MM30
MOTOR PROTECTION RELAY

Complete motor protection relay designed for the protection and active security of medium and large size induction motors.

The relay also computes the positive (Id) and negative (Is) sequence components of phase-current system.

The earth current input circuit includes a 3rd harmonic active filter.

Protective Functions

- **F12/14** : Speed Control input.
- **F37** : No-Load Running.
- **F46** : Current Unbalance.
- **F47** : Phase sequence or phase-balance voltage (negative sequence).
- **F48** : Starting Control.
- **F49** : Thermal Image.
- **F50/51** : Overcurrent.
- **F51LR** : Locked Rotor.
- **F64** : Earth Fault.
- **F66** : Control of n° of startings.
- Low Power Factor
- Autosetting
- Reduced Voltage Starting Control

Measurements

- Real Time Measurements
- Maximum Demand and Inrush Recording
- Trip Recording (last 5 trips with date & time).

Control

- 5 Output Relays (Programmable)
- 3 Digital Inputs (RTD input)
- Remote Trip Control

Technical Characteristics

- Complete autodiagnostic program
- Display 8 characters
- 8 Leds for signalization

Communications

- RS485 Serial communication port on rear side
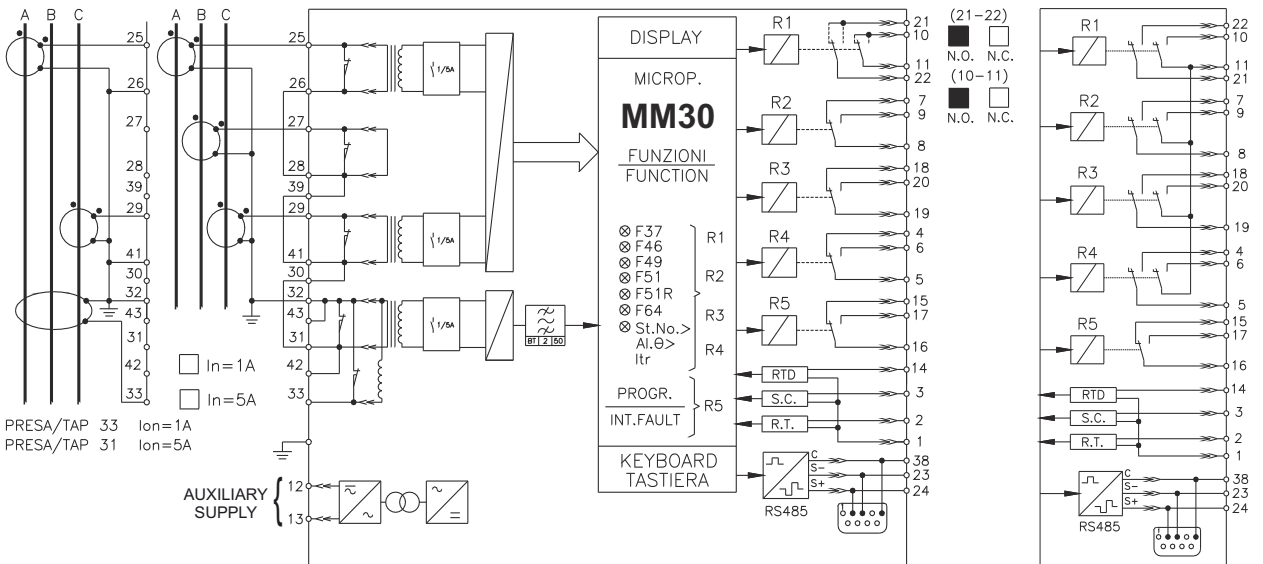- Modbus RTU communication Protocol

Mounting

- 2 Module box
- P44 protection case (on request IP54)
- Totally draw-out execution.

Power Supply Ratings

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

Software

- MScom - program interface for device management

MS-SCE1269-R7 - Standard Output

MS-SCE1462-R2 -Double Output

N02-ING-Rev.04

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Protection Relays

Programmable Input Quantities		
Fn = System frequency	: (50 - 60) Hz	
In = Rated primary current of phase CTs	: (0 - 9999)A	step 1A
On = Rated primary current of earth fault detection CT	: (0 - 9999)A	step 1A

F49 : Thermal Image

The current I producing motor warming-up is computed as a conventional composition of positive and negative sequence components of the motor current.

Measured current : $I = \sqrt{I_1^2 + 3I_2^2}$

$$t = [tm] \ \ln \frac{(I/Im)^2 - (Ip/Im)^2}{(I/Im)^2 - (Ib/Im)^2}$$

Im = Motor full load current	: (0.1 ÷ 1.5)In	step 0.01In
Ist = Motor start-up (Locked Rotor) current	: (0.5 ÷ 10)Im	step 0.1Im
tst = Motor starting time	: (1 ÷ 120)s	step 1s
tm = Motor warming-up time constant	: (1 ÷ 60)m	step 1m
to = Steady motor cooling-down time constant	: (1 ÷ 10)tm	step 1tm
Ta/n = Thermal prealarm	: (50 ÷ 110)%Tn	step 1%
Ts/n = Restart thermal level	: (40 ÷ 100)%Tn	step 1%
Ib = Rated maximum continuous current of the motor	: (1 ÷ 1.3)Im	step 0.05Im

F46 : Current Unbalance

Negative sequence current	: Is> = (0.1 ÷ 0.8)Im	step 0.1Im
Inverse time current curve	: tIs> = (1 ÷ 8)s	step 1s
		(tIs> = trip time @ Is = In)
	When current is below 0.1 Im the function is disabled	

F50/51 : Overcurrent

Current setting range	: I> = (1 ÷ 5)Ist	step 0.1Ist (limited to 20 In)
Independent time delay	: tI> = (0.05 ÷ 1)s	step 0.01s
Instantaneous output	≤ 0.03s (Reset time of instantaneous output : tI> + tBO)	
Reset time delay of the blocking output relay	: tBO = (0.05 ÷ 0.5)s	step 0.01s

F37 : No-Load Running

Under current level	: I< = (0.15 ÷ 1)Im	step 0.01Im
Trip time delay	: tI< = (0.1 ÷ 90)s	step 0.01s
	When current is below 0.1 Im the function is disable	

F51LR : Locked Rotor

Trip Current level	: ILR = (1 ÷ 5)Im	step 0.1Im
Trip time delay	: tLr = (1 ÷ 25)s	step 1s
Inhibition time at motor starting	: 1s	

F64 : Earth Fault

Current setting range	: O> = (0.02 ÷ 2)On	step 0.01On
Independent time delay	: tO> = (0.05 ÷ 5)s	step 0.01s
Istantaneous output	: ≤ 0.03s (Reset time of instantaneous output : tO> + tBO)	

F66 (StNo) : Limitation of N° of Startings

Numbers of startings	: StNo = (1 ÷ 60)	step 1
Time interval for counting of StNo	: tStNo = (1 ÷ 60)min	step 1min
If during the set interval the StNo is attained, a new start is inhibited for the time tBst.		
Reset time after trip	: tBst = (1 ÷ 60)min	step 1min

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Protection Relays

Starting Sequence Control

During start-up of the motor, the unit can control an output contact used to operate the switch-over of Reduced Voltage motor starter (star-delta, resistance or impedance, autotransformers, etc.) to automatically manage the starting transition:

Switch-over (transition) current	$: Itr = (0.1 \div 1)Ist$	step 0.1Ist
Maximum switch-over time delay	$: tTr = (0.5 \div 50)s$	step 0.1s

At motor's start, counting of tTr begins. If during tTr the motor current drops below ITr, switching-over is operated; if motor current stays over ITr longer than tTr, the Locked Rotor element is activated.

Autosetting

The complexity of properly set a motor protection, frequently produces undesired tripping or non-operation of some of the data functions. The relay MM30 automatically selects the best setting of the according to motor and system basic data.
These parameters are: *System frequency, Rated primary current of phase CTs., Rated primary current of earth fault CT, Motor rated current, Motor starting current, Starting time,Transition current level, Transition time.*
Once these settings have been programmed the AUTOSET function can be activated and all the variables are computed and automatically set at values suitable for a normal duty of the motor. Variables can be anyhow manually modified if different setting is needed.

Order Code - Example :

MM30	1	2	1	1
	Power supply	Phase Rated Input Current	Relay Outputs	R1 Configuration for standard outputs
	1 = Type 1	1 = 1A	1 = Standard	1 = (21-22) N.O. - (10-11) N.O. - Standard
	2 = Type 2	2 = 5A	2 = Double	2 = (21-22) N.O. - (10-11) N.C.
				2 = (21-22) N.C. - (10-11) N.O.
				2 = (21-22) N.C. - (10-11) N.C.

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