## RESISTORS – HEATING ELEMENTS

All types of tubular heating elements can be used as resistors. The use of large diameter resistance wires, gives low resistance elements that withstand high loads. Large element diameter withstands high voltage.

### Types of cooling
- Air; convection or forced convection
- Liquid; water, oil etc.

### Materials
- Steel – grade D
- Stainless steel – EN 1.4301, EN 1.4404, UNS S31254
- UNS N08904, Incoloy 800, Incoloy 825
- Aluminium AA6060, AA6063

### Dimensions
- Tubular elements: Ø 8.5, Ø 14, Ø 21 mm
- Aluminium I or X shaped with or without cooling fins.

### Example of applications
- Cranes
- Trains
- Trams
- Vehicles
- Hybrid vehicles
- Frequency converters
- Sine-wave filter resistors

### Fastening of elements
- Flanges; welded or brazed
- Nipples; pressed or brazed

### Electric connections
- Cables
- Threaded pins M4/M6

### Designs
- Numerous elements are often connected together, series and/or parallel, to achieve intended properties.

### Safety
- The elements are 100 % tested for insulation and dielectric rigidity. Also, the elements are often built into protection cages to prevent contact with heated parts. Connection boxes with different IP classes can be used.

### Others
- Computerized pulse load simulation is done to optimize each resistor application.
- Specific element data on the back side of this leaflet.

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![Example of product design](image-url)
# Technical Specifications

<table>
<thead>
<tr>
<th>Ø 8.5 al-profiles</th>
<th>Ø 14 al-profiles</th>
<th>Ø 18</th>
<th>Ø 21</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Minimum resistance/element</strong></td>
<td>0.12 ohm/m</td>
<td>0.06 ohm/m</td>
<td>1.6 ohm/m</td>
</tr>
<tr>
<td><strong>Resistance tolerance</strong></td>
<td>± 5 %</td>
<td>± 5 %</td>
<td>± 5 %</td>
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<tr>
<td><strong>Dielectric strength</strong></td>
<td>1.5 kV DC 1 min</td>
<td>4 kV DC 1 min</td>
<td>7 kV DC 1 min</td>
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<tr>
<td><strong>Length</strong></td>
<td>300–6000 mm</td>
<td>300–6000 mm</td>
<td>300–1500 mm</td>
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<tr>
<td><strong>Minimum bending radius</strong></td>
<td>12.5 mm</td>
<td>25 mm</td>
<td>40 mm</td>
</tr>
<tr>
<td><strong>Inductance</strong></td>
<td>0.5–1 µH / element</td>
<td></td>
<td></td>
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</tbody>
</table>