MICROPROCESSOR
FEEDER MANAGER RELAY

TYPE

N-DIN-F

(Version N-DIN-Fp – 19)

OPERATION MANUAL

CE

INDEX

1. GENERAL UTILIZATION AND COMMISSIONING DIRECTIONS

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

1.1 - Storage and Transportation

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

1.2 - Installation

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

1.3 - Electrical Connection

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.

1.4 - Measuring Inputs and Power Supply

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

1.5 - Outputs Loading

must be compatible with their declared performance.

1.6 - Protection Earthing

When earthing is required, carefully check its efficiency.

1.7 - Setting and Calibration

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.

1.8 - Safety Protection

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

1.9 - Handling

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; dismounting the cards without proper cautions expose them to the risk of damage and voids any guarantee and relieves the Manufacture of any liability.

1.10 - Maintenance

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.

1.11 - Fault Detection and Repair

Internal calibrations and components should not be alterated 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.

2. GENERAL CHARACTERISTICS

N-DIN is a very versatile and complete Feeder Manager Relay with overcurrent end 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.

- Input currents are supplied to 3 current transformers: - two measuring phase current (the third current is computed as vector summation of the two others) - one measuring the earth fault zero-sequence current.

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, self-powered digital inputs (D1, D2, RTD) are provided.
  The digital inputs D1 and D2 are activated when their input terminals (6-8, 6-9) are shorted by a cold contact ($R \leq 3k\Omega$); The input RTD is activated when the resistance connected across its terminals exceeds 2900Ω or is below 30Ω.
  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.

2.1 - Power Supply

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

Two options are available:

a) - 24V(-20%) / 80V(+15%) a.c.
24V(-20%) / 90V(+20%) d.c.

b) - 80V(-20%) / 230V(+15%) a.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
RI	100	-	Ratio of the phase C.Ts. (Ip/Is)	1	-	6500	1	-
RIo	100	-	Ratio of the C.Ts. or of the tore C.T. detecting earth fault current.	1	-	6500	1	-
In	100	**A**	Reference primary current of the relay	1	-	6500	1	A
TW	15	**m**	Warming-up time constant for Thermal Image	1	-	60	1	m
Ib	105	**%In**	Maximum admissible continuous overload for Thermal Image	100	-	130	1	%In
Freq	50	**Hz**	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 $RI = \frac{In \quad primary}{In \quad secondary}$ of the phase C.Ts
(In case of direct connection, without C.Ts. RI=1).
Only phase A and C currents are measured, whereas the current of the phase B is computed as vector summation of the currents of the other two phases.
The algorithm is based on the following considerations coming from well-known vector relations among the three-phase currents and the zero sequence current.

- In any circumstance – currents balanced or not, sinusoidal or not – it is always true that:

$$(1) \quad \overline{I_A} + \overline{I_B} + \overline{I_C} + \overline{I_0} = 0$$

- When no Earth Fault exists ($I_0 = 0$)

$$(2) \quad \overline{I_A} + \overline{I_B} + \overline{I_C} = 0 \quad \Rightarrow \quad \overline{I_B} = \left(\overline{I_A} + \overline{I_C}\right)$$

The earth fault protection element is independently supplied by the residual current coming either from the residual connection of the 3 system C.Ts. or from the core balance C.T.

If any Earth Fault is experienced ($I_0 \neq 0$) the Earth Fault Protection Element trips independently from the phase current measuring elements.

If no Earth Fault is present ($I_0 = 0$), the equation (2) is valid, no matter if currents are balanced or not, sinusoidal or not.

The third phase current is calculated, in real time, as vector summation of the other two-phase currents

Similarly, the Positive Sequence Current Component " $\mathbf{I_1}$ " and the Negative Sequence Component " $\mathbf{I_2}$ **"**, with no Earth Fault, are computed according to the normal equations of the System Symmetrical Components, using two currents only:

$$\begin{cases} \overline{I_A} = \overline{I_1} + \overline{I_2} \\ \overline{I_C} = \alpha \overline{I_1} + \alpha^2 \overline{I_2} \end{cases} \Rightarrow \begin{cases} \overline{I_C} - \alpha\, \overline{I_A} = I_2\left(\alpha^2 - \alpha\right) \\ \overline{I_C} - \alpha^2\, \overline{I_A} = \overline{I_1}\left(\alpha - \alpha^2\right) \end{cases} \Rightarrow \begin{cases} \overline{I_2}\sqrt{3} = \left|\overline{I_C} - \overline{I_A} e^{j120}\right| \\ \overline{I_1}\sqrt{3} = \left|\overline{I_C} - \overline{I_A} e^{j120}\right| \end{cases}$$

In case of Earth Fault the Earth Fault Element trips before tripping of the unbalance element.

- During Faults

A) Single phase to earth Fault

Trip of the earth fault element directly measuring the Residual Current.

B) Two Phase Fault

In any case one of the currents directly measured is involved, so the relay trips correctly.

C) Two Phase to Earth Fault

Same as A + B

D) Three Phase Fault

All the three currents are correctly measured (in any case two directly).

2.2.2.3 - Earth Fault Current Input (RIo)

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 " **RIo** " 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, " **RIo** " 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.

2.2.2.5 - Warming-up Time Constant " tw " for the Thermal Image Protection

" **tw** " is a characteristic parameter of the load connected to the feeder.

2.2.2.6 - Maximum admissible continuous overload current " Ib "

Setting " **Ib** " corresponds to deciding what level of overload the thermal image protection must continuously tolerate.
Warming-up is proportional to the square of the current.

Example : Ib = 105%In means that the function F49 will trip when the computed warming-up reaches 1.05^2 x 100 = 110.25% of the temperature corresponding to the continuous full load operation.

2.2.3 - Functions and Settings

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

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

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

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

2.2.3.3 - Algorithm of the time current curves

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

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

where :

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

I = Maximum of the three input currents.

Is = 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

- **Function Enable**	:	***Status***	(**Disable/Enable**) if disable the function is disactivated.
- **Options**	:	***TCC***	(Time current curves): **D** : Independent Definite Time **A** : IEC A Inverse **B** IEC B Very Inverse **C** IEC C Extremely Inverse
		OUT	*Selection of the output relay operated at the end of trip time delay*: **R1, R2, R1 + R2, None**
- **Trip Level**	:	*Minimum Zero Sequence Residual Current Pick-up l*evel : **Io>** = (20-9999)mAs, step 1mAs	
- **Timers**	:	*Trip time delay* : **tIo>** = (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>] x [RIo] = Io> 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

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

2.2.3.6 - F49 (T>) - Thermal Image (See curves)

Warming-up is computed proportionally to the square of the largest phase current "I".

- *Allowed overloading time* (See Curve § 12)

  The trip time delay " **t** " of the thermal element, depends on the warming-up time constant " **tw** ", on the previous thermal status $(Ip/In)^2$, on the admissible continuous overload (Ib) and, of course, on the actual load (I)

$$t = tw \cdot \ell_n \left[\frac{(I/In)^2 - (Ip/In)^2}{(I/In)^2 - (Ib/In)^2} \right] \quad \text{where :}$$

tw	=	Warming-up time constant	(1-60)min.
I	=	Largest of the three phase currents	
Ip	=	Preheating current: Steady-State Current corresponding to the thermal status existing at the moment when the current is increased to the overload value "I"	
Ib	=	Continuously admissible current	(50-200)%In, step 1%In
In	=	Rated primary current of phase C.Ts	
ℓ_n	=	natural logarithm	

  - Reset takes place at 99% of the trip heating level.

- **Function Enable**	:	***Status***	(**Disable/Enable**) if disable the function is disactivated.
- **Options**	:	***OUT_T***	*Selection of the output relay operated on tripping*: **R1, R2, R1 + R2, None**
		OUTal	*Selection of the output relay operated on tripping*: **R1, R2, R1 + R2, None**
- **Trip Levels**	:	*Thermal prealarm* : **Tal** = (50-110)%Tn, step 1%Tn	
		F49 Reset Level : **Tst** = (10-100)%Tn, step 1%Tn	
- **Timers**	:	No Parameters	

An alarm signal is issued when the computed warming exceeds the set percentage " Tal " of the Full Load temperature "Tn".

2.2.3.7 - F46 (I2>) - Current Unbalance (Negative Sequence Current) protection

The current unbalance controls a time delayed element which can be used for single phasing or unbalance protection.

- **Function Enable**	:	***Status***	(**Disable/Enable**) if disable the function is disactivated.
- **Options**	:	***OUT***	*Selection of the output relay operated at the end of trip time delay*: **R1, R2, R1 + R2, None**
- **Trip Levels**	:	*Minimum Negative Sequence current pick-up level* : **I2>** = (10-99)%In, step 1%In.	
- **Timers**	:	*Trip time delay* : **tI2>** = (0.1-60)s, step 0.1s	

N.B.: During Single phase operation the ratio of the negative sequence current component to the total current absorbed by the load is approximately 0.577.

2.2.3.8 - BF (F51BF) - Breaker Failure

- **Function Enable**	:	***Status***	(**Disable/Enable**) if disable the function is disactivated.
- **Options**	:	***OUT***	*Selection of the output relay operated at the end of trip time delay*: **R2, None**
- **Trip Levels**	:	No Parameters	
- **Timers**	:	**tBF** = (0.05-0.75)s, step 0.01s	

Operation: If after the time “tBF” from pick-up of the relay R1 (i.e. from tripping of any protection function programmed to operate the output relay R1) the current measured still exceeds 2%In, the output relay R2 will trip.

2.2.3.9 - RTD (F26) - Overtemperature protection

A RTD probe can be connected to the relevant N-DIN input (terminals 6-7) to trip when overtemperature is detected.

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

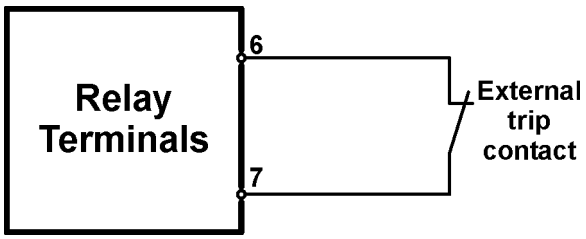
With reference to the resistance value “ R “ of the probe, measured at relay terminals, the operation limits are:

R> 2900Ω = Overtemperature or Probe Open → Trip

Different probe characteristics require special factory calibration.

Note: When no RTD probe is connected, D3 can be used as user available Digital Input.

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



2.2.3.10 - OperMod - Operation Mode

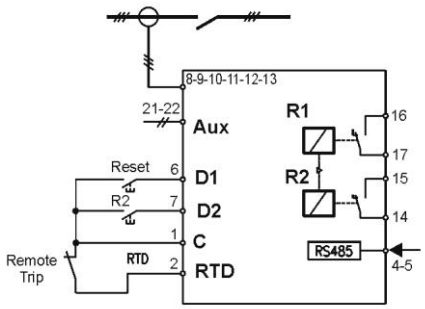
The N-DIN-F is fitted with 2 output relays R1, R2 and 3 Digital Input D1, D2, RTD (see § 2):

- **R1**	Can be controlled by any of the N-DIN-F functions (except Breaker Failure) according to programming. Reset can be operated by the reset button of the RMB and/or FFP and/or by activation of the Digital Input "D1".
- **R2**	Can be controlled by any of the N-DIN-F functions according to programming. Reset is automatic.
- **D1** (Terminals 6-8)	Operates the reset after tripping cause is cleared (example: Overcurrent trip – Circuit Breaker Open– Current interrupted – Reset) If "D1" terminals (6-8) are permanently shorted, reset of "R1" after tripping takes place automatically as soon as the tripping cause disappears.
- **D2** (Terminals 6-9)	Is only enabled in the Local control mode. 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.")
- **RTD** (Terminals 6-7)	Operates according to § 2.2.3.9

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

- **Function Enable**	:	No Parameters	
- **Options**	:	**Op_R1**	*For selection of different operation modes of the Output Relay "R1":* **N.E.** (Normally energized, deenergized on trip). **N.D.** (Normally deenergized, energized on trip).
		Op_R2	*For selection of different operation modes of the Output Relay "R2".* **N.E.** (Normally energized, deenergized on trip). **N.D.** (Normally deenergized, energized on trip).
		Ctrl	*For selection between Local/Remote relay control:* **Local** : The Digital Inputs "D2" is enabled and can be controlled via terminals (6-9) on relay RMB. **Remote** : 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 (6-9) is ignored.
- **Trip Levels**	:	No Parameters	
- **Timers**	:	No Parameters	

APPLICATION EXAMPLE



LOCAL CONTROL VIA DIGITAL INPUTS
REMOTE CONTROL VIA RS485

2.2.3.11 - Load Profile

- **Function Enable**	:	***Status***	(**Disable/Enable**) if disable the function is disactivated.
- **Options**	:	No Parameters	
- **Trip Levels**	:	No Parameters	
- **Timers**	:	**tLP** = (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 MSCom interface program, they are displayed as time/current curve.

2.2.3.12 - I.R.F. - Internal Relay Failure

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

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

- A/D conversion
- Checksum of the settings stored into E^2P.
- 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^2P.
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 ".

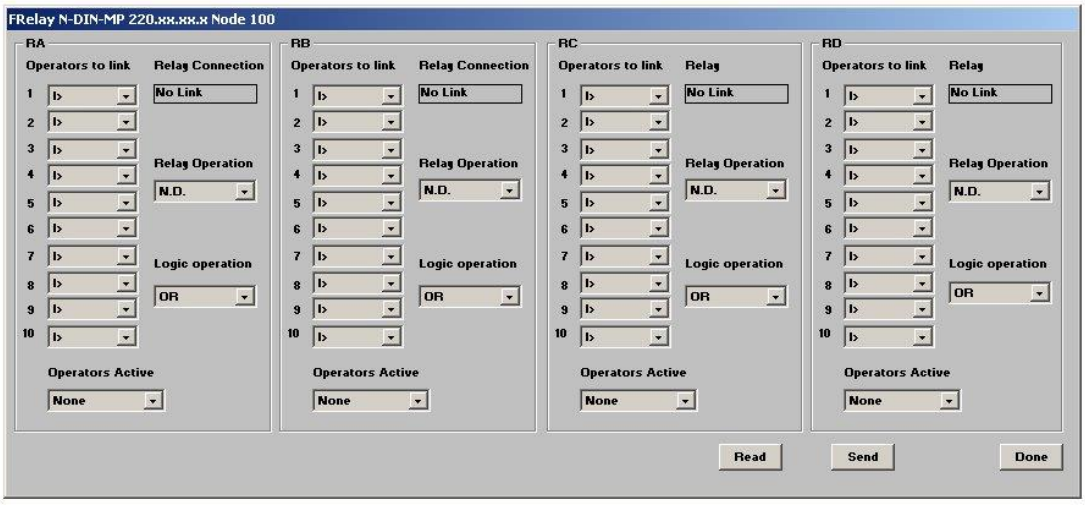
It is also present a supervision circuit that, in case a transient operation anomaly of the DSP is detected, produces a Reset to restore the normal operation and increment the counter "HR" (see § Operation counter).

2.3 - EX/IO Module – Input/Output expansion

4 Output Relays and 5 Digital Inputs (dry contact) can be added using EX/IO module that provide which must be connected to the CANBUS port (see connection example).
These additional inputs and outputs can be configured via MSCom software through serial communication (see Operation Manual MSCom).

1) Press button 

2) The below Window will open:



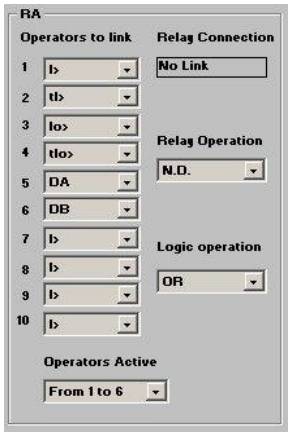
RA-RB-RC-RD	EX-I/O Output Relays.
RE	The relay is Normally energized (N.E.). Normally Deenergized (N.D.) when: No Power supply, CanBus Failure.
Operator to link	To select the Functions / Digital Inputs to be associated to the output relay.
Relay Operation	*N.E.* = Normally Energized; *N.D.* = Normally Deenergized
Logic Operation	*OR* = Output relay activated when one OR more of the associated functions are activated. *AND* = Output relay activated when ALL the associated functions are activated.
Operators Active	To activate one or more among the Functions / Digital Inputs (Max. 10) associated to the output relay: *None* = No Functions/Digital Inputs associated. *From 1 to 2* = Functions/Digital Inputs from 1 to 2. *From 1 to 3* = Functions/Digital Inputs from 1 to 3, ecc.

Functions	I>, tI>, I>>, tI>>, Io>, tIo>, Io>>, tIo>>, Tst, Tal, I2>, tI2>, BF, RTD, IRF, HR.
Output Relays	R1, R2. (Replica of N -DIN Output Relays R1 and R2 status). (see note 1)
EX/IO Digital Inputs	DA, DB, DC, DD, DE, DU (F27), DA_NEG, DB_NEG, DC_NEG, DD_NEG, DE_NEG, DU_NEG (F27), Canstatus (disturbance CanBus line)
DU (Voltage presence)	Activated when the voltage is below 240Va.c ±20%.

3) Example:

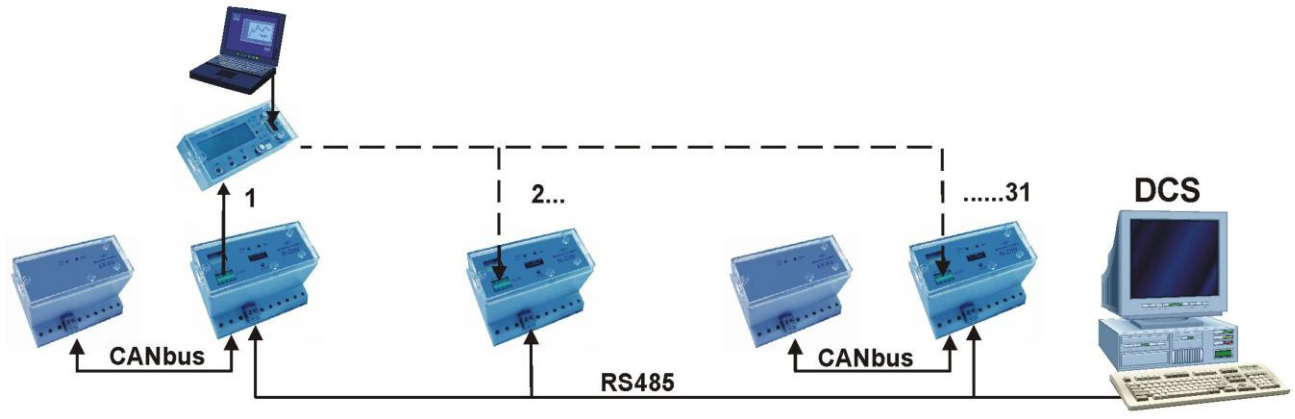
Output relay “RA” configurated to be energized if one or more Functions/Digital Inputs (“I> - tI> - Io> - tIo> - DA - DB”) are activated.

	RA		
Operator to link	1 - I>	3 - Io>	4 - DA
	2 - tI>	4 - tIo>	5 - DB
Relay Oper	N.D.		
Logic Operation	OR		
Operation Active	From 1 to 6		

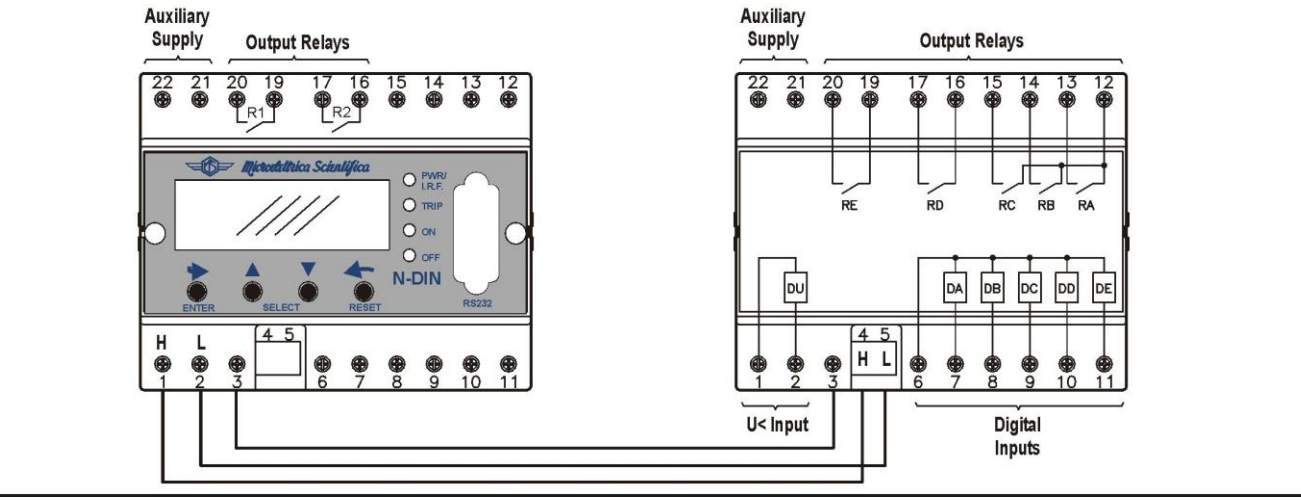


Note 1: N -DIN Output Relays R1 and R2 operate according to the selected operation mode (see § “ OpMode “)

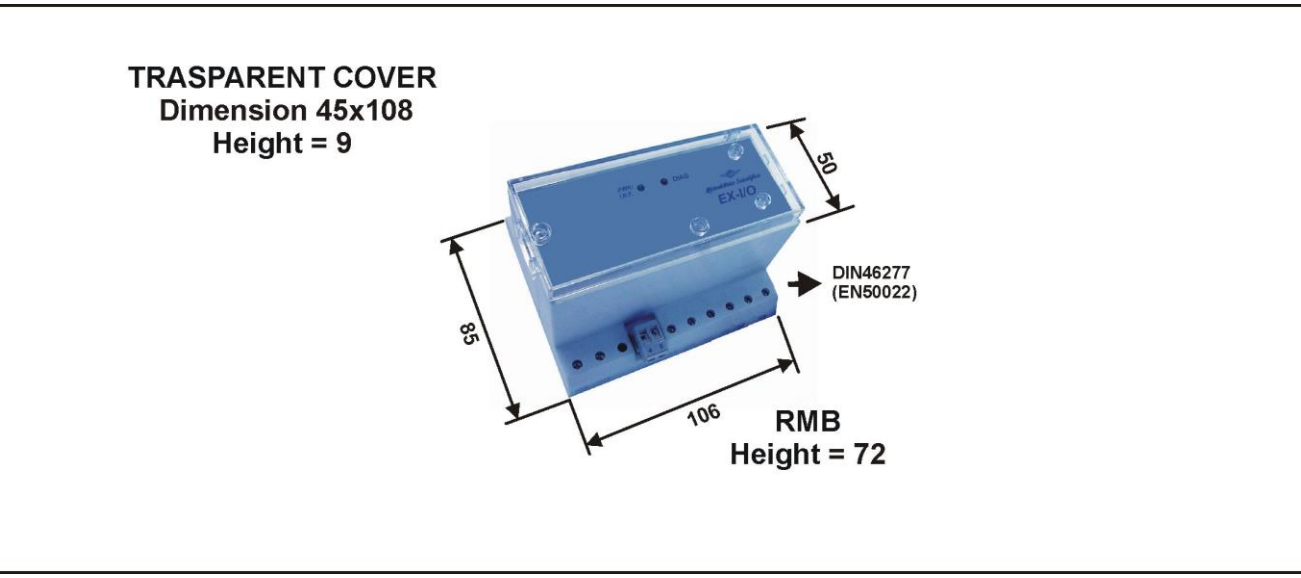
2.3.1 - Connection Example



2.3.2 - Connection Diagram

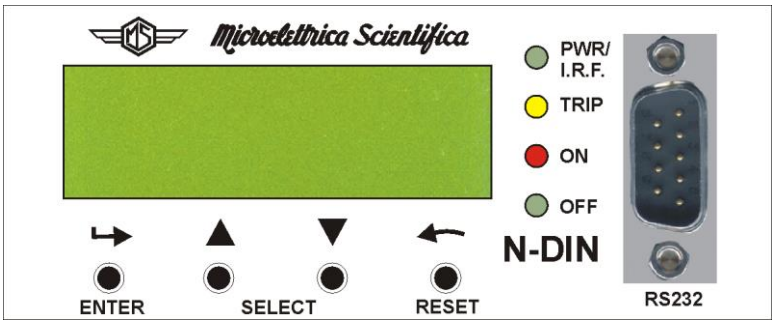


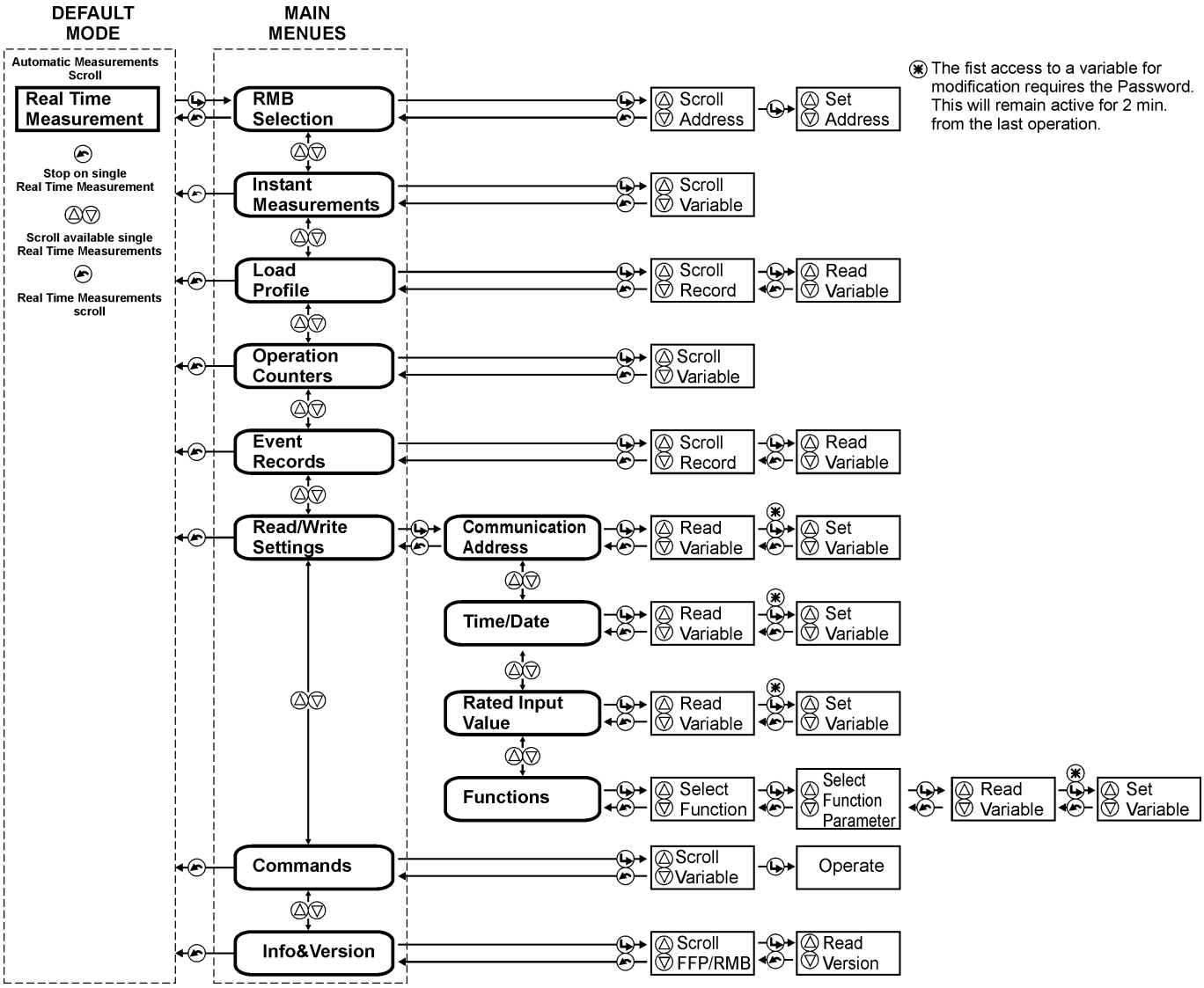
2.3.3 - Overall Dimensions (mm)



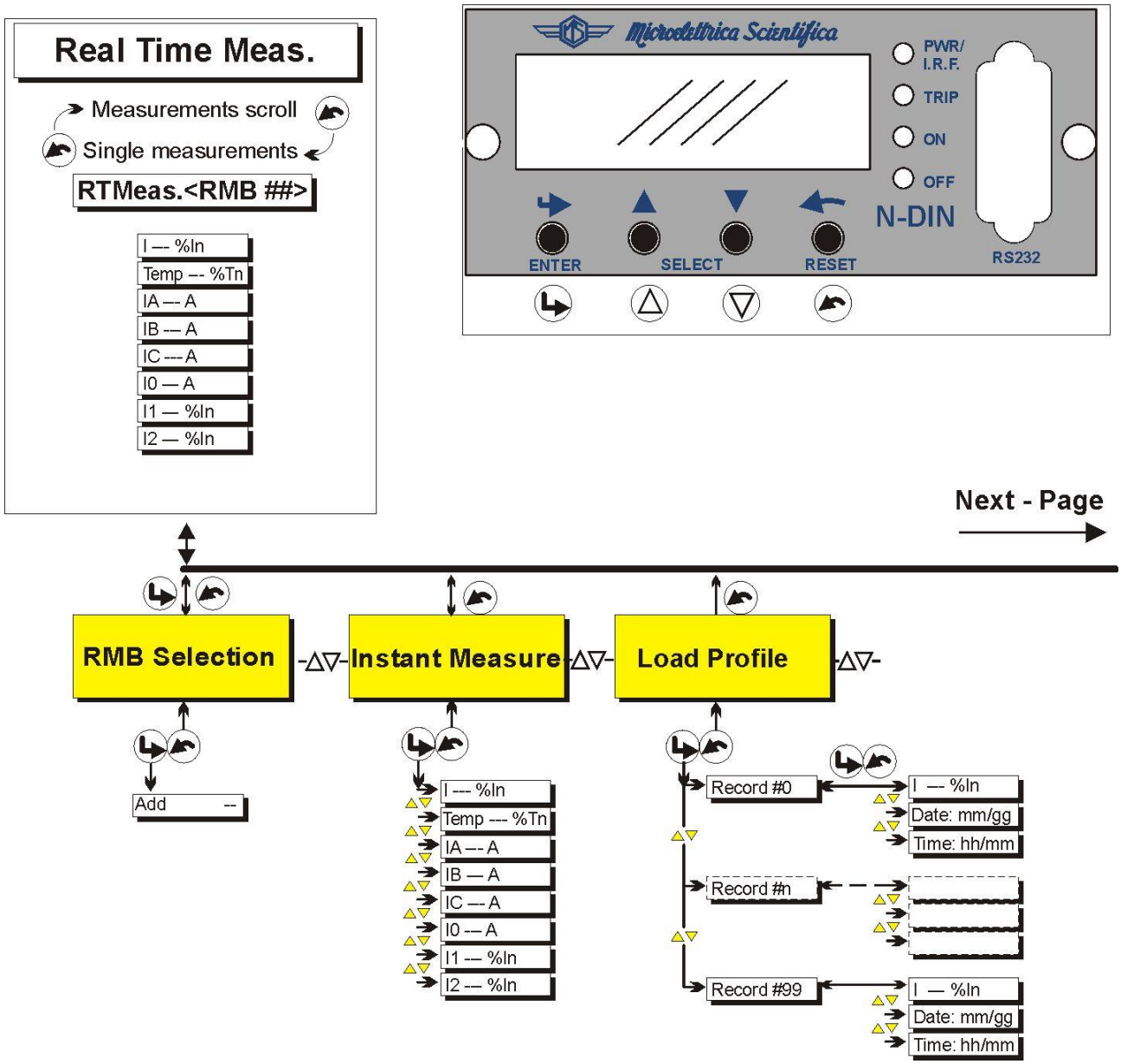
3. RELAY MANAGEMENT

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



Previous - Page

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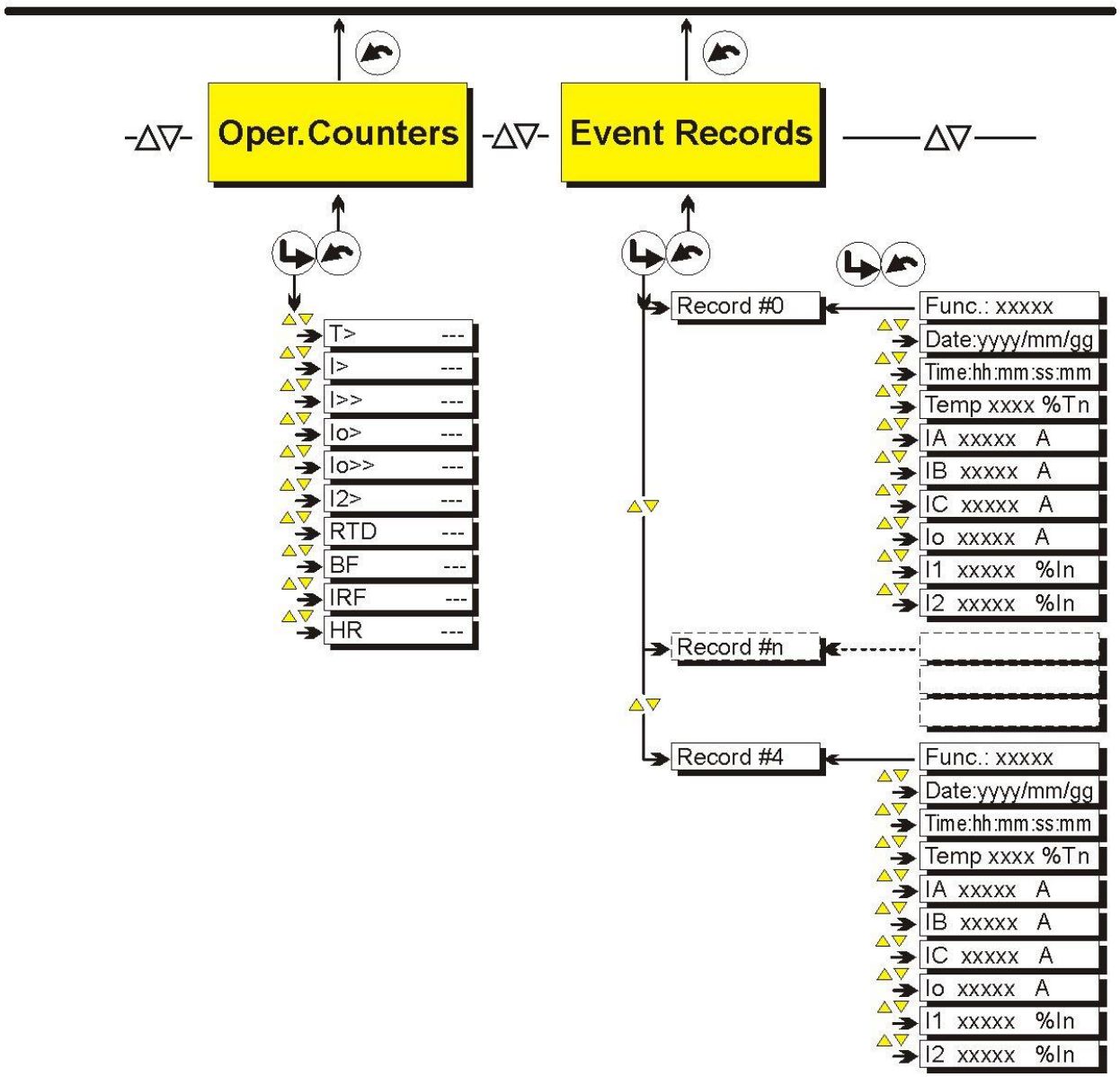
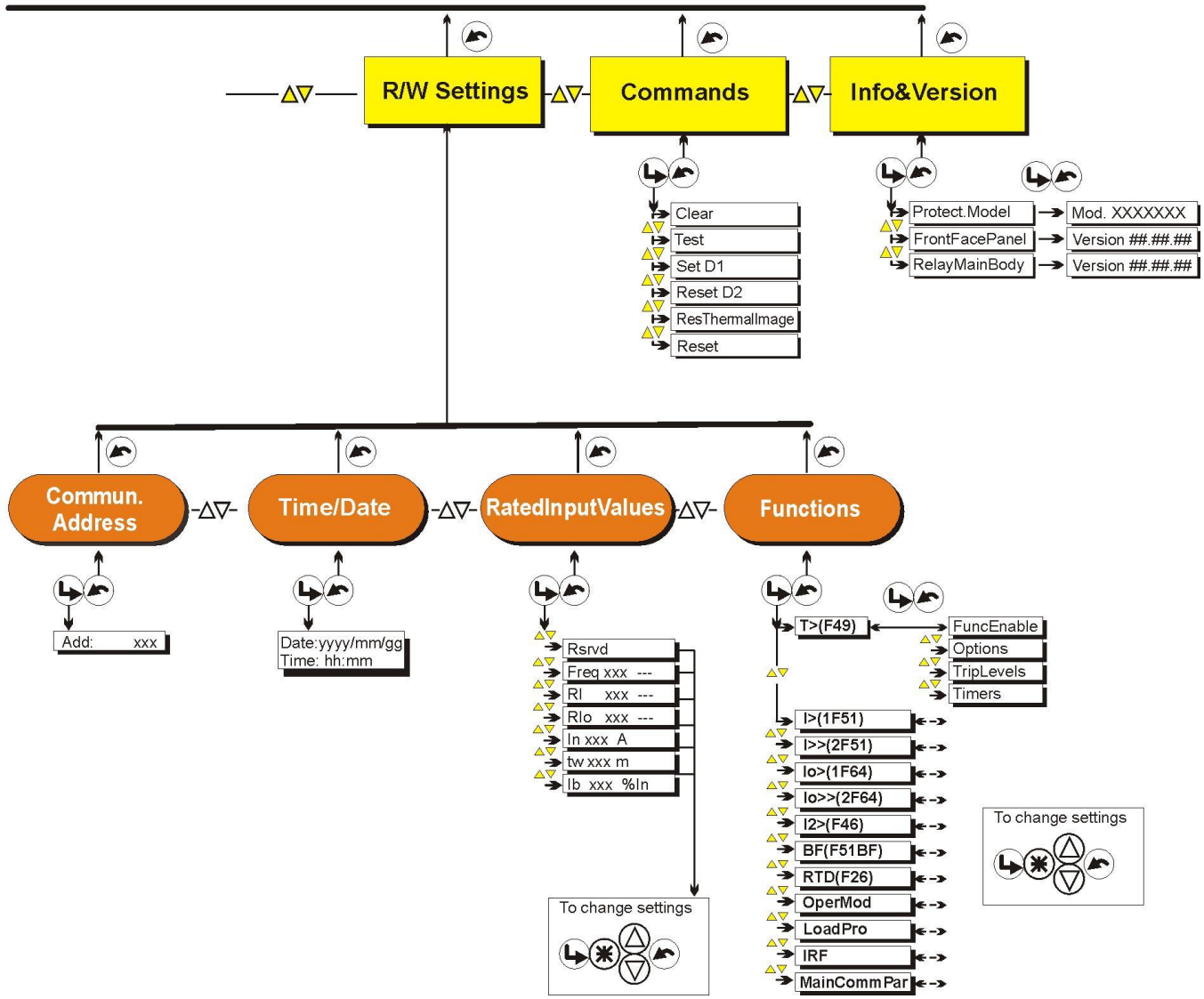
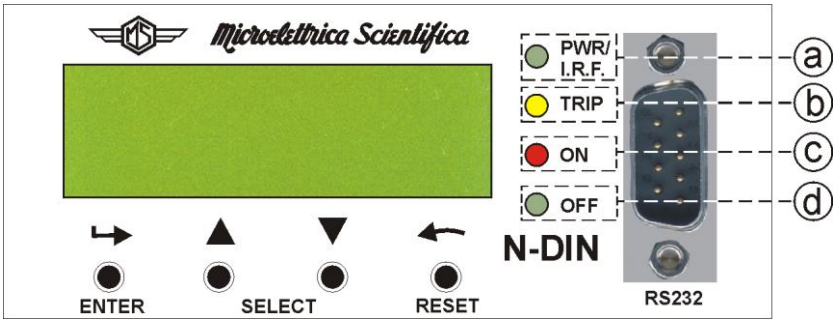


Previous - Page



4. SIGNALIZATIONS

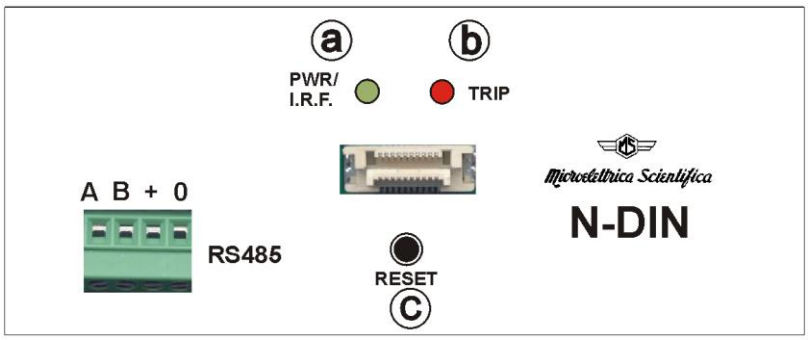
Four signal leds are available on the removable **F**ront **F**ace **P**anel (FFP):



a)	Green LED	**PWR/ I.R.F.**	❑ Illuminated during normal operation when Power Supply is ON. ❑ Flashing when a Relay Internal Fault is detected.
b)	Yellow LED	**TRIP**	❑ Flashing when a timed function has started to operate. ❑ 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 ≥ 3%In).
c)	Red LED	**ON**	❑ Illuminated when C/B close status is detected. (Input current exceeding 3%In)
d)	Green LED	**OFF**	❑ Illuminated when C/B open status is detected. (Input current below 2%In)

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

Other two leds are provided on the **R**elay **M**ain **B**ody (RMB) visible when the front face is removed

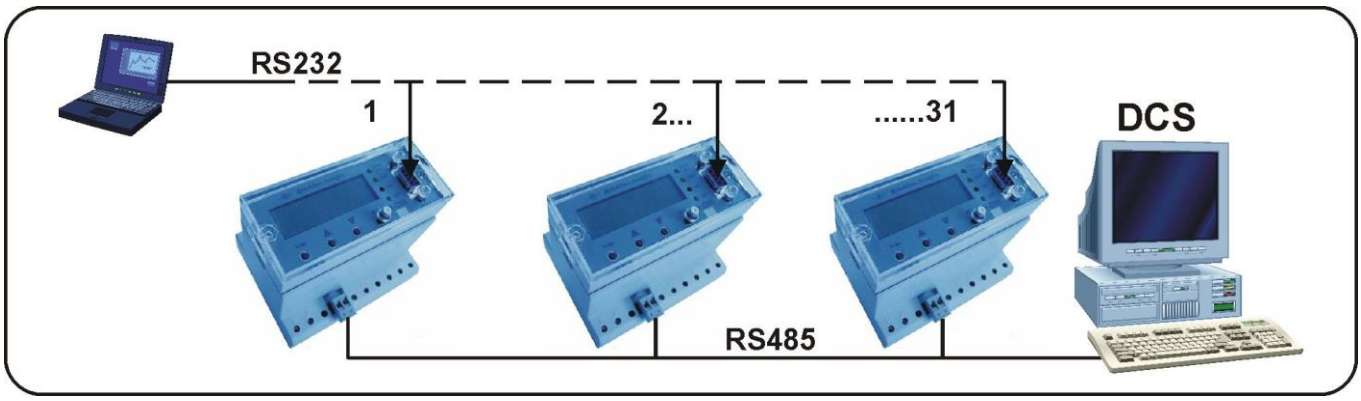


a)	Green LED	**PWR/ I.R.F.**	❑ Illuminated during normal operation when Power Supply is ON. ❑ Flashing when a Relay Internal Fault is detected.
b)	Red LED	**TRIP**	❑ Flashing when a timed function has started to operate. ❑ Illuminated when any function was tripped until Reset button is pressed.
c)	Button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

5. SYSTEM CONFIGURATION OPTIONS

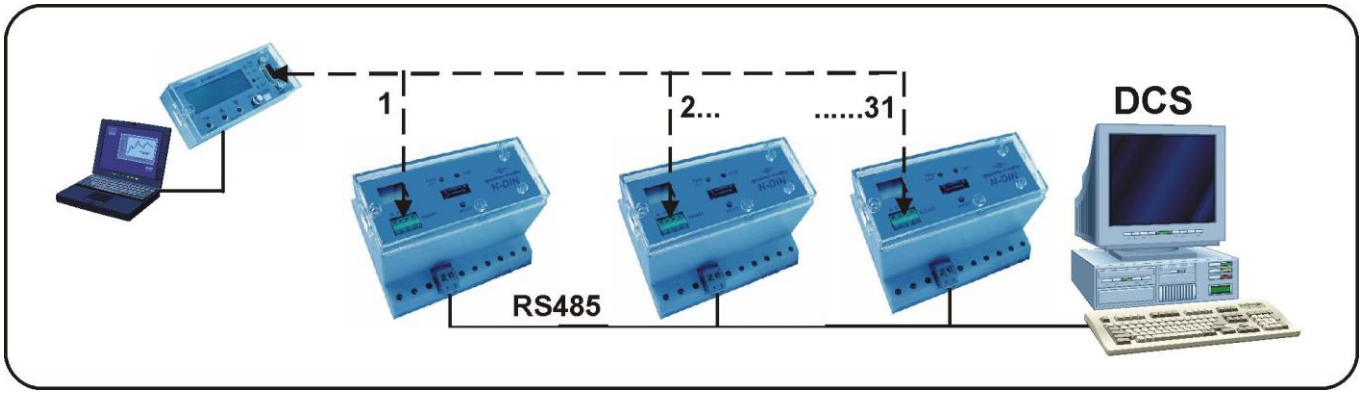
The relay N-DIN is constituted of two independent parts (**RMB** and **FFP**) that can be either used as stand-alone device or combined in different ways.
The FFP can be directly plug-in and fixed by two screws on one RMB or it can be remotely connected to one or more (up to 31) RMB by the relevant terminals (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.

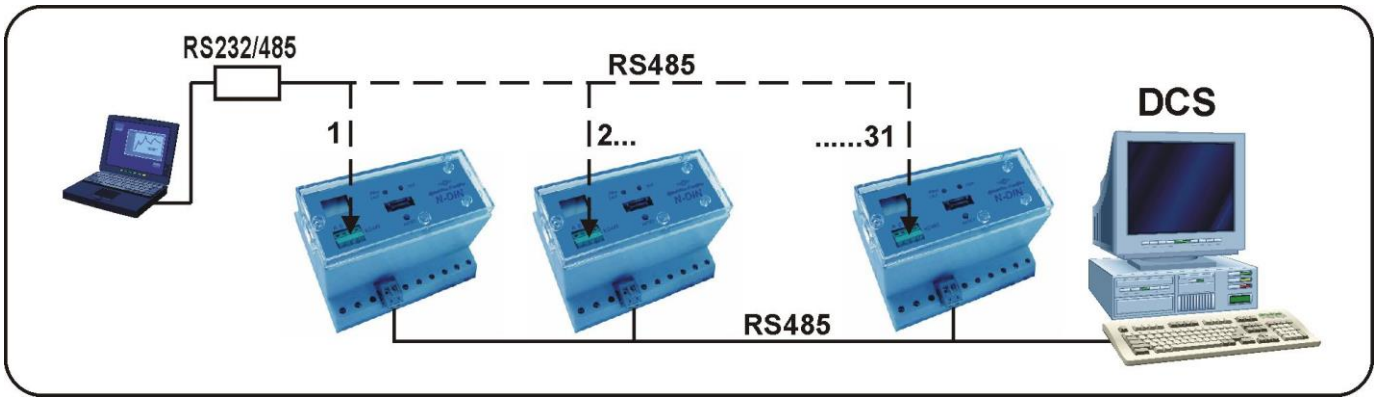


The **FFP** module can be mounted either directly on its **RMB** module or on the front panel of the board connected to the **RMB** by four wires (terminals A, B, +, 0, see §5.2).

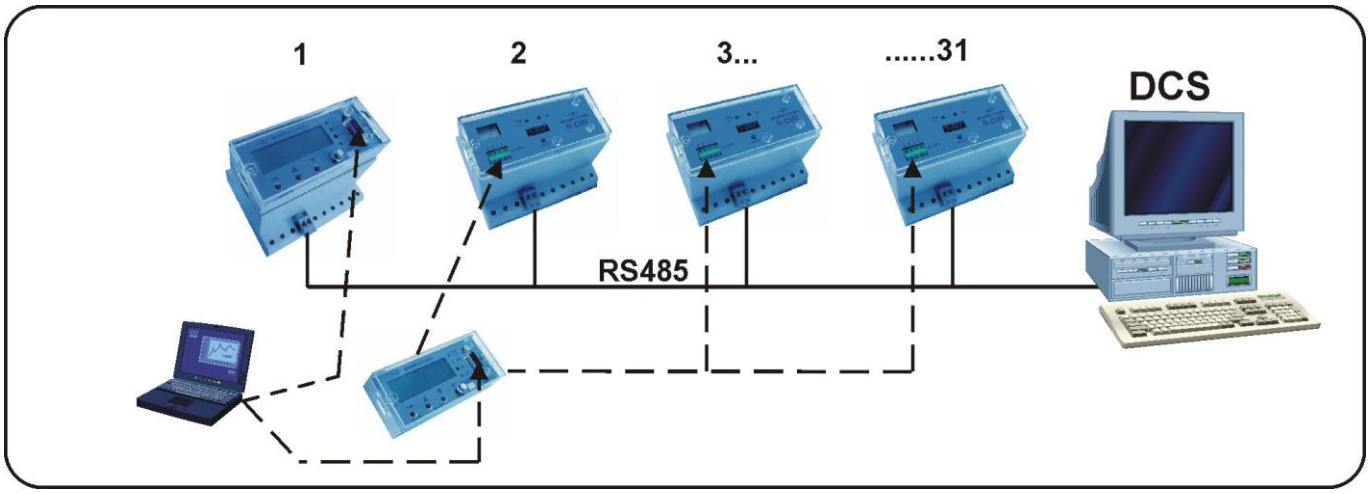
2) Use of up to 31 **RMB** modules managed by only one **FFP**.



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

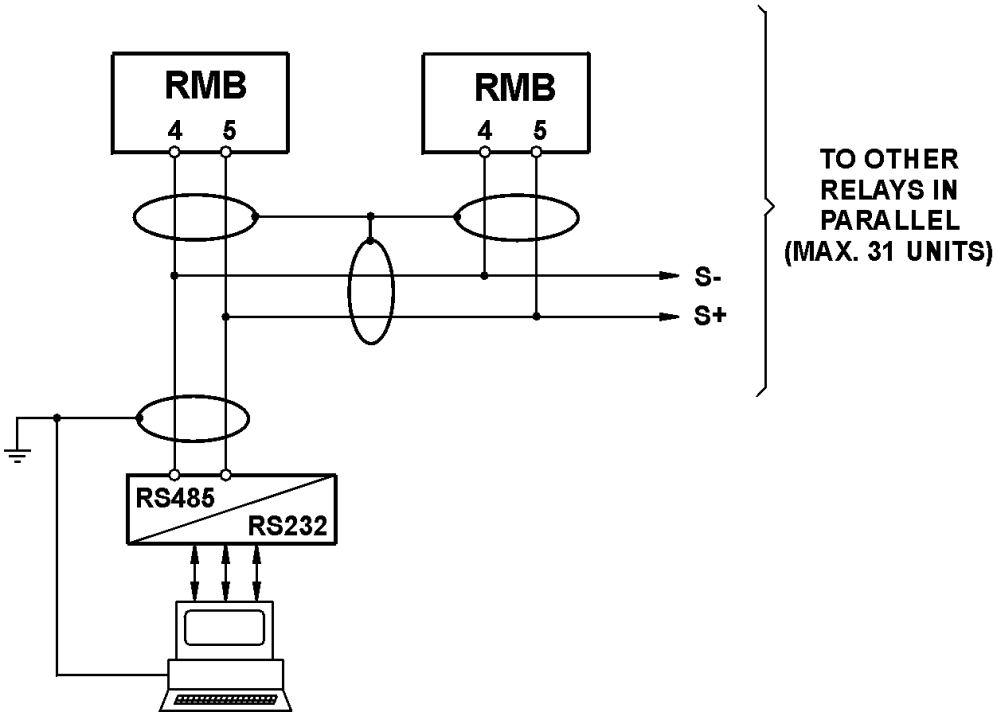
This port is accessible via the plug-in terminals " 4 – 5 " provided on the RMB.
It is used for connection to a serial bus interfacing up to 31 - N-DIN units with the Central Supervision System (SCADA, DCS, ecc).
The serial bus is a shielded pair of twisted cables connecting in parallel (Multi Drop) the different units (slaves) by the relevant terminals available on the " **R**elay **M**ain **B**ody ".
The physical link is RS485 and the Communication Protocol is MODBUS/RTU:
The configuration is selectable (see § 6.7.4)

❑ Baud Rate	:	9600/19200 bps	9600/19200 bps	9600/19200 bps
❑ Start bit	:	1	1	1
❑ Data bit	:	8	8	8
❑ Parity	:	None	Odd	Even
❑ 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

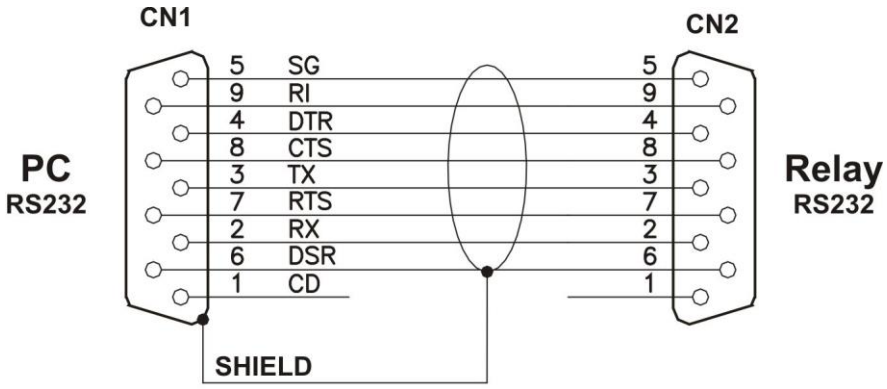


For longer distance and for connection of up to 250 Relays, optical interconnection is recommend. (please ask Microelettrica for accessories)

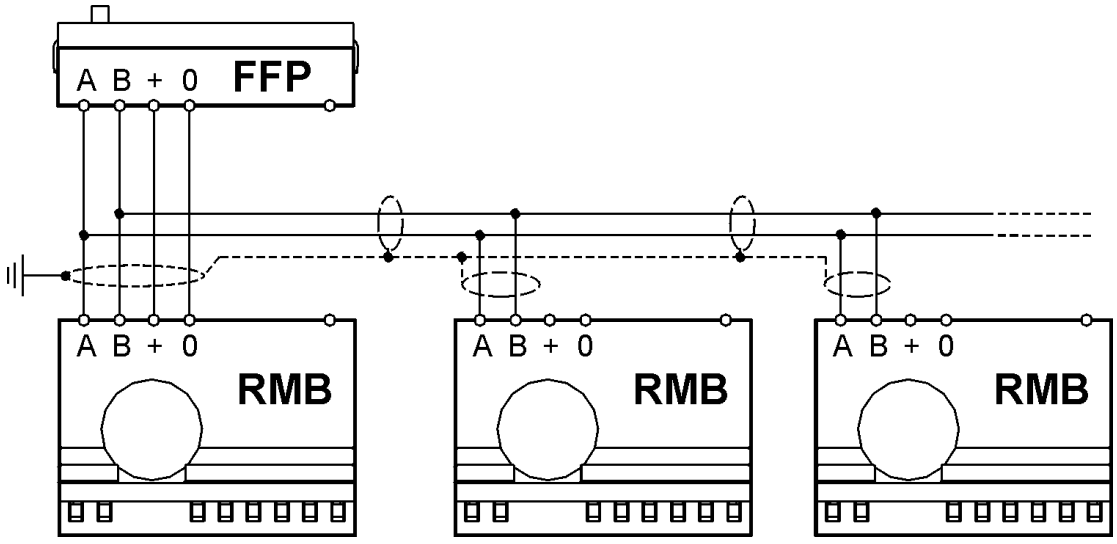
5.2 - Communication Port on Front Face Panel

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..



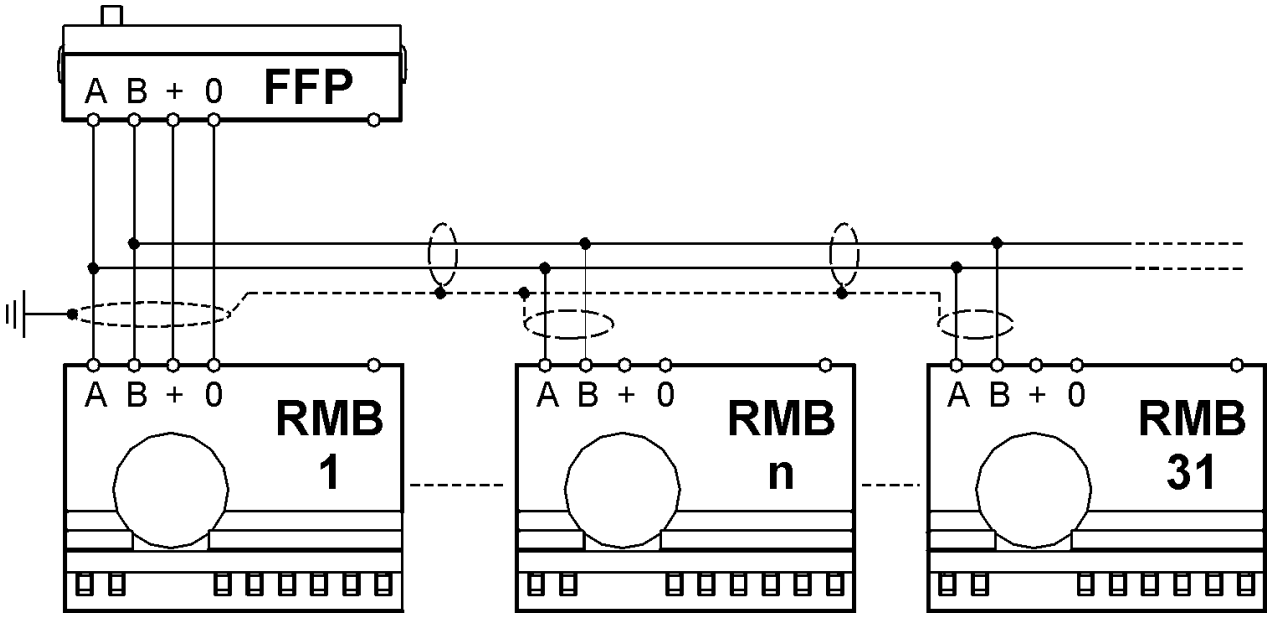
The connection between the " FFP " and the " RMB " (when FFP is removed) is made by four shielded twisted cables connected to the relevant terminals available on the back of the " FFP " and on the front of the " RMB ". All additional RMBs only need a pair of shielded twisted cables.



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)
Temp	=	0 – 65535	%Tn	Thermal status (% of steady Full Load Temp)
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)
I1	=	0 – 65535	%In	Positive Sequence Current (% of Rated current)
I2	=	0 – 65535	%In	Negative Sequence Current (% of Rated current)

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 " ↳
- " 1st 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)
Temp	=	0 – 65535	%Tn	Thermal status (% of steady Full Load Temp)
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)
I1	=	0 – 65535	%In	Positive Sequence Current (% of Full Load current)
I2	=	0 – 65535	%In	Negative Sequence Current (% of Full Load current)

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 " →
- → 1st 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
I	=	0 – 65535 **%In**	Largest of the 3 phase-currents (% of Full Load Current)
Date:	=	MM/GG	Record Date
Time:	=	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 " →
- " 1st counters △▽ other counters
- ← to go back to " Real Time Meas ".

Display			Description
T>	=	0 – XXXXXX	Number of Thermal overload trip
I>	=	0 – XXXXXX	Number of 1st Overcurrent (Short Circuit) trip
I>>	=	0 – XXXXXX	Number of 2nd Overcurrent (Short Circuit) trip
Io>	=	0 – XXXXXX	Number of 1st Earth Fault trip
Io>>	=	0 – XXXXXX	Number of 2nd Earth Fault trip
I2>	=	0 – XXXXXX	Number of Unbalance / Single Phasing trip
RTD	=	0 – XXXXXX	Number of External Termistor trip
BF	=	0 – XXXXXX	Number of operation of Breaker Failure
HR	=	0 – XXXXXX	Number of Hardware Restore (see § self-diagnostic)
I.R.F.	=	0 – XXXXXX	Number of Internal Relay Faults

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 " →
- → 1st event,
- ↑↓ to scroll available events,
- → to " Record # " selected,
- ↑↓ to select the different fields;

Display				Description
Func		**xxxxx**		Indication of the protection function which caused the relay tripping. For indication of the TRIP Cause the following acronyms are used: - **T>** = Thermal overload - **I>** = 1st Overcurrent (Short Circuit) - **I>>** = 2nd Overcurrent (Short Circuit) - **Io>** = 1st Earth Fault - **Io>>** = 2nd Earth Fault - **I2>** = Unbalance / Single Phasing - **RTD** = External Termistor - **IRF** = Internal Relay Fault
Date	:	YYYY/MM/GG		Date: Year/Month/Day
Time	:	hh:mm:ss:cc		Time: hours/minutes/second/hundredths of seconds
Temp	=	0 – 65535	**%Tn**	Thermal status (% of Full Load Temp)
IA	=	0 – 65535	**A**	RMS value of phase A current (Primary Amps)
IB	=	0 – 65535	**A**	RMS value of phase B current (Primary Amps)
IC	=	0 – 65535	**A**	RMS value of phase C current (Primary Amps)
Io	=	0.0 – 6553.5	**mA**	RMS value of Zero Sequence Current
I1	=	0 – 65535	**%In**	Positive Sequence Current (% of Full Load Current)
I2	=	0 – 65535	**%In**	Negative Sequence Current (% of Full Load 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
Add: 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 "
- ↳ 1st 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			
Rl	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
tw	15	**m**	Warming-up time constant	1 - 60	1	m
Ib	105	**%Im**	Maximum admissible continuous overload	100 - 130	1	%In
Freq	50	**Hz**	System rated frequency	50 - 60	10	Hz

6.7.4 - Functions

- ▲▼ " Functions ",
- ↳ 1st 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)		
T>(F49)	FuncEnable	→	Status:	Enable		Enable of the protection function	Enable/Disable	-
	Options	→	OUT_T	R1		Selection of the output relay operated at the end of trip time delay	R1, R2, R1+R2, NONE	-
			OUTal	NONE		Selection of the output relay operated at the end of trip time delay	R1, R2, R1+R2, NONE	-
	TripLevels	→	Tal	90	%Tn	Prealarm Temperature rise (% of Full Load temperature rise)	50-110	1
			Tst	100	%Tn	F49 Reset Level	10 – 100	1
	Timers	→	No Parameters					
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>	50	%In	Trip level of overcurrent protection	20 – 400	1
	Timers	→	tI>	5	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	→	tI>>	0.1	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>	50	mAs	Trip level of Earth Fault protection	20-9999	1
	Timers	→	tIo>	5	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>>	50	mAs	Trip level of Earth Fault protection	20-9999	1
	Timers	→	tIo>>	0.3	s	Trip time delay *	0.00 – 60.00	0.01
I2>(F46)	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	→	I2>	20	%In	Trip level of current unbalance protection	10-99	1
	Timers	→	tI2>	5	s	Trip time delay	0.1-60	0.1
BF(F51BF)	FuncEnable	→	Status:	Enable		Enable of the protection function	Enable/Disable	-
	Options	→	OUT	R2		Selection of the output relay operated at the end of trip time delay	R2, None	-
	TripLevels	→	No Parameters					
	Timers	→	tBF	0.2	s	Time delay for Breaker Failure alarm	0.05 – 0.75	0.01
RTD(F26)	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	→	No Parameters					
	Timers	→	No Parameters					
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					
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

Display						Description	Setting Range	Step
Function	Type		Variable	Default Value	Unit			
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) ***Note**: any change of this setting became valid at the next power on*	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 "
- ↳ 1st Control,
- △▽ to select other available control,
- ↳ to operate selected control.

Display		Description
Clear	:	Erase memory of Trip Counters, Event Records, Load Profile
Test	:	Starts a relay diagnostic test
Set D2	:	Operate output relay R2
Reset D2	:	Reset output relay R2
Reset Thermal Image	:	Erase thermal memory content
Reset	:	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 1st digit (1-9) ↳ to validate
- △▽ to select 2nd digit (1-9) ↳ to validate
- △▽ to select 3rd digit (1-9) ↳ to validate
- △▽ to select 4th 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

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.1

Fig.2

7.2 - Modbus Password

This Password is requested to a Supervision System 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 Address 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.

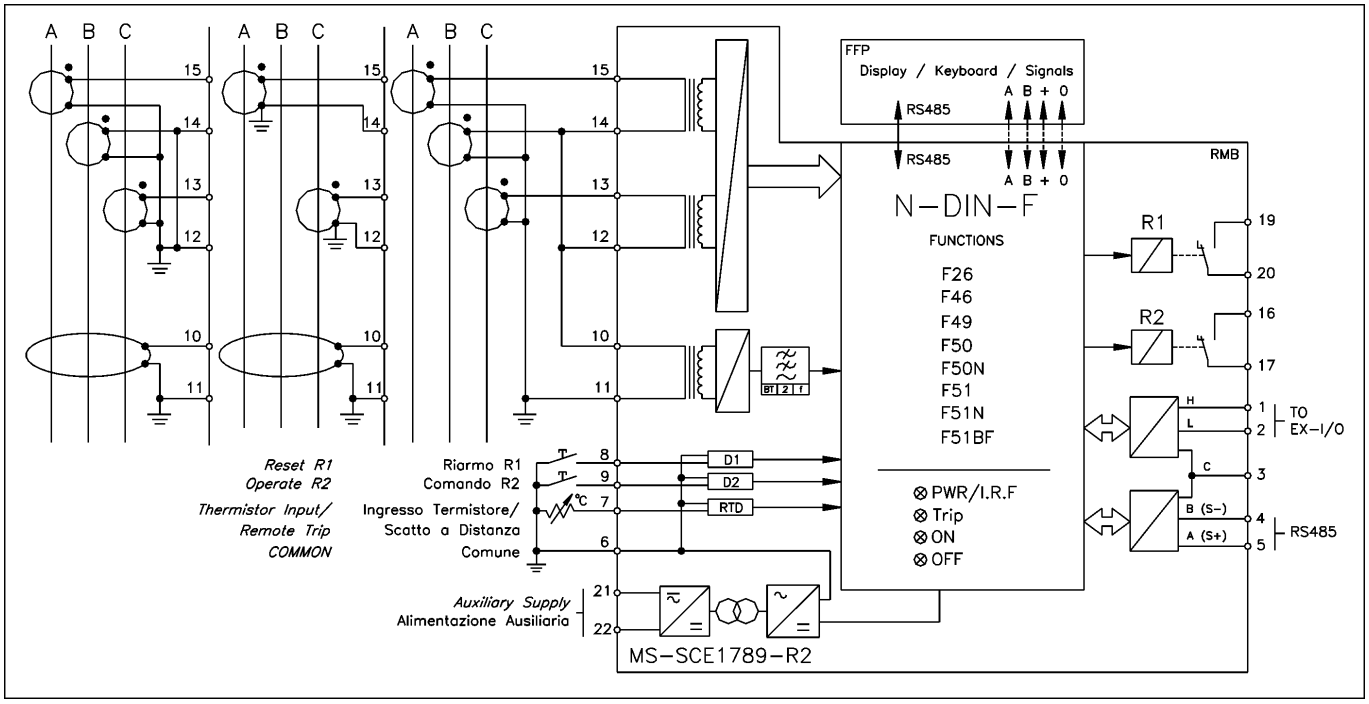
8. MAINTENANCE

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.

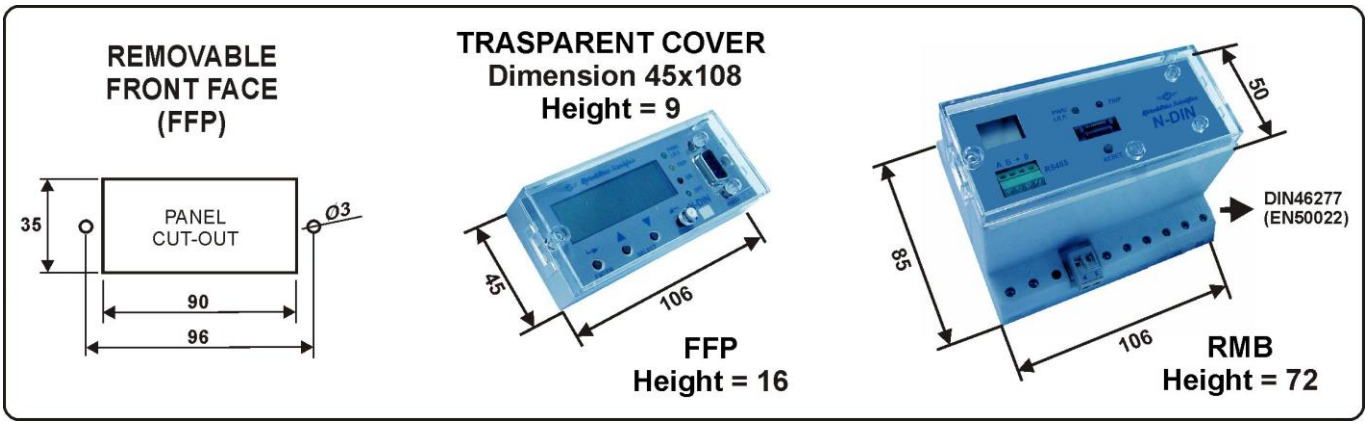
9. POWER FREQUENCY INSULATION TEST

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 tacking 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.

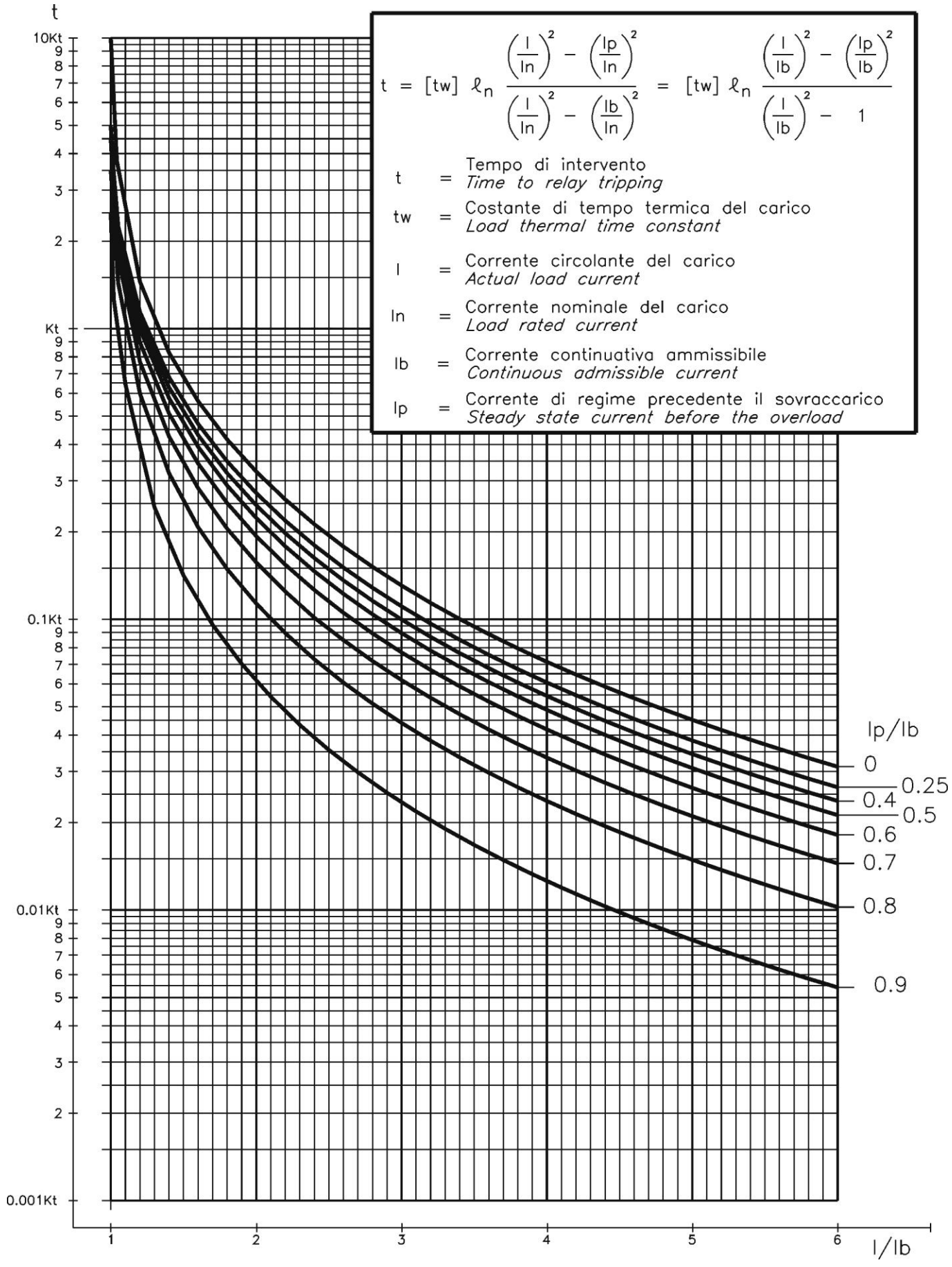
2) To remove FFP from RMB loosen the two screws and pull-out.

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

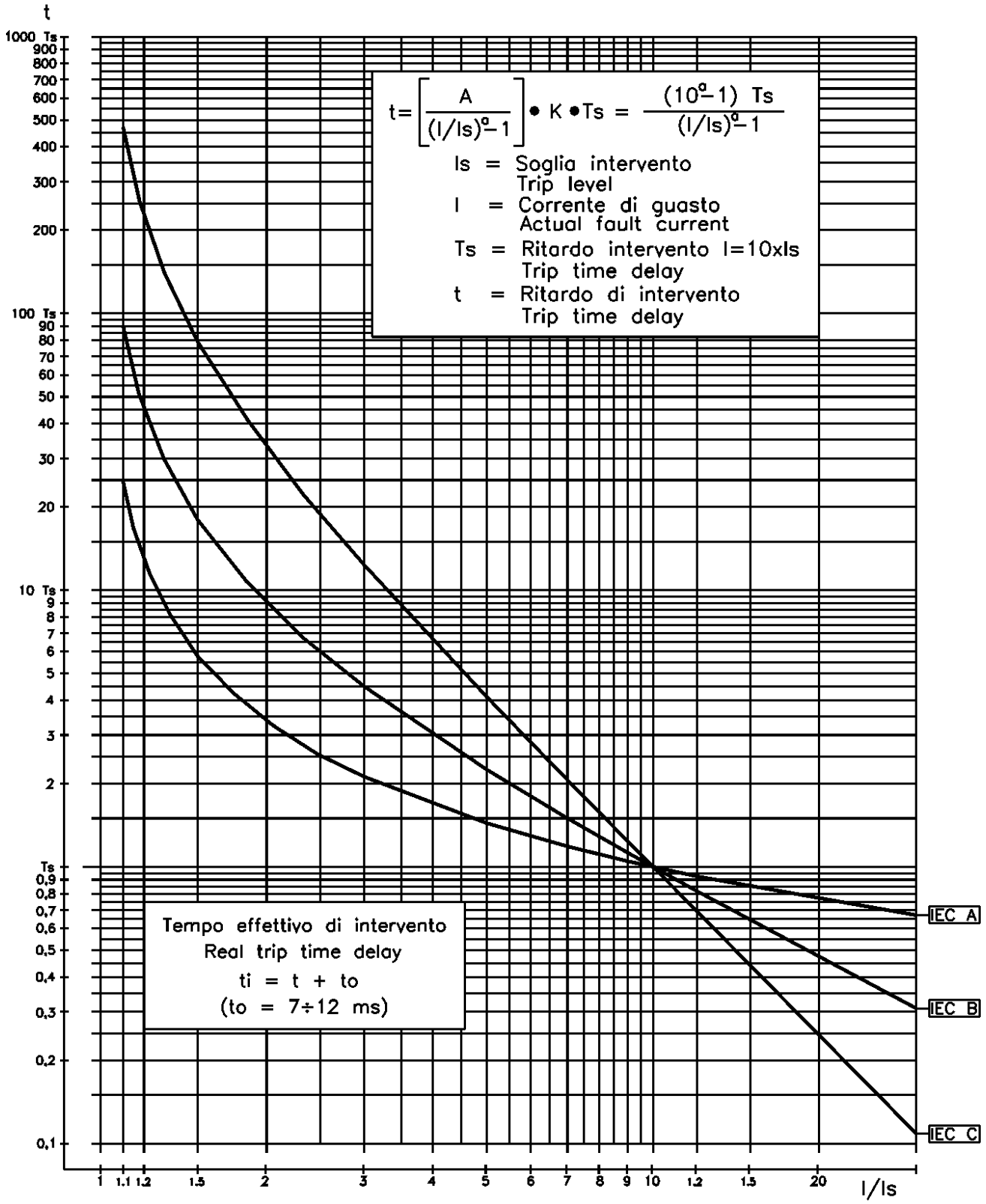
N.B.

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. THERMAL IMAGE CURVES (TU1091 Rev.1)



13. 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

14. ELECTRICAL CHARACTERISTICS

APPROVAL: CE
REFERENCE STANDARDS IEC 60255 - CE Directive - EN/IEC61000 - IEEE C37

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

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

❑	Operation ambient temperature	-10°C / +55°C			
❑	Storage temperature	-25°C / +70°C			
❑	Humidity	IEC68-2-3 RH 93% Without Condensing AT 40°C			

CE EMC Compatibility (EN61000-6-2 - EN61000-6-4 - EN50263)

❑	Electromagnetic emission	EN55011		industrial environment	
❑	Radiated electromagnetic field immunity test	IEC61000-4-3 ENV50204	level 3	80-1000MHz 900MHz/200Hz	10V/m 10V/m
❑	Conducted disturbances immunity test	IEC61000-4-6	level 3	0.15-80MHz	10V
❑	Electrostatic discharge test	IEC61000-4-2	level 3	6kV contact / 8kV air	
❑	Power frequency magnetic test	IEC61000-4-8		1000A/m	50/60Hz
❑	Pulse magnetic field	IEC61000-4-9		1000A/m, 8/20μs	
❑	Damped oscillatory magnetic field	IEC61000-4-10		100A/m, 0.1-1MHz	
❑	Electrical fast transient/burst	IEC61000-4-4	level 3	2kV, 5kHz	
❑	HF disturbance test with damped oscillatory wave (1MHz burst test)	IEC60255-22-1	class 3	400pps, 2,5kV (m.c.), 1kV (d.m.)	
❑	Oscillatory waves (Ring waves)	IEC61000-4-12	level 4	4kV(c.m.), 2kV(d.m.)	
❑	Surge immunity test	IEC61000-4-5	level 4	2kV(c.m.), 1kV(d.m.)	
❑	Voltage interruptions	IEC60255-4-11		50ms	
❑	Resistance to vibration and shocks	IEC60255-21-1 - IEC60255-21-2 10-500Hz 1g			

ELECTRIC RATED VALUE

❑	Accuracy at reference value of influencing factors	2% In for measure 0,2% On 2% +/- 20ms for times
❑	Rated Current	In = 5A - On = 5A
❑	Current overload	200 A for 1 sec; 10A continuous
❑	Burden on current inputs	Phase : 0.05VA at In = 5A Neutral : 0.07VA at On = 5A
❑	Average power supply consumption	≤ 7 VA
❑	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

❑	RMB	RS485 – 9600/19200 bps – 8,N,1 - 8,E,1 - 8,O,1 – Modbus RTU
❑	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