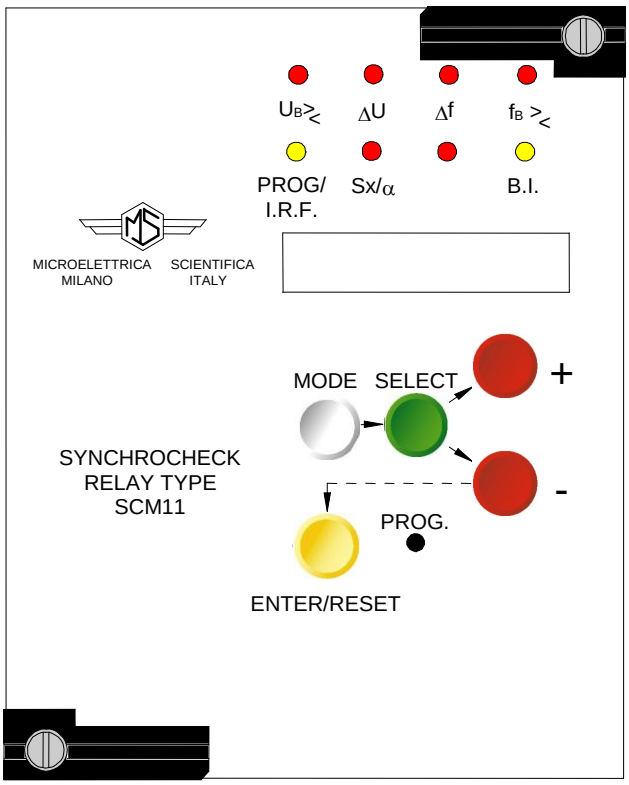
# MULTIFUNCTION MICROPROCESSOR SYNCHROCHECK RELAY

## TYPE
# SCM11

# OPERATION MANUAL




CE

- **Check of voltage, frequency and phase displacement**
- **Dead bus, dead line operation programmable**
- **Additional over/under voltage and over/under frequency function**
- **Continuos self supervision with built-in autodiagnostic**
- **Serial communication interface**
- **Local display of measurements, settings, event recording and operation counters**
- **Local and remote programming of settings, operation modes and configuration of output relays**

## INDEX

# 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 - 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

Input quantities are supplied to 3 Potential Transformers each measuring a phase-to-phase voltage.
Rated voltage input is adjustable from 100 through 240V - 50 or 60Hz.
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.
The auxiliary power is supplied by a built-in interchangeable module fully isolated and self protected.

### 2.1 POWER SUPPLY

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

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

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

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

## 2.2 – Operation Configuration

The relay can be programmed to operate in four different system's conditions:

| | | | | | | |
|---|---|---|---|---|---|---|
| 1 | - | DB | = | OFF | DL | = OFF |
| 2 | - | DB | = | ON | DL | = OFF |
| 3 | - | DB | = | OFF | DL | = ON |
| 4 | - | DB | = | ON | DL | = ON |

### 2.2.1 - DB = OFF (Dead Bus not allowed) - DL = OFF (Dead Line not allowed)

In this configuration closing of the C/B can only take place if all the following conditions exist:

- Bus voltage BU is within the set limits : [U<]<BU<[U>]
- Voltage difference is below the set limit : ΔU<[ΔU]
- Frequency difference is below the set limit : Δf<[Δf]
- Phase displacement is below the set limit : α<[α]

### 2.2.2 - DB = ON (Dead Bus allowed) - DL = OFF (Dead Line not allowed)

The closing conditions are :

A) - If Line voltage U<5%Un. No closing of the dead line.

B) - If Bus voltage BU≤5%Un (5%Un = Dead bus detection level)
- Line voltage in the limits : [U<]<U<[U>]
- Line frequency in the limits : [f<]<f<[f>]

The relay closes the line where the closing conditions are present and then starts checking the other line as § 2.2.1

C) - If bus voltage BU>5%Un. Normal conditions as at § 2.2.1

### 2.2.3 - DB = OFF (Dead Bus not allowed) - DL = ON (Dead Line allowed)

The closing conditions are :

A) - If Line voltage U≤5%Un.
- Bus voltage in the limits : [U<]<BU<[U>]
- Bus frequency in the limits : [f<]<Bf<[f>]

B) - If Line voltage 1U>5%Un. Normal conditions as at § 2.2.1

C) - If bus voltage BU<5%Un : No closing.

### 2.2.4 - DB = ON (Dead Bus allowed) - DL = ON (Dead Line allowed)

The closing conditions are :

A) - If Bus is dead while the line is live : same as § 2.2.2

B) - If Bus and the line are live : same as § 2.2.1

C) - If Bus is live while the line is dead : same as § 2.2.3

D) - If Bus and the line are dead : closing inhibited

## 2.3 - Phase displacement control

Checking of the phase displacement condition for closing the C/B (angle below the set level and decreasing) is initiated only if the voltage and frequency closing conditions have been permanently present for longer than the set time [ts].
After expiry of [ts] the angle starts to be checked. Closing command is anyhow inhibited for the set time [to] from last opening of the C/B or from removal of the external Blocking Input. (see § 2.6)

### 2.3.1 - C/B closing time (tcb)

The angle where C/B closing command is issued (energization of the output relay) can be different according to the programming of the parameter [$t_{CB}$ = 0,05 - 0,50 / Dis.] which represents the closing time of the C/B for automatic selection of the closing angle.

- If $t_{CB}$ = Dis.
  Closing command is issued as soon as phase difference $\alpha$ between Line voltage and bus voltage, while decreasing, is below the set value [$\alpha$]:

- If a $t_{CB}$ time is set (programming of $t_{CB} \neq$ Dis.):
  Closing command is issued as soon as the phase difference $\alpha$, while decreasing comes within the limits $1{,}1\alpha_S > \alpha > 0{,}9\alpha_S$ where :

  - $\alpha_S = \Delta f \bullet 360 \bullet (t_{CB} + tr)$
  - $\Delta f$ = measured frequency difference $f_L - f_B$
  - $t_{CB}$ = time value as set
  - tr = output relay operating time ($\cong$ 25ms)

  Closing takes place any how if the angle remains below the set value [$\alpha$] for the time programmed for the parameter [tk].

## 2.4 - C/B closing command

A closing command when issued remains active (if the closing conditions are present) up to 100ms after the C/B close signal is detected (status input SX1, SX2 shorted). When a closing command is issued, the next command can not take place before the wait time [to] is expired.

## 2.5 - Lock-out input

The lock-out input BF when activated (terminals 1-14 shorted), inhibits the operation of the output relay for C/B closing. After removal of the Blocking Input the lock-out status remains active for the time [to].

## 2.6 - CLOCK AND CALENDAR

The unit features a built in clock calendar with Years, Months, Days, Hours, Minutes, Seconds, Tenths of seconds and Hundredths of seconds.

### 2.6.1 - Clock synchronization.

The clock can be synchronized via the serial communication interface.
The following synchronization periods can be set: 5, 10, 15, 30, 60 minutes.
Synchronization can also be disabled, in which case the relay ignores the serial broadcast signal.
In case synchronization is enabled, the unit expects to receive a sync signal at the beginning of every hour and once every $T_{syn}$ minutes. When a sync signal is received, the clock is automatically set to the nearest expected synchronization time.
For example: if $T_{syn}$ is 10min and a sync signal is received at 20:03:10 January the 10$^{th}$, 98, then the clock is set to 20:00:00 January the 10$^{th}$, 1998.
On the other hand, if the same sync signal were received at 20:06:34, the clock would be set to 20:10:00, January the 10$^{th}$ 98.
Note that if a sync signal is received exactly in the middle of a $T_{syn}$ period, the clock is set to the previous expected synchronization time.

### 2.6.2 - Date and time setting.

When the PROG/SETTINGS menu is entered, the current date is displayed with one of the groups of digits (YY, MMM or DD) blinking.
The DOWN key operates as a cursor. It moves through the groups of digits in the sequence YY => MMM => DD => YY => …
The UP key allows the user to modify the currently blinking group of digits.
If the ENTER button is pressed the currently displayed date is set.
Pressing the SELECT button the current time is displayed which can be modified using the same procedure as for the date.
If synchronization is enabled and the date (or time) is modified, the clock is stopped until a sync signal is received via the serial port. This allows the user to manually set many units and have them to start their clocks in a synchronized fashion.
If synchronization is disabled the clock is never stopped.
Note that the setting of a new time always clears 10ths and 100ths of sec.

### 2.6.3 - Time resolution.

The clock has a 10ms resolution. This means that any event can be time-stamped with a 10ms accuracy, although the information concerning 10ths and 100ths of sec. can be accessed only via the serial communication interface.

### 2.6.4 - Operation during power off.

The unit has an on board Real Time Clock which maintains time information for at least 1 hour in case of power supply failure.

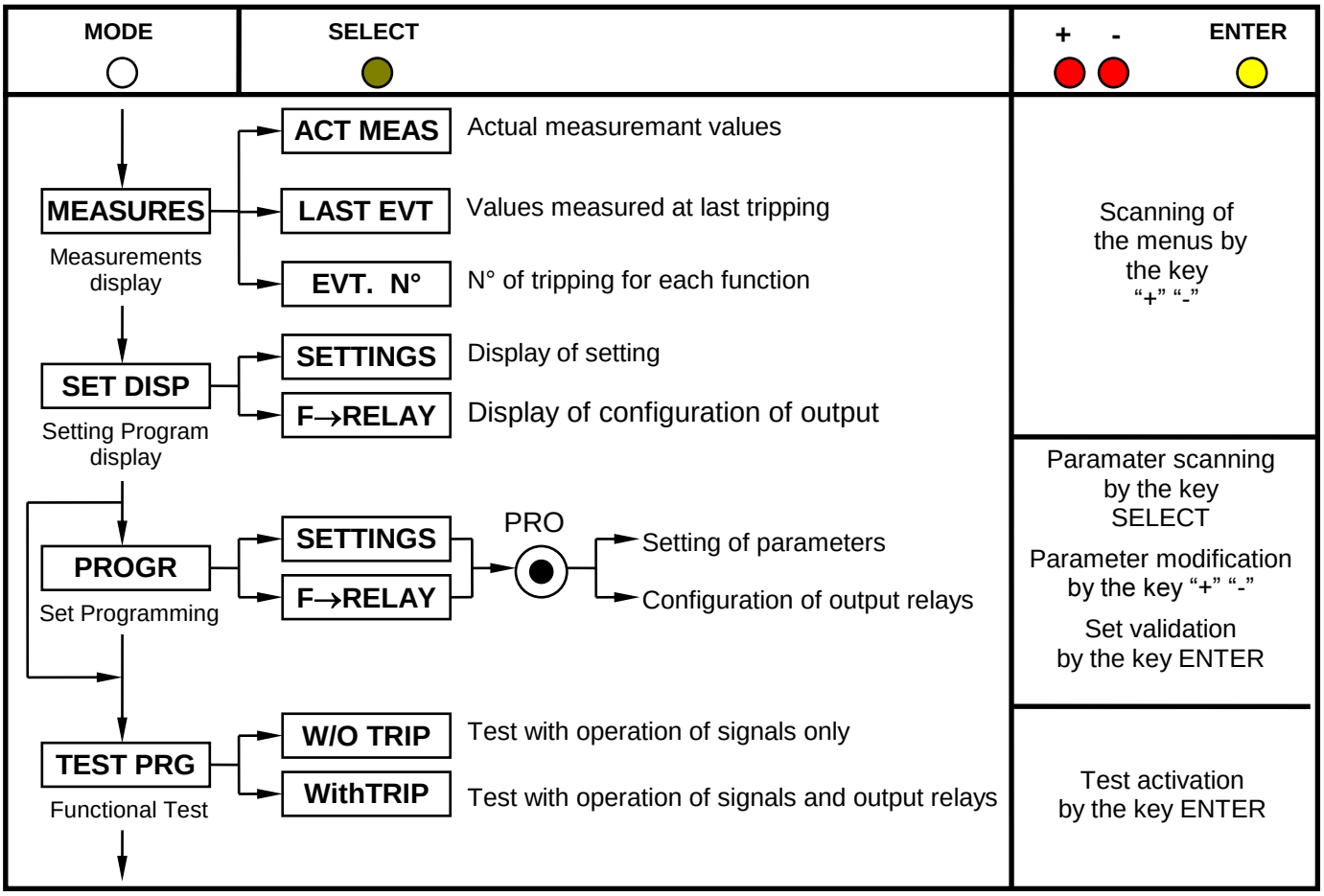
### 2.6.5 - Time tolerance.

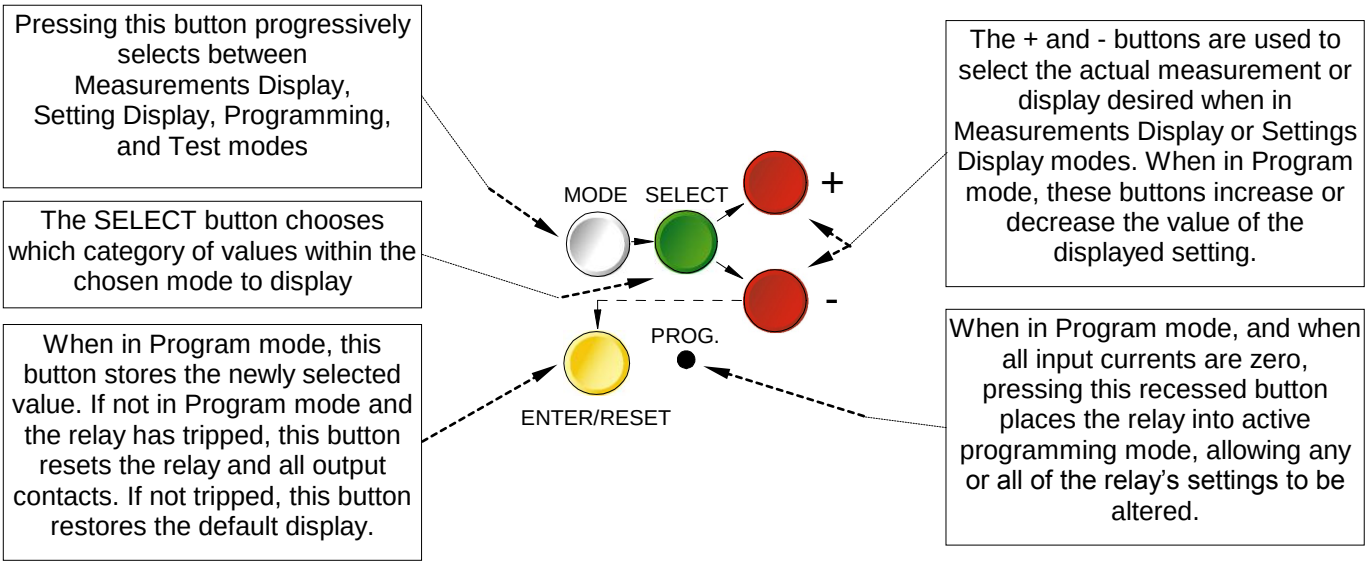
During power on, time tolerance depends on the on board crystal (+/-50ppm typ, +/-100ppm max. over full temperature range).
During power off, time tolerance depends on the RTC's oscillator (+65 /–270 ppm max over full temperature range).

## 3. CONTROLS AND MEASUREMENTS

Five key buttons allow for local management of all relay's functions.
A 8-digit high brightness alphanumerical display shows the relevant readings **(xxxxxxxx)**
(see synoptic table fig.1)

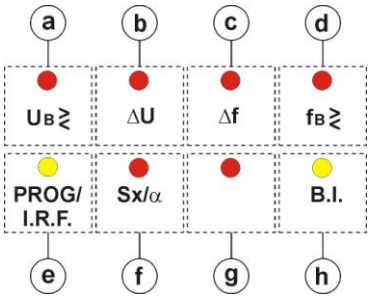
**FIG.1**



## 4. SIGNALIZATIONS

Eight signal leds provide information on relay actual status:




| | | | | |
|---|---|---|---|---|
| a) | Red led | **$U_B$** $\gtrless$ | : | ❑ When both the Circuit Breakers are open (inputs 1-2) the led is flashing if the Bus voltage BU is within the set limits [U<], [U>]; the led is on if BU out of the limits.<br>❑ If Circuit Breakers is closed the led monitors the over/under voltage trip elements:<br>➢ off if BU within the set limits [U<], [U>].<br>➢ flashing if BU is out of the limits during the trip time delay [tU<], [tU>]<br>➢ lit-on at time delay expiry when the over or under voltage element is tripped.<br>This situation is memorized and led's reset takes only place by manual yellow key) or remote (via serial bus) reset. |
| b) | Red led | **ΔU** | : ❑ | Flashing when ΔU<[ΔU]; lit-on when ΔU>[ΔU]<br>➢ If Circuit Breakers are open, the led monitors the voltage difference UL-BU = ΔU>[ΔU]<br>➢ If Circuit Breakers closed the led is off. |
| c) | Red led | **Δf** | : ❑<br>❑ | Flashing when Δf<[Δf]; lit-on when Δf>[Δf].<br>Same operation as led ΔU but referred to frequency difference, Δf compared with the relevant levels [1Δf]. |
| d) | Red led | **$f_B$** $\gtrless$ | : | ❑ Same operation as led $U_B$> but referred to bus frequency compared with the levels [f>], [f<] and time delay [tf>], [tf<]. |
| e) | Yellow led | **PROG./I.R.F.** | : | ❑ Flashing when in the programming mode.<br>❑ Lit-on when any internal relay Fault is detected |
| f) | Red led | **SX/α** | : | ❑ Flashing when the phase displacement between Line and Bus voltage is below the set level [α].<br>❑ Off when α>[α]<br>❑ Lit-on when Circuit Breakers is closed (terminals 1-2 shorted). |
| g) | Red led | | : | |
| h) | Yellow led | **B.I.** | : | ❑ Lit-on when a blocking input is present (terminals 1-14 shorted). |

## 5. OUTPUT RELAYS

Five output relays are available (R1, R2, R3, R4, R5):

a) - The relays **R1,R2,R3,R4** are normally deenergized (energized on trip): these output relays are user programmable and any of them can be associated to any of the following SCM11's functions:

| | | | | |
|---|---|---|---|---|
| SX | (close C/B), | - | | |
| tU< | (time delayed undervoltage), | - | tU> | (time delayed overvoltage) |
| tf< | (time delayed underfrequency) | - | tf> | (time delayed overfrequency) |

Any relay associated to SX does not accept to be also associated to any other function.
Relays associated to SX are automatically reset (see § 2.4).
The reset of the relays associated to the function tU<, tU>, tf<, tf> can be programmed as Automatic or Manual or Time delayed.

- Automatic instantaneous : Rxtr = Aut. (x = 1, 2, 3, 4)
- Manual (reset only by reset key or serial) : Rxtr = Man. (x = 1, 2, 3, 4)
- Automatic with adjustable time delay : Rxtr = (0,1-9,9)s

b) - The relay **R5**, normally energized, is not programmable and it is deenergized on:

- internal fault
- power supply failure
- during the programming

## 6. SERIAL COMMUNICATION

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

## 7. DIGITAL INPUTS

Three digital inputs active when the relevant terminals are shorted by cold contacts:

- **SX** (terminals 1 - 2) : detection of the status of C/B (C/B closed when 1-2 shorted).
- **BF** (terminals 1 - 14) : it blocks the operation of the synchrocheck output relays and when removed starts the timing **[to]**.

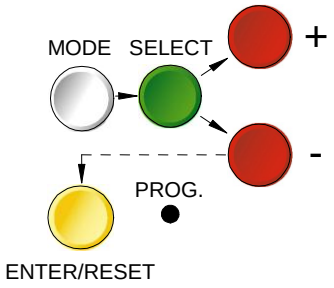
## 8. TEST

Besides the normal "WATCHDOG" and "POWERFAIL" functions, a comprehensive program of self-test and self-diagnostic provides:

- Diagnostic and functional test, with checking of program routines and memory's content, run every time the aux. power is switched-on: the display shows the type of relay and its version number.
- Dynamic functional test run during normal operation every 15 min. (relay's operation is suspended for less than ≤4ms). If any internal fault is detected, the display shows a fault message, the Led "PROG/IRF" illuminates and the relay R5 is deenergized.
- Complete test activated by the keyboard or via the communication bus either with or without tripping of the output relays.

## 9. KEYBOARD AND DISPLAY OPERATION

All controls can be operated from relay's front or via serial communication bus.
The keyboard includes five hand operable buttons **(MODE) - (SELECT) - (+) - (-) - (ENTER/RESET)** plus one indirect operable key **(PROG)** (see synoptic table a fig.1):




| | | | |
|---|---|---|---|
| a) - White key | **MODE** | : | when operated it enters one of the following operation modes indicated on the display : |
| | **MEASURES** | = | Reading of all the parameters measured and of those recorded in the memory |
| | **SET DISP** | = | Reading of the settings and of the configuration of the output relays as programmed. |
| | **PROG** | = | Access to the programming of the settings and of relay configuration. |
| | **TEST PROG** | = | Access to the manual test routines. |
| b) - Green key | **SELECT** | : | When operated it selects one of the menus available in the actual operation MODE |
| c) - Red key | "**+**" AND "**-**" | : | When operated they allow to scroll the different information available in the menu entered by the key SELECT |
| d) - Yellow key | **ENTER/RESET** | : | It allows the validation of the programmed settings<br>- the actuation of test programs<br>- the forcing of the default display indication<br>- the reset of signal Leds. |
| e) - Indirect key | ● | : | Enables access to the programming. |

## 10. READING OF MEASUREMENTS AND RECORDED PARAMETERS

Enter the MODE "MEASURE", SELECT the menus "ACT.MEAS"-"LAST EVT"-"EVT. N°", scroll available information by key "+" or "-" .

### 10.1 ACT.MEAS

Actual values as measured during the normal operation. The values displayed are continuously refreshed.

| Display | | | Description |
|---|---|---|---|
| **xxXXXxx** | | | Date : Day, Month, Year |
| **xx:xx:xx** | | | Hour : Hours, Minutes, Seconds |
| **UL** | xxx | **%Un** | Line voltage measured at input UL (terminals 25-26) |
| **BU** | xxx | **%Un** | Bus voltage measured at input BU (terminals 29-30) |
| **1Hz** | xxxxx | | Line frequency measured at input UL |
| **BHz** | xxxxx | | Bus frequency measured at input BU |
| **ΔU** | xx | **%BU** | Voltage difference \| UL-BU \| |
| **Δf** | xxx | **Hz** | Frequency difference \| Lf-Bf \| |
| **α** | xxxxx | **°** | Phase displacement angle between UL-BU |

### 10.2 LASTEVT

Display of the function which caused the last pick-up of any output relay plus values of the parameters at the moment of tripping. The memory buffer is refreshed at each new relay pick-up.

| Display | | | Description |
|---|---|---|---|
| **xxXXXxx** | | | Date : Day, Month, Year |
| **xx:xx:xx** | | | Hour : Hours, Minutes, Seconds |
| **EVT** | xxxx | | SX, tU>, tU<, tf>, tf<. |
| **BU** | xxx | **%Un** | As recorded at the moment of the last pick-up command |
| **BHz** | xxxxx | | As recorded at the moment of the last pick-up command |
| **ΔU** | xx | **%BU** | As recorded at the moment of the last pick-up command |
| **Δf** | xxx | **Hz** | As recorded at the moment of the last pick-up command |
| **α** | xxxxx | **°** | As recorded at the moment of the last pick-up command |

### 10.3 EVT. N°

Counters of the number of operations for each of the relay functions.
The N° is increased at each next operation of the function.
The memory is non-volatile and can be cancelled only with a secret procedure.

| Display | | Description |
|---|---|---|
| **SX** | xxxxx | Closing command to C/B |
| **tU>** | xxxxx | Tripping of time delayed overvoltage element |
| **tU<** | xxxxx | Tripping of time delayed undervoltage element |
| **tf>** | xxxxx | Tripping of time delayed overfrequency element |
| **tf<** | xxxxx | Tripping of time delayed underfrequency element |

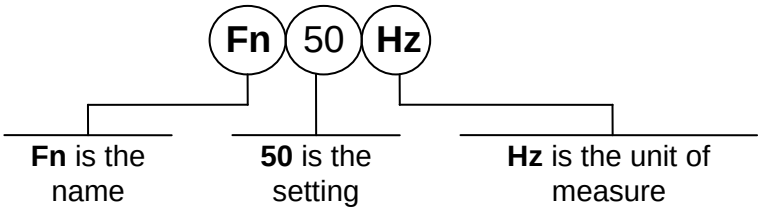
## 11. READING OF PROGRAMMED SETTINGS AND RELAY'S CONFIGURATION

Enter the mode "SET DISP", select the menu "SETTINGS" or "F→RELAY", scroll information available in the menu by keys "+" or "-".
SETTINGS= values of relay's operation parameters as programmed
F→RELAY= output relay associated to the different functions as programmed.

## 12. PROGRAMMING

The relay is supplied with the standard default programming used for factory test [ Values here below reported in the " Display " column ].
All parameters can be modified as needed in the mode PROG and displayed in the mode SET DISP
As soon as programming is enabled, the Led PRG/IRF flashes and the relay R5 is deenergized.
Operation of the synchrocheck is blocked during programming.
**Programming via the serial port is always enabled but a password is required to access the programming mode. The default password is the null string; in the standard application program for communication "MS-COM" it is also provided an emergency password which can be disclosed on request only.** Enter MODE "PROG" and SELECT either "SETTINGS" for programming of parameters or "F→RELAY" for programming of output relays configuration; enable programming by the indirect operation key PROG.
The key SELECT now scrolls the available parameters. By the key (+) , (-) the displayed values can be modified; to speed up parameter's variation press the key SELECT while "+" or "-" are pressed.
Press key "ENTER/RESET" to validate the set values.

### 12.1 - PROGRAMMING OF FUNCTIONS SETTINGS



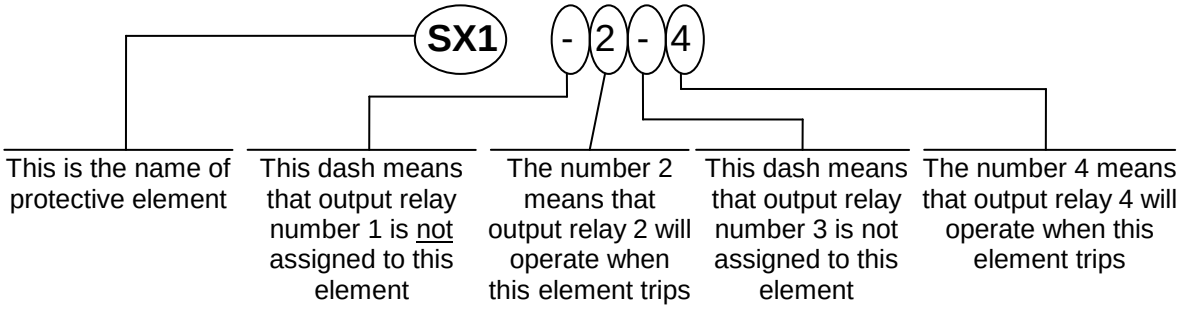

Mode PROG menu SETTINGS. (Production standard settings here under shown).

| Display | | | Description | Setting Range | Step | Unit |
|---|---|---|---|---|---|---|
| **xxxxxxx** | | | Current date | DDMMMYY | - | - |
| **xx:xx:xx** | | | Current time | HH:MM:SS | - | - |
| **Fn** | 50 | **Hz** | Mains frequency | 50 or 60 | 10 | Hz |
| **UnS** | 100 | **V** | Rated input voltage | 100 - 240 | 1 | V |
| **U<** | 85 | **%Un** | Minimum Bus voltage (Line voltage if Dead Bus detected) to allow C/B closure, system undervoltage level when at least one C/B closed. | 15 - 120 | 1 | %Un |
| **tU<** | 5.0 | **s** | Trip time delay of undervoltage function. If no C/B closed timer is not started | 0.1 - 30 | 0.1 | s |
| **U>** | 110 | **%Un** | Maximum Bus voltage (Line voltage if Dead Bus detected) to allow C/B closure, system overvoltage level when at least one C/B closed. | 20 - 150 | 1 | %Un |
| **tU>** | 5.0 | **s** | Trip time delay of overvoltage function. If no C/B closed timer is not started. | 0.1 - 30 | 0.1 | s |

| Display | | | Description | Setting Range | Step | Unit |
|---|---|---|---|---|---|---|
| **f<** | 49.5 | **Hz** | Minimum Bus frequency (Line frequency if Dead Bus detected) to allow C/B closure, system underfrequency level when at least one C/B closed. | 45 - 60 | 0.1 | Hz |
| **tf<** | 10.0 | **s** | Trip time delay of underfrequency function. If no C/B closed timer is not started. | 0.1 - 30 | 0.1 | s |
| **f>** | 50.5 | **Hz** | Maximum Bus frequency (Line frequency if Dead Bus detected) to allow C/B closure, system overfrequency level when at least one C/B closed. | 50 - 65 | 0.1 | Hz |
| **tf>** | 10.0 | **s** | Trip time delay of overfrequency function. If no C/B closed timer is not started. | 0.1 - 30 | 0.1 | s |
| **DB** | OFF | | Dead Bus operation allowed (ON) or not (OFF). (see § 2.2) | ON - OFF | - | - |
| **DL** | OFF | | Dead Line operation allowed (ON) or not (OFF). (see § 2.2) | ON - OFF | - | - |
| **ΔU** | 10 | **%BU** | Maximum permissible voltage difference for closing of C/B. Not considered when Dead Bus, (BU<5%Un) or Dead Line (UL<5%Un) condition is detected | 1 - 20 | 1 | %BU |
| **Δf** | 0.20 | **Hz** | Maximum permissible frequency difference for closing of C/B. Not considered when Dead Bus, (BU<5%Un) or Dead (UL<5%Un) condition is detected. | 0.02 - 0.5 | 0.01 | Hz |
| **1α** | 15° | | Maximum permissible displacement angle UL/BU for closing C/B. Not considered if DB or DL1 condition is detected. | 3 - 30 | 1 | ° |
| **ts** | 10.0 | **s** | Minimum permanence time of voltage and frequency closing conditions to start checking of angle (see § 2.3). | 0 - 60 | 0.1 | s |
| **tk** | 5.0 | **s** | Time after which closing is forced if angle remains steady within the max. permissible without searching $\alpha_{CB}$ (automatic adjusted angle) (see § 2.3) | 0.1 - 30 - Dis | 0.1 | s |
| **tcb** | Dis | | Closing time of C/B for automatic adjusting of the closing angle (see § 2.3.1) | 0.05 - 0.5 - Dis | 0.01 | s |
| **to** | 5 | **s** | Minimum reclose time (see § 2.3). | 0 - 600 | 1 | s |
| **Tsyn** | Dis | **m** | Synchronisation Time Expected time interval between sync. pulses. | 5 - 60 - Dis | 5-10<br>15-30<br>60-Dis | m |
| **NodAd** | 1 | | Identification number for connection on serial communication bus | 1 - 250 | 1 | - |

**The setting Dis indicates that the function is disactivated.**

## 12.2 - PROGRAMMING THE CONFIGURATION OF OUTPUT RELAYS




Mode PROG menu F→RELAY (Production standard settings here under shown).
The key "**+**" operates as cursor; it moves through the digits corresponding to the four programmable relays in the sequence 1,2,3,4,(1= relay R1, etc.) and makes start flashing the information actually present in the digit. The information present in the digit can be either the number of the relay (if this was already associated to the function actually on programming) or a dot (-) if the relay was not yet addressed.
The key "**-**" changes the existing status from the dot to the relay number or viceversa.

| Display | | Description |
|---|---|---|
| **SX** | 1 - - - | Closing command of C/B. |
| **tU<** | - 2 - - | Time delayed undervoltage. |
| **tU>** | - - - 4 | Time delayed overvoltage. |
| **tf<** | - 2 - - | Time delayed underfrequency. |
| **tf>** | - - - 4 | Time delayed overfrequency. |
| **R1tr** | Aut | Reset time delay of output relay R1 can be :<br>- instantaneous (R1tr = Aut.)<br>(*) - time delayed (R1tr = 0,1- 9,9 s) step 0,1s<br>- manual (R1tr = Man.)<br>**(*) Selection is made via the keys +/-** |
| **R2tr** | Aut. | As above for relay R2. |
| **R3tr** | Aut. | As above for relay R3. |
| **R4tr** | Aut. | As above for relay R4. |

## 13. MANUAL TEST OPERATION

### 13.1 Mode "TESTPROG" subprogram "W/O TRIP"

Operation of the yellow key activates a complete test of the electronics and the process routines. All the leds are lit-on and the display shows (TEST RUN).
If the test routine is successfully completed the display switches-over to the reading existing after the test. If an internal fault is detected, the display shows the fault identification code and the relay R5 is deenergized. This test can be carried-out even during the operation of the relay without affecting the relay tripping in case a fault takes place during the test itself.

### 13.2 Mode "TESTPROG" subprogram "WithTRIP"

Access to this program is enabled only if the current detected is zero (breaker open).
Pressing the yellow key the display shows "TEST RUN?". A second operation of the yellow key starts a complete test which also includes the activation of all the output relays.
The display shows (TEST RUN) with the same procedure as for the test with W/O TRIP.
Every 15 min during the normal operation the relay automatically initiates an auto test procedure (duration ≤ 10ms). If any internal fault is detected during the auto test, the relay R5 is deenergized, the relevant led is activated and the fault code is displayed.

- Further operation of key SELECT instead of the TEST programs gives the indication of the version and production date of the firmware.

**WARNING**

Running the **WithTRIP** test will operate all of the output relays. Care must be taken to ensure that no unexpected or harmful equipment operations will occur as a result of running this test.
It is generally recommended that this test be run only in a bench test environment or after all dangerous output connections are removed.

## 14. MAINTENANCE

No maintenance is required. Periodically a functional check-out can be made with the test procedures described under MANUAL TEST chapter. In case of malfunctioning please contact Microelettrica Scientifica Service or the local Authorised Dealer mentioning the relay's Serial No reported in the label on relays enclosure.

**WARNING**

In case of Internal Relay Fault detection, proceed as here-below indicated :

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

## 15. POWER FREQUENCY INSULATION TEST

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

## 16. ELECTRICAL CHARACTERISTICS

**APPROVAL: CE – RINA – UL and CSA approval File : E202083**
**REFERENCE STANDARDS IEC 60255 - EN50263 - CE Directive - EN/IEC61000 - IEEE C37**

| | | | |
|---|---|---|---|
| ❑ | Dielectric test voltage | IEC 60255-5 | 2kV, 50/60Hz, 1 min. |
| ❑ | Impulse test voltage | IEC 60255-5 | 5kV (c.m.), 2kV (d.m.) – 1,2/50μs |
| ❑ | Insulation resistance | > 100MΩ | |

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

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

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

| | | | | | |
|---|---|---|---|---|---|
| ❑ | Electromagnetic emission | EN55022 industrial environment | | | |
| ❑ | Radiated electromagnetic field immunity test | IEC61000-4-3<br>ENV50204 | level 3 | 80-1000MHz<br>900MHz/200Hz | 10V/m<br>10V/m |
| ❑ | Conducted disturbances immunity test | IEC61000-4-6 | level 3 | 0.15-80MHz | 10V |
| ❑ | Electrostatic discharge test | IEC61000-4-2 | level 4 | 6kV contact / 8kV air | |
| ❑ | Power frequency magnetic test | IEC61000-4-8 | | 1000A/m | 50/60Hz |
| ❑ | Pulse magnetic field | IEC61000-4-9 | | 1000A/m, 8/20μs | |
| ❑ | Damped oscillatory magnetic field | IEC61000-4-10 | | 100A/m, 0.1-1MHz | |
| ❑ | Electrical fast transient/burst | IEC61000-4-4 | level 3 | 2kV, 5kHz | |
| ❑ | HF disturbance test with damped oscillatory wave (1MHz burst test) | IEC60255-22-1 | class 3 | 400pps, 2,5kV (m.c.), 1kV (d.m.) | |
| ❑ | Oscillatory waves (Ring waves) | IEC61000-4-12 | level 4 | 4kV(c.m.), 2kV(d.m.) | |
| ❑ | Surge immunity test | IEC61000-4-5 | level 4 | 2kV(c.m.), 1kV(d.m.) | |
| ❑ | Voltage interruptions | IEC60255-4-11 | | | |
| ❑ | Resistance to vibration and shocks | IEC60255-21-1 - IEC60255-21-2 10-500Hz 1g | | | |

**CHARACTERISTICS**

| | | | |
|---|---|---|---|
| ❑ | Accuracy at reference value of influencing factors | 2% In<br>0,2% On<br>2% +/- 10ms | for measure<br><br>for times |
| ❑ | Rated Voltage | Un = 100 – 125V, 50 – 60Hz | |
| ❑ | Voltage overload | 2 Un continuous | |
| ❑ | Burden on voltage input | 0.2 VA at Un | |
| ❑ | Average power supply consumption | 8.5 VA | |
| ❑ | Output relays | rating 5 A; Vn = 380 V<br>A.C. resistive switching = 1100W (380V max)<br>make = 30 A (peak) 0,5 sec.<br>break = 0.3 A, 110 Vcc,<br>L/R = 40 ms (100.000 op.) | |

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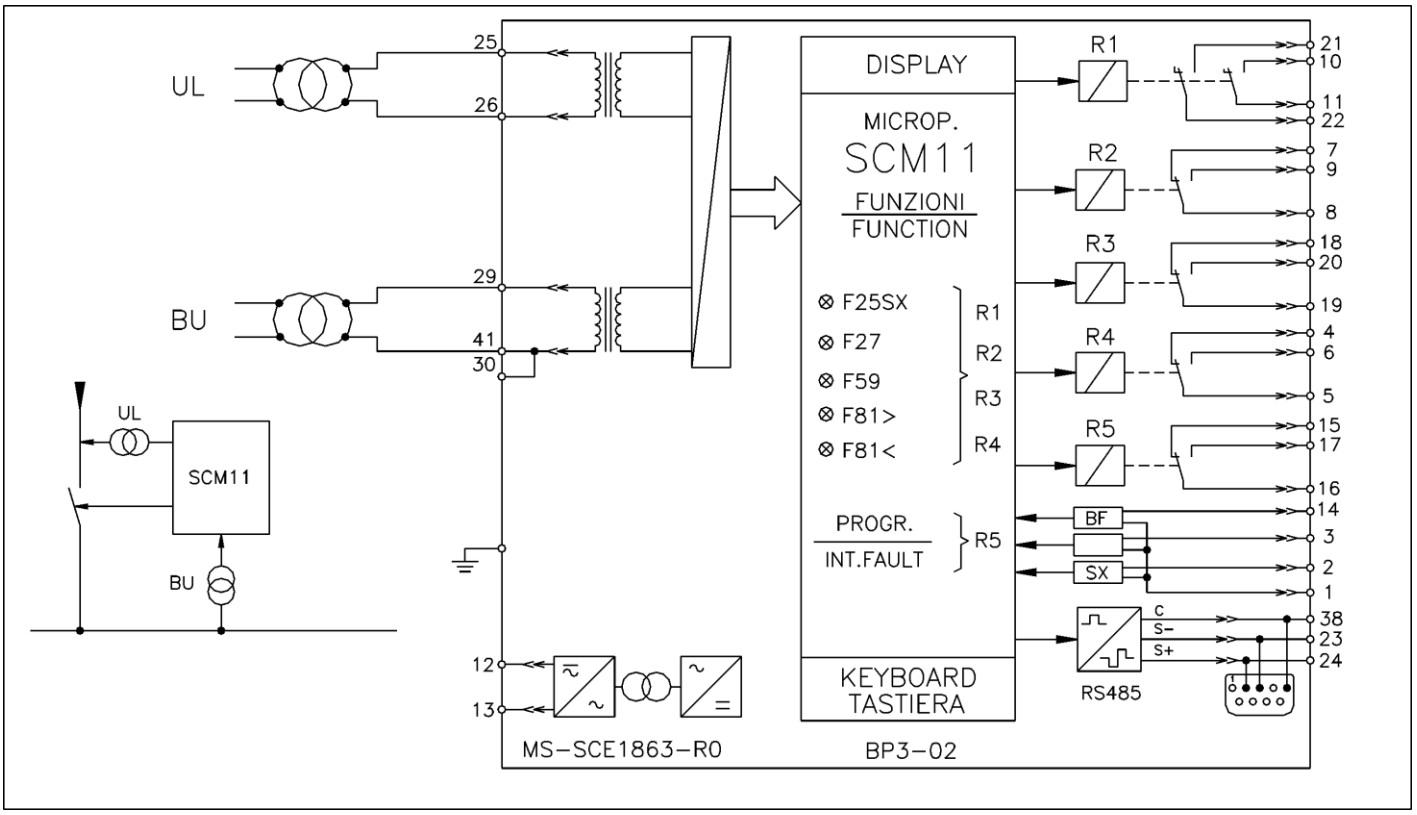
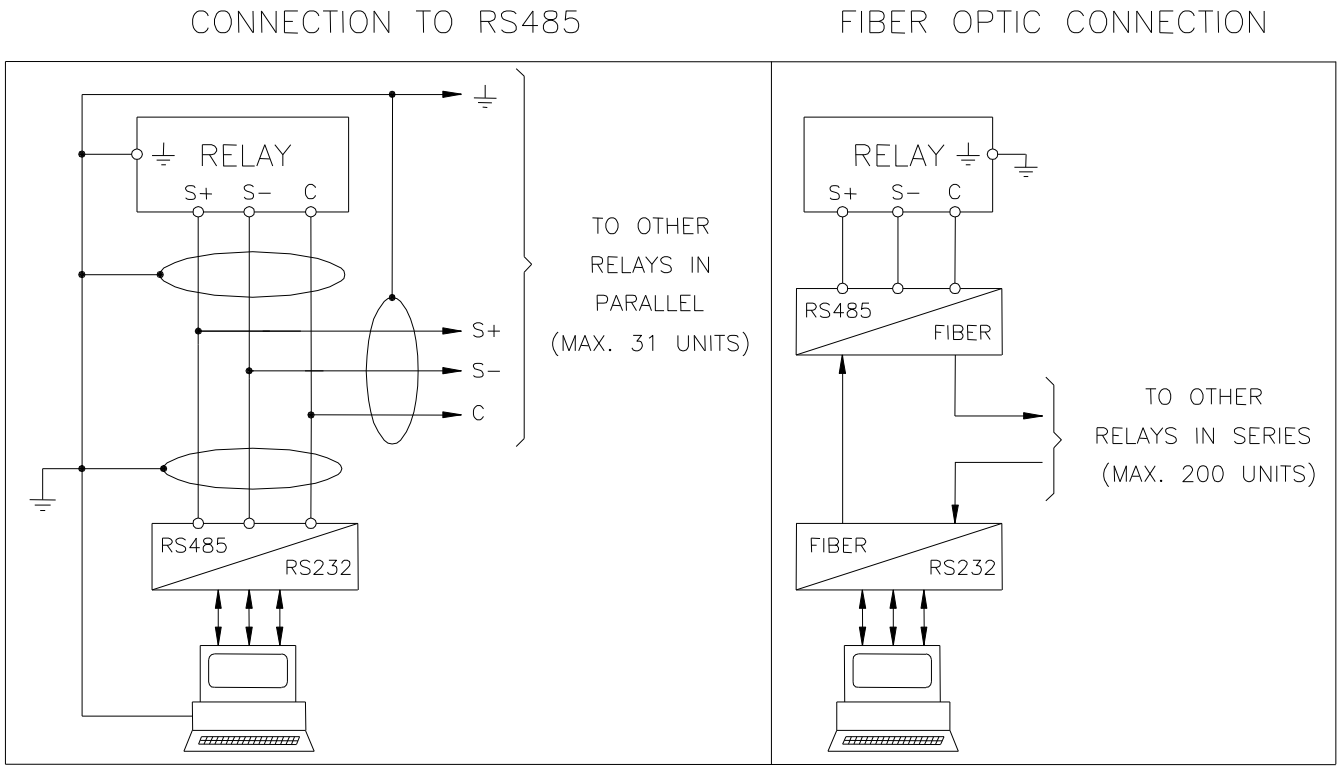
http://www.microelettrica.com **e-mail :** ute@microelettrica.com

*The performances and the characteristics reported in this manual are not binding and can modified at any moment without notice*

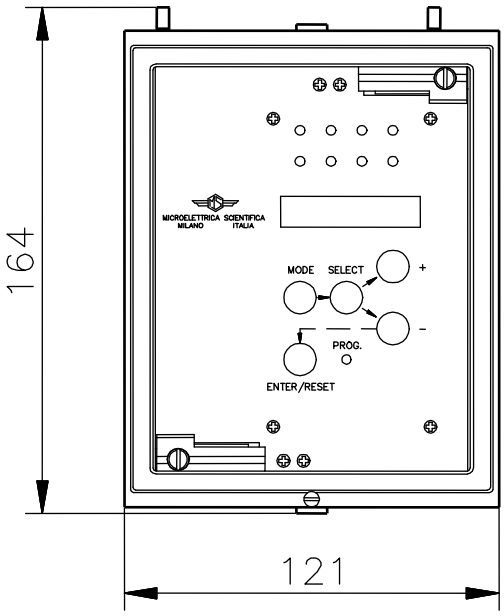
## 17. CONNECTION DIAGRAM (SCE1863 Rev.0)



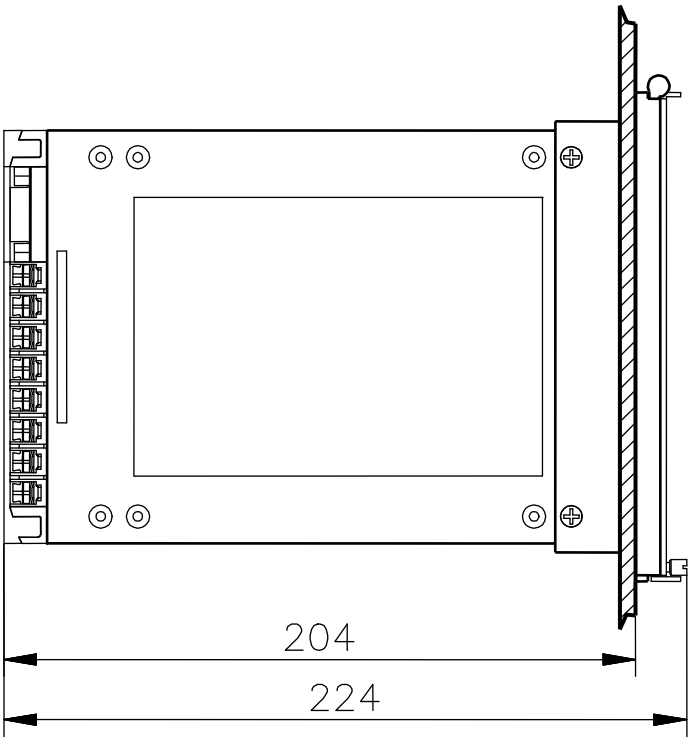

## 18. WIRING THE SERIAL COMMUNICATION BUS (SCE1309 Rev.0)

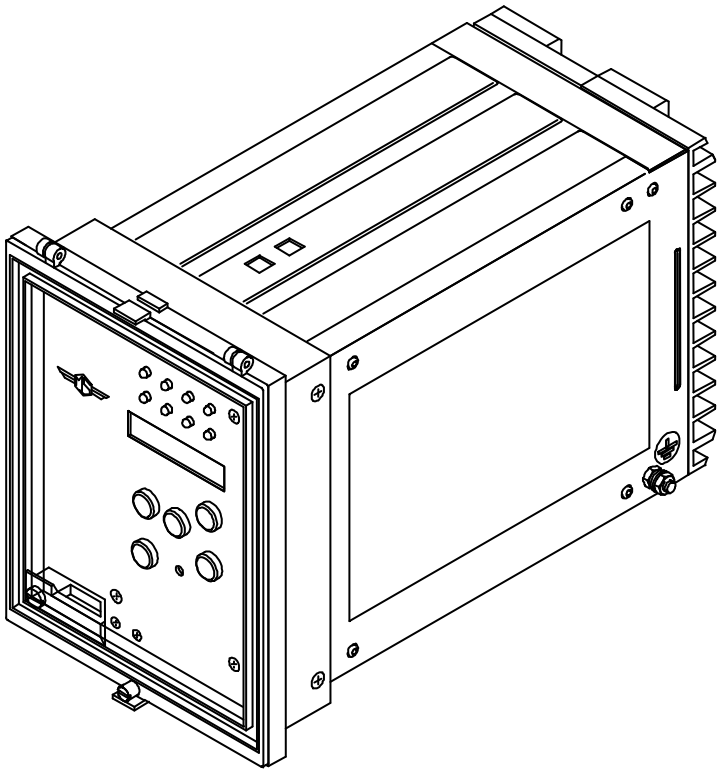


## 19. OVERALL DIMENSIONS

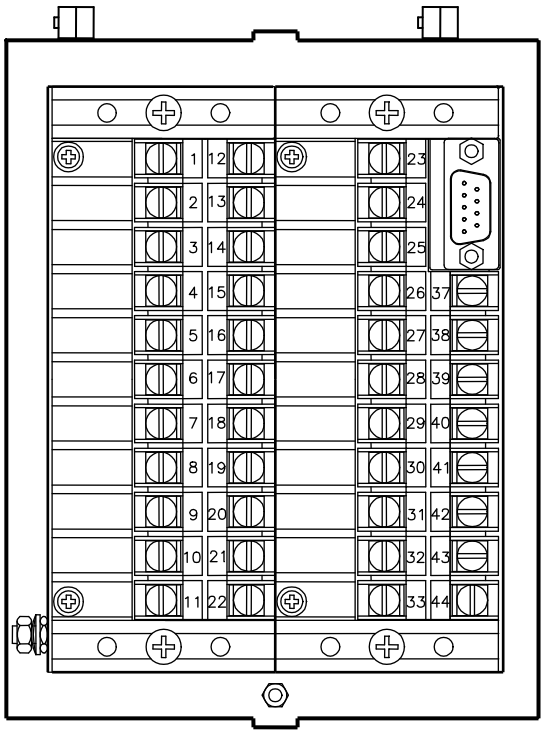



PANEL CUT-OUT 113x142 (LxH)



**View of Rear**
**Terminal Connection**



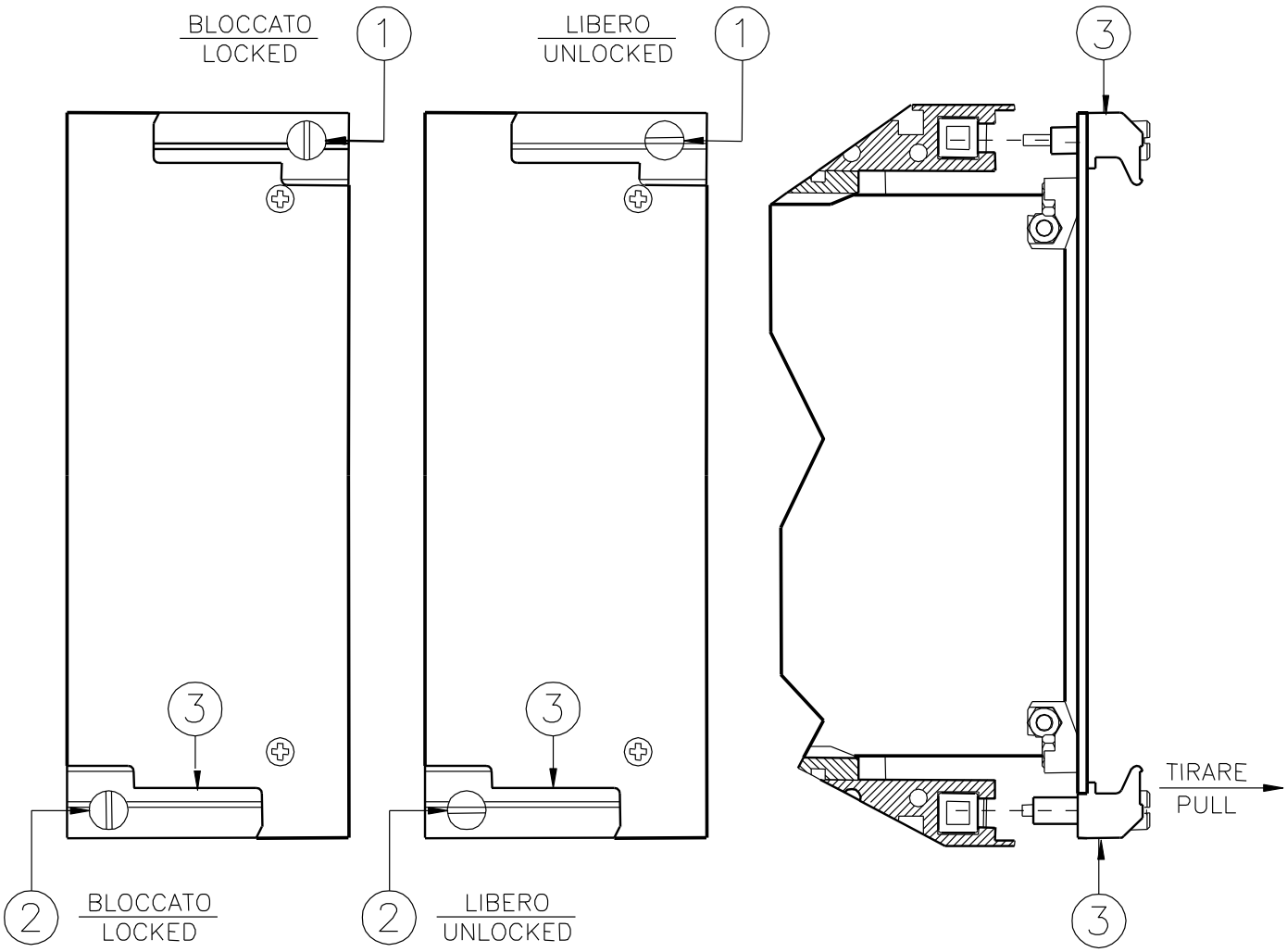
## 20. DIRECTION FOR PCB'S DRAW-OUT AND PLUG-IN

### 20.1 DRAW-OUT

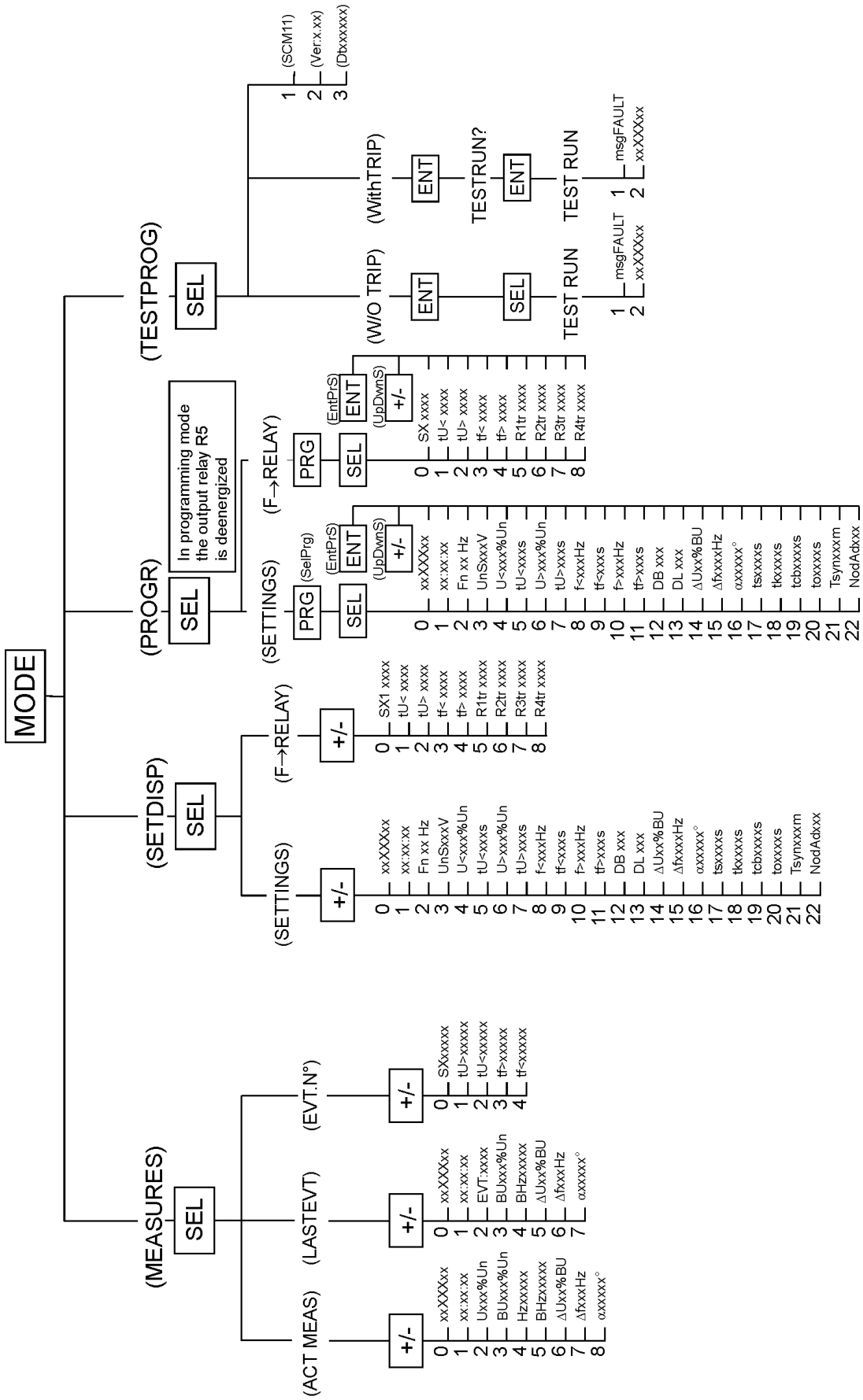
Rotate clockwise the screws ① and ② in the horizontal position of the screws-driver mark.
Draw-out the PCB by pulling on the handle ③

### 20.2 PLUG-IN

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



## 21. KEYBOARD OPERATIONAL DIAGRAM



## 22. SETTING'S FORM

| | | | | | |
|---|---|---|---|---|---|
| **Relay Type** | **SCM11** | **Station :** | | **Circuit :** | |
| **Date :** | **/ /** | **FW Version:** | | **Relay Serial Number :** | |
| **Power Supply** | ☐ 24V(-20%) / 110V(+15%) a.c. 24V(-20%) / 125V(+20%) d.c.<br>☐ 80V(-20%) / 220V(+15%) a.c. 90V(-20%) / 250V(+20%) d.c. | | | **Rated Voltage :** | |

**RELAY PROGRAMMING**

| Variable | Description | Setting Range | | Default Setting | Actual Setting | Test Result | |
|---|---|---|---|---|---|---|---|
| | | | | | | Pick-up | Reset |
| **xxxxxxx** | Current date | DDMMMYY | **-** | random | | | |
| **xx:xx:xx** | Current time | HH:MM:SS | **-** | random | | | |
| **Fn** | Mains frequency | 50 or 60 | **Hz** | 50 | | | |
| **UnS** | Rated input voltage | 100 - 240 | **V** | 100 | | | |
| **U<** | Minimum Bus voltage | 15 - 120 | **%Un** | 85 | | | |
| **tU<** | Trip time delay of undervoltage function. | 0.1 - 30 | **s** | 5.0 | | | |
| **U>** | Maximum Bus voltage | 20 - 150 | **%Un** | 110 | | | |
| **tU>** | Trip time delay of overvoltage function. | 0.1 - 30 | **s** | 5.0 | | | |
| **f<** | Minimum Bus frequency | 45 - 60 | **Hz** | 49.5 | | | |
| **tf<** | Trip time delay of underfrequency function. | 0.1 - 30 | **s** | 10.0 | | | |
| **f>** | Maximum Bus frequency | 50 - 65 | **Hz** | 50.5 | | | |
| **tf>** | Trip time delay of overfrequency function. | 0.1 - 30 | **s** | 10.0 | | | |
| **DB** | Dead Bus operation allowed (ON) or not (OFF) | ON - OFF | **-** | OFF | | | |
| **DL** | Dead Line operation allowed (ON) or not (OFF) | ON - OFF | **-** | OFF | | | |
| **ΔU** | Max. permissible voltage diff. for closing of C/B. | 1 - 20 | **%BU** | 10 | | | |
| **Δf** | Maximum permissible frequency difference for closing of C/B. | 0.02 - 0.5 | **Hz** | 0.20 | | | |
| **α** | Maximum permissible displacement angle 1U/BU for closing C/B. | 3 - 30 | **°** | 15 | | | |
| **ts** | Minimum permanence time of voltage and frequency closing conditions to start checking of angle | 0 - 60 | **s** | 10.0 | | | |
| **tk** | Time after which closing is forced if angle remains steady within the max. permis. without searching $\alpha_{CB}$ | 0.1 - 30 - Dis | **s** | 5.0 | | | |
| **tcb** | Closing time of C/B for automatic adjusting of the closing angle | 0.05-0.5-Dis | **s** | Dis | | | |
| **to** | Minimum reclose time | 0 - 600 | **s** | 5 | | | |
| **Tsyn** | Synchronisation Time | 5 - 60 - Dis | **m** | Dis | | | |
| **NodAd** | Identification number for serial connection | 1 - 250 | - | 1 | | | |

**CONFIGURATION OF OUTPUT RELAYS**

| Default Setting | | | | | | Actual Setting | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Prot Elem. | Output Relays | | | | Description | Prot. Elem. | Output Relays | | | | |
| **SX** | 1 | - | - | - | Closing command of C/B | **SX** | | | | | |
| **tU<** | - | 2 | - | - | Time delayed undervoltage | **tU<** | | | | | |
| **tU>** | - | - | - | 4 | Time delayed overvoltage | **tU>** | | | | | |
| **tf<** | - | 2 | - | - | Time delayed underfrequency | **tf<** | | | | | |
| **tf>** | - | - | - | 4 | Time delayed overfrequency | **tf>** | | | | | |
| **R1tr** | Aut | | | | Reset time delay of output relay R1 | **R1tr** | | | | | |
| **R2tr** | Aut | | | | Reset time delay of output relay R2 | **R2tr** | | | | | |
| **R3tr** | Aut | | | | Reset time delay of output relay R3 | **R3tr** | | | | | |
| **R4tr** | Aut | | | | Reset time delay of output relay R4 | **R4tr** | | | | | |

**Commisioning Engineer :** _____ **Date:** _____

**Customer Witness :** _____ **Date :** _____