a slave via DIP switch and the corresponding slave addresses (1 - 3) need to be set.

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

Fig. 5.10: Submenu Device administration

After selecting the desired fault annunciator from the list, the device is automatically created and appears under the name Slave device 1 to Slave device 3 in the main menu "Parameters". The menu of a newly created slave annunciator corresponds to the menu of the master device. However, the "Reporting sequence" tab is missing, since the reporting sequences of the slave annunciators are identical to those of the master annunciator.

That way, up to three slave devices can be added. Each slave will be displayed under the name Slave-device 1…3 in the menu „Parameter“ – independent from the defined device name.
By click on the paper bin symbol the respective last slave device in the cascaded system can be deleted again.

The device type of the master device cannot be changed, as this is determined by the hardware used.

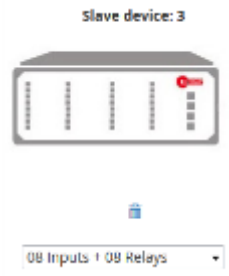


Fig. 5.11: Paper bin - symbol of the last annunciator in the cascaded system

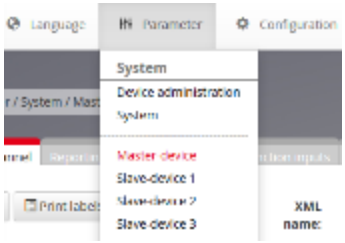


Fig. 5.12: Menu „Parameter“, complemented with the entries „Slave-device 1…3“

5.4.1.2 Submenu Import

On this page, the configuration of the fault annunciator(s) can be stored or a parameter file can be loaded. The following options are available:

*.pcf USM system & device parameterization
*.ucf USM 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 file, the USM automatically recognizes which configuration blocks are contained in the file. These blocks are displayed in the lower part of the page and marked for import by default. If the import of of certain blocks is not desired, they can be deactivated. Depending on the software version and the license status of the USM device for which the parameter file has been the following blocks may be included.

System configuration
Contains the basic configuration of the USM. This includes the parameter groups Network, Time, Error mask, firewall, IEC 60870, alarm sequence, horn, event log*. When importing configurations created with USM devices prior to software version V 4.0.0, this block is is included in the configuration of the master device.

Device configuration(s)
Contains the channel-related configuration of the USM or the possible slave devices. This includes 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 checkboxes in the "Import block to" column can be used to select whether the respective block is to be imported. In cascaded systems it can also be determined into which target device which target device which block is to be imported, whereby the target device must have either the same configuration as the device in the parameter file or must not have been created yet. In latter case, the following options can be selected:

Keep 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 taken over according to the file and the parameters are imported. (This function is not available for taking over the parameters into a master device).

Attach new slave device
A new Slave device is attached to the cascade. Configuration and device type are taken from the file. (Only possible if the cascade is not yet completely extended).

By pressing the "Import" button, the selected blocks are taken over into the system and immediately active.

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

- Engineer: Parameters except security settings.
- Administrator: Only security settings.

Import of an Excel parameterization

The parameters can also be imported from an Excel file. This Excel file must have a 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 to recognize the corresponding type.
Columns that are not needed can be deleted for a better overview, empty columns are ignored. With the respective IEC settings the IEC objects for IEC101/104 are created and can be viewed and edited in the corresponding menu.

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

For more information, refer to the section Parameterization via Excel list.

5.4.1.3 Submenu Parameterization report

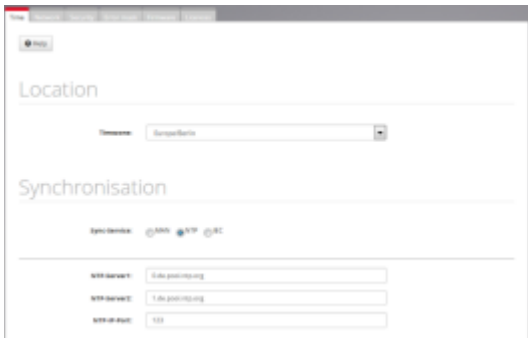
The "Generate" button can be used to generate the configuration currently stored in the device in the form of a readable report in PDF format.

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

5.4.2 Submenu System

Various system functions can be parameterized in the System menu.

5.4.2.1 Submenu Time



On the page „time“, the time zone and way of time synchronization can be defined. The internal real time clock of the annunciator can be set manually or synchronized cyclically by a NTP-server or the IEC interface.

Fig. 5.13: Submenu Time

Manual time synchronization

With the button "Set selected time" the manually entered time is taken over into the USM.
With the button "set current time" the PC time is taken over into the USM.

Synchronization via NTP

Two alternative NTP servers can be used for synchronization. For this purpose the server name or the IP address and the port number of the service. Please note that the DNS servers must also be configured 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 Submenu Network

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. IP address, subnet mask and gateway IP address can be parameterized for both interfaces.

If the USM has two network interfaces, the two IP addresses must be in two IP addresses must be in two different subnets. Otherwise it can lead to the that the USM can no longer be addressed via the network.

IP address

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

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

Please note that activation of a new IP address with „accept configuration“ will interrupt the connection to the fault annunciator. The connection has to be reestablished with the new IP address.

Subnet mask

Please enter the subnet mask for the network used.

Gateway IP Address

If the network communication is realised through more complex structures (e.g. if the NTP server is available through a gateway only), please enter the gateway IP address here.

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.

IEC 61850 interface

If an IEC 61850 interface is to be used, select the network via which this is to be done. Communication via IEC 61850 is only possible on one of the two networks.

DNS server

If the DNS server option is activated, two alternative DNS servers can be entered.

5.4.2.3 Submenu User administration

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

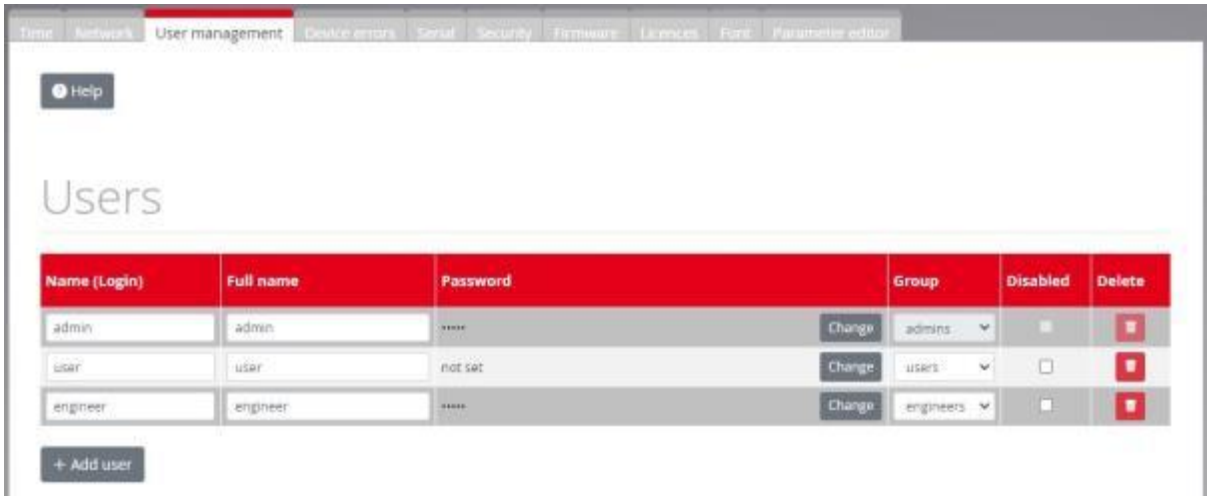


Fig. 5.14: Submenu User administration

In the USM, a distinction is made between 3 user groups to which fixed authorization levels are assigned.

The passwords for the two users “admin” (with authentication) and “user” can be changed here.

admin	- administrator (rights for reading and writing) (Authorized for user administration, firmware updates, security settings and all rights of the user group).
user	- user (Permission to view, but not change, the non-safety related settings).
engineer	- Authorized to parameterize all settings of the fault annunciator except for the settings for which the above-mentioned administrator rights are required. In addition, a user of this group also has the rights of the user group.

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

User name
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 may contain, for example, the user's full name.

Password
The password must be entered twice and is saved with the "Set" button.
The "x" button deletes the password of this user.

Group
Defines the group (rights) of the user.

Deactivated
By setting a check mark in this column the user is deactivated. A login by this user is no longer possible.

Delete
Clicking on the recycle bin sign deletes the user.

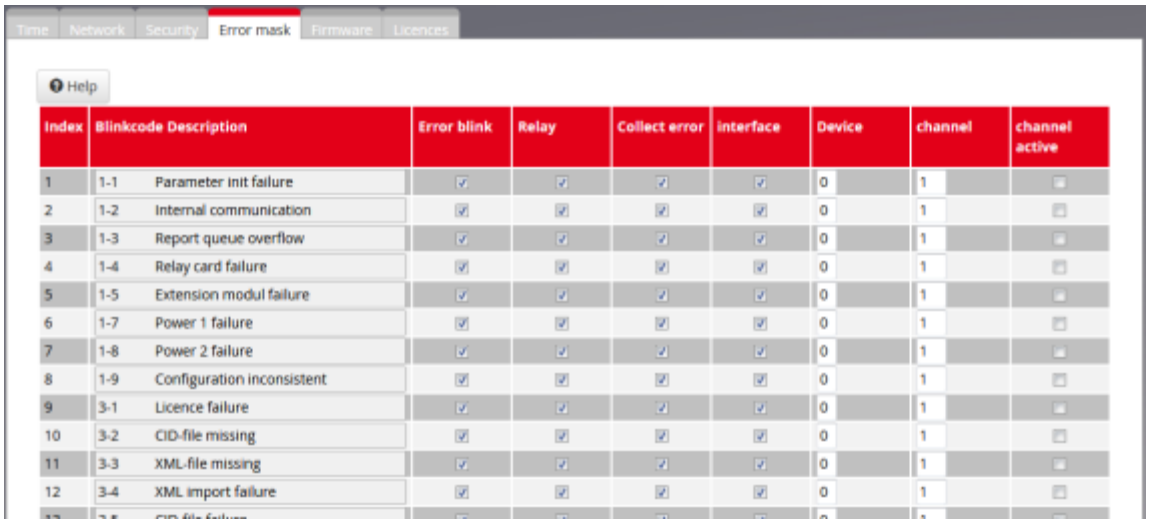
The first user "admin" is specially protected. Its group cannot be changed and the user cannot be deleted or deactivated.

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

Sftpuser status
Only if the password is enabled, a parameter import via SFTP can be done. To activate the password, it must first be entered twice and the "Change" button must be pressed.

If the Sftpuser status is deactivated again, SFTP parameter import is no longer possible.

5.4.2.4 Submenu Error mask



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	☐

Fig. 5.15: Submenu Error mask

This menu is used to parameterize the handling of the individual device errors of the USM.

Blinkcode and description
The entries in this field cannot be edited and show the blinkcode and the corresponding error in clear text. The first 20 entries are device errors and can be displayed with the blinkcode by the Watchdog LED „Self-monitoring“. For example, error „1-4 Relay card failure“ will be displayed with one long and four short flashing pulses (→ section 3.12 “Diagnosis“).
The additional 32 error entries (160…191) signalise a faulty connection to an IEC104 client each and can only be forwarded to the IEC interface or be displayed on a signal channel.

Error blink
If this checkbox is activated the corresponding error will be displayed by flashing on the Watchdog-LED.

Relay
The Alive-Relay is triggered by this error. (→section 3.12 “Diagnosis “).

Collective error
This error is assigned to the collective device error which can be transmitted through the IEC interface.

Interface
If this checkbox is activated, the corresponding error can be forwarded through the IEC interface.

Output active
If this check box is activated, the error is assigned to a alarm channel of a fault annunciator. For this purpose, a device and a channel must be selected in the following two columns. In cascaded systems, any connected device (Master or Slave) can be selected.

> In order to use a signalling channel of a fault annunciator for error alarms, "Device error" must also be selected in the column “Signal source” in the menu "Parameter / Device" in the register “Reporting channels”.

Fig. 5.16: Parameterization of channel 1 of a fault annunciator for signaling a device error

5.4.2.5 Submenu Serial

This menu is used to set the serial interface on the two possible interface cards.

The following parameters can be set for both possible interfaces:

Baud rate - 110, 300, 600, 1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200 Baud
Parity - none, even, odd

The serial interface on the 2nd interface card terminal X96 can be switched between RS232 and RS485.

5.4.2.6 Submenu Security

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

Firewall

With the firewall function, the available IP ports can be allowed or blocked.

HTTPS	Port 443	Port for secured browser access
HTTP	Port 80	Port for browser access
SFTP/SSH	Port 22	Port for SFTP and SSH access
NTP	Port 123	Port for NTP access
IEC61850	Port 102	Port for IEC61850 protocol
Ping		Accept or decline ping packages

If a link is parameterized in the menu of the IEC protocol setting "Parameters/Protocols/IEC 60870-5-104", a link is automatically opened.

Import certificate

This function can be used to reinstall the certificate for the HTTP server. Via the ”Browse" button to select the certificate, which can then be loaded into the device using the "update" button to load it into the device. After successful loading, the device must be restarted.

5.4.2.7 Submenu Firmware

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

Firmware update

Via the button "Browse" a software package file (ees-usm-package*.fwu) is selected and can now be loaded into the device with the "update" button. The update process can no longer be interrupted after confirmation of the query. While the update is executed, the device must not be disconnected from the power supply. If the update was installed successfully, the device restarts automatically.

Rollback

With the rollback function, it is possible to reset the device to the previous software status for certain updates back to the previous software version. The target version must first be detected via 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 via the "Rollback target version" button. The rollback can be started via the "Execute rollback" button. After the rollback, the device restarts automatically.

5.4.2.8 Submenu Licences

With this function, licenses that were not delivered ex works can be imported subsequently.

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

5.4.3 Menu Master-device / Slave-device 1..3

In the menu “Master-device” or “Slave-device1..3”, respectively, the fault annunciation functionalities of the device can be parameterized. This menu contains the following sub-menus:

- Reporting channel
- Reporting sequence (only available for Master-device)
- Buttons & function inputs
- Relays
- Repeat relays (if optionally installed)
- LED-colour selection
- Analog channels (if optionally installed)

5.4.3.1 Submenu reporting channel

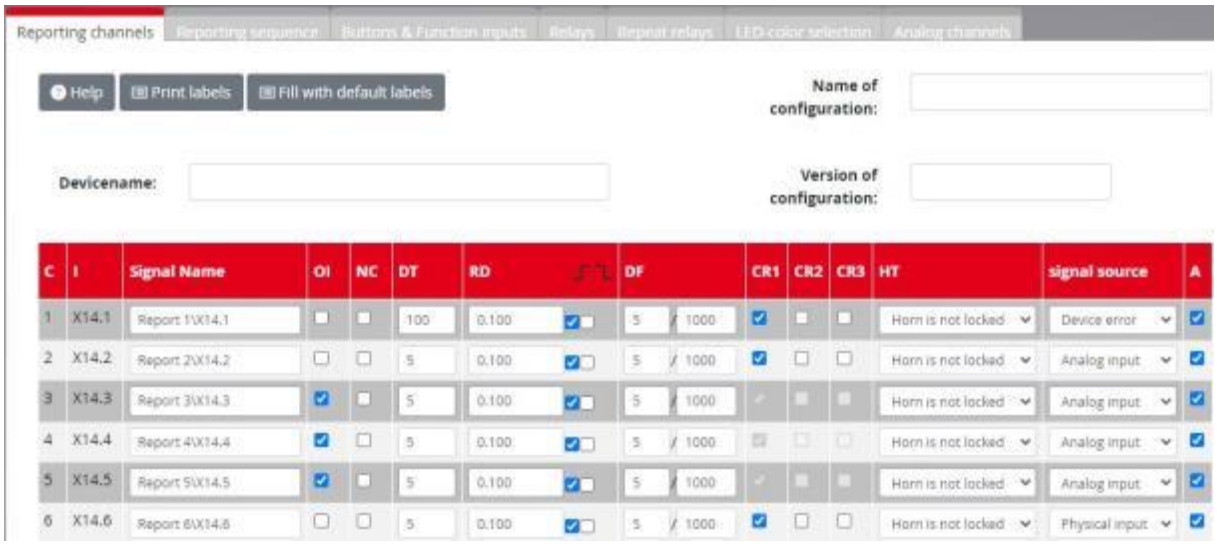


Fig. 5.17: Submenu Reporting channel

Version of configuration
In these fields declarations for name and version of the respective device parameterization can be entered. This information is stored in the parameterization file and on the device and will be read and displayed when loading a parameterization file or when a device is connected.

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

Labelling strips
With a click on the button “Print labels”, a new window with the labelling strips will be opened. The signal texts resemble the labelling of the channels, the button texts follow the declaration on the page “buttons & function inputs”. If a text is too long, it will be displayed in red characters and should be changed – otherwise only the visible part of the text will be printed. By click on a text within the labelling foil a new dialog for editing of the text will be opened. Please choose DIN A4 landscape format as paper settings for your printer. Please also make sure that the page is printed out in its original size, i.e. do not adjust or reduce or enlarge it.

Fill in with standard label
If no label has been stored in the device, predefined labels can be used with this button. The standard labelling is two lines with the following labels: in the upper line Signal x, in the lower line Alarm x.

In the table the following parameters can be defined for each signal channel:

Field name	Explanation
C	**Channel number** (firmly specified)
I	**Input terminal** (firmly specified)
Signal name	**Designation of the respective channel** This designation will be used when printing the labelling strips. A 2-line labelling can be realised by separating the second line by "\" (backslash) from the first line (e.g. "Bucholtz\Alarm").
OI	**Operation indication** If this checkbox is ticked, the signal will be treated as operation indication. If this box is unchecked (default setting), the signal will be processed according to the chosen reporting sequence (→ tab reporting sequence). By defining the signal to be operation indication or fault annunciation, the LED-colour will automatically be set according to the settings on the page "LED-colour". Default settings: operation indication = green, fault annunciation = red.
NC	**Normally closed principle of the inputs** (on checking the box) Normally open principle: application of a voltage at the input triggers an alarm. Normally closed principle: voltage drop at the input triggers an alarm. Default setting: Checkbox not ticked – normally open principle.
DT	**Debouncing time** The debouncing time defines the timespan for which a signal must continuously be applied before an alarm is issued. This prevents multiple alarms in the case of a bouncing switch. Time 0 ms … 1000 ms, settable in steps of 1 ms.
RD _|‾ ‾|_	**Response delay** The alarm delay delays a permanently pending alarm (debounced and monitored for flutter) before it is processed. This is intended to suppress error alarms that would occur, for example, if a value is only briefly exceeded or underrun. The time span is significantly greater than the response delay (debouncing time). The time span goes from 0...32400 s (9 h) and is definable in two grids (value < 30 s in a 1 ms grid and for values > 30 s in a 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 checkboxes _|‾ and ‾|_ for rising and falling edge define for which signal edge the alarm delay is active. _|‾ checked: delay is active for coming alarm ‾|_ checked: delay is active for receding alarm
DF	The **defluttering** prevents alarms from being triggered and reset permanently e.g. by a loose contact. The defluttering acts after the response delay (debouncing). If an input changes more often than the defined number of edges within the fluttering time, the defluttering comes into effect and the alarm channel is marked as faulty. Number of edges: 0 … 255 Fluttering time: 0 ms … 65535 ms, ~1 min., in steps of 1 ms Default settings: 5/100

Table 5.1a: Parameters of reporting channel

Field name	Explanation
CR1, CR2, CR3	**Assignment to collective reports** If one of these check boxes is activated, the alarm triggers the corresponding collective alarm. Multiple assignments or none are possible. All alarms assigned to a collective alarm form a group. This assignment is also important for alarm acknowledgement and RESET.
HT	**Horn triggering** None: Alarm does not trigger horn With horn lock: Horn acknowledgement only possible after lamp acknowledge No horn lock: Horn acknowledgement always possible
Signal Source	**Triggering of the alarm channel** The source of the signal for each channel can be defined with this checkbox. Physical input: Alarm via the physical input Interface: Alarm via interface command (IEC101/104 or IEC61850) Display: Alarm occurs via interface command and is only displayed (LED), it is not included in the fault alarm sequence (No horn activation and no collective alarm formation etc.) Logic: Alarm via internal logical link (currently only possible via an EXCEL list to be imported → Section "Parameterization via Excel list") Device error: Alarm channel is triggered by a device error as defined in the menu "System" → "Error mask" Analog input: Alarm is formed from an analog input Watchdog: Alarm is generated from the function Watchdog object for monitoring of the IEC 61850 communication.
A	**Activation of the alarm channel** If this checkbox is unticked, the channel will not be processed. The alarm will be ignored within the complete system. Default setting: channel activated

Table 5.1b: Parameters of reporting channel

Explanation of the delay times

The following drawing illustrates the mode of operation of the two delay times and the defluttering. The options for triggering of the optionally integrated repeat relays is displayed as well (→ section "Repeat relays").

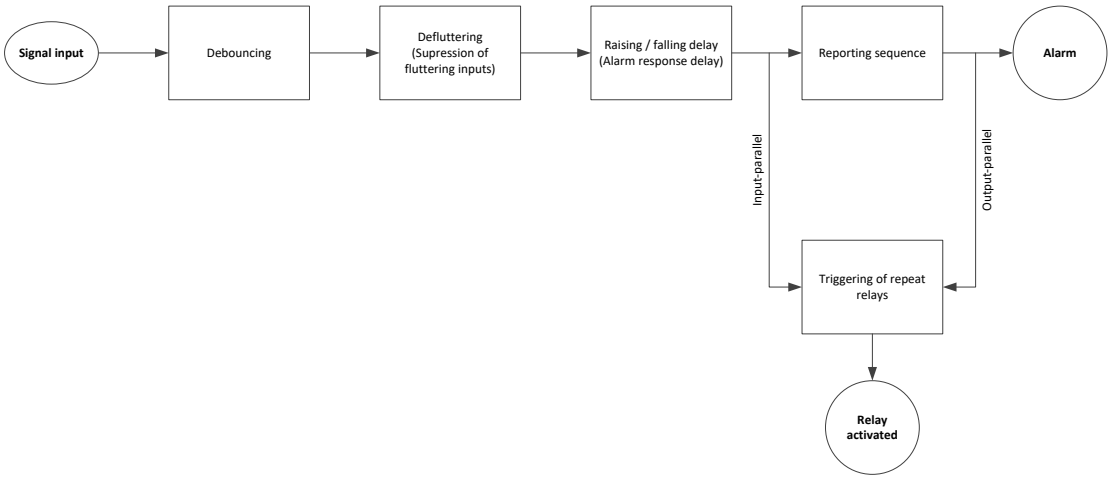


Fig. 5.18 Schematic illustration of the alarm processing in the annunciator

Response delay (debounce time)
Closing a contact may cause several edge changes before the contact is permanently closed. Due to the short response time when detecting alarms, several alarms could therefore be generated during the closing of the contact. 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 not recognized as valid until it is permanently present beyond this time period. However, the time stamp is still set with the first edge of the signal and not only at the time of the validity of the signal.

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

Example:
The monitoring contact of a thermostat triggers briefly before the corresponding temperature is reached by the conditional control loop time. Because this short overtemperature should not be reported as a malfunction, 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 at the output-parallel repeat relays.

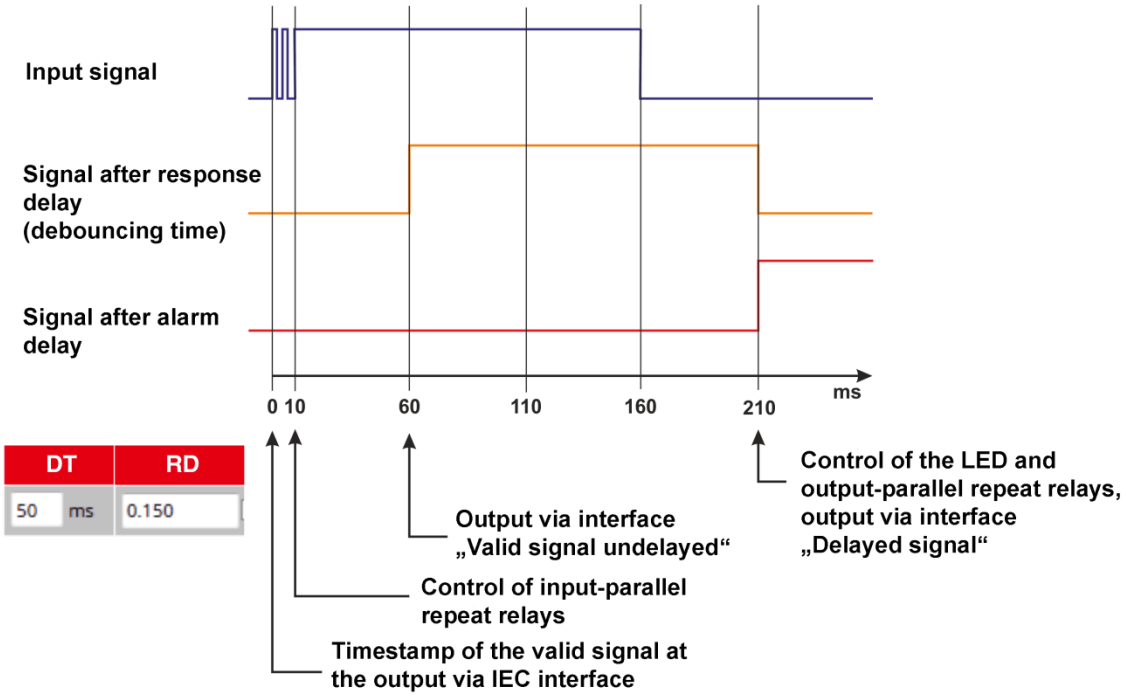


Fig. 5.19: Time diagram with a response delay of 50 ms and a alarm delay of 150 ms

To use the settings in one line for one or all other lines, line contents can be copied to the desired line(s). By right-click on the marked line a context menu with the following options opens:

Copy
Paste
Paste to all

The latter option fills all lines with the respective contents.

For device and channel designation, all characters from A…Z and 0…9 are allowed. The special characters „ { } | $ & # ; “ are not allowed. For channel designations, „\“ (backslash) is used as separation mark to start a new line.

5.4.3.2 Submenu “Reporting sequence” (only master device)

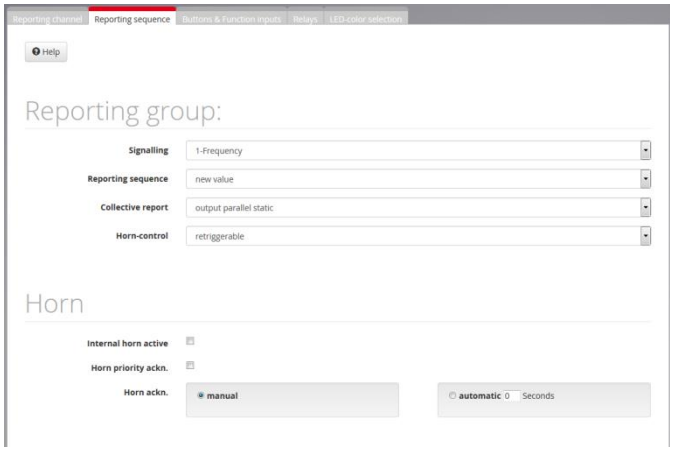


Fig. 5.20: Submenu “Reporting sequence”

In this submenu, the reporting sequence and the horn control are parameterized. In cascaded systems, the same reporting 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, these are composed of individual components.

Reporting sequence

Designation	Selection options	Note
Signaling	1-Frequency	1- Frequency flashing light
	2-Frequency	2- Frequency flashing light
	Status display	Self-clearing alarm: Alarm is immediately displayed as an acknowledged alarm and goes when the associated input is no longer present.
Reporting sequence	New value	New value alarm
	First value	First value alarm
	Steady light	Only selectable in conjunction with 2-frequency
Collective alarm	Input parallel static	The collective alarm is set with the first coming alarm and goes, regardless of the acknowledgement, with the last going alarm.
	Input parallel static dynamic	The collective alarm is set with the first incoming alarm. With each further alarm, the collective alarm is deleted for approx. 0.8 s and then set again. When all alarms have gone, the collective alarm is permanently deleted.
	Output parallel static	The collective alarm is set with the first incoming alarm. The collective alarm is only deleted when all alarms have been sent **and** acknowledged.
	Output parallel static dynamic	The collective alarm is set with the first coming alarm. With each further alarm, the collective alarm is deleted for approx. 0.8 s, then set again. When all alarms have gone **and** have been acknowledged, the collective alarm is permanently deleted.
	dynamic	The collective alarm is activated for approx. 0.8 s with each incoming alarm.
	Input parallel statically acknowledgeable	The collective alarm is set with the first coming alarm and goes with the last going alarm or when all alarms have been acknowledged.
	Output parallel statically acknowledgeable	The collective alarm is set with an upcoming alarm. When the alarm is acknowledged, the collective alarm is deleted, even if alarms are still pending.
Horn control	Horn can be triggered again	The horn is activated again with the next alarm, even if alarms are already pending.
	Horn cannot be controlled again	The horn is only activated again for subsequent alarms if no alarms are pending.

Table 5.2: Dialog field reporting sequence

More detailed information on the reporting procedures and their designation can be found in the separate document "Description of the reporting procedures" with the document designation "SM-MA-ZI-UK".

Horn

Designation	Selection options	Note
Internal horn active	Activated	The internal and external horns are controlled in parallel.
	Deactivated	The internal horn is switched off, the horn contact for connecting the external horn is still active.
Horn priority acknowledgement	Inactive	The alarms can be acknowledged according to the Horn activation setting of the "Reporting channels" submenu.
	Active	The alarms can only be acknowledged when the horn has already been acknowledged.
Horn acknowledgement	Manual	Horn is acknowledged manually by pushbutton or via a function input.
	Automatic	Horn is automatically acknowledged after the set time.
Horn mute	No triggering when button is pressed	The horn is not triggered or automatically acknowledged after a parameterizable time if a key parameterized for this purpose or a parameterized function input is pressed or activated. (see section “Buttons and function inputs“)
	Automatic acknowledgement	Horn is automatically acknowledged after the set time. This time can be selected differently from the time for automatic horn acknowledgement in normal operating mode.

Table 5.3: Parameter of the horn function

Please note the connection between the "Horn priority acknowledgement" parameter and the "Horn activation" parameter of the "Signal channels" submenu, which can be set individually for each channel. The "Horn priority acknowledgement" parameter applies to all signal 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 Submenu Buttons and function inputs

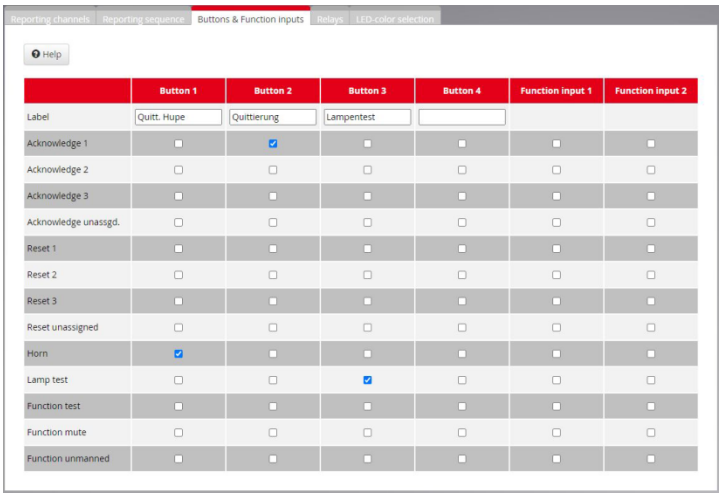


Fig. 5.21: Submenu „Buttons and function inputs”

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

The texts entered in the "Labeling" line are printed out together with the labels of the reporting channels by pressing the "Labeling strips" button in the "Reporting channels" submenu.

Function	Meaning
Acknowledge 1, 2, 3, unassigned	Acknowledgement optical for alarms of groups 1, 2 ,3 or unassigned alarms
Reset 1, 2, 3, unassigned	Reset for alarms of the collective alarm groups 1, 2 or 3 or unassigned alarms (only needed when 2-frequency reporting sequence is activated)
Horn	Acknowledgement acoustic (horn)
Lamp test	Lamp test
Test function	Simulation of the excitation of all inputs
Mute function	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 control of relays or the output of alarms via interface remain active. Alarm acknowledgement at the fault annunciator is deactivated.

Table 5.4: Assignment of buttons and function inputs

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

The assignment is made in form of a matrix whose rows represent the functions and whose columns represent the buttons and function inputs. Realized links are marked by check marks.

5.4.3.4 Submenu Relays (function relays)

In this submenu, the assignment of the 4 function relays to the individual fault alarm functions, buttons or function inputs takes place. 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 gone, the relay drops out again. For each relay, a check mark in the "Inverted" field can be used to specify whether the switching function or its negation is executed. For example, the relay then drops out when the collective alarm occurs.

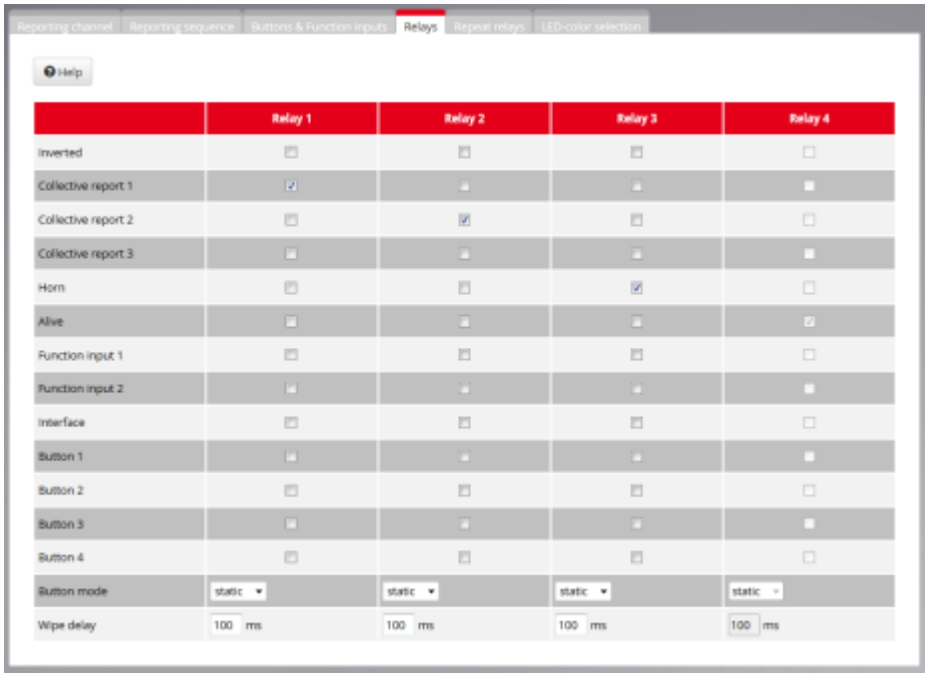


Fig. 5.22: Submenu Relays

The assignment is made via matrix whose rows represent the triggering events (e.g. pushed button) and whose columns represent the relays. Realized links are marked by check marks.

Function	Meaning
Inverted	If the box is checked, the negation of the switching function is executed.
Collective report 1, 2, 3	The relay is activated by collective alarm 1,2 or 3.
Horn	Horn control
Alive	Live contact of the self-monitoring (permanently assigned to relay 4)
Function input 1, 2	Function input controls relay output
Interface	Control via interface (e.g. 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 controlled via a button or the interface Static – The relay is energized as long as the key remains pressed. Toggle – The bistable relay changes its state with each excitation (flip-flop function) Wipe – Relay switches with each excitation and drops out again after the wipe duration (10 ms ... 10 000 ms).

Table 5.5: Function assignment of the relays

5.4.3.5 Submenu Repeat relays

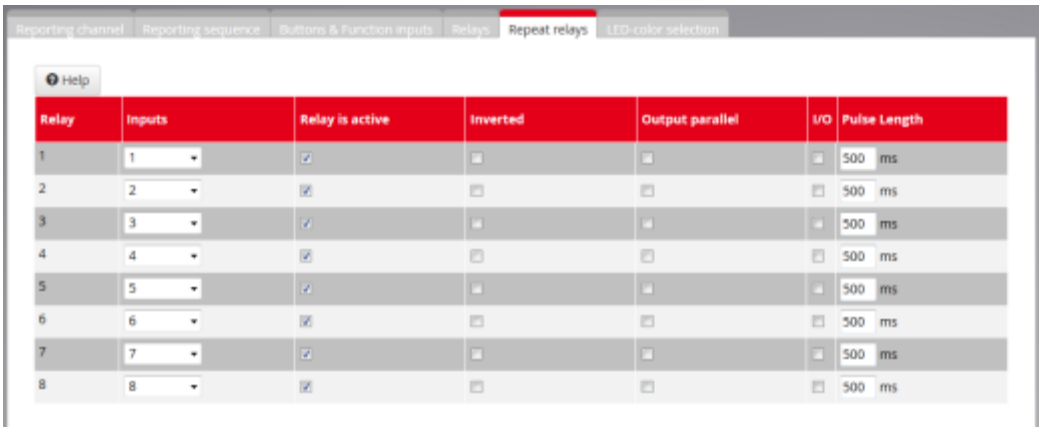


Fig. 5.23: Submenu Repeat relays

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

Control via signal input or device function

Inputs
Here, the trigger for the relay can be defined. The following options are available:

- Function collective report 1,2 or 3
- Function horn triggering
- Available galvanic signal inputs

Relay is active
By removing the check mark, the control of the relay by the above functions and inputs can be deactivated. The deactivation does not affect the control via the interface.

Inverted
If this check mark is set, the negation of the respective function is executed, e.g. the relay then drops out when the collective report occurs and picks up when no collective report is present. This option is also effective for control via the interface.

Output parallel
If the relay is activated by an alarm input, it can be defined whether it follows this input directly (tick not set) or remains activated until the alarm has been acknowledged (tick set) - signaling of the stored alarm.

Control via interface

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

Pulse length
If a relay is triggered from the IEC interface, the pulse width can be defined here in the range from 10…10000 ms. For IEC continuous commands, this time is ignored. For Modbus commands, the wipe duration is also irrelevant.

5.4.3.6 Submenu LED colour settings

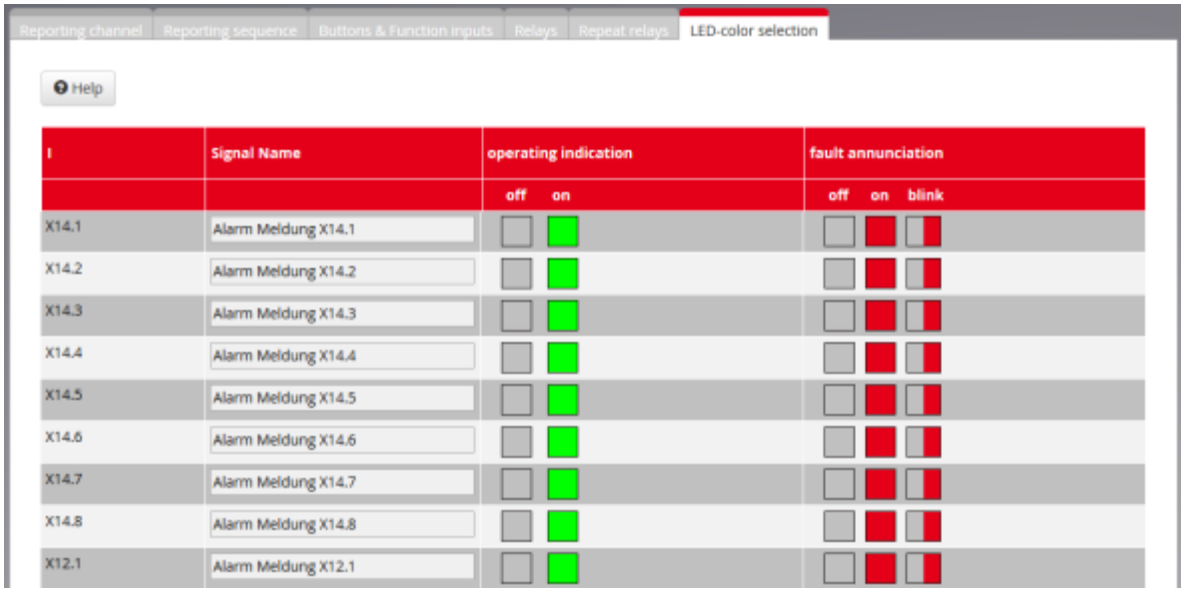


Fig. 5.24: Submenu LED colour settings

On this page the LED colours for the operation modes “operation indication” and “fault annunciation” of each channel can be defined. The variants differ only in the selectable colours:

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

Operation indication
For both states OFF and ON the LED can be triggered as follows:
LED OFF or colour: RED, GREEN for Duo-LED
Otherwise for the RGB LED version, all colours as described above are available.

Fault annunciation
For the fault alarm, one of the above-mentioned colours is set for the states "Off", "On" and "Flashing".

Please note that for the states OFF and ON of one channel, different colours need to be defined.

5.4.3.7 Submenu Analog channels

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 indicator. The parameters are divided into 4 dialog pages which are displayed by clicking the corresponding buttons.

- Reports
- Adaption
- Sensor
- Transmission

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

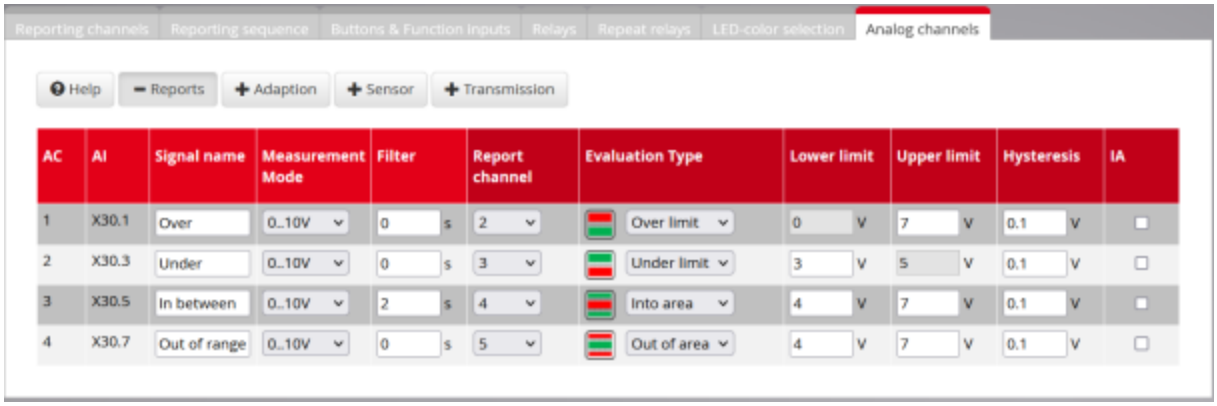


Fig. 5.25: Submenu analog channels for a fault annunciator with one analog card with 4 inputs

Dialog Reports

Parameter	Interpretation
AI	Terminal of the analog value
Signalname	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	The inputs can be configured as voltage or current inputs depending on the application. The following options are available: • 0 … 10 V • -10 … 10 V • 0 … 20 mA • 4 … 20 mA In mode 4 ... 20 mA a wire break monitoring is active. At a current value below 4 mA, the device error "4-8" is generated. The further processing of the error is described in the submenu "Parameter / System / Device error" is set. In the main menu "Monitor", the corresponding analog input is indicated by an orange background.
Filter	The measured values are filtered after acquisition 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 the filtered value has reached 62% of the input value in the event of a sudden change in the input value. The time constant is specified in the unit seconds.

Table 5.6: Basic settings of the analog inputs

When the analog values are changed, alarms can be generated in the fault annunciator during one of the following operations.

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

Parameter	Interpretation
Reporting channel	Channel on which an alarm is generated if this results from the following parameters.
Evaluation	The analog values can be monitored according to the methods mentioned above. The evaluation method must be defined in this parameter: • above limit value • below limit value • outside of range • within range
Lower limit	Lower limit value
Higher limit	Higher limit value
Hysteresis	A hysteresis can be defined to avoid the generation and deletion of fault alarms in case of small changes of the analog value. A fault is only generated or deleted when limit value + (hysteresis / 2) exceeds the measured value or limit value - (hysteresis / 2) undercuts the measured value
IA	In order to prevent the generation of a fault alarm with the evaluation method "out of range" while the sensor value is still outside of range when the plant is started up, this box can be activated. Fault signal processing is only activated when the analog value has entered the range once.

Table 5.7: Limit value formation of analog inputs

Dialog Adjustment

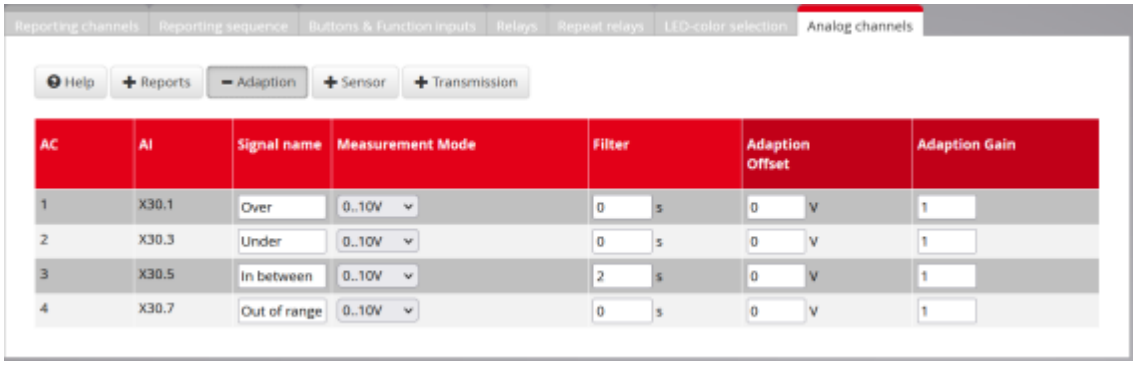


Fig. 5.26: Submenu analog channels - Dialog adaption

The measured value acquisition has an accuracy of better than 0.5% when delivered. If it is necessary to adapt the measured value acquisition, e.g. for a lead adjustment of the sensor, it can be readjusted via two parameters.

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

Parameter	Interpretation
Adaption Offset	The offset is added to the measured value. (The addition takes place only after the value has been multiplied by the gain). The unit of the offset is automatically adapted to the measuring mode and displayed as Volt or mA. Factory setting: 0
Adaption Gain	The measured value is multiplied by the gain. Only then is the offset added. Factory setting: 1

Table 5.8: Adaption of analog inputs

Dialog Sensor

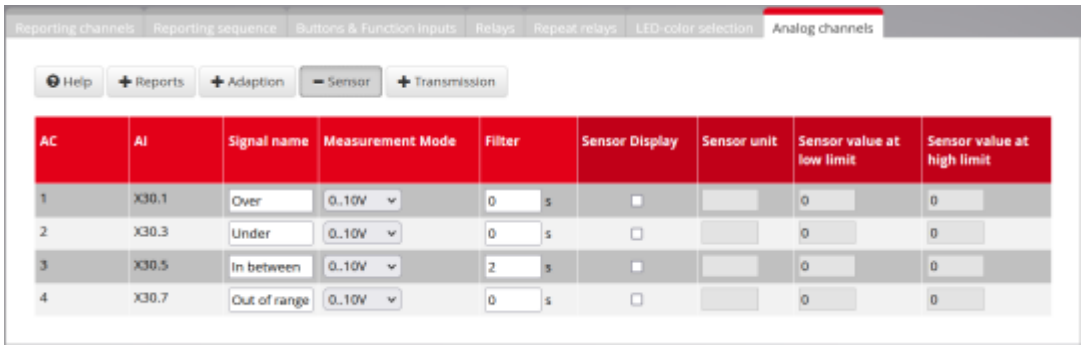


Fig. 5.27: Submenu analog channels - Dialog Sensor

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

Parameter	Meaning
Sensor display	**Option not activated** The display is as current or voltage value depending on the parameterized measuring mode. The unit is displayed accordingly in V or mA. **Option activated** This releases the following 3 columns for parameterization to be able 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 smallest sensor value (0 V, 0 mA or 4 mA) and at the largest possible sensor value (10 V or 20 mA).

Table 5.9: Scaling of analog values

Dialog Transmission

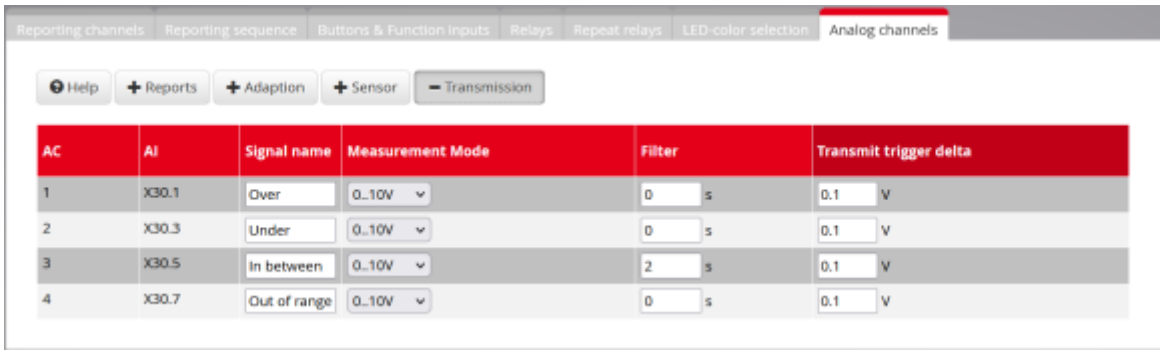


Fig. 5.28: Submenu analog channels – dialog transmission

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 defined that values are only transferred as spontaneous values or reports when they change. 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 refers to the respective current or voltage value and can be set in steps of 0.001.

5.5 Main menu Monitor

The monitor is a diagnostic tool for the USM and any slave devices connected in the cascade. In this representation, the LED of the fault indicator is shown with its states (flashing, on and off).

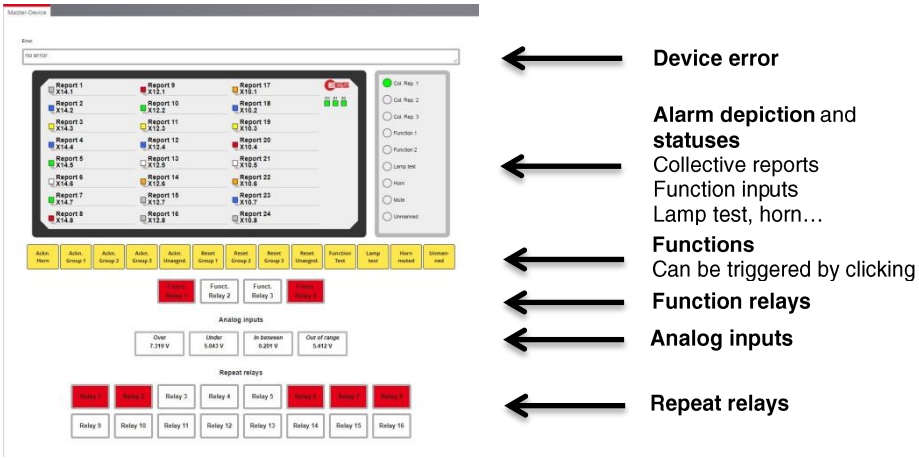


Fig. 5.29: Monitor – a diagnosis tool

For each device (Master or Slave 1...3) created in "Parameter / Device administration", a separate monitor screen can be called up via the corresponding register cards.

The buttons shown in yellow symbolise functions and can be "pressed" by mouse click to trigger the corresponding action (acknowledgement, function test ...), if logged in as administrator.

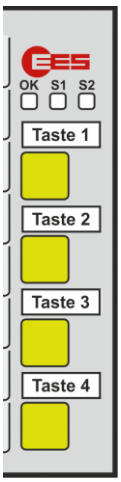
The states of the 4 function relays and, if available, the 1:1 relays are also displayed (red excited, white idle state).

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

5.6 Reset to factory settings

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

To restore the factory settings, please proceed as follows:



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

2. The signal lamp 1 at the top in the left column lights up orange, the signal lamp 2 below it lights up red or green and the internal horn is excited briefly. The "OK" LED above the buttons flashes red-green. The fault annunciator is now in parameter adjustment mode.

3. By pushing key 3 several times, the second signal lamp in the left column can be switched over between the colours red and green. The LED colour signals which action is carried out in the following step:
   Red - keep current configuration
   Green - Reset to factory settings.

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

5. If the action has been selected to "Reset factory setting" (green signal lamp 2), the fault indicator needs a few seconds to carry out the action, which is concluded with an alternating green flashing of the indicator lamps "OK", "S1" and "S2". Hence the fault indicator is in delivery condition.

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

For devices with integrated IT security functionality (options "S" and "P"), the security-relevant settings (port releases, passwords) are also reset to the delivery status.

6 Parameterization via Excel file

In many applications, a part of the required information for parameterization is already available in Excel-files (e.g. data point lists). In this case it is useful to transfer this information to a template and import it into the annunciator. EES provides a template that can be filled in and processed with common procedures. With the Excel file the parameters for the alarm channels, repeat relays and IEC objects can be imported into the WAP.
All other parameters can then separately be adjusted on the web interface.

The given structure of the Excel file must not be changed. This applies especially for the designations in the first two rows. For a better overview, columns which are not required can be deleted from the table. Empty columns will not be processed during the import.

The file consists of three different tabs which allow for parameterization of the following features:

EES_Input - Alarm channels and IEC objects
EES_Relay - Repeat relays
EES_Collective - Logic disjunctions for 16 „collective alarms“

If the Excel-file contains parameters for additional slave-devices (within a cascaded annunciator system), these can only be imported if the respective annunciators have been edified in the parameterization of the master annunciator before.

The Excel-file has to be of the type .xls, other Excel formats cannot be processed by the annunciator.

6.1 Alarm channels and IEC objects

The name of the tab „EES_Input“ must not be changed, otherwise the tab will not be processed during the import.

Further information on the parameters can be found in the section → Submenu Reporting channel.

6.1.1 Alarms

Index (idx)
The index is a consecutive number which ensures that the original sequence is reproducible when sorting the table according to certain contents.

Device number and input
The column **device number** (0…3) indicates the device that is addressed (master annunciator (0) or one of the up to three slaves (1…3)).
The column **input** addresses the alarm channel on the respective device.
The values entered in these columns have to be consistent.

Signal name 1 and 2
The content of these two fields is used for the parameter „Signal name“ of the reporting channels in the parameterization interface. To gain a 3-lined labelling , a third line can be generated in the field „signal name 2“ by inserting a „\“ as separation between lines 2 and 3.

Operation / Normally closed
The respective function (operation indication or processing of the input in normally closed principle) can be activated with „x“ or „X“. If the field is empty, the respective function is not activated.

Delay times / Defluttering

„debounce time“	0 – 1000 ms
„response delay“	delay time from 0ms .. 32400s (9h), up to 30s in pattern of 1ms, any longer times in pattern of 1s. Format: mmm:ss.xxx (xxx indicates the value of the milliseconds). If no delimiters are used, the entered value will be interpreted in seconds.
„deflutter number“	0 – 255
„deflutter time“	0 – 65535 ms

These fields must not be empty.

Selective functions

For additional parameters, which can be activated or deactivated, the respective function can be activated by entering “x” or “X” in the corresponding column:

Alarm edges	- „rising“, „falling“ (multiple assignment possible)
Collective reports	- „collective report1 – collective report3“ (multiple assignment possible)
Horn triggering:	- „not active“, „not locked“, „locked“ (only one assignment possible)
Signal source :	- „input physical“, „interface“, “display“, „logic“ (only one assignment possible)

For empty fields the respective function is not activated.

6.1.2 IEC-objects of the reporting channels

For each alarm channel and IEC type an IEC object is generated. All objects are formed identically and have the same parameters.

Discrete object parameters

„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-Typ“	- integer value indicating the respective IEC object type according to standard:

1	single report without timestamp
2	single report with short timestamp
3	double report without timestamp
4	double report with short timestamp
5	step position without timestamp
6	step position with short timestamp
7	32 bit report without timestamp
8	32 bit report with short timestamp
30	single report with long timestamp
31	double report with long timestamp
32	step position with long timestamp
33	32 bit report with long timestamp
45	single command without timestamp
46	double command without timestamp
47	step command without timestamp
58	single command with long timestamp
59	double command with long timestamp
60	step command with long timestamp

For empty fields the value will be set to 0 (no type).

Object parameters selective functions

The respective function can be activated by entering “x” or “X” in the corresponding column.

„Link1 –Link4“	- defines on which link the respective object will be forwarded
„blocked“	- the respective object is blocked, no forwarding on the IEC interface
„double“	- the respective object will be addressed as double command

For empty fields the respective function is not activated.

Object types
Two object groups are available for communication as IEC server (station) and IEC client (Master).

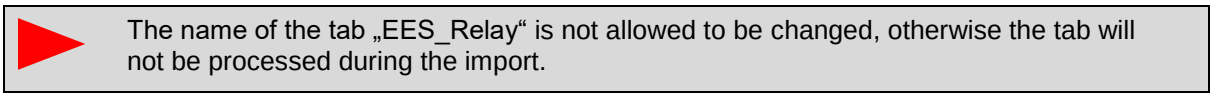
Object types server communication:

Input (undelayed)	- physical activation of the signal input
Delayed Input	- signal input after expiration of the response delay
Unacknowledged Alarm	- alarm at issue/receded (stored, but not acknowledged)
Stored Alarm	- alarm stored and at issue (output-parallel)
Status	- status of the alarm (Status 1 .. 4)
Status set	- status of the alarm is set (Status 1 .. 4)
Input set	- input is set

For empty fields the value will be set to 0.

Object types client communication:
The available information objects of the IEC client are identical to the information objects of the IEC server.

6.2 IEC objects and repeat relays



6.2.1 Relays

Index (idx)
The index is a consecutive number which ensures that the original sequence is reproducible when sorting the table according to certain contents.

Device number and relay
The column **device number** (0…3) indicates the device that is addressed (master annunciator (0) or one of the up to three slaves (1…3)).
The column **relay** addresses the respective repeat relay on the respective device.
The values entered in these columns have to be consistent.

Input
Input indicates the signal input which triggers the relay. The inputs 1…40 can be assigned to a repeat relay. Additionally, the triggering of an external horn (“h”, “H”) or the output of the collective reports 1 – 3 (“s1…s3”, “S1…S3”) can be assigned to a repeat relay. Triggering input and repeat relay have to be on the same device.
These fields must not be empty.

Pulse length
The pulse length is an integer value between 10 and 10000 in ms.
These fields must not be empty.

Selective functions
In the columns “active”, “inverted”, “output parallel” and “IEC-interface”, the respective function can be activated by entering “x” or “X”.
For empty fields the respective function is not activated.

6.2.2 IEC-objects of the repeat relays

For each repeat relay and IEC type, an IEC object is generated. All objects are formed identically and have the same parameters.

Discrete object parameters

„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 indicating the respective IEC object type according to standard:

1	single report without timestamp
2	single report with short timestamp
3	double report without timestamp
4	double report with short timestamp
5	step position without timestamp
6	step position with short timestamp
7	32 bit report without timestamp
8	32 bit report with short timestamp
30	single report with long timestamp
31	double report with long timestamp
32	step position with long timestamp
33	32 bit report with long timestamp
45	single command without timestamp
46	double command without timestamp
47	step command without timestamp
58	single command with long timestamp
59	double command with long timestamp
60	step command with long timestamp

For empty fields the value will be set to 0 (no type).

Object parameters selective functions

The respective function can be activated by entering “x” or “X” in the corresponding column.

„Link1 –Link4“ - defines on which link the respective object will be forwarded
„blocked“ - the respective object is blocked, no forwarding on the IEC interface
„double“ - the respective object will be addressed as double command

For empty fields, the respective function is not activated.

Object types

Two object groups are available for communication as IEC server (station) and IEC client (Master).

Object types server communication:
relay - read relay status
relay set - set relay status

Object types client communication

The available information objects of the IEC client are identical to the information objects of the IEC server.

6.3 Simple logic function

With the tab EES_Collective a simple logic disjunction for up to 16 alarms, which are formed out of OR-disjunctions of multiple inputs, can be parameterized. The designations in line 2 are mandatory for correct import of the Excel file.

Index (idx)
Index of the collective report or disjunction, respectively, 1 – 16.

Output device (device)
This value defines the device which holds the alarm channel which is to be triggered when the disjunction is fulfilled. Device 0…3.

Output channel (alarm)
This value defines the alarm channel which is triggered on the respective device when the disjunction is fulfilled. Alarm 1…48.

Triggering alarms (E1 – E192)
An „x“, „X“ in the respective column indicates that this alarm is used as input for the logic disjunction.

Logic inputs
In the parameterization interface, menu “Annunciator -> Reporting channels -> Signal source” the inputs which are triggered from the logic disjunction, are set to “Logic”.

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 / Annunciator channels / I/O" menu.

7 Use and product life cycle

7.1 Maintenance

To ensure a high life expectancy 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!
Carry out all maintenance work only when the device is in a de-energized state!

7.2 Repair

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

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

7.3 Shutdown

In the event of temporary or permanent decommissioning of the product, proceed according to 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!
Carry out all work for decommissioning only when the device is de-energized!

Shutdown:

- Deenergize the device
- Disconnect the wiring
- Loosen the retaining clips and remove the unit from the front panel or door.

Proper storage until re-commissioning or until dispatch to the manufacturer's customer service requires suitable premises according to the storage conditions in the section "Technical Data".

In case of complete decommissioning, proceed according to section 7.6 "Disposal".

In the event of re-commissioning, proceed as described in section 4 "Mounting and installation".

7.4 Packaging and transport

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

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

7.5 Spare parts

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

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 Disposal

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

Disposal instructions:

Returning the 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, save the packaging during the warranty period so that you can properly pack the device in the event of a warranty claim.

The disposal of the device itself is covered by the scope of electrical waste. If necessary, contact your local waste disposal company for information on suitable disposal methods. Do not dispose of electrical equipment in household waste, but use the regional collection points. If electrical devices are disposed of in an uncontrolled manner, hazardous substances can enter the groundwater and thus the food chain during weathering or poison the flora and fauna for years.