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## FEEDER PROTECTION RELAY



**Feeder Protection Relay (MC12A);** Relay MC12A is a single phase, non-directional, over current or Earth fault relay with one measuring element. The relay can be used for feeder protection in all low voltage, medium voltage and high voltage sub-stations. The relay has a built in high set facility. DIP switches are provided on the front panel for pick up and time delay settings. User has a choice of 7 trip time characteristics.

<b>FEEDER PROTECTION RELAY (MC12A)</b>	
<b>Item</b>	Feeder Protection Relay
<b>Make</b>	L&T
<b>Model</b>	MC 12A
<b>Specifications</b>	1 phase, non-directional, Over Current or Earth Fault Relay
<b>Applications</b>	The relay can be used for feeder protection in all low voltage, medium voltage sub-stations. The relay has a built in high set facility. DIP switches are provided on the front panel for pick up and time delay settings.
<b>Features</b>	<ul style="list-style-type: none"> <li>Dual CT Rating</li> <li>Draw out type construction</li> <li>Micro controller based design</li> <li>7 types of trip time characteristics available</li> </ul>





# AUMSHIVAY ENGINEERING PRIVATE LIMITED

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<b>TECHNICAL SPECIFICATIONS (FEEDER PROTECTION RELAY-MC12A)</b>	
<b>Rated Current (In)</b>	1A or 5A
<b>Rated Frequency</b>	50Hz $\pm$ 2.5 Hz
<b>Auxiliary Power Supply</b>	24V to 110V AC/DC $\pm$ 10%
	95V to 240V AC/DC $\pm$ 10%
<b>Relay Settings</b>	<p><b>Current (IS):</b> One of the three ranges (User selectable) 10% to 40% of In in steps of 2% or 20% to 80% of In in steps of 4 % or 50% to 200% of in steps of 10%.</p> <p><b>High-set Current (Ihs):</b> 2 Is to 16 Is in steps of 2 Is and disable.</p> <p><b>Time Multiplier TMS:</b> 0.1 to 1.6 in steps of 0.1.</p>
<b>Operating Characteristics</b>	<p>Front panel programmable, using push buttons.</p> <p><b>Time /Current characteristics;</b></p> <p><b>Pick up current;</b> Same as set current Is.</p> <p><b>Reset Current:</b> 95% to 90% of set current Is.</p>
<b>Operating time :</b>	<p><b>Inverse time;</b></p> <p>Four curves, As per IS 3231:1987.</p> <p>a) Normal Inverse 3s</p> <p>b) Normal Inverse 1.3s</p> <p>c) Very Inverse</p> <p>d) Extremely Inverse</p>
	<p><b>Definite time;</b></p> <p>Three curves as follows:</p> <p>e) Definite Time 1s</p> <p>f) Definite time 10s</p> <p>g) Definite time 100s</p>
	<b>Accuracy:</b> As per Error class 5 of IS3231: 1987
	<b>Reset time:</b> Less than 50 milli sec
	<p><b>High-set (Instantaneous trip):</b></p> <p><b>Accuracy:</b> As per Error class 5 of IS3231: 1987.</p> <p><b>Operating time:</b> Less than 50 ms for <math>I_{in} &lt; 1.5 I_{hs}</math> Less than 35 ms for <math>I_{in} &gt; 1.5 I_{hs}</math> (<math>I_{in}</math> = input current)</p>
	<b>Burden</b>
<b>Operation Indicators</b>	<p>Separate LED indications for:</p> <ul style="list-style-type: none"> <li>• Power on</li> <li>• Trip status (LED blinks when input crosses set point and becomes steady on when relay has tripped. LED has to be manually reset)</li> <li>• Time current characteristics selected</li> </ul>
<b>Output Relay Contacts</b>	• 2 c/o contacts for trip signal (self reset)
<b>Output contact rating</b>	<p><b>Rated voltage:</b> 250 V AC / 30 V DC, <b>Max. S/W voltage:</b> 440 V AC / 300 V DC</p> <p><b>Rated current:</b> 8A , <b>Max. Current:</b> 14A</p> <p><b>Rated Breaking Capacity:</b> 2000VA / 240 W (Resistive)</p>
<b>Over Load capacity</b>	2 In continuously, 20 times In for 1 sec.
<b>Case</b>	Front Bezel: 158 x 71 mm, Panel Cutout: 142 x 62 mm , Depth:224 mm
<b>Weight</b>	0.9 kg approx.





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**Feeder Protection Relay (nX Series);** nX Series offer you numerical type 3 phase over current & Earth Fault Relay. Its microcontroller based design offers you to choose from various field selectable IDMT & definite curves.

<b>FEEDER PROTECTION RELAY (nX SERIES)</b>	
<b>Item</b>	Feeder Protection Relay
<b>Make</b>	L&T
<b>Model</b>	nX Series (MC31AnX - 51, 51N, MC61AnX - 51, 51N, 50, 50N & MC61CnX - 51, 51N, 50, 50N + Communication facility)
<b>Specifications</b>	1 phase, non-directional, Over Current or Earth Fault Relay
<b>Applications</b>	The relay can be used for feeder protection in all low voltage, medium voltage sub-stations. The relay has a built in high set facility. DIP switches are provided on the front panel for pick up and time delay settings



<b>TECHNICAL SPECIFICATIONS (FEEDER PROTECTION RELAY-nX SERIES)</b>	
<b>Rated Current (In)</b>	1A or 5A
<b>Dual Rating</b>	Suitable for CT Sec 1A/5A
<b>Universal Auxiliary Supply</b>	24 - 240 V AC/DC
<b>Wide TMS Range</b>	0.01 - 1.60
<b>Draw-out execution</b>	With automatic CT shorting facility
<b>Instantaneous</b>	Over current and earth fault element
<b>Communication</b>	Through Modbus Protocol on RS485
<b>Breaker</b>	Control and failure protection
<b>Auto-Doubling feature:</b>	Avoid nuisance tripping on high inrush current



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## GENERATOR PROTECTION RELAY



**GENERATOR PROTECTION RELAY (MG30 & MG30-I);** These are Multifunction Microprocessor Relay for protection of medium/ large synchronous generators. The relay measures the RMS of three-phase currents and voltages and computes the positive and negative sequence components of the Current system. A separate input is dedicated to the measurement of the Neutral-to-Ground voltage and its harmonic components used for a complete Stator Ground Fault protection. MG30 incorporates 5 output relays expandable up to 16 with the additional module REX-8.

<b>GENERATOR PROTECTION RELAY (MG30 &amp; MG30-I)</b>	
<b>Item</b>	Generator Protection Relay
<b>Make</b>	L&T
<b>Model</b>	MG30 & MG30-I
<b>Generator Type</b>	<b>MG30:</b> For Impedance Grounded (NGR / NGT) Generators.
<b>Applications</b>	MG30 / is Multifunction Microprocessor Relay for protection of medium/large synchronous generators. The relay measures the RMS of three-phase currents and voltages and computes the positive and negative sequence components of the Current system.



### Features;

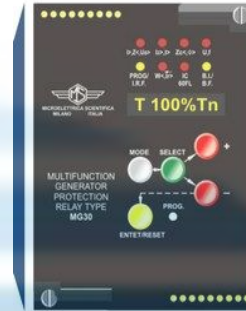
- Voltage-controlled over-current protection.
- Thermal image element with pre-alarm level.
- Reverse power protection.
- Loss of Field protection.
- PT s' fuse failure protection
- Modbus Communication Protocol
- Breaker Failure protection
- Inadvertent C/B closure protection
- Blocking Output and Blocking Input for pilot wire selectivity coordination.



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**Generator Protection Relay (Md-32);** Three-phase percentage biased differential protection relay for generators and rotating machines, with stator earth fault or restricted earth fault element. Measurement of the System-frequency differential current with DC offset and harmonic components rejection.

GENERATOR PROTECTION RELAY (MD-32G)	
Item	GENERATOR PROTECTION RELAY
Make	L&T
Model	MD32-G
Description	MD32-G is three-phase percentage biased differential protection relay for generators and rotating machines, with stator earth fault or restricted earth fault element.



# TM

TECHNICAL SPECIFICATIONS	
Real Time Measurements	IdA - IdB - IdC - Ido - I1A - I1B - I1C - I2A - I2B - I2C
Maximum Demand and Inrush Recording	IdA - IdB - IdC - Ido - I1A - I1B - I1C - I2A - I2B - I2C
Programmable Input Quantities	Fn = System frequency (50 - 60)Hz. In = Rated primary current of phase CTs (1 - 9999)A, step 1A
Differential Protection	Current setting range: $I_d = (0.02 - 0.2)I_n$ , step 0.01 Instantaneous output: 30ms 2 Harmonic restraint level : $2H = (0.1 - 1.0)I_d$ , step 0.01 $I_d$ First percent bias ( $0.5 < IR / I_n < P$ ): $1R = (2 - 20)\%$ , step 1%, Second percent bias ( $IR / I_n > P$ ): $2R = (5 - 50)\%$ , step 1% Point of slope variation: $P = (1 - 3)$ , step 0.1
Over current Protection	Current setting range: $I > = (0.5 - 10)I_n$ , step 0.01 $I_n$ Instantaneous output: $\leq 30$ ms, Definite time trip delay; $t_I > = (0.05 - 99)$ s, step 0.01s
Stator Earth Fault	Current setting range; $I_o = (0.01 - 1)I_{on}$ , step 0.01 $I_{on}$ Instantaneous output: $\leq 30$ ms Trip time delayed element: $t_{I0} = (0.02 - 9.99)$ s, step 0.01s
Breaker Failure Element	Trip time delay: $t_{BF} = (0.05 - 1.00)$ s, step 0.01s

### Features:

- Harmonic Restraint.
- Phase Over-current protection and Phase Differential protection.
- Dual slope programmable percentage bias curve.
- Earth Fault or Restricted Earth Fault protection and Breaker Failure protection.
- Modbus Communication Protocol.





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**Generator Protection Relay (SC14S);** Relay SC14S is a self-powered, single-phase, non-directional, Earth fault relay with one measuring element. The relay can be used for differential protection of generators, REF applications of generators and transformers in all low voltage, medium voltage and high voltage sub-stations. The relay's solid-state design offers seven fields selectable pick up current settings. There are two time delay options in addition to instantaneous trip-100 millisecond and 200 millisecond. The relay has a built in third harmonic filter to avoid spurious tripping in harmonic rich power systems.

GENERATOR PROTECTION RELAY (SC14S)	
<b>Description</b>	INSTANTANEOUS EARTH FAULT RELAY
<b>Make</b>	L&T
<b>Model</b>	SC14S
<b>Specifications</b>	1 phase, non-directional, Earth fault relay with one measuring element.
<b>Applications</b>	The relay can be used for differential protection of generators, REF applications of generators and transformers in all low voltage, medium voltage sub-stations.



TECHNICAL SPECIFICATIONS	
<b>Relay Ratings</b>	<b>Nominal Current (In):</b> 1A or 5A <b>Frequency:</b> 50Hz ± 2.5 Hz
<b>Auxiliary Power Supply</b>	Self powered
<b>Relay Settings:</b>	Current (Is): One of the two ranges (factory set), 10% to 40% of In in steps of 5% or 20% to 80% of In in steps of 10%
<b>CT Burden</b>	Less than 1.0 VA at Is min Less than 6 VA at Is max
<b>Operating Characteristics</b>	Front panel programmable, using push buttons. <b>Pick up current:</b> Same as set current Is <b>Operating time:</b> Field selectable Instantaneous (Typical 25 ms @ 3 Is) or 100 msec, 200 msec ( at 3 Is)
<b>Accuracy</b>	As per Error class 5 of IS 3231: 1987
<b>Over Load capacity</b>	20 times set current Is for 3 sec
<b>Operation Indicators</b>	LED indication Flag indication (manual reset)
<b>Output Relay Contacts</b>	2 C/O contacts for trip signal (self reset)
<b>Output contact rating</b>	<b>Rated voltage:</b> 250 V AC / 30 V DC <b>Rated current:</b> 5A <b>Rated Breaking Capacity:</b> 2000VA / 240 W (Resistive)
<b>Electrical performance:</b>	Please refer separate document
<b>Specifications</b>	" General Electrical Characteristics"
<b>Case</b>	Draw out case <b>Front Bezel:</b> 158 x 71 mm <b>Panel Cutout:</b> 142 x 62 mm <b>Depth:</b> 224 mm
<b>Weight</b>	1.0 kg approx.



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## MOTOR PROTECTION RELAY



**Motor Protection Relay;** These Motor Protection Relay's have 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.

MOTOR PROTECTION RELAY (MM30-743)	
<b>Description</b>	MM30 Comprehensive Motor Protection
<b>Make</b>	L&T
<b>Model</b>	MM30
<b>Specifications</b>	MM30 is a Microprocessor based Comprehensive Motor Protection Relay designed for Medium and Large Motors.



TECHNICAL SPECIFICATIONS	
<b>Real Time Measurements</b>	T/Tn- IA - IB - IC - Io - I1 - I2
<b>Maximum Demand and Inrush Recording</b>	T/Tn - IA - IB - IC - Io - I1 - I2 - tstart
<b>Programmable Input Quantities</b>	<b>F<sub>n</sub></b> = System frequency : (50 - 60)Hz <b>I<sub>n</sub></b> = Rated primary current of phase Cts : (1 - 9999)A, step 1A <b>O<sub>n</sub></b> = Rated primary current of earth fault detection Cts : (1 - 9999)A, step 1A
<b>CT Burden</b>	Less than 1.0 VA at I <sub>s</sub> min Less than 6 VA at I <sub>s</sub> max
<b>Operating Characteristics</b>	Front panel programmable, using push buttons. Pick up current: Same as set current I <sub>s</sub> Operating time: Field selectable Instantaneous (Typical 25 ms @ 3 I <sub>s</sub> ) or 100 msec, 200 msec ( at 3 I <sub>s</sub> )
<b>Thermal Image</b>	The current I producing motor warming-up is computed as a conventional composition of positive and negative sequence components of the motor current.
<b>Locked Rotor</b>	Trip Current level : ILR = (1 - 5)I <sub>m</sub> , step 0.1I <sub>m</sub> Inhibition time at motor starting: 2tst Trip time delay: tLr = (1 - 25)s, step 1s
<b>Current Unbalance</b>	Negative sequence current: I <sub>s</sub> > = (0.1 - 0.8)I <sub>m</sub> , step 0.1I <sub>m</sub> Inverse time current curve: tI <sub>s</sub> > = (1 - 8)s, step 1s (tI <sub>s</sub> > = trip time @ I <sub>s</sub> = I <sub>n</sub> )





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<b>No-Load Running</b>	Under current level: $I <= (0.15-1)I_m$ , step $0.01I_m$ Trip time delay: $tI <= (0.1-90)s$ , step $0.1s$ When current is below $0.1 I_m$ the function is disabled
<b>Earth Fault</b>	Current setting range: $0 >= (0.02 - 2)0_n$ , step $0,010_n$ Instantaneous output : $\leq 0.03s$ (Reset time of instantaneous output : $tO > + tBO$ ) Independent time delay : $tO >= (0.05 - 5)s$ , step $0.01s$
<b>Over-current</b>	Current setting range: $I >= (1 - 5)I_{st}$ , step $0.1I_{st}$ (limited to $20 I_n$ ) Instantaneous output : $\leq 0.03s$ (Reset time of instantaneous output : $tI > + tBO$ ) Independent time delay: $tI >= (0.05 - 1)s$ , step $0.01s$ Reset time delay of the blocking output relay : $tBO = (0.05 - 0,5)s$ , step $0,01s$
<b>Limitation of N° of Starting</b>	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 $1min$ .
<b>Starting Sequence Control</b>	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: $I_{tr} = (0.1-1)I_{st}$ , step $0.1I_{st}$ . Maximum switch-over time delay: $t_{Tr} = (0.5-50)s$ , step $0.1s$ . At motor's start, counting of $t_{Tr}$ begins. If during $t_{Tr}$ the motor current drops below $I_{Tr}$ , switching-over is operated; if motor current stays over $I_{Tr}$ longer than $t_{Tr}$ , the Locked Rotor element is activated.
<b>Auto-setting</b>	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.

## Features:

- Auto setting of parameters.
- Draw out enclosure.
- 8 digit alpha numeric display.
- Real Time Measurements.
- Measurement and display of actual & trip data recordings.
- 8 LED's for fault indication.
- Control on number of starts of motor and Starting sequence control.  
During start-up of the motor, the unit can control an output contact to automatically manage the starting transition.
- RS485 port for communication with Modbus Protocol.





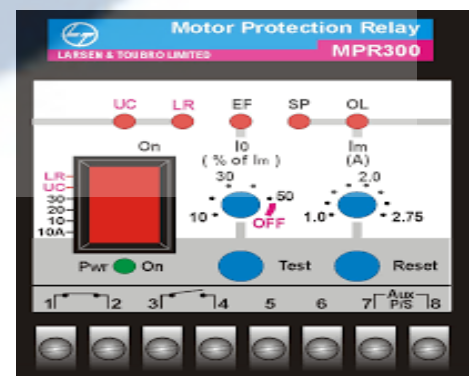
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**Motor Protection Relay (MPR300);** These are Microprocessor based Motor protection relay. The relay has got inbuilt CTs for motor sizes up to 50KW (i.e 88 A current). They provide the protection from Thermal Overload, Earth Fault, Single Phasing, Locked Rotor, Under Current. Relay MPR300 is a three-phase motor protection relay for motor sizes up to 50KW (max. 88 A current). It is a low cost solution, offering five major protections for motors widely used in fans, pumps, crushers, mills, compressors, belt conveyors, centrifuges, mixers, ventilators, escalators, motorized valves etc. Major advantage is that it provides E/F co-ordination in contactor-started motors, thus offering greater security, operator safety and economy. The relay is micro controller based, highly user friendly and compact with inbuilt CTs. The relay can also be used for protection of larger motors by using external CTs. medium voltage and high voltage sub-stations.

<b>MOTOR PROTECTION RELAY (MPR300)</b>	
<b>ITEM</b>	MPR300 Mini Motor Protection Relay
<b>MAKE</b>	L&T
<b>MODEL</b>	MPR300
<b>SIDE LABELS:</b>	All data pertaining to pick up level and applicable time delays are indicated on a label on right hand side of the unit. The wiring diagram label is provided on the left hand side of the unit.
<b>SETTINGS:</b>	<p>*<b>Motor Full load current Im</b></p> <p>*<b>E/F pick up level Io</b></p> <p>*<b>Trip time characteristic (Class 10A, 10, 20, 30)</b></p> <p>*<b>Enable / Disable Locked Rotor</b></p> <p>The pick up levels and time delays for negative sequence, locked rotor and under current protections are preset in the relay.</p>
<b>RELAY CONNECTIONS</b>	<p>*R-Y-B phase wires pass through relay.</p> <p>*Trip contacts to be wired to starter.</p>
<b>APPLICATIONS</b>	<p>MPR 300 offers you greater security, operator safety through proper co-ordination in case of earth fault on motor feeder.</p> <p>MPR300 is used for protection of motors widely used in fans, pumps, crushers, mills, compressors, belt conveyors, centrifuges, mixers, ventilators, escalators, motorized valves etc.</p>



MPR300 has very few controls / settings on the front panel. There are two potentiometers – one for setting the motor rated current and the other for setting the E/F pick up level. A DIP switch is provided for selection of thermal overload trip class and enable / disable of Locked rotor protection and under current protection. Other settings are prefixed in the relay (some of them related to the trip class selected). Six LEDs are provided – five to indicate the faults and one to indicate power on condition. There are two push buttons- one to reset the LEDs on clearance of fault and the other to test the relay. The test PB operation runs a small software routine, which performs check on all software & hardware blocks internal to relay.





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TECHNICAL SPECIFICATIONS	
<b>Protections offered:</b>	Thermal over load, Single Phasing, Earth fault, Locked rotor, Under current.
<b>Thermal Over Load Protection</b>	<p>*<b>Current setting;</b> 1 to 88 A in 6 different models. 1A to 2.75 A, 2A to 5.50 A, 4A to 11 A, 8A to 22 A, 16A to 44 A, 32A to 88 A. Continuously adjustable.</p> <p>*<b>Trip Time Characteristics;</b> Class 10A, 10, 20 and 30 as per IEC 947-4-1. Field selectable through front DIP switches.</p> <p>*<b>Pre alarm;</b> at 1.05 Im – by flashing LED (Im = Motor rated current)</p> <p>*<b>Thermal Memory:</b> Provided.</p>
<b>Earth fault Protection</b>	<p>*<b>Current setting:</b> 10 to 50% of Im (Field selectable by front panel control)</p> <p>*<b>Trip time delay:</b> 200 msec (Factory set)</p> <p>*<b>Disable feature:</b> Available</p>
<b>Phase Unbalance Protection</b>	<p>*<b>Unbalance current :</b> 40% of Im</p> <p>*<b>Trip time delay:</b> 3 sec (Both factory set)</p>
<b>Locked rotor protection</b>	<p>*<b>Locked rotor current -</b> 3 Im</p> <p>*<b>Trip time delay -</b> 1 sec (Both factory set)</p> <p>*<b>Disable feature -</b> Available</p>
<b>Under Current protection</b>	<p>*<b>Under current threshold -</b> 50% of Im</p> <p>*<b>Trip time delay -</b> 3 sec (Both factory set)</p> <p>*<b>Disable feature -</b> Available</p>
<b>Operational Indicators</b>	<p>*<b>Indications for Power On:</b> LED</p> <p>*<b>Indications for trip</b> on each of the 5 faults LED starts flashing when fault is detected. Become steady on when the relay trips after the preset time delay. LEDs are manual reset.</p>
<b>Contacts</b>	<p>*<b>1 N/O + 1 N/C</b> – manual reset</p> <p>*<b>Rated Voltage:</b> 250 V AC / 30 V DC</p> <p>*<b>Rated Current:</b> 5A</p> <p>*<b>Rated breaking capacity:</b> 2000 VA / 240 W (Resistive)</p>
<b>Auxiliary power supply</b>	240 V AC +/- 20% or 110V AC +/-20%
<b>Operating Temperature</b>	0 to 60 deg. C
<b>Accuracy</b>	As per IEC 947-4-1
<b>Reference Standards</b>	IEC 60255, IEC 61000 and IEC 60068 Please refer separate document “ General Electrical Characteristics”
<b>Over all dimensions</b>	70mm W x 85 mm H x 106 mm D
<b>Weight</b>	Less than 400 gms

## Features:

- LED's for trip indication.
- Inbuilt CTs available.
- 4 selectable trip time curves for thermal overload.
- Test facility through front push button.
- Manual reset facility through front push button.
- With / Without fail safe mode.





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**Motor Protection Relay (MM10);** These Relay is a microprocessor based Motor Protection Relay with 4 digits LED Display MM10 is a motor protection relay that combines thermal overload, short circuit, undercurrent, unbalance, phase loss, phase sequence, lock/stall rotor and earth fault protections. These incorporates a 4-digit LED indicator which allows direct numerical readout of set values, actual measured value and system indication. MM10 has 2 relay outputs (R1 and R2). R1 is On under normal operating condition to allow motor running, and off during tripping. R2 is programmable to give signal in various conditions. A programmable binary input is provided to perform various operations upon binary input triggering.

<b>MOTOR PROTECTION RELAY (MM10)</b>	
<b>ITEM</b>	Compact Motor Protection Relay
<b>MAKE</b>	L&T
<b>MODEL</b>	MM10
<b>SIDE LABELS</b>	All data pertaining to pick up level and applicable time delays are indicated on a label on right hand side of the unit. The wiring diagram label is provided on the left hand side of the unit.
<b>Display</b>	<p><b>Current and Thermal Capacity Display:</b> During power up, when the relay is not under tripping condition, the display shows current in ampere or thermal capacity %. The Function LED indicates which parameter is being displayed. The Data LED showing value.</p> <p>Press "UP" or "DOWN" to scroll through the parameters.</p> <p><b>Auto Scroll:</b> When auto scroll is enabled, the display scrolls between currents and thermal reading every 10 seconds. To toggle auto scroll mode, press "UP" and "DOWN" simultaneously</p> <p><b>*LED Display: i) Run LED</b> -Run LED shows the motor status. Refer to 3.2.1 Motor Starting.</p> <p><b>Off</b> - Motor stopping,  <b>Blink</b> - Motor starting,  <b>On</b> - Motor running</p> <p><b>*Trip LED:</b> Trip LED is normally off. During tripping pickup, where tripping delay is counting down, Trip LED blinks. Trip LED on during tripping.</p> <p><b>Off</b> - Normal  <b>Blink</b> - Pickup  <b>On</b> - Tripping</p> <p><b>*Thermal LED:</b> Thermal LED blinks when motor current is more than 105% of IB. Thermal LED on during thermal overload tripping, and when thermal capacity is more than 40% after overload tripping (in which R1 is off, motor not allowed to start).</p> <p><b>Off</b> - Normal  <b>Blink</b> - Thermal overload warning  <b>On</b> - Thermal overload tripping, Thermal capacity high, R1 off.</p>





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<b>Setting Display</b>	When the relay is not under tripping condition, pressing "RESET/MODE" will scroll through various settings. Function LED showing number or alphabet to indicate which setting is being view as shown in Figure 3. Table 1 gives description of each setting.
<b>APPLICATIONS</b>	MPR 300 offers you greater security, operator safety through proper co-ordination in case of earth fault on motor feeder. MPR300 is used for protection of motors widely used in fans, pumps, crushers, mills, compressors, belt conveyors, centrifuges, mixers, ventilators, escalators, motorized valves etc. Tip: To quickly jump back to current/thermal display during setting display, press and hold "RESET/MODE" for 1.5 second
<b>PROGRAMMING SETTING</b>	Step 1: Press "RESET/MODE" until the Function LED shows the required setting. Step 2: Press "UP" and "DOWN" simultaneously to enter programming mode. The Function LED blinks to indicate the relay is in programming mode. Step 3: Press "UP" or "DOWN" to change the value. Step 4: To save the new value, press "UP" and "DOWN" simultaneously again. Programming mode exits, function LED stop blinking. To exit programming mode without saving, press "RESET/MODE" once.

## Features:

- 4 Digit LED display
- Measurement of RYB, Zero Sequence current and Thermal capacity.
- Separate LED's for indication of Motor operational, Trip & Thermal OL/ pre-alarm status.
- Programmable thermal OL time constant right from 1 sec to 40 sec.
- 2 nos. of C/O output contacts.
- 1 no. Programmable Binary input for remote operation.

It can be configured for either of these operations:

- ❖ Inhibit Motor Start
- ❖ Trip Reset
- ❖ Instant Tripping
- Relay testing facility
- Trip data recording

Fault current or cause of last trip is displayed.





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## TRANSFORMER RELAY



**Transformer Differential Relay (MD32TM);** These are three-phase percentage biased differential protection relay for 2 winding transformers or 3 winding with only one source of supply. The relay measures the incoming currents and operates the CT ratio and Power Transformer vector group compensation without the need of using interposing CTs.

<b>TRANSFORMER DIFFERENTIAL RELAY (MD32TM)</b>	
<b>Item</b>	Transformer Differential Relay (MD32-TM)
<b>Make</b>	L&T
<b>Model</b>	MD32-TM
<b>Real Time Measurements</b>	IdA-IdB-IdC-Ido - I1A-I1B-I1C - I2A-I2B-I2C - IdIIA-IdIIB-IdIIC - IdVA-IdVB-IdVC
<b>Maximum Demand and Inrush Recording</b>	IdA-IdB-IdC-Ido - I1A-I1B-I1C - I2A-I2B-I2C - IdIIA-IdIIB-IdIIC - IdVA-IdVB-IdVC
<b>Programmable Input Quantities</b>	<b>F<sub>n</sub></b> = System frequency : (50 - 60)Hz <b>1In</b> = Rated primary current of phase CTs HV side : (1 - 9999) A, step 1A <b>2In</b> = Rated primary current of phase CTs LV side : (1 - 9999) A, step 1A <b>1V</b> = Rated primary voltage of Transformer HV side : (0.2 - 380)kV, step 0.01kV <b>2V</b> = Rated primary voltage of Transformer LV side : (0.2 - 380)kV, step 0.01kV <b>a</b> = Selection of Transformer's vector group.
<b>F87T : Low-set Phase Differential</b>	Current setting range : $d > = (0.1 - 0.5)I_n$ , step $0.01I_n$ Instantaneous output : $\epsilon 0.03s$ Bias percentage : $R = (10 - 50)\%$ , step 1% 2 Harmonic restraint level : $2H = (0.1 - 0.3)I_d$ , step $0.01I_d$ 5 Harmonic restraint level : $5H = (0.2 - 0.4)I_d$ , step $0.01I_d$ Time during which harmonic restraint level can be lowered at transformer energisation: $t_H = (0.05 - 90)s$ , step 0.01s 2 Harmonic restraint level reduction during $t_H$ : $R2H = (0.5 - 1)2H$ , step 0.01 5 Harmonic restraint level reduction during $t_H$ : $R5H = (0.5 - 1)5H$ , step 0.01





# AUMSHIVAY ENGINEERING PRIVATE LIMITED

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<b>F87T : High-set Phase Differential</b>	Current setting range : $d >> = (2 - 20)I_n$ , step $0.01I_n$ Detection time: $6ms < t < 20ms$ Peak current detection with DC offset restraint.
<b>Digital Inputs</b>	<b>B1</b> = Operation block input <b>B2</b> = Harmonic restraint's reduction <b>B3</b> = Oscillographic record external trigger
<b>Approval: CE Reference Standards</b>	Dielectric test voltage- IEC 60255-5 Impulse test voltage - IEC 60255-5 Insulation resistance - $>100 M$
<b>Characteristics</b>	<b>Accuracy at reference value of influencing factors :</b> 2% $I_n$ for measurement and 2% +/- 10ms for times. <b>Rated Current:</b> $I_n = 1$ or 5A <b>Current overload :</b> 200 A for 1 sec; 10A continuous <b>Burden on current inputs :</b> Phase : 0.01VA at $I_n = 1A$ ; 0.2VA at $I_n = 5A$ and Neutral : 0.015VA at $I_n = 1A$ ; 0.35VA at $I_n = 5A$ . <b>Average power supply consumption:</b> 8.5 VA <b>Output relays :</b> Rating 5 A; $V_n = 380 V$ 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.)

## Features;

- Automatic correction of CTs' mismatch and Transformer Vector Group.
- Two differential current levels.
- 2nd and 5th harmonic adjustable restraint levels.
- Programmable percentage bias curve.
- Oscillographic recording.
- Modbus Communication Protocol.
- Maximum Demand & Inrush Recording.





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**Transformer Instantaneous Earth Fault Relay (S14S);** Relay SC14S is a self-powered, single-phase, non-directional, Earth fault relay with one measuring element. The relay can be used for differential protection of generators, REF applications of generators and transformers in all low voltage, medium voltage and high voltage sub-stations. The relay's solid-state design offers seven fields selectable pick up current settings. There are two time delay options in addition to instantaneous trip-100 millisecond and 200 millisecond. The relay has a built in third harmonic filter to avoid spurious tripping in harmonic rich power systems.

<b>TRANSFORMER INSTANTANEOUS EARTH FAULT RELAY (SC14S)</b>	
<b>Item</b>	Transformer Instantaneous Earth Fault Relay
<b>Make</b>	L&T
<b>Model</b>	SC14S
<b>Relay Ratings</b>	Nominal Current (In) : 1A or 5A Frequency : 50Hz ± 2.5 Hz
<b>Auxiliary Power Supply</b>	Self powered
<b>Relay Settings</b>	<b>Current (Is):</b> One of the two ranges (factory set) 10% to 40% of In in steps of 5% or 20% to 80% of In in steps of 10 %
<b>CT Burden</b>	Less than 1.0 VA at Is min Less than 6 VA at Is max
<b>Operating Characteristics</b>	Front panel programmable, using push buttons. <b>Pick up current :</b> Same as set current Is <b>Operating time:</b> Field selectable Instantaneous (Typical 25 ms @ 3 Is) or 100 msec, 200 msec ( at 3 Is)
<b>Accuracy</b>	As per Error class 5 of IS 3231: 1987
<b>Over Load capacity</b>	20 times set current Is for 3 sec
<b>Operation Indicators</b>	LED indication Flag indication (manual reset)
<b>Output Relay Contacts</b>	2 C/O contacts for trip signal (self reset)
<b>Output contact rating</b>	Rated voltage : 250V AC/ 30V DC                          Rated current : 5A                                                          Rated Breaking Capacity: 2000VA/240W (Resistive)
<b>Case</b>	Draw out case; <b>Front Bezel :</b> 158 x 71 mm, <b>Panel Cutout :</b> 142 x 62 mm, <b>Depth :</b> 224 mm
<b>Weight</b>	1.0 kg approx.



#### Features:

- Micro-controller based design
- Draw out facility.
- Built in Third Harmonic Filter (It helps to avoid spurious tripping in harmonic rich power systems)
- Instantaneous time delay or delay of 100 ms, 200 ms can be set
- Current Input: 1A / 5A.

#### Application:

These relay can be used for differential protection of generators, REF applications of generators and transformers in all low voltage, medium voltage sub-stations.



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## VOLTAGE & FREQUENCY RELAY



# TM

**Voltage & Frequency Relay (MC3V);** These are three-phase voltage relay, suitable for protection of HV, MV, LV power transmission and distribution systems. The relay MC3V measures the true R.M.S. value of the 3 phase to neutral voltages fed to three transformers isolated high-impedance inputs.

<b>VOLTAGE &amp; FREQUENCY RELAY (MC3V);</b>	
<b>Item</b>	VOLTAGE & FREQUENCY RELAY
<b>Make</b>	L&T
<b>Model</b>	MC3V
<b>Real Time Measurements</b>	f - EA - EB - EC - Vo - V1 - V2
<b>Programmable Input Quantities</b>	Fn = System frequency : (50 - 60)Hz V1 = Rated primary phase to phase voltage of system's Pt : (0.05 - 500)kV, step 0.01kV. V2 = Rated secondary phase to phase voltage of system's Pts : (50 - 400)V, step 0.01V.
<b>F59 (V&gt;) : First OverVoltage Element</b>	<b>Function enabling :</b> = Enable - Disable <b>Setting range :</b> V> = (0.5 - 1.50)Vn, step 0.01Vn <b>Instantaneous output :</b> £ 0.03s <b>Trip time delay :</b> tV> = (0.05 - 60)s, step 0.01s
<b>F59 (V&gt;&gt;) : Second OverVoltage Element</b>	<b>Function enabling :</b> = Enable - Disable <b>Setting range :</b> V>> = (0.5 - 1.50)Vn, step 0.01Vn <b>Instantaneous output :</b> £ 0.03s <b>Trip time delay :</b> tV>> = (0.05 - 60)s, step 0.01s
<b>F27 (V&lt;) : First UnderVoltage Element</b>	<b>Function enabling :</b> = Enable - Disable <b>Setting range :</b> V< = (0.2 - 1.20)Vn, step 0.01Vn <b>Instantaneous output :</b> £ 0.03s <b>Trip time delay :</b> tV< = (0.05 - 60)s, step 0.01s
<b>F27 (V&lt;&lt;) : Second Under Voltage Element</b>	<b>Function enabling :</b> = Enable - Disable <b>Setting range :</b> V<< = (0.2 - 1.20)Vn, step 0.01Vn <b>Instantaneous output :</b> £ 0.03s <b>Trip time delay :</b> tV<< = (0.05 - 60)s, step 0.01s
<b>81&gt; (f&gt;) : Maximum Frequency Element</b>	<b>Function enabling :</b> = Enable - Disable <b>Setting range :</b> f> = (40 - 70)Hz, step 0.01Hz <b>Instantaneous output :</b> = £ 0.03s <b>Trip time delay :</b> tf> = (0.05 - 60)s, step 0.01s
<b>81&lt; (f&lt;) : Minimum Frequency Element</b>	<b>Function enabling :</b> = Enable - Disable <b>Setting range :</b> f< = (40 - 70)Hz, step 0.01Hz <b>Instantaneous output :</b> = £ 0.03s <b>Trip time delay :</b> tf< = (0.05 - 60)s, step 0.01s
<b>1-59o (Vo&gt;) : Zero Sequence Voltage Control</b>	<b>Function enabling :</b> = Enable - Disable <b>Setting range :</b> Vo> = (0.1 - 2)Vn, step 0.01Vn







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<b>Element</b>	<b>Instantaneous output</b> : = $\epsilon$ 0.03s <b>Trip time delay</b> : $t_{Vo} > = (0.05 - 60)s$ , step 0.01s
<b>1-27 (V1&lt;): Positive Sequence Undervoltage Element</b>	<b>Function enabling</b> : = Enable - Disable <b>Setting range</b> : $V1 < = (0.02 - 1.5)V_n$ , step 0.01Vn <b>Instantaneous output</b> : = $\epsilon$ 0.03s <b>Trip time delay</b> : $t_{V1 < =} (0.05 - 60)s$ , step 0.01s
<b>1 - 47 (V2&gt;): Negative Sequence (Unbalanced) Overvoltage Element</b>	<b>Function enabling</b> : = Enable - Disable <b>Setting range</b> : $V2 > = (0.1 - 1.5)V_n$ , step 0.01Vn <b>Instantaneous output</b> : = $\epsilon$ 0.03s <b>Trip time delay</b> : $t_{V2 < =} (0.05 - 60)s$ , step 0.01s
<b>Characteristics</b>	<b>Accuracy at reference value of influencing factors:</b> 2% $U_n$ (for measurements) 2% + ( $t_o=20-30ms$ ) (for times) <b>Rated Voltage:</b> $U_n = (50 - 400)V_{ac}$ phase to phase. <b>Voltage Overload:</b> $2U_n$ for 1sec <b>Burden on voltage input:</b> 0.2 VA/phase at $U_n$ <b>Average power supply consumption</b> : <7 VA <b>Output relays:</b> A.C. resistive switching = 1500W (400V max) make = 30 A (peak) 0.5 sec. break = 0.3 A, 110 Vcc, L/R = 40 ms (100.000 op.)
<b>Power Supply</b>	<b>Type 1</b> : 24 , 110V A.C.( $\pm 20\%$ ) - 24 , 125V D.C. ( $\pm 20\%$ ) <b>Type 2</b> : 80 , 220V A.C.( $\pm 20\%$ ) - 90 , 250V D.C. ( $\pm 20\%$ )
<b>Accessories</b>	*Two Under Voltage elements. *Two Over Voltage elements. *One Under Frequency element. *One OverFrequency element. *One Zero Sequence Overvoltage Element. *One Negative Sequence Overvoltage Element. *One Positive Sequence Undervoltage Element *Time tagged multiple event recording. *Oscillographic wave form capture *Modbus RTU / IEC870-5-103 Communication Protocols *Display LCD 16 (2x8) characters.

## Features;

- Zero Sequence voltage protection
- LCD 16 (2x8) characters display
- Over / Under voltage protection
- Over / Under frequency protection
- Positive / negative sequence voltage protection
- Time tagged multiple event recording
- Oscillographic wave form capture
- Modbus RTU / IEC870-5-103 Communication Protocol



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**Voltage & Frequency Relay (MV12);** Relay MV12 is a single phase, over voltage or under Voltage relay with one measuring element. The relay can be used for feeder protection in all low voltage, medium voltage and high voltage sub-stations. DIP switches are provided on the front pannel for pick-up and time delay setting. User has a choise of 7 trip time characteristics.

<b>VOLTAGE &amp; FREQUENCY RELAY (MV12);</b>	
<b>Item</b>	VOLTAGE & FREQUENCY RELAY
<b>Make</b>	L&T
<b>Model</b>	MV12
<b>Rate Voltage (Vn)</b>	110/ 240/ 415V AC (Field Selectable)
<b>Rated Frequency</b>	50Hz $\pm$ 2.5 Hz
<b>Auxiliary Power Supply</b>	24V to 110V AC/DC or 95V to 240V AC/DC
<b>Relay Setting</b>	Pick Up Voltage (Vs): <b>Over Voltage Mode</b> = 105% to 180% of Vn in steps of 5%. <b>Under Voltage Mode</b> = 95% to 20% of Vn in Steps of 5%. <b>Time Multiplier</b> = 0.1 to 1.6 in Steps of 0.1
<b>Operating Characteristics</b>	<b>Time Current Characteristics;</b> Normal Inverse 3.5 sec in O/V mode. Normal Inverse 5.7 sec in U/V mode. Definite Time : 1, 10, 100 Sec
	<b>Pick-up Voltage:</b> Same as set Voltage Vs
	<b>Reset Voltage:</b> (90% to 95%) of Set Voltage Vs (105% to 110%) of Set Voltage Vs for under Voltage
	Accuracy : $\pm$ 5% of Vs
	<b>Operating Time:</b> Normal Inverse - As per IS3231:1987. Please refer fig.2 for details (The Curve is given for Vn=110V. For Vn=240V and Vn=415V, it is limited by overload capacity.
	<b>Definite Time:</b> Three Ranges (1 Sec, 10 Sec, 100 Sec). Time = TMS x Range c) With three ranges as above, user can get a definite time delay from 0.1 Sec to 160 Sec.
<b>Accuracy :</b> As per Error Class 5 of IS3221:1987	
<b>Reset Time :</b> Less than 50 millisecond	
<b>Burden</b>	Less than 0.25 VA at PT input. Less than 8 VA at Auxiliary Power Supply
<b>Operation Indicators</b>	Separate LED indications for: <b>Power On, Over Voltage, Under Voltage</b> Trip Status (LED blinks when input crosses set Point and becomes steady on when relay has tripped LED has to be manually reset). Time current characteristics selected.
<b>Output Relay Contacts</b>	2 c/o conacts for trip signal (self reset)
<b>Output Contact rating</b>	Rated Voltage : 250V AC/ 30V DC Max S/W Voltage : 440V AC/ 300V DC Rate Current : 8A Max Current : 14A Rated Breaking Capacity : 2000VA/ 240W (Resistive)
<b>Overload Capacity</b>	800 Volts
<b>Case</b>	Front Bezel = 158 x 71 mm, Pannel Cutout = 150 x 62 mm Depth = 224 mm
<b>Weight</b>	0.9 Kg Approx



### Features;

- Micro-controller based design.
- Draw Out type construction, Inverse & Definite time trip characteristics.