**ES braking resistors**

A comprehensive range of compact, IP20 dynamic braking resistors with a choice of accessories that keeps both purchase and installation costs low - all available at short notice.

**Features and Benefits**

- Rated for repetitive duty
- Resistance never lower than expected
- Robust construction
- Low inductance element
- High overload capacity
- Close tolerance (+5% - 0%)
- Noise free
- Temperature stable element

**Applications**

- Dynamic braking
- Motor control
- Variable speed drives
- Lifts & elevators
- Cranes & winches
- Conveyors
- Test loads

**Resistor design**

Cressall ES braking resistors are based on HP Coils, spiral wire-wound on ceramic formers. These elements have a high overload capacity and cool rapidly. The resistance material is a high grade stainless steel with no more than 7% resistance increase over the whole temperature range. Cheaper designs using 304 stainless steel can increase in resistance during the heating cycle by as much as 50%, which results in lower current and less effective braking.

The enclosures are made of galvanized steel. Ingress protection is IP 20.

Options are a thermal switch and/or terminal cover.

**Electrical and thermal data**

<table>
<thead>
<tr>
<th>Enclosure</th>
<th>Continuous power/kW</th>
<th>Min Ω</th>
<th>Max Ω</th>
</tr>
</thead>
<tbody>
<tr>
<td>ESH</td>
<td>0.6</td>
<td>2.5</td>
<td>180</td>
</tr>
<tr>
<td>EST1</td>
<td>1.0</td>
<td>4.0</td>
<td>300</td>
</tr>
<tr>
<td>ES1</td>
<td>1.5</td>
<td>6.0</td>
<td>450</td>
</tr>
<tr>
<td>EST2</td>
<td>2.0</td>
<td>2.0</td>
<td>600</td>
</tr>
<tr>
<td>ES2</td>
<td>3.0</td>
<td>3.0</td>
<td>900</td>
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<tr>
<td>EST3</td>
<td>4.5</td>
<td>2.0</td>
<td>1350</td>
</tr>
<tr>
<td>ES3</td>
<td>6.0</td>
<td>1.5</td>
<td>1800</td>
</tr>
<tr>
<td>EST4</td>
<td>8.0</td>
<td>0.75</td>
<td>3600</td>
</tr>
</tbody>
</table>

**Duty cycle and power**

The eight standard enclosures have continuous power ratings from 0.6kW to 8kW. These ratings can be exceeded when power is applied for less than 100% of the time. The graph below gives a “power multiplier” based on a 10 second “on time”. Multiply the resistor’s continuous rating by the “power multiplier” number to calculate power.

Example: 10 seconds on in 100 seconds is defined as a 10% duty cycle. A 10% duty cycle gives a 4.6 times power multiplier. ES1 resistors are rated 1.5kW continuously and so can be rated 6.9kW (4.6 x 1.5kW) for 10 seconds in 100 seconds. If the resistors have a resistance of 100Ω or more, then the power rating is reduced by 20%.
Mechanical data

**Maximum operating voltage:**
1000V DC or AC rms

**Connections**
Power: Screw terminals for up to 10mm² cable (ESH-ES3), M8 stud terminals (ES4-8)
Earth: Self-tapper, near screw terminals
Thermal sensor: 6.25mm male blade (faston) connections (receptacles not supplied)

**Terminal cover (optional for ESH-ES3)**
Two 20mm gland holes with cover grommets provided on end face.
The cover overhangs the resistor by 22mm. The open overhang area can be used for cable entry.

**Thermal sensor (optional)**
Located near screw terminals
Normally closed contact, opens at ~250°C, re-closes at ~210°C
Voltage: 240V AC rms; current: 7A AC rms

**Installation**
Units have slotted mounting points suitable for M6 fixings. Mount horizontally with base facing down.
Other orientations may result in increased element temperatures.

**Warning:** Units must never be mounted with the terminal area or base uppermost.

**Mounting dimensions (mm) and weights**

<table>
<thead>
<tr>
<th></th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>kg</th>
</tr>
</thead>
<tbody>
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<td>ESH</td>
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<td>236</td>
<td>121</td>
<td>92</td>
<td>141</td>
<td>1.4</td>
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<tr>
<td>EST</td>
<td>367</td>
<td>315</td>
<td>121</td>
<td>92</td>
<td>141</td>
<td>1.8</td>
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<tr>
<td>ES1</td>
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<td>415</td>
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<td>141</td>
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<td>315</td>
<td>213</td>
<td>185</td>
<td>141</td>
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<td>141</td>
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<td>195</td>
<td>6.6</td>
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<tr>
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<td>410</td>
<td>388</td>
<td>360</td>
<td>390</td>
<td>11.5</td>
</tr>
</tbody>
</table>

**Part numbers have three components:**

**ES2 – 4R5 – SN**

ESH - ES3 only