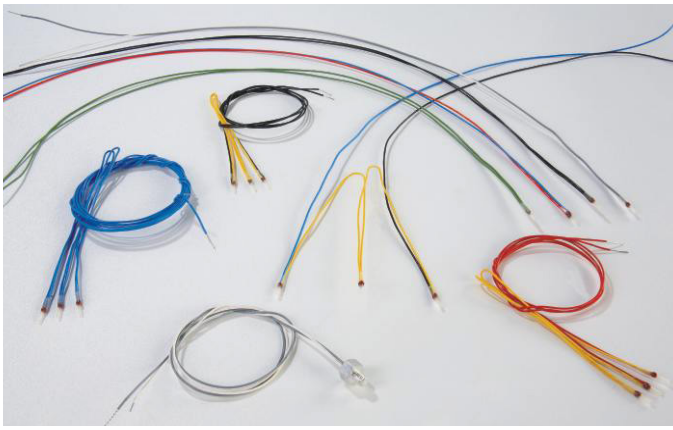


PTC THERMISTORS



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PTC Thermistors

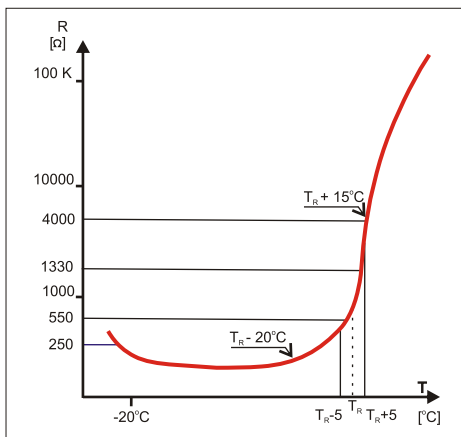
PTC thermistors are temperature sensitive ceramic semi-conductors. These devices have a very high Positive Temperature Coefficient and hence can be used for over-temperature protection in a variety of applications. These are also known as Motor protection sensors or PTC resistors. The PTC thermistors are in accordance to DIN std. 44081 / 44082 and BS EN 60034.

Function

The PTC thermistor is a temperature dependant sensor. The nominal switching temperature (T_R) corresponds to the curie point temperature of the ceramic. Under normal conditions the PTC thermistor has a low resistance. The resistance of the PTC thermistor rises very steeply near its T_R , thus triggering the switching function. This change of resistance vs temperature is used to activate a circuit and provide overtemperature protection.

Characteristics

- Precise repeatability of the switching point
- Ideal for installation in small space surroundings
- Suitable for mounting IN and ON windings / surfaces
- Excellent thermal sensitivity



Resistance - Temperature Characteristic

The graph shows the relationship between the resistance and temperature. The increase in the resistance from the switching point onwards is exponential.

Temperature	Resistance	Measuring Voltage (D)
-20° C upto $T_R - 20^\circ\text{C}$	20 to 250 Ω	$\leq 2.5\text{ V}$
$T_R - 5^\circ\text{C}$	$\leq 550\ \Omega$	$\leq 2.5\text{ V}$
$T_R + 5^\circ\text{C}$	$\geq 1330\ \Omega$	$\leq 2.5\text{ V}$
$T_R + 15^\circ\text{C}$	$\geq 4000\ \Omega$	$\leq 7.5\text{ V}$

T_R = Nominal Switching Temperature Approx. resistance at $T_R = 1000\ \Omega$

PTC Thermistor lead colour code chart

The following chart gives the colours of end leads of the PTC thermistors. The standard colour of interconnecting lead wires is yellow.

Features

- Temperature range 60° C to 180° C
- Available in Single, Double, Triple, Adaptor etc versions
- Customized lead lengths
- Cost effective

Applications

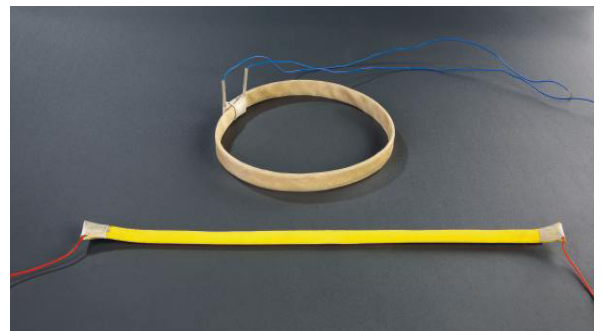
- Electric Motors
- Transformers
- Alternators
- Welding Machines
- UPS / SMPS.... and many more

Space Heaters

Flexible space heaters are used to prevent formation of condensation in electric motors / generators. These heaters, also known as Anti-condensation Heaters, are installed on the windings before varnishing / impregnation process. After proper impregnation they form a homogeneous mass and have a good thermal conductivity. The space heater is usually designed to fit around the stator winding, covering at least 70% of the circumference. The space heaters are normally switched on when the motor / generator stops for long duration.

Characteristics

- High flexibility
- Very good physical strength
- Excellent heat transfer
- Large range of lengths, widths & wattages



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Applications of Space Heater

- Typical applications of these heaters are in motors and generators which operate in moist and humid conditions. For eg. Crane motors near docks, Offshore & marine equipment, Well pumps etc.
- Rewinding costs and machine down time can be saved if space heaters are specified while ordering the equipment.

Thermistor Relay

The Thermistor Relay is used along with PTC thermistors for over-temperature protection of various equipment. The Thermistor Relay operates on the resistance of PTC Thermistors which are installed in the equipment. Whenever the equipment temperature increases to the switching temperature of the installed thermistors, the relay contacts of the Thermistor Relay changeover. These changeover contacts are used for switching off the equipment thus protecting it.

DUAL Thermistor Relay

The DUAL type Thermistor Relay is used for over-temperature protection of equipment which cannot be switched off suddenly. Two sets of thermistors of different switching temperatures are installed in the equipment, one set for ALARM and the other for TRIP. Normally a temperature difference of 20 – 30° C is kept between ALARM and TRIP thermistors.

The ALARM relay contacts changeover at the ALARM temperature. If no corrective action is taken after getting this indication, the temperature of the equipment increases and it trips after the TRIP temperature is attained.

The output relay contacts are potential free and hence can be used for connecting a lamp / siren for annunciation and contactor coil for tripping. The biggest advantage of this Relay is that it gives an ALARM indication at predefined temperature.

Features

- Various supply voltages: 110/ 230/ 380/ 415 V AC, 24 V DC
- DIN rail & Chassis mounting type
- Upto 6 thermistors can be connected to the Thermistor Relay

Advantages

- Very economical. Price is same for motor of any HP rating
- The DUAL type Relay reduces maintenance costs and repair cost of the machine due to overheating and burning
- Machine downtime is reduced
- Inventory costs are cut down

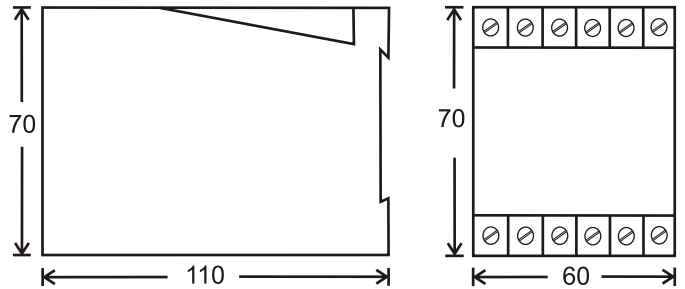
Applications

The Thermistor Relays are mainly used for motors / generators in;

- Paper Mills
- Sugar Mills
- Cement Factories
- Rubber Factories
- Steel Industries



DIMENSIONAL DRAWING



Causes of Motor burning

Excessive winding temperature leads to breakdown of the wire insulation and ultimately to the burning of winding.

Conditions that may cause motor burning are;

- Single Phasing
- Continuous overloading
- Under voltage or Over voltage
- Intermittent operation or excessive start / stops
- Insufficient ventilation
- Bearing failure
- Mechanical jam / overload

The Thermistor Relay protects windings against all the above causes of failure. It is superior as it eliminates the root cause of failure.



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Pt 100 RTD / BTD

Pt-100 Resistance Temperature Detectors (RTDs) and Bearing Temperature Detectors (BTDs) are Platinum sensors which have a linear Resistance – Temperature characteristic. Due to this linear characteristic, the Pt-100 sensors are used for temperature measurement and control along with a temperature indicator or a temperature controller .

The RTDs are widely used to monitor the winding temperature of Electric Motors and Generators (Alternators). Due to their various sizes the RTDs can be mounted on the Motor / Generator bearing housings by providing suitable tapped holes. The BTDs can be placed directly in the motor winding or can be fitted in the slots.

Features

- Customized designs and enclosures. RTDs are available in various designs from small bead type (overhang) sensors to Slot type RTDs
- The BTDs are manufactured as per customer requirements (in SS, HA Aluminium etc.)
- Various lead lengths and colour codes of wires can be supplied
- Ex-stock delivery of standard models

Thermal Protectors (TOP)

The thermal protectors (TOPs) are temperature dependent switching devices which operate at a predefined temperature. Due to their switching characteristic they are used for over-temperature protection in various applications like motors, transformers, electronic equipments etc. The TOPs can practically fit into the smallest motor, transformer or any other equipment.

Whenever the equipment gets hot and the switching temperature of the TOP is attained, the TOP trips thus protecting the equipment against overheating & burning. When the equipment cools down to a safe temperature, the TOP resets automatically and the normal function of the equipment is resumed. Its automatic operation makes it a fail-safe and tamper-proof device.

Features

- Wide range of switching temperatures : from 50° C to 160° C
- Current capacity of 8A/ 10A (surface mount type)
- Excellent accuracy and longer life
- Low differential temperature for electronic applications
- Very economical

Applications

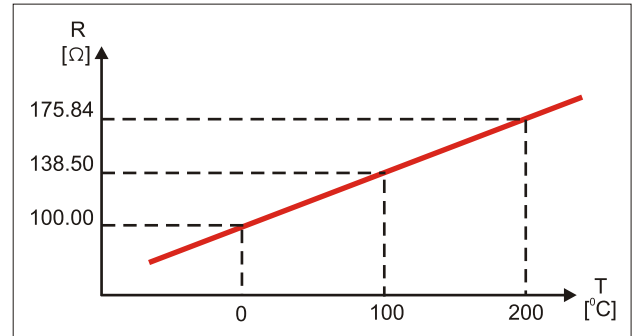
- Single Phase & FHP Motors
- Monoblock / Jet / Submersible Pumps
- Transformers / Ballasts / Chokes
- Heat Sinks
- Battery Packs
- Solenoids... etc.

Resistance – Temperature Characteristic

Following table gives the values of resistance at various temperatures.

Temperature	Resistance	Temperature	Resistance
0°C	100.00	110°C	142.29
10°C	103.90	120°C	146.06
20°C	107.79	130°C	149.82
30°C	111.67	140°C	153.58
40°C	115.54	150°C	157.31
50°C	119.40	160°C	161.04
60°C	123.24	170°C	164.76
70°C	127.07	180°C	168.46
80°C	130.89	190°C	172.16
90°C	134.70	200°C	175.84
100°C	138.50	210°C	179.51

Following graph shows variation of R vs T



Applications

- AC Motors
- Alternators
- DC Motors
- Transformers



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SPECIFICATION SHEET FOR SINGLE PTC THERMISTORS

Parameter	Symbol	Unit	Value
Rated response temperature	V_{NAT}	°C	60 – 190
Tolerance of V_{NAT}	T	°C	± 5
Resistance at – 20° C upto $V_{NAT} - 20$ °C. ($U_{KL} \leq 2.5$ V)		Ω	20 – 250
Max. operating voltage	U_{max}	V DC	30
Thermal response time	t_a	s	< 5
Dielectric strength between leads and sleeve	$U_{is} \sim$	kV	2.5
Max. operating temperature	V_{max}	°C	200
Max. storage temperature	V_{imax}	°C	160
Min. storage temperature	V_{imin}	°C	– 25

U_{KL} – Normal Measuring Voltage.

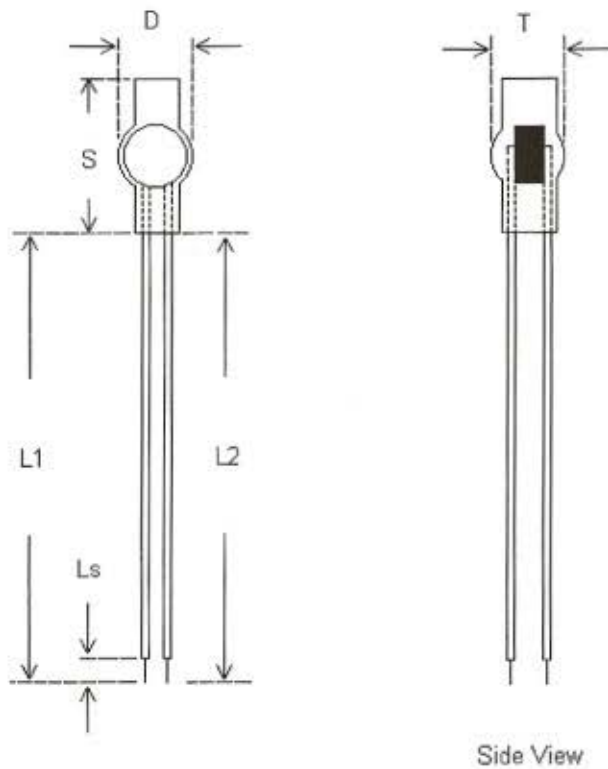
Resistance characteristics.

V_{NAT} (°C)	$V_{NAT} - 5^\circ\text{C}$ (ohm)	$V_{NAT} + 5^\circ\text{C}$ (ohm)	$V_{NAT} + 15^\circ\text{C}$ (ohm)	$V_{NAT} + 23^\circ\text{C}$ (ohm)	Wire Colour Code
60	< 570	> 570		> 10000	White – Grey
70	< 570	> 570		> 10000	White – Brown
80	< 570	> 570		> 10000	White – White
90	< 550	> 1330	> 4000		Green – Green
100	< 550	> 1330	> 4000		Red – Red
110	< 550	> 1330	> 4000		Brown – Brown
115	< 550	> 1330	> 4000		Brown – Red
120	< 550	> 1330	> 4000		Grey – Grey
130	< 550	> 1330	> 4000		Blue – Blue
140	< 550	> 1330	> 4000		Blue – White
145	< 550	> 1330	> 4000		White – Black
150	< 550	> 1330	> 4000		Black – Black
155	< 550	> 1330	> 4000		Black – Blue
160	< 550	> 1330	> 4000		Red – Blue
170	< 570	> 570		> 10000	White – Green
180	< 570	> 570		> 10000	White – Red
190	< 570	> 570		> 10000	Grey – Brown



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Dimensional details of SINGLE PTC Thermistor



Details.

Parameter	Symbol	Unit	Value	Tolerance
Thickness of Thermistor	T	mm	≤ 3	---
Diameter of Thermistor	D	mm	≤ 3	---
Shrink Sleeve length	S	mm	15	± 1
Lead length	L1	mm	500	± 5
Lead length	L2	mm	500	± 5
Stripped Lead length	Ls	mm	10	± 1

Lead Wire.

AWG 24 (7/32). PTFE (Teflon) insulated, Flexible Tinned Copper wire.



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SPECIFICATION SHEET FOR TRIPLE PTC THERMISTORS

Parameter	Symbol	Unit	Value
Rated response temperature	V_{NAT}	°C	60 – 190
Tolerance of V_{NAT}	T	°C	± 5
Resistance at – 20° C upto $V_{NAT} - 20$ °C. ($U_{KL} \leq 2.5$ V)		Ω	60 – 750
Max. operating voltage	U_{max}	V DC	30
Thermal response time	t_a	s	< 5
Dielectric strength between leads and sleeve	$U_{la\sim}$	kV	2.5
Max. operating temperature	V_{max}	°C	200
Max. storage temperature	V_{lmax}	°C	160
Min. storage temperature	V_{lmin}	°C	– 25

U_{KL} – Normal Measuring Voltage.

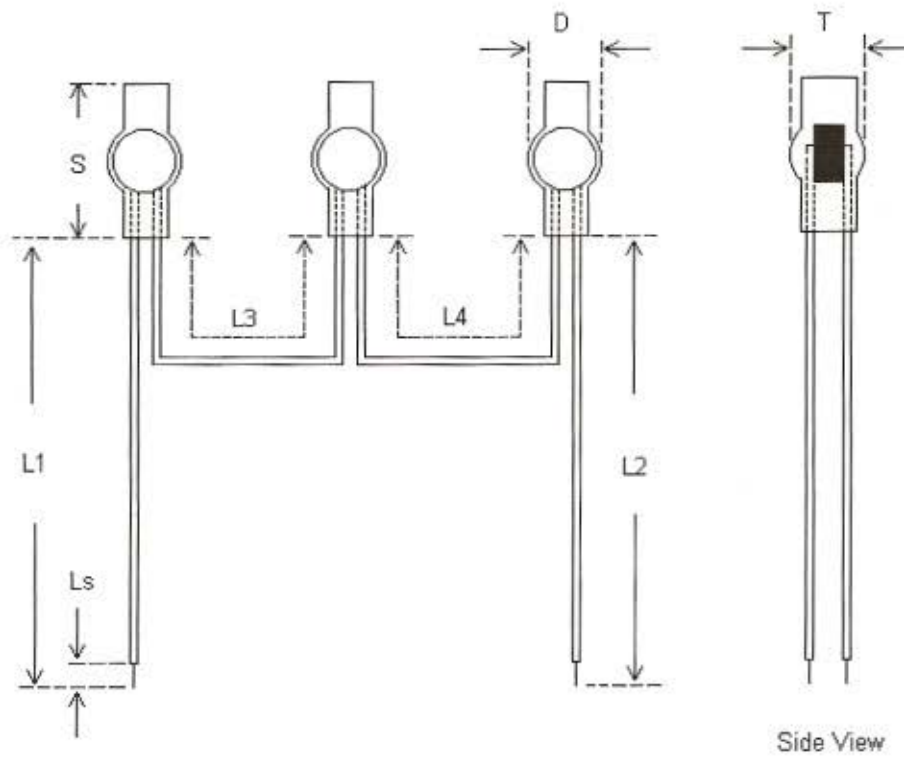
Resistance characteristics.

V_{NAT} (°C)	$V_{NAT} - 5^\circ\text{C}$ (ohm)	$V_{NAT} + 5^\circ\text{C}$ (ohm)	$V_{NAT} + 15^\circ\text{C}$ (ohm)	$V_{NAT} + 23^\circ\text{C}$ (ohm)	End Wire Colour Code
60	< 1710	> 1710		> 30000	White – Grey
70	< 1710	> 1710		> 30000	White – Brown
80	< 1710	> 1710		> 30000	White – White
90	< 1650	> 3990	> 12000		Green – Green
100	< 1650	> 3990	> 12000		Red – Red
110	< 1650	> 3990	> 12000		Brown – Brown
120	< 1650	> 3990	> 12000		Grey – Grey
130	< 1650	> 3990	> 12000		Blue – Blue
140	< 1650	> 3990	> 12000		Blue – White
145	< 1650	> 3990	> 12000		White – Black
150	< 1650	> 3990	> 12000		Black – Black
155	< 1650	> 3990	> 12000		Black – Blue
160	< 1650	> 3990	> 12000		Red – Blue
170	< 1710	> 1710		> 30000	White – Green
180	< 1710	> 1710		> 30000	White – Red
190	< 1710	> 1710		> 30000	Grey – Brown



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Dimensional details of TRIPLE PTC Thermistor



Details.

Parameter	Symbol	Unit	Value	Tolerance
Thickness of Thermistor	T	mm	≤ 3	---
Diameter of Thermistor	D	mm	≤ 3	---
Shrink Sleeve length	S	mm	15	± 1
End Lead length	L1, L2	mm	500	± 5
Interconnecting Lead length	L3, L4	mm	185	± 3
Stripped Lead length	Ls	mm	10	± 1

Lead Wire.

AWG 24 (7/32). PTFE (Teflon) insulated, Flexible Tinned Copper wire.



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THERMISTOR RELAY

Model No.: TR1-110A

- Supply Voltage - 110 V AC \pm 15 %, 50 Hz.
Ambient temperature - - 5° C to + 55° C.
Type of reset - Auto Reset.
- Output Contacts - 2 Potential-free Changeover (1 NO + 1 NC) contacts.
Contact rating - The contacts are rated at 4 Amps @ 230 VAC, 50 Hz.
4 Amps @ 24 VDC.
- Operational life - 1 million On/Off operations.
LED Indication - POWER ON
- TRIP
- Connection of Thermistors - Maximum 6 PTC thermistors can be connected to the thermistor relay.
- High Voltage Test - 1 KV between terminals and body.
1.5 KV between NO / NC contacts and body.
1.5 KV between supply terminals and body.
- Relay Characteristics - Pick-up resistance > 40 Ω
Trip resistance : 3700 Ω \pm 50 Ω
Reset resistance : 1625 Ω \pm 25 Ω
Re-drop resistance < 40 Ω
- (The above relay characteristics are at rated input supply voltage).
- Overall Dimensions - 70 x 60 x 110 mm
(H x W x D)
Mounting - Suitable for Din Rail channel mounting & Chassis mounting.



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THERMISTOR RELAY

Model No.: TR1-230A

Supply Voltage	- 230 V AC \pm 15 %, 50 Hz.
Ambient temperature	- - 5° C to + 55° C.
Type of reset	- Auto Reset.
Output Contacts	- 2 Potential-free Changeover (1 NO + 1 NC) contacts.
Contact rating	- The contacts are rated at 4 Amps @ 230 VAC, 50 Hz. 4 Amps @ 24 VDC.
Operational life	- 1 million On/Off operations.
LED Indication	- POWER ON - TRIP
Connection of Thermistors	- Maximum 6 PTC thermistors can be connected to the thermistor relay.
High Voltage Test	- 1 KV between terminals and body. 1.5 KV between NO / NC contacts and body. 1.5 KV between supply terminals and body.
Relay Characteristics	- Pick-up resistance > 40 Ω Trip resistance : 3700 $\Omega \pm$ 50 Ω Reset resistance : 1625 $\Omega \pm$ 25 Ω Re-drop resistance < 40 Ω

(The above relay characteristics are at rated input supply voltage).

Overall Dimensions - 70 x 60 x 110 mm

(H x W x D)

Mounting - Suitable for Din Rail channel mounting & Chassis mounting.



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