Motor Protection Thermistors (PTC) Type (MTS / MT-xxx)

Fig. 2: Above MT-S-xxx
Below MT-xxx, AV = outside connection; IV = inside connection

Specification

MTS/MT-xxx
MTS = single PTC thermistor
MT = triplet PTC thermistors
xxx = (NAT) nominal response temperature °C

Construction

MTS-xxx
PTC thermistor pill according to DIN 44081 varnish and shrinkage tube insulated with fix connected single strands
MT-xxx
3 PTC thermistor pills according to DIN 44082 varnish and shrinkage tube insulated with fix connected single strands boarded in series

Operating temperature

-25°C up to max. 23°C over NAT

Tolerance range

± 5K

Cold resistance $R_{25}$

MTS-xxx $<100$ Ohm | $<250$ Ohm
MT-xxx $<300$ Ohm | $<750$ Ohm

Max. operating voltage

$(T_A = 0...40°C)$

30V

Max. measurement voltage

$(T_A-25K...T_{NAT}+15K)$

7.5V
Pill size (insulated)  
Standard pill ø<4mm | Mini pill ø < 3mm

Pill insulation  
T < 160°C => Kynar shrinkage tube  
T ≥ 160°C => PTFE shrinkage tube

Response time  
< 3 sec (dependant on pill size and insulation)

Nominal response temperature and corresponding colour codes  
60 – 190°C see table

<table>
<thead>
<tr>
<th>$T_{\text{NAT}}$ [°C]</th>
<th>Colour code</th>
</tr>
</thead>
<tbody>
<tr>
<td>60</td>
<td>WHT / GRY</td>
</tr>
<tr>
<td>70</td>
<td>WHT / BRN</td>
</tr>
<tr>
<td>80</td>
<td>WHT / WHT</td>
</tr>
<tr>
<td>90</td>
<td>GRN / GRN</td>
</tr>
<tr>
<td>100</td>
<td>RED / RED</td>
</tr>
<tr>
<td>110</td>
<td>BRN / BRN</td>
</tr>
<tr>
<td>120</td>
<td>GRY / GRY</td>
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<td>145</td>
<td>WHT / BLK</td>
</tr>
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<td>155</td>
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<td>160</td>
<td>BLU / RED</td>
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<tr>
<td>170</td>
<td>WHT / GRN</td>
</tr>
<tr>
<td>180</td>
<td>WHT / RED</td>
</tr>
<tr>
<td>190</td>
<td>BLK / GRY</td>
</tr>
</tbody>
</table>

Tab. 1: Colour code of motor protection PTC thermistors according to DIN 40080

Connection line  
Single strands AWG 26/7

Insulation  
PTFE

Standard cable length*)  
MTS 500mm | 2000mm

MT 500/180/180/500mm | 2000/300/300/2000mm

*) Other cable lengths on request

Colour code  
Outside connection (AV) according to tab. 1
Inside connection (IV) bei DPTC => yellow

Test voltage  
2,5kV

Confectioning variations  
ESH/DSH | SGH | KH | AK/ZS | MH
Motor Protection Thermistors (PTC)

General

A Positive Temperature Coefficient thermistor (PTC) is a semiconductor of endowed, polycrystalline barium titanate ceramic, whose electrical resistance rapidly increases when a certain temperature is exceeded. PTC thermistors deliverable by Mod-Tronic are mainly motor protection thermistors according to DIN 44080 – 82, which are set in the winding of electrical motors, generators and transformers. The typical resistance / temperature characteristic of motor protection thermistors is displayed in the following diagram.

\[ R_{\text{PTC}} = f(T_{\text{PTC}}) \]

\[ R_N \quad \text{PTC thermistor resistance at } T_N \]

\[ T_N \quad \text{Rated temperature (25°C)} \]

\[ R_{\text{min}} \quad \text{Minimum resistance} \]

\[ T_{\text{Rmin}} \quad \text{Temperature at } R_{\text{min}} \]

\[ \left( \text{beginning of the positive } \alpha \right) \]

\[ R_{\text{Ref}} \quad \text{Reference resistance at } T_{\text{Ref}} \]

\[ T_{\text{Ref}} \quad \text{Reference temperature (beginning of the steep resistance increase)} \]

\[ R_{\text{PTC}} \quad \text{Arbitrary resistance in the steep zone} \]

\[ T_{\text{PTC}} \quad \text{to } R_{\text{PTC}} \text{ belonging temperature} \]

\[ T_{\text{NAT}} \quad \text{Nominal response temperature for motor protection PTC thermistors defined instead of the reference temperature in the steep zone} \]

Fig. 1: Characteristic response curve flow of motor protection PTC thermistors \( R_{\text{PTC}} = f(T_{\text{PTC}}) \)

At combination of a motor protection PTC thermistor with a switching device one receives an effective, well-priced and quickly reacting solution for the protection of electrical machines from overheating.

As visible in fig. 1, the resistance value of the PTC thermistor increases steeply after reaching of its reference temperature. For the classification of the sensor one fixes a point in the steep zone of the response curve, the so called nominal response temperature (NAT). It signifies the temperature value, at which the downstream connected release device reacts inside the tolerance range. At the selection of the used PTC, its NAT incl. tolerance has to be chosen so, that it corresponds to the maximum acceptable operation temperature of the motor. The PTC’s are also to be connected in series with different NAT...
inside a measurement circuit. Thereby different ranges of temperature of a machine can be controlled with only one measurement circuit. As soon as at one PTC the by its NAT defined maximum temperature is exceeded, the connected downstream switching device switches the machine off. Furthermore the usage of 2 different NAT is possible, if for example, one wants to realise at a single motor a combination of forewarn and shutoff. However in this case two measurement circuits are necessary.