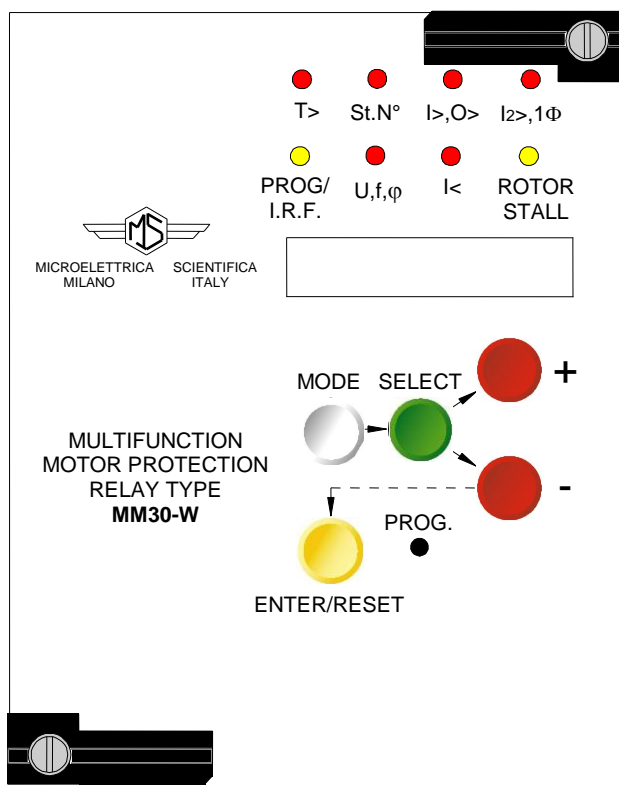


MICROPROCESSOR MOTOR PROTECTION RELAY

TYPE MM30-W

OPERATION MANUAL



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1. General utilization and commissioning directions

Always make reference to the specific description of the product and to the Manufacturer's instruction.

Carefully observe the following warnings.

1.1 STORAGE AND TRANSPORTATION,

must comply with the environmental conditions stated on the product's instruction or by the applicable IEC standards.

1.2 INSTALLATION,

must be properly made and in compliance with the operational ambient conditions stated by the Manufacturer.

1.3 ELECTRICAL CONNECTION,

must be made strictly according to the wiring diagram supplied with the Product, to its electrical characteristics and in compliance with the applicable standards particularly with reference to human safety.

1.4 MEASURING INPUTS AND POWER SUPPLY,

carefully check that the value of input quantities and power supply voltage are proper and within the permissible variation limits.

1.5 OUTPUTS LOADING,

must be compatible with their declared performance.

1.6 PROTECTION EARTHING

When earthing is required, carefully check its 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.

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- 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

Input currents are supplied to 3 current transformers: - two measuring phase current (the third current is computed as vector sum of the two others) - one measuring the earth fault zero-sequence current. Phase current rated input can be 1 or 5A (Selectable by movable bridges an relay card) For zero-sequence current taps for 1A and 5A input are provided on relay's terminal board. Phase-to-phase voltage input is supplied to one voltage transformer. Rated input voltage can be adjusted from 100 to 125V – 50 or 60Hz. Make electric connection in conformity with the diagram reported on relay's enclosure. Check that input currents are same as reported on the diagram and on the test certificate. The auxiliary power is supplied by a built-in interchangeable module fully isolated an self protected.

2.1 POWER SUPPLY

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

- | | | | |
|--------|-----------------------------|--------|-----------------------------|
| a) - { | { | b) - { | { |
| | 24V(-20%) / 110V(+15%) a.c. | | 80V(-20%) / 220V(+15%) a.c. |
| | 24V(-20%) / 125V(+20%) d.c. | | 90V(-20%) / 250V(+20%) d.c. |

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

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2.2 - 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.

2.2.1 - 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 10th, 98, then the clock is set to 20:00:00 January the 10th, 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 10th 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.

2.2.2 - 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.

2.2.3 - 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.

2.2.4 - 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.

2.2.5 - Time tolerance.

During power on, time tolerance depends on the on board crystal (+/-50ppm typ, +/-100ppm max. over full temperature range).

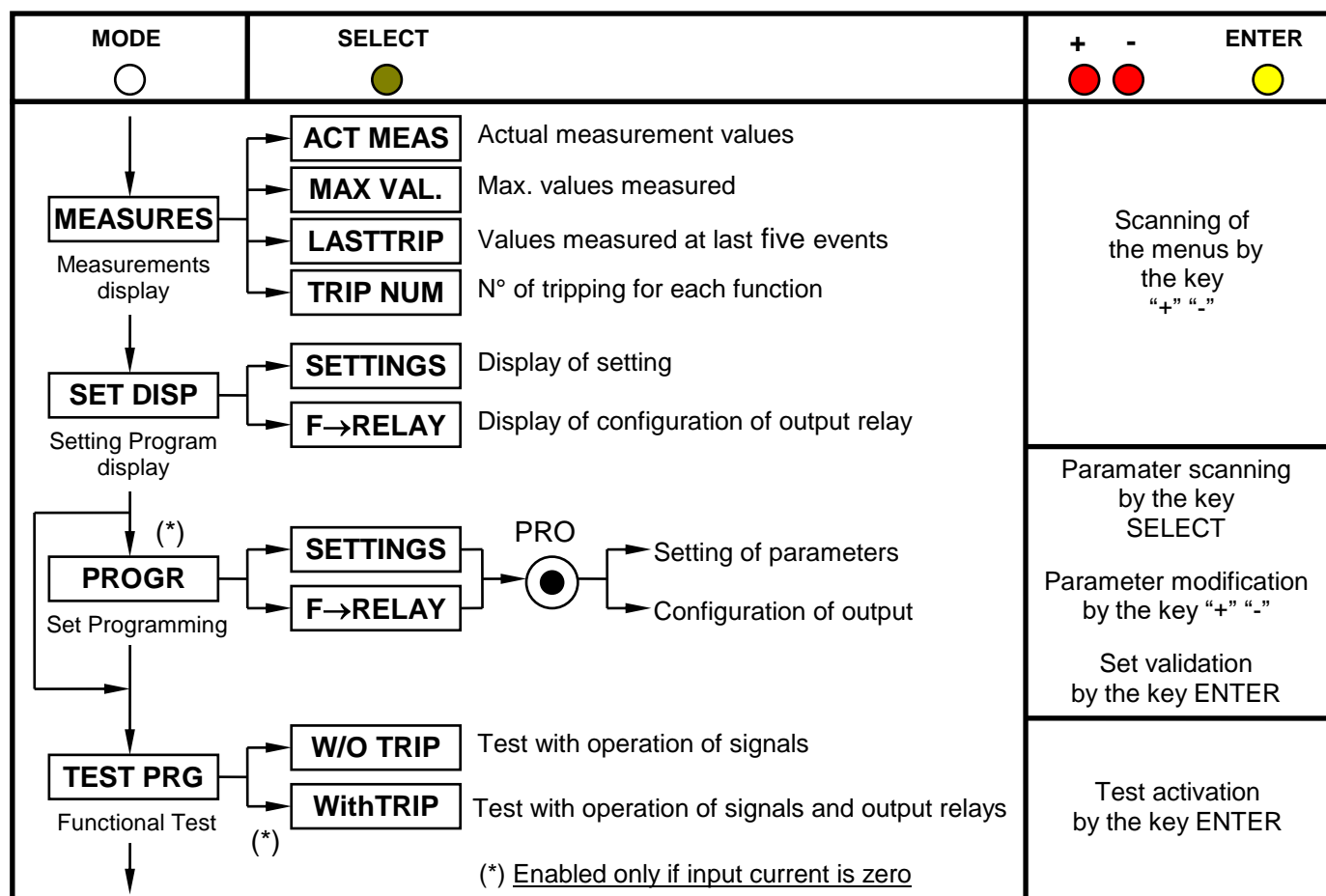
During power off, time tolerance depends on the RTC's oscillator (+65 /-270 ppm max over full temperature range).

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)

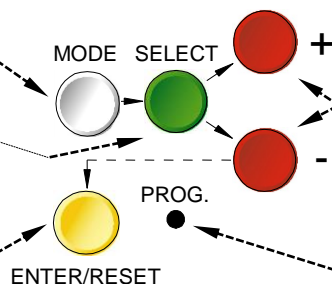
FIG.1



Pressing this button progressively selects between Measurements Display, Setting Display, Programming, and Test modes

The SELECT button chooses which category of values within the chosen mode to display

When in Program mode, this button stores the newly selected value. If not in Program mode and the relay has tripped, this button resets the relay and all output contacts. If not tripped, this button restores the default display.

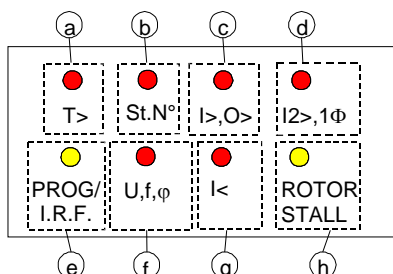


The + and - buttons are used to select the actual measurement or display desired when in Measurements Display or Settings Display modes. When in Program mode, these buttons increase or decrease the value of the displayed setting.

When in Program mode, and when all input currents are zero, pressing this recessed button places the relay into active programming mode, allowing any or all of the relay's settings to be altered.

4. SIGNALIZATIONS

Eight signal leds (normally off) are provided:



a)	Red LED	T>	<input type="checkbox"/> Flashing when motor heating exceeds the set alarm level [Ta]. <input type="checkbox"/> Illuminated on overheating trip and/or activation of RTD input.
b)	Red LED	St.N°	<input type="checkbox"/> Flashing after tripping of the consecutive starts number limitation element [St.N°] during the restart inhibition time [tBSt] <input type="checkbox"/> Illuminated after tBSt expiry.
c)	Red LED	I>,O>	<input type="checkbox"/> Flashing when the minimum pick-up level of the overcurrent element [I>] and/or the Earth Fault element [O>] is exceeded. <input type="checkbox"/> Illuminated on tripping of the I> or O> element at the end of the relevant time delay [tI>] or [tO>].
d)	Red LED	I2>,1Φ	<input type="checkbox"/> Flashing when negative sequence current exceeds the set minimum pick-up level [I2>]. <input type="checkbox"/> Illuminated on tripping of the unbalance inverse time element [tI2>] or of the single phasing element [1Φ].
e)	Yellow LED	PROG/I.R.F.	<input type="checkbox"/> Flashing during the programming of the parameters. <input type="checkbox"/> Illuminated on Internal Relay Fault detection.
f)	Red LED	U,f,φ	<input type="checkbox"/> Flashing when any of the voltage and/or frequency and/or Power Factor control elements starts operating. <input type="checkbox"/> Illuminated on tripping of any of the U,f, Power Factor element at the end of the relevant time delay.
g)	Red LED	I<	<input type="checkbox"/> Flashing when motor current drops below the no-load running level [I<]. <input type="checkbox"/> Illuminated on tripping at the end of the 3 sec time delay
h)	Yellow LED	ROTOR STALL	<input type="checkbox"/> Illuminated on tripping of the Locked Rotor element [ILR] or of the Rotor Stall element [tTr].

The leds reset takes place as follows:

- ☐ From flashing to off, automatically when the flashing cause disappears.
- ☐ From Steady light to off by Enter/Reset push button (if the lit-on cause is cleared)



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5. OUTPUT RELAYS

The unit MM30-W includes four (R1, R2, R3, R4) user programmable plus one diagnostic (R5) output relays.

In the version MM30-WX the number of output relays can be increased by the addition of one or two optional Relay Expansion modules REX-8.

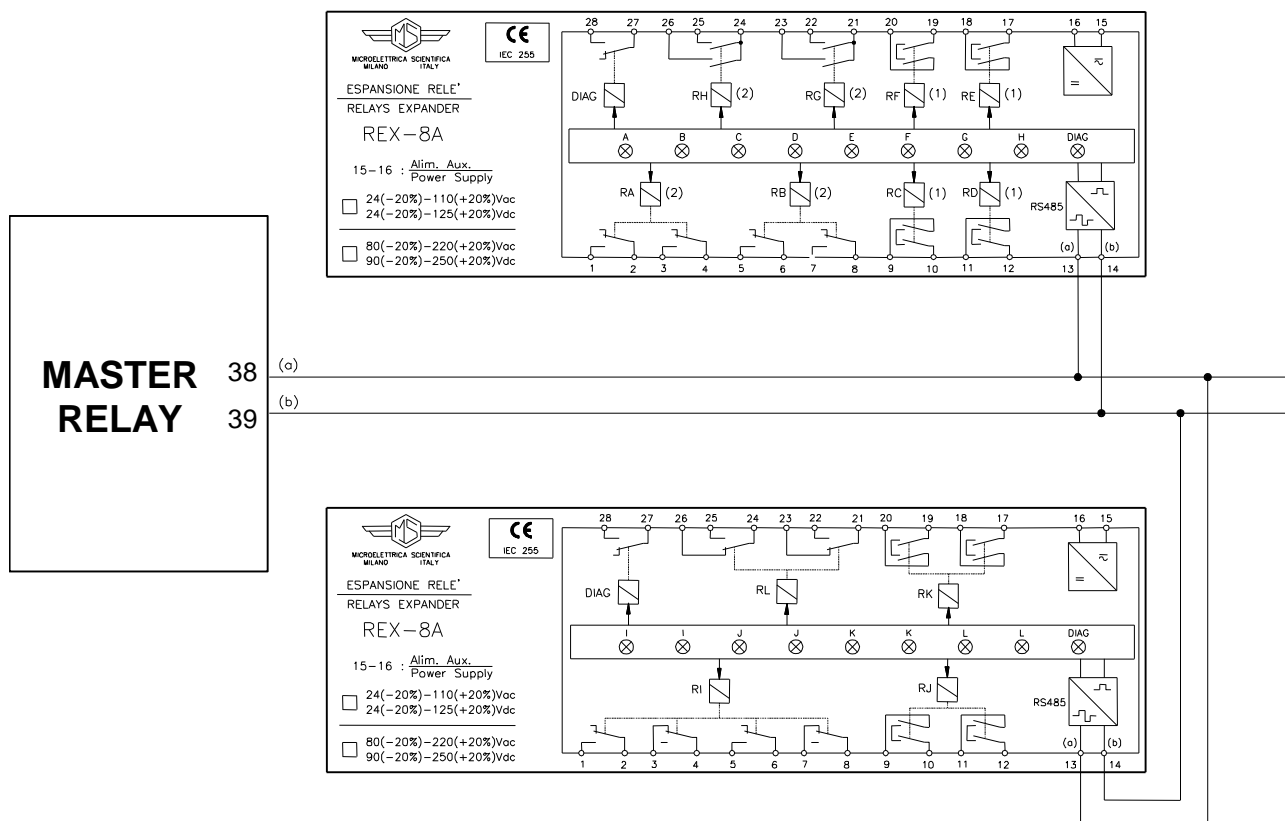
The modules REX-8 are for protruding mounting and are controlled by the master module MM30-WX via a screened twisted pair of cables connecting dedicated RS485 serial ports (see diagram herebelow).

The module REX-8 includes eight (RA, RB, RC, RD, RE, RF, RH, RG) user programmable plus one (R-Diag) diagnostic output relays

The master module MM30-W can control altogether up to sixteen output relays

- 4 internal R1 – R2 – R3 – R4
- 8 from the first optional REX-8 module RA – RB – RC – RD – RE – RF – RG – RH
- 4 from a second optional REX-8 module RI(RA+RB) – RJ(RC+RD) – RK(RE+RF) – RL(RG+RH)

This second unit REX-8 is configured (by internal Dip-Switch) to operate the eight relays two by two in parallel (only four user programmable outputs with double number of available contacts)



Any of the functions featured by the MM30-W can be programmed to control up to four out of the sixteen user programmable output relays

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The user programmable relays (all but R5, DIAG) are normally deenergized, i.e. energized on trip. These relays pick-up as soon as the tripping cause appears (relays controlled by the instantaneous functions) or at the end of the set trip time delay (relays controlled by time delayed functions).

The reset after trip takes place automatically as soon as the relevant tripping cause has been cleared.

The relays R5, R DIAG are not user programmable; they are normally energized and get deenergized on :

R5 { - internal fault of MM30-W { - MM30-W power supply failure { - during the programming	R DIAG	{ - Internal fault of REX-8 { - REX-8 power supply failure { - Interruption/fault on the serial control communication
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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 download 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 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.

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7. DIGITAL INPUTS

The relay is fitted with three digital inputs activated when the relevant terminals are shorted by a cold contact :

- **R.T.** (terminals 1-2) Remote Trip control.
Activation of the input R.T. (Terminals 1-2 shorted) produces the following operation :
 - ☐ The output relay associated to the function R.T. is energized
 - ☐ The Trip Number Counter R.T. is incremented by 1 unit
 - ☐ The event recording is activated and shows "CAUSE: RT"

- **S.p.C.** (terminals 1-3) Speed switch control.
The Speed Control input is connected to an external N/O contact which closes as soon as the motor is running. If the contact does not close within the set start time [tst] from the moment the motor is energised, the Locked Rotor function is tripped. The relay and the signal led associated to ILR are energised, the recording on Last Trip will show cause SpC and trip N° LR will be increased.
If the Speed Control function is not used, it must be deactivated by programming the variable [Spc] = OFF (see § 12.1)

- **RTD** (terminals 1-14) Thermal probe.
This function is enabled by programming the variable [RTD] = ON (see § 12.1)
If the function is enabled, the input RTD is activated when the resistance connected to the terminals 1-14 exceeds the limits $50\Omega > R_{1-14} > 2900\Omega$. This limits respectively correspond to "Shorted Probe" ($<50\Omega$) or to "Overtemperature" ($R > 2900\Omega$)
In this case activation of the input 1-14 (terminals shorted) produces the following operation:
 - ☐ The relay associated to R.T. is energized
 - ☐ The Led T> is lit-on.
 - ☐ The counter of Trip Number of the function T> is incremented
 - ☐ LastTrip recording shows : "CAUSE RTD"

N.B.

If the RTD input is not used, a resistor of any value from 100 through 1000 Ohm rated $>0.5W$ must be connected across the terminals 1-14

8. TEST

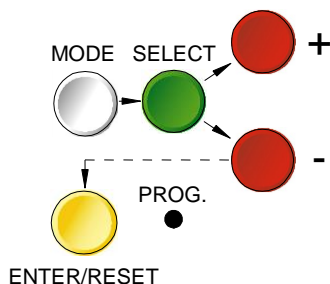
Besides the normal "WATCHDOG" and "POWERFAIL" functions, a comprehensive program of self-test and self-diagnostic provides:

- ☐ 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 10 ms). 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 <ul style="list-style-type: none"> <input type="checkbox"/> the actuation of test programs <input type="checkbox"/> the forcing of the default display indication <input type="checkbox"/> the reset of signal Leds.
e) - Indirect key	●	:	Enables access to the programming.

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10. READING OF MEASUREMENTS AND RECORDED PARAMETERS

Enter the MODE "MEASURE", SELECT the menus "ACT.MEAS"-"MAX VAL"-"LASTTRIP"-"TRIP NUM", scroll available information by key "+" or "-" .

10.1 - ACT.MEAS

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

Display	Description
xxXXXxx	Date : Day, Month, Year
xx:xx:xx	Hour : Hours, Minutes, Seconds
T/Tnxxx%	Actual temperature rise displayed as % of the motor full load temperature rise (0 - 999%)
IAxxxxxA	True R.M.S. value of the current of phase A displayed as primary Amps. (0 - 99999)
IBxxxxxA	As above, phase B.
ICxxxxxA	As above, phase C.
IoxxxxxA	As above, earth fault current.
I1/mxxx%	Positive sequence component of motor current displayed as % of motor full load current. (0 - 999)%
I2/mxxx%	Negative sequence component of motor current displayed as % of motor full load current. (unbalance degree) (0 - 999)%
U xxxxxV	RMS Voltage displayed as primary volts (0 – 65000)
fxx.xxHz	Frequency (40 – 70)Hz
PFx.xxC	Power Factor (0.10 – 1.00) C = Lead / L = Lag
φ xxx°	Phase displacement
WxxxxxKW	Active Power (0 – 10000)kW
h xxxxx	Operation hours (0 – 65000)

10.2 - MAX VAL

Highest values recorded during motor run after the starting time (refreshed at each higher value) plus highest values recorded during the starting time (refreshed at each new starting).

Display	Description
T/Tnxxx%	Highest temperature recorded since the start of the run. (0 - 99,9)%
IAxxxxxA	Current of phase A measured during run after starting time (0-99999)
IBxxxxxA	As above, phase B.
ICxxxxxA	As above, phase C.
IoxxxxxA	As above, zero sequence current.
WxxxxxKW	As above, 3ph power
I1/mxxx%	Positive sequence component of motor current.
I2/mxxx%	Negative sequence component of motor current
SAxxxxxA	Current of phase A during the starting time.
SBxxxxxA	As above, phase B.
SCxxxxxA	As above, phase C.
SoxxxxxA	As above, earth fault current.
S1/mxxx%	Positive sequence current component during starting time.
S2/mxxx%	Negative sequence current component during starting time.
tStxxxxs	Measurement of the Motor Starting time.

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10.3 - LASTTRIP

Display of the function which caused the last tripping of the relay and values of the parameters at the moment of tripping. The memory buffer is refreshed at each new relay tripping.

Display	Description
LastTr-x	Indication of the recorded event (x= 0 to 4) Example: Last event (LastTr -0) Last but one event (LastTr-1) etc...
xxXXXxx	Date : Day, Month, Year
xx:xx:xx	Hour : Hours, Minutes, Seconds
Causexxx	Function which caused the last tripping: T>; Is>; I>; O>; I<; LR; StN; ITr; PF<; U>; U<; f>; f<; SpC; RTD; RT.
IAxxxxxIn	Current of phase A.
IBxxxxxIn	Current of phase B.
ICxxxxxIn	Current of phase C.
IoxxxxxOn	Earth fault current.
I1/mxxx%	Positive sequence component of current.
I2/mxxx%	Negative sequence component of current.
T/Tnxxx%	Motor heating
Uxx.xxUn	Phase-to-phase voltage
fxx.xxHz	Frequency
PFx.xxC	Power Factor (0.00 – 1.00) C = Lead / L = Lag

10.4 - TRIP NUM

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

Display	Description
T> xxxxx	Motor overload.
I2>xxxxx	Current unbalance.
I> xxxxx	Overcurrent.
O>xxxxx	Earth fault.
I< xxxxx	No load running.
LRxxxxx	Locked rotor.
StN>xxxx	No of consecutive startings.
ITr xxxx	Too long starting.
PF< xxxx	Low power factor.
U> xxxx	Overvoltage.
U< xxxx	Undervoltage
f> xxxx	Overfrequency
f< xxxx	Underfrequency
RT xxxx	Remote trip
1φ xxxx	Single phasing

11. READING OF PROGRAMMED SETTINGS AND RELAY'S CONFIGURATION

Enter the mode "SET DISP", select the menu "SETTINGS" or "F→RELAY", scroll information available in the menu by keys "+" or "-".

SETTINGS= values of relay's operation parameters as programmed

F→RELAY= output relays associated to the different functions as programmed.

12. PROGRAMMING

The relay is supplied with the standard default programming used for factory test. [Values here below reported in the " Display " column].

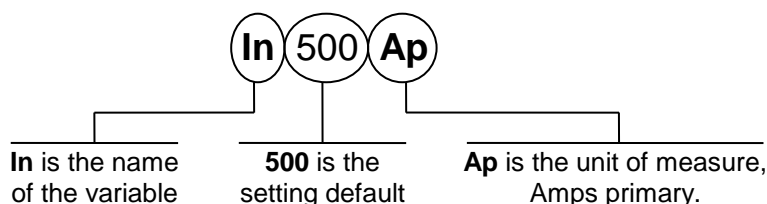
All parameters can be modified as needed in the mode PROG and displayed in the mode SET DISP **Local Programming by the front face key board is enabled only if no input current is detected (main switch open). Programming via the serial port is always enabled but a password is required to access the programming mode. The default password is the null string; in the standard application program for communication "MS-COM" it is also provided an emergency password which can be disclosed on request only.**

As soon as programming is enabled, the Led PRG/IRF flashes and the reclosing lock-out relay R5 is deenergized. Enter MODE "PROG" and SELECT either "SETTINGS" for programming of parameters or "F→RELAY" for programming of output relays configuration; enable programming by the indirect operation key PROG.

The key SELECT now scrolls the available parameters. By the key (+) , (-) the displayed values can be modified; to speed up parameter's variation press the key SELECT while "+" or "-" are pressed.

Press key "ENTER/RESET" to validate the set values.

12.1 - PROGRAMMING OF FUNCTIONS SETTINGS



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

Display	Description	Setting Range	Step	Unit
xxXXXxx	Current date	DDMMYY	-	-
xx:xx:xx	Current time	HH:MM:SS	-	-
NodAd 1	Identification number for connection on serial communication bus	1 - 250	1	1
Fn 50 Hz	Mains frequency	50 - 60	10	Hz
UP 1000V	Rated phase-to-phase system voltage (Primary voltage of system's PTs.)	100 - 32500	10	V
US 100V	Rated phase-to-phase system voltage (Secondary voltage of system's PTs.)	100 - 125	1	V
In 500Ap	Rated primary current of the phase C.Ts.	1 - 9999	1	Ap
On 500Ap	Rated primary current of the C.Ts. or of the tore C.T. detecting earth fault current	1 - 9999	1	Ap
Im 1.0In	Motor full-load current (p.u. of phase C.Ts. rated current)	0.1 – 1.5	0.01	In
Ist 6Im	Motor start-up current (p.u. of motor full load current)	0.5 – 10	0.1	Im
tst 5s	Motor starting time	1 – 120	1	s
ITr0.5Ist	Switch-over current of motor starter (p.u. of motor starting current)	Dis – 0.1 – 1	0.1	Ist
tTr 6s	Max switch-over time from reduced to full voltage operation during motor starting.	0.5 – 50	0.1	s

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Display	Description	Setting Range	Step	Unit
AUTOSET? + ENTER	Automatic setting of all the following parameters computed on the base of the setting of the previous parameters			
tm 34min	Thermal time constant of motor while running ; tm is computed to allow at least one restarting with the motor at its rated full load temperature	1 - 60	1	min
to/tm 3	Steady/running motor thermal time constant	1 - 10	1	1
Ta/n 90%	Prealarm motor heating level (% of motor full-load temperature rise)	50 - 110	1	%
Ts/n100%	Motor restart heating level	40 - 100	1	%
lb1.05lm	Rated maximum continuous motor overload	1 - 1.3	0.01	lm
StNo 6	Max. No of startings allowed within the time tStNo	Dis - 1 - 60	1	-
tStNo60m	Time into which the StNo is counted	1 - 60	1	m
tBSt 12m	Restart inhibition time after tripping of the function StNo (Rm = restart inhibited until manual RESET is operated)	1 - 60 - Rm	1	min
ILR 2lm	Trip level of Locked Rotor function (activated after 2tst from motor start)	Dis - 1 - 5	0.1	lm
tLR 5s	Trip time delay of LR element during run	1 - 25	1	s
I2> 0.3lm	Trip level of inverse time current unbalance protection element	Dis-0.1-0.8	0.1	lm
tI2> 4s	Trip time delay of inverse time current unbalance protection when I2=lm	1 - 8	1	s
I< 0.2lm	Trip level of undercurrent (no-load running) element	Dis-0.15-1	0.01	lm
I> 2lst	Trip level of phase overcurrent element	Dis - 1 - 5	0.1	lst
tI> 0.1s	Trip time delay of phase overcurrent element	0.05 - 1	0.01	s
O> 0.1On	Trip level of earth fault element	Dis - 0.02 - 2	0.01	On
tO> 0.2s	Trip time delay of earth fault element	0.05 - 5	0.01	s
tBO 0.15s	Maximum energization time of the output relays associated to the instantaneous functions I> and/or O> (Blocking output with safety disactivation)	0.05 - 0.5	0.01	s
RTD OFF	Enabling of the input 1 - 14 for operation of RTD function	OFF - ON	-	-
SpC OFF	Enabling of input 1 - 3 for operation of the Speed Control function	OFF - ON	-	-
PF< 0.9	Trip level of Power Factor element	Dis-0.5-0.98	0.01	-
tPF 60s	Trip time delay of the Power Factor element	1 - 999	1	s
f>=Fn+1f	Operation mode of first frequency element + = over-frequency Dis = Disabled	+ / D	-	-
1f 1.0Hz	Trip level of over-frequency element	0 - 9.99	0.01	Hz
tf> 10s	Trip time delay of the over-frequency element	0.1 - 99.9	0.1	s
f<=Fn-2f	Operation mode of second frequency element - = under-frequency Dis = Disabled	- / D	-	-
2f 1.0Hz	Trip level of under-frequency element	0 - 9.99	0.01	Hz
tf< 10s	Trip time delay of the under-frequency element	0.1 - 99.9	0.1	s
U> 1.1Un	Trip level of over-voltage element	0.7 - 1.4 - Dis	0.01	Un
tU> 10s	Trip time delay of the over-voltage element	0.1 - 99.9	0.1	s
U< 0.85Un	Trip level of under-voltage element	Dis - 0.3 - 1	0.01	Un
tU< 10s	Trip time delay of the under-voltage element	0.1 - 99.9	0.1	s
Ust 0.9Un	Minimum restart voltage (Reset level of the element U<)	0.3 - 1.0	0.01	Un
Tsyn Dis m	Clock synchronisation Time Expected time interval between sync. signal.	5 - 60 - Dis	5-10 15-30 60-Dis	m

The setting Dis indicates that the function is disactivated.

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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 default reading (xx:xx:xx). 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 ≤ 10 ms). If any internal fault is detected during the auto test, the relay R5 is deenergized, the relevant led is activated and the fault code is displayed.



WARNING

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

14. MAINTENANCE

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



WARNING

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

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

15. POWER FREQUENCY INSULATION TEST

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

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16. ELECTRICAL CHARACTERISTICS

APPROVAL: CE – UL and CSA approval File : E202083

REFERENCE STANDARDS IEC 60255 - EN50263 - CE Directive - EN/IEC61000 - IEEE C37

<input type="checkbox"/> Dielectric test voltage	IEC 60255-5	2kV, 50/60Hz, 1 min.
<input type="checkbox"/> Impulse test voltage	IEC 60255-5	5kV (c.m.), 2kV (d.m.) – 1,2/50µs
<input type="checkbox"/> Insulation resistance	> 100MΩ	

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

<input type="checkbox"/> Operation ambient temperature	-10°C / +55°C
<input type="checkbox"/> Storage temperature	-25°C / +70°C
<input type="checkbox"/> Humidity	IEC68-2-3 RH 93% Without Condensing AT 40°C

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

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

CHARACTERISTICS

<input type="checkbox"/> Accuracy at reference value of influencing factors	2% In for measure 0,2% On 2% +/- 10ms for times
<input type="checkbox"/> Rated Current	In = 1 or 5A - On = 1 or 5A
<input type="checkbox"/> Current overload	200 A for 1 sec; 10A continuous
<input type="checkbox"/> Burden on current inputs	Phase : 0.01VA at In = 1A; 0.2VA at In = 5A Neutral : 0.03VA at On = 1A; 0.2VA at On = 5A
<input type="checkbox"/> Rated Voltage	Un = 100 – 125V
<input type="checkbox"/> Voltage overload	2 Un continuous
<input type="checkbox"/> Burden on voltage input	0,04 VA at Un
<input type="checkbox"/> Average power supply consumption	8.5 VA
<input type="checkbox"/> Output relays	rating 5 A; Vn = 380 V A.C. resistive switching = 1100W (380V max) make = 30 A (peak) 0,5 sec. break = 0.3 A, 110 Vcc, L/R = 40 ms (100.000 op.)

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<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



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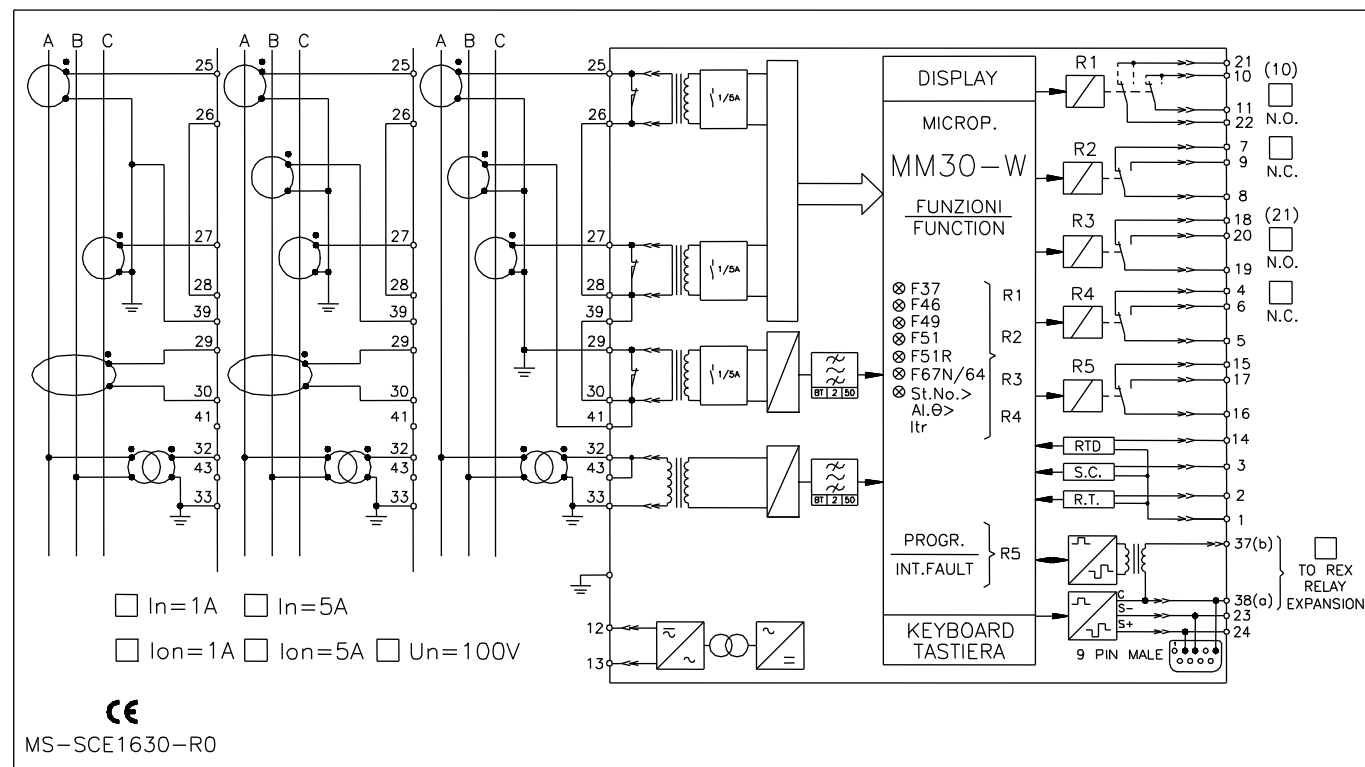
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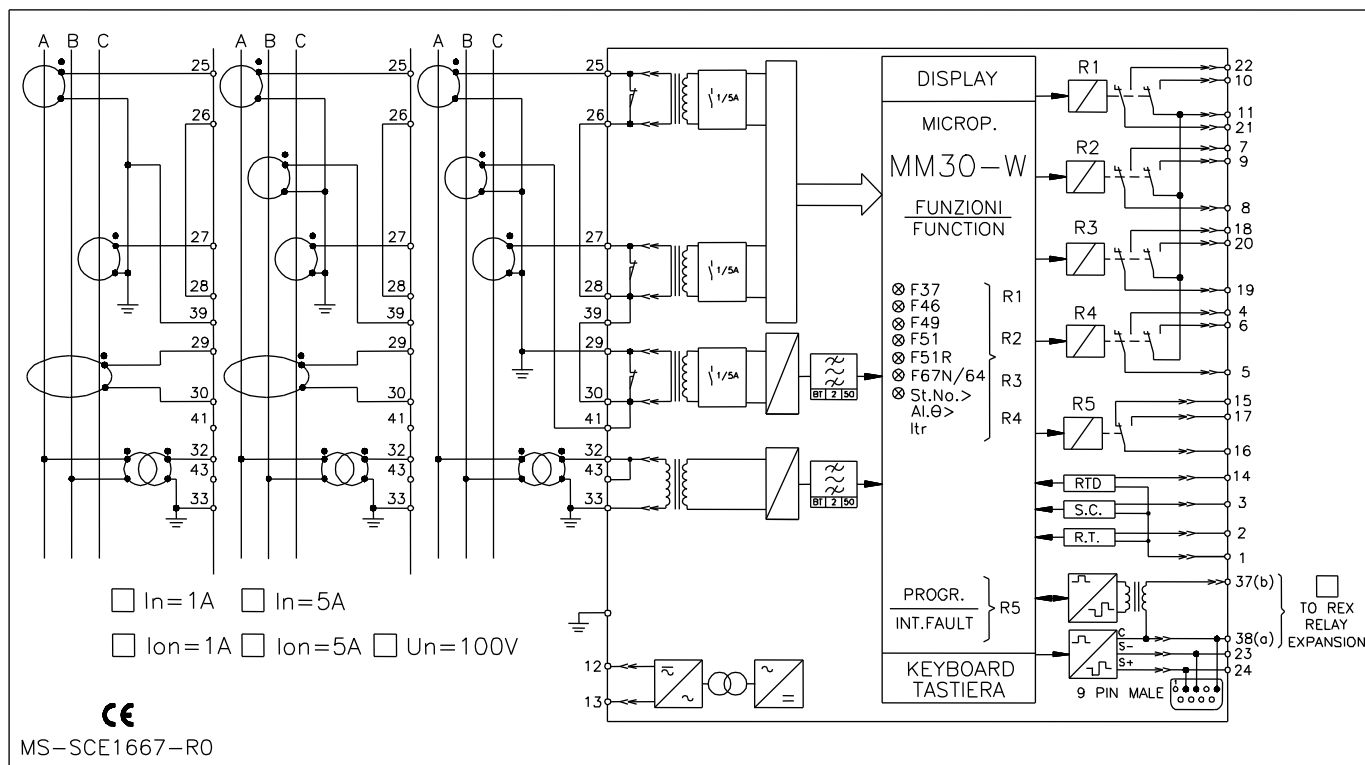
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17. CONNECTION DIAGRAM (SCE1630 Rev.0 Standard Output)



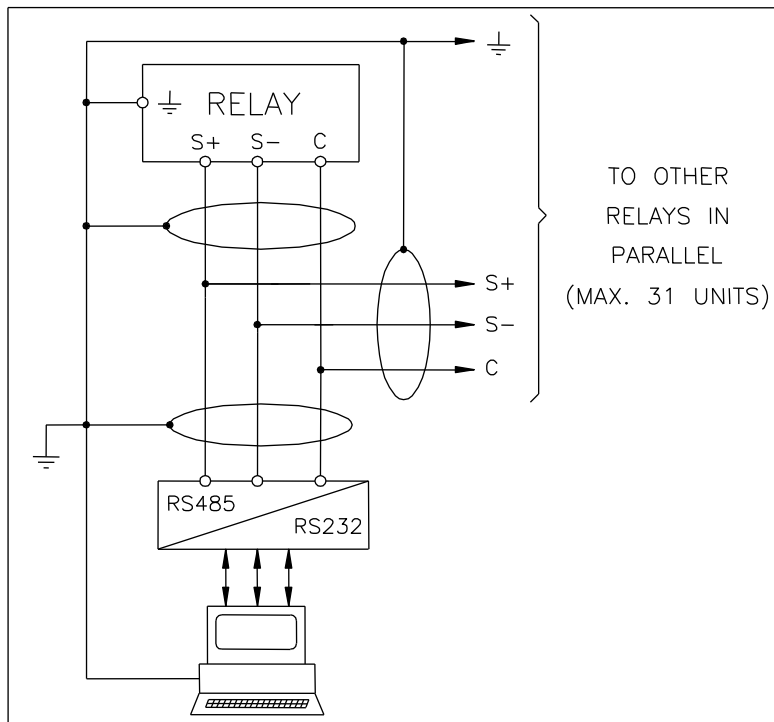
17.1 - CONNECTION DIAGRAM (SCE1667 Rev.0 Double Output)



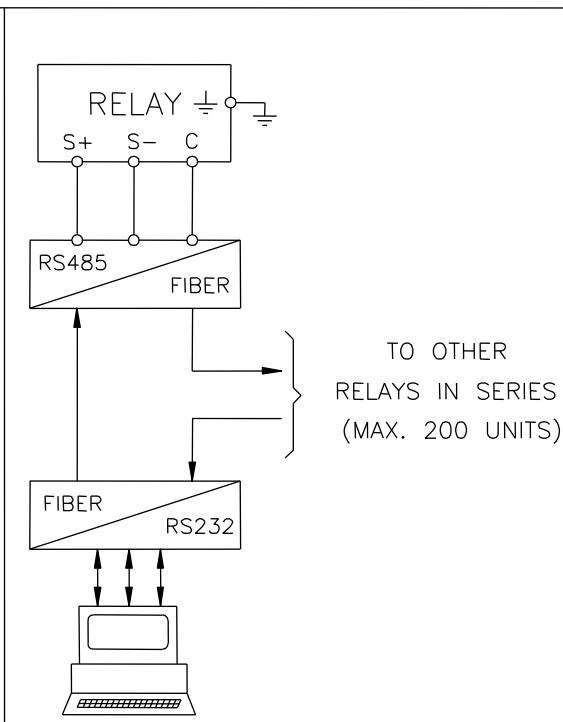


18. WIRING THE SERIAL COMMUNICATION BUS (SCE1309 Rev.0)

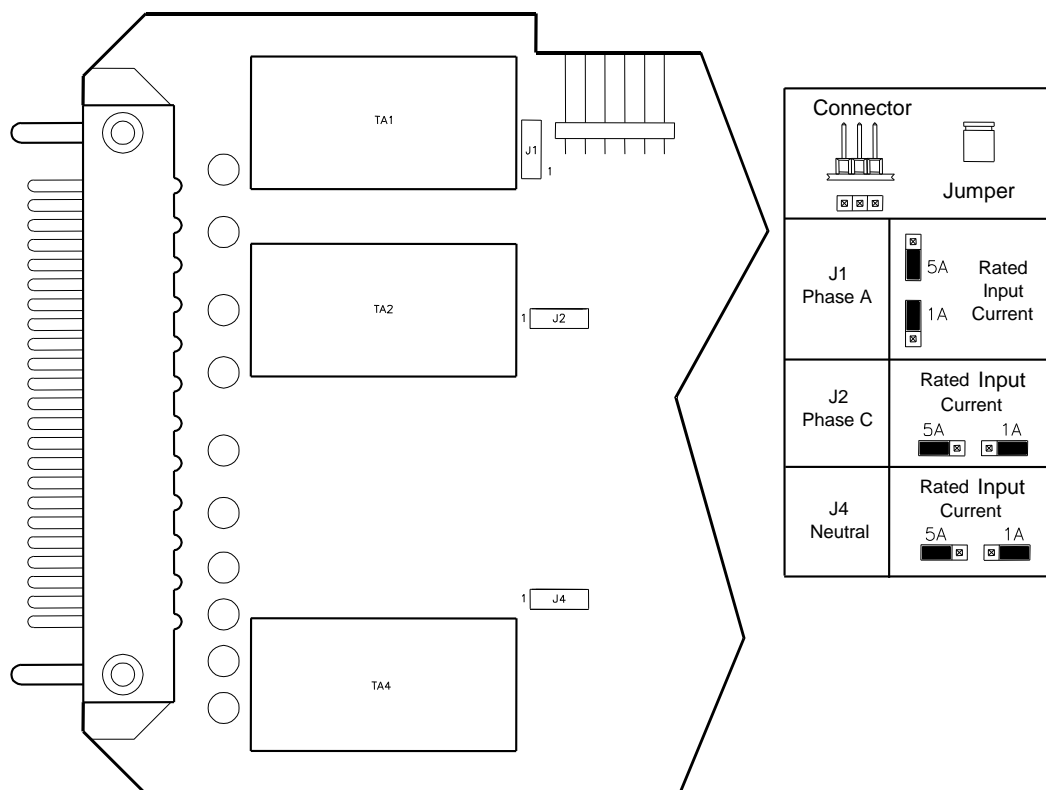
CONNECTION TO RS485



FIBER OPTIC CONNECTION

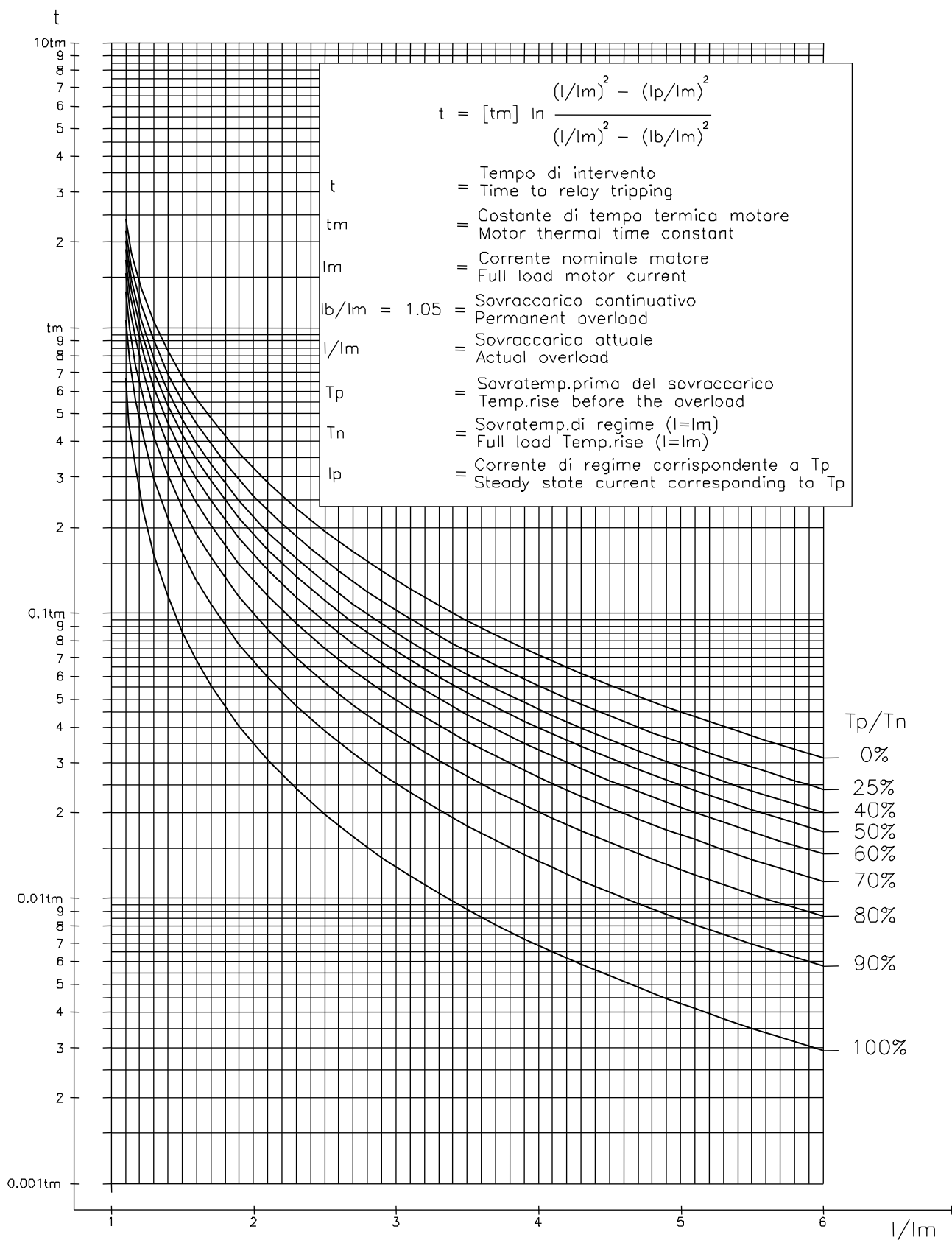


19. CHANGE PHASE CURRENT RATED INPUT 1 OR 5A



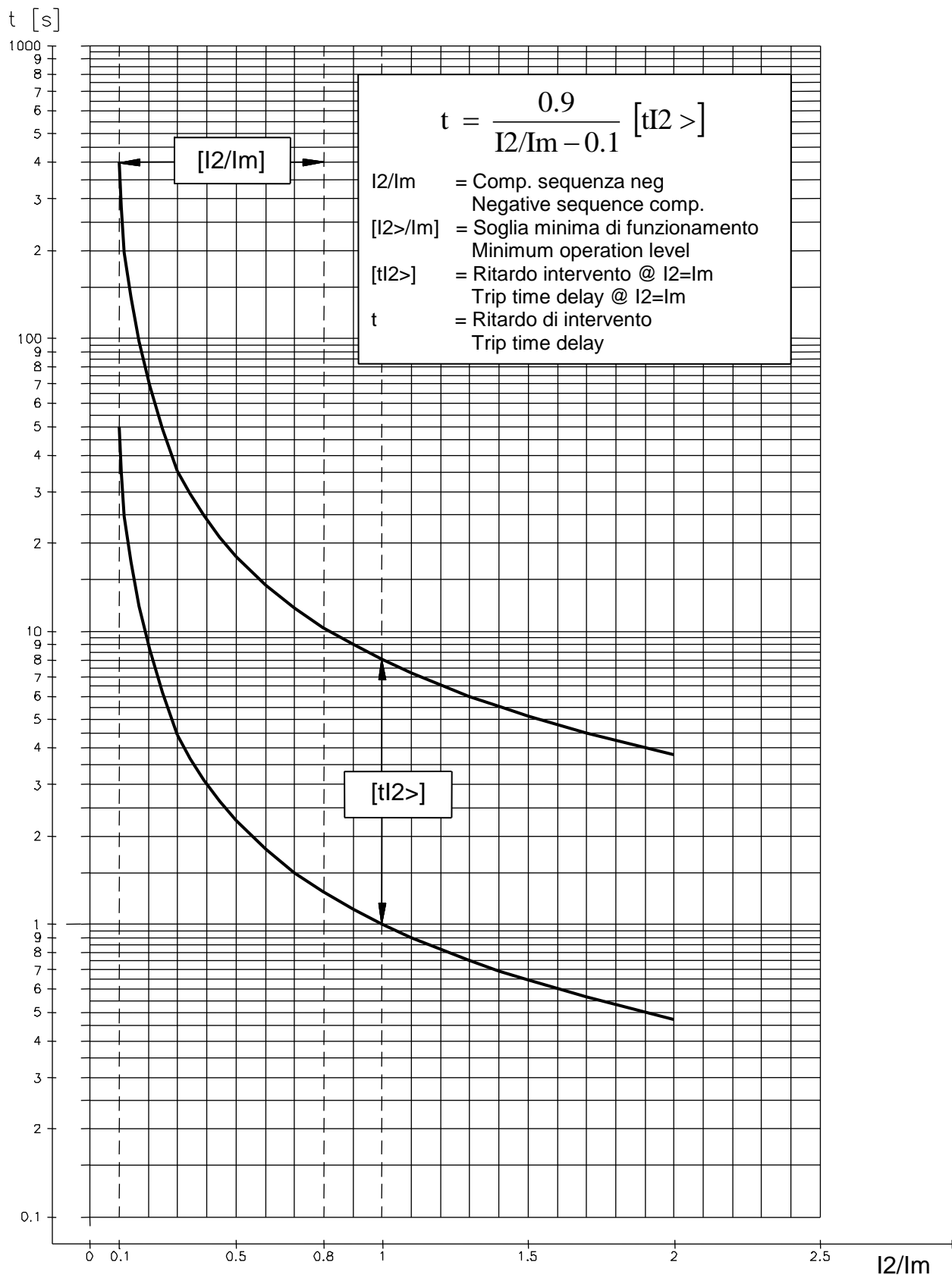


20. THERMAL IMAGE CURVES (TU0249 Rev.1)





21. INVERSE TIME UNBALANCE PROTECTION ELEMENT (TU0248 Rev.1)





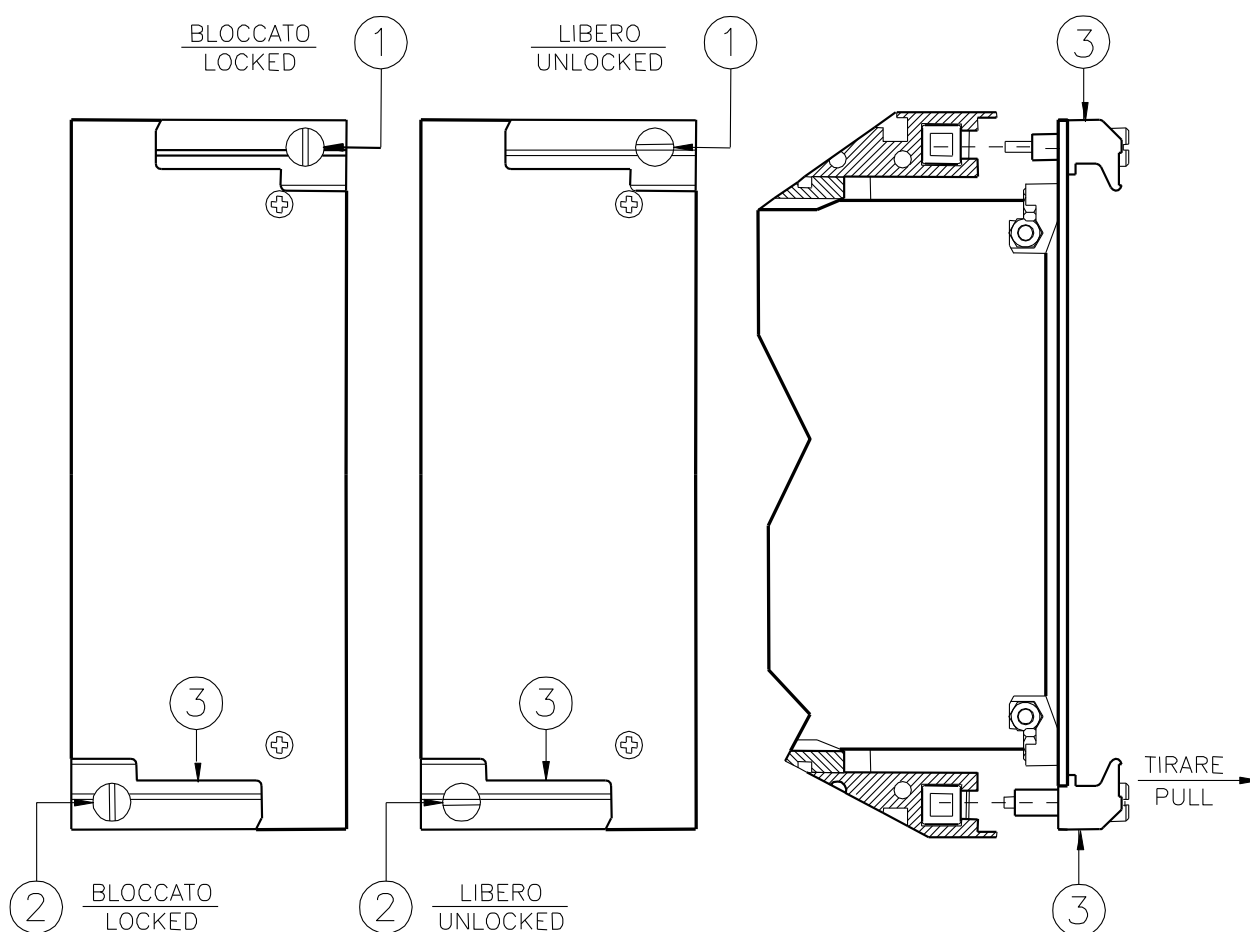
22. DIRECTION FOR PCB'S DRAW-OUT AND PLUG-IN

22.1 Draw-out

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

22.2 Plug-in

Rotate clockwise the screws ① and ② 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 and ② with the mark in the vertical position (locked).





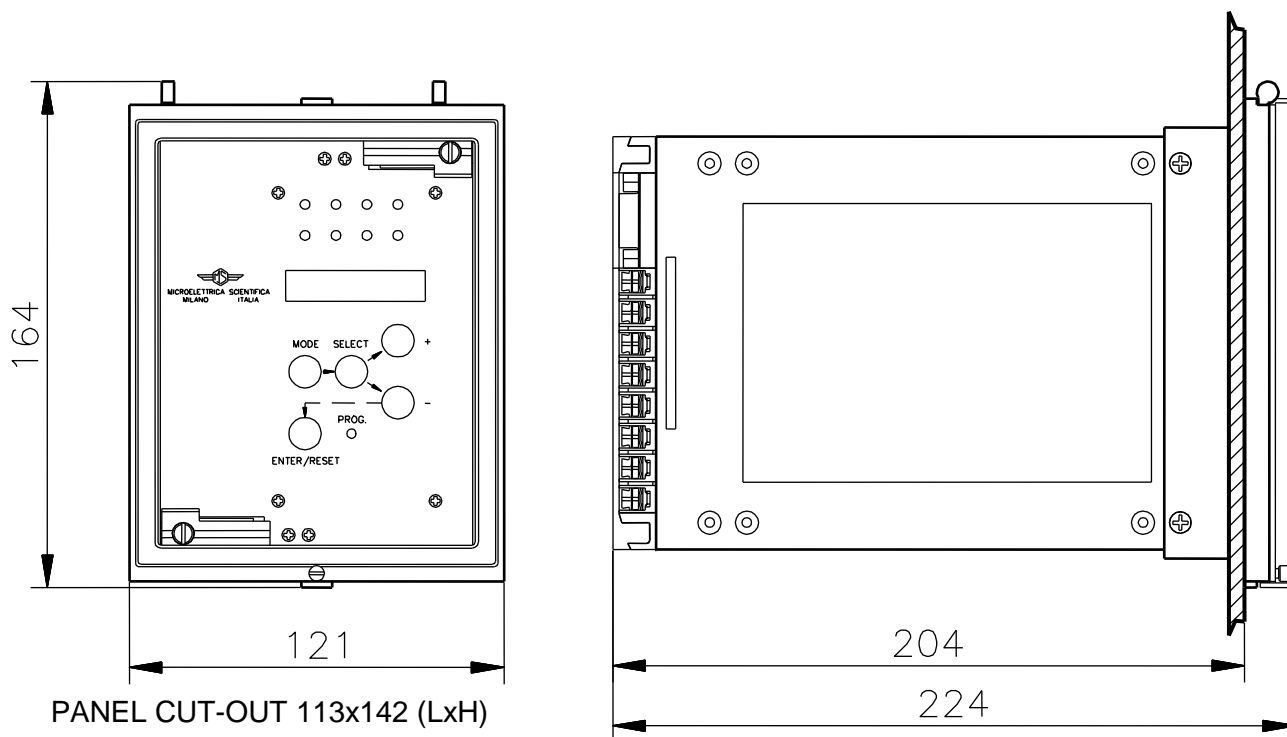
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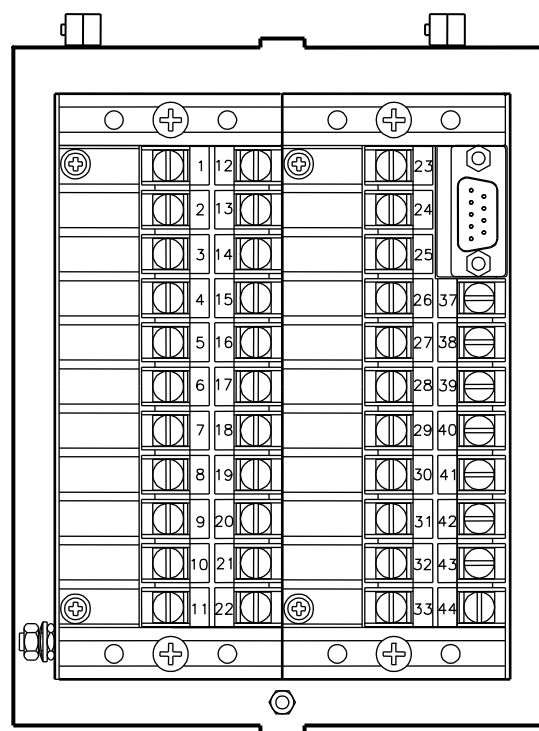
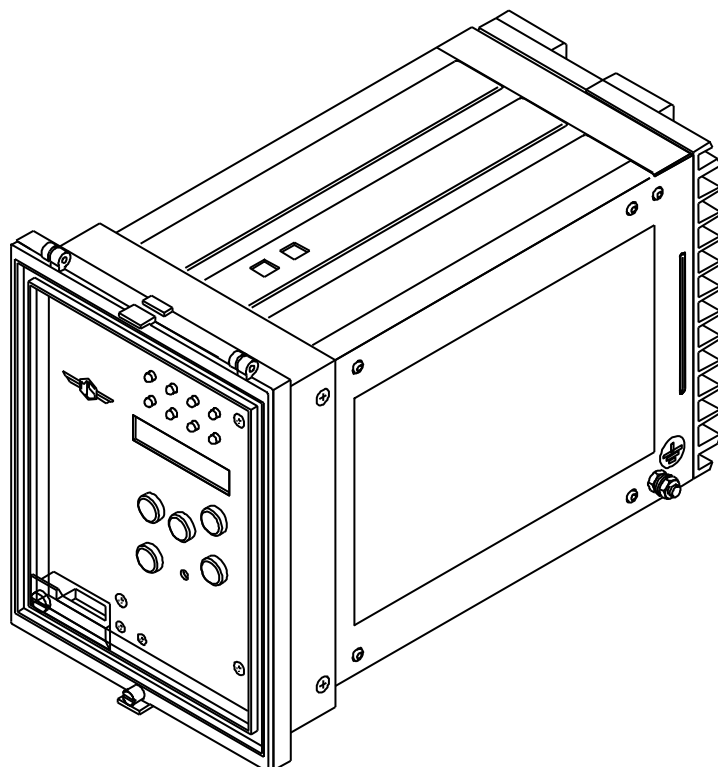
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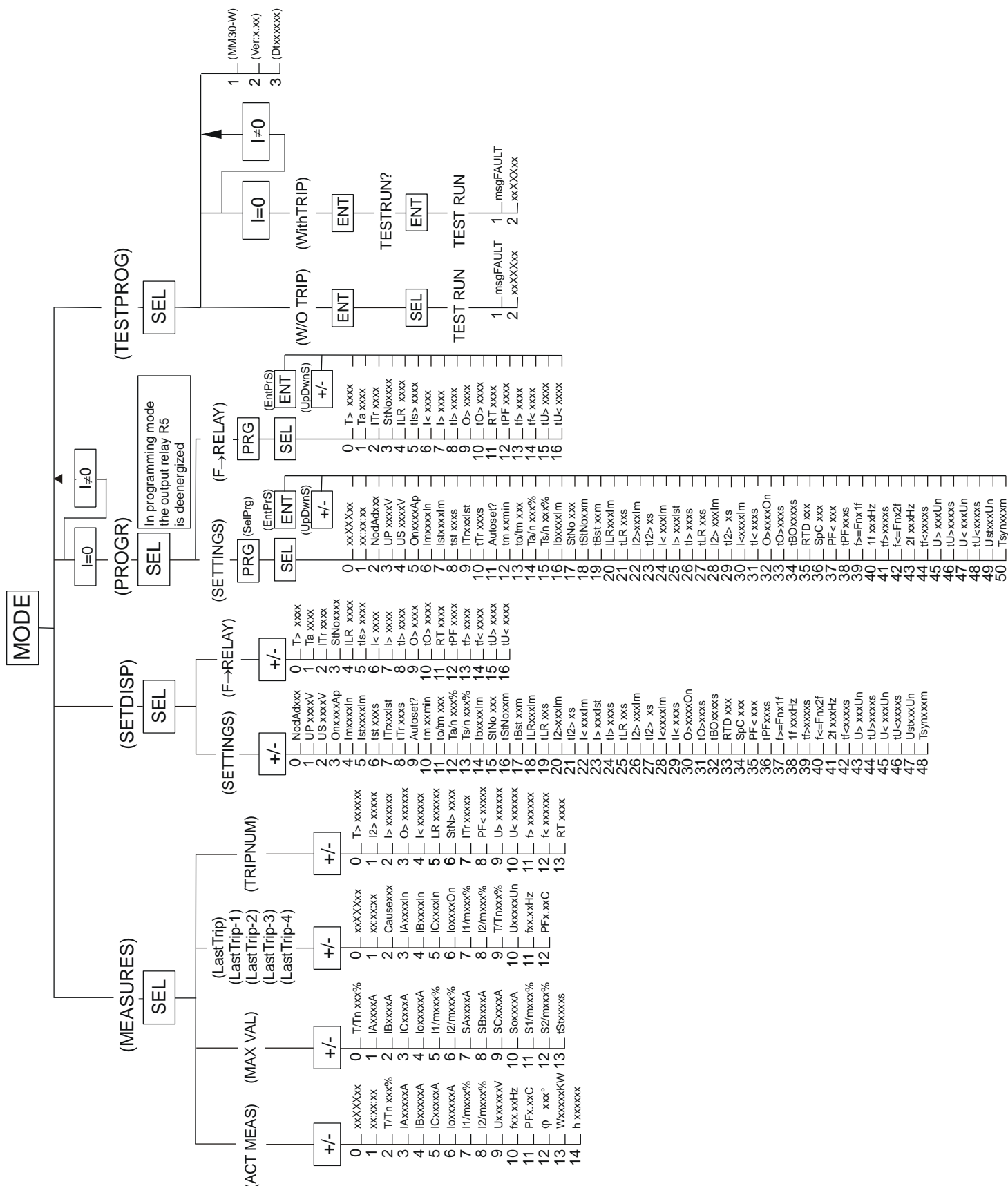
23. OVERALL DIMENSIONS / MOUNTING



View of Rear
Terminal Connection



24. KEYBOARD OPERATIONAL DIAGRAM





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25. SETTING'S FORM

Relay Type	MM30-W	Station :	Circuit :	
Date :	/ /	FW Version:	Relay Serial Number :	
Power Supply	<input type="checkbox"/> 24V(-20%) / 110V(+15%) a.c. 24V(-20%) / 125V(+20%) d.c. <input type="checkbox"/> 80V(-20%) / 220V(+15%) a.c. 90V(-20%) / 250V(+20%) d.c.		Rated Current :	<input type="checkbox"/> 1A <input type="checkbox"/> 5A
			Rated Voltage :	

RELAY PROGRAMMING						
Variable	Description	Setting Range	Default Setting	Actual Setting	Test Result	
					Pick-up	Reset
xxXXXxx	Current date	DDMMYY -	random			
xx:xx:xx	Current time	HH:MM:SS -	random			
NodAd	Identification number serial communication bus	1 - 250 -	1			
Fn	Mains frequency	50 - 60 Hz	50			
UP	Rated phase-to-phase system voltage (Primary voltage PTs.)	100-32500 V	1000			
US	Rated phase-to-phase system voltage (Second. voltage PTs.)	100 - 125 V	100			
In	Rated primary current of the phase C.Ts.	1 - 9999 Ap	500			
On	Rated primary current of the C.Ts.	1 - 9999 Ap	500			
Im	Motor full-load current	0.1 - 1.5 In	1.0			
Ist	Motor start-up current	0.5 - 10 Im	6			
tst	Motor starting time	1 - 120 s	5			
ITr	Switch-over current of motor starter	Dis-0.1-1 Ist	0.5			
tTr	Max switch-over time from start-up	0.5 - 50 s	6			
AUTOSSET? + ENTER						
tm	Thermal time constant of motor while running	1 - 60 min	34			
to/tm	Steady/running motor thermal time constant	1 - 10 -	3			
Ta/n	Prealarm motor heating level	50 - 110 %	90			
Ts/n	Motor restart heating level	40 - 100 %	100			
Ib	Rated maximum continuous motor overload	1 - 1.3 Im	1.05			
StNo	Max. No of startings allowed within the time tStNo	Dis-1-60	6			
tStNo	Time into which the StNo is counted	1 - 60 m	60			
tBSt	Restart inhibition time after tripping of the function StNo	1-60-Rm m	12			
ILR	Trip level of Locked Rotor function	Dis - 1 - 5 Im	2			
tLR	Trip time delay of LR element during run	1 - 25 s	5			
I2>	Trip level of inverse time current unbal. protection element	Dis-0.1-0.8 Im	0.3			
tI2>	Trip time delay of inverse time current unbalance protection	1 - 8 s	4			
I<	Trip level of undercurrent (no-load running) element	Dis-0.15-1 Im	0.2			
I>	Trip level of phase overcurrent element	Dis - 1 - 5 Ist	2			
tI>	Trip time delay of phase overcurrent element	0.05 - 1 s	0.1			
O>	Trip level of earth fault element	Dis-0.02-2 On	0.1			
tO>	Trip time delay of earth fault element	0.05 - 5 s	0.2			
tBO	Maximum energization time of the output relays associated to the instantaneous functions I> and/or O>	0.05 - 0.5 s	0.15			
RTD	Enabling of the input 1 - 14 for operation of RTD function	OFF - ON -	OFF			
SpC	Enabling of input 1 - 3 for operation of the Speed Control	OFF - ON -	OFF			
PF<	Trip level of Power Factor element	Dis-0.5-0.98 -	0.9			
tPF	Trip time delay of the Power Factor	1 - 999 s	60			
f>=Fn	Operation mode of first frequency element	+ / D 1f	+			
1f	Trip level of over-frequency element	0 - 9.99 Hz	1.0			
tf>	Trip time delay of the over-frequency element	0.1 - 99.9 s	10			
f<=Fn	Operation mode of second frequency element	- / D 2f	-			
2f	Trip level of under-frequency element	0 - 9.99 Hz	1.0			
tf<	Trip time delay of the under-frequency element	0.1 - 99.9 s	10			
U>	Trip level of over-voltage element	0.7-1.4-Dis Un	1.1			
tU>	Trip time delay of the over-voltage element	0.1 - 99.9 s	10			
U<	Trip level of under-voltage element	Dis - 1 Un	0.85			
tU<	Trip time delay of the under-voltage element	0.1 - 99.9 s	10			
Ust	Minimum restart voltage	0.3 - 1.0 Un	0.9			
Tsyn	Clock synchronisation Time	5 - 60 - Dis m	Dis			



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CONFIGURATION OF OUTPUT RELAYS

CONFIGURATION OF OUTPUT RELAYS												
Default Setting					Description			Actual Setting				
Protect. Element	Output Relays							Protect. Element	Output Relays			
T>	-	-	-	1	Overload tripping operates relay	T>						
Ta	-	-	-	-	Overload prealarm tripping operates relay	Ta						
ITr	-	-	-	-	Starting switch-over tripping operates relay	ITr						
StNo	-	-	-	1	Start No limitation tripping operates relay	StNo						
ILR	-	-	-	1	Locked Rotor tripping operates relay	ILR						
tl2>	-	-	-	1	Time delayed unbalance tripping operates relay	tl2>						
I<	-	-	-	-	No load running tripping operates relay	I<						
I>	-	-	-	-	Instantaneous overcurrent tripping operates relay	I>						
tl>	-	-	-	2	Time delayed overcurrent tripping operates relay	tl>						
O>	-	-	-	-	Instantaneous earth fault tripping operates relay	O>						
tO>	-	-	-	2	Time delayed earth fault tripping operates relay	tO>						
RT	-	-	-	-	Remote trip command (input 1-2) operates relay	RT						
tPF	-	-	-	3	Low Power Factor tripping operates relay	tPF						
tf>	-	-	-	3	Time delayed overfrequency tripping operates relay	tf>						
tf<	-	-	-	3	Time delayed underfrequency tripping operates relay	tf<						
tU>	-	-	-	4	Time delayed overvoltage tripping operates relay	tU>						
tU<	-	-	-	4	Time delayed undervoltage tripping operates relay	tU<						
1φ	-	-	-	1	Time delayed Phase loss tripping operates ready	1φ						

Commissioning Engineer : _____

Date : _____

Customer Witness : _____

Date : _____