TEXAS INSTRUMENTS

KLIXON®
3BA, 4BA, 7BA and 10BA PTC MOTOR SENSORS

General Description

The 3BA, 4BA, 7BA and 10BA are Positive Temperature Coefficient (PTC) sensors with a low resistance property. Once the motor winding temperature increases to a pre-determined trip temperature, the sensor resistance increases several orders of magnitude for a correspondingly small change in temperature.

This sharp increase in resistance causes the Texas Instruments control module (See table below) to de-energize an internal relay which in turn opens the contactor/starter coil circuit. Because the system places thermal sensors at the precise point where protection is needed (in the motor windings, for instance), equipment is protected against heat damage regardless of cause - including external faults such as blocked ventilation.

An advantage of the PTC type sensor is that several of them may be connected in series without a significant loss of calibration. If only one sensor reaches the trip temperature, the module will trip. Another advantage is the motor manufacturer fixes the protection temperature by sensor selection which prevents operator tampering.

Sensor vs. Electronic Module

TI PTC Sensor	All TI PTC Sensors can be used in Conjunction with any Electronic Control Module
3BA 4BA 7BA 10BA	15AA, 30AA, 31AA, 32AA, 40AA, 41AA, 42AA, 50AA, 51AA, 2ACE

System features

- Tamperproof
- Rapid responding
- UL Recognized Component
- Eliminates Nuisance Trips
- Field Proven Klixon design
- No Field Adjustment Required
- Easily Specified and Installed
- Allows Full Use of Motor Rating
- Directly Senses Winding Overheating
- Module Independent of Motor HP
- Wide Trip Temperature Range from 80ºC to 170ºC in 5º increments
- Insulation System 600V

Motor Protection

- Locked Rotor
- Running Overload
- Single Phasing
- Voltage Unbalance
- High Motor Ambient
- Blocked Ventilation
- Loss of Hermetic Compressor Charge

Suggested Applications

- Motor and Generator Stator Windings
- Transformers
- Clutch and Brake Coils
- Electromagnets
- Induction Regulators
- Solenoid Operators

Sensor Nomenclature

4BA XXX X XXX

4BA is the **Sensor Type:**

1. 3BA - Foil
2. 4BA - Foil
3. 7BA - Bead
4. 10BA - Bead

XXX is the **Operating Temperature:**

- Three digit trip temperature rating in 5ºC increments from 80ºC to 170ºC*

X is the **Sensor Configuration:**

1 - for Single Sensor

3 - for Three Sensor Harness

XXX is the **Wire Lead:**

- Designates wire gauge insulation and lead length. (Standard is 24", 20GA, 600V, 200ºC rated wire)

* Range of temperature ratings varies by individual sensor type. Other temperatures available on 4BA & 7BA.

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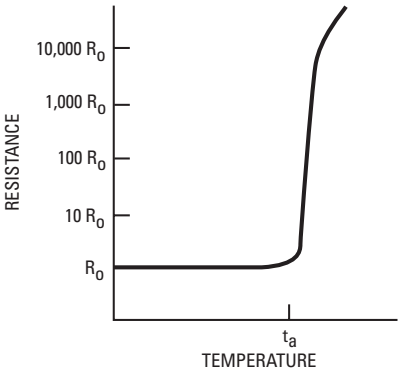
PTC MOTOR SENSORS

What is PTC?

PTC stands for *Positive Temperature Coefficient*, a conductive ceramic material used by Texas Instruments. PTC's most useful electrical property is its ability to remain at a low base resistance over a wide temperature band, and to increase its resistance abruptly at some predetermined elevated temperature. When this increase in resistance occurs, the PTC sensor acts as a solid state thermal switch and provides an input signal to the Texas Instruments electronic module which controls power to a motor starter or contactor coil.

Illustration of PTC Properties



Reduced Downtime

PTC sensors and the corresponding control modules eliminate long and costly downtime resulting from motor burnouts by safely limiting each motor to a maximum ceiling temperature determined by the motor manufacturer. Motors cannot be escalated above the established maximum temperature limit. For this reason, the machine operator, instead of an electrician, can be allowed to safely reset his overload equipment once the fault is removed. The time saved by this feature can greatly minimize downtime costs.

Features

3BA

- can be applied to track rates of temperature rise in excess of 30°C/sec
- Rugged design for installation during motor manufacturing
- Withstand standard varnish dip and bake operations

4BA

- can be applied to track rates of temperature rise in excess of 30°C/sec
- Rugged design for installation on new & rewound motors
- Withstand standard varnish dip and bake operations
- Solid State Industrial Protectors

7BA

- can be applied to track rates of temperature rise in excess of 15°C/sec
- Allows installation on existing motors by regular maintenance personnel
- Can be installed on motors without removal from machine
- Solid State Industrial Protectors
- SL7BA Repair Kits available with all necessary installation materials

10BA

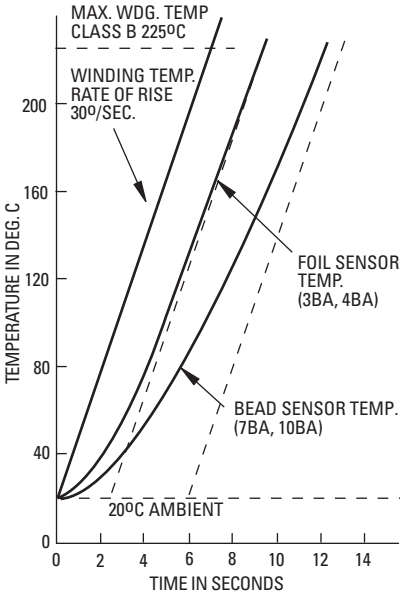
- can be applied to track rates of temperature rise in excess of 20°C/sec
- Withstand standard varnish dip and bake operations
- Cost effective design for installation during motor manufacturing

Sensor Selection

Motors can be secured with sensors installed from your motor manufacturer. Certain sensors can also be installed on existing motors. Sensor temperature should be selected on the basis of the design temperature rise of the motor which is usually related to the class of insulation used.

The sensor temperature elected should allow the motor to reach its normal running temperature in an industrial ambient. This places a lower limit on the sensor temperature selected. However, UL and NEMA specify maximum temperatures which may be permitted by protection devices at locked rotor and running overload conditions. These considerations place an upper limit on sensor temperatures selected.

BA Sensor-Typical Characteristic Curves



Example of sensor temperature tracking capability with locked rotor conditions.

For further information write or call:

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