



Digital Protective Relays

Larsen & Toubro

Larsen & Toubro infuses engineering with imagination. The Company offers a wide range of advanced solutions in the field of Engineering, Construction, Electrical & Automation, Machinery and Information Technology.

L&T Switchgear, a part of the Electrical & Automation business, is India's largest manufacturer of low voltage switchgear, with the scale, sophistication and range to meet global benchmarks. With over five decades of experience in this field, the Company today enjoys a leadership position in the Indian market with a growing international presence.

It offers a complete range of products including powergear, controlgear, industrial automation, building electricals & automation, reactive power management, energy meters, and protective relays. These products conform to Indian and International Standards.

L&T limited offers a wide range of Microprocessor based State-of-the-art digital protective relays suitable for LV, MV and HV power distribution systems. These relays are manufactured at L&T's Mysore works equipped with modern infrastructure and employing latest manufacturing and testing equipments. L&T's range also include relays for special applications manufactured by Microelettrica Scientifica, Italy. The applications include Feeder Management, Load Sharing, Load Shedding, Synchronising, Grid Islanding etc.

L&T also manufactures a range of electronic single phase energy meters, three phase energy meters and trivector meters at the Mysore works.



Mysore Works

Contents

	Pages
ANSI / IEEE Device Function Number Details	1
Time - Current Characteristics	2
Over Current Relays & Earth fault Relays - MC31A, MC61A, MC61C	3
Current Sensing Relays - MC12A, ME12A, SC14S	5
Reverse Power Relay - MRP11	7
Voltage Relay - MV12	
Power Factor Control Relays - RPM14, RPM08	9
Motor Protection Relays - MM30, MM30W, N-DIN-MA	11
MCOMP, MPR300	13
Generator Protection Relays - MG30, MG30I, MD32G	15
Transformer Protection Relays - IM30T, MD32T, MD32TM	17
Feeder Protection Relays - MC20, MC30, FMR	19
Vector Surge Protection Relay - UM30A	
Control & Supervision Relays - MW33	23
Synchronising Load Sharing Relays - SPM21, RRS	
Voltage and Frequency Relays - MC1V, MC3V, UFD34	25

ANSI/IEEE

Correlation between ANSI/IEEE device Function number and Relays

Device No.	Function Name	L&T Relays	MS Relays
21	Under impedance relay / Distance relay		MG30 / MG30-I
25	Auto Synchronising		SPM21
	Synchro-check relay		SCM21
27	AC under voltage relay	MV12	UM30-A / MC1V / MC3V
			UFD34
32	Power directional relay	MRP11	MG30 / MW33 / MG30-I
37	Under current or under power relay		MM30
			MW33
40	Field control (loss of field) relay		MG30 / MG30-I
45	DC over voltage relay		UBC / 45
46	Reverse phase or phase balance current relay		IM30T
			MM30
47	Phase-sequence or single-phasing voltage relay		UM30-A, MC3V
49	Machine or transformer thermal relay		IM30T
			MG30 / MG30-I
		MPR300	MM30 / MM30-W
50	Instantaneous over current (or rate-of-rise) relay		MC20 / MC30
		ME12	IM30-T / IM30-AP
		MC12A	FMR
		MC61A / MC61C	MG30 / MG30-I
51V, 50V	Voltage restrained over current relay		MG30 / MG30-I
50BF	Breaker - failure		MC20 / MC30 / FMR / IM30T / IM30AP
50N	Instantaneous earth fault over current relay	MC12A	IM30 AP / IM30-T
		MC61A	MC20 / MC30
		MC61C	FMR / IM30-T
51	AC time over current relay	MC12A	IM30-AP / IM30-T
		MC61A	MC20 / MC30
		MC31A	FMR / IM30-T
		MC61C	--
51N-(51G)	Ground fault time over current relay	MC12A	IM30-AP / IM30-T
		MC61A	MC20 / MC30
		MC31A	FMR
		MC61C	--
58	Rectifier failure relay (rotating diodes)	--	RHS
59	AC over voltage relay	MV12	--
		--	UFD34, MW33
59/81	Overexcitation relay V/Hz	--	UM30-A / MG30 / MG30-I
60	Voltage balance relay		UM30-A
64	Ground detector (insulation to ground failure of machine or other apparatus)		MG30
64S	Machine stator ground fault detector relay	--	MG30
64R	Machine rotor ground fault detector relay	--	UBO / CR
67	AC directional over current relay	--	FMR
67N-(67G)	Directional ground fault over current relay	--	FMR
76	DC over current relay	--	--
78	Phase angle measuring or out of-step protection relay	--	IM30-GOS
79	Reclosing relay	--	MC20R
80	DC under voltage relay	--	UBC / 80
81	Frequency relay	--	UM30-ASV / MG30
		--	UFD34 / MC1V / MC3V / MW33
86	Lock-out relay	--	--
87	Differential protective relay	SC14S	MD32G
		--	MD32T / MD32TM
87N-(87G)	Ground fault differential protective relay	--	MD32G, MD32T
90	Regulating device to adjust a quantity	--	--
95	Automatic active or reactive load sharing relay	--	RRS
	Vector surge protection relay	--	UM30-A
df/dt	Rate of change of frequency	--	UFD34

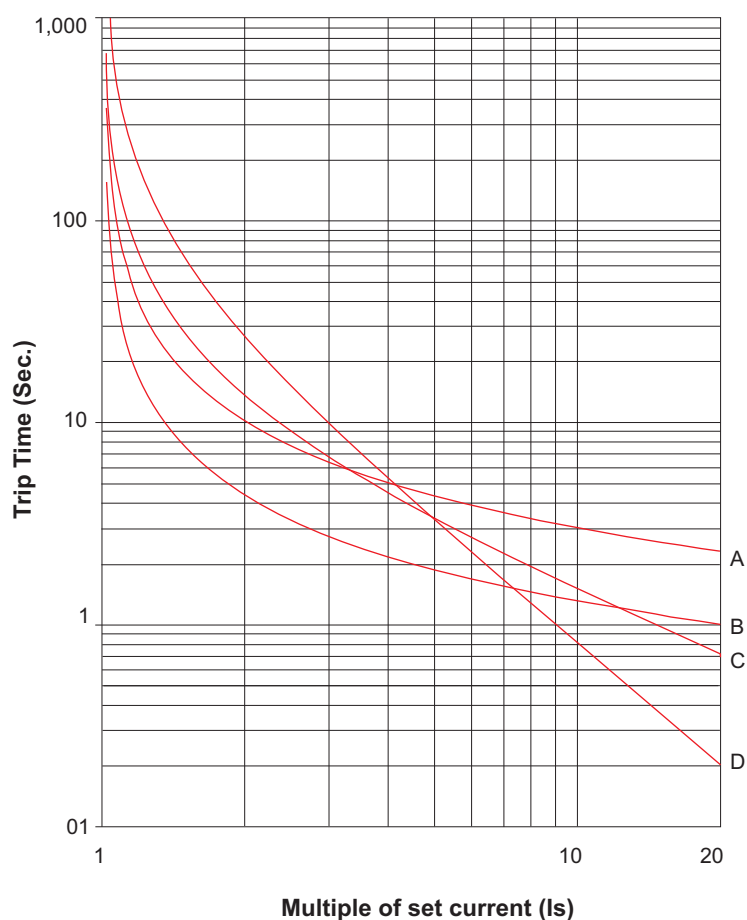
Time - Current Characteristics

Product design standards

Reference standards
IEC 60255, IEC 61000,
IS3231, IS8686

Dielectric test	: IS 3231 / IEC 60255-5
Impulse test	: IS 8686 / IEC 60255- 5
HF disturbance test	: IS 8686 / IEC 60255-22-1
Electrostatic discharge test	: IEC 61000-4-2
Electrical fast transient	: IEC 61000-4-4
Radiated electro magnetic field test	: IEC 61000-4-3
Surge immunity	: IEC 61000-4-5
Ring wave test	: IEC 61000-4-12
Voltage dips & interruption test	: IEC 61000-4-11
Power frequency magnetic test	: IEC 61000-4-8

Time - Current Characteristics (At TMS = 1)



For Trip time at TMS other than 1
Trip time = (Trip time at TMS = 1) x TMS OR
50 msec whichever is more

A : Normal Inverse 3.0 Sec
B : Normal Inverse 1.3 Sec
C : Very Inverse
D : Extreme Inverse

Over Current and Earth Fault Relays

- Three Phase Over Current & Earth fault Relays

Salient Features

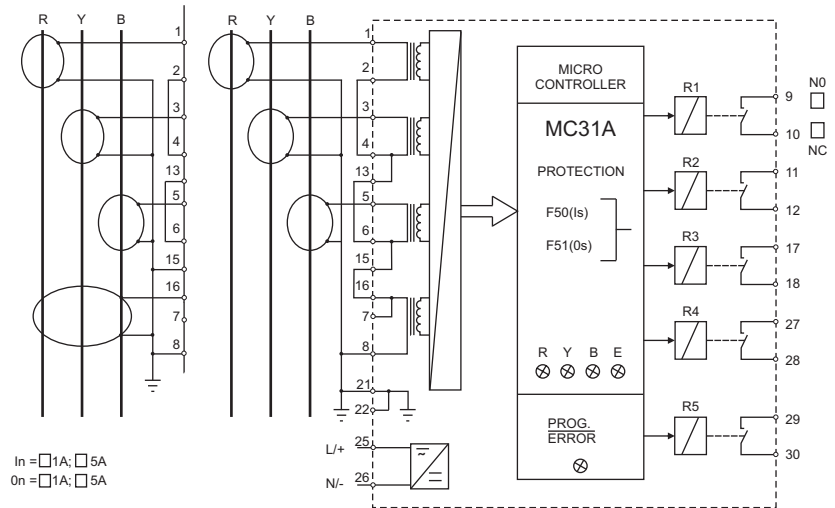
- Display of currents, settings, Trip data & Trip history for analysis & trouble shooting
- Built in self supervision & self testing feature to ensure continuous reliability
- Separate indication for power ON & programming mode on relay fault
- Separate fault indication
- In MC61C - Communication with computer & breaker control through RS485 Port
- Four user programmable output relays



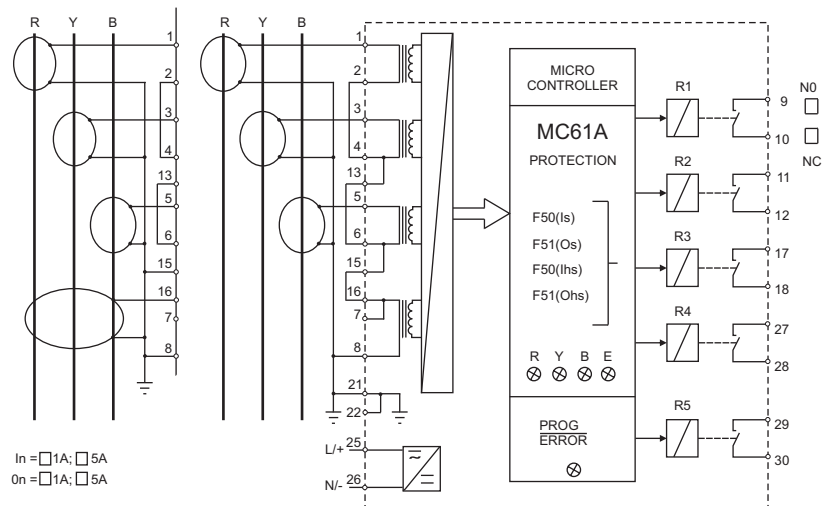
Model	MC31A	MC61A	MC61C
Description	3 Phase O/C + E/F	3 Phase O/C + E/F + Highset	3 Phase O/C + E/F + Highset Communication and breaker control
Device Code	51 RYBN	50/51 RYBN	50/51 RYBN
Design	Numerical Relay	Numerical Relay	Numerical Relay
Functions Available	Lowset O/C -Is Lowset E/F -Os	Lowset O/C -Is Highset O/C -Ihs Lowset E/F -Os Highset E/F -Ohs	Lowset O/C -Is Highset O/C -Ihs Lowset E/F -Os Highset E/F -Ohs
Settings	O/C Is = 20-200% Step 5% E/F Os = 5-80% Step 5% Time Characteristics available - NI, VI, EI, Definite Time TMS 0.1 - 1.6 Step 0.05	O/C Is = 20-200% Step 5% E/F Os = 5-80% Step 5% HS O/C = (0.2 to 40) x In step of - 0.2 In or disable HS E/F = (0.1 to 20) x On step of - 0.1 On or disable Time Characteristics available - NI, VI, EI, Definite Time TMS : 0.1 - 1.6 Step 0.05	O/C Is = 20-200% Step 5% E/F Os = 5-80% Step 5% HS O/C = (0.2 to 40) x In step of - 0.2 In or disable HS E/F = (0.1 to 20) x On step of - 0.1 On or disable Time Characteristics available - NI, VI, EI, Definite Time TMS : 0.1 - 1.6 Step 0.05
Other Features	Site selectable Trip time Char. Display of Currents, Trip count Self supervision feature	Highset can be disabled Display of Currents, Trip count Self supervision feature	HS delay: 0.1-2 Sec step 0.01 - Sec. or Inst. RS485 Communication Breaker control Auto doubling of highset, - Relay co-ordination - BI & BO
Burden on CT	≤ 0.25 VA on CT/Phase	≤ 0.25 VA on CT/Phase	≤ 0.25 VA on CT/Phase
Burden on PT	Not applicable	Not applicable	Not applicable
Operating temp	0°C to 60°C	0°C to 60°C	0°C to 60°C
Weight	< 2kg	< 2kg	< 2kg
Burden on Auxiliary supply	≤ 10 VA	≤ 10 VA	≤ 10 VA
Output Contact	1 N/O Contact for self suprvn	1 N/O Contact for self suprvn	1 N/O Contact for self suprvn, 1N/O for trip
Construction	Draw out	Draw out	Draw out
Dim W x H x D in mm	121 x 158 x 224	121 x 158 x 224	121 x 158 x 224
Panel Cut out	113 x 142	113 x 142	113 x 142
Ordering Information			
Auxiliary supply Type 1 Type 2	20-110 V AC / DC or 88-264 V AC / DC	20-110 V AC / DC or 88-264 V AC / DC	20-110 V AC / DC or 88-264 V AC / DC
CT Rating	1 A or 5 A (site selectable)	1 A or 5 A (site selectable)	1 A or 5 A (not site selectable)
Output Contacts	4 NO or 2 NO + 2 NC	4 NO or 2 NO + 2 NC	4 NO

Wiring Diagrams

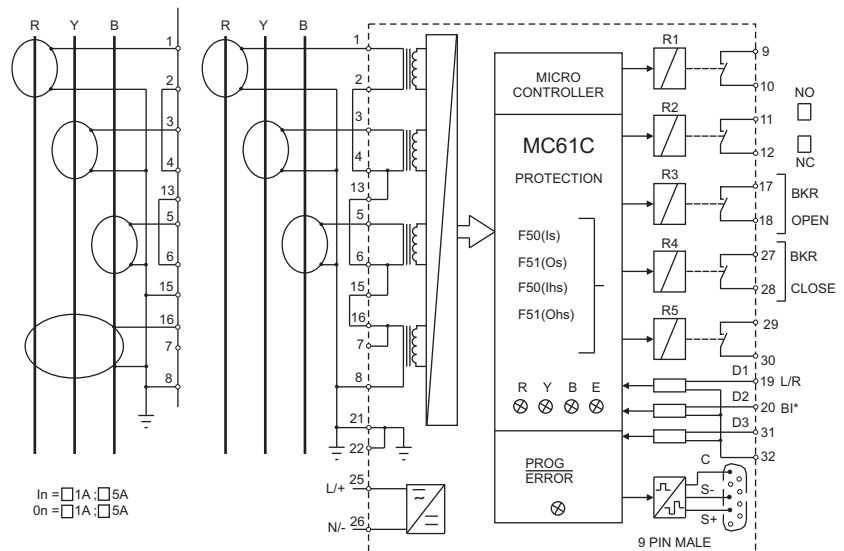
MC31A



MC61A



MC61C



Current Sensing Relays

- Single Phase Over current / Earth fault Relay
- Sensitive E/F Relay / Instantaneous Current Relay

Salient Features

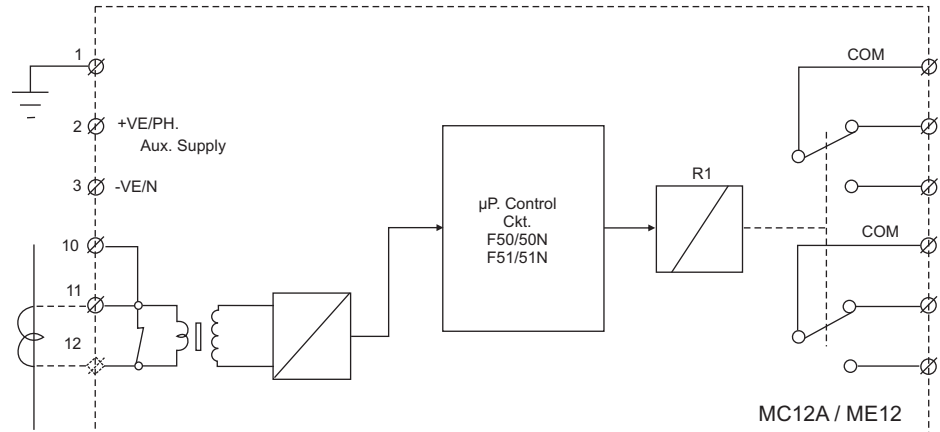
- Easy setting through front panel DIP switches
- Indication for Power ON and trip status
- Test feature - helps in better maintenance
- Compact, light weight helps in reducing panel size & thickness



Model	MC12A	ME12A	SC14S
Description	1 Ph O/C or E/F	1 Ph Sensitive E/F	Instantaneous current relay
Device Code	50/51 or 50N/51N	50N/51N	87N/64R
Design	Microcontroller Based	Microcontroller Based	Static
Functions Available	Lowset O/C -Is Highset O/C -Ihs Lowset E/F -Os Highset E/F -Is	Lowset S E/F -Is Highset S E/F -Ihs.	
Settings	O/C Is = 50-200% Step 10% OR E/F Is = 10-40% Step 2% OR E/F Is = 20-80% Step 4% HS O/C = (2-16) xls step 2 Is HS E/F = (2-16) xls step 2 Is Time Characteristics available- NI, VI, EI, Definite Time 3 ranges of def Time (1, 10,100) TMS : 0.1 - 1.6 Step 0.1	S E/F = 1-16% step 1% HS S E/F = (2-16) xls in steps of 2 Is Time Characteristics available- NI, VI, EI, Definite Time 3 ranges of def Time (1, 10, 100) TMS : 0.1 - 1.6 Step 0.1	Is = 10-40% step 5% OR 20-80% step 10% Time Characteristics available- Instantaneous (25ms) OR time delayed 100ms / 200ms Self Powered
Other Features	Site selectable Trip time Char. Highset can be disabled	Site selectable Trip time Char. Highset can be disabled Harmonic rejection	Relay testing possible by ext. 24 V - Supply Flag indication / LED indication
Burden on CT	≤ 0.25 VA on CT	≤ 0.25 VA on CT	≤ 6 VA
Burden on PT	Not applicable	Not applicable	Not Applicable
Operating temp	0°C - 60°C	0°C to 60°C	0°C to 60°C
Weight	< 1.5kg	< 1.5kg	< 1.5kg
Burden on Auxiliary supply	≤ 5.5 VA	≤ 5.5 VA	Not Applicable
Output Contacts	2 C/O Contacts (S/R)	2 C/O Contacts (S/R)	2 C/O Contacts (S/R)
Construction	Draw out	Draw out	Draw out
Dim W x H x D in mm	71 x 158 x 224	71 x 158 x 224	71 x 158 x 224
Panel Cutout	62 x 142	62 x 142	62 x 142
Ordering Information			
Auxiliary supply Type 1 Type 2	20-110 V AC / DC or 88-264 V AC / DC	20-110 V AC / DC or 88-264 V AC / DC	Not Applicable
CT Rating	1 A or 5 A	1 A or 5 A	1 A or 5 A
Range Setting	10-40% or 20-80% or 50-200% Site Selectable		10-40% or 20-80%

Wiring Diagrams

MC12A / ME12A



In
☐ 1A
☐ 5A

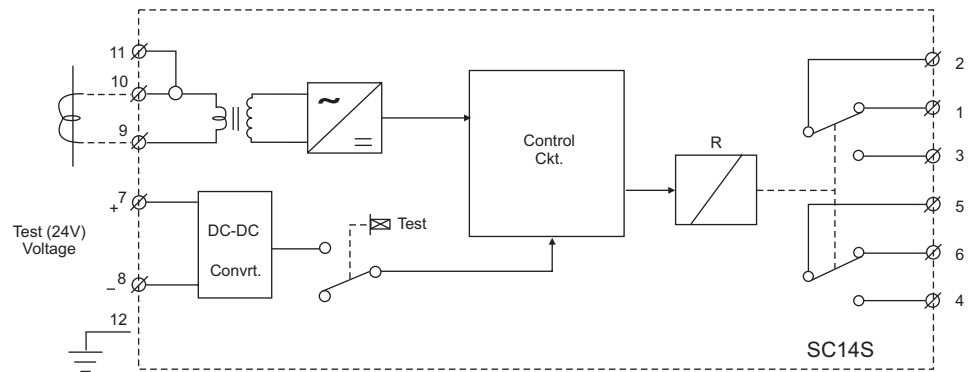
AUX SUPPLY
☐ 24 - 110V AC/DC
☐ 95 - 240V AC/DC

SETTING RANGE (Is)

MC12A
☐ (10-40)% In
☐ (20-80)% In
☐ (50-200)% In

ME12
☐ (1-16)% In

SC14S



In
☐ 1A
☐ 5A

CT OPERATED RELAY
 NO AUXILIARY SUPPLY
 REQUIRED

SETTING RANGE (Is)

☐ (10-40)% IN
☐ (20-80)% IN

Reverse Power Relay, Under Voltage or Over Voltage Relay

Salient Features

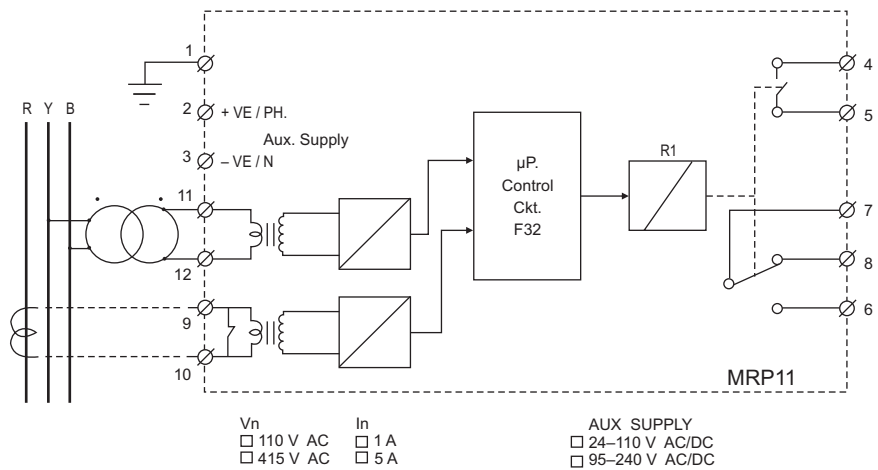
- Easy setting through front panel DIP switches
- LED indication for Power ON and trip status
- Test feature - helps in better maintenance
- Compact, light weight helps in reducing panel size & thickness



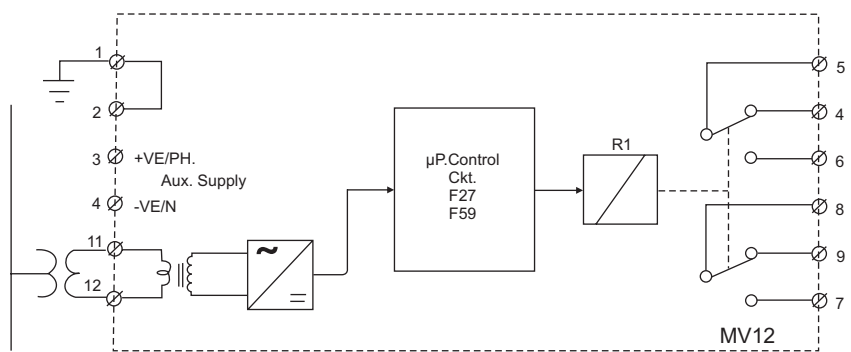
Model	MRP11	MV12
Description	Reverse Power	1 Ph U/V OR O/V
Device Code	32	27 OR 59
Design	Microcontroller Based	Microcontroller Based
Functions Available	Reverse Power Level	Lowset U/V - Vs Lowset O/V - Vs
Settings	PT input Vn 110 V, 415 V AC CT input In 1 A / 5 A Pick up level 1% - 15% Min. setting 0.5% TMS 0 to 1.5 step 0.1 Definite time characteristics	U/V Vs = 95-20% step 5% O/V Vs = 105-180% step 5% Time Characteristics available- Inverse time, Definite time TMS : 0.1 - 1.6 Step 0.1
Other Features	LED indication Test feature	Site selectable U/V OR O/V Site selectable Trip time Char.
Burden on PT	< 0.25 VA	< 0.25 VA
Burden on CT	< 0.05 VA	?0.075 VA on PT
Operating temp	0°C to 60°C	0°C to 60°C
Weight	< 1.5 kg	< 1.5 kg
Burden on Auxiliary supply	< 8 VA	?8 VA
Output Contacts	1 N/O + 1 C/O	2 C/O Contacts (S/R)
Construction	Draw out	Draw out
Dim W x H x D in mm	71 x 158 x 224	71 x 158 x 224
Panel Cutout	62 x 142	62 x 142
Ordering Information		
Auxiliary supply Type 1	20-110 V AC / DC	20-110 V AC / DC
Type 2	88-264 V AC / DC	88-264 V AC / DC
CT Rating	1A or 5 A	Not Applicable
PT Rating	Upto 380 V AC	110 V / 240 V / 415 V (site selectable)

Wiring Diagrams

MRP11



MV12



Power Factor Control Monitoring Relays

- (8 & 14 Stages) Intelligent Power Factor Controller Relay

Salient Features

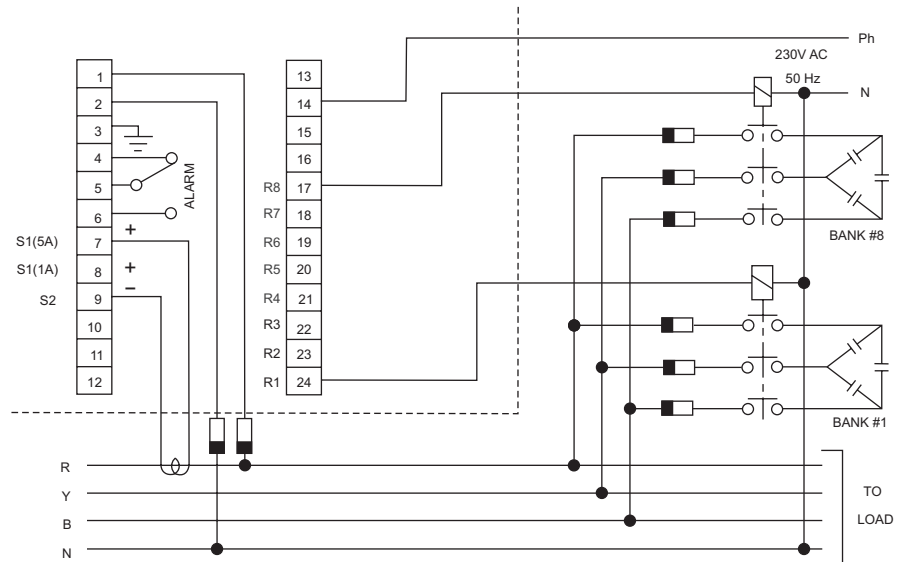
- On line display of system PF
- Easy setting through - front panel push button
- Suitable for non-uniform banks
- LED indication for alarm code, no. of Banks selected, PF status-lead / lag / unity
- Auto / Manual mode
- Measurement sensitivity of 1%
- Automatic C/K correction
- Display of current, Voltage, kVAR, & Capacitor values



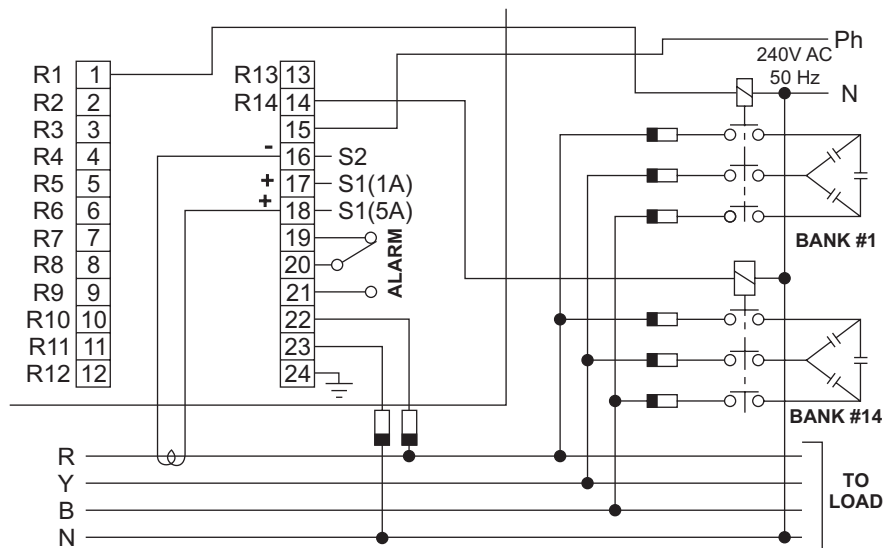
Model	RPM-8	RPM-14
Description	Automatic Power Factor Controller 8 stage	Automatic Power Factor Controller 14 stage
Device Code		
Design	Microcontroller Based	Microcontroller Based
Functions Available	Automatic PF control upto 8 stage	Automatic PF control upto 14 stage
Settings	Switching time 1-255 Sec. in step of 1 sec for same Bank switching Auto C/K selection PF control range 1% to 120% of rated current	Switching time 1-255 Sec. in step of 1 sec for same Bank switching Auto C/K selection PF control range 1% to 120% of rated current
Other Features	Can accept unequal banks Display of PF, V, I, kVAR LED indications for faults Alarm signal for CT reversal, under current, Under compensation, over compensation, over voltage, 1 A / 5 A field selectable	Can accept unequal banks Display of PF, V, I, kVAR LED indications for faults Alarm signal for CT reversal, under current, Under compensation, over compensation, over voltage, 1 A / 5 A field selectable
Burden on CT	0.3 VA	0.3 VA
Burden on PT	15 VA	15 VA
Operating temp	0°C to 60°C	0°C to 60°C
Weight	< 2kg	< 2kg
Output Contacts	8 N/O 1 N/O contact for alarm	14 N/O 1 N/O contact for alarm
Dim W x H x D in mm	144 x 144 x 100	144 x 144 x 100
Panel Cutout	138 x 138	138 x 138
Ordering Information		
Auxiliary supply	240 V AC	240 V AC

Wiring Diagrams

RPM-8



RPM-14



Motor Protection Relay

- Motor Protection Relay
- Motor Protection Relay with Voltage input

Salient Features

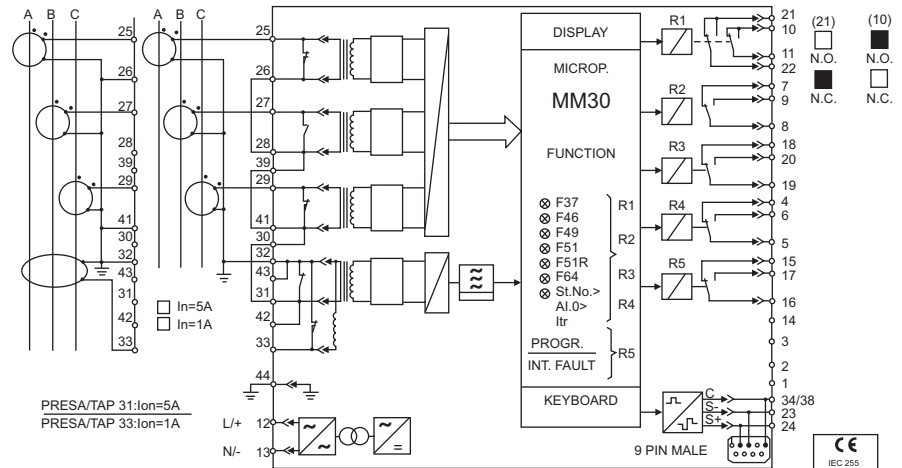
- Display of various parameters, trip count and trip data
- LEDs for fault indication
- User programmable output relays
- Built in self supervision & self testing feature helps maintenance
- RS485 Port for serial communication with "MSCOM" user friendly software



Model	MM30	MM30W	N-DIN-MA
Description	Motor Protection	Motor Protection	Motor Protection
Device Code	50/51, 51LR, 64, 68, 49, 46, 37, St no, ltr	50/51, 51LR, 64, 49, 46, 37, St no, ltr, 55, 68, 81, 47, 12/14, 27/59	49, 51LR, 46, 37, 50/51, 64, St no, ltr
Design	Numeric	Numeric	Numeric
Functions Available	Trip circuit supervision Thermal O/L and Pre-alarm Locked Rotor Current unbalance, phase reversal, phase loss Over Current Earth Fault Repeat and prolonged starts Restart Inhibition No load running Blocking Function	Trip circuit supervision Thermal O/L and Pre-alarm Locked Rotor Current unbalance, phase reversal, phase loss Over Current Earth Fault Repeat and prolonged starts Restart Inhibition No load running Blocking Function Under frequency / over frequency Under voltage / over voltage Running hours Low PF	Thermal O/L and Pre-alarm Locked Rotor Current unbalance, phase reversal, phase loss Over Current Earth Fault Repeat and prolonged starts Restart Inhibition No load running Blocking Function
Other Features	Auto setting 1 A or 5 A site selectable (Default 5 AMP) Selectable motor time constant (1 - 60 min) Display of parameters Built in self supervision RS485 port	Auto setting 1 A or 5 A site selectable (Default 5 AMP) Selectable motor time constant (1 - 60 min) Display of parameters Built in self supervision RS485 port	2 Programable digital inputs 1 Removable front face panel LCD Display 1 A or 5 A site selectable (Default 5 AMP) Selectable motor time constant (1-60 min) Display of parameters Built in self supervision RS485 port, front RS232 port (on FFP)
Burden on CT	0.2 VA for 5 A, 0.01 VA for 1 A	0.2 VA for 5 A, 0.01 VA for 1 A	0.075 VA for 5 A, 0.01 VA for 1 A
Burden on PT	Not Applicable	Not Applicable	Not Applicable
Operating temp	10°C to 60°C	10°C to 60°C	10°C to 60°C
Weight	< 2kg	< 2kg	< 1kg
Burden on Auxiliary	8.5 VA	8.5 VA	3 VA
Output Contacts	4 C/O + 1 C/O for self supervision	4 C/O + 1 C/O for self supervision	2 C/O Contacts
Construction	Draw out	Draw out	DIN rail mounting
Dim W x H x D in mm	121 x 158 x 224 113 x 142	121 x 158 x 224 113 x 142	FFP = 106 x 45 x 16 RMB = 106 x 85 x 72
Ordering Information			
Auxiliary supply	20-110 V AC / DC or 88-264 V AC / DC	20-110 V AC / DC or 88-264 V AC / DC	20-110 V AC / DC or 88-264 V AC / DC

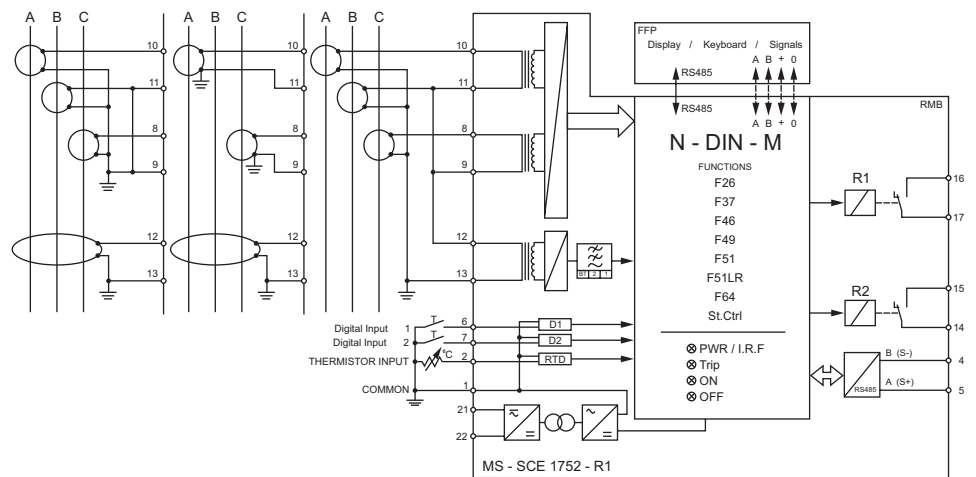
Wiring Diagrams

MM30



N-DIN-M

N-DIN-M



Motor Protection Relay

- Intelligent Motor Protection & Control Relay - MCOMP
- Economical Motor Protection relay - MPR 300



MCOMP relay



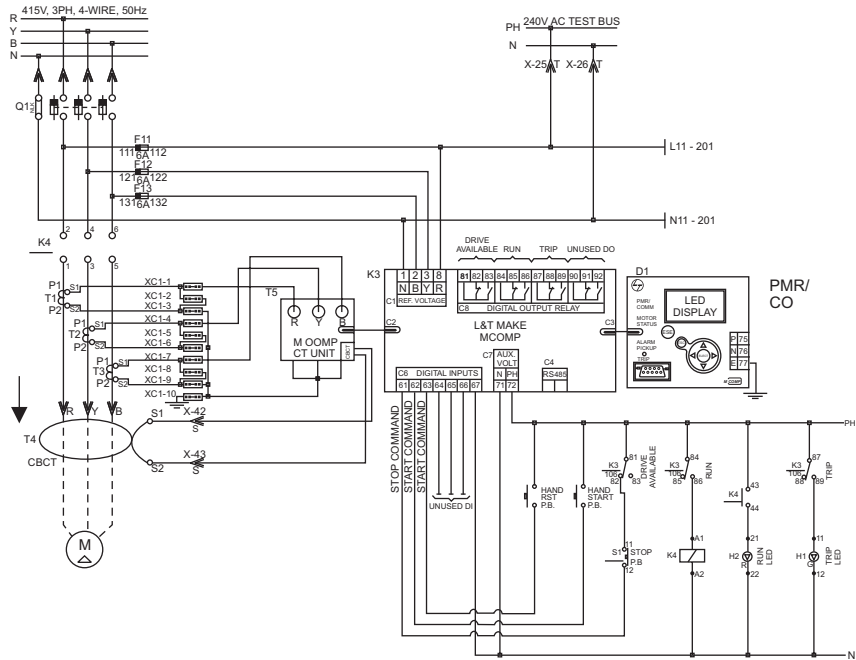
MPR 300

Model	MCOMP	MPR 300
Description	Motor Protection	Motor Protection
Device Code	49, 14, 46, 50N, 3, 59, 27, 47, 81H, 81L, 66, 27LV, 47a, 47b	49, 51LR, 64, 46, 37
Design	Numeric	Numeric
Functions Available	Thermal Over load Locked rotor Current unbalance Phase loss Under current Over Voltage Under Voltage Over Frequency Under frequency Max. no. of starts Reacceleration Phase reversal	Thermal overload Locked Rotor Earth fault Single phasing No load running
Other Features	Intelligent relay with separate protection, display and CT modules Suitable for 50/ 60 Hz Can be used with DOL, RDOL and Star delta starters Communication options - Modbus RTU, Modbus TCP IP and Profibus	up to 88A Trip time characteristics as per IEC947
Burden on PT	Not Applicable	Not Applicable
Burden on CT	Not Applicable	Not Applicable
Operating temp	10 to 60° C	0-60° C
Weight	< 2kg	< 0.5kg.
Burden on Auxiliary supply	< 8VA	< 8VA
Output Contacts	4C/O	1NO+1NC
Dim W x H x D in mm	Split Protection unit 92 x 123 x 103.95	Not applicable
Panel Cutout	Display - 92 x 92	Not applicable
Auxiliary supply	80 - 300 VAC/ 80 - 240 VDC	240V AC

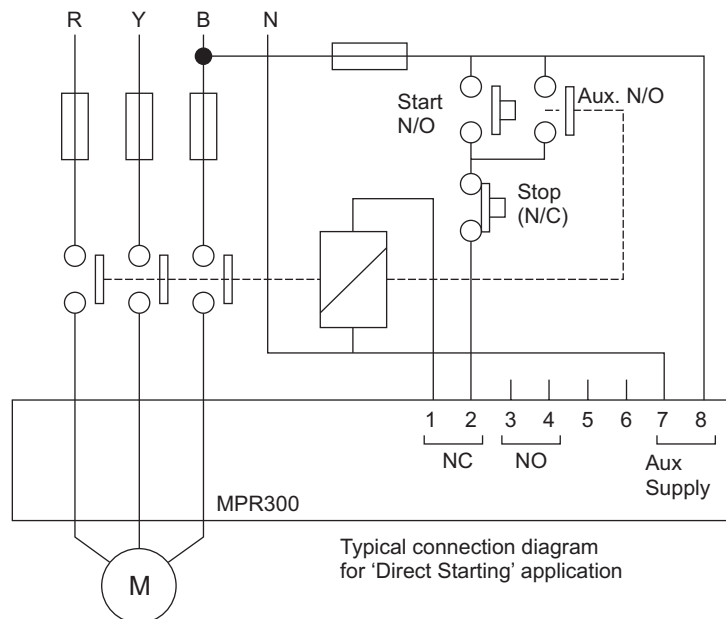
Wiring Diagrams

MCOMP Relay

Typical Dol feeder with **MCOMP**



MPR300 Relay



Generator Protection Relays

- Multifunction Generator Protection Relays
- Percentage Based Generator Differential Relay

Salient Features

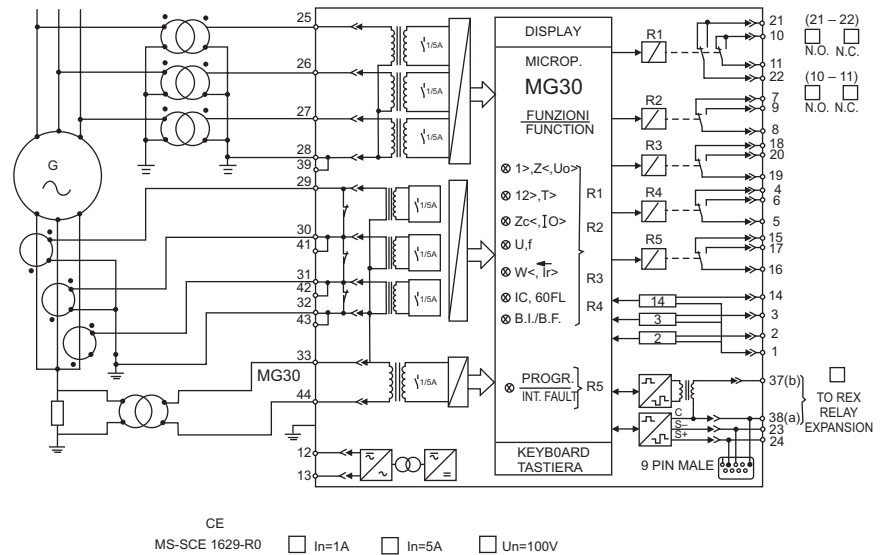
- Display of various parameters, trip count & trip data on 8 digit alphanumeric display
- Separate LEDs for various fault indication
- Four user programmable output relays
- Built in self supervision & self testing feature help maintenance
- Easy operation by 5 push buttons
- RS485 Port for serial communication with “MSCOM” user friendly software



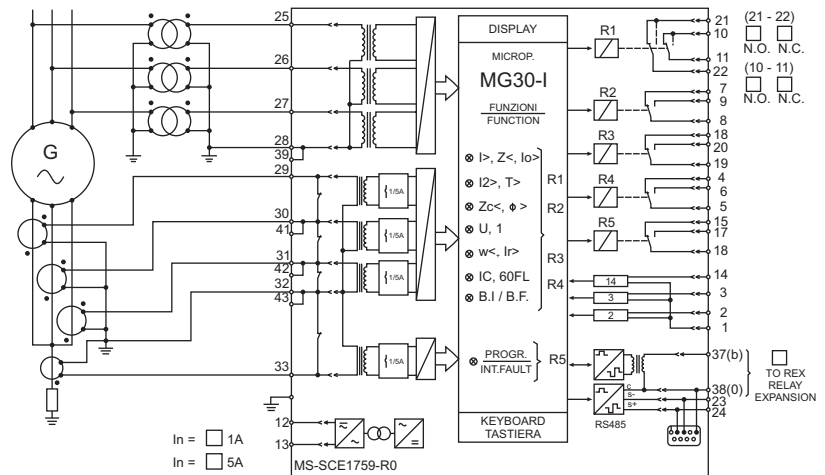
Model	MG30	MG30-I	MD32-G
Description	Generator Protection	Generator Protection	Generator Differential
Device Code	21, 24, 27/59, 32, 37, 40, 46, 49, 50/27, 50V/51V, 51BF, 60FL, 64S, 68, 81	21, 24, 27/59, 32, 37, 40, 46, 49, 50/27, 50V/51V, 51BF, 60FL, 64S, 68, 81	87, 50/51, 64S/87N, 68
Design	Numeric	Numeric	Numeric
Functions Available	Two levels of voltage controlled O/C, Thermal Image with pre-alarm, Two levels of current unbalance Two levels of under / over voltage Two levels of under / over frequency 95% + 100% Stator Earth fault, Two levels of Over excitation Two levels of Under impedance, Loss of Field, Under Power PT Fuse Failure, Breaker Failure, Inadvertent C/B Closure etc.	Two levels of voltage controlled O/C, Thermal Image with pre-alarm, Two levels of current unbalance Two levels of under / over voltage Two levels of under / over frequency 95% stator Earth fault Two levels of Over excitation Two levels of Under impedance, Loss of Field, Under Power PT Fuse Failure, Breaker Failure, Inadvertent C/B Closure etc.	Generator Differential Bias % with dual adjustable - slope Over Current Stator E/F CB Failure protection
Other Features	1 A or 5 A site selectable Display of Parameters Built in Self supervision RS485 Port, MODBUS protocol.	1 A or 5 A site selectable Display of Parameters Built in Self supervision RS485 Port, MODBUS protocol.	1 A or 5 A site selectable Display of Parameters Wave form capture feature Built in Self supervision, - RS485 Port
Burden on CT	Blocking inputs & Blocking outputs 0.25 VA for 5 Amp CT 0.01 VA for 1 Amp CT	Blocking inputs & Blocking outputs 0.25 VA for 5 Amp CT 0.01 VA for 1 Amp CT	0.2 VA for 5 A, 0.01 VA for 1 A Not Applicable
Burden on PT	0.05 VA (MG30)	0.05 VA (MG30)	
Burden on Auxiliary supply	8.5 VA	8.5 VA	8.5 VA
Operating temp	10°C to 60°C	10°C to 60°C	-10°C to 60°C
Weight	< 2kg	< 2kg	< 2kg
Output Contacts	3 C/O+(1 N/O + N/C)+separate relay 1 C/O for self supervision	3 C/O+(1 N/O + N/C)+separate relay 1 C/O for self supervision	4 C/O, S/R or H/R or Time del 1 C/O for self supervision
Construction	Draw out	Draw out	Draw out
Dim W x H x D in mm	121 x 158 x 224	121 x 158 x 224	121 x 158 x 224
Panel Cutout	113 x 142	113 x 142	113 x 142
Ordering Information			
Auxiliary supply Type 1	20-110 V AC / DC or	20-110 V AC / DC or	20-110 V AC / DC or
Type 2	88-264 V AC / DC	88-264 V AC / DC	88-264 V AC / DC

Wiring Diagrams

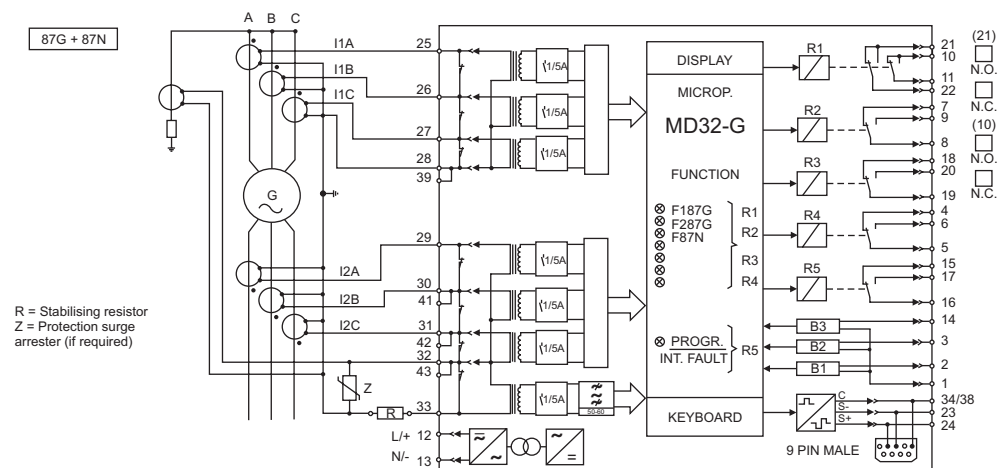
MG30



MG30-I



MD32-G



Transformer Protection Relay

- Percentage Based Transformer Differential Relay
- 3 Phase Thermal + Over Current + Earth Fault Relay for transformer protection

Salient Features

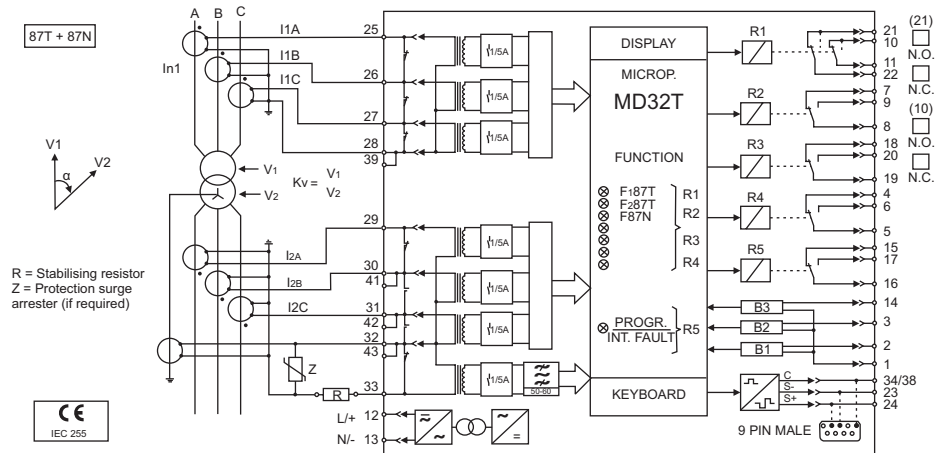
- Display of various parameters, trip count & trip data on 8 digit alphanumeric display
- Separate LEDs for individual fault indication
- Four user programmable output relays
- Built in self supervision & self testing feature help maintenance
- Easy operation by 5 push buttons
- RS485 Port for serial communication with "MSCOM" user friendly software



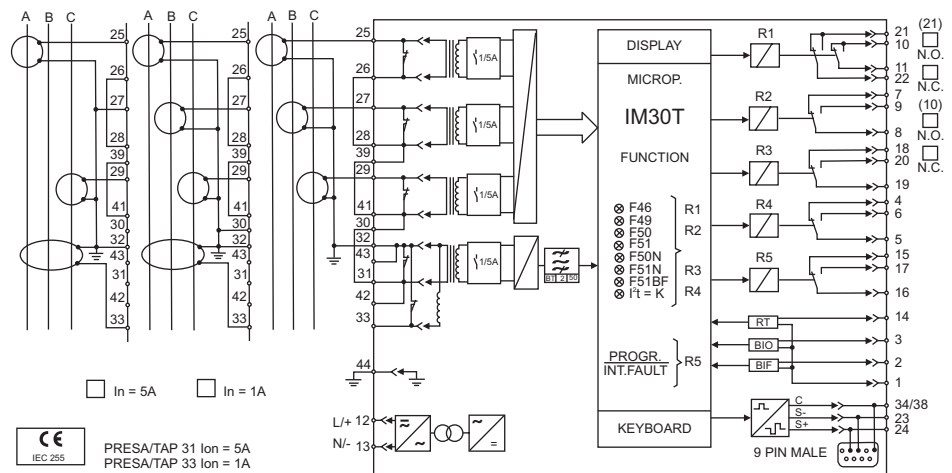
Model	MD32T	MD32TM	IM30T
Description	Transformer Differential + Restricted E/F	Transformer Differential	3 Ph O/C, E/F + Thermal
Device Code	87 RYB, 87N	87 RYB	50/51 RYBN, 49, 46, I ² t, 51BF, 50N/51N
Design Functions Available	Numeric Lowset Differential Lowset Op time : <=30mS Highset Differential Highset Op time : 6-20mS Restricted Earth Fault Dual slope Bias Highset can be Biased / Unbiased 2nd harmonic restraint setting 5th harmonic restraint setting Auto correction of CT Ratio Zero sequence compensation Blocking Function	Numeric Lowset Differential Lowset Op time : <=30mS Highset Differential Highset Op time : 6-20mS Dual slope Bias Highset can be Biased / Unbiased 2nd harmonic restraint setting 5th harmonic restraint setting Auto correction of CT Ratio Zero sequence compensation Blocking Function	Numeric Lowset O/C Highset O/C Lowset E/F Highset E/F Thermal Overload Lowset current unbalance with Definite / Inverse time tripping Highset current unbalance Inrush Energy protection CB Failure function Blocking function
Other Features	Display of parameters Built in self supervision RS485 Port 1 A OR 5 A site selectable Waveform capture feature	Display of parameters Built in self supervision RS485 Port 1 A OR 5 A site selectable Waveform capture feature	Display of Parameters Built in self supervision RS485 Port 1 A OR 5 A site selectable
Burden on CT	0.2 VA for 5 A, 0.01 VA for 1 A	0.2 VA for 5 A, 0.01 VA for 1 A	0.2 VA for 5 A, 0.01 VA for 1 A
Operating temp	10°C to 60°C	10°C to 60°C	10°C to 60°C
Weight	< 2kg	< 2kg	< 2kg
Burden on Auxiliary supply	8.5 VA	8.5 VA	8.5 VA
Output Contacts	5 C/O, S/R or H/R or Time del	5 C/O, S/R or H/R or Time del	5 C/O, S/R or H/R or Time del
Construction	Draw out	Draw out	Draw out
Dim W x H x D in mm	121 x 158 x 224	121 x 158 x 224	121 x 158 x 224
Panel Cutout	113 x 142	113 x 142	113 x 142
Ordering Information			
Auxiliary Supply	20-110 V AC / DC 88-264 V AC / DC	20-110 V AC / DC 88-264 V AC / DC	20-110 V AC / DC 88-264 V AC / DC

Wiring Diagrams

MD32T / MD32TM



IM30T



Feeder Protection Relays

- 3 Phase O/C & E/F relay with Highset + Auto Reclosure (Optional)
- 3 Phase Directional O/C & E/F relay with Highset

Salient Features

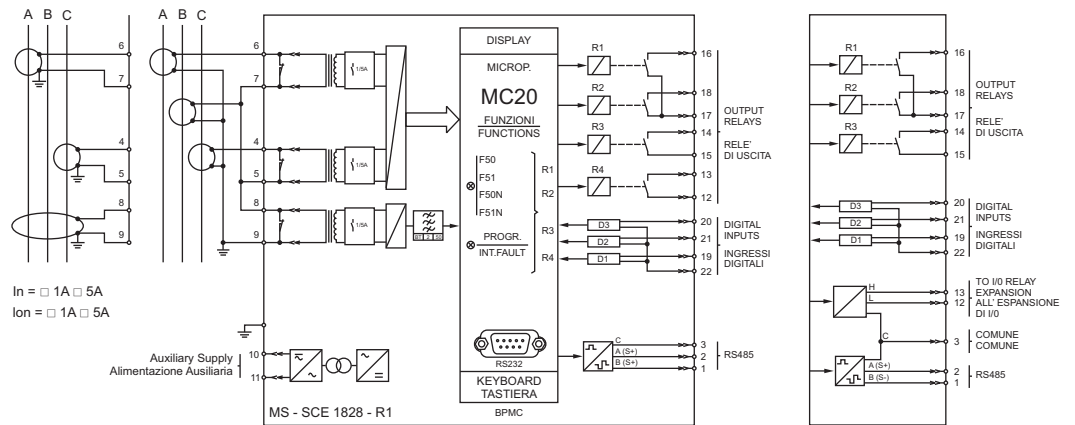
- Display of various parameters, trip count & trip data on LCD screen
- Separate LEDs for various fault indication
- Built in self supervision & self testing feature
- Wave form capturing
- RS485 Port for serial communication with "MSCOM" user friendly software
- Front RS232 Port for local programming



Model	MC20	MC30
Description	3P O/C + E/F + Highset + Autoreclosing (Optional)	3P O/C + E/F + Highset
Device Code	51, 51N, 50, 50N, 51BF, 79 (optional)	51, 51N, 50, 50N, 49, 51BF
Design	Numeric	Numeric
Functions Available	Lowset O/C 2 Highset O/C Levels Lowset E/F 2 Highset E/F Levels Time current curves selectable according to IEC/IEEE standards Auto Reclose (In MC20-R) Breaker Failure protection Circuit Breaker control via serial port Blocking Output and Blocking Input for pilot wire selectivity coordination Time tagged multiple event recording Oscillographic wave form capture Accepts 3 Digital inputs Display LCD 16 (2 x 8) characters 3rd Harmonic Filter on the neutral input current Password protection facility	Lowset O/C 2 Highset O/C Levels Lowset E/F 2 Highset E/F Levels Thermal image Breaker Failure protection Circuit Breaker control via Serial port Blocking Output and Blocking Input for pilot Wire selectivity coordination Time tagged multiple event recording Oscillographic wave form capture Accepts 3 Digital inputs Display LCD 16 (2 x 8) characters Time current curves selectable according to IEC/IEEE standards Password protection facility
Rating	1 A or 5 A site selectable	1 A or 5 A site selectable
Other Features	Display of parameters Built in supervision Modbus RTU / IEC870-5-103 Communication Protocols Front RS232 Port for Local Programming Oscillographic recording of input Quantities RS485 serial communication port on Back Panel	Display of parameters Built in supervision Modbus RTU / IEC870-5-103 Communication Protocols Front RS232 Port for Local Programming Oscillographic recording of input Quantities RS485 serial communication port on Back Panel
Burden on CT	0.1 VA for 1 A, 0.3 VA for 5 A	0.1 VA for 1 A, 0.3 VA for 5 A
Burden on PT	NA	NA
Burden on Aux. Supply	< 7 VA	< 7 VA
Operating Temp	-10°C to 55°C	-10°C to 55°C
Weight	< 1.5Kg	< 1.5Kg
Output Contacts	4 C/O Contacts	4 C/O Contacts
Construction	Drawout	Drawout
Dim	83 x 164 x 225	83 x 164 x 225
Panel Cutout	64 x 137	64 x 137
Ordering Information		
Aux. Supply Type 1	24-110 V AC/DC	24-110 V AC/DC
Type 2	88-264 V AC/DC	88-264 V AC/DC

Wiring Diagrams

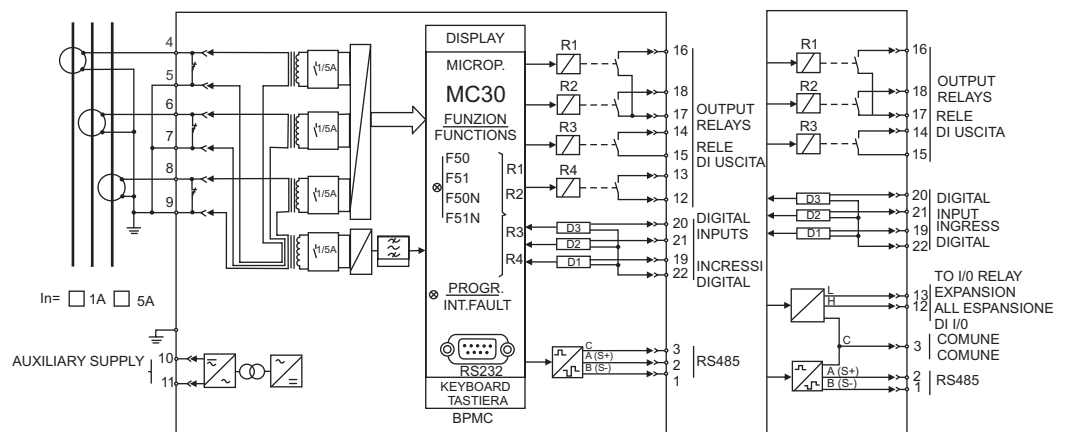
MC20



MS - SCE 1828 - R1
Standard Output

MS - SCE 1839 - R2
I/O Output

MC30



MS-SCE1895-R2
Standard Output

MS - SCE1924-R2
I/O Output

Feeder Protection Relays / Vector Shift Relay

- 3 Phase Directional O/C & E/F relay with Highset
- 3 Phase voltage and frequency relay with vector shift

FMR - Salient Features :-

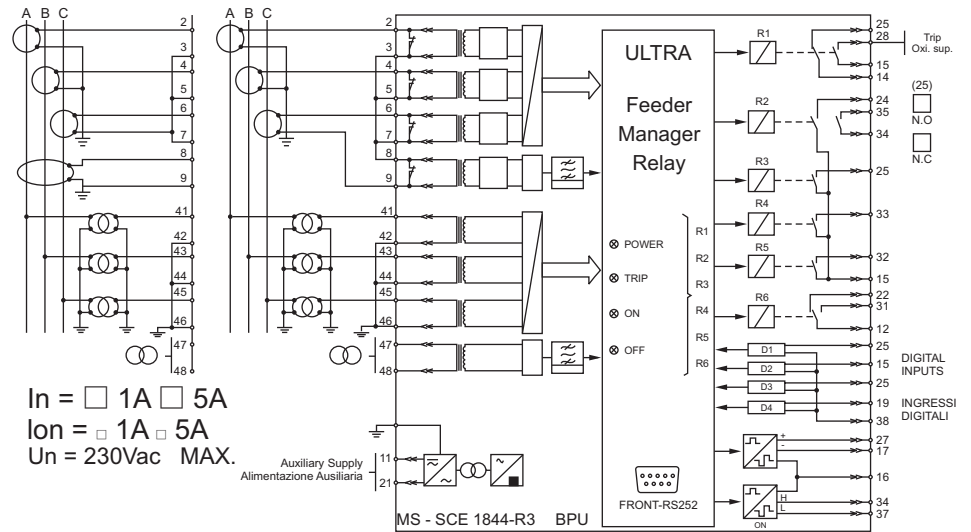
- Display of various parameters, trip count & trip data on LCD screen
- Separate LEDs for various fault indication
- Built in self supervision & self testing feature
- Wave form capturing
- RS485 Port for serial communication with "MSCOM" user friendly software
- Front RS232 Port for local programming



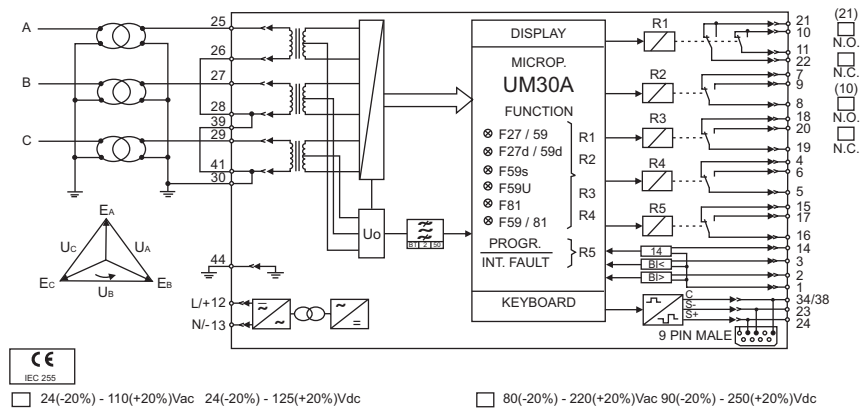
Model	FMR	UM30A
Description	Feeder Manager Relay	3 Phase V and F relay with vector shift
Device Code	46, 49, 50/51, 67, 50N/51N, 67N, 27/59, 59UO, 74, 81, 86, 121, I't	24, 27d/59d, 47, 59, 59Uo, 78, 81
Design	Numeric	Numeric
Functions Available	Three levels for phase over current independently programmable as directional or non directional Three levels for Earth Fault independently programmable as directional or non directional Thermal image Selectable Time current curves according to IEC and IEEE standards Two over/under voltage levels Two over/under frequency levels Zero sequence over voltage level Two Negative Sequence current levels One Positive Sequence over voltage level One Negative Sequence undervoltage level Trip circuit supervision Associated Circuit Breaker control Breaker failure protection Breaker interruption energy	Over Fluxing Two Levels of under / over voltage Two Levels of under / over frequency Zero seq. voltage Voltage unbalance Vector shift detection
Rating	1 A or 5 A site selectable / 100-125 V PTI	
Other Features	Graphical display 128 x 64 dots Display of V, I, PF, kW, kVA, kVAr and thermal status Modbus RTU / IEC870-5 Communication Protocols RS232 serial communication port on front face MIMIC diagram on LCD Oscillographic recording of input quantities RS485 serial communication port on Back Panel	Display of Parameters Built in Self supervision RS485 Port
Burden on CT	Phase 0.01 VA at In = 1 A; 0.2 VA at In = 5 A Neutral	NA
Burden on PT	0.01 VA at In = 1A; 0.2 VA at In = 5 A	0.2 VA / Phase at UN
Burden on Aux. Supply	0.1 VA at UN	8.5 VA
Operating Temp	-10°C to 55°C	10°C to 60°C
Weight	< 2Kg	< 2kg
Burden on Aux.	< 10 VA	3 C/O+(1 N/O + 1 N/C)+separate relay
Output Contacts	6 C/O Contacts	1 C/O for self supervision
Construction	Drawout	Draw out
Dim	121 x 164 x 224	121 x 158 x 224
Panel Cutout	113 x 142	113 x 142
Ordering Information		
Aux. Supply Type 1 Type 2	20-110 V AC/DC or 88-264 V AC/DC	20-110 V AC / DC or 88-264 V AC / DC

Wiring Diagrams

FMR



UM30A



Control & Supervision Relays

- Power Management Relay
- Multifunction 3 Phase Measuring Instrument

Salient Features

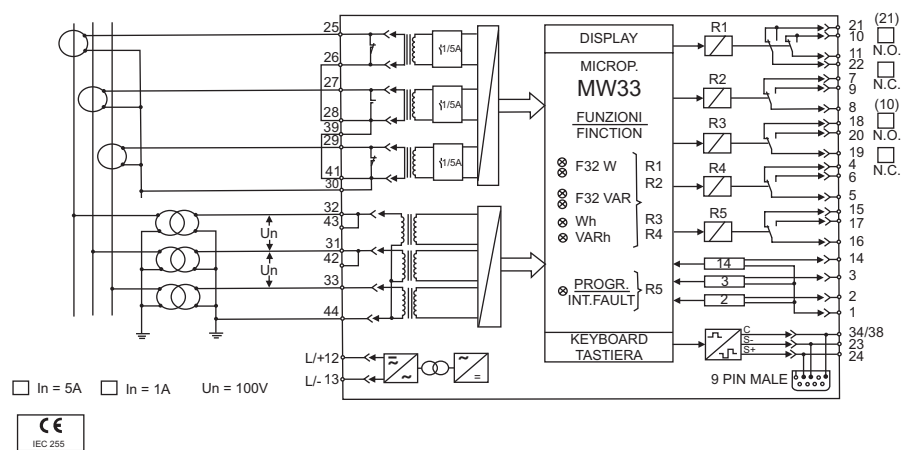
- Display of various parameters, event count & event data on 8 digit alphanumeric display
- Separate LEDs for various fault indication
- Four user programmable output relays
- Built in self supervision & self testing feature help maintenance
- Easy operation by 5 push buttons
- RS485 Port for serial communication with "MSCOM" user friendly software



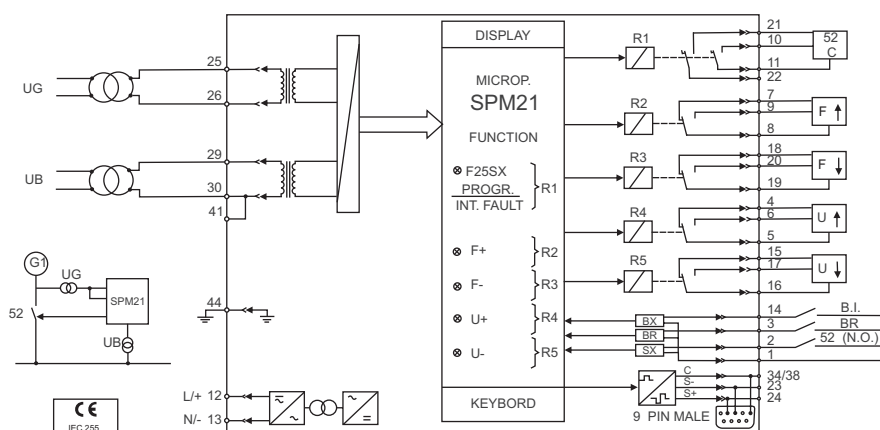
Model	MW33	SPM21	RRS
Description	Power management	Auto Synchronising Relay	Generator load sharing
Device Code	81, 27, 59, 32P, 32Q	25, 27	95
Design	Numeric	Numeric	Static
Functions Available	Frequency 2 stages, Voltage 2 stage, Power factor 2 stage, Active power 2 stage, Capacitor reactive power 2 stage. Actual measurement of Freq, V, I, PF, active power, reactive power	Auto Synchronising with Adjustable Voltage, Adjustable Frequency, Adjustable Phase angle Adjustable Reclose time, Bus Live / Dead operation, Speed Regular Control, Voltage Regulator Control, Digital inputs to monitor CB position	Active / reactive power Over power Load sharing Frequency control
Other Features	Display of parameters MD recording & data logging RS485 Port, Event recording	110V - 125 V PT input Display of Parameters, Built in self supervision, RS485 Port	110 V PT input 1 A / 5 A CT input
Burden on CT	0.2 VA for 5 A, 0.01 VA for 1 A	NA	NA
Burden on PT	0.04 VA	0.04 VA	< 5 VA
Operating temp	10°C to 60°C	10°C to 60°C	10°C to 60°C
Weight	< 2kg	< 2kg	< 1.5kg
Burden on Auxiliary supply	8.5 VA max	8.5 VA	8.5 VA
Output Contacts	5 C/O	5 C/O	3 N/O
Construction	Draw out	Draw out	Draw out
Dim W x H x D in mm	121 x 158 x 224	121 x 158 x 224	71 x 158 x 224
Panel Cutout	113 x 142	113 x 142	62 x 142
Ordering Information			
Auxiliary supply Type 1 Type 2	20-110 V AC / DC 88-264 V AC / DC	20-110 V AC / DC or 88-264 V AC / DC	20-110 V AC / DC or 88-264 V AC / DC Upto 380 V AC 1 A / 5 A

Wiring Diagrams

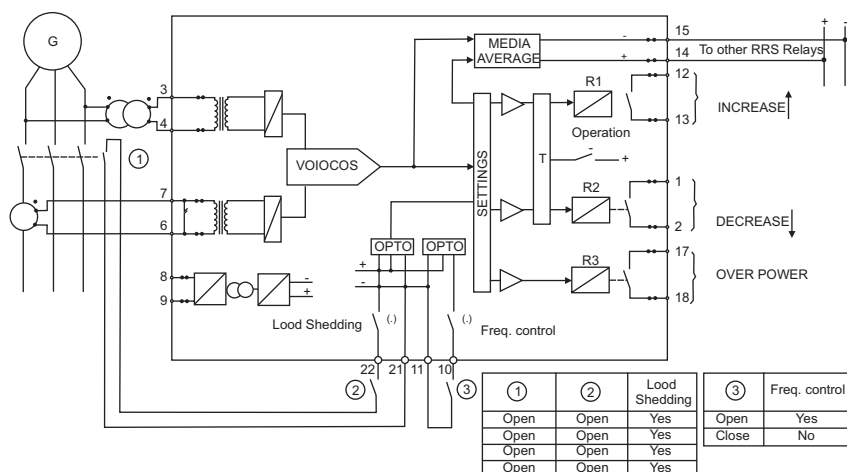
MW33



SPM21



RRS



Voltage and Frequency Relays

- 3 Phase Voltage and frequency relay with df/dt & dv/dt
- 1 Phase Voltage and frequency relay

Salient Features

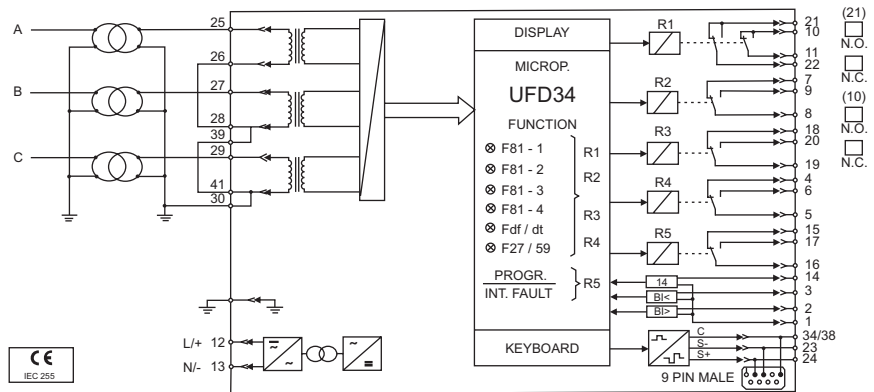
- Display of various parameters, tripcount & trip data on LCD screen
- Separate LEDs for individual fault indication
- Built in self supervision & self testing feature
- RS485 port for serial communication with "MSCOM" software
- Easy operation by push buttons



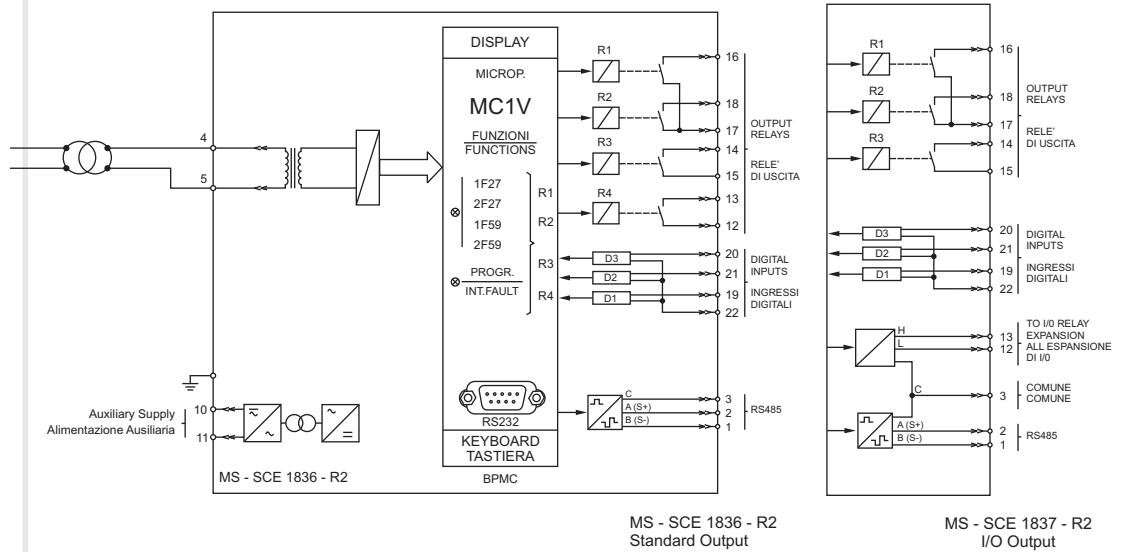
Model	UFD34	MC1V	MC3V
Description	3 Ph Voltage and Frequency Relay	Single phase Voltage and Frequency Relay	3 Ph Voltage and Frequency Relay
Device Code	81, 27, 59, df/dt , dv/dt	27, 59, 81	27, 59, 47, 59 V 0, 81
Design	Numeric	Numeric	Numeric
Functions Available	Selectable 4 stages of frequency as Under/Over frequency Selectable 2 stages of voltage as Under/Over voltage Selectable 2 stages of df/dt Selectable 1 stages of de/dt Blocking Output and Blocking Input Time tagged multiple event recording	Two Under Voltage elements Two Over Voltage elements One Under Frequency element One Over Frequency element Blocking Output and Blocking Input Time tagged multiple event recording Oscillographic wave form capture Display LCD 16 (2 x 8) characters	Two Under Voltage elements Two Over Voltage elements One Under Frequency element One Over Frequency element One Zero Sequence Over Voltage Element One Negative Sequence Under Voltage Element One Positive Sequence Over Voltage Element Oscillographic wave form capture Modbus RTU / IEC870-5-103 Communication Protocols Display LCD 16 (2 x 8) characters
Rating	100-125 V	100-125 V	100-125 V
Other Features	Display of parameters Built in self supervision Oscillographic recording of input quantities RS485 serial communication port on Back Panel	Display of parameters Built inSelf supervision Modbus RTU / IEC870-5-103 Communication Protocols Front RS232 Port for Local Programming Oscillographic recording of input quantities RS485 serial communication port on Back Panel	Display of parameters Built in self supervision Modbus RTU / IEC870-5-103 Communication Protocols Front RS232 Port for Local Programming Oscillographic recording of input quantities RS485 serial communication port on Back Panel
Burden on CT	Not Applicable	0.1 VA for 1 A, 0.3 VA for 5 A	0.1 VA for 1 A, 0.3 VA for 5 A
Burden on PT	0.04 VA	NA	NA
Operating temp	-10°C to 60°C	-10°C to 55°C	-10°C to 55°C
Weight	< 2.5Kg	< 1.5Kg	< 1.5Kg
Burden on Auxiliary	8.5 VA	< 7 VA	< 7 VA
Output Contacts	4 C/O Contacts + 1 C/O for Self supervision	4 C/O Contacts + 1 C/O for Self supervision	4 C/O Contacts + 1 C/O for Self supervision
Construction	Drawout	Drawout	Drawout
Dim W x H x D in mm	121 x 164 x 224	83 x 164 x 224	83 x 164 x 224
Panel Cutout	113 x 142	64 x 137	64 x 137
Ordering Information			
Auxiliary Supply	20-110 V AC/DC or 88-264 V AC/DC	20-110 V AC/DC or 88-264 V AC/DC	20-110 V AC/DC or 88-264 V AC/DC

Wiring Diagrams

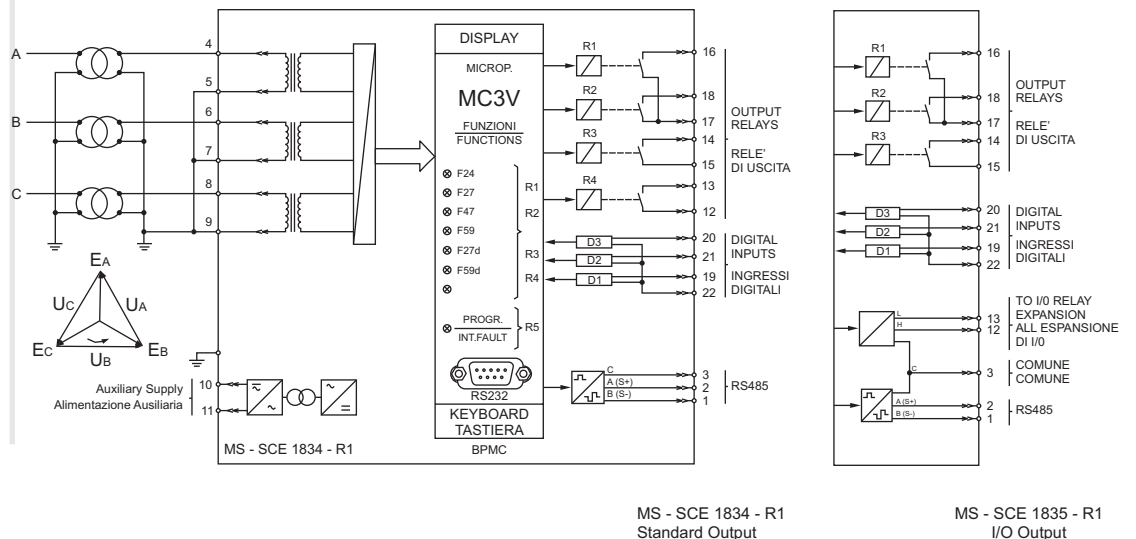
UFD34



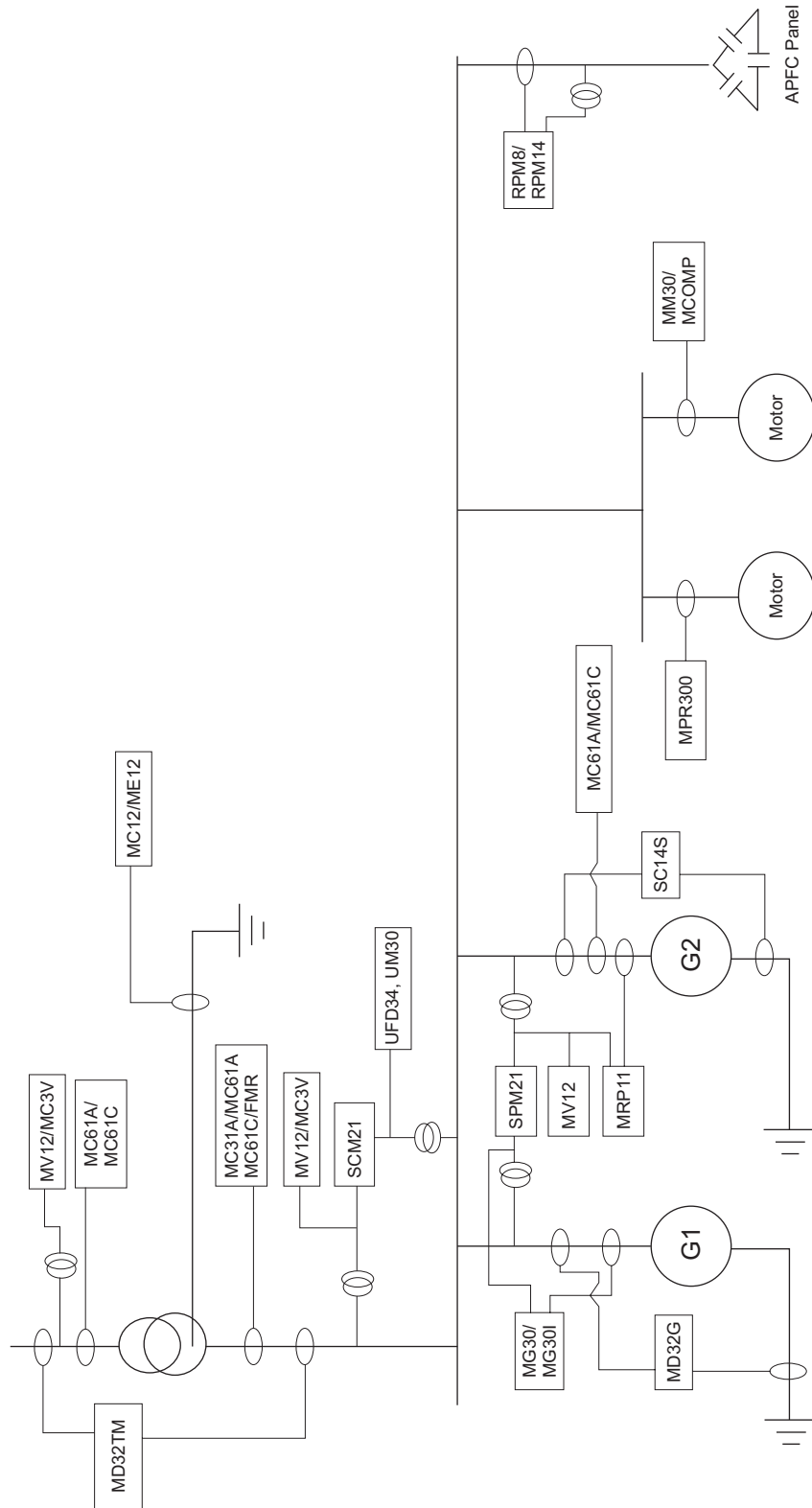
MC1V



MC3V



Schematic - Relay Application



scheme - 1

scheme - 2

scheme - 1

scheme - 2

Get the Switchgear Training Edge!

Aimed at maximizing productivity, conserving energy, minimizing costs and enhancing safety, our Electrical & Automation training programmes have benefitted over 1 Lakh professionals in the last 25 years. These training programmes are highly beneficial as they provide right exposure and impart knowledge on selection, installation, maintenance and testing of Electrical & Automation products.

So gain the advantage and go the extra mile with:

- 15 courses on contemporary topics
- Courses applicable to all switchgear brands
- Training Centers in Pune, Lucknow and Coonoor
- Blend of theory and practical experience

The typical training programmes on LV Switchgear:

- Electrical Design of Switchgear Assembly – Advanced
- Design of Control Circuits
- Introduction to LV Switchgear
- Introduction to Building Power Distribution
- LV Switchgear Selection & Maintenance - Advanced
- Breaker Maintenance Workshop - Advanced
- Switchgear Maintenance Workshop - Advanced

Please contact any of the training centres for participation and detailed training programme schedule.



Pune

Larsen & Toubro Limited
Switchgear Training Centre
T-156/157, MIDC, Bhosari,
Pune: 411 026.
Tel.: (020) 2712 0037 / 2712 0653
Fax.: (020) 2712 2933
E-mail : STC-PUNE@LNTEBG.COM



Lucknow

Larsen & Toubro Limited
Switchgear Training Centre
C-6&7, UPSIDC, P.O. Sarojini Nagar,
Lucknow: 226 008.
Tel.: (0522) 247 6110 / 099355 63239
Fax.: (0522) 247 6015
E-mail : STC-LUCKNOW@LNTEBG.COM



Coonoor

Larsen & Toubro Limited
Switchgear Training Centre Ooty-Coonoor
Main Road, Yellanahalli
P.O., The Nilgiris – 643 243.
Tel.: (0423) 251 7107
Fax.: (0423) 251 7158
E-mail : STC-COONOOR@LNTEBG.COM

Electrical Standard Products (ESP) Branch Offices:

REGISTERED OFFICE AND HEAD OFFICE

L&T House, Ballard Estate
P. O. Box 278
Mumbai 400 001
Tel: 022-67525656
Fax: 022-67525858
Website: www.Larsentoubro.com

ELECTRICAL STANDARD PRODUCTS (ESP)

501, Sakar Complex I
Opp. Gandhigram Rly. Station
Ashram Road
Ahmedabad 380 009
Tel: 079-66304006-11
Fax: 079-66304025
e-mail: esp-ahm@LNTEBG.com

38, Cubbon Road, P. O. Box 5098
Bangalore 560 001
Tel: 080-25020100 / 25020324
Fax: 080-25580525
e-mail: esp-blr@LNTEBG.com

131/1, Zone II
Maharana Pratap Nagar
Bhopal 462 011
Tel: 0755-4098721 / 7 / 8 / 9
Fax: 0755-2769264
e-mail: esp-bho@LNTEBG.com

Plot No. 559, Annapurna Complex
Lewis Road
Bhubaneswar 751 014
Tel: 0674-6451342, 2436696
Fax: 0674-2537309
e-mail: esp-bbi@LNTEBG.com

SCO 32, Sector 26-D
Madhya Marg, P. O. Box 14
Chandigarh 160 026
Tel: 0172-4646840, 4646853
Fax: 0172-4646802
e-mail: esp-chd@LNTEBG.com

10, Club House Road,
Annasalai
Chennai 600 002
Tel: 044-28462072 / 4 / 5 / 2109
Fax: 044-28462102 / 3
e-mail: esp-maa1@LNTEBG.com

67, Appuswamy Road
Post Bag 7156
Opp. Nirmala College
Coimbatore 641 045
Tel: 0422-2588120 / 1 / 5
Fax: 0422-2588148
e-mail: esp-cbe@LNTEBG.com

L&T House, Group MIG-5
Padmanabhpur
Durg 491 001
Tel: 0788-2213833 / 14 / 21 / 29
Fax: 0788-2213820
e-mail: esp-durg@LNTEBG.com

Khairasol, Degaul Avenue
Durgapur 713 212
Tel: 2559848, 2559849, 2559844
Fax: 0343-2553614
e-mail: esp-dgp@LNTEBG.com

Milanpur Road, Bamuni Maidan
Guwahati 781 021
Tel: 0361-2550562 / 65
Fax: 0361-2551308
e-mail: hazrasudipto@LNTEBG.com

II Floor, Vasantha Chambers
5-10-173, Fateh Maidan Road
Hyderabad 500 004
Tel: 040-67015052
Fax: 040-23296468
e-mail: esp-hyd@LNTEBG.com

Monarch Building, 1st Floor
D-236 & 237, Amrapali Road
Vaishali Nagar
Jaipur 302 021
Tel: 0141-4385914 / 18
Fax: 0141-4385925
e-mail: esp-jai@LNTEBG.com

Akashdeep Plaza, 2nd Floor
P. O. Golmuri
Jamshedpur 831 003
Jharkhand
Tel: 0657-2312205 / 38
Fax: 0657-2341250
e-mail: esp-jam@LNTEBG.com

Skybright Bldg; M. G. Road
Ravipuram Junction, Ernakulam
Kochi 682 016
Tel: 0484-4409420 / 4 / 5 / 7
Fax: 0484-4409426
e-mail: esp-cok@LNTEBG.com

3-B, Shakespeare Sarani
Kolkata 700 071
Tel: 033-44002572 / 3 / 4
Fax: 033-22821025 / 7587
e-mail: esp-ccu@LNTEBG.com

A28, Indira Nagar, Faizabad Road
Lucknow 226 016
Tel: 0522-2312904 / 5 / 6
Fax: 0522-2311671
e-mail: esp-Lko@LNTEBG.com

No: 73, Karpaga Nagar, 8th Street
K. Pudur
Madurai 625 007
Tel: 0452-2537404, 2521068
Fax: 0452-2537552
e-mail: esp-mdu@LNTEBG.com

EBG North Wing Office-Level 2
Gate 7, Powai Campus
Mumbai 400 072
Tel: 022-67052874 / 2737 / 1156
Fax: 022-67051112
e-mail: esp-bom@LNTEBG.com

12, Shivaji Nagar
North Ambazari Road
Nagpur 440 010
Tel: 0712-2260012 / 3
Fax: 0712-2260020 / 30
e-mail: esp-nag@LNTEBG.com

32, Shivaji Marg
P. O. Box 6223
New Delhi 110 015
Tel: 011-41419514 / 5 / 6
Fax: 011-41419600
e-mail: esp-del@LNTEBG.com

L&T House
P. O. Box 119
191/1, Dhole Patil Road
Pune 411 001
Tel: 020-26135048 / 26164048
Fax: 020-26124910, 26135048
e-mail: esp-pnq@LNTEBG.com

3rd Floor
Vishwakarma Chambers
Majura Gate, Ring Road
Surat 395 002
Tel: 0261-2473726
Fax: 0261-2477078
e-mail: esp-sur@LNTEBG.com

Radhadaya Complex
Old Padra Road
Near Charotar Society
Vadodara 390 007
Tel: 0265-6613610 / 1 / 2
Fax: 0265-2336184
e-mail: esp-bar@LNTEBG.com

48-8-16, Dwarakanagar
Visakhapatnam 530 016
Tel: 0891-6620411-2 / 3
Fax: 0891-6620416
e-mail: esp-viz@LNTEBG.com

Product improvement is a continuous process. For the latest information and special applications, please contact any of our offices listed here.



Larsen & Toubro Limited
Electrical Standard Products
Powai Campus, Mumbai 400 072
Customer Interaction Center (CIC)
BSNL / MTNL (toll free) : 1800 233 5858
Reliance (toll free) : 1800 200 5858
Tel : 022 6774 5858, Fax : 022 6774 5859
E-mail : cic@LNTEBG.com
Website : www.LNTEBG.com