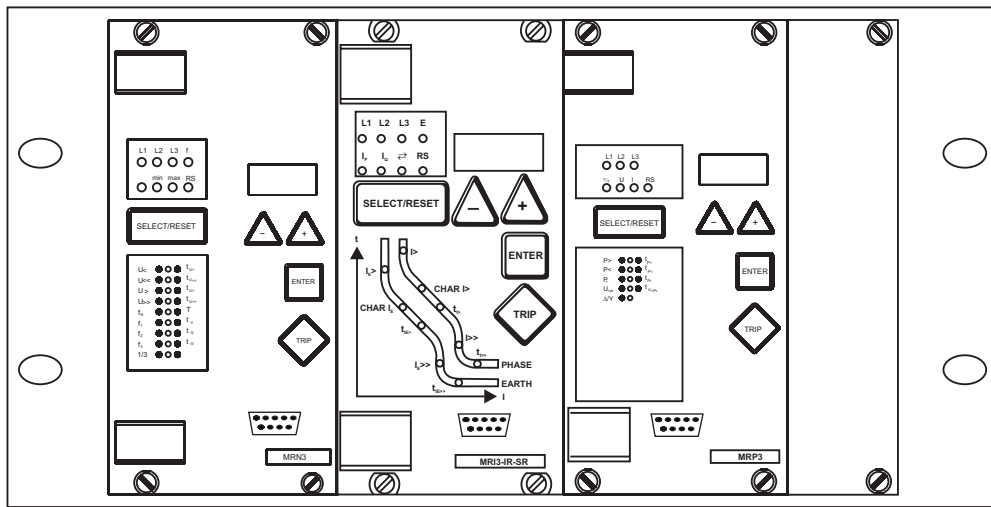


# High-Tech Range



## MR3 SERIES- Specification and Operational Guidelines



	<b>Page No</b>
<b>1 Introduction</b>	<b>3</b>
<b>2 Features and characteristics</b>	<b>3</b>
<b>3 Technology of the MR3-relays</b>	<b>3-4</b>
3.1 Input circuits	
3.2 Data communication	
3.3 Indication- and operation elements	
3.3.1 Front plate	
3.3.2 Display	
3.3.3 LEDs	
<b>4 Operation and setting</b>	<b>5-7</b>
4.1 Push buttons	
4.2 Code jumpers	
4.2.1 Function of the output relays	
4.2.2 Reset	
4.3 Relay setting principle	
4.3.1 Setting of default parameters	
4.4 Password	
4.4.1 Password programming	
4.4.2 Using the password	
4.5 Indication of measuring values and fault data	
4.5.1 Indication of measuring values	
4.5.2 Indication of fault data	
4.6 Display of software version and test-TRIP	
<b>5 Relay case</b>	<b>8-9</b>
5.1 Terminal connection	
5.2 Fitting & withdraw of relays	
<b>6 Relay testing and commissioning</b>	<b>9</b>
<b>7 General technical data</b>	<b>10-12</b>
7.1 Power supply	
7.2 Output relays	
7.3 System data and test specifications	
7.4 Dimensional drawings (12TE Relay case)	

# 1 Introduction

The development of numerical 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 CSPC protective relay family - **HIGH TECH RANGE MR3** - was developed. The protective relay family MR3 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 exceptionally good price/performance ratio because of integration of three protection functions.

The superiority of digital protective systems to the traditional protective relays is embodied by the relay family **MR3** 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 alphanumeric display
- Data exchange with station control center by means of serial interface
- RS232 port for communication provided on Front & RS485 on Rear
- Operation reliability by means of continuous self-supervision

## 2 Features and characteristics

- 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 selfsupervision for software and hardware
- Serial data communication facilities via RS232 (front) and RS485 (Rear)
- Wide voltage range for DC or AC auxiliary power supply
- High precision components and overrating guarantee:

- precision
- reliability
- long service life

**Following protection relays, based on common Hardware platform, are available in MR3 series.**

<b>MR13</b>	Digital Multifunctional Relay for time over current, directional time over current, earth fault current, directional earth fault protection for isolated and compensated systems, directional earth fault protection for rigidly or low resistance system.	50/51/67/50N 51N/67N
<b>MRN3</b>	Mains Decoupling Relay	27/59/78/81
<b>MRU3-1</b>	A.C. Voltage Relay	27/59/59N
<b>MRF3</b>	Frequency relay	81
<b>MRP3</b>	Directional Power Relay	32
<b>MRS3</b>	Negative Sequence Relay	46
<b>MRQ3</b>	Field Failure Relay	40
<b>MRK3</b>	Auto Reclosing Relay	79
<b>MRM3</b>	Motor Protection Relay	2/3/9/19/23/27/ 30/37/38/46/47/ 48/49/50/50N/ 51/51N/55/59

## 3 Technology of the MR3-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 **MR3** relays offer communication ports - RS232 on Front & RS485 on Rear. All data obtainable can be found in the specific technical descriptions named RS485-PRO.

### 3.3 Indication- and operation elements

#### 3.3.1 Front plate

The front plate of **MR3**-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

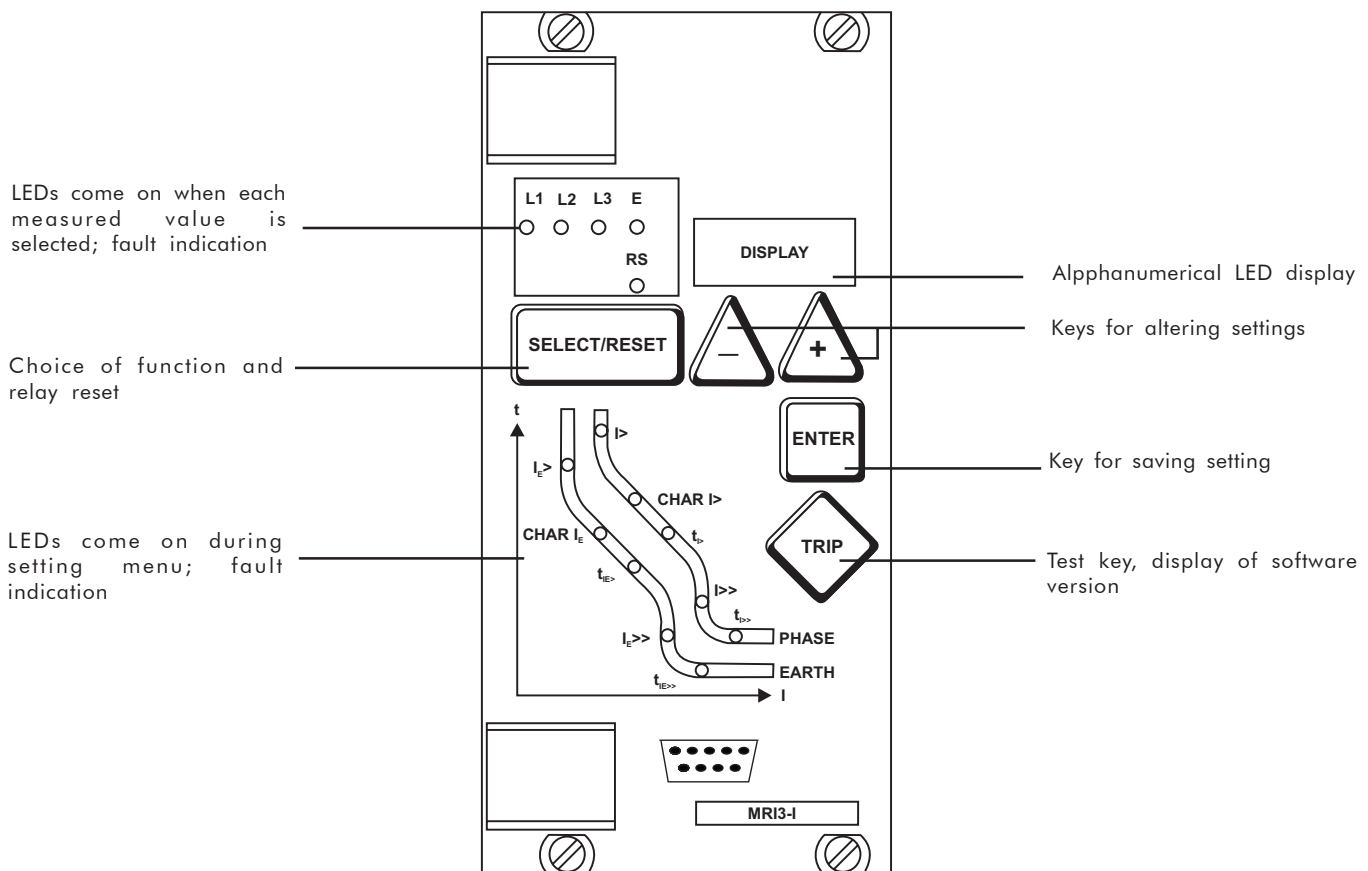


Fig. 3.1 Example of a front plate (MR3)

#### 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 a password identification (see 4.4.2).

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

#### Coding possibilities

Code Jumper	Function	Code Jumper position	Operation mode
J1	Password	OFF	Normal position
		ON	Password selection
J2	Alarm relays	OFF	Alarm relay 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 software

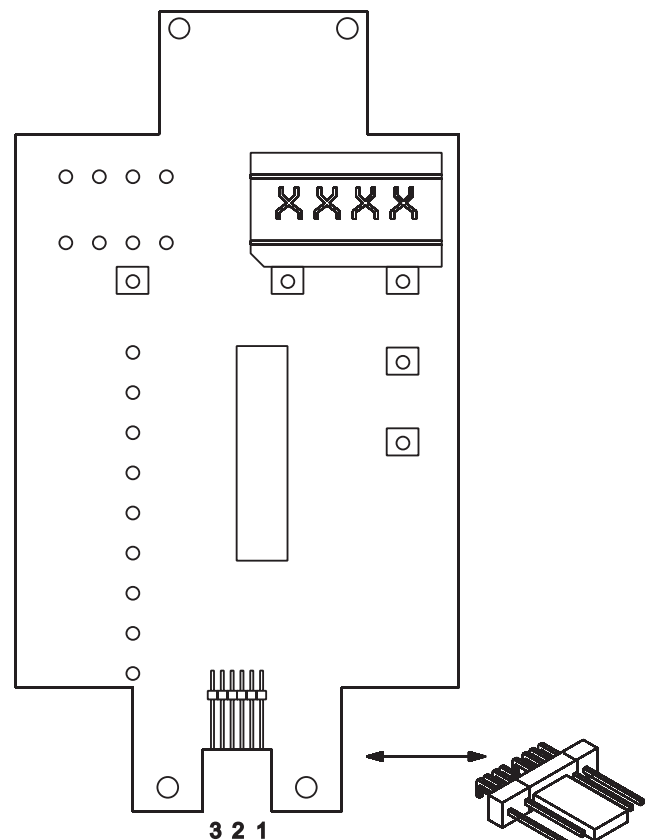
### 4.2 Code jumpers

Behind the front plate of the **MR3**-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:



**Fig. 4.1** Position and designation of the code jumpers

## 4.2.1 Function of the output relays

The following functions of **MR3** 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 pre-setting:

### Code jumper J2 OFF:

The alarm relays pickup directly with energizing of the corresponding measuring circuit. Thus, an alarm signalling can be given before the relay trips.

### Code jumper J2 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 J3 OFF:

All output relays will be reset automatically after the fault has been rectified, (e.g. when the fault current is interrupted).

### Code jumper J3 ON:

All output relays remains activated and must be reset after fault clearance.

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

## 4.2.2 Reset

### Manual reset

By pressing pushbutton <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> pushbutton on the front plate

Connecting auxiliary voltage to this input, the unit can be reset, provided that the fault is removed.

Software reset via serial interface RS 485

Software reset has the same function as pushbutton <SELECT/RESET>. Please refer to open data protocol of RS 485 interface named RS 485-PRO.

## 4.3 Relay setting principle

By pressing pushbutton <ENTER>, the parameter menu can be called up. By pressing pushbutton <SELECT/RESET> the parameter to be set is reached. The corresponding LED lights up. The actual set value of the selected parameter is indicated on the display. To indicated set value can then be changed by pressing pushbuttons <+><-> (in/decrementing). The selected set value is stored by pressing pushbutton <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 pushbutton <SELECT/RESET> is reserved for the indication of fault data. Now new parameter setting by means of pushbutton <SELECT/RESET> is only possible by pressing <ENTER> first.

### 4.3.1 Setting of default parameters

Setting of the **MR3** default parameters can be done as follows :

- switch off the auxiliary voltage supply
- press simultaneously pushbuttons <+><-> and <ENTER> and
- switch on the auxiliary voltage supply again.

## 4.4 Password

### 4.4.1 Password programming

The **MR3**-relays are delivered with the preset password "Enter, Enter, Enter, Enter", it can be programmed new with code jumper J1:

Apply code jumper J1. After power on and pressing any push button, the relay MR3 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 inquire 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 seconds.
- 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.

#### 4.5 Indication of measuring values and fault data

##### 4.5.1 Indication of measuring values

The displays for the measuring values are selected with pushbutton <SELECT>. By pressing this pushbutton the measured values called up step by step. The relevant values of the individual measuring quantities are indicated on the display.

##### 4.5.2 Indication of fault data

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.

After tripping, the fault data in all three phases and residual circuit can be shown on the display one after another by pressing the <SELECT/RESET> pushbutton repeatedly. By pressing the <SELECT/RESET> pushbutton for about 3 s the relay is reset to its original position.

If a protective function picked up, but reset before tripping, picking up is indicated afterwards by slow flashing of the corresponding LED.

This indication can be reset either by pushbutton <SELECT/RESET>, software reset or external reset (see para. 4.2.2).

#### 4.6 Display of software version and test-TRIP

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.

By entering the password the display shows "TRI?". After pressing <TRIP> again all output relays will be energized one after the other with a time delay of 1 s.

All relays stay energized until manual reset. The protection functions are not affected.

## 5 Relay case

The **MR3**-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 withdrawable.

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 RANGE** relays are available in two sizes: 12 TE and 42TE.

Please refer to the **HIGH TECH RANGE** 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 RANGE** relay per panel door is used, for instance feeder protection with a MRI3 time overcurrent relay, we recommend the housing "D".

The dimension of the mounting frame corresponds to the requirements of DIN 43700 (76 x 142 mm). The cut-out for panel mounting is 68.7 x 136.5 mm.

The front plates of the **MR3**-relays are covered with a transparent, sealable flap (IP54), with reset push button.

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

If several **HIGH TECH RANGE** 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.

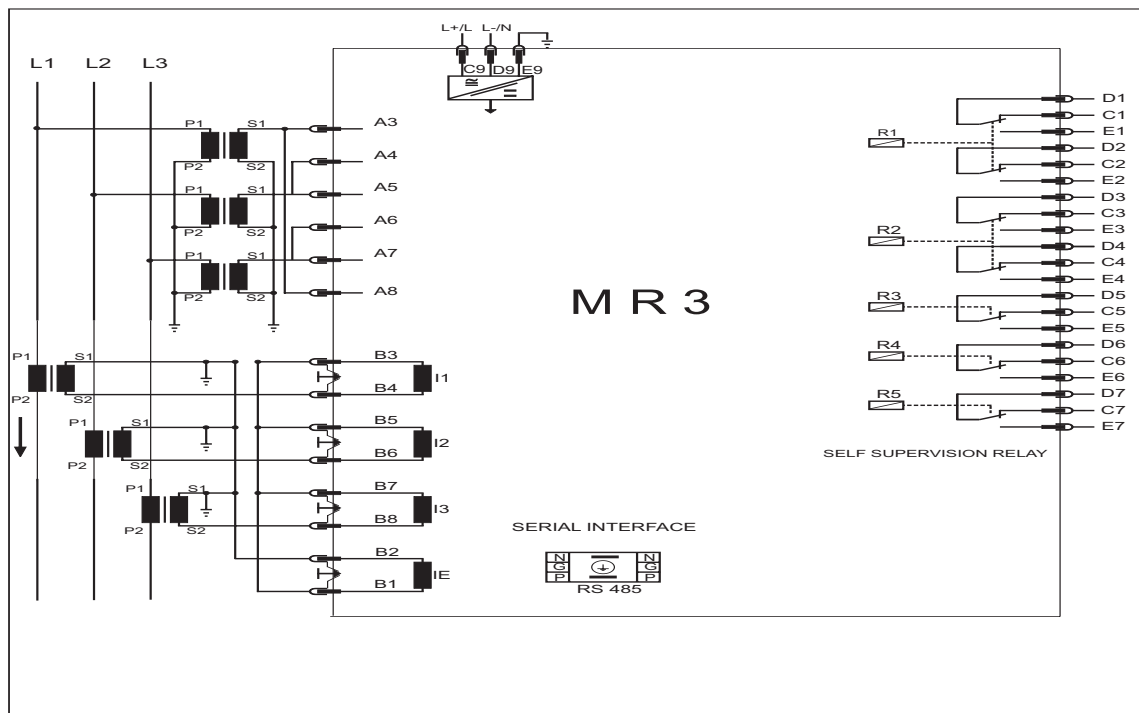


Fig. 5.1: Typical Connection Diagram



## 5.1 Terminal connectors

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/1s).
- 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<sup>2</sup> or with tabs 2.8 x 0.8 mm for cable up to max. 1 mm<sup>2</sup>.

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 **MR3**:

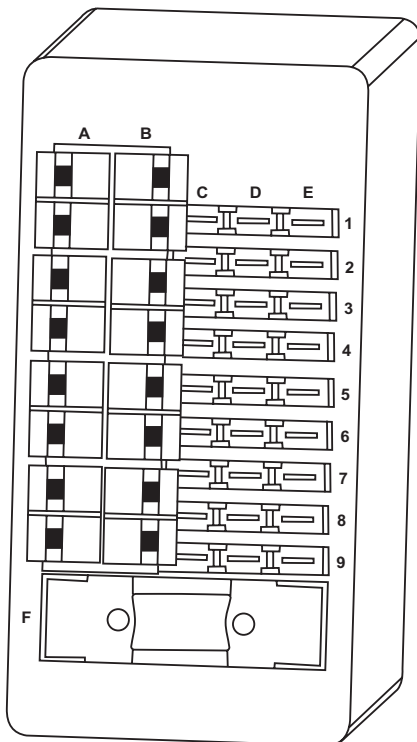


Fig. 5.2 Terminal block

## 5.2 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 toggler levers outwards (as shown in fig. 5.3)
- Now the relay can be removed easily from the 19" rack

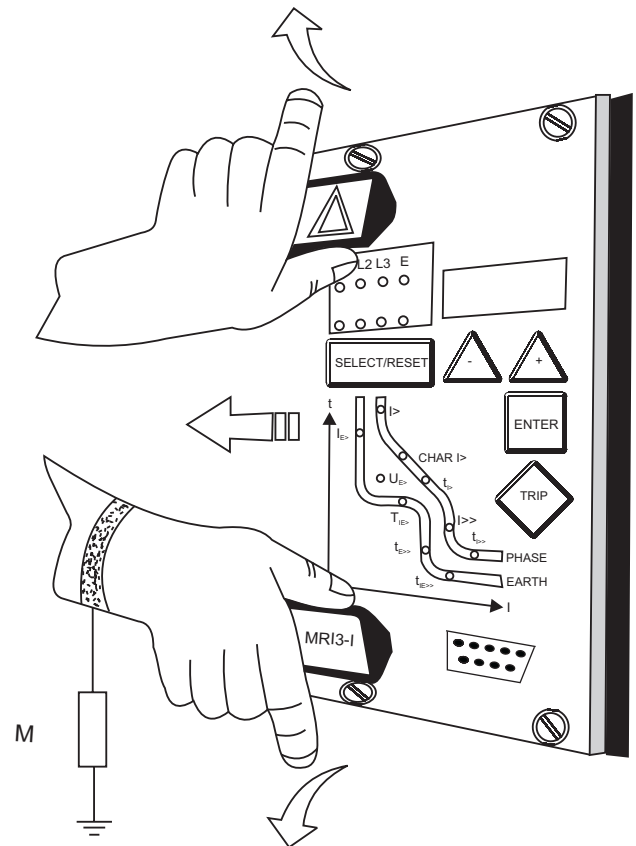


Fig. 5.3 Withdrawl of the Relay

## 6 Relay testing and commissioning

The measuring input circuits are of complete static design and the relay functions are entirely digitalized, so that the device **MR3** 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 pushbutton <TRIP>, has to be named. (see chapter 4.6).

## 7 General technical data

### 7.1 Power supply

Auxiliary voltage	24 V	:	16 - 80 V DC / 16 - 60 V AC
	110 V	:	70 - 160 V DC / 50 - 270 V AC
Power consumption		:	24 V; standby 3 W, operating 5 W 110 V; standby 3 W, operating 5 W

The connection terminals are C9, E9.

Proper connection of the earthing terminal D9 is essential for the EMC withstand of the relay.  
Use wires of min. 1.5 mm<sup>2</sup>.

### 7.2 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
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)
mechanical life span	:	30 x 10 <sup>6</sup> operating cycles
electrical life span	:	2 x 10 <sup>5</sup> operating cycles at 220 V AC / 6 A
Contact material	:	silver cadmium oxide (AgCdO)

### 7.3 System data and test specifications

Design standards	:	VDE 0435, part 303, IEC 255-4, BS 142
Specified ambient service		
Storage temperature range	:	- 40°C to + 85°C
Operating temperature range	:	- 20°C to + 70°C
Moisture-carrying capacity class F as per DIN 40040 and per DIN IEC 68, part 2-3	:	rel. humidity <95% to 40°C for 56 days
Insulation test voltage, inputs and outputs between themselves and to the relay frame as per VDE 0435, part 303; IEC 255-5	:	2.5 kV (eff.) / 50 Hz; 1 min. Power supply inputs C9, E9 limited to 1000 V due to EMC-Filter
Impulse test voltage, inputs and outputs between themselves and to the relay frame as per VDE 0435, part 303; IEC 255-5	:	5 kV; 1.2 / 50 $\mu$ s, 0.5 J
High frequency interference test voltage, inputs and outputs between themselves and to the relay frame as per IEC 255-6	:	2.5 kV / 1 MHz
Electrical fast transient (Burst) test as per DIN VDE 0843, part 4 IEC 801-4	:	4 kV / 2.5 kHz, 15 ms
Electrical discharge (ESD) test as per VDE 0843, part 2 IEC 801-2	:	8 kV
Radio interference suppression test as per VDE 0871	:	limit value class B
Radiated electromagnetic field test as per DIN VDE 0843, part 3, IEC 801-3	:	electric field strength: 10 V / m

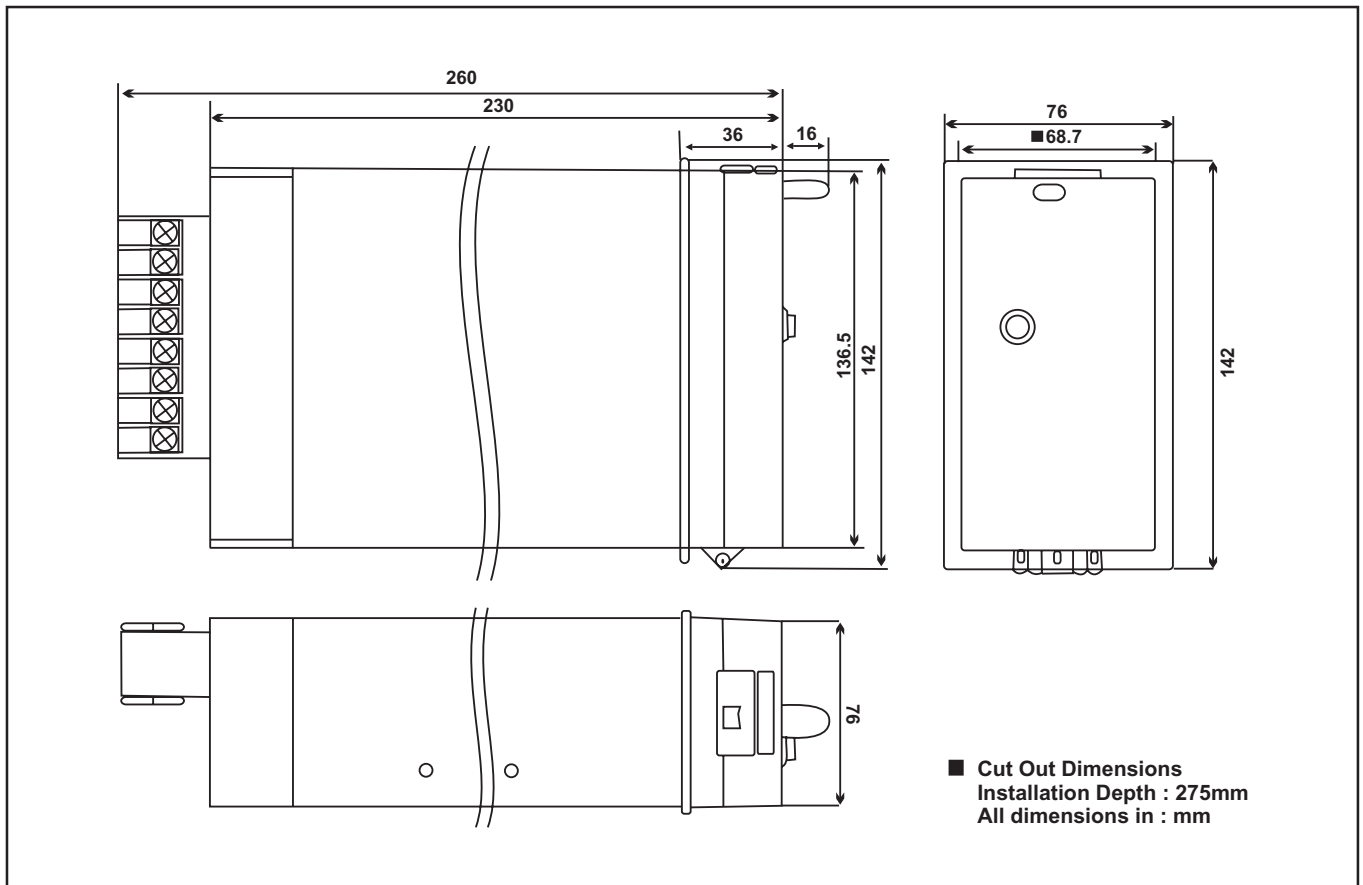
#### **Mechanical test :**

Shock	:	Class 1 as per DIN IEC 255 T 21-2
Vibration	:	Class 1 as per DIN IEC 255 T 21-1
Degree of protection	:	IP54 by enclosure of the relay case and front plate (relay version D)
Overvoltage class	:	III
Weight	:	see separate description

Variations from this MR3 descriptions might be possible in some cases and are explained on the specific descriptions!

Technical data subject to change without notice!

## 7.4 Dimensional drawings (12 TE Relay case)



**Fig. 7.1 Dimensional drawings**

### Please observe!

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.

For further information, please contact :



### C&S Protection & Control Ltd.

44, Okhla Indl. Estate, New Delhi-110020, Ph.: 011-55602414, 26319465-66 Fax: 011-55602413 email: cspc@controlsindia.com

**Marketing Office : DELHI** : Ph.: 55602414, 26319465-66 Fax: 55602413 **CHANDIGARH** : Ph. 2776154, 2776151, 2726153 Fax: 2726154  
**KOLKATA** : Ph. 24549607-08 Fax: 24549371 **MUMBAI** : Ph.: 24114727-28 Fax : 24126631 **PUNE** : Ph.: 5444822-824, Fax: 5410820,  
**AHMEDABAD** : Ph.: 65841425, 6589132 Fax : 6589132 **BANGALORE** : Ph.: 5586147, 5323582, 5594939 Fax: 5582796,  
**CHENNAI** : Ph.: 26426475, 26426572 Fax: 26411972 **HYDERABAD** : Ph.: 27813003, 55332304 Fax: 27812987