

# **MICROPROCESSOR FAULT DETECTOR RELAY**

**TYPE**

## **N-DIN-TS**

# **OPERATION MANUAL**



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**1. GENERAL UTILIZATION AND COMMISSIONING DIRECTIONS**

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Always make reference to the specific description of the product and to the Manufacturer's instruction. Carefully observe the following warnings.

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**1.1 - Storage And Transportation**

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must comply with the environmental conditions stated on the product's instruction or by the applicable IEC standards.

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**1.2 - Installation**

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must be properly made and in compliance with the operational ambient conditions stated by the Manufacturer.

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**1.3 - Electrical Connection**

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must be made strictly according to the wiring diagram supplied with the Product, to its electrical characteristics and in compliance with the applicable standards particularly with reference to human safety.

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**1.4 - Measuring Inputs Aand Power Supply**

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carefully check that the value of input quantities and power supply voltage are proper and within the permissible variation limits.

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**1.5 - Outputs Loading**

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must be compatible with their declared performance.

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**1.6 - Protection Earthing**

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When earthing is required, carefully check its efficiency.

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**1.7 - Setting and Calibration**

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Carefully check the proper setting of the different functions according to the configuration of the protected system, the safety regulations and the co-ordination with other equipment.

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**1.8 - Safety Protection**

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Carefully check that all safety means are correctly mounted, apply proper seals where required and periodically check their integrity.

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**1.9 - Handling**

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Notwithstanding the highest practicable protection means used in designing M.S. electronic circuits, the electronic components and semiconductor devices mounted inside can be seriously damaged by electrostatic voltage discharge which can be experienced when handling the cards.

The damage caused by electrostatic discharge may not be immediately apparent but the design reliability and the long life of the product will have been reduced. The electronic circuits produced by M.S. are completely safe from electrostatic discharge when housed in their case; dismantling the cards without proper cautions expose them to the risk of damage and voids any guarantee and relieves the Manufacture of any liability.

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**1.10 - Maintenance**

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Make reference to the instruction manual of the Manufacturer ; maintenance must be carried-out by specially trained people and in strict conformity with the safety regulations.

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**1.11 - Fault Detection and Repair**

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Internal calibrations and components should not be altered or replaced.  
For repair please ask the Manufacturer or its authorised Dealers.

Misapplication of the above warnings and instruction relieves the Manufacturer of any liability.

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## 2. GENERAL CHARACTERISTICS

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N-DIN is a very versatile and complete Feeder Manager Relay with overcurrent and Earth Fault Protection. N-DIN relay is designed for surface mounting inside switchboards or panels on standard DIN-EN 50022 rail, but its Front-Face-Panel (FFP) can be removed (by simply unscrewing the two fastening screws) and flush mounted on the front panel of the Switchboard or on the front of a Power Control Center bay. Connection between the MAIN RELAY BODY (MRB) mounted inside the switchboard and the FFP mounted on the front panel, is made by a shielded double pair of twisted cables connected to the relevant screw terminals available on the front of the MRB and on the back of the FFP.

The max distance between the two parts can be up to 2 meters; for longer distance the connection cables must be laid in proper shielding conduits.

Connection between the two parts when assembled together is made by a plug-in connector provided on each of the two parts (see § 5.3).

This unique feature allows to have all controls and measurements available on the switchboard front panel including local connection to a Lap-top PC, while the part connected to the Power Circuit remains inside the panel closed to the C.Ts and to the control devices.

Moreover, where local display of measurements and data is not required, the RMB part can be used as a stand alone relay featuring all protection and communication functions, saving the cost of the FFP.

The measuring inputs have the following ratings:

- Rated continuous current 5A
  - Overload: 10A continuous – 200A for 1s
  - Phase current measuring dynamic: (0.05-50)A
  - Neutral current measuring dynamic: (0.01-10)A
- Three optoisolated, selfpowered digital inputs (D1, D2, RTD) are provided.  
The digital inputs D1 and D2 are activated when their input terminals (1-6, 1-7) are shorted by a cold contact ( $R \leq 3k\Omega$ ); The input RTD is activated when the resistance connected across its terminals exceeds  $2900\Omega$  or is below  $30\Omega$ .  
The Digital inputs can also be controlled via the serial communication ports or by the FFP when in “ Remote “ control mode.
- Two output relays (R1, R2), each with one Normally Open 6A rating contact, are available.

Make electric connection in conformity with the diagram reported on relay's enclosure.

Check that input currents are same as reported on the diagram and on the test certificate.

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### 2.1 - Power Supply

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The auxiliary power is supplied by a built-in module fully isolated and self protected.

Two options are available:

- |        |                             |        |                             |
|--------|-----------------------------|--------|-----------------------------|
| a) - { | 24V(-20%) / 110V(+15%) a.c. | b) - { | 80V(-20%) / 220V(+15%) a.c. |
|        | 24V(-20%) / 125V(+20%) d.c. |        | 90V(-20%) / 250V(+20%) d.c. |

Before energising the unit check that supply voltage is within the allowed limits.

## 2.2 – Operation and Algorithms

### 2.2.1 – Reference Input Values

Display	Description	Setting Range	Step	Unit
<b>RI</b> 100 -	Ratio of the phase C.Ts. (Ip/Is)	1 - 6500	1	-
<b>Rlo</b> 100 -	Ratio of the C.Ts. or of the tore C.T. detecting earth fault current.	1 - 6500	1	-
<b>In</b> 100 <b>A</b>	Reference primary current of the relay	1 - 6500	1	A
<b>Freq</b> 50 <b>Hz</b>	System rated frequency	50 - 60	10	Hz

### 2.2.2 – Input quantities

#### 2.2.2.1 – Mains Frequency (Freq)

The relay can operate either in 50Hz or 60Hz systems.  
The rated Mains Frequency “ Freq ” must be set accordingly.

#### 2.2.2.2 – Phase Current inputs (RI)

The relay directly displays the r.m.s. value of the Phase Currents “ **IA** ”, “ **IB** ”, “ **IC** ” flowing in the Primary of the input Current Transformers and refers all its measurements to that value.  
To make the relay properly working with any C.T., when programming the relay settings, input the value of the Ratio  $RI = \frac{In \text{ primary}}{In \text{ secondary}}$  of the phase C.Ts  
(In case of direct connection, without C.Ts. RI=1).

#### 2.2.2.3 – Earth Fault Current Input (Rlo)

Same as for the Phase Currents, the relay directly displays the r.m.s. value of the Zero Sequence Residual Current flowing at the Primary of the Current Transformers.

If the input to the Earth Fault element is supplied by the residual connection of the 3 phase C.Ts., we shall set for the ratio “ **Rlo** ” the same value as “ **RI** ”.

If the input to the Earth Fault element is supplied by a separated Core Balance C.T., or by another CT, “ **Rlo** ” value will be the Ratio of this C.T., normally different from “ **RI** ”.

#### 2.2.2.4 – Phase CT primary rated current “ In ”

“ **In** ” is the primary rated current of the feeder;  
this is the reference value for all the protection functions.

## 2.2.3 – Functions and Settings

### 2.2.3.1 - 1F51(I>) – First overcurrent protection level

- <b>Function Enable</b>	:	<b>Status</b>	(Disable/Enable) if disable the function is disactivated.
- <b>Options</b>	:	<b>TCC</b>	(Time current curves):
		<b>D</b>	: Independent Definite Time
		<b>A</b>	: IEC A Inverse
		<b>B</b>	: IEC B Very Inverse
		<b>C</b>	: IEC C Extremely Inverse
		<b>OUT</b>	Selection of the output relay operated at the end of trip time delay: <b>R1, R2, R1 + R2, None</b>
- <b>Trip Level</b>	:	Minimum phase current pick-up level: <b>I&gt; = (20-400)%In, step 1%In (limited to 50A secondary)</b>	
- <b>Timers</b>	:	Trip time delay <b>tl&gt; = (0.05-60.00)s, step 0.01s.</b>	

### 2.2.3.2 - 2F51 (I>>) – Second overcurrent protection level

- <b>Function Enable</b>	:	<b>Status</b>	(Disable/Enable) if disable the function is disactivated.
- <b>Options</b>	:	<b>OUT</b>	Selection of the output relay operated at the end of trip time delay: <b>R1, R2, R1 + R2, None</b>
- <b>Trip Level</b>	:	Minimum phase current pick-up level: <b>I&gt;&gt; = (20-999)%In, step 1%In (limited to 50A secondary)</b>	
- <b>Timers</b>	:	Trip time delay <b>tl&gt;&gt; = (0.05-60.00)s, step 0,01s.</b>	

### 2.2.3.3 - Algorithm of the time current curves

The Time Current Curves are generally calculated with the following equation :

$$(1) \quad t(I) = \left[ \frac{A}{\left( \frac{I}{I_s} \right)^a - 1} \right] \bullet K \bullet T_s \bullet tr$$

where :

$t(I)$  = Actual trip time delay when the input current equals “I”

$I$  = Maximum of the three input currents.

$I_s$  = Set minimum pick-up level

$$K = \left( \frac{A}{10^a - 1} \right)^{-1}$$

$T_s$  = Set time delay :  $t(I) = T_s$  when  $\frac{I}{I_s} = 10$

$tr$  = Operation time of the output relay on pick-up (7ms).

The parameters “A” and “a” have different values for the different Time Current Curves.

Curve Name	Curve Identifier	A	a
IEC A Inverse	A	0.14	0.02
IEC B Very Inverse	B	13.5	1
IEC C Extremely Inverse	C	80	2

### 2.2.3.4 - 1F64 (Io>) – First Earth Fault protection level

- <b>Function Enable</b>	:	<b>Status</b>	(Disable/Enable) if disable the function is disactivated.
- <b>Options</b>	:	<b>TCC</b>	(Time current curves): <b>D</b> : Independent Definite Time <b>A</b> : IEC A Inverse <b>B</b> : IEC B Very Inverse <b>C</b> : IEC C Extremely Inverse  <b>OUT</b> : Selection of the output relay operated at the end of trip time delay: <b>R1, R2, R1 + R2, None</b>
- <b>Trip Level</b>	:	Minimum Zero Sequence Residual Current Pick-up level : <b>Io&gt;</b> = (20-9999)mAs, step 1mAs	
- <b>Timers</b>	:	Trip time delay : <b>tIo&gt;</b> = (0.05-60.00)s, step 0.01s.	

The setting “ Io> ” is given in Secondary Amps (current following through the relay’s input terminals).

The set value [ Io> ] multiplied by the set value [ RIo ], gives the Primary value of “ Io> ”.

$$[Io>] \times [RIo] = Io> \text{ Primary Amps}$$

Example:

A)

- Set value: Io> = 40 mAs (Secondary Current)
- CT ratio: RIo = 100/1
- Primary Trip Level : 40 x 100 = 4000 mAp = 4 Ap (Primary Current)

B)

- Required Primary Trip Level: Io> = 4 Ap
- CT ratio: RIo = 100/1
- Io> Set = 4 / 100 = 0.04As = 40mAs

### 2.2.3.5 - 2F64 (Io>>) – Second Earth Fault protection level

- <b>Function Enable</b>	:	<b>Status</b>	(Disable/Enable) if disable the function is disactivated.
- <b>Options</b>	:	<b>OUT</b>	Selection of the output relay operated at the end of trip time delay: <b>R1, R2, R1 + R2, None</b>
- <b>Trip Level</b>	:	Minimum Zero Sequence Residual Current Pick-up level : <b>Io&gt;&gt;</b> = (20-9999)mAs, step 1mAs	
- <b>Timers</b>	:	Trip time delay : <b>tIo&gt;&gt;</b> = (0.05-60.00)s, step 0.01s.	



### 2.2.3.6 – RTD (F26) – Overtemperature protection

A RTD probe can be connected to the relevant N-DIN input (terminals 1-2) to trip when overtemperature is detected.

- <b>Function Enable</b>	:	<b>Status</b>	(Disable/Enable) if disable the function is disactivated.
- <b>Options</b>	:	<b>OUT</b>	Selection of the output relay operated on tripping : <b>R1, R2, R1 + R2, None</b>
- <b>Trip Levels</b>	:	No Parameters	
- <b>Timers</b>	:	No Parameters	

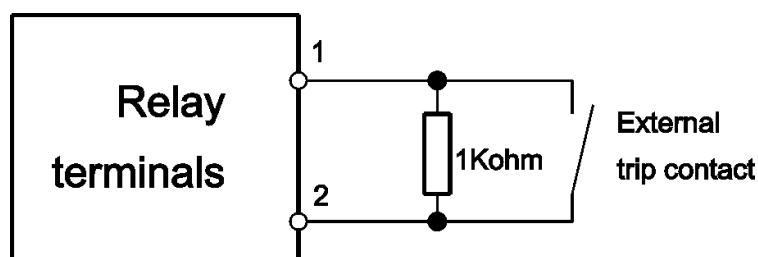
With reference to the resistance value “ R “ of the probe, measured at relay terminals, the operation limits are:

$R < 30\Omega$  = Probe Shorted → Trip

$R > 2900\Omega$  = Overtemperature or Probe Open → Trip

Different probe characteristics require special factory calibration.

It is possible to use RTD input as a remote trip input, driven by a cold contact.



Connecting  $1K\Omega$  across relay terminals 1 – 2, tripping can be obtained shunting the resistors by an external cold contact..

### 2.2.3.7 – **OperMod** - Operation Mode

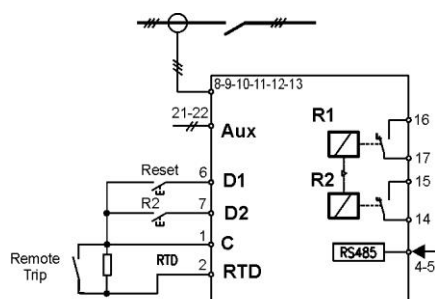
The N-DIN-TS is fitted with 2 output relays R1, R2 and 3 Digital Input D1, D2, RTD (see § 2):

- <b>R1</b>	Can be controlled by any of the N-DIN-TS functions according to programming. <ul style="list-style-type: none"> <li>- <b>Pick-up:</b> As soon as any of the phase input currents or of the ground input current exceeds the set pick-up level [Is] the output relay "R1" or "R2" is energized and the trip signal led is lit-on.</li> <li>- <b>Reset:</b> When the input current "I" drops below 0.95 the set pick-up level [Is], a 0.5 sec timer is started; at the end of the 0.5 sec delay the relay automatically resets if <math>5\% I_n \leq I \leq 0.95 [Is]</math> (Circuit Breaker closed but current below reset threshold. If the above conditions are not detected the reset can only take place by operating the reset push button of the RMB, or FFP, or by the digital input "D1".</li> </ul> Reset can be operated by the reset button of the RMB and/or FFP and/or by activation of the Digital Input "D1".
- <b>R2</b>	Can be controlled by any of the N-DIN-F functions according to programming. Reset is automatic. ( $I < 0.95[Is]$ )
- <b>D1</b> (Terminals 1-6)	Operates the reset after tripping cause is cleared (example: Overcurrent trip – Circuit Breaker Open– Current interrupted – Reset) If "D1" terminals (1-6) are permanently shorted, reset of "R1" after tripping takes place automatically as soon as the tripping cause disappears.
- <b>D2</b> (Terminals 1-7)	When activated, "D2" operates the output relay "R2" (energizes "R2" if "R2" operation mode id "N.D."; deenergizes "R2" if "R2" operation mode is "N.E.")
- <b>RTD</b> (Terminals 1-2)	Operates according to § 2.2.3.9

The menu " OperMode ", includes three submenus (OPTIONS):

- <b>Function Enable</b>	:	No Parameters
- <b>Options</b>	:	<div> <div> <b>Op_R1</b>  <i>For selection of different operation modes of the Output Relay "R1":</i>  <b>N.E.</b> (Normally energized, deenergized on trip).  <b>N.D.</b> (Normally deenergized, energized on trip). </div> <div> <b>Op_R2</b>  <i>For selection of different operation modes of the Output Relay "R2":</i>  <b>N.E.</b> (Normally energized, deenergized on trip).  <b>N.D.</b> (Normally deenergized, energized on trip). </div> </div>
		<div> <b>Ctrl</b>  <i>For selection between Local/Remote relay control:</i>  <b>Local</b> : The Digital Inputs "D2" is enabled and can be controlled via terminals (1-7) on relay RMB.  <b>Remote</b> : The Digital Inputs "D2" is only operated by the communication ports or by the commands on the FFP.  In the Remote control mode, the status of the terminals (1-7) is ignored. </div>
- <b>Trip Levels</b>	:	No Parameters
- <b>Timers</b>	:	No Parameters

### **APPLICATION EXAMPLE**



**LOCAL CONTROL VIA DIGITAL INPUTS  
REMOTE CONTROL VIA RS485**

### 2.2.3.8 – Load Profile

- <b>Function Enable</b>	:	<b>Status</b> (Disable/Enable) if disable the function is disactivated.
- <b>Options</b>	:	No Parameters
- <b>Trip Levels</b>	:	No Parameters
- <b>Timers</b>	:	<b>tLP</b> = (1-650)m, step 1m

The Load Profile function, when activated, records the value of current “ I “ (largest of the 3 phase-currents) at any C/B closure, at every time interval “ tLP “and at any C/B opening, (tLP programmable 1 – 650 min, step 1min).

Each record is complete with time/date tagging (see § 3.1).

The memory buffer can store up to 100 records.

All the recorded data can be downloaded by the serial communication port and, with MScCom interface program, they are displayed as time/current curve.

### 2.2.3.9 – I.R.F. – Internal Relay Failure

- <b>Function Enable</b>	:	<b>Status</b> (Disable/Enable) if disable the function is disactivated.
- <b>Options</b>	:	<b>OpIRF</b> = Trip/NoTrip <b>OUT</b> Selection of the output relay operated on tripping : <b>R1, R2, R1 + R2, None</b>
- <b>Trip Levels</b>	:	No Parameters
- <b>Timers</b>	:	No Parameters

The variable “ OpIRF “ available in the options of the “ IRF “ function, can be programmed to trip the output relays same as the other protection functions (OpIRF = TRIP), or to only operate the “ IRF “ signal led without tripping the output relays (OpIRF = NoTRIP).

### 2.2.4 – Selfdiagnostic

The N-DIN incorporates a sophisticated selfdiagnostic feature that continuously checks the following elements:

- A/D conversion
- Checksum of the settings stored into E<sup>2</sup>P.
- DSP general operation (Power, Routines, etc.)
- Lamp test (only on manual test).

Any time Power is switched on, a complete test is run; then, during normal operation, the test is run continuously and the checksum is done any time a parameter is stored into E<sup>2</sup>P.

If during the test any Relay Internal Failure (I.R.F) is detected:

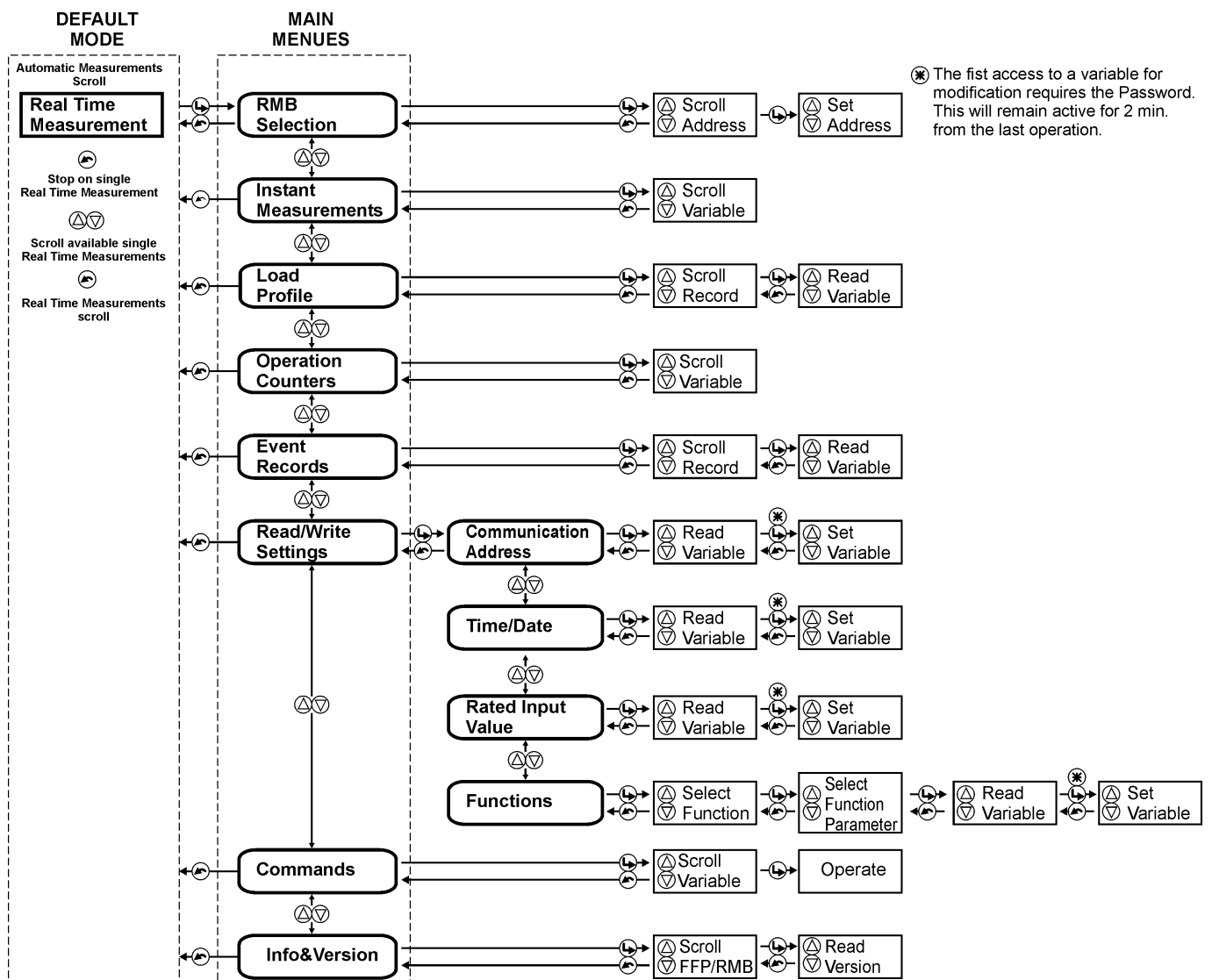
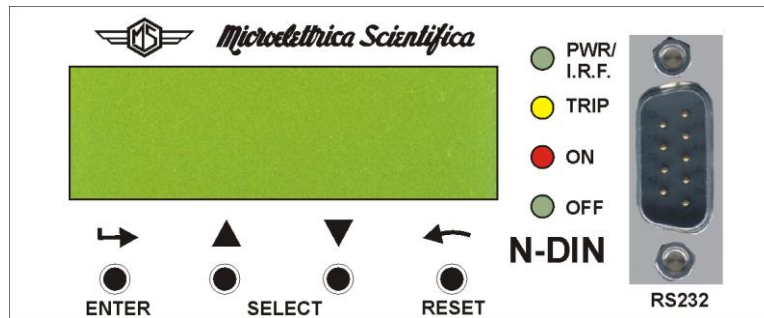
- If “ I.R.F. “ is programmed to “ Trip “ (see § 2.2.3.12) the output relays are operated same as on tripping of any protection function
- If “ I.R.F. “ is programmed “NO Trip”, operation is memorized in the “ Event Records “.

### 3. RELAY MANAGEMENT

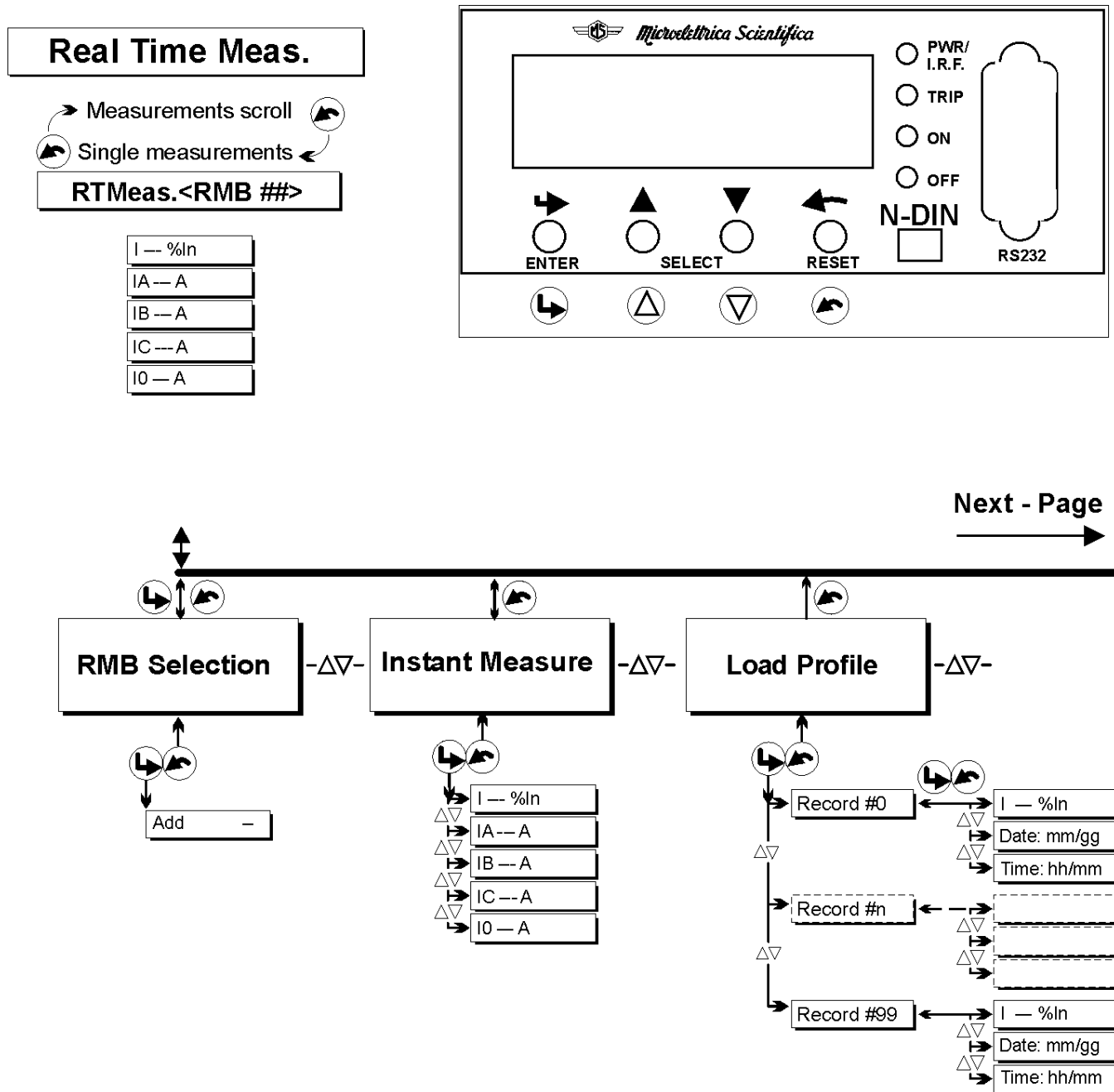
The relay can be totally managed either locally by the 4 key buttons and the LCD display or remotely either by a PC connected to the serial port on Front Face (RS232) and/or by the main serial communication bus RS485 connected to the RMB (see §8).

The 2 line x 16 characters LCD display shows the available information.

Key buttons operate according to the flow-chart herebelow.

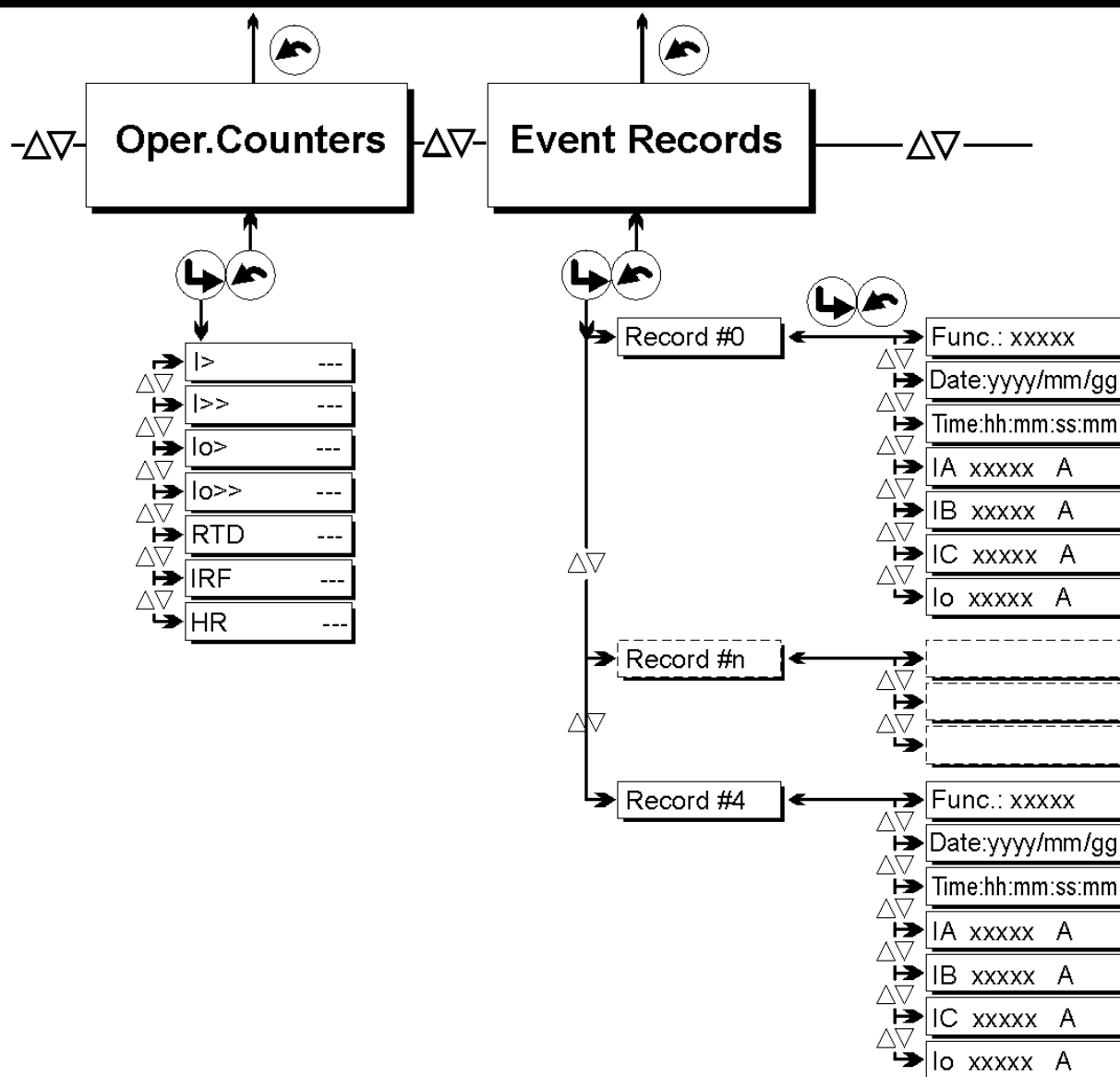


### 3.1 - Keyboard Operational Diagram



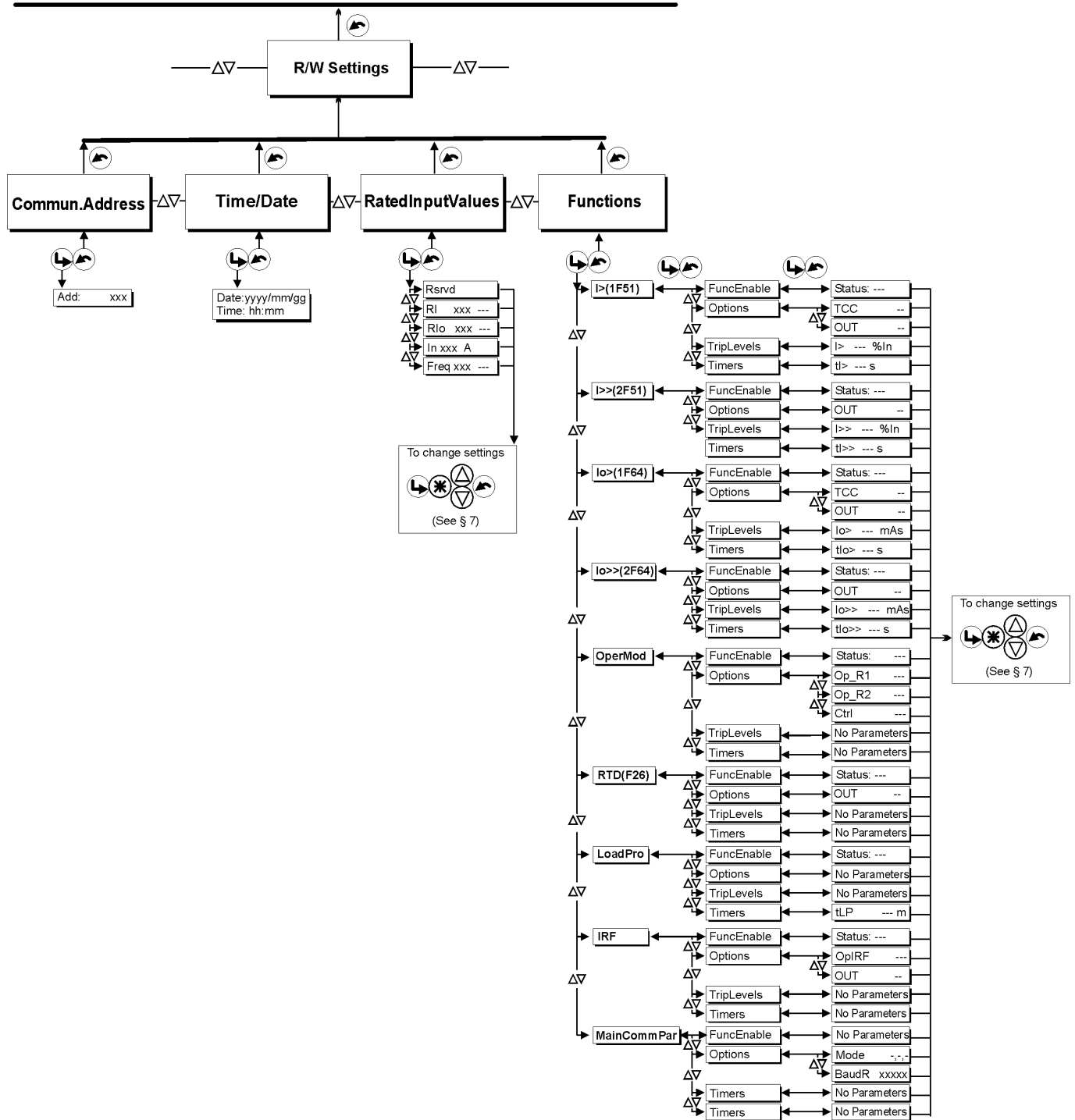
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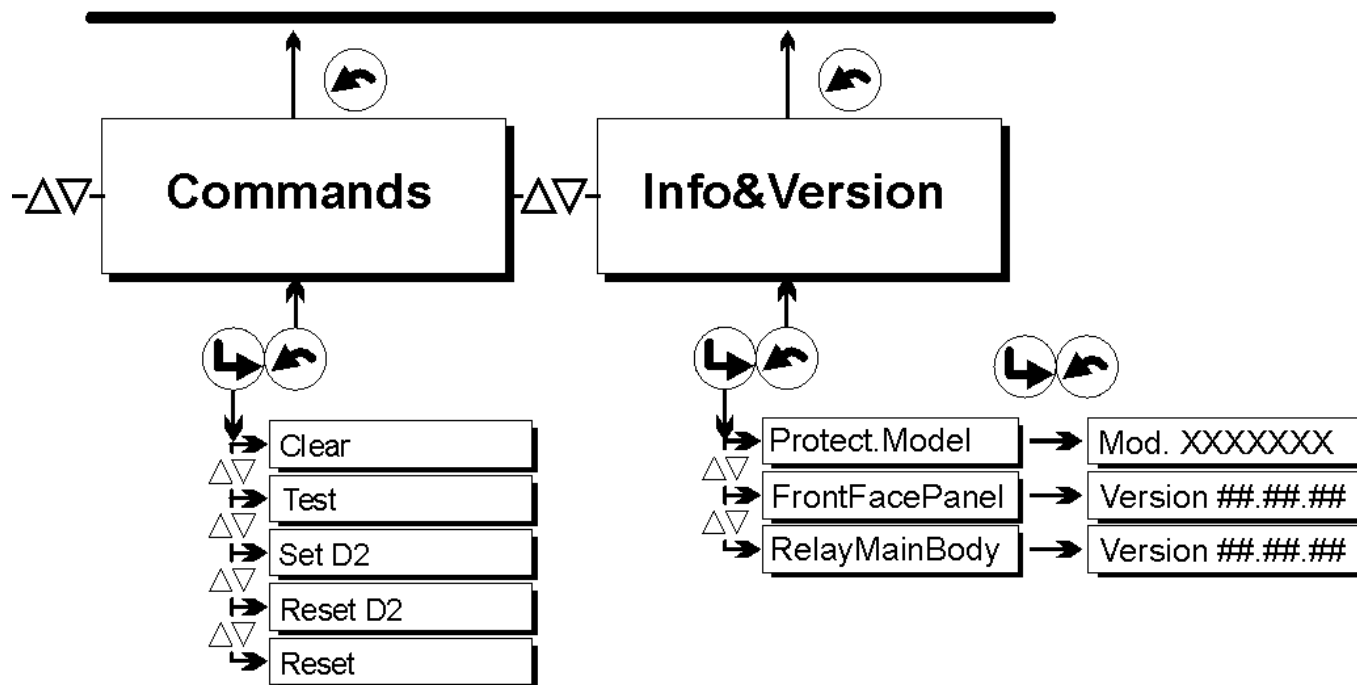


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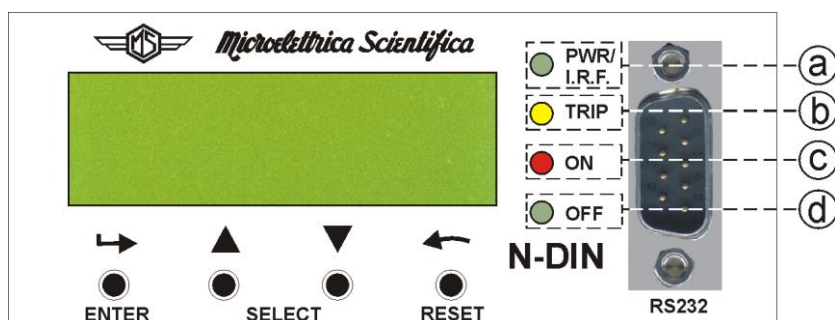
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## 4. SIGNALIZATIONS

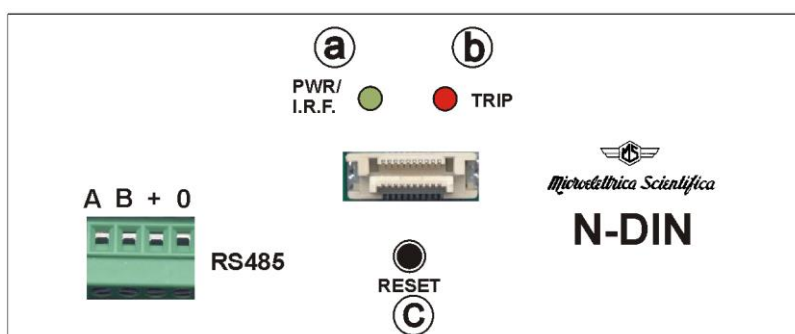
Four signal leds are available on the removable **Front Face Panel (FFP)**:



a)	Green LED	<b>PWR/ I.R.F.</b>	<input type="checkbox"/> Illuminated during normal operation when Power Supply is ON. <input type="checkbox"/> Flashing when a Relay Internal Fault is detected.
b)	Yellow LED	<b>TRIP</b>	<input type="checkbox"/> Flashing when a timed function has started to operate. <input type="checkbox"/> Illuminated when any function was tripped, reset takes places either by pressing the reset button and as soon as the C/B closed status is detected (Input current $\geq 5\%I_n$ ).
c)	Red LED	<b>ON</b>	<input type="checkbox"/> Illuminated when C/B close status is detected. (Input current exceeding $5\%I_n$ )
d)	Green LED	<b>OFF</b>	<input type="checkbox"/> Illuminated when C/B open status is detected. (Input current below $4\%I_n$ )

The reset button on FFP, resets the Output Relays and the Trip Signal Led after tripping.

Other two leds are provided on the **Relay Main Body (RMB)** visible when the front face is removed



a)	Green LED	<b>PWR/ I.R.F.</b>	<input type="checkbox"/> Illuminated during normal operation when Power Supply is ON. <input type="checkbox"/> Flashing when a Relay Internal Fault is detected.
b)	Red LED	<b>TRIP</b>	<input type="checkbox"/> Flashing when a timed function has started to operate. <input type="checkbox"/> Illuminated when any function was tripped until Reset button is pressed.
c)	Button	<b>RESET</b>	<input type="checkbox"/> To Reset after tripping the output relays and the trip signal led.

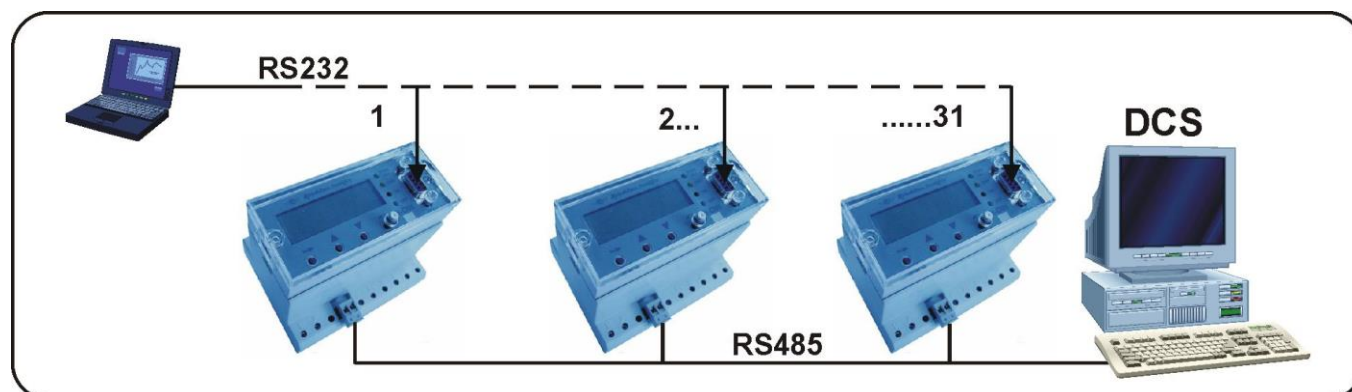
## 5. SYSTEM CONFIGURATION OPTIONS

The relay N-DIN is constituted of two independent parts (**RMB** and **FFP**) that can be either used as stand-alone device or combined in different ways.

The FFP can be directly plug-in and fixed by two screws on one RMB or it can be remotely connected to one or more (up to 31) RMB by the relevant terminals (see § 11).

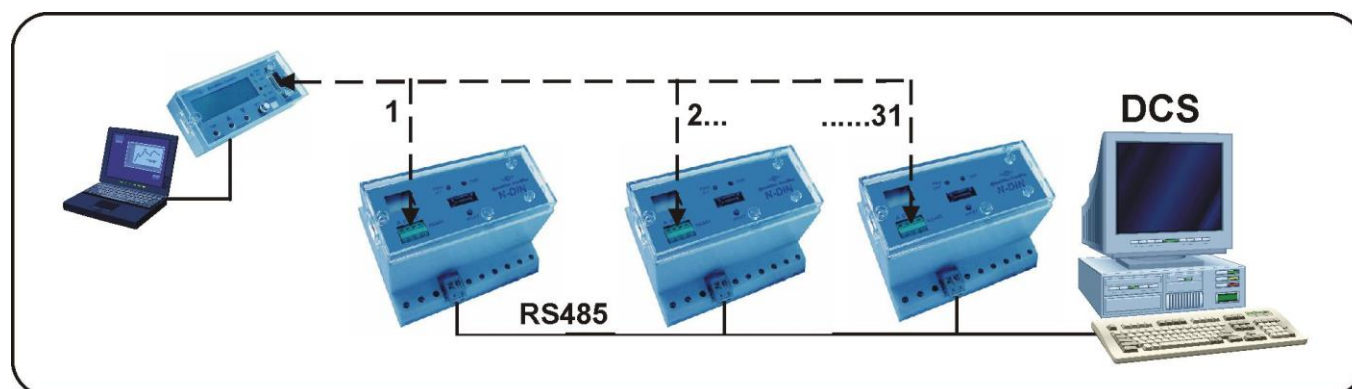
**It is recommended to power-off the RMB modules before plug-in/out or connecting the FFP.**

1) Use of one “ **RMB + FFP** ” assembly for each protection unit.

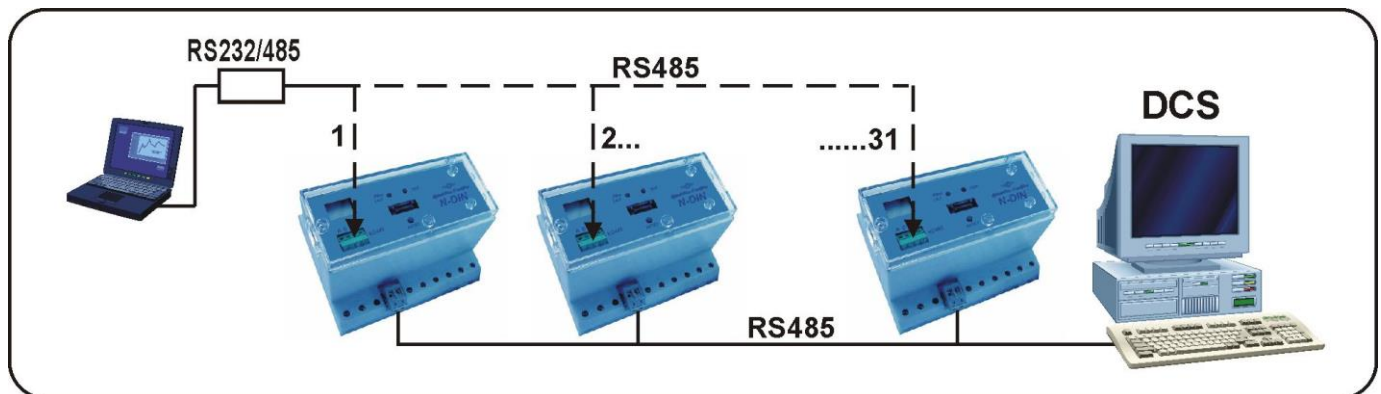


The **FFP** module can be mounted either directly on its **RMB** module or on the front panel of the board connected to the **RMB** by four wires (terminals A, B, +, 0, see §5.2).

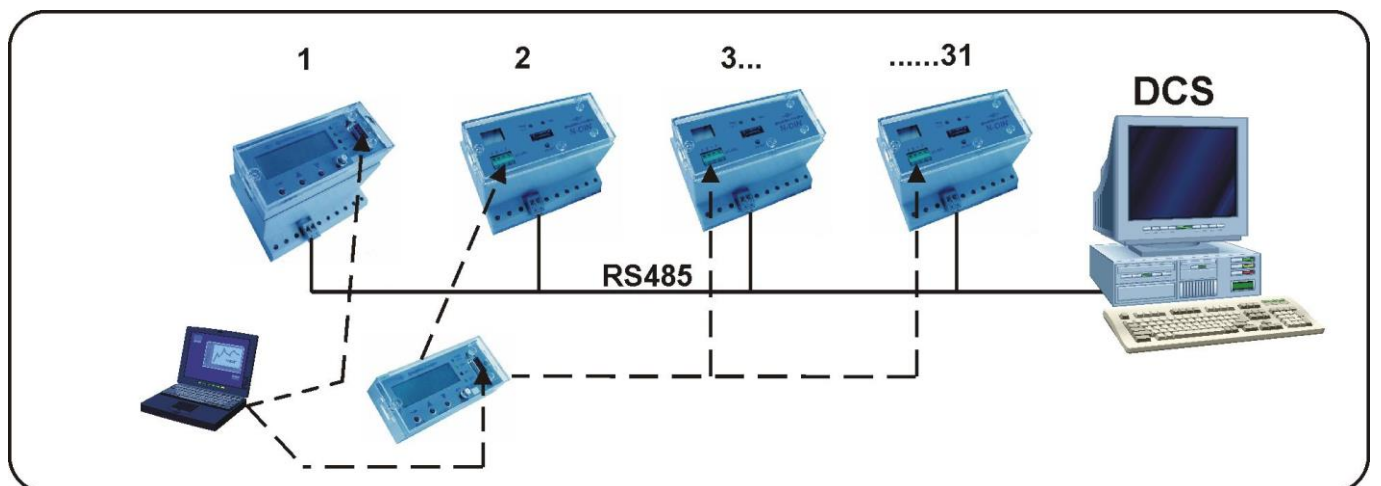
2) Use of up to 31 **RMB** modules managed by only one **FFP**.



3) Use of **RMB** modules only without **FFP**.



4) combination of configuration 1 – 2 – 3.



### 5.1 - Main communication serial port on the Relay Main Body

This port is accessible via the plug-in terminals “ 4 – 5 “ provided on the RMB.

It is used for connection to a serial bus interfacing up to 31 - N-DIN units with the Central Supervision System (SCADA, DCS, ecc).

The serial bus is a shielded pair of twisted cables connecting in parallel (Multi Drop) the different units (slaves) by the relevant terminals available on the “ **Relay Main Body** “.

The physical link is RS485 and the Communication Protocol is MODBUS/RTU:

The configuration is selectable (see § 6.7.4)

<input type="checkbox"/> Baud Rate	: 9600/19200 bps	9600/19200 bps	9600/19200 bps
<input type="checkbox"/> Start bit	: 1	1	1
<input type="checkbox"/> Data bit	: 8	8	8
<input type="checkbox"/> Parity	: None	Odd	Even
<input type="checkbox"/> Stop bit	: 1	1	1

**Note:** any change of this setting became valid at the next power on.

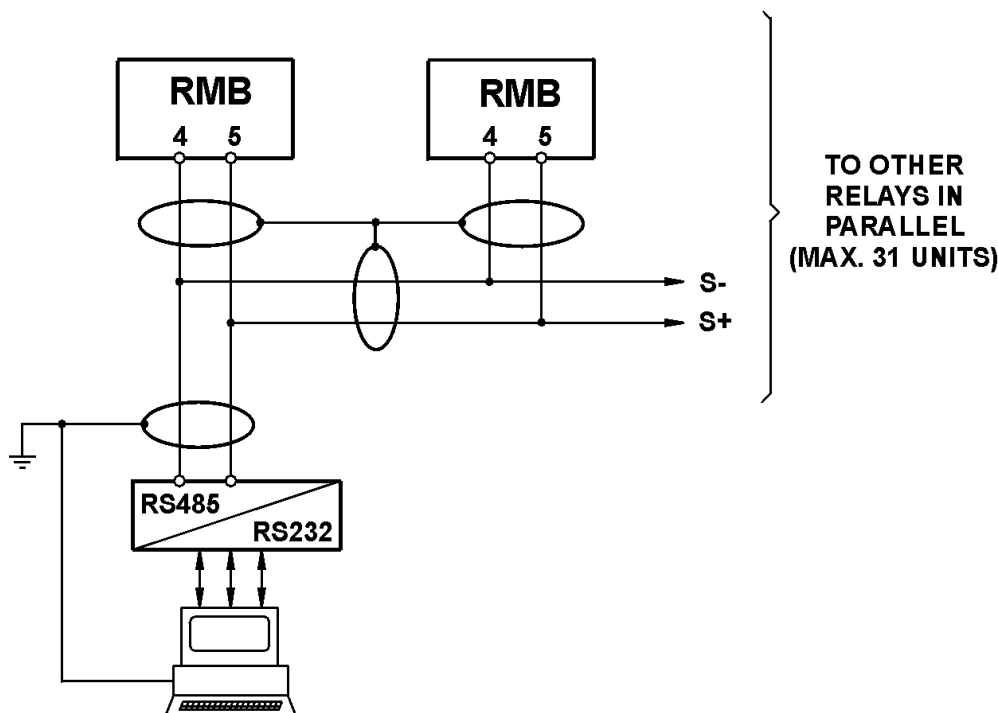
Each relay is identified by its programmable address code (NodeAd) and can be called from the P.C.

A dedicated communication software (MSCom) for windows 95/98/NT4 SP3 (or later) is available.

Please refer to the MSCom instruction manual for more information.

Maximum length of the serial bus can be up to 200m.

## CONNECTION TO RS485



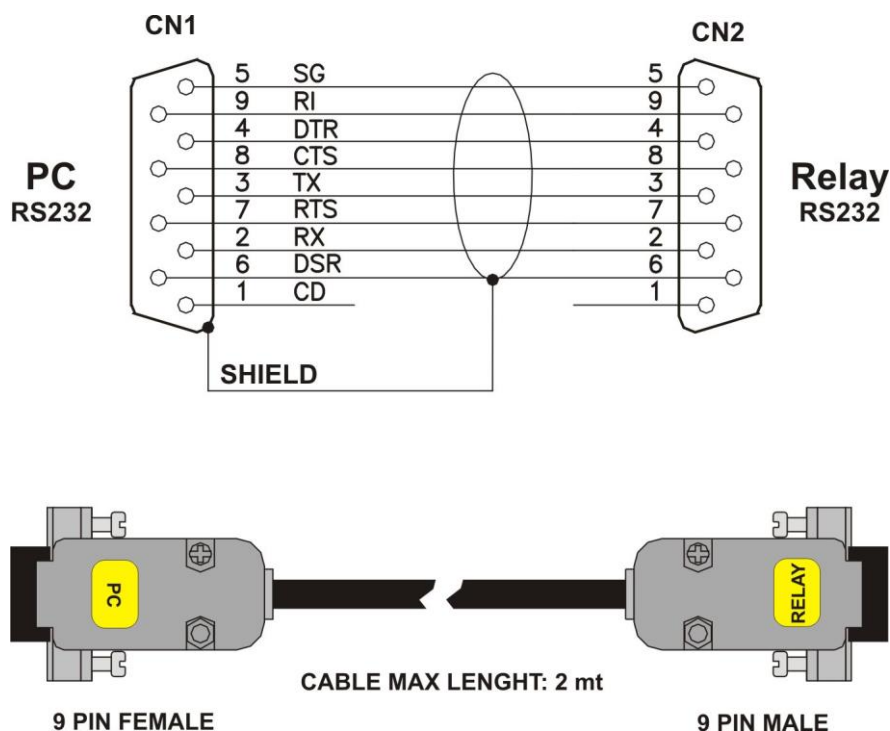
For longer distance and for connection of up to 250 Relays, optical interconnection is recommend.  
(please ask Microelettrica for accessories)

## 5.2 – Communication Port on Front Face Panel

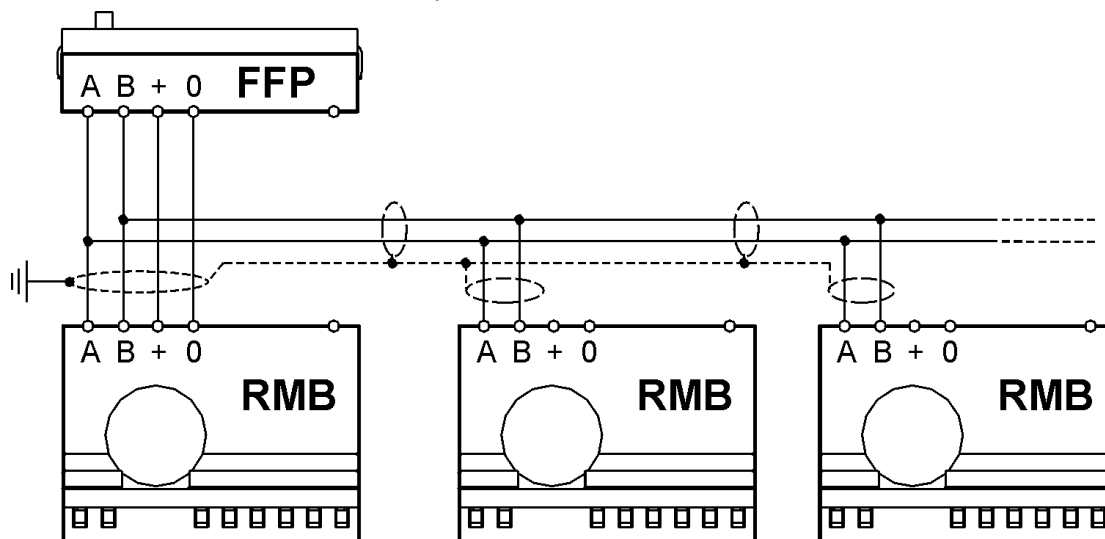
This port is used for communication through the Front Face Panel (FFP) between a local Lap-top PC and any of the RMB connected to the FFP.

The physical link is RS232 by the standard female 9-pin D-sub connector available on the Front Face Panel. Via this Port complete Relay management and data acquisition is possible.

When this serial Port is connected, the Front Face Panel is bypassed, but still in communication with the Relay Main Bodys connected..



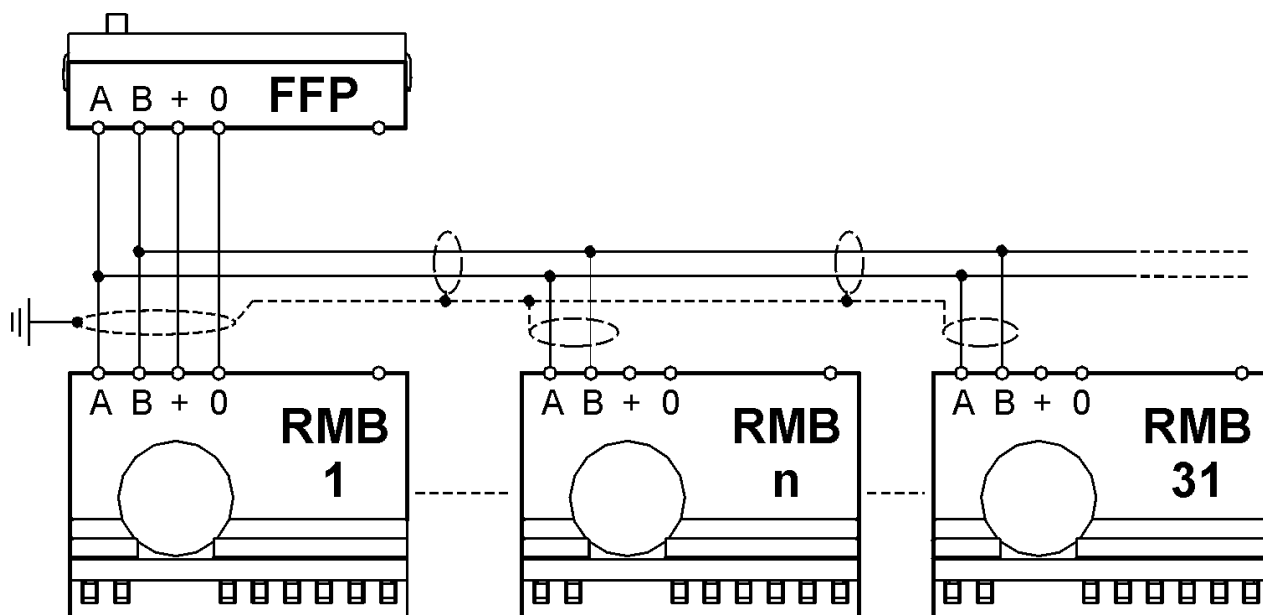
The connection between the “ FFP “ and the “ RMB ” (when FFP is removed) is made by four shielded twisted cables connected to the relevant terminals available on the back of the “ FFP “ and on the front of the “ RMB “. All additional RMBs only need a pair of shielded twisted cables.



The terminals on the “ RMB “front can also be used for direct connection to a local Lap-top PC through a RS485/232 converter without going through a FFP.

### 5.3 – Communication between FFP and RMB

As already said, one Front Face Panel can control only one RMB or up to 31 RMB in Multi-Drop connection.



The FFP is powered by one RMB.

Anytime power to “ RMB 1 “ is switched on, the FFP starts searching the RMBs connected (Scan Network) and, as soon as the first RMB (the one with the lowest address number from 1 to 250) is found the “ Scan Network “ stops and the RMB starts communicating with the FFP which displays the relevant Real Time Measurement:

```
- " RTMeas.<RMB ###> "
- |
- |
- |
```


If communication with another RMB among those connected is required, go to the “RMB Selection” menu and enter the required address N° (see § 3.1 and § 6.2).






## 6. MENU AND VARIABLES

### 6.1 – Real Time Measurements

Scrolling display of the Real Time Measurements is the Default operation.








Scrolling can be stopped at any of the measurements and restarted by pressing the Reset button .

When stopped on one variable,  appears aside the measurement and the different available measurements can be selected by the   buttons.

Display			Description
I	= 0 – 65535	%In	Largest of the 3 phase-currents (% of Full Load Current)
IA	= 0 – 65535	A	RMS value of Phase A current
IB	= 0 – 65535	A	RMS value of Phase B current
IC	= 0 – 65535	A	RMS value of Phase C current
Io	= 0.0 – 6553.5	A	RMS value of Zero Sequence Current (RMS Secondary Amps)

### 6.2 – RMB Selection


Selection of the Address Number of the RMB to call for communication and Supervision.

- “ Real Time Meas “ 
- “ RMB Selection “ 
- “ Add ### “ 
-   to input the Address from 1 to 250,
-  to validate,
-  to go back

Display		Description
Add	= 1 – 250	RMB address number for serial communication

### 6.3 – Instantaneous Measurements








Real time measurements can be frozen at any moment selecting the menu “ Instant Measure “:

- “ Real Time Meas “ 
- “ Instant Meas “ 
- “ 1<sup>st</sup> Measurement   other measurements
-  to go back to “ Real Time Meas “.

Display			Description
I	= 0 – 65535	%In	Largest of the 3 phase-currents (% of Full Load Current)
IA	= 0 – 65535	A	RMS value of Phase A current
IB	= 0 – 65535	A	RMS value of Phase B current
IC	= 0 – 65535	A	RMS value of Phase C current
Io	= 0.0 – 6553.5	A	RMS value of Zero Sequence Current (RMS Primary Amps)



## 6.4 – Load Profile

The relay can record the measurement of the feeder current “ I “ (largest of the 3 phase currents) at programmable time intervals “ tLP “.

- “ Real Time Meas “ 
-  “ Load Profile “ 
-  1<sup>st</sup> record,
-  to scroll available records,
-  to “ Record # “ selected,
-  to select the different fields;

The circular memory (FIFO) can store up to 100 records, each including:





Display			Description
<b>I</b>	=	0 – 65535 %In	Largest of the 3 phase-currents (% of Full Load Current)
<b>Date:</b>	=	MM/GG	Record Date
<b>Time:</b>	=	hh/mm	Record Time

-  to go back to “ Record # “,
-  to go back to “ Real Time Meas “.

Once the Load Profile function is programmed ( Enable/Disabled and “ tLP “ set) the recording automatically starts and stops any time the current starts or stop to flow.  
Display of records is available in the menu “ Load Profile”.

## 6.5 – Operation Counters

The operation of any of the function herebelow reported, is counted and recorded in the menu “ Operation Counters “.







- “ Real Time Meas “ 
- “ Oper.Counters “ 
- “ 1<sup>st</sup> counters  other counters
-  to go back to “ Real Time Meas “.

Display			Description
<b>I&gt;</b>	=	0 – 65535	Number of 1 <sup>st</sup> Overcurrent (Short Circuit) trip
<b>I&gt;&gt;</b>	=	0 – 65535	Number of 2 <sup>nd</sup> Overcurrent (Short Circuit) trip
<b>Io&gt;</b>	=	0 – 65535	Number of 1 <sup>st</sup> Earth Fault trip
<b>Io&gt;&gt;</b>	=	0 – 65535	Number of 2 <sup>nd</sup> Earth Fault trip
<b>RTD</b>	=	0 – 65535	Number of External Termistor trip
<b>I.R.F.</b>	=	0 – 65535	Number of Internal Relay Faults
<b>HR</b>	=	0 – 65535	Number of Hardware Recovery





## 6.6 – Event Recording





The N-DIN records any tripping and stores the information relevant to the last five events (FIFO). Each event recording includes the following information.

- “ Real Time Meas “ 
- “ Event Records “ 
-  1<sup>st</sup> event,
-  to scroll available events,
-  to “ Record # “ selected,
-  to select the different fields;






Display	Description
<b>Func</b> <b>xxxxx</b>	Indication of the protection function which caused the relay tripping. For indication of the TRIP Cause the following acronyms are used:
	<ul style="list-style-type: none"> <li>- <b>I&gt;</b>                    = 1<sup>st</sup> Overcurrent (Short Circuit)</li> <li>- <b>I&gt;&gt;</b>                  = 2<sup>nd</sup> Overcurrent (Short Circuit)</li> <li>- <b>Io&gt;</b>                   = 1<sup>st</sup> Earth Fault</li> <li>- <b>Io&gt;&gt;</b>                 = 2<sup>nd</sup> Earth Fault</li> <li>- <b>RTD</b>                = External Termistor</li> <li>- <b>IRF</b>                 = Internal Relay Fault</li> </ul>
<b>Date</b> :    YYYY/MM/GG	Date: Year/Month/Day
<b>Time</b> :    hh:mm:ss:cc	Time: hours/minutes/second/hundredths of seconds
<b>IA</b> = 0 – 65535 <b>A</b>	RMS value of phase A current (Primary Amps)
<b>IB</b> = 0 – 65535 <b>A</b>	RMS value of phase B current (Primary Amps)
<b>IC</b> = 0 – 65535 <b>A</b>	RMS value of phase C current (Primary Amps)
<b>Io</b> = 0.0 – 6553.5 <b>mA</b>	RMS value of Zero Sequence Current

-  to go back to “ Record # “ ,
-  to go back to “ Real Time Meas “.

## 6.7 – Programming / Reading the Relay Settings (R/W Setting)

-  “ Main Menu “
-  select “ R/W Setting “ 
-  select among following sub menus:
















### 6.7.1 – Communication Address

-  “ Communication Address “ 
- “ Add: # “ 
- “ Password ???? “ (if not yet entered; see § 7)
-  to select the Address (1-250)
-  to validate.







The default address is 1.

Display	Description	Setting Range	Step	Unit
<b>Add:</b> 1	Identification number for connection on serial communication bus	1 - 250	1	-

### 6.7.2 – Time/Date









-  “ Time/Date “  Date: Current Date, Time: Current time
-  “ 20YY/..... “  to set year,
-  “ 20XX/MM “  to set month,
-  “ 20XX/XX/DD “  to set day,
-  “ 20XX/XX/XX “
-  “ hh/mm “  to set hour,
-  “ XX/mm “  to set minutes,
-  To validate
-  Exit

### 6.7.3 – Rated Input Values

-  “ Rated Input Value “
-  1<sup>st</sup> Variable
-  to scroll variables
-  to modify selected variable
- “ Password “ (if not yet entered) or #??? (if not yet entered; see § 10)
-  to set variable value,
-  to validate.

Display			Description	Setting Range	Step	Unit
Rsrvd			Reserved			
RI	100	-	Ratio of the phase C.Ts. (Ip/Is)	1 - 6500	1	-
Rlo	100	-	Ratio of the C.Ts. or of the tore C.T. detecting earth fault current.	1 - 6500	1	-
In	100	A	Full Load current of the feeder	1 - 6500	1	A
Freq	50	Hz	System rated frequency	50 - 60	10	Hz

### 6.7.4 – Functions





-  “ Functions “,
-  1<sup>st</sup> function,
-  to scroll available Functions,
-  to Read/Write setting of the selected function,
-  to select the different definable fields;
  - Function Enable
  - Options
  - Trip Levels
  - Timers
-  to access the selected field and read the actual setting of the relevant variable
-  to modify the actual setting;
-  to set the new value.

Display						Description	Setting Range	Step
Function	Type		Variable	Default Value	Unit			
Password = 0000-9999 1111 -						Password for programming enable (see §7)		
I>(1F51)	FuncEnable	→	Status:	Enable		Enable of the protection function	Enable/Disable	-
	Options	→	TCC	D		Time Current Curves	D,A,B,C	-
			OUT	R1		Selection of the output relay operated at the end of trip time delay	R1, R2, R1 + R2, None	-
	TripLevels	→	I>	120	%In	Trip level of overcurrent protection	20 – 400	1
	Timers	→	tl>	10	s	Trip time delay	0.05 – 60.00	0.01
I>>(2F51)	FuncEnable	→	Status:	Enable		Enable of the protection function	Enable/Disable	-
	Options	→	OUT	R1		Selection of the output relay operated at the end of trip time delay	R1, R2, R1 + R2, None	-
	TripLevels	→	I>>	200	%In	Trip level of overcurrent protection	20 – 999	1
	Timers	→	tl>>	0.5	s	Trip time delay *	0.05 – 60.00	0.01
Io>(1F64)	FuncEnable	→	Status:	Enable		Enable of the protection function	Enable/Disable	-
	Options	→	TCC	D		Time Current Curves	D,A,B,C	-
			OUT	R1		Selection of the output relay operated at the end of trip time delay	R1, R2, R1 + R2, None	-
	TripLevels	→	Io>	100	mAs	Trip level of Earth Fault protection	20-9999	1
	Timers	→	tIo>	10	s	Trip time delay	0.05 – 60.00	0.01
Io>>(2F64)	FuncEnable	→	Status:	Enable		Enable of the protection function	Enable/Disable	-
	Options	→	OUT	R1		Selection of the output relay operated at the end of trip time delay	R1, R2, R1 + R2, None	-
	TripLevels	→	Io>>	500	mAs	Trip level of Earth Fault protection	20-9999	1
	Timers	→	tIo>>	0.5	s	Trip time delay *	0.00 – 60.00	0.01
OperMod	FuncEnable	→	No Parameters					
	Options	→	Op_R1	N.D.		For selection of different operation	N.E./N.D.	-
			Op_R2	N.D.		For selection of different operation	N.E./N.D.	-
			Ctrl	Local		Control mode Local / Remote (via serial)	Local – Remote	-
	TripLevels	→	No Parameters					
Timers	→	No Parameters						
RTD(F26)	FuncEnable	→	Status:	Disable		Enable of the protection function	Enable/Disable	-
	Options	→	OUT	R1		Selection of the output relay operated at the end of trip time delay	R1, R2, R1 + R2, None	-
	TripLevels	→	No Parameters					
	Timers	→	No Parameters					
LoadPro	FuncEnable	→	Status:	Enable		Enable of the Load Profile function	Enable/Disable	-
	Options	→	No Parameters					
	TripLevels	→	No Parameters					
	Timers	→	tLP	30	m	Interval time	1-650	1
IRF	FuncEnable	→	No Parameters					
	Options	→	OpIRF	NoTrip		Motor stop on detection of relay internal fault	NoTrip – Trip	-
			OUT	R1		Selection of the output relay operated at the end of trip time delay	R1, R2, R1 + R2, None	-
	TripLevels	→	No Parameters					
Timers	→	No Parameters						
Main Comm Par	FuncEnable	→	No Parameters					
	Options	→	Mode	8,N,1		RMB main RS485 port configuration (see §5.1) <i>Note: any change of this setting became valid at the next power on</i>	8,N,1 8,O,1 8,E,1	-
			BaudR	9600		Communication speed	9600 - 19200	-
	TripLevels	→	No Parameters					
	Timers	→	No Parameters					

Settings can also be programmed via the serial communication ports.

\* No intentional delay (minimum trip time ≈30ms)














## 6.8 – Commands

-  “ Commands “
-  1<sup>st</sup> Control,
-  to select other available control,
-  to operate selected control.

Display	Description
<b>Clear</b>	: Erase memory of Trip Counters, Event Records, Load Profile
<b>Test</b>	: Starts a relay diagnostic test
<b>Set D2</b>	: Operate output relay R2
<b>Reset D2</b>	: Reset output relay R2
<b>Reset</b>	: Reset after trip of R1&R2

## 6.9 – Firmware – Info&Version

The menu displays the Model Relay and the Firmware Version of the FFP and of the RMB actually in communication.

-  “ Real Time Meas “
-  “ Info&Version “,
-  “ Proctect. Model ”,
-  “ Mod. XXXXXX ”,
-  to go back to “ Proctect. Model ”,
-  to “ FrontFacePanel “,
-  “ Version ##.##.## “,
-  to go back to “FrontFacePanel “,
-  to “ RelayMainBody “,
-  “ Version ##.##.## “,
-  to go back to “RelayMainBody “,
-  to go back to “ Info&Version “.
-  to go back to “ Real Time Meas “.

## 7. PASSWORD

In the system RMB + FFP + MS-Com there are three different passwords:













### 7.1 - FFP Password

This password is requested anytime the user wants to write in the “R/W Settings” menu of the FFP and/or to issue from the FFP a command of the “Commands” menu.


The default password is “ 1111 “

When password is required, proceed as follows

The Display shows the message “ Password ???? “

-   to select 1<sup>st</sup> digit (1-9)       to validate
-   to select 2<sup>nd</sup> digit (1-9)       to validate
-   to select 3<sup>rd</sup> digit (1-9)       to validate
-   to select 4<sup>th</sup> digit (1-9)       to complete procedure.

The “ password “ is required any time you attempt to modify one of the programmable variables at the first entrance in the “R/W Settings” and/or “Commands” menus.

The “ password “remains valid for 2 minutes from the last operation of the programming buttons or until the  button is pressed to return to the default display (RT Meas).

Once the FFP Password has been entered, a “ # “ appears before the variable that can be modified.

### CHANGE PASSWORD

Fig.1

In order to CHANGE the FFP Password:


- ❑ Open the MS-Com software and connect the relay,
- ❑ Open the “Settings” window,
- ❑ Digit the new password (different from the default one – Example: 1234) in the “FFP Password” area (see fig. 1).  
Note: Any time the software MSCom is opened, the FFP Password (see §7.3) is not visualized (see fig. 2) and cannot be modified until the MSCom Password is not entered by clicking the button .
- ❑ Click on the “Send” button to confirm the modification to the relay.



Fig.2



### 7.2 - Modbus Password

This Password is requested to a Supervision Sistem any time the automation is programmed to modified whichever relay parameter and/or to issue commands through the relay itself.

**DEFAULT STATUS (DISABLED):**      Password = 2295      at      Address 8001

When set to the value 2295, the password is DISABLED and a DCS or whichever Supervision System can be programmed to both change the relay parameters and to issue commands through the relay itself without writing any password.

### ENABLED/DISABLED PASSWORD:

In order to ENABLE the Modbus Password the Supervision System must write the desired password (different from the default one) at the Address 8001.

In order to DISABLE the Modbus Password the Supervision System must write once the DEFAULT Password (2295) at the Adress 8001.

---

**7.3 - MS-Com Password**

---

This password is requested anytime the user wants to send to the relay a setting parameters modification or to issue a command through the relay itself using the managing software MSCom. The user can decide whether inserting his own password (see MS-Com Operational Manual) or keeping the password disabled just clicking on the OK button when the password is requested.

---

**8. MAINTENANCE**

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No maintenance is required. In case of malfunctioning please contact Microelettrica Scientifica Service or the local Authorised Dealer mentioning the relay's Serial No reported in the label on relays enclosure.

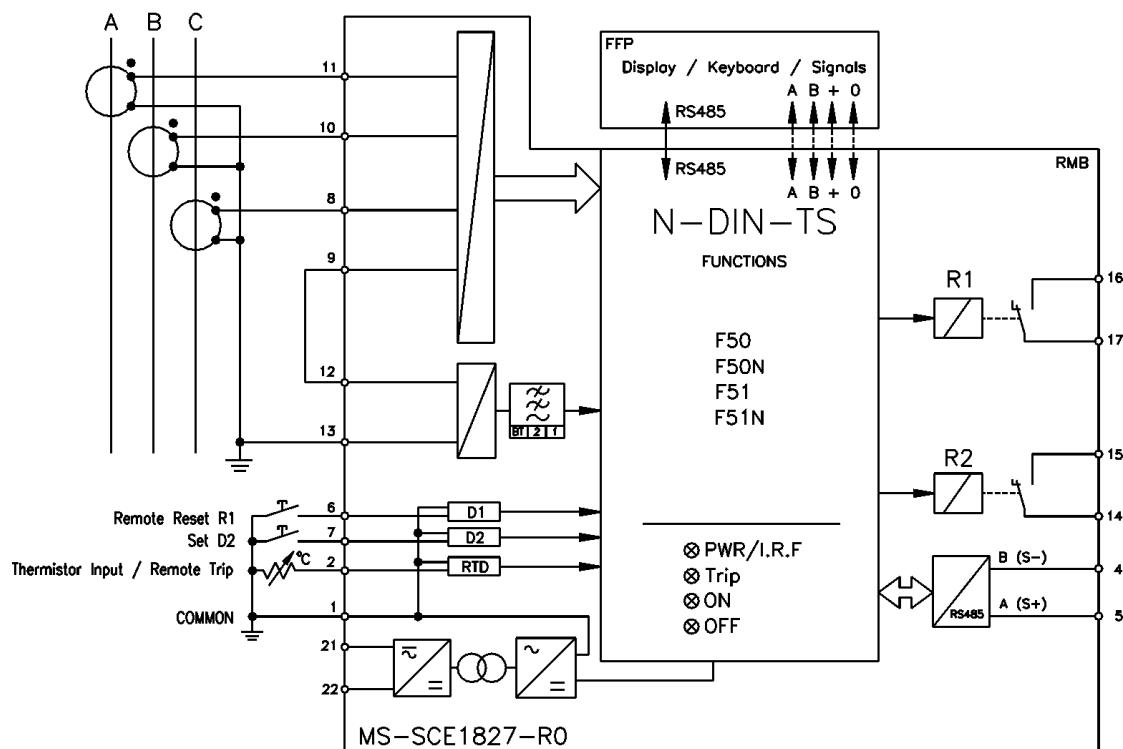
---

**9. POWER FREQUENCY INSULATION TEST**

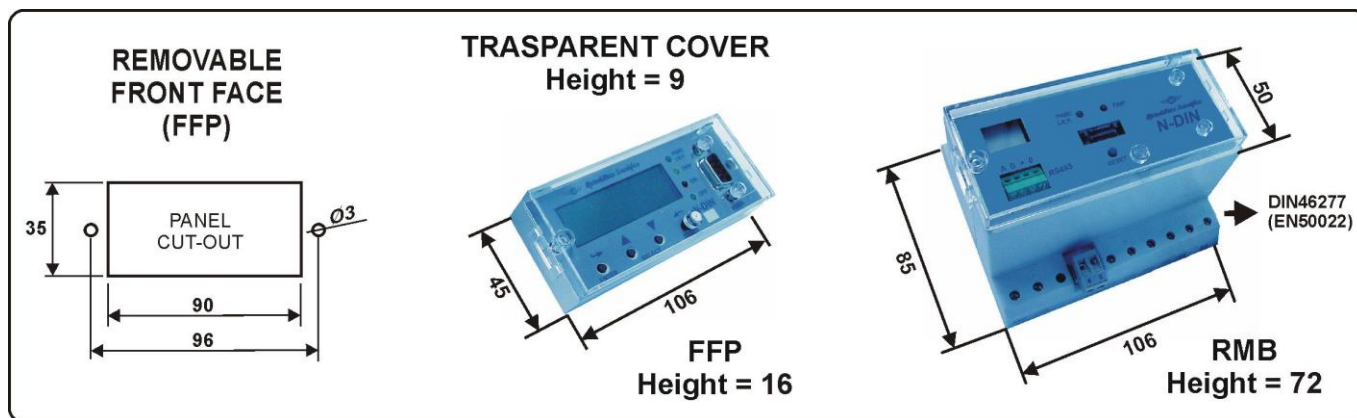
---

Every relay individually undergoes a factory insulation test according to IEC255-5 standard at 2 kV, 50 Hz 1min. Insulation test should not be repeated as it unusefully stresses the dielectrics. When doing the insulation test, the terminals relevant to serial output, digital inputs and RTD input must always be short circuited to ground. When relays are mounted in switchboards or relay boards that have to undergo the insulation tests, the relay should be isolated. This is extremely important as discharges eventually taking place in other parts or components of the board can severely damage the relays or cause damages, not immediately evident to the electronic components.

## 10. CONNECTION DIAGRAM



## 11. OVERALL DIMENSIONS



1) To mount FFP on RMB plug-in the connector and tighten the two screws.

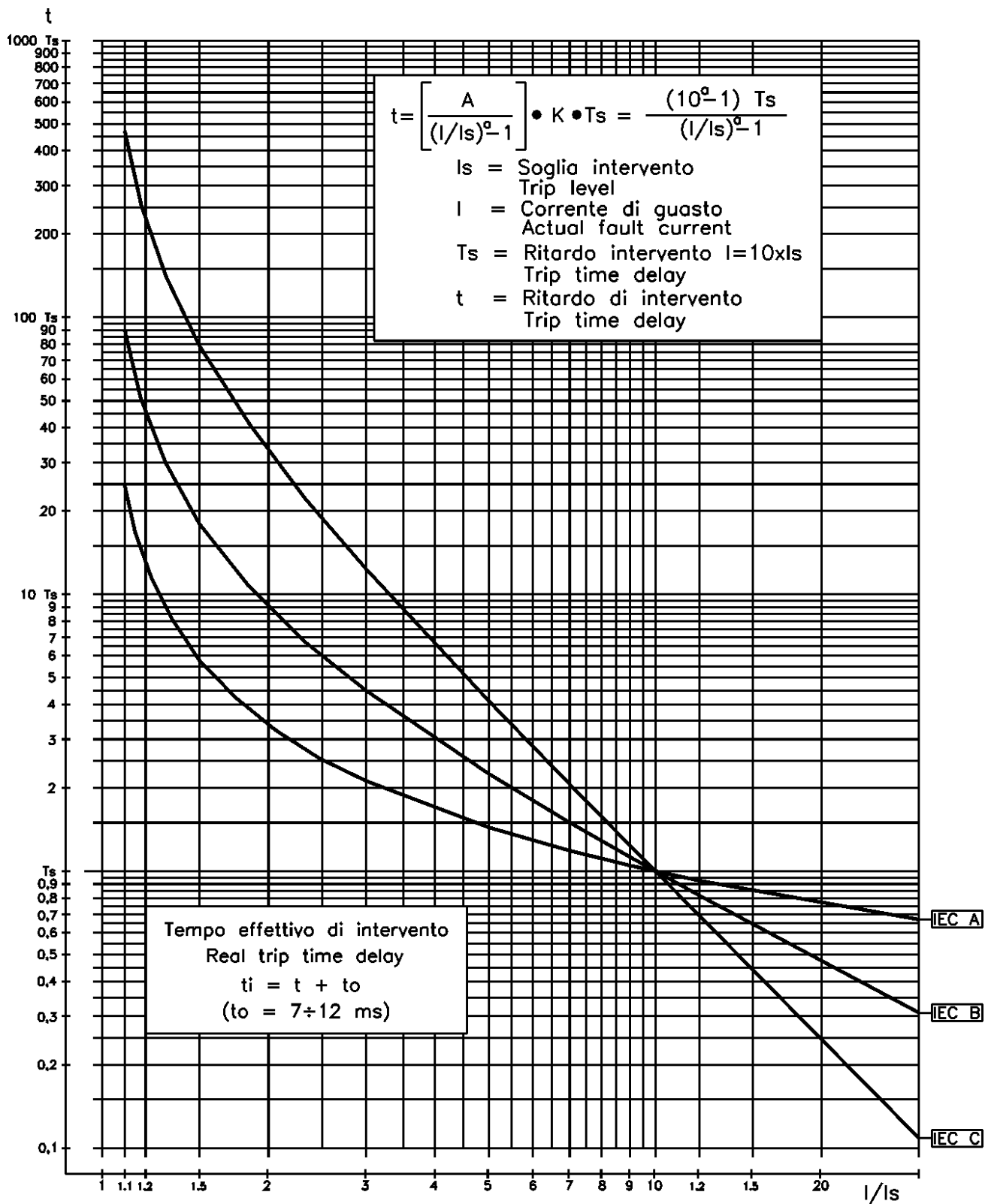
2) To remove FFP from RMB loosen the two screws and pull-out.

**Note:** Before plugging in removing the FFP, the Auxiliary Power Supply must be switched OFF

### N.B.

A sealable transparent cover is also available for protection of the controls on the removable Front Panel. – To remove the cover slightly pull the side fastening clips.

## 12. TIME CURRENT CURVES IEC (TU0446 Rev.0)



Curve Type	A	K	a
IEC A	0.14	0.336632	0.02
IEC B	13.5	0.666667	1
IEC C	80	1.2375	2



**13. ELECTRICAL CHARACTERISTICS****APPROVAL: CE****REFERENCE STANDARDS IEC 60255 - EN50263 - CE Directive - EN/IEC61000 - IEEE C37**

<input type="checkbox"/> Dielectric test voltage	IEC 60255-5	2kV, 50/60Hz, 1 min.
<input type="checkbox"/> Impulse test voltage	IEC 60255-5	5kV (c.m.), 2kV (d.m.) – 1,2/50µs
<input type="checkbox"/> Insulation resistance	> 100MΩ	

**Environmental Std. Ref. (IEC 68-2-1 - 68-2-2 - 68-2-33)**

<input type="checkbox"/> Operation ambient temperature	-10°C / +55°C
<input type="checkbox"/> Storage temperature	-25°C / +70°C
<input type="checkbox"/> Humidity	IEC68-2-3 RH 93% Without Condensing AT 40°C

**CE EMC Compatibility (EN50081-2 - EN50082-2 - EN50263)**

<input type="checkbox"/> Electromagnetic emission	EN55022	industrial environment	
<input type="checkbox"/> Radiated electromagnetic field immunity test	IEC61000-4-3	level 3	80-1000MHz 10V/m
	ENV50204		900MHz/200Hz 10V/m
<input type="checkbox"/> Conducted disturbances immunity test	IEC61000-4-6	level 3	0.15-80MHz 10V
<input type="checkbox"/> Electrostatic discharge test	IEC61000-4-2	level 4	6kV contact / 8kV air
<input type="checkbox"/> Power frequency magnetic test	IEC61000-4-8		1000A/m 50/60Hz
<input type="checkbox"/> Pulse magnetic field	IEC61000-4-9		1000A/m, 8/20µs
<input type="checkbox"/> Damped oscillatory magnetic field	IEC61000-4-10		100A/m, 0.1-1MHz
<input type="checkbox"/> Electrical fast transient/burst	IEC61000-4-4	level 3	2kV, 5kHz
<input type="checkbox"/> HF disturbance test with damped oscillatory wave (1MHz burst test)	IEC60255-22-1	class 3	400pps, 2,5kV (m.c.), 1kV (d.m.)
<input type="checkbox"/> Oscillatory waves (Ring waves)	IEC61000-4-12	level 4	4kV(c.m.), 2kV(d.m.)
<input type="checkbox"/> Surge immunity test	IEC61000-4-5	level 4	2kV(c.m.), 1kV(d.m.)
<input type="checkbox"/> Voltage interruptions	IEC60255-4-11		50ms
<input type="checkbox"/> Resistance to vibration and shocks	IEC60255-21-1 - IEC60255-21-2 10-500Hz 1g		

**ELECTRIC RATED VALUE**

<input type="checkbox"/> Accuracy at reference value of influencing factors	2% In for measure 0,2% On 2% +/- 20ms for times
<input type="checkbox"/> Rated Current	In = 5A - On = 5A
<input type="checkbox"/> Current overload	200 A for 1 sec; 10A continuous
<input type="checkbox"/> Burden on current inputs	Phase : 0.05VA at In = 5A Neutral : 0.07VA at On = 5A
<input type="checkbox"/> Average power supply consumption	≤ 7 VA
<input type="checkbox"/> Output relays	rating 6 A; Vn = 250 V A.C. resistive switching = 1500VA (400V max) make = 30 A (peak) 0,5 sec. break = 0.2 A, 110 Vcc, L/R = 40 ms (100.000 op.)

**COMMUNICATION PARAMETER**

<input type="checkbox"/> RMB	RS485 – 9600/19200 bps – 8,N,1 - 8,E,1 - 8,O,1 – Modbus RTU
<input type="checkbox"/> FFP	RS232 – 9600bps – 8,N,1 – Modbus RTU

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*The performances and the characteristics reported in this manual are not binding and can modified at any moment without notice*