THREE PHASE
O/U VOLTAGE
O/U FREQUENCY
MICROPROCESSOR
RELAY

TYPE

MC3V-CEI

OPERATION MANUAL

CE

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 effectiveness.

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, make sure 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 - Waste Disposal of Electrical & Electronic Equipment

(Applicable throughout the European Union and other European countries with separate collection program).
This product should not be treated as household waste when you wish dispose of it. Instead, it should be handed over to an applicable collection point for the recycling of electrical and electronic equipment.
By ensuring this product is disposed of correctly, you will help prevent potential negative consequence to the environment and human health, which could otherwise be caused by inappropriate disposal of this product. The recycling of materials will help to conserve natural resource.

1.12 - Fault detection and repair

Internal calibrations and components should not be altered or replaced.
For repair please ask the Manufacturer or its authorised Dealers.

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

2. General Characteristics

The MC is a very innovative and versatile line of Protective Relays which takes advantage of the long and successful experience coming from the M-Line.

The main features of the MC-Line relays are:

Compact draw-out execution for Flush Mounting or for assembly in 19” 3U chassis for 19” Rack systems.

User friendly front face with 2x8 characters LCD Display, four signal Leds, four keys for complete local management and 9-pin socket for local RS232 serial communication.

Four user programmable Output Relays. On request one of the Output Relays can be replaced by a Can Bus port for control of additional I/O modules.

Three optoisolated, self-powered Digital Inputs.

RS485 communication port (independent from the RS232 port on front panel)

Totally draw-out execution.

Input voltage is supplied to 3 internal isolated transformers.

The Measuring Ranges are:

Phase Voltage : (0.1 – 1.6)Un - (Un=440V)
Frequency : (40.00 - 70.00)Hz

Make electric connection in conformity with the diagram reported on relay's enclosure.

Check that input quantities are same as reported on the diagram and on the test certificate.

2.1 - Power Supply

The auxiliary power is supplied by a built-in module fully isolated an self protected.

Two options are available:

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 and Algorithms

2.2.1 - Reference Input Values

Display			Description	Setting Range			Step	Unit
V1	10	kV	Rated Primary voltage (phase to phase) VT	0.05	-	500	0.01	kV
V2	100	V	Rated Secondary (phase to phase) VT	100	-	440	0.01	V
Vo1	10	kV	Rated Primary zero sequence voltage (open triangle)	0.05	-	500	0.01	kV
Vo2	100	V	Rated Secondary zero sequence voltage (open triangle)	50	-	115	0.01	V
Freq	50	Hz	System frequency	50	-	60	10	Hz

2.2.2 - Input quantities

2.2.2.1 - Mains Frequency (Freq)

The relay can operate either in 50Hz or 60Hz systems.
The rated Mains Frequency " Freq " must be set accordingly.

2.2.2.2 - Phase Voltage inputs

Input voltages are supplied to 2 internal adapting transformers; the rated input voltage (phase-to-phase) can be programmed in the range (100 - 440)V.
The display shows the measurement of the phase-to-phase voltages in primary volt according to the programmed reference input values.

2.2.3 – Functions and Settings

The device includes two groups of setting "Grp1" and "Grp2", each of groups includes the following parameters:

Grp1 = 27, 59, 59Vo, 81<, 81>, I.R.F., TS, BF, Osc, Comm, LCD,
Grp2 = 27, 59, 59Vo, 81<, 81>

The parameters "I.R.F., TS, BF, Osc, Comm, LCD" is present only in the group 1 "Grp1", but are in common for both groups

2.2.4 - Functions and Settings *(Function)*

2.2.4.1 - 27 – Undervoltage phase-to-phase element

Stato (Status)	→		Abilit.		[Disabl.(Disable) / Abilit.(Enable)]			
Opzioni (Options)	→	**BI**	Disabl.		[Disabl.(Disable) / Abilit.(Enable)]			
Livelli (Trip Level)	→	**27**	0.90	**Vn**	(0.20 ÷ 1.20)	step	0.01	Vn
Tempi (Timer)	→	**t27**	1.00	**s**	(0.05 ÷ 60.00)	step	0.01	s

- ❑ **Status** : If disable the function is disactivated
- ❑ **BI** : Operation controlled by Blocking Digital Input
- ❑ **27** : Trip level
- ❑ **t27** : Trip time delay

2.2.4.2 - 59 – Overvoltage phase-to-phase element

Stato (Status)	→		Abilit.		[Disabl.(Disable) / Abilit.(Enable)]			
Opzioni (Options)	→	**BI**	Disabl.		[Disabl.(Disable) / Abilit.(Enable)]			
Livelli (Trip Level)	→	**59**	1.10	**Vn**	(0.50 ÷ 1.50)	step	0.01	Vn
Tempi (Timer)	→	**t59**	1.00	**s**	(0.05 ÷ 60.00)	step	0.01	s

- ❑ **Status** : If disable the function is disactivated
- ❑ **BI** : Operation controlled by Blocking Digital Input
- ❑ **59** : Trip level
- ❑ **t59** : Trip time delay

2.2.4.3 – 59Vo – Zero sequence overvoltage element

Stato (Status)	→		Abilit.		[Disabl.(Disable) / Abilit.(Enable)]			
Opzioni (Options)	→	***BI***	Disabl.		[Disabl.(Disable) / Abilit.(Enable)]			
Livelli (Trip Level)	→	***59o***	0.10	**Vn**	(0.10 ÷ 1.00)	step	0.01	Vn
Tempi (Timer)	→	***t59o***	0.30	**s**	(0.05 ÷ 60.00)	step	0.01	s

- ❑ ***Status*** : If disable the function is disactivated
- ❑ **BI** : Operation controlled by Blocking Digital Input
- ❑ **Trg** : Function operation triggers the oscillographic wave form capture (see § Oscillographic)
- ❑ **59o** : Trip level
- ❑ **t59o** : Trip time delay

2.2.4.4 – 81< - Underfrequency protection level

Stato (Status)	→		Abilit.		[Disabl.(Disable) / Abilit.(Enable)]			
Opzioni (Options)	→	***BI***	Disabl.		[Disabl.(Disable) / Abilit.(Enable)]			
Livelli (Trip Level)	→	***81<***	49.50	**Hz**	(40.00 ÷ 70.00)	step	0.01	Hz
Tempi (Timer)	→	***t81<***	1.00	**s**	(0.05 ÷ 60.00)	step	0.01	s

- ❑ ***Status*** : If disable the function is disactivated
- ❑ **BI** : Operation controlled by Blocking Digital Input
- ❑ **f>** : Trip level
- ❑ **tf>** : Trip time delay

2.2.4.5 – 81> - Overfrequency protection level

Stato (Status)	→		Abilit.		[Disabl.(Disable) / Abilit.(Enable)]			
Opzioni (Options)	→	***BI***	Disabl.		[Disabl.(Disable) / Abilit.(Enable)]			
Livelli (Trip Level)	→	***81>***	50.50	**Hz**	(40.00 ÷ 70.00)	step	0.01	Hz
Tempi (Timer)	→	***81>***	1.00	**s**	(0.05 ÷ 60.00)	step	0.01	s

- ❑ ***Status*** : If disable the function is disactivated
- ❑ **BI** : Operation controlled by Blocking Digital Input
- ❑ **f<** : Trip level
- ❑ **tf<** : Trip time delay

2.2.4.6 - I.R.F. - Internal Relay Failure

Stato (Status)	→	No Param	No Parameters
Opzioni (Options)	→ **Opz**	NoScat	[NoScat (No Trip) / Scatto (Trip)]
Livelli (Trip Level)	→	No Param	No Parameters
Tempi (Timer)	→	No Param	No Parameters

- **Opz** : The variable " Opz " can be programmed to trip the output relays same as the other protection functions (Opz = Scatto (Trip)), or to only operate the " IRF " signal led without tripping the output relays (Opz = NoScat(NoTrip)).

2.2.4.7 – TS – Remote Trip

Stato (Status)	→		Abilit.		[Disabl.(Disable) / Abilit.(Enable)]		
Opzioni (Options)	→ ***iTS***		TS		[TS / Bi]		
Livelli (Trip Level)	→		Non Disp.		No Parameters		
Tempi (Timer)	→ ***tTS***	1.00	**s**	(0.00 ÷ 10.00)	step	0.05	s

- ***Status*** : If disable the function is disactivated
- ***iTS*** : Remote trip is controlled by the digital input D2.
  TS = Used for Remote trip
  Bi = Used for blocking functions
- ***tTS*** : Trip time delay

2.2.4.8 - BF - Breaker Failure

Stato (Status)	→		Abilit.		[Disabl.(Disable) / Abilit.(Enable)]		
Opzioni (Options)	→ ***TrR***		Relè1		Relè1(Relay1) – Relè2(Relay2) – Relè3(Relay3) – Relè4(Relay4)		
Livelli (Trip Level)	→		Non Disp.		No Parameters		
Tempi (Timer)	→ ***tBF***	0.20	**s**	(0.05 ÷ 0.75)	step	0.01	s

- **Status** : If disable the function is disactivated
- **TrR** : Output relay programmed for trip command to the Circuit Breaker
- **tBF** : Trip time delay

- Operation: If after the time "tBF" from pick-up of the programmed relay "TrR" the current measured still exceeds 5%In, the output relay associated to the "BF" function is operated (relay another than TrR).

2.2.4.9 - Osc - Oscillographic Recording

Stato (Status)	→		Abilit.		[Disabl.(Disable) / Abilit.(Enable)]			
Opzioni (Options)	→	**Trg**	Scatto		[Disab. / Avviam. / Scatto / Inp.Est]			
Livelli (Trip Level)	→		Non Disp.		No Parameters			
Tempi (Timer)	→	**tPre**	0.30	**s**	(0.10 ÷ 0.50)	step	0.1	s
	→	**tPost**	0.30	**s**	(0.10 ÷ 1.50)	step	0.1	s

❑	***Status***	:	If disable the function is disactivated
❑	**Trg**	:	*Disab* = Function Disable (no recording) *Avviam.* = Trigger on time start of protection functions *Scatto* = Trigger on trip (time delay end) of protection functions *Inp.Est.* = Trigger from the Digital Input D3
❑	**tPre**	:	Recording time before Trigger (Pre-trigger)
❑	**tPost**	:	Recording time after Trigger (Post-trigger)

When the option “Avviam.” or “Scatto” is selected:

The oscillographic recording is started respectively by the “Time Start” or by the “Trip at time end” of any of the functions that have been programmed to Trigger the Wave Form Capture (27, 59, 59Vo, 81>, 81<).

The “Osc” Function includes the wave Form Capture of the input quantities (U, f) and can totally store a record of 3 seconds.

The number of events recorded depends on the duration of each individual recording (tPre + tPost).
In any case the number of event stored can not exceed ten (10 x 0.3 sec).
Any new event beyond the 3 sec capacity of the memory, cancel and overwrites the former records (FIFO Memory).

2.2.4.10 - Comm – Communication Parameters

Stato (Status)	→	Non Disp.	No Parameters
Opzioni (Options)	→ ***LBd***	9600	[9600 / 19200 / 38400]
	→ ***RBd***	9600	[9600 / 19200]
	→ ***Mod***	8,n,1	[8,n,1 / 8,o,1 / 8,e,1]
	→ ***RPr***	Modbus	[Iec103 / Modbus]
Livelli (Trip Level)	→	Non Disp.	No Parameters
Tempi (Timer)	→	Non Disp.	No Parameters

- ***LBd*** : Local Baud Rate (Front panel RS232 communication speed)
- ***RBd*** : Remote Baud Rate
  (Rear panel terminal blocks RS485 communication speed)
- ***Mod*** : Communication mode (communication parameters)
  Note: Any change of this setting becomes valid at the next power on
- ***RPr*** : Remote Protocol

2.2.4.11 - LCD – Display and Buzzer operation

Stato (Status)	→	Non Disp.	No Parameters
Opzioni (Options)	→ ***Key***	BeepON	[BeepOFF / BeepON]
	→ ***BkL***	Auto	[Auto (Automatic) / Accesa (ON)]
Livelli (Trip Level)	→	Non Disp.	No Parameters
Tempi (Timer)	→	Non Disp.	No Parameters

- ***Key*** : Buzzer “Beep” on operation of Keyboard buttons.
- ***LCD*** : LCD Backlight.
  Accesa = Backlight ON.
  Auto = Switched-on Automatically on operation of Keyboard buttons. Off after 10sec of inactivity.

3. Instantaneous Output and Blocking Input

3.1 - Instantaneous Output

The instantaneous element of each of the protection functions (F59, F59Vo, F27, F81) can be programmed to control one of the Output Relays.
This relay picks-up as soon as the input quantity exceeds the set trip level of the Protection Function and automatically resets when the input quantity drops below the function reset level (≈95% of the trip level).

3.2 – Blocking Input

Tripping at time end of any time delayed protection function (tF59, fF81,tF59Vo,) can be blocked by activating the Digital Input D1 (BI = Enable).

4. Output Relays

Four user programmable Output Relays are normally available R1, R2, R3, R4.
Each of them can be programmed to be controlled by any element (instantaneous or time delayed) of any of the Relay Functions including Remote trip and Internal Relay Fault.
Moreover, the operation of each of the output relays can be programmed to be either Normally Deenergized (energized on tripping of the controlling Functional Element) or Normally Energized (Deenergized on tripping of the controlling Functional Element)

5. Digital Inputs

Three optoisolated, self-powered Digital Inputs D1, D2, D3 are provided.
A Digital Input is activated when its terminals are shorted by a cold contact.

❑	**D1**	(terminals 22 - 19)	:	It is used to enable or disable setting “Grp2” (Close = “Grp2” attive; Open = “Grp1” active)
❑	**D2**	(terminals 22 - 21)	:	It is used to Remote Trip (see § TS parameter “iTS”)
❑	**D3**	(terminals 22 - 20)	:	Circuit breaker status. (Closed = C/B closed; Open = C/B open)

6. Self-diagnostic

The Relay incorporates a sophisticated self-diagnostic feature that continuously checks the following elements:

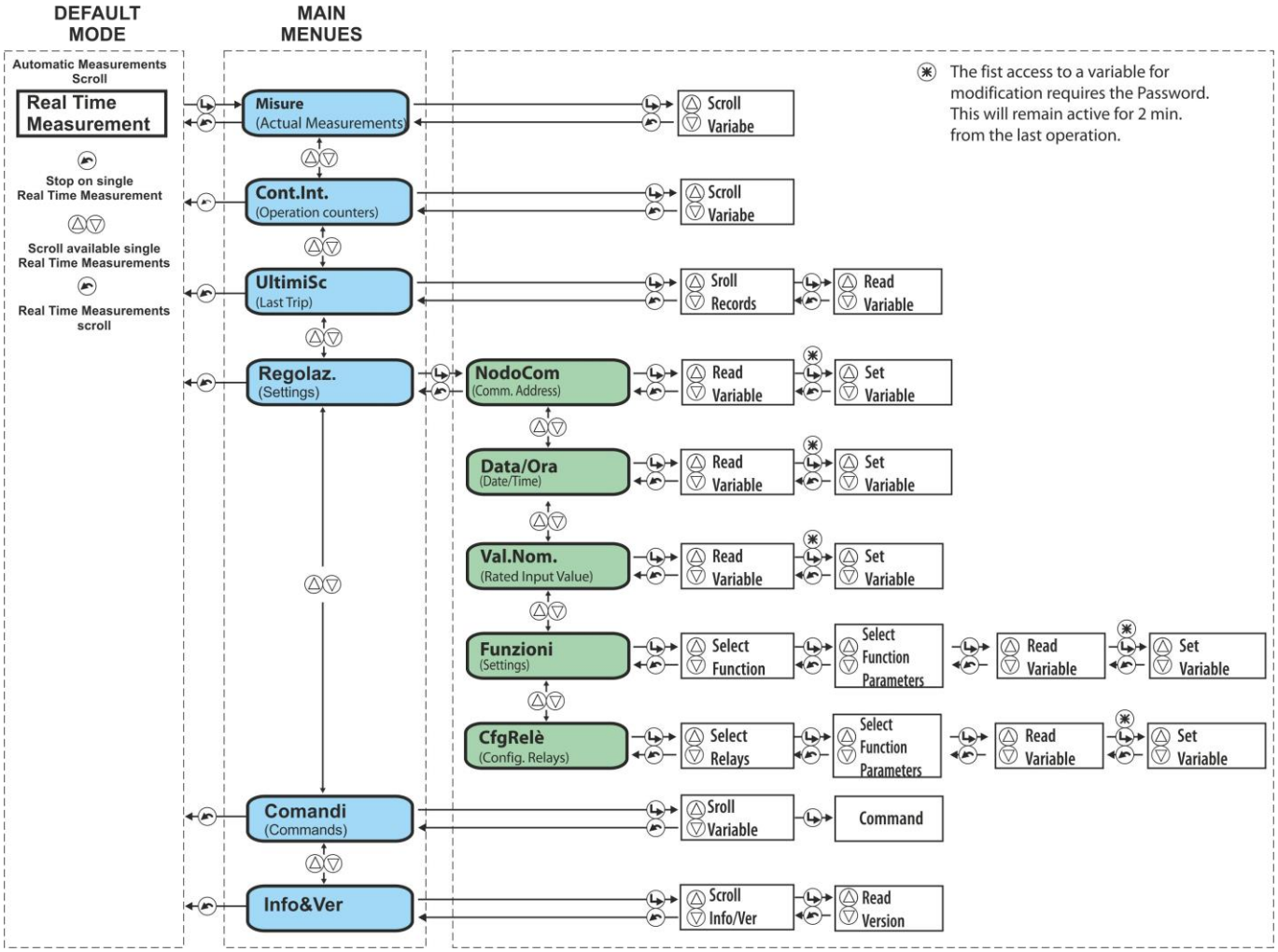
- A/D conversion
- Checksum of the settings stored into E^2Prom.
- DSP general operation (Power, Routines, etc.)
- Lamp test (only on manual test).

Any time Power is switched on, a complete test is run; then, during normal operation, the test runs continuously and the checksum is done any time a parameter is stored into E^2Prom.
If during the test any Relay Internal Failure (I.R.F) is detected:

- If “ I.R.F. “ is programmed to “ Trip “, the programmed output relays are operated same as on tripping of any protection function operation is stored in the “ Last Trip “ and the I.R.F. signal led is set to flashing.
- If “ I.R.F. “ is programmed to “NO Trip”, and only the I.R.F. signal led is set to flashing.

7. Relay Management

The relay can be totally managed locally, either by the RS232 communication port or by the 4 key buttons and the LCD display, or remotely via the communication bus RS485 connected to the rear terminal blocks. The 2 line x 8 characters LCD display shows the available information.
Key buttons operate according to the flow-chart herebelow.



8. Signalizations

Four signal leds are available on the Front Face Panel:

a)	Green LED	**On I.R.F.**	❑ Illuminated during normal operation when Power Supply is ON. ❑ Flashing when a Relay Internal Fault is detected.
b)	Red LED	**Pres.Tens. B.I.**	❑ Illuminated when the input voltage is present (at least one phase-to-phase voltage exceeding 5% of its rated input value). ❑ Off when the input voltage is not present ❑ Flashing when the signal Blocking Input is present
c)	Red LED	**Intervento Avviamento (*)**	❑ Flashing when a timed function starts to operate. ❑ Illuminated when any function is tripped; reset takes places by pressing the reset button.
d)	Yellow LED	**Tar.1 Tar.2**	❑ Illuminated when setting group 1 “Gpr1” is active. ❑ Flashing when setting group 2 “Gpr2” is active.

(*) When any protection function is tripped besides the Led which gives the general trip indication. The display shows the function that caused the tripping:

LastTrip “Cause”	steady blinking

9. Keyboard Buttons

	**Enter**	Give access to any menu or convalidate any programming changement.
	**Reset**	Return from the actual selected menu to the former menu.
	**Select +**	Scrolls variables available in the different menus or increases/decreases setting values.
	**Select -**	

10. Serial Communication Port

10.1 - Main RS485 Serial Communication Port

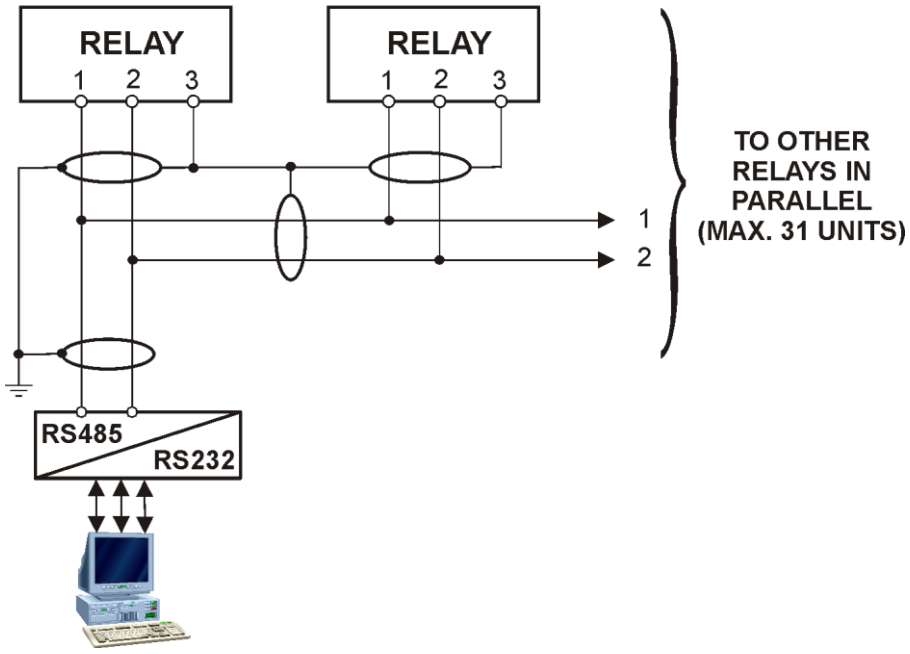
This port is accessible via the terminals 1-2-3 provided on the relay terminal board.
It is used for connection to a serial bus interfacing up to 31 units with the Central Supervision System (SCADA, DCS, ecc).
The serial bus is a shielded pair of twisted cables connecting in parallel (Multi Drop) the different units (slaves) by the relevant terminals.
The physical link is RS485 and the Communication Protocol is MODBUS/RTU / IEC60870-5-103.
The configuration of transmission parameters is selectable.

❑	Baud Rate	: 9600/19200 bps	9600/19200 bps	9600/19200 bps
❑	Start bit	: 1	1	1
❑	Data bit	: 8	8	8
❑	Parity	: None	Odd	Even
❑	Stop bit	. 1	1	1

Note: any change of this setting becomes valid at the next power on.

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.
Maximum length of the serial bus can be up to 200m.

CONNECTION TO RS485

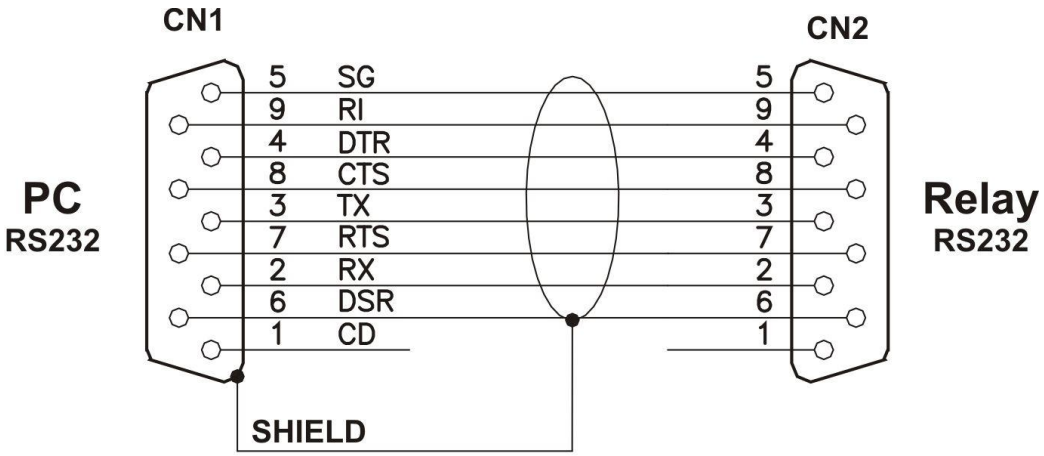


For longer distance and for connection of up to 250 Relays, optical interconnection is recommend.
(please ask Microelettrica for accessories)

10.2 - Communication Port on Front Face Panel

This port is used for communication through the Front Face Panel between a local Lap-top PC.

The physical link is RS232 by the standard female 9-pin D-sub connector available on the Front Face Panel. Via this Port complete Relay management and data acquisition is possible.



11. Menu and Variables

11.1 - Real Time Measurements

Scrolling display of the Real Time Measurements is the Default operation.
Scrolling can be stopped at any of the measurements and restarted by pressing the Reset button ↶.
When stopped on one variable, ✱ appears aside the measurement and the different available measurements can be selected by the △▽ buttons.

Display				Description
VA	=	0 – 999999	V	Voltage (phase to phase) A
VB	=	0 – 999999	V	Voltage (phase to phase) B
VC	=	0 – 999999	V	Voltage (phase to phase) C
Vo	=	0 – 999999	V	Zero sequence voltage
f	=	40.00-70.00	Hz	System Frequency

11.2 - Misure (Instantaneous Measurements)

Real time measurements can be frozen at any moment selecting the menu " Instant Measure ":

- " **R**eal **T**ime **M**eas " ↳
- " Meas " ↳
- " 1st Measurement △▽ other measurements
- ↶ to go back to " Meas "

Display				Description
VA	=	0 – 999999	V	Voltage (phase to phase) A
VB	=	0 – 999999	V	Voltage (phase to phase) B
VC	=	0 – 999999	V	Voltage (phase to phase) C
Vo	=	0 – 999999	V	Zero sequence voltage
f	=	40.00-70.00	Hz	System Frequency

11.3 - Cont.Int (Operation Counters)

The operation of any of the function herebelow reported, is counted and recorded in the menu "Counters ".

- " **R**eal **T**ime **M**eas " ↳
- "Counter " ↳
- " 1st counters △▽ other counters
- ↶ to go back to "Counter "

Display			Description
27	=	0 – 65535	Operations counters of undervoltage element
59	=	0 – 65535	Operations counters of overvoltage element
59Vo	=	0 – 65535	Operations counters of Zero sequence overvoltage element
81<	=	0 – 65535	Operations counters of underfrequency element
81>	=	0 – 65535	Operations counters of overfrequency element
TS	=	0 – 65535	Operations counters of Remote trip
IRF	=	0 – 65535	Operations counters of Internal Fault Relay
BF	=	0 – 65535	Operations counters of breaker failure element
HR	=	0 – 65535	Operations counters of HW recovery operations

11.4 - UltimiSc (Event Recording - Last Trip)

The Relay records any tripping and stores the information relevant to the last 20 tripping of protection functions (FIFO).
Each event recording includes the following information.

- “ Real Time Meas “ →
- “ LastTrip “ →
- → 1st event,
- △▽ to scroll available events,
- → to “ Rec # “ selected,
- △▽ to select the different fields;

Display				Description
Data	=	YYYY/MM/GG		Date: Year/Month/Day
Ora	=	hh:mm:ss:cc		Time: hours/minutes/second/hundredths of seconds
Funz		**xxxxx**		Indication of the protection function which caused the relay tripping. For indication of the TRIP Cause the following acronyms are used:
				- **27** = Undervoltage element - **59** = Overvoltage element - **59Vo** = Zero sequence overvoltage element - **81<** = Underfrequency element - **81>** = Overfrequency element - **Ts** = Remote Trip - **IRF** = Internal Fault Relay
VA	=	0 - 999999	**V**	Voltage (phase to phase) A
VB	=	0 - 999999	**V**	Voltage (phase to phase) B
VC	=	0 - 999999	**V**	Voltage (phase to phase) C
Vo	=	0 - 999999	**V**	Zero sequence voltage
f	=	40.00-70.00	**Hz**	System Frequency

- ↶ to go back to “ Rec # “,
- ↶ to go back to “ Real Time Meas “.

11.5 - Regolaz. (Programming / Reading the Relay Settings)

- ↳ " Main Menu "
- △▽ select "Regolaz." ↳
- △▽ select among following sub menus:

11.5.1 - NodoCom (Communication Address)

- △▽ "NodoCom " ↳
- " Add: # " ↳
- " Password ???? " (if not yet entered; see § Password)
- △▽ to select the Address (1-250)
- ↳ to validate. Set Done!

The default address is 1.

Display	Description	Setting Range	Step	Unit
Add: 1	Identification number for connection on serial communication bus	1 - 250	1	-

11.5.2 - Data/Ora (Time/Date)

- △▽ "Data/Ora " ↳ Data: Current Date, Ora: Current time
- ↳ " YY/…… " △▽ to set year,
- ↳ " XX/MM " △▽ to set month,
- ↳ " XX/XX/DD " △▽ to set day,
- ↳ " XX/XX/XX "
- ↳ " hh/mm " △▽ to set hour,
- ↳ " XX/mm " △▽ to set minutes,
- ↳ To validate Set Done!
- ↶ Exit

11.5.3 - Val.Nom. (Rated Input Values)

- △▽ "Val.Nom."
- ↳ 1st Variable
- △▽ to scroll variables
- ↳ to modify selected variable
- " Password ???? " (if not yet entered) or #??? (if not yet entered; see § Password)
- △▽ to set variable value,
- ↳ to validate. Set Done!

Display			Description	Setting Range	Step	Unit
V1	10	**kV**	Rated Primary voltage (phase to phase) VT	0.05 - 500	0.01	kV
V2	100	**V**	Rated Secondary (phase to phase) VT	100 - 440	0.01	V
Vo1	10	**kV**	Rated Primary zero sequence voltage (open triangle)	0.05 - 500	0.01	kV
Vo2	100	**V**	Rated Secondary zero sequence voltage (open triangle)	50 - 115	0.01	V
Freq	50	**Hz**	System frequency	50 - 60	10	Hz

11.5.4 - Funzioni (Functions)

- ⇧⇩ "Funzioni ",
- ↵ 1st function,
- ⇧⇩ to scroll available Functions,
- ↵ to Read/Write setting of the selected function,
- ⇧⇩ to select the different definable fields
  - Stato (Status)
  - Livelli (Trip Level)
  - Opzioni (Options)
  - Tempi (Timers)
- ↵ to access the selected field and read the actual setting of the relevant variable
- ↵ to modify the actual setting;
- ⇧⇩ to set the new value.
- ↵ to validate. Set Done!

Display						Description	Setting Range	Step
Function	Type		Variable	Default Setting	Unit			
Password		=	0000-9999	1111	-	Password for programming enable (see § Password)		
Grp1		→	Settings Group 1					
Grp2		→	Settings Group 2					
27	**Stato**	→		Abilit.		Enable of the protection function	Disabil/Abilit.	-
	Opzioni	→	**BI**	Disabil.		Operation controlled by Blocking Digital Input	Disabil/Abilit.	-
	Livelli	→	**V<**	0.90	**Vn**	Trip level	0.20 – 1.20	0.01
	Tempi	→	**tV<**	1.00	**s**	Trip time delay	0.05 – 60.00	0.01
59	**Stato**	→		Abilit.		Enable of the protection function	Disabil/Abilit.	-
	Opzioni	→	**BI**	Disabil.		Operation controlled by Blocking Digital Input	Disabil/Abilit.	-
	Livelli	→	**V>**	1.10	**Vn**	Trip level	0.50 – 1.50	0.01
	Tempi	→	**tV>**	1.00	**s**	Trip time delay	0.05 – 60.00	0.01
59Vo	**Stato**	→		Abilit.		Enable of the protection function	Disabil./Abilit.	-
	Opzioni	→	**BI**	Disabil.		Operation controlled by Blocking Digital Input	Disabil./Abilit.	-
	Livelli	→	**59o**	0.10	**Vn**	Trip level	0.10 – 1.00	0.01
	Tempi	→	**t59o**	0.30	**s**	Trip time delay	0.05 – 60.00	0.01
81>	**Stato**	→		Abilit.		Enable of the protection function	Disabil./Abilit.	-
	Opzioni	→	**BI**	Disabil.		Operation controlled by Blocking Digital Input	Disabil./Abilit.	-
	Livelli	→	**f>**	50.50	**Hz**	Trip level	40 – 70	0.01
	Tempi	→	**tf>**	1.00	**s**	Trip time delay	0.05 – 60.00	0.01
81<	**Stato**	→		Abilit.		Enable of the protection function	Disabil./Abilit.	-
	Opzioni	→	**BI**	Disabil.		Operation controlled by Blocking Digital Input	Disabil./Abilit.	-
	Livelli	→	**f<**	49.50	**Hz**	Trip level	40 – 70	0.01
	Tempi	→	**tf<**	1.00	**s**	Trip time delay	0.05 – 60.00	0.01

Display						Description	Setting Range	Step
Function	Type		Variable	Default Value	Unit			
IRF	Stato	→		Abilit.		Enable of the protection function	Disabil./Abilit.	-
	Opzioni	→	Opz	NoScat		Operation of output Relays on detection of Internal Relay Fault	NoScat– Scat	-
			Non Disp.			No Parameters		
	Livelli	→	Non Disp.			No Parameters		
	Tempi	→	Non Disp.			No Parameters		
TS	Stato	→		Abilit.		Enable of the protection function	Disabil./Abilit.	-
	Opzioni	→	iTS	TS		TS = Remote Trip / Bi = Block input	TS / Bi	-
	Livelli	→	Non Disp.			No Parameters		
	Tempi	→	tTS	1.00		Trip time delay	0.00 – 10.00	0.05
Osc	Stato	→		Enable		Enable of the protection function	Disabil./Abilit.	-
	Opzioni	→	Trg	Scatto		Trigger operation mode	Disab./Avviam. Scatto / Inp.Est	-
	Livelli	→	Non Disp.			No Parameters		
	Tempi	→	tPre	0.30		Recording time before Trigger	0.10 – 0.50	0.1
		→	tPost	0.30		Recording time after Trigger	0.10 – 1.50	0.1
Comm	Stato	→	Non Disp.			No Parameters		
	Opzioni	→	LBd	9600		Local Baud Rate (Front panel RS232 communication speed)	9600 - 19200 38400 - 57600	-
			RBd	9600		Remote Baud Rate (Rear panel terminal blocks RS485 communication speed)	9600 - 19200	-
			Mod	8,N,1		Remote mode (communication parameters) ***Note**: any change of this setting became valid at the next power on*	8,N,1 8,O,1 8,E,1	-
			RPr	Modbus		Remote Protocol	IEC103- Modbus	-
	Livelli	→	No Param.			No Parameters		
	Tempi	→	No Param.			No Parameters		
LCD	Stato	→	No Param.			No Parameters		
	Opzioni	→	Key	BeepON		Buzzer “Beep” on operation of Keyboard buttons.	BeepON- BeepOFF	-
			BkL	ON		LCD Backlight continuously “ON” or switched-on Automatically on operation of Keyboard buttons.	ON - OFF	-
	Livelli	→	No Param.			No Parameters		
	Tempi	→	No Param.			No Parameters		

Settings can also be programmed via the serial communication ports.

11.6 - Cfg.Relè (Relay Configuration)

To associate one of the Output Relays to one or more functions (see § Password): enter the menu "Regolaz. (R/W setting)", select "Cfg.Relè (Relay Configuration)", select the "Relè #" to be programmed, select "Link"; at this stage the list of the available functions is displayed. Scrolling the list by the "+" and "-" keys the function is selected and than assigned by the key "Enter". The assignation is confirmed by the function indication that switches from blinking to steady.
Any of the Output Relays can be programmed to work in two different modes:

- **N.D.** Normally Deenergized Relay is energized on trip of the associated functions
- **N.E.** Normally Energized Relay is deenergized on trip of the associated functions

Programming of working mode is made as above selecting "OpMode" instead of "Link".

Display				Description	Setting Range	Step
Relay	Type		Default Value			
Relè1 (R1)	**Link**	→	**t27, t59, t59Vo, t81<, t81>**	Association of functions to output relay R1	HwRecov. – 27 – t27 – 59 – t59 – 59Vo – t59Vo – 81< - t81< - 81> - t81> - IRF – TS – tTS – BF – 81Dis - Von	-
	ModoOp	→	**N.D.**	N.D. (Normally Deenergized) N.E. (Normally Energized)	N.D./N.E.	-
Relè2 (R2)	**Link**	→	**27, 59, 59Vo, 81<, 81>**	Association of functions to output relay R2	HwRecov. – 27 – t27 – 59 – t59 – 59Vo – t59Vo – 81< - t81< - 81> - t81> - IRF – TS – tTS – BF – 81Dis - Von	-
	ModoOp	→	**N.D.**	N.D. (Normally Deenergized) N.E. (Normally Energized)	N.D./N.E.	-
Relè3 (R3)	**Link**	→	**tTS**	Association of functions to output relay R3	HwRecov. – 27 – t27 – 59 – t59 – 59Vo – t59Vo – 81< - t81< - 81> - t81> - IRF – TS – tTS – BF – 81Dis - Von	-
	ModoOp	→	**N.D.**	N.D. (Normally Deenergized) N.E. (Normally Energized)	N.D./N.E.	-
Relè4 (R4)	**Link**	→	**IRF**	Association of functions to output relay R4	HwRecov. – 27 – t27 – 59 – t59 – 59Vo – t59Vo – 81< - t81< - 81> - t81> - IRF – TS – tTS – BF – 81Dis - Von	-
	ModoOp	→	**N.E.**	N.D. (Normally Deenergized) N.E. (Normally Energized)	N.D./N.E.	-

ModoOp = Operation Mode

Functions		Description
27	**27** **t27**	*Start* *Trip*
59	**59** **t59**	*Start* *Trip*
59Vo	**59Vo** **t59Vo**	*Start* *Trip*
81<	**81<** **t81<**	*Start* *Trip*
81>	**81>** **t81>**	*Start* *Trip*
TS	**TS** **tTS**	*Remote Trip o Blocking Input (see § TS)* *Trip time delay*
IRF	**IRF**	*Internal Fault Relay*
BF	**BF**	*Breaker Failure*
	81Dis	*Signalization "81<" and "81>"elements disable, when the voltage is under 20%Vn*
	Von	*Signalization voltage over 5% Vn*
	HwRecov.	*Automatic reset after diagnostic signal (watchdog)*

11.7 – Comandi (Commands)

- " Comandi "
- 1st Control,
- to select other available control,
- to operate selected control.

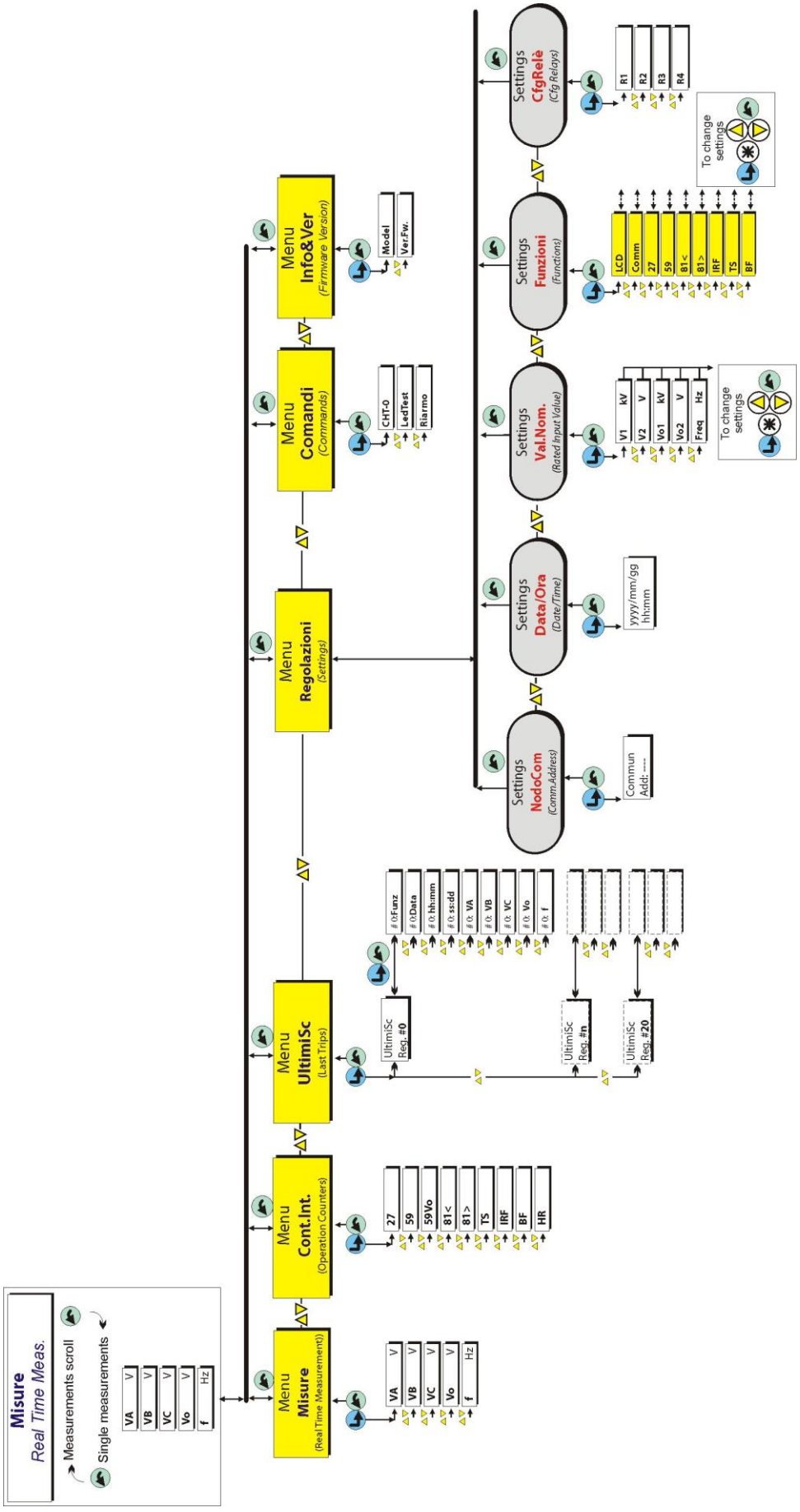
Display		Description
CTH=0	:	Erase memory of Trip Counters, Event Records.
LedTest	:	Starts a relay diagnostic test
Riarmo	:	Reset after trip

11.8 - Info&Ver (Firmware - Info&Version)

The menu displays the Relay Model and the Firmware Version

- " **R**eal **T**ime **M**eas "
- " Info/Ver ",
- " Model XXXXXX ", Model Relay
- " RelayVrs ###.#.#*X* ", Firmware Version
- to go back to " Info&Ver ".
- to go back to " **R**eal **T**ime **M**eas "

12. Keyboard Operational Diagram



13. Password

This password is requested anytime the user wants to write in the “Settings” menu a command of the “Commands” menu.

The default password is “ 1111 “

When password is required, proceed as follows

The Display shows the message “ Password ???? “

- △▽ to select 1st digit (1-9) ↳ to validate
- △▽ to select 2nd digit (1-9) ↳ to validate
- △▽ to select 3rd digit (1-9) ↳ to validate
- △▽ to select 4th digit (1-9) ↳ to complete procedure.

The “ password “ is required any time you attempt to modify one of the programmable variables at the first entrance in the “Settings” and/or “Commands” menus.
The “ password “remains valid for 2 minutes from the last operation of the programming buttons or until the ↶ button is pressed to return to the default display (RT Meas).
Once the Password has been entered, a “ # “ appears before the variable that can be modified.

13.1 - MS-Com Password

This password is requested anytime the user wants to send to the relay a setting parameters modification or to issue a command through the relay itself using the managing software MSCom.
The user can decide whether inserting his own password (see MS-Com Operational Manual) or keeping the password disabled just clicking on the OK button when the password is requested.

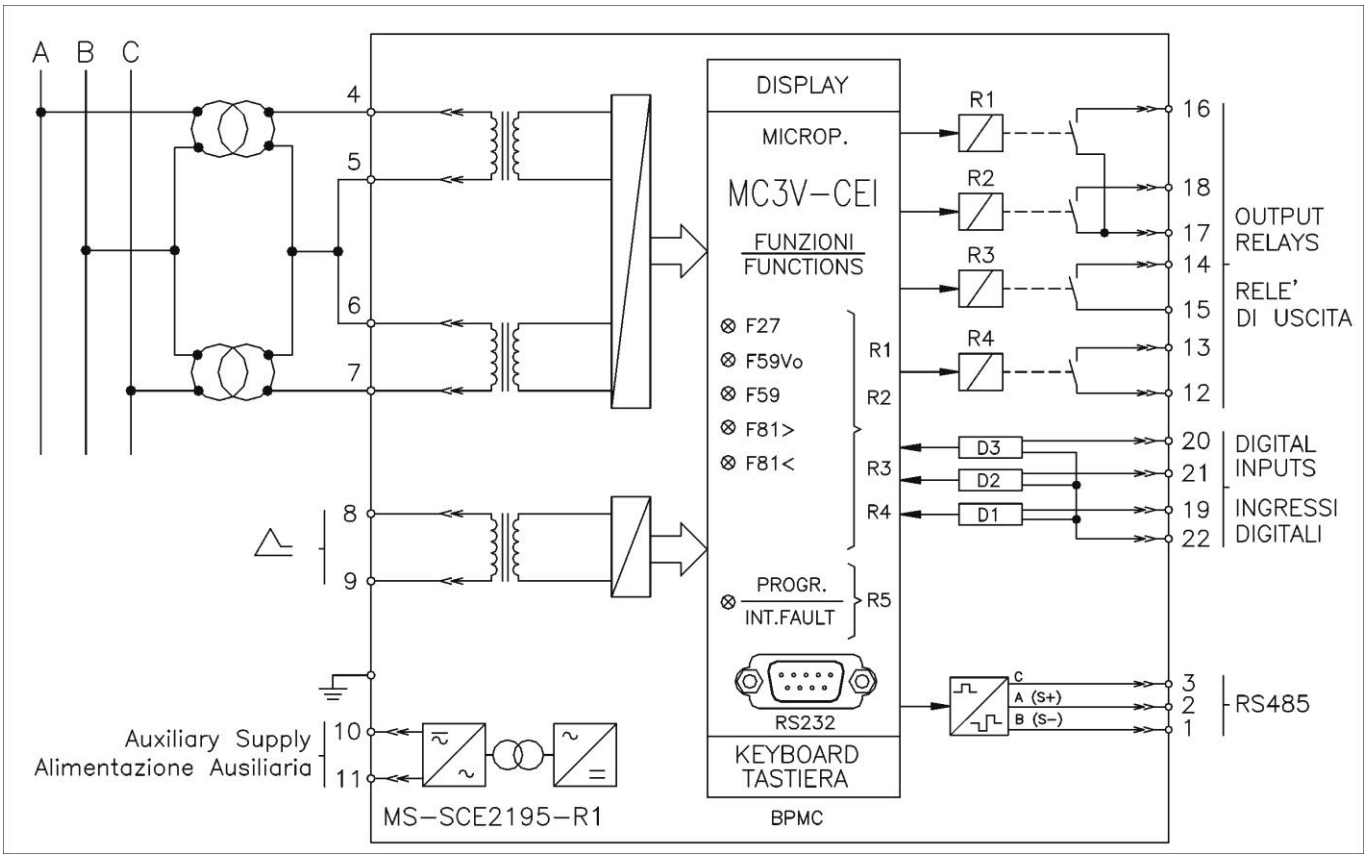
14. Maintenance

No maintenance is required. 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. Power frequency insulation test

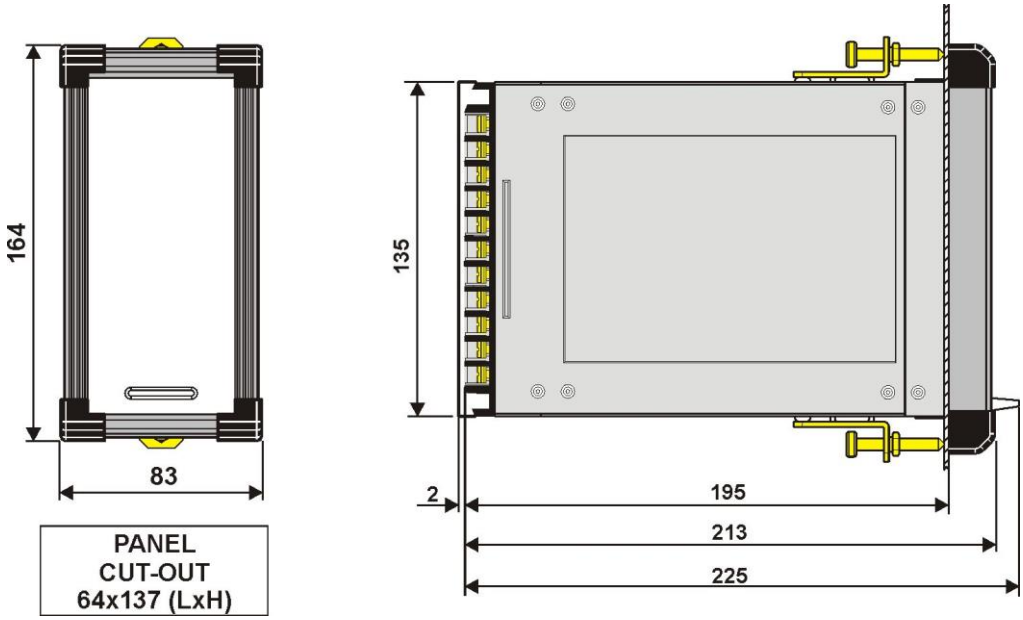
Every relay individually undergoes a factory insulation test according to IEC255-5 standard at 2 kV, 50 Hz 1min. Insulation test should not be repeated as it unusefully stresses the dielectrics.
When doing the insulation test, the terminals relevant to serial output, digital inputs and RTD input must always be short circuited to ground. When relays are mounted in switchboards or relay boards that have to undergo the insulation tests, the relay should be isolated. 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. Connection Diagram



17. Overall Dimensions

PROTECTION DEGREE IP44 (IP54 on request)



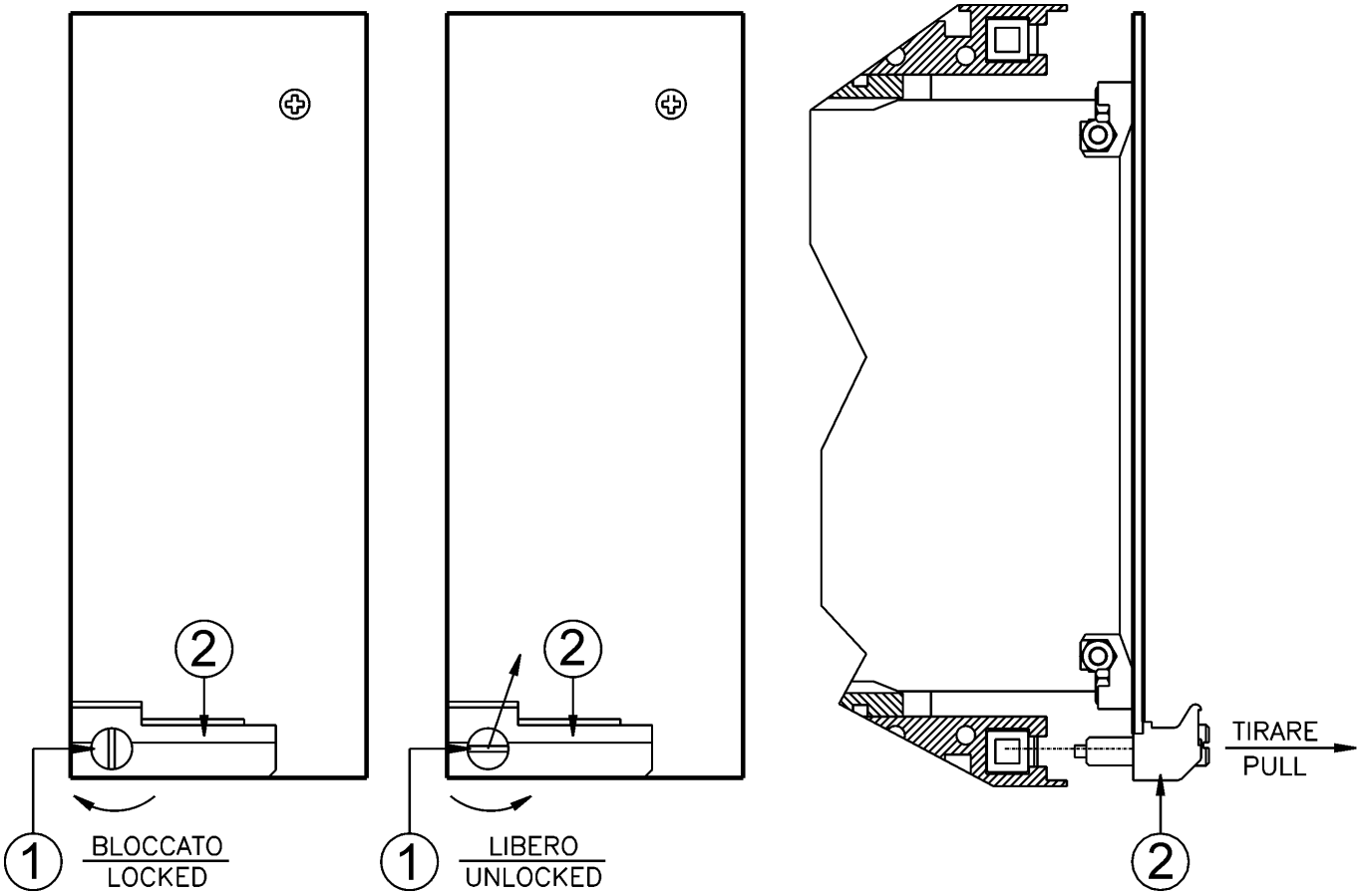
18. Direction for PCB's Draw-Out and Plug-In

18.1 - Draw-Out

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

18.2 - Plug-In

Rotate clockwise the screws ① in 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 with the mark in the vertical position (locked).



19. Electrical Characteristics

APPROVAL: CE

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 60068)					
❑ Operation ambient temperature		-10°C / +55°C			
❑ Storage temperature		-25°C / +70°C			
❑ Environmental testing	(Cold)	IEC60068-2-1			
	(Dry heat)	IEC60068-2-2			
	(Change of temperature)	IEC60068-2-14			
	(Damp heat, steady state)	IEC60068-2-78	RH 93% Without Condensing AT 40°C		
CE EMC Compatibility (EN61000-6-2 - EN61000-6-4 - EN50263)					
❑ Electromagnetic emission		EN55011	industrial environment		
❑ Radiated electromagnetic field immunity test		IEC61000-4-3 ENV50204	level 3	80-2000MHz 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	
❑ Immunity to conducted common mode disturbance 0Hz-150KHz		IEC61000-4-16	level 4		
❑ 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			
ELECTRIC RATED VALUE					
❑ Accuracy at reference value of influencing factors		2% Un 2% + to (to=20÷30ms)		for measure for times	
❑ Rated Voltage		Un = (100 ÷440)Vac			
❑ Voltage overload		2Un 1sec			
❑ Burden on voltage inputs		0,2VA at Un			
❑ Average power supply consumption		≤ 7 VA			
❑ Output relays		rating 6 A; Vn = 250 V A.C. resistive switching = 1500VA (400V max) make = 30 A (peak) 0,5 sec. break = 0.3 A, 110 Vcc, L/R = 40 ms (100.000 op.)			
COMMUNICATION PARAMETER					
❑ RS485 (Back)		9600/19200 bps – 8,N,1 - 8,E,1 - 8,O,1 – Modbus RTU or IEC60870-5-103			
❑ RS232 (Front)		9600 - 19200 - 38400 - 57600 – 8,N,1 – Modbus RTU			

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