# TeSys protection components
## Thermistor protection units for use with PTC thermistor probes *(1)*

| | |
|---|---|
| **Applications** | **General protection and protection of motors fitted with PTC thermistor probes** *(1)* |


| | |
|---|---|
| **Standards and approvals** | IEC 60034-11, UL, CSA |
| **Reset method** | Automatic |
| **Fault signalling** | – |
| **Fault memory in the event of a supply failure** | – |
| **Fault test** | – |
| **Rated control circuit voltages ∼ 50/60 Hz** | Single voltage 115 V or 230 V |
| **Rated control circuit voltages ⎓** | Single voltage 24 V |
| **Contact type** | 1 N/C |
| **Protection unit type** | **LT3 SE** |
| **Pages** | 6/50 |

*(1) PTC: Positive Temperature Coefficient*

6



| | |
|---|---|
| IEC 60034-11, PTB, UL, CSA<br>LROS | |
| Automatic | Manual or automatic |
| On front panel of unit and remote | |
| – | Yes |
| – | By pushbutton on front panel of unit |
| Dual voltage 115/230 V<br>Multivoltage 24…230 V | Single voltage 400 V<br>Dual voltage 24/48 V, 115/230 V<br>Multivoltage 24…230 V |
| Dual voltage 24/48 V | Dual voltage 24/48 V<br>Multivoltage 24…230 V |
| Dual voltage 1 N/C + 1 N/O<br>Multivoltage 2 C/O | Single voltage or dual voltage 1 N/C + 1 N/O<br>Multivoltage 2 C/O |
| **LT3 SA** | **LT3 SM** |
| 6/50 | |

# TeSys protection components
## Thermistor protection units for use with PTC thermistor probes (1)

## Application

LT3 S● thermistor protection units continuously monitor the temperature of the machines to be protected (motors, generators, etc.) by means of PTC thermistor probes embedded in the machine windings.

If the nominal operating temperature of the probes is reached, they convert the rapid increase in resistance into a switching function which can be used to switch off the machine or signal a fault (see paragraph relating to thermistor probes below).

Accidental breaks in the supply circuits of the thermistors are also detected.

## Electromagnetic compatibility

Conforming to "Electromagnetic compatibility" directive.
Conforming to standard EN 61000-6-2.

| | |
|---|---|
| Resistance to electrostatic discharge (conforming to IEC 61000-4-2) | **Level 3** |
| Resistance to fast transients (conforming to IEC 61000-4-4) | **Level 3** |
| Susceptibility to electromagnetic fields (conforming to IEC 61000-4-3) | **Level 3** |
| Surge resistance 1.2/50 - 8/20 (conforming to IEC 61000-4.5) | **Level 4** |
| Immunity to microbreaks and voltage drops (IEC 61000-4-11) | |
| Suitable for use with variable speed controllers | |

## Thermistor probes

Range of most commonly used PTC thermistor probes:
from 90 to 160 °C, in steps of 10 °C.
Curve R = f (θ), characteristic of a PTC thermistor probe, is defined by standard IEC 60947-8.

The choice of PTC thermistor probe to be incorporated in the motor winding depends on the insulation class, the type of motor and the most suitable location for the probe. This choice is usually made by the motor manufacturer or the motor rewinder, who have all the necessary information.

**Application example**

| Insulation class of rotating machines conforming to IEC 60034-11 (S1 duty) | NOT Nominal operating temperature | Temperature at which rapid increase in resistance occurs Probes used for Alarm | Fault |
|---|---|---|---|
| | °C | °C | °C |
| A | 100 | 100 | 100 |
| B | 110 | 110 | 120 |
| E | 120 | 120 | 130 |
| F | 140 | 140 | 150 |
| H | 160 | 160 | 170 |

*(1) PTC: Positive Temperature Coefficient*

Characteristics : pages 6/47 to 6/49
References : pages 6/50 and 6/51
Dimensions : page 6/52
Schemes : pages 6/52 and 6/53

# TeSys protection components
## Thermistor protection units for use with PTC thermistor probes (1)

| Protection unit type | | | | LT3 SE | LT3 SA | LT3 SM |
|---|---|---|---|---|---|---|
| **Reset method** | | | | Automatic | Automatic | Manual/Automatic |
| **Fault indication** | | | | – | On front panel of unit and remote | On front panel of unit and remote |
| **Fault test** | | | | – | – | By pushbutton on front panel of unit |
| **Probe interchangeability** | | | | Label "Mark A" to IEC 60034-11 | Label "Mark A" to IEC 60034-11 | Label "Mark A" to IEC 60034-11 |
| **Environment** | | | | | | |
| **Conforming to standards** | | | | IEC 60034-11 VDE 0660 | IEC 60034-11 VDE 0660 | IEC 60034-11 VDE 0660 |
| **Product certifications** | | | | – | LROS | |
| **Degree of protection** | | | | IP 20 conforming to IEC 60529, VDE 0106 | | |
| **CE marking** | | | | LT3 S● protection units have been designed to comply with the basic recommendations of European directives relating to low voltage and EMC. Therefore LT3 S● products bear the European Community CE mark. | | |
| **Ambient air temperature around the device** | Storage Conforming to IEC 60068-2-1 and 2-2 | | °C | - 40…+ 85 | | |
| | Operation | | °C | - 25…+ 60 | | |
| **Maximum operating altitude** | Without derating | | | 1500 m | | |
| | With derating | | | Up to 3000 m, the maximum permissible ambient air temperature for operation (60 °C) must be reduced by 5 °C per additional 500 m above 1500 m | | |
| **Vibration resistance** | Conforming to IEC 60068-2-6 | | | 2.5 gn (2…25 Hz) 1 gn (25…150 Hz) | | |
| **Shock resistance** | Conforming to IEC 60068-2-27 | | | 5 gn (11 ms) | | |
| **Operating positions** without derating | In relation to normal vertical mounting plane | | | Any position | | |
| **Power supply circuit characteristics** | | | | | | |
| **Rated control circuit voltage** (Uc) | ∼ 50/60 Hz 0.85…1.1 Uc | Single voltage | V | 115 or 230 | – | 400 |
| | | Dual voltage | V | – | 115/230 | 115/230. 24/48 |
| | ∼ 50/60 Hz 0.85…1.1 Uc | Multivoltage | V | – | 24…230 | 24…230 |
| | ⎓ | Single voltage | V | 24 | – | – |
| | 0.8…1.25 Uc | Dual voltage | V | – | 24/48 | 24/48 |
| | 0.85…1.1 Uc | Multivoltage | V | – | 24…230 | 24…230 |
| **Average consumption** | Sealed | ∼ | VA | < 2.5 | < 2.5 | < 2.5 except (400 V : 2.7) |
| | | ⎓ | W | < 1 | < 1 | < 1 |

(1) PTC: Positive Temperature Coefficient

6

References : pages 6/50 and 6/51 | Dimensions : page 6/52 | Schemes : pages 6/52 and 6/53

# TeSys protection components
## Thermistor protection units for use with PTC thermistor probes *(1)*

### Control circuit characteristics

| Protection unit type | | | LT3 SE | LT3 SA | LT3 SM |
|---|---|---|---|---|---|
| **Resistance** | Tripping | Ω | 2700…3100 | 2700…3100 | 2700…3100 |
| | Reset | Ω | 1500…1650 | 1500…1650 | 1500…1650 |
| **Maximum number of probes** fitted in series *(2)* | Probes ⩽ 250 Ω at 25° | | 6 | 6 | 6 |
| **Voltage at terminals in the thermistor circuit** | Normal operation (R = 1500 Ω) | **V** | < 2.5 | < 2.5 | < 2.5 |
| | Conforming to IEC 60034-11 (R = 4000 Ω) | **V** | < 7.5 | < 7.5 | < 7.5 |
| **Thermistor probe short-circuit detection** | Operating threshold | Ω | – | < 20 | < 20 |
| **Connection of probes to the LT3** | Distance | **m** | 300 | 400 | 500 | 1000 *(3)* |
| | Minimum c.s.a. of conductors | **mm²** | 0.75 | 1 | 1.5 | 2.5 |

### Electrical characteristics of the output relay contacts

| | | | | | |
|---|---|---|---|---|---|
| **Contact type** | Single voltage or dual voltage | | 1 N/C | 1 N/C + 1 N/O | 1 N/C + 1 N/O |
| | Multivoltage | | – | 2 C/O | 2 C/O |
| **Rated insulation voltage** | | **V** | ∼ 500 | | |
| **Maximum operational voltage** | | **V** | ∼ 250 (∼ 400 V for **LT3 SM00V**) | | |
| **Rated impulse withstand voltage** | Uimp | **kV** | 2.5 | | |
| **Conventional thermal current** | | **A** | 5 | | |
| **Operational power** | At 220 V | **VA** | 100 for 0.5 million operating cycles | | |
| **Breaking capacity** | In cat. AC-16 120 V | **A** | 6 | | |
| | 250 V | **A** | 3 | | |
| | In DC-13 24 V | **A** | 2 | | |
| **Cabling** (cage type connector) for flexible or solid cable | Without cable end | **mm²** | 2 x 1…1 x 2.5 | | |
| | With cable end | **mm²** | 1 x 0.75…2 x 2.5 | | |
| **Tightening torque** | | **N.m** | 0.8 | | |

### Thermistor probe characteristics

| Probe type | | | DA1 TT●●● | DA1 TS●●● |
|---|---|---|---|---|
| **Conforming to standards** | | | IEC 60034-11. Mark A | |
| **Resistance** | At 25 °C | Ω | 3 x 250 in series | 250 |
| **Rated operational voltage** (Ue) | Per probe | **V** | ⎓ 2.5 V max | ⎓ 2.5 V max |
| **Rated insulation voltage** (Ui) | | **kV** | 2.5 | 1 |
| **Insulation** | | | Reinforced | Reinforced |
| **Length of connecting cables** | Between probes | **mm** | 250 | – |
| | Between probe and motor terminal plate | **m** | 1 | 1 |

*(1) PTC: Positive Temperature Coefficient*
*(2) Provided that the total resistance of the probe circuit is less than 1500 Ω at 20 °C.*
*(3) For distances greater than 500 m take cabling precautions (twisted shielded pairs).*

6

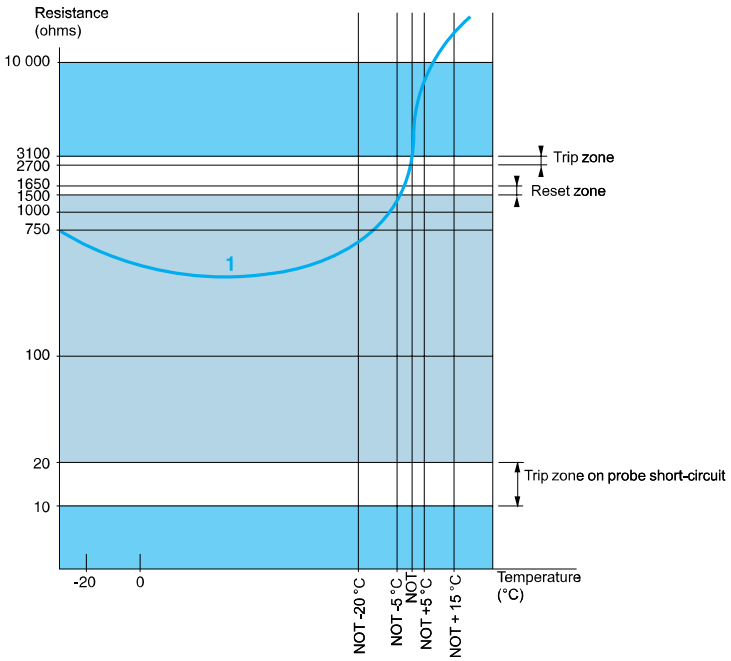
References : pages 6/50 and 6/51
Dimensions : page 6/52
Schemes : pages 6/52 and 6/53

# TeSys protection components
## Thermistor protection units for use with PTC thermistor probes *(1)*

### LT3 S protection unit/thermistor probe combination

Guaranteed operating zones: examples with 3 probes type DA1 TT●●● (250 Ω at 25 °C) in series, conforming to standard IEC 60034-11, Mark A.

**LT3 SE, LT3 SA, LT3 SM protection units**




1 3 probes type DA1 TT●●● (250 Ω at 25 °C) in series.

NOT: Nominal Operating Temperature

Protection unit tripped.

Protection unit reset.

*(1) PTC: Positive Temperature Coefficient*

6

# TeSys protection components
## Thermistor protection units for use with PTC thermistor probes *(1)*


*LT3 SE00M*


*LT3 SA00M*


*LT3 SM00M*

### Protection units (without fault memory)

**Units with automatic reset with thermistor short-circuit detection**

| Connection | Voltage | | Output contact | Reference | Weight kg |
|---|---|---|---|---|---|
| **Cage connectors** | ∼ 50/60 Hz | 115 V | N/C | **LT3 SE00F** | 0.220 |
| | | 230 V | N/C | **LT3 SE00M** | 0.220 |
| | ⎓ | 24 V | N/C | **LT3 SE00BD** | 0.220 |

**Units with automatic reset with thermistor short-circuit detection**

On front panel: fault and voltage signalling indicator.

| Connection | Voltage | | Output contact | Reference | Weight kg |
|---|---|---|---|---|---|
| **Cage connectors** | ∼ 50/60 Hz | 115/230 V | N/C + N/O | **LT3 SA00M** | 0.220 |
| | ⎓ | 24/48 V | N/C + N/O | **LT3 SA00ED** | 0.220 |
| | ∼ 50/60 Hz or ⎓ | 24…230 V | 2 C/O | **LT3 SA00MW** | 0.220 |

### Protection units (with fault memory)

**Units with manual reset with thermistor short-circuit detection**

On front panel:
- fault and voltage signalling indicator,
- Test and Reset button.

| Connection | Voltage | | Output contact | Reference | Weight kg |
|---|---|---|---|---|---|
| **Cage connectors** | ∼ 50/60 Hz | 400 V | N/C + N/O | **LT3 SM00V** | 0.220 |
| | | 24/48 V | N/C + N/O | **LT3 SM00E** | 0.220 |
| | | 115/230 V | N/C + N/O | **LT3 SM00M** | 0.220 |
| | ⎓ | 24/48 V | N/C + N/O | **LT3 SM00ED** | 0.220 |
| | ∼ 50/60 Hz or ⎓ | 24…230 V | 2 C/O | **LT3 SM00MW** | 0.220 |

*(1) PTC: Positive Temperature Coefficient*

6

Characteristics : pages 6/47 to 6/49
Dimensions : page 6/52
Schemes : pages 6/52 and 6/53

# TeSys protection components
## Thermistor protection units for use with PTC thermistor probes *(1)*

813383

*DA1 TT●●●*

813384

*DA1 TS●●●*

### PTC thermistor probes *(1)*

| Description | Nominal Operating Temperature (NOT) | Colour | Sold in lots of | Unit reference | Weight |
|---|---|---|---|---|---|
| | ° C | | | | kg |
| **Integrated triple probes** | 90 | Green/green | 10 | **DA1 TT090** | 0.010 |
| | 110 | Brown/brown | 10 | **DA1 TT110** | 0.010 |
| | 120 | Grey/grey | 10 | **DA1 TT120** | 0.010 |
| | 130 | Blue/blue | 10 | **DA1 TT130** | 0.010 |
| | 140 | White/blue | 10 | **DA1 TT140** | 0.010 |
| | 150 | Black/black | 10 | **DA1 TT150** | 0.010 |
| | 160 | Blue/red | 10 | **DA1 TT160** | 0.010 |
| | 170 | White/green | 10 | **DA1 TT170** | 0.010 |
| **Surface probes** | 60 | White/grey | 10 | **DA1 TS060** | 0.005 |
| | 70 | White/brown | 10 | **DA1 TS070** | 0.005 |
| | 80 | White/white | 10 | **DA1 TS080** | 0.005 |
| | 90 | Green/green | 10 | **DA1 TS090** | 0.005 |
| | 100 | Red/red | 10 | **DA1 TS100** | 0.005 |

### Accessories (to be ordered separately)

#### Mounting accessories

| Description | Application | Sold in lots of | Unit reference | Weight |
|---|---|---|---|---|
| | | | | kg |
| **Adapter** | For fixing on ⊔ rail DZ5 MB | 10 | **RHZ 66** | 0.005 |

#### Marking accessories

| | | | | |
|---|---|---|---|---|
| **Clip-in markers** (maximum of 5 per unit) | Strips of 10 identical numbers (0 to 9) | 25 | **AB1 R●** *(2)* | 0.002 |
| | Strips of 10 identical capital letters (A to Z) | 25 | **AB1 G●** *(2)* | 0.002 |

*(1) PTC: Positive Temperature Coefficient*
*(2) When ordering, replace the ● in the reference with the number or letter required.*

6

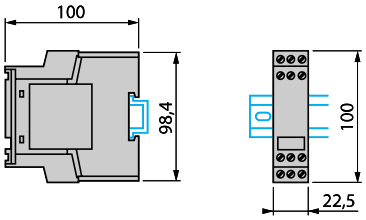
Characteristics : pages 6/47 to 6/49 | Dimensions : page 6/52 | Schemes : pages 6/52 and 6/53

# TeSys protection components
## Thermistor protection units for use with PTC thermistor probes *(1)*

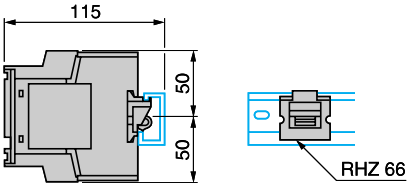
## Dimensions

### LT3 SE, SA, SM

**Mounting on ⊥ rail AM1 DP200**



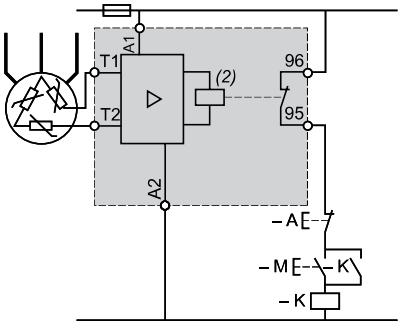

**Mounting on 1 ⊔ rail**
(with adapter RHZ 66)



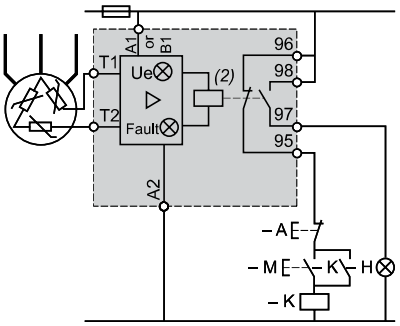

## Schemes for "no fault" operation

### LT3 SE

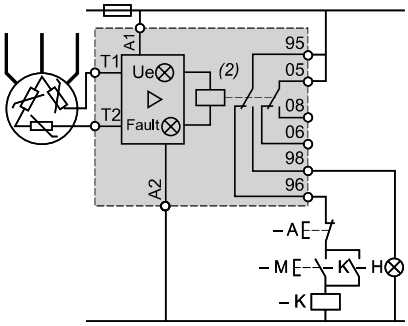
Without fault memory



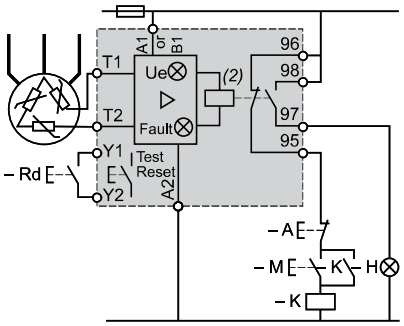

### LT3 SA dual voltage



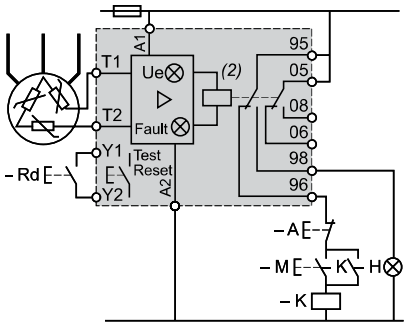

### LT3 SA multivoltage




### LT3 SM dual voltage and 400 V (without B1)




### LT3 SM multivoltage




### LT3 S● dual voltage

| Terminal | A1 | B1 |
|---|---|---|
| Voltage | 48 V | 24 V |
| | 230 V | 115 V |

## Setting-up

### Cabling

It is inadvisable to use the same multi-core cable for the thermistor probe circuit and the power circuit. This is especially important for long cable runs.
If it is impossible to comply with the above recommendation, a pair of twisted conductors must be used for the thermistor probe circuit.

### Testing the insulation of the line connecting the thermistors to the LT3 S unit

Before carrying out this test, short-circuit all the terminals of the LT3 S protection unit.
Measure the insulation value between these terminals and earth using a megger or a flash tester, progressively increasing the voltage to the value defined by the standards.

### Checking the PTC thermistor probes for correct operation

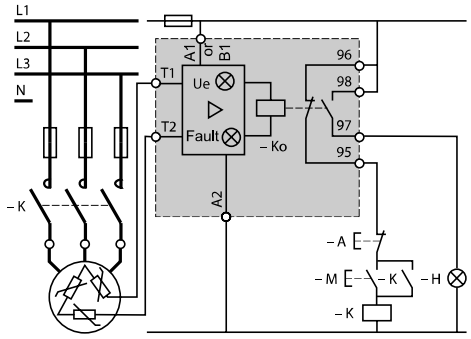
With the machine stopped, in the cold state and after having taken all the necessary safety precautions:
- disconnect the line linking the thermistors to the LT3 S protection unit, at the terminals of the machine being protected: motor, etc.,
- using an ohmmeter with a voltage rating less than or equal to 2.5 V, measure the resistance of the probe circuit at the machine terminals,
- depending on the number and type of thermistors connected in series, check that their resistance value at 25 °C is correct.

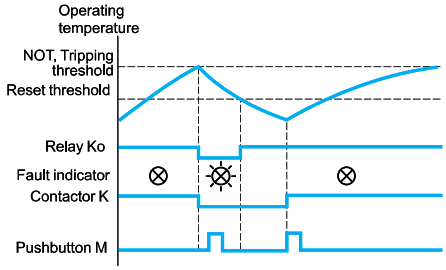
Example: motor fitted with 3 PTC thermistor probes with a resistance ⩽ 250 Ω at 25 °C.
Any value higher than 250 x 3 = 750 Ω indicates a problem.

*(1) PTC: Positive Temperature Coefficient*
*(2) Relay energised: the contacts are shown in the "operating" position.*

Characteristics : pages 6/47 to 6/49
References : pages 6/50 and 6/51

# TeSys protection components
## Thermistor protection units for use with PTC thermistor probes (1)




## LT3 SA protection units

### Starting

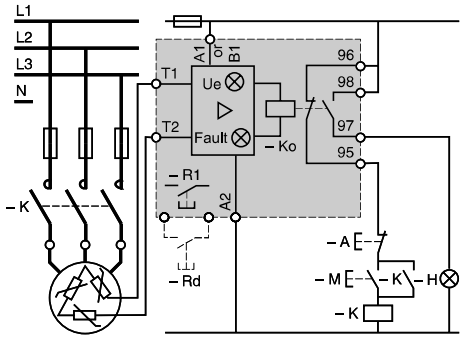
The LT3 SA is normally energised and its internal relay is in the pre-energised position.
The motor is started by operating pushbutton M automatically held in by K (3-wire control circuit).

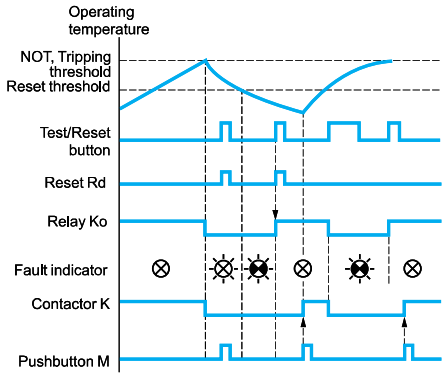
### Thermal fault

The strong increase in resistance of the PTC probes at the moment their temperature reaches the nominal operating temperature (NOT) is detected by the LT3 SA unit and causes the relay to drop out; indicator H comes on, as does the built-in indicator on unit LT3 SA.
Contactor K drops out and pressing button M has no effect.

### Reset

As the motor cools, it reaches the reset threshold, 2 to 3°C below the nominal operating temperature.
The relay resets and the motor can be started by pressing button M.




## LT3 SM protection units

Operation is very similar to that described above, except for the following:

### Reset

After tripping on thermal fault and cooling to the reset threshold, the Test/RESET button on the unit (R1) or a remote reset button (Rd) must be pressed to energise the relay.

The fault is therefore memorised, even though the temperature of the probes has dropped to well below the reset threshold.

### Signalling circuit

As the relay is fitted with 2 separate contacts, the signalling voltage may be different from the contactor control voltage.

### Test

Pressing the Test/RESET button simulates a fault and causes the relay to drop out: the FAULT indicator comes on, as does the remote signalling indicator. The unit is reset by pressing the Test/RESET button again.

(1) PTC: Positive Temperature Coefficient

6

Characteristics : pages 6/47 to 6/49
References : pages 6/50 and 6/51