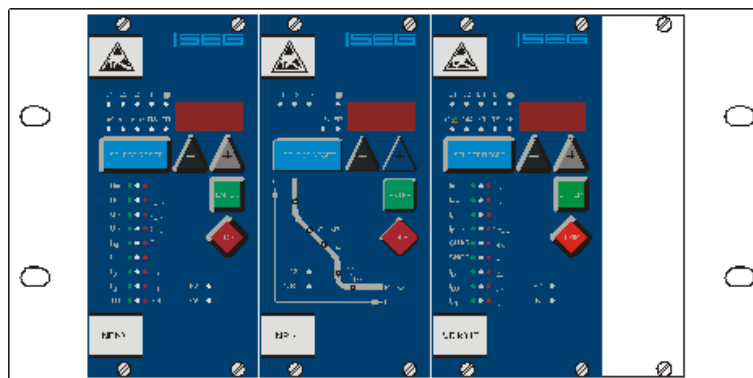# MANUAL

HighTECH Line | PROTECTION TECHNOLOGY
MADE SIMPLE

MR | DIGITAL MULTIFUNCTIONAL RELAYS



**DIGITAL MULTIFUNCTIONAL RELAYS**

Original document

English

Revision: L

## Contents

# 1. Introduction

The application of powerful microprocessors opens a new chapter for power system protective re-laying. Because of their capabilities to process the measuring values digitally and to perform arith-metical and logical operations the digital protective relays are superior to the traditional analog stat-ic protective relays. Besides, the digital protective relays offer some additional ad-vantages such as very small power consumption, adaptability, possibilities for self-supervision, fault diagnosis by means of fault data recording, flexible construction and selection of relay characteristics etc.
The development of microprocessor-based protective relays and their introduction into the market are stimulated by the trend nowadays to replace the analog with the digital protective equipments. Owing to this trend a new SEG Electronics GmbH protective relay family - HIGH TECH LINE MR - was developed. The protective relay family MR consists of a great deal of protective relays which satisfy the needs of various protective functions. As an example the MRN3, an universally used mains decoupling relay for power generating systems in mains parallel operation with an excep-tionally good price/performance ratio be-cause of integration of three protection functions.

The superiority of digital protective systems to the traditional protective relays is embodied by the relay family MR with the following features:
- Integration of many protective functions in only one compact case
- High accuracy owing to digital processing
- Digital relay setting with very wide setting range
- and fine setting steps
- Comfortable user-friendly menu-driven parameter settings
- Measuring value and fault data indication by means of alphanumerical display
- Data exchange with station control centre by means of serial interface
- Operation reliability by means of continuous self-supervision

A similar, but simplified version the PROFESSIONAL LINE with limited functions is also available.

# 2. Features and characteristics

- Display of primary values
- Two parameter sets
- CB failure protection
- Relay matrix (output relay)
- Real time clock / can be synchronized
- Fault value recorder
- Fault recorder, oscillographic
- Modbus RTU protocol
- Complete digital processing of the sampled measuring values
- Extremely wide setting ranges and fine steps for measuring value and time settings
- Setting authorization through password against unauthorized setting actions
- Password defined by the user himself
- Continuous self-supervision for software and hard-ware
- Serial data communication facilities via RS485 or RS232
- Wide voltage range for DC or AC auxiliary power supply
- High precision components and overrating guarantee:
  Precision
  Reliability
  Long service life

# 3. Technology of the MR-relays

## 3.1   Input circuits

Analog input signals are electrically isolated by the input transformers of the relay, then filtered analog and processed to the analog/digital converters. External wiring of the measuring circuits as well as the auxiliary voltage are shown on the connection diagrams in the specific technical descriptions.

## 3.2   Data communication

For data communication with a central control system all MR relays are provided with a serial interface RS485 or RS232. (For more details please see chapter 6.0 device communication) Simplified and fast reading and changing of parameters and measuring values can be achieved by HTL/PL-Soft4. Data can also be included in a made-to-order system by means of Development Kit RS485 Profi-Pack; this kit can be bought from SEG Electronics GmbH.

## 3.3   Indication- and operation elements

### 3.3.1   Front plate

The front plate of MR-protection relays comprises the following operation and indication elements:

- Alphanumerical display (4 Digits)
- Push buttons for setting and other operations
- LEDs for measured value indication and setting
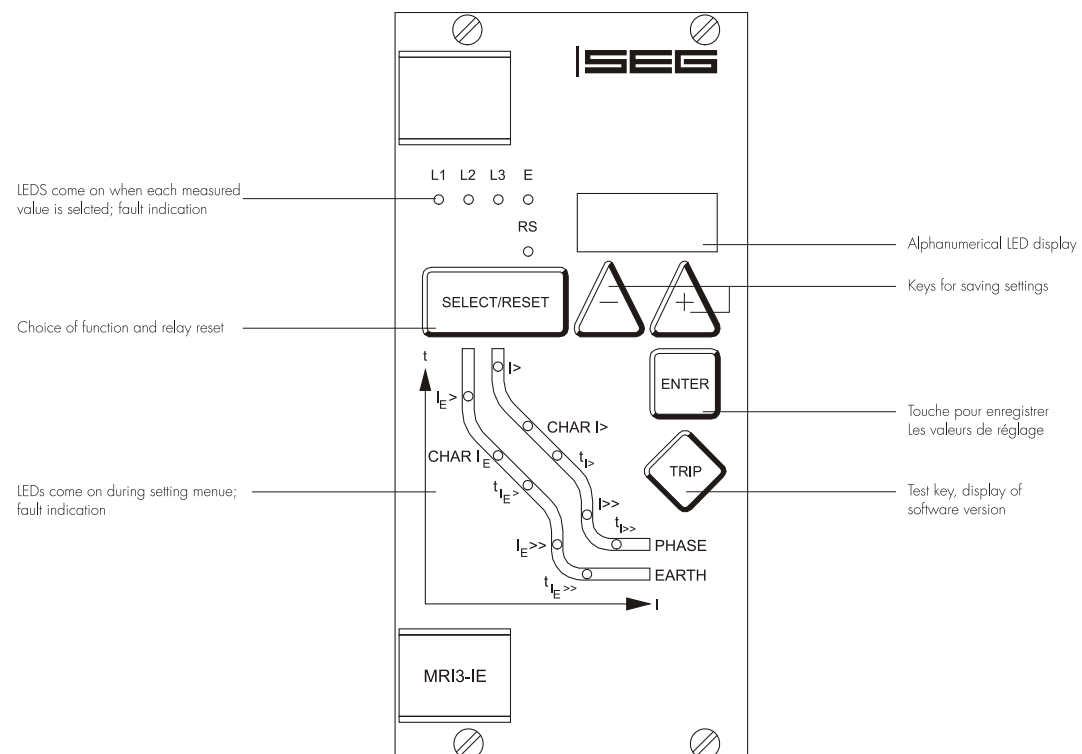


*Figure 3.1: Example of a front plate (MRI1)*

### 3.3.2  Display

The measured and set values, the recorded fault data as well as the system reply are shown on the alphanumerical display. With the help of the optical indication of the LEDs on the front plate, the meaning of the displayed value can be identified very easily.

### 3.3.3  LEDs

The LEDs are used for indicating parameters or measuring data on the display.
The function of the individual LED is shown on the front plate.

# 4. Operation and setting

## 4.1 Push buttons

Push buttons are used for calling up the parameters to be processed, for selection of measuring parameters to be indicated and for changing and storing the parameters.

The individual setting and measuring values can be selected one after another by pressing push button <SELECT/RESET>. This push button is also used for resetting the display by pressing approx. 3s.

As for an individual case (relay version D) the push button can also be operated when the front cover of the relay is closed and sealed with lead.

Push buttons <+> <-> are used for in-/decrementing of the parameter indicated on the display. They can be pressed step-by-step or continuously.
After the selected parameter is set by the <+> <-> push button it may be stored using the <ENTER> push button.

Through the push button <ENTER> the set value indicated on the display will be transferred to the internal parameter memory. An unintended or unauthorized change of the selected parameter is avoided by means of password identification (see 4.4.2).

The <TRIP>-push button is used to test the output relay circuits both for tripping and signaling During normal operation it is also interlocked by means of the password identification.

### 4.1.1 Indication of measuring values and fault data

**Indication in faultless condition**

In normal operation the display always shows WW. After pressing the push button <SELECT/RESET> the display switches cyclically to the next measuring value. The display can show the value as absolute or as relative value (x IN). After the measuring values had been indicated the setting parameters are displayed. Hereby the LEDs in the upper section signalize which measured value is indicated, the LEDs in the lower section signalize which setting parameter is indicated on the display. Longer actuating the push button resets the relay and the display changes into normal operation (WW).

**Indication after pickup/tripping**

All of the faults detected by the relay are indicated on the front plate optically. Here not only the faults are indicated but also the faulty phase(s) and the protection function in operation. During the excitation phase LEDs are flashing, after tripping this changes to continuous light.
In tripped condition "TRIP" appears on the display and the LEDs of the operating measuring data light up red together with the LEDs of the tripping parameter. All operating data, which were measured at the moment of tripping, can now be called one after another by pressing push button <SELECT/RESET>. If in this condition setting parameters are to be indicated, push button <ENTER> has to be pressed.

The graphic below shows again the difference between the different display modes.


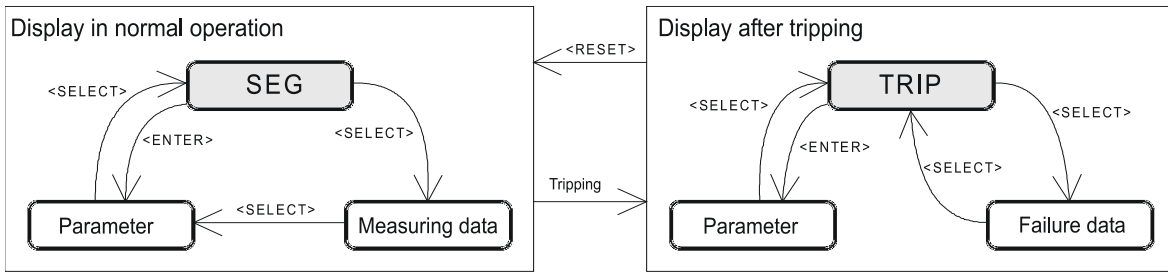
*Figure 4.1: Switching over of the display in dependence of the operating mode.*

## 4.2  Code jumpers

Behind the front plate of the MR-relays there are three code jumpers to preset the following functions:

- Password programming
- Output relay functions

The following figure shows the position and designation of the code jumpers:
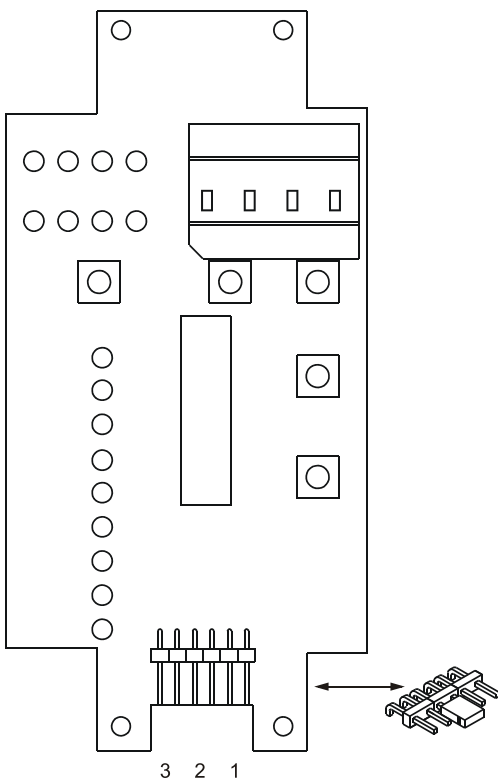


*Figure 4.2: Position and designation of the code jumpers*

## 4.2.1  Function of the output relays

The following functions of MR output relays can be preset:

- Alarm relay activation at pickup or after tripping of the relay
- Reset of the output relays manually or automatically

The alarm relays are activated according to the presetting:

**Code jumper 2 OFF**:
The alarm relays pickup directly with energizing of the corresponding measuring circuit. Thus, an alarm signaling can be given before the relay trips.

**Code jumper 2 ON**\*:
The alarm relays pickup only after relay trip. That means: the trip relay and the corresponding alarm relay pickup at the same time after the time delay elapsed.

**Code jumper 3 OFF**:
All output relays will be reset automatically after the fault has been rectified, (e.g. when the fault current is interrupted).

**Code jumper 3 ON**:
All output relays remains activated and must be re-set after fault clearance.

- Manually: By pressing push button <SELECT/RESET>
- External: By connecting aux. voltage to C8/D8
- Via RS 485 or RS232 interface

To let the parameter change take effect, the auxiliary voltage has to be switched on and off again after the code jumpers are plugged or unplugged.

\*        Some of the relay types do not have this function now because they are provided with a relay matrix for free parameter setting.

| Code Jumper | Function | Code jumper position | Operation mode |
|---|---|---|---|
| J1 | Password | OFF | Normal position |
|  |  | ON | Password selection |
| J2 | Alarm relays | OFF | Alarm relays will be activated at pickup |
|  |  | ON | Alarm relay will be activated at tripping |
| J3 | Reset | OFF | Output relays will be reset automatically |
|  |  | ON | Output relays will be reset manual/external/via soft-ware |

*Table 4.1: Summary of coding possibilities*

## 4.3   Reset

**Manual reset**
By pressing push button <RESET/SELECT> for some time (about 3 s).

**External reset-input C8/D8**
The external reset input C8/D8 has the same function as the <SELECT/RESET> push button on the front plate. Connecting auxiliary voltage to this in-put, the unit can be reset, provided that the fault is removed.

**Software reset via serial interface RS 485 or RS232**
Software reset has the same function as push but-ton <SELECT/RESET>. Please refer to open da-ta protocol of RS 485 interface named RS485-PRO.

## 4.4   Password

### 4.4.1  Password programming

The MR-relays are delivered with the preset pass-word "++++", it can be programmed new with code jumper J1:
Apply code jumper J1. After power on and pressing any push button, the relay MR inquires for a new password. The text "PSW?" appears on the display. The new password is entered by any combination of the push buttons <SELECT> <-> <+> <ENTER>. After the new password is given, the code jumper J1 has to be removed. Therefore the relay module should be extracted from the relay case.

### 4.4.2  Using the password

Step by step, a new relay setting is made according to the following sequence:
- After the present setting value is changed with <+><-> push button, <ENTER>-push button should be pressed.
- A message "SAV?" appears on the display to in-quire if the new setting value is really wanted to be stored.
- After pressing the <ENTER>-push button again, the password will be inquired by means of the message "PSW?" on the display.
- After the password is given correctly, which is prompted by message "SAV!" on the display, the new setting value can be stored by pressing the<ENTER>-push button for about 3 sek
- The new setting value for the selected parameter appears on the display again.

A password consists of four push button operations. The pressed push buttons and their sequences define the password.
<SELECT>        =        S
<->                 =        -
<+>                 =        +
<ENTER>        =        E
then a password "-E+S" means pressing push buttons according to the following sequence:
<-> <ENTER> <+> <SELECT>

After the password is given correctly, parameter setting is permitted for five minutes. This means: For a subsequent parameter setting, as long as it is made within five minutes after the password input, a renewed password input is not required. Moreover, the valid period for parameter setting is automatically extended to further 5 minutes after each new push button operation.

If no push button operation follows within the five minute period after password input, the validity for parameter setting will be suspended. For entering further parameters the password is then called up again. During the validity for parameter setting a new set value, after having acknowledged "SAV" two times, is stored by just pressing push button <ENTER> for some time. As to parame-tersetting via RS 485 interface: see open data protocol.

# 4.5　Relay setting principle

By pressing push button <ENTER>, the parameter menu can be called up. By pressing push button <SELECT/RESET> the parameter to be set is reached. The corresponding LED lights up. The ac-tual set value of the selected parameter is indicated on the display. The indicated set value can then be changed by pressing push buttons <+><-> (in-/decrementing). The selected set value is stored by pressing push button <ENTER> and by input of the authority code (password) which means the adjustment of the unit is only possible after the password had been put in. (see 4.4.1)

After a trip the push button <SELECT/RESET> is reserved for the indication of fault data. Now new parameter setting by means of push button <SELECT/RESET> is only possible by pressing <ENTER> first.

## 4.5.1　Setting of default parameters

Setting of the MR default parameters can be done as follows:

- switch off the auxiliary voltage supply
- press simultaneously push buttons <+><-> and <SELECT/RESET> and
- switch on the auxiliary voltage supply again.

## 4.5.2　Blocking the protection functions

The blocking function of the MR-relays can be set according to requirement. When pressing push buttons <ENTER> and <TRIP> at the same time the blocking mode is entered. For further information please refer to the special MR-descriptions.

## 4.6    Display of software version, release version and handoff_ID

The software of HighTechLine devices are tracked and secured by RMS - release management system.
Future changes in software are released with a software release version and handoff_ID which can be viewed on the device display.

### 4.6.1   Devices with software version

By pressing push button <TRIP> the first part of the software version is displayed, the second part appears when this push button is pressed again. When push button <TRIP> is pressed repeatedly, the test trip routine starts. (See chapter 4.7)

Example:
First part:          D01
Second part:    1.04

### 4.6.2   Devices with release version and handoff_ID

By pressing push button <TRIP> the release version is displayed, the device type appears when this push button is pressed again. When push button <TRIP> is pressed repeatedly, the handoff_ID is displayed in two steps. After pressing the button <TRIP> again the trip routine starts. (See chapter 4.7)

Example: (display of release version and handoff_ID)
First part:          R2.0     (release version)
Second part:    ICER    (device version of the related device model)
Third part:         ID_1      (1st   part of the handoff_ID no.)
Fourth part:     5452     (2nd part of the handoff_ID no.)

## 4.7    Start output contact- and LED test

The outgoing contact and LED test can be started after software version (release version and handoff_ID) indication. See chapter 4.6
Further steps:
By entering the password the display shows "TRI?".
After pressing <TRIP> again all output contacts will be energized one after the other with a time delay of 1 s. The self supervision relay will be deenergized.
At the same time each LED will be flashed consecutively one after the other for 1s.
All relays stay energized (self supervision relay deenergized) until manual reset.

## 4.8    Low/High range of functions blocking and reset

All relays of the HIGH TECH LINE have a wide-range power supply unit allowing to choose a suitable supply voltage. The operating threshold of the blocking and reset inputs, however, has to be de-fined by taking the supply voltage into account. The following two different operating thresholds can be adjusted:

- Low-range threshold $U_{AN} >= 10$ V; $U_{AB} <= 8$ V = code jumper plugged
- High-range threshold $U_{AN} >= 80$ V; $U_{AB} = <60$ V = code jumper unplugged
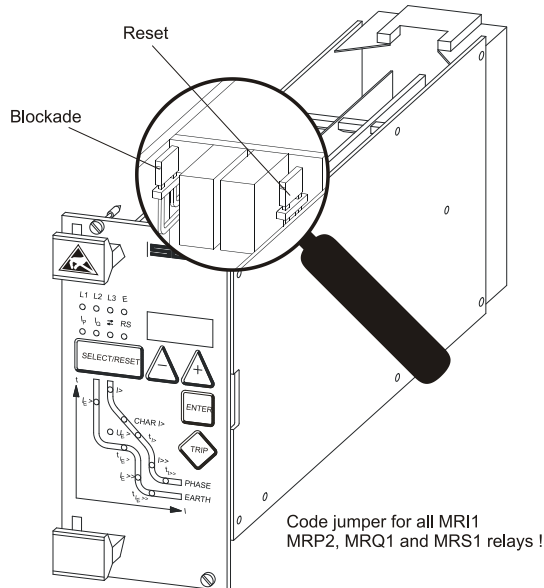

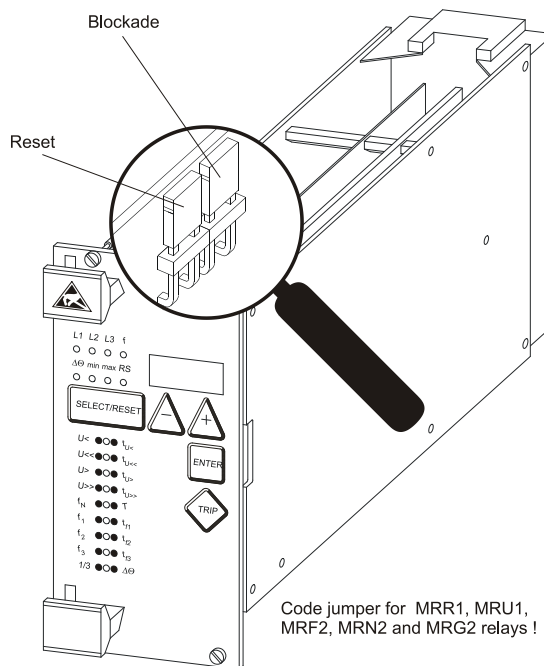
*Figure 4.3: Code jumper*



*Figure 4.4: Code jumper*

# 5. Relay case

The MR-relay can be delivered as an individual unit for flush mounting or as plug-in module for installation in a rack according to DIN 41494. Both versions are withdraw able.

Version D is a complete unit in an individual housing, for flush mounting. In version A, on the other hand, all relays are available as plug-in modules for mounting in 19"-racks. The rack dimensions are divided into width-units (German abbreviation "TE") and height units ("HE").

HIGH TECH LINE relays are available in two sizes: 12 TE and 42 TE.
Please refer to the HIGH TECH LINE brochure or to order form of the individual manual.

All relay versions have to be installed into switchboards with protection class IP51.

If only one HIGH TECH LINE relay per panel door is used, for instance feeder protection with a MRI3 time over current relay, we recommend the housing "D".

The dimension of the mounting frame corresponds to the requirements of DIN 43700 (72 x 144 mm). The cut-out for panel mounting is 68 x 138 mm.

The front plates of the MR-relays are covered with a transparent, sealable flap (IP40), with reset push button.

The individual case is fixed with the delivered clasper from the rear of the panel.

If several HIGH TECH LINE relays are installed in a panel door, for instance on a protective panel for a generator, they can conveniently be mounted in a rack. This will make them immediately accessible for operation and enable the display to be read off at all times.

We can also provide suitable racks for back panel mounting in withdraw able technology. Protective devices of this type are normally located behind a window in the cubicle, so that the display can be more easily read from the outside. In this version, the connecting terminals are led out to the front. For order assistance please refer to the HIGH TECH LINE price list.
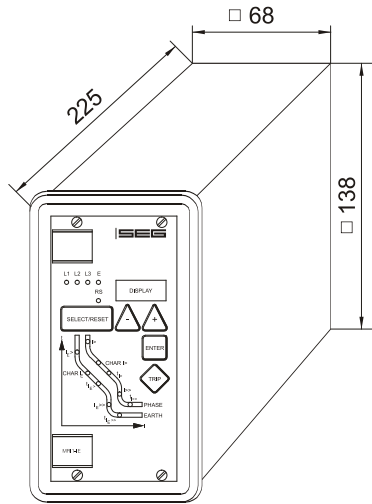
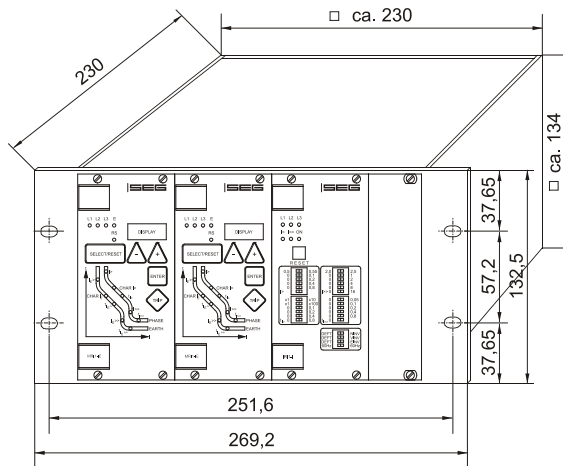*Figure 5.1: Individual housing (flush mounting) relay version D*



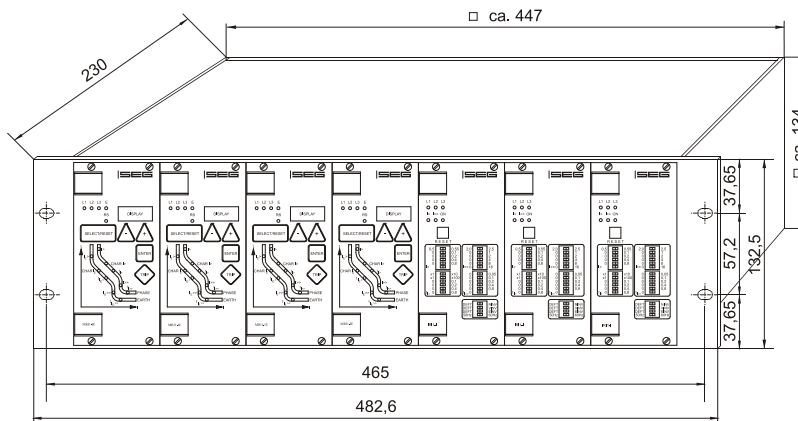*Figure 5.2: Rack for flush mounting with relay version A, width 42 TE*



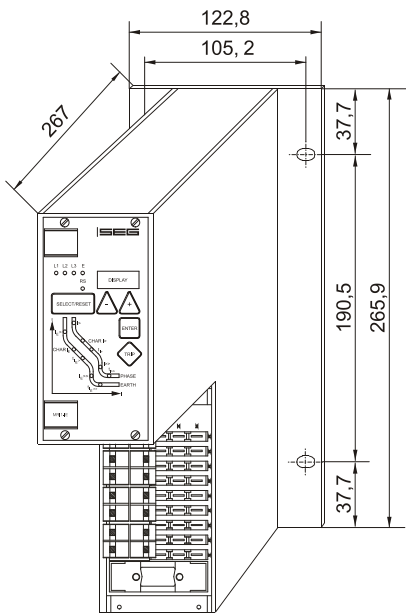*Figure 5.3: Rack for flush mounting with relay version A, width 84 TE*

*Figure 5.4: Rack for back panel mounting with relay version A, width 12 TE*
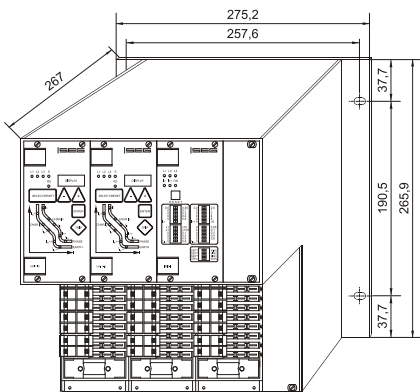


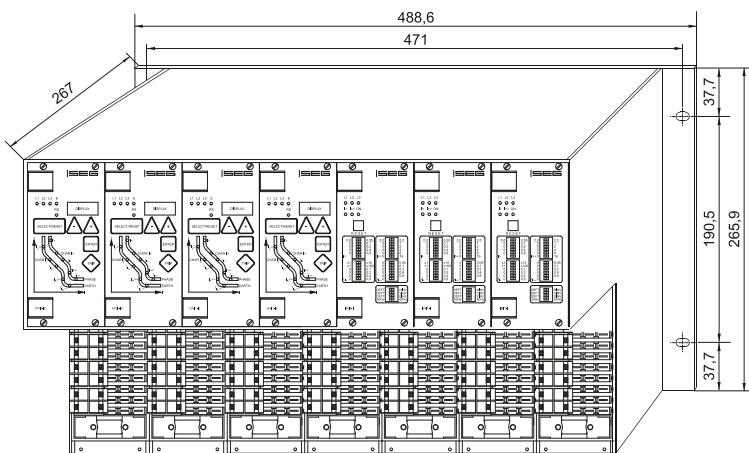*Figure 5.5: Rack for back panel mounting with relay version A, width 42 TE*



*Figure 5.6: Rack for back panel mounting with relay version A, width 84 TE*

## 5.1   Terminal block

The plug-in module has a very compact base with plug connectors and screw-type connectors.

- max. 15 poles screw-type terminals for voltage and current circuits (terminal connectors series A and B with a short time current capability of 500 A/1 s).
- 27 poles tab terminals, supply voltage etc.(terminal connectors series C, D and E, max. 6 A current carrying capacity). Connection with tabs 6.3 x 0.8 mm for cable up to max. 1.5 mm$^2$ or with tabs 2.8 x 0.8 mm for cable up to max. 1 mm$^2$.
  By using 2.8 x 0.8 mm tabs a bridge connection between different poles is possible.
  Screw terminals are provided for easy wiring (daisy chain) of the RS485 interface.

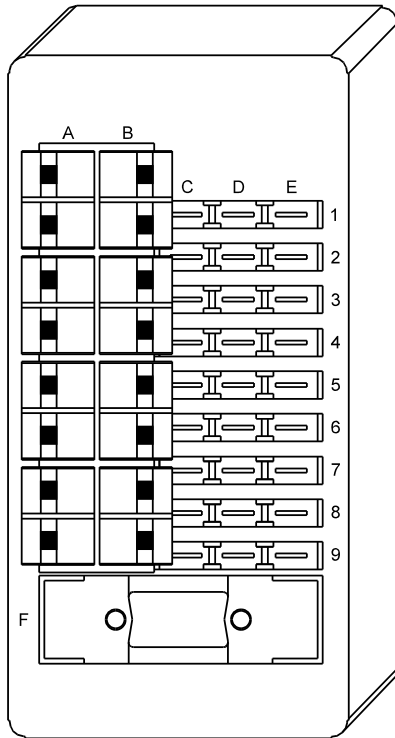The following figure shows the terminal block of MR:



*Figure 5.7: Terminal block*

# 6. Device communication

For the MR device types the serial data exchange is possible via interface RS485 or RS232 (with Modbus RTU Protocol). The interfaces only can be used individually. For communication with a SCADA system the RS485 interface is recommendable, for PC communiation the RS232 interface is provided.

The communication layer must be selected before the relay is activated.
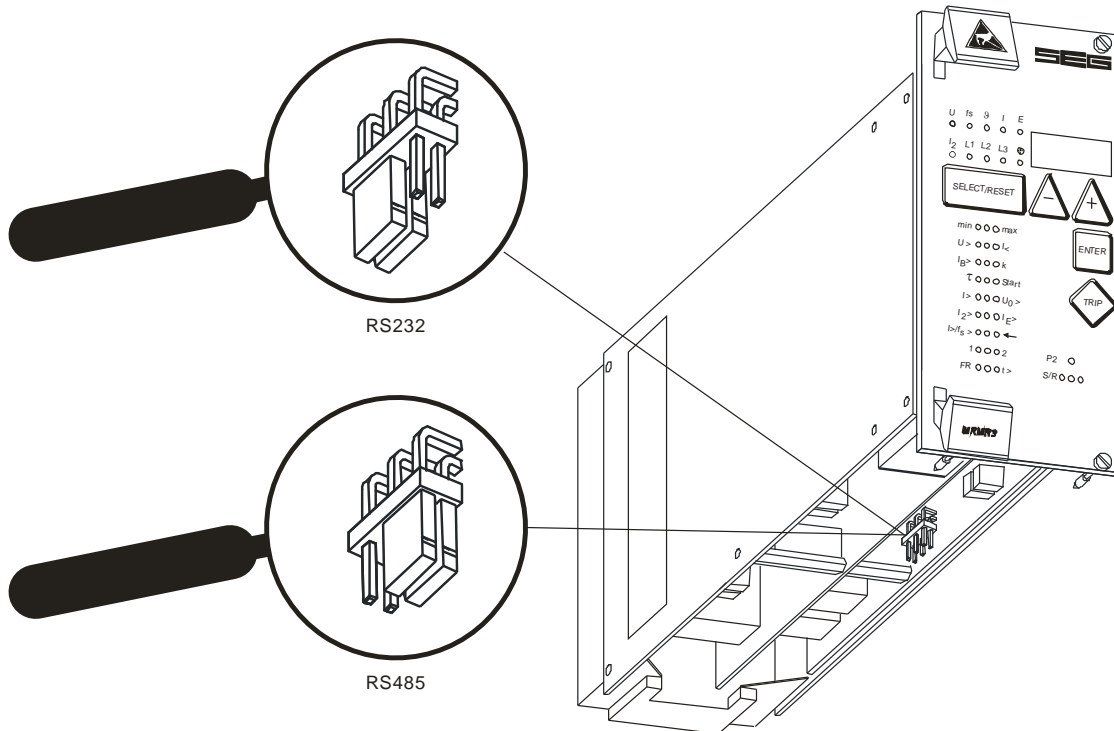


*Figure 6.1: coding plugs to choose RS485 or RS232 communication interface*

The RS485 communication is the default setting

**Important information:**
The optional communication via RS232 port is valid for device type with Rev. B or higher. All other MRx device types with lower Rev. No. Gv.xxx no have no RS232 communication available.

## 6.1    Serial data exchange via RS485 interface.

The RS485 interface is a Master/Slave connection. It is possible to connect up to 32 devices to this bus. Transmission distance up to the control system is max. 1000m.

## 6.2   Connection of RS485 interface
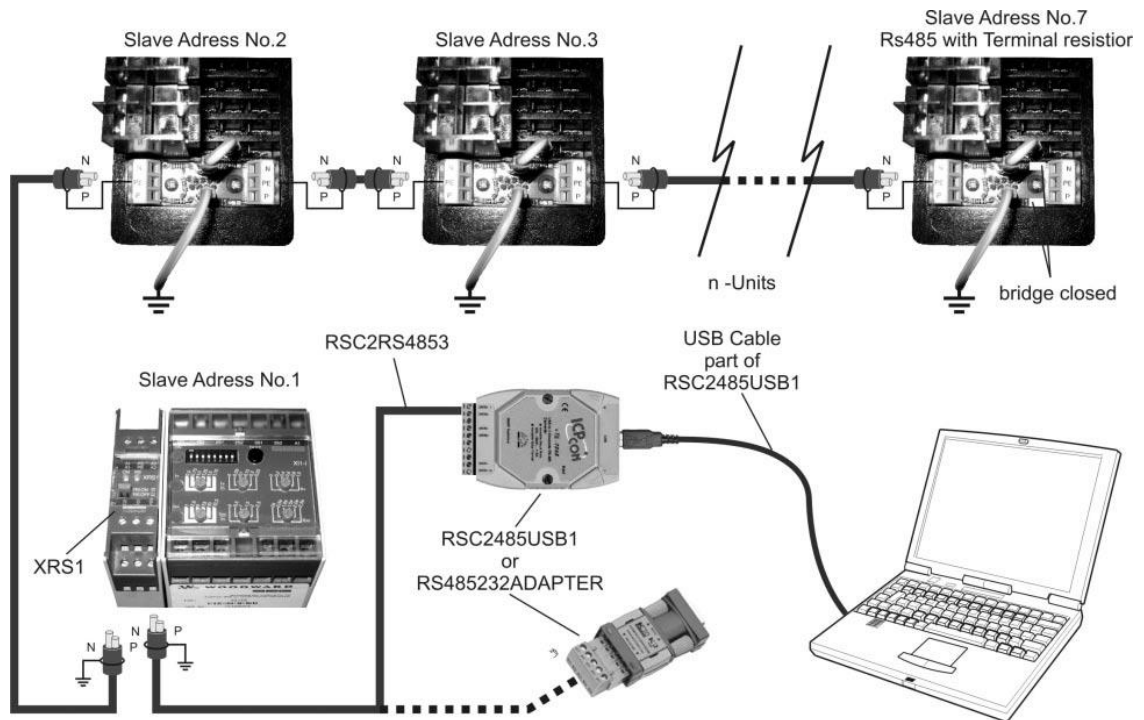


*Figure 6.2: Interface configuration*

Corresponding equipment converter, cable and power supply can be delivered on request. Please refer to description HTL/PL-Soft4.

HIGH TECH LINE relays can be interconnected to those of the PROFESSIONAL LINE via interface. Each terminal block of HIGH TECH LINE relays has two soldering points for integrating terminal resistors. If there are several relays to a system, the last relay of the chain has to be provided with terminal resistors.
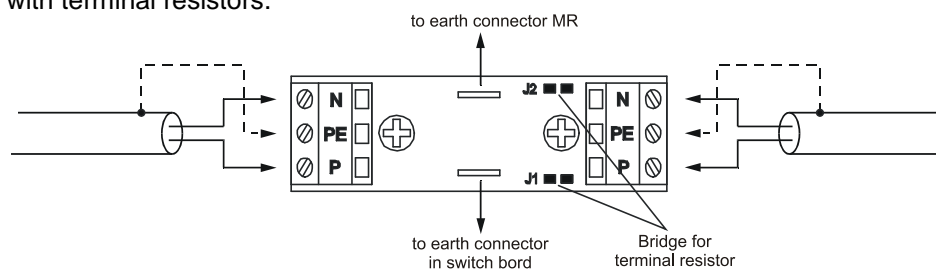


*Figure 6.3: Terminal connections of RS485 interface*

Connect the two data lines and the shielding of the interface adapter to the two terminal strips of the terminal connector. The two connection plugs are earthing connections. The top one should be connected to the earthing connection of the MR device, the lower one to the switchboard earth. This ensures that the shielding of the interface cable is also connected to earth. If a system consists of several relays, the last relay of the chain must be provided with terminal resistors. For this purpose, merely close the soldered bridges J1 and J2.

**Attention**

The two coding plugs for RS485 communication on the withdrawble electronic device part must be set to the right position. See figure 6.1: coding plugs to choose RS485 or RS232 communication interface

## 6.3    Serial data exchange via RS232 interface

For access to the RS232 interface the connector block of the RS485 interface has to be removed. Respective screws on the block to be loosened for this.
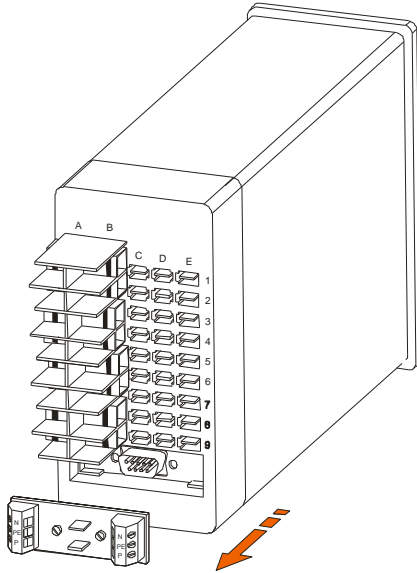


*Figure 6.4: Removal of RS485 connector block*

A 9-pole DSUB plug is fixed behind it. Via this plug a direct connection to the PC can be achieved with a 9-pole 1:1 standard cable.
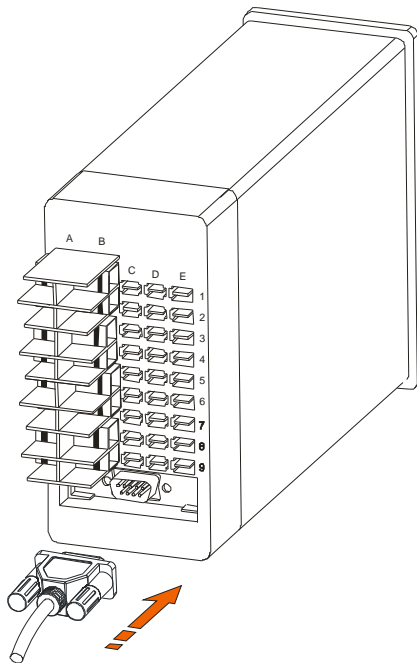


*Figure 6.5: Using RS232 Serial Interface*

**Attention**

Additionally the two coding plugs for RS232 communication on the withdrawble electronic device part must be set to the right position. See figure 6.1: coding plugs to choose RS485 or RS232 communication interface

## 6.4   Operation via the diagnosis- and parametering software HTL/PL-Soft4

For the serial data exchange the MRx relays can use the diagnosis- and parametering software HTL/PL-Soft4. The following functions can be realized with this software:

- Reading of measuring values
- Reading and setting of parameters
- Download and visualization of fault recordings
- Trend generator for long-term recording of measuring values and digital signals
- Communication via modem

For further information please see detailed description of the HTL/PL-Soft4 and/or the online help.

# 7. Fitting and withdraw of the relay

For withdrawing the relay please note the following order:

- Firstly unscrew the 4 screws at the front
- Push then the two toggles levers outwards (as shown in fig. 5.9)
- Now the relay can be removed easily from the 19" rack



*Figure 7.1: Withdraw of the relay*
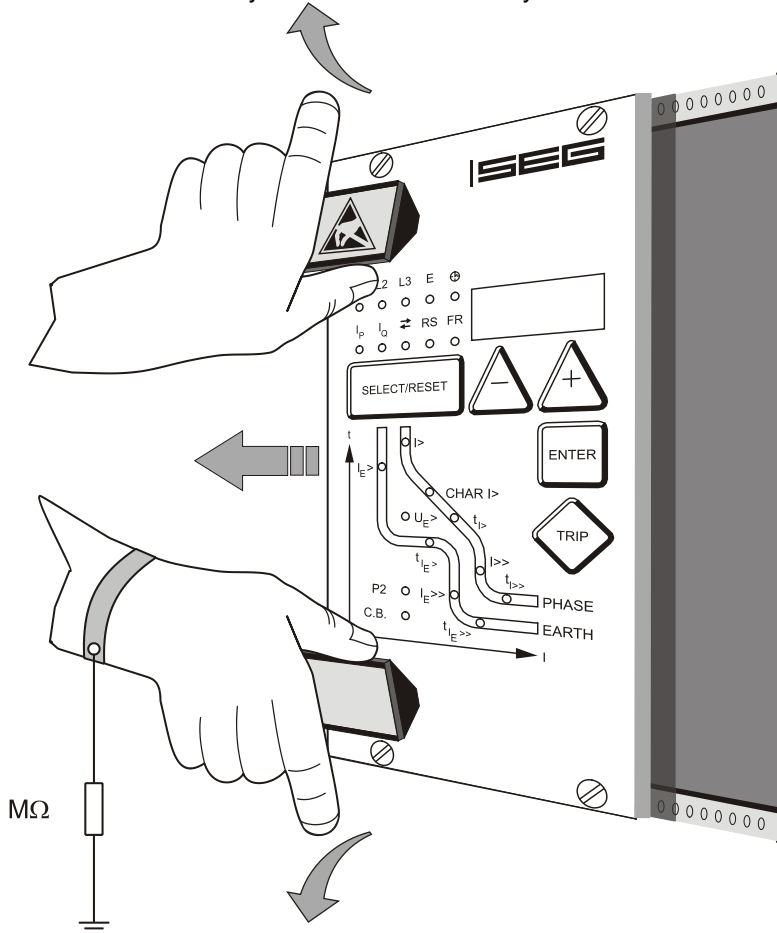
# 8. Relay testing and commissioning

The measuring input circuits are of complete static design and the relay functions are entirely digi-talized, so that the device MR has no particular demand on the maintenance.

For technical requests with regard to the relay function, the software version, shown on the display after pressing push button <TRIP>, has to be named (see 4.6).

# 9. General technical data

## 9.1   Power supply

Auxiliary voltage                                16 - 360 V DC/16 - 250 V AC
Power consumption:                               standby 3 W operating 5 W

Auxiliary voltages up to 100 V have to be fused with a 1.25 A delay fuse
Auxiliary voltages exceeding 100 V have to be fused with a 2 A delay fuse
The connection terminals are C9, E9.

Max. allowed interruption of the
auxiliary supply without effecting
the function of the device:                      50 ms

Propper connection of the earthing terminal D9 is essential for the EMC withstand of the relay.
Use wires of min. 1.5 mm$^2$.

## 9.2   Output relays

The output relays have with the following characteristics:
maximum breaking capacity    250 V AC/1500 VA / continuous current 6 A

| for DC voltage: | ohmic | L/R = 40 ms | L/R = 70 ms |
|---|---|---|---|
| 300 V DC | 0.3 A/90 W | 0.2 A/63 W | 0.18 A/54 W |
| 250 V DC | 0.4 A/100 W | 0.3 A/70 W | 0.15 A/40 W |
| 110 V DC | 0.5 A/55 W | 0.4 A/40 W | 0.2 A/22 W |
| 60 V DC | 0.7 A/42 W | 0.5 A/30 W | 0.3 A/17 W |
| 48 V DC | 2.6 A/124 W | 1.85 A/88 W | 1.1 A/53 W |
| 24 V DC | 6 A/144 W | 4.2 A/100 W | 2.5 A/60 W |

Max. rated making current:          64 A (VDE 0435/0972 and IEC 65/VDE 0860/8.86)
Making current:                     max 20 A (16 ms)
mechanical life span:               30 x 10$^6$ operating cycles
electrical life span:               2 x 10$^5$ operating cycles at 220 V AC / 6 A
Contact material:                   silver cadmium oxide (AgCdO)

## 9.3   Inputs

Low-range:
For rated voltages          24 V, 48 V, 60 V                    $U_{AN} \leq 10$ V       $U_{AB} \geq 8$ V
Current consumption         1 mA DC at 24 V

High-range:
For rated voltages          100 V, 110 V, 125 V, 220 V, 230 V   $U_{AN} \leq 70$ V       $U_{AB} \geq 60$ V
Current consumption   1     .5 mA DC 270 V or 11.0 mA AC

## 9.4   Common Data

Minimum hold time of the output relays ≥ 200 ms

## 9.5   System data and test specifications

Design standards:
| | |
|---|---|
| Generic standard: | EN 50082-2, EN 50081-1 |
| Product standard: | EN 60255-6, BS142 |

Specified ambient service
temperature limits
| | |
|---|---|
| in operation: | -10°C to +55°C |
| at storage: | -25°C to +70°C |

Moisture-carrying capacity class F
as per DIN 40040 and per DIN
IEC 68, part 2-3:                    rel. humidity <95 % at 40°C for 56 days

Insulation test voltage, inputs and
outputs between themselves and
to the relay frame as per EN 60255-6,
IEC 255-5:                            2.5 kV (eff.)/50 Hz.; 1 min.

Impulse test voltage, inputs and
outputs between themselves and
to the relay frame as per
EN 60255-6, IEC 255-5:            5 kV; 1.2/50 μs, 0.5 J

High frequency interference test
voltage, inputs and outputs between
themselves and to the relay frame as
per EN 60255-6, IEC 255-22-1:      2.5 kV/1 MHz

Electrical discharge (ESD)
test as per EN 61000-4-2,
IEC 255-22-2:                      8 kV air discharge, 6 kV contact discharge

Electrical fast transient (Burst)
test as per EN 61000-4-4,
IEC 255-22-4:                      4 kV/2.5 kHz, 15 ms

Power frequency magnetic
| | |
|---|---|
| field immunity test: | 100 A/m continuously |
| EN 61000-4-8 | 1000 A/m for 3 s |

Radiated electromagnetic field disturbance
test as per ENV 50140, IEC 255-22-3:    electric field strength: 10 V / m

Guided radiated electromagnetic field
disturbance test as per ENV 50141:     electric field strength: 10 V / m

Surge immunity test as per
EN 61000-4-5:                      4 kV

Radio interference suppression
test as per EN 55011:              limit value class B

Radio interference radiation
test as per EN 55011:              limit value class B

**Mechanical test**:

Shock:                              Class 1 as per DIN IEC 255 T 21-2
                                    5 g/11 ms, n = 3 at energized conditions and
                                    10 g/16 ms, n= 1000 at de-energized conditions
Vibration:                          Class 1 as per DIN IEC 255 T 21-1
                                    0.5 g/10 - 150 Hz, n = 1 with 1 octave each minute
                                    and 1 g/10 - 150 Hz, n = 20 with 1 octave each
                                    minute

Degree of protection (EN60529):
  Front panel                       IP40 by enclosure of the relay case and front plate
                                    (relay version D)

  Rear side terminals               IP 20

Overvoltage class:                  III
Weight:                             see separate description
Relay case material:                self-extinguishing

**Statistical data:**

MTBF                 200.000 h            *1
$\gamma$             0.97                 *2
$T_{max}$            250.000 h            *3
MTTR                 6.4 business days     *4

*1                   MTBF = Meantime between failure
*2                   failure probability $\gamma = 1 - \frac{MTBF}{T}$
                     with T = supervision time of MTBF
*3                   maximum live time
*4                   Mean time to repair. Attention, repairs only
                     allowed by an authorized technician
                     from SEG Electronics GmbH.
                     At side change of relay through withdraw
                     able housing.

Technical data subject to change without notice!

Deviations from this general MR description might be possible in some cases, these are explained
in the device-specific descriptions!
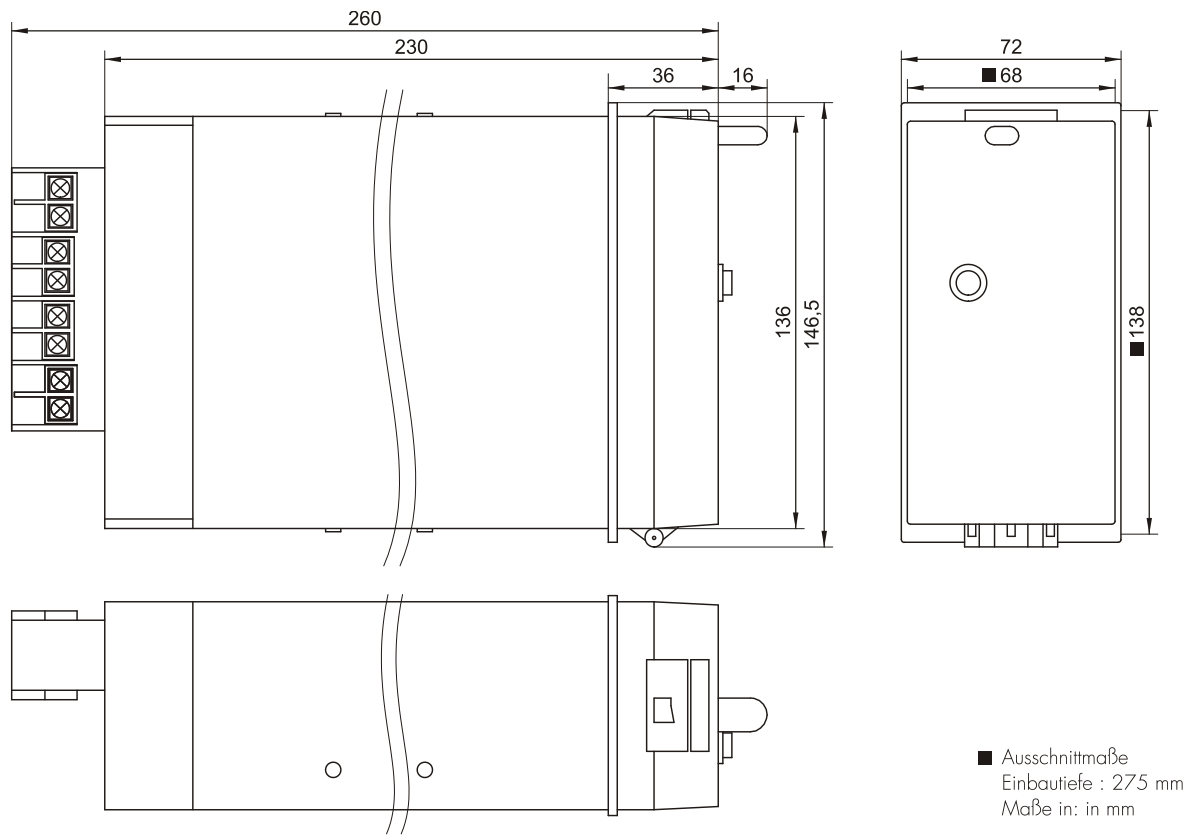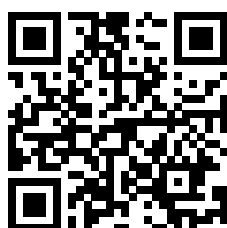
## 9.6    Dimensional drawings (12TE Relay case)



*Figure 9.1: Dimensional drawings*

A distance of 50 mm is necessary when the units are mounted one below the other for the front cover to be easily opened. The front cover can be opened downwards.

# HighTECH Line



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