Electronic circuit protection type ESX10-T is designed to ensure selective disconnection of 24VDC load systems.

24VDC power supplies, which are widely used in industry today, will shut down the output in the event of an overload with the result that one faulty load in the system can lead to complete disconnection of all loads.

Through selective disconnection the ESX10-T responds much faster to overload or short circuit conditions than the switch-mode power supply. This is achieved by active current limitation. The ESX10-T limits the highest possible current to 1.3 to 1.8 times the selected rated current of the circuit protector. Thus it is possible to switch on capacitive loads of up to 20,000 µF, but they are disconnected only in the event of an overload or short circuit.

For optimal alignment with the characteristics of the application the current rating of the ESX10-T can be selected in fixed values from 0.5 A...12 A. Failure and status indication are provided by a multicolour LED and an integral short-circuit-proof status output or a relay signal contact. Remote operation is possible by means of a remote reset signal or a remote ON/OFF control signal. The manual ON/OFF button allows separate actuation and reset of individual load circuits.

Upon detection of overload or short circuit in the load circuit, the MOSFET of the load output will be blocked to interrupt the current flow. The load circuit can be re-activated via the remote electronic reset input, control input or manually by means of the ON/OFF button.

Features

- Selective load protection, electronic trip characteristics
- Active current limitation for safe connection of capacitive loads up to 20,000 µF and on overload/short circuit
- Current ratings 0.5 A...12 A
- Reliable overload disconnection with 1.1 x Iₙ plus, even with long load lines or small cable cross sections (see table 3)
- Manual ON/OFF button (S1)
- Control input IN+ for remote ON/OFF signal (option)
- Electronic reset input RE (option)
- Clear status and failure indication through LED, status output SF or Si contact F
- Integral fail-safe element adjusted to current rating
- Width per unit only 12.5 mm
- Rail mounting
- Ease of wiring through busbar LINE+ and 0 V as well as signal bars and bridges

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For optimal alignment with the characteristics of the application the current rating of the ESX10-T can be selected in fixed values from 0.5 A...12 A. Failure and status indication are provided by a multicolour LED and an integral short-circuit-proof status output or a relay signal contact. Remote operation is possible by means of a remote reset signal or a remote ON/OFF control signal. The manual ON/OFF button allows separate actuation and reset of individual load circuits.

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Features

- Selective load protection, electronic trip characteristics
- Active current limitation for safe connection of capacitive loads up to 20,000 µF and on overload/short circuit
- Current ratings 0.5 A...12 A
- Reliable overload disconnection with 1.1 x Iₙ plus, even with long load lines or small cable cross sections (see table 3)
- Manual ON/OFF button (S1)
- Control input IN+ for remote ON/OFF signal (option)
- Electronic reset input RE (option)
- Clear status and failure indication through LED, status output SF or Si contact F
- Integral fail-safe element adjusted to current rating
- Width per unit only 12.5 mm
- Rail mounting
- Ease of wiring through busbar LINE+ and 0 V as well as signal bars and bridges
**Technical data**

**(Tambient = 40°C, operating voltage Ub = 24VDC)**

### Status output SF

ESX10-TB-114/-124/

#### Electrical data

- Plus-switching signal output, connects Ub to terminal 12 of module 17 plus
- Nominal data: 24VDC (max. 0.2 A (short circuit proof))
- Status output is internally connected to GND with a 10 kΩ resistor

#### Status OUT

ESX10-TB-114/124 (signal status OUT),

- at Ub = +24 V
- +24 V = S1 is ON, load output connected through 0 V = S1 is ON, load output blocked and/or
- switch S1 is OFF
- red LED lighted

#### OFF condition

0 V level at status output when:

- switch S1 is in ON position, but device is still in switch-on delay
- switch S1 is OFF, or control signal OFF, device is switched off
- no operating voltage Ub

#### Signal output F

ESX10-TB-101/-102

#### Electrical data

- Potential-free signal contact max. 30 VDC/0.5 A, 10 V/10 mA

#### On condition LED green

- +24 V level (HIGH): device will be switched on by a remote ON/OFF signal

#### Off condition LED red

- voltageUb applied, switch S1 is in ON position
- no overload, no short circuit

#### Fault condition LED orange

- Overload condition > 1.1 x In up to 1.3 x In
- device switched off (switch S1 is in OFF position)
- red LED lighted (electronic disconnection)

#### Fault condition LED red

- electronic disconnection upon overload or short circuit
- device switched off with control signal (switch S1 is in ON position)
- ESX10-TB-101
  - Single signal, make contact
  - Contact SC/SO-SI open
- ESX10-TB-102
  - Single signal, break contact
  - Contact SC/SO-SI closed

#### Reset input RE

ESX10-TB-124

#### Electrical data

- Voltage: max. +24VDC
- High > 8VDC ≤ 32VDC
- Low < 0 V
- Power consumption typically 2.6 mA
- (+24VDC)
- Min. pulse duration typically 10 ms

#### Reset signal RE (terminal 22)

The electronically blocked ESX10-TB-124 may remotely be reset via an external momentary switch due to the falling edge of a +24 V pulse.

A common reset signal can be applied to several devices simultaneously. Switched on devices remain unaffected.

#### Control input IN+

ESX10-TB-114

#### Electrical data

- See reset input RE

#### Control signal IN+ (terminal 21)

- +24 V level (HIGH): device will be switched on by a remote ON/OFF signal
- 0 V level (LOW): device will be switched off by a remote ON/OFF signal

#### Switch S1 UN/UF

Unit can only be switched on with S1 if a HIGH level is applied to IN+
ESX10-T Electronic Circuit Protection

Technical data (Tambient = 40°C, operating voltage Ub = 24VDC)

General data
Fail-safe element: backup fuse for ESX10-T not required because of the integral redundant fail-safe element

Terminals
screw terminals M4
max. cable cross section flexible with wire end ferrule w/o plastic sleeve 0.5 - 10 mm²
multi-lead connection (2 identical cables) rigid/flexible 0.5 - 4 mm²
flexible with wire end ferrule with plastic sleeve 0.5 - 2.5 mm²
flexible with TWIN wire end ferrule with plastic sleeve 0.5 - 6 mm²
wire stripping length 10 mm
tightening torque (EN 60934) 1.2 Nm

Terminals aux. contacts
screw terminals M3
max. cable cross section flexible with wire end ferrule with plastic sleeve 0.25 – 2.5 mm²
wire stripping length 8 mm
tightening torque (EN 60934) 0.5 Nm

Housing material moulded
Mounting symmetrical rail to EN 50022-35x7.5
Ambient temperature 0...+50 °C (without condensation, see EN 60204-1)
Storage temperature -20...+70 °C
Humidity 96 hrs/95 % RH/40 °C to IEC 60068-2-78-Cab climate class 3K3 to EN 60721

EMC emission: EN 61000-6-3
(EMC directive, CE logo) susceptibility: EN 61000-6-2
Insulation co-ordination 0.5 kV/2 pollution degree 2
(IEC 60934) re-inforced insulation in operating area
dielectric strength max. 32VDC (load circuit)
Insulation resistance (OFF condition) n/a, only electronic disconnection
Approvals UL 2367, File E306740, Solid State Overcurrent Protectors
UL 1604 (class I, div. 2, zone 2), UL508 pending, CE logo
Dimensions (W x H x D) 12.5 x 80 x 83 mm
Mass approx. 65 g

Table 1: voltage drop, current limitation, max. load current

<table>
<thead>
<tr>
<th>Current rating</th>
<th>Typically voltage drop Udp at In</th>
<th>Active current limitation (typically)</th>
<th>max. load current at 100% ON duty</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.5 A</td>
<td>70 mV</td>
<td>1.8 x In</td>
<td>0.5 A</td>
</tr>
<tr>
<td>2 A</td>
<td>130 mV</td>
<td>1.8 x In</td>
<td>2 A</td>
</tr>
<tr>
<td>3 A</td>
<td>80 mV</td>
<td>1.8 x In</td>
<td>3 A</td>
</tr>
<tr>
<td>4 A</td>
<td>100 mV</td>
<td>1.8 x In</td>
<td>4 A</td>
</tr>
<tr>
<td>6 A</td>
<td>130 mV</td>
<td>1.8 x In</td>
<td>6 A</td>
</tr>
<tr>
<td>8 A</td>
<td>120 mV</td>
<td>1.5 x In</td>
<td>8 A</td>
</tr>
<tr>
<td>10 A</td>
<td>150 mV</td>
<td>1.5 x In</td>
<td>10 A</td>
</tr>
<tr>
<td>12 A</td>
<td>180 mV</td>
<td>1.3 x In</td>
<td>12 A</td>
</tr>
</tbody>
</table>

Attention: when mounted side-by-side without convection the ESX10-T should not carry more than 80% of its rated load with 100% ON duty due to thermal effects.

Table 2: ESX10-T - product version

<table>
<thead>
<tr>
<th>Version</th>
<th>Signal input</th>
<th>Signal output</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>without</td>
<td>Control input</td>
</tr>
<tr>
<td></td>
<td>Signal Input</td>
<td>ON/OFF Reset</td>
</tr>
<tr>
<td>ESX10-TA-100</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>ESX10-TB-101</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>ESX10-TB-102</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>ESX10-TB-114</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>ESX10-TB-124</td>
<td>x</td>
<td>x</td>
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</tbody>
</table>

Table 2 (continued):

<table>
<thead>
<tr>
<th>Current Rating</th>
<th>Circuit Protection</th>
<th>Current Rating</th>
<th>N/C Contact</th>
<th>Current Rating</th>
<th>N/C Contact</th>
<th>Control Input</th>
<th>Reset Input</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.5 A</td>
<td>6720005305</td>
<td>0.5 A</td>
<td>6720005320</td>
<td>0.5 A</td>
<td>6720005340</td>
<td></td>
<td></td>
</tr>
<tr>
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<td>1 A</td>
<td>6720005321</td>
<td>1 A</td>
<td>6720005341</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 A</td>
<td>6720005302</td>
<td>2 A</td>
<td>6720005322</td>
<td>2 A</td>
<td>6720005342</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 A</td>
<td>6720005303</td>
<td>3 A</td>
<td>6720005323</td>
<td>3 A</td>
<td>6720005343</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4 A</td>
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<td>4 A</td>
<td>6720005324</td>
<td>4 A</td>
<td>6720005344</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6 A</td>
<td>6720005306</td>
<td>6 A</td>
<td>6720005326</td>
<td>6 A</td>
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<td>6720005328</td>
<td>8 A</td>
<td>6720005348</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10 A</td>
<td>6720005310</td>
<td>10 A</td>
<td>6720005330</td>
<td>10 A</td>
<td>6720005350</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12 A</td>
<td>6720005312</td>
<td>12 A</td>
<td>6720005332</td>
<td>12 A</td>
<td>6720005352</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Please note:
- The user should ensure that the cable cross sections of the relevant load circuit are suitable for the current rating of the ESX10-T used.
- Automatic start-up of machinery after shut down must be prevented (Machinery Directive 98/37/EG and EN 60204-1). In the event of a short circuit or overload the load circuit will be disconnected electronically by the ESX10-T.

Attention: when mounted side-by-side without convection the ESX10-T should not carry more than 80% of its rated load with 100% ON duty due to thermal effects.

This document provided by Barr-Thorp Electric Co., Inc. 800-473-9123    www.barr-thorp.com
ESX10-T Signal inputs / outputs (wiring diagram)

ESX10-TA-100
without signal input/output

ESX10-TB-101
without signal input with signal output F (single signal, N/O)

ESX10-TB-102
without signal input with signal output F (single signal, N/C)

ESX10-TB-114
with control input IN+ (+24VDC) with status output SF (+24 V = load output ON)

ESX10-TB-124
with reset input RE (+24VDC ↓) with status output SF (+24 V = load output ON)

Dimensions

This is a metric design and millimeter dimensions take precedence. [mm] [inch]
**ESX10-T Electronic Circuit Protection**

**Time/Current characteristic curve** (T_{ambient} = 40 °C)

- The trip time is typically 3 s in the range between 1.1 and 1.8 x I_{n}^{*1}.

- Electronic current limitation occurs at typically 1.8 x I_{n}^{*1} which means that under all overload conditions (independent of the power supply and the resistance of the load circuit) the max. overload before disconnection will not exceed 1.8 x I_{n}^{*1} times the current rating. Trip time is between 100 ms and 3 sec (depending on overload or at short circuit).

- Without this current limitation a considerably higher overload current would flow in the event of an overload or short circuit.

---

**Table 3: Reliable trip of ESX10-T**

<table>
<thead>
<tr>
<th>Reliable trip of ESX10-T with different cable lengths and cross sections</th>
<th>0.0178 (Ohm x mm²) / m</th>
</tr>
</thead>
<tbody>
<tr>
<td>( U_b ) = DC 19.2 V (= 80 % of 24 V)</td>
<td>voltage drop of ESX10-T and tolerance of trip point typically 1.1 x I_{n} = 1.05 ... 1.35 x I_{n} have been taken into account.</td>
</tr>
<tr>
<td>ESX10-T-selected rating I_{n} (in A)</td>
<td>3 5 7</td>
</tr>
<tr>
<td>e. g. trip current I_{ab} = 1.25 x I_{n} (in A)</td>
<td>3.75 7.5 ESX10-T trips after 3 s</td>
</tr>
<tr>
<td>( R_{\text{max}} ) in Ohm = ( \left( \frac{U_b}{I_{ab}} \right) - 0.050 )</td>
<td>5.07 2.51</td>
</tr>
</tbody>
</table>

**The ESX10-T reliably trips from 0 Ohm to max. circuitry resistance \( R_{\text{max}} \)**

<table>
<thead>
<tr>
<th>Cable section A in mm²</th>
<th>0.14</th>
<th>0.25</th>
<th>0.34</th>
<th>0.5</th>
<th>0.75</th>
<th>1</th>
<th>1.5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cable length L in meter (= single length)</td>
<td>5</td>
<td>0.17</td>
<td>0.71</td>
<td>0.52</td>
<td>0.36</td>
<td>0.24</td>
<td>0.18</td>
</tr>
<tr>
<td>10</td>
<td>2.54</td>
<td>1.42</td>
<td>1.05</td>
<td>0.71</td>
<td>0.47</td>
<td>0.36</td>
<td>0.24</td>
</tr>
<tr>
<td>15</td>
<td>3.81</td>
<td>2.14</td>
<td>1.57</td>
<td>1.07</td>
<td>0.71</td>
<td>0.53</td>
<td>0.36</td>
</tr>
<tr>
<td>20</td>
<td>5.09</td>
<td>2.85</td>
<td>2.09</td>
<td>1.42</td>
<td>0.95</td>
<td>0.71</td>
<td>0.47</td>
</tr>
<tr>
<td>25</td>
<td>6.36</td>
<td>3.56</td>
<td>2.62</td>
<td>1.78</td>
<td>1.19</td>
<td>0.89</td>
<td>0.59</td>
</tr>
<tr>
<td>30</td>
<td>7.63</td>
<td>4.27</td>
<td>3.14</td>
<td>2.14</td>
<td>1.42</td>
<td>1.07</td>
<td>0.71</td>
</tr>
<tr>
<td>35</td>
<td>8.90</td>
<td>4.98</td>
<td>3.66</td>
<td>2.49</td>
<td>1.66</td>
<td>1.25</td>
<td>0.83</td>
</tr>
<tr>
<td>40</td>
<td>10.17</td>
<td>5.70</td>
<td>4.19</td>
<td>2.85</td>
<td>1.90</td>
<td>1.42</td>
<td>0.95</td>
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<tr>
<td>45</td>
<td>11.44</td>
<td>6.41</td>
<td>4.71</td>
<td>3.20</td>
<td>2.14</td>
<td>1.60</td>
<td>1.07</td>
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<tr>
<td>50</td>
<td>12.71</td>
<td>7.12</td>
<td>5.24</td>
<td>3.56</td>
<td>2.37</td>
<td>1.78</td>
<td>1.19</td>
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<tr>
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<td>13.98</td>
<td>7.85</td>
<td>5.78</td>
<td>3.93</td>
<td>2.67</td>
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<tr>
<td>60</td>
<td>15.25</td>
<td>8.57</td>
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<td>3.06</td>
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<tr>
<td>65</td>
<td>16.52</td>
<td>9.28</td>
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<td>4.67</td>
<td>3.46</td>
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<td>1.70</td>
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<td>8.51</td>
<td>5.80</td>
<td>4.67</td>
<td>4.07</td>
<td>2.80</td>
</tr>
<tr>
<td>85</td>
<td>21.62</td>
<td>11.90</td>
<td>9.07</td>
<td>6.18</td>
<td>5.07</td>
<td>4.47</td>
<td>3.20</td>
</tr>
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<td>22.90</td>
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<td>9.63</td>
<td>6.55</td>
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<td>4.87</td>
<td>3.60</td>
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<td>10.20</td>
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<td>11.34</td>
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<td>7.87</td>
<td>7.27</td>
<td>6.00</td>
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<td>17.32</td>
<td>14.20</td>
<td>9.57</td>
<td>8.67</td>
<td>8.07</td>
<td>6.80</td>
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<tr>
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<td>34.41</td>
<td>17.92</td>
<td>14.78</td>
<td>9.95</td>
<td>9.07</td>
<td>8.47</td>
<td>7.20</td>
</tr>
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<td>140</td>
<td>35.69</td>
<td>18.52</td>
<td>15.36</td>
<td>10.33</td>
<td>9.47</td>
<td>8.87</td>
<td>7.60</td>
</tr>
</tbody>
</table>

**Example 1:** max. length at 1.5 mm² and 3 A 214 m

**Example 2:** max. length at 1.5 mm² and 6 A 106 m

**Example 3:** mixed wiring:
- Control cabinet – sensor/actuator level: R1 = 40 m in 1.5 mm²; and R2 = 5 m in 0.25 mm²
- Total (R1 + R2) = 1.66 Ohm

---

*1) current limitation typically 1.8 x I_{n} times rated current at I_{n} = 0.5 A ... 6 A
current limitation typically 1.5 x I_{n} times rated current at I_{n} = 8 A or 10 A
current limitation typically 1.3 x I_{n} times rated current at I_{n} = 12 A
Mounting examples for ESX10-T

The ESX10-T features an integral power distribution system.

Mounting procedure:
Before wiring insert busbars into protection block.
Connection diagrams and application examples ESX10-T
Signal contacts are shown in OFF or fault condition.

ESX10-TA-100

ESX10-TB-101

ESX10-TB-102

ESX10-TB-124

Single signaling with common line entry

Single signaling with common reset
Accessories for ESX10-T

Description
The ESX10-T features an integral power distribution system. The following wiring modes are possible with various pluggable current and signal busbars:

- **LINE + (24VDC)**
- **0 V**

**Caution:** The electronic devices ESX10-T require a 0 V connection

- signal contacts
- reset inputs

<table>
<thead>
<tr>
<th>Description</th>
<th>Part No.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Busbars for LINE+ and 0 V</strong></td>
<td>6720005315</td>
</tr>
<tr>
<td>max. load with one line entry</td>
<td>( I_{\text{max}} ) 50 A</td>
</tr>
<tr>
<td>(recommended: centre line entry)</td>
<td></td>
</tr>
<tr>
<td>max. load with two line entries</td>
<td>( I_{\text{max}} ) 63 A</td>
</tr>
<tr>
<td>length:</td>
<td>500 mm</td>
</tr>
<tr>
<td><strong>Signal busbars for signal contacts and reset inputs</strong></td>
<td>6720005316</td>
</tr>
<tr>
<td>max. load with one line entry</td>
<td>( I_{\text{max}} ) 1 A</td>
</tr>
<tr>
<td>with one series connection of signal contacts</td>
<td>( I_{\text{max}} ) 0.5 A</td>
</tr>
<tr>
<td>length:</td>
<td>500 mm</td>
</tr>
<tr>
<td><strong>Jumpers for signal contacts</strong></td>
<td>6720005317</td>
</tr>
<tr>
<td>length:</td>
<td>21 mm</td>
</tr>
<tr>
<td>packing unit:</td>
<td>10 pcs</td>
</tr>
</tbody>
</table>

All dimensions without tolerances are for reference only. In the interest of improved design, performance and cost effectiveness the right to make changes in these specifications without notice is reserved. Product markings may not be exactly as the ordering codes. Errors and omissions excepted.