MULTIFUNCTION VOLTAGE AND FREQUENCY PROTECTION RELAY TYPE UM30-LF

OPERATION MANUAL

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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

The measured quantities are supplied from 3 Wye-connected system's P.Ts to the 3 input transformers; the zero sequence voltage is built-up internally.
The relay is normally supplied for 100V phase-to-phase input. Any different input voltage is available on request.
The rated input voltage is marked on the relay's P.C. board as well as on the connection diagram printed on its enclosure.
Make electric connection in conformity with this diagram and check that input voltages 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.** }

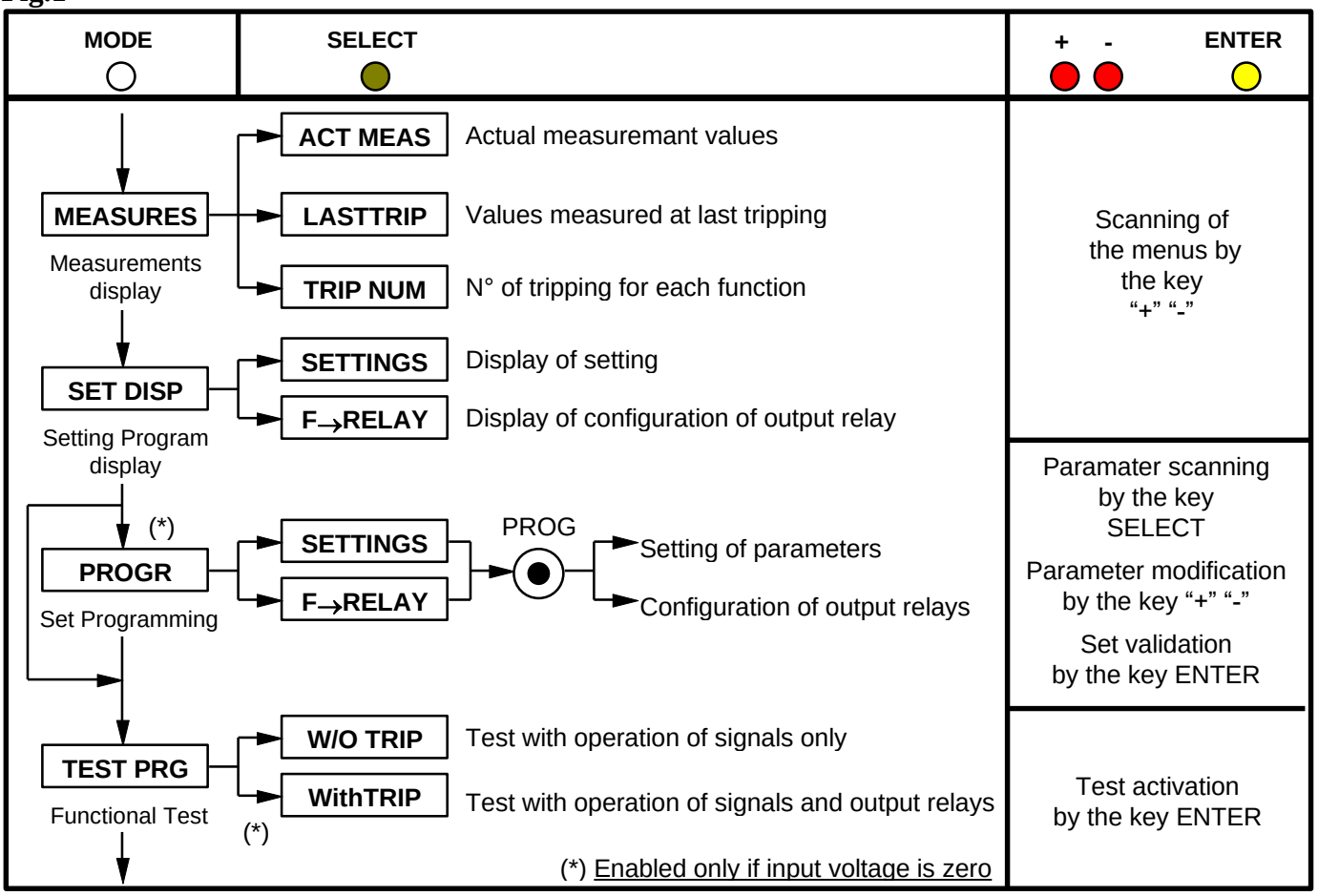
b) - { **80V(-20%) / 220V(+15%) a.c.** / **90V(-20%) / 250V(+20%) d.c.** }

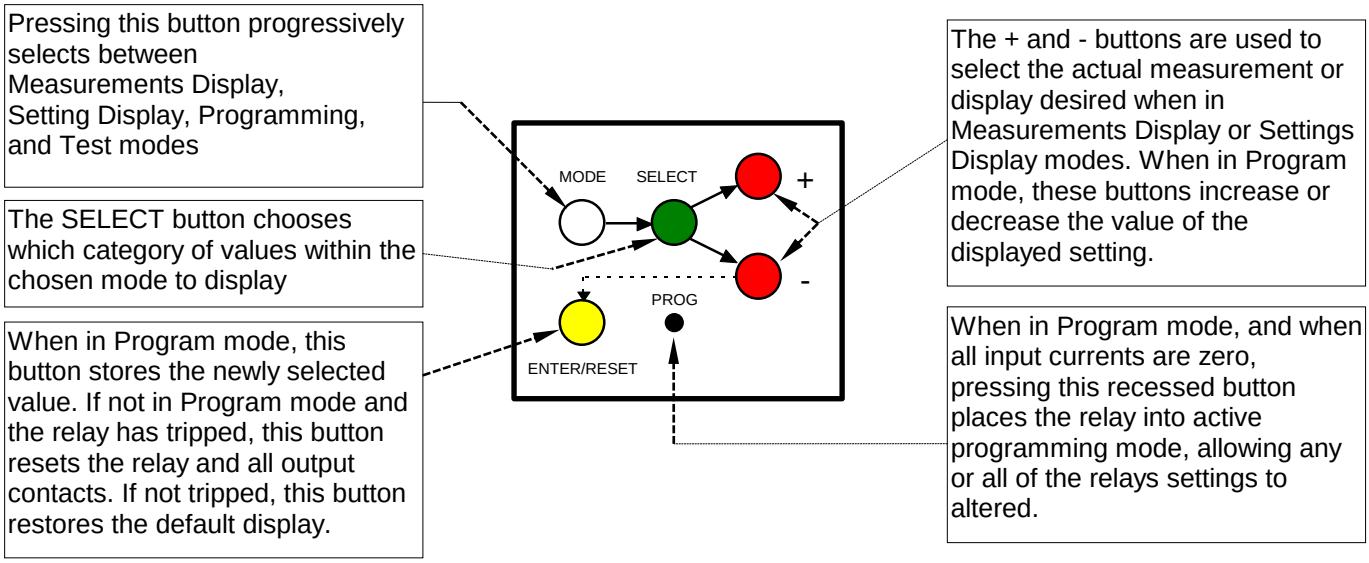
Before energizing the unit check that supply voltage is within the allowed limits.

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 **F** : flashing as soon as one of the two frequency control elements starts to operate; lit-on at the end of the set time delay
b) Red LED **U** : as above for the two voltage control elements
c) Red LED **Ed** : as above for the direct sequence voltage control element
d) Red LED **Es** : as above for the negative sequence voltage control element
e) Red LED **U/F** : as above for the V/Hz ratio control element
f) Red LED **Uo** : as above for the two zero sequence voltage control elements
g) Yellow LED **PRG/IRF** : Flashing when programming; lit-on in case of internal fault detected during relay's autotest.
h) Yellow LED **BI** : Lit-on when a blocking signal input is present (BI).

The reset of the leds takes place as follows:

- Leds a,b,c,d,e,f : -From flashing to off, when the start cause disappears.
  -From lit-on to off, by the "ENTER/RESET" push button or via serial bus only if the tripping cause has been cleared.
- Leds g,h : -From flashing/lit-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.
At switch-on of auxiliary power the relay performs an automatic self diagnostic test routine during which all signal leds are lit-on and the display shows the type of the relay.
If no internal fault has been detected, after a few seconds the leds are turned off and the display is turned to its default indication.

5. OUTPUT RELAYS

Five output relays are available (R1, R2, R3, R4, R5) for external signalization and trip.

a) - The relays **R1, R2, R3, R4** are normally deenergized (energized on trip): one or more of them can be associated to one or more of the UM30's functions (programmable configuration).
One relay associated to more than one function will be operated by the function which is set to operate first.
The reset after trip can only take place if the relevant tripping cause has been cleared.
The reset function is programmable as follows :
- Automatic instantaneous (Rxtr AUT.)
- Automatic after adjustable time delay 0,1 to 9,9 sec. (Rxtr x,x s)
- Manual (Rxtr MAN.) : in this mode the reset is operated either by the ENTER/RESET push button on the relay's front face or via serial bus

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 INPUT

Two blocking inputs activated by external cold contacts are available at relay's terminal board.

- **BI>** (terminals 1 - 2) : inhibits the operation of the output relays controlled by the "over level" functions (F>, U>, Ed>, Es>, Uo>, Uo>>,U/F) as long as it is active. As soon as the blocking input is removed the output relays associated to functions actually in operation will trip either instantaneously or after the remaining time delay if any. (*)

- **BI<** (terminals 1 - 3) : when active, inhibits the operation of all the "under level" functions (F<, U<, Ed<) including their timers. As soon as the blocking input is removed the timers of the functions eventually in operation, start counting and relevant output relays trip at the end of the set time delay. (*)

- **BIU>** (terminals 1 - 14) : when active, inhibits the operation of the function U>

(*) If the blocking input is activated before the input quantity has overpassed the operation level of the function blocked, the timing does not start at all.

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 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 menu "ACT.MEAS" or "LAST TRIP" or "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
Fxxxxx**Hz**	Input frequency : 40,00 - 70,00 Hz
UAxx**V,kV**	R.M.S. value of system's phase-to-phase voltage U_{A-B} : 0-999V or 0-9,99kV or 0-999kV with automatic scale selection (kV showed as K)
UBxx**V,kV**	As above U_{B-C}
UCxx**V,kV**	As above U_{C-A}
Uoxxxxx**V**	Zero sequence voltage at secondary of system's P.Ts. : 0,0-999,9V
EAxx**V,kV**	R.M.S. value of system's phase A-to neutral voltage 0-999kV
EBxx**V,kV**	As above phase B
ECxxx**,kV**	As above phase C
Edxxx**%En**	Direct sequence component of voltage as % of system's rated voltage: 0-999%
Esxxx**%En**	Negative sequence component of voltage as above

LAST TRIP = Display of the function which caused the last 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
Cau:xxxx	Display of the time delayed function which has operated the last tripping **--f'** = 1st frequency element **--f"** = 2nd frequency element **--u'** = 1st voltage element **--U>** = 2nd voltage element (max. voltage) **-O>A or O>B or O>C=** 1st zero sequence element for earth fault on phase A or B or C **O>>A or O>>B or O>>C =** as above 2nd level **--Ed** = Direct sequence voltage element **--Es** = Negative sequence voltage element **--1Φ** = V/Hz 1st element **--2Φ** = V/Hz 2nd element
Fnxxxx**Hz**	Frequency as measured at the instant of last trip
UAxxx**V,kV**	Voltage U_{A-B} as measured at the instant of last trip
UBxxx**V,kV**	As above U_{B-C}
UCxxx**V,kV**	As above U_{C-A}
Uoxxx**V,kV**	As above U_O
Edxxx**V,kV**	As above E_D
Esxxx**V,kV**	As above E_S

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
f' xxxxx	First frequency delayed element [t1f']
f" xxxxx	Second frequency delayed element [t2f''].
u' xxxxx	First voltage delayed element [tU'].
U>xxxxx	Second voltage delayed element [tU>].
Uo>xxxx	Low set zero seq. voltage delayed element [tO>]
Uo>>xxx	High set zero seq. voltage delayed element [tO>>]
Edxxxxx	Direct sequence voltage delayed element [tEd]
Esxxxxx	Negative sequence voltage delayed element [tEs]
1Φ>xxxx	V/Hz delayed 1st element [tU/F]
2Φ>xxxx	V/Hz delayed 2nd element [tU/F]

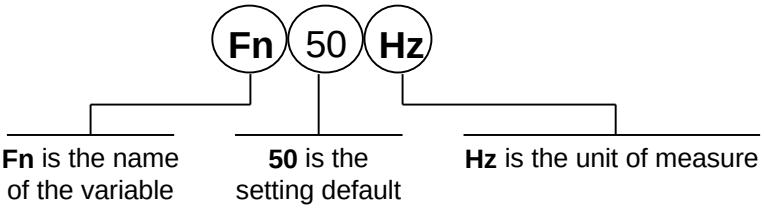
11. READING OF PROGRAMMED SETTINGS AND RELAY'S CONFIGURATION

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 relays 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 voltage 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	Unit
Fn 50 **Hz**	System frequency	50 - 60	10	Hz
UnP 10**kV**	Rated primary phase-to-phase voltage of system's P.Ts.	0.10 - 655	(0.1-1) step 0.01 (1.1-9.9) step 0.1 (10-655) step 1	kV
UnS 100**V**	Rated secondary phase-to-phase voltage of system's P.Ts	100 - 125	1V	V
1Φ> 1,2**pU**	Trip level of the V/Hz 1st element	1 - 2 - Dis	0.1	pU
K 5.0	Time delay coefficient of the function 1Φ>	0.5 - 5	0.1	-
2Φ> 1,2**pU**	Trip level of the V/Hz 2nd element	1 - 2 - Dis	0.1	pU
t2Φ 5,0**s**	Time delay of the function 2Φ> definite time	0.1 - 60	0.1	s
Fn -/+ **f'**	Operation mode of the first frequency control element **+** = overfrequency **-** = underfrequency **-/+** = under/over frequency **Dis** = function is disactivated	+ - -/+ Dis	+ - -/+ Dis	-
f' 0.50 **Hz**	Trip differential level of the 1st frequency control element	0.05 – 9.99	0.01	Hz
tf' 1.0 **s**	Trip time delay of first frequency control element	0.1 – 60.0	0.1	s

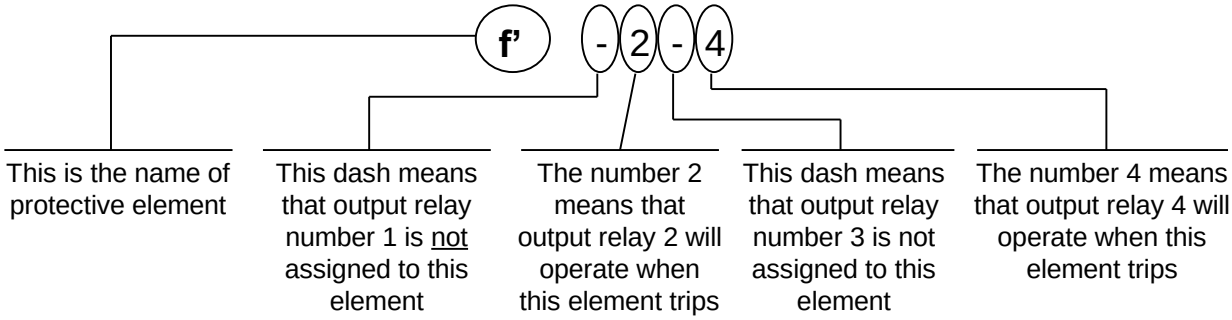
Display	Description	Setting Range	Step	Unit
Fn - f"	Operation mode of the second freq. control element **+** = overfrequency **-** = underfrequency **-/+** = under/over frequency **Dis** = function is disactivated	+ - -/+ Dis	+ - -/+ Dis	-
f"1.00**Hz**	Trip differential level of the 2nd freq. element	0.05 – 9.99	0.01	Hz
tf" 2.0 **s**	Trip time delay of 2nd freq. control element	0.1 - 60	0.1	s
Un -/+ **u'**	Operation mode of the first voltage control element **+** = overvoltage **-** = undervoltage **-/+** = under/over voltage **Dis** = function is disactivated **see note 1**	+ - -/+ Dis	+ - -/+ Dis	-
u' 10**%Un**	Trip differential level of the 1st voltage control element	5 - 90	1	%Un
tu' 1,0 **s**	Trip time delay of 1st voltage control element	0.1- 60	0.1	s
U>10**%Un**	Trip differential level of the 2nd voltage control element	5 - 90	1	%Un
tU> 2.0 **s**	Time delay of 2nd voltage control element	0.1 - 60	0.1	s
Edn -/+**Ed**	Operation mode of the direct sequence voltage element **+** = overvoltage **-** = undervoltage **-/+** = under/over voltage **Dis** = function is disactivated **see note 1**	+ - -/+ Dis	+ - -/+ Dis	-
Ed 20**%En**	Trip differential level of the direct sequence element	5 - 90	1	%En
tEd 5,0 **s**	Trip time delay of the direct sequence voltage element	0,1 - 60	0,1	s
Es 10**%En**	Trip level of the negative sequence voltage element	1 - 99 - Dis	1	%En
tEs 5,0 **s**	Trip time delay of the negative sequence element	0,1 - 60	0,1	s
Uo> 10 **V"**	Trip level of the low-set zero sequence voltage element (Volts at PT's secondary) **see note 2**	1 - 99 - Dis	1	V"
to> 0,50 **s**	Trip time delay of low-set zero sequence element	0.05 - 60	0.05 – 9.9 step 0.05 10 - 60 step 0.1	s
Uo>>20**V"**	Trip level of the high-set zero sequence voltage element **see note 2**	1 - 99 - Dis	1	V"
to>>0,20 **s**	Trip time delay of high-set zero sequence element	0,05 - 9,9	0,05	s
NodAd 1	Identification number for connection on serial communication bus	1 - 250	1	-

The setting Dis indicates that the function is disactivated.

NOTE 1 : If this element is programmed to operate as Undervoltage **(Un-u')**, **(En-Ed)**, it is automatically locked-out when the input frequency is ≤8Hz.

NOTE 2: The zero sequence Overvoltage elements having a band-pass filter do not work when the frequency is different from the rated by more than ±5%

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
f' ---4	Instantaneous element of 1st frequency level operates relays R1, R2, R3, R4 Minimum time delay 80ms.
tf' 1---	As above, time delayed element.
f" ---4	Instantaneous element of 2nd frequency level operates relays R1, R2, R3, R4. Minimum time delay 80ms.
tf" -2--	As above, time delayed element.
u' ---4	Instantaneous element of 1st voltage level operates relays R1, R2, R3, R4.
tu' 1---	As above, time delayed element.
U> ---4	Instantaneous element of 2nd voltage level operates relays R1, R2, R3, R4.
tU> -2--	As above, time delayed element.
Uo>---4	Instantaneous elements of low-set earth fault level operates relays R1, R2, R3, R4.
to> 1---	As above, time delayed element
Uo>>---4	Instantaneous element of high-set earth fault level operates relays R1, R2, R3, R4.
to>>--3-	As above, time delayed element
Ed ---4	Instantaneous element of direct sequence voltage level operates relays R1, R2, R3, R4.
tEd --3-	As above, time delayed element.
Es ---4	Instantaneous element of negative seq. voltage level operates relays R1, R2, R3, R4.
tEs --3-	As above, time delayed element.
1Φ ---4	Instantaneous element of the 1Φ> element operates relays R1, R2, R3, R4 (only one or more whatever combination).
t1Φ--3-	As above, time delayed 1Φ> element
2Φ ---4	Instantaneous element of the 2Φ> element operates relays R1, R2, R3, R4
t2Φ--3-	As above, time delayed 2Φ> element

Display	Description
R1tr 3**s**	Reset time delay of output relay R1 can be: - instantaneous (R1tr Aut.) - time delayed (R1tr 0,1- 9,9 s) step 0,1 s (3 s delay showed) - manual (R1tr Man.)
R2tr Aut.**)**	As above for relay R2.
R3tr Man.	As above for relay R3.
R4tr Aut.	As above for relay R4.

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 (FxxxxxHz).
  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 "**LED+TRIP**":
  Access to this program is enabled only if the voltage measured 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.
- 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 **LED+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

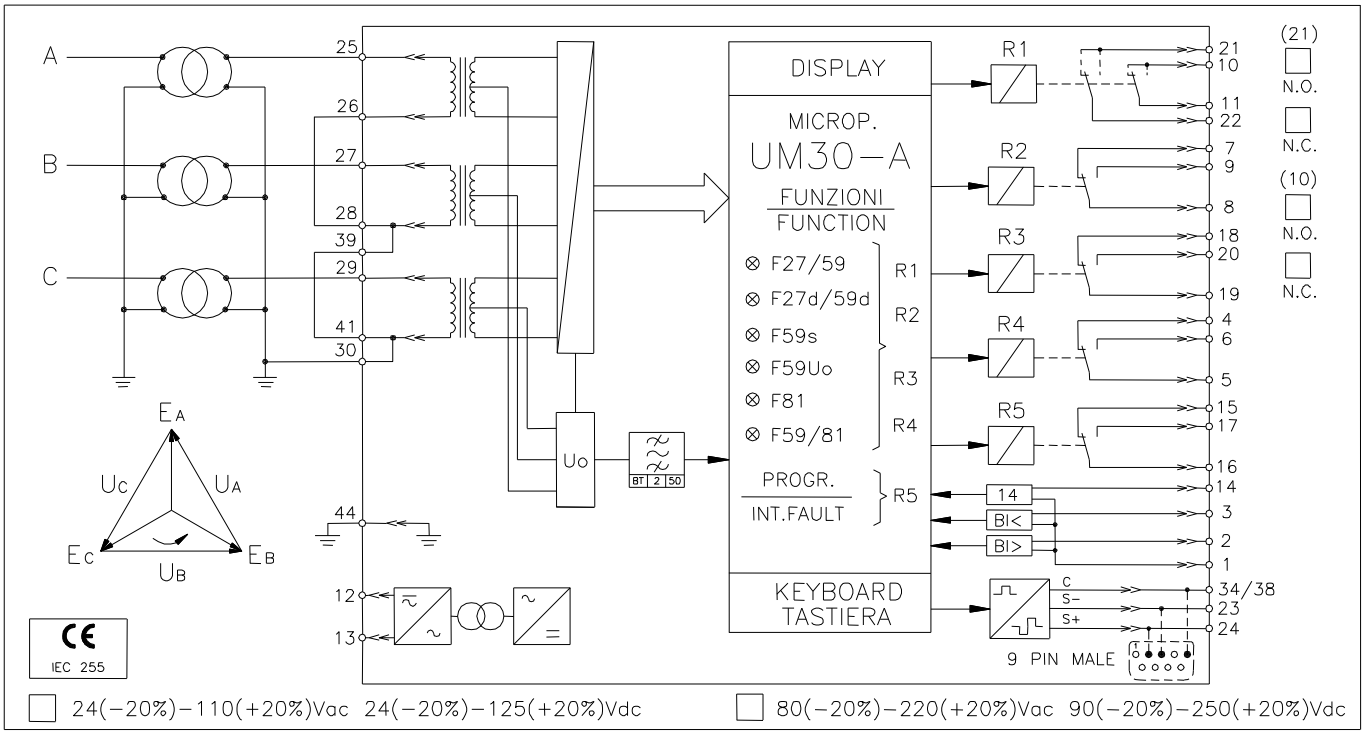
No maintenance is required. Periodically a functional check-out can be made with the test procedures described under MANUAL TEST chapter. In case of malfunctioning please contact Microelettrica Scientifica Service or the local Authorised Dealer mentioning the relay's Serial No reported in the label on relays enclosure.

15. ELECTRICAL CHARACTERISTICS

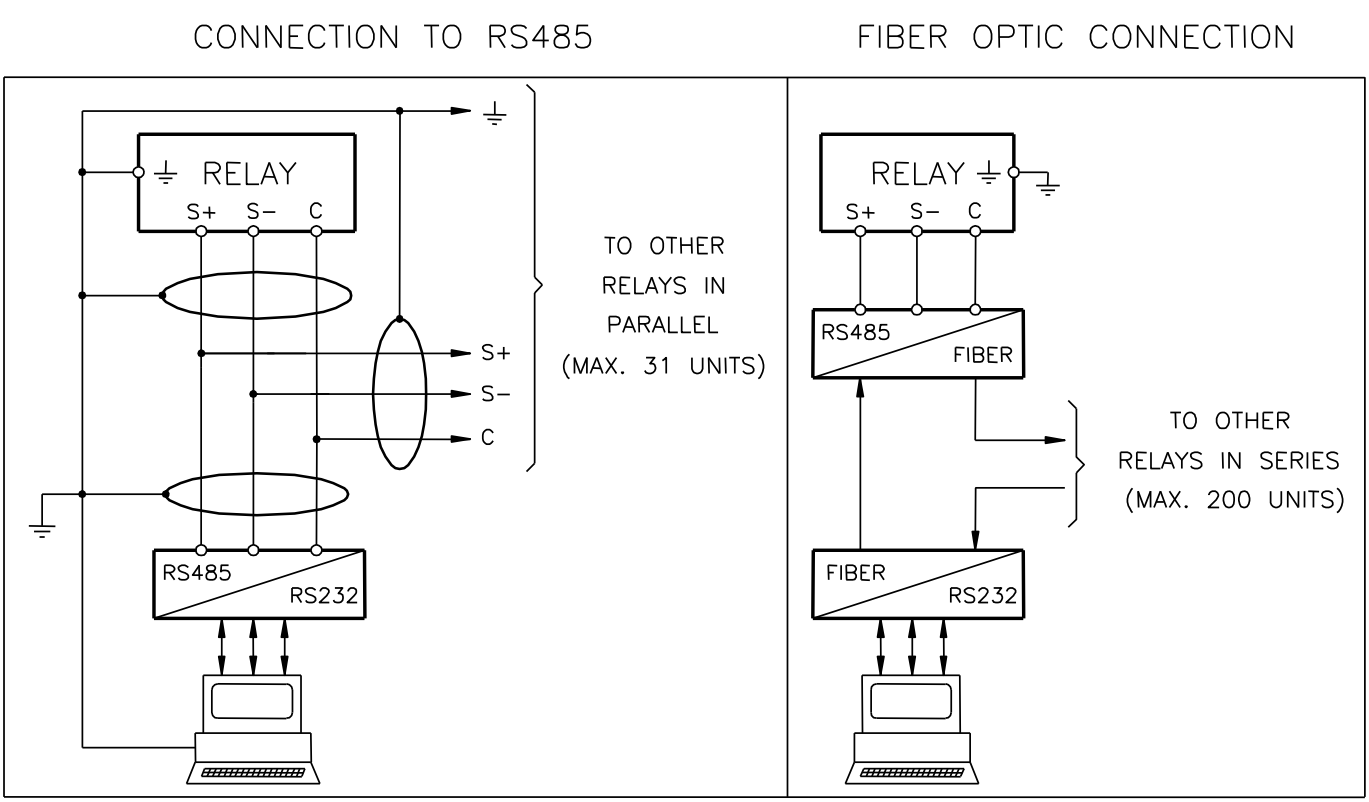
Reference standards	IEC 255, 801; CEI 41-1; IEEE C37; CE
Dielectric test voltage	2000 V, 50 Hz, 1 min.
Impulse test voltage	5kV (MC), 2 kV (MD) - 1,2/50μμs
Immunity to high frequency burst	1 kV (MC), 0,5 kV (MD) - 0,1 MHz 2,5 kV (MC), 1 kV (MD) - 1 MHz
Immunity to electrostatic discharge	15 kV
Immunity 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 voltage	100 V phase to phase
Voltage overload	200 V continuous
Burden on voltage inputs	0,033 VA/phase at 100/√3
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

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

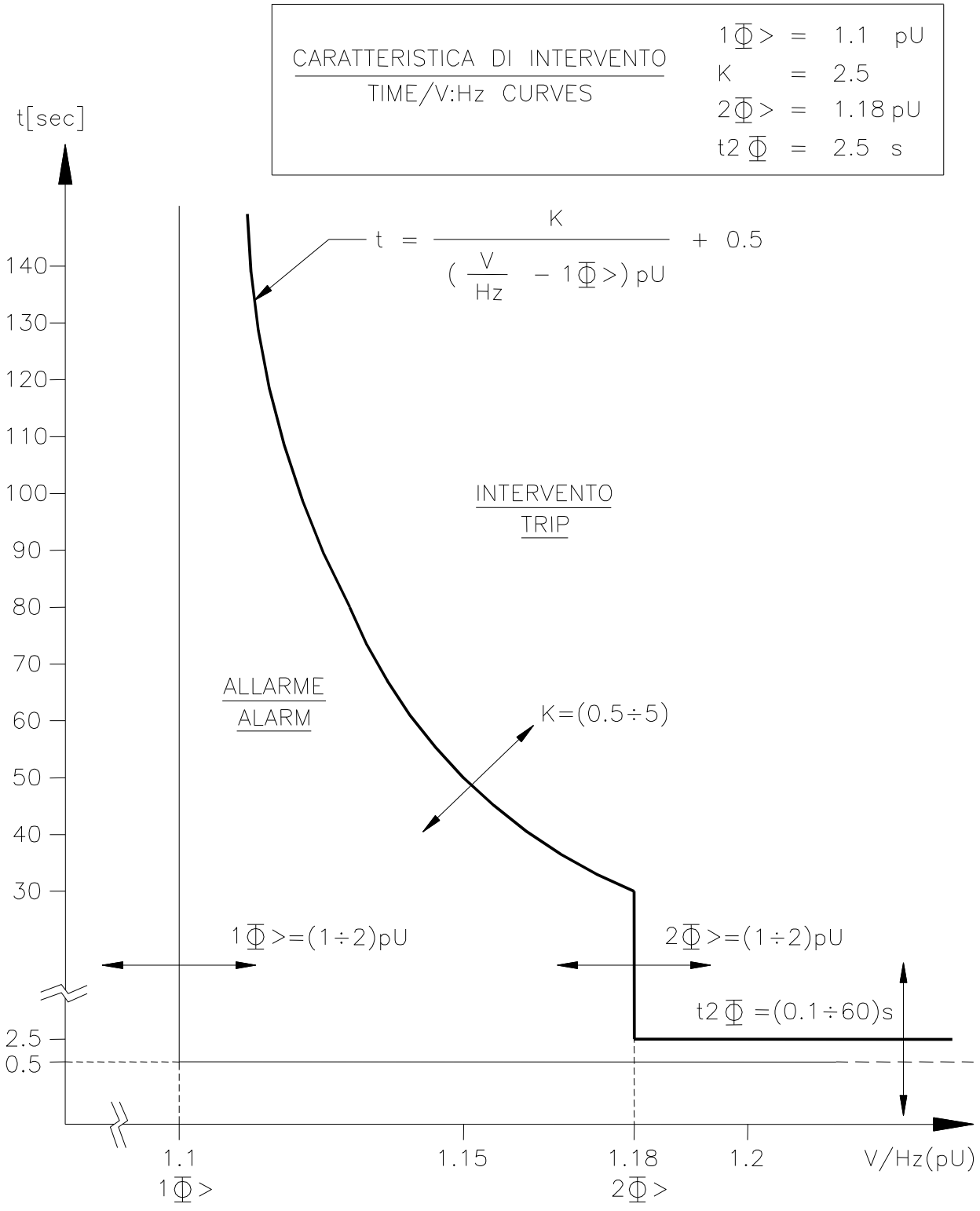
16. CONNECTION DIAGRAM (SCE1342 Rev.3)



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



18. TIME CURRENT CURVES V/Hz (TU0326 Rev.0)



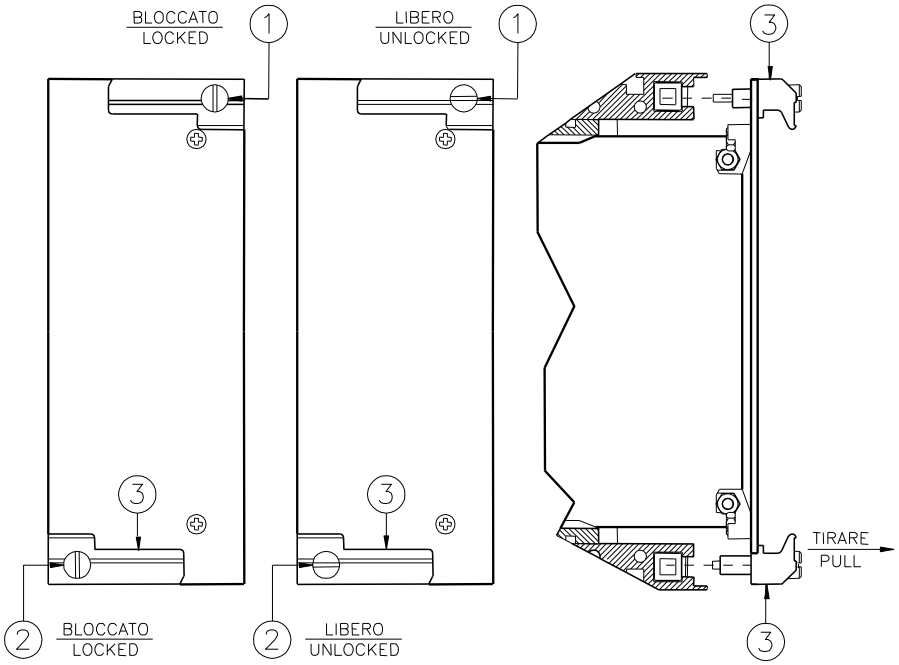
19. DIRECTION FOR PCB'S DRAW-OUT AND PLUG-IN

DRAW-OUT

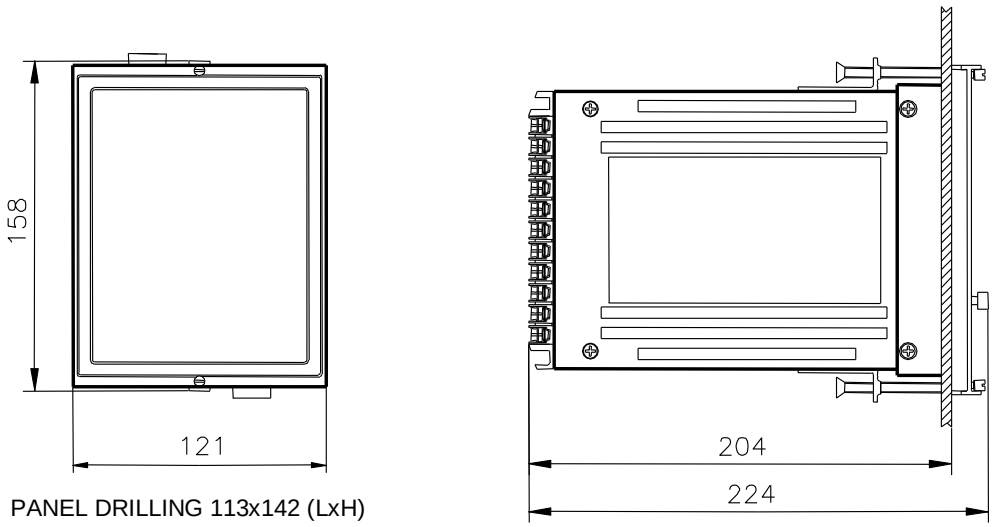
Rotate clockwise the screws ① and ② in the horizontal position of the screws-driver mark.
Draw-out the PCB by pulling on the handle ③

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).

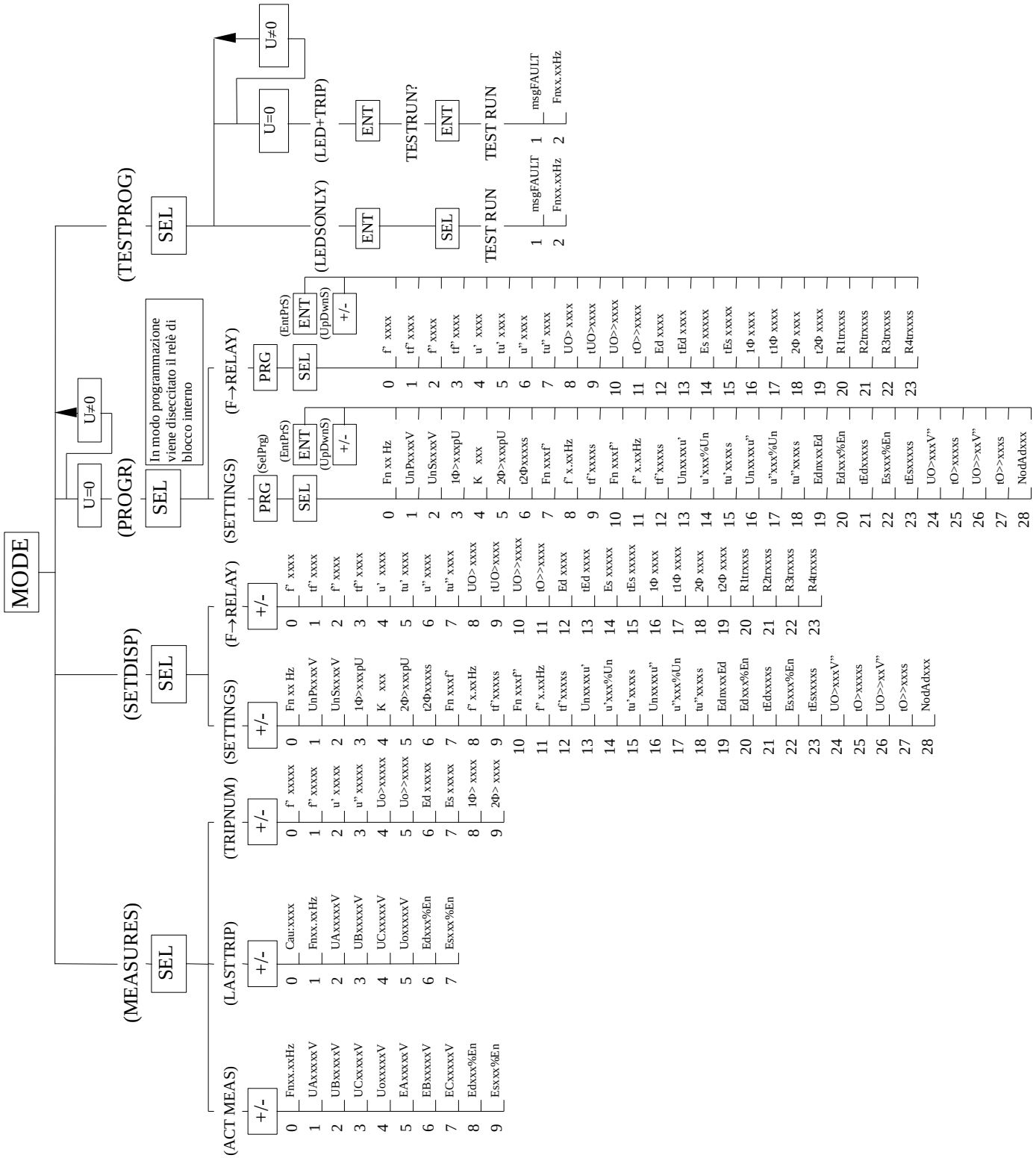


20. OVERALL DIMENSIONS



PANEL DRILLING 113x142 (LxH)

21. KEYBOARD OPERATIONAL DIAGRAM (D46015 Rev.3)



22. SETTINGS' FORM

Date :		**Number Relay:**	

RELAY PROGRAMMING

Default Setting			**Default Setting**		
Variable	**Value**	**Measurement Unit**	**Variable**	**Value**	**Measurement Unit**
Fn	50	**Hz**	**Fn**		**Hz**
UnP	10	**kV**	**UnP**		**kV**
UnS	100	**V**	**UnS**		**V**
1Φ>	1,2	**pU**	**1Φ>**		**pU**
K	5.0	----------	**K**		----------
2Φ>	1,2	**pU**	**2Φ>**		**pU**
t2Φ	5,0	**s**	**t2Φ**		**s**
Fn	-/+	**f'**	**Fn**		**f'**
f'	0,50	**Hz**	**f'**		**Hz**
tf'	1,0	**s**	**tf'**		**s**
Fn	-	**f"**	**Fn**		**f"**
f"	1,00	**Hz**	**f"**		**Hz**
tf"	2,0	**s**	**tf"**		**s**
Un	-/+	**u'**	**Un**		**u'**
u'	10	**%Un**	**u'**		**%Un**
tu'	1,0	**s**	**tu'**		**s**
U>	10	**%Un**	**U>**		**%Un**
tU>	2.0	**s**	**tU>**		**s**
Edn	-/+	**Ed**	**Edn**		**Ed**
Ed	20	**%En**	**Ed**		**%En**
tEd	5.0	**s**	**tEd**		**s**
Es	10	**%En**	**Es**		**%En**
tEs	5.0	**s**	**tEs**		**s**
Uo>	10	**V"**	**Uo>**		**V"**
to>	0.50	**s**	**to>**		**s**
Uo>>	20	**V"**	**Uo>>**		**V"**
to>>	0.20	**s**	**to>>**		**s**
NodAd	1	----------	**NodAd**		----------

CONFIGURATION OF OUTPUT RELAYS

Default Setting					**Actual Setting**				
Protective Elem.	**Output Relays**				**Protective Elem.**	**Output Relays**			
f'	-	-	-	4	**f'**				
tf'	1	-	-	-	**tf'**				
f"	-	-	-	4	**f"**				
tf"	-	2	-	-	**tf"**				
u'	-	-	-	-	**u'**				
tu'	1	-	-	-	**tu'**				
U>	-	-	-	4	**U>**				
tU>	-	2	-	-	**tU>**				
Uo>	-	-	-	4	**Uo>**				
to>	1	-	-	-	**to>**				
Uo>>	-	-	-	4	**Uo>>**				
to>>	-	-	3	-	**to>>**				
Ed	-	-	-	4	**Ed**				
tEd	-	-	3	-	**tEd**				
Es	-	-	-	4	**Es**				
tEs	-	-	3	-	**tEs**				
1Φ	-	-	-	4	**1Φ**				
t1Φ	-	-	3	-	**t1Φ**				
2Φ	-	-	-	4	**2Φ**				
t2Φ	-	-	3	-	**t2Φ**				
R1tr	3s				**R1tr**				
R2tr	Aut.				**R2tr**				
R3tr	Man.				**R3tr**				
R4tr	Aut.				**R4tr**				