MULTIFUNCTION ZERO SEQUENCE
OVERCURRENT EARTH FAULT and
SENSITIVE EARTH FAULT RELAY
TYPE

MC0A

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, 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 need to be at the same potential.
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 authorized 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 opto-isolated, self-powered Digital Inputs.

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

Totally draw-out execution with automatic C.T. shorting device.

Input currents are supplied to 2 current transformers: - one measuring low level earth fault current, the second measuring high level earth fault current.
Current inputs can be 1 or 5A, selection between 1A or 5A is made by dedicated input terminal blocks (see wiring diagram).

Measuring Ranges of the inputs:

Neutral Current A		(0.001-1)On
Neutral Current B	:	(0.1-10) On

The two inputs need to be put in series (see wiring diagram) to ensure a complete protection against earth faults.

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.

2.1 - Power Supply

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

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

Type 1	24V(-20%) / 110V(+15%) a.c.	24V(-20%) / 125V(+20%) d.c.
Type 2	80V(-20%) / 220V(+15%) a.c.	90V(-20%) / 250V(+20%) d.c.

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

2.2 - Operation and Algorithms

2.2.1 - Reference Input Values

Display			Description	Setting Range			Step	Unit
Io1	100	A	Rated Primary current of the C.T. detecting earth fault current.	1	-	9999	1	A
Io2	1	A	Rated secondary current of the C.T. detecting earth fault current.	1	-	5	1/5	A
Freq	50	Hz	System rated 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 - Earth Fault Current Input (Ion)

The relay directly displays the r.m.s. value of the Zero Sequence Residual Current flowing at the Primary of the Current Transformers.

The measure are not displayed below : < 0,1% On

3. Functions and Settings (Function)

3.1 - 1Io (1F51N) - First Earth Fault protection level

FuncEnab	→		Enable		[Disable / Enable]			
Options	→	***Trg***	Enable		[Disable / Enable]			
TripLev	→	***1Io>***	0.001	Ion	(0.001 ÷ 0.2)	step	0.001	Ion
Timers	→	***1tIo***	0.0	s	(0.0 ÷ 60.0)	step	0.1	s

Description of variables

FuncEnab	:	If disable the function is disactivated
Trg	:	Function operation triggers the oscillographic wave form capture
Io>	:	Trip level
tIo	:	Trip time delay

3.2 - 2Io (2F51N) - Second Earth Fault protection level

FuncEnab	→		Enable		[Disable / Enable]			
Options	→	***Trg***	Enable		[Disable / Enable]			
TripLev	→	***2Io>***	0.01	Ion	(0.001 ÷ 2.00)	step	0.001	Ion
Timers	→	***2tIo***	0.05	s	(0.0 ÷ 60.0)	step	0.01	s

Description of variables

FuncEnab	:	If disable the function is disactivated
Trg	:	Function operation triggers the oscillographic wave form capture
2Io>	:	Trip level
2tIo	:	Trip time delay

3.3 – 3Io (3F51N) - Third Earth Fault protection level

FuncEnab	→		Enable		[Disable / Enable]			
Options	→	*Trg*	Enable		[Disable / Enable]			
TripLev	→	*3Io>*	0.1	Ion	(0.1 ÷ 10.00)	step	0.1	Ion
Timers	→	*3tIo*	0.01	s	(0.0 ÷ 60.0)	step	0.01	s

Description of variables

FuncEnab	:	If disable the function is disactivated
Trg	:	Function operation triggers the oscillographic wave form capture
3Io>	:	Trip level
3tIo	:	Trip time delay

3.4 – 4Io (4F51N) - Third Earth Fault protection level

FuncEnab	→		Enable		[Disable / Enable]			
Options	→	*Trg*	Enable		[Disable / Enable]			
TripLev	→	*4Io>*	0.1	Ion	(0.1 ÷ 10.00)	step	0.1	Ion
Timers	→	*4tIo*	0.01	s	(0.0 ÷ 60.0)	step	0.01	s

Description of variables

FuncEnab	:	If disable the function is disactivated
Trg	:	Function operation triggers the oscillographic wave form capture
4Io>	:	Trip level
4tIo	:	Trip time delay

3.5 - BF (F51BF) - Breaker Failure

FuncEnab	→		Enable		[Disable / Enable]			
Options	→	***TrR***	Relay1		Relay1 – Relay2 – Relay3 – Relay4			
TripLev	→		No Param		No Parameters			
Timers	→	***tBF***	0.20	s	(0.05 ÷ 0.75)	step	0.01	s

Description of variables

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).

3.6 - 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			

Description of variables

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).

3.7 - Osc - Oscillographic Recording

FuncEnab	→		Enable		[Disable / Enable]			
Options	→	**Trg**	Trip		[Disable / Start / Trip / Ext.Inp.]			
TripLev	→		No Param		No Parameters			
Timers	→	**tPre**	0.30	s	(0.10 ÷ 0.50)	step	0.1	s
	→	**tPost**	0.30	s	(0.10 ÷ 1.50)	step	0.1	s

Description of variables

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 D3
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 (1Io>, 2Io>, 3Io>, 4Io>).

The "Osc" Function includes the wave Form Capture of the input quantities 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 events stored cannot 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).

3.8 - 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

Description of variables

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

3.9 - LCD – Display and Buzzer operation

FuncEnab	→	No Param	No Parameters
Options	→ ***Key***	BeepON	[BeepOFF / BeepON]
	→ ***LCD***	Auto	[Auto / On]
TripLev	→	No Param	No Parameters
Timers	→	No Param	No Parameters

Description of variables

Key	:	Buzzer "Beep" on operation of Keyboard buttons.
LCD	:	LCD Backlight continuously "ON" or switched-on Automatically on operation of Keyboard buttons.

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 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)
As an option (to be required when ordering the relay), the output relay "R4" can be replaced by a Field 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 relay.

5. Digital Inputs

Three opto-isolated, 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)	:	Available
D2	(Terminals 22 - 21)	:	Remote Trip
D3	(Terminals 22 - 20)	:	The digital Input indicates the position of the Circuit Breaker (Input Closed = C/B closed; Input Open = C/B open). If the option External Trigger = Enabled 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 here below.

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)
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 (*)	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.

(*) 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

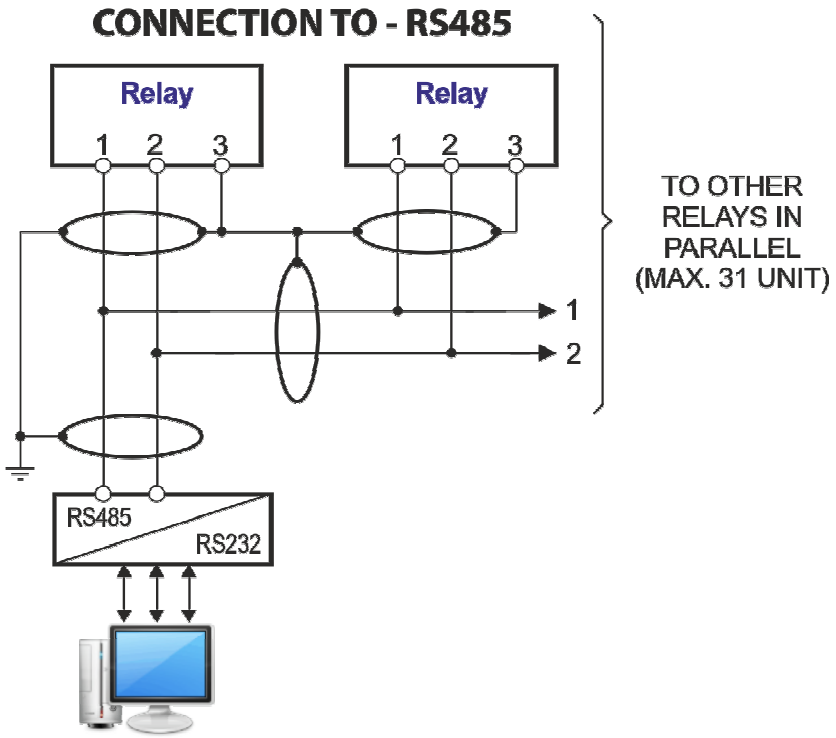
10.1 - Main RS485 Serial Communication Port

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 is available on www.microelettrica.com.
Maximum length of the serial bus can be up to 200m.

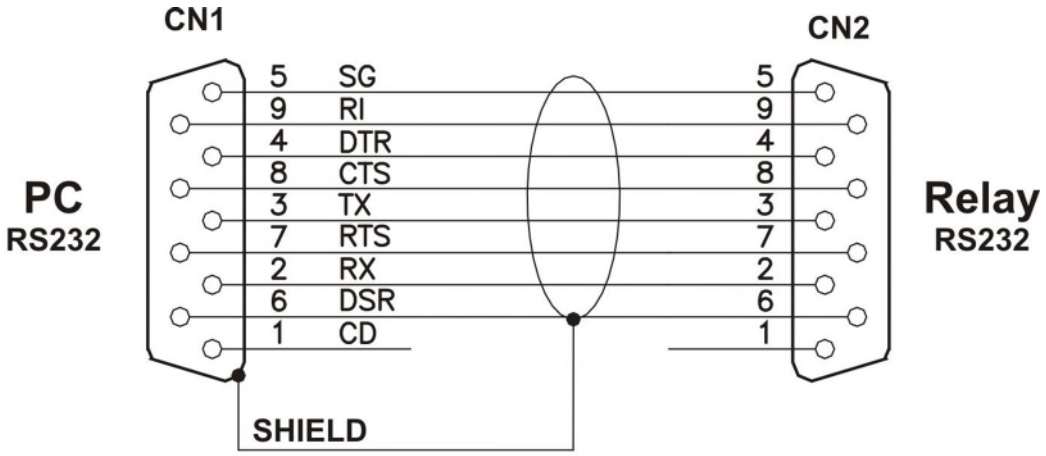


For longer distance and for connection of up to 250 Relays, optical interconnection is recommended.
(Please ask Microelettrica for accessories)

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*
Io	=	0.0 – 6553.5	A	RMS value of Zero Sequence Current (RMS Primary Amps)

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*
Io	=	0.0 – 6553.5	A	RMS value of Zero Sequence Current (RMS Primary Amps)

11.3 - Counter (Operation Counters)

The operation of any of the function here below 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*
1Io	=	0 – 65535	Number of 1st Earth Fault (time delayed) trip
2Io	=	0 – 65535	Number of 2nd Earth Fault (time delayed) trip
3Io	=	0 – 65535	Number of 3rd Earth Fault (time delayed) trip
4Io	=	0 – 65535	Number of 4th Earth Fault (time delayed) trip
BF	=	0 – 65535	Number of operations 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 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*
Func		xxxxx		Indication of the protection function which caused the relay tripping. For indication of the TRIP Cause the following acronyms are used: *1Io* = 1st Earth Fault element *2Io* = 2nd Earth Fault element *3Io* = 3rd Earth Fault element *4Io* = 4th Earth Fault 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
IA	=	0 – 65535	A	RMS value of phase A current (Primary Amps)
IB	=	0 – 65535	A	RMS value of phase B current (Primary Amps)
IC	=	0 – 65535	A	RMS value of phase C current (Primary Amps)
Io	=	0.0 – 6553.5	A	RMS value of Zero Sequence Current (Primary Amps)

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)

"Common"
"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

10.5.3 - 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
Io1	100	A	Rated Primary current of the C.T. detecting earth fault current.	1 - 9999	1	A
Io2	1	A	Rated secondary current of the C.T. detecting earth fault current.	1 - 5	1/5	A
Freq	50	Hz	System rated frequency	50 - 60	10	Hz

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 - TripLev - Options - 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!

Function	Type	Display	Variable	Default Setting	Unit	Description	Setting Range	Step
Password		=	0000-9999	1111	-	Password for programming enable (see § Password)		
1Io	*FuncEnab*	→		Enable		Enable of the protection function	Enable/Disable	-
(1F51N)	*Options*	→	*Trg*	Enable		Function operation triggers the oscillographic wave form capture	Enable/Disable	-
			1Io>	0.001	Ion	Trip level of Earth Fault protection	0.001 – 0.2	0.001
	Timers	→	*1tIo*	0.0	s	Trip time delay	0.0 – 60.00	0.01
2Io	*FuncEnab*	→		Enable		Enable of the protection function	Enable/Disable	-
(2F51N)	*Options*	→	*Trg*	Enable		Function operation triggers the oscillographic wave form capture	Enable/Disable	-
	TripLev	→	*2Io>*	0.01	Ion	Trip level of Earth Fault protection	0.001 – 2.00	0.001
	Timers	→	*2tIo*	0.05	s	Trip time delay	0.0 – 60.00	0.01
3Io	*FuncEnab*	→		Enable		Enable of the protection function	Enable/Disable	-
(3F51N)	*Options*	→	*Trg*	Enable		Function operation triggers the oscillographic wave form capture	Enable/Disable	-
	TripLev	→	*3Io>*	0.1	Ion	Trip level of Earth Fault protection	0.1 – 10.00	0.01
	Timers	→	*3tIo*	0.01	s	Trip time delay	0.0 – 60.00	0.01
4Io	*FuncEnab*	→		Enable		Enable of the protection function	Enable/Disable	-
(4F51N)	*Options*	→	*Trg*	Enable		Function operation triggers the oscillographic wave form capture	Enable/Disable	-
	TripLev	→	*4Io>*	0.1	Ion	Trip level of Earth Fault protection	0.1 – 10.00	0.01
	Timers	→	*4tIo*	0.01	s	Trip time delay	0.0 – 60.00	0.01
BF	*FuncEnab*	→		Enable		Enable of the protection function	Enable/Disable	-
(F51BF)	*Options*	→	*TrR*	Relay1		Output relay operated on BF tripping	Relay1- Relay2 Relay3- Relay4	-
	TripLev	→		No Parameters				
	Timers	→	*tBF*	0.20	s	Time delay for Breaker Failure alarm	0.05 – 0.75	0.01
IRF	*FuncEnab*	→		Enable		Enable of the protection function	Enable/Disable	-
	Options	→	*Opl*	NoTrip		Operation of output Relays on detection of Internal Relay Fault	NoTrip – Trip	-
				No Parameters				
	TripLev	→		No Parameters				
	Timers	→		No Parameters				
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*	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	*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	-
			Rmd	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	IEC103		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	ON		LCD Backlight continuously "ON" or switched-on Automatically on operation of Keyboard buttons.	ON - OFF	-
	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 (see § Password): 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 then 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" istead of "Link".

Relay	*Display Type*		*Default Value*	*Description*	*Setting Range*	*Step*
Relay1 (R1)	*Link*	→	1Io>, 2Io>, 3Io>, 4Io>	Association of functions to output relay R1	1Io> - t1Io - 2Io> - t2Io - 3Io> - t3Io - 4Io> - t4Io - BF - RTD – IRF – HwRec – CBopen - CBclose	-
	OpMode	→	N.D.	N.D. (Normally Deenergized) N.E. (Normally Energized)	N.D./N.E.	-
Relay2 (R2)	*Link*	→	BF	Association of functions to output relay R2	1Io> - t1Io - 2Io> - t2Io - 3Io> - t3Io - 4Io> - t4Io - BF - RTD – IRF – HwRec – CBopen - CBclose	-
	OpMode	→	N.D.	N.D. (Normally Deenergized) N.E. (Normally Energized)	N.D./N.E.	-
Relay3 (R3)	*Link*	→	t1Io, t2Io, t3Io, t4Io	Association of functions to output relay R3	1Io> - t1Io - 2Io> - t2Io - 3Io> - t3Io - 4Io> - t4Io - BF - RTD – IRF – HwRec – CBopen - CBclose	-
	OpMode	→	N.D.	N.D. (Normally Deenergized) N.E. (Normally Energized)	N.D./N.E.	-
Relay4 (R4)	*Link*	→	IRF	Association of functions to output relay R4	1Io> - t1Io - 2Io> - t2Io - 3Io> - t3Io - 4Io> - t4Io - BF - RTD – IRF – HwRec – CBopen - CBclose	-
	OpMode	→	N.E.	N.D. (Normally Deenergized) N.E. (Normally Energized)	N.D./N.E.	-

11.7 - Commands

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

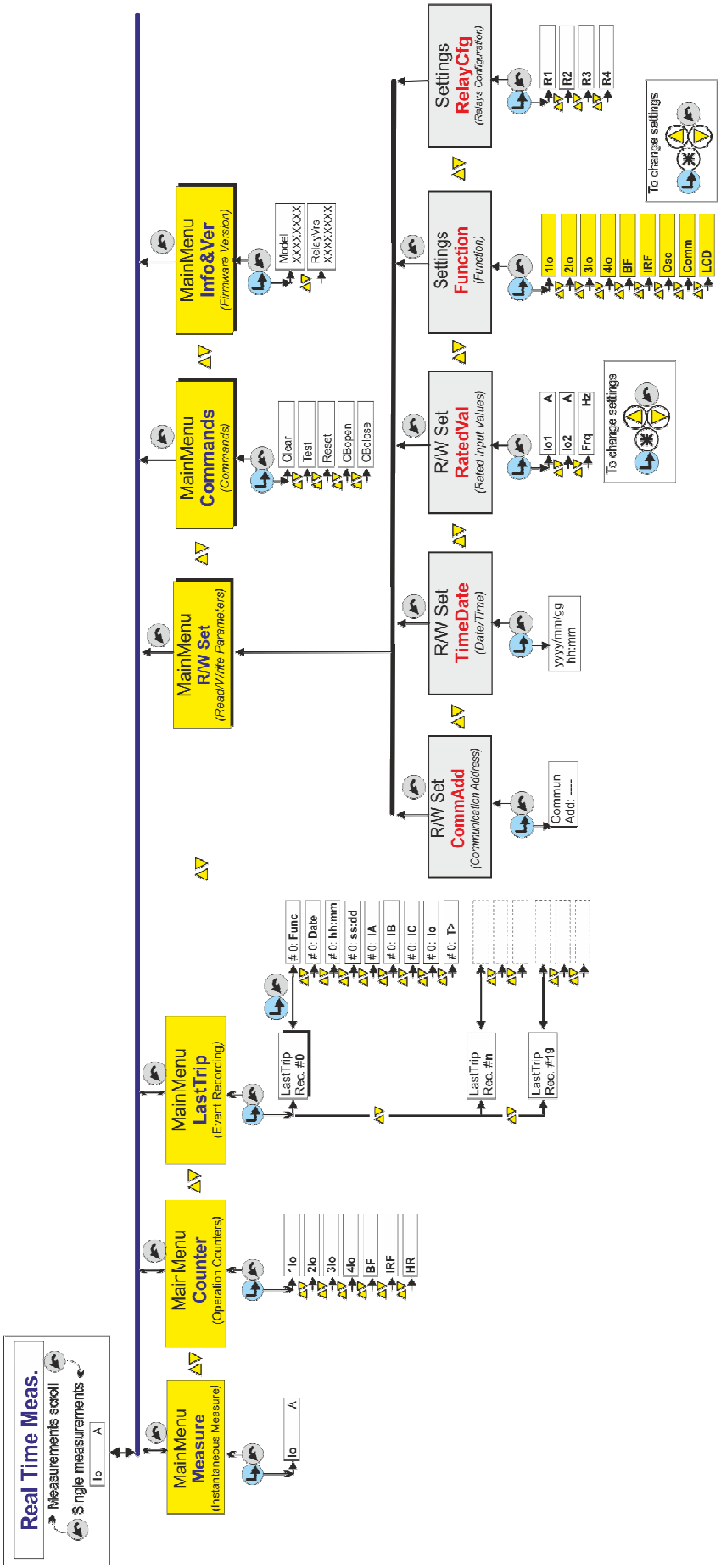
Display		*Description*
Clear	:	Erase memory of Trip Counters, Event Records.
Test Leds	:	Start diagnostic
Reset	:	Reset after trip
CBopen	:	Manual Open - Close Breaker
CBclose	:	Manual Close - Close Breaker

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.

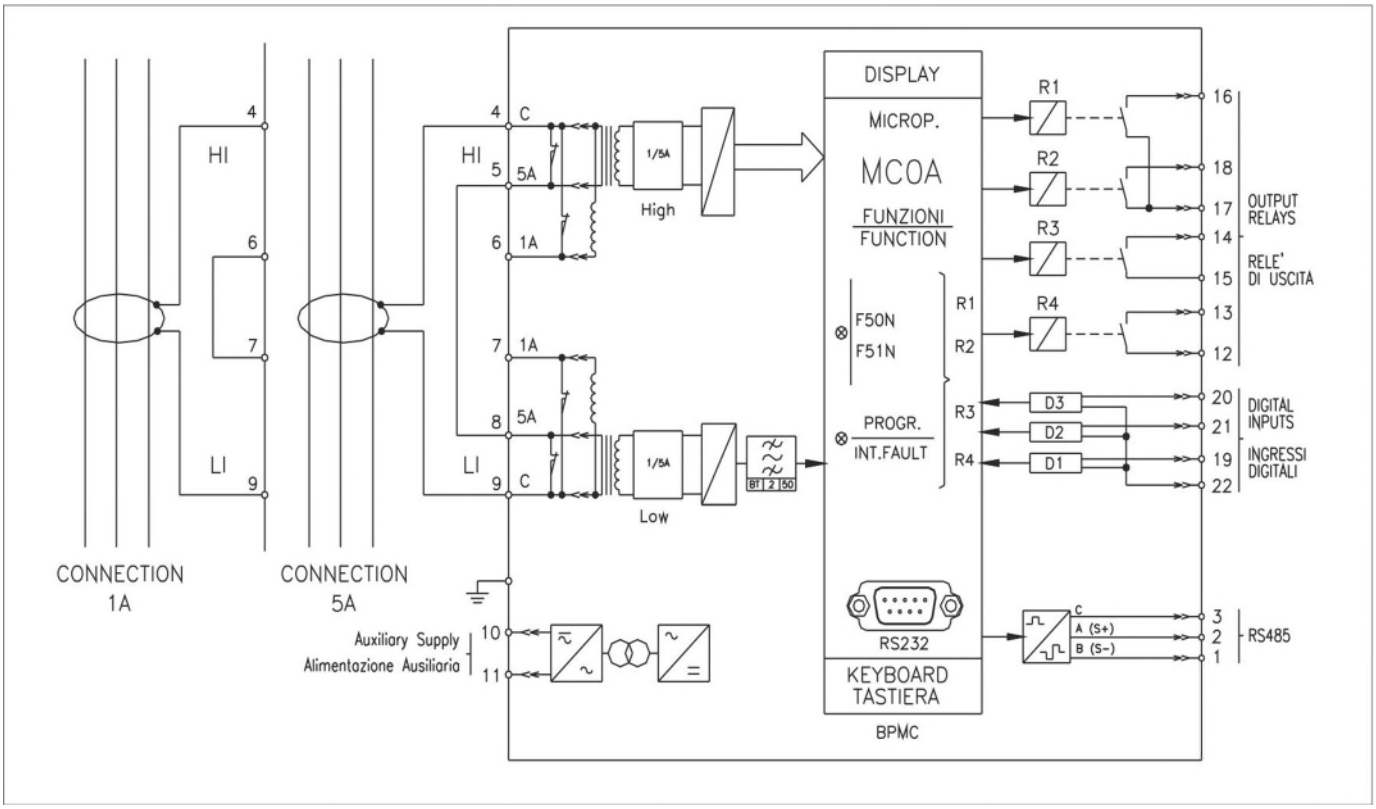
14. Maintenance

No maintenance is required. In case of malfunctioning please contact Microelettrica Scientifica Service or the local Authorized 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 unsafely 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

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 - 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	level 3	80-2000MHz	10V/m
	ENV50204		900MHz/200Hz	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	0,05% On 2% + to (to=20÷30ms @ 2xIs)	for measure for times
Rated Current	On = 1A/5A	
Current overload	80 On for 1 sec; 2On continuous	
Burden on current inputs	Neutral : 0.05VA at On = 1A ; 0.2VA at On = 5A	
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 PARAMETERS	
RS485 (Back)	9600/19200/38400/57600 bps – 8,n,1 - 8,e,1 - 8,o,1 – Modbus RTU or IEC60870-5-103
RS232 (Front)	9600 – 8,n,1 – Modbus RTU

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