MICROPROCESSOR OVERCURRENT AND DIRECTIONAL EARTH FAULT PROTECTION RELAY + AUTORECLOSE TYPE IM30-DR

OPERATION MANUAL

REV.	DESCRIPTION	DATE	PREP.	APPR.
1	MOD.327	25/10/95	BRASCA	
0	EMISSION	13/10/95	BRASCA	

INDEX

Page

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.

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 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

Input quantities are supplied to 1 Potential Transformer and to 4 Current Transformers
(- three measuring phase current - one measuring the earth fault zero-sequence current).
Rated current input can be 1 or 5A
The zero sequence polarizing voltage input is rated 100V (from V1:√3/(100:3)V open delta connected V.Ts.).
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

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

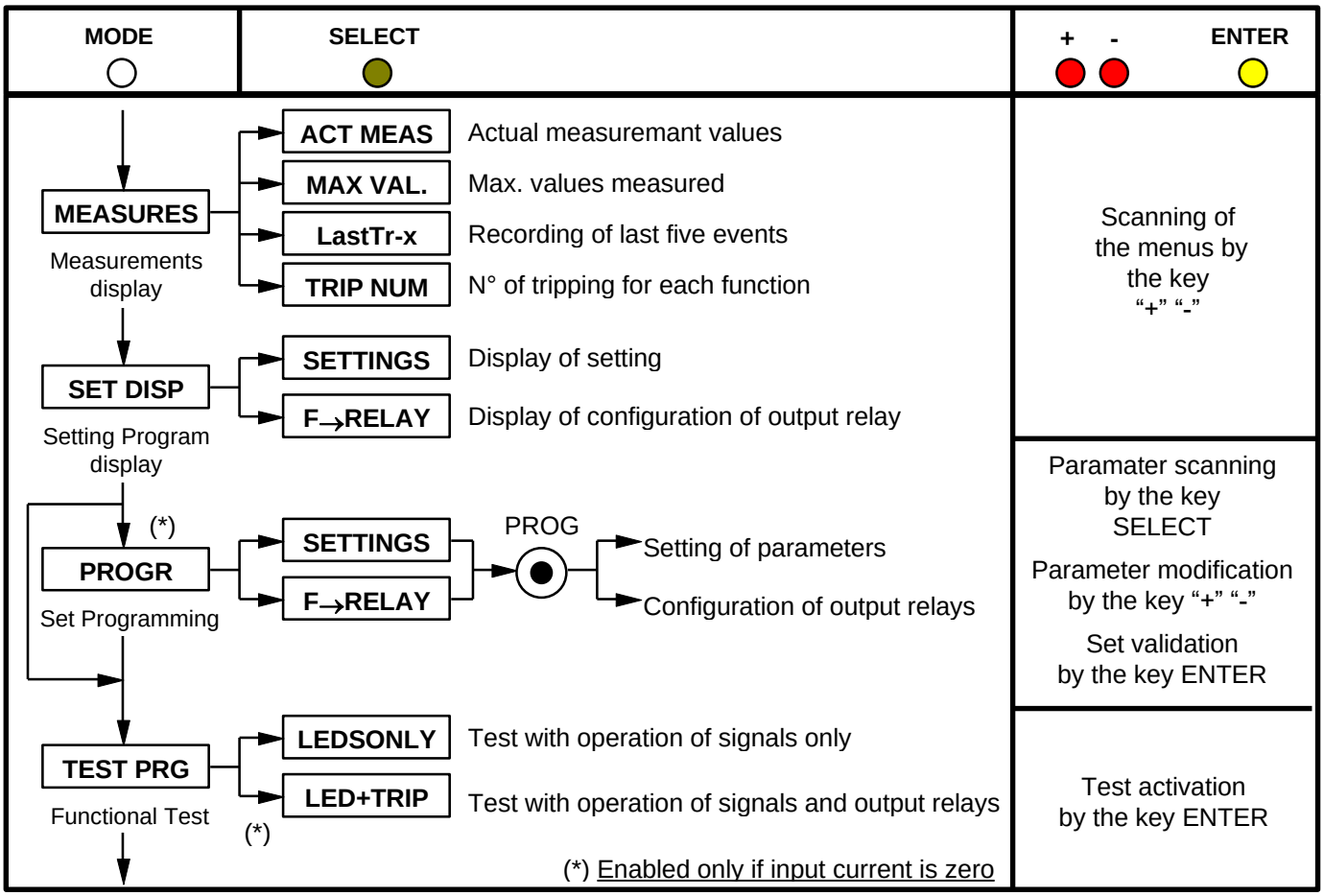
a) - { **24V(-20%) / 110V(+15%) a.c.** / **24V(-20%) / 125V(+20%) d.c.** } **b) -** { **80V(-20%) / 220V(+15%) a.c.** / **90V(-20%) / 250V(+20%) d.c.** }

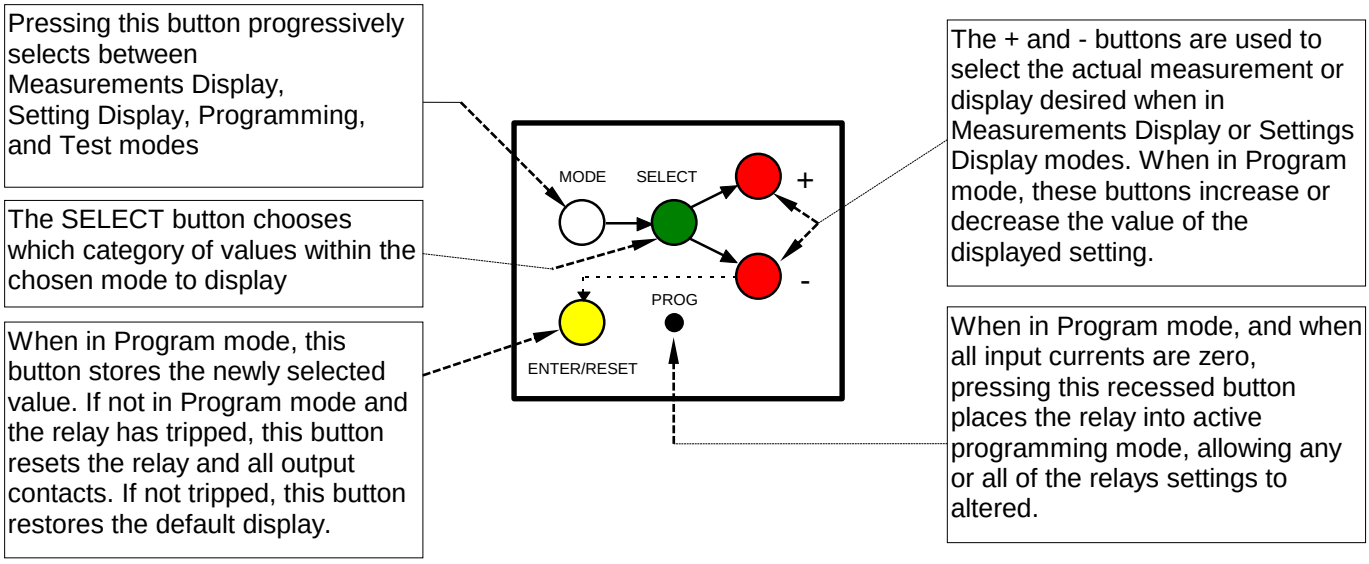
Before energising the unit check that supply voltage is within the allowed limits.

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 **(xxxxxxxx)**
(see synoptic table fig.1)

FIG.1





4. SIGNALIZATIONS

Eight signal leds (normally off) are provided:

a) Red LED **I>** : Flashing when measured current overcomes the set trip level [I>]. Illuminated on trip after expiry of the set trip time delay [tI>].

b) Red LED **I>>** : Same as above related to [I>>], [tI>>].

c) Red LED **O>** : Same as above related to [O>], [tO>].

d) Red LED **O>>** : Same, as above related to [O>>], [tO>>].

e) Yellow LED **PROG/IRF** : Flashing during the programming of the parameters or in case of Internal Relay Fault.

f) Red LED **BLOCK INPUT** : Flashing when a blocking signal is present at the relevant input terminals.

g) Red LED **BR. FAIL.** : Lit-on when the BREAKER FAILURE function is activated.

h) Yellow LED **FUNC. DISAB.** : Flashing during reclose timing (tXC) Lit-on when reclosing function is in the lock-out status

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 IM30-DR's functions.
One relay eventually associated to the instantaneous element of one of the functions, 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 relevant function, the drop-out of the instantaneous relay is anyhow forced after an adjustable waiting time [tBO]. (Diasactivation of the blocking output eventually used to block a relay upstream in the distribution system).
It has to be remarked that the programming structure does not allow to associate the same relay at the same time to instantaneous and delayed elements. Therefore any relay already associated to any time delayed element cannot be associated to any instantaneous element and viceversa.

b) - The relay **R5**, normally energized, is not programmable and it is deenergized on:
- internal fault
- power supply failure
- during the programming

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

Three optoisolated digital inputs are available:
Open circuit voltage at relevant terminals (1-2, 1-3, 1-14) is 15 Vdc
Internal resistance 2,2kΩ
The input are activated when relevant terminals are shorted (external resistance < 2kΩ)

- **BI** (terminals 1-2) : it blocks the operation of the time delayed element of the functions which are controlled by blocking input (see “Programming of output relays”)

When a function is blocked the pick-up of its output is inhibited. Programming allows to have the inhibition either permanent as long as the blocking input is active or automatically removed with a programmable wait-time (see page 12 : tBI) after the operation of the time delayed function.
By proper interconnection of the blocking inputs output among different relays it is possible to configurate very efficient arrangements of logic fault discrimination as well as to feature a safe and quick breaker back-up protection.

- **BIR** (terminals 1-3) : it blocks the operation of the autoreclose functions

- **C/B** (terminals 1-14) : connected to a normally open auxiliary contact of the Circuit Breaker, it discriminates Open Status (contact open) or Closed Status (contact closed) This input is used for operation of the autoreclose functions.

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. (Aniway the output relay associated to reclosing in not energized during test)

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 a 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 measured and of those 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 the settings and of relay configuration.
- **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 different 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 test programs - 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 "MEASURE", 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
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.
Uoxxxxx**V**	True R.M.S. value of the zero-sequence voltage displayed as secondary voltage of main V.Ts. (1-210)V
φoxxxxx°	Io/Uo phase displacement angle in degrees.

MAX VAL = Highest values recorded starting from 100ms after closing of main Circuit Breaker plus inrush values recorded within the first 100ms from Breaker closing, (refreshed any time the breaker closes).

Display	Description
IAxxxx**In**	Max demand of phase A current after the first 100ms, displayed as p.u. of C.Ts rated current
IBxxxx**In**	As above, phase B.
ICxxxx**In**	As above, phase C.
Ioxxxx**On**	As above, earth fault current.
Uoxxxxx**V**	Max value of Uo recorded after the first 100ms.
SAxxxx**In**	Max demand current of phase A during the first 100ms.
SBxxxx**In**	As above, phase B.
SCxxxx**In**	As above, phase C.
SOxxxxOn	As above, earth fault current.
SUoxxxx**V**	Max value of Uo recorded during the first 100ms.

LASTTRIP = RECORDING OF THE LAST FIVE EVENTS: Display of the function which caused the tripping of the relay plus values of the parameters at the moment of tripping. The memory buffer is refreshed at each new relay tripping.

Display	Description
LastTr-x	Indication of the recorded event (x= 0 to 4) Example: Last event (LastTr -0) Last but one event (LastTr-1) etc...
Causexxx	Display of the function which caused the last tripping: **I>; I>>; O>; O>>.**
IAxxxx**In**	Current of phase A.
IBxxxx**In**	Current of phase B.
ICxxxx**In**	Current of phase C.
Ioxxxx**On**	Earth fault current.
Uoxxxxx**V**	Zero-sequence voltage.
φoxxxxx°	Io/Uo phase displacement.
trrxxxx**s**	Remaining time to elapse of **tr** - If trr≠0 the trip has taken place during **tr** after a closure

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
I> xxxxx	Low set overcurrent trips after time delay [tI>].
I>>xxxxx	High set overcurrent trips after time delay [tI>>].
Io>xxxxx	Low set earth fault trips after time delay [tO>].
Io>>xxxxx	High set earth fault trips after time delay [tO>>].
1Cxxxxxx	N° of reclousure operated by the first reclosing shot 1C
2Cxxxxxx	N° of reclousure operated by the 2nd reclosing shot 2C
3Cxxxxxx	N° of reclousure operated by the 3rd reclosing shot 3C
OPSxxxxx	Number of Circuit Breaker's operations

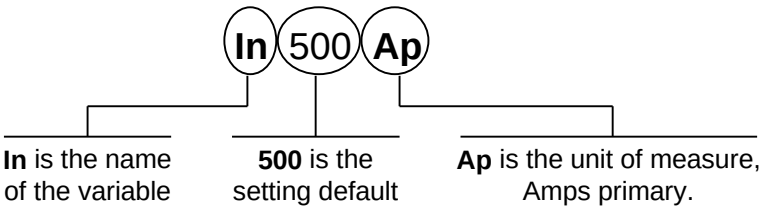
11. READING OF PROGRAMMED SETTINGS AND RELAY'S CONFIGURATION

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 while "+" or "-" are pressed.
Press key "ENTER/RESET" to validate the set values.

12.1 - PROGRAMMING OF FUNCTIONS SETTINGS



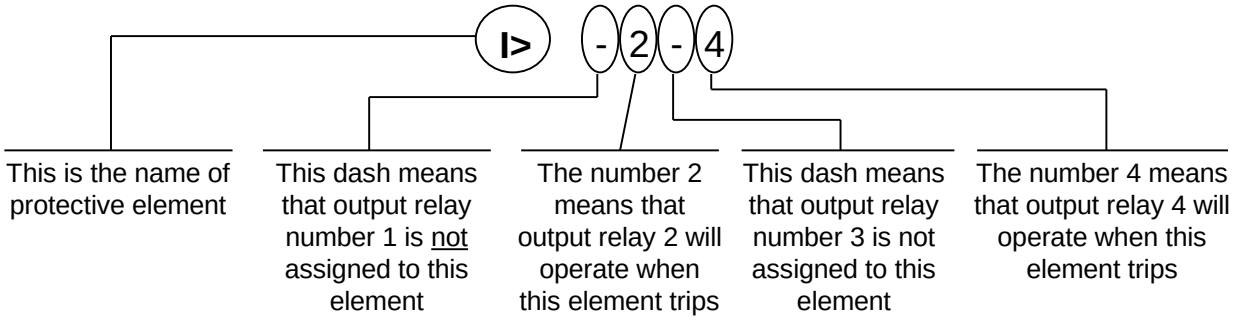
Mode PROG menu SETTINGS. (Production standard settings here under shown).

Display	Description	Setting Range	Step
Fn 50 **Hz**	Mains frequency	50 - 60 Hz	-
In 500**Ap**	Rated primary current of the phase C.Ts.	(1 - 9999)A	1A
On 500**Ap**	Rated primary current of the C.Ts. or of the tore C.T. supplying the zero sequence current	(1 - 9999)A	1A
F(I>) D	Operation characteristic of the low-set overcurrent element: D = Independent definite time. SI = Dependent normal inverse time. VI = Dependent very inverse time. EI = Dependent extremely inverse time.	D SI VI EI	-
I> 1.0**In**	Trip level of low-set overcurrent element (p.u. of the rated current of the phase C.Ts.)	(Dis- 0.5 - 4)In	0.01In

Display	Description	Setting Range	Step
tI> 2.0**s**	Trip time delay of the low-set overcurrent element In the inverse time operation [tI>] is the trip time delay at I = 10x[I>].	(0.05 - 30)s	0.01s
I>> 2**In**	Trip level of high-set overcurrent element (p.u. of the rated current of the phase C.Ts	(Dis- 0.5 - 40)	0.1In
tI>> 1.0**s**	Trip time delay of the high-set overcurrent element	(0.05 - 3)s	0.01s
Uo .10**V**	Starting level of the zero-sequence polarizing input voltage. This is the minimum level of Uo needed to enable the operation of the directional earth element.	(2-25)V	1V
α= 90°	Max sensibility direction of the earth fault current **When α = Dis the operation of the earth fault element is non directional**	(0° - 90° - Dis)	1°
F(O>) D	Operation characteristic of the low-set earth fault element: D = Independent definite time. SI = Dependent normal inverse time. VI = Dependent very inverse time. EI = Dependent extremely inverse time.	D SI VI EI	-
O> .1**On**	Trip level of low-set earth fault element (p.u. of the rated current of the C.Ts. for zero sequence detection)	(Dis- 0.02 - 0.4)	0.01On
tO> 4.0**s**	Trip time delay of low-set earth fault element In the inverse time operation [tO>] is the trip time delay at I = 10x[O>].	(0.05 - 30)s	0.01s
O>> .5**On**	Trip level of high-set earth fault element (p.u.of the rated current of the C.Ts. for zero sequence detection)	(0.02 - 1)	0.01On
tO>> 3.0**s**	Trip time delay of the high-set earth fault element	(0.05 - 3)s	0.01s
1C Ih Oh	Selection of the function(s) selected to initiate the fist reclosing shot 1C (I = tI>; Ih = tI>>; O = tO>; Oh = tO>>)	I - Ih - O - Oh	-
2C I O Oh	As above for second reclosing shot 2C	I - Ih - O - Oh	-
3C O Oh	As above for third reclosing shot 3C	I - Ih - O - Oh	-
t1C 2**s**	Reclosing time interval of first reclosing shot	(0.1 - 99.9)s	0.1s
t2C 4**s**	As above for 2nd reclosing shot	(0.1 - 99.9)s	0.1s
t3C 6**s**	As above for 3rd reclosing shot	(0.1 - 99.9)s	0.1s
tr 8**s**	Reset interval (reclaim time)after any successful reclosure (**see note**)	(1 - 200)s	1s
tBO .25**s**	Max reset time delay of the instantaneous element after tripping of the delayed element	(0.05 - 0.25)s	0.01s
NodAd 1	Identification number for connection on serial communication bus	(1 - 250)	1

The setting Dis indicates that the function is disactivated.

12.2 - PROGRAMMING THE CONFIGURATION OF OUTPUT RELAYS



Mode PROG menu F→RELAY (Production standard settings here under shown).
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.

Display	Description
I> ----	Instantaneous element of low-set overcurrent operates relays R1,R2,R3,R4. (only one or more, whatever combination)
tI> 12--	As above, time delayed element.
I>> ----	Instantaneous element of high-set overcurrent operates relay R1,R2,R3,R4.
tI>> 12--	As above, time delayed element.
O> ----	Instantaneous element of low-set earth fault element operates relay R1,R2,R3,R4.
tO> 1-3-	As above, time delayed element.
O>> ----	Instantaneous element of high-set earth fault element operates relay R1,R2,R3,R4.
tO>> 1-3-	As above, time delayed element.
C ---4	Reclousure operates relay R1,R2,R3,R4.
tFRes: A	The reset after tripping of the relays associated to the time delayed elements can take place: **(A)** automatically when current drops below the trip level. **(M)** manually by the operation of the "ENTER/RESET" key.
BIf I>>I >	The input (BI) can act on the function I> only or I>> only, or on both.
BIoO>>O>	The input (BI) can act on the function O> only or O>> only, or on both.
tBI 2tBO	The blocking can be programmed so that it lasts as long the blocking input signal is present (tBI Dis) or so that, even with the blocking input still present, it only lasts for the set trip time delay of the function plus an additional time 2xtBO (tBI 2xtBO).

NOTE :

The timing **tr** is started any time the C/B is reclosed
Tripping of any protection function during **tr** after a manual closure of the C/B, produces the lock-out of the reclosing functions.
Tripping during **tr** of any function not programmed for initiating the reclose shot, produces the lock-out of the reclosing functions.
Tripping during **tr** of any function programmed for initiating the reclose shot, starts the reclosing time of the next reclose shot (t2C or t3C).
Tripping of any function after **tr** produces either:

- Starting of the reclosing cycle from the first shot if the function tripped is one of those selected to initiate the fist reclose shot, or

- Lock-out of the reclosing functions if the function tripped was not programmed to initiate the fist reclose shot.

To reset from lock-out status, the Circuit Breaker must be open and then manually reclosed.
After reset the reclosing cycle restarts from the biginning (1st shot).
As long as the reclousure blocking input BIR (terminals 1-3) is active the reclosing functions are locked-out.

13. MANUAL AND AUTOMATIC TEST OPERATION

- Mode "TESTPROG" subprogram"LEDS ONLY":
  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 (IAxxxxxA).
  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 "LEDS+TRIP":
  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 LEDSONLY.
  Every 15 min during the normal operation the relay automatically initiates an auto test procedure (duration ≤ 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.

CAUTION

Running the **LEDS+TRIP** 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.

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.

15. OPERATION OF THE DIRECTIONAL EARTH FAULT ELEMENT

It is assumed :

- **Is** = Set current trip level (O>. O>>)
- **Uo** = Set voltage enable level
- **α** = Set characteristic angle
- **Io** = Actual zero-sequence fault current
- **Vo** = Actual zero-sequence fault voltage
- **φo** = Actual Io/Vo phase displacement
- **Ios** = Component of Io in the direction α

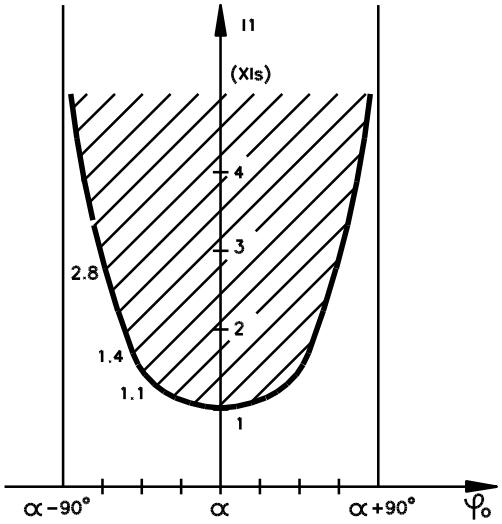


Fig 1

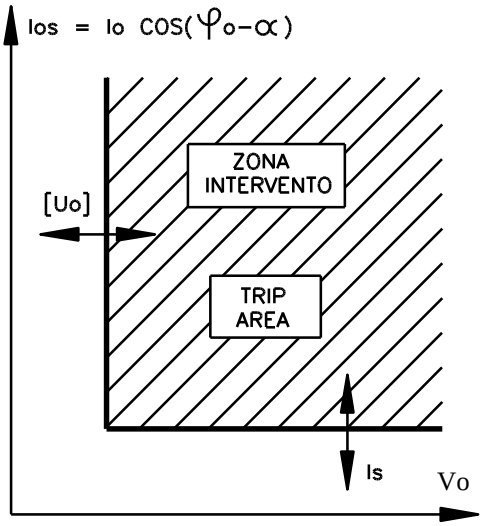


Fig.2

The relay measurement is:

Io x cos(φo -α) = Ios

The relay trips (if Vo>Uo) when **<u>Ios>Is</u> (fig.2)** i.e,when the component of the input current in the measuring direction of the relay overcomes the set trip level Is.

Operation is enabled only if the input zero-sequence voltage Vo is above the set level Vs (Vs = Uo<)

The sensitivity of the relay is then proportional to cos(φo -α), it is maximum when φo =α
and its the operation field is limited within the range:

(α - 90°) < φo < (α + 90) **(fig.1).**

The characteristic angle of the relay must be selected according to the kind of earthing of the installation which has to be protected against earth fault; typical setting are:

- UNEARTHED NEUTRAL **α= 90°**

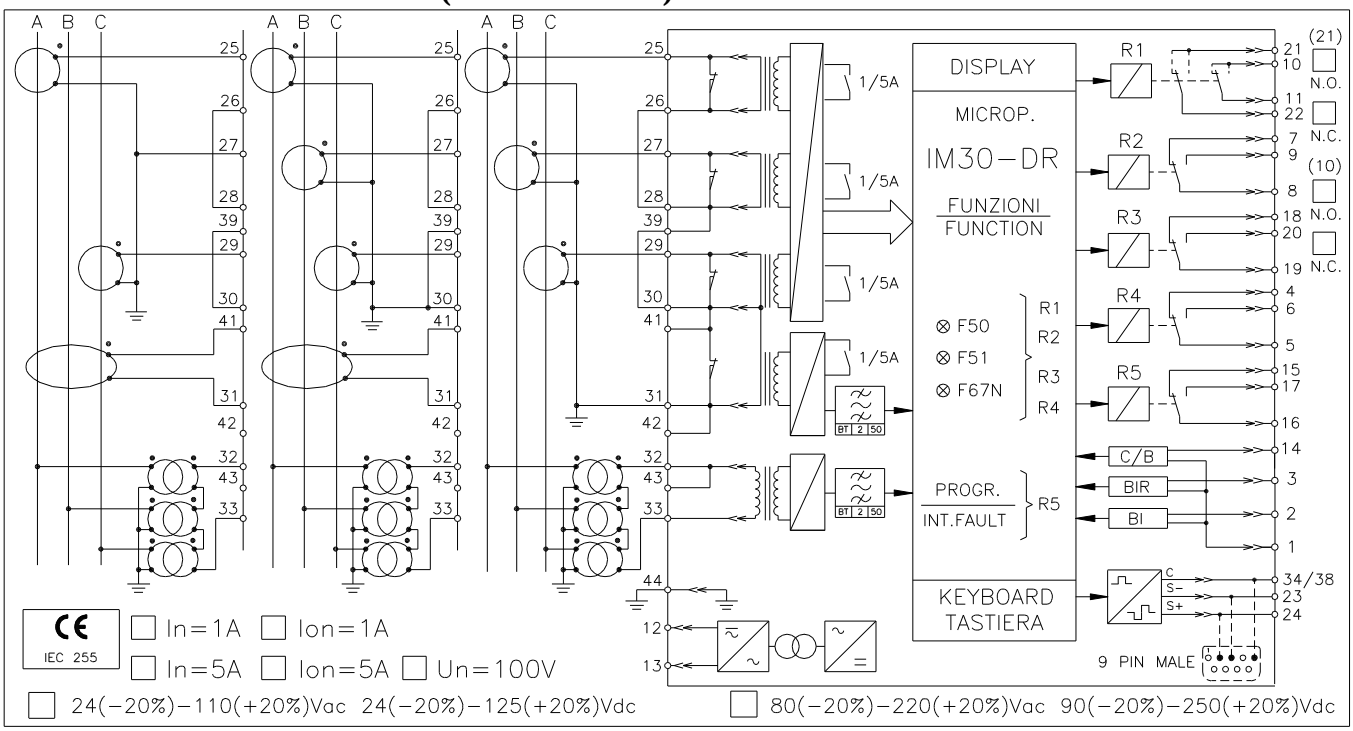
- NEUTRAL EARTHED VIA RESISTOR **α= 0°**

- SOLIDLY EARTHED NEUTRAL **α= 60°**

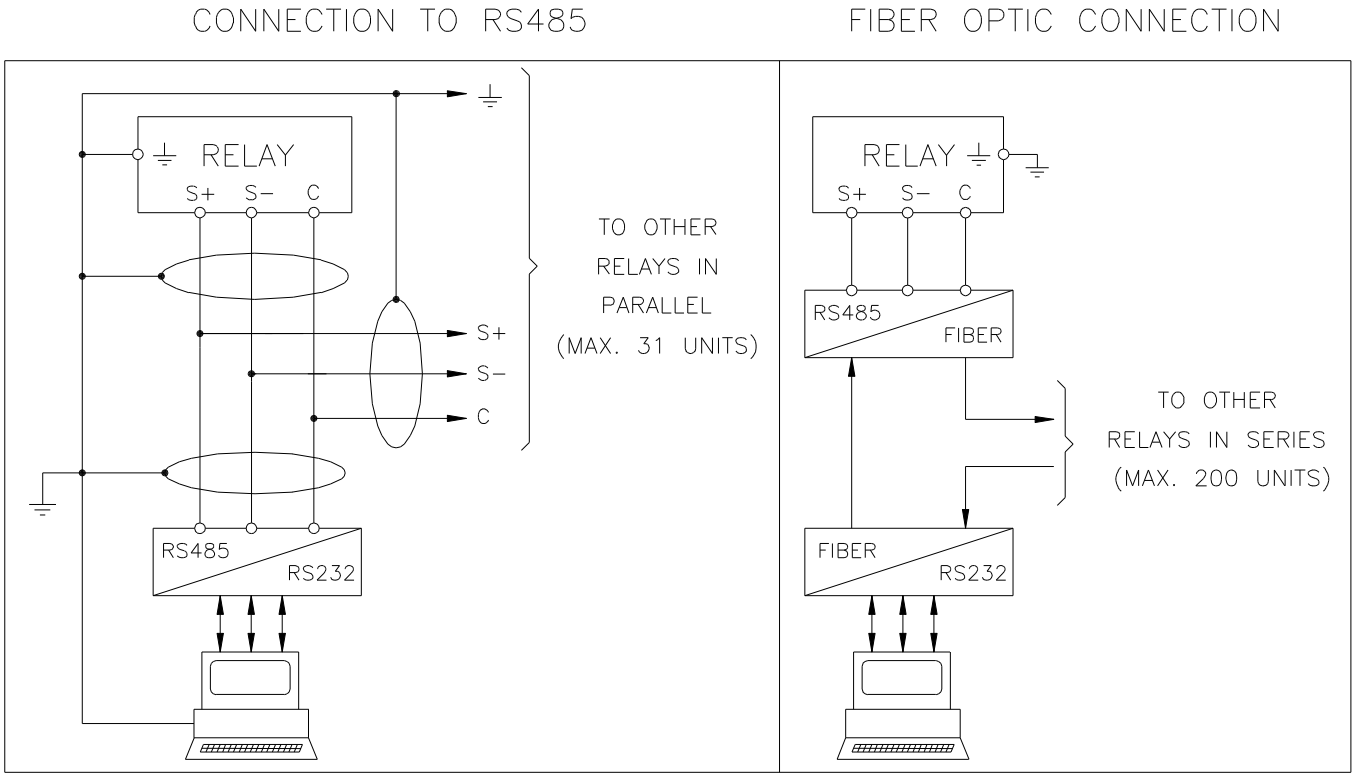
16. ELECTRICAL CHARACTERISTICS

- Reference standards	IEC 255, 801; CEI 41-1; IEEE C37; CE
- Dielectric test voltage	2000 V, 50 Hz, 1 min.
- Impulse test voltage	5kV (MC), 2 kV (MD) - 1,2/50μμs
- Accuracy at reference value of	1% In; 0,1% On for measure
influencing factors	+/- 10ms for times
- Immunity to high frequency burst	1 kV (MC), 0,5 kV (MD) - 0,1 MHz
	2,5 kV (MC), 1 kV (MD) - 1 MHz
- Immunity to electrostatic discharge	15 kV
- Immunity to sinusoidal wave burst	100 V - (0,01-1) MHz
- Immunity to radiated E.M. field	10 V/m - (20-1000) MHz
- Immunity to high energy burst	4 kV (MC), 2 kV (MD) - (IEC 805-5)
- Immunity to 50-60 Hz magnetic field	1000 A/m
- Immunity to impulse magnetic field	1000 A/m - 8/20μs
- Immunity to magnetic burst	100A/m - (0,1-1) MHz
- Resistance to vibration and shocks	10-500 Hz - 1 g - 0,075 mm
- Rated current	In = 1 or 5 A
	On = 1 or 5 A
- Current overload	200 a for 1 sec; 10 A continuos
- Burden on current inputs	0,2 VA/phase at In; 0,06 VA at On
- Rated Voltage	Un = 100V (different on request)
- Voltage overload	2 Un continuous
- Burden on voltage input	0,2 VA at Un
- Average power supply consumption	8,5 VA
- Output relays	rating 5 A; Vn = 380 V
	A.C. resistive switching = 1100 W
	(380 V 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

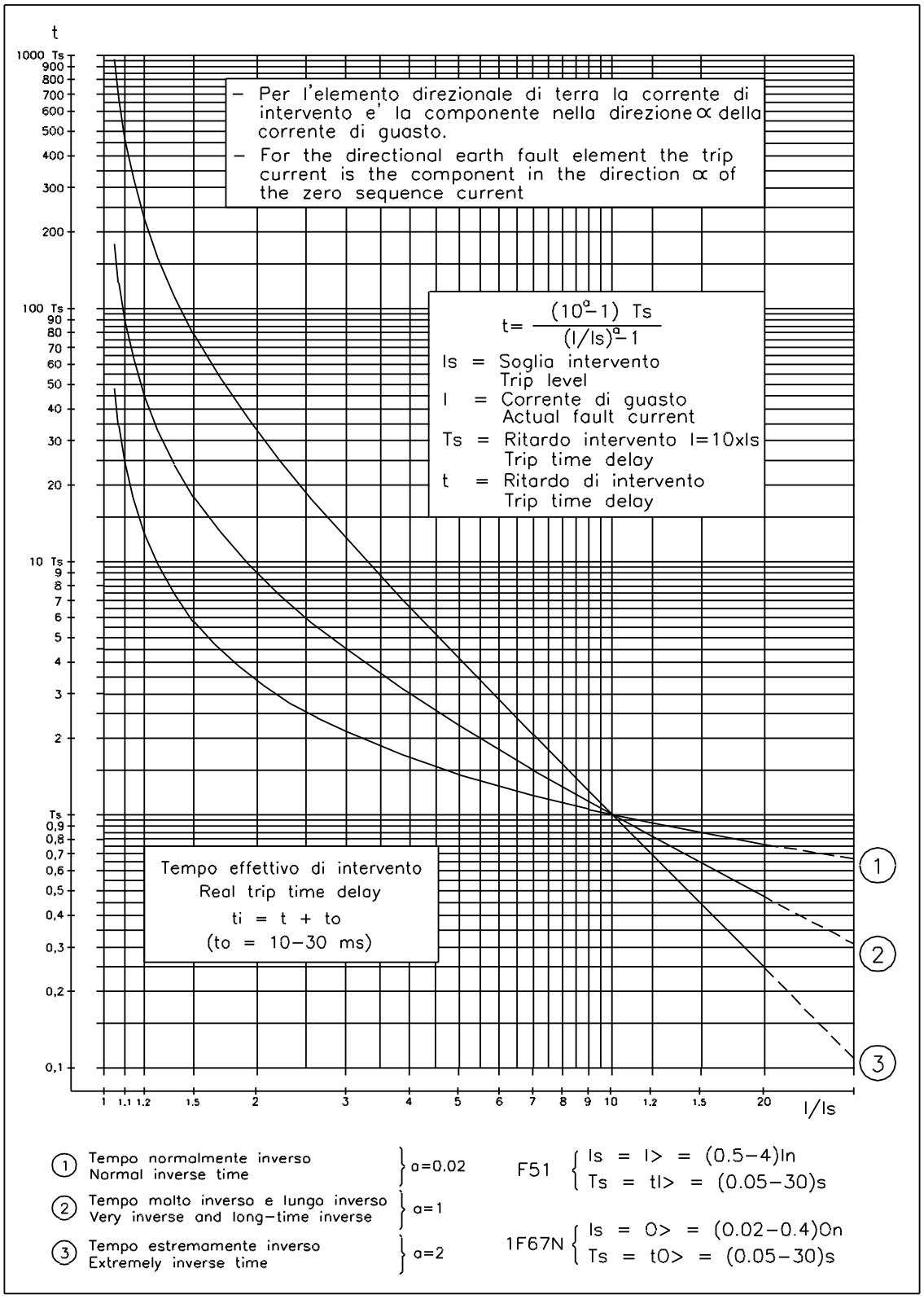
17. CONNECTION DIAGRAM (SCE1404 Rev.1)



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



19. TIME CURRENT CURVES (TU0288 Rev.0)



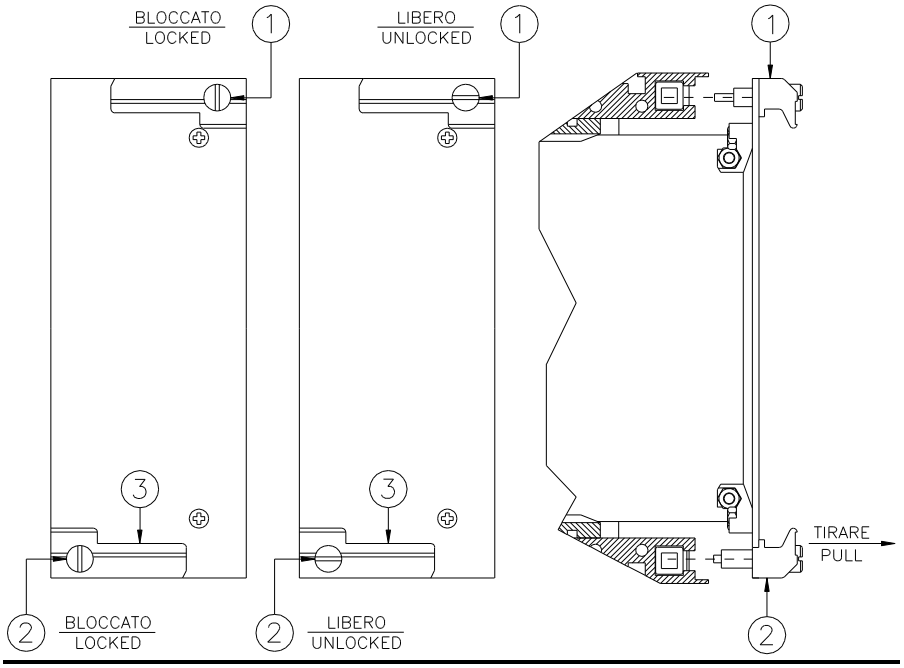
20. DIRECTION FOR PCB'S DRAW-OUT AND PLUG-IN

DRAW-OUT

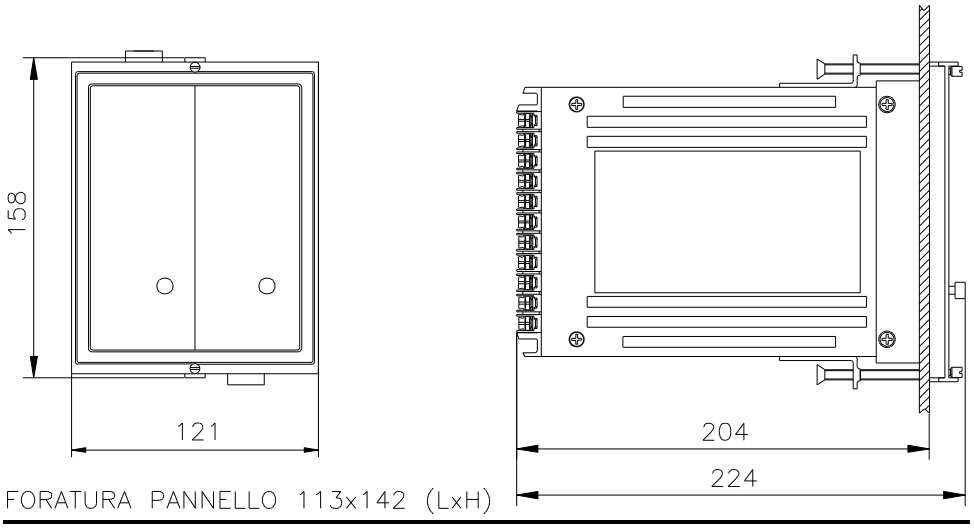
Rotate clockwise the screws ① and ② in the horizontal position of the screws-driver mark.
Draw-out the PCB by pulling on the handle ③

PLUG-IN

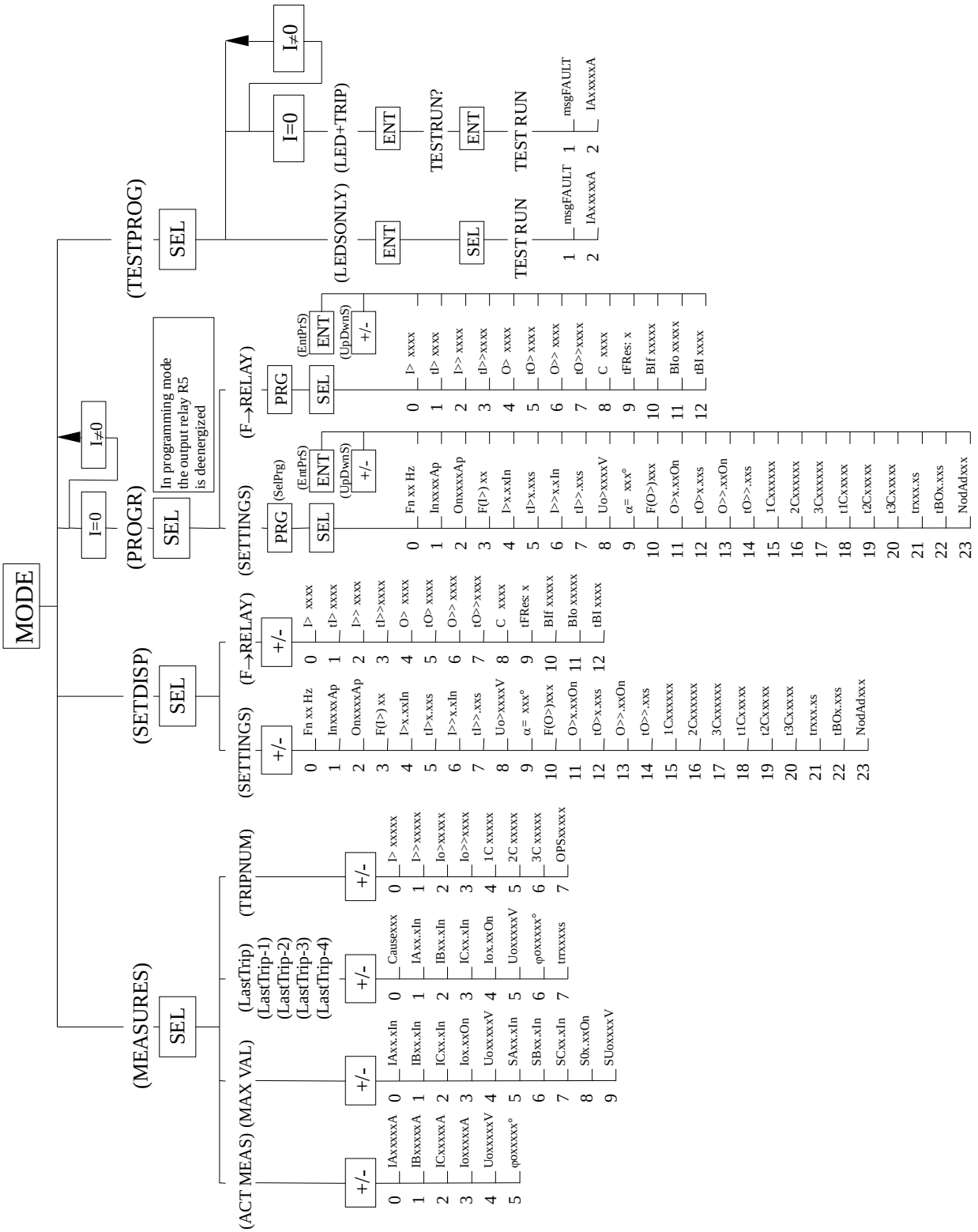
Rotate clockwise the screws ① and ②in the horizontal position of the screws-driver mark.
Slide-in the card on the rails provided inside the enclosure.
Plug-in the card completely and by pressing the handle to the closed position.
Rotate anticlockwise the screws ① and ② with the mark in the vertical position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



21. MOUNTING



22. KEYBOARD OPERATIONAL DIAGRAM (D46514 Rev.0)



23. SETTINGS' FORM

Date :		**Number Relay:**	

RELAY PROGRAMMING

Default Setting			**Actual Setting**		
Variable	**Value**	**Measurement Unit**	**Variable**	**Value**	**Measurement Unit**
Fn	50	**Hz**	**Fn**		**Hz**
In	500	**Ap**	**In**		**Ap**
On	500	**Ap**	**On**		**Ap**
F(I>)	D	**--------**	**F(I>)**		**--------**
I>	1.0	**In**	**I>**		**In**
tI>	2.0	**s**	**tI>**		**s**
I>>	2	**In**	**I>>**		**In**
tI>>	1.0	**V**	**tI>>**		**V**
Uo>	10	**V**	**Uo>**		**V**
α=	90°	**--------**	**α=**		**--------**
F(O>)	D	**--------**	**F(O>)**		**--------**
O>	.1	**On**	**O>**		**On**
tO>	4.0	**s**	**tO>**		**s**
O>>	.5	**On**	**O>>**		**On**
tO>>	3.0	**s**	**tO>>**		**s**
1C	Ih Oh	**--------**	**1C**		**--------**
2C	I O Oh	**--------**	**2C**		**--------**
3C	O Oh	**--------**	**3C**		**--------**
t1C	2	**s**	**t1C**		**s**
t2C	4	**s**	**t2C**		**s**
t3C	6	**s**	**t3C**		**s**
tr	8	**s**	**tr**		**s**
tBO	.25	**s**	**tBO**		**s**
NodAd	1	**--------**	**NodAd**		**--------**

CONFIGURATION OF OUTPUT RELAYS

Default Setting					**Actual Setting**				
Protecive Elem.	**Output Relays**				**Protecive Elem.**	**Output Relays**			
I>	-	-	-	-	**I>**				
tI>	1	2	-	-	**tI>**				
I>>	-	-	-	-	**I>>**				
tI>>	1	2	-	-	**tI>>**				
O>	-	-	-	-	**O>**				
tO>	1	-	3	-	**tO>**				
O>>	-	-	-	-	**O>>**				
tO>>	1	-	3		**tO>>**				
C	-	-	-	4	**C**				
tFRes:	A				**tFRes**:				
BIf	I>>I>				**BIf**				
BIo	O>>O>				**BIo**				
tBI	2tB0				**tBI**				