MICROPROCESSOR
MOTOR PROTECTION RELAY

TYPE

N-DIN-MA

(Version N-DIN-MAp – 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 Motor Protection Relay suitable for any size of induction motors.
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 Motor 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

- Two optoisolated, self-powered digital inputs (D1, D2) are provided.
  The digital inputs are activated when their input terminals (6-8, 6-9) are shorted by a cold contact ($R \leq 3k\Omega$). 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.

2.1 - Power Supply

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

a) - { **80V(-20%) / 120V(+15%) a.c.**
90V(-20%) / 160V(+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	-	6500.0	0.1	-
RIo	100	-	Ratio of the C.Ts. or of the tore C.T. detecting earth fault current.	1	-	6500.0	0.1	-
Im	100	**A**	Motor full-load current	1	-	6500.0	0.1	A
Ist	500	**%Im**	Motor start-up current (% of motor full load current)	50	-	999	1	%Im
tst	5	**s**	Motor starting time	1	-	120	1	s
tm	15	**m**	Motor warming-up time constant	1	-	60	1	m
to/tm	3	**-**	Steady/Running Motor time constant ratio	1	-	10	1	-
Ib	105	**%Im**	Maximum admissible continuous overload	100	-	130	1	%Im
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 the value of the Ratio $RI = \frac{In \quad primary}{In \quad secondary}$ of the phase C.Ts must be input (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 " **I_1** " and the Negative Sequence Component " **I_2** **"**, with no Earth Fault, are computed according to the normal equations of the system symmetrical components, using two currents only:

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

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 of 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 of 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 - Motor rated full load current " Im "

" **Im** " is the Motor Rate Current reported on motor data label.

2.2.2.5 - Motor Locked Rotor current " Ist "

" **Ist** " is the current absorbed by the motor at start-up; this value is also reported on motor data label.

2.2.2.6 - Motor Starting Time " tst "

" **tst** " is the time it takes for the motor to accelerate from zero to the rated speed.
If unknown this time can be measured by the N-DIN itself at motor fist start.
The figure is displayed in the Real Time as well as in the Instant Measurement menues.

2.2.2.7 - Motor warming-up Time Constant " tm "

" **tm** " is a characteristic parameter of the motor.

	IEC Class	tm [min]
IEC Motor Thermal Overload Class corresponds to the following values of the warming-up time constant	5	3
	10	6
	15	9
	20	12
	25	15
	30	18

2.2.2.8 - Ratio of the steady state motor time constant to the running motor time constant " to/tm "

When motor is steady its ventilation and cooling conditions may be different from when it is running.
" **to/tm** " takes properly account of this.

2.2.2.9 - Maximum admissible motor 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%Im

Means that the function F49 will trip when the computed motor warming reaches 1.05^2 x 100 = 110.25% of the temperature corresponding to the motor continuous full load operation.

2.2.3 - Functions And Settings

2.2.3.1 - F51 - Overcurrent protection

❑ **Function**	:	***Status***	Disable/Enable if disable the function is disactivated.
❑ **Options**	:	No Parameters	
❑ **Trip Level**	:	*Minimum Pick-up Current level in at least one phase* : **I>** = (100-999)%Im, step 1%Im (limited to 50A secondary)	
❑ **Timers**	:	*Trip time delay:* **tI>** = (0.05-9.99)s, step 0,01s	

2.2.3.2 - F64 - Earth Fault protection

❑ **Function**	:	***Status***	Disable/Enable if disable the function is disactivated.
❑ **Options**	:	No Parameters	
❑ **Trip Level**	:	*Minimum Zero Sequence Residual Current Pick-up l*evel : **Io>** = (20-9999)mAs, step 1mAs	
❑ **Timers**	:	*Trip time delay*: **tIo>** = (0.05-9.99)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

2.2.3.3 - Too long starting protection and Starting Sequence Control

❑ **Function**	:	***Status***	Disable/Enable if disable the function is disactivated.
❑ **Options**	:	No Parameters	
❑ **Trip Level**	:	*Switch-over (transition) current*: **ITr** = (10-999)%Im, step 0.1%Im (limited to 50A)	
❑ **Timers**	:	*Maximum switch-over (transition) time delay*: **tTr** = (0.1-60)s, step 0.1s.	

A – Too long starting (rotor jam) protection

In the " Direct On Line " as well as in the " Reversing " operation modes, this element operates as follows:

At motor start, counting of " tTr " begins; if the current absorbed by the motor stays above the set level " Itr " for longer than " tTr ", the Locked Rotor element is tripped and the motor stopped.
If starting takes place normally, as soon as motor current drops below " Itr ", the duration of the starting (tSt) is recorded and displayed in the Real Time Measurements menu.

B – Automatic Two-Step starter control (example Star-Delta starter)

When the " Two-Step " operation mode is programmated, the N-DIN operates as follows (see § 7):

On start command, R2 output relay is energized and after 0.1s also R1 is energized: the motor starts running (Star condition) and the time " tTr " begins counting.
If within " tTr " the motor current drops below the " Itr "set value, R2 is deenergized and the second step transition (Star to Delta) is operated.
If, after start command, the motor current stays above the set level " Itr " for longer than " tTr ", the Locked Rotor element is tripped and the motor stopped.

2.2.3.4 - F37 - No-Load Running protection

This function performs the protection against no-load running: it is activated when the larger of phase currents drops below the set level [I<].

❑ **Function**	:	***Status***	Disable/Enable if disable the function is disactivated.
❑ **Options**	:	No Parameters	
❑ **Trip Level**	:	*Under current level :* **I<** = (10-100)%Im, step 1%Im. When current is below 10%Im in all phases the function is disactivated.	
❑ **Timers**	:	*Trip time delay*: **tI<** = (0.1-60)s, step 0.1s.	

2.2.3.5 - F51LR – Locked Rotor Protection

At motor starting this function is disabled for twice the set starting time: when this time has elapsed, if current exceeds the set level " **ILR** ", the relay trips with a delay of " **tLR** " sec.

❑ **Function**	:	***Status***	Disable/Enable if disable the function is disactivated.
❑ **Options**	:	No Parameters	
❑ **Trip Level**	:	*Current level* : **ILR** = (50-500)Im, step 1Im.	
❑ **Timers**	:	*Trip time delay*: **tLR** = (1-60)s, step 1s	

- *Inhibition time of the locked rotor function*: **2[tSt]**

  tSt = (1-120)s, step 1s = motor start-up time

  The function is also instantaneously tripped by " Itr " (see § 2.2.3.3)

2.2.3.6 - Limitation of the Starts Number of consecutive starting

❑ **Function**	:	***Status***	Disable/Enable if disable the function is disactivated.
❑ **Options**	:	No Parameters	
❑ **Trip Level**	:	*Allowed Number of startings:* **St No** = (1-60), step 1	
❑ **Timers**	:	Time interval in *which the StNo is counted:* **tStNo** = (1-60)m, step 1m. (m= minutes) *Restart Inhibition time*: **tBst** = (1-60)m, step 1m. (m= minutes)	

Each starting is counted and stored into memory for " tStNo / StNo " minutes.
If the number of counted startings present in the memory exceeds " StNo ", the restarting is inhibited for the time " tBst ".

2.2.3.7 - F49 – Thermal Image (See curves)

The current " **I** " producing motor warming-up is computed as a conventional composition of Positive Sequence " I_1 " and Negative Sequence " I_2 " components of the motor current.

- Computed current: $I = \sqrt{I_1^2 + 3I_2^2}$
- *Allowed overloading time* (See Curve § 15)

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

$$t = tm \ln\left[\frac{(I/Im)^2 - (Ip/Im)^2}{(I/Im)^2 - (Ib/Im)^2}\right] \quad \text{where :}$$

tm	=	Warming up time constant	(1-60)min.	
I	=	computed current		
Ip	=	preheating current		
Ib	=	continuously admissible current	(100-130)%Im, step 1%Im	(§ 9.5)
Im	=	motor rated current	(10-6500)A, step 1A	(§ 9.5)
In	=	Rated primary current of phase C.Ts		

- Steady motor *cooling-down* time constant: **to** = (1-10)tm, step 1tm

  The cooling-down time constant of the motor when running is "**tm**"; it is automatically changed to " **to** " when the motor current drops below 0.1 Im (running/steady motor discrimination level).

❑ **Function**	:	***Status*** Disable/Enable if disable the function is disactivated.
❑ **Options**	:	No Parameters
❑ **Trip Level**	:	*Thermal prealarm* : **Tal** = (50-110)%Tn, step 1%Tn
❑ **Timers**	:	*Restart inhibition*: **Tst** = (10-100)%Tn, step 1%Tn

An alarm signal is issued when the computed warming exceeds the set percentage " Tal " of the motor steady Full Load temperature "Tn", and motor restart is inhibited until the motor has cooled down below " Tst ".

2.2.3.8 - F46 - Current Unbalance (Negative Sequence Current) protection

Besides its contribution to the thermal image algorithm, current unbalance also controls another time delayed element which can be used for single phasing or unbalance protection

❑ **Function**	:	***Status*** Disable/Enable if disable the function is disactivated.
❑ **Options**	:	No Parameters
❑ **Trip Level**	:	*Minimum Negative Sequence current operation level* : **I2>** = (10-99)%Im, step 1%Im.
❑ **Timers**	:	*Trip time delay:* **tI2>** = (0.1-60)s, step 0.1s

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

2.2.3.9 - Operation Mode

When programming the " Functions " the menu " OperMode ", includes two submenus:

❑ **Function**	:	No Parameters		
❑ **Options**	:	**OpMod**	***D Io>=R2***	D.O.L. with "Io>" controlling to R2
			D Tal=R2	D.O.L. with "Tal" controlling to R2
			Two_Step	2-step reduced voltage start control.
			Revers.	Reversing starter
			D_RA	D.O.L. with Automatic Reacceleration
			D F/A R2	D.O.L. with all functions controlling to R1 and to R2
			D F/A	D.O.L. with all functions controlling to R1 and to R2 and F27 control
		Ctrl	*For selection between Local/Remote relay control:*	
			Local :	The Digital Inputs are active and can be controlled on relay RMB.
			Remote :	The Digital Inputs are disactivated and the relay can be controlled via the communication ports or via the front panel FFP. In the [Remote] control mode, the Digital Inputs are ignored: Reset after tripping is always manual by the push buttons of FFP and/or RMB or by the communication software control.
			Note: When in the D_RA Operation Mode, the relay must always be set in the "**Remote**" Control Mode.	
		Op_R1	Operation mode output relay R1:	**N.E.** = Normally Energized **(1)** **N.D.** = Normally Deenergized **(1)**
		Op_R2	Operation mode output relay R2:	**N.E.** = Normally Energized **(1)** **N.D.** = Normally Deenergized **(1)**
❑ **Trip Level**	:	No Parameters		
❑ **Timers**	:	Maximum duration of the voltage lack to allow the instantaneous "Reacceleration" of the motor.		TR=(0.1-0.5)s, step 0.01s
		Maximum duration of the voltage lack to operate the "Restart" of the motor.		To=(0.1-5)s, step 0.1s
		Restart delay after To		T1=(0.1-40)s, step 0.01s

(1)

❑ **N.D.**	:	*Normally Energized*	The relay is Energized in normal conditions and gets Deenergized on command (Tripping of protection functions). Reset means Reenergized the relay.
❑ **N.E.**	:	*Normally Deenergized*	The relay is Deenergized in normal conditions and gets Energized on command (Tripping of protection functions). Reset means Deenergized the relay.

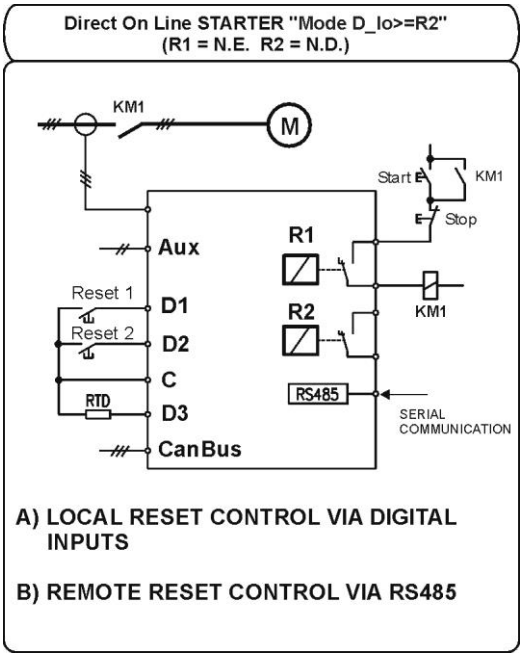
2.2.3.9.1 - " OpMode "

For selection of different operation modes of the Output Relays (R1, R2) and of the Digital Inputs (D1, D2).

Operation Mode "D Io>=R2"
(Direct-On-Line start with external motor control)**:**

Operation of output relays "R1" and "R2":

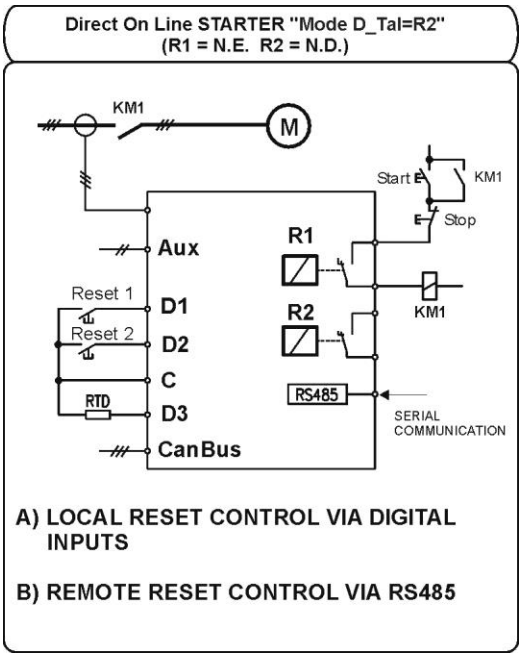
- **R1** Switches-over on tripping of any Protection Function except "Io>";
  Reset via "D1" or serial command.
- **R2** Switches-over on tripping of "Io>" only;
  Reset via "D2" or serial command.



Operation Mode "D Tal=R2"
(Direct-On-Line start with external motor control)**:**

Operation of output relays "R1" and "R2":

- **R1** Switches-over on tripping of any Protection Function except "Tal";
  Reset via "D1" or serial command.
- **R2** Switches-over on tripping of "Tal" only;
  Reset via "D2" or serial command.



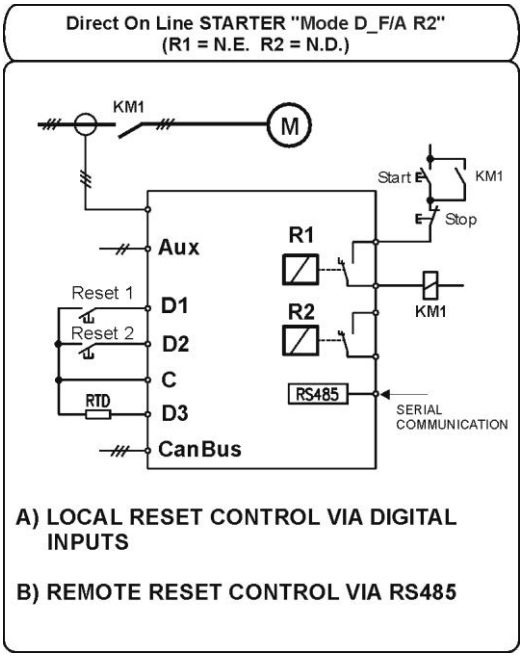
Reset of Output Relays an Signalizations

If the Digital Inputs controlling the reset are permanently shorted, the Reset takes place automatically as soon as the tripping cause is removed.
The signal Leds stay on until the motor is restarted or the Reset button is operated.
If the Digital Inputs controlling the reset are left open, output relays and signal leds are reset by the reset button.

Operation Mode "D F/A R2"
(Direct-On-Line start with external motor control)**:**

Operation of output relays "R1" and "R2":

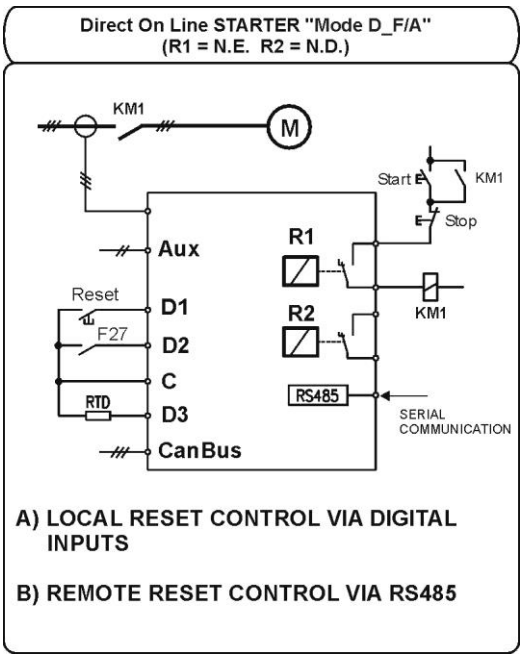
- **R1** Switches-over on trip of any Protection Function except "Tal";
  Reset via "D1" or serial command.
- **R2** Switches-over on tripping of any Protection Function (including "Tal");
  Reset via "D2" or serial command.



Operation Mode "D F/A"
(Direct-On-Line start with external motor control)**:**

Operation of output relays "R1" and "R2":

- **R1** Switch-over on trip of any Protection Function except "Tal";
  Reset can be controlled via "D1" or by the reset button.
- **R2** Switches-over on tripping of any Protection Function (including "Tal");
  Reset can be controlled via "D1" or by the reset button.



Operation of Digital Inputs "D1" e "D2":

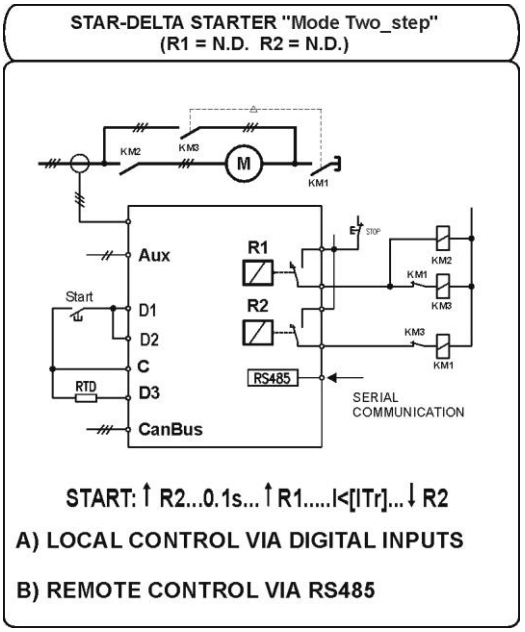
- **D1** Controls the reset of "R1" and "R2".
  "D1" can be operated either short-circuiting its physical terminals or by the serial command "Set D1".
- **D2** This digital input is used to receive the system Undervoltage signal by an external contact ("D2" Terminals shorted=Undervoltage).
  On voltage restoration, "D2" terminals change from closed to open-circuited; "D2" is reset and activates the following functionalities:
  - Trip inhibition of the Locked Rotor element for the time "2xtSt" (see § 2.2.3.5).
  - Start Sequence Transition at the end of the time "tTr" (see § 2.2.3.3).

  The N-DIN relay will not count a new motor starting and the signalization of motor On-Off does not operate (this is controlled by the current level).
  The Thermal Image and all other function are not affected by "D2".

Operation Mode "Two_Step"
(Automatic control of Reduced-Voltage Starter)**:**

Operation of output relays "R1" and "R2":

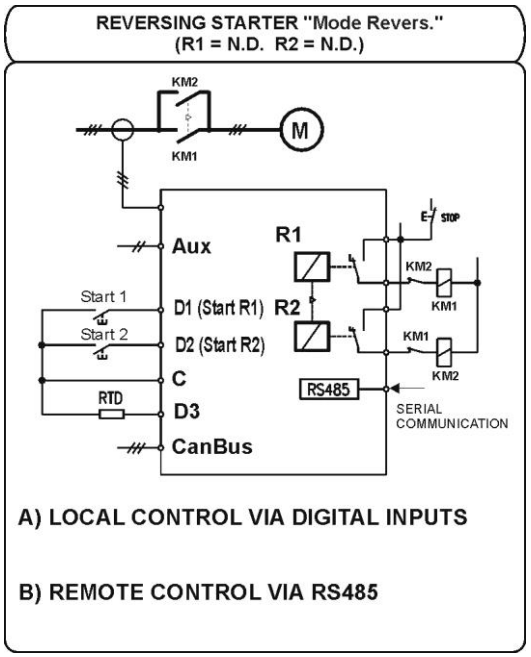
- **R1** On motor start command "R2" is switched-on instantaneously and "R1" after 0.1s. Is switched-off on tripping of protection Function or by the stop command.
- **R2** Is used for Star/Delta change-over; it is switched-off at the end of the Starting Sequence (see function "St.Seq").



Operation Mode "Revers."
(Control of Reversing motor through N-DIN)**:**

Operation of output relays "R1" and "R2":

- **R1** Switches-on start command by "D1" and reset on tripping or stop command.
- **R2** Switches-on start command by "D2" and reset on tripping or stop command.



Operation Mode "D_RA" (Direct-On-Line with automatic Reacceleration)**:**

- **R1** Switches-over on tripping of any Protection Function except "Tal".
- **R2** Operates in the Reacceleration Sequence and in the Automatic Operation mode.

- **D1** Enables the Automatic operation mode (D1=closed)
- **D2** Resets the Line Undervoltage alarm received from an external Undervoltage relay (Closed=Undervoltage)

- **Manual Operation ("D1" Open):**

  Motor Start — Is controlled only by an external contact in series with the contact of "R1".

  Motor Stop — Controlled either by External Stop or by Serial Stop command that deenergizes "R1" for 200ms.

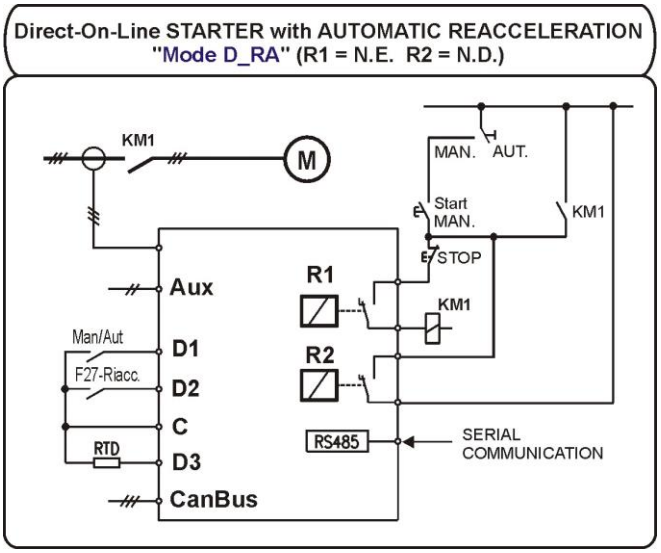
- **Automatic Operation ("D1" Closed - "Ctrl" = Remote)**

  Motor Start — Can be controlled via a serial command that energizes "R2" for 200ms. "R1" is normally energized as in the manual operation mode.

  Motor Stop — Controlled either by External Stop or via Serial command that deenergizes "R1" for 200ms.

Automatic Reacceleration

Reacceleration takes place using an external under voltage relay that controls the digital input "D2" or via the Undervoltage detection element provided in the (optional) EX-I/O Expansion Module.
The contact of the external U/V relay (open when the voltage is normal) closes on undervoltage and activates the Digital Input "D2".
If voltage loss is detected by the optional EX-I/O module, this directly activates "D2".



When line voltage loss is detected, the N-DIN-MA starts counting the time "t" during which the voltage loss remains:

- **If "t ≤ TR"** : *Reacceleration*:
  "R1" remains energized and, as soon as the voltage is restored, the motor is instantaneously restarted via the contact of "R2" (energized for 200ms).
- **If "TR < t ≤ To"** : *Restart*:
  When the voltage is restored, a second timer "T1" is started; when "T1" is expired, the N-DIN-MA automatically restarts the motor by closing the output relay "R2" (for 200ms).
  The motors powered by the same line are sequentially restarted according to the delay "T1" set on the relevant N-DIN-MA relay.
- **If "t > To"** : The motor has to be restarted by Local or Remote START Command.

Note:
"TR" can be adjusted from 0.1s to 0.5s, step 0.01s
"To" can be adjusted from 0.1s to 5s, step 0.01s
"T1" can be adjusted from 0.1s to 40s, step 0.1s

2.2.3.10 - RTD – F26 – Overtemperature protection (Digital Input D3)

A RTD probe in the motor can be connected to the relevant N-DIN input (terminals 6-7) to stop the motor in case overtemperature is detected.

❑ *Function Enable*	:	**Status**	Disable/Enable if disable the function is disactivated.

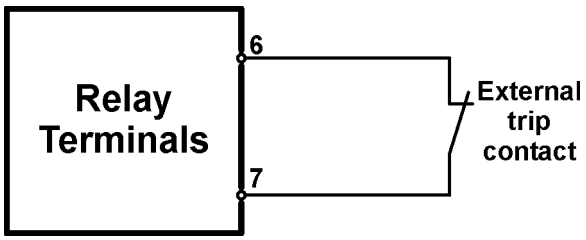
With reference to the resistance value " R " of the probe, measured at relay terminals, the operation limits are:

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).



2.2.3.11 - Load Profile

The Load Profile function, when activated, records the value of current " I " (largest of the 3 phase-currents absorbed by the motor) at any motor Start, at every time interval " tLP "
(tLP programmable 1 – 650 min, step 1min) during run and at motor stop.
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

The variable " OpIRF " available in the options of the " IRF " function (Internal Relay Failure Diagnostic, see § 2.2.5), 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^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; " I.R.F. " operation is memorized in the " Event Records ", "I.R.F." counter is incremented and, 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.

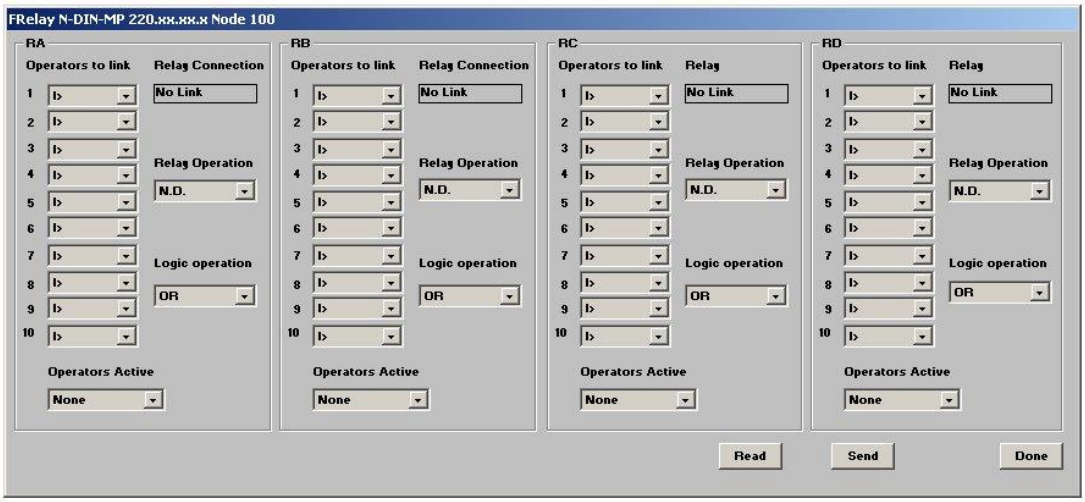
It is also present a supervision circuit that, in case a transient operation anomaly of the DSP is detected, produces a Reset to restore the normal operation and increment the counter "HR" (see § 6.5).

2.3 - EX/IO Module – Input/Output expansion

4 Output Relays and 5 Digital Inputs 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 MS-Com software through serial communication (see Operation Manual MSCom).

1) Press button 

2) The below Window will open:



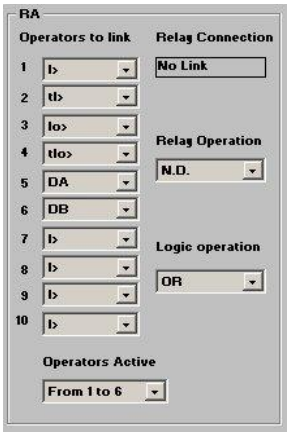
RA-RB-RC-RD	EX-I/O Output Relays.
Operator to link	To select the Functions / Digital Inputs to be associated to the output relay.
Relay Operation	*N.E.* = Normally Energized; *N.D.* = Normally Deenergized
Logic Operation	*OR* = Output relay activated when one OR more of the associated functions are activated. *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>, Io>, tIo>, ITr, tI<, I<, tLR, ILR, Stno, Ta, T>, tI2>, I2>, RTD, IRF.
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, F27, DA_NEG, Db_NEG, DC_NEG, DD_NEG, DE_NEG, F27_NEG.
Generic Trip	GENTRIP
Motor On	MOT_ON

3) Example:

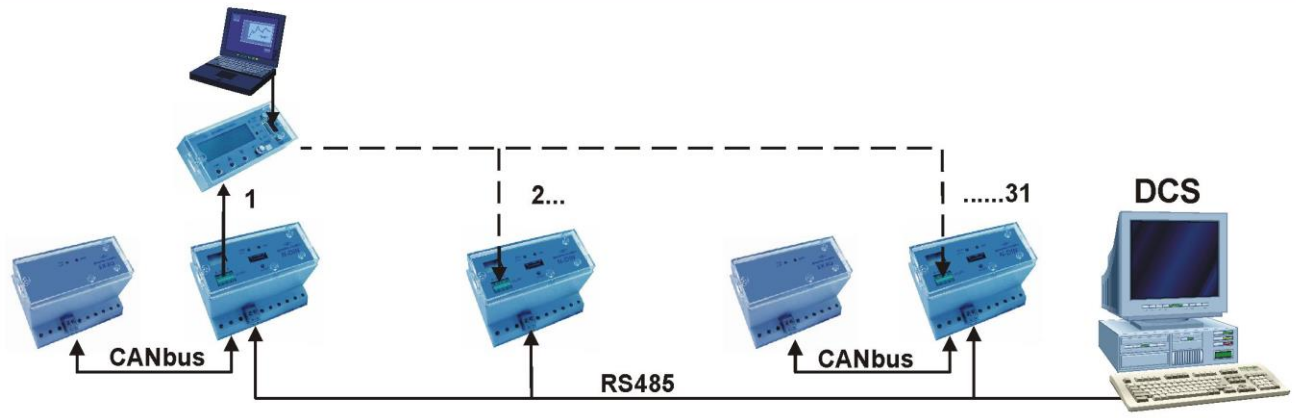
Output relay “RA” configurated to be energized if one or more Functions/Digital Inputs (“I> - tI> - Io> - tIo> - DA - DB”) are activated.

	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		

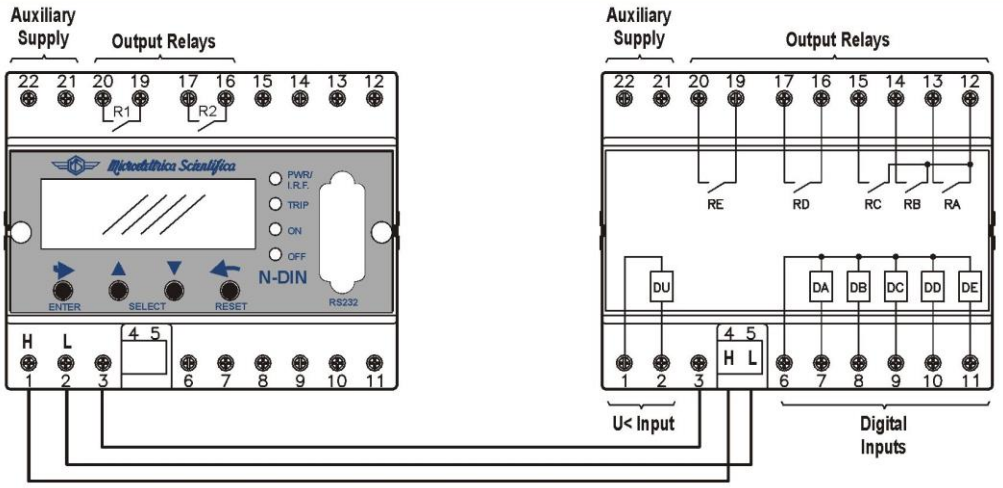


Note 1: N -DIN Output Relays R1 and R2 operate according to the selected operation mode (see § “ OpMode “)

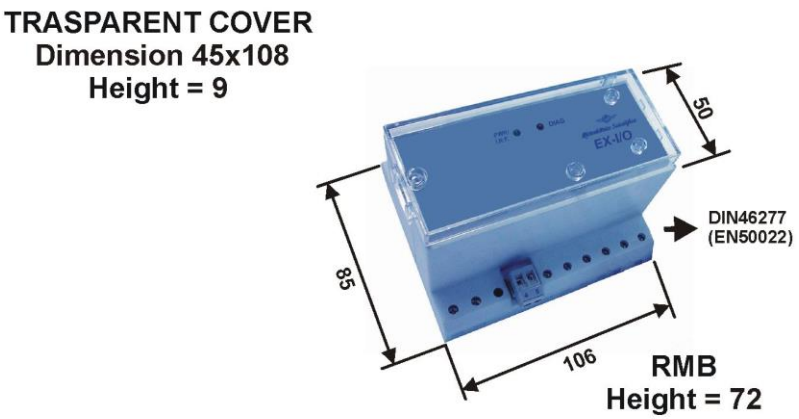
2.3.1 - Connection Example



2.3.2 - Connection Diagram

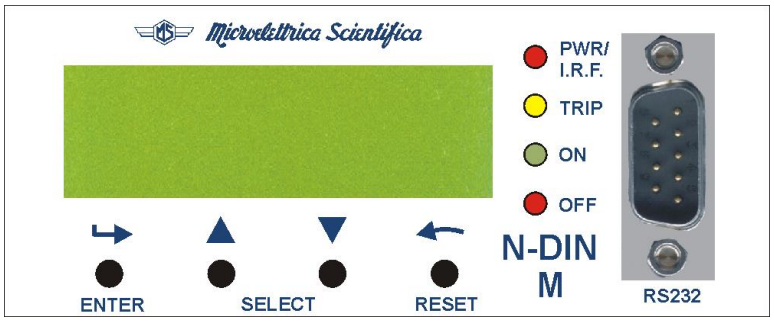


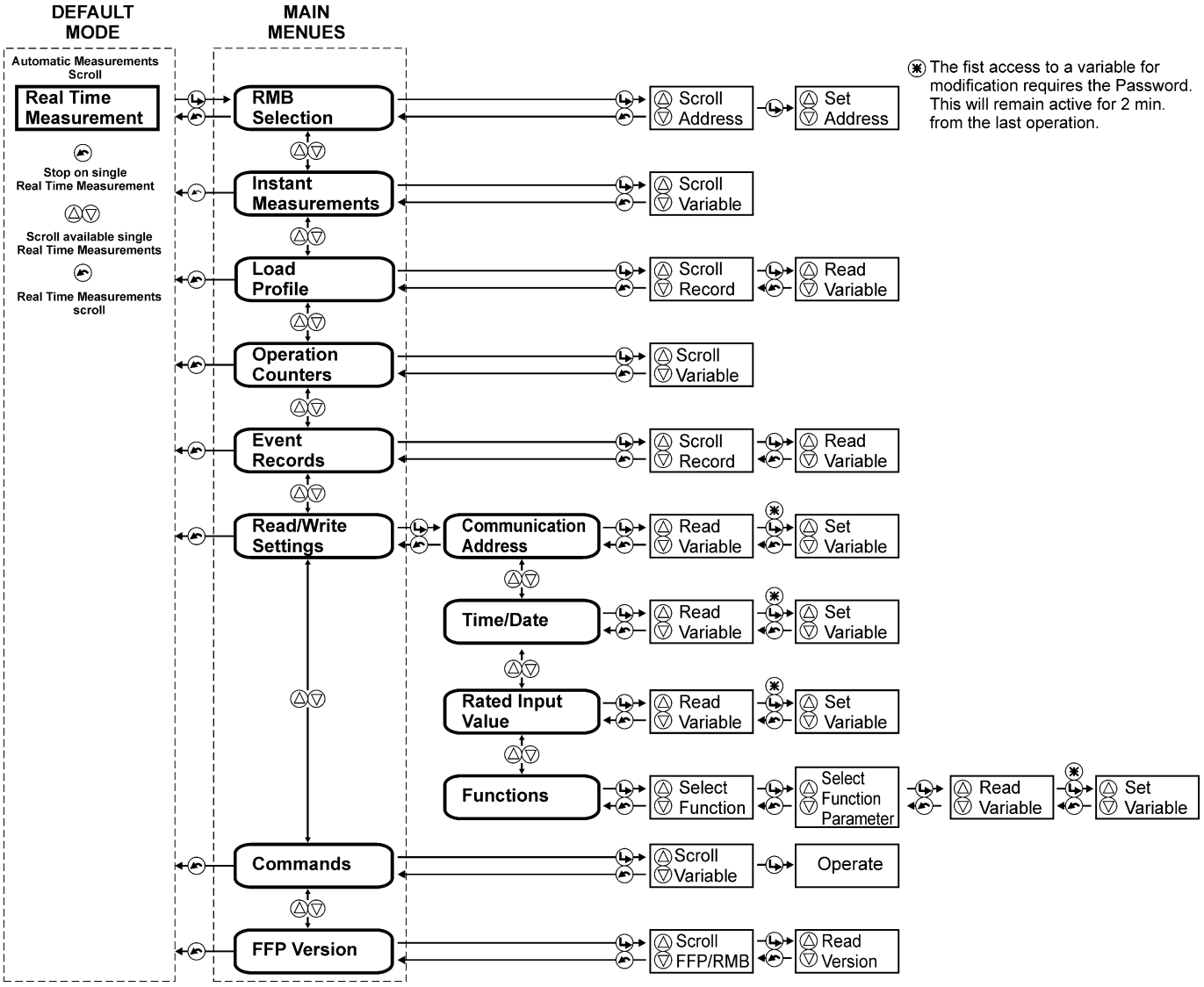
2.3.3 - Overall Dimensions (mm)



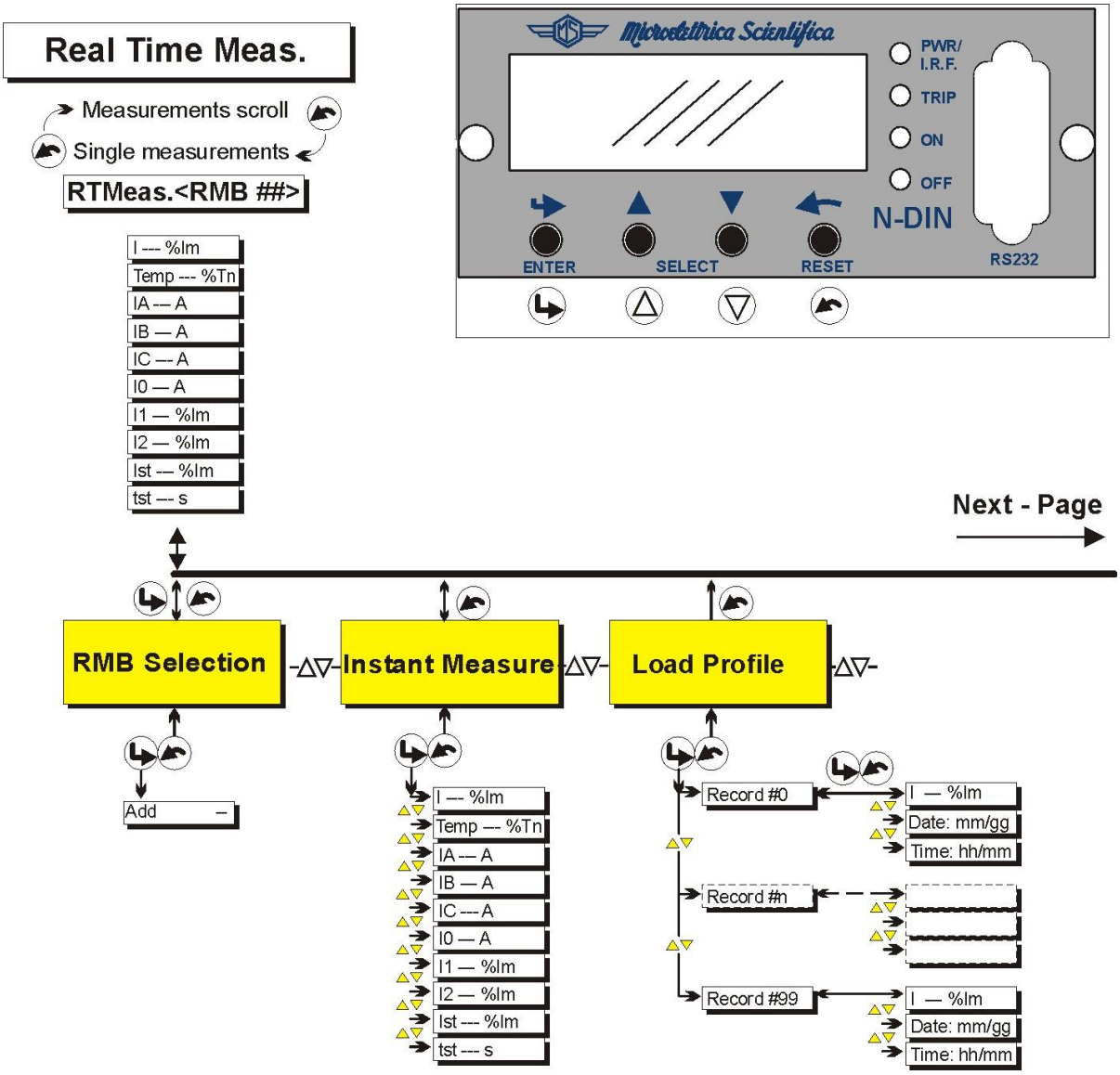
3. RELAY MANAGEMENT

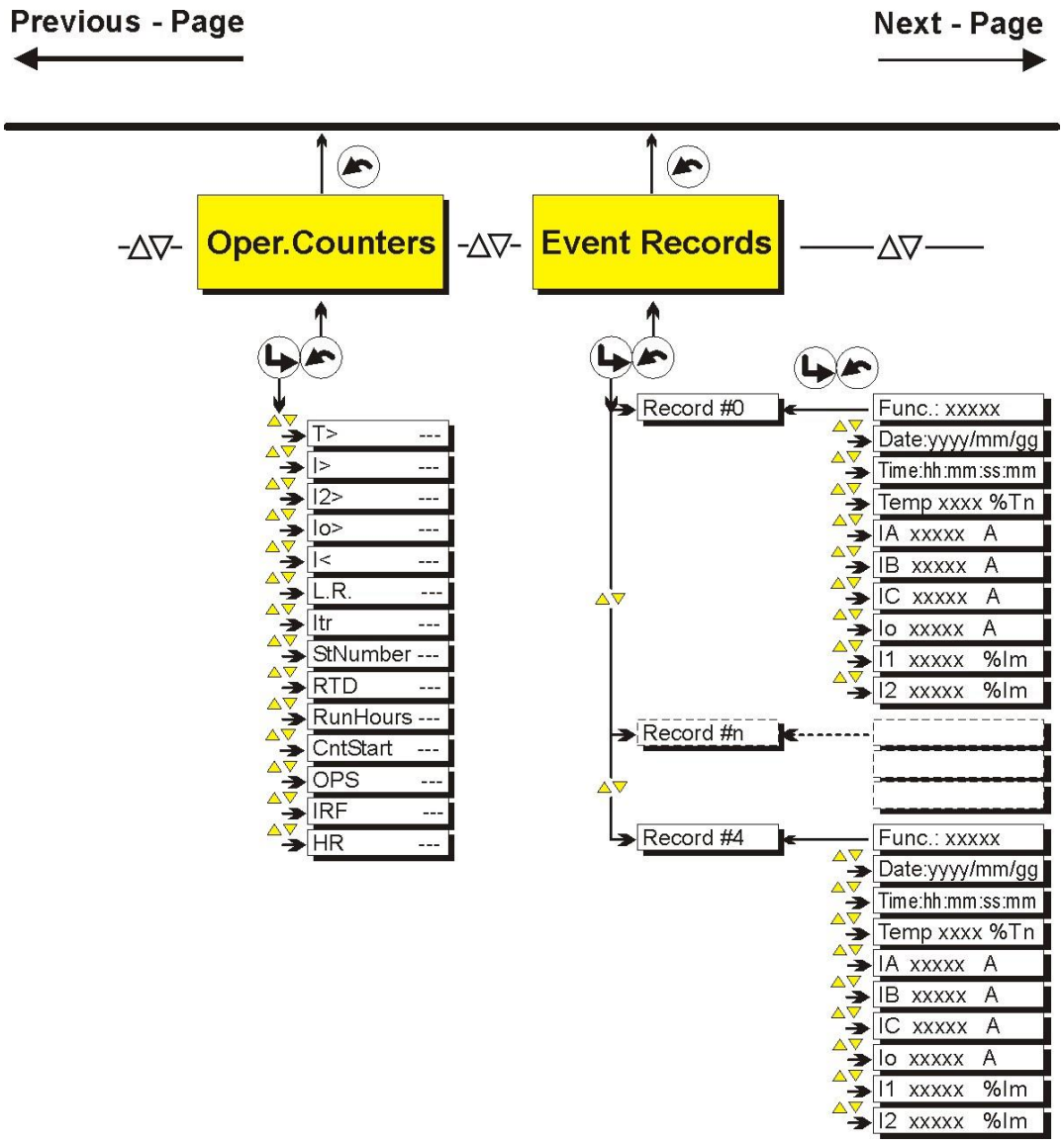
The relay can be totally managed either locally by the 4 key buttons and the LCD display or remotely either by a PC connected to the serial port on Front Face (RS232) and/or by the main serial communication bus RS485 connected to the RMB (see § 8).
The 2 line x 16 character LCD display the available information.
Key buttons operate according to the flow-chart herebelow.



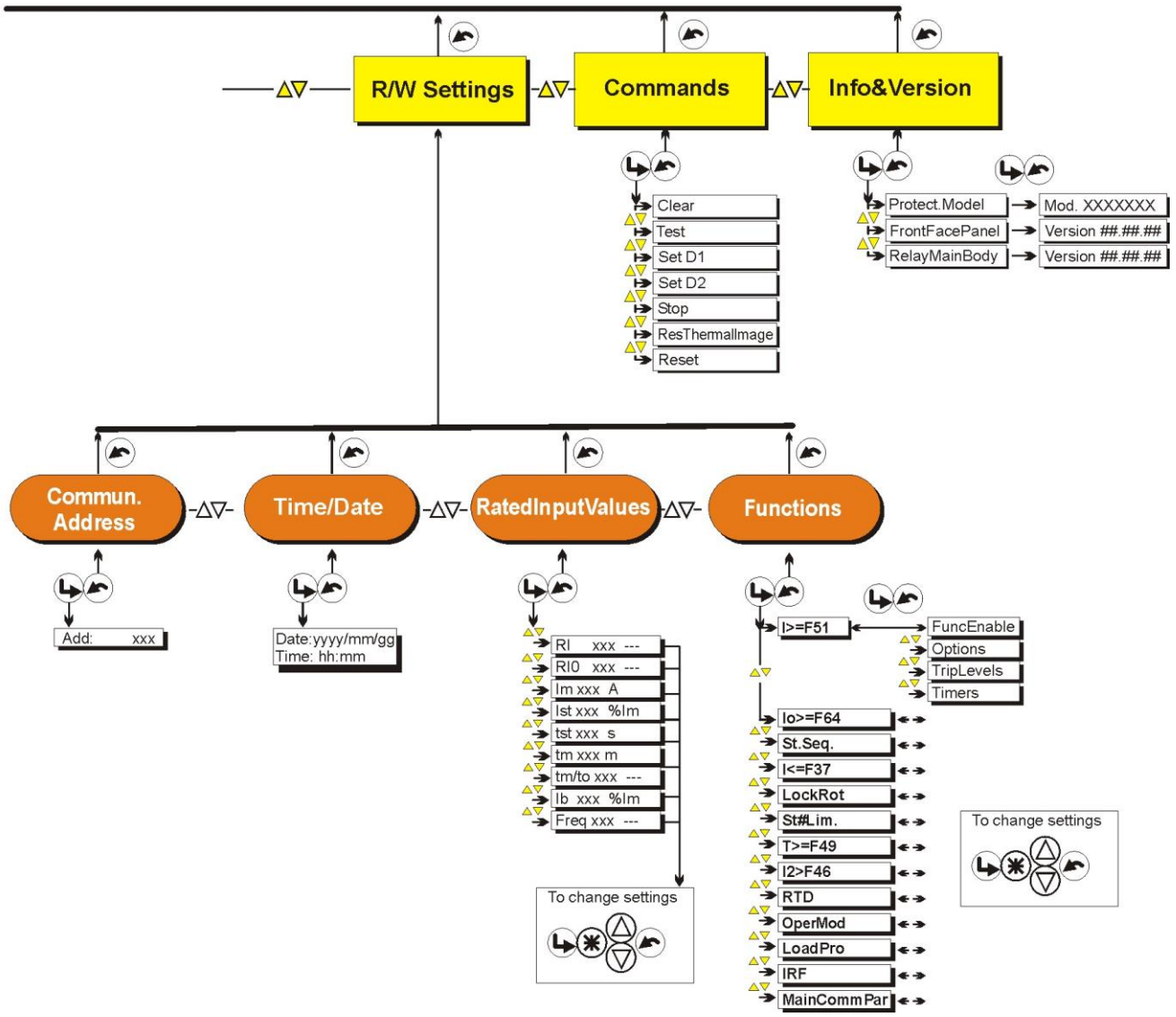


3.1 - Keyboard Operational Diagram



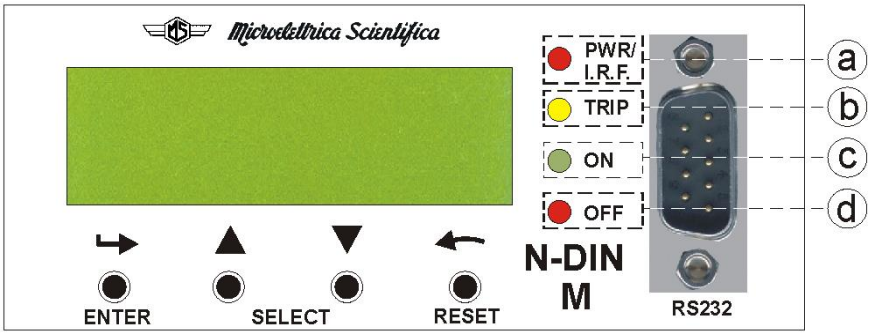

Previous - Page
Next - Page
Oper.Counters
Event Records
T> ---
I> ---
I2> ---
Io> ---
I< ---
L.R. ---
Itr ---
StNumber ---
RTD ---
RunHours ---
CntStart ---
OPS ---
IRF ---
HR ---
Record #0
Func.: xxxxx
Date:yyyy/mm/gg
Time:hh:mm:ss:mm
Temp xxxx %Tn
IA xxxxx A
IB xxxxx A
IC xxxxx A
Io xxxxx A
I1 xxxxx %Im
I2 xxxxx %Im
Record #n
Record #4
Func.: xxxxx
Date:yyyy/mm/gg
Time:hh:mm:ss:mm
Temp xxxx %Tn
IA xxxxx A
IB xxxxx A
IC xxxxx A
Io xxxxx A
I1 xxxxx %Im
I2 xxxxx %Im

Previous - Page



4. SIGNALIZATIONS

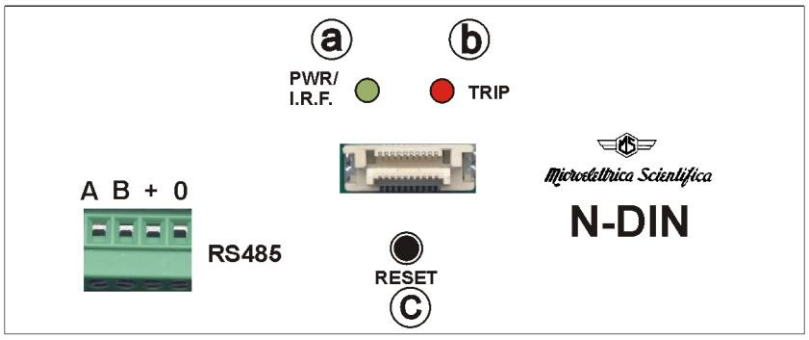
Four signal leds are available on the removable **F**ront **F**ace **P**anel (FFP):



a)	Red 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 or the motor heating exceeds the prealarm level " Tal ". ❑ Illuminated when any function was tripped, until motor is restarted or Reset button is pressed.
c)	Red LED	**ON**	❑ Illuminated when running motor status is detected. ❑ Flashing during " tBSt " or as long as restart is inhibited.
d)	Green LED	**OFF**	❑ Illuminated when steady motor status is detected.

The reset button on FFP, reset after tripping the Output Relays and the Trip Led when in the " D " operation modes; reset only the Trip Led in the " Two Steps " and " Revers. " operation modes.

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

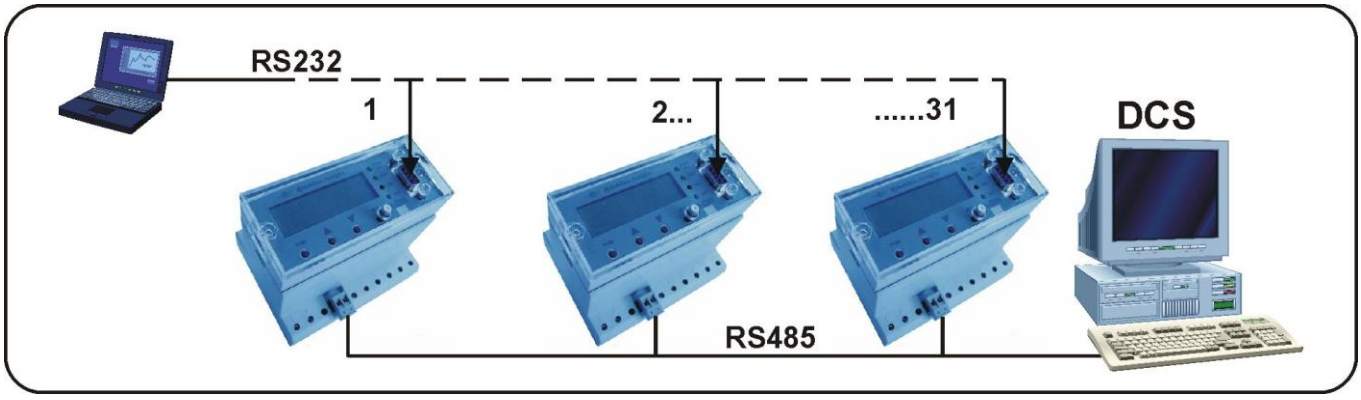


a)	Green LED	**PWR/ IRF**	❑ Illuminated during normal operation when Power Supply is ON. ❑ Flashing when a Relay Internal Fault is detected.
b)	Red LED	**TRIP**	❑ Flashing when a timed function has started to operate or the motor heating exceeds the prealarm level " Tal ". ❑ Illuminated when any function was tripped until motor is restarted or Reset button is pressed.
c)	Button	**RESET**	❑ To Reset after tripping the output relays and the trip signal led in the " D " operation mode (only Led reset in the operation modes " Two Steps " and " Revers. ".

5. SYSTEM CONFIGURATION OPTIONS

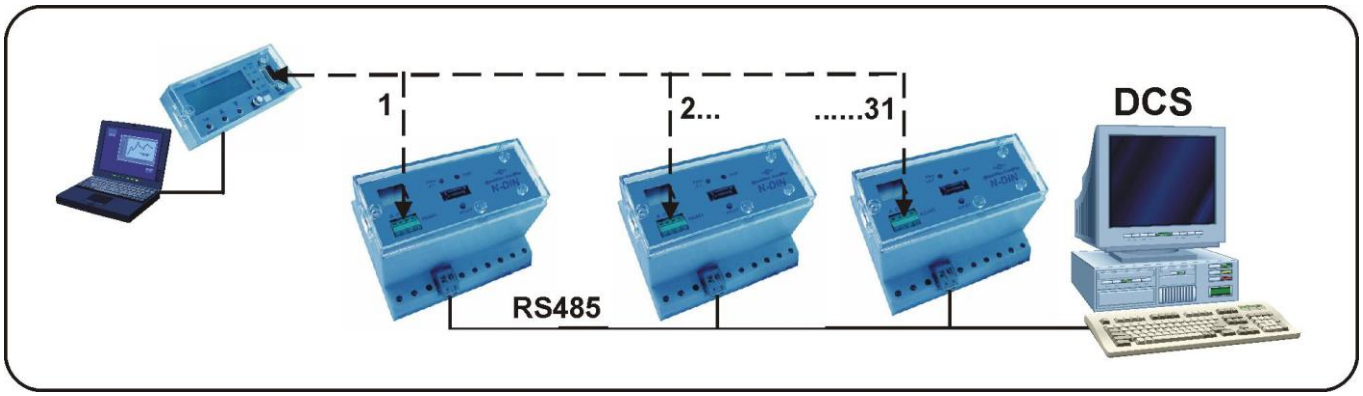
The relay N-DIN is constituted of two independent parts (**RMB** and **FFP**) that can be either used as stand-alone device or combined in different ways.
The FFP can be directly plug-in and fixed by two screws on one RMB or it can be remotely connected to one or more (up to 31) RMB by the relevant terminals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

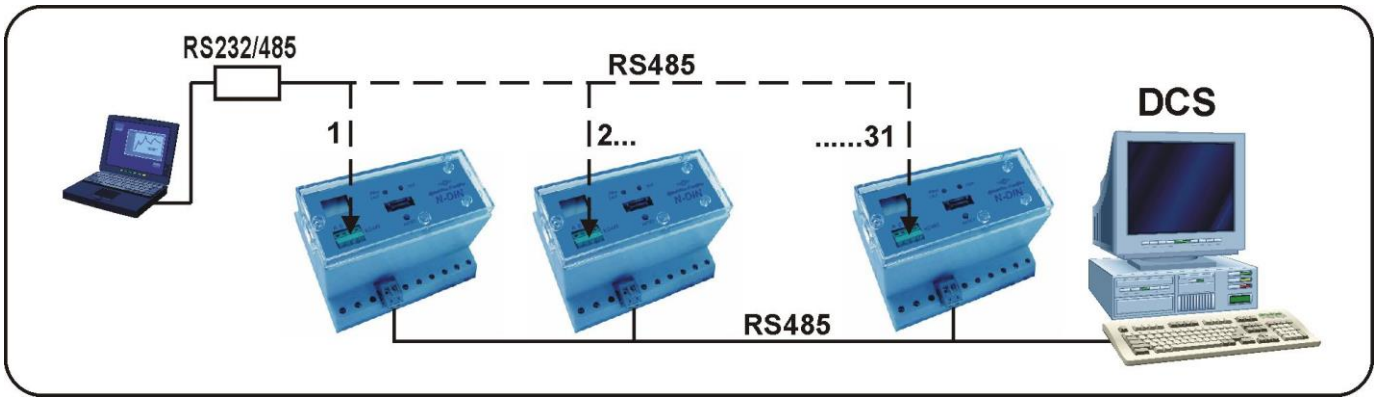


The **FFP** module can be mounted either directly on its **RMB** module or on the front panel of the board connected to the **RMB** by four wires (terminals A, B, +, 0).

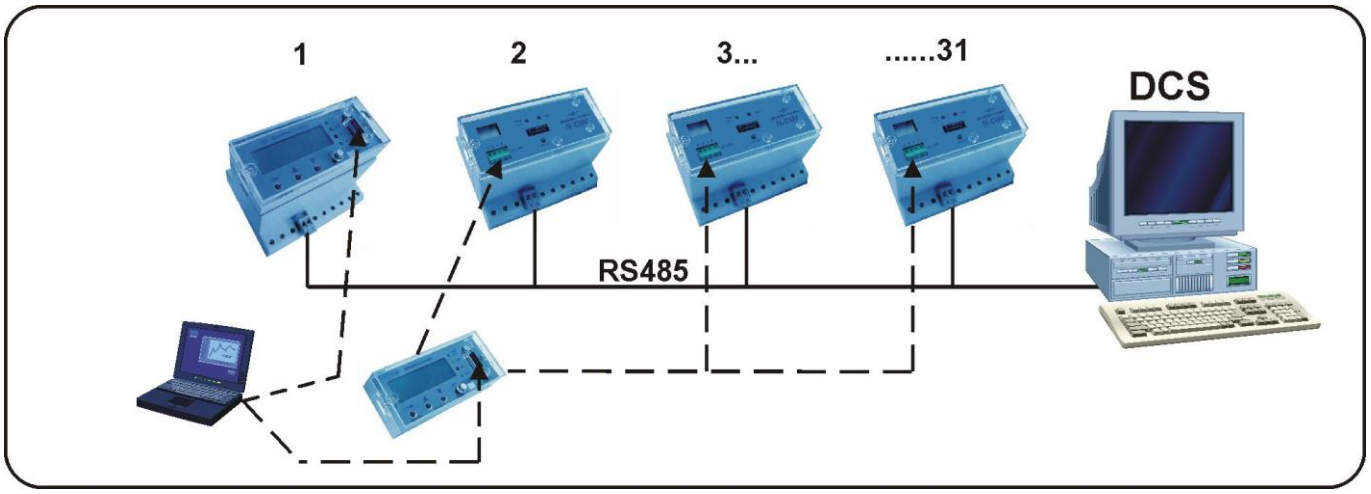
2) Use of up to 31 **RMB** modules managed by only one **FFP**.



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

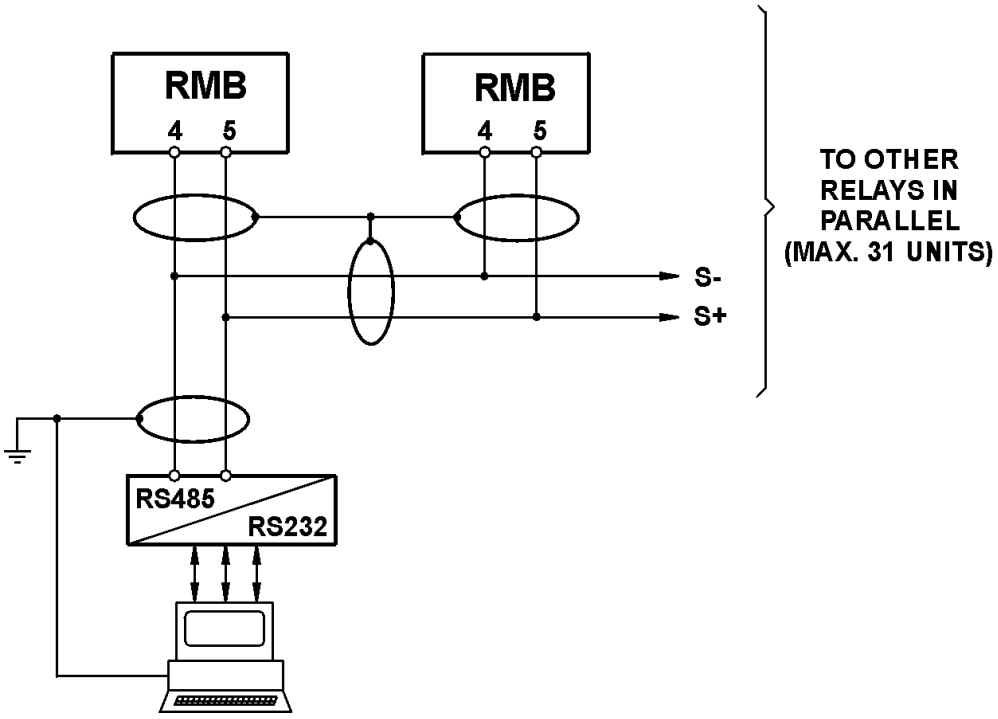
This port is accessible via the plug-in terminals " 4 – 5 " provided on the RMB.
It is used for connection to a serial bus interfacing up to 31 - N-DIN units with the Central Supervision System (SCADA, DCS, ecc).
The serial bus is a shielded pair of twisted cables connecting in parallel (Multi Drop) 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

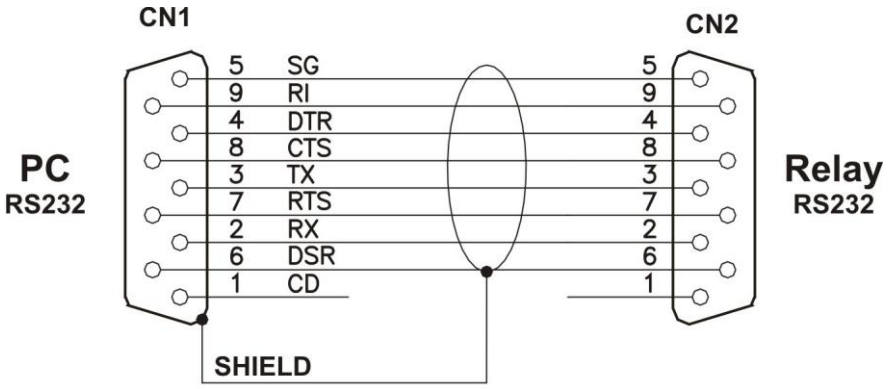


For longer distance and for connection of up , to 250 Relays, optical interconnection is recommend. (please ask Microelettrica for accessories)

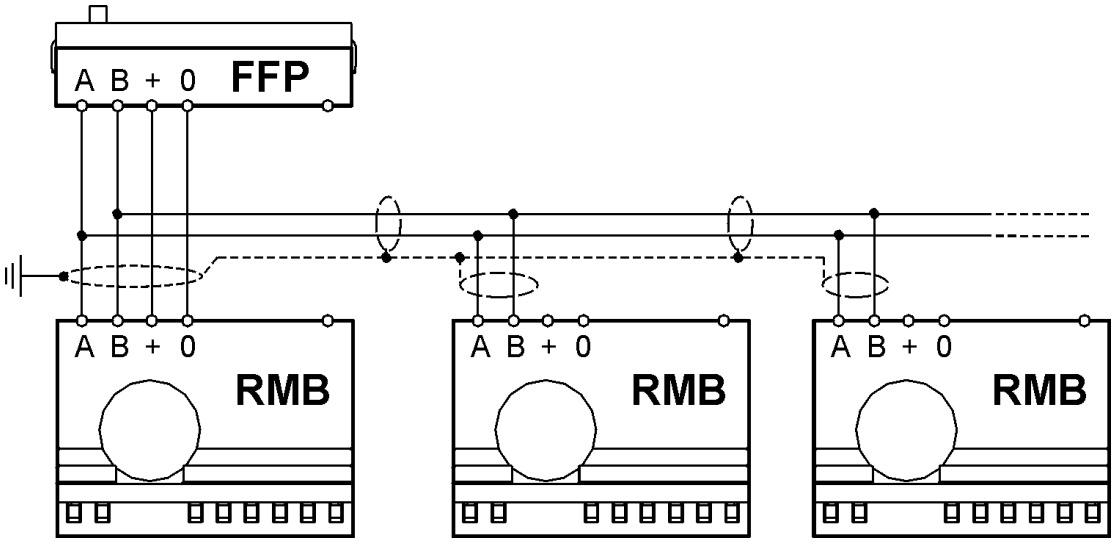
5.2 - Communication Port on Front Face Panel

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..



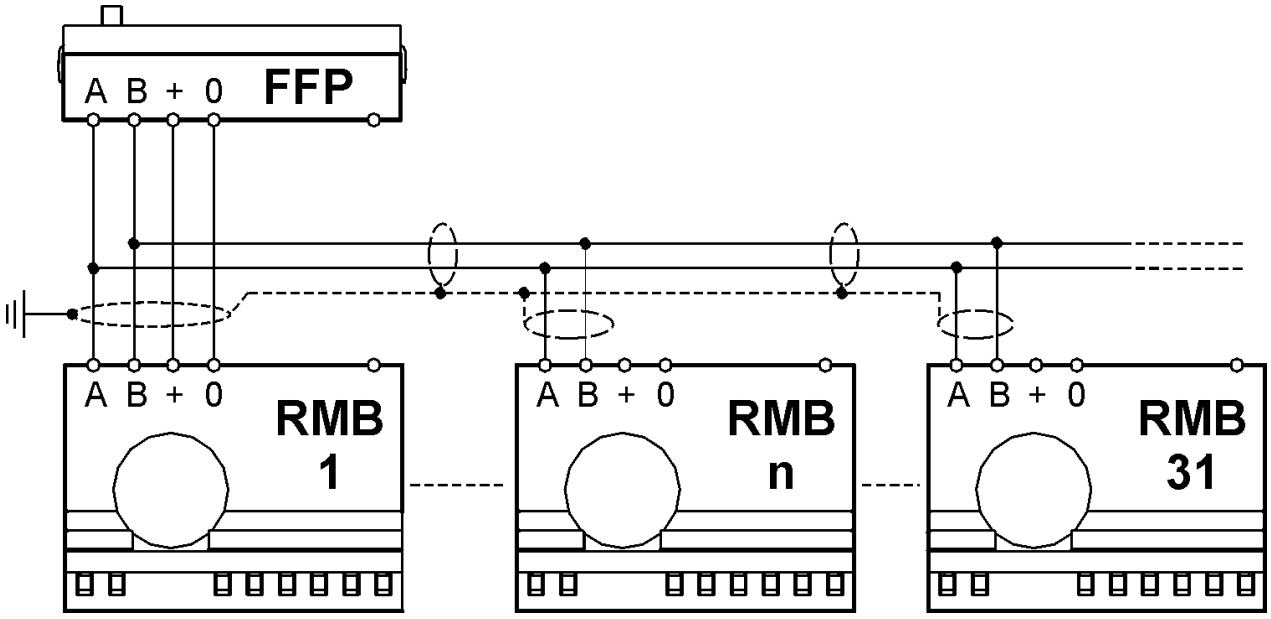
The connection between the " FFP " and the " RMB " (when FFP is removed) is made by four shielded twisted cables connected to the relevant terminals available on the back of the " FFP " and on the front of the " RMB ".All additional RMBs only need a pair of shielded twisted cables.



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.

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

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 - 99999.9	%Im	Largest of the 3 phase-currents (% of motor Full Load Current)
Temp	=	0 - 99999.9	%Tn	Motor thermal status (% of motor steady F.L.Temp)
IA	=	0 - 99999.9	A	RMS value of Phase A current
IB	=	0 - 99999.9	A	RMS value of Phase B current
IC	=	0 - 99999.9	A	RMS value of Phase C current
Io	=	0 - 99999.9	A	RMS value of Zero Sequence Current (RMS Primary Amps)
I1	=	0 - 99999.9	%Im	Positive Sequence Current (% of motor F.L. current)
I2	=	0 - 99999.9	%Im	Negative Sequence Current (% of motor F.L. current)
Ist	=	0 - 99999.9	%Im	Motor start-up current (% of motor F.L. current)
Tst	=	0 - 99999.9	s	Motor start-up time

6.4 - Load Profile

The relay can record the measurement of the motor current " I " (largest of the 3 phase currents) at programmable time intervals " tLP " – the circular memory (FIFO) can store up to 100 records, each including:

- " Real Time Meas " →
- △▽ " Load Profile " →
- → 1st record,
- △▽ to scroll available records,
- → to " Record # " selected,
- △▽ to select the different fields;

Display				Description
I	=	0 - 99999.9	%Im	Largest of the 3 phase-currents (% of motor 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 motor is started or stopped.
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 Overcurrent (Short Circuit) trip
I2>	=	0 – XXXXXX	Number of Unbalance / Single Phasing trip
Io>	=	0 – XXXXXX	Number of Earth Fault trip
I<	=	0 – XXXXXX	Number of No Load Running trip
L.R.	=	0 – XXXXXX	Number of Locked Rotor trip
Itr	=	0 – XXXXXX	Number of Start-up time too long trip
StNumber	=	0 – XXXXXX	Number of Excess of consecutive starts trip
RTD	=	0 – XXXXXX	Number of External Termistor trip
Run Hours	=	0 – XXXXXX	Number of Motor running hours
CNTStart	=	0 – XXXXXX	Number of Consecutive Startings accumulated
OPS	=	0 – XXXXXX	Number of Motor starts
I.R.F.	=	0 – XXXXXX	Number of Internal Relay Faults
HR	=	0 – XXXXXX	Number of Hardware Restore (see § 2.2.5 selfdiagnostic)

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>** = Overcurrent (Short Circuit) - **I2>** = Unbalance / Single Phasing - **Io>** = Earth Fault - **I<** = No Load Running - **L.R.** = Locked Rotor - **Itr** = Start-up time too long - **StNumber** = Excess off consecutive starts - **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 – 99999.9	**%Tn**	Motor thermal status (% of motor steady F.L. Temp)
IA	=	0 – 99999.9	**A**	RMS value of phase A current (% of motor Full Load Current)
IB	=	0 – 99999.9	**A**	RMS value of phase B current (% of motor Full Load Current)
IC	=	0 – 99999.9	**A**	RMS value of phase C current (% of motor Full Load Current)
Io	=	0.0 – 99999.9	**A**	RMS value of Zero Sequence Current
I1	=	0 – 99999.9	**%Im**	Positive Sequence Current
I2	=	0 – 99999.9	**%Im**	Negative Sequence Current

- ↶ to go back to " Record # ",
- ↶ to go back to " Real Time Meas ".

6.7 - Programming / Reading The Relay Settings

- → " 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 § 10)
- △▽ 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
RI	100	-	Ratio of the phase C.Ts. (Ip/Is)	1 - 6500.0	0.1	-
RIo	100	-	Ratio of the C.Ts. or of the tore C.T. detecting earth fault current.	1 - 6500.0	0.1	-
Im	100	**A**	Motor full-load current	1 - 6500.0	0.1	A
Ist	500	**%Im**	Motor start-up current (% of motor full load current)	50 - 999.0	1	%Im
tst	5	**s**	Motor starting time	1 - 120.0	1	s
tm	15	**m**	Motor warming-up time constant	1 - 60.0	1	m
to/tm	3	**-**	Steady/Running Motor time constant ratio	1 - 10.0	1	-
Ib	105	**%Im**	Maximum admissible continuous overload	100 - 130.0	1	%Im
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)		
I>=F51	**FuncEnable**	→	**Status:**	Enable		Enable of the protection function	Enable/Disable	-
	Options	→	No Parameters					
	TripLevels	→	**I>**	900	**%Im**	Trip level of overcurrent protection	100 – 999	1
	Timers	→	**tI>**	0.1	**s**	Trip time delay	0.05 – 9.99	0.01

Display						Description	Setting Range	Step
Function	Type		Variable	Default Value	Unit			
Io>=F64	FuncEnable	→	Status:	Enable		Enable of the protection function	Enable/Disable	-
	Options	→	No Parameters					
	TripLevels	→	Io>	50	mAs	Trip level of Earth Fault protection	20-9999	1
	Timers	→	tIo>	0.5	s	Trip time delay	0.05-9.99	0.01
St.Seq.	FuncEnable	→	Status:	Disable		Enable of the protection function	Enable/Disable	-
	Options	→	No Parameters					
	TripLevels	→	Itr	100	%In	Switch-over current for two step motor starter control	10-999	0.1
	Timers	→	tTr	7	s	Maximum switch over time delay	0.1-60	0.1
I<=F37	FuncEnable	→	Status:	Disable		Enable of the protection function	Enable/Disable	-
	Options	→	No Parameters					
	TripLevels	→	I<	20	%Im	Trip level of the No Load Running protection	10-100	1
	Timers	→	tI<	6	s	Trip time delay	0.1-60	0.1
LockRot	FuncEnable	→	Status:	Enable		Enable of the protection function	Enable/Disable	-
	Options	→	No Parameters					
	TripLevels	→	ILR	200	%Im	Current level for locked Rotor trip	50-500	1
	Timers	→	tLR	2	s	Trip time delay of Locked Rotor protection	1-60	1
St#Lim.	FuncEnable	→	Status:	Disable		Enable of the protection function	Enable/Disable	-
	Options	→	No Parameters					
	TripLevels	→	StNo	10	-	Maximum N° of starting allowed in the time tSt	1-60	1
	Timers	→	tStNo	60	m	Time in to which StNo are counted	1-60	1
			tBst	10	m	Restart inhibition time after StNo is exceeded	1-60	1
T>=F49	FuncEnable	→	Status:	Enable		Enable of the protection function	Enable/Disable	-
	Options	→	No Parameters					
	TripLevels	→	Tal	90	%Tn	Prealarm Motor Temperature rise (% of Full Load temp. rise)	50-110	1
			Tst	100	%	Motor restart enable temperature	10-100	1
	Timers	→	No Parameters					
I2>=F46	FuncEnable	→	Status:	Enable		Enable of the protection function	Enable/Disable	-
	Options	→	No Parameters					
	TripLevels	→	I2>	20	%Im	Trip level of current unbalance protection	10-99	1
	Timers	→	tI2>	6	s	Trip time delay	0-60	0.1
RTD	FuncEnable	→	Status:	Disable		Enable of the protection function	Enable/Disable	-
	Options	→	No Parameters					
	TripLevels	→	No Parameters					
	Timers	→	No Parameters					
Oper Mod	FuncEnable	→	No Parameters					
	Options	→	OpMod	D Io>=R2		D Io>=R2 D.O.L. with Io> assigned to R2	D Io>=R2 D Ta=R2 Two_Step Revers. D_RA D F/A R2	-
						D Tal=R2 D.O.L. with Tal assigned to R2		
						Two_Step 2-step reduced voltage start control.		
						Revers. Reversing starter		
						D_RA D.O.L. with Automatic Reacceleration		
						D F/A R2 D.O.L. with all functions assigned to R1 and to R2		
						D F/A D.O.L. with all functions assigned to R1 and to R2 and F27 control		
			Ctrl	Local		Control mode Local / Remote (via serial)	Local – Remote	-
			Op_R1	N.D.		N.D. Normally Deenergized /N.E. Normally Energized	N.D. / N.E	-
			Op_R2	N.D.		N.D. Normally Deenergized /N.E. Normally Energized	N.D. / N.E	-
	TripLevels	→	No Parameters					
	Timers	→	TR	0.2	s	Maximum duration of the voltage lack to allow the instantaneous “Reacceleration” of the motor	0.1 -0.5	0.01
			To	5	s	Maximum duration of the voltage lack to operate the “Restart” of the motor.	0.1-5	0.1
			T1	5	s	Restart delay after To	0.1-40	0.1
LoadPro	FuncEnable	→	Status:	Enable		Enable of the protection function	Enable/Disable	-
	Options	→	No Parameters					
	TripLevels	→	No Parameters					
	Timers	→	tLP	30	m	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 failure	NoTrip – Trip	-
	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.

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 D1	:	Remote control of Digital Input D1 (Not Working in the Operation Mode D_RA)
Set D2	:	Remote control of Digital Input D2
Stop	:	Deenergized Relays R1&R2 in the operation modes " Two Step " and or " Revers. "
Reset Thermal Image	:	Erase thermal memory content
Reset	:	Reset after trip of R1&R2 in the operation mode " D " only

6.9 - Firmware Version

The menu displays the Model Relay and 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 - MSCom 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.

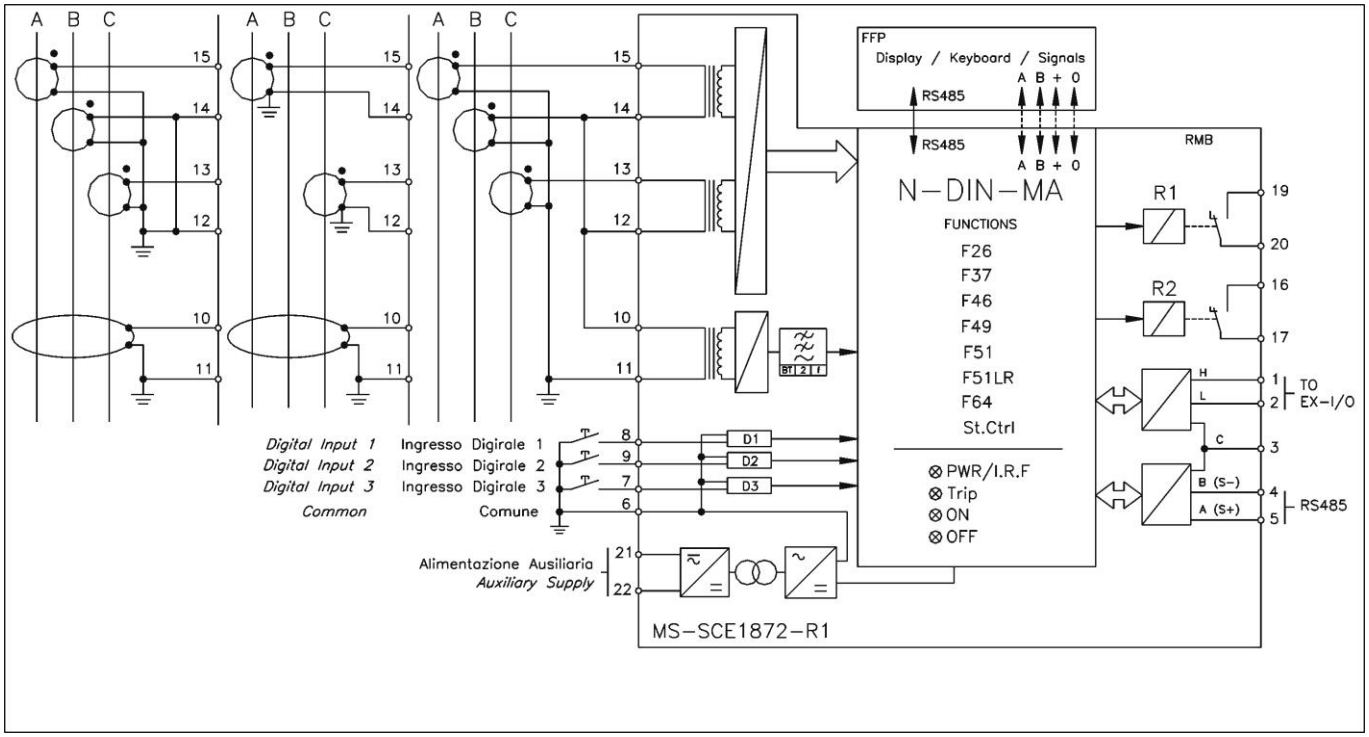
8. MAINTENANCE

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.

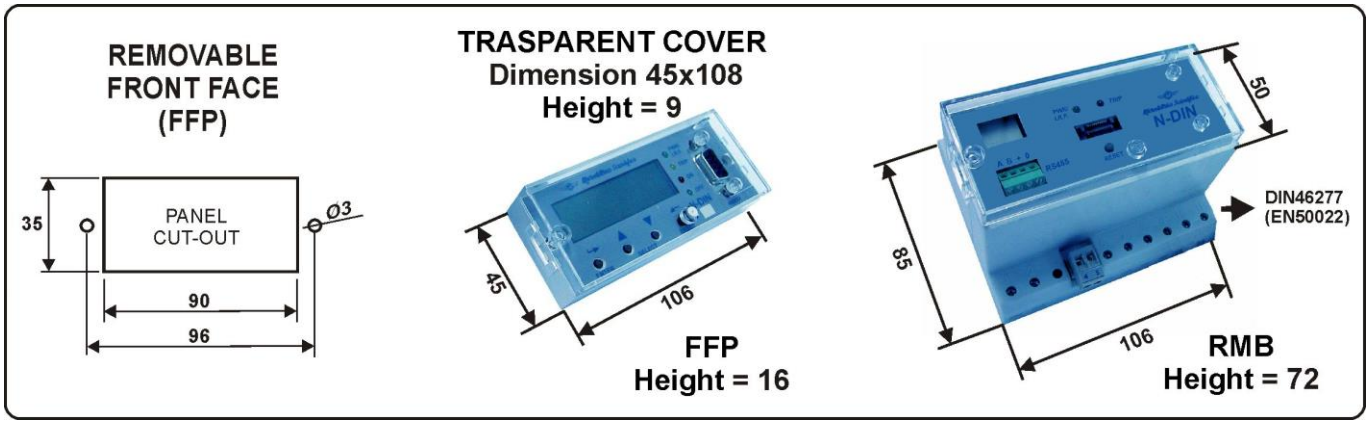
9. POWER FREQUENCY INSULATION TEST

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.

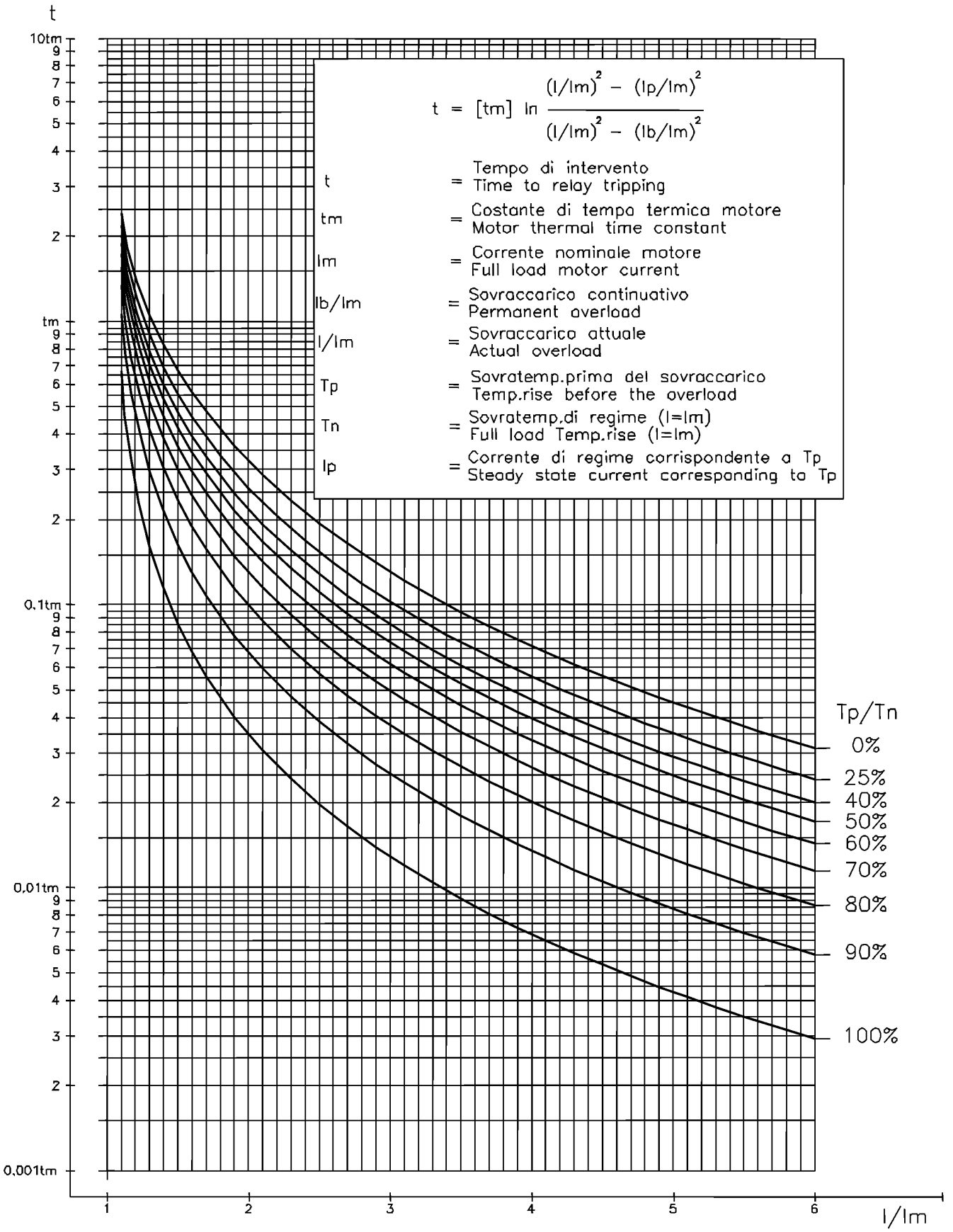
2) To remove FFP from RMB loosen the two screws and pull-out.

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 (TU0249 Rev.1)



13. 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 60068)					
❑ Operation ambient temperature		-10°C / +55°C			
❑ Storage temperature		-25°C / +70°C			
❑ Environmental testing	(Cold)	IEC60068-2-1			
	(Dry heat)	IEC60068-2-2			
	(Change of temperature)	IEC60068-2-14			
	(Damp heat, steady state)	IEC60068-2-78	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	level 3	80-2000MHz	10V/m
		ENV50204		900MHz/200Hz	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	
❑ Immunity to conducted common mode disturbance 0Hz-150Kz		IEC61000-4-16	level 4		
❑ 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			
CHARACTERISTICS					
❑ Accuracy at reference value of influencing factors		2% In 0,2% On 2% +/- 20ms	for measure 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 – 9600/19200bps –8,N,1 - 8,O,1 - 8,E,1 – Modbus RTU			
❑ FFP		RS232 – 9600bps – 8,N,1 – Modbus RTU			

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