Modular Powerline
Telecontrol system

➔ Telecontrolling on live cables and cable shields

10.08.2023

Operating manual

MFW-PL-BA-UK-001

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1 Validity

This description of the MFW system is valid for the following modules:

Master modules

Item number	Type	from software version
97BPAGANBBB0	MF-PLM15-G8DEX-DIA-B-BB-0	19AC0005.001.2.0
97BPAGCNBBX0	MF-PLM15-G8DAR-DIA-B-BX-01	9AC0007.001.2.0
97BPA7JNBBX0	MF-PLM15-7PMIP-DIA-B-BX-0	19AC0047.000.2.0

Substation modules

Item number	Type	from software version
97HPAGANBBB0	UF-PLM15-G8DEX-DIA-B-BB-0	19AC0006.001.2.0
97HPAGCNBBX0	UF-PLM15-G8DAR-DIA-B-BX-01	9AC0008.001.2.0

The description of the parameterization software refers to the status from version 2.3.12.

→ These operating instructions contain the hardware description of the MFW modular telecontrol system for live cables and cable shields. The MFW basic modules can optionally have extended functions, e.g. interfaces to automation or control systems. These functions are described in separate documentation.

2 General information

2.1 Supplementary instructions

Please note!
These instructions enable the safe and efficient use of the Modular Telecontrol System (hereinafter referred to as "MFW" or devices). The instructions are an integral part of the devices and must be kept in the immediate vicinity of the devices and accessible to personnel at all times.

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

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

2.2 Use

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

2.3 Target group

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

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

2.4 Explanation of symbols

Safety instructions

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

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

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

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

Tips and recommendations

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

Further markings

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

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

Important passage

This symbol indicates particularly important information.

Cross reference

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

2.5 Safety instructions

2.5.1 Intended use

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

WARNING!
Danger of misuse!
Misuse of the telecontrol devices can lead to dangerous situations.

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

2.5.2 Storing the instructions

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

2.6 Customer service

Our customer service is available for technical information:

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

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

2.7 Copyright, trademark rights

Copyright protection

These instructions are protected by copyright.

The transfer of these instructions to third parties, reproduction in any form or by any means - including excerpts - as well as the utilization and/or communication of the contents are prohibited without written permission.
The use of the product is not permitted without the prior written consent of Elektra Elektronik GmbH & Co Störcontroller KG (hereinafter referred to as the "manufacturer"), except for internal purposes. Infringements will result in compensation for damages. The manufacturer reserves the right to assert additional claims.

The copyright lies with the manufacturer.

2.8 Terms used

MFW
In the system-integrated version, the MFW modular telecontrol system consists of a master unit and up to 31 substations. A basic module is required in each station, to which up to 15 optional extension modules can be connected.

Basic module
The basic modules represent the minimum configuration of a telecontrol station (master unit or substation).
They are available in two versions - master module and substation module.

Master module and substation module
A basic module in the master module variant is used in the control center. The master module coordinates the data exchange between the individual stations and has an image of all the system's inputs and outputs. The substation modules are used in the substations.

Extension module
To extend the I/O range, each basic module can be equipped with a maximum of 15 extension modules. The modules are hot pluggable. These are connected via the system bus (based on CAN bus).

I/O module
Most basic modules have 8 inputs or outputs. These are referred to as I/O modules. The expansion modules also contain an I/O module, consisting of 8 digital inputs, 8 transistor outputs, 8 output relays, 4 analog inputs or 4 analog outputs.

Station address
To identify the station in the MFW system, each substation module is assigned a station address (1 - 31) and is assigned to each substation module. Address 0 is permanently assigned to the master module and does not need to be set. Station addresses must not be assigned twice!

Module number
Each I/O module is assigned a module number. The input and output modules are assigned via their respective module numbers. The location of the module within the system (station address) is completely irrelevant. For example, the input module with the number 5 transmits its data to all output modules with the number 5.

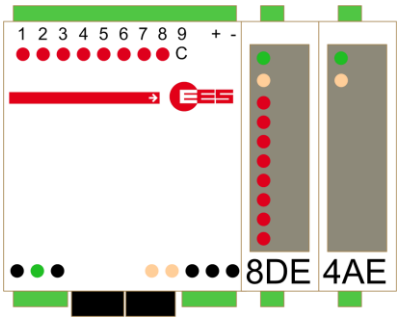
3 Functional description

In its minimum configuration, the telecontrol system consists of a master unit and a substation. At least one basic module is required in each station. To extend the I/O range, each basic module can be upgraded with a maximum of 15 extension modules. These are connected to the basic module using the system bus cable supplied. Further information can be found in the separate expansion module data sheet.

Data exchange is coordinated by the master using the polling principle. In the event of a fault, the system recognizes the faulty communication and reports this via LED and relay contact both in the control panel and in the substation concerned. In addition, the accessibility of each connected station can be signaled at any point in the telecontrol system via a binary contact if appropriate I/O modules are used. This information can also be evaluated via the optional protocol interface. Once the cause of the fault has been rectified, normal operation is automatically resumed.

The configuration of the system is simple and convenient. Only the station address (1 - 31), module number (0 ... 254), static input or pulse input for digital I/Os and current/voltage for analog signals etc. are set on the modules themselves using DIP switches. Further parameters for optional interfaces or functions are set using a PC and parameterization program if necessary.

3.1 Modular structure of a MFW station

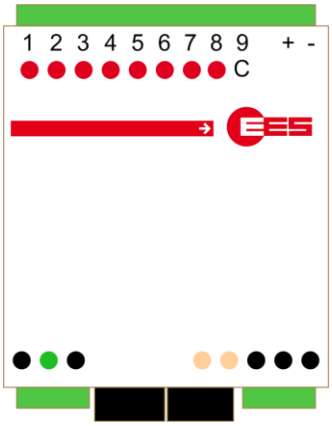


Each MFW station consists of a basic module and optional extension modules. An I/O module or a protocol interface can be integrated in the basic module. Additional I/Os can be implemented using a maximum of 15 external extension modules, each of which contains an I/O module. The expansion modules are connected to the basic module via a station-internal system bus (based on CAN bus).

Fig. 3-1: MFW station consisting of a basic module and 2 extension modules

3.1.1 Basic modules

Basic modules contain the following function groups, display and setting elements:



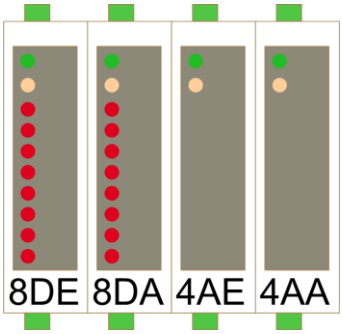
- Internal powerline modem
- USB-B socket (service and diagnostic interface)
- I/O module with galvanic inputs or outputs (optional)
- Protocol interface (parameterizable RS232 or RS485) (optional)
- RJ11 socket (system bus based on CAN bus) for connecting optional expansion modules
- RJ45 socket (Ethernet connection)
- Displays and relay contact for monitoring the device status
- DIP switch for configuring the basic settings (station address, module number, etc.)

Figure 3-2: Basic module

3.1.2 Extension modules

The extension modules for extending the I/O range are connected to the basic module via the station's internal system bus (CAN bus socket on the underside of the modules). A 20 cm long system bus cable is included with the extension modules. Longer system bus cables are available on request. The extension modules each contain an I/O module consisting of binary inputs, relay outputs, transistor outputs, analog inputs or analog outputs.

The following extension modules are currently available:



- 8 DE = 8 DI (digital inputs:
  12V, 24V, 60V, 110V or 220V AC/DC)
- 8 DA = 8 DO
  - 8 DAR (relay outputs)
  - 8 DAL (transistor outputs 24 V)
- 4 AE = 4 AI (analog inputs 0 ... 10 V and 0 ... 20 mA switchable)
- 4 AA = 4 AO (analog outputs 0 ... 10 V and 0 ... 20 mA switchable)
- Object protection module

Fig. 3-3: Extension modules

The function of the extension modules is explained in detail in the separate "MFW-EM-BA-DE" operating instructions.

3.2 Process data, module assignment and data exchange

The process data present at galvanic inputs and outputs is transmitted as measured and set values, alarms, commands, pulses and counter values**.** All the inputs and outputs of a module are referred to as I/O modules. Module numbers are assigned to these I/O modules using DIP switches (see Configuration section). Data is automatically routed in the MFW system based on these module numbers. Data is exchanged between modules with the same module number. The station in which the module is located - defined by the station address of the basic module - is irrelevant here. Output module numbers can be assigned multiple times. However, input module numbers can only occur once in an MFW system.

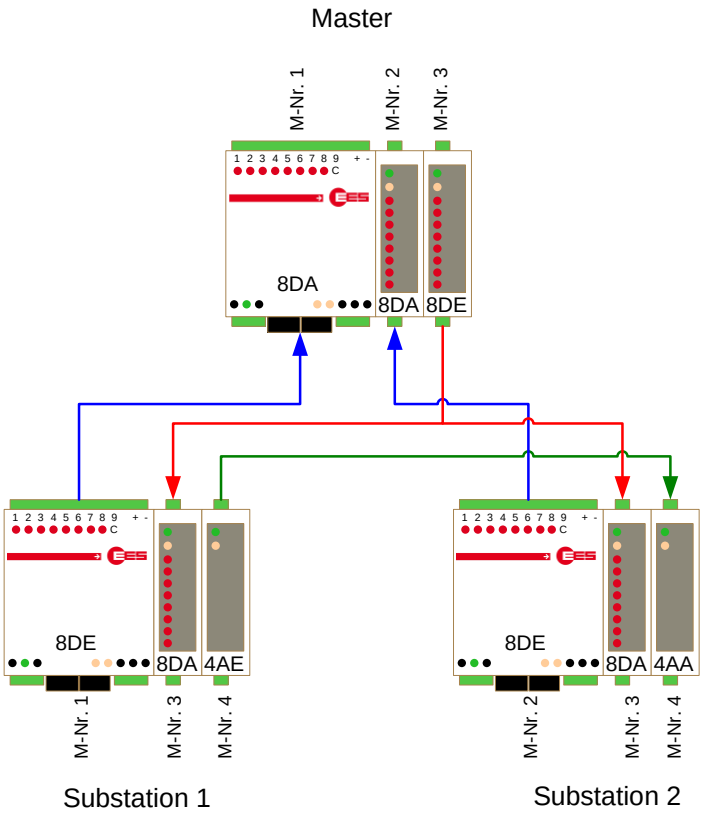


Fig. 3-4: Example of a module assignment

In the example above, the modules are ranked as follows:

The inputs of module 3 of the master unit are output on the two output modules 3 of the substations.

The states of input modules 1 and 2 of the two substations are transmitted to the master unit and displayed there on output modules 1 and 2.

The analog inputs of module 4 of substation 1 are output at module 4 of substation 2.

The transmission of the values of the module with module number 4 shown in this example always takes place via the master unit, not directly between the two substations, even if there is no corresponding output module in the master unit. The master always knows the module structure of the substations and forwards the values automatically.

If a basic module with a protocol interface is used, the data points of the protocol interface are converted into virtual MFW modules (see section memory model and data formats). Depending on the number of virtual modules required, expansion modules with galvanic I/Os can also be connected. The maximum number of all modules (real I/O modules and virtual modules) is 16. Further details can be found in the separate interface description.

3.3 Transmission on current-carrying lines

The MFW powerline telecontrol system uses a very secure carrier frequency method (Hamming distance > 6) for signal transmission and is therefore also suitable for use in harsh, interference-contaminated industrial environments. The MFW is suitable for bridging distances of several kilometers.

In accordance with DIN 50065-1:1999, the frequency range of 95-125 kHz and 140-148.5 kHz is approved for general signal transmission with an undefined protocol on electrical low-voltage networks (powerline). The MFW Powerline telecontrol system operates with a carrier frequency of 109.4 kHz as standard. Equipment in this class is suitable for general use and therefore does not require registration or approval from authorized approval bodies.

The structure of the transmission network can be designed as a star, ring or branch system. In order to achieve long data transmission distances, we recommend the use of carrier frequency barriers in all cases. The potential separation between supply voltage, signal inputs, transmission line and signal outputs prevents the carry-over of fault currents.

Consumers and power transformers represent an RF short circuit for the carrier frequency signal. In order to achieve the longest possible ranges, the section of cable used for data transmission should be isolated by carrier frequency traps. If there are other cable outlets between the marked barriers, these must also be equipped with carrier frequency traps.

For shorter transmission distances, carrier frequency blocking may not be necessary. Our service team will be happy to advise you on the necessity of carrier frequency traps and mains filters in your specific application.

The bus terminals of the basic modules are designed for direct connection to the live cable up to 500 V AC/DC. If lines with voltages up to 1000 V are to be transmitted, additional coupling transformers must be used. By using coupling transformers, the transmission medium can also be changed (e.g. from a power line to a potential-free cable and back). Only coupling transformers are also required to switch between power lines of different voltage levels.

In some cases, other electrical devices (e.g. frequency converters) can cause interference in data transmission. If the mains cable intended for transmission is heavily contaminated with interference voltage or high-frequency harmonics are present, suitable mains filters must also be used. In this context, please note that various types of interference can only occur intermittently and therefore cannot be detected immediately during one-off measurements.

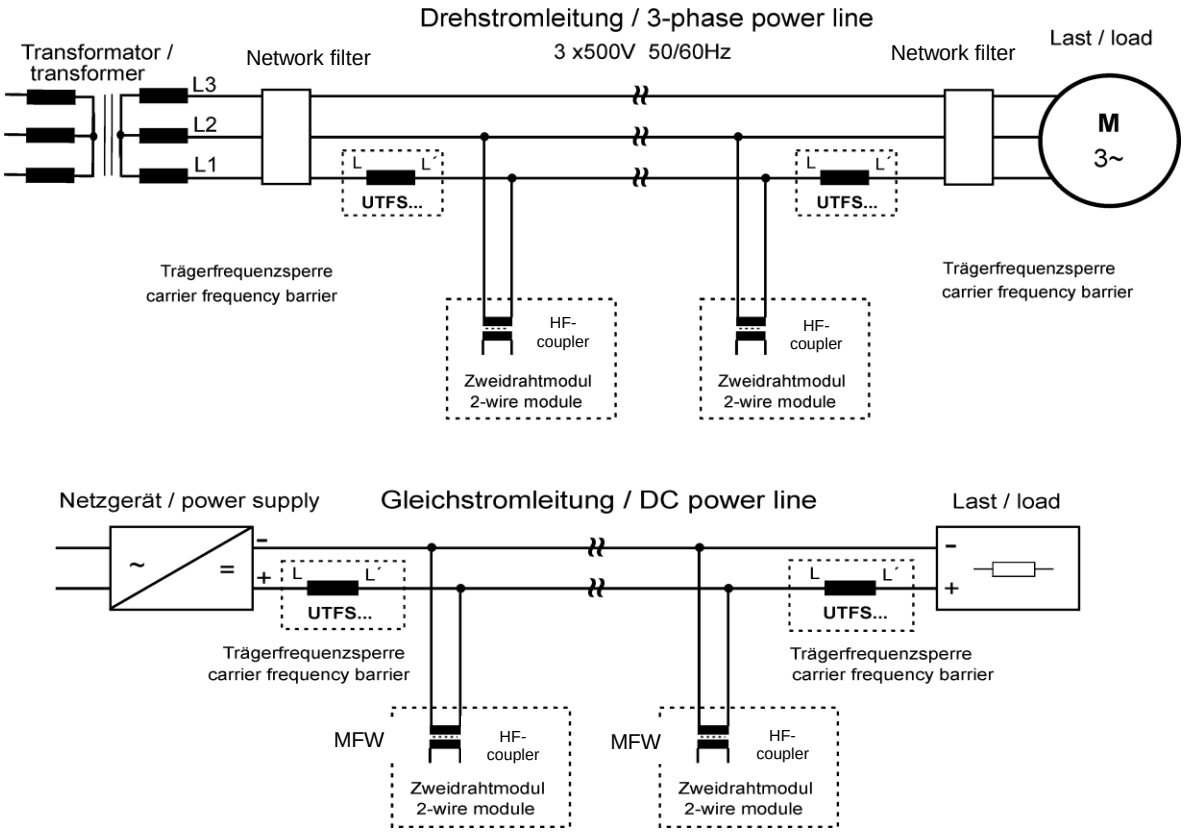
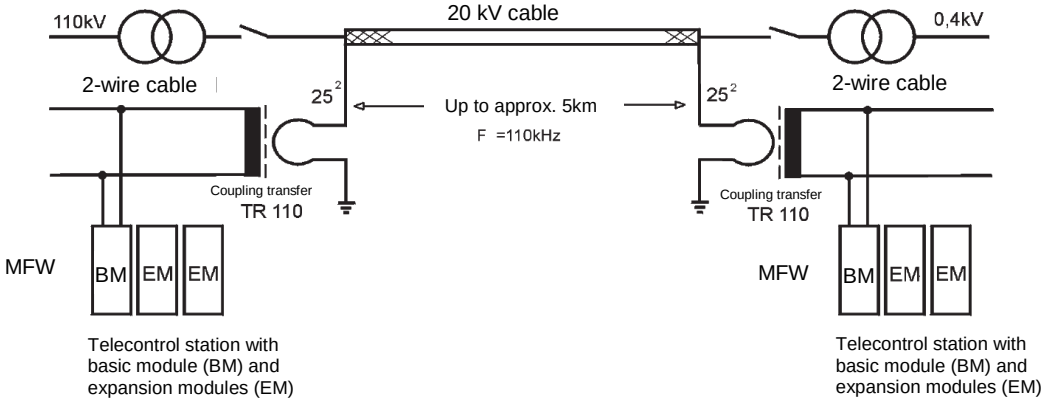


Figure 3.5 Application of data transmission on three-phase and direct current lines

3.4 Transmission on cable screens

Data transmission via the cable shield of medium-voltage systems takes place between the cable shield and earth. This naturally requires an unearthed cable shield. If necessary, older cables should be checked for this. The Powerline modules are connected to the shield using special coupling transformers. The connecting cables of the transformer must be inserted into the earth connection of the cable shield so that the purely passive transformer can fully discharge both fault and short-circuit currents to earth and also couple the carrier frequency into the cable shield with very little loss. The following figure shows the basic structure of a cable shield transmission line.

Figure 3.6 Application of data transmission on cable shields



3.5 Encryption of the data connection

Data transmission between the individual MFW stations can optionally be encrypted using the AES-128 method. This method works with pre-shared keys. Separate keys can be defined between the master unit and the individual substations. You can use your own keys or keys generated in the parameterization program and transfer and save them to the devices during parameterization. For security reasons, it is not possible to read out the keys from the devices. The storage and management of the keys on the parameterization PC is secured via user management and passwords in the parameterization program.

3.6 Inputs and outputs

3.6.1 Digital inputs

Digital inputs are realized by basic or extension modules. Each module has 8 inputs, which are switched to one of the following 4 input types using DIP switches or parameterization via PC:

Static binary input

The current status of the input is recorded for each transmission. In order to reliably transmit a status change, the status must be present for longer than the cycle time.

Binary input stored statically (only for substation base modules with 8DE)

A change to a digital input of the basic module of a substation is recorded and stored in the substation until the master registers and confirms the change. Only after this confirmation can a new status be recorded at the digital input. All status changes that occur in the meantime are not registered.

Pulse input

For the transmission of short pulses, inputs E1 ... E4 can be configured for secure pulse transmission using a DIP switch. Pulses or counter values are totalized in the input module until the next polling of the station and transmitted as a counter reading. Please note that the assigned outputs must also be configured as pulse outputs.

Operating hours counter

Inputs E1 and E2 of the "EM-G8DEX-..." digital expansion modules can be used as operating hours counters. To do this, the inputs must be configured for counter value processing and operating hours counter at the same time. Operating hours counters are treated like all other counter values in the MFW. The value of the operating hours counters can be configured (→ Operating instructions for the extension modules).

Operating hours counters can only be configured on the "EM-G8DEX-..." extension module from software version 01404001.021.000, but not on basic modules.

3.6.2 Digital outputs

Basic and extension modules can have 8 relay outputs. Extension modules are also available with 8 transistor outputs. The outputs A1 ... A4 can be configured as static binary outputs or pulse outputs using DIP switches. The outputs A5 ... A8 can be used as static binary outputs.

The output frequency (pulse width/pause) can be adapted to the input of the processing system on expansion modules via configuration and on basic modules via parameterization (→ chapter "Parameterization via PC").

It must be ensured that the pulse frequency at the input module is not permanently higher than the output frequency of the output module.

If the pulse frequency is high, it is advisable to use extension modules with transistor outputs (EM-G8DAL-0-BB-0) for the output for reasons of service life.

The behavior of the digital outputs of a station in the event of a transmission interruption can be defined via parameterization. There are two alternatives. In the event of a transmission interruption

1. the values of the binary outputs are retained. (factory setting)
2. the outputs are set to "0". (output relays drop out)

3.6.3 Analog inputs and outputs

The analog modules are
available as input or output modules (EM-G4AE0-0-BX-0 and
EM-G4AA0-0-BX-0). They have 4 analog inputs or outputs that can process either current values (0 ... 20 mA) or voltage values (0 ... 10 V).

3.7 Storage model and data formats

5 words (16 bits) are reserved internally in MFW for each I/O module. The assignment of these words is defined for standard I/O modules - depending on the module type - according to the table below. For virtual modules, the assignment of values may deviate from this model.

Data word	analog module	digital module
1	1. analog value	States of the contact inputs
2	2. analog value	1. counter value, if available
3	3. analog value	2. counter value, if available
4	4. analog value	3. counter value, if available
5	not used	4. counter value, if available

Table 3-1: Assignment of the 5 data words of an MFW I/O module

The process data and system statuses are displayed in the following formats depending on the data type:

Value	Representation	Value range
Binary values	The 8 digital inputs or outputs of a module are represented in the low byte of a 16-bit word. Bit 0 - E1 / A1 Bit 1 - E2 / A2 Bit 2 - E3 / A3 Bit 3 - E4 / A4 Bit 4 - E5 / A5 Bit 5 - E6 / A6 Bit 6 - E7 / A7 Bit 7 - E8 / A8 Bit 8 - 15 not assigned	0/1
Count values	The counting pulses totalized by the digital inputs are stored as 16-bit counter readings. The counter changeover can be parameterized on the master module in the range from 1 to 65535. When this value is reached, the counter is immediately set to 0.	0 ... 65535 By default, the counter envelope is set to 32768.
Analog values	The I/O modules of the MFW can process both 0...10 V and 0...20 mA values. However, the internal representation is always in the 16-bit word as a standardized value (0 ... 10 000 mV). One digit therefore corresponds to 1 mV or 2µ A.	0 ... 10 000

Table 3-2: Assignment of data words for standard I/O modules

The following table shows some typical analog values:

Voltage value	Current value	decimal representation	hexadecimal representation	Binary representation
1 mV	2 Aµ	1	0x0001	0000.0000 0000.0001
50 mV	100 Aµ	50	0x0032	0000.0000 0011.0010
1 V	2 mA	1000	0x03E8	0000.0011 1110.1000
5 V	10 mA	5000	0x1388	0001.0011 1000.1000
10 V	20 mA	10000	0x2710	0010.0111 0001.0000

Table 3-3: Representation of typical analog values within the MFW system

3.8 Interfaces of the basic modules

Depending on the type, the basic modules can have the following interfaces:

- USB socket Parameterization and diagnostic interface
- RJ11 socket System bus (based on CAN bus)
- Sub-D socket Serial protocol interface (optional)
- RJ45 socket Ethernet

The USB interface is located at the front, the system bus and Ethernet at the bottom of the devices. The optional Sub-D socket is located on the top of the modules.

3.8.1 USB interface

The USB interface serves two purposes:

Parameterization	- Parameterization of special parameters via PC program
Diagnostics-	Simple diagnostics and fault localization of the telecontrol system under Use of a terminal program (e.g. Hyperterminal in Windows or MFW-Commander)

To use the USB interface as a service or diagnostic interface, the terminal program used must be set to the following values:

- 115200baud
- 8 bit
- 1 start bit
- 1 stop bit
- No parity
- No flow control

3.8.2 Internal system bus (based on CAN bus)

This interface is used to connect the extension modules via a system bus cable (standard length 20 cm). The system bus cable is included with the extension modules. Longer system bus cables can be supplied on request. The extension modules communicate with the basic module via this cable. It is also used to supply power to the extension modules. If several extension modules are connected, the bus is looped from extension module to extension module.

This interface is not suitable for connecting CAN bus modules from other manufacturers.

3.8.3 Ethernet connection

This interface can be used as a parameterization and diagnostic interface as an alternative to the USB interface. Please note the interface settings in the corresponding sections.

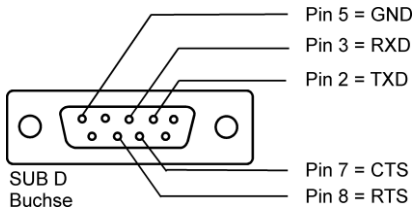
The Ethernet interface on the MF-PLM15-7PMIP-DIA-B-BX-0 and UF-PLM15-7PMIP-DIA-B-BX-0 basic modules is used to use the Modbus TCP protocol

On delivery, the basic modules do not have an IP address, the Telnet port is deactivated and the Modbus TCP interface, if present, is also deactivated. If these properties are to be used, they must first be specified or enabled in the parameterization via the USB interface.

3.8.4 Serial protocol interface (optional)

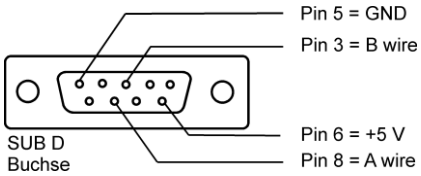
The MF-PLM15-7PMIP-DIA-B-BX-0 and UF-PLM15-7PMIP-DIA-B-BX-0 basic modules have a serial protocol interface on the top of the modules. This can be used as an RS 232 or RS 485 interface (parameterizable). The Modbus RTU protocol is currently supported.

With these two modules, the Modbus TCP protocol can still be used on the Ethernet interface.



The control lines CTS and RTS are not used for control, but are set to the correct level for data exchange.

Fig. 3-7: Assignment of the RS 232 protocol interface



The interface does not provide a 24 V output voltage for supplying an operating or maintenance device.

Fig. 3-8: Assignment of the RS 485 protocol interface

→ Further information on the Modbus protocol can be found in the separate interface description.

3.9 Connections, indicator lights and DIP switches

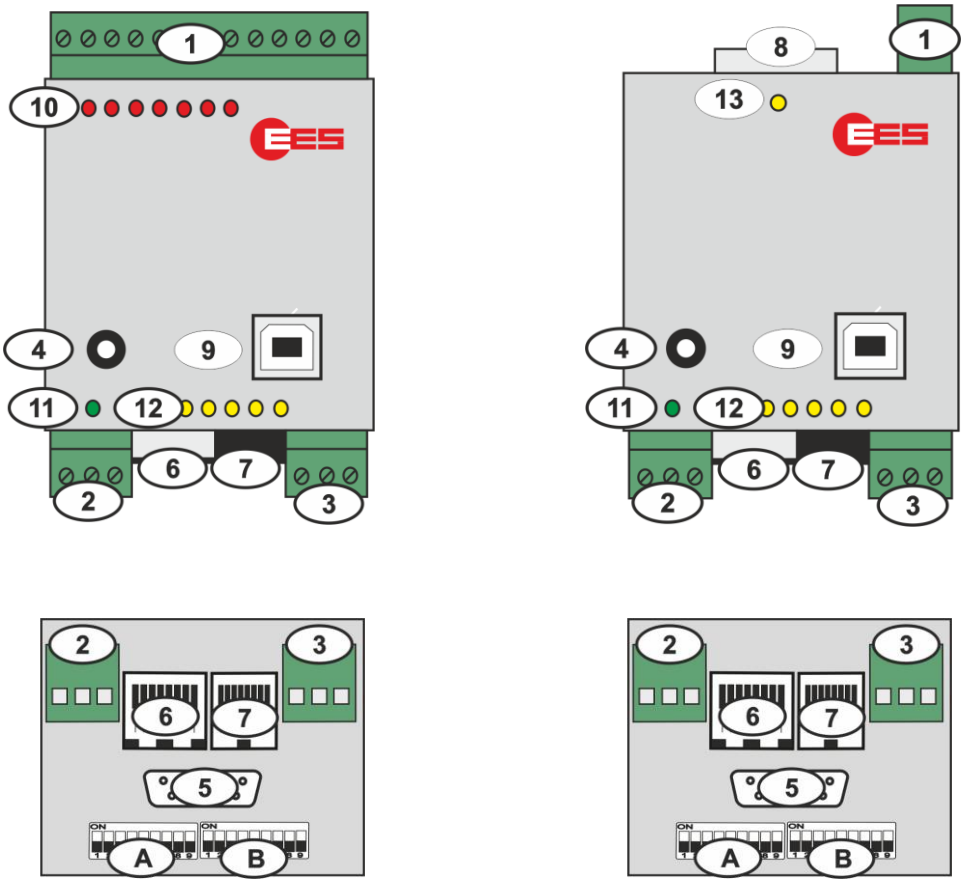


Fig. 3-9: Front and underside of basic module with galvanic I/Os or serial interface

[1] Terminal X2 (galvanic I/Os and operating voltage)
[2] Terminal X3 (fault signal relay)
[3] Terminal X7 (Powerline bus)
[4] Socket X8 (for DCF77 active antenna)
[5] Socket X6 (Sub-D) not used in this version
[6] Socket X4 (RJ45) LAN interface
[7] Socket X5 (RJ11) system bus (based on CAN bus) (for connecting expansion modules)
[8] Socket X96 (Sub-D) serial protocol interface
[9] Socket X1 (USB interface)

[10] Indicator lights "Outputs or inputs" (red) - light up when a signal is present.
[11] "Operating status" indicator light (green)

Permanent light	- No error
Off	- No supply voltage or module defective
Flashing	- Error (→ section "Diagnostic functions")
Fast flashing	- (flickering) Transferring or saving a new parameterization parameterization

[12] Status LEDs (yellow)

L/A - off, no connection in the network
- flashing, activity on the network connection (CRS active)

SPD - off, no network connection or network 10 Base-T
- on, network connection 100 Base-T

RUN - Data traffic on the Powerline bus (sending telegrams)

BUS - Data traffic on the Powerline bus (receiving telegrams)

CAN -"External module" LED - flashes when an extension module is connected.

DCF - LED "DCF77 module"

Flashing every second	- DCF77 reception
Irregular flashing	- poor DCF77 reception
Off	- No DCF77 reception or no DCF77 receiver connected

[13] LED (RX/TX) for the serial interface - flashes when data is being sent or received on the serial protocol interface.

[A & B] DIP switches for configuration (→ chapter Configuration)

3.10 Diagnostic functions

Various diagnostic information is available for monitoring and assessing the system functions. This includes, for example, the display of individual station faults via LEDs and relay contacts or further information via the diagnostic interface.

3.10.1 "Operating status" indicator light and fault signal relay

The green "Operating status" indicator light provides information about the current status of the station or system:

- Permanent light = no error
- Flashing with flashing sequence = error (→ section "Error codes")
- Off = no power supply
- Fast flashing (flickering) = transfer or saving of a new parameterization

A flashing sequence consists of:

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

Example: long, short, short, short, pause = error code 13

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

In addition to the "Operating status" indicator light, a relay with changeover contact signals the status of the station. (The status of the entire system is signaled on the master module).

Contact 14 / 15 closed - power failure or error (→ section "Error codes")
Contact 15 / 16 closed - no error

3.10.2 Error codes

The hexadecimal error numbers listed in the following table correspond to the flashing sequences of the "Operating status" indicator light. If the error code is read out via the protocol interface, it may be evaluated in decimal form depending on the higher-level system.

Example:

Error 12 - System bus error (CAN bus)
Flashing sequence of the indicator light - long, short, short, pause
Display on the protocol interface
hexadecimal - 0x12
binary - 0001.0010
decimal - 18

The following table lists the error codes for all basic modules. However, some errors can only occur on certain basic modules.

Error number		Error	Remark
hex	decimal		
12	18	System bus error (CAN bus)	Communication between the basic module and at least one extension module is faulty or an extension module is defective.
13	19	Error at substation	An error has occurred in a substation. (This error is only signaled on the master)
15	21	Substation / master not reachable	Substation: Master could not be reached. Master: The master had no contact with the substation within a time that can be parameterized separately for each substation.
51	81	Parameter reset	Parameter loss, possibly due to prolonged power failure or software update. If this error occurs again, the parameters could be reconstructed from the EEPROM status.
52	82	Parameter error Load EEPROM	The parameters could not be reconstructed from the EEPROM status. The factory parameterization was adopted.
61	97	Error Serial interface	There are communication problems on the protocol interface.
64	100	Ethernet connection disrupted	There is no connection to the network. Check the cable connection!
68	104	Error NTP	No connection to the NTP server
94	148	RAM error	Hardware error in RAM, Send in device for service
95	149	FLASH error code	Hardware error in the FLASH memory, Send in device for service

Table 3-4: Error codes

3.10.3 Station error as binary alarm

In certain applications, it makes sense to assign each substation its own binary output for signaling the operating status. Module numbers 254 - 251 are reserved for this by default. Errors are assigned to the outputs as shown in the following table. Set outputs signal a faulty station. The specified output modules can be inserted anywhere in the telecontrol system. Multiple insertion of the modules is also possible.

Module number	Output	Error in station
254	A1	Master
	A2	Substation 1
	A3	Substation 2
	A4	Substation 3
	A5	Substation 4
	A6	Substation 5
	A7	Substation 6
	A8	Substation 7
253	A1	Substation 8
	A2	Substation 9
	A3	Substation 10
	A4	Substation 11
	A5	Substation 12
	A6	Substation 13
	A7	Substation 14
	A8	Substation 15

Module number	Output	Error in station
252	A1	Substation 16
	A2	Substation 17
	A3	Substation 18
	A4	Substation 19
	A5	Substation 20
	A6	Substation 21
	A7	Substation 22
	A8	Substation 23
251	A1	Substation 24
	A2	Substation 25
	A3	Substation 26
	A4	Substation 27
	A5	Substation 28
	A6	Substation 29
	A7	Substation 30
	A8	Substation 31

Table 3-5: Assignment of the ward error alarms to the outputs

The module numbers for the error alarms can be changed via parameterization.

3.10.4 Diagnostics via USB interface

Additional information about the system status can be obtained via the USB interface using a terminal program (e.g. MFW-Commander or Hyperterminal). The interface parameters of the terminal program must be set as follows:

- 115200baud
- 8 bit
- 1 start bit
- 1 stop bit
- No parity
- No flow control

3.10.5 Diagnostics via Ethernet

If the IP address is known, diagnostic commands can also be issued and diagnostic data queried via the network connection and the programs mentioned above (e.g. MFW-Commander or Hyperterminal).

On delivery, the basic modules do not have an IP address and the Telnet port is deactivated. Both must first be specified or enabled in the parameterization via the USB interface.

The access data must be entered in accordance with the device parameterization (→ section "Parameterization/LAN parameters/Telnet port activation").

Please note the network settings on your PC and the configuration of your network.

3.10.6 Diagnostic commands

This section lists the commands that can be used to query the diagnostic information. Command letters are case insensitive. The commands must be terminated with <ENTER>.

Command /Syntax	Function
f<no.>	f - Output of the currently pending errors (error codes) f<no.> - Output of the error text associated with the error number <no.> *Example:* *f<ENTER> → "Error: 12,13"* *f12<ENTER> → "Error: System bus (CAN bus)"* *f13<ENTER> → "Error: (1) Error at substation" ; Error at substation 1*
hl hl<n>	Output of the entire history or the <n> most recent entries. *Example:* *hl5 → Output of the last 5 entries in the history* *hl → Edition of the entire history* *hl0 → Stops the output of the history*
i	Output of the station address or number of connected substations and the module number of the basic module *Example master: Number of substations =1 Module number 0* *Example substation: Substations = 1 Module number = 0*
l	**Can only be used on master modules** Output of the configuration list of the entire system *Example:* *l<station address>,<module number>,<module type>,<4-digit serial number>*
m	Output of the list of the station's modules. One line is used for each possible module. *Example:* *<LNo.>,<status>,<serial number>,<MNR>,<MType><error>* *<LNo.> 0...15 (position of the module in the configuration list)* *<status> 0 = free, 1 = occupied* *<Serial number> 4-digit serial number of the module* *<MNR> set module number* *<MType> Type of module DE, DA, AE, AA* *<Error> "Error" or "OK"*
<mnr>	Output of the 5 data words of a module as a decimal value <mnr> - Module number 0 ... 254 *Example:* *0, 254, 5, 0, 0, 0 ;module number 0, 1st value = 254, 2nd value =5, 3rd-5th value =0*
s	Outputs the DIP switch positions of the basic module as a 0/1 sequence 1 = ON, 0 = OFF *Example:* *Switch= <10000000>,<10000000>* *< SA1 - SA8>< SA9,SB1 - SB7> Switches in the underside of the module, the* *The positions of switches SB8 and SB9 are not output.*
t52	Output of the hardware serial number of the module Example: 0.0.0.112.66.16
t52,h	Output of the MAC address of the module Example: 00-00-00-70-42-10
t53	Output of the software version *Example: 01b16000.000.000*
u<n>	**Can only be used on master modules** If there is a substation error, this can be queried. <n> is the number of the substation 1...31 The function outputs the error code of the current error of the substation. Only the error with the highest value is output. *Example: u1 → Output of the error of substation 1* *12 = CAN bus error*

Table 3-6a: Diagnostic commands

Command /Syntax	Function
v<n>	**Can only be used with master modules** Display of the connection quality <n> is the number of the substation 0...30 (address -1) The ratio of response to query telegram of this substation is output as per thousand (0...999).

Table 3-6b: Diagnostic commands

Data word	Analog module	Digital module
1	1. analog value	Binary value as decimal value
2	2. analog value	1. counter value, if available
3	3. analog value	2. counter value, if available
4	4. analog value	3. counter value, if available
5	not used	4. counter value, if available

Table 3-7: Internal representation of the I/O states of the I/O modules in 5 data words each.

Example 1:

On the digital input module with module number 0, the first input is switched as a pulse input. The 5 data words are output as follows:

0, 6, 5, 0, 0, 0

Module number 0

1. *Binary value decimal = 6 → "00000110" E1 = 0 (counting input)*
   E2 = 1
   E3 = 1
   E4 ... E8 = 0
2. *So far, 5 counts have been registered at entrance E1.*

Example 2:

On the analog output module with module number 1, the first input is switched as a current output and the second, third and fourth outputs as voltage outputs. Analog values are stored in the range from 0 ... 10 000 standardized. The 5 data words are output as follows:

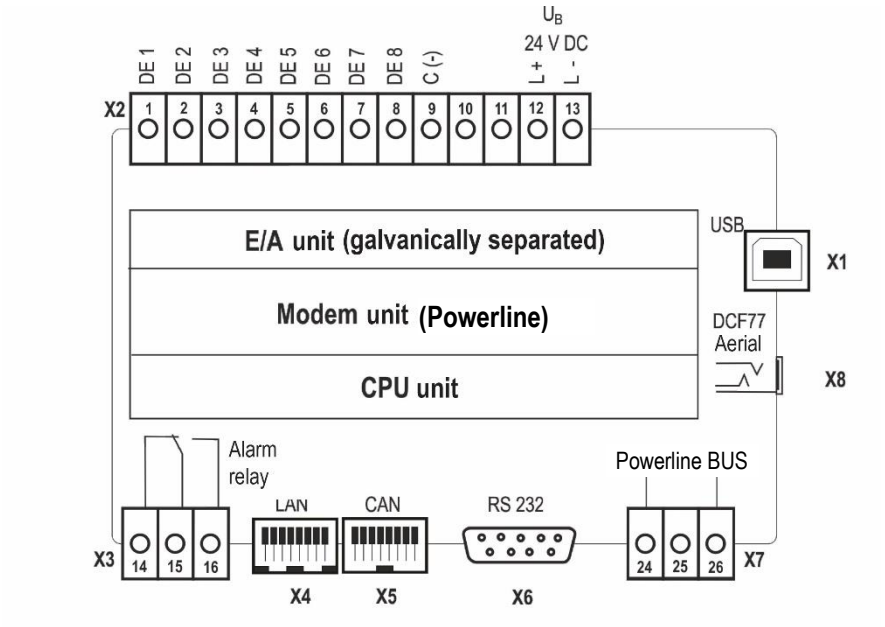
1, 1000, 5000, 1,10000, 0

Module number 1

1. *Analog value = 1000 → 2 mA*
2. *Analog value = 5000 → 5 V*
3. *Analog value = 1 → 1 mV*
4. *Analog value = 10 000 → 10 V*

Analogue input modules can standardize the values to 0 ... 10,000 (MFW standard) or 0 ... 32,767 (IEC standard). Which standardization is used can be selected on the input module using a DIP switch. The above examples only apply to the MFW

3.11 Terminal assignments



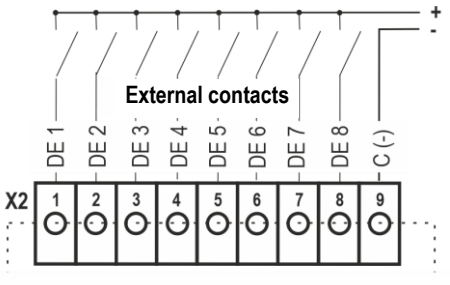
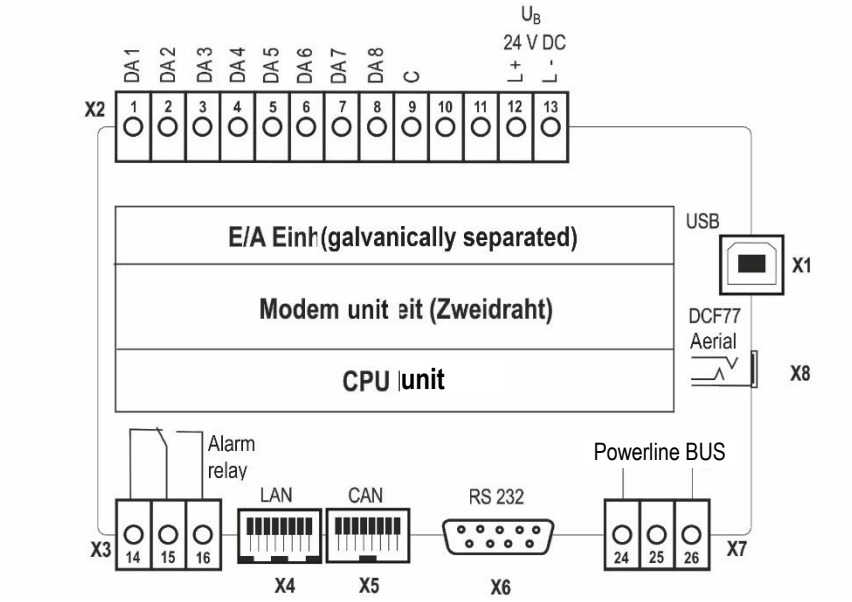


Fig. 3-10: Terminal assignment of basic module with 8 digital inputs



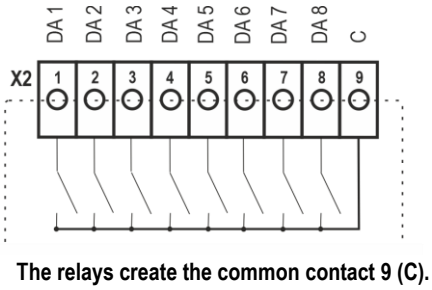


Fig. 3-11: Terminal assignment of basic module with 8 relay outputs

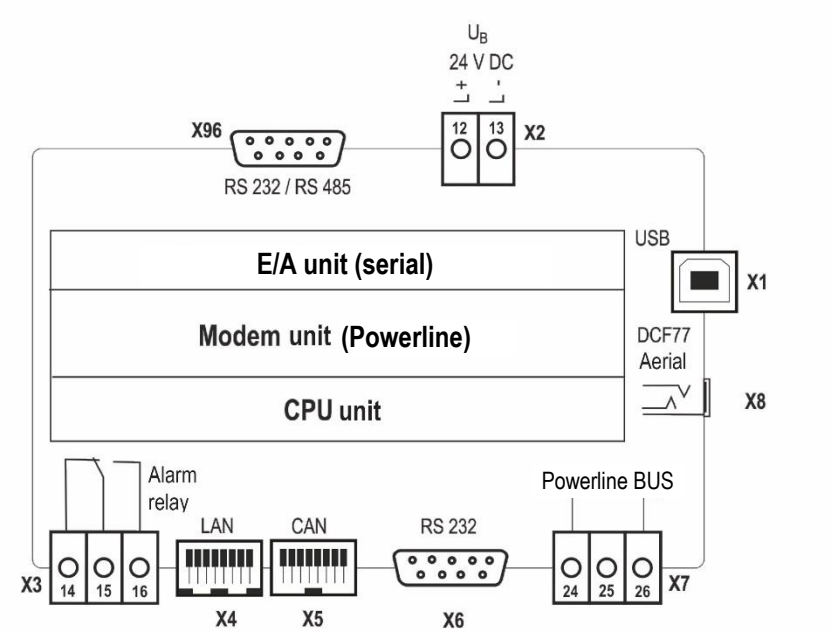


Fig. 3-12: Terminal assignment of basic module with serial protocol interface

3.12 Dimensional drawings

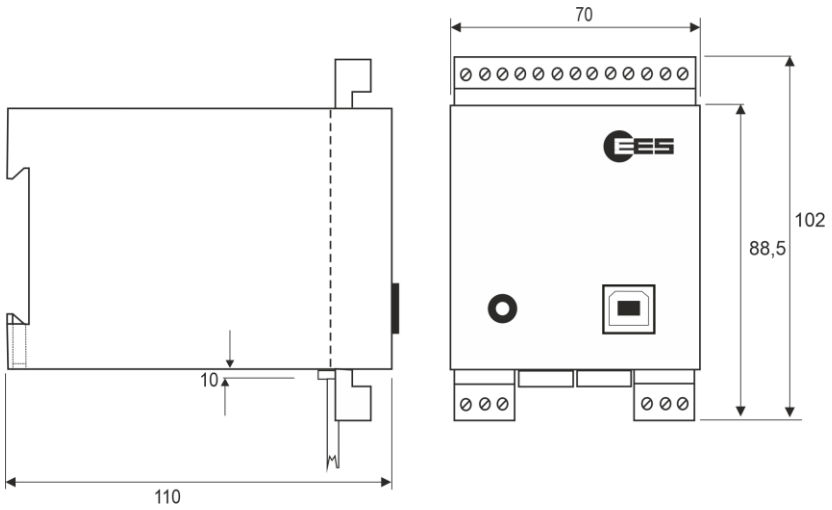


Fig. 3-13: Basic module with 8 digital inputs or outputs

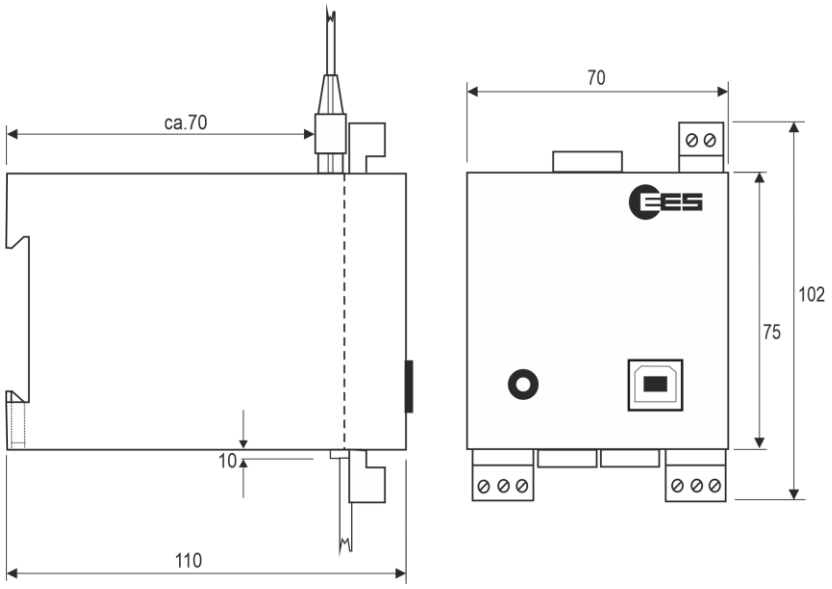


Fig. 3-14: Basic module with protocol interface

Dimensions in mm

3.13 Technical data

General data	
Mounting	on C-rail TS35 according to EN60715
Housing / protection class	ABS / IP 40
Connection terminals	pluggable
Conductor cross-section rigid or flexible	
without ferrules	0,2 ... 2.5 mm ^{2}
with ferrules	0,25 ... 2.5 mm^2
Operating and ambient temperature	-20 °C ... + 60 °C
Air humidity	maximum 95 % non-condensing
Operating voltage	
Nominal operating voltage U_B	24 V DC
Operating voltage range	20 ... 32 V DC
System bus	
Connection	RJ11 based on CAN bus
Operating range	maximum 10 m
Parameterization and diagnostic interface	
USB	USB-B socket
Protocol interface	
Protocol	Modbus RTU/TCP
Ethernet	RJ45 10/100 Base-T
Serial	RS232 or RS485 (parameterizable)
Powerline modem	
Level class / type	122 (registration-free) / type 2
Transmit voltage	2.8 Vpp at 5 Ω (regulated)
Receive sensitivity	Standard approx. 3 mVpp (higher values can be set)
Insulation voltage between Powerline and supply voltage as well as Powerline and I/Os	4 kV $_{eff}$
Basic modules with 8 DE	
Power consumption (basic module only)	approx. 2.5 W
Signal voltage U_S	
Rated voltage	24 V AC/DC
Maximum voltage	48 V
Minimum voltage for high state	14.5 V DC / 19.0 V AC
Maximum voltage for low state	9.5 V DC / 6.5 V AC
Input resistance	approx. 10 kΩ
Maximum counting frequency	10 Hz * [1]
Minimum pulse width	50 ms * [1]
galvanic isolation between Signal and supply voltage	4 kV $_{eff}$

Basic modules with 8 relay outputs

Power consumption (basic module only)	maximum 3.5 W
Contact load capacity of the relay outputs*[2]	
minimum	1.2 V / 1 mA (suitable for controlling LEDs)
maximum	250 V AC / 400 mA 250 V AC / 2 A (purely resistive load) 30 V DC / 2 A 110 V DC / 0.2 A 220 V DC / 0.1 A
Total current 230 V AC	maximum 8 A (purely resistive load)
Counting frequency	12 Hz
Pulse width / pause	40 ms
Galvanic isolation between	
Output and supply voltage	4 kV $_{eff}$

Basic modules with protocol interface

Power consumption (basic module only)	maximum 2.5 W

EMC compatibility according to

EN 61000-6-2
EN 61000-6-4 + A1
EN 61000-4-2
EN 61000-4-3 + A1 + A2
EN 61000-4-4
EN 61000-4-5 + A1
EN 61000-4-6
EN 61000-4-29

[1] *We do not recommend
operating pulse inputs with AC voltage, but only with DC voltage.
[2] *We will be happy to provide you with more detailed specifications on request.

Unless otherwise stated, the specifications for AC voltage refer to a sinusoidal AC voltage with a frequency of 50/60 Hz.

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

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

For specification of the extension modules, see separate operating instructions.

Subject to technical changes

4 Installation and in stallation

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

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

   The delivery can consist of master module, substation and extension modules as well as other accessories. The extension modules are also supplied with the system bus cables for connection to the basic modules.

2. Select installation locations for the individual stations.

3. Configuring the modules→ Chapter "Configuration via DIP switch".

4. Snap the basic module and any necessary extension modules onto the mounting rail.

5. If extension modules are used, connect them to the base module via the RJ11 socket on the underside of the modules using the system bus cable supplied. If several extension modules are used, loop the bus connection.

   Only use the right-hand socket (RJ11) to connect the expansion modules (see illustration). If required, connect the Ethernet cable to the left-hand socket (RJ45).

6. Connect the input and output cables according to the terminal assignment.

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

7. Connect the Powerline bus to the X7 bus terminal.

8. If necessary, connect the optionally available DCF77 active antenna to the DCF77 socket [5]. Assembly and installation are carried out in accordance with the corresponding instructions.

9. Connect the power supply.

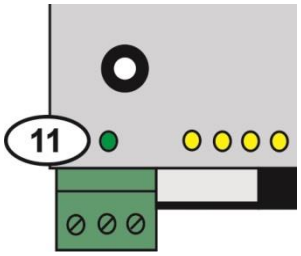
   The maximum length of the supply lines should be 10 m.

10. Switch on the power supply.

11. If necessary, parameterize the telecontrol system (→ corresponding chapter "Parameterization via PC").

12. Green "Operating status" indicator light [11] lights up continuously

    Continuously = the station is ready for operation. If the indicator light flashes, there is an error (→ section "Error codes").



5 Configuration

5.1 General principles Configuration via DIP switch

Data exchange within the telecontrol system is based on module numbers. A module number is assigned to each basic or extension module with an I/O module. The data is exchanged between modules with the same module number. The location of the module within the system (station address) is completely irrelevant. For example, the input module with the number 5 transmits its data to all output modules with the module number 5. There can be several output modules with one module number. However, an input module number may only be used once in the system.

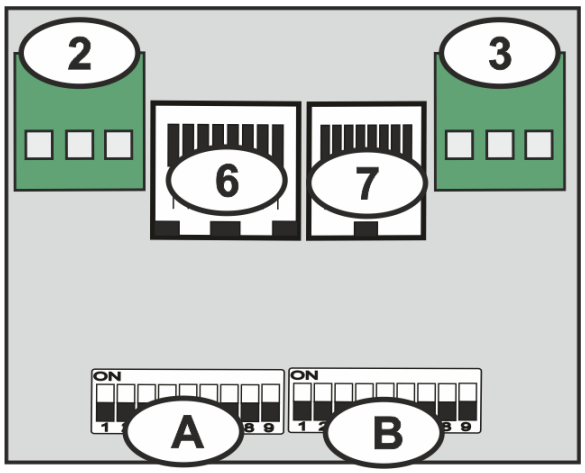


Fig. 5-1: Underside of the base modules

The most important settings can be made using DIP switches. These are, for example, station address (0 - 31), module number (0 ... 254), switching between binary and pulse input for digital I/O as well as current and voltage for analog signals, etc. The DIP switches A and B are located on the underside of the basic modules.

The module numbers 251 ... 254 are reserved for the output of station errors in the factory setting.

5.2 Master module

The station address is set to 0. The following settings must also be made:

Meaning	Values	DIP switch
Module number of the I/O module *1	0 - 250 (binary coded)	A1 - A8
Not used	ON	A9
Number of substations	1 - 31 (binary coded)	B1 - B5
Number of pulse inputs or pulse outputs *1	0, 1, 2 or 4 (All other inputs or outputs are treated as static I/O by the MFW).	B6 / B7 / Pulse input or output: OFF / OFF / none ON / OFF / I/O1 OFF / ON / I/O1 and I/O2 ON / ON / E/A1 - E/A4
Not used	ON	B5, B/
Powerline reception level	ON - Standard OFF -20 dB	B8
Powerline transmission level	ON - High OFF - Standard	B9

Table 5-1: DIP switches of the master module

*1 Only for modules with inputs or outputs

The number of connected substations and the module number are set in binary code.

Example:

Meaning	A1	A2	A3	A4	A5	A6	A7	A8
	$2^0 = 1$	$2^1 = 2$	$2^2 = 4$	$2^3 = 8$	$2^4 = 16$	$2^5 = 32$	$2^6 = 64$	$2^7 = 128$
Module number 2	OFF	ON	OFF	OFF	OFF	OFF	OFF	OFF
Module number 7	ON	ON	ON	OFF	OFF	OFF	OFF	OFF
Module number 254	OFF	ON	ON	ON	ON	ON	ON	ON

Table 5-2a: Example settings for module numbers

Meaning	B1	B2	B3	B4	B5
	$2^0 = 1$	$2^1 = 2$	$2^2 = 4$	$2^3 = 8$	$2^4 = 16$
2 stations	OFF	ON	OFF	OFF	OFF
7 stations	ON	ON	ON	OFF	OFF
31 stations	ON	ON	ON	ON	ON

Table 5-2a: Example settings for the number of substations

The pulse inputs or outputs are always counted from output 1 - 4. If 1 pulse counter is set, this is always output 1. The number of pulse outputs must always match the number of pulse inputs on the assigned module of the remote station.

The pulse width of the outputs can be set on the basic module in the range from 40 ms to 10 s in 40 ms steps. (See section "Parameterization").

5.3 Substation module with 8 DI or 8 DO

The substation module with 8 DE or 8 DA has 8 digital inputs or 8 relay outputs, of which the first 4 inputs or outputs can be switched as pulse inputs or pulse outputs using DIP switches.

On the UF-PLM5-G8DEX-DIA-0-BB-0 input module, each digital input that has been configured as a static binary input can be parameterized for the operating mode "Binary input statically stored" (→ section "Digital inputs") (→ section "Parameterization via PC"). In the factory setting, all 8 digital inputs are parameterized as static binary inputs without storage.

The following settings must be made:

<table>
<tr><th>Meaning</th><th>Values</th><th>DIP switch</th></tr>
<tr><td>Module number of the I/O module</td><td>0 - 250 (binary coded)</td><td>A1 - A8</td></tr>
<tr><td>Not used</td><td></td><td>A9</td></tr>
<tr><td>Station address</td><td>1 - 31</td><td>B1 - B5</td></tr>
<tr><td>Number of pulse inputs or pulse outputs</td><td>0, 1, 2 or 4
(All other inputs or outputs are treated as static I/O by the MFW).</td><td>
<table>
<tr><th>B6</th><th>B7</th><th>Pulse input or output</th></tr>
<tr><td>OFF</td><td>OFF</td><td>none</td></tr>
<tr><td>ON</td><td>OFF</td><td>I/O1</td></tr>
<tr><td>OFF</td><td>ON</td><td>I/O1 and I/O2</td></tr>
<tr><td>ON</td><td>ON</td><td>E/A1 - E/A4</td></tr>
</table>
</td></tr>
<tr><td>2-wire reception level</td><td>ON - Standard
OFF -20 dB</td><td>B8</td></tr>
<tr><td>2-wire transmission level</td><td>ON - High
OFF - Standard</td><td>B9</td></tr>
</table>

Table 5-2: DIP switches of the substation module with 8 DE or 8 DA

The station address and module number are set in binary code.

Example:

Meaning	A1	A2	A3	A4	A5	A6	A7	A8
	$2^0 = 1$	$2^1 = 2$	$2^2 = 4$	$2^3 = 8$	$2^4 = 16$	$2^5 = 32$	$2^6 = 64$	$2^7 = 128$
Module number 2	OFF	ON	OFF	OFF	OFF	OFF	OFF	OFF
Module number 7	ON	ON	ON	OFF	OFF	OFF	OFF	OFF
Module number 254	OFF	ON	ON	ON	ON	ON	ON	ON

Table 5-2a: Examples of DIP switch settings for the module number

Meaning	B1	B2	B3	B4	B5
	$2^0 = 1$	$2^1 = 2$	$2^2 = 4$	$2^3 = 8$	$2^4 = 16$
2 Station / Station 2	OFF	ON	OFF	OFF	OFF
7 Station / Station 7	ON	ON	ON	OFF	OFF
32 Station / Station 32	ON	ON	ON	ON	ON

Table 5-2b: Examples of DIP switch settings for the ward address

→ Please refer to the separate MFW-EM-BA-UK operating instructions for the configuration options of the extension modules.

6 Parameterization

The MFW parameterization program was developed to make the extensive setting options of the MFW as simple and convenient as possible using a PC. It is suitable for parameterizing all MFW modules that have parameterizable settings in addition to the DIP switch configuration. With the help of the program, the parameters are set menu-guided and loaded into the respective basic module of the station via the USB interface or network.

Factory parameterization can be carried out by the manufacturer in accordance with the user specifications.

6.1 Parameterization program

6.1.1 Installing the parameterization program

Installation requirements

- PC with Pentium processor or higher / installation - and administration rights if necessary
- At least 16 MB RAM
- At least 30 MB free hard disk space
- CD-ROM drive for installation
- Free, serial interface for communication with the MFW modules;
  alternatively USB or network interface (depending on hardware module)
- Windows 7, 8 and 10 operating system

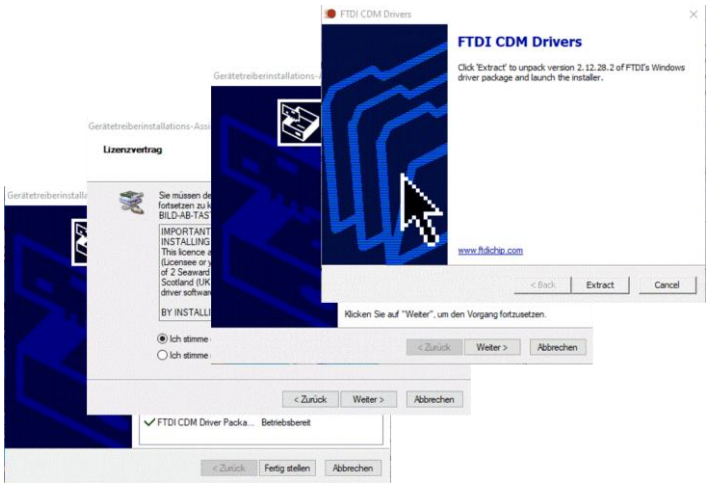
Installing the software

Please insert the CD into your CD-ROM / DVD drive. If the installation does not start automatically, please select the file "EES MFW Parametriersoftware Vx.x.x setup.exe" via a file browser (e.g. Windows Explorer - call via the Windows key & E) or the taskbar (Start/Run/...) and follow the instructions on the screen.

As an alternative to using the parameterization CD, you can also download the software from the download area of the EES homepage www.ees-online.de.

6.1.2 Installing the USB driver

If the MFW device is not recognized at the USB interface, the required USB driver is probably not yet installed on your PC. You can find the driver on the parameterization CD or in the download area of the EES homepage www.ees-online.de. The name of the installation program is CDM21228_Setup.exe.



Start the file and follow the prompts during installation:

1. Extract the driver files.
2. Agree to the installation of the drivers.
3. Read the license agreement and confirm it.
4. Confirm that the driver installation is complete.

Fig. 6-1: Driver installation dialogs

6.1.3 Program interface

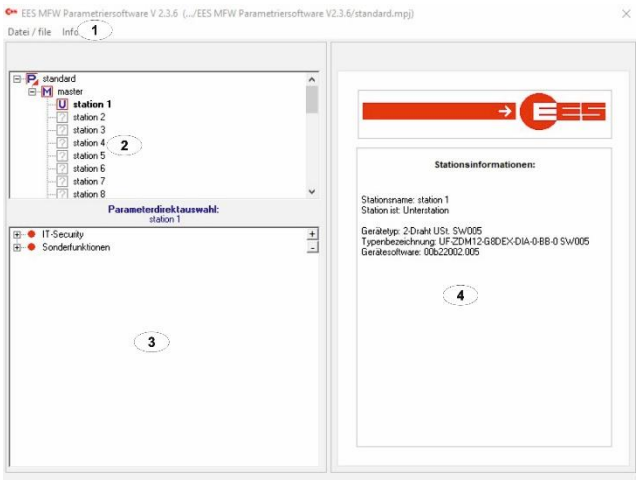


Fig. 6-2: Interface of the parameterization program

The user interface of the parameterization program shows 4 elements:

[1] Menu bar
[2] Project window
[3] Parameter selection window
[4] Station information (basic information on the selected station)

6.1.4 Menu bar

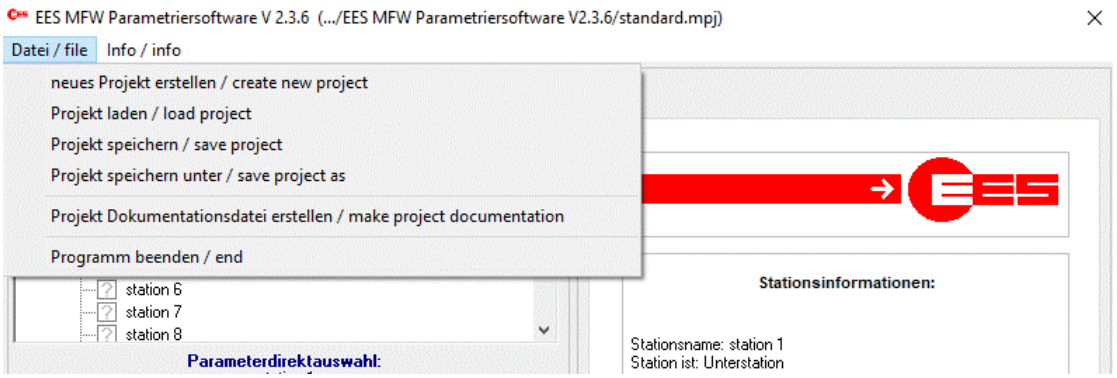


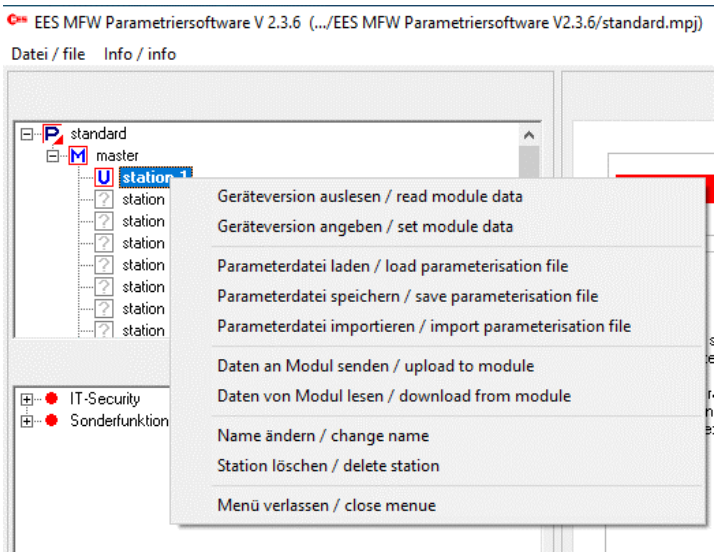
Fig. 6-3: Open "File" menu

The following actions can be carried out using the "File" menu item:

- Creating a new project
- Loading an existing project
- Saving a project
- Saving a project under a new name
- Exit program

6.1.5 Project window

The tree of an MFW project with all associated stations is displayed in the project window.



Right-clicking on a station in the project tree opens a context menu with the functions listed below.

Fig. 6-4: Open context menu for station 1

Menu item	Function
Read device version	This function is used to read the module type and software version from the connected device and load the corresponding standard parameter set.
Specify device version	If the module to be parameterized is not available, the module type and software version can alternatively be assigned in the dialog box that opens. e.g. Station 0 (Master) Module type MF-PLM15-G8DEX-DIA-B-BX-0 The selection must be completed with the "Accept data" button.
Save parameter file	Saving the parameters of a station independently of the project in an external file.
Load parameter file	The parameters saved in a file are assigned to the selected station. This function is used to exchange parameters between stations with the same software version or to transfer parameters from another project.
Import parameter file	The parameters saved in a file are assigned to the selected station. The module types or software versions of the two associated modules do not have to match. Only the parameters available in both modules are adopted. The other parameters remain in the previous setting. This function is used to exchange parameters between stations with different software versions (e.g. software update) or to adopt partial parameterizations (e.g. interface settings).
Send data to module	Write parameters of the module to the MFW
Read data from module	Read parameters from the MFW module
Change name	Change the name of the device or project (e.g. pump station 1)
Delete station	Remove a station from the project. Only the station and its parameter set are removed. The memory location of the station is retained.
Exit menu	Close menu

Table 6-1: Menu items of the context menu

6.1.6 Parameter selection and parameter window

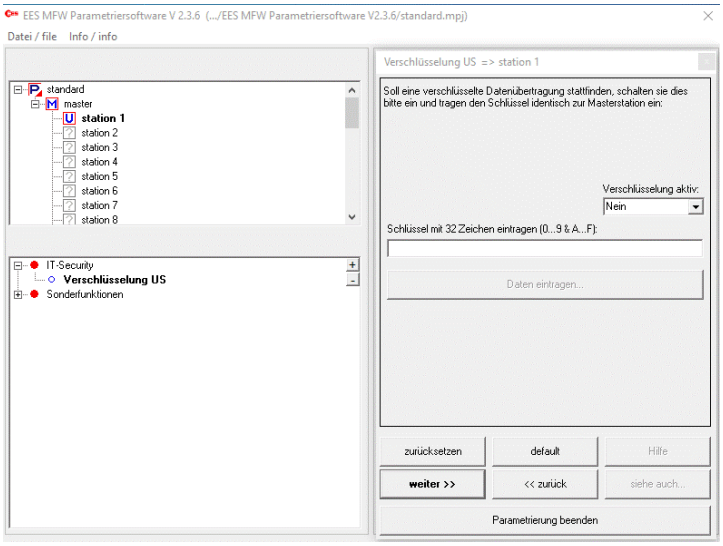


Fig. 6-5: Program interface with activated parameter window

All parameters of the station activated in the project window are listed in the parameter selection window below the project window. The list is arranged according to parameter groups (e.g. LAN parameters and special functions). The individual parameters are listed by clicking on the plus sign in front of the parameter group. If such a parameter is activated by clicking on it, the parameter window is opened in the window above the station information.

It is possible to open several windows next to each other in order to better parameterize linked parameters of different stations. To do this, simply drag the open window out of the parameter window before activating a new parameter. However, only one parameter window can be opened per station.

Each parameter window contains a brief description of the parameter, one or more adjustable values and 8 buttons, the meaning of which is explained in the following table.

Fig. 6-6: Parameter window

Button	Function
Enter data ...	Storage of the modified data
reset	Resets the modified but not yet saved value to the initial value.
default	Restoring the default setting of the parameter
Help	Call up an explanation of the parameter (currently not yet supported)
more >>	Change to the next parameter
<< back	Change to the previous parameter
see also ...	Cross-reference to related parameters
End parameterization	Closes this parameter window

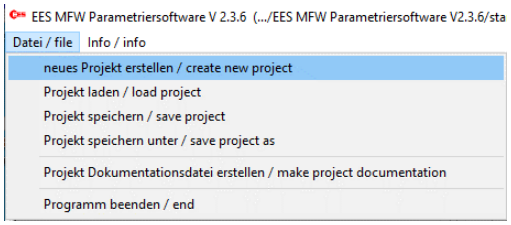
Table 6-2: Functions of the parameter window

6.1.7 Projects

A project contains all the information of an MFW system. This includes the system structure and the parameters of all stations.

6.1.7.1 Create new project or load from file

The parameters of all stations in an MFW system are saved in a project. The following steps are required to create a new project:



Installations of a new project

- Select the menu item "File / Create new project"
- Enter project name
- Select storage location

F

Loading an existing project

- Select the menu item "File / Load project"
- Specify project folder
- Select project (
  file with the extension mpj)

If the program detects when loading a project that the data record of a station no longer corresponds to the current program status (e.g. with an extended setting range or newly activated functions), you will be asked whether the previous database should continue to be used (recommended if all required functions could be used without any problems) or whether the data record should be updated (import). If you select the "Import" option, this may require subsequent settings - after importing, please open the automatically created "Import info" project in a second instance of the parameterization software and follow the instructions that appear.

6.1.7.2 Saving a project

The entire project can be saved in any folder using the "File" menu button under "Save project as". Click on "Save project" to save the open project under the same name.

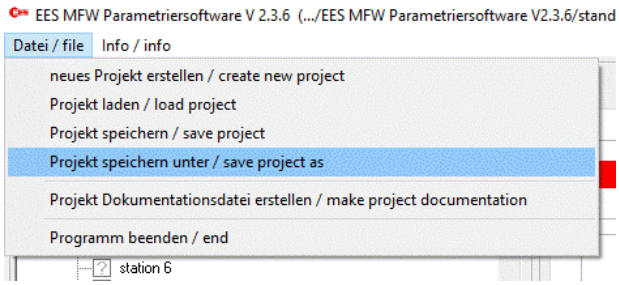


Fig. 6-8: Open "File" menu for saving a project

6.1.7.3 Saving individual stations of a project

Alternatively, the parameters of individual stations can be saved separately. An individual module file can be saved in any directory by selecting the context menu (right-click on the desired station) and the "Save parameter file" command.

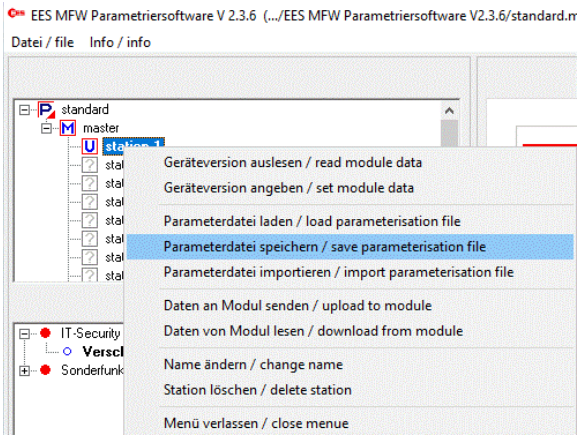


Fig. 6-9: Open context menu of the station1 Saving the parameter file of the station independently of the project.

6.1.7.4 Project files

A project always consists of several files that are stored in a directory of your choice.

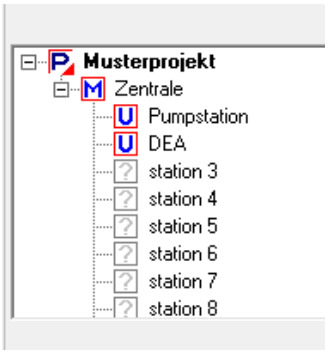


Fig. 6-10: Project tree

The project shown above with the name "Sample project" was saved in the folder with the name "Sample project" and contains the following files:

- *Sampleproject.mpj*
- *Sampleproject.ini*
- *Central.xml (parameter file of the master)*
- *Pumpstation.xml (parameter file of substation 1)*
- *DEA.xml (parameter file of substation 2)*
- *Sample project Backup info at .....*
  (for each backup a text file with information about the software version and the date and time of saving)

If you want to save this project or transfer it to another computer, you only need to copy the complete project folder.

6.1.8 Stations

If a project has been opened or newly created, the individual stations can be edited.

6.1.8.1 Creating a new station

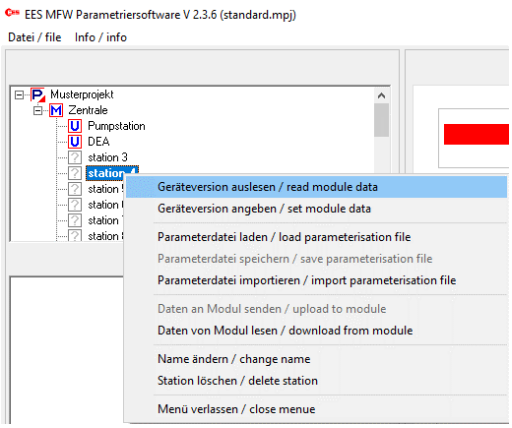


Figure 11: Open context menu for station 1

Right-clicking on a station in the project tree opens a context menu, the first two functions of which can be used to assign a device to the station:

Read device version

Module type and software version from the connected
from the connected device and load the corresponding standard parameter set.

Specify device version

Alternatively, the module type and the software version can be assigned.

If a module type has been assigned to a station, a colored "M" for master or "U" for substation appears instead of the question mark in front of the station name. The standard parameter set can now be edited, an existing parameter set can be read from a module or a file can be loaded.

6.1.8.2 Adopting the parameter set

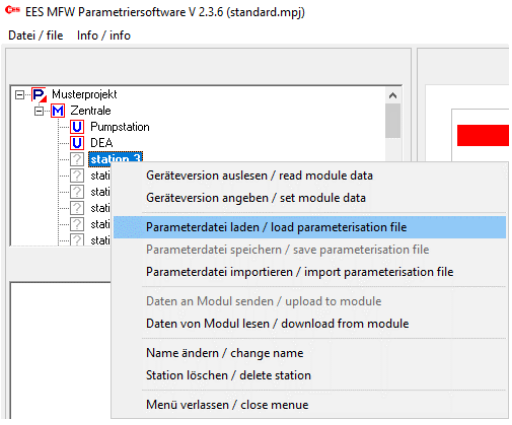


Figure 12: Open context menu for station 3

Right-clicking on a station in the project tree opens a context menu with two options for adopting a parameter set. can be realized.

Load parameter file

The station is assigned the parameters saved in an xml file of another station with the same software number.

with the same software number are assigned to the station. This file can come from the same project or

from another project.

Import parameter file

The parameters saved in an XML file are assigned to the station. The module types or software versions of the two associated modules do not have to match. match. Only the parameters that are common to both modules are are adopted. All other parameters remain in the existing setting. This function is used to exchange parameters between stations with different software software version (e.g. when re-importing the parameters of a station after a software after a software update) or to adopt partial parameterizations (e.g. interface settings). transfer.

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6.1.9 Changing the parameter set of a station

To change the parameters of a station, the saved project can be edited and the data then imported into the corresponding station. Alternatively, the parameters can also be read directly from the relevant station, edited and then imported again. Right-click on the relevant MFW module in the project tree and select "Read data from module" from the menu. In the window that opens, you can choose between the three transfer options:

- directly via the USB interface
- Remote parameterization via modem connection (not possible in the Powerline version)
- Parameterization via network connection

can be selected.

6.1.9.1 Reading out the parameters via the USB interface

This is the standard method for reading out the parameters of a station. The COM port assigned to the respective USB interface on the PC is used for this purpose. Please set the correct COM port and the baud rate 115200.

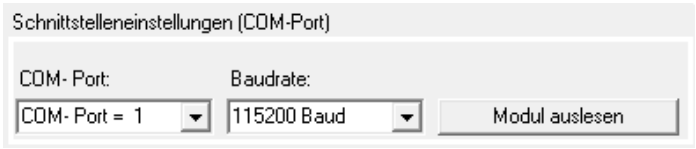


Fig. 6-13: COM port setting for reading the parameters of a module

The COM port assigned to the USB interface can be found in the PC settings.

6.1.9.2 Reading out the parameters via a network connection

If the IP address of the basic module is known and the Telnet port is enabled, the parameters can be read out remotely via a network connection (LAN or WAN).

Telnet is deactivated on delivery and must first be enabled for use in the parameterization.

Fig. 6-14: Setting for reading the parameters of a module via network connection

Please check the "Establish TCP/IP connection" box and enter the access data. These must correspond to the parameterization saved on the device (→ section "Parameterization/LAN parameters/Telnet port activation").

The settings for network access can be saved under "Save texts" and read in again for later transfers via the "Load texts" item. The last data used is already preset by default.

6.1.9.3 Editing the parameter set of a station

If a station has been assigned a module type and a corresponding parameter set using one of the above options, the parameters can be modified. By selecting the station with the left mouse button, all parameters of the station appear in the parameter selection window. If one of these parameters is selected by clicking with the left mouse button, the parameter window opens on the left-hand side. The necessary settings can be made in this parameter window.

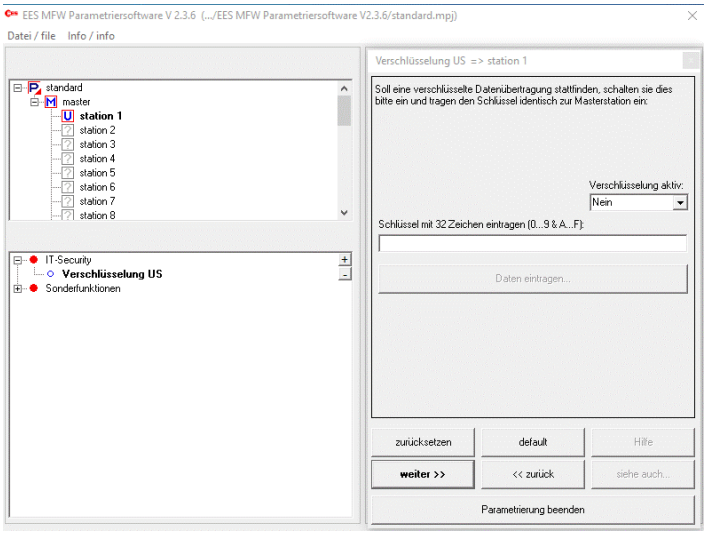


Fig. 6-15: Program interface with activated parameter window for substation 1, "Encryption " parameter

Please note the description of the parameters further down in this document for sensible settings. Incorrect settings or the import of incorrect parameters or files can cause malfunctions in the respective modules or in the entire MFW structure. EES cannot accept any liability for this.

6.1.9.4 Writing a parameter set to the basic module

To transfer the data from the parameterization program to the MFW module, right-click on the corresponding MFW module in the project tree and select "Send data to module" from the menu. In the window that opens, you can choose between the three transfer options:

- directly via the USB interface
- Remote parameterization via modem connection (not possible in the Powerline version)
- Parameterization via network connection (only for modules with Ethernet connection and enabled Telnet function in the parameter set stored on the device).

can be selected.

The procedure corresponds to the description for reading out the parameters in the sections above.

The parameter set is only fully saved in the MFW basic module when the green "Operating status" indicator light no longer flashes rapidly (flickers).

6.2 Parameter descriptions

In the following sections, all media-specific parameters are explained according to the structure in the parameter selection window. However, only the parameters required for the selected device type are offered for setting in the parameterization program.

Parameters for special functions, e.g. interface parameters, are documented in the respective separate descriptions. In these cases, we strongly recommend reading the corresponding descriptions, e.g. of the respective protocol interface.

6.2.1 LAN parameters

All network parameters are summarized in this parameter group if the devices have a network interface.

6.2.1.1 IP address

IP address on the local network:

The IP address of the module on the local network must be entered here, i.e. the IP address with which the module itself is registered on the Ethernet connection (LAN) of a router. This address is used for parameterization or diagnostics via Telnet or the MFW-Commander. For reasons of IT security, the address 0.0.0.0 is entered on delivery, which deactivates the connection.

The address entered here must be outside the DHCP range of the router.

6.2.1.2 Subnet mask for IP connection

A subnet or subnet is a physical segment of a network in which the IP addresses match in certain parts. These sub-networks can be connected to each other via routers and then form a large interconnected network.

In conjunction with the IP address of a device, the subnet mask determines which IP addresses this device can reach in its own network without the help of a router and for which recipients it must send the packets to a router (gateway) for forwarding to other networks.

6.2.1.3 Telnet port activation

If the IP address is known, parameterization and diagnostics can be carried out via a Telnet port in addition to the USB interface. The Telnet port is deactivated in the factory setting.

In addition to activating the Telnet port, a port number must also be defined.

- The port number must be specified for remote access via Telnet.
- The port number is used for port-forwarding on any router in the system. The port forwarding itself must be set on the router.
- The port must be enabled in the router's firewall

After commissioning, the Telnet port should be deactivated again for IT security reasons.

6.2.1.4 Telnet login = parameterization password

A user ID and password must be entered for parameterization via a network connection.

Parameters	Value range
User ID	10 characters (special characters allowed)
password	10 characters (special characters allowed)

Table 6-3: Telnet login parameters

6.2.1.5 Telnet logout

Time after which the MFW automatically closes the connection if no activities (parameterization or diagnostic commands) are detected. After closing the connection, it must be opened again if further diagnostic actions are to be carried out.

Parameters	Value range	Factory setting
Time	Hours and minutes 0 : 0 - no time limit 4 : 15 maximum time limit	5 minutes

Table 6-4: Telnet logout parameters

6.2.1.6 Ping requester

The "ping command" is used to test whether an IP address can be reached. This sends a data packet to an IP address and evaluates the response. The command for diagnosing a connection is very useful, but carries the risk of spying on connected stations. To protect against such attacks, the response to such "ping commands" can be prevented.

For IT security reasons, the response to the "ping command" is deactivated by default.

6.2.1.7 Gateway IP address

Modules that communicate with higher-level stations outside the local network via routers or other communication channels do not send their telegrams directly to the higher-level station, but to the router, which in this case acts as a gateway. The
IP address of the router must be entered as the gateway.

The parameter is only required in more complex networks (see Subnet mask parameter).

6.2.2 Modbus settings

A description of these parameters can be found in the separate descriptions of the Modbus interface for substation or master modules.

6.2.3 ASCII protocol settings

This parameter can be used to modify the setting of the USB interface, which is used to transfer the parameters and for diagnostics.

This interface is optimally set at the factory. To avoid malfunctions, please leave the parameters of this group in the factory setting.

6.2.4 Time management

MFW basic modules have an internal real-time clock. This can be synchronized either via an external DCF77 receiver, an IEC client or an NTP server. Alternatively, MFW substations can synchronize themselves via their own MFW master. Which of these variants is selected depends on the device and the respective application.

6.2.4.1 Time settings

Time source:

- **DCF77**
  There is no time shift due to undefined transmission delays in the network. However, DCF77 receivers require at least 3 minutes after switching on to determine the exact time and an external receiver is required, which is available as an accessory.
- **NTP server**
  If a time server accessible in the network is to be used, the necessary settings must be made in the "NTP server settings" parameter.
- **IEC from the client**
  If the MFW module communicates via an IEC 60870-5-101/104 interface, the original time can also be synchronized via this interface.
- **Time transfer from the master**
  The transmission time of the data telegrams of a two-wire communication depends on various factors, e.g. the degree of expansion of the system and the quality of the transmission cables, and therefore cannot be determined exactly. The undefinable time shifts resulting from these transmission delays can lead to time jumps in the internal clock.

The time zone and automatic summer/winter time changeover can also be set. For the latter, the "Start and end of summer time" parameter must also be edited.

6.2.4.2 NTP server settings

If time synchronization is to take place via an NTP server, 2 alternative NTP server addresses, the query interval and the port number of the NTP service must be set in this parameter.

6.2.4.3 Beginning and end of summer time

If the summer/winter time changeover is to be used, the data for this must be entered in this parameter. This can be done automatically or set manually.

6.2.5 IT security

Data transmission between the individual MFW stations can optionally be encrypted using the AES-128 method. This method works with pre-shared keys. Separate keys can be defined between the master unit and the individual substations. It is possible to operate encrypted and unencrypted connections in one system to enable the expansion of existing systems in which not all substations have the encryption function. Only the master module must have the encryption function. For security reasons, it is not possible to read back the keys from the devices.

6.2.5.1 Encryption on the master module

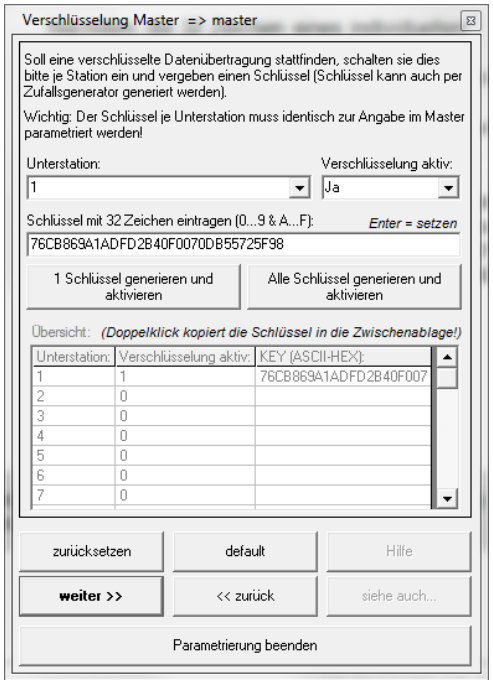


Fig. 6-16: Telephone numbers parameter window

The keys for each substation consist of 32 characters, which can consist of the numbers 0 to 9 and the capital letters A to F. The keys can either be defined individually or generated by the parameterization program using a random combination.

Once the 32 characters of an individual key have been entered, they are transferred to the table below by entering a final "ENTER". At the same time, the encryption for this station is activated.

When automatically generating keys, you can choose between generating a key for the substation selected above or 31 keys for all substations with a single click.

In a second step, the keys must be transferred to the parameterization of the substation. Double-click on the key in the corresponding line to copy it to the clipboard. It can then be transferred to the parameter window of the corresponding substation by right-clicking with the mouse and selecting the "Paste" menu function.

6.2.5.2 Encryption on the substation module

After entering the key or copying it from the clipboard by right-clicking with the mouse and using the "Paste" menu function, the key must still be activated in the selection field above it.

Fig. 6-17: Parameter window Telephone numbers

6.2.6 Special functions

6.2.6.1 Fault module assignment

In certain applications, it makes sense to assign each substation its own binary output for signaling the operating status. Module numbers 254 - 251 are reserved for this purpose as standard. Set outputs signal a faulty station. For a more detailed description of station faults, please refer to the chapter "Diagnostic functions", section "Station fault as binary alarm". This parameter can be used to change the assignment of the module numbers of the error alarms. The list field can be used to assign a new module number to each fault module or to prevent the output of faults.

List field	Selection option
Station error alarms	Master and substations 1 ... 7
	Substations 8 ... 15
	Substations 16 ... 23
	Substations 24 ... 31
Are issued on module number	0 ... 254, no output

Table 6-5: Assignment of the error modules to individual module numbers

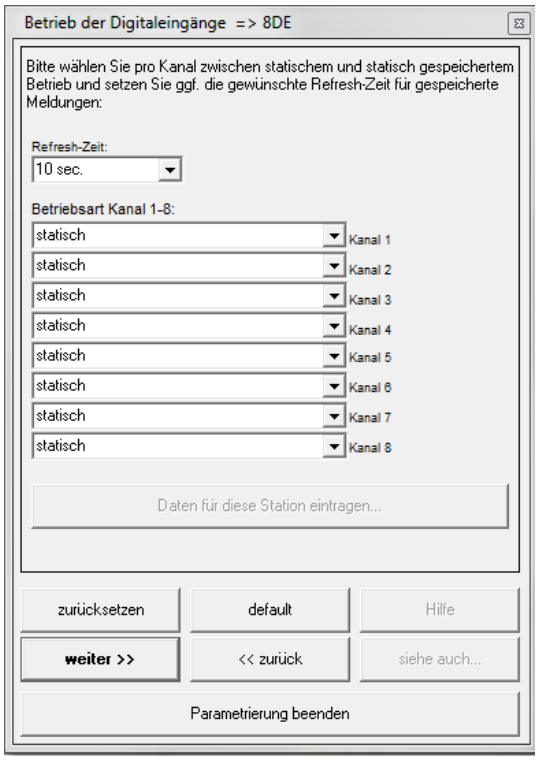
In the "No output" setting, the station error alarms are **deactivated**.
This setting is useful if the ward error alarms are to be deliberately suppressed.

Error module	Alarms from station	Module number
1	Master and 1 - 7	254
2	8 - 15	253
3	16 - 23	252
4	24 - 31	251

Table 6-6: Factory setting of the assignment of the module numbers of the error modules

6.2.6.2 Operation of the digital inputs (binary input static / statically stored)

Each digital input of a "UF-PLM15-G8DEX-..." that has been configured as a static binary input (→ chapter Configuration) can be parameterized for the operating mode "Binary input statically stored" (→ section "Digital inputs" in the chapter Function description). In the factory setting, all digital inputs are parameterized as static binary inputs without storage.



Refresh time

Time after which the saved status of the input is sent again when queried by the master. This continues until the master acknowledges receipt of the status change.

Value range: 0...2560 s

Fig. 6-18: Parameter window Operation of the digital inputs

As soon as one of the 8 digital inputs is parameterized to "statically stored binary input", a virtual module "EM-G8DAR-..." with the same module number is automatically generated in the substation. This virtual module must be taken into account when calculating the maximum number of extension modules that can be connected per substation (15).

6.2.6.3 Intrinsically safe states of the outputs

This parameter can be used to define the behavior of all digital outputs of the station when transmission is interrupted.

Initial states are retained
If transmission is interrupted, the values of the binary outputs are retained. (factory setting)

Outputs are switched off
In this setting, the outputs are set to "0" when transmission is interrupted, output relays drop out.

6.2.6.4 Pulse width counter value output

If the outputs A1 ... A4 of a basic module "..-ZDM12-PLM15-DIA-B-BX-0" are configured as a pulse output via DIP switches B6 and B7, the pulse width/pause can be adapted to the speed of the processing system. Pulse width/pause can be set in 40 ms steps. The parameterized value applies simultaneously to all outputs of the basic module that are set to pulse output via DIP switch. The pulse width of any connected extension modules is configured on these via DIP switches (→ separate description of the extension modules).

When parameterizing the pulse width, it should be noted that more pulses must not be permanently input than output. This would lead to a loss of pulses and could occur if the input frequency is permanently greater than the output frequency.

7 Use and product life cycle

7.1 Maintenance

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

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

7.2 Maintenance

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

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

7.3 Decommissioning

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

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

Decommissioning:

- De-energize the device
- Disconnect wiring
- Remove the device from the top-hat rail.

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

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

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

7.4 Packaging and transportation

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

Packaging instructions:
Please 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 can, if necessary, be prevented by appropriate repair work using suitable spare parts, which may only be carried out by the manufacturer due to the complexity of the device. Please contact our customer service department.

Technical service:
Elektra Elektronik GmbH & Co Störcontroller KG
Hummelbühl 7-7/1
71522 Backnang
Phone: + 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 appliances can have potentially negative effects on health and the environment, which is why they must be disposed of in a harmless and environmentally friendly manner in accordance with the regional legal disposal regulations. Alternatively, a return delivery to the manufacturer should be considered.

Disposal instructions:
Returning 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, keep the packaging during the warranty period so that you can pack the appliance properly in the event of a warranty claim.

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

8 List of amendments

Issue	Amendment	Date	Name
V001	• Revised for new device version (see section Validity)	02.07.2023	R. Schöner

Contact us

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