

A system from the
MFW product family



Modular power line telecontrol system

Remote operation on live cables and cable screens

- Modular upgrading up to 32 stations and a maximum of 512 I/O modules
- Transmission on live cables up to 3 x 1000 V, 0 ... 60 Hz or cable screens of medium voltage lines
- Simple parameterisation of modules via DIP switch
- High immunity security against faults through carrier frequency technique, Hamming distance > 6
- Simple connection to other transmission media, such as radio or telephone networks in the MFW product family, and also to 3rd party systems via various interfaces and protocols

Functional description

The **MFW Modular Telecontrol Network** has been specially designed for the interconnection of widely scattered outdoor installations, such as for example pump, transformer and gas regulating stations, storm-overflow reservoirs, inspection chambers and elevated reservoirs. The MFW can be operated as a fully independent, cost-effective telecontrol system or as an extension to existing telecontrol interface modules. Almost all types of cables (telephone line, three-phase current cable, cable screen, electrically isolated cable, optical fibres etc.) and various radio frequencies are suitable as transmission media. This documentation only deals with one particular aspect: the transmission on live cables or cable screens.

In its minimum configuration, the telecontrol system consists of a master station and an outstation. In each station at least one **basic module** is needed. This includes the following function groups, display and setting elements:

- internal power line modem
- RS 232 diagnosis interface
- I/O -module with as required 8 binary inputs or outputs with status LED or an additional serial interface for protocol connection
- two CAN bus interfaces for connecting the expansion modules
- watchdog LED and fault signalling contact
- DIP switches for setting the station address, module number, etc.

The basic modules can be obtained in two versions:

- Only one master module, whose type name contains “MF-...”, needs to be present in the system, and is usually used in the central station. It co-ordinates the flow of data.
- The outstation module, whose type name contains “UF-...”, is used in the outstations.

Each basic module can be fitted with up to a maximum of 15 expansion modules in order to increase the I/O scope. These are connected via the CAN bus interface. You can find more detailed information in the separate datasheet “Expansion modules”.

Each **I/O module** is given a module number. The data is exchanged between modules with the same module number. The physical arrangement of the modules within the system (the modules address) is of no significance at all. The input module with number 5, for instance, transmits its data to all the output modules with number 5.

The data exchange is event- and time-controlled. **Measuring and nominal values, messages, commands, momentary and counting pulses** are transmitted. In the case of digital I/O modules the inputs/outputs 1-4 can be switched-over between the two types of functions - static or counting/momentary pulses. Analog signals can be transmitted both as voltage values 0-10 V or as current values 0-20 mA.

In the event of a fault, the system detects the faulty communication and reports it via LED and a relay contact both in the master station and the respective outstation. In addition, a binary contact can be used to signal availability of all connected stations at any point of the telecontrol system, if appropriate I/O modules are used.

If a serial interface is used, all this information can also be evaluated via this interface. After the cause of the fault has been removed, normal operation is resumed automatically.

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The **configuration** of the system is very simple. All the important settings can be made with the aid of DIP switches. These include station address (1 – 31), module number (0 ... 254), static/counter value figure in the case of digital I/O and current/voltage with analog signals etc.

Transmission on live cables

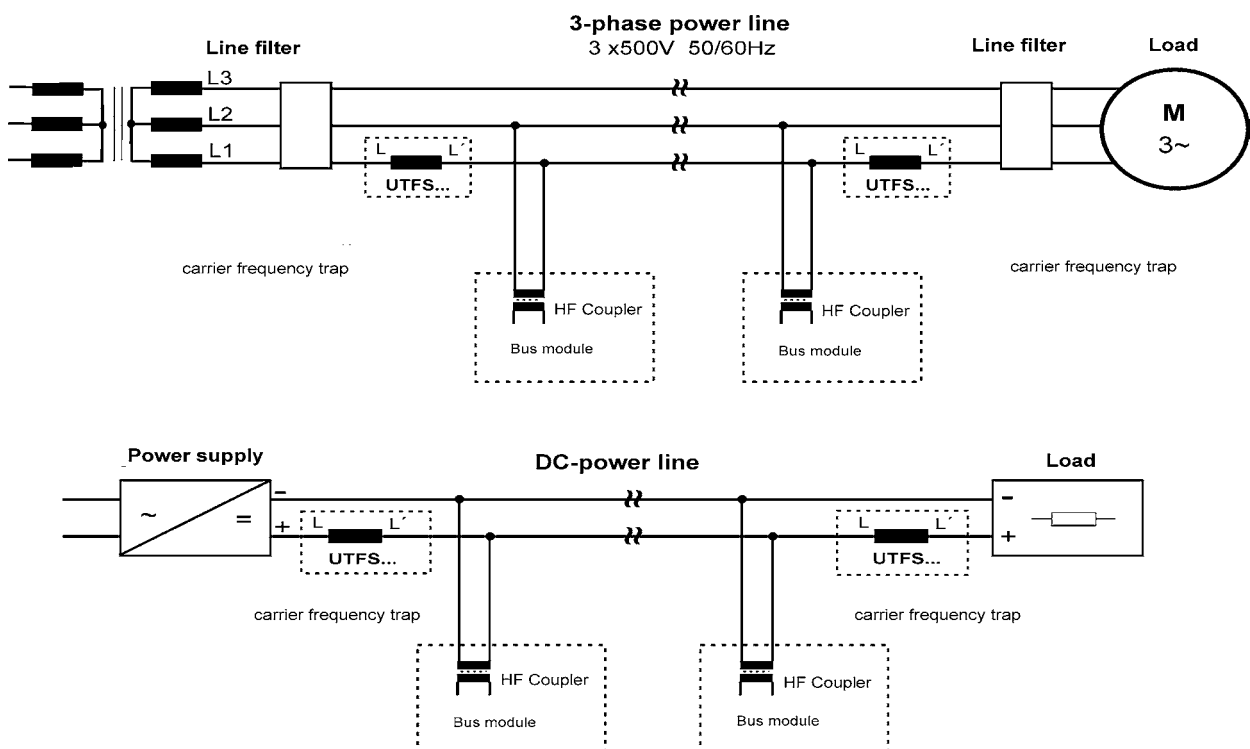
The MFW power line telecontrol system uses for signal transmission a very safe carrier frequency technique (Hamming distance > 6) and is therefore suitable for application in rough problematic industrial environments. The MFW is suitable for bridging distances of several kilometres.

In accordance with DIN 50065-1:1999 the frequency range of 95-125 kHz and 140-148,5 kHz is free for general signal transmission with indeterminate protocol on electrical low voltage networks (Powerline). The MFW power line telecontrol system operates as standard with a carrier frequency of 109.4 kHz. This means it corresponds to class 122. The operating materials of this class are suitable for general use and therefore do not require any notification or permission from certification authorities.

The transmission network can be designed as a star, ring or tree system. In order to achieve substantial distances for data transmission we recommend in each case the use of carrier frequency traps. The carrying over of faulty current is prevented by the potential separation between power supply, signal inputs, transmission line and signal outputs.

Consumer and power mains transformers appear as a HF-short circuit for the carrier frequency signal. For realizing a possibly great distance the line part which is used for transmission, should be connected with carrier frequency traps. In case there are additional line branches between the assigned traps, these are also to be fitted with carrier frequency traps.

EES For smaller transmission distances carrier frequency traps can be left out under certain circumstances. The necessity of carrier frequency traps and line filters in your special application can be judged by our service-team.



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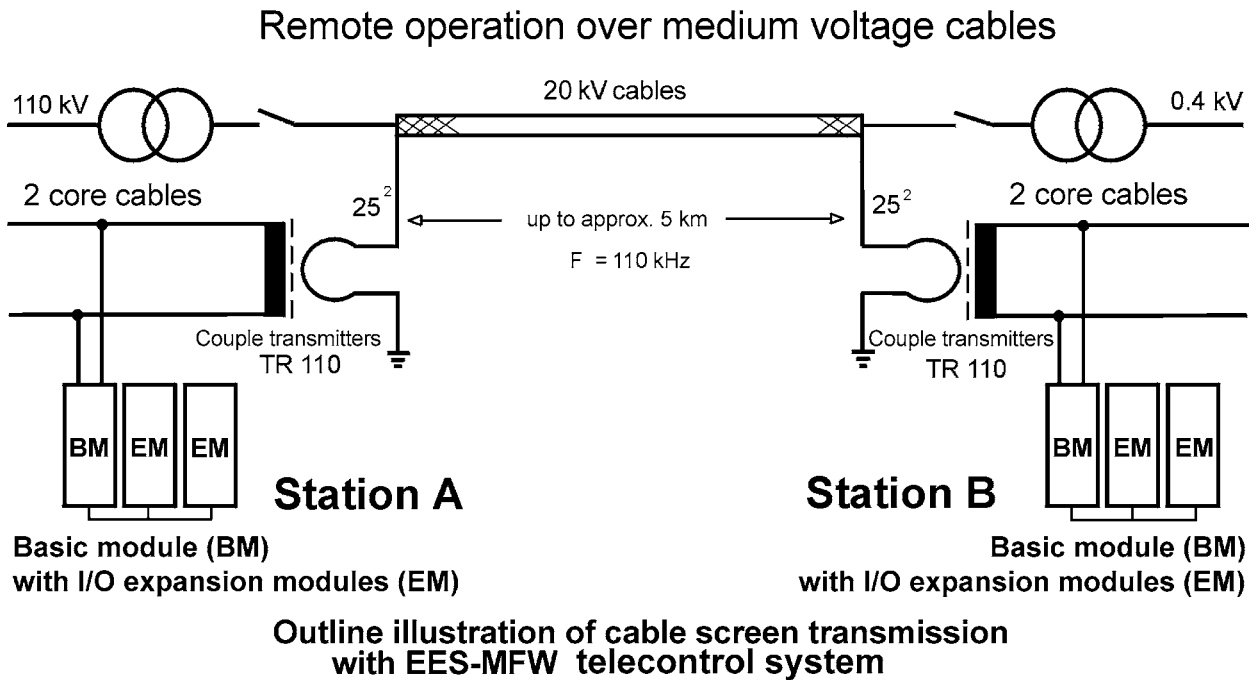
The bus terminals of the basic module are laid out to the direct connection at the electric line up to 500 V AC/DC. If transmission is to be on lines with voltages up to 1000 V additional coupling transmitters need to be inserted. By the insertion of coupling transmitters and repeaters the transmission medium can also be changed (e.g. from a current line to a potential-free cable and back again). For changing between lines of various levels of voltage also only coupling transmitters are necessary.

In some circumstances it is possible that other electrical equipment (such as frequency converters) cause disturbances in the data transmission. Whenever the network which is to be used for the data transmission shows faulty currents, or high frequency distortions, then additional network filters must be installed. In this connection please note that some disturbances can occur only now and then and may not therefore be identified by one-off measurements.

Transmission on cable screens

Data transmission via cable screens of medium voltage systems are established between the cable screen and earth. This naturally requires an earth-free cable screen. Where necessarily older cables should be checked for this. The power line modules are connected to the screen by special coupling transmitters. The connection lines of the transmitter are to be inserted into the earth connection of the cable screen, so that the purely passively operating transmitter can divert both faulty currents and also short-circuit currents fully to earth and thereby the carrier frequency is coupled into the cable screen with very little loss.

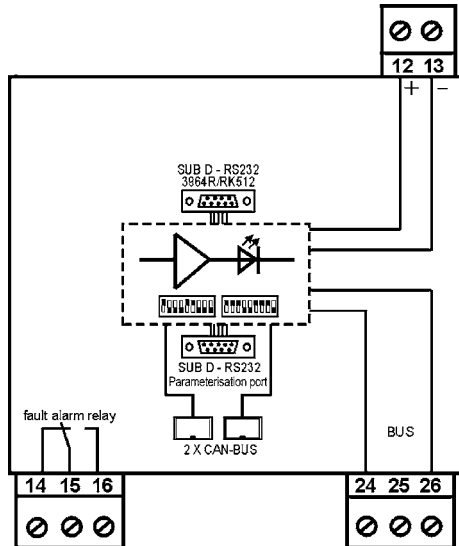
The following illustration shows the principal design of a cable screen transmission section.



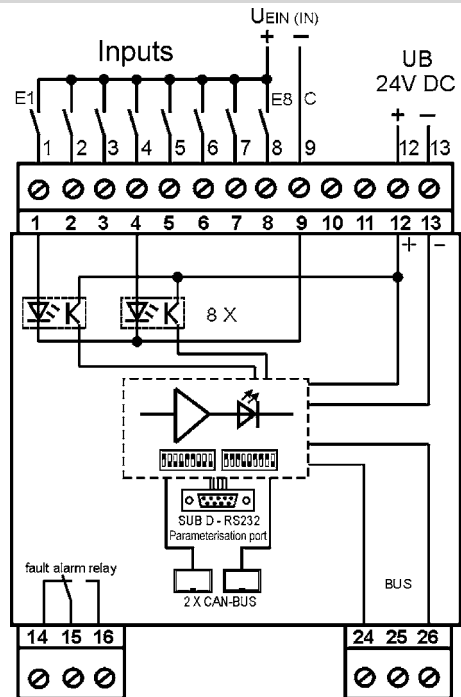
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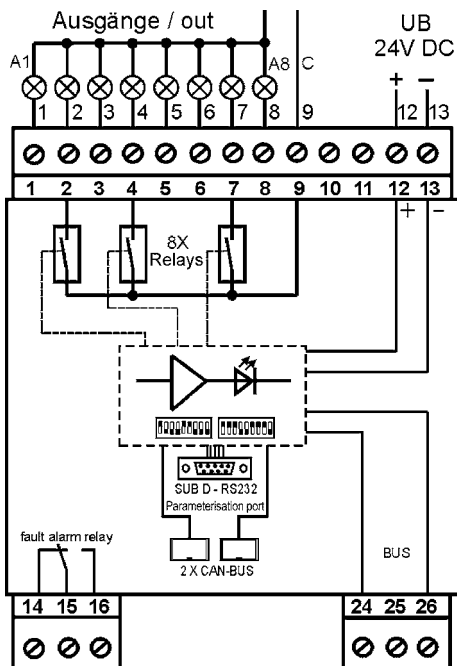
Terminal assignments



Basic module with protocol interface



Basic module with 8 digital inputs



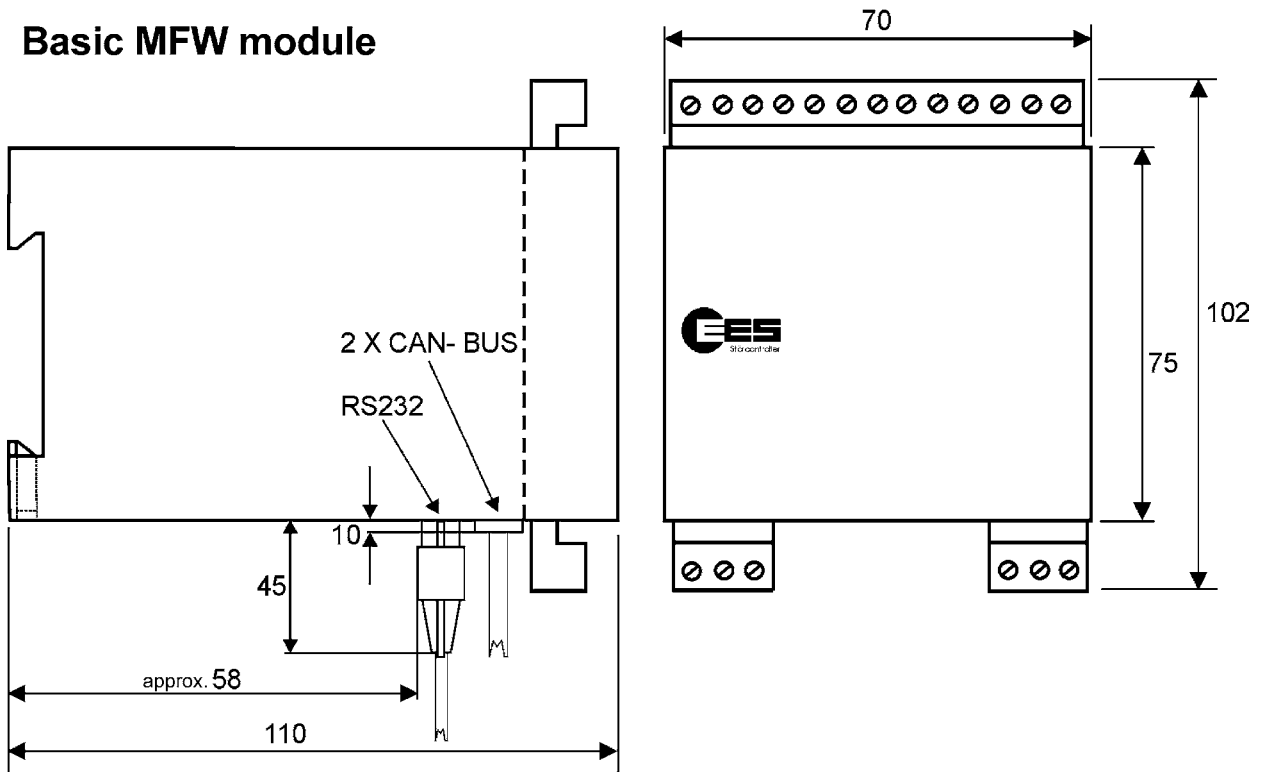
Basic module with 8 output relays

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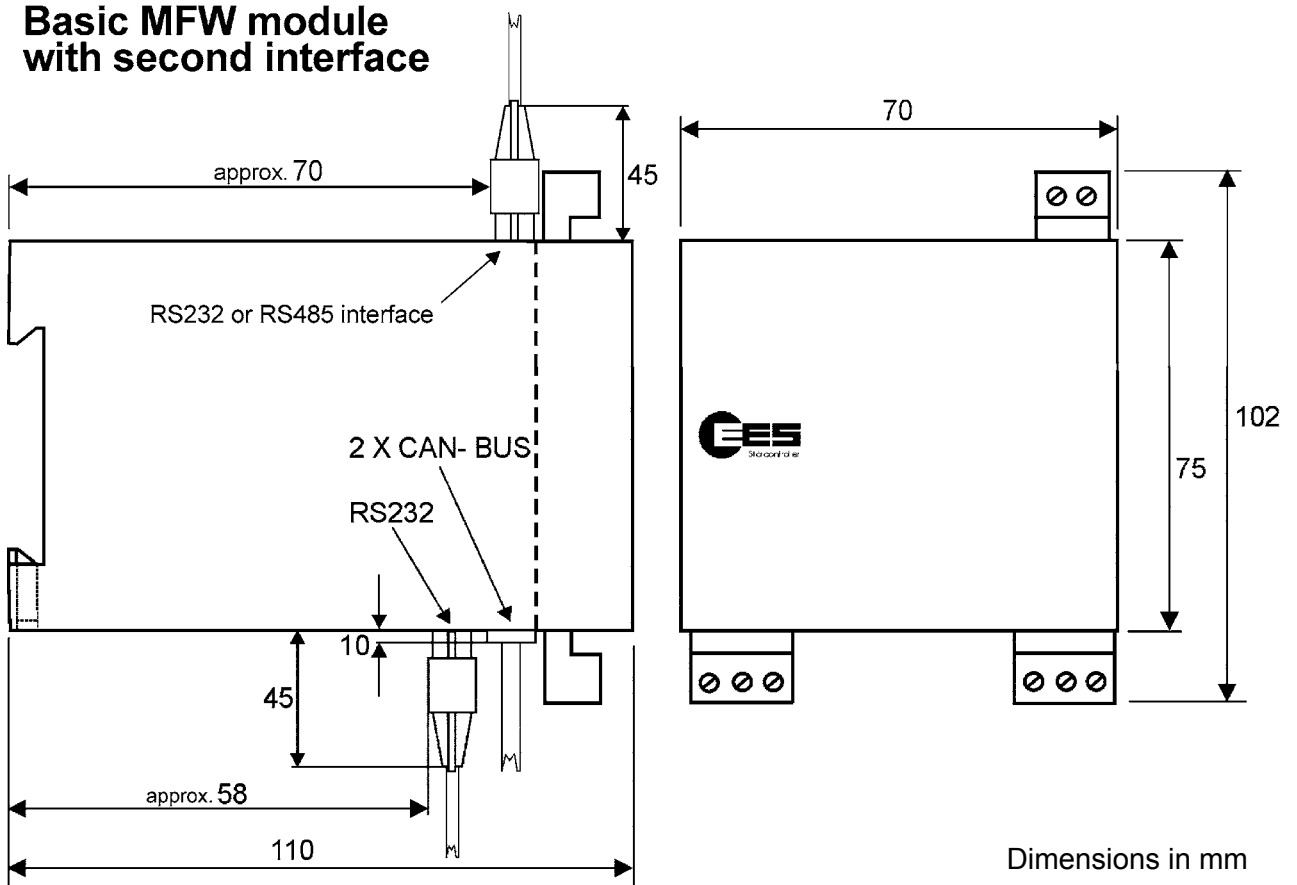
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Dimensional drawing

Basic MFW module



Basic MFW module with second interface



Dimensions in mm

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Technical data

General data

Rated operating voltage	24 V DC
Operating voltage range	20 ... 32 V DC
Operating and ambient temperature	-20°C ... +60°C
Air humidity	max. 95% without condensation
Connection terminals	pluggable
Wire cross section rigid or flexible	
without wire sleeve	0.22.5 mm ²
with wire sleeve	0.25...2.5 mm ²
Housing / protection class	plastic / IP 40

Power line modem

Signal level class / type	122 (registration not required) / type 2
Transmit voltage	2.8 V _{ss} at 5 Ω (regulated)
Reception sensitivity	Standard approx. 3 mV _{ss} (higher values adjustable)
Isolation voltage between Power line and supply voltage as well as power line and I/O	4 kV _{eff}

Digital input modules

Power consumption	approx. 2.5 W
Signal voltage	see table
Threshold for 24V nominal voltage *	
Maximum voltage	48 V
Voltage for high-state (DC)	> 10 V respectively < -10 V
Voltage for high-state (AC)	> 15 V _{eff}
Voltage for low-state (DC)	< 9 V respectively > -9 V
Voltage for low-state (AC)	< 9 V _p
Input resistance	see table
Maximum count rate	10 Hz
Minimum pulse width	50 ms
Galvanic isolation between signal and supply voltage	4 kV _{eff}

Digital output modules

Power consumption with relay outputs	approx. 3.5 W
Contact loading of the relay outputs**	
minimum	1,2 V / 1 mA (suitable for controlling LED)
maximum	250 V AC / 400 mA 250 V AC / 2 A (pure ohmic 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 (pure ohmic load)
Maximum count rate	12 Hz ***
Pulse width / pause	40 ms ***
Isolation between output and supply voltage	4 kV _{eff}

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Digital input modules can be supplied with varying signal voltages. The voltage is specified via the 23th character/digit of the type identifier.

Short designation	Rated voltage	Voltage range limit value	Input resistance
...-PLM15-G8DEX-DIA-0-BA-0	12 V AC/DC	9 V – 24 V AC/DC	approx. 5 kΩ
...-PLM15-G8DEX-DIA-0-BB-0	24 V AC/DC	16 V – 48 V AC/DC	10 kΩ
...-PLM15-G8DEX-DIA-0-BE-0	60 V AC/DC	35 V – 75 V AC/DC	22 kΩ
...-PLM15-G8DEX-DIA-0-BF-0	110 V AC/DC	75 V – 130 V AC/DC	68 kΩ
...-PLM15-G8DEX-DIA-0-BJ-0	220 V AC/DC	180 V – 255 V AC/DC	180 kΩ

* Thresholds of other signal voltages on request

** We would be happy to supply you with more precise specifications on request.

*** Other figures on request

The right to make technical changes is reserved

Order identification

Master modules

MF-PLM15-1P512-DIA-0-BX-0	RS 232 interface with RK 512 protocol
MF-PLM15-G8DEX-DIA-0-BB-0	8 digital inputs, signal voltage 24 V
MF-PLM15-G8DAR-DIA-0-BX-0	8 relay outputs

Outstation modules

UF-PLM15-1P512-DIA-0-BX-0	RS 232 interface with RK 512 protocol
UF-PLM15-G8DEX-DIA-0-BB-0	8 digital inputs, signal voltage 24 V
UF-PLM15-G8DAR-DIA-0-BX-0	8 relay outputs

Expansion modules

Please find more information in our special datasheet.

Accessories

Carrier frequency traps, network filters, coupling transmitters, connection cable to PC or laptop, power supplies, DC/DC converters, battery boosters and accumulator packs

Further accessories and more detailed information may be found in the appropriate product sections in the catalogue.



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