PTC Thermistors
Temperature Sensors for Motor Protection and Electronics

(temperature-sensitive resistors)

YD 1
YG 1
YD 3
YG 3
EF 1
YGM 1
YGM 3
TKA 1
TKA 2

FEATURES

– rapid response protection for electrical machines
– compact size for easy assembly into windings
– silvered copper leads

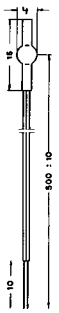
DESCRIPTION

PTC thermistors act as thermal protection for electrical machines, and are well known particularly as motor-protectors. They are available with or without insulating sleeve and have flexible connecting leads.

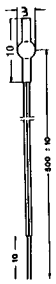
PTC thermistors have a non-linear resistance/temperature response, and at a specified temperature the resistance changes rapidly to a very high value.

DIMENSIONS

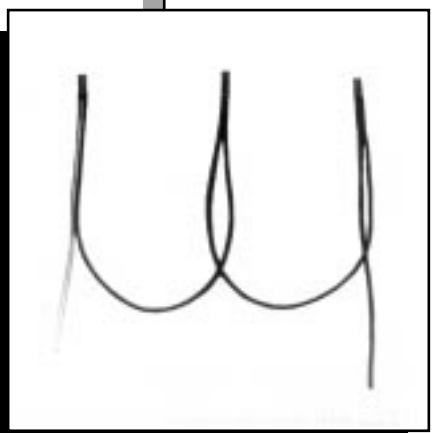
YD 1
Single thermistor
with shrunk-sleeve



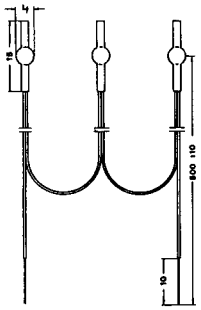
YGM 1
Mini-version
with shrunk-sleeve



Mini

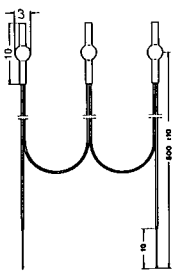


YD 3
Triplet version (in series)



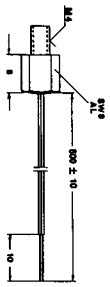
Standard

YGM 3
Mini-version



mini

EF 1
Sensor



threaded

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PTC-Thermistors
02-02-02
1000-Y-180

OPERATION

PTC thermistors exhibit very high sensitivity over a narrow temperature band. For temperature measurement in this range, NTC thermistors are easier to measure and more accurate.

PTC thermistors are especially suited as temperature sensors for monitoring the windings of electric machines, and also for use in simple fail-safe circuitry. When a given temperature (nominal response temperature ϑ_{NAT}) is exceeded, the circuit can be switched off through a relay or amplifier, since the PTC-sensor will have an extremely high ohmic value in the region of its response temperature. This will have the same effect as a break in the circuit or a failure of the thermistor.

TECHNICAL DATA

Nominal response temperature	80 ° to 180 °C in steps of 10 °, plus 145 ° and 155 °C
Maximum allowable operating temp.	$T_{max.}$ 200 °C
Max. allowable operating voltage at + 25 °C	$U_{max.}$ 25V (per bead)
Max. allowable power dissipation at + 25 °C	690 mW
Insulation strength (between leads and outer insulation) also for threaded sensor	2.5 kV
Conductors - silvered copper wire with teflon insulation	PTFE
Insulation stripping	approx 10 mm
Conductor cross-section	0.25 mm² for single, double and triple PTC's

CONDUCTOR LENGTHS

Single PTC	500 mm ± 10 mm
Double PTC	500 - 180 - 500 m ± 10 mm
Triple PTC	500 - 180 - 180 - 500 mm ± 10 mm

SPECIAL VERSIONS

PTC's are also available in many special housings (can be manufactured to customers specifications)

INSTALLATION TIPS

For PTC temperature sensors in electrical windings:

- the thermistors can only be inserted in the windings before impregnation
- it is advisable to embed one in each phase, if possible in the centre of the coil generating most heat, and generally on the outflow side of any air movement
- air inflow onto the temperature sensor will interfere with heat transfer
- if using varnish/lacquer which is not chemically neutral, suitability tests must be undertaken by the customer
- WARNING! It is very important that the sensor must be installed parallel with the copper of the winding, so that the teflon leads can assume the form of the rest of the winding and thereby retain the high-voltage resistance rating.
- PTC's are classified according to their nominal response temperature ϑ_{NAT} but all have similar resistance characteristics to simplify the choice of switching device; the relationship of resistance to temperature of all these PTC's is as follows:

STANDARD RESISTANCE VALUES

Single PTC

Temperature °C	Resistance Ω	measuring Voltage V
– 20 to ϑ_{NAT} – 20	250 max./100 max.	2.5
ϑ_{NAT} – 5	550 max.	2.5
ϑ_{NAT}	1.000	2.5
ϑ_{NAT} + 5	1.330 min.	2.5
ϑ_{NAT} + 15	4.000 min	7.5

Triple PTC

Temperature °C	Resistance Ω	measuring Voltage V
– 20 to ϑ_{NAT} – 20	750 max./300 max.	7.5
ϑ_{NAT} – 5	1.650 max.	7.5
ϑ_{NAT} + 5	4.000 min.	7.5
ϑ_{NAT} + 15	4.000 min.*	7.5

* one PTC might reach ϑ_{NAT} + 15 °C, while the second or even both of the others could still remain at room temperature.

The PTC's resistance values for motor protection are specified in DIN 44081/44082. Resistance values below ϑ_{NAT} –20 are not specified, and resistance when cold is no indication of the PTC's condition. It is ideally between 40 - 200 ohms but can be anywhere between 35 - 250 ohms.

The greatest resistance change occurs between ±5 °C either side of ϑ_{NAT}, being at least 15%/K.

Twin/double and triple PTC's are available with standard or mini-bead.

QUALITY STANDARD

Random testing is carried out according to DGQ P90/P10 (DIN 40080). AQL values can be fixed by arrangement.

ORDERING INFORMATION

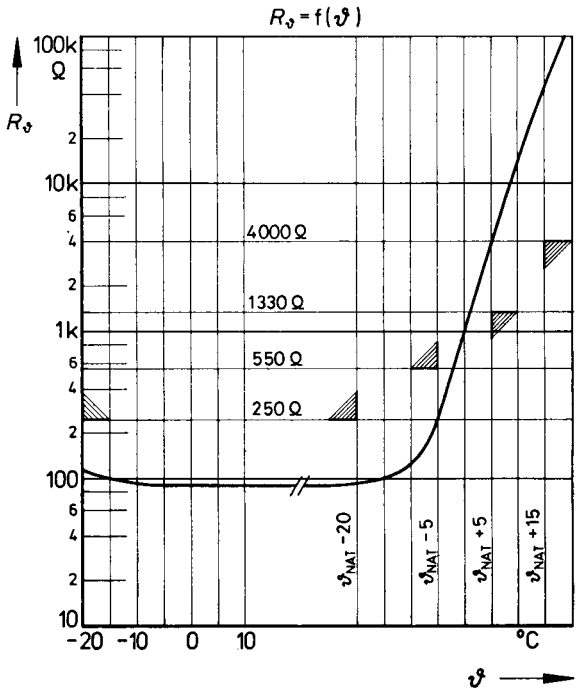
Quantity	Type	Temperature code No.	Resistance max.
1.000	YD1	C 510	250 ohms

Single PTC

YD = standard size bead 4 mm with shrunk-sleeve
YG = standard size bead 4 mm with shrunk-sleeve and epoxy seal
YGM = mini-bead 3 mm with shrunk-sleeve and epoxy seal

Type YD1	Type YG1	Type YGM1	Resp. temp. ϑ_{NA}	Std. Colour code
YD1 C508	YG1 C508	YGM1 C508	80 ±5	white - white
YD1 C509	YG1 C509	YGM1 C509	90 ±5	green - green
YD1 C510	YG1 C510	YGM1 C510	100 ±5	red - red
YD1 C511	YG1 C511	YGM1 C511	110 ±5	brown - brown
YD1 C512	YG1 C512	YGM1 C512	120 ±5	grey - grey
YD1 C513	YG1 C513	YGM1 C513	130 ±5	blue - blue
YD1 C514	YG1 C514	YGM1 C514	140 ±5	white - blue
YD1 C545	YG1 C545	YGM1 C545	145 ±5	white - black
YD1 C515	YG1 C515	YGM1 C515	150 ±5	black - black
YD1 C655	YG1 C655	YGM1 C655	155 ±5	blue - black
YD1 C516	YG1 C516	YGM1 C516	160 ±5	blue - red
YD1 C517	YG1 C517	YGM1 C517	170 ±5	white - green
YD1 C518	YG1 C518	YGM1 C518	180 ±5	red - white

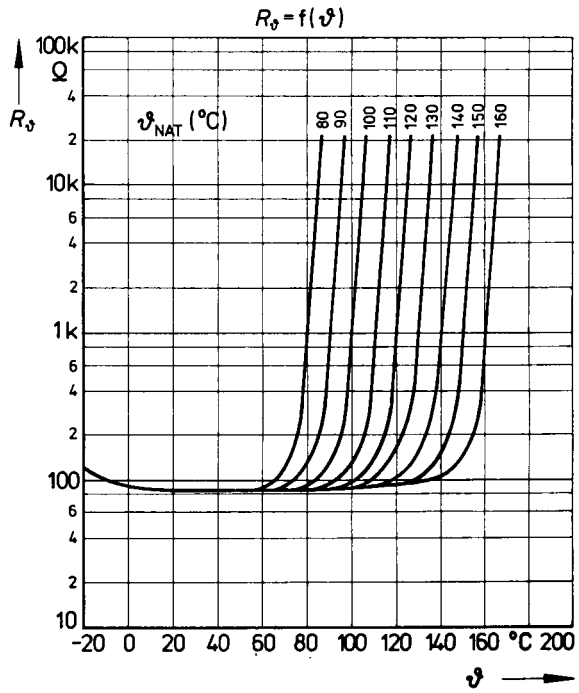
TEMPERATURE-RESISTANCE CURVE



Triple PTC

YD = standard size bead 4 mm with shrunk-sleeve
YG = standard size bead 4 mm with shrunk-sleeve and epoxy seal
YGM = mini-bead 3 mm with shrunk-sleeve and epoxy seal

Type YD3	Type YG3	Resp. temp. ϑ_{NA}	Std. Colour code YD YG
YD3 C508	YG3 C508	80 ±5	white - black - black - white
YD3 C509	YG3 C509	90 ±5	green - black - black - green
YD3 C510	YG3 C510	100 ±5	red - black - black - red
YD3 C511	YG3 C511	110 ±5	brown - black - black - brown
YD3 C512	YG3 C512	120 ±5	grey - black - black - grey
YD3 C513	YG3 C513	130 ±5	blue - black - black - blue
YD3 C514	YG3 C514	140 ±5	white - black - black - blue
YD3 C545	YG3 C545	145 ±5	white - black - black - black
YD3 C515	YG3 C515	150 ±5	black - black - black - black
YD3 C655	YG3 C655	155 ±5	blue - black - black - black
YD3 C516	YG3 C516	160 ±5	blue - black - black - red
YD3 C517	YG3 C517	170 ±5	white - black - black - green
YD3 C518	YG3 C518	180 ±5	red - black - black - white



Mini PTC

YGM = mini-bead 3 mm with shrunk-sleeve and epoxy seal

Type YGM3	Resp. temp. ϑ_{NA}	Std. Colour code YGM3
YGM3 C508	80 ±5	white - yellow - yellow - white
YGM3 C509	90 ±5	green - yellow - yellow - green
YGM3 C510	100 ±5	red - yellow - yellow - red
YGM3 C511	110 ±5	brown - yellow - yellow - brown
YGM3 C512	120 ±5	grey - yellow - yellow - grey
YGM3 C513	130 ±5	blue - yellow - yellow - blue
YGM3 C514	140 ±5	white - yellow - yellow - blue
YGM3 C545	145 ±5	white - yellow - yellow - black
YGM3 C515	150 ±5	black - yellow - yellow - black
YGM3 C655	155 ±5	blue - yellow - yellow - black
YGM3 C516	160 ±5	blue - yellow - yellow - red
YGM3 C517	170 ±5	white - yellow - yellow - green
YGM3 C518	180 ±5	red - yellow - yellow - white

Threaded housing

Type EF1	Resp. temp. ϑ_{NA}	Std. Colour code
EF1 C508	80 ±5	white - white
EF1 C509	90 ±5	green - green
EF1 C510	100 ±5	red - red
EF1 C511	110 ±5	brown - brown
EF1 C512	120 ±5	grey - grey
EF1 C513	130 ±5	blue - blue
EF1 C514	140 ±5	white - blue
EF1 C545	145 ±5	white - black
EF1 C515	150 ±5	black - black
EF1 C655	155 ±5	blue - black
EF1 C516	160 ±5	blue - red
EF1 C517	170 ±5	white - green
EF1 C518	180 ±5	red - white

When ordering please specify thread size, otherwise the stock M4 size will be supplied.

PTC SWITCHING DEVICE
TYPE TKA1, TKA2
PTC RELAY UNIT
TYPE TKA1, TKA2

FEATURES

- sensor and relay unit are both interchangeable
- fixed sensor response temperature from 80 - 180 °C
- safe monitoring of sensing circuit and sensor
- upto 6 PTC's can be connected
- quick installation housing (DIN-EN 50022) or screw fixing (M4)
- also available with push-button test light (can be retrofitted)

DESCRIPTION

These PTC relay units have been developed as state of the art devices. All other commercially available units can be replaced with ours.

Relay unit and sensors as per DIN 44081 and 44082 give optimum protection against thermal overload. Together they provide a rapid and reliable motor-protection system.

Two basic formats are available:

TKA1 for applications where space is at a premium

TKA2 in a DIN housing, eg. for use in control panels

Any PTC thermistors that conform to DIN 44081 or 44082 can be connected to these relay units.

INSTALLATION

Screw or snap-on fixing TKA2

Installed on a 35 mm rail to DIN 46277 B.3 by means of an integral snap-on housing.

Screw fixing TKA1

ELECTRICAL DATA

POWER SUPPLY:

Voltage:	42 V, 110 V, 230 V, 400 V, 415 V0 ac
Special voltages:	eg dc, please ask
Tolerance:	+ 10 % ... – 15 %
Power consumption:	less than 3VA
Frequency:	40 – 60 Hz
Operating temp.:	– 20 °C to 60 °C

RELAY OUTPUT
1 change-over contact
Switching capacity at 250V
Use category AC 11 3A
Continuous current rating 6A
Max. current rating of overload fuse 6 A

VOLTAGE TESTING
Test voltage between supply, relay contacts and PTC circuit, 2.5 kV
Test voltage on output contacts, 1.0 kV

PTC CONNECTION

Max. quantity of PTC connectable:	6 pcs
Terminal voltage for PTC's	
Range:	larger 1.6 k
	Smaller 3.6 k +/- 10 %

SPECIAL VERSIONS

PTC sensors can be delivered with a warning label/ tag. This has a 4 cm cord, so that the tag can be seen from the exterior when attached to the motor, equipment or plant, and will warn against applying voltages higher than 2.5V (surely this should be 2.5 kV).

The ordering code for this label ist K105.

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