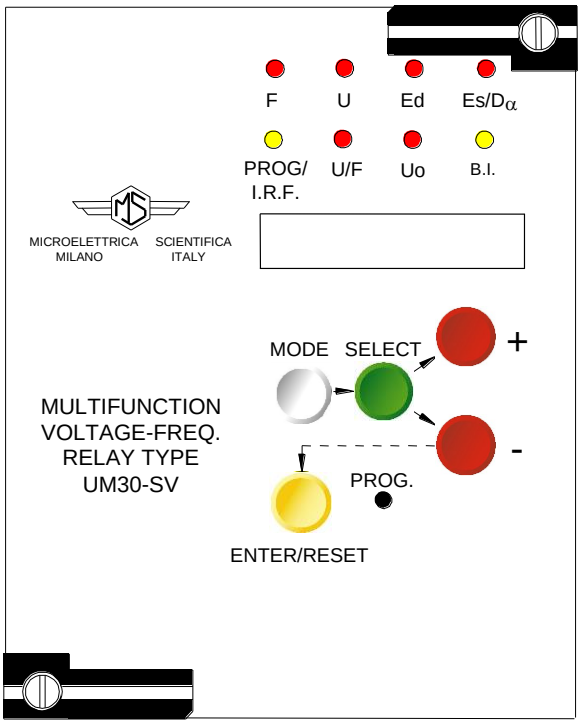
MULTIFUNCTION VOLTAGE AND FREQUENCY PROTECTION RELAY WITH "VECTOR JUMP" DETECTION ELEMENT

TYPE

UM30-SV

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 reduced by M.S. are completely safe from electrostatic discharge (8 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

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 - POWER SUPPLY

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.

2.2 - OPERATION OF THE "VECTOR JUMP" DETECTION ELEMENT

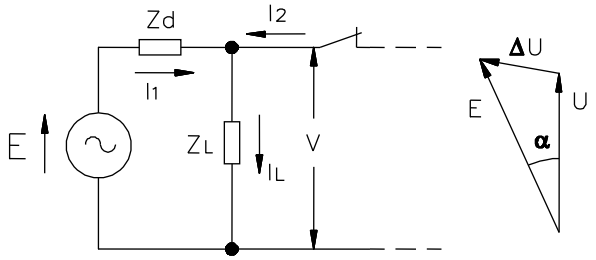
The relay UM30-SV includes an element designed to instantaneously detect the perturbation produced by a sudden variation of the load at the terminals of a generator.
Such variation results in a proportional variation of the angular displacement "d" between the generator Electromotive Force "E" and voltage at its terminals "V".
In the case of a generator operating in parallel with a distribution network, when the last is suddenly disconnected, the generator comes "Islanding" and totally supplies the loads connected to the bus including the share of load formerly supplied by the network.
This perturbation produces a sudden variation "$\Delta\alpha$" of the angle α which is called "Vector Jump".
If the Circuit Breaker of the network is automatically reclosed the voltage displacement between the generator's bus and the network can be too large for a safe parallel.
An instantaneous detection of this situation can timely open the generator's Circuit Breaker before the network's reclousure takes place thus avoiding possible serious damages to the generator itself.
The relay can detect a Vector Jump adjustable from 2° to 30° giving out a trip signal in less than 60ms.
The detection of the perturbation can be selected between two different modes : 1-phase or 3-phase.

- In the 1-phase mode tripping takes place as soon as a $\Delta\alpha$ exceeding the set level is detected on one of the three phase voltages.

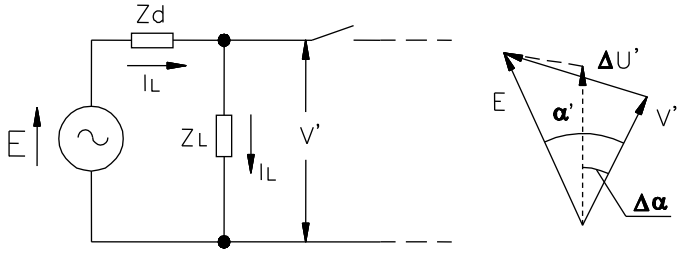
- In the 3-phase mode tripping takes place only if $\Delta\alpha$ above the set level is detected on all the three phases at the same time.

Mode 1 is more sensitive than Mode 3 to the Vector Jump as well as to spurious perturbations.
An undervoltage detector blocks the "Vector Jump" function if the voltage drops below an adjustable level Vb.
A digital input (terminals 1-14) operated by a N/O auxiliary contact of the generator's Circuit Breaker blocks the Vector Jump functions when the Circuit Breaker is open as well as for 5 sec. from its closure.

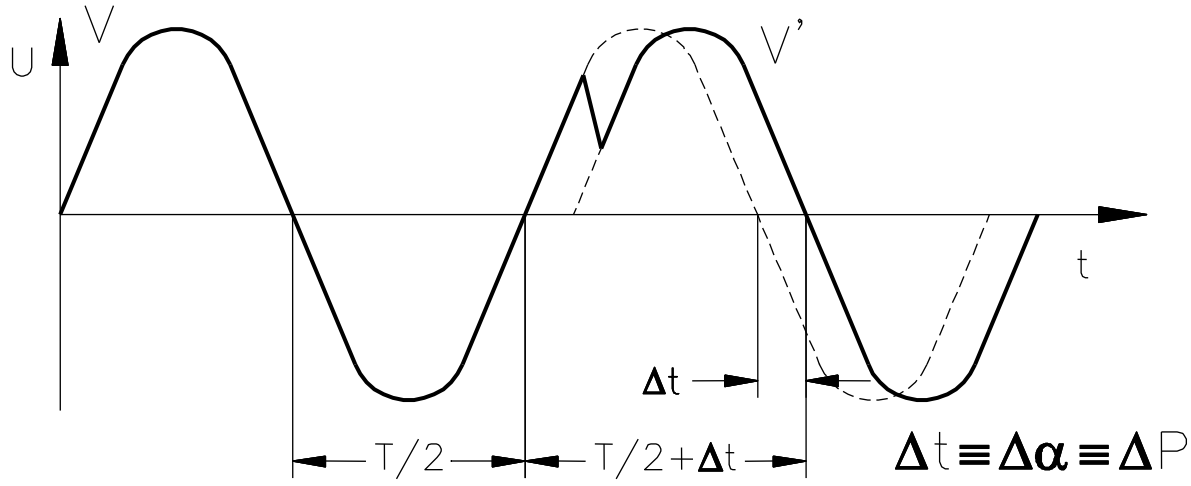
As an indication the value of $\Delta\alpha$ in function of the Power variation of the Generator ΔP passing from the normal situation to "Islanding" can be assumed : $\Delta\alpha$ (°) = (0.4 – 0.8) ΔP% going from large to small Generators.



$$\Delta U = \bar{E} - \bar{V} = \bar{I}_1 \bullet JZd \quad \text{(Volts)}$$



$$\Delta U' = \bar{E} - \bar{V}' = \bar{I}_L \bullet JZd = (\bar{I}_1 + \bar{I}_2)JZd \quad \text{(Volts)}$$

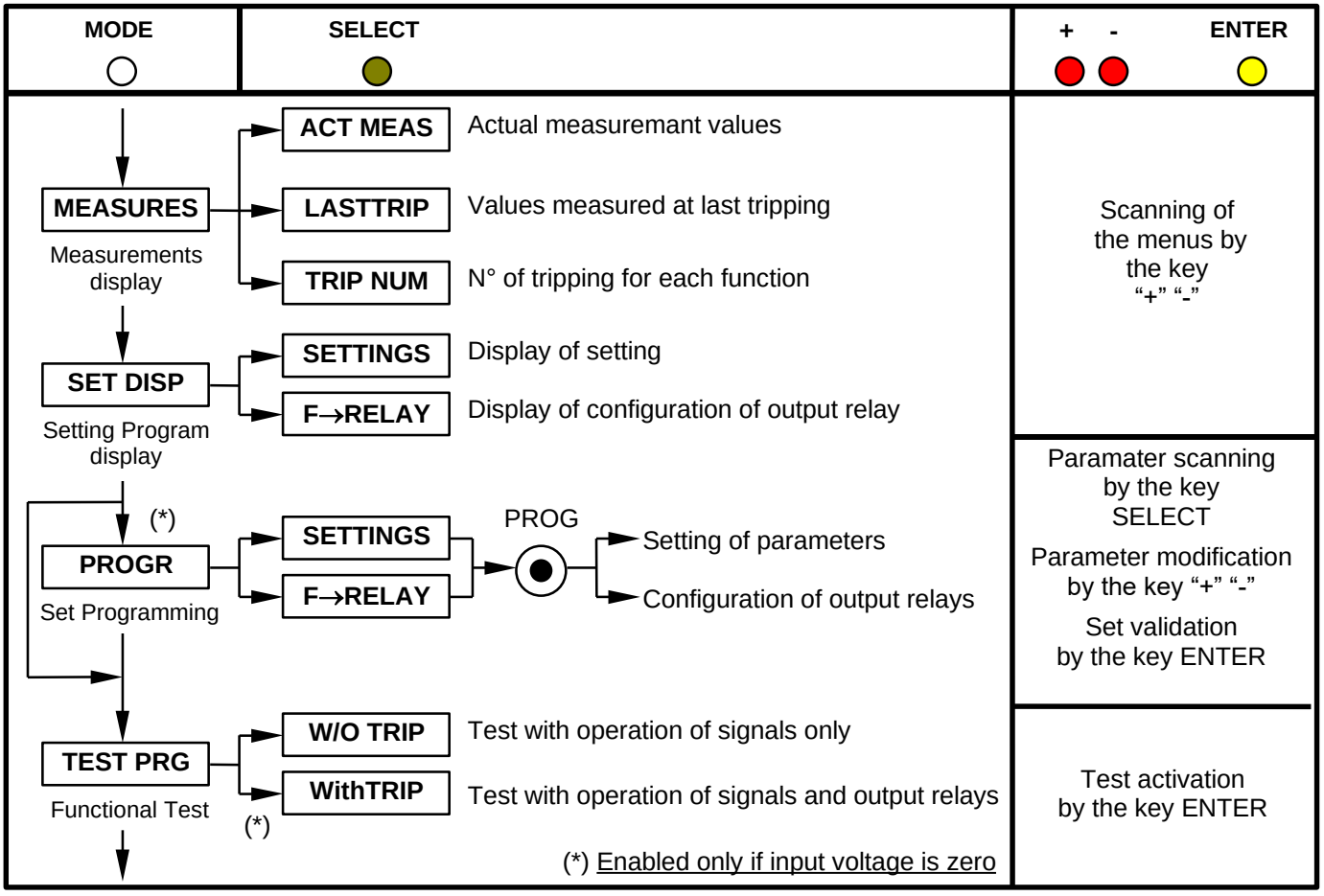


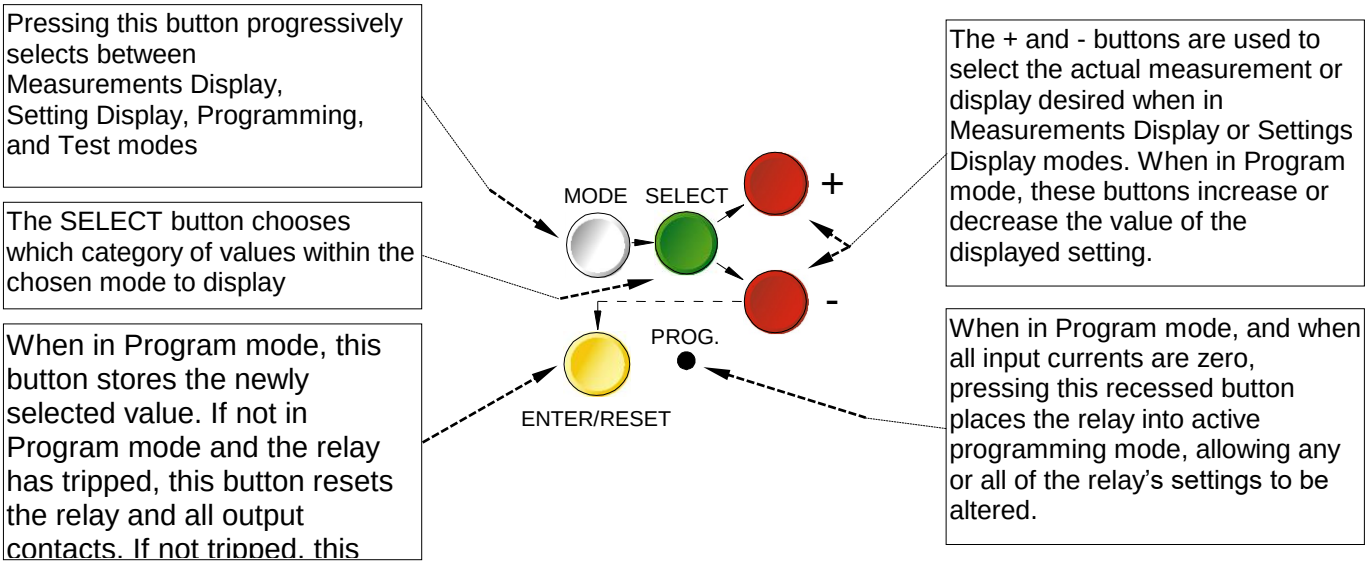
$$\Delta\alpha(^\circ) = \Delta t(\text{sec}) \cdot fn(\text{Hz}) \cdot 360^\circ \cong (50 \div 100)\% \Delta P$$

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)

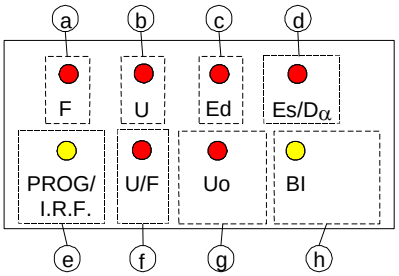
FIG.1





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/Dα**	❑ As above for the negative sequence voltage control element and for Vector Jump element.
e)	Yellow 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)	Red 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.) (x = 1,2,3,4)
- Automatic after adjustable time delay 0,1 to 9,9 sec. (Rxtr x,x s) (x = 1,2,3,4)
- 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

The relays fitted with the serial communication option can be connected via a cable bus a fiber optic bus for interfacing with a Personal Computer (type IBM or compatible).
All the functionalities that can be operated locally (for example reading of input measurement and changing of relay's settings) are also possible via the serial communication interface.
Furthermore the serial port allows the user to read event recording and stored data.
The unit has a RS232 / RS485 interface and can be connected either directly to a P.C. via a dedicated cable or to a RS485 serial bus, allowing having many relays to exchange data with a single master P.C. using the same physical serial line. A RS485/232 converter is available on request.
The communication protocol is MODBUS RTU (only functions 3, 4 and 16 are implemented).
Each relay is identified by its programmable address code (NodeAd) and can be called from the P.C.
A dedicated communication software (MSCOM) for Windows 95/98/NT4 SP3 (or later) is available.
Please refer to the MSCOM instruction manual for more information Microelettrica Scientifica.

7. DIGITAL INPUTS

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. (*)
❑ **14**	(terminals 1 - 14)	This input is controlled by one “status monitoring N/O auxiliary contact of the generator’s Circuit Breaker”. When it becomes active, inhibits the operation of the “Vector Jump” function.during 5 seconds.

(*) 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.

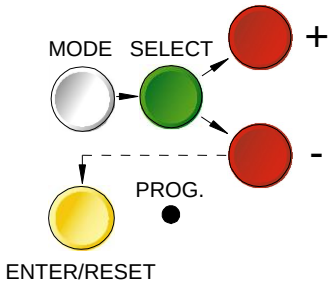
8. TEST

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 4 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 :
	MEASURES	=	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	●	:	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 "-" .

10.1 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 UA-B : 0-999V or 0-9,99kV or 0-999kV with automatic scale selection (kV showed as K)
UBxx**V,kV**	As above UB-C
UCxx**V,kV**	As above UC-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
ECxx**V,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

10.2 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 -**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 **-Dα>** = Vector Jump detection element
Fxxxx**Hz**	Frequency as measured at the instant of last trip
UAxxx**V,kV**	Voltage UA-B as measured at the instant of last trip
UBxxx**V,kV**	As above UB-C
UCxxx**V,kV**	As above UC-A
UOxxx**V,kV**	As above UO
Edxxx**%En**	As above ED
Esxxx**%En**	As above ES
Dα>xxx°	Displacement angle on Vector Jump as measured at the instant of last trip

10.3 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 [t1u].
u"xxxxx	Second voltage delayed element [t2u].
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]
Dα>xxx	Vector Jump element

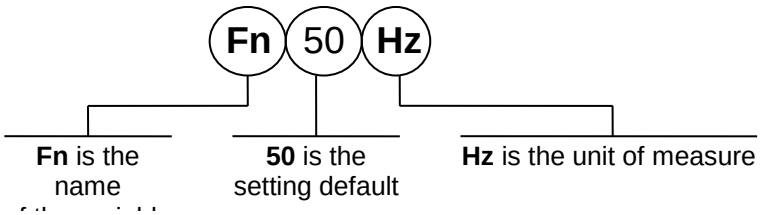
11. READING OF PROGRAMMED SETTINGS AND RELAY'S CONFIGURATION

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 in the " Display " column].
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).
Programming via the serial port is always enabled but a password is required to access the programming mode. The default password is the null string; in the standard application program for communication "MS-COM" it is also provided an emergency password which can be disclosed on request only.
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



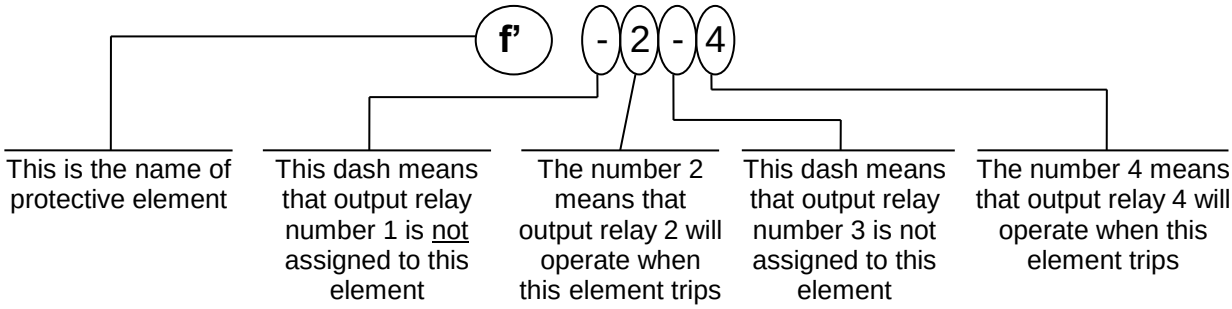
Mode PROG menu SETTINGS. (Production standard settings here under shown).

Display	Description	Setting Range	Step	Unit
Fn 50 **Hz**	System frequency	50 - 60	-	Hz
UnP 10**kV**	Rated primary phase-to-phase voltage of system's P.Ts.	0.10 - 655	(0.1 - 1) 0,01 (1.1-9.9) 0.1 (10-655) 1	kV
UnS 100**V**	Rated secondary phase-to-phase voltage of system's P.Ts	100 - 125	1	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	0.1	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	+ - -/+ 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
Un +**u"**	Operation mode of the 2nd voltage control element **+** = overvoltage **-** = undervoltage **-/+** = under/over voltage **Dis** = function is disactivated	+ - -/+ Dis	+ - -/+ Dis	-
u"20**%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	+ - -/+ 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 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)	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) 0.05 (10 - 60) 0.1	s
Uo>>20**V"**	Trip level of the high-set zero sequence voltage element	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
Dα> 10°	Trip level of Vector Jump detection element	2° - 30°	1	°
Dα 1	Operation mode of the Vector Jump detection element 1 – Trip on vector jump above set level at least on one phase 3 – Trip on Vector Jump above level on all the three phases at the same time	1 – 3 - Dis	1 – 3 - Dis	-
Ub100**%Un**	Undervoltage blocking level for the Vector Jump function	10 - 100	1	%Un
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		Descrizione	
f'	---4	Instantaneous element of 1st frequency level (Minimum time delay 80ms.)	operates relays R1, R2, R3, R4.
tf'	1---	As above, time delayed element.	operates relays R1, R2, R3, R4.
f"	---4	Instantaneous element of 2nd frequency level (Minimum time delay 80ms)	operates relays R1, R2, R3, R4.
tf"	-2--	As above, time delayed element.	operates relays R1, R2, R3, R4.
u'	---4	Instantaneous element of 1st voltage level	operates relays R1, R2, R3, R4.
tu'	1---	As above, time delayed element.	operates relays R1, R2, R3, R4.
u"	---4	Instantaneous element of 2nd voltage level	operates relays R1, R2, R3, R4.
tu"	-2--	As above, time delayed element.	operates relays R1, R2, R3, R4.
Uo>	---4	Instantaneous elements of low-set earth fault level	operates relays R1, R2, R3, R4.
to>	1---	As above, time delayed element	operates relays R1, R2, R3, R4.
Uo>>	---4	Instantaneous element of high-set earth fault level	operates relays R1, R2, R3, R4.
to>>	--3-	As above, time delayed element	operates relays R1, R2, R3, R4.
Ed	---4	Instantaneous element of direct sequence voltage level	operates relays R1, R2, R3, R4.
tEd	--3-	As above, time delayed element.	operates relays R1, R2, R3, R4.
Es	---4	Instantaneous element of negative seq. voltage level	operates relays R1, R2, R3, R4.
tEs	--3-	As above, time delayed element.	operates relays R1, R2, R3, R4.
1Φ	---4	Instantaneous element of the 1Φ> element (only one or more whatever combination).	operates relays R1, R2, R3, R4
t1Φ	--3-	As above, time delayed 1Φ> element	operates relays R1, R2, R3, R4.
2Φ	---4	Instantaneous element of the 2Φ> element	operates relays R1, R2, R3, R4
t2Φ	--3-	As above, time delayed 2Φ> element	operates relays R1, R2, R3, R4.
Dα	1---	Vector Jump detection element	operates relay R1, R2, R3, R4
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

13.1 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 (FnxxxHz)
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.

13.2 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 ≤ 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.

WARNING

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.

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.

WARNING

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” ,”ADCErr”, 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.

15. ELECTRICAL CHARACTERISTICS

REFERENCE STANDARDS IEC 60255 - EN50263 - CE Directive - EN/IEC61000 - IEEE C37

❑	Dielectric test voltage	IEC 60255-5	2kV, 50/60Hz, 1 min.		
❑	Impulse test voltage	IEC 60255-5	5kV (c.m.), 2kV (d.m.) – 1,2/50μs		
❑	Climatic tests	IEC 68-2			

CE EMC Compatibility (EN50081-2 - EN50082-2 - EN50263)

❑	Electromagnetic emission	EN55022			
❑	Radiated electromagnetic field immunity test	IEC61000-4-3 ENV50204	level 3	80-1000MHz 900MHz/200Hz	10V/m 10V/m
❑	Conducted disturbances immunity test	IEC61000-4-6	level 3	0.15-80MHz	10V/m
❑	Electrostatic discharge test	IEC61000-4-2	level 4	6kV contact / 8kV air	
❑	Power frequency magnetic test	IEC61000-4-8		1000A/m	50/60Hz
❑	Pulse magnetic field	IEC61000-4-9		1000A/m, 8/20μs	
❑	Damped oscillatory magnetic field	IEC61000-4-10		100A/m, 0.1-1MHz	
❑	Electrical fast transient/burst	IEC61000-4-4	level 4	2kV, 5kHz	
❑	HF disturbance test with damped oscillatory wave (1MHz burst test)	IEC60255-22-1	class 3	400pps, 2,5kV (m.c.), 1kV (d.m.)	
❑	Oscillatory waves (Ring waves)	IEC61000-4-12	level 4	4kV(c.m.), 2kV(d.m.)	
❑	Surge immunity test	IEC61000-4-5	level 4	2kV(c.m.), 1kV(d.m.)	
❑	Voltage interruptions	IEC60255-4-11			
❑	Resistance to vibration and shocks	IEC60255-21-1 - IEC60255-21-2			

CHARACTERISTICS

❑	Accuracy at reference value of influencing factors	2% Un 2% +/- 10ms	for measure for times
❑	Rated Voltage	100V Phase to Phase	
❑	Voltage overload	2 Un continuous	
❑	Burden on voltage input	0.2 VA / Phase at Vn	
❑	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	-10°C / +55°C	
❑	Storage temperature	-25°C / +70°C	
❑	Humidity	93% Without Condensing	

Microelettrica Scientifica S.p.A. - 20089 Rozzano (MI) - Italy - Via Alberelle, 56/68
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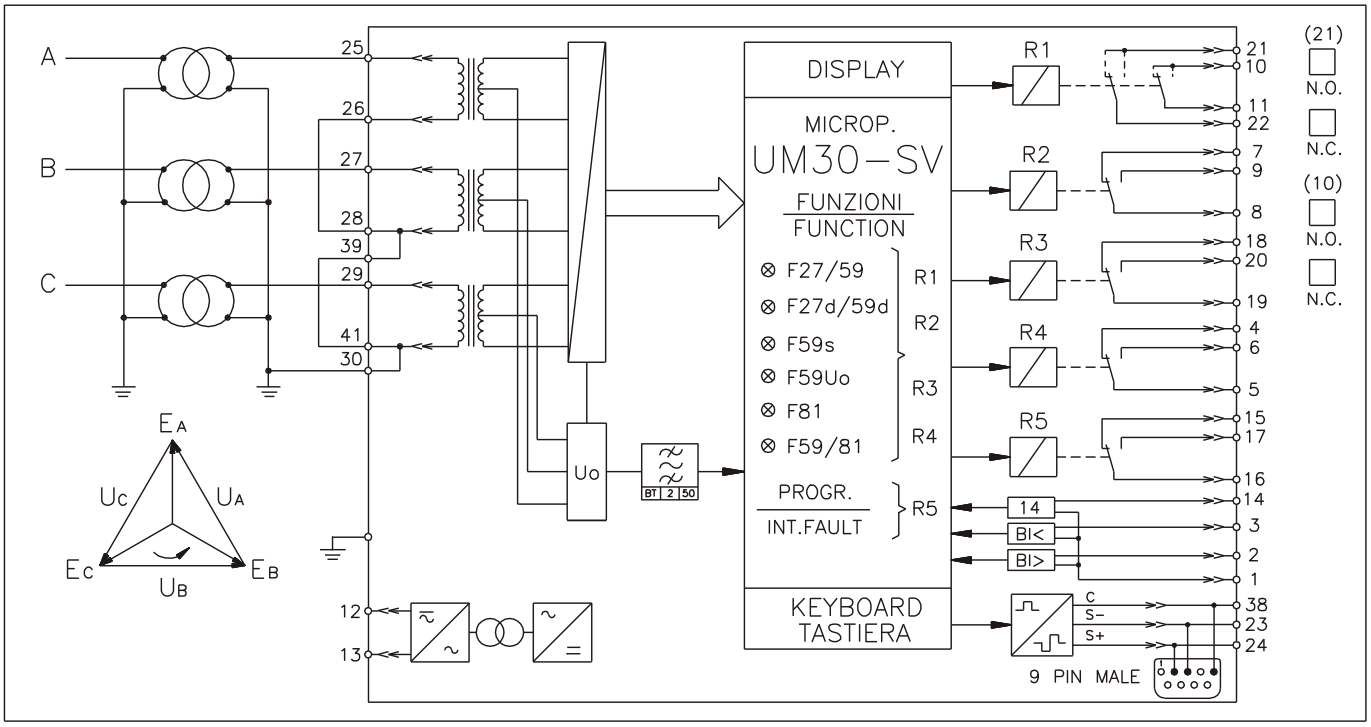
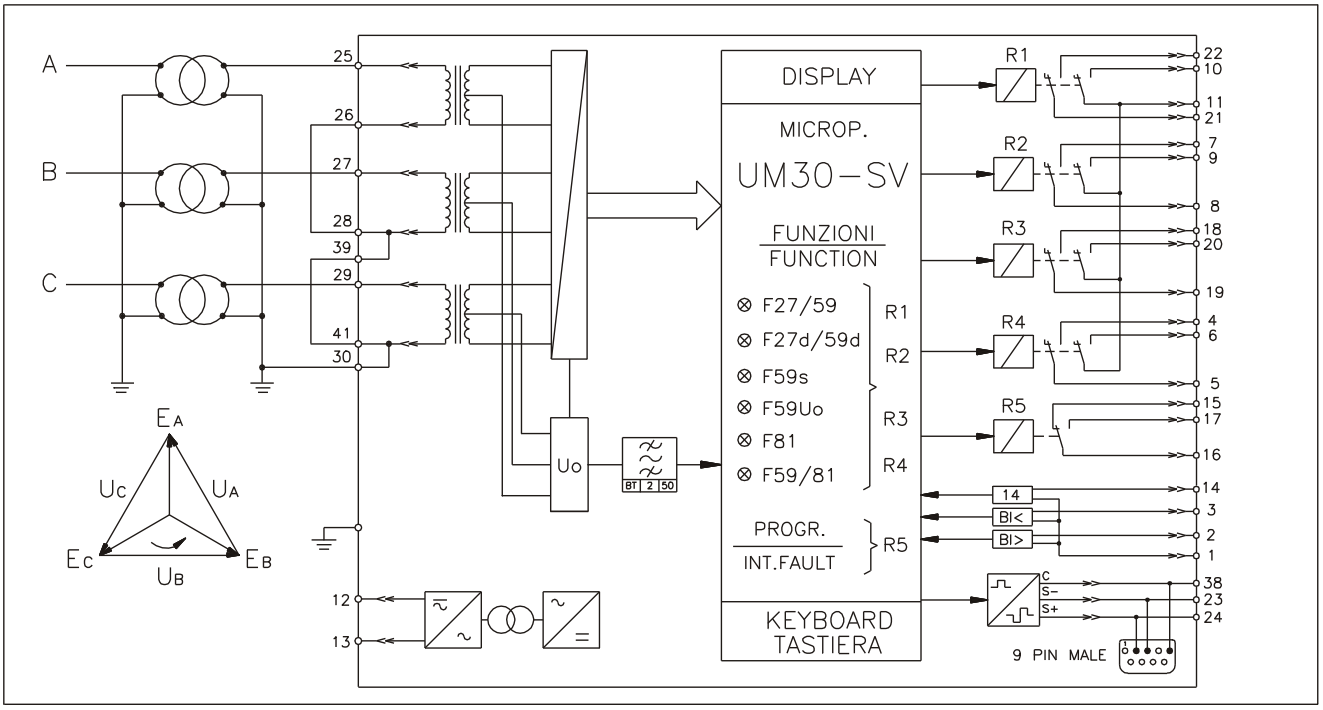
http://www.microelettrica.com - **e-mail :** ute@microelettrica.com

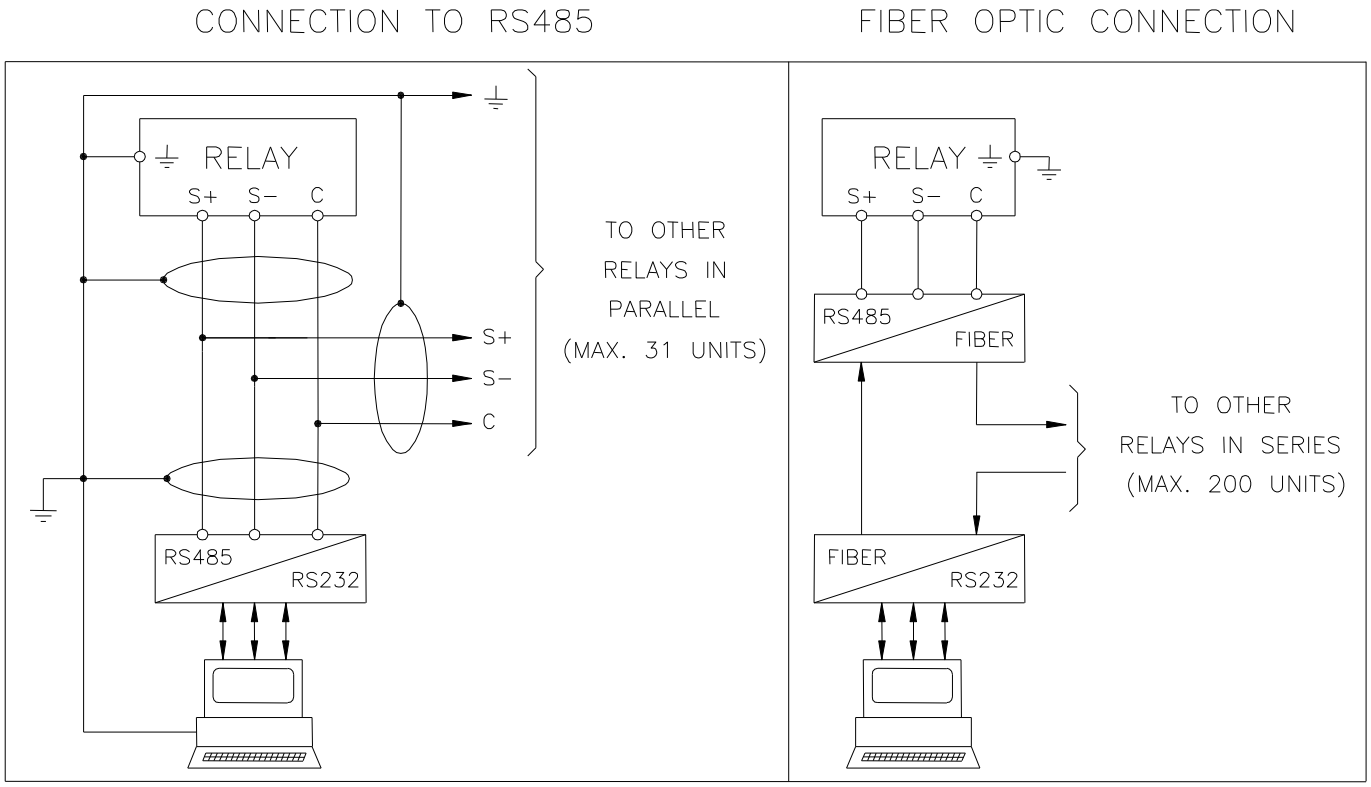
16. CONNECTION DIAGRAM - STANDARD OUTPUT (SCE1580 Rev.0)



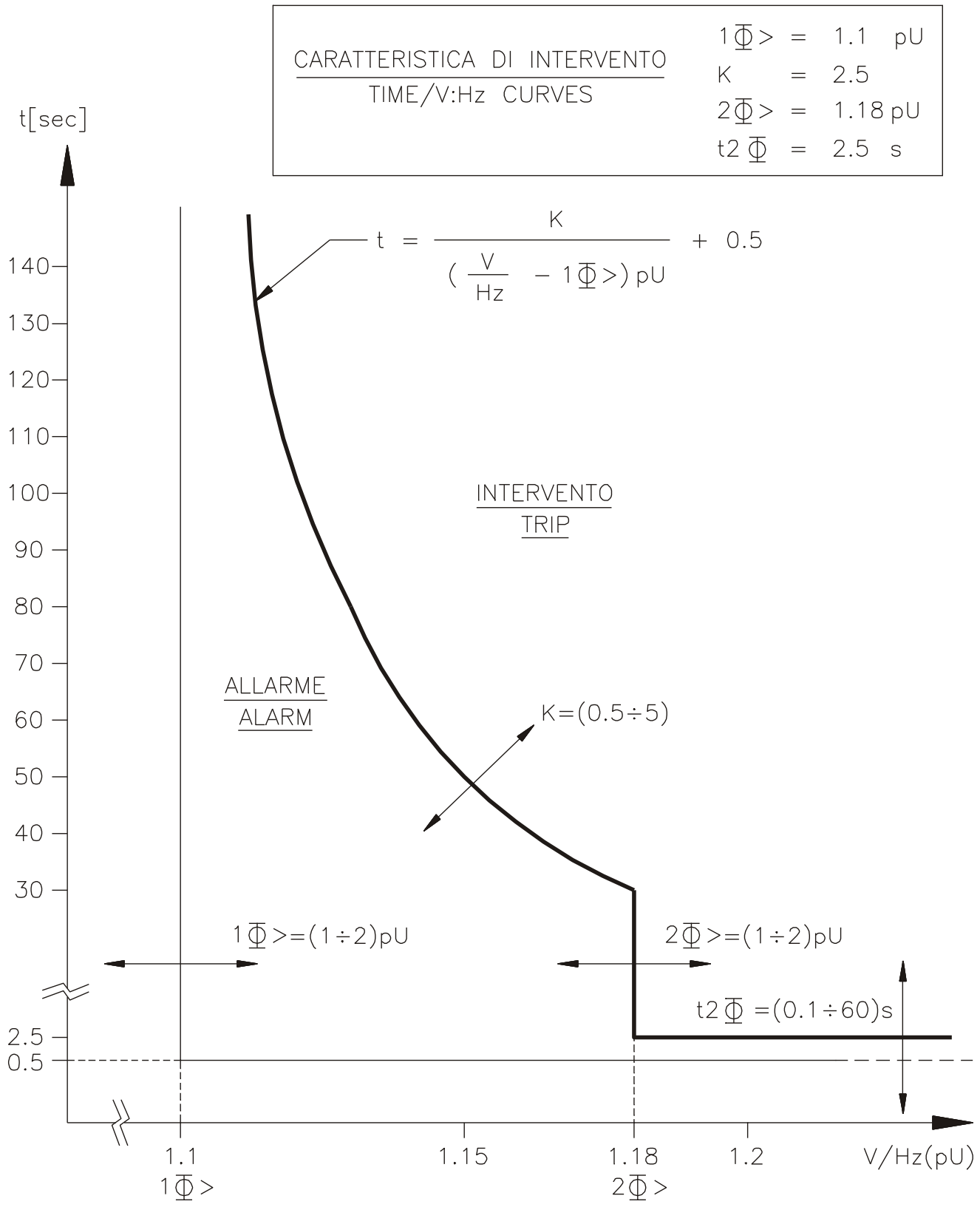
16.1 CONNECTION DIAGRAM - DOUBLE OUTPUT (SCE1581 Rev.0)



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



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



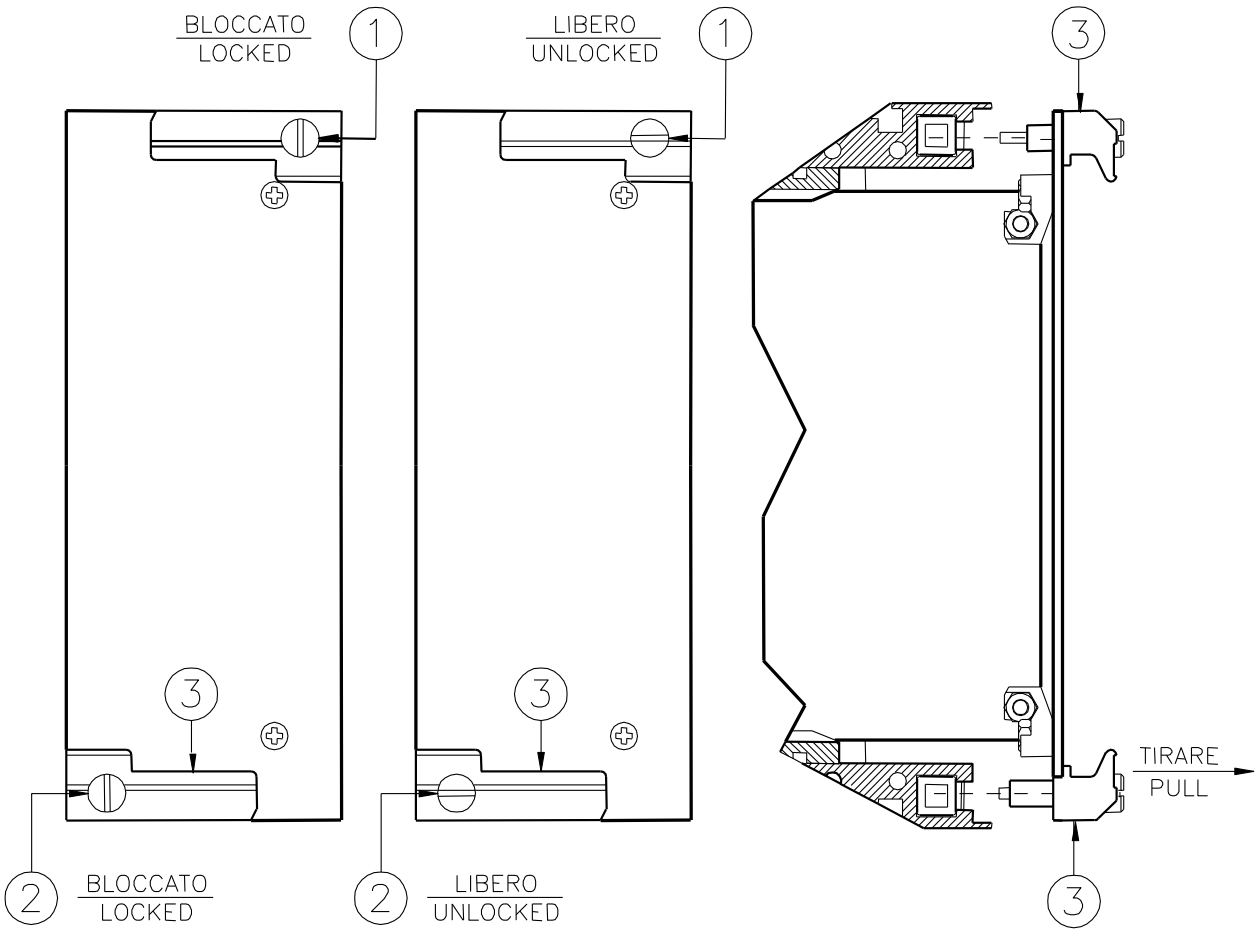
19. DIRECTION FOR PCB'S DRAW-OUT AND PLUG-IN

19.1 - Draw-out

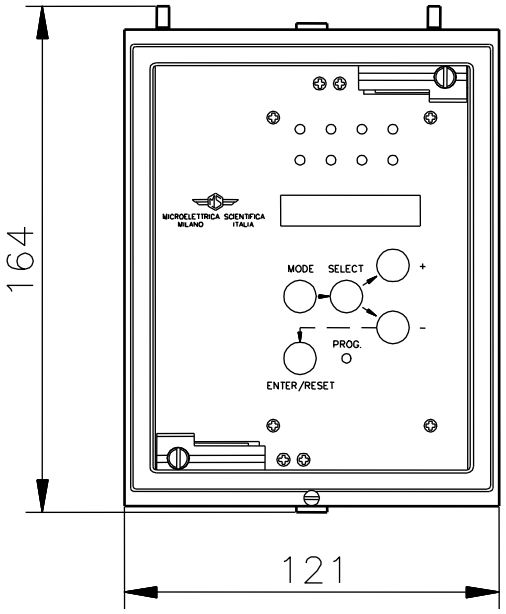
Rotate clockwise the screws ① and ② in the horizontal position of the screws-driver mark.
Draw-out the PCB by pulling on the handle ③

19.2 - Plug-in

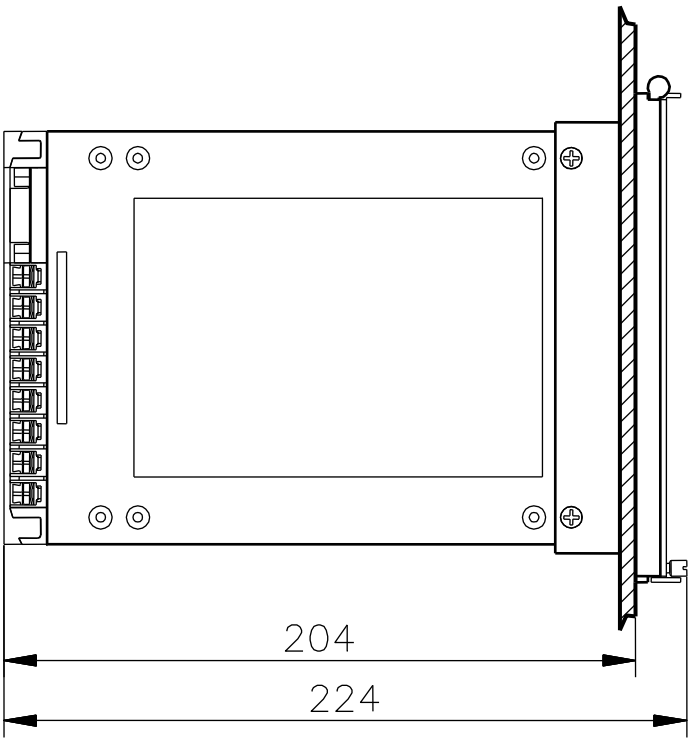
Rotate clockwise the screws ① and ②in the horizontal position of the screws-driver mark.
Slide-in the card on the rails provided inside the enclosure.
Plug-in the card completely and by pressing the handle to the closed position.
Rotate anticlockwise the screws ① and ② with the mark in the vertical position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

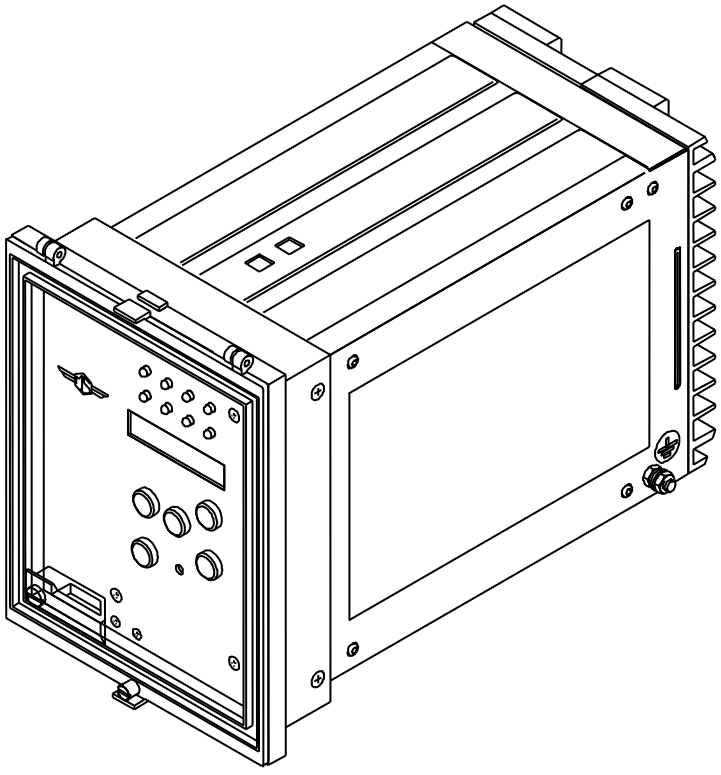


20. OVERALL DIMENSIONS

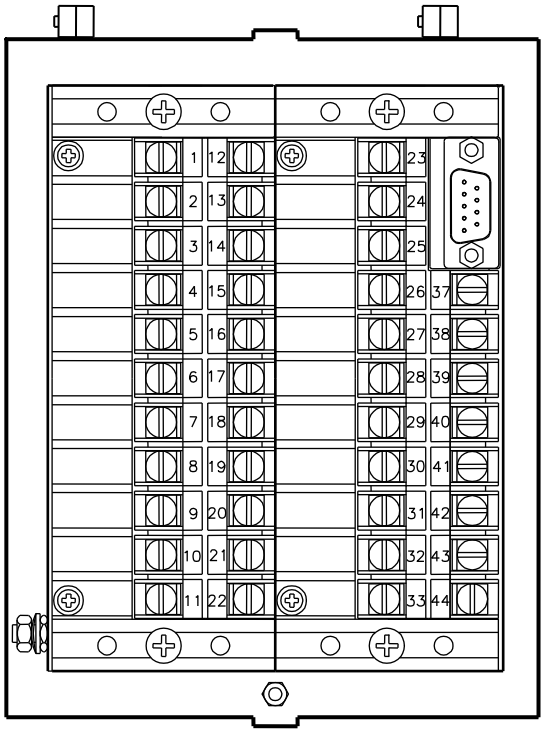


PANEL CUT-OUT 113x142 (LxH)

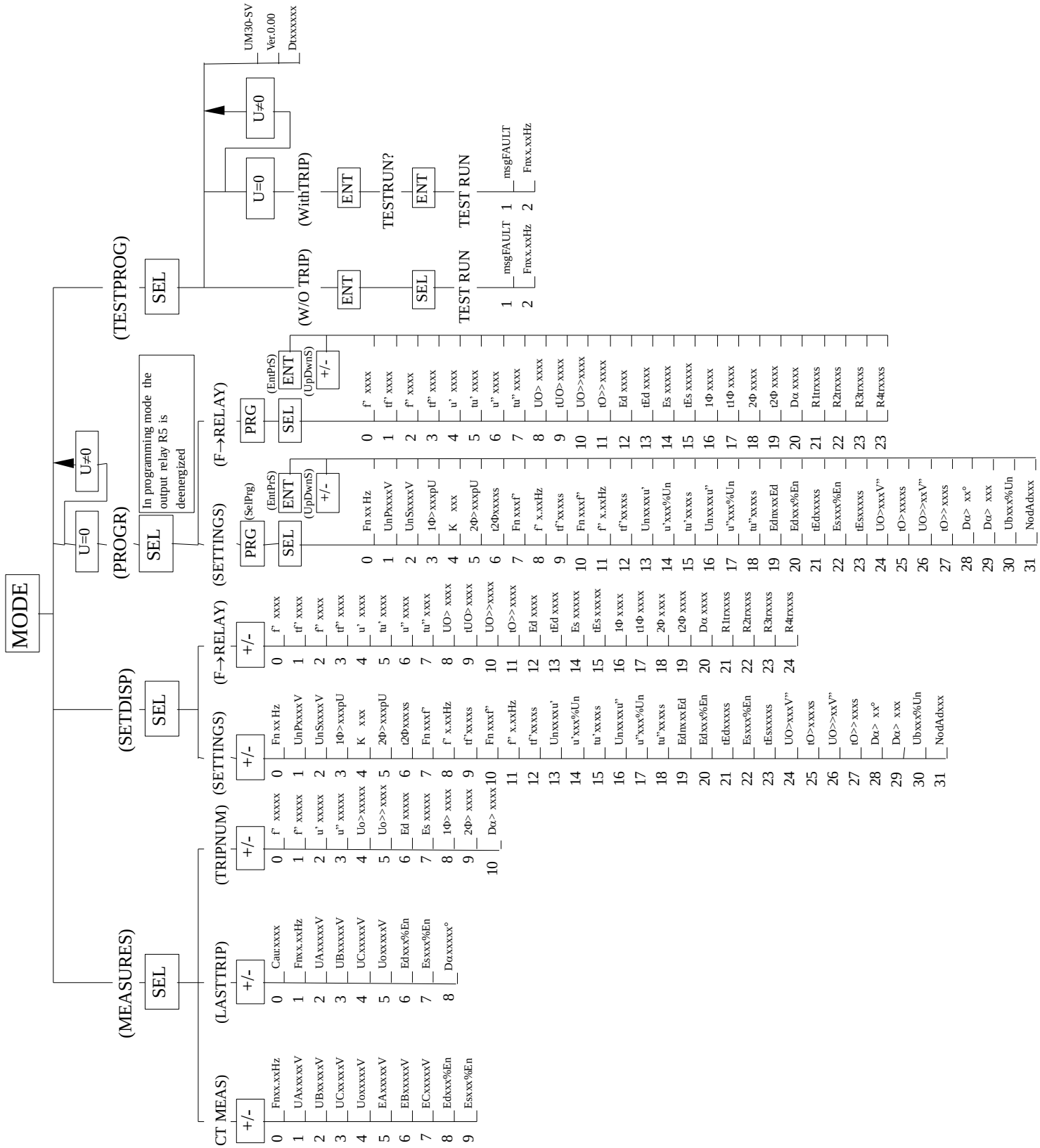




View of Rear
Terminal Connection



21. KEYBOARD OPERATIONAL DIAGRAM



22. SETTINGS' FORM

Date :		Number Relay:	

RELAY PROGRAMMING

Default Setting				Default Setting		
Variable	**Value**	**Measurement Unit**	**Description**	**Variable**	**Value**	**Measurement Unit**
Fn	50	**Hz**	System Frequency	**Fn**		**Hz**
UnP	10	**kV**	Rated primary phase-to-phase voltage of system's P.Ts.	**UnP**		**kV**
UnS	100	**V**	Rated secondary phase-to-phase voltage of system's P.Ts	**UnS**		**V**
1Φ>	1,2	**pU**	Trip level of the V/Hz 1st element	**1Φ>**		**pU**
K	5.0	----------	Time delay coefficient of the function 1Φ>	**K**		----------
2Φ>	1,2	**pU**	Trip level of the V/Hz 2nd element	**2Φ>**		**pU**
t2Φ	5,0	**s**	Time delay of the function 2Φ> definite time	**t2Φ**		**s**
Fn	-/+	**f'**	Operation mode of the first frequency control element	**Fn**		**f'**
f'	0,50	**Hz**	Trip differential level of the 1st frequency control element	**f'**		**Hz**
tf'	1,0	**s**	Trip time delay of first frequency control element	**tf'**		**s**
Fn	-	**f"**	Operation mode of the second freq. control element	**Fn**		**f"**
f"	1,00	**Hz**	Trip differential level of the 2nd freq. element	**f"**		**Hz**
tf"	2,0	**s**	Trip time delay of 2nd freq. control element	**tf"**		**s**
Un	-/+	**u'**	Operation mode of the first voltage control element	**Un**		**u'**
u'	10	**%Un**	Trip differential level of the 1st voltage control element	**u'**		**%Un**
tu'	1,0	**s**	Trip time delay of 1st voltage control element	**tu'**		**s**
Un	+	**u"**	Operation mode of the 2nd voltage control element	**Un**		**u"**
u"	20	**%Un**	Trip differential level of the 2nd voltage control element	**u"**		**%Un**
tu"	2,0	**s**	Time delay of 2nd voltage control element	**tu"**		**s**
Edn	-/+	**Ed**	Trip differential level of the direct sequence element	**Edn**		**Ed**
Ed	20	**%En**	Trip differential level of the direct sequence element	**Ed**		**%En**
tEd	5,0	**s**	Trip time delay of the direct sequence element	**tEd**		**s**
Es	10	**%En**	Trip level of the negative sequence voltage element	**Es**		**%En**
tEs	5,0	**s**	Trip time delay of the negative sequence element	**tEs**		**s**
Uo>	10	**V"**	Trip level of the low-set zero sequence voltage element	**Uo>**		**V"**
to>	0,50	**s**	Trip time delay of low-set zero sequence element	**to>**		**s**
Uo>>	20	**V"**	Trip level of the high-set zero sequence voltage element	**Uo>>**		**V"**
to>>	0,20	**s**	Trip time delay of high-set zero sequence element	**to>>**		**s**
Dα>	10	**°**	Trip level of Vector Jump detection element	**Dα>**		**°**
Dα	1	-	Operation mode of the Vector Jump detection element	**Dα**		-
Ub	100	**%Un**	Undervoltage blocking level for the Vector Jump function	**Ub**		**%Un**
NodAd	1	----------	Communication address	**NodAd**		----------

CONFIGURATION OF OUTPUT RELAYS											
Default Setting						**Actual Setting**					
Protective Element	**Output Relays**				**Description**	**Protective Element**	**Output Relays**				
f'	-	-	-	4	Instantaneous element of 1st frequency level operates relays	**f'**	-	-	-	4	
tf'	1	-	-	-	As above, time delayed element	**tf'**					
f"	-	-	-	4	Instantaneous element of 2nd frequency level operates relays	**f"**					
tf"	-	2	-	-	As above, time delayed element.	**tf"**					
u'	-	-	-	-	Instantaneous element of 1st voltage level operates relays	**u'**					
tu'	1	-	-	-	As above, time delayed element.	**tu'**					
u"	-	-	-	4	Instantaneous element of 2nd voltage level operates relays	**u"**					
tu"	-	2	-	-	As above, time delayed element.	**tu"**					
Uo>	-	-	-	4	Instantaneous elements of low-set earth fault level operates relays	**Uo>**					
to>	1	-	-	-	As above, time delayed element	**to>**					
Uo>>	-	-	-	4	Instantaneous element of high-set earth fault level operates relays	**Uo>>**					
to>>	-	-	3	-	As above, time delayed element	**to>>**					
Ed	-	-	-	4	Instantaneous element of direct sequence voltage level operates relays	**Ed**					
tEd	-	-	3	-	As above, time delayed element.	**tEd**					
Es	-	-	-	4	Instantaneous element of negative seq. voltage level operates relays	**Es**					
tEs	-	-	3	-	As above, time delayed element.	**tEs**					
1Φ	-	-	-	4	Instantaneous element of the 1Φ> element operates relays	**1Φ**					
t1Φ	-	-	3	-	As above, time delayed 1Φ> element	**t1Φ**					
2Φ	-	-	-	4	Instantaneous element of the 2Φ> element operates relays	**2Φ**					
t2Φ	-	-	3	-	As above, time delayed 2Φ> element	**t2Φ**					
Dα	-	-	3	-	Vector Jump detection element operates relay	**t2Φ**					
R1tr	3s				Reset time delay of output relay R1	**R1tr**					
R2tr	Aut.				Reset time delay of output relay R2	**R2tr**					
R3tr	Man.				Reset time delay of output relay R3	**R3tr**					
R4tr	Aut.				Reset time delay of output relay R4	**R4tr**					