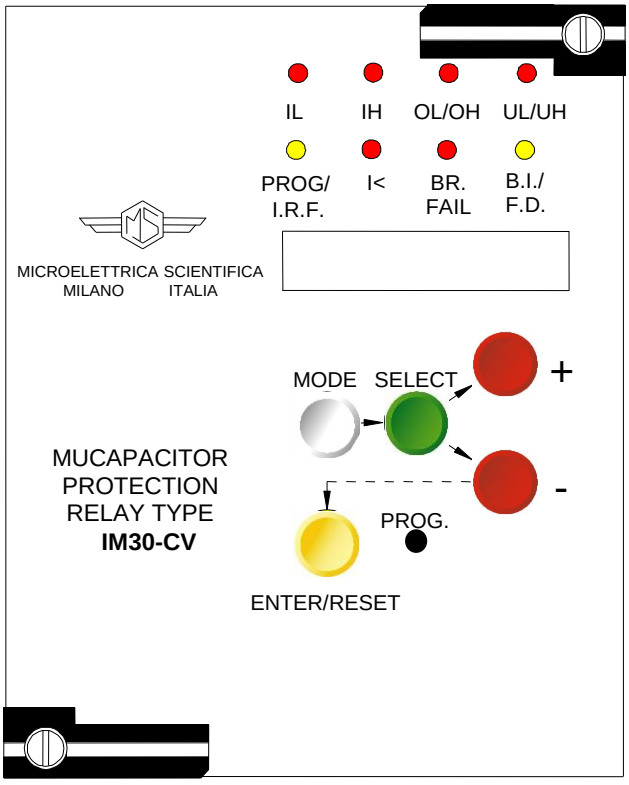
MULTIFUNCTION MICROPROCESSOR PROTECTION RELAY 3 PHASE OVERLOAD AND UNBALANCE PROTECTION FOR CAPACITOR BANK

TYPE IM30-CV

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

Input quantities are supplied to 4 Current Transformers (- three measuring phase current - one measuring the unbalance current)
Phase current inputs can be rated either 1 or 5A: changing over from one to the other configuration is made by movable bridges provided on the relay card.
For the unbalance current input two taps (1 or 5A) are provided on the terminal board.
Make electric connection in conformity with the diagram reported on relay's enclosure.
Check that input currents are same as reported on the diagram and on the test certificate.
The auxiliary power is supplied by a built-in interchangeable module fully isolated an self protected.

2.1 - POWER SUPPLY

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

a) - 24V(-20%) / 110V(+15%) a.c.
24V(-20%) / 125V(+20%) d.c.

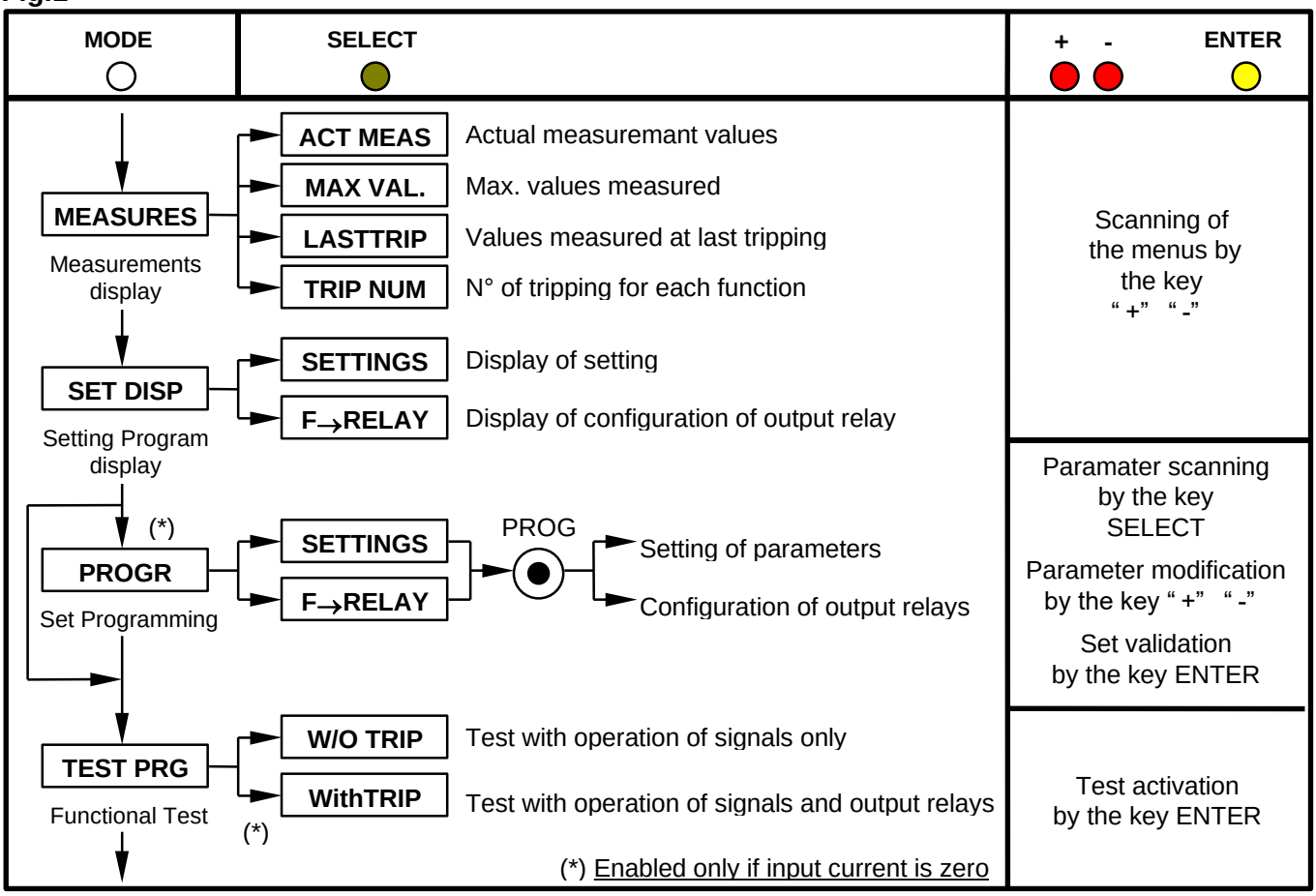
b) - 80V(-20%) / 220V(+15%) a.c.
90V(-20%) / 250V(+20%) d.c.

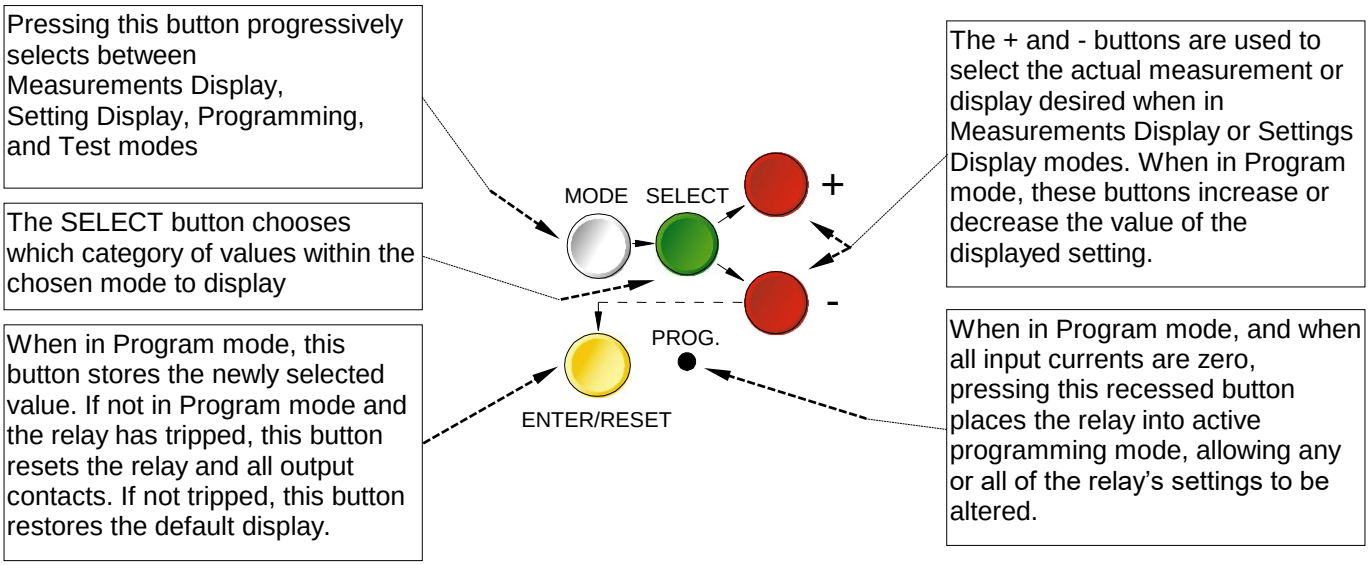
Before energising the unit check that supply voltage is within the allowed limits.

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)

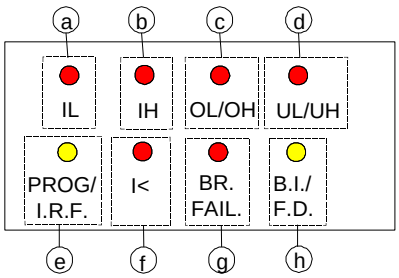
Fig.1





4. SIGNALIZATIONS

Eight signal leds (normally off) are provided:



a)	Red LED	**IL (OVERLOAD)**	❑ Flashing when measured current exceeds the set pick-up IL. ❑ Illuminated on trip after expiry of the set trip time delay tIL.
b)	Red LED	**IH (PHASE FAULT)**	❑ Same as above related to IH and tIH.
c)	Red LED	**OL/OH (EARTH FAULT)**	❑ Flashing when Earth Fault current exceeds the pick-up level OL or OH. ❑ Illuminated on trip of the time delayed element tOL or tOH.
d)	Red LED	**UL/UH (UNBALANCE)**	❑ Flashing when the UNBALANCE voltage exceeds the pick-up level UL or UH ❑ Illuminated on trip of the time delayed element tUL or tUH.
e)	Yellow LED	**PROG/IRF**	❑ Flashing during the programming of the parameters ❑ Lit-on in case of Internal Relay Fault.
f)	Red LED	**I< (RECLOSE INHIBIT)**	❑ Flashing when the current drops below the set level I<. ❑ Illuminated on trip after expiry of the set trip time delay tI<; the led automatically extinguishes at the end of the set wait time for enabling to reenergize the capacitor bank.
g)	Red LED	**BR. FAIL.**	❑ Flashing during the reclose inhibition time tRI ❑ Lit-on when the BREAKER FAILURE function is activated.
h)	Yellow LED	**B.I./F.D. (FUNCTION DISABLED)**	❑ Illuminated when the operation of one or more of the relay functions has been disactivated in the programming ❑ Flashing when a block signal is present.

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)

- The relays **R1,R2,R3,R4** are normally deenergized (energised on trip): these output relays are user programmable and any of them can be associated to any of the IM30-C's functions.
  For some function both instantaneous and time delayed elements are provided.
  One relay eventually controlled by the instantaneous element of one function picks up or drops out as soon as the measured input value gets respectively into the operation or the reset zone.
  When the time of the delayed element of the same function has expired the relay is supposed to trip the circuit breaker.
  If after that time the input value still remains into the operation zone (Breaker Failure to open), the relay controlled by the instantaneous element is anyhow forced to reset after a programmable wait-time [tBF], thus eliminating any interlock of the backup protection.
  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.
- The relay **R5**, normally energised, is not programmable and 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 or (with proper adapters) a fiber optic bus for interfacing with a Personal Computer (type IBM or compatible).
All the operations which can be performed locally (for example reading of measured data and changing of relay's settings) are also possible via the serial communication interface.
Furthermore the serial port allows the user to read the demand recording 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, thus 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 (or later) is available.
Please refer to the MSCOM instruction manual for more information.
Microelettrica Scientifica.

7. DIGITAL INPUTS FOR FUNCTION BLOCKING AND FOR SETTING PROGRAM'S CHANGE-OVER

Three digital inputs are provided: they are active when the relevant terminals are shorted

B2	terminals 1 – 2	:	❑ it blocks the operation of the time delayed elements relevant to phase and/or Earth Fault detection; IL, IH, OL, OH - programming allows to block one or more of the functions.
B3	terminals 1 – 3	:	❑ it blocks the operation of the time delayed elements relevant to UNBALANCE detection; programming allows to block the operation of the function UL only or UH only or both.

When a function is blocked the pick-up of its time delayed output is inhibited. Programming allows to have the inhibition either permanent as long as the blocking input is active (tBf=Dis; tBo=Dis) or automatically removed after the expiry of the set trip time delay of the function blocked plus an additional time 2tBF (tBf=2tBF; tBo=2tBF). By proper interconnection of the blocking inputs and different among output 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.

B14	terminals 1 –14	:	❑ input from 52a contact (Normally Open) of the capacitor bank Circuit Breaker for monitoring the C/B open/close status.

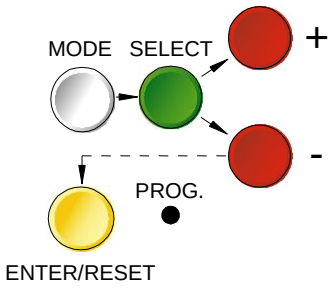
8. TEST

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 and then switches over to the default display.
- ❑ Dynamic functional test run during normal operation every 15 min. (relay's operation is suspended for less than ≤ 4ms).
- ❑ Complete test activated by the keyboard or via the communication bus either with or without tripping of the output relays.
- ❑ If any internal fault is detected, the display shows a fault message, the Led "PROG/IRF" illuminates and the relay R5 is deenergized.

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 and to increase-decrease the settings.
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
I/In	xxx	**%**	Highest among the 3 phase-currents displayed as % of the rated current of T.A (0 - 999)%
IA	xxxxx	**A**	True R.M.S. value of the current of phase A displayed as primary Amps. (0 - 99999)
IB	xxxxx	**A**	As above, phase B
IC	xxxxx	**A**	As above, phase C
Io	xxxxx	**A**	As above, residual current (3 x Zero Seq. Current)
Uo	x.xx	**Un**	As above, unbalance voltage displayed as p.u. of the rated input Un
αu	xxxxx	**°**	Uo/IA displacement in degrees of Uo from IA (0-360° anticlockwise)
Ud	x.xx	**Un**	Unbalance compensated voltage as p.u. of rated input Un

10.2 MAX VAL

Max demand values recorded starting from 100ms after closing of main Circuit Breaker plus highest inrush values recorded within the first 100ms from Breaker closing, (updated any time the breaker closes).

Display			Description
IA	xx.x	**In**	Max value of phase A current after the first 100ms, displayed as p.u. of C.Ts rated current
IB	xx.x	**In**	As above, phase B
IC	xx.x	**In**	As above, phase C
Io	x.xx	**In**	As above, residual current (3 x Zero Sequence current)
Ud	x.xx	**Un**	As above, unbalance compensated voltage (0 – 9,99)
SA	xx.x	**In**	Highest current of phase A during the first 100ms, displayed as p.u. of C.Ts rated current
SB	xx.x	**In**	As above, phase B
SC	xx.x	**In**	As above, phase C
Sd	x.xx	**Un**	As above, unbalance compensated voltage

10.3 LASTTRIP

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
Cause	xxx		Display of the function which caused the last tripping: **IL; IH; OL; OH; UL; UH; I<**
IA	xx.x	**In**	Current of phase A
IB	xx.x	**In**	Current of phase B
IC	xx.x	**In**	Current of phase C
Io	xx.x	**In**	Residual current (3 x Zero Sequence current)
Ud	x.xx	**Un**	Unbalance compensated voltage

10.4 TRIP NUM

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

Display		Description
IL	xxxxxx	Low set overcurrent trips
IH	xxxxxx	High set overcurrent trips
OL	xxxxxx	Low set Earth Fault
OH	xxxxxx	High set Earth Fault
UL	xxxxxx	Low set unbalance
UH	xxxxxx	High set unbalance
I<	xxxxxx	Undercurrent trips

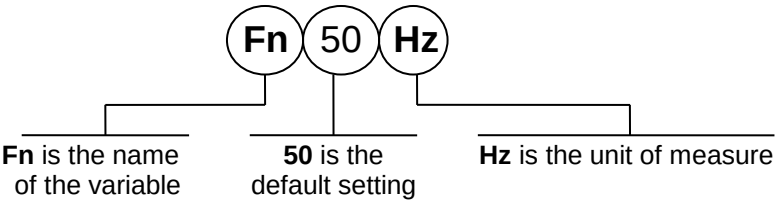
11. READING OF PROGRAMMED SETTINGS AND RELAY'S CONFIGURATION

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
Local Programming by the front face key board is enabled only if no input current 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 FUNCTION SETTINGS



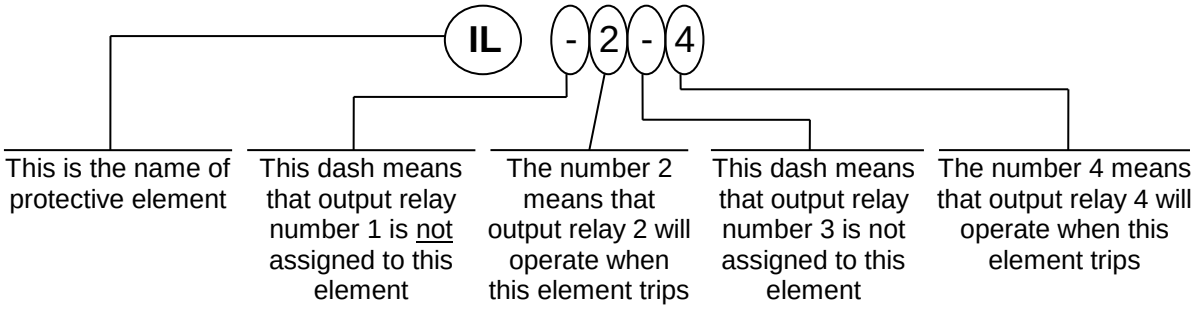
Mode PROG menu SETTINGS. (Production standard settings here under shown).

Display			Description	Setting Range	Step	Unit
Fn	50	**Hz**	Mains frequency	50 - 60	10	Hz
In	500	**Ap**	Rated primary current of the phase C.Ts.	0 - 9999	1	A
Un	100	**V**	Rated secondary voltage of the P.Ts. supplying the unbalance voltage element .	50 - 125	0.1	V
F(IL)	D		Operation characteristic of the low-set overcurrent element D =Independent definite time SI = Dependent normal inverse time	D SI	D SI	-
IL	0.3	**In**	Trip level of low-set overcurrent element (p.u. of the rated current of the phase C.Ts.)	0.3 - 1.5 - Dis	0.01	In
tIL	1	**s**	Trip time delay of the low-set overcurrent element In the inverse time operation it is the trip time delay at I = 10xI>	1 - 50	0.1	s
IH	0.6	**In**	Trip level of high-set overcurrent element (p.u. of the rated current of the phase C.Ts.)	0.2 - 2 - Dis	0.01	In
tIH	0.1	**s**	Trip time delay of the high-set overcurrent element	0.1 – 6500	(0.1-99.9) 0.1 (100-6500) 1	s

Display			Description	Setting Range	Step	Unit
F(OL)	D		Operation characteristic of the low-set earth fault element D = Independent definite time SI = Dependent normal inverse time	D SI	D SI	-
OL	0.1	**In**	Trip level of low-set earth fault element (p.u. of the rated current of the phase C.Ts.)	0.1 - 1.0 - Dis	0.01	In
tOL	0.05	**s**	Trip time delay of low-set earth fault element In the inverse time operation it is the trip time delay at Io = 5xOL	0.05 – 30	(1-9.99) 0.01 (10-30) 0.1	s
OH	0.2	**In**	Trip level of high-set earth fault element (p.u. of the rated current of the phase C.Ts.)	0.1 - 2.0 - Dis	0.01	In
tOH	0.05	**s**	Trip time delay of the high-set earth fault element	0.05 – 9.99	0.01	s
F(UL)	D		Operation characteristic of the low-set unbalance element D = Independent definite time SI = Dependent normal inverse time	D SI	D SI	-
UL	0.02	**Un**	Trip level of low-set unbalance element (p.u. of the rated voltage of the P.Ts. for unbalance detection)	0.02 - 0.8 -Dis	0.01	Un
tUL	1.0	**s**	Trip time delay of low-set unbalance element In the inverse time operation it is the trip time delay at Io = 5xOL	1.0 - 30	(1-9.99) 0.01 (10-30) 0.1	s
UH	0.04	**Un**	Trip level of high-set unbalance element (p.u. of the rated voltage of the P.Ts. for unbalance detection)	0.01 - 1.0 - Dis	0.01	Un
tUH	1	**s**	Trip time delay of the high-set unbalance element	0.1 - 300	(1-99.9) 0.1 - (100-300) 1	s
I<	0.1	**In**	Trip level of undercurrent element (p.u. of the rated current of the phase C.Ts)	Dis - 0.10 - 1.0	0.01 **See note 1**	In
tI<	1	**s**	Trip time delay of the undercurrent element	1.0 - 99.9	0.1	s
tRI<	5	**m**	Wait time for the reenergization of the capacitors	Dis - 0.5 - 100	0.1	m
Uc	0.00	**Un**	Unbalance compensation level	0.00 - 0.2	0.01 **See note 2**	Un
αc	0	**°**	UoΛIA phase displacement (counter clockwise rotation)	0 - 359	1	°
B14	Dis		C/B status monitoring input enabled/disabled	En - Dis	-	-
tBF	0.1	**s**	Max reset time delay of the instantaneous element after tripping of the delayed element	0.1-0.75	0.1	s
NodAd	1		Identification number for the 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 numbers 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	
IL	- - 3 -	Instantaneous element of low-set overcurrent (only one or more, whatever combination)	operates relay R1,R2,R3,R4
tIL	1 2 - -	As above, time delayed element	operates relay R1,R2,R3,R4
IH	- - 3 -	Instantaneous element of high-set overcurrent	operates relay R1,R2,R3,R4
tIH	1 2 - -	As above, time delayed element	operates relay R1,R2,R3,R4
OL	- - - -	Instantaneous element of low-set earth fault element	operates relay R1,R2,R3,R4
tOL	1 2 - -	As above, time delayed element	operates relay R1,R2,R3,R4
OH	- - - -	Instantaneous element of high-set earth fault element	operates relay R1,R2,R3,R4
tOH	1 2 - -	As above, time delayed element	operates relay R1,R2,R3,R4
UL	- - - -	Instantaneous element of low-set unbalance element	operates relay R1,R2,R3,R4
tUL	- 2 - -	As above, time delayed element	operates relay R1,R2,R3,R4
UH	- - - -	Instantaneous element of high-set unbalance element	operates relay R1,R2,R3,R4
tUH	- 2 - -	As above, time delayed element	operates relay R1,R2,R3,R4
tI<	- - - 4	Time delayed element min. current	operates relay R1,R2,R3,R4
tRI	- - - -	Start of reclose timer tRI	operates relay R1,R2,R3,R4
tBF	- - - -	Breaker failure element	operates relay R2,R3,R4
tFRes:	M	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	
Bf	- - - i	The input for blocking the operation of the time delayed elements relevant to phase faults (IL, IH, OL, OH) can act on the function (IL) only, (OL) only, (IH) only or (OH) only, or on both. (i = IL, I = IH, o = OL, O = OH)	
Bo	-u	The input for blocking the operation of the time delayed elements relevant to unbalance (UH, UL) can act on the function (U=UH) only or (u=UL) only, or on both	
tBf	2tBF	The blocking of the phase fault elements can be programmed so that it lasts as long the blocking input signal is present (tBIf Dis) or (tBf 2xtBf); even with the blocking input still present, it only lasts for the set trip time delay of the function plus an additional time 2xtBf	
tBo	2tBF	As above for the unbalance functions	

Note 1: Function I<

This element is enabled only when the circuit breaker is closed (see Note 3). The largest among the 3 phase currents (I_{max}) is compared to the set trip level [I<]. If I_{max} < [I<] then the [tI<] timer is started. When such timer expires, a trip occurs.

Note 2 Breaker Failure Protection

Setting : **tBF** = (0.05 – 0.75)s, steps 0.01s
The element operates as follows:
After tripping of the output relay R1 the time tBF starts. If at the end of tBF I_{max} is still above the zero current level I_{zero} (equal to 5%In), the output relay associated to the Breaker Failure protection is energized. A breaker failure can be detected also in case the value of I_{max} is not consistent with the status of the B14 digital input (see Note 3).

Note 3: Circuit breaker status detection

A setting is available (B14 En/Dis) to enable or disable the B14 digital input.
When B14 is ENABLED the circuit breaker status is computed according to the following truth table :

Status of B14 (52a contact)	Value of I_{max}	C/B status
Closed	$I_{max} > I_{zero}$	Closed
Open	$I_{max} > I_{zero}$	Failure
Closed	$I_{max} <= I_{zero}$	Closed
Open	$I_{max} <= I_{zero}$	Open

State transitions are not instantaneous. Signals are validated if and only if no change is detected for at least 50ms. Furthermore, in case a breaker failure condition is detected (row #2), the breaker failure timer is started (tBF). When such timer expires, the $I>I_{zero}$ condition is checked again and the breaker failure function is energized only if current is still above I_{zero}.
When B14 is DISABLED, its status is ignored. Thus, the following table is considered:

Status of B14 (52a contact)	Value of I_{max}	C/B status
Any	$I_{max} > I_{zero}$	Closed
Any	$I_{max} <= I_{zero}$	Open

Note 4: Wait time for the reenergization of the capacitors

When the relay detects a transition of the circuit breaker status from closed to open, the reclosing inhibition timer (tRI) is started and the tRI relay is energized. This condition is signalled by the flashing of Led g).
The reset of this function takes place in two different ways depending on the reset mode (tFRes=Auto or tFRes=Man).
If tFRes is equal to Auto (automatic reset), tRI can be forced to 0 by pressing the ENTER button. As a consequence, the tRI relay is de-energized and Led g) stops flashing. If the ENTER button is not pressed, the element automatically resets itself at the end of tRI.
If tFRes is equal to Man (manual reset), the ENTER button must be pressed to reset the element. No command is accepted before tRI has expired.

Note 5: Setting of the function for inherent unbalance compensation of the capacitors

- Switch on the capacitors and read, in the mode MEASURES function ACT.MEAS., the values of Uo, αu and Ud.
- Switch off the capacitors. Set for Ic and αc the values Iu, αu
- When the capacitors are switched on again, the values Iu, αu displayed remain practically unchanged, while the value of Id will be nearly zero.

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 (I/Inxxx%).
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” ,”ADC Err”, switch-off power supply and switch-on again. If the message does not disappear send the relay to Microelettrica Scientifica (or its local dealer) for repair.
- If the error message displayed is “E2P Err”, try to program any parameter and then run “W/OTRIP”.
- If message disappear please check all the parameters.
- If message remains send the relay to Microelettrica Scientifica (or its local dealer) for repair.

15. POWER FREQUENCY INSULATION TEST

Every relay individually undergoes a factory insulation test according to IEC255-5 standard at 2 kV, 50 Hz 1min. Insulation test should not be repeated as it unusefully stresses the dielectrics.
When doing the insulation test, the terminals relevant to serial output must always be short circuited to ground.
When relays are mounted in switchboards or relay boards that have to undergo the insulation tests, the relay modules must be drawn-out of their enclosures and the test must only include the fixed part of the relay with its terminals and the relevant connections. This is extremely important as discharges eventually tacking place in other parts or components of the board can severely damage the relays or cause damages, not immediately evident to the electronic components.

16. ELECTRICAL CHARACTERISTICS

APPROVAL: CE – RINA – UL and CSA approval File : E202083
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
❑	Insulation resistance	> 100MΩ	

Environmental Std. Ref. (IEC 68-2-1 - 68-2-2 - 68-2-33)

❑	Operation ambient temperature	-10°C / +55°C
❑	Storage temperature	-25°C / +70°C
❑	Humidity	IEC68-2-3 RH 93% Without Condensing AT 40°C

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

❑	Electromagnetic emission	EN55022 industrial environment			
❑	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
❑	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 3	2kV, 5kHz	
❑	HF disturbance test with damped oscillatory wave (1MHz burst test)	IEC60255-22-1	class 3	400pps, 2,5kV (m.c.), 1kV (d.m.)	
❑	Oscillatory waves (Ring waves)	IEC61000-4-12	level 4	4kV(c.m.), 2kV(d.m.)	
❑	Surge immunity test	IEC61000-4-5	level 4	2kV(c.m.), 1kV(d.m.)	
❑	Voltage interruptions	IEC60255-4-11			
❑	Resistance to vibration and shocks	IEC60255-21-1 - IEC60255-21-2 10-500Hz 1g			

CHARACTERISTICS

❑	Accuracy at reference value of influencing factors	2% Rated Input for trip levels 2% +/- 10ms for times
❑	Rated input Current	In = 1 or 5A ; On = 1 or 5A
❑	Current overload	200 A for 1 sec; 10A continuous
❑	Burden on current inputs	Phase : 0.01VA at In = 1A; 0.2VA at In = 5A Neutral : 0.03VA at In = 1A; 0.2VA at In = 5A
❑	Rated input Voltage	Un = 50 – 125V
❑	Voltage overload	2 Un
❑	Burden on voltage input	0,08 VA at Un
❑	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.)

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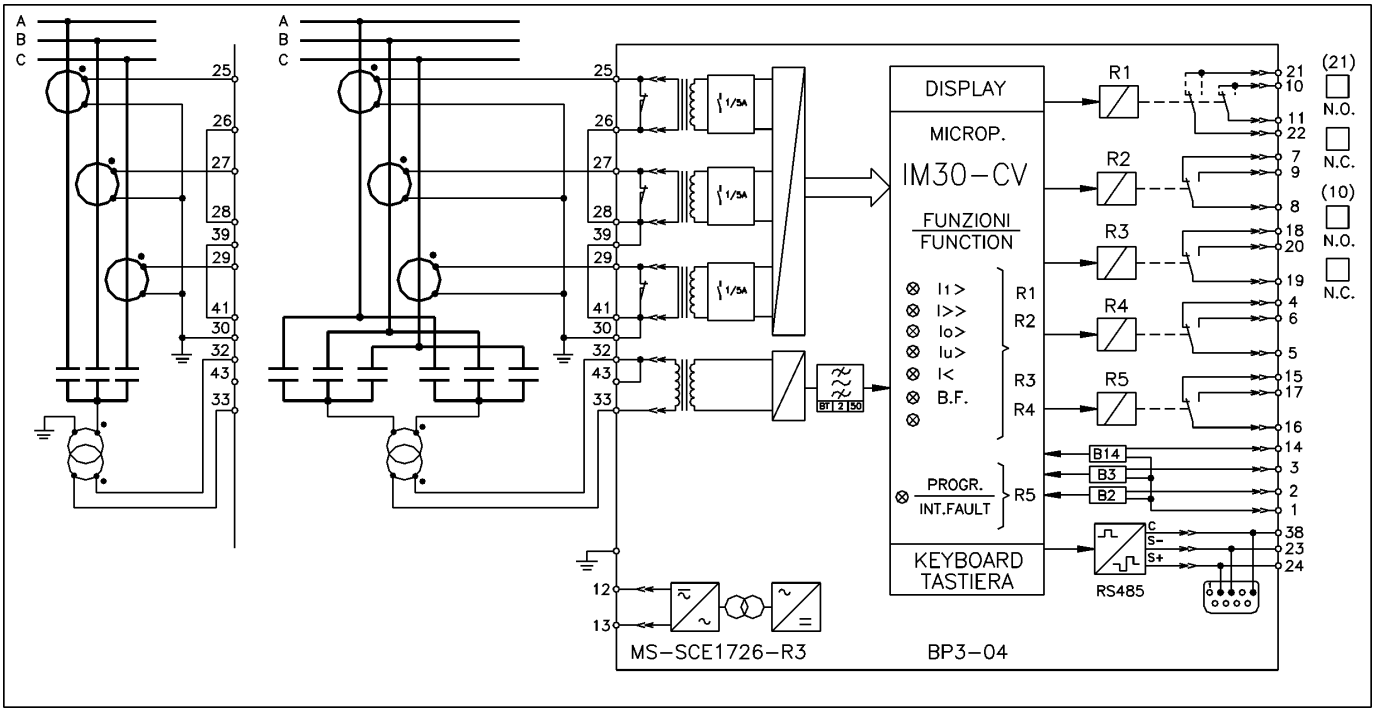
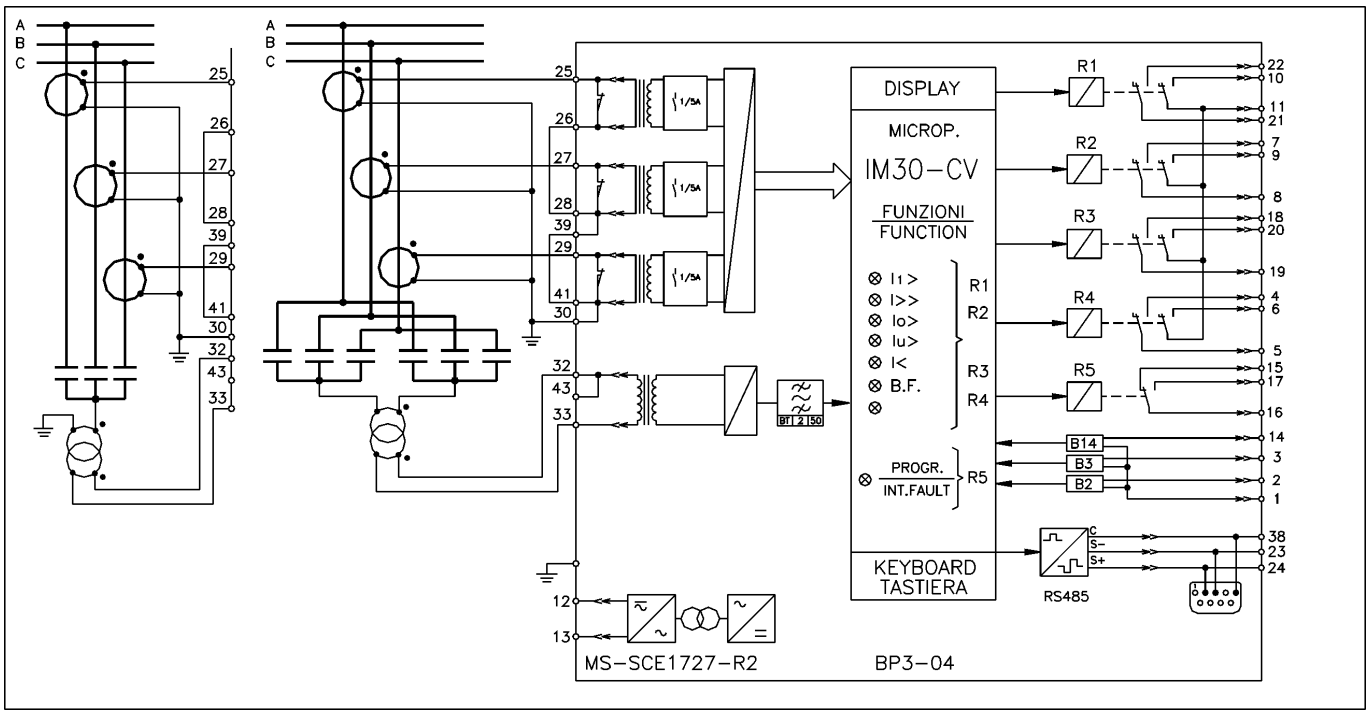
Tel. (##39) 02 575731 - Fax (##39) 02 57510940

http://www.microelettrica.com **e-mail :** ute@microelettrica.com

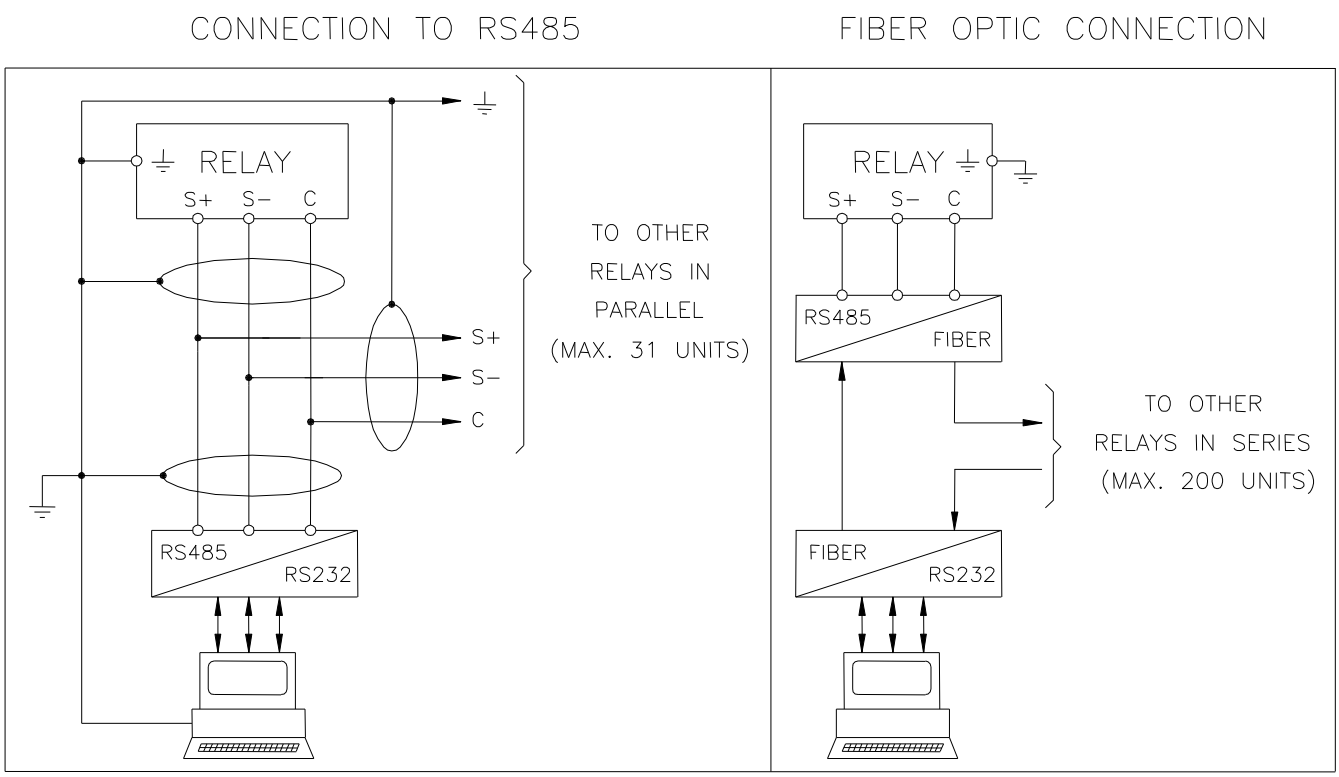
17. CONNECTION DIAGRAM (SCE1726 Rev.2 Standard Output)



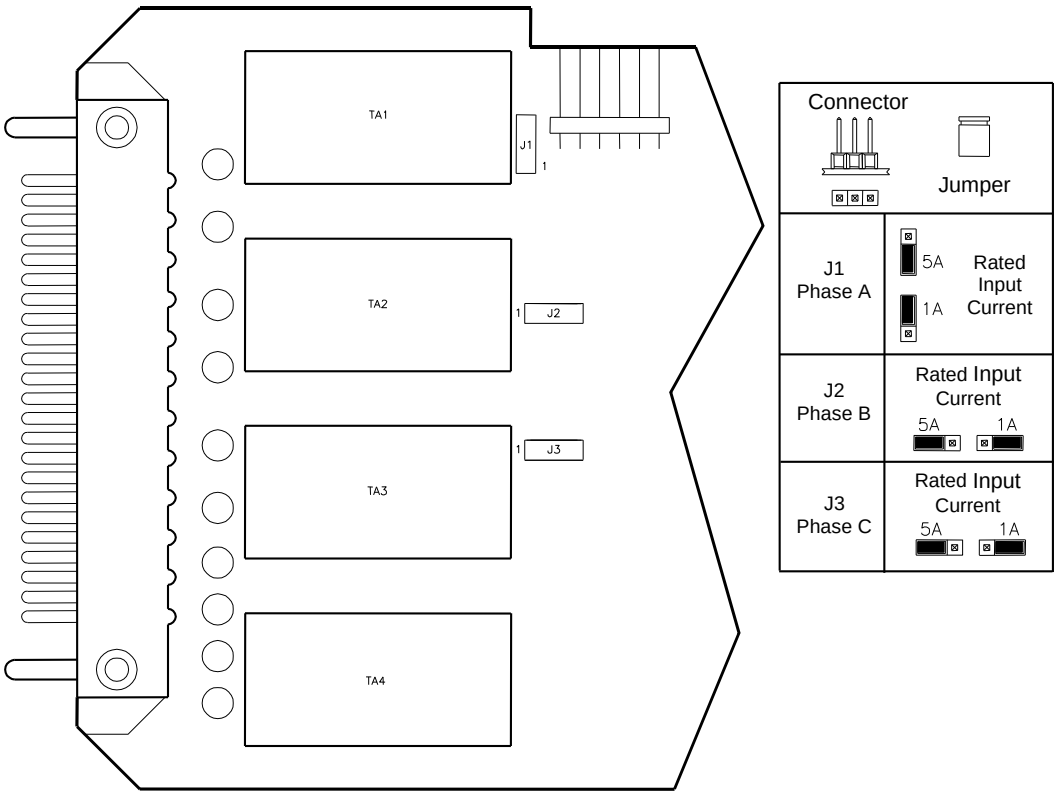
17.1 CONNECTION DIAGRAM (SCE1727 Rev.2 Double Output)



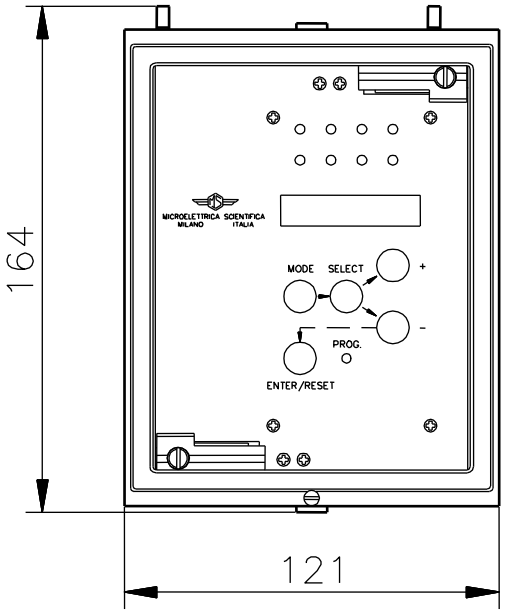
18. WIRING THE SERIAL COMMUNICATION BUS (SCE1309 Rev.0)



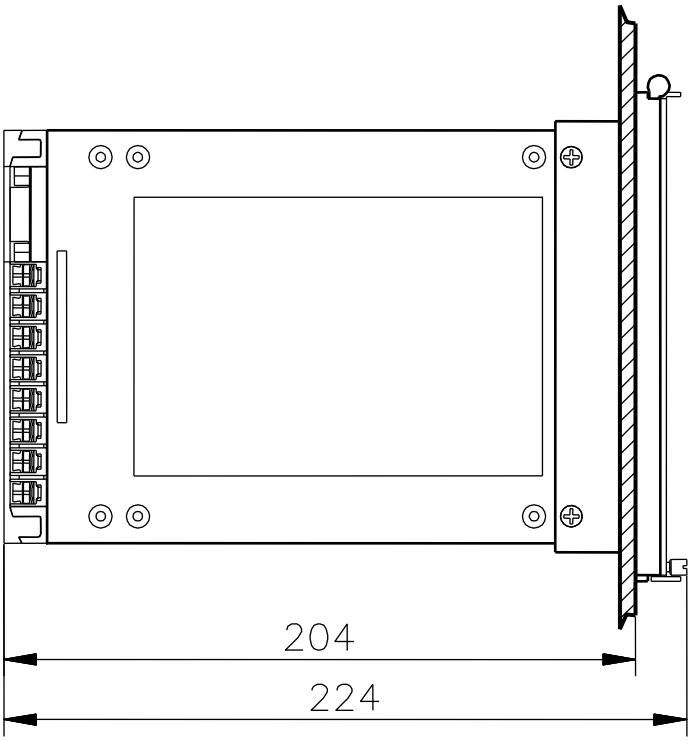
19. CHANGE PHASE CURRENT RATED INPUT 1 OR 5A

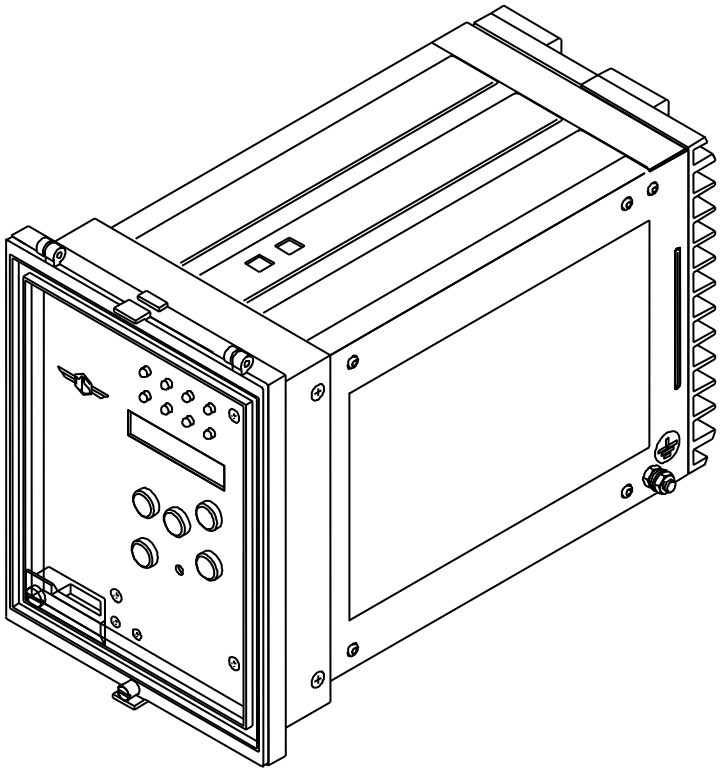


24. OVERALL DIMENSIONS

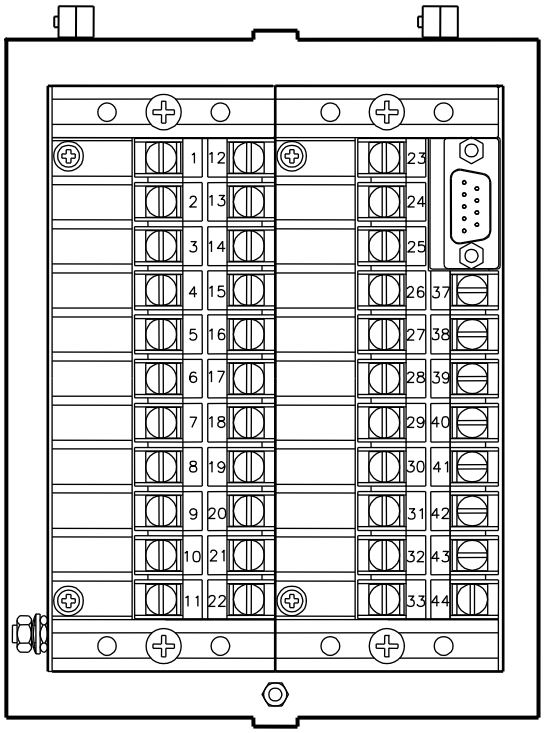


PANEL CUT-OUT 113x142 (LxH)

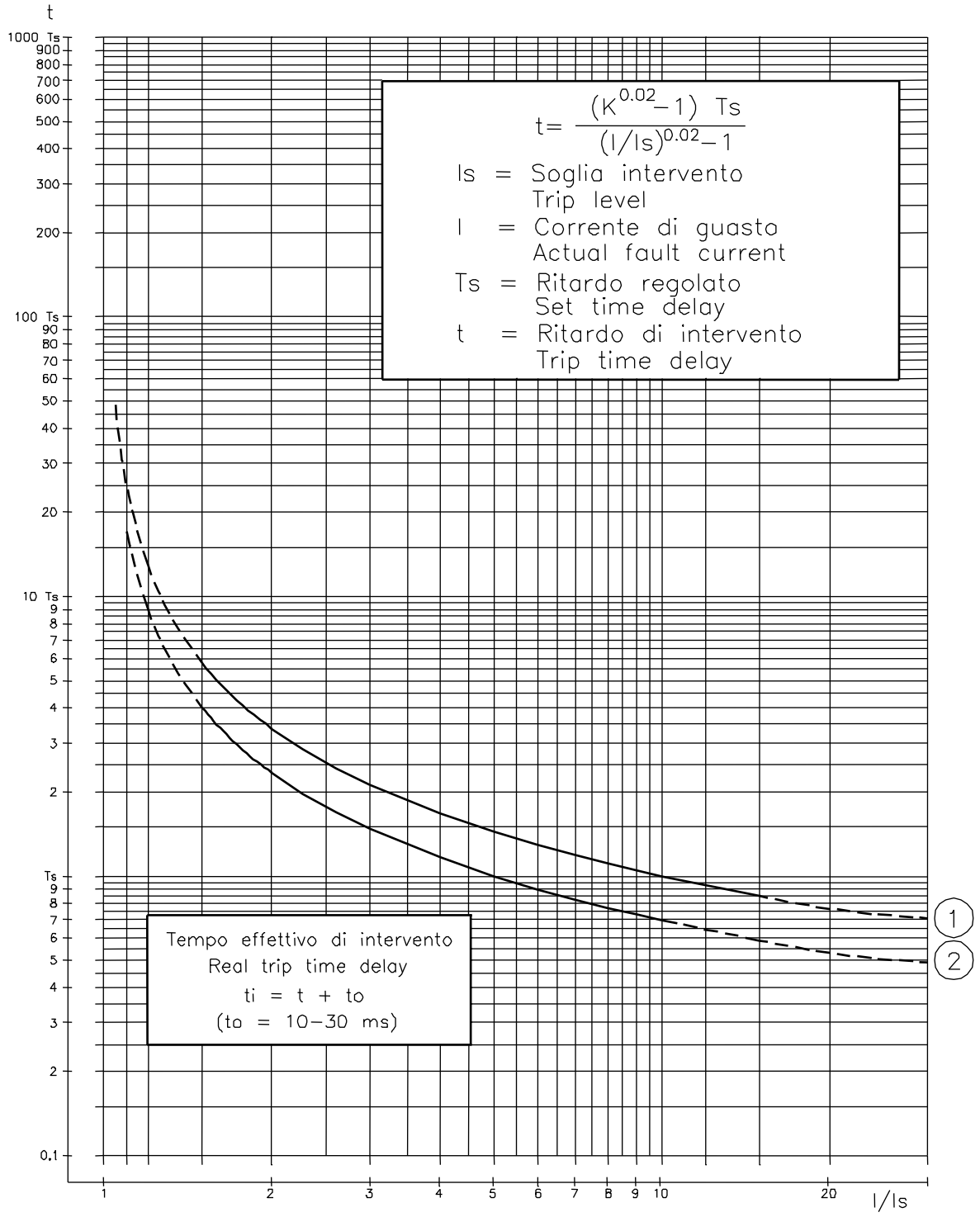




View of Rear Terminal Connection



21. TIME CURRENT (TU0298 – R2)



② K=5
- Is = UL = (0.02−0.8) On
- Ts = tUL = (1−30)s a 5xIs

① K=10
- Is = IL = (0.3−1.5) In
- Ts = tIL = (1−50)s a 10xIs
- Is = OL = (0.1−1.0) In
- Ts = tOL = (0.05−30)s a 10xIs

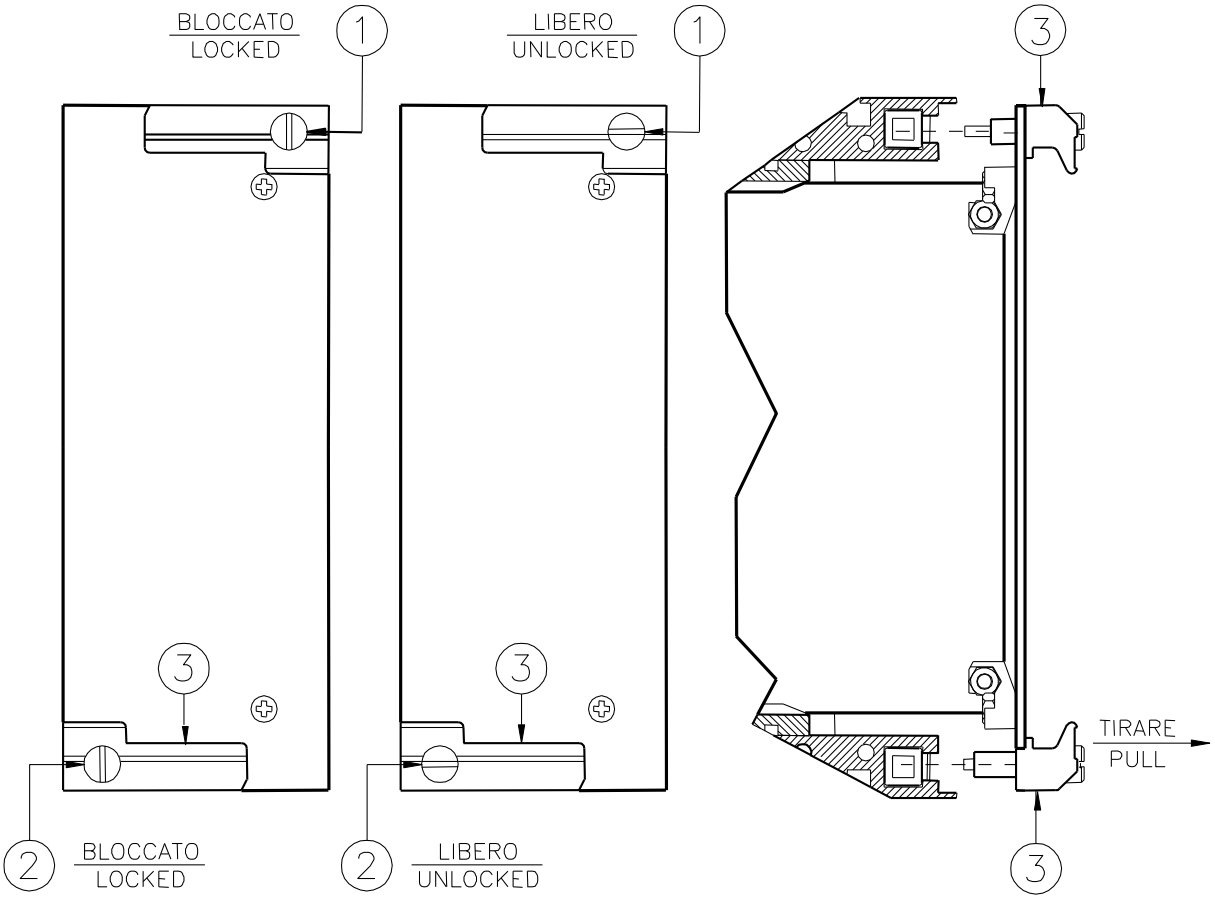
24. DIRECTION FOR PCB'S DRAW-OUT AND PLUG-IN

22.1 DRAW-OUT

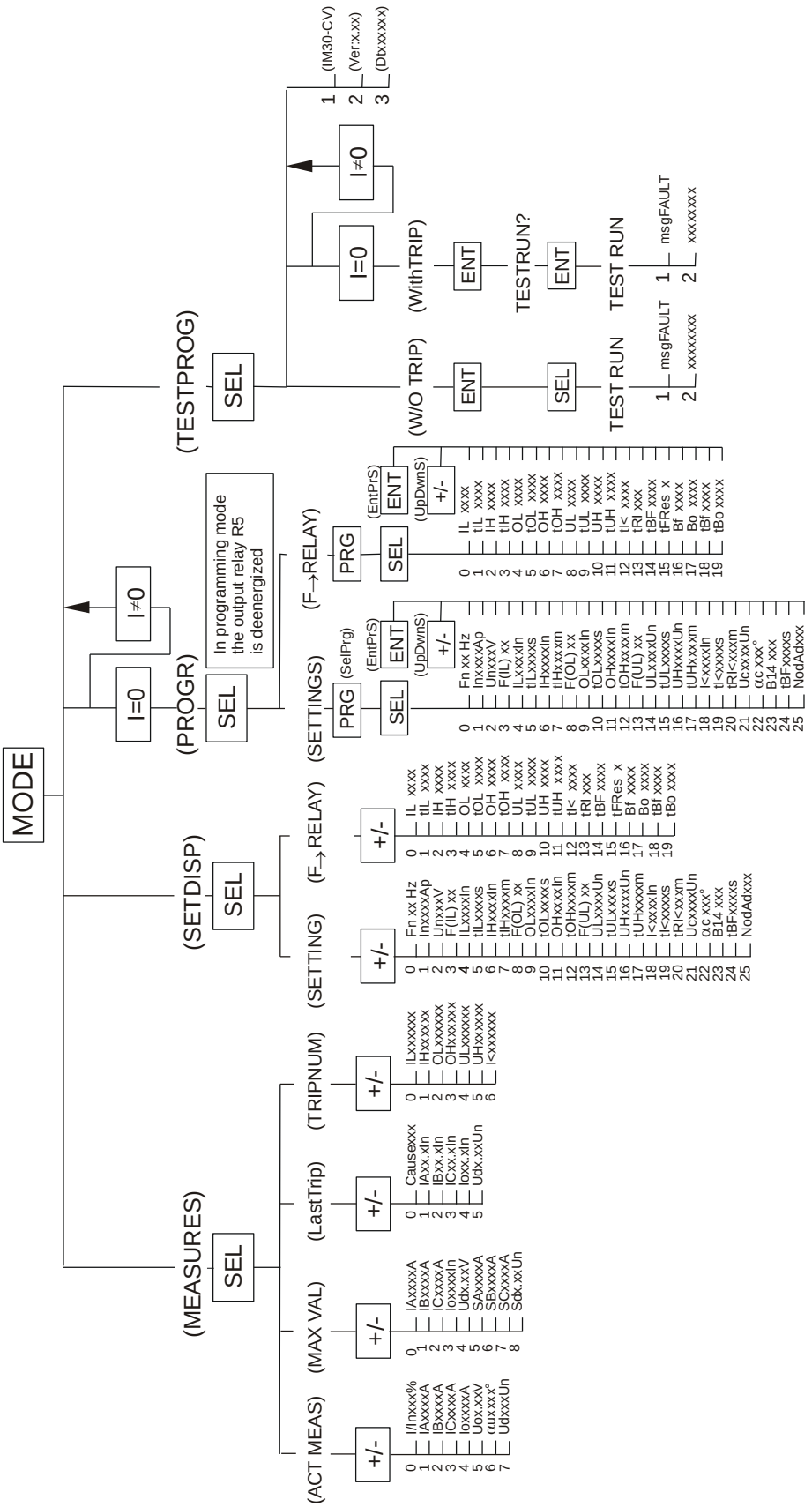
Rotate clockwise the screws ① and ② in the horizontal position of the screws-driver mark.
Draw-out the PCB by pulling on the handle ③

22.2 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).



23. KEYBOARD OPERATIONAL DIAGRAM



24. SETTING'S FORM

Relay Type	**IM30-CV** **Station :**	**Circuit :**	
Date :	**/ / Firmware Version:**	**Relay Serial Number :**	
Power Supply	☐ 24V(-20%) / 110V(+15%) a.c. 24V(-20%) / 125V(+20%) d.c.	**Rated Current :**	
	☐ 80V(-20%) / 220V(+15%) a.c. 90V(-20%) / 250V(+20%) d.c.		

RELAY PROGRAMMING

Variable	Description	Setting Range		Default Setting	Actual Setting	Test Result	
						Pick-up	Reset
Fn	Mains frequency	50 - 60	**Hz**	50			
In	Rated primary current of the phase C.Ts.	0 - 9999	**Ap**	500			
Un	Rated secondary voltage of the P.Ts.	50 - 125	**V**	100			
F(IL)	Operation characteristic of the low-set overcurrent element	D - SI	-	D			
IL	Trip level of low-set overcurrent element	0.3-1.5-Dis	**In**	0.3			
tIL	Trip time delay of the low-set overcurrent element	1 - 50	**s**	1			
IH	Trip level of high-set overcurrent element	0.2 - 2 - Dis	**In**	0.6			
tIH	Trip time delay of the high-set overcurrent element	0.1 – 6500	**s**	0.1			
F(OL)	Operation characteristic of the low-set earth fault element	D - SI	-	D			
OL	Trip level of low-set earth fault element	0.1-1.0-Dis	**In**	0.1			
tOL	Trip time delay of low-set earth fault element	0.05 – 30	**s**	0.05			
OH	Trip level of high-set earth fault element	0.1-2.0-Dis	**In**	0.2			
tOH	Trip time delay of the high-set earth fault element	0.05 – 9.99	**s**	0.05			
F(UL)	Operation characteristic of the low-set unbalance element	D - SI	-	D			
UL	Trip level of low-set unbalance element	0.02-0.8-Dis	**Un**	0.02			
tUL	Trip time delay of low-set unbalance element	1.0 - 30	**s**	1.0			
UH	Trip level of high-set unbalance element	0.01-1.0-Dis	**Un**	0.04			
tUH	Trip time delay of the high-set unbalance element	0.1 - 300	**s**	1			
I<	Trip level of undercurrent element	Dis-0.10-1.0	**In**	0.1			
tI<	Trip time delay of the undercurrent element	1.0 – 99.9	**s**	1			
tRI<	Wait time for the reenergization of the capacitors	Dis-0.5-100	**m**	5			
Uc	Unbalance compensation level	0.00 - 0.2	**Un**	.00			
αc	Uo∧IA phase displacement	0 - 359	**°**	0			
B14	C/B status monitoring input enabled/disabled	En - Dis	-	Dis			
tBF	Max reset time delay of the instantaneous element	0.1-0.75	**s**	0.1			
NodAd	Identification number for the serial connection	1 - 250	-	1			

CONFIGURATION OF OUTPUT RELAYS

Default Setting						Actual Setting					
Prot Elem.	Output Relays				Description	Prot. Elem.	Output Relays				
IL	-	-	3	-	Instantaneous element of low-set overcurrent	**IL**					
tIL	1	2	-	-	As above, time delayed element	**tIL**					
IH	-	-	3	-	Instantaneous element of high-set overcurrent	**IH**					
tIH	1	2	-	-	As above, time delayed element	**tIH**					
OL	-	-	-	-	Instantaneous element of low-set earth fault element	**OL**					
tOL	1	2	-	-	As above, time delayed element	**tOL**					
OH	-	-	-	-	Instantaneous element of high-set earth fault element	**OH**					
tOH	1	2	-	-	As above, time delayed element	**tOH**					
UL	-	-	-	-	Instantaneous element of low-set unbalance element	**UL**					
tUL	-	2	-	-	As above, time delayed element	**tUL**					
UH	-	-	-	-	Instantaneous element of high-set unbalance element	**UH**					
tUH	-	2	-	-	As above, time delayed element	**tUH**					
tI<	-	-	-	4	Time delayed element min. current	**tI<**					
tRI	-	-	-	-	Start of reclose timer tRI	**tRI**					
tBF	-	-	-		Breaker failure element	**tBF**					
tFRes:	M				Relay reset mode A = Automatic, M = Manual	**tFRes**:					
Bf	-	-	-	i	The input for blocking the operation of the time delayed elements relevant to phase faults (IL, IH, OL, OH)	**Bf**					
Bo			-	u	The input for blocking the operation of the time delayed elements relevant to unbalance (UH, UL)	**Bo**					
tBf	2tBF				Breaker failure alarm	**tBf**					
tBo	2tBF				As above for the unbalance functions	**tBo**					

Commissioning Engineer : _____ **Date :** _____

Customer Witness : _____ **Date :** _____