MICROELETTRICA SCIENTIFICA
MILANO   ITALY

MM30

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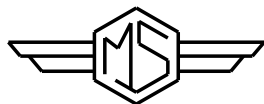# MICROPROCESSOR
MOTOR PROTECTION RELAY
TYPE MM30

OPERATION MANUAL

SPECIAL EXECUTION
MM30LT
VERSION 2.00

$C\epsilon$

1	Mod.431					
		30-07-97	P.Brasca	D.Abad	
0	EMISSION	01-07-96	P.Brasca	D.Abad	
REV.	**DESCRIPTION**	**DATE**	**PREP.**	**CONTR.**	**APPR.**

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 on the modules can be
seriously damaged by electrostatic voltage discharge which can be experienced when handling
the modules.
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 (15 KV IEC 255.22.2) when housed in
their case; withdrawing the modules without proper cautions expose them to the risk of damage.

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a. Before removing a module, ensure that you are at the same electrostatic potential as the equipment by touching the case.

b. Handle the module by its front-plate, frame, or edges of the printed circuit board. Avoid touching the electronic components, printed circuit tracks or connectors.

c. Do not pass the module to any person without first ensuring that you are both at the same electrostatic potential. Shaking hands achieves equipotential.

d. Place the module on an antistatic surface, or on a conducting surface which is at the same potential as yourself.

e. Store or transport the module in a conductive bag.

More information on safe working procedures for all electronic equipment can be found in BS5783 and IEC 147-OF.

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 altered or replaced.
For repair please ask the Manufacturer or its authorised Dealers.

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

2. GENERAL CHARACTERISTICS

Input currents are supplied to 3 current transformers: - two measuring phase current (the third current is computed as vector sum of the two others) - one measuring the earth fault zero-sequence current.
Phase current rated input can be 1 or 5A (Selectable by movable bridges an relay card)
For zero-sequence current taps for 1A and 5A input are provided on relay's terminal board.
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.
The auxiliary power is supplied by a built-in interchangeable module fully isolated an self protected.

2.1 – POWER SUPPLY

The relay can be fitted with two different types of **power supply** module :

a) - $\begin{cases} \textbf{24V(-20\%) / 110V(+15\%) a.c.} \\ \\ \textbf{24V(-20\%) / 125V(+20\%) d.c.} \end{cases}$ b) - $\begin{cases} \textbf{80V(-20\%) / 220V(+15\%) a.c.} \\ \\ \textbf{90V(-20\%) / 250V(+20\%) d.c.} \end{cases}$
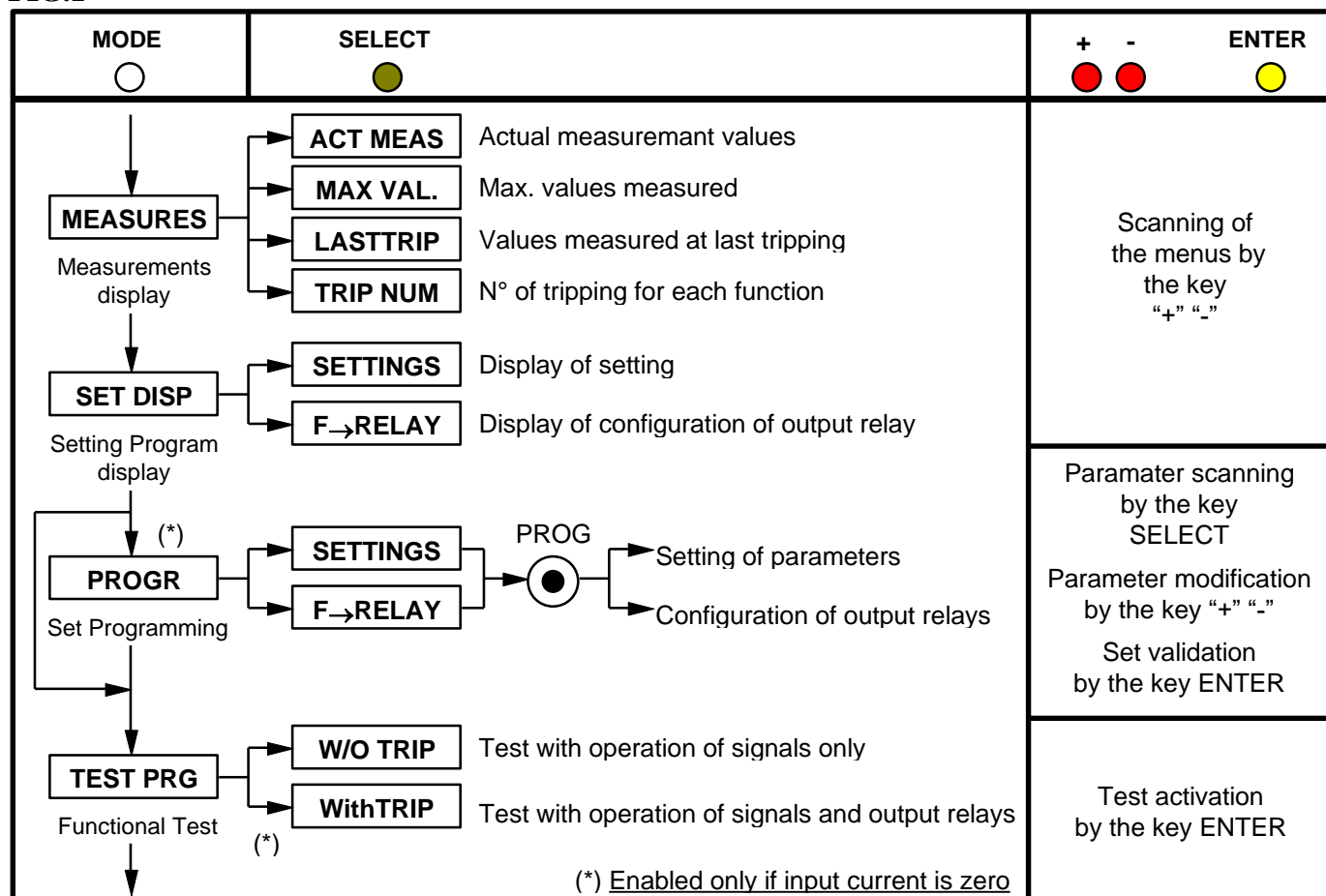
Before energising the unit check that supply voltage is within the allowed limits.

3. CONTROLS AND MEASUREMENTS

Five key buttons allow for local management of all relay's functions.
A 8-digit high brightness alphanumerical display shows the relevant readings (**xxxxxxx**)
(see synoptic table fig.1)

FIG.1

MODE ◯	SELECT ●		+ - ENTER ● ● ◯
MEASURES Measurements display	**ACT MEAS** → Actual measuremant values **MAX VAL.** → Max. values measured **LASTTRIP** → Values measured at last tripping **TRIP NUM** → N° of tripping for each function		Scanning of the menus by the key "+" "-"
SET DISP Setting Program display	**SETTINGS** → Display of setting **F→RELAY** → Display of configuration of output relay		
PROGR (*) Set Programming	**SETTINGS** **F→RELAY**	PROG ● → Setting of parameters → Configuration of output relays	Paramater scanning by the key SELECT Parameter modification by the key "+" "-" Set validation by the key ENTER
TEST PRG Functional Test	**W/O TRIP** → Test with operation of signals only **WithTRIP** → Test with operation of signals and output relays (*)		Test activation by the key ENTER

(*) <u>Enabled only if input current is zero</u>

Pressing this button progressively selects between Measurements Display, Setting Display, Programming, and Test modes

The SELECT button chooses which category of values within the chosen mode to display

When in Program mode, this button stores the newly selected value. If not in Program mode and the relay has tripped, this button resets the relay and all output contacts. If not tripped, this button restores the default display.
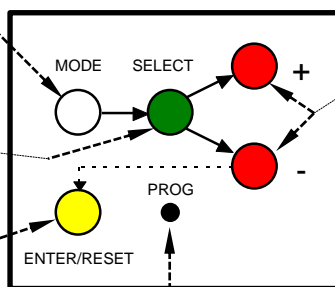
The + and - buttons are used to select the actual measurement or display desired when in Measurements Display or Settings Display modes. When in Program mode, these buttons increase or decrease the value of the displayed setting.

When in Program mode, and when all input currents are zero, pressing this recessed button places the relay into active programming mode, allowing any or all of the relays settings to altered.

MODE   SELECT   +   -   PROG   ENTER/RESET

4. SIGNALIZATIONS

Eight signal leds (normally off) are provided:

a) Red LED Θ> : Flashing when the motor heating T overcomes the set alarm level [Ta]. Illuminated on overtemperature trip.

b) Red LED **St N°** : Illuminated on tripping of the element for limitation of the number of startings.

c) Red LED **I<** : Flashing as soon as motor current drops below the set level [I<] Illuminated at the end of trip time delay (3 sec).

d) Red LED **Is>** : Flashing as soon as motor unbalance overpasses the set level [Is>] Illuminated on trip after delay [tIs>].

e) Yellow LED **ROTOR-STALL** : Flashing (after twice the starting time) when motor current overpasses the set level [ILR]; Illuminated on trip (1 sec delay).

f) Red LED **I>>** : Flashing when motor current is above the set level [I>] Illuminated on trip after delay [tI>].

g) Red LED $\frac{\text{W}}{\underline{\underline{=}}}$: Flashing when earth fault current is above the set level [O>] Illuminated on trip after delay [tO>].

h) Yellow LED **START INHIBIT** : Flashing when motor temp. is above the set restart level [Ts] or after StNo trip during the set waiting time [tBst]. Illuminated when in PROGRAM MODE or when relay internal fault is detected.

The reset of the leds takes place as follows:

- Leds a,b,c,d,g :   -From flashing to off, automatically when the lit-on cause disappears.

   -From ON to OFF, by "ENTER/RESET" push button only if the tripping cause has disappeared.

- Leds e,f,h :   -From ON to OFF, automatically when the lit-on cause disappears.

In case of auxiliary power supply failure the status of the leds is recorded and reproduced when power supply is restored.

5. OUTPUT RELAYS

Five output relays are available (R1, R2, R3, R4, R5)

a) - The relays **R1,R2,R3,R4** are normally deenergized (energized on trip): these output relays are user programmable and any of them can be associated to one of the MM30's functions.

One relay eventually associated to instantaneous element of the function 51 or 51N(64), after pick-up normally drops-out as soon as the tripping cause is cleared (current below the set trip level). If the current remains above the trip level longer than the time delay programmed for the same function, the drop-out of the instantaneous relay is anyhow forced after an adjustable waiting time [tBO]. (Breaker failure protection control)

The reset after tripping of the relays associated to the time delayed functions takes place automatically as soon as the pick-up cause is cleared.

b) - The relay **R5**, normally energized, is not programmable and is deenergized on:
- internal fault
- power supply failure
- during the programming
- max no. of starting attained
- restart lock-out activated

6. SERIAL COMMUNICATION (Optional: see relevant instruction manual)

The relays fitted with the serial communication option can be connected via a cable bus or (with proper adapters) a fiber optic bus for interfacing with a Personal Computer (type IBM or compatible).
Via the communication bus all settings and commands available on relay's keyboard can be operated from the computer and viceversa all information available at relay's level can be received at computer's level.
The transmission standard is RS485 (converter 485/232 available).
Each relay is identified by its programmable address code (NodeAd) and can be called from the P.C. fitted with a WINDOWS (version 3.1 or later) program driven by the application program supplied by Microelettrica Scientifica.

7. DIGITAL INPUTS

The relay is fitted with three digital inputs activated when the relevant terminals are shorted by a cold contact :

- **R.T.** (terminals 1-2)   Remote trip control.
The input (1-2) can be programmed (see section 12) to operate as Remote Trip [(1-2) = RT] or to power an adapter for RTD input [(1-2) = RTD]+ according to drawing D47089.
When programmed for Remote Trip control activation of the input energises the output relay which has been associated to this function when programming the configuration of the output relays (see section 12).

- **S.p.C.** (terminals 1-3)   Speed switch control.
The Speed Control input is connected to N/O contact which closes as soon as the motor is running. If the contact does not close within the set start time (tst) from the moment the motor is energised, the Locked Rotor function is tripped. The relay associated ILR is energised, the recording on Last Trip will show cause S.p.C. and trip N° LR will be increased.
If the Speed Control function is not used, terminals 1-3 must be permanently shorted

- **RTD**   (terminals 1-14)   Thermal probe.
This input is alternative to input R.T. ; it only operates when the input 1-2 is programmed [(1-2) = RTD].
In this case activation of the input 1-14 (terminals shorted) produces the following operation:

> ➢ The relay associated to R.T. is energized
> ➢ The yellow led n°5 "ROTOR STALL" is flashing.
> ➢ The counter of Trip Number of the function T> is incremented
> ➢ LastTrip recording shows : "CAUSE RTD"

N.B. For PTC probes a proper adapter D47089 supplied by Microelettrica Scientifica must be used. This device is energized by terminals 1-2 (RT) and guarantees tripping of the RTD function even in case of short circuit or open circuit on the cables of the PTC.

8. TEST

Besides the normal "WATCHDOG" and "POWERFAIL" functions, a comprehensive program of self-test and self-diagnostic provides:
   - Diagnostic and functional test, with checking of program routines and memory's content, run every time the aux. power is switched-on: the display shows the type of relay and its version number.
   - Dynamic functional test run during normal operation every 15 min. (relay's operation is suspended for less than 10 ms). If any internal fault is detected, the display shows a fault message, the Led "PROG/IRF" illuminates and the relay R5 is deenergized.
   - Complete test activated by the keyboard or via the communication bus either with or without tripping of the output relays.

9. KEYBOARD AND DISPLAY OPERATION

All controls can be operated from relay's front or via serial communication bus.
The keyboard includes five hand operable buttons **(MODE)-(SELECT)-(+)-(-)-(ENTER/RESET)**
plus one indirect operable key **(PROG)** (see synoptic table fig.1):

a) - White key MODE: when operated it enters one of the following operation modes indicated on
the display:

  MEASURE   = Reading of all the parameters actually measured or recorded in the memory
  SET DISP   = Reading of the settings and of the configuration of the output relays as
          programmed.
  PROG   = Access to the programming of settings and of configuration of output relays.
  TEST PROG = Access to the manual test routines.

b) - Green key SELECT   : when operated it selects one of the menus available in the actual
                operation MODE

c) - Red key"+" AND "**-**"   : when operated they allow to scroll the information available
                in the menu entered by the key SELECT

d) - Yellow key ENTER/RESET : it allows the validation of the programmed settings - the actuation of
                manual test - the forcing of the default display indication
                - the reset of signal Leds.

e) - Indirect key PROG   : enables access to the programming.

10. READING OF MEASUREMENTS AND RECORDED PARAMETERS

Enter the MODE "MEASURES", SELECT the menus "ACT.MEAS"-"MAX VAL"-"LASTTRIP"-
-"TRIP NUM", scroll available information by key "+" or "-" .

ACT.MEAS   = Actual values as measured during the normal operation.
          The values displayed are continuously refreshed.

Display	Description
T/Tnxxx**%**	Actual temperature rise displayed as % of the motor full load temperature rise (0 - 999%)
IAxxxxx**A**	True R.M.S. value of the current of phase A displayed as primary Amps. (0 - 99999)
IBxxxxx**A**	As above, phase B.
ICxxxxx**A**	As above, phase C.
Ioxxxxx**A**	As above, earth fault current.
Id/mxxx**%**	Positive sequence component of motor current displayed as % of motor full load current. (0 - 999)%
Is/mxxx**%**	Negative sequence component of motor current displayed as % of motor full load current. (unbalance degree) (0 - 999)%

NB: If no key is operated within 60 sec. the display is automatically switched to the default indication

MAX VAL = Highest values recorded during motor run after the starting time (refreshed at each higher value) plus highest values recorded during the starting time (refreshed at each new starting).

Display	Description
T/Tnxxx**%**	Highest temperature recorded since the start of the run. (0 - 99,9)%
IAxxxxx**A**	Current of phase A measured during run after starting time (0-99999)
IBxxxxx**A**	As above, phase B.
ICxxxxx**A**	As above, phase C.
Ioxxxxx**A**	As above, zero sequence current.
Id/mxxx**%**	Positive sequence component of motor current.
Is/mxxx**%**	Negative sequence component of motor current
SAxxxxx**A**	Current of phase A during the starting time.
SBxxxxx**A**	As above, phase B.
SCxxxxx**A**	As above, phase C.
SOxxxxx**A**	As above, earth fault current.
Sd/mxxx **%**	Positive sequence current component during starting time.
Ss/mxxx**%**	Negative sequence current component during starting time.
ts xxxx**s**	Measure of the start time.

LASTTRIP = Display of the function which caused the last tripping of the relay and values of the parameters at the moment of tripping. The memory buffer is refreshed at each new relay tripping.

Display	Description
Causexxx	Function which caused the last tripping: **T>; Is>; I>; O>; I<; LR; StN; ITr.**
IAxxxxx**A**	Current of phase A.
IBxxxxx**A**	Current of phase B.
ICxxxxx**A**	Current of phase C.
Ioxxxxx**A**	Earth fault current.
Id/mxxx**%**	Positive sequence component of current.
Is/mxxx**%**	Negative sequence component of current.
T/Tnxxx**%**	Motor heating

TRIP NUM = Counters of the number of operations for each of the relay functions. The memory is non-volatile and can be cancelled only with a secret procedure.

Display	Description
T> xxxxx	Motor overload.
Is>xxxxx	Current unbalance.
I> xxxxx	Overcurrent.
O>xxxxx	Earth fault.
I< xxxxx	No load running.
LRxxxxx	Locked rotor.
StN>xxxx	No of consecutive startings.
ITrxxxxx	Too long starting.

11. READING OF PROGRAMMED SETTINGS AND RELAY'S CONFIGURATION

Enter the mode "SET DISP", select the menu "SETTINGS" or "F→RELAY", scroll information available in the menu by keys "+" or "-".
SETTINGS= values of relay's operation parameters as programmed
F→RELAY= output relay associated to the different functions as programmed.

12. PROGRAMMING

The relay is supplied with the standard default programming used for factory test.[Values here below reported (**-----**)].
All parameters can be modified as needed in the mode PROG and displayed in the mode SET DISP
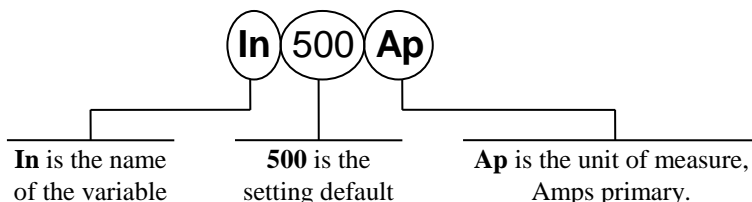**Programming is enabled only if no input current is detected (main switch open).**
As soon as programming is enabled, the Led PRG/IRF flashes and the reclosing lock-out relay R5 is deenergized. Enter MODE "PROG" and SELECT either "SETTINGS" for programming of parameters or "F→RELAY" for programming of output relays configuration; enable programming by the indirect operation key PROG.
The key SELECT now scrolls the available parameters. By the key (+) , (-) the displayed values can be modified; to speed up parameter's variation press the key SELECT <u>while</u> "+" or "-" are pressed.
Press key "ENTER/RESET" to validate the set values.

12.1 - PROGRAMMING OF FUNCTIONS SETTINGS

$$\boxed{\text{In}}\ \boxed{500}\ \boxed{\text{Ap}}$$

In is the name of the variable	**500** is the setting default	**Ap** is the unit of measure, Amps primary.

Mode PROG menu SETTINGS.   (Production standard settings here under shown).

Display	Description	Setting Range	Step	Units
NodAd 1	Identification number for connection on serial communication bus	1 - 250	1	-
Fn 50 **Hz**	Mains frequency	50 - 60	10	Hz
In 500**Ap**	Rated primary current of the phase C.Ts.	1 - 9999	1	A
On 500**Ap**	Rated primary current of the C.Ts. or of the tore C.T. detecting earth fault current	1 - 9999	1	A
Im 1.0**In**	Motor full-load current (p.u. of phase C.Ts. rated current)	0.10 - 1.50	0.01	In
Ist 6**Im**	Motor start-up current (p.u. of motor full load current)	0.5 - 10	0.1	Im
tst 5s	Motor starting time	1 - 120	1	s
ITr.5**Ist**	Switch-over current of motor starter (p.u. of motor starting current)	Dis - 0.1 - 1	0.1	Ist

Display	Description	Setting Range	Step	Units
tTr 6**s**	Max switch-over time from start-up	(0,5 - 50)s	0.1	s
AUTOSET? + ENTER	Automatic setting of all the following parameters computed on the base of the setting of the previous parameters			
tm 34**min**	Thermal time constant of motor while running **tm** is computed to allow at least one restarting with the motor at its rated full load temperature	1 - 60	1	min
to/tm 3	Steady/running motor thermal time constant	1 - 10	1	-
Ta/n 90**%**	Prealarm motor heating level (% of motor full-load temperature rise)	50 - 110	1	%Tn
Ts/n100**%**	Motor restart heating level	40 - 100	1	%Tn
Ib 1.05 **Im**	Rated maximum continuous current of the motor	1.00 - 1.30	0.01	Im
StNo 6	Max. No of startings allowed within the time tStNo	Dis - 1 - 60	1	-
tStNo60**m**	Time into which the StNo is counted	1 - 60	1	m
tBSt 12**m**	Restart inhibition time after tripping of the function StNo (Rm = restart inhibited until manual RESET is operated)	Rm-1-60	1	min
ILR 2**Im**	Trip level of Locked Rotor function	Dis- 1 - 5	0.1	Im
Is> .3**Im**	Trip level of inverse time current unbalance protection element	Dis - 0.1 - 0.8	0.1	Im
tIs> 4**s**	Trip time delay of inverse time current unbalance protection when Is=Im	1 - 8	1	s
I< .2**Im**	Trip level of undercurrent (no-load running) element	Dis - 0.15 - 1	0.01	Im
I> 2**Ist**	Trip level of overcurrent element	Dis - 1 - 5	0.1	Ist
tI> .1**s**	Trip time delay of overcurrent element	0.05 - 1	0.01	s
O> .1**On**	Trip level of earth fault element	Dis- 0.02 - 2	0.01	On
tO> .2**s**	Trip time delay of earth fault element	0.05 - 5	0.01	s
tBO .15**s**	Reset time delay of the blocking output relay	0.05 - 0.5	0.01	s
(1-2)= RT	Selection of the operation mode of the digital input 1-2: [(1-2)=RT]= operation os Remote Trip function ; [(1-2)=RTD]= operation of the RTD function (see section 7)	RT - RTD	-	-

The setting Dis indicates that the function is disactivated.

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12.2 - PROGRAMMING THE CONFIGURATION OF OUTPUT RELAYS

This is the name of protective element

This dash means that output relay number 1 is <u>not</u> assigned to this element

The number 2 means that output relay 2 will operate when this element trips

This dash means that output relay number 3 is not assigned to this element

The number 4 means that output relay 4 will operate when this element trips

<u>Mode PROG menu F→RELAY   (Production standard settings here under shown).</u>
The key "+" operates as cursor; it moves through the digits corresponding to the four programmable relays in the sequence 1,2,3,4,(1= relay R1, etc.) and makes start flashing the information actually present in the digit. The information present in the digit can be either the number of the relay (if this was already associated to the function actually on programming) or a dot (-) if the relay was not yet addressed.
The key "**-**" changes the existing status from the dot to the relay number or viceversa.
After programming of any function (T>, Ta, etc.), press the key ENTER to validate the configuration selected,

Display		Description
T>	1---	Overload tripping operates relay R1,R2,R3,R4.
Ta	-2--	Overload prealarm tripping operates relay R1,R2,R3,R4.
ITr	----	Starting switch-over tripping operates relay R1,R2,R3,R4.
StNo	----	Start No limitation tripping operates relay R1,R2,R3,R4.
ILR	1---	Locked Rotor tripping operates relay R1,R2,R3,R4.
tIs>	1---	Time delayed unbalance tripping operates relay R1,R2,R3,R4.
I<	---4	No load running tripping operates relay R1,R2,R3,R4.
I>	----	Instantaneous overcurrent tripping operates relay R1,R2,R3,R4.
tI>	1---	Time delayed overcurrent tripping operates relay R1,R2,R3,R4
O>	----	Instantaneous earth fault tripping operates relay R1,R2,R3,R4
tO>	1---	Time delayed earth fault tripping operates relay R1,R2,R3,R4.
RT	----	The function RT or RTD operates relay R1,R2,R3,R4.

13. MANUAL AND AUTOMATIC TEST OPERATION

- Mode "TESTPROG" subprogram "**W/O TRIP**":
  Operation of the yellow key activates a complete test of the electronics and the process routines.
  All the leds are lit-on and the display shows (TEST RUN).
  If the test routine is successfully completed the display switches-over to the default reading (T/Tnxxx%)
  If an internal fault is detected, the display shows the fault identification code and the relay R5 is deenergized. This test can be carried-out even during the operation of the relay without affecting the relay tripping in case a fault takes place during the test itself.

- Mode "TESTPROG" subprogram "**WithTRIP**":
  Access to this program is enabled only if the current detected is zero (breaker open).
  Pressing the yellow key the display shows "TEST RUN?". A second operation of the yellow key starts a complete test which also includes the activation of all the output relays.
  The display shows (TEST RUN) with the same procedure as for the test with W/O TRIP.
  Every 15 min during the normal operation the relay automatically initiates an auto test procedure (duration $\leq$ 10ms). If any internal fault is detected during the auto test, the relay R5 is deenergized, the relevant led is activated and the fault code is displayed.

- Further operation of key SELECT instead of the TEST programs gives the indication of the version and production date of the firmware.

⚠ CAUTION

Running the **WithTRIP** test will operate all of the output relays. Care must be taken to ensure that no unexpected or harmful equipment operations will occur as a result of running this test.
It is generally recommended that this test be run only in a bench test environment or after all dangerous output connections are removed.

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14. MAINTENANCE

No maintenance is required. Periodically a functional check-out can be made with the test procedures described under MANUAL TEST chapter. 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.

<u>WARNING</u>

In case of Internal Relay Fault detection, proceed as here-below indicated :

➢ If the error message displayed is one of the following "DSP Err", "ALU Err" ,"KBD Err" ,"ADC Err", switch off power supply and switch-on again. If the message does not disappear send the relay to Microelettrica Scientifica (or its local dealer) for repair.

➢ If the error message displayed is "E2P Err" , send the relay to Microelettrica Scientifica (or its local dealer) for repair.
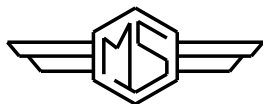
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15. ELECTRICAL CHARACTERISTICS

- Reference standards	IEC 255, IEC1000; IEEE C37; CE Directive	
- Dielectric test voltage	IEC 255-5	: 2kV, 1 min.
- Impulse test voltage	IEC 255-5	: 5kV (c.m.), 2 kV (d.m.) - 1,2/50μs
- HF disturbance test with damped oscillatory wave (1MHz burst test)	IEC255-22-1 class 3	: 2,5kV (m.c.), 1kV (d.m.)
- Electrostatic discharge test	IEC1000-4-2 level 4	: 15 kV
- Conducted disturbances immunity test	IEC1000-4-6 level 3	: 0.15-80MHz, 10V/m
- Radiated electromagnetic field immunity test	IEC1000-4-3 level 3	: 80-1000MHz, 10V/m
- Electrical fast transient/burst	IEC1000-4-4 level 4	: 4kV, 2.5kHz, 15/300ms (c.m.) 2kV, 5kHz, 15/300ms (d.m.)
- Surge immunity test	IEC1000-4-5 level 4	: 4kV(c.m.), 2kV(d.m.)
- Oscillatory waves (Ring waves)	IEC1000-4-12 level 4	: 4kV(c.m.), 2kV(d.m.)
- Power frequency magnetic test	IEC1000-4-8	: 1000A/m
- Pulse magnetic field	IEC1000-4-9	: 1000A/m, 8/20μs
- Damped oscillatory magnetic field	IEC1000-4-10	: 1000A/m, 0.1-1MHz
- Immunity test for voltage dips, short interruptions and voltage variations	IEC1000-4-11	
- HF inducted voltage	IEC1000-4-1 A.2.6 level 4	: 100V, 0.01-1MHz

CE EMC Compatibility:

- Electromagnetic emission	EN50081-2
- Radiated electromagnetic disturbance test	EN50082-2
- Resistance to vibration and shocks	IEC255-21-1, IEC255-21-2
- Accuracy at reference value of influencing factors	1% In; 0,1% On for measure +/- 10ms for times
- Rated input current	In = 1 or 5A, On = 1 or 5A
- Current overload	200A for 1 sec; 10A continuos
- Burden on current inputs	Phase : 0.01VA at In = 1A; 0.2VA at In = 5A Neutral : 0.03VA at 1A ; 0.2VA at 5A
- Average power supply consumption	8,5 VA
- Output relays	rating 5 A; Vn = 380 V A.C. resistive switching = 1100W (380V max) make = 30 A (peak) 0,5 sec. break = 0.3 A, 110 Vcc, L/R = 40 ms (100.000 op.)
- Operation ambient temperature	-20°C / +60°C
- Storage temperature	-30°C / +80°C

The performances and the characteristics reported in this manual are not binding and can modified at any moment without notice
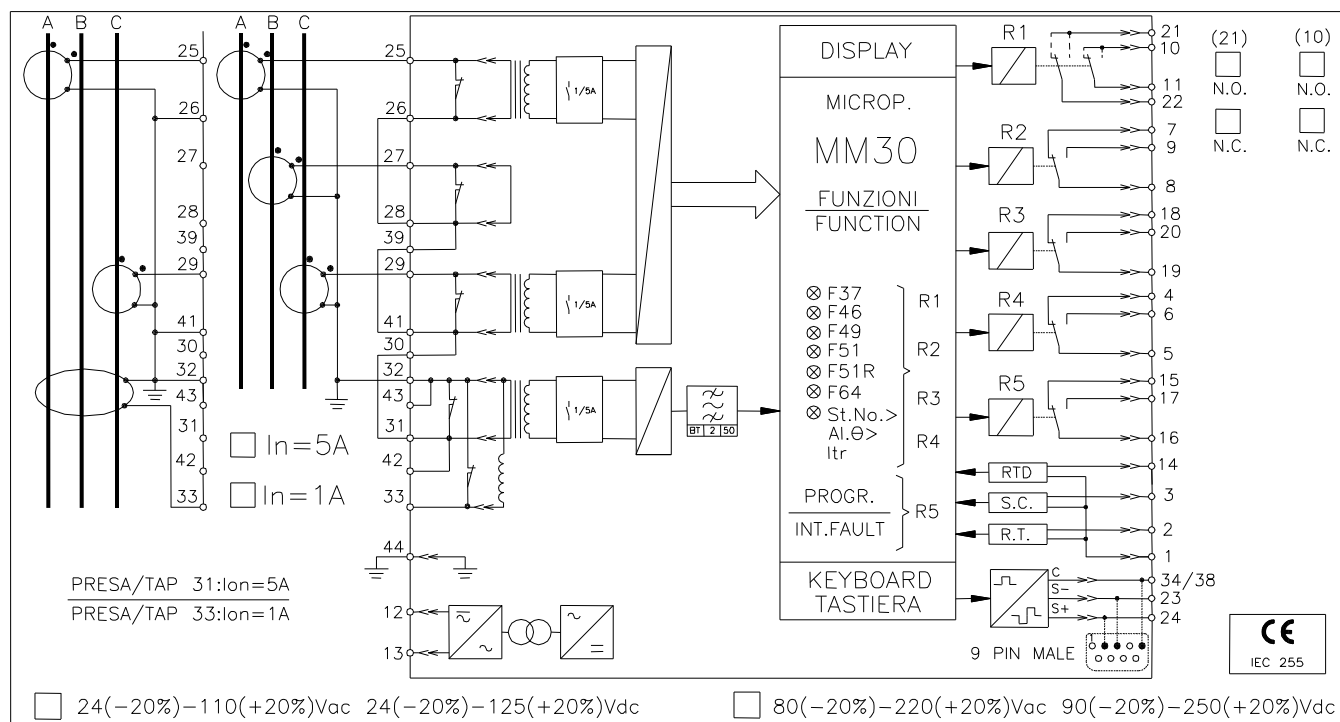
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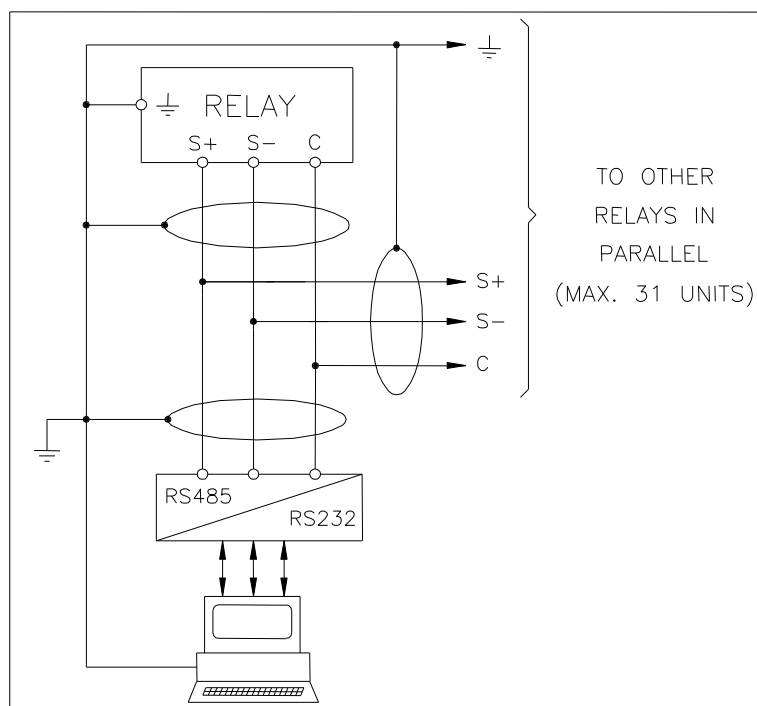
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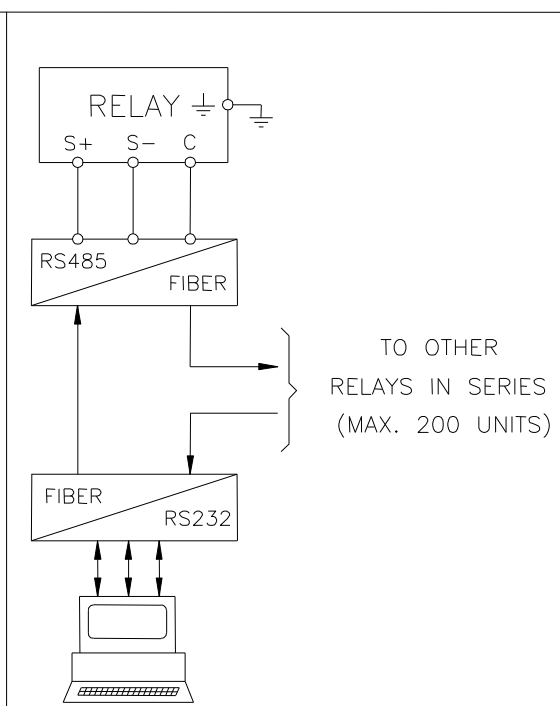
16. CONNECTION DIAGRAM (SCE1269 Rev.5)

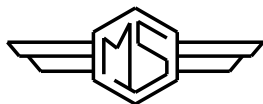
17. WIRING THE SERIAL COMMUNICATION BUS (SCE1309 Rev.0)

CONNECTION TO RS485

FIBER OPTIC CONNECTION

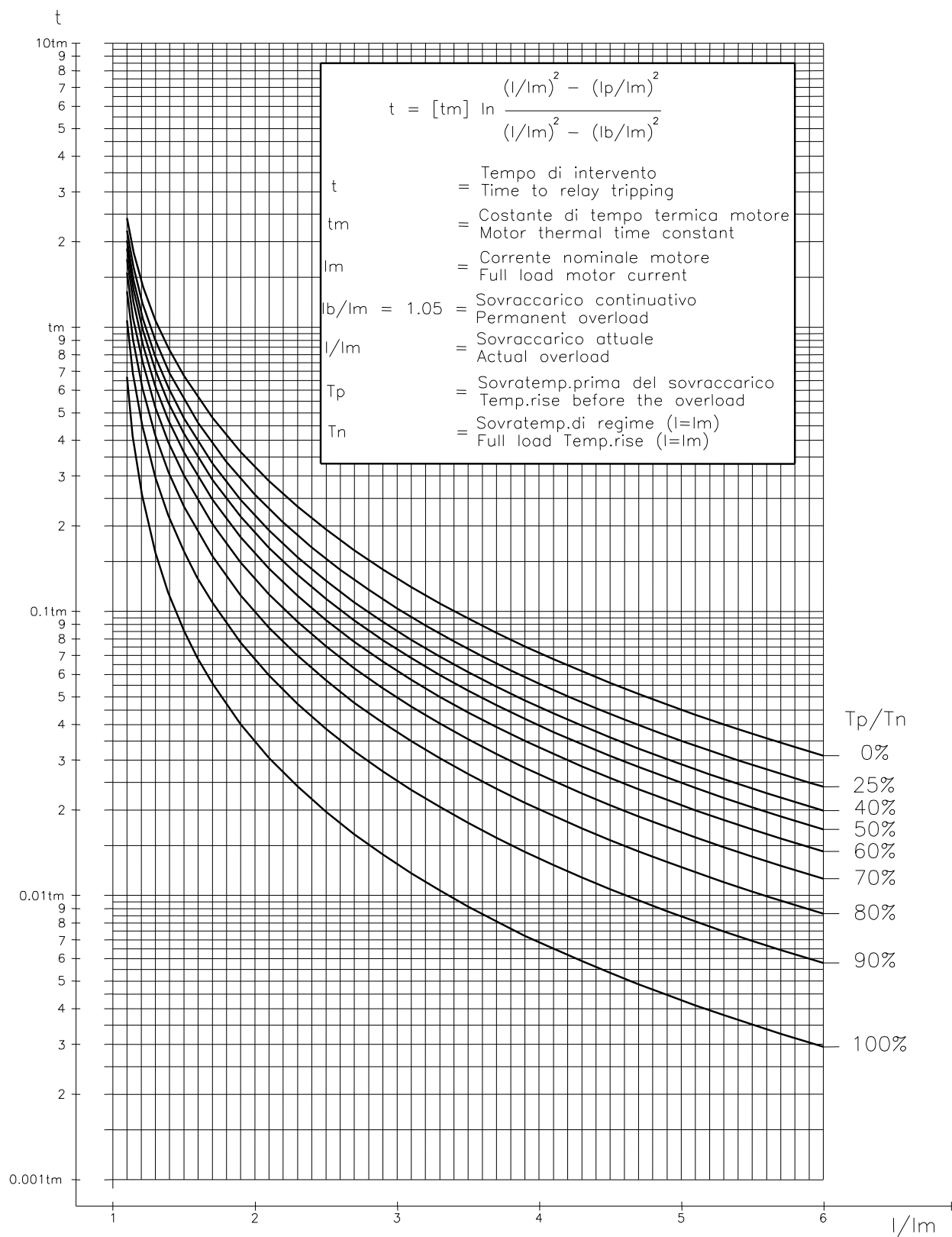**MICROELETTRICA SCIENTIFICA**
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18. THERMAL IMAGE CURVES (TU0249 Rev.1)

$$t = [tm] \ln \frac{(I/Im)^2 - (Ip/Im)^2}{(I/Im)^2 - (Ib/Im)^2}$$

t	=	Tempo di intervento / Time to relay tripping
tm	=	Costante di tempo termica motore / Motor thermal time constant
Im	=	Corrente nominale motore / Full load motor current
Ib/Im = 1.05	=	Sovraccarico continuativo / Permanent overload
I/Im	=	Sovraccarico attuale / Actual overload
Tp	=	Sovratemp.prima del sovraccarico / Temp.rise before the overload
Tn	=	Sovratemp.di regime (I=Im) / Full load Temp.rise (I=Im)

Tp/Tn

0%
25%
40%
50%
60%
70%
80%
90%
100%

I/Im

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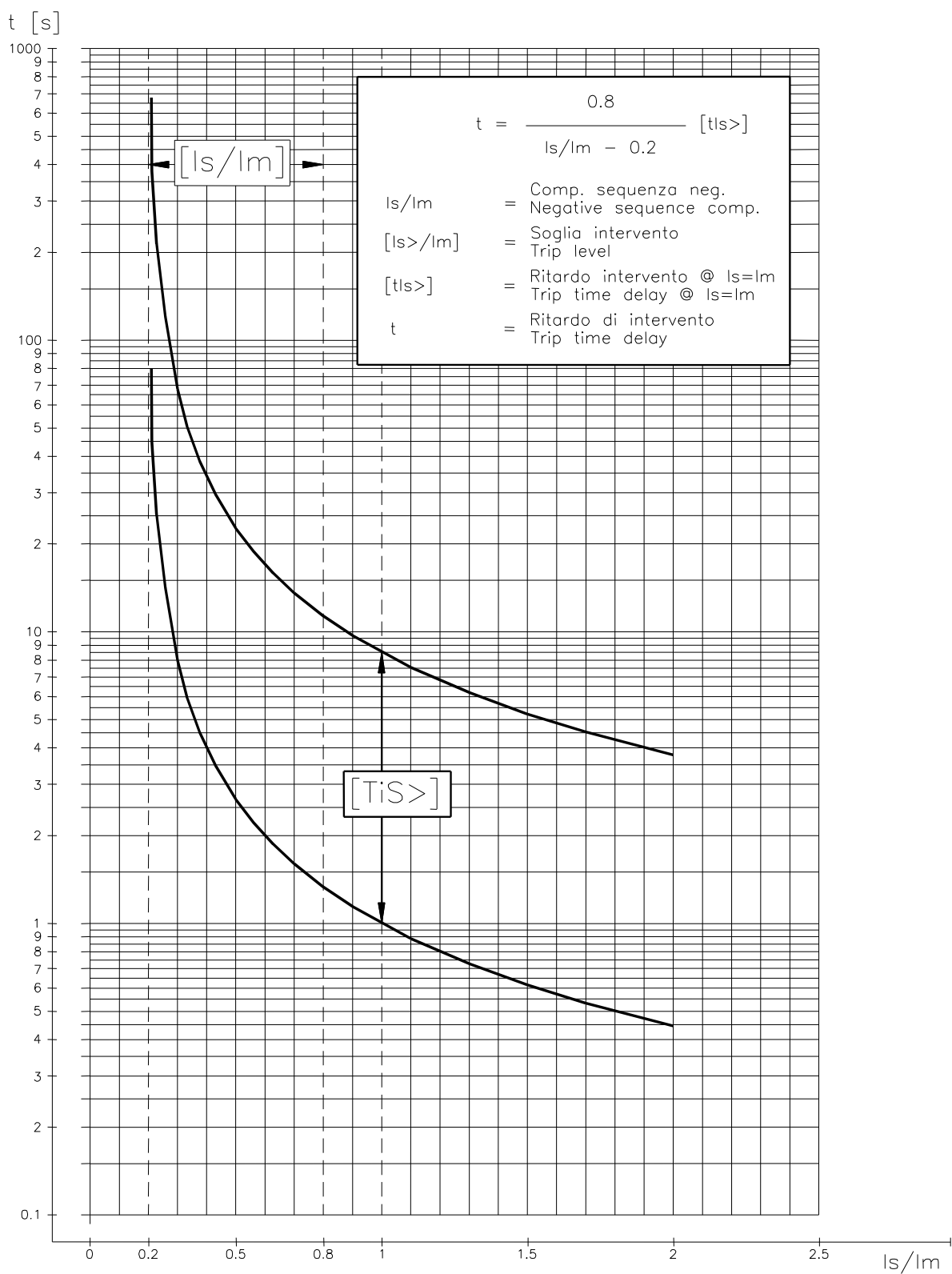**MM30**

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19. INVERSE TIME UNBALANCE PROTECTION ELEMENT (TU0248 Rev.0)

$$t = \frac{0.8}{Is/Im - 0.2} \ [tIs>]$$

|		
Is/Im	=	Comp. sequenza neg. Negative sequence comp.
[Is>/Im]	=	Soglia intervento Trip level
[tIs>]	=	Ritardo intervento @ Is=Im Trip time delay @ Is=Im
t	=	Ritardo di intervento Trip time delay

[Is/Im]

[TiS>]

t [s]

Is/Im

## 20. DIRECTION FOR PCB'S DRAW-OUT AND PLUG-IN

DRAW-OUT

Rotate clockwise the screws ① and ② in the horizontal position of the screws-driver mark.
Draw-out the PCB by pulling on the handle ③

PLUG-IN

Rotate clockwise the screws ① and ②in the horizontal position of the screws-driver mark.
Slide-in the card on the rails provided inside the enclosure.
Plug-in the card completely and by pressing the handle to the closed position.
Rotate anticlockwise the screws ① and ② with the mark in the vertical position (locked).
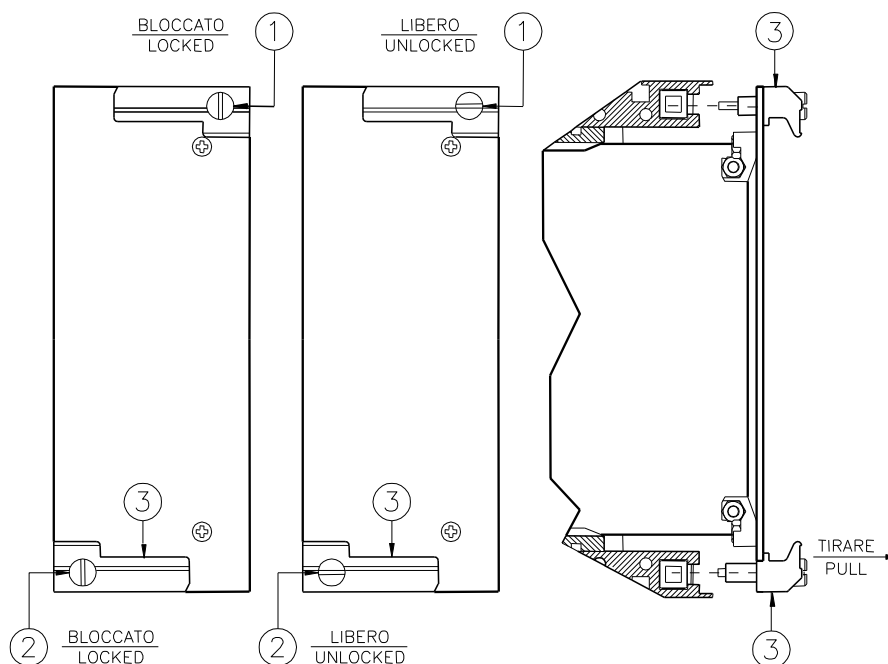
21. OVERALL DIMENSIONS

PANEL DRILLING 113x142 (LxH)
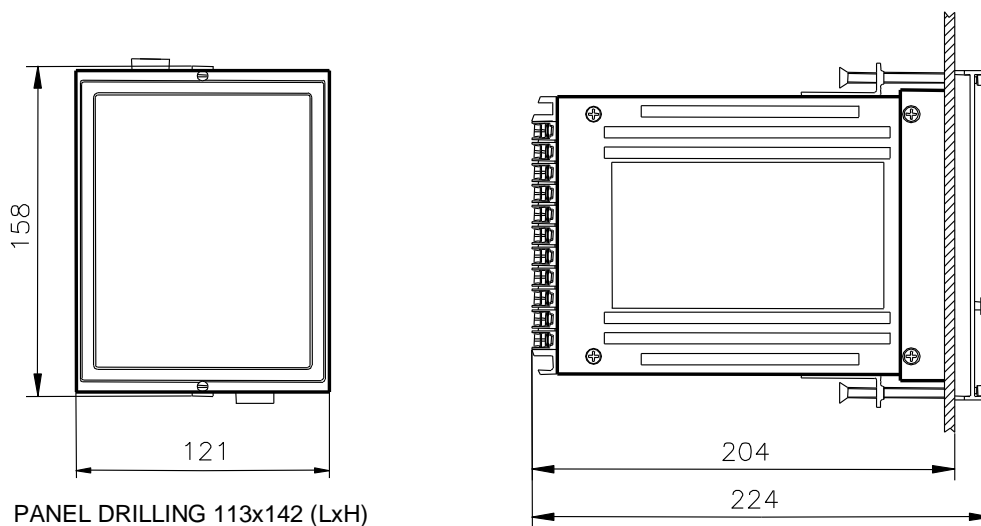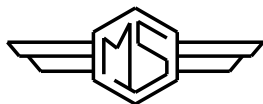
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22. OVERALL DIMENSIONS PTC CONVERTER (D47089 Rev.0)

23. CONNECTIONS PTC CONVERTER (D47089 Rev.0)

MICROELETTRICA SCIENTIFICA
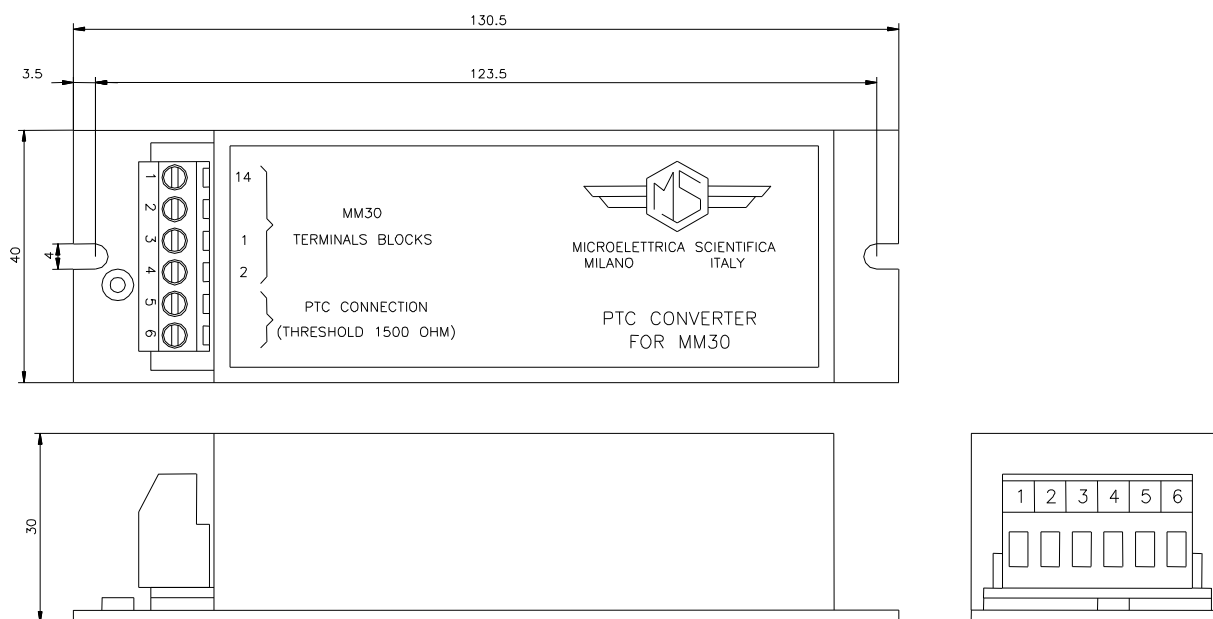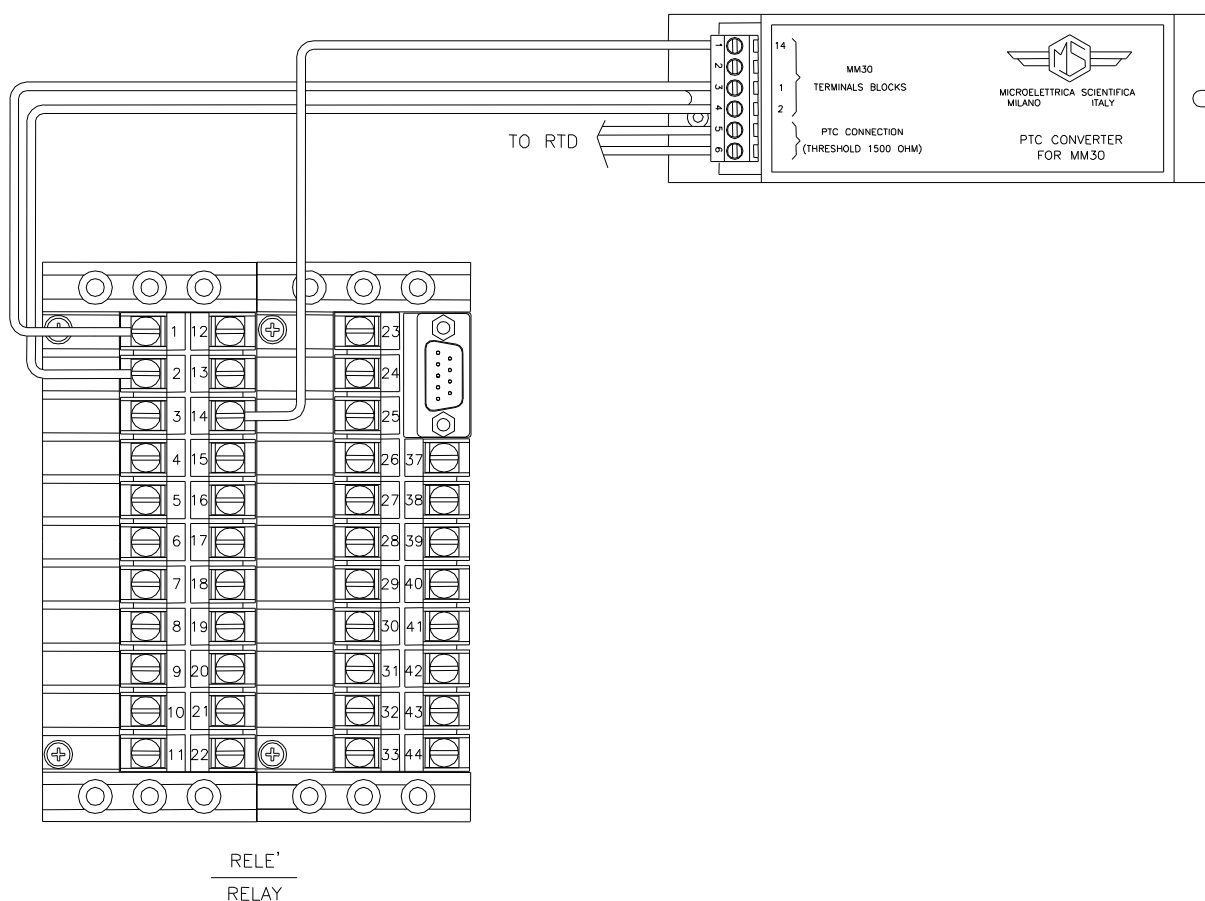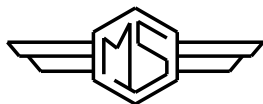**MILANO   ITALY**

24. KEYBOARD OPERATIONAL DIAGRAM (D46116 Rev.1)

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25. SETTING'S FORM

Date :				Number Relay:		
RELAY PROGRAMMING						
Default Setting			**Actual Setting**			
Variable	**Value**	**Measurement Unit**	**Variable**	**Value**	**Measurement Unit**	
NodAd	1	----------	**NodAd**		----------	
Fn	50	**Hz**	**Fn**		**Hz**	
In	500	**Ap**	**In**		**Ap**	
On	500	**Ap**	**On**		**Ap**	
Im	1.0	**In**	**Im**		**In**	
Ist	6	**Im**	**Ist**		**Im**	
tst	5	**s**	**tst**		**s**	
ITr	.5	**Ist**	**ITr**		**Ist**	
tTr	6	**s**	**tTr**		**s**	
AUTOSET? + ENTER			**AUTOSET? + ENTER**			
tm	34	**min**	**tm**		**min**	
to/tm	3	----------	**to/tm**		----------	
Ta/n	90	**%**	**Ta/n**		**%**	
Ts/n	100	**%**	**Ts/n**		**%**	
Ib	1.05	**Im**	**Ib**		**Im**	
StNo	6	----------	**StNo**		----------	
tStNo	60	**m**	**tStNo**		**m**	
tBSt	12	**m**	**tBSt**		**m**	
ILR	2	**Im**	**ILR**		**Im**	
Is>	.3	**Im**	**Is>**		**Im**	
tIs>	4	**s**	**tIs>**		**s**	
I<	.2	**Im**	**I<**		**Im**	
I>	2	**Ist**	**I>**		**Ist**	
tI>	.1	**s**	**tI>**		**s**	
O>	.1	**On**	**O>**		**On**	
tO>	.2	**s**	**tO>**		**s**	
tBO	.15	**s**	**tBO**		**s**	

CONFIGURATION OF OUTPUT RELAYS									
Default Setting					**Actual Setting**				
Protective Elem.	**Output Relays**				**Protective Elem.**	**Output Relays**			
T>	1	-	-	-	**T>**				
Ta	-	2	-	-	**Ta**				
ITr	-	-	-	-	**ITr**				
StNo	-	-	-	-	**StNo**				
ILR	1	-	-	-	**ILR**				
tIs>	1	-	-	-	**tIs>**				
I<	-	-	-	4	**I<**				
I>	-	-	-	-	**I>**				
tI>	1	-	-	-	**tI>**				
O>	-	-	-	-	**O>**				
tO>	1	-	-	-	**tO>**				
RT	-	-	-	-	**RT**				