BIMETALLIC OVERLOAD RELAYS

SELECTION GUIDE

BULLETIN 193-T1
**Bulletin 193-T1 — Bimetallic Overload Relays**

- Overload protection trip class 10 / 10A
- Phase loss protection
- Ambient temperature compensation
- Auxiliary contacts (1 N.O. and 1 N.C.)
- Manual/automatic reset mode selectable
- Test function for auxiliary contacts
- Stop button
- Trip indicator
- Optional remote reset solenoid and external reset accessories

The 193-T1 bimetal overload relays are ambient temperature compensated, ensuring that the tripping characteristic of the relay remains constant over an ambient temperature range of -20°C…+60°C. These class 10 / 10A thermal overload relays include a differential mechanism for high sensitivity to phase loss conditions and provide reliable motor protection in normal duty applications. In addition, they can be used to protect against overloads in DC-motor and variable frequency drive applications.

---

**Table of Contents**

Product Selection.... this page
Accessories............. 2
Specifications.......... 3
Approximate Dimensions............ 7

**Standards Compliance**

IEC/EN 60947-1, -4-1, -5-1
UL508
CSA C22.2 No.14

**Certifications**

cULus (File No. E33916, Guide NKCR, NKCR7), CE marked

---

**Thermal Overload Relays**

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>100-C09…100-C23</td>
<td>0.1…0.16</td>
<td>50</td>
</tr>
<tr>
<td></td>
<td>0.16…0.25</td>
<td>50</td>
</tr>
<tr>
<td></td>
<td>0.25…0.40</td>
<td>50</td>
</tr>
<tr>
<td></td>
<td>0.35…0.50</td>
<td>50</td>
</tr>
<tr>
<td></td>
<td>0.45…0.63</td>
<td>50</td>
</tr>
<tr>
<td></td>
<td>0.55…0.80</td>
<td>50</td>
</tr>
<tr>
<td></td>
<td>0.75…1.0</td>
<td>50</td>
</tr>
<tr>
<td></td>
<td>0.90…1.3</td>
<td>50</td>
</tr>
<tr>
<td></td>
<td>1.1…1.6</td>
<td>50</td>
</tr>
<tr>
<td></td>
<td>1.4…2.0</td>
<td>50</td>
</tr>
<tr>
<td></td>
<td>1.8…2.5</td>
<td>50</td>
</tr>
<tr>
<td></td>
<td>2.3…3.2</td>
<td>50</td>
</tr>
<tr>
<td></td>
<td>2.9…4.0</td>
<td>50</td>
</tr>
<tr>
<td></td>
<td>3.5…4.8</td>
<td>50</td>
</tr>
<tr>
<td></td>
<td>4.5…6.3</td>
<td>50</td>
</tr>
<tr>
<td></td>
<td>5.5…7.5</td>
<td>50</td>
</tr>
<tr>
<td></td>
<td>7.2…10</td>
<td>50</td>
</tr>
<tr>
<td></td>
<td>9.0…12.5</td>
<td>50</td>
</tr>
<tr>
<td>100-C12…100-C23</td>
<td>11.3…16</td>
<td>50</td>
</tr>
<tr>
<td></td>
<td>15…20</td>
<td>80</td>
</tr>
<tr>
<td></td>
<td>17.5…21.5</td>
<td>80</td>
</tr>
<tr>
<td></td>
<td>21…25</td>
<td>80</td>
</tr>
<tr>
<td></td>
<td>15…20</td>
<td>80</td>
</tr>
<tr>
<td></td>
<td>17.5…21.5</td>
<td>80</td>
</tr>
<tr>
<td></td>
<td>21…25</td>
<td>80</td>
</tr>
<tr>
<td></td>
<td>24.5…30</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td>29…36</td>
<td>125</td>
</tr>
<tr>
<td></td>
<td>33…38</td>
<td>125</td>
</tr>
<tr>
<td></td>
<td>17…25</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td>24.5…36</td>
<td>125</td>
</tr>
<tr>
<td></td>
<td>35…47</td>
<td>160</td>
</tr>
<tr>
<td></td>
<td>35…47</td>
<td>160</td>
</tr>
<tr>
<td></td>
<td>45…60</td>
<td>200</td>
</tr>
<tr>
<td></td>
<td>58…75</td>
<td>200</td>
</tr>
<tr>
<td></td>
<td>72…90</td>
<td>250</td>
</tr>
</tbody>
</table>

---

**IEC/EN 60497-1, -4-1, -5-1 Coordination**

<table>
<thead>
<tr>
<th>glG/gG</th>
<th>UL Class K5</th>
</tr>
</thead>
<tbody>
<tr>
<td>50 kA, 690V AC</td>
<td>5 kA, 600V AC</td>
</tr>
</tbody>
</table>

---

**UL 508 Type 1 Type 2 UL 508**

<table>
<thead>
<tr>
<th>Cat. No.</th>
<th>193-T1A16</th>
</tr>
</thead>
<tbody>
<tr>
<td>100-C09…100-C23</td>
<td>103-T1A25</td>
</tr>
<tr>
<td>100-C12…100-C23</td>
<td>103-T1A40</td>
</tr>
<tr>
<td>100-C16…100-C23</td>
<td>103-T1A50</td>
</tr>
<tr>
<td>100-C23</td>
<td>103-T1A63</td>
</tr>
<tr>
<td>100-C09…100-C23</td>
<td>103-T1B10</td>
</tr>
<tr>
<td>100-C12…100-C23</td>
<td>103-T1B13</td>
</tr>
<tr>
<td>100-C14…100-C23</td>
<td>103-T1B20</td>
</tr>
<tr>
<td>100-C16…100-C23</td>
<td>103-T1B25</td>
</tr>
<tr>
<td>100-C20…100-C23</td>
<td>103-T1B32</td>
</tr>
<tr>
<td>100-C23</td>
<td>103-T1B40</td>
</tr>
<tr>
<td>100-C09…100-C23</td>
<td>103-T1B48</td>
</tr>
<tr>
<td>100-C12…100-C23</td>
<td>103-T1B63</td>
</tr>
<tr>
<td>100-C16…100-C23</td>
<td>103-T1B75</td>
</tr>
<tr>
<td>100-C23</td>
<td>103-T1B97</td>
</tr>
<tr>
<td>100-C09…100-C23</td>
<td>103-T1C10</td>
</tr>
<tr>
<td>100-C12…100-C23</td>
<td>103-T1C12</td>
</tr>
<tr>
<td>100-C14…100-C23</td>
<td>103-T1C20</td>
</tr>
<tr>
<td>100-C16…100-C23</td>
<td>103-T1C21</td>
</tr>
<tr>
<td>100-C23</td>
<td>103-T1C25</td>
</tr>
<tr>
<td>100-C09…100-C23</td>
<td>103-T1C20</td>
</tr>
<tr>
<td>100-C12…100-C23</td>
<td>103-T1C21</td>
</tr>
<tr>
<td>100-C14…100-C23</td>
<td>103-T1C25</td>
</tr>
<tr>
<td>100-C16…100-C23</td>
<td>103-T1C30</td>
</tr>
<tr>
<td>100-C23</td>
<td>103-T1C36</td>
</tr>
<tr>
<td>100-C09…100-C23</td>
<td>103-T1C38</td>
</tr>
<tr>
<td>100-C12…100-C23</td>
<td>103-T1C39</td>
</tr>
<tr>
<td>100-C14…100-C23</td>
<td>103-T1C40</td>
</tr>
<tr>
<td>100-C16…100-C23</td>
<td>103-T1C47</td>
</tr>
<tr>
<td>100-C23</td>
<td>103-T1C47</td>
</tr>
<tr>
<td>100-C09…100-C23</td>
<td>103-T1C50</td>
</tr>
<tr>
<td>100-C12…100-C23</td>
<td>103-T1C75</td>
</tr>
<tr>
<td>100-C14…100-C23</td>
<td>103-T1C90</td>
</tr>
</tbody>
</table>
# Bulletin 193-T1

**Bimetallic Overload Relays**

**Product Selection / Accessories**

## Thermal Overload Relays, continued

<table>
<thead>
<tr>
<th>For Use With*</th>
<th>Setting Range [A]‡</th>
<th>UL 508</th>
<th>Cat. No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Separate mounting required (Panel-mounted device)</td>
<td>35...47</td>
<td>160</td>
<td>175♣</td>
</tr>
<tr>
<td></td>
<td>45...60</td>
<td>200</td>
<td>125</td>
</tr>
<tr>
<td></td>
<td>58...75</td>
<td>200</td>
<td>125</td>
</tr>
<tr>
<td></td>
<td>72...90</td>
<td>250</td>
<td>160</td>
</tr>
</tbody>
</table>

* Bulletin 193-T1 overload relays shall not be used with conventional DC controlled contactors. Use electronic controlled DC versions.

† To select the setting range for use in Y-Δ Starters, multiply the rated operating current of the motor by a factor of 0.58.

‡ For motors with service factor of 1.15 or greater, use motor nameplate full load current. For motors with service factor of 1.0, use 90% of the motor nameplate full load current.

§ Max. Back-up fuse [A], UL Class K5, 10 kA, 600V AC

▲ Only in combination with 100-C contactors.

## Accessories

**Add-On Modules**

<table>
<thead>
<tr>
<th>Description</th>
<th>For Use With</th>
<th>Pkg. Quantity</th>
<th>Cat. No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>DIN Rail/Panel Mounting Adapter</td>
<td>193-T1AA, 193-T1AB, 193-T1AC, 193-T1BC</td>
<td>1</td>
<td>193-T1APM</td>
</tr>
<tr>
<td>Screw Adapter</td>
<td>193-T1APM</td>
<td>10</td>
<td>140M-C-N45</td>
</tr>
<tr>
<td>Remote Reset Solenoid</td>
<td>193-K, 193-T1 (not for 193-T1DC_P)</td>
<td>1</td>
<td>193-T1R®</td>
</tr>
<tr>
<td>External Reset Button</td>
<td>All</td>
<td>1</td>
<td>800FM-R611</td>
</tr>
<tr>
<td>Reset Rod</td>
<td>All</td>
<td>1</td>
<td>800F-ATR08</td>
</tr>
<tr>
<td>Reset Adapter</td>
<td>All</td>
<td>1</td>
<td>193-RA3</td>
</tr>
</tbody>
</table>

* Must be ordered in multiples of package quantity.

**Coil Voltage Codes for Remote Reset Solenoid**

<table>
<thead>
<tr>
<th>[V]</th>
<th>24</th>
<th>48</th>
<th>110</th>
<th>120</th>
<th>125</th>
<th>220...240</th>
</tr>
</thead>
<tbody>
<tr>
<td>50 Hz</td>
<td>—</td>
<td>—</td>
<td>D</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>60 Hz</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>D</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>50/60 Hz</td>
<td>KJ</td>
<td>KY</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>KF</td>
</tr>
<tr>
<td>DC</td>
<td>ZJ</td>
<td>ZY</td>
<td>ZD</td>
<td>—</td>
<td>ZS</td>
<td>—</td>
</tr>
</tbody>
</table>
# Marking System
Uniform labeling materials for contactors, motor starting equipment, timing relays, and circuit breakers

<table>
<thead>
<tr>
<th>Description</th>
<th>Pkg.</th>
<th>Quantity</th>
<th>Cat. No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Label Sheet</td>
<td>10</td>
<td>100-FMS</td>
<td></td>
</tr>
<tr>
<td>105 self-adhesive paper labels each, 6 x 17 mm</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Marking Tag Sheet</td>
<td>10</td>
<td>100-FMP</td>
<td></td>
</tr>
<tr>
<td>160 perforated paper labels each, 6 x 17 mm, to be used with a transparent cover</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Transparent Cover</td>
<td>100</td>
<td>100-FMC</td>
<td></td>
</tr>
<tr>
<td>To be used with marking tag sheets</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Must be ordered in multiples of package quantities.

## Specifications

### Main Circuits

<table>
<thead>
<tr>
<th>Cat. No.</th>
<th>193-T1...</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rated isolation voltage $U_i$</td>
<td>690V AC</td>
</tr>
<tr>
<td>Rated impulse withstand voltage $U_{imp}$ (between main poles and between main poles and auxiliary circuits)</td>
<td>6kV AC</td>
</tr>
<tr>
<td>Rated impulse withstand voltage $U_{imp}$ (between auxiliary circuits)</td>
<td>4kV AC</td>
</tr>
<tr>
<td>Rated operating voltage $U_e$</td>
<td>IEC 690V AC</td>
</tr>
<tr>
<td>DC 600V AC</td>
<td></td>
</tr>
<tr>
<td>Rated frequencies [Hz]</td>
<td>50/60</td>
</tr>
<tr>
<td>Operational frequencies</td>
<td>DC...400 Hz</td>
</tr>
<tr>
<td>Power dissipation</td>
<td>193-T1A, 193-T1B up to 0.4 A 7 W</td>
</tr>
<tr>
<td>0.5...36 A 6 W</td>
<td></td>
</tr>
<tr>
<td>38 A 12 W</td>
<td></td>
</tr>
<tr>
<td>193-T1C 25...47 A 12 W</td>
<td></td>
</tr>
<tr>
<td>193-T1D 47...90 A 18 W</td>
<td></td>
</tr>
</tbody>
</table>

### Control Circuits

<table>
<thead>
<tr>
<th>Cat. No.</th>
<th>193-T1...</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rated operating current $I_e$</td>
<td>AC-15 24V [A] 4</td>
</tr>
<tr>
<td>240V [A] 2</td>
<td></td>
</tr>
<tr>
<td>400V [A] 1.6</td>
<td></td>
</tr>
<tr>
<td>690V [A] 0.15</td>
<td></td>
</tr>
<tr>
<td>DC-13 24V [A] 2</td>
<td></td>
</tr>
<tr>
<td>110V [A] 0.4</td>
<td></td>
</tr>
<tr>
<td>220V [A] 0.25</td>
<td></td>
</tr>
<tr>
<td>440V [A] 0.08</td>
<td></td>
</tr>
<tr>
<td>Thermal Current $I_{th}$</td>
<td>5</td>
</tr>
<tr>
<td>Short-circuit withstand, Fuse</td>
<td>IEC, gL/gG [A] 6</td>
</tr>
<tr>
<td>Short-circuit withstand, circuit breaker ≤ 1 kA prospective short-circuit-current [A] 4</td>
<td></td>
</tr>
<tr>
<td>Min. contact load for reliable operation</td>
<td>15V, 2 mA</td>
</tr>
<tr>
<td>UL Rating</td>
<td>A600/Q300</td>
</tr>
</tbody>
</table>

## Terminations

<table>
<thead>
<tr>
<th>Cat. Nos.</th>
<th>193-T1A...</th>
<th>193-T1B</th>
<th>193-T1C...</th>
<th>193-T1D...</th>
<th>193-T1APM</th>
<th>193-T1... all</th>
<th>193-T1R...</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wiring cross section</td>
<td>Terminal type</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Terminal screws</td>
<td>M4</td>
<td>M4</td>
<td>M4</td>
<td>M5</td>
<td>M6</td>
<td>M4</td>
<td>M3.5</td>
</tr>
<tr>
<td>Fine stranded with ferrule</td>
<td>1 conductor [mm²]</td>
<td>1.5...4</td>
<td>1.5...4</td>
<td>2.5...10</td>
<td>2.5...16</td>
<td>10...35</td>
<td>10...35</td>
</tr>
<tr>
<td>2 conductors [mm²]</td>
<td>1.5...4</td>
<td>1.5...4</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>1...4</td>
<td>1...4</td>
</tr>
<tr>
<td>Solid or coarse stranded</td>
<td>1 conductor [mm²]</td>
<td>1.5...6</td>
<td>1.5...6</td>
<td>2.5...16</td>
<td>2.5...25</td>
<td>10...35</td>
<td>15...16</td>
</tr>
<tr>
<td>2 conductors [mm²]</td>
<td>1.5...6</td>
<td>1.5...6</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>1...4</td>
</tr>
<tr>
<td>1 conductor [AWG]</td>
<td>No. 16...10</td>
<td>No. 16...10</td>
<td>No. 14...10</td>
<td>No. 14...10</td>
<td>No. 10...6</td>
<td>No. 8...1</td>
<td>No. 16...6</td>
</tr>
<tr>
<td>2 conductors [AWG]</td>
<td>No. 16...10</td>
<td>No. 14...10</td>
<td>No. 14...10</td>
<td>No. 14...10</td>
<td>No. 8...1</td>
<td>No. 16...6</td>
<td>No. 18...12</td>
</tr>
<tr>
<td>Recommended torque</td>
<td>[N•m]</td>
<td>1.5...2.2</td>
<td>1.5...2.2</td>
<td>2.5...3.5</td>
<td>2.5...3.5</td>
<td>4.5...6</td>
<td>1.8...2.8</td>
</tr>
<tr>
<td>[lb-in]</td>
<td>13...20</td>
<td>13...20</td>
<td>22...31</td>
<td>22...31</td>
<td>40...53</td>
<td>16...25</td>
<td>10...6</td>
</tr>
<tr>
<td>Pozidrive screwdriver No.</td>
<td>Size</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Slotted screwdriver</td>
<td>[mm]</td>
<td>0.8 x 5.5</td>
<td>0.8 x 5.5</td>
<td>0.8 x 5.5</td>
<td>0.8 x 5.5</td>
<td>-</td>
<td>0.8 x 5.5</td>
</tr>
<tr>
<td>Hexagon socket screw</td>
<td>Size</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>4</td>
<td>-</td>
</tr>
</tbody>
</table>
## Bimetallic Overload Relays

### General

<table>
<thead>
<tr>
<th>Cat. No.</th>
<th>193-T1...</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type of Overload Relay</td>
<td>Bimetallic, Ambient Compensated, Phase Loss Sensitive</td>
</tr>
<tr>
<td>Trip Rating (ultimate tripping current)</td>
<td>120% FLA</td>
</tr>
<tr>
<td>Phase loss sensitivity: Trip rating at phase loss</td>
<td>115% FLA</td>
</tr>
<tr>
<td>Trip Class</td>
<td>193-T1A/-T1B, 193-T1C/-T1D</td>
</tr>
<tr>
<td>UL</td>
<td>10</td>
</tr>
</tbody>
</table>

### Specifications, Continued

**Reset Mode**
- Automatic or Manual

**Test release**
- Manual release of auxiliary contacts

**Trip indication**
- By means of a flag visible through an opening in the relay front

**Compensation temperature range**
-20...+60 °C (-4...+140 °F)

### Climatic Conditions

<table>
<thead>
<tr>
<th></th>
<th>Release Tolerance at -20 °C</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1.05...1.4 x I_n</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Storage Temperature Range</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>-55...+80 °C (-67...+176 °F)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Operating Temperature Range</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>-20...+60 °C (-4...+140 °F)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Air moisture (Storage/Operating)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>5...95% rel.humidity, non-condensing</td>
</tr>
</tbody>
</table>

### Vibration

- IEC/EN 61373 (vibration railways)
  - category 1, class B

- IEC/EN 60092-504 (vibration ships), service
  - 0.7 g, all axes, 2...200 Hz

### Shock

- IEC/EN 60068-2-27 (Shock half-sinus), service
  - 11 ms > 5 g all axes

- IEC/EN 61373 (shock railways), category 1, class B, 5g 30 ms

### Max. Altitude
- 2000 m

### Pollution Degree
- 3

### Degree of Protection, with wires connected
- IP2X

### Approximate Weight (unpackaged)

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>193-T1A, 193-T1B</td>
<td>0.16...25 A</td>
</tr>
<tr>
<td>193-T1B</td>
<td>0.115 kg</td>
</tr>
<tr>
<td>193-T1C</td>
<td>0.155 kg</td>
</tr>
<tr>
<td>193-T1D</td>
<td>0.360 kg</td>
</tr>
<tr>
<td>193-T1....P</td>
<td>0.330 kg</td>
</tr>
</tbody>
</table>

### Standards

- IEC/EN 60497-1, -4-1, -5-1, UL508, CSA C22.2 No.14

### Certifications

- CE, cULus

### Circuit Diagrams

![Circuit Diagram 1](image1.png)

![Circuit Diagram 2](image2.png)

### Wiring Schematic

![Wiring Schematic](image3.png)
Trip Characteristics
These trip characteristics refer to IEC/EN 60947-4-1 and are average values from cold start at an ambient temperature of 20 °C. Trip time is pictured as a function of operating current. With the device at max. operating temperature, the trip time decreases to approximately 25% of the shown value.

(a) Tripping characteristics 3-poles from the cold state
(b) Tripping characteristics 2-poles from the cold state
Overload Relays 193-T1BC30…BC38

(a) Tripping characteristics 3-poles from the cold state
(b) Tripping characteristics 2-poles from the cold state

Overload Relays 193-T1CC25…CC47

Multiple of the set current $I_e$ → Discussion of the diagrams

Overload Relays 193-T1DC47…DC90

Multiple of the set current $I_e$ → Discussion of the diagrams
Approximate Dimensions
Dimensions are shown in millimeters (inches). Dimensions are not intended for manufacturing purposes.

Overload Relays 193-T1AA16...AC25

Overload Relays 193-T1BC20...25
Bimetallic Overload Relays

Approximate Dimensions

Overload Relays 193-T1BC30...38

Overload Relays 193-T1CC25...47
Overload Relays 193-T1DC47...90

Approximate Dimensions

Overload Relays 193-T1DC47P...90P
DIN Rail/Panel Mounting Adapter 193-T1APM
(for use with Overload Relays 193-T1AA16…AC25 and 193-T1BC20…25)

Remote Reset Solenoid 193-T1R®

Reset Adapter 193-RA3