MICROPROCESSOR
D.C. CURRENT
RELAY

TYPE

MCDC

MCDC-I
MCDC-V

OPERATION MANUAL

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, 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 - 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.

Five 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

An additional TV is available on demand for AC measurements.

The Measuring Ranges of the different inputs respectively are:

DC Nominal Current (from shunt): : 50/60/75mV
DC Nominal Voltage : 0V – 600V

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

Check that input values are the 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 and self protected.

Two options are available on request:

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
Vnp	500	A	Rated Primary Current Nominal Value	0 - 1000	1	A
V_SH	50	mV	Shunt Value	0 - 100	5	mV
Vn	100	V	Nominal Voltage *see note	1 - 9999	1	V
TW	60	min	Warming-up time constant for Thermal Image	1 - 60	1	min
Ib	105	%In	Maximum admissible continuous overload for Thermal Image	50 - 130	1	%In

* Note: Voltage range should not be programmed over 600V.

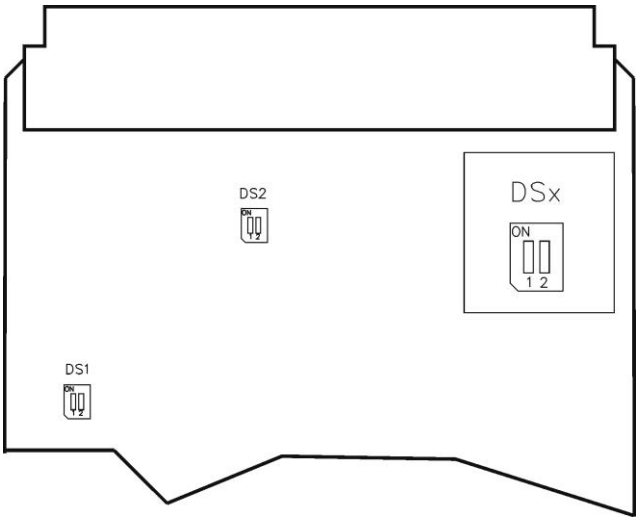
2.2.2 - Input quantities

Setting Current Input:

Dip Switch	Shunt	Dip 1	Dip 2
DS1	50mV	on	off
	60mV	off	off
	75mV	off	on

Setting Voltage input:

Dip Switch	Rated Input	Dip 1	Dip 2
DS2	300V	off	off
	600V	off	on



2.2.2.1 - Current inputs (Type –I)

The relay displays the value of the Current flowing in the Line through the shunt.
To make the relay properly working, programming the relay settings, input the value “V_SH“ and “In”.

2.2.2.2 - Voltage Input (Type –V)

The relay displays the value of the Voltage Line. To make the relay properly working, programming the relay settings, input the value “Vn“.

The measures are not displayed below : < 5% Vn

2.2.2.3 - Algorithm of the time current curves

The Time Current Curves are generally calculated with the following equation :

(1) $$t(I) = \left[\frac{A}{\left(\frac{I}{Is}\right)^{a} - 1} + B \right] \bullet K \bullet T_s + t_r$$

where :

t(I) = Actual trip time delay when the input current equals “I”

I = Maximum of the three input currents.

Is = Set minimum pick-up level

K = $$\left(\frac{A}{10^{a} - 1} \right)^{-1}$$

T_s = Set time delay : t(I) = T_s when $\frac{I}{I_s} = 10$

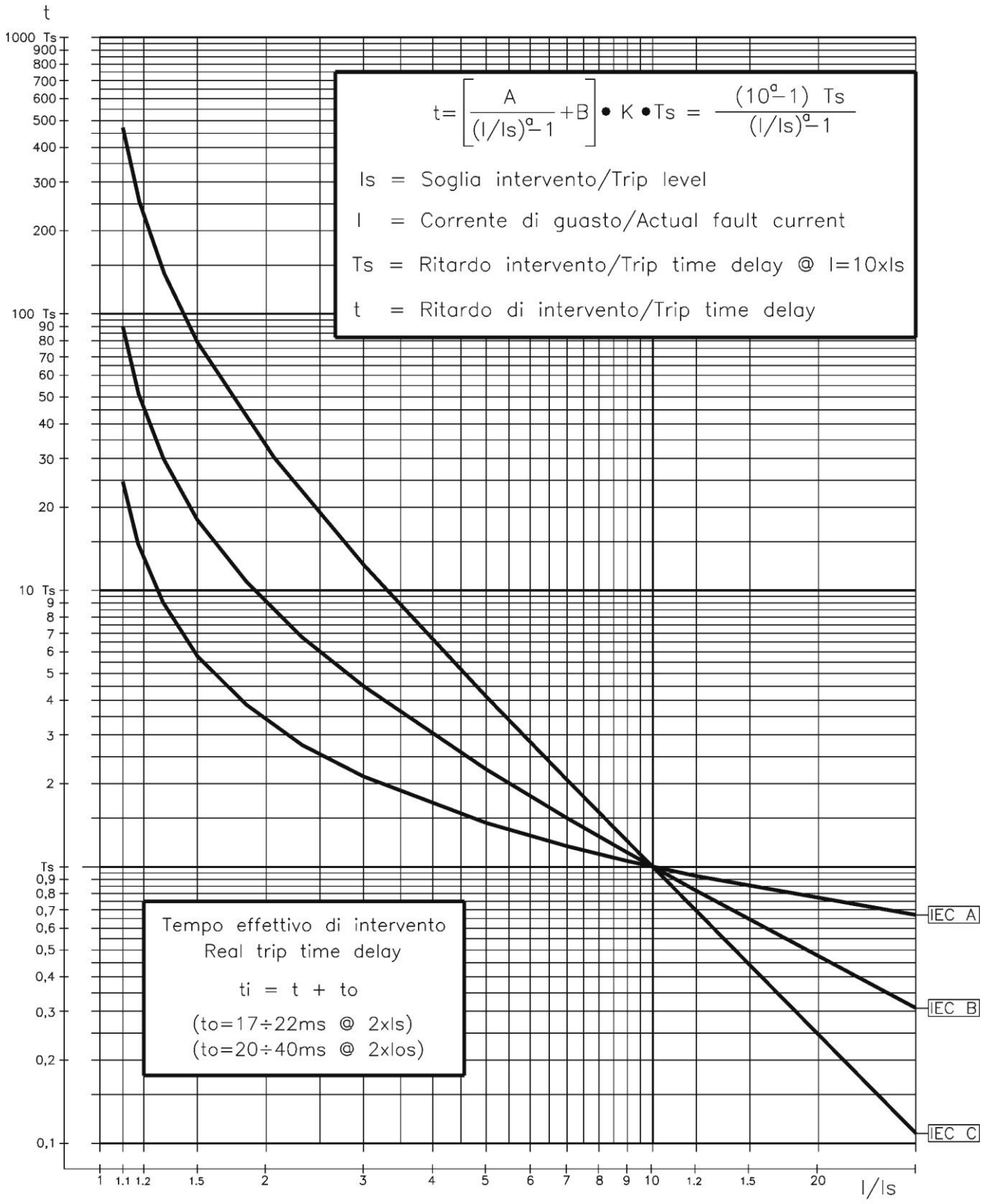
tr = Operation time of the output relay on pick-up (7ms).

The parameters “**A**” and “**a**” have different values for the different Time Current Curves.

Curve Name	Curve Identifier	A	B	a
IEC A Inverse	A	0.14	0	0.02
IEC B Very Inverse	B	13.5	0	1
IEC C Extremely Inverse	C	80	0	2

The maximum measuring current is “10xIn”.

2.2.3 - Time Current Curves IEC (TU1029 Rev.0)



Curve Type	A	B	K	a
IEC A	0.14	0	0.336632	0.02
IEC B	13.5	0	0.666667	1
IEC C	80	0	1.2375	2

Max. "I" Phase = 40xIn
Max. "I" Neutral = 10xOn

2.2.4 - Functions and Settings (Function)

2.2.4.1 - T> - Thermal Image protection level

FuncEnab	→		Disable		[Disable / Enable]			
Options	→		No Param		No Parameters			
TripLev	→	***Tal***	50	**%Tb**	(50 ÷ 110)	step	1	%Tb
	→	***Tst***	100	**%Tb**	(10 ÷ 100)	step	1	%Tb
Timers	→		No Param		No Parameters			

- **FuncEnab** : If disable the function is disactivated.
- **Tal** : Thermal prealarm temperature.
- **Tst** : Reset level.

Alarm when : The temperature exceeded level “Tal”

When the function is tripped : *Signalization* = Led “Trip” is illuminated
Last Trip = Is recorded

Reset when : Returns in normal condition.

Warming-up is computed proportionally to the square of the largest phase current “I”.

- *Allowed overloading time* (See Curve)

The trip time delay “ **t** “ of the thermal element, depends on the warming-up time constant “ **tw** “, on the previous thermal status $(Ip/In)^2$, on the admissible continuous overload (Ib) and, of course, on the actual load (I)

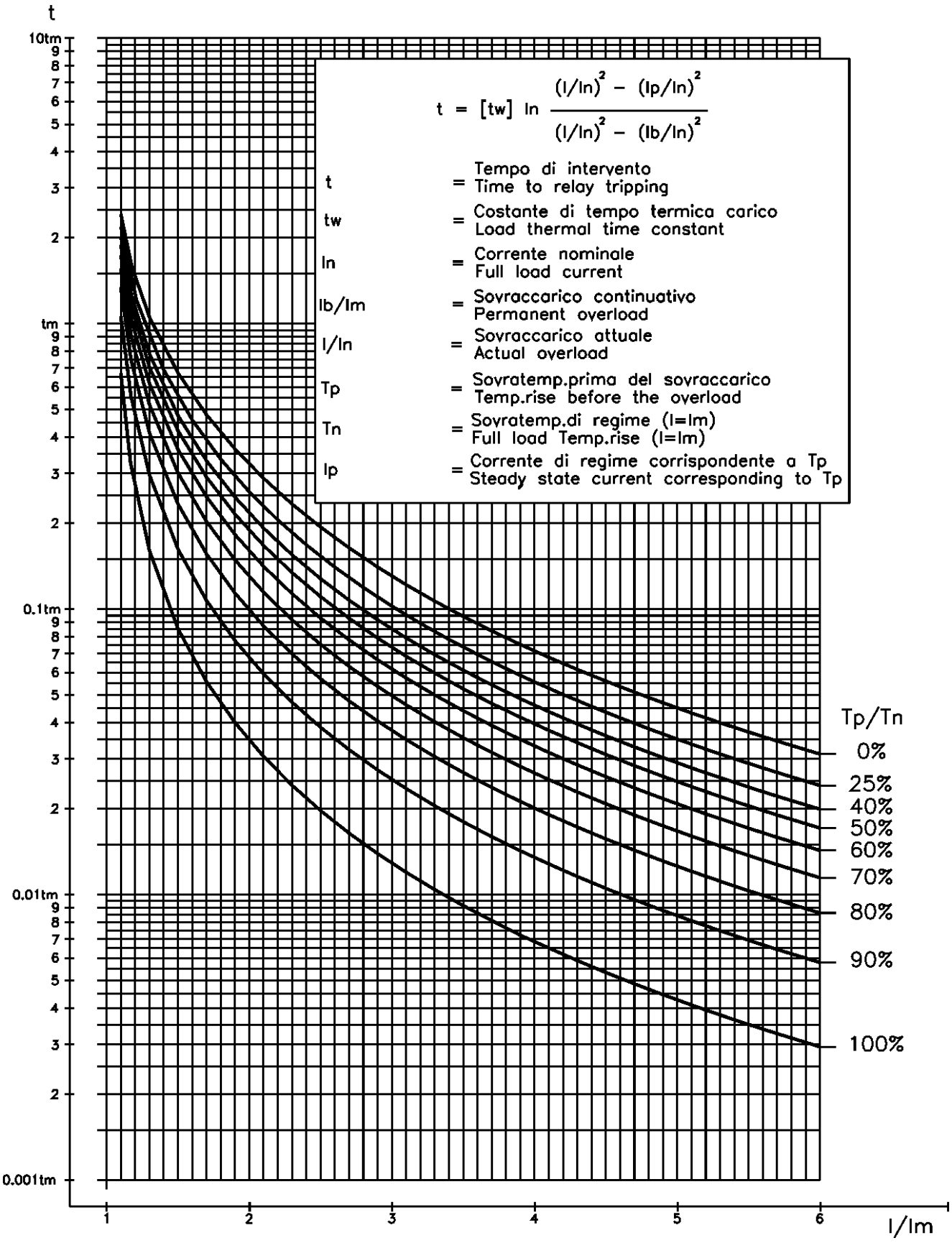
$$t = tw \cdot \ell_n \left[\frac{(I/In)^2 - (Ip/In)^2}{(I/In)^2 - (Ib/In)^2} \right] \quad \text{where :}$$

tw = Warming-up time constant
I = Largest of the three phase currents
Ip = Preheating current: Steady-State Current corresponding to the thermal status existing at the moment when the current is increased to the overload value “I”
Ib = Continuously admissible current
In = Rated primary current of phase C.Ts
ℓ**n** = Natural logarithm

Reset takes please when the simulated temperature drops below the programming level [Tst].

An alarm signal is issued when the computed warming exceeds the set percentage “ Tal “ of the Full Load temperature “Tb”.

2.2.4.2 - Thermal Image Curves (TU0445 Rev.0)



2.2.4.3 - 1I> - First overcurrent protection level (-I)

FuncEnab	→		Enable		[Disable / Enable]			
Options	→	***OM***	NO_DIR		[No_Dir / Pos_Dir / Neg_Dir]			
	→	***TCC***	D		[D / A / B / C]			
	→	***BI***	Disable		[Disable / Enable]			
	→	***2tBO***	Disable		[Disable / 2tBO]			
	→	***Trg***	Enable		[Disable / Enable]			
TripLev	→	***1I>***	0.5	**In**	(0.05 ÷ 10.00)	step	0.01	In
Timers	→	***t1I>***	0.05	**s**	(0.05 ÷ 99.99)	step	0.01	s
	→	***tBO***	0.05	**s**	(0.05 ÷ 0.75)	step	0.01	s

- **FuncEnab** : If disable the function is disactivated
- **OM** : Operation Mode
  - **NO_DIR** = Independent Definite Time
  - **POS_DIR** = IEC A Inverse
  - **NEG_DIR** = IEC B Very Inverse
- ***TCC*** : Time current curves
  - **D** = Independent Definite Time
  - **A** = IEC A Inverse
  - **B** = IEC B Very Inverse
  - **C** = IEC C Extremely Inverse
- **BI** : Operation controlled by Blocking Digital Input
- ***2tBO*** : Time to reset
  - **Disable** = Permanent block
  - **2tBO** = Set 2xtBO.
- **Trg** : Function operation triggers the oscillographic wave form capture (see § Oscillographic Recording)
- **1I>** : Trip level
- **t1I>** : Trip time delay
- **tBO** : Time to reset of the Blocking Output after expiring of the Trip time delay. “tBO” is also the trip time delay of the Breaker Failure function.

Trip when : The current trip level is exceeded for time “t1I>”.

When the function is tripped : *Signalization* = Led “Trip” is illuminated
Last Trip = Is recorded

Function reset when : The current drop below 95% 1I>.
Led reset when : push-button is pressed

2.2.4.4 - 2I> - Second overcurrent protection level (-I)

FuncEnab	→		Enable		[Disable / Enable]			
Options	→	***OM***	NO_DIR		[No_Dir / Pos_Dir / Neg_Dir]			
	→	***BI***	Disable		[Disable / Enable]			
	→	***2tBO***	Disable		[Disable / 2tBO]			
	→	***Trg***	Enable		[Disable / Enable]			
TripLev	→	***2I>***	0.5	**In**	(0.05 ÷ 10.00)	step	0.01	In
Timers	→	***t2I>***	0.05	**s**	(0.05 ÷ 99.99)	step	0.01	s
	→	***tBO***	0.05	**s**	(0.05 ÷ 0.75)	step	0.01	s

- **FuncEnab** : If disable the function is disactivated
- **OM** : Operation Mode
  NO_DIR = Independent Definite Time
  POS_DIR = IEC A Inverse
  NEG_DIR = IEC B Very Inverse
- **BI** : Operation controlled by Blocking Digital Input
- ***2tBO*** : Time to reset
  Disable = Permanent block
  2tBO = Set 2xtBO.
- **Trg** : Function operation triggers the oscillographic wave form capture (see § Oscillographic Recording)
- **2I>** : Trip level
- **t2I>** : Trip time delay
- **tBO** : Time to reset of the Blocking Output after expiring of the Trip time delay. "tBO" is also the trip time delay of the Breaker Failure function.

Trip when : The current trip level is exceeded for time "t2I>".

When the function is tripped : *Signalization* = Led "Trip" is illuminated
Last Trip = Is recorded

Function reset when : The current drop below 95% 2I>.
Led reset when : push-button is pressed

2.2.4.5 - 3I> - Third overcurrent protection level (-I)

FuncEnab	→		Enable		[Disable / Enable]			
Options	→	***OM***	NO_DIR		[No_Dir / Pos_Dir / Neg_Dir]			
	→	***BI***	Disable		[Disable / Enable]			
	→	***2tBO***	Disable		[Disable / 2tBO]			
	→	***Trg***	Enable		[Disable / Enable]			
TripLev	→	***3I>***	0.5	**In**	(0.05 ÷ 10.00)	step	0.01	In
Timers	→	***t3I>***	0.05	**s**	(0.05 ÷ 99.99)	step	0.01	s
	→	***tBO***	0.05	**s**	(0.05 ÷ 0.75)	step	0.01	s

- **FuncEnab** : If disable the function is disactivated
- **OM** : Operation Mode
  - **NO_DIR** = Independent Definite Time
  - **POS_DIR** = IEC A Inverse
  - **NEG_DIR** = IEC B Very Inverse
- **BI** : Operation controlled by Blocking Digital Input
- ***2tBO*** : Time to reset
  - **Disable** = Permanent block
  - **2tBO** = Set 2xtBO.
- **Trg** : Function operation triggers the oscillographic wave form capture (see § Oscillographic Recording)
- **3I>** : Trip level (limited to 20 times In)
- **t3I>** : Trip time delay
- **tBO** : Time to reset of the Blocking Output after expiring of the Trip time delay. "tBO" is also the trip time delay of the Breaker Failure function.

Trip when : The current trip level is exceeded for time "t3I>".

When the function is tripped : *Signalization* = Led "Trip" is illuminated
Last Trip = Is recorded

Function reset when : The current drop below 95% 3I>.

Led reset when : push-button is pressed

2.2.4.6 - V> - First overvoltage protection level (-V)

FuncEnab	→	Enable		[Disable / Enable]			
Options	→ *BI*	Disable		[Disable / Enable]			
	→ *Trg*	Enable		[Disable / Enable]			
TripLev	→ *V>*	1.00	**%Vn**	(1.00 ÷ 100)	step	0.01	%Vn
Timers	→ *tV>*	0.05	**s**	(0.05 ÷ 60.00)	step	0.01	s

- **FuncEnab** : If disable the function is disactivated
- **BI** : Operation controlled by Blocking Digital Input
- **Trg** : Function operation triggers the oscillographic wave form capture (see § Oscillographic)
- **V>** : Trip level
- **tV>** : Trip time delay

2.2.4.7 - V>> - Second overvoltage protection level (-V)

FuncEnab	→	Enable		[Disable / Enable]			
Options	→ *BI*	Disable		[Disable / Enable]			
	→ *Trg*	Enable		[Disable / Enable]			
TripLev	→ *V>>*	1.00	**Vn**	(1.00 ÷ 100)	step	0.01	%Vn
Timers	→ *tV>>*	0.05	**s**	(0.05 ÷ 60.00)	step	0.01	s

- **FuncEnab** : If disable the function is disactivated
- **BI** : Operation controlled by Blocking Digital Input
- **Trg** : Function operation triggers the oscillographic wave form capture (see § Oscillographic)
- **V>>** : Trip level
- **tV>>** : Trip time delay

2.2.4.8 - V< - First undervoltage protection level (-V)

FuncEnab	→		Enable		[Disable / Enable]			
Options	→	***BI***	Disable		[Disable / Enable]			
	→	***Trg***	Disable		[Disable / Enable]			
TripLev	→	***V<***	1.00	**%Vn**	(1.00 ÷ 100)	step	0.01	%Vn
Timers	→	***tV<***	0.05	**s**	(0.05 ÷ 60.00)	step	0.01	s

- ❑ **FuncEnab** : If disable the function is disactivated
- ❑ **BI** : Operation controlled by Blocking Digital Input
- ❑ **Trg** : Function operation triggers the oscillographic wave form capture (see § Oscillographic)
- ❑ **V<** : Trip level of undervoltage protection
- ❑ **tV<** : Trip time delay

2.2.4.9 - V<< - Second undervoltage protection level (-V)

FuncEnab	→		Enable		[Disable / Enable]			
Options	→	***BI***	Disable		[Disable / Enable]			
	→	***Trg***	Disable		[Disable / Enable]			
TripLev	→	***V<<***	1.00	**%Vn**	(1.00 ÷ 100)	step	0.01	%Vn
Timers	→	***tV<<***	0.05	**s**	(0.05 ÷ 60.00)	step	0.01	s

- ❑ **FuncEnab** : If disable the function is disactivated
- ❑ **BI** : Operation controlled by Blocking Digital Input
- ❑ **Trg** : Function operation triggers the oscillographic wave form capture (see § Oscillographic)
- ❑ **V<<** : Trip level of undervoltage protection
- ❑ **tV<<** : Trip time delay

2.2.4.10 - BF - Breaker Failure

FuncEnab	→		Enable		[Disable / Enable]			
Options	→	***TrR***	Relay1		Relay1 – Relay2 – Relay3			
TripLev	→		No Param		No Parameters			
Timers	→	***tBF***	0.20	**s**	(0.05 ÷ 0.75)	step	0.01	s

- **FuncEnab** : 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).

2.2.4.11 - CBMng – Close Breaker Manage

FuncEnab	→		No Param		No Parameters			
Options	→		No Param		No Parameters			
TripLev	→		No Param		No Parameters			
Timers	→	***tcmd***	0.10	**s**	(0.10 ÷ 5.00)	step	0.1	s
	→	***tC***	0.10	**s**	(0.10 ÷ 5.00)	step	0.1	s

- **tcmd** : C/B closing output command duration
- **tC** : Maximum admissible delay for detection of status signal after C/B operation.

2.2.4.12 - Osc - Oscillographic Recording

FuncEnab	→		Enable		[Disable / Enable]			
Options	→	**Trg**	Trip		[Disable / Start / Trip / Ext.Inp.]			
TripLev	→		No Param		No Parameters			
Timers	→	**tPre**	5	**s**	(5 ÷15)	step	1	s
	→	**tPost**	10	**s**	(10 ÷ 65)	step	1	s

❑	**FuncEnab**	:	If disable the function is disactivated		
❑	**Trg**	:	*Disab*	=	Function Disable (no recording)
			Start.	=	Trigger on time start of protection functions
			Trip	=	Trigger on trip (time delay end) of protection functions
			Ext.Inp.	=	Trigger from the Digital Input
❑	**tPre**	:	Recording time before Trigger		
❑	**tPost**	:	Recording time after Trigger		

When the option “Start” or “Trip” is selected:

The oscillographic recording is started respectively by the “Time Start” or by the “Time End” of any of the functions that have been programmed to Trigger the Wave Form Capture (1I>, 2I>, 3I>, V>, V>>, V<, V<<).

The “Osc” Function includes the wave Form Capture of the input quantities (I, V,) 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 (5 x 15 sec).
Any new event beyond the capacity of the memory, cancel and overwrites the former records (FIFO Memory).

2.2.4.13 - LoadP – Load Profile

FuncEnab	→		No Param		No Parameters			
Options	→		No Param		No Parameters			
TripLev	→		No Param		No Parameters			
Timers	→	**tLP**	1	**m**	(1 ÷ 650)	step	1	m

- **tLP** : Time delay

The Load Profile function, when activated, records the value of current " I "at any C/B closure, at every time interval " tLP "and at any C/B opening. Each record is complete with time/date tagging. The memory buffer can store up to 100 records.
All the recorded data can be downloaded by the serial communication port and, with MSCom2 interface program, they are displayed as time/current curve.

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

FuncEnab	→		No Param	No Parameters
Options	→	**OpI**	NoTrip	[NoTrip / Trip]
TripLev	→		No Param	No Parameters
Timers	→		No Param	No Parameters

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

Trip when	:	The Internal failure is detected.(see § self-diagnostic)		
When the function is tripped	:	*Signalization*	=	Led "PWR/I.R.F." flashing
		Last Trip	=	Is recorded
Function reset when	:	Returns in normal condition		
Led reset when	:	Push-button is pressed		

2.2.4.15 - LCD – Display operation

FuncEnab	→	No Param	No Parameters
Options	→ ***BkL***	Auto	[Auto / On]
TripLev	→	No Param	No Parameters
Timers	→	No Param	No Parameters

- ***BkL*** : LCD Backlight continuously "ON" or switched-on Automatically on operation of Keyboard buttons.

2.2.4.16 - Comm – Communication Parameters

FuncEnab	→	No Param	No Parameters
Options	→ ***LBd***	9600	[9600 / 19200 / 38400 / 57600]
	→ ***RBd***	9600	[9600 / 19200]
	→ ***Mod***	8,n,1	[8,n,1 / 8,o,1 / 8,e,1]
	→ ***RPr***	Modbus	[Iec103 / Modbus]
TripLev	→	No Param	No Parameters
Timers	→	No Param	No Parameters

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

3. Logic Blocking of Functions

3.1 - Blocking Outputs

The instantaneous element of each of the protection functions (1I>, 2I>, 3I>, V<, V<<, V>, V>>) 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 it automatically resets when the input quantity drops below the function reset level (≈95% of the trip level) or, in any case as soon as the time delay (tBF) of the Breaker Failure function is expired.
This instantaneous output can be used to activate the Blocking Input of another Protection Relay to implement a logic selectivity systems. As above explained, in case of Breaker Failure, the blocking output is released and the back-up protection enabled.

3.2 – Blocking Inputs

The time delayed tripping of any of the Protection functions (1I>, 2I>, 3I>, V<, V<<, V>, V>>) can be controlled by the activation of the Digital Input D1 (BI=Enable): in this case the set trip time delay of the function is increased by "2xtBF" so that other Protection Relays (set with the same trip time delay) that send the activation signal to the blocking Input D2, can trip before open and the C/B nearest to the Fault.
Also in this case, however, another "2xtBF" seconds from the expiry of the set trip time delay, the blocking input is disregarded so allowing the protection relay to trip in case of Failure to open of the upstream Circuit Breaker.

4. Output Relays

Three user programmable Output Relays are normally available R1, R2, R3.
Each of them can be programmed to be controlled by any element (instantaneous or time delayed) of any of the Relay Functions including Breaker Failure and Internal Relay Fault.
Each output relay can also be programmed to operate "OPEN" and "CLOSE" control of the C/B either by the Relay Keyboard or via the serial communication bus
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).
Bus output (CANBUS) that controls additional I/O modules for increasing as needed the number of user programmable Output Relays and Digital Inputs controlled from the main relay.

5. Digital Inputs

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

❑ **D1**	(terminals 37 - 38)	:	Available as Function Blocking Input
❑ **D2**	(terminals 37 - 39)	:	Options: 1) Position of the Circuit Breaker; C/B. read as closed if the input is activated. 2) External Trigger; Any time the DI passed from closed to open the oscillographic recording is started.

6. Self-diagnostic

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

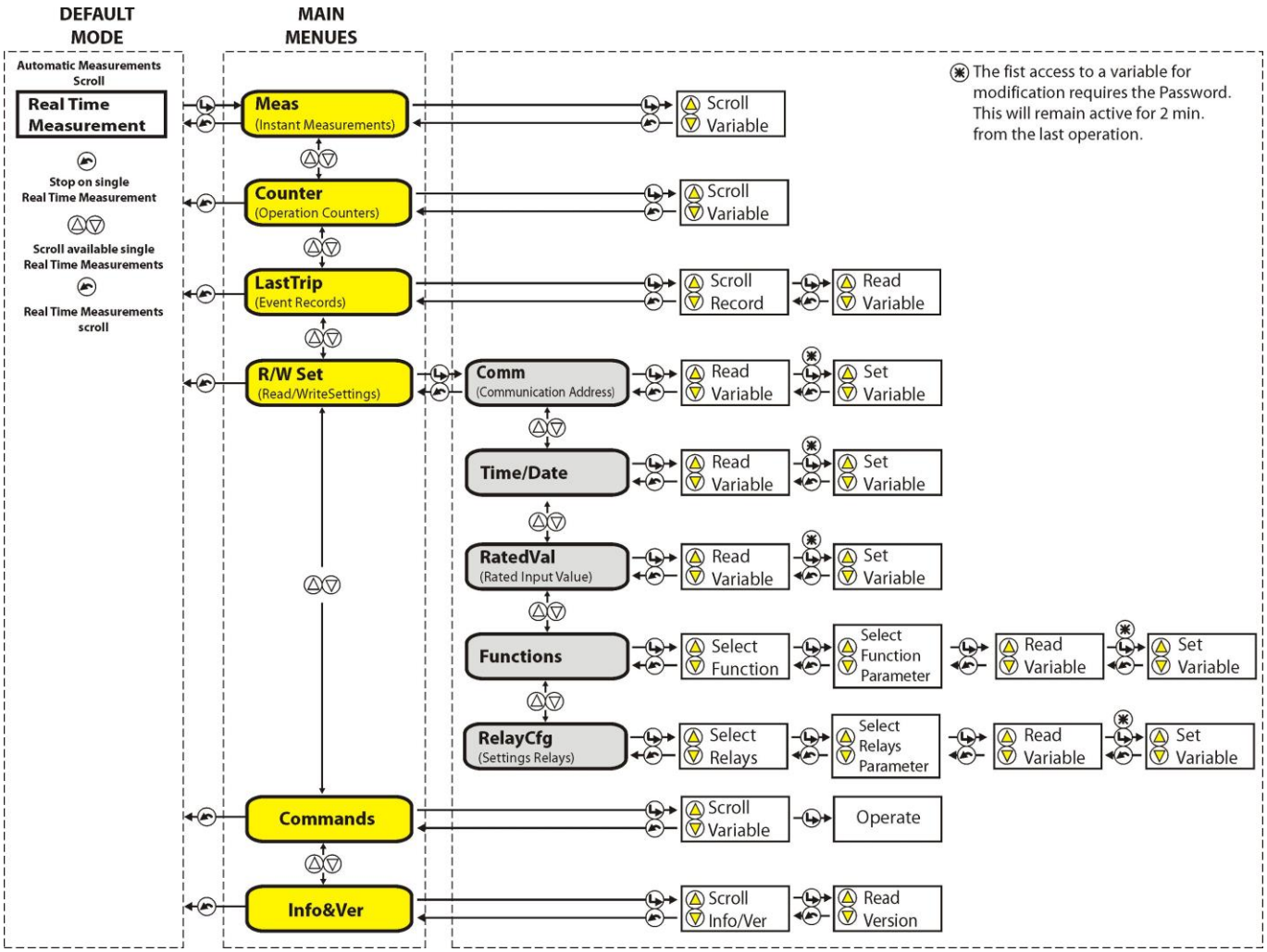
- A/D conversion
- Checksum of the settings stored into E^2Prom.
- DSP general operation (Power, Routines, etc.)
- Lamp test (only on manual test).

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 " Event Records " 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.

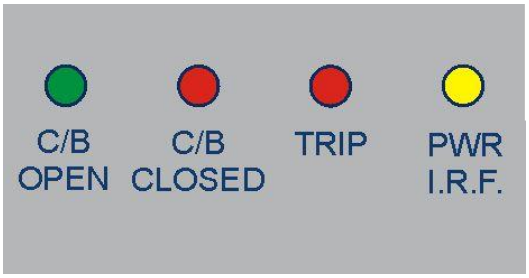
7. Relay Management

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	**C/B OPEN**	❑ Illuminated when C/B open status is detected. (Digital Input D3 Open) ❑ Flashing when Breaker Failure is detected.
b)	Red LED	**C/B CLOSED**	❑ Illuminated when C/B close status is detected. (Digital Input D3 closed) ❑ Flashing when Breaker Failure is detected.
c)	Red LED	**TRIP / START**	❑ 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	**PWR/ I.R.F.**	❑ Illuminated during normal operation when Power Supply is ON. ❑ Flashing when a Relay Internal Fault is detected.

b) 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	steady
"Cause"	blinking

9. Keyboard Buttons

	**Enter**	Give access to any menu or convalidate any programming changement. This button is besides used for the control of Open/Close C/B (see § Command).
	**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

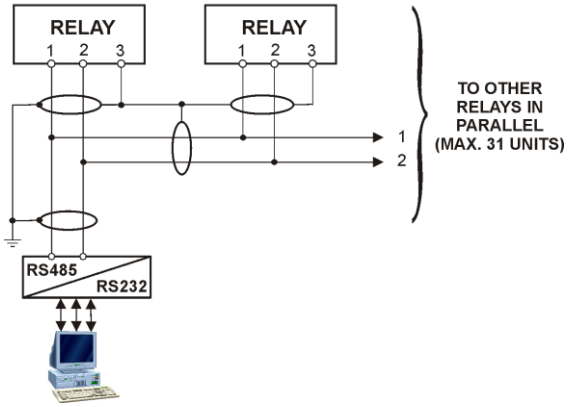
This port is accessible via the terminals 1-2-3 provided on the relay terminal board.
It is used for connection to a serial bus interfacing up to 31 units with the Central Supervision System (SCADA, DCS, ecc).
The serial bus is a shielded pair of twisted cables connecting in parallel (Multi Drop) the 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

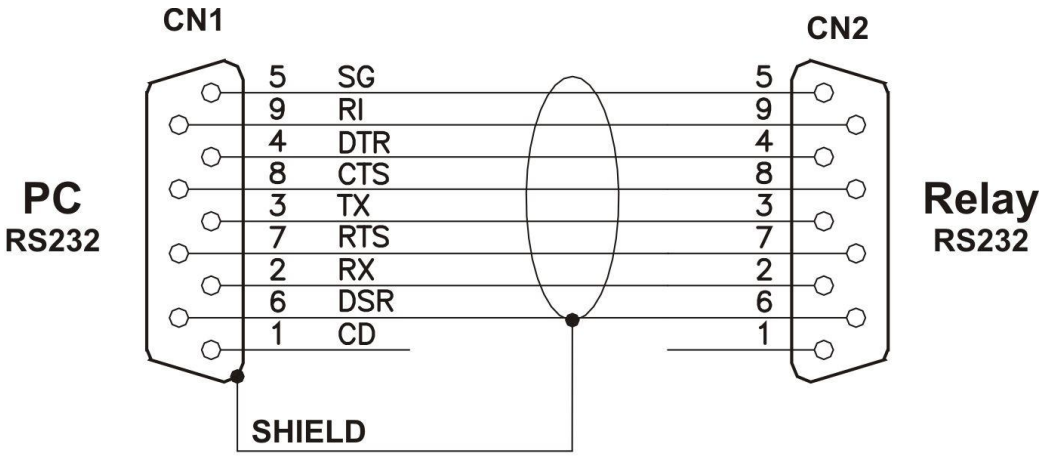


For longer distance and for connection of up to 250 Relays, optical interconnection is recommended.
(Please ask Microelettrica for accessories)

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		
I	=	0 – 65535	A	Current	-I	-VI
Tem	=	0 – 65535	%T	Line thermal status		
V	=	0 – 65535	V	Voltage	-V	

11.2 - Meas (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		
I	=	0 – 65535	A	Current	-I	
Tem	=	0 - 65535	%T	Line thermal status		
V	=	0 – 65535	V	Voltage	-V	

11.3 - Counter (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		
T>	=	0 – 65535	Number of Thermal Image		
1I>	=	0 – 65535	Number of 1st Overcurrent (time delayed) trip	Type (-I)	
2I>	=	0 – 65535	Number of 2nd Overcurrent (time delayed) trip		
3I>	=	0 – 65535	Number of 3rd Overcurrent (time delayed) trip		
V>	=	0 – 65535	Number of 1st Overvoltage (time delayed) trip	Type (-V)	
V>>	=	0 – 65535	Number of 2nd Overvoltage (time delayed) trip		
V<	=	0 – 65535	Number of 1st Undervoltage (time delayed) trip		
V<<	=	0 – 65535	Number of 2nd Undervoltage (time delayed) trip		
BF	=	0 – 65535	Number of operation of Breaker Failure		
I.R.F.	=	0 – 65535	Number of Internal Relay Faults		
HR	=	0 – 65535	Number of HW recovery operations		

*11.4 - **LastTrip** (Event Recording)*

The MC 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
Func		**xxxxx**		Indication of the protection function which caused the relay tripping. For indication of the TRIP Cause the following acronyms are used: - **T>** = Thermal Image - **1I>** = 1st Overcurrent element - **2I>** = 2nd Overcurrent element (-I) - **3I>** = 3rd Overcurrent element - **V<** = 1st Overvoltage element - **V<<** = 2nd Overvoltage element - **V>** = 1st Undervoltage element (-V) - **V>>** = 2nd Undervoltage element - **IRF** = Internal Relay Fault
Date	:	YYYY/MM/GG		Date: Year/Month/Day
Time	:	hh:mm:ss:cc		Time: hours/minutes/second/hundredths of seconds
I	=	0 - 65535	**A**	Current
Tem	=	0 - 65535	**%T**	Actual Line thermal status
V	=	0 - 65535	**V**	Voltage

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

11.5 - R/W Set (Programming / Reading the Relay Settings)

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

11.5.1 - CommAdd (Communication Address)

- △▽ " Commun " ↳
- " 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 - Time/Date (Time/Date)

- △▽ " Time/Date " ↳ Date: Current Date, Time: 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 - RatedVal (Rated Input Values)

- △▽ "RatedVal "
- ↳ 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
Vnp	500	**A**	Rated Primary Current Nominal Value	0 - 1000	1	A
V_SH	50	**mV**	Shunt Value	0 - 100	5	mV
Vn	100	**V**	Nominal Voltage ***see note**	1 - 9999	1	V
TW	60	**min**	Warming-up time constant for Thermal Image	1 - 60	1	min
Ib	105	**%In**	Maximum admissible continuous overload for Thermal Image	50 - 130	1	%In

* Note: Voltage range should not be programmed over 600V.

*11.5.4 - **Function** (Functions)*

- ▲▼ " Function ",
- ↳ 1st function,
- ▲▼ to scroll available Functions,
- ↳ to Read/Write setting of the selected function,
- ▲▼ to select the different definable fields
  - FuncEnab
  - Options
  - TripLev
  - 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)		
T>	FuncEnab	→		Disable		Enable of the protection function	Enable/Disable	-
	Options	→		NoParam		No Parameters	-	-
	TripLev	→	Tal	50	%Tb	Thermal prealarm	50 - 110	1
			Tst	100	%Tb	Reset level.	10 - 100	1
	Timers	→		NoParam		No Parameters	-	-
1I>	FuncEnab	→		Enable		Enable of the protection function	Enable/Disable	-
	Options	→	OM	NO_DIR		Operation Mode	No_Dir, os_Dir, Neg_Dir	-
			TCC	D		Time Current Curves	D,A,B,C.	-
			BI	Disable		Operation controlled by Blocking Digital Input	Enable/Disable	-
			2tBO	Disable		Time to Reset	Disable/2tBO	-
			Trg	Enable		Function operation triggers the oscillographic wave form capture	Enable/Disable	-
	TripLev	→	1I>	0.5	In	Trip level	0.05 – 10.00	0.01
	Timers	→	t1I>	0.05	s	Trip time delay	0.05 – 99.99	0.01
			tBO	0.05	s	Time to Reset of the blocking output	0.05 – 0.75	0.01
2I>	FuncEnab	→		Enable		Enable of the protection function	Enable/Disable	-
	Options	→	OM	NO_DIR		Operation Mode	No_Dir, os_Dir, Neg_Dir	-
			BI	Disable		Operation controlled by Blocking Digital Input	Enable/Disable	-
			2tBO	Disable		Time to Reset	Disable/2tBO	-
			Trg	Enable		Function operation triggers the oscillographic wave form capture	Enable/Disable	-
	TripLev	→	2I>	0.5	In	Trip level	0.05 – 10.00	0.01
	Timers	→	t2I>	0.05	s	Trip time delay	0.05 – 99.99	0.01
			tBO	0.05	s	Time to Reset of the blocking output	0.05 – 0.75	0.01
3I>	FuncEnab	→		Enable		Enable of the protection function	Enable/Disable	-
	Options	→	OM	NO_DIR		Operation Mode	No_Dir, os_Dir, Neg_Dir	-
			BI	Disable		Operation controlled by Blocking Digital Input	Enable/Disable	-
			2tBO	Disable		Time to Reset	Disable/2tBO	-
			Trg	Enable		Function operation triggers the oscillographic wave form capture	Enable/Disable	-
	TripLev	→	3I>	0.5	In	Trip level	0.05 – 10.00	0.01
	Timers	→	t3I>	0.05	s	Trip time delay	0.05 – 99.99	0.01
			tBO	0.05	s	Time to Reset of the blocking output	0.05 – 0.75	0.01
V>	FuncEnab	→		Enable		Enable of the protection function	Enable/Disable	-
	Options	→	BI	Disable		Operation controlled by Blocking Digital Input	Enable/Disable	-
			Trg	Enable		Function operation triggers the oscillographic wave form capture	Enable/Disable	-
	TripLev	→	V>	1.00	%Vn	Trip level	1.00 – 100	0.01
	Timers	→	tV>	0.05	s	Trip time delay	0.05 – 60.00	0.01

Display						Description	Setting Range	Step
Function	Type		Variable	Default Value	Unit			
V>>	FuncEnab	→		Enable		Enable of the protection function	Enable/Disable	-
	Options	→	BI	Disable		Operation controlled by Blocking Digital Input	Enable/Disable	-
			Trg	Enable		Function operation triggers the oscillographic wave form capture	Enable/Disable	-
	TripLev	→	V>>	1.00	%Vn	Trip level	1.00 – 100	0.01
	Timers	→	tV>>	0.05	s	Trip time delay	0.05 – 60.00	0.01
V<	FuncEnab	→		Enable		Enable of the protection function	Enable/Disable	-
	Options	→	BI	Disable		Operation controlled by Blocking Digital Input	Enable/Disable	-
			Trg	Enable		Function operation triggers the oscillographic wave form capture	Enable/Disable	-
	TripLev	→	V<	1.00	%Vn	Trip level	1.00 – 100	0.01
	Timers	→	tV<	0.05	s	Trip time delay	0.05 – 60.00	0.01
V<<	FuncEnab	→		Enable		Enable of the protection function	Enable/Disable	-
	Options	→	BI	Disable		Operation controlled by Blocking Digital Input	Enable/Disable	-
			Trg	Disable		Function operation triggers the oscillographic wave form capture	Enable/Disable	-
	TripLev	→	V<<	1.00	%Vn	Trip level	1.00 – 100	0.01
	Timers	→	tV<<	0.05	s	Trip time delay	0.05 – 60.00	0.01
BF	FuncEnab	→		Enable		Enable of the protection function	Enable/Disable	-
	Options	→	TrR	Relay1		Output relay operated on BF tripping	Relay1,2,3,4,5	-
	TripLev	→	No Parameters					
	Timers	→	tBF	0.20	s	Time delay for Breaker Failure alarm	0.05 – 0.75	0.01
CBMng	FuncEnab	→	No Parameters					
	Options	→	No Parameters					
	TripLev	→	No Parameters					
	Timers	→	tcmd	0.10	s	C/B closing output command duration	0.10 – 5.00	0.1
		→	tC	0.10	s	Maximum admissible delay for detection of status signal after C/B operation.	0.10 – 5.00	0.1
Osc	FuncEnab	→		Enable		Enable of the protection function	Enable/Disable	-
	Options	→	Trg	Trip		Trigger operation mode	Disable, Start Trip, Ext.Inp	-
	TripLev	→	No Parameters					
	Timers	→	tPre	5	s	Recording time before Trigger	5 - 15	1
		→	tPost	10	s	Recording time after Trigger	10 - 65	1
LoadP	FuncEnab	→	No Parameters					
	Options	→	No Parameters					
	TripLev	→	No Parameters					
	Timers	→	tLP	1		Time delay	1 – 650	1
IRF	FuncEnab	→	No Parameters					
	Options	→	Opl	NoTrip		Operation of output Relays on detection of I.R.F.	NoTrip – Trip	-
			No Parameters					
	TripLev	→	No Parameters					
	Timers	→	No Parameters					
Comm	FuncEnab	→	No Parameters					
	Options	→	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	-
	TripLev	→	No Parameters					
	Timers	→	No Parameters					
LCD	FuncEnab	→	No Parameters					
	Options	→	Key	BeepON		Buzzer “Beep” on operation of Keyboard buttons.	BeepON-BeepOFF	-
			BkL	Auto		LCD Backlight setting	Auto - ON	-
	TripLev	→	No Parameters					
	Timers	→	No Parameters					

Settings can also be programmed via the serial communication ports.

*11.6 - **RelayCfg** (Relay Configuration)*

To associate one of the Output Relays to one or more functions: enter the menu “R/W Set”, select “Relay Cfg”, select the “Relay #” 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 Type (-VI) Type (-I)	Type (-V)			
Relay1 (R1)	**Link**	→	**T>, t1I>, t2I>,t3I>**	**T>, tV>, tV>>, tV<, tV>>**	Association of functions to output relay R1	See Table 1	-
	OpMode	→	**N.D.**		N.D. (Normally Deenergized) N.E. (Normally Energized)	N.D./N.E.	-
Relay2 (R2)	**Link**	→	**Ta, 1I>, 2I>, 3I>**	**Ta, V>, V>>, V<, V<<**	Association of functions to output relay R2	See Table 1	-
	OpMode	→	**N.D.**		N.D. (Normally Deenergized) N.E. (Normally Energized)	N.D./N.E.	-
Relay3 (R3)	**Link**	→	**IRF**		Association of functions to output relay R3	See Table 1	-
	OpMode	→	**N.D.**		N.D. (Normally Deenergized) N.E. (Normally Energized)	N.D./N.E.	-

Available in the additional expansion module

Relay4 (1.R1)	**Link**	→		Association of functions to output relay R3	See Table 1	-
	OpMode	→	**N.D.**	N.D. (Normally Deenergized) N.E. (Normally Energized)	N.D./N.E.	-
Relay5 (1.R2)	**Link**	→		Association of functions to output relay R3	See Table 1	-
	OpMode	→	**N.D.**	N.D. (Normally Deenergized) N.E. (Normally Energized)	N.D./N.E.	-
Relay6 (1.R3)	**Link**	→		Association of functions to output relay R3	See Table 1	-
	OpMode	→	**N.D.**	N.D. (Normally Deenergized) N.E. (Normally Energized)	N.D./N.E.	-
Relay7 (1.R4)	**Link**	→		Association of functions to output relay R3	See Table 1	-
	OpMode	→	**N.D.**	N.D. (Normally Deenergized) N.E. (Normally Energized)	N.D./N.E.	-

Table.1

T>	Ta T>	*Alarm* *Trip*	*Thermal Image T>*		
1I>	1I> t1I>	*Start* *Trip*	*First overcurrent element*	Type (-I)	
2I>	2I> t2I>	*Start* *Trip*	*Second overcurrent element*		
3I>	3I> t3I>	*Start* *Trip*	*Third overcurrent element*		
V>	V> tV>	*Start* *Trip*	*First overvoltage element*	Type (-V)	
V>>	V>> tV>>	*Start* *Trip*	*Second overvoltage element*		
V<	V< tV<	*Start* *Trip*	*First undervoltage element*		
V<<	V<< tV<<	*Start* *Trip*	*Second undervoltage element*		
IRF	IRF		*Internal Relay Failure*		
BF	BF		*Breaker Failure*		
HwRec	HwRec		*Hw Recovery*		
C/B	CBopen		*C/B Open*		
	CBClose		*C/B Close*		
	CBfail		*C/B Fail*		
1.D1 1.D -- 1.D10	Digital Input “1.D1” Digital Input “1.D--” Digital Input “1.D10”	Available in the additional expansion module		By the interface program “MSCom 2” it is possible to Activate/Deactivate the modules.	

11.7 - Commands

- ↳ “ Commands “
- ↳ 1st Control,
- △▽ to select other available control,
- ↳ to operate selected control.

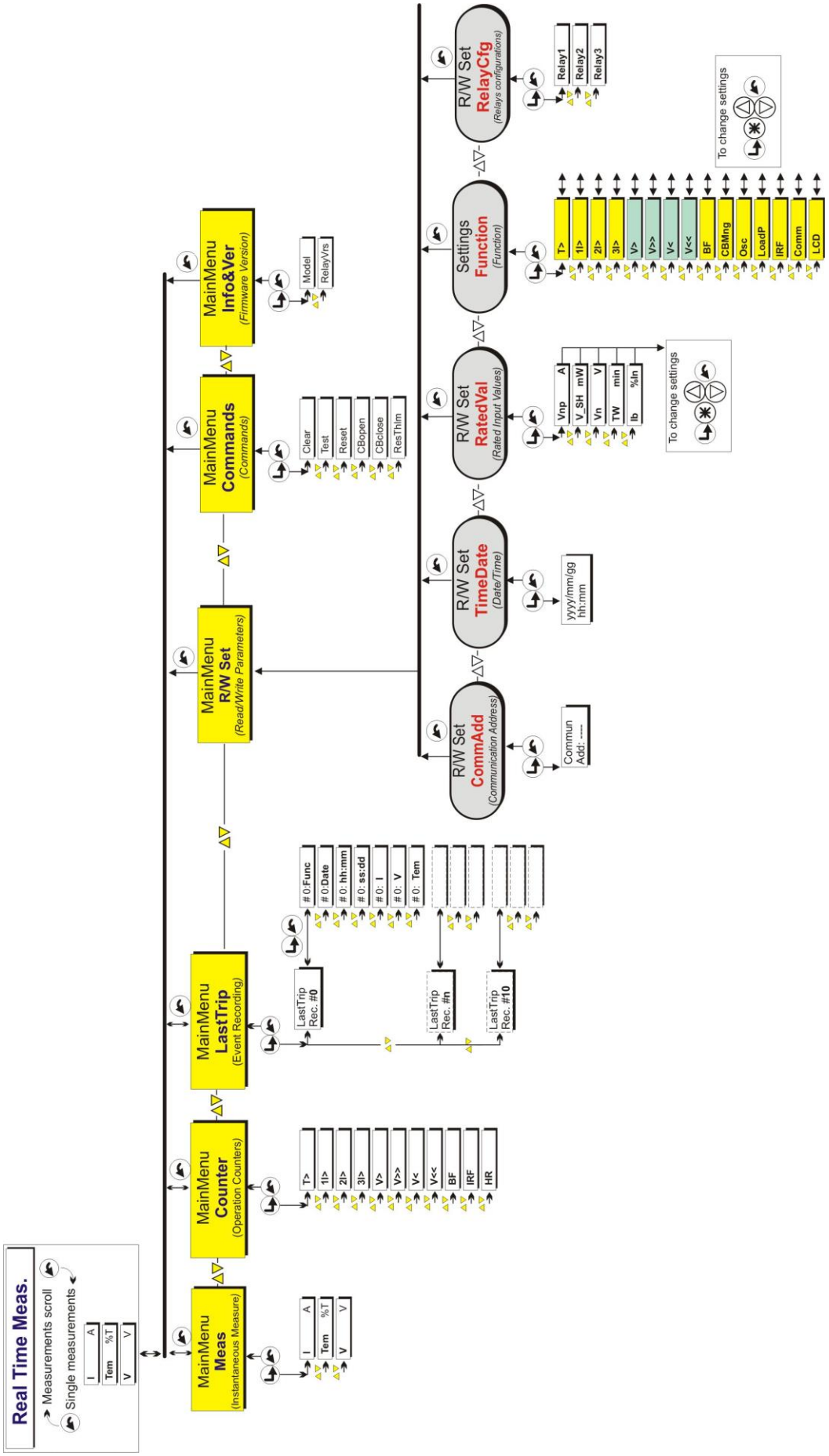
Display		Description
Clear	:	Erase memory of Trip Counters, Event Records.
Test	:	Starts a relay diagnostic test
Reset	:	Reset after trip
CBopen	:	Manual Open - Close Breaker
CBclose	:	Manual Close - Close Breaker
ResThIm	:	Reset Thermal Image

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.

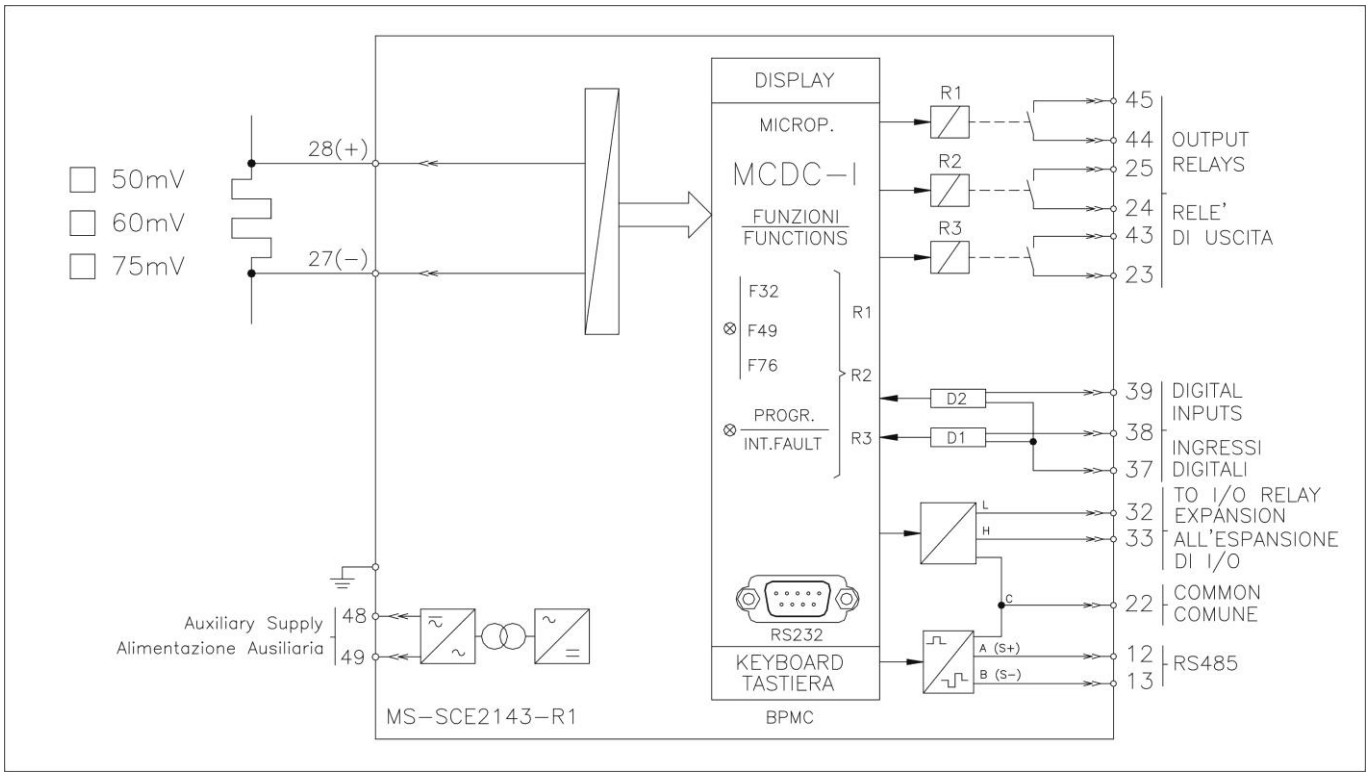
15. Power Frequency Isolation Test

Every relay individually undergoes a factory Isolation test according to IEC60255-5 and EN50124-1 standards.

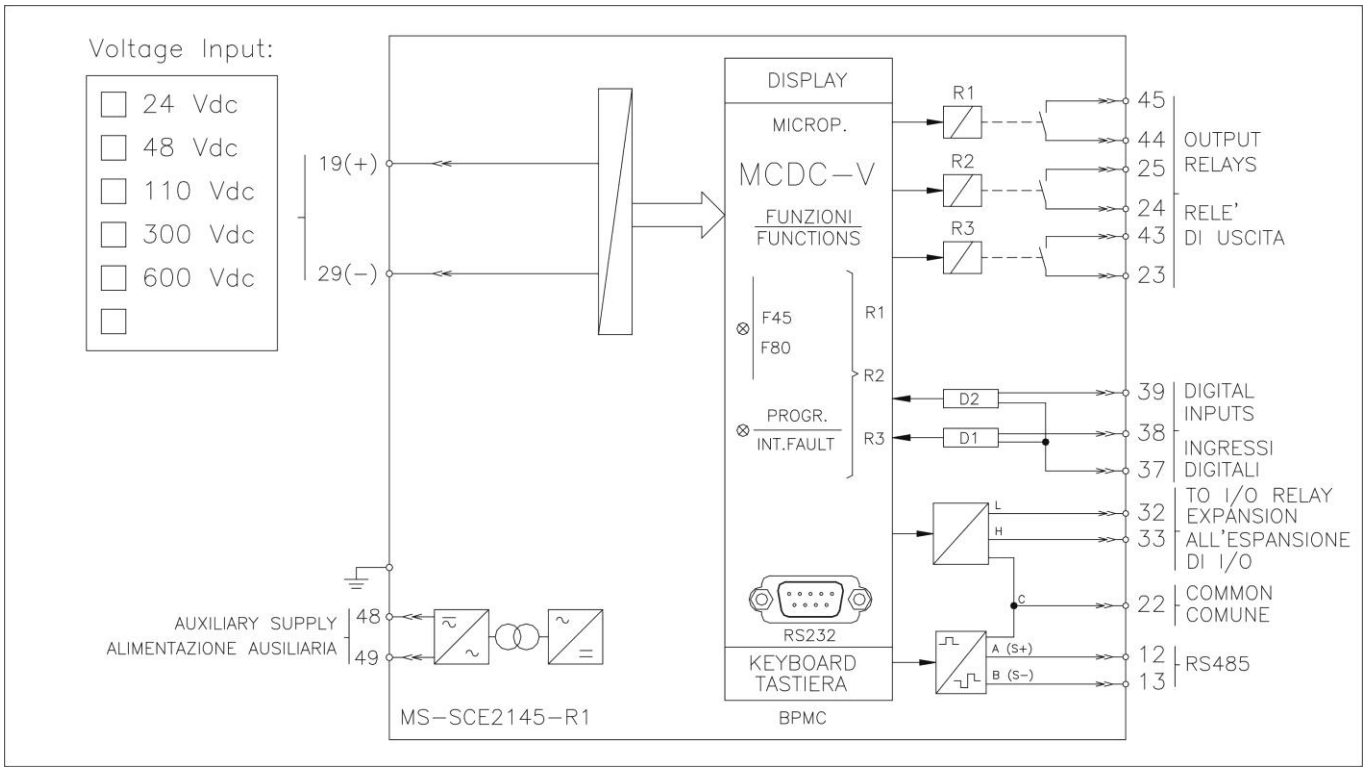
Levels:
Only for HV inputs: 6kVrms, 50Hz, 10sec.
Auxiliary input, AC voltage measure input, Digital inputs and relay outputs: 2 kV, 50 Hz 1min.
Communication interfaces: 500Vrms, 1 min.
Isolation test is already done in factory and should not be repeated with same levels as it unsafely stresses the dielectrics. Typically a 20% derating is needed for further isolation tests and for each further test.
While the Isolation test, the terminals relevant to communication outputs must always be short circuited to ground.
When relays are mounted in switchboards or relay assembly that have to undergo to the Isolation test, the relay should be isolated.
This is extremely important because sparks eventually taking place in other parts of the system can take place to a serious damage of the relay or causes damages not immediately evident to the electronic components.

16. Wiring Diagram

16.1 – MCDC-I – Wiring Diagram

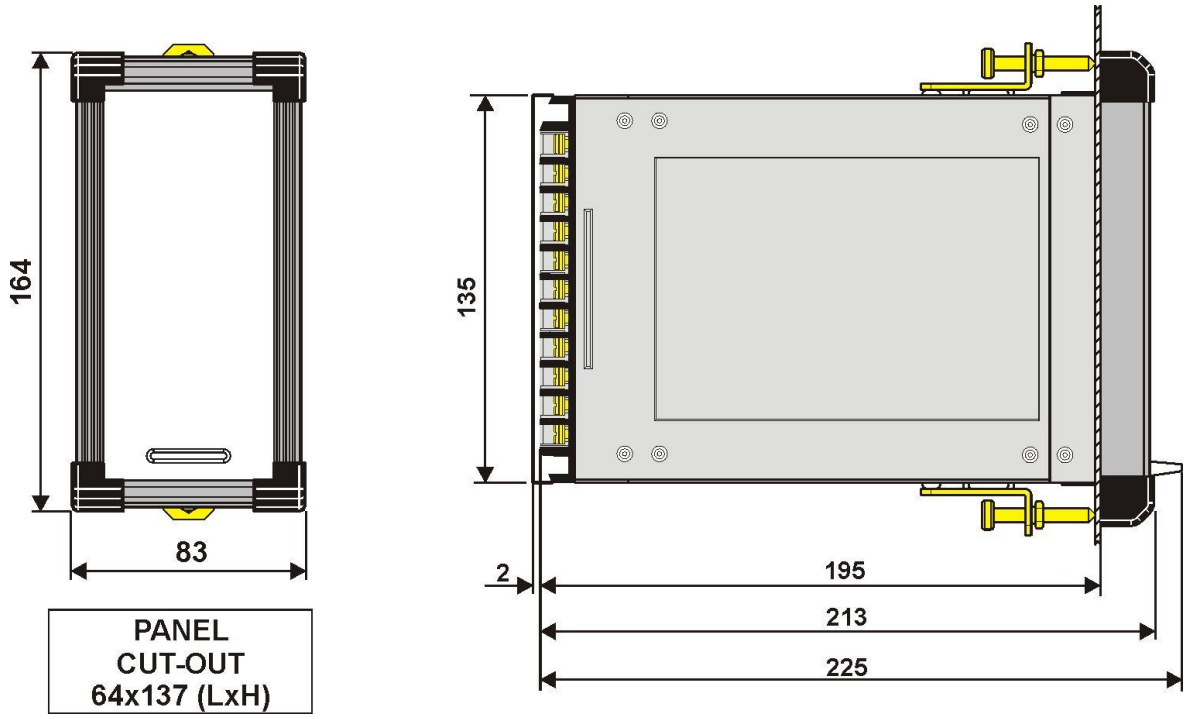


16.2 – MCDC-V – Wiring Diagram



17. Overall Dimensions

PROTECTION DEGREE IP44 (IP54 on request)



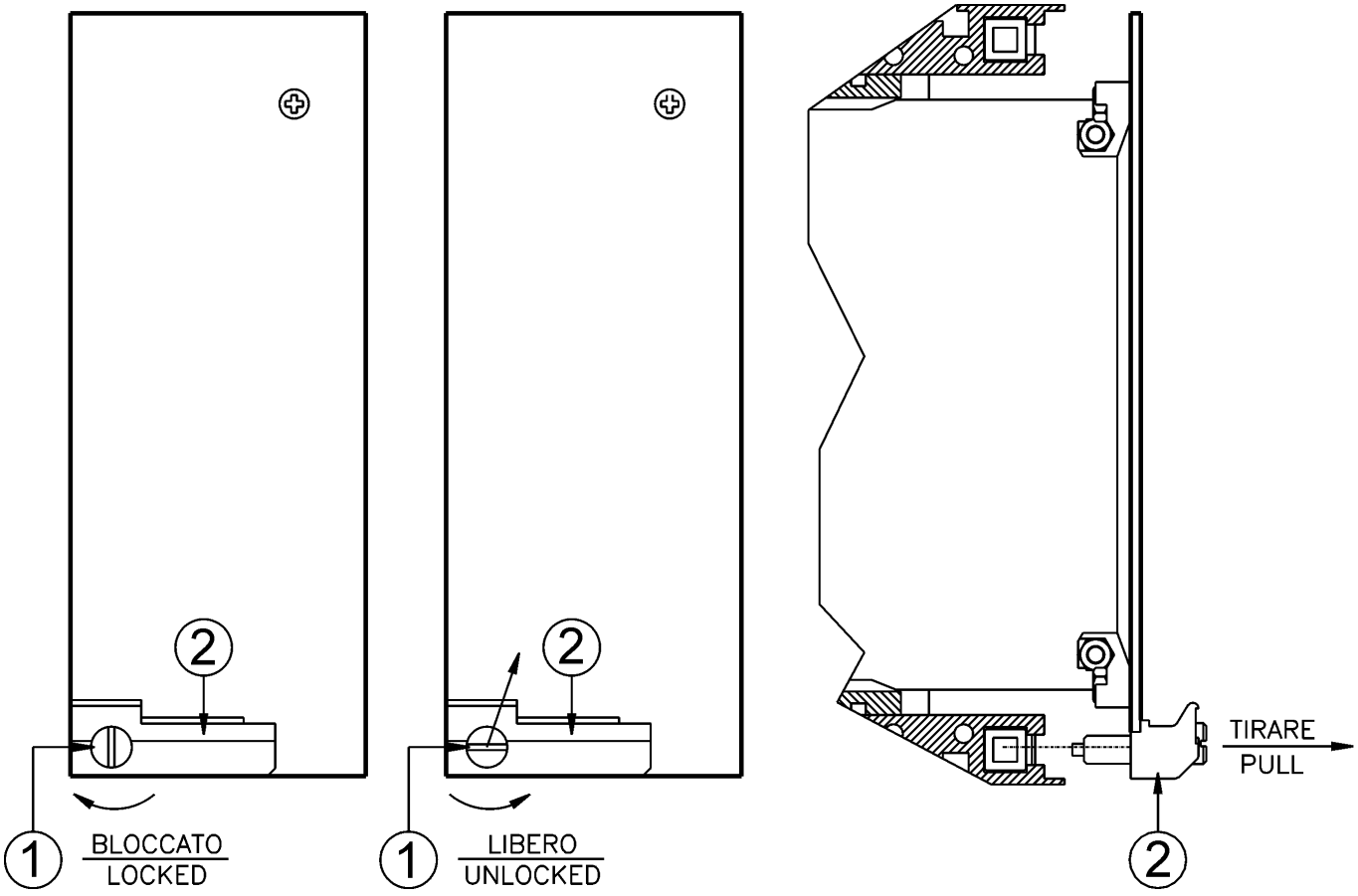
18. Direction for Pcb's Draw-Out and Plug-In

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

REFERENCE STANDARDS		**IEC 60255 - CE Directive - EN/IEC61000 - IEEE C37**			
❑ Dielectric test voltage		IEC 60255-5	Limited to 2kV, 50/60Hz, 1 min.		
❑ Impulse test voltage		IEC 60255-5	Limited to 5kV (c.m.), 2kV (d.m.) – 1,2/50µs		
❑ Isolation resistance		> 100MΩ			
Environmental Std. Ref. (IEC 60068)					
❑ Operation ambient temperature		-10°C / +55°C			
❑ Storage temperature		-25°C / +70°C			
❑ Environmental testing	(Cold) (Dry heat) (Change of temperature) (Damp heat, steady state)	IEC60068-2-1 IEC60068-2-2 IEC60068-2-14 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 3	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% 2% + to (to=20÷30ms @ 2xIs)		for measure for times	
❑ Rated Current		Shunt: 50/60/75mV			
❑ Rated Voltage		0-600V			
❑ 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 - Remote)	Max 19200 bps – 8,n,1 - 8,e,1 - 8,o,1 – Modbus RTU or IEC60870-5-103
❑ RS232 (Front – Local)	Max 57600 – 8,n,1 – Modbus RTU

Microelettrica Scientifica S.p.A. - 20089 Rozzano (MI) - Italy - Via Alberelle, 56/68
Tel. (+39) 02 575731 - Fax (+39) 02 57510940 http://www.microelettrica.com **e-mail :** info@microelettrica.com
The performances and the characteristics reported in this manual are not binding and can modified at any moment without notice