

MOTOR / PUMP PROTECTION RELAYS

minilec[®]



These relays are useful for protection of 3-phase AC induction motors against various hazards. With their unique advantages they eliminate use of a thermal/bimetal relay for motor protection. Being current sensing, they are to be selected according to motor rating and are available for practically all ranges of motors. These relays are ideally suitable for Air-conditioning Compressor motor protection, and also for motors in machines, conveyors, cranes/hoists and lifts, and for pumps.



MODELS

**MPR D2, SPG D2,
D2 MPR1, D2MPR2, D2MPR3, S2 CMR1
S2 CTS1, F3 MPR1
MBMPR, M-Commander,
WTR D1, S2 WTR1**

FEATURES

- Fixed/adjustable unbalance settings
- Fixed/adjustable settings for under/over voltage, current, load
- Fixed/adjustable trip delays
- Resetting Auto or Manual
- Output contacts : 1 CO or 2 CO
- Choice of enclosures (DIN-Rail, Flush)
- Models with Micro-Controller based design
- Serial Communication (RS485) port
- 2 line alpha-numeric LCD display
- Use of SMD Technology
- User-friendly LED indications

PROTECTIONS / FUNCTIONS

- Phase Failure (Phase Loss/Single Phasing),
- Phase sequence reversal,
- Voltage Unbalance,
- Under Voltage, Over Voltage
- Overload protection as per motor IDMTL characteristics
- No-load/dry running
- Motor Winding overheating
- Over-current/Short circuit/locked rotor
- Earth Fault

Ordering Instructions

- Product Family Name
- Model Name
- System Supply Voltage & Frequency
- Aux. Supply/Control supply voltage
- Motor/Pump rating HP/KW & duty
- Overload characteristics required
- No. of PTCs & Temp. graph

MOTOR / PUMP PROTECTION RELAYS

MPR D2 Overload Protection Relay with Phase Failure	SPG D2 Dry Run & Overload Protection Relay with Phase Failure	D2 MPR1 Dry Run & Overload Protection Relay with Phase Failure
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Phase Failure, Unbalance, Phase sequence and overloading
Auto / Manual Reset,
Adjustable current trip settings,
selectable characteristics,
1CO/2CO output relay



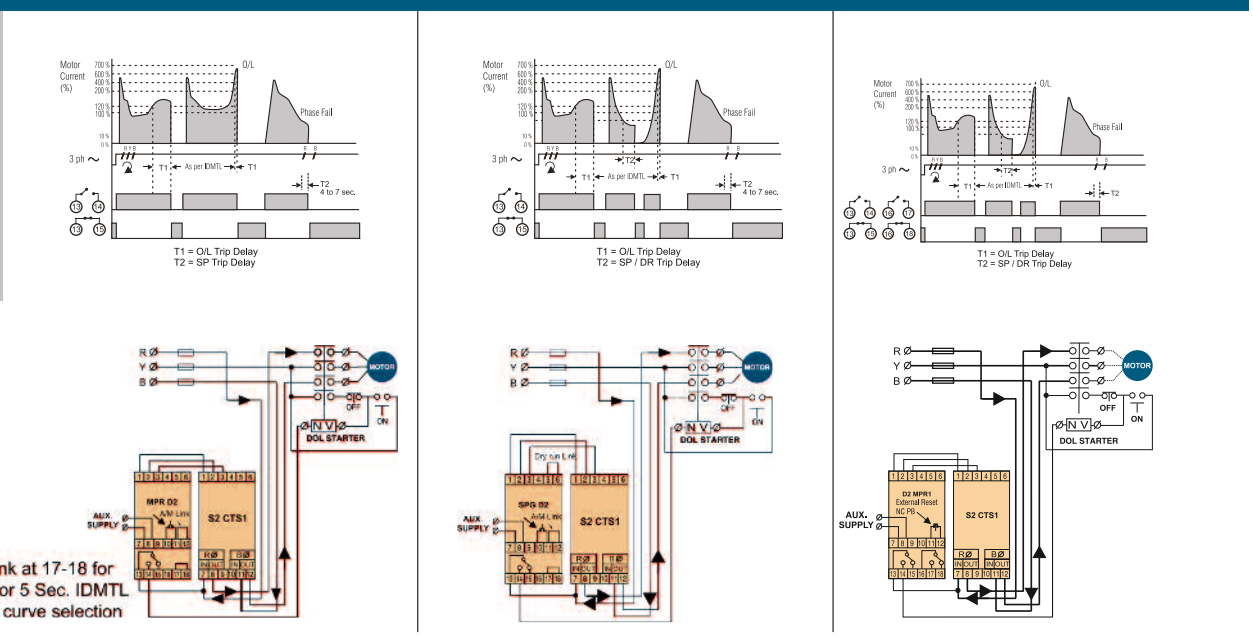
Phase Failure, Unbalance, Phase sequence,
Overloading & Dry running
Auto/Manual Reset,
Adjustable current trip settings,
selectable overload characteristics,
1CO/2CO output relay



Phase Failure, Unbalance, Phase sequence and overloading,
Under Current, Auto/Manual Reset,
Adjustable current trip settings,
Test Facility,
UC bypass facility,
selectable overload characteristics,
2CO output relay

Supply Voltage	System 100-120 / 220-240 / 380-440 V AC ±20%	100-120/220-240/380-440V AC ±20%	380-440 V AC ± 20%, 48-63 Hz
<small>Note: Mention specific voltage (Fixed/wide range) in order</small> Auxiliary	110/240/380/415VAC/24VAC/DC ±20%, 50/60Hz	110/240/380/415/440 V AC 24 V AC/DC ±20%, 50/60 Hz	220-240 / 380-440V AC
Output Relay Contact	1 CO (2 CO)	1 CO (2 CO)	2 CO
Input	From S2 CTS	From S2 CTS	From S2 CTS
Trip Setting			
Phase to phase unbalance	50% of motor Current ±10%	50% of motor Current	50% of Motor Current (Fixed)
Under current (Dry running)	N.A.	50%/75% of set current	40% to 80% of set current (Adj. with Bypass facility)
Overload	Above 120% of set Current (IDMTL)	Above 120% of set current (IDMTL)	As per inverse time characteristics
UV/OV			N.A.
Trip Time delay			
On phase failure	5.5 secs. ± 1.5 secs.	5.5 secs. ± 1.5 secs.	4 Sec ± 1 Sec
For overloading	As per selectable inverse time Characteristics 2/5 Sec. (selectable) 10/15/20 Sec. (Optional)	As per selectable inverse time Characteristics 2/5 Sec. (selectable) 10/15/20 Sec. (Optional)	As per Inverse Time Characteristics 2/5/10 Sec. (Selectable)
UV/OV RP	N.A.	N.A.	N.A.
Resetting	Auto / Manual / Remote	Auto / Manual / Remote	Auto/ Manual (Remote with NC Push Button)
Dimensions (mm)			
Overall (L x W x D)	76 x 56.5 x 117.5	76 x 56.5 x 117.5	76 x 56.5 x 117.5
Panel mounting (L x W)	67 x 46 [] / 35 mm Rail Mounting	67 x 46 [] / 35 mm Rail Mounting	67 x 46 [] / 35 mm Rail Mounting
Approx Weight	425 gms.	425 gms.	400 gms





• Wherever not specified
 Contact Rating :
 5A @ 230 V AC (resistive)

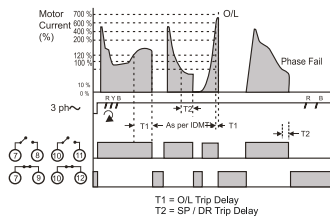
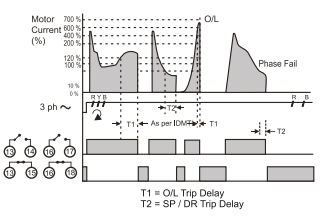
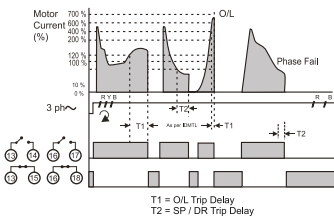


Relay contact position shown in 'Power off' condition

Note: PGS D2 (Single Phase Dry Run & Overload Protection Relay) Model Available on request.

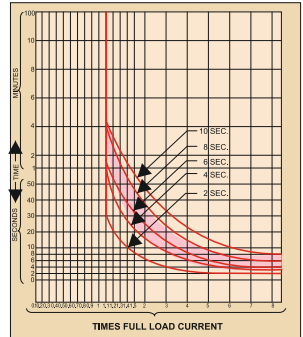
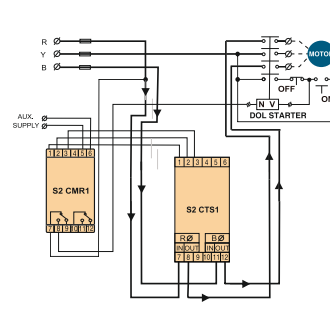
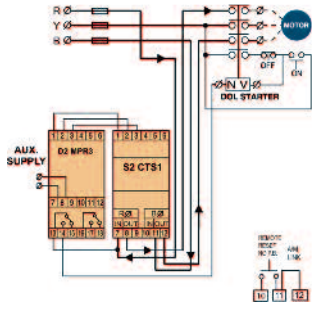
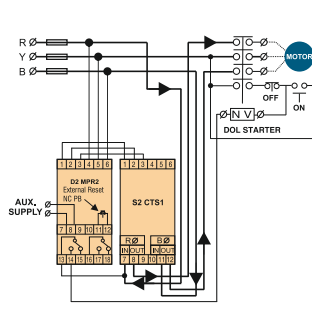
MOTOR / PUMP PROTECTION RELAYS minilec®

D2 MPR2 Dry Run & Overload Protection with Phase Failure & UV+OV	D2 MPR3 Dry Run & Overload Protection Relay with Phase Failure	S2 CMR1 Dry Run & Overload Protection Relay with Phase Failure	S2 CTS1 Current Sensor
			
Sensing both voltage and current signals, Phase Failure, Unbalance, Phase sequence, under over voltage, overloading and dry running. Manual Reset, Delayed auto reset, fixed trip settings, fixed overload characteristics, 2CO output relay	Phase Failure, Unbalance, Phase sequence and overloading, Under Current, Auto/Manual Reset, Adjustable current trip settings, Test Facility, UC bypass facility, selectable overload characteristics, 2CO output relay	Phase Failure, Unbalance, Phase sequence, overloading and dry running (Under current) Microcontroller based design, SMD technology, Auto/Manual Reset, Adjustable current trip settings, selectable overload characteristics, 2CO output relay	Current sensor suitable for full load motor current of 1.25A, 2.5A, 5A, 10A, 20A, 40A & 80A To be used with Minilec relays only.
380 / 415V AC ± 20%, 48-63 Hz 220-240 / 380 - 415 V AC ± 20% 2 CO	220 - 240 / 380 - 440 VAC ± 20%, 48-63 Hz 100 - 120 / 220 - 240 / 380 - 440 VAC ± 20% 2 CO	100-120/220-240/380-440V AC ± 20%, 48-63 Hz 100-120/220-240/415 VAC±20%, 24V DC+10%-15% 2 CO	N.A. N.A. 3-wire terminal Output
From S2 CTS	From S2 CTS	From S2 CTS	
50% of Motor Current (Fixed) 50% of set current (Fixed) As per inverse time characteristics UV = -20% (Fixed) OV = +20% (Fixed)	50% of motor current ± 10% (Fixed) 40% to 80% ± 5% of Set Current (Adj. with Bypass facility) As per Inverse Time Characteristics N.A.	50% of Motor Current (Fixed) 40% to 80% of set current (Adj. with bypass facility) As per inverse time characteristics N.A.	N.A. N.A. N.A. N.A.
4 Sec ± 1%	4.0 ± 1.0 secs.	4 Sec ± 1 Sec (Fixed)	N.A.
As per Inverse Time Characteristics 2 Sec. (Fixed)	As per Inverse Time Characteristics 2 / 5 / 10 / 15 / 20 sec. (Selectable)	As per Inverse Time Characteristics 2/5/10 Sec. (Selectable)	N.A.
For UV/OV - 4 Sec ± 1 Sec for RP - Instant Delayed Auto	N.A. Auto / Manual / Remote	N.A. Auto / Manual	N.A.
76 x 56.5 x 117.5 67 x 46 / 35 mm Rail Mounting	76 X 56.5 X 117.5 67 x 46 / 35 mm Rail Mounting	90 x 35 x 60 35 mm Rail Mounting	90 x 35 x 60 35 mm Rail Mounting
400 gms	250 gms	140 gms	140 gms.



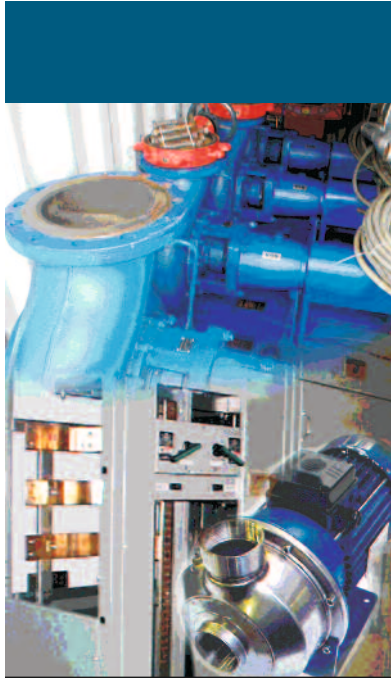
Selection Chart for S2 CTS1

HP	KW	Amp	S2 CTS1
<0.75	<0.5	0.5-1.25	S2 CTS1/1.25
<1.75	<1.30	1-2.5	S2 CTS1/2.5
<3	<2.25	2-5	S2 CTS1/5
<6	<4.5	4-10	S2 CTS1/10
<12.5	<9.4	8-20	S2 CTS1/20
<30	<22.5	16-40	S2 CTS1/40
<60	<45	32-80	S2 CTS1/80



Relay contact position shown in 'Power off' condition
Note: S2 Series - RoHS Product available on request.

MICROPROCESSOR BASED MOTOR PROTECTION RELAY



F3 MPR1
Motor Protection Relay



MBMPR
Comprehensive Motor Protection Relay



Microcontroller based. Sensing voltage, current and temperature. Protecting against Phase Failure, Unbalance, Phase sequence, Under/over voltage, overloading, winding over temperature, Over current/Short circuit, locked rotor, Auto/Manual resetting, Adjustable trip settings for UV/OV, UC/OC, O/L, Locked rotor & earth fault. On delay & start-up delay adjustable, 2x1CO output relays and serial communication port.

CT Module
(CT 20 / CT 50)



CT Module is specially designed for use with Minilec relays only like F3 MPR1, MBMPR and M-Commander Available in 2 modules, CT20 and CT50. Interconnecting cable (2.5mtrs) is provided with this module.

F3 MPR 1

Supply Voltage	System 220-440 V AC ± 20%
Auxiliary	90-270 V AC/DC (45-65Hz), 24 VDC
Output Relay Contact	2 CO (5 Amp, 230 V AC Resistive)
Serial Communication	Provision of RS 485 Output (Optional)
Input	External CTS (CT 1/ CT 2.5/ CT5/ CT20/ CT50)

Trip Setting	Protection Parameter	Setting Range	Trip Delay	LCD Display	Resetting Mode
Trip Setting	Over load Trip Setting As per IDMTL Char	2/5/10/15/20 Sec	N.A	Over Load	Manual
	Unbalance Trip Setting	20%-60%	1-10 Sec	Current Unbalance	Manual/Multi Attempt
	Phase Failure	N.A	1-10 Sec	Current S.P.	Manual
	Reverse Phasing	N.A	Instant	Phase Reversal	Manual
	Under Current	30%-90%	1-60 Sec	Under Current	Manual/Multi Attempt
	Over Current	300%-800%	2-25 Sec	Over Current	Manual/Multi Attempt
	Lock Rotor	200%-800%	1-10 Sec	Rotor Lock	Manual
	Earth Fault Setting	10%-100%	0.5 - 10 Sec	Earth Fault	Manual
	Over Temp.	70°C to 180°C	1-20 Sec	Sensor Fail, Motor Temp. High	Auto/Manual

Display	16x2 (Back lit LCD Display)
Operating Temperature	0°C to 60°C
Humidity	Upto 95% Rh
Enclosure	F3 Series ABS
Dimensions (mm.)	
Overall (L x W x D)	96 x 96 x 80
Mounting (L x W)	Panel Mounting - 92 x 92
Approx Weight Unit	400 gms

MBMPR

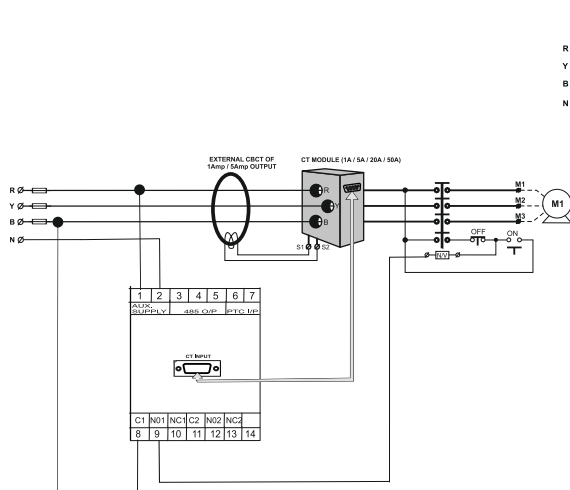
Supply Voltage	System 415V AC +20%,-25% 3Ø, 3 Wire, 50 / (60)Hz ± 3%
Auxiliary	90-270V AC / DC
Output	1 CO for Trip & 1 CO for Alarm/RS 232 Port (Optional)
Input	Current Sensor - External CTS (CT1/CT5/CT 20/CT50)
Power Consumption	8 VA

Trip Setting	Settings	Trip Level	Trip Delay	LED	Reset Mode
Trip Setting	Power ON	-	-	★	-
	Unbal/Ph.Rev	1% - 20%	1-10 Secs.	★	Auto / Manual
	Under Voltage	75% - 95%	1-10 Secs.	★	Auto / Manual
	Over Voltage	105% - 120%	1-10 Secs.	★	Auto / Manual
	Current unbalance	20-60% of Imax	1-10 Secs.	★	Multi Attempt
	Current phase Loss	-	1-10 Secs.	★	Multi Attempt
	Under Current (dry run)	30-90% of Imax	1-10 Secs.	★	Multi Attempt
	Over Current/ Short Circuit	300% - 800% of Imax	2-25 Secs.	★	Multi Attempt
	Overload	2/5/10/15/20 Sec.	As per IDMTL char.	★	Manual
	Lock Rotor	200%-500% of Imax	1-10 Secs.	★	Manual
	Earth Fault	30% - 80%	0.5 - 10 Secs.	★	Manual
	Winding Overheat	4K1 - 5K6	1-20 Secs.	★	Auto / Manual

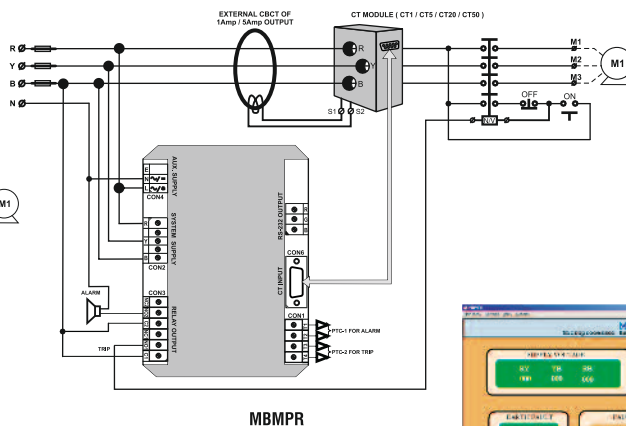
Display	16x2 Ch. (Back lit LCD Display)
Dimensions (mm)	
Overall (L x W x D)	166 x 216 x 80
Panel mounting (L x W)	153 x 203
Approx Weight	600 gms

- Interconnection cable
- Input from R.Y.B. phases and CBCT

CT Module Selection Chart	
CT	Range
CT20	For motor currents (FLA) upto 20 Amp
CT50	For motor currents (FLA) upto 50 Amp



F3 MPR1



MBMPR



PC Side Software

Relay contact position shown in 'Power off' condition

MICROPROCESSOR BASED PUMP AUTOMATION RELAY



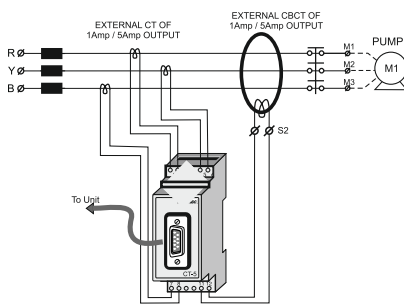
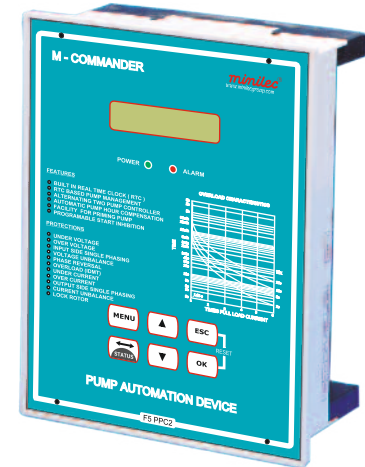
CT Module (CT1 / CT 5)



For motor current above 50 Amp. customer to use suitable external CT of 1 Amp/5 Amp Secondary and CT Module CT 1/CT 5 for Minilec relay only like F3 MPR1, MBMPR & M-COMMANDER

M-COMMANDER Pump Management & Protection System

M-Commander is a micro-processor based Motor protection and Pump management system, suitable for 2 pumps. Sensing voltage and current. Protecting against Phase Failure, Unbalance, Phase sequence, Under/over voltage, overloading, dry running, Over current/Short circuit. Auto/Manual resetting, Adjustable trip settings for UV/OV, UC/OC, O/L. On delay & startup delay adjustable, Start inhibition time adjustable, 2x1CO output relays RTC based time settings.



Motor protection Includes

- Under/Over voltage protection
- Single/Reverse phasing protection
- Voltage / Current unbalance
- Overload trip
- Over current protection
- Dry running protection

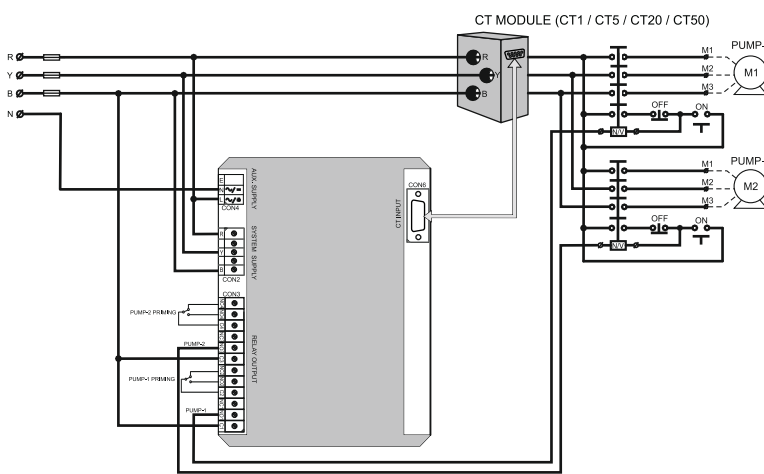
Pump Management System Features

- Auto Change over between two pumps
- Intelligent resetting facility
- On-site programming facility
- Password protection for programming
- Pump On-Off timer programmable for 10 times a day, with advance programming of 7 days
- Run-time compensation
- Ideal for Pump Automation & Unmanned Pumping Stations.
- Start Inhibition Facility

PARAMETERS	SPECIFICATIONS
Supply Voltage	
System	415 V AC $\pm 20\%$, 3 Phase, 50/60Hz $\pm 3\%$
Auxiliary	90-270 VAC/DC $\pm 20\%$, 50Hz
Output Contacts	4 x 1 CO Relays (for 2 pumps)
Current sensor	External CT1 / CT5 / CT20 / CT50
Reset	Auto/ Multi-Attempt / Manual
Unbalance	4-20% for Voltage Unbalance 40-60% $\pm 10\%$ for current unbalance
Overload	As per Inverse Time Characteristics
Over Current / Short Circuit	300% - 800% $\pm 50\%$ of Imax.
Under Voltage	75% - 95% of system supply (adjustable)
Over Voltage	105%-120% of system supply (adjustable)
Dry Running	30-90% $\pm 10\%$ of Imax
Display	16x2 Ch. (Backlit LCD)
Weight	800gms
Wherever not specified Contact Rating : 5A @ 230 V AC (resistive)	

90 x 35 x 60
35 mm Rail Mounting
400 gms

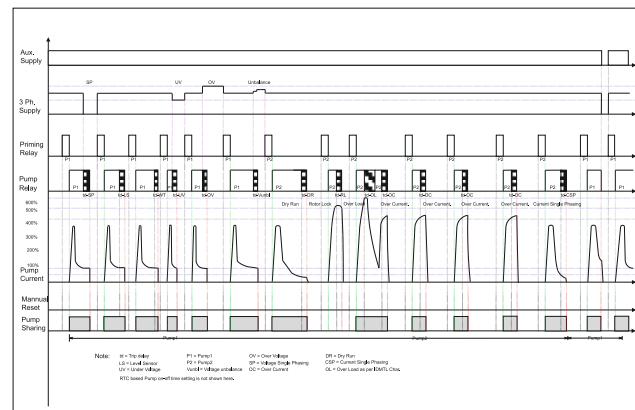
For more detailed specifications, refer table on page No. 28 (MBMPR)



M-COMMANDER





For Auto operation, Put link across 'ON' push button

M-Commander Timing Diagram



Relay contact position shown in 'Power off' condition

WINDING OVER-TEMPERATURE PROTECTION RELAYS

	WTR D1 Winding Protection Relay	S2 WTR1 PTC Thermistor Relay	PTC Thermistor
	ABS 	ABS 	
	Sensing motor winding temperature through PTC Thermistors. Winding overheating, sensor short, sensor open faults. Suitable for single, triple or 6/9/12 PTC's	Sensing motor winding temperature through PTC Thermistors. Winding overheating, sensor short, sensor open faults. Suitable for single, triple or 6/9/12 PTC's failsafe/Non fail safe	

	Supply Voltage	
	WTR D1	S2 WTR1
Note: Mention specific voltage (Fixed/wide range) in order		
Auxiliary	24 / 48 / 110-120/220-240/380-440 V AC/24 V DC 50Hz(60 Hz) ± 10%	12/24V DC/100-120/220-240V AC, 50Hz(60 Hz) ± 10%
Output Contacts	1 CO	2 CO
Trip Setting		
Thermistor Sensor Healthy	40 - 4 K	40 Ω - 4K Ω
Thermistor Sensor Trip	4.1 K - 5.5 K	4.1K Ω - 5.5K Ω
Thermistor Sensor Open	5.6 K & above	5.6K Ω & Above
Thermistor Sensor Short	39 & below	0 - 39 Ω
Trip time delay	Less than 2 secs.	Less than 1 Sec (Fixed)
Resetting	Below 1.51 K	Below 1.51 K
Dimensions (mm)		
Overall (L x W x D)	76 x 30.5 x 117.5	90 x 35 x 60
Mounting (L x W)	68 mm centre to centre / 35 mm Rail Mounting	35 mm Rail Mounting
Weight	300 gms.	150 gms.
Resetting Mode	Auto / Manual (Optional)	Auto / Manual

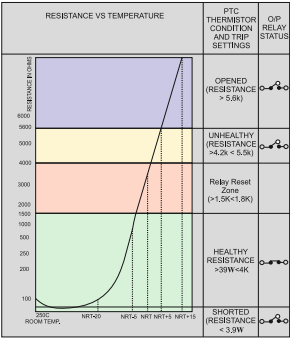
PTC Thermistors are semi conductor sensors. These have typical characteristics that change their resistance instantly at a specified pre-defined response temperature (NRT). As soon as the surrounding temperature of PTC reaches it's NRT value the body resistance of PTC Thermistor rises sharply from 200 / 250 Ohms to more than 5000 Ohms. The PTC Thermistors are embedded in the overhang location of the motor windings.

The NRT value of PTC is selected according to the Insulation Class of the copper windings of motor or transformers.

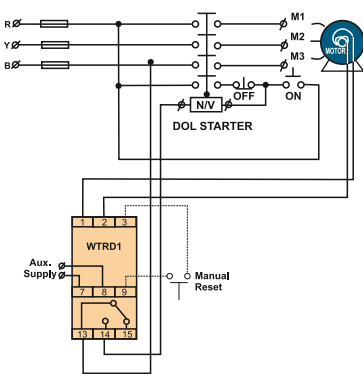
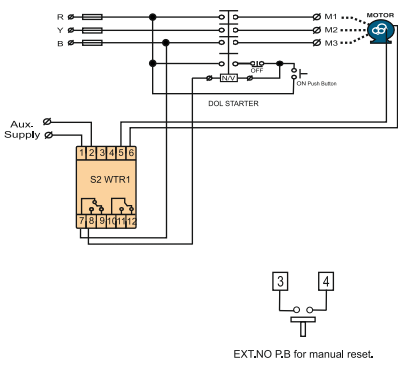
Selection Chart for NRT of PTC Thermistors.

Wherever not specified Contact Rating :
5A @ 230 V AC (resistive)

TYPICAL CHARACTERISTICS OF PTC (THERMISTOR)



RESISTANCE VS TEMPERATURE	PTC THERMISTOR CONDITION AND TRIP SETTINGS	OIP RELAY STATUS
HEALTHY RESISTANCE >39Ω<4K	Relay Reset Zone (>1.5K<1.8K)	ON
UNHEALTHY (RESISTANCE >4.2K <5.5K)	TRIP	OFF
OPENED (RESISTANCE >5.5K)	TRIP	OFF
SHORTED (RESISTANCE <3.9Ω)	TRIP	OFF

EXT.NO P.B for manual reset.

NRT °C	Class of Ins.	Cable Colour Code
70	-	White - Brown
80	-	White - White
90	-	Green - Green
100	A	Red - Red
110	-	Brown - Brown
120	E	Grey - Grey
130	B	Blue - Blue
140	-	White - Blue
150	F	Black - Black
160	-	Blue - Red
170	H	White - Green
180	C	White - Red
190	-	Orange - Black

Relay contact position shown in 'Power off' condition