



Numerical Relays

For Protection, Monitoring & Control



Switchgear Factory, Navi Mumbai



Switchgear Factory, Ahmednagar



Switchgear Factory, Vadodara

Larsen & Toubro is a technology-driven company that 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 offers a wide range of numerical relays suitable for LV & MV 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 also manufactures a range of electronic single phase energy meters, three phase energy meters and trivector meters at the Mysore works.

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Correlation between ANSI/IEEE device function number and relays

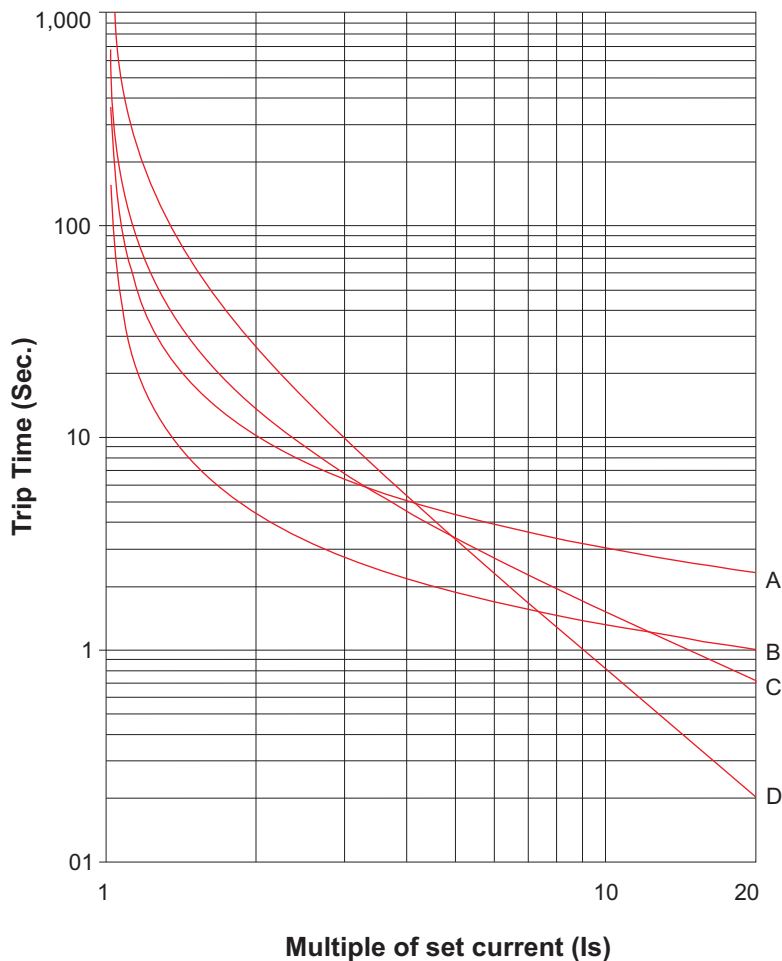
Device No.	Function Name	L&T Relays	MS Relays
21	Under impedance relay / Distance relay		MG30 / MG30-I
25	Auto synchronising		SPM21
27	AC under voltage relay	MV12 / MCOMP	UM30-A / MC1V / MC3V UFD34 / MM 30-W
27LV	Reacceleration	MCOMP	
32	Power directional relay	MRP11	MG30 / MG30-I
37	Under current or under power relay	MPR200nX / MPR300 / MCOMP	MM30 / MM30-W
40	Field control (loss of field) relay		MG30 / MG30-I
46	Reverse phase or phase balance current relay	MPR200nX / MCOMP / MPR300	MM30 / MM30-W
47	Phase-sequence or single-phasing voltage relay	MCOMP	UM30-A, MC3V / MM30-W
49	Machine or transformer thermal relay	MPR200nX / MPR300	MM30 / MM30-W
		MCOMP	MG30 / MG30-I
50	Instantaneous over current (or rate-of-rise) relay	MC12A / MC61AnX	MC30 / MG30 / MG30-I
50V	Voltage restrained over current relay		MG30 / MG30-I
50BF	Breaker - failure		MC30
51	AC time over current relay	MC12A / MC31AnX / MC61AnX	MC30
51N-(51G)	Ground fault time over current relay	MC12A / MC31AnX / MC61AnX	MC30
51LR	Locked rotor	MPR200nX / MPR300 / MCOMP	MM30 / MM30-W
51V	Voltage restrained for Phase Timed OC		MG30 / MG30-I
59	AC over voltage relay	MV12 / MCOMP	UFD34
59/81	Over excitation 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)	MPR300	MG30 / MM30 / MM30-W
64S	Machine stator ground fault detector relay		MG30
66	Max. no. of starts	MCOMP	MM30 - W
81	Frequency relay	MCOMP	UM30-ASV / MG30 UFD34 / MC1V / MC3V
87	Differential protective relay		MD32G / MD32T
87N-(87G)	Ground fault differential protective relay		MD32G, MD32T
78	Vector surge protection relay		UM30-A
81R, 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 for Feeder, AC Machines and Transformer Protection in LV & MV Systems

MC31AnX – 51, 51N

MC61AnX – 51, 51N, 50, 50N

MC61CnX – 51, 51N, 50, 50N + RS485 port

Salient Features

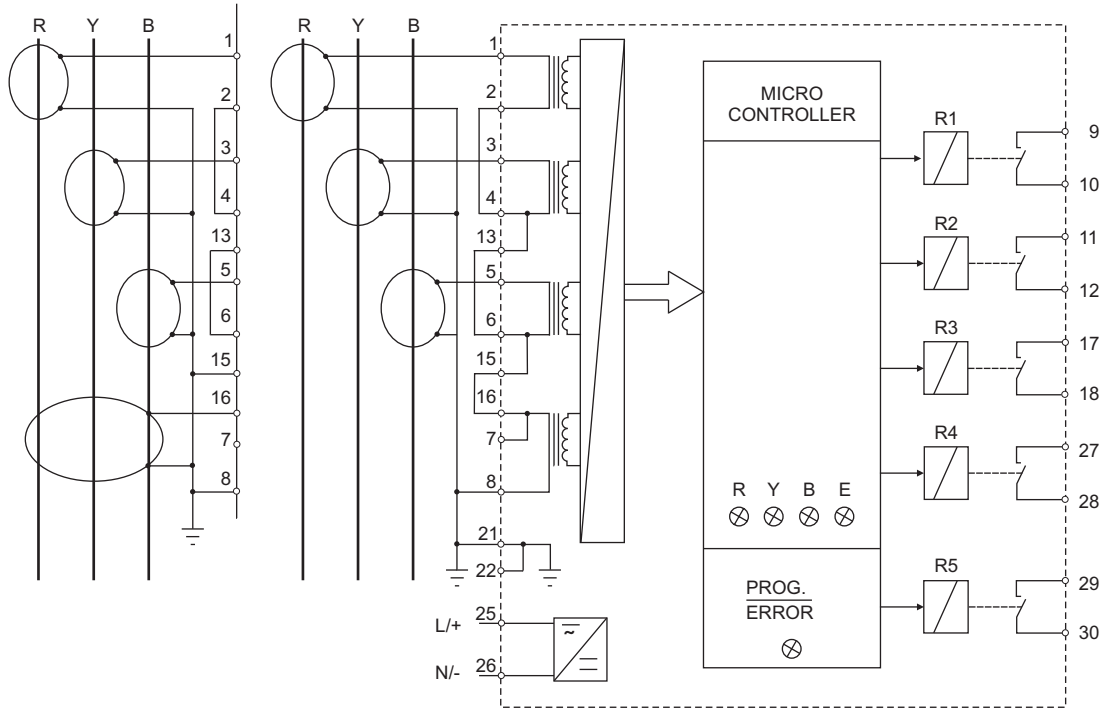
- Site selectable IEC Curves - 4 nos. of IDMT curves + 3 Definite time characteristics
- Universal Aux. supply: 24 - 240 VAC/ DC
- Large LCD Display and 4 LED's for fault indication
- Last 30 trip records with Date and Time stamping
- Built in self supervision and relay test facility
- Wide TMS Range: 0.01 – 1.60



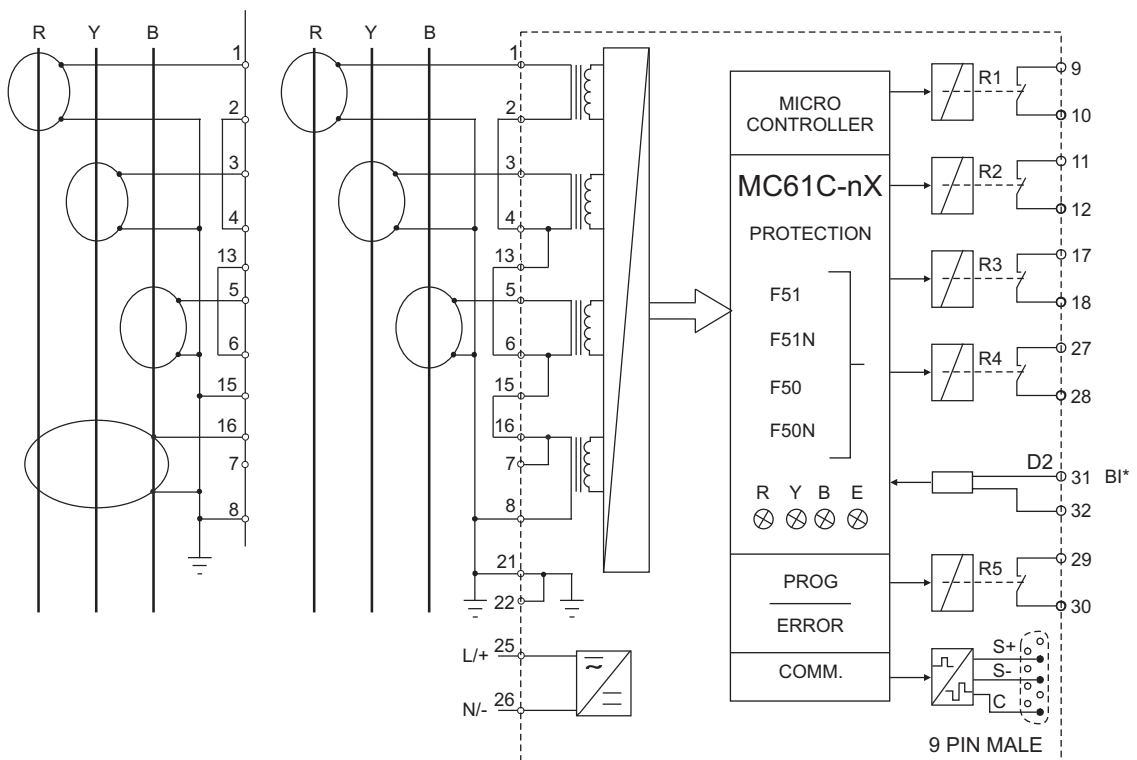
Model	MC31AnX	MC61AnX	MC61CnX
Description	3 Phase O/C + E/F	3 Phase O/C + E/F + High set	3 Phase O/C + E/F + High set + RS485 port
Device code	51, 51N	51, 51N, 50, 50N	51, 51N, 50, 50N
Function available	Lowset O/C - Is	Lowset O/C - Is	Lowset O/C - Is
	Lowset E/F - Os	Lowset E/F - Os	Lowset E/F - Os
		Highset O/C - Ihs	Highset O/C - Ihs
		Highset E/F - Ohs	Highset E/F - Ohs
Settings			Modbus on RS485
O/C Is	20 - 200% of In in step of 1%	20 - 200% of In in step of 1%	20 - 200% of In in step of 1%
E/F Os	5 - 80% of In in step of 1%	5 - 80% of In in step of 1%	5 - 80% of In in step of 1%
TMS	0.01 - 1.60 in step of 0.01	0.01 - 1.60 in step of 0.01	0.01 - 1.60 in step of 0.01
O/C High set		Disable or 0.2 to 40 of In	Disable or 0.2 to 40 of In
E/F High set		Disable or 0.05 to 20 of In	Disable or 0.05 to 20 of In
O/C & E/F High set delay		Instantaneous	Disable, 0.05, 0.1 to 2 sec in step of 0.01
Time Current Characteristics	NI1.3, NI3, VI, EI, Definite Time	NI1.3, NI3, VI, EI, Definite Time	NI1.3, NI3, VI, EI, Definite Time
Other features	Display of currents, trip count	Display of currents, trip count	Display of currents, trip count
	Self supervision feature	Self supervision feature	Self supervision feature
		Highset can be disabled	Highset can be disabled
			Breaker control
			Breaker failure protection
			Auto-doubling feature
Output contact	Programmable 4NO or 2NO+2NC Additional 1NO contact for IRF	Programmable 4NO or 2NO+2NC Additional 1NO contact for IRF	Programmable 4NO Additional 1NO contact for IRF
Burden on CT	< 0.1VA for 1A & < 0.25VA for 5A	< 0.1VA for 1A & < 0.25VA for 5A	< 0.1VA for 1A & < 0.25VA for 5A
Burden on PT	Not Applicable	Not Applicable	Not Applicable
Operating temperature	0° to 60°C	0° to 60°C	0° to 60°C
Weight	Approx. 1.7 kg	Approx. 1.7 kg	Approx. 1.7 kg
Burden on auxiliary supply	< 3W for DC & < 10VA for AC	< 3W for DC & < 10VA for AC	< 3W for DC & < 10VA for AC
Construction	Draw out	Draw out	Draw out
Dim W x H x D in mm	121 x 164 x 224	121 x 164 x 224	121 x 164 x 224
Panel Cut out in mm	113 x 142	113 x 142	113 x 142
Ordering Information			
Auxiliary Supply	24 - 240 V AC / DC	24 - 240 V AC / DC	24 - 240 V AC / DC
CT Rating	1 A or 5 A (Site Programmable)	1 A or 5 A (Site Programmable)	1 A or 5 A (Site Programmable)
Output Contacts	4 NO or 2 NO + 2 NC	4 NO or 2 NO + 2 NC	4 NO

Wiring Diagrams

MC31AnX / MC61AnX



MC61CnX



* BLOCKING INPUT

Trip Circuit Supervision Relay

- TCS01-nX is an electronic relay, designed to monitor the healthiness of trip coil circuit of a circuit breaker

Salient Features

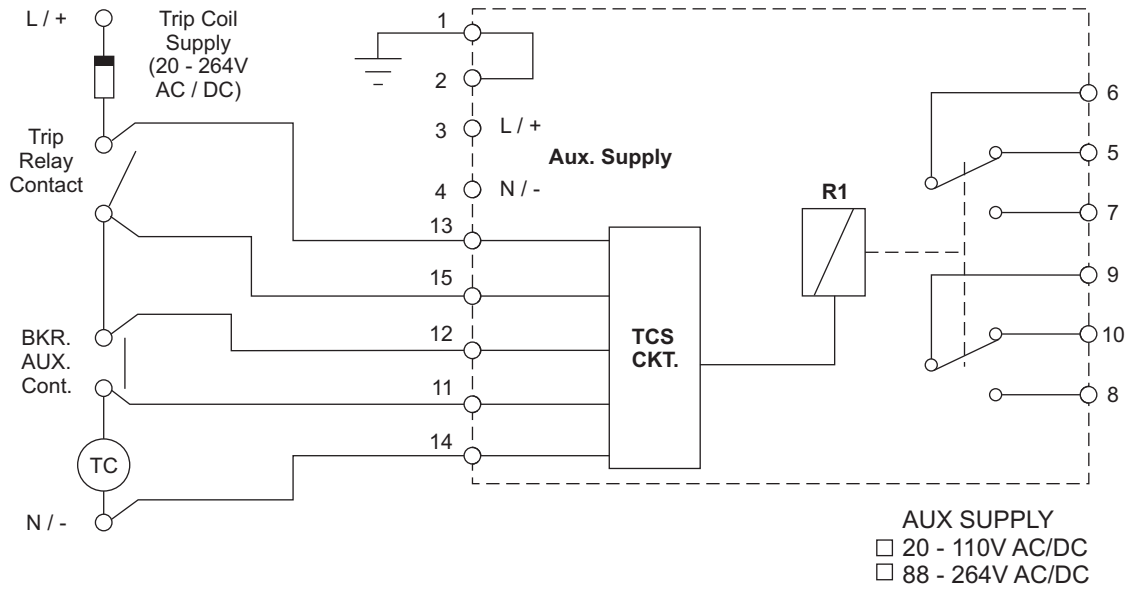
- It monitors the trip coil circuit continuously in breaker ON as well as breaker OFF conditions and gives alarm in case of following faults:
 - Open Circuit of trip coil or trip coil circuit
 - Failure of trip coil supply
 - Under voltage condition of trip coil supply
 - Failure of auxiliary supply
 - Failure of circuit breaker mechanism to complete trip operation
- TCS01-nX will work for any Trip coil supply between 20V to 264V AC/DC. It can be set to monitor standard voltages i.e., 24, 48,110, 220V DC and 110, 240V AC
- Enable/Disable facility for Trip coil supply monitoring
- Relay testing facility
- Flush mounting with draw-out case design



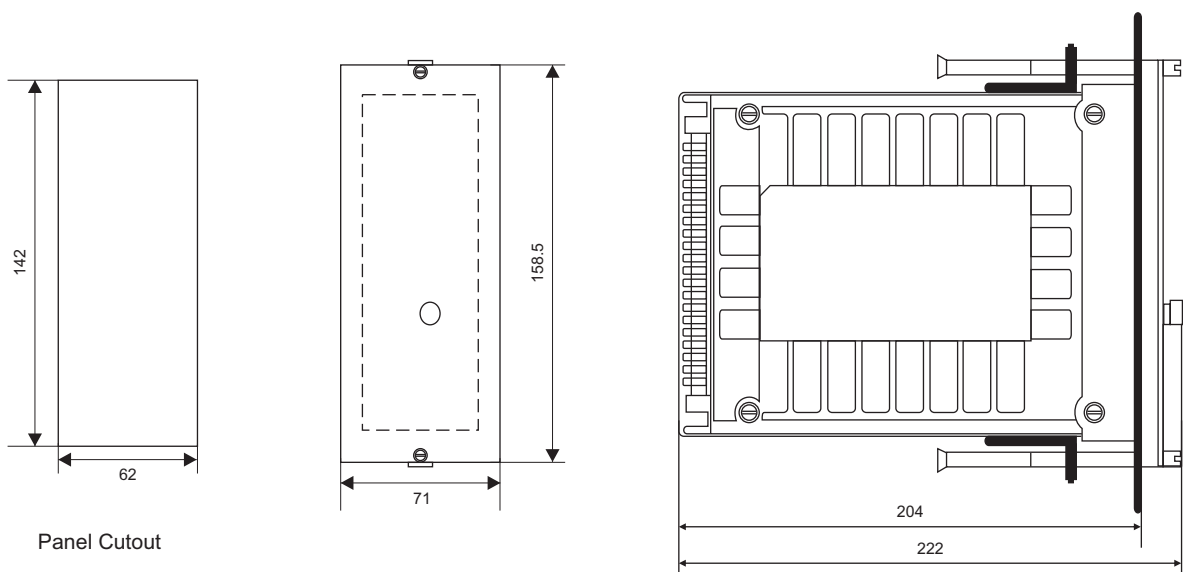
Model		TCS01NX
Description		Trip Circuit Supervision Relay
Device code		74
Design		static
Settings	Trip coil supply	24, 48,110,220V DC & 110, 240V AC
Trip time	Trip time delay	600 msec ± 100 msec
	Trip time delay in low	< 3 sec
	TC voltage condition	
Reset Time		< 150 msec
Burden on CT		Not applicable
Burden on PT		Not applicable
Operating temp		-10°C to 55°C
weight		Around 1 kg
Output contacts		2 C/O contacts (self reset)
Output contact Rating		8 A, (250 VAC / 30 VDC)
Construction		Draw-out
Dim (W x H x D) in mm		71 x 158 x 204
Panel cutout (WxH) in mm		62 x 142
Ordering information		
Auxiliary supply	Type 1	20-110 VAC/ DC
	Type 2	88-264 VAC/ DC

Wiring Diagrams

TCS01NX



Dimensions



All Dimensions (mm)

Current Sensing Relays

- Single phase over current / earth fault relay - MC12

Salient Features

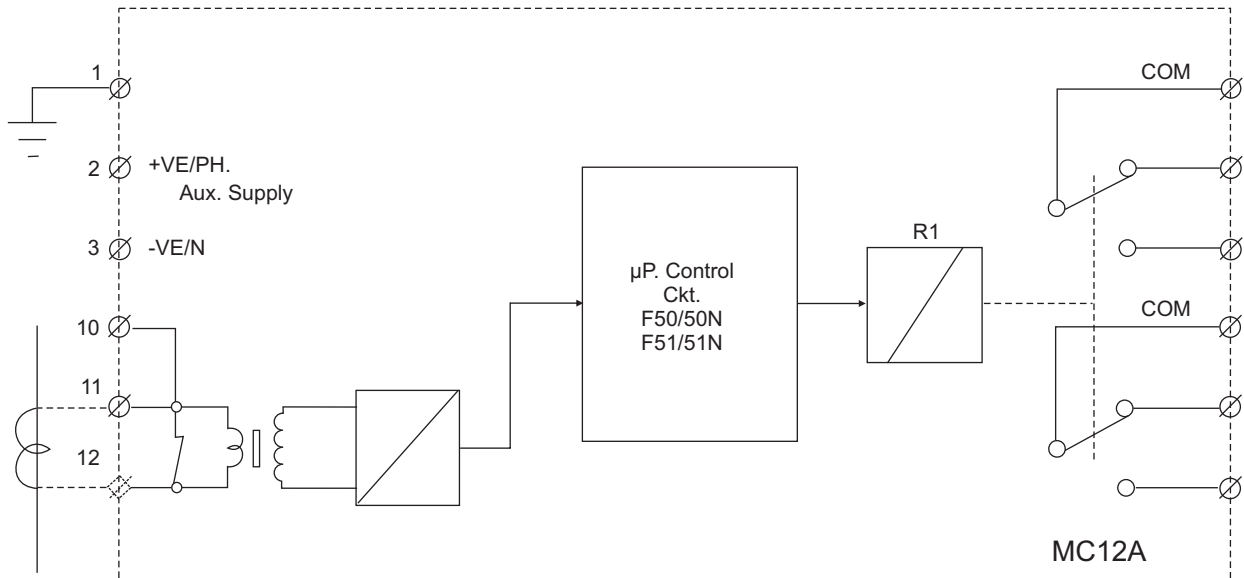
- Easy setting through front panel DIP switches
- Indication for power ON and trip status
- Test feature - helps in better maintenance
- Compact, light weight helps in reducing panel size & thickness



Model	MC12A	
Description	1 Ph O/C or E/F	
Device code	50/51 or 50N/51N	
Design	Microcontroller based	
Functions available	Lowset O/C - Is	
	Highset O/C - Ihs	
	Lowset E/F - Os	
	Highset E/F - Is	
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)	
Other features	TMS : 0.1 - 1.6 Step 0.1	
	Site selectable trip time char.	
Burden on CT	Highset can be disabled	
Burden on PT	≤ 0.25 VA on CT	
Operating temp	Not applicable	
Weight	0°C - 60°C	
Burden on auxiliary supply	< 1.5kg	
Output contacts	≤ 5.5 VA	
Construction	2 C/O Contacts (S/R)	
Dim W x H x D in mm	Drawout	
Panel cutout	71 x 158 x 224	
	62 x 142	
Ordering Information		
Auxiliary supply	Type 1	20 - 110 V AC / DC or
	Type 2	88 - 264 V AC / DC
CT Rating	1 A or 5 A	
Range setting	10 - 40% or 20 - 80% or 50 - 200%	
	Site selectable	

Wiring Diagrams

MC12A



In
 1A
 5A

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

SETTING RANGE (I_s)
 MC12A
 (10-40)% I_n
 (20-80)% I_n
 (50-200)% I_n

Reverse Power Relay, Under Voltage or Over Voltage Relay

Salient Features

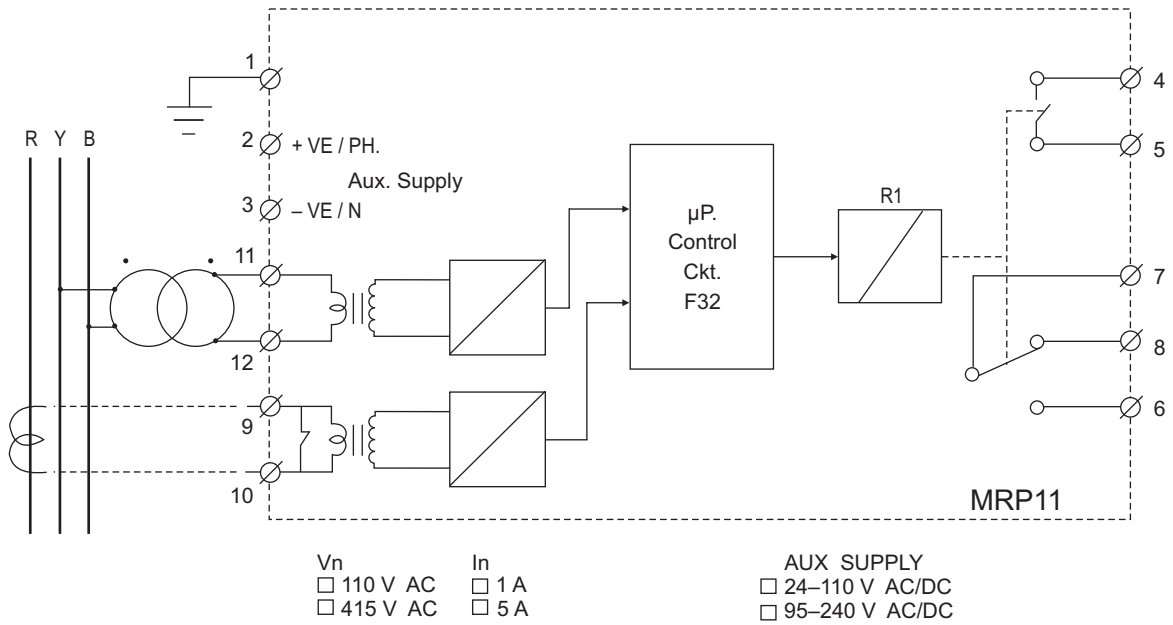
- Easy setting through front panel DIP switches
- LED indication for power ON and trip status
- Test feature - helps in better maintenance
- Compact, light weight helps in reducing panel size & thickness



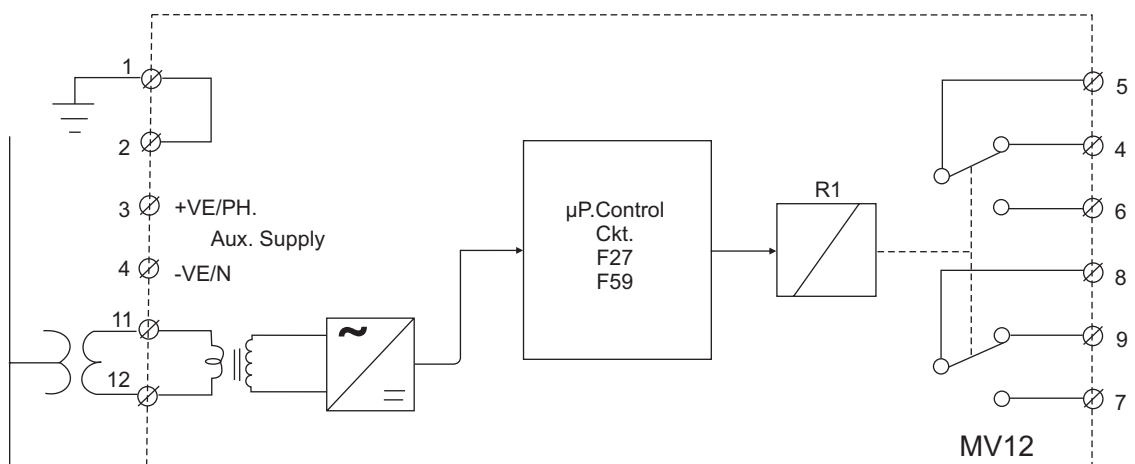
Model	MRP11	MV12	
Description	Reverse power	1 Ph U/V or O/V	
Device code	32	27 or 59	
Design	Microcontroller based	Microcontroller based	
Functions available	Reverse power level	Lowset U/V - Vs	
		Lowset O/V - Vs	
Settings	PT input Vn 110 V, 415 V AC	U/V Vs = 95-20% step 5%	
	CT input In 1 A / 5 A	O/V Vs = 105-180% step 5%	
	Pick up level 1% - 15%	Time characteristics available-	
	Min. setting 0.5%	Inverse time, definite time	
	TMS 0 to 1.5 step 0.1	TMS : 0.1 - 1.6 Step 0.1	
	Definite time characteristics		
Other features	LED indication	Site selectable U/V or O/V	
	Test feature	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	< 1.5kg	< 1.5kg	
Burden on auxiliary supply	< 8 VA	8 VA	
Output contacts	1 N/O + 1 C/O	2 C/O Contacts (S/R)	
Construction	Drawout	Drawout	
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	1 A 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

- Intelligent Power factor controllers with Automatic set-up

Salient Features

- Auto / Manual mode
- Measurement Sensitivity - 2.5%
- 4 Quadrant / 2 Quadrant operation
- Automatic recognition of current flow direction
- Online display of PF, Voltage, Current, kVAR, capacitor overload and Panel temperature
- The last two contacts are programmable as alarm and / or fan control except for etaCON 3
- Capacitor over-current and panel over-heating protection
- Use in co-generation systems - 4 Quadrant operation



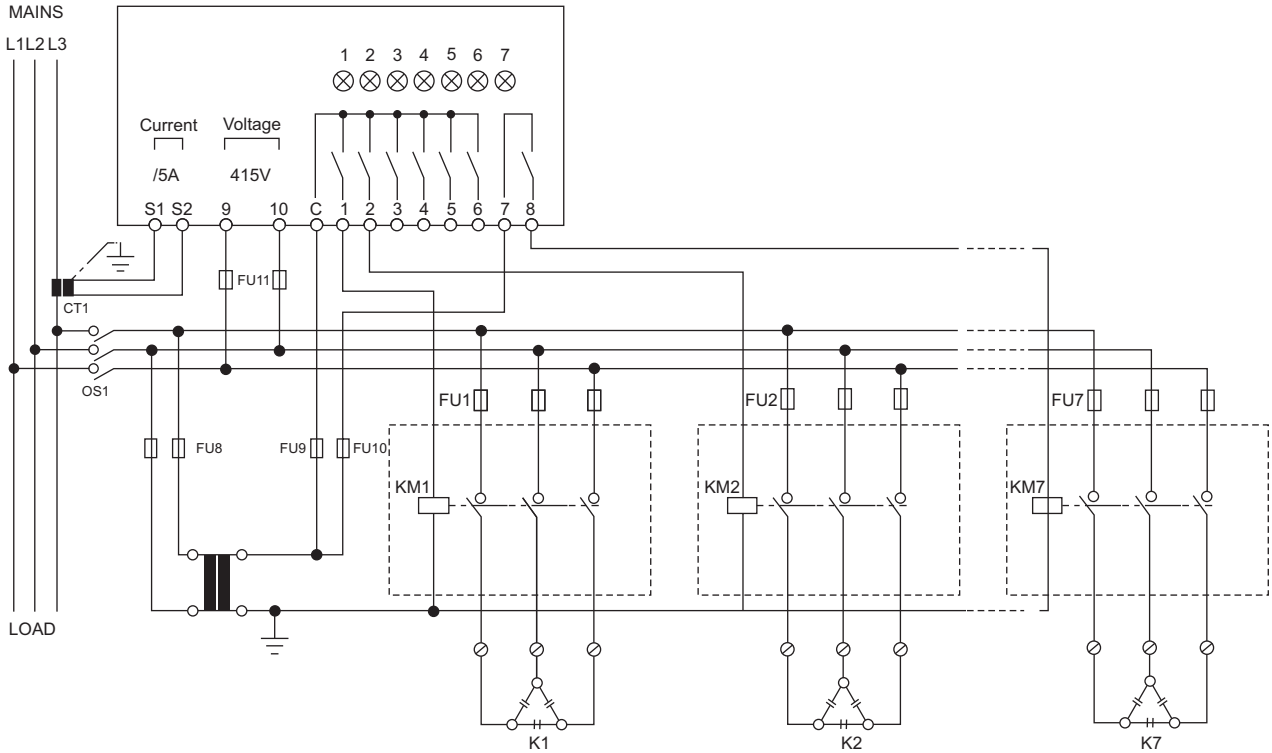
etaCON Series

Inbuilt Controller Set-up feature provides an option of Automatic configuration of etaCON controller.

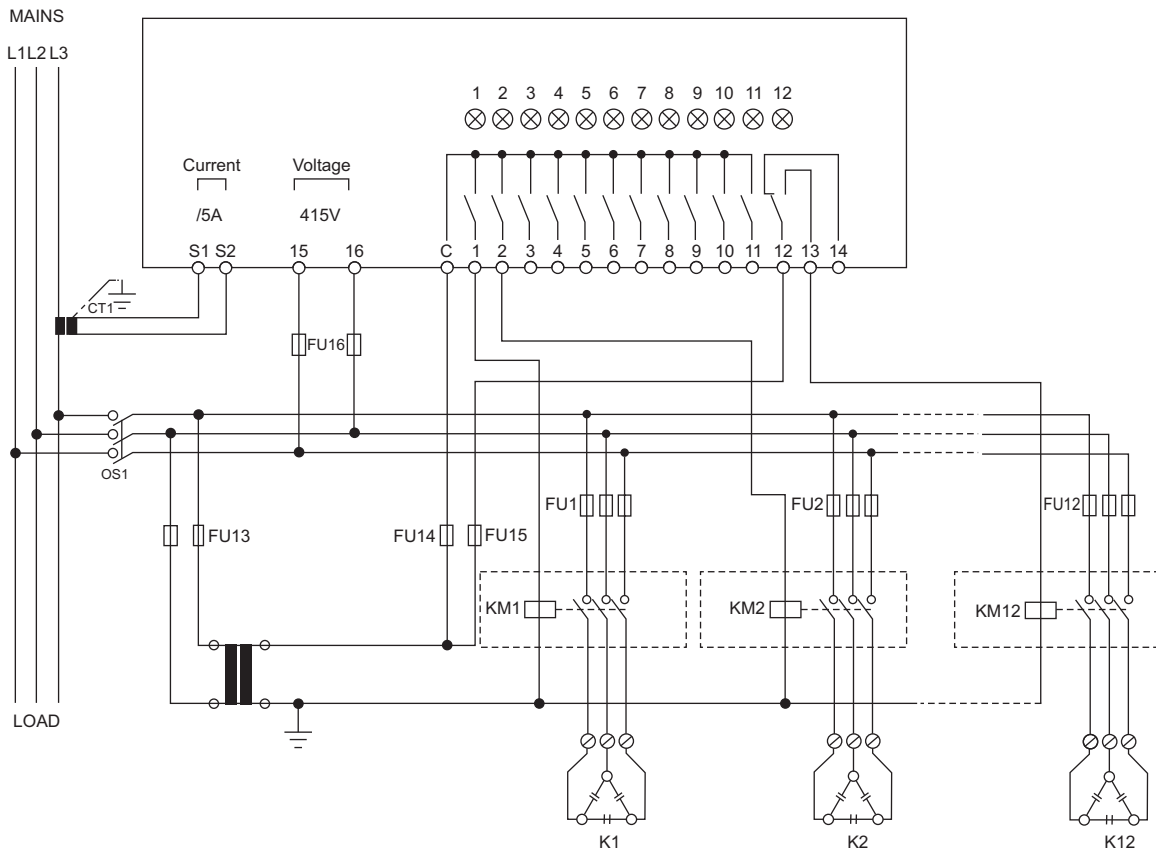
Product	etaCON L series APFC relay	
Model	etaCON L3; etaCON L5; etaCON L7	etaCON L8; etaCON L12
No.of steps	3, 5, 7	8, 12
Design	Digital Microprocessor based	
Display	3 Digit LED	
Current Input	5 Amp	
Voltage Input	415 VAC ± 15%	
Rated Frequency	50/ 60 Hz	
Measurement	Instantaneous PF, V, I, kVAR, Capacitor Over load	
	Panel temperature, Average weekly PF,	
	Maximum Voltage, current, capacitor overload, panel temperature value	
Setting	Target PF adjustment: 0.8 inductive to 0.8 capacitive	
	Reconnection time of same capacitor : 5 - 240 secs	
	Switching time sensitivity : 5 - 600 secs	
Alarms	Under / Over compensation; Low / High Current; Low / High Voltage; Capacitor Overload due to	
	harmonic Voltage; Over temperature; No-voltage release	
Power consumption	Less than 10 VA	
Burden on CT	Less than 0.8 VA	
Dimensions W x H x D in mm	96 x 96 x 71	144 x 144 x 69.7
Panel cutout	92 x 92	138.5 x 138.5
Ordering Information		
Voltage Input	415 V AC	415 V AC
CT Input	5 A secondary	5 A secondary
No.of steps	3; 5; 7 steps	8; 12 steps

Wiring Diagrams

etaCON L3/L5/L7



etaCON L8/L12



Power Factor Control Monitoring Relays

- Intelligent power factor controller relay

Salient Features

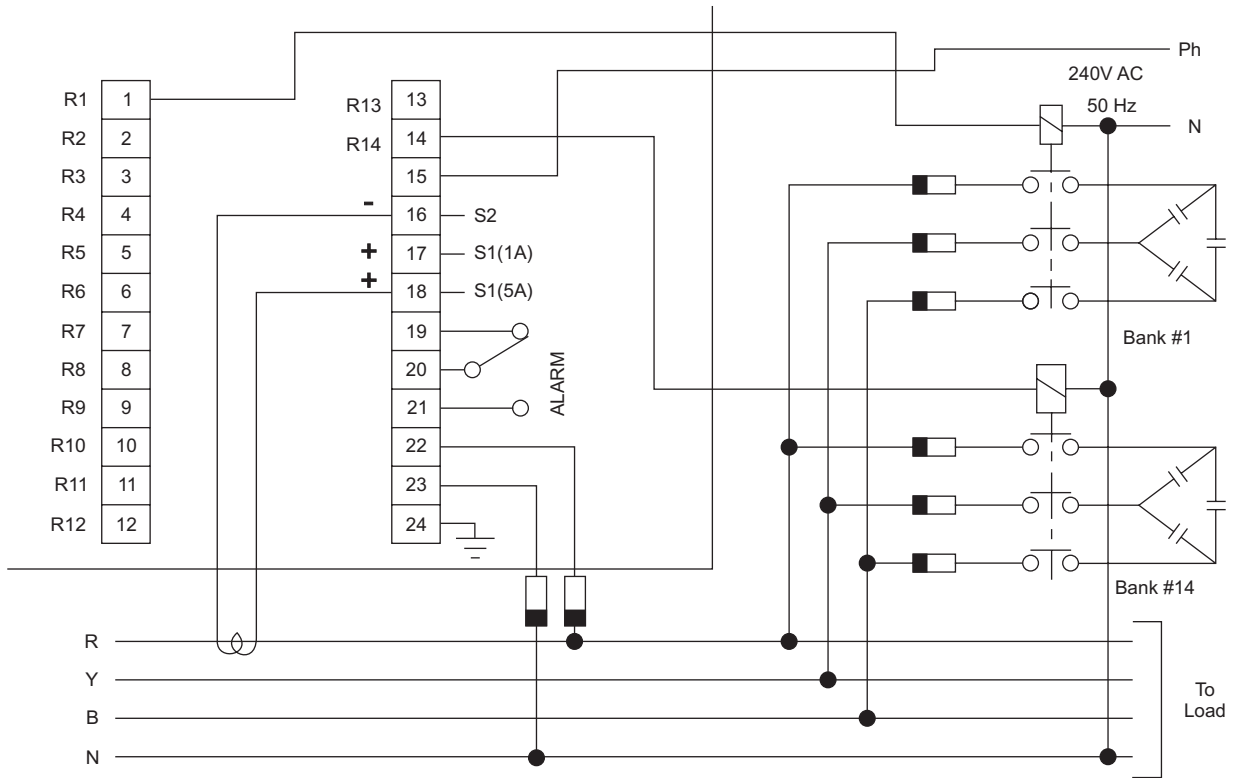
- On line display of system PF
- Easy setting through - front panel push button
- Suitable for non-uniform banks
- LED indication for alarm code, no. of banks selected, PF status-lead / lag / unity
- Auto / Manual mode
- Measurement sensitivity of 1%
- Automatic C/K correction
- Display of Current, Voltage,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



Model	RPM-14
Description	Automatic power factor controller 14 stage
Design	Microcontroller based
Functions available	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
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
Burden on CT	0.3 VA
Burden on PT	15 VA
Operating temp	0°C to 60°C
Weight	< 2kg
Output contacts	14 N/O
	1 N/O contact for alarm
Dim W x H x D in mm	144 x 144 x 100
Panel cutout	138 x 138
Ordering Information	
Auxiliary supply	240 V AC

Wiring Diagrams

RPM-14



Motor Protection Relay

- Motor protection relay - MM30-743
- Motor protection relay with voltage input - MM30-W74

Salient Features

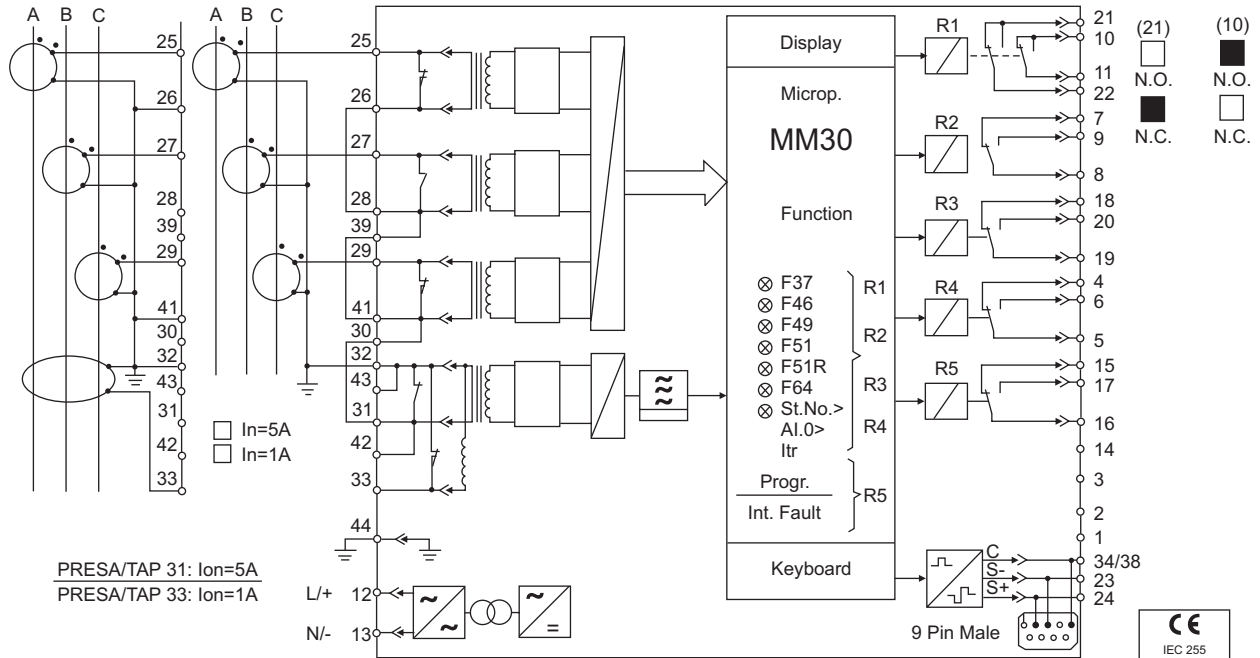
- Display of various parameters, trip count and trip data
- LEDs for fault indication
- User programmable output relays
- Built in self supervision & self testing feature helps maintenance
- RS485 Port for serial communication with “MSCOM” user friendly software



Model	MM30-743	MM30-W74
Description	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
Design	Numeric	Numeric
Functions available	Trip circuit supervision	Trip circuit supervision
	Thermal O/L and Pre-alarm	Thermal O/L and Pre-alarm
	Locked rotor	Locked rotor
	Current unbalance, phase reversal, Phase loss	Current unbalance, phase reversal, phase loss
	Over current	Over current
	Earth fault	Earth fault
	Repeat and prolonged starts	Repeat and prolonged starts
	Restart inhibition	Restart inhibition
	No load running	No load running
	Blocking function	Blocking function
		Under frequency / Over frequency
		Under voltage / Over voltage
		Running hours
		Low PF
Other features	Auto setting	Auto setting
	1 A or 5 A site selectable (Default 5 Amp)	1 A or 5 A site selectable (Default 5 Amp)
	Selectable motor time constant (1 - 60 min)	Selectable motor time constant (1 - 60 min)
	Display of parameters	Display of parameters
	Built in self supervision	Built in self supervision
	RS485 port	RS485 port
	Burden on CT	0.2 VA for 5 A, 0.01 VA for 1 A
Burden on PT	Not applicable	0.04 VA
Operating temp	10°C to 60°C	10°C to 60°C
Weight	< 2kg	< 2kg
Burden on auxiliary	8.5 VA	8.5 VA
Output contacts	4 C/O + 1 C/O for self supervision	4 C/O + 1 C/O for self supervision
Construction	Drawout	Drawout
Dim W x H x D in mm	121 x 158 x 224	121 x 158 x 224
Panel cutout	113 x 142	113 x 142
Ordering Information		
Auxiliary supply	20-110 V AC / DC or	20-110 V AC / DC or
	88-264 V AC / DC	88-264 V AC / DC

Wiring Diagrams

MM30



Motor Protection Relay

- Economical motor protection relay - MPR 200nX / MPR 300
- Intelligent motor protection & control relay - MCOMP



MPR 300



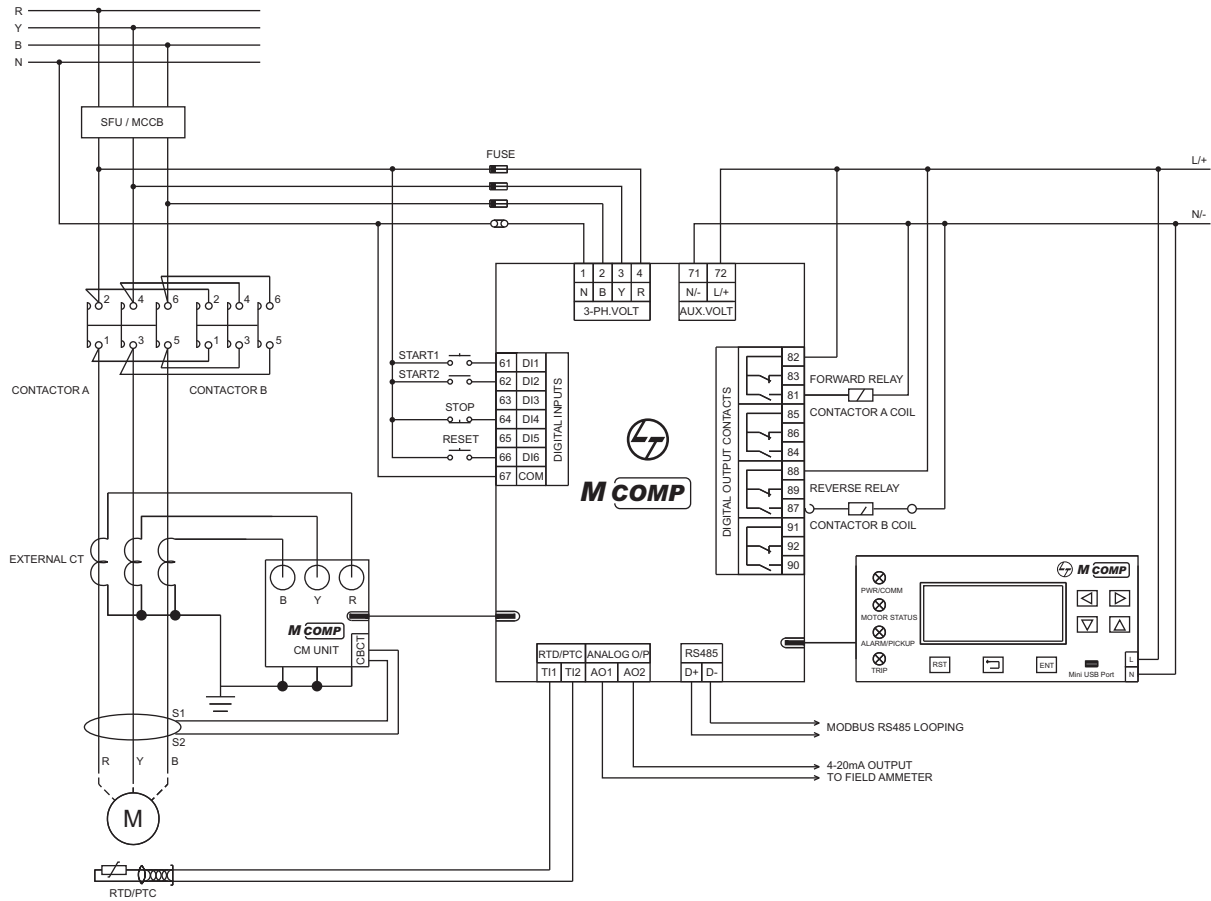
MCOMP Relay



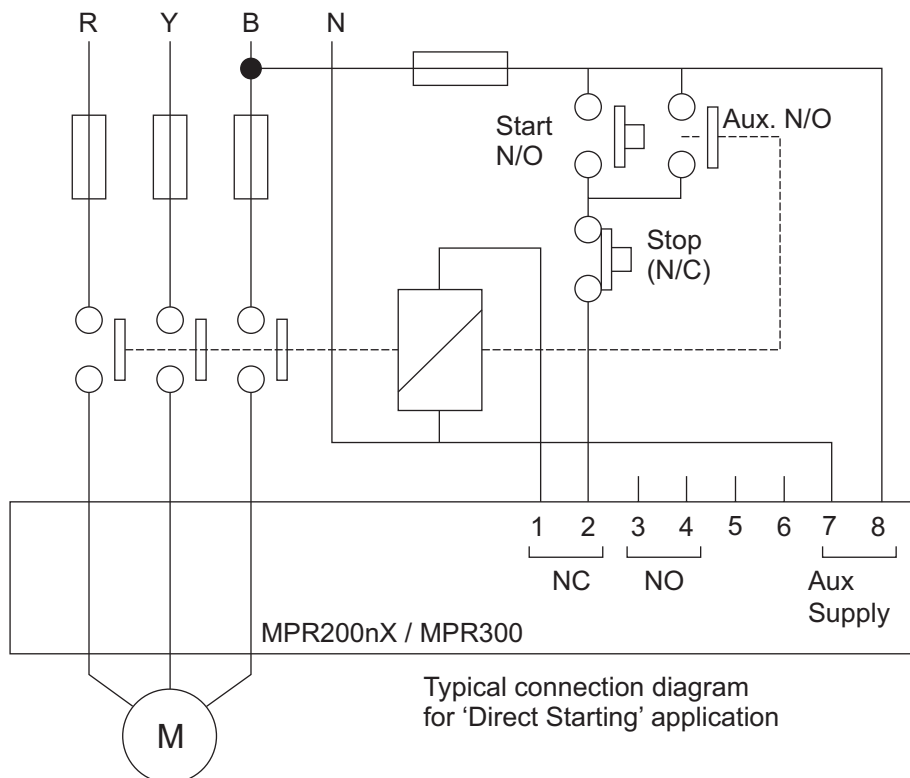
Model	MPR 200nX	MPR 300	MCOMP	
Description	Motor protection	Motor protection	Motor protection	
Device code	49, 51LR, 46, 37	49, 51LR, 64, 46, 37	49, 14, 46, 50N, 37, 59, 27, 47, 81H, 81L, 66, 27LV, 47a, 47b	
Design	Numeric	Numeric	Numeric	
Functions available	Thermal overload	Thermal overload	Thermal over load	
	Locked rotor	Locked rotor	Locked rotor	
	Single phasing	Earth fault	Current unbalance	
	No load running	Single phasing	Phase loss	
	Phase sequence reversal	No load running	Under current	
		Phase sequence reversal	Over voltage	
			Under voltage	
			Over frequency	
			Under frequency	
			Max. no. of starts	
Other features	upto 88 A	upto 88 A	Intelligent relay with separate protection, display and CT modules	
	Trip time characteristics as per IEC947	Trip time characteristics as per IEC947	Suitable for 50 / 60 Hz	
			Can be used with DOL, RDOL and Star delta starters	
			Communication options - Modbus RTU, Modbus TCP IP and Profibus	
	Burden on PT	Not applicable	Not applicable	Not applicable
	Burden on CT	Not applicable	Not applicable	Not applicable
	Operating temp	0-60°C	0-60°C	10 to 60°C
	Weight	< 0.5kg	< 0.5kg	< 2kg
Burden on auxiliary supply	< 8 VA	< 8 VA	< 8 VA	
Output contacts	1NO + 1NC	1NO + 1NC	4 C/O	
Dim W x H x D in mm	70 x 85 x 106	70 x 85 x 106	Split protection unit 92 x 123 x 103.95	
Auxiliary supply	240 V AC / 110 V AC	240 V AC / 110 V AC	80 - 240 V AC / DC	

Wiring Diagrams

MCOMP Relay



MPR200nX / MPR300 Relay



Motor Protection Relay

- Comprehensive Motor Protection Relay for protection of medium and large size Induction Motors - MM10

Salient Features

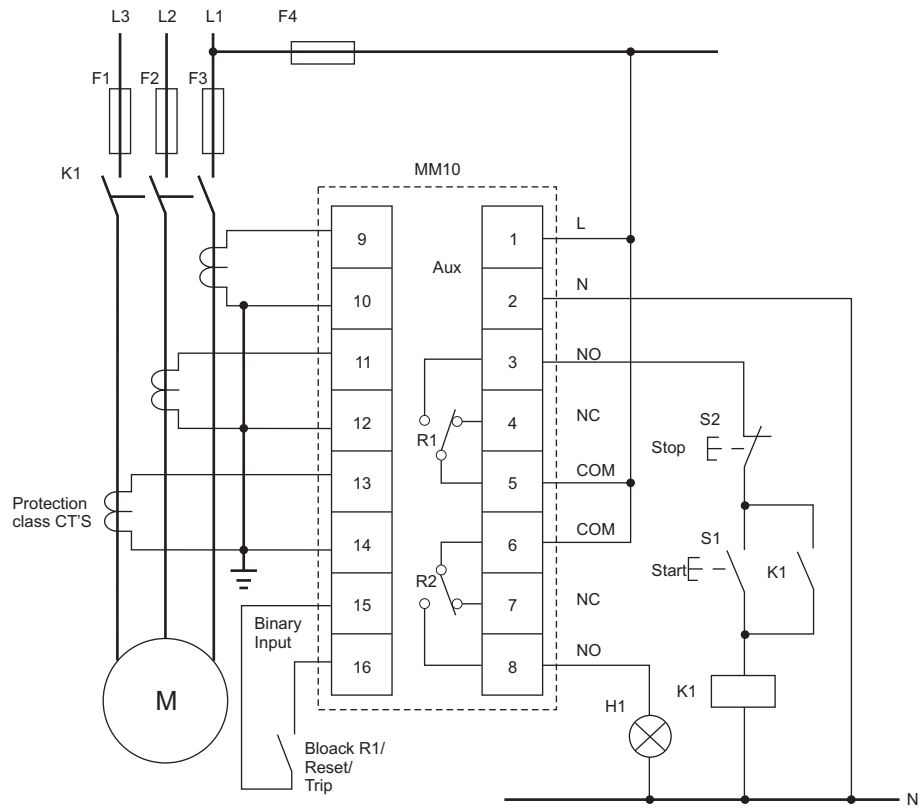
- Microprocessor based Numerical relay
- 4 Digit LED display
- 2 C/O output contacts
- Previous trip data recording
- 1 no. programmable binary input
- Programmable protection function settings



Model	MM10	
Description	Motor protection	
Device code	37, 46, 49, 50/ 51, 51LR, 64	
Frequency	50 Hz	
Design	Numerical relay	
Functions available	Thermal overload with warning	
	Short circuit	
	Undercurrent	
	Unbalance	
	Phase loss	
	Phase sequence reversal	
	Earth fault	
Burden on CT	0.3 VA at rated current	
Burden on PT	not applicable	
Maximum power consumption	3 VA typical	
Output Contact	2 C/O	
Operating temperature	-5°C to +55°C	
Degree of protection	IP52	
Weight	0.75 kg	
Mounting	Panel mounted	
Dim W×H×D in mm	96 × 96 × 110	
Panel Cut Out in mm	90 × 90	
Ordering Information		
Cat nos.	Auxiliary supply	CT input
MM10240X005	110 - 240 V AC/DC	5 A secondary

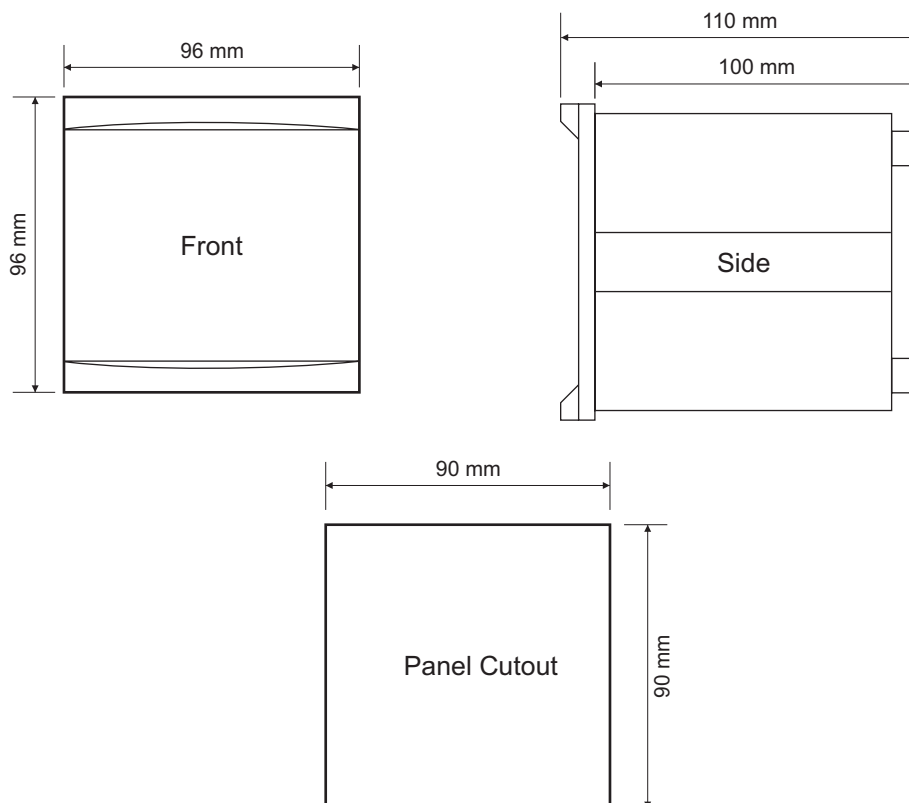
Wiring Diagrams

MM10 relay



External CT's - Protection class CT's [5 - 1000 Amps] with 5 Amp secondary

Dimensions



Generator Protection Relays

- Multifunction generator protection relays
- Percentage based generator differential relay

Salient Features

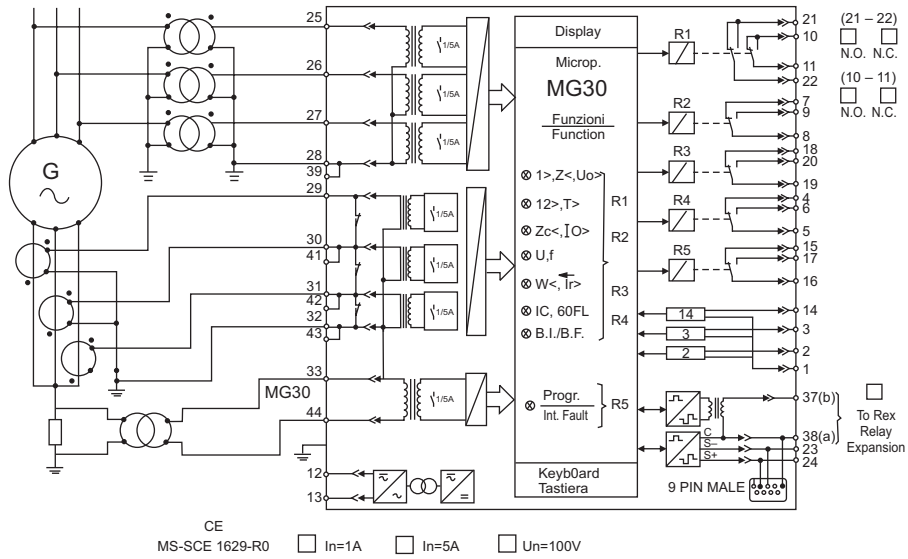
- Display of various parameters, trip count & trip data on 8 digit alphanumeric display
- Separate LEDs for various fault indication
- Four user programmable output relays
- Built in self supervision & self testing feature help maintenance
- Easy operation by 5 push buttons
- RS485 Port for serial communication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



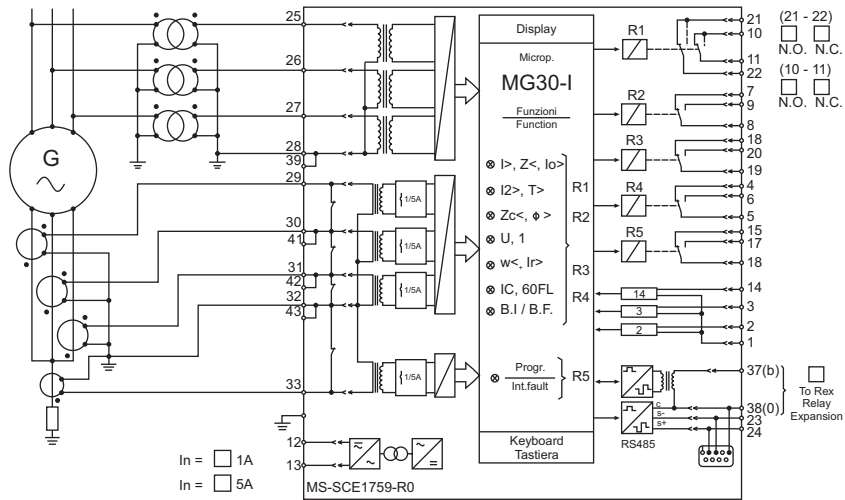
Model	MG30	MG30-I	MD32-G
Description	Generator protection	Generator protection	Generator differential
Device code	21, 24, 27/59, 32, 37, 40, 46, 49, 50/27, 50V/51V, 51BF, 60FL, 64S, 68, 81	21, 24, 27/59, 32, 37, 40, 46, 49, 50/27, 50V/51V, 51BF, 60FL, 64S, 68, 81	87, 50/51, 64S/87N, 68
Design	Numeric	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
Burden on PT	0.05 VA (MG30)	0.05 VA (MG30)	Not applicable
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	Drawout	Drawout	Drawout
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
	Type 2	88 - 264 V AC / DC	88 - 264 V AC / DC
			20 - 110 V AC / DC or 88 - 264 V AC / DC

Wiring Diagrams

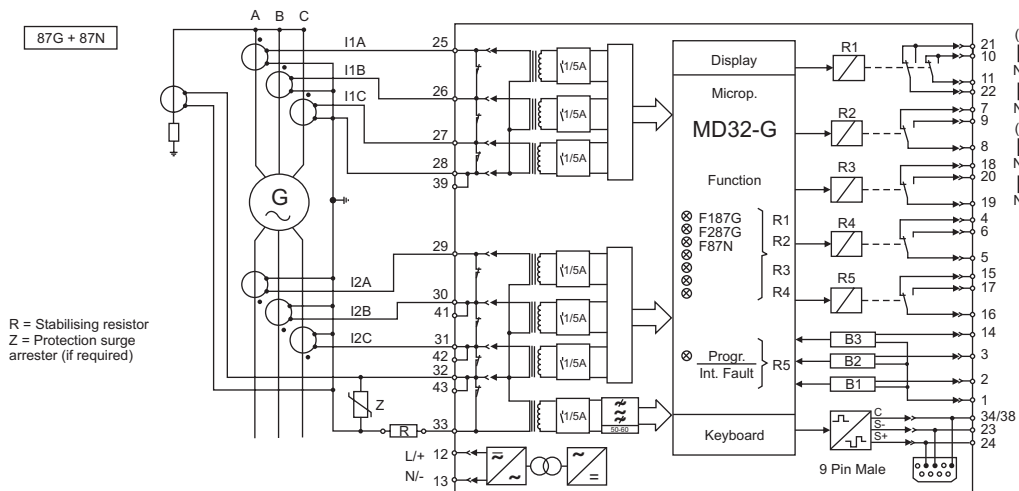
MG30



MG30-I



MD32-G



Transformer Protection Relay

- Percentage based transformer differential relay

Salient Features

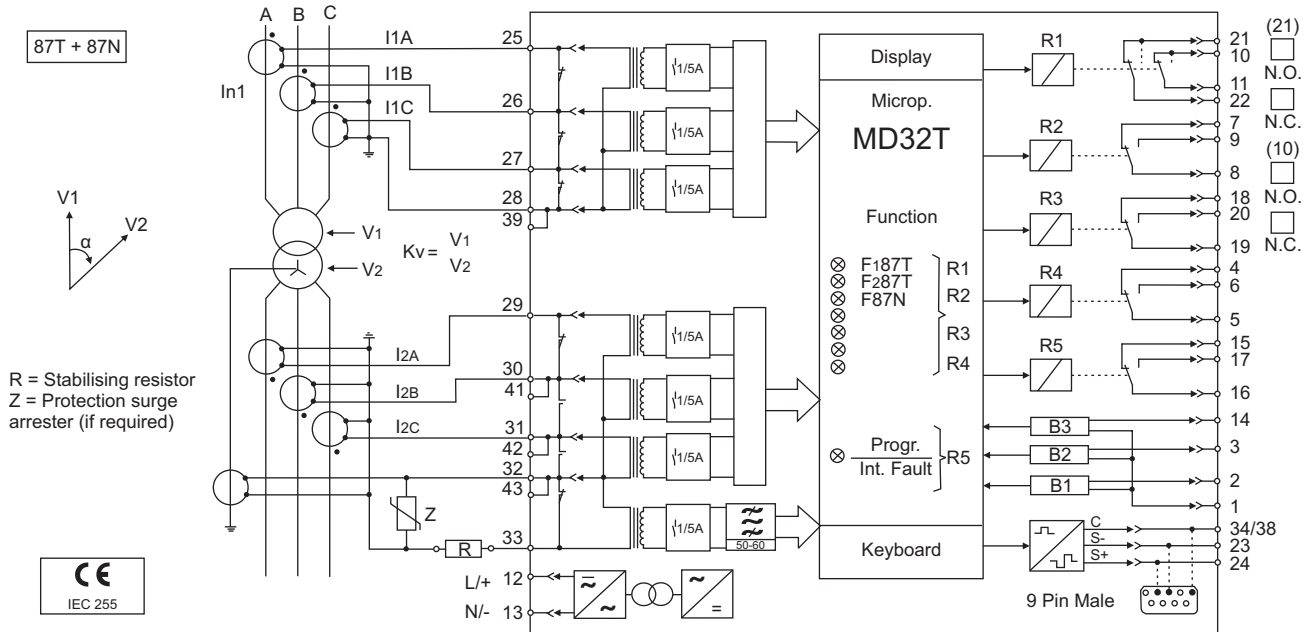
- Display of various parameters, trip count & trip data on 8 digit alphanumeric display
- Separate LEDs for individual fault indication
- Four user programmable output relays
- Built in self supervision & self testing feature help maintenance
- Easy operation by 5 push buttons
- RS485 Port for serial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



Model	MD32TM	
Description	Transformer differential	
Device code	87 RYB	
Design	Numeric	
Functions available	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	
Other features	Display of parameters	
	Built in self supervision	
	RS485 port	
	1 A or 5 A site selectable	
	Waveform capture feature	
Burden on CT	0.2 VA for 5 A, 0.01 VA for 1 A	
Operating temp	10°C to 60°C	
Weight	< 2kg	
Burden on auxiliary supply	8.5 VA	
Output contacts	5 C/O, S/R or H/R or Time del	
Construction	Draw out	
Dim W x H x D in mm	121 x 158 x 224	
Panel cutout	113 x 142	
Ordering Information		
Auxiliary supply	Type 1	20 - 110 V AC / DC
	Type 2	88 - 264 V AC / DC

Wiring Diagrams

MD32T / MD32TM



Voltage and Frequency Relay

- With vector shift protection - UM30A
- With df/dt protection - UFD34
- With zero sequence Over Voltage / Neutral shift Protection - MC3V

Salient Features :-

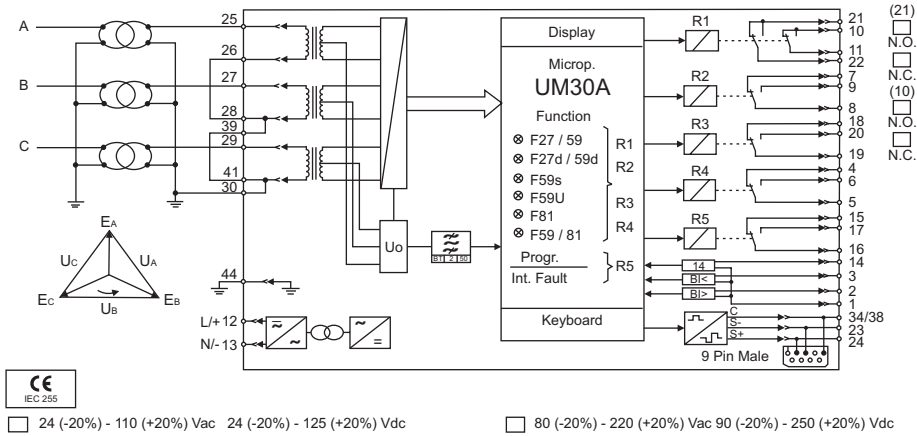
- Display of various parameters, trip count & trip data on LCD screen
- Separate LEDs for individual fault indication
- Built in self supervision & self testing feature
- RS485 port for serial communication with “MSCOM” software
- Easy operation by push buttons



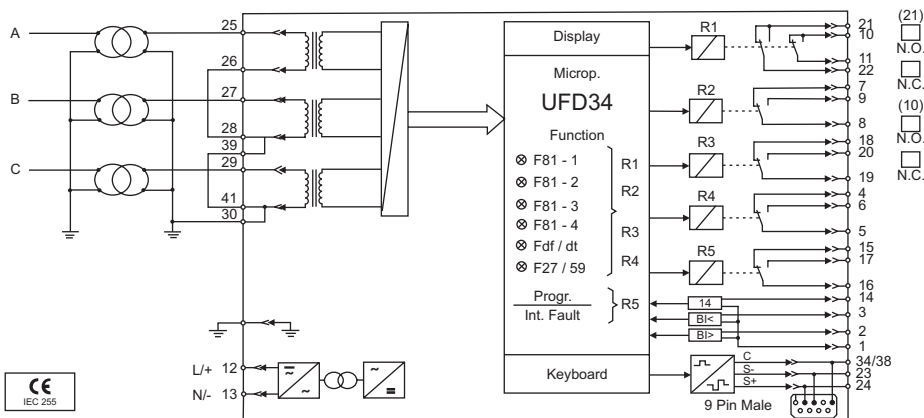
Model	UM30A	UFD34	MC3V
Description	3 Phase V and F relay with vector shift	3 Ph voltage and Frequency relay	3 Ph voltage and Frequency relay
Device code	24, 27d/59d, 47, 59, 59Uo, 78, 81	81, 27, 59, df/dt, dv/dt	27, 59, 47, 59 V 0, 81
Design	Numeric	Numeric	Numeric
Functions available	Over fluxing	Selectable 4 stages of frequency	Two under voltage elements
	Two levels of under / over voltage	as under/over frequency	Two over voltage elements
	Two levels of under / over frequency	Selectable 2 stages of	One under frequency element
	Zero seq. voltage	voltage as under/over voltage	One over frequency element
	Voltage unbalance	Selectable 2 stages of df/dt	One zero sequence over voltage element
	Vector shift detection	Selectable 1 stages of de/dt	One negative sequence under voltage element
		Blocking output and Blocking Input	One positive sequence over voltage element
		Time tagged multiple event recording	Oscillographic wave form capture
Rating		100-125 V	100-125 V
Other features	Display of parameters	Display of parameters	Display of parameters
	Built in self supervision	Built in self supervision	Built in self supervision
	RS485 Port	Oscillographic recording of input quantities	Modbus RTU / IEC870-5-103
		RS485 serial communication port on back panel	Communication protocols
			Front RS232 port for local programming
			Oscillographic recording of input quantities
			RS485 serial communication port on Back panel
Burden on CT	NA	Not applicable	0.1 VA for 1 A, 0.3 VA for 5 A
Burden on PT	0.2 VA / phase at UN	0.04 VA	NA
Burden on aux. supply	8.5 VA		
Operating temp	10°C to 60°C	-10°C to 60°C	-10°C to 55°C
Weight	< 2kg	< 2.5kg	< 1.5kg
Burden on auxiliary	3 C/O + (1 N/O + 1 N/C) + separate relay	8.5 VA	< 7 VA
Output 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 158 x 224	121 x 164 x 224	83 x 164 x 224
Panel cutout	113 x 142	113 x 142	64 x 137
Ordering Information			
Auxiliary supply	Type 1	20 - 110 V AC / DC or	20 - 110 V AC / DC or
	Type 2	88 - 264 V AC / DC	88 - 264 V AC / DC

Wiring Diagrams

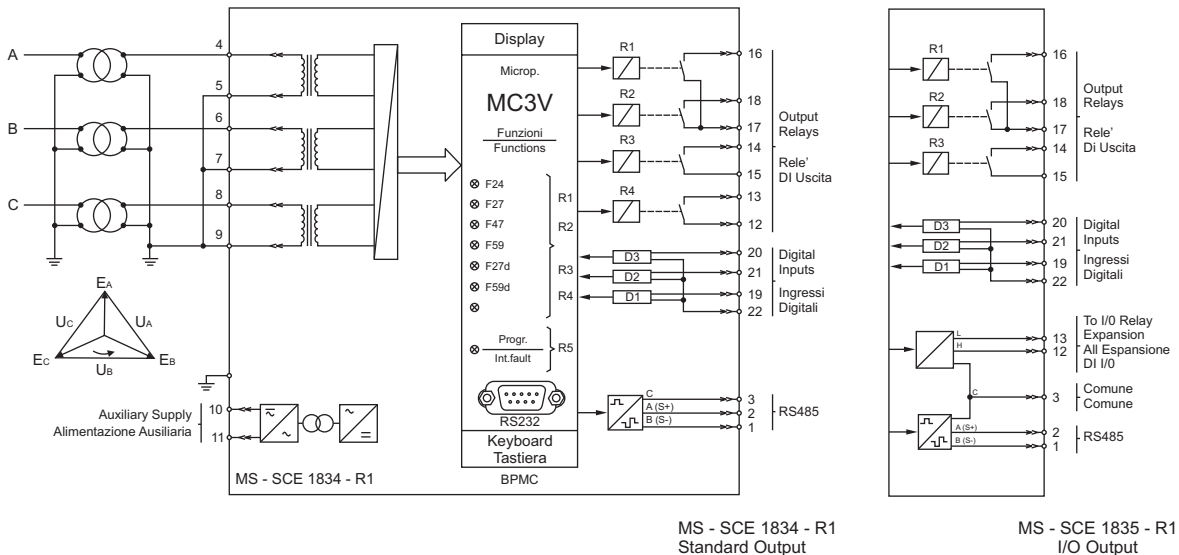
UM30A



UFD34



MC3V



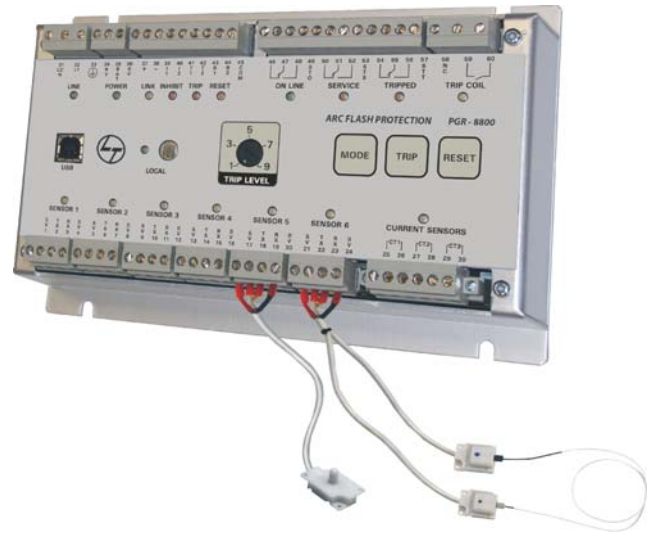
Arc - Flash Protection Relay : PGR - 8800

Introduction

L&T's PGR-8800 arc flash protection system is a high speed device for protection of electrical power systems against arc flash. It has one local sensor and supports both point and fiber optic sensor technologies for optical arc detection. There are inputs for 6 optical sensors and 3 current sensors.

Features

- Redundant internal trip path
- Continuous sensor health monitoring
- Combination of point and fiber sensors
- CT connections provided to avoid nuisance trips
- Settings configuration through simple plug and play software
- Communication with DCS/SCADA possible using MODBUS



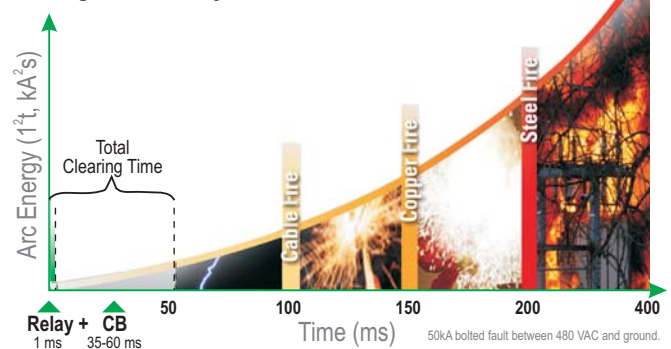
In the event of an arc flash, copper fire occurs within 150 ms of arcing leading to devastation of switch board. System needs to be tripped in less than 100 ms to avoid major damage.

L&T's arc flash protection system PGR-8800 combines the data from reliable optical sensors along with an efficient micro-controller based algorithm to generate a trip within 1 ms of arc detection.

Power may be disconnected within 35-50ms depending on the breaker operation time.

The system is easy to use and can be easily retrofitted into an existing power protection system without major wiring changes. This lowers the hazard risk category of the equipment.

Damage Caused By Arc-Flash Incident

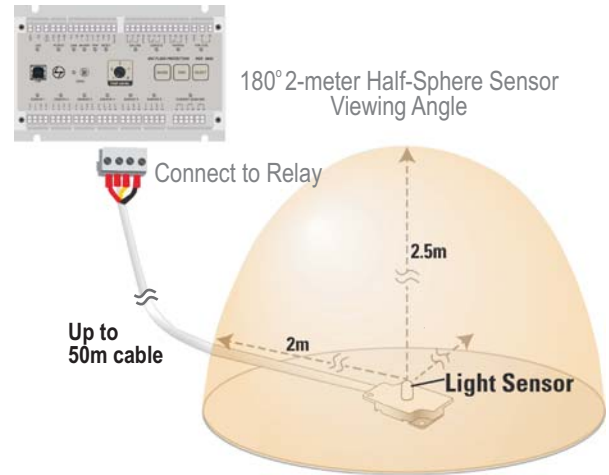


PGR-8800 ARC Flash Relay Sensors

Point Light Sensor: PGA-LS10

Line-of-sight light sensor detects an arc as small as 3 kA in a 2-meter half-sphere radius

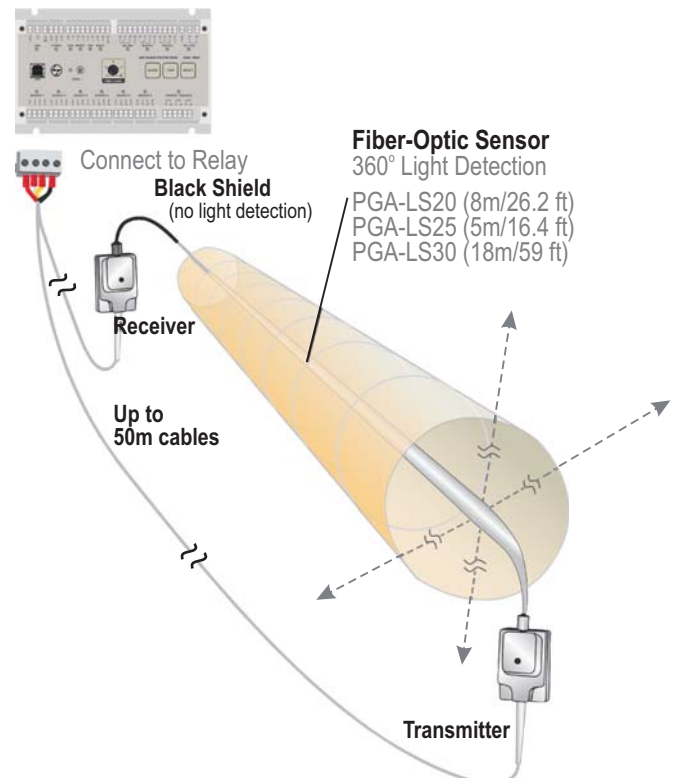
- Visual LED indication for “Ready” or “Tripped” state to assist with fault location
- Electrical cable can be cut and re-terminated in the field (max. length 50 meters/164 feet)



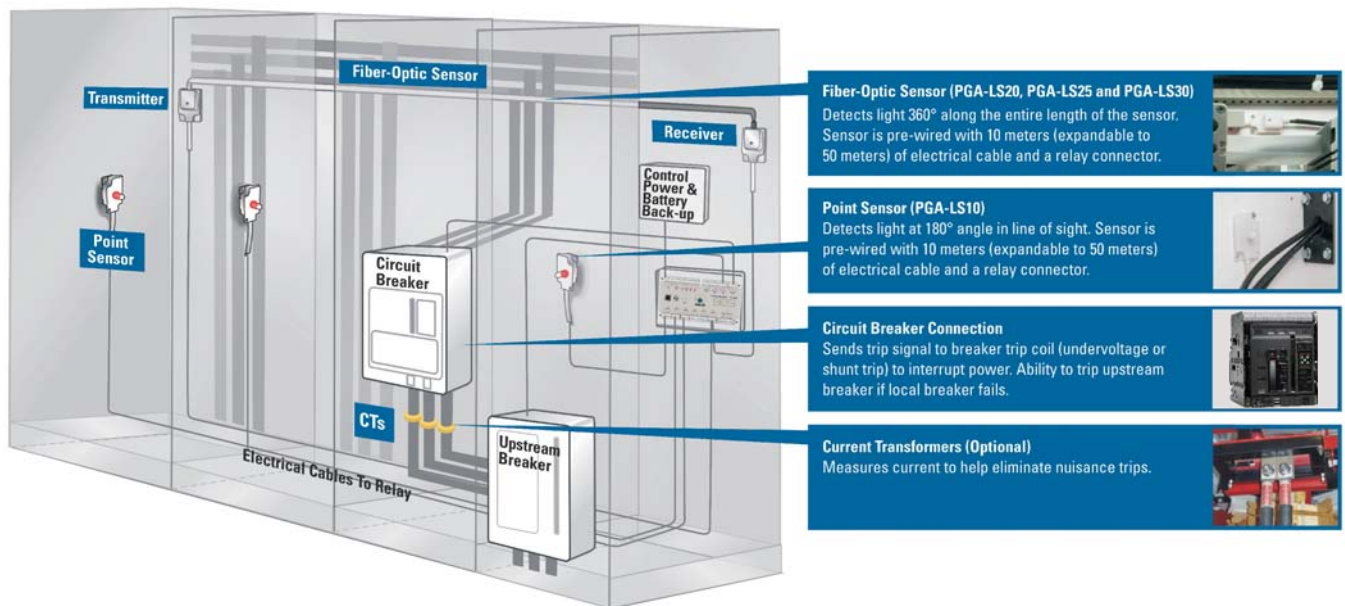
Fiber Optic Light Sensor: PGA-LS20/25/30

360° light sensor detects light along the entire length of the active sensor. They are ideal to run along bus bars or in installations with multiple compartments.

- Connection of the sensor to the relay via transmitter and receiver, which allows a distance of up to 50m between the sensor and the relay.
- Visual LED indication for “Ready” or “Tripped” state to assist with the fault location.
- Durable resin fiber material allows small bending radius (>5 cm) and greater flexibility without breaking
- Ready to install from the factory, no need to terminate in the field or polish as with glass fiber
- Electrical cable can be cut and re-terminated in the field (max. length 50 meters/164 feet)



Typical Installation



Sensor Placement Recommendations

It is recommended to mount 1 or 2 sensors per cubicle to cover all horizontal and vertical bus bars, breaker compartments, drawers and any other place that has a potential for arc fault. Installing a fibre optic sensor through cabinets and in areas where point-sensor coverage is uncertain results in complete coverage and an added level of protection. All maintenance areas should be monitored for arc flash to prevent potential damage and additional cost.

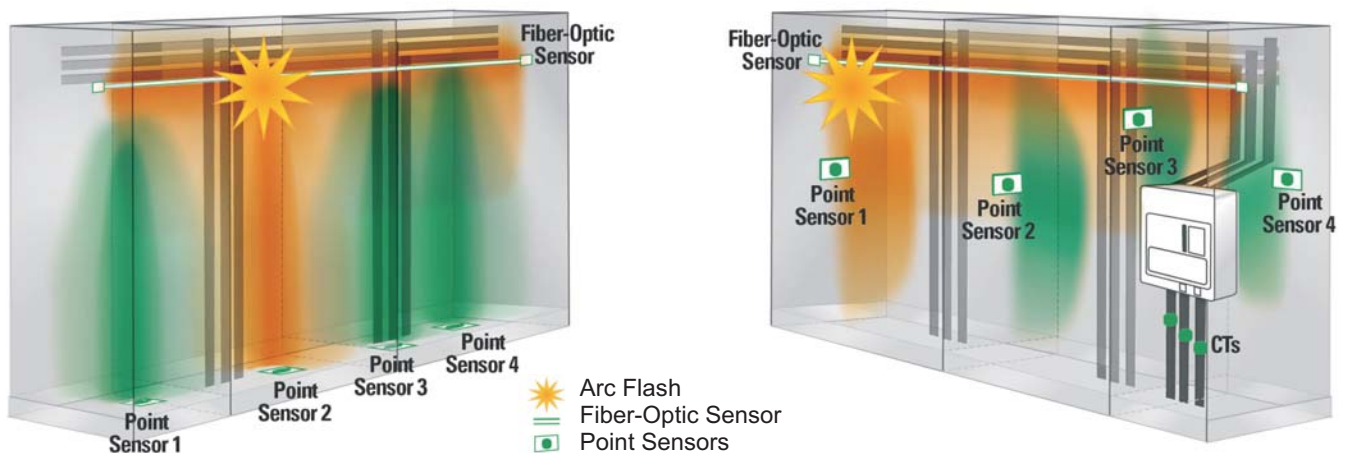


Figure 1: Scenario with point sensor placement on the bottom of each compartment, looking up. Arc detection area for each sensor is shown in green shade. In this case, both Point sensor 2 and the Fiber-optic Sensor detected the flash as it was within their viewing area (shown in orange).

Figure 2: Scenario with point sensor placement on the wall of each compartment. Arc detection area for each sensor is shown in green shade. In this case, both Point sensor 1 and the Fiber-optic Sensor detected the flash as it was within their viewing area (shown in orange).

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