Braking Resistors with a system

- customized solutions
- consistent casing design
- the complete product range
  - wire-wound
  - steel grid
  - cast iron
GINO Series DEZ …

These tube resistors consist of a ceramic support tube with wire windings made from NiCr 3020 or CuNi44. In the next manufacturing step, the winding is coated with a layer of special concrete to fix the resistor wire. The braking resistors are mounted in a touch guard casing made from galvanized steel sheet and wired to terminals arranged on the inside of the casing. The cable entry point is a metric thread.

**Technical data**
- Resistance tolerance: +/- 10 % of the nominal value
- Operating voltage: \(< 1000 \text{ V AC or } 1200 \text{ V DC}\)
- Insulating test voltage: 3.5 kV, 50 Hz, 60 s

**System characteristics**
- Nominal power range \(\leq 3 \text{ kW}\)
- Compact design
- High pulse resistance and overload capacity
- Low inductivity
- Optional temperature control
- Protection IP00 and IP20

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**Tube resistor**

**Dimensions + no. of tubes in a casing**
<table>
<thead>
<tr>
<th>Tube A (mm)</th>
<th>30</th>
<th>30</th>
<th>30</th>
<th>40</th>
<th>40</th>
<th>40</th>
<th>60</th>
<th>60</th>
<th>60</th>
<th>60</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tube lengths (mm)</td>
<td>120</td>
<td>160</td>
<td>200</td>
<td>200</td>
<td>200</td>
<td>200</td>
<td>300</td>
<td>300</td>
<td>400</td>
<td>400</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Dimensions + no. of tubes in a casing</th>
<th>A</th>
<th>B</th>
<th>C1</th>
<th>C2</th>
<th>C3</th>
<th>D</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>not dependent on number</td>
<td>225</td>
<td>265</td>
<td>305</td>
<td>305</td>
<td>405</td>
</tr>
<tr>
<td>C1</td>
<td>1</td>
<td>70</td>
<td>70</td>
<td>70</td>
<td>95</td>
<td></td>
</tr>
<tr>
<td>C2</td>
<td>2</td>
<td>140</td>
<td>140</td>
<td>140</td>
<td>190</td>
<td></td>
</tr>
<tr>
<td>C3</td>
<td>3</td>
<td>210</td>
<td>210</td>
<td>210</td>
<td>285</td>
<td></td>
</tr>
<tr>
<td>D</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>not dependent on number</td>
<td>95</td>
<td>95</td>
<td>120</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Fastening dimensions + no. of tubes in a casing**
<table>
<thead>
<tr>
<th>E</th>
<th>F1</th>
<th>F2</th>
<th>F3</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>not dependent on number</td>
<td>200</td>
<td>248</td>
</tr>
<tr>
<td></td>
<td>388</td>
<td>488</td>
<td>488</td>
</tr>
<tr>
<td></td>
<td>588</td>
<td>688</td>
<td></td>
</tr>
</tbody>
</table>

**Metric thread**
- M16 + M16
- M16 + M20

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**Classic, wire-wound braking resistor with concrete-coated winding**
This is a series of encapsulated, wire-wound resistors mounted in aluminum sections and coated with concrete. The degree of protection of these resistor elements is IP65. With this high protection, the braking resistors are also suited for operation in demanding climates with up to 100 % air humidity. In addition, the aluminum sections are mounted in touch guard casings made from galvanized steel sheet and wired to terminals arranged on the inside of the casing. The cable entry point is a metric thread. Due to the terminals, the resulting degree of protection of the braking resistor is IP20. The system is suited for installing up to four encapsulated resistors in one casing.

**Encapsulated resistor**

**Technical data**
- Resistance tolerance: +/- 10 % of the nominal value
- Operating voltage: ≤ 1000 V AC or 1200 V DC
- Insulation test voltage: 4 kV, 50 Hz, 60 s

**System characteristics**
- Resistant to vibration and shock
- Compact, robust design
- High pulse resistance and overload capacity
- Low inductivity
- Optional temperature control
- Nominal power range ≤ 2 kW
GINO Series BEG ...

The steel grid resistor elements of this series consist of wave-patterned, punched or laser-cut elements made from aluminum-chromium steel X100CrAl13. The elements made from this stainless steel alloy are reinforced on their longitudinal sides and will be combined on insulated support brackets to form resistor banks. These banks are mounted in casings, e.g. made from galvanized steel sheet. The resistors are wired to terminals, the cable entry point is a metrical thread. Given the large surface of the resistor elements and the resulting good heat dissipation, this series is particularly suited for higher loads.

**Braking resistor**

**Technical data**

- Resistance tolerance: +/- 10% of the nominal value
- Operating voltage: \( \leq 1000 \text{ V AC or 1200 V DC} \)
- Insulation test voltage: 4 kV, 50 Hz, 60 s

**System characteristics**

- Resistant to vibration and shocks
- High pulse resistance and overload resistance
- Optional temperature control
- Protection from IP00 to IP23
- Low inductivity
- Nominal power range \( \geq 2 \text{ kW} \)

<table>
<thead>
<tr>
<th>Steel grid resistors</th>
<th>B12</th>
<th>B13</th>
<th>B14</th>
<th>B15</th>
<th>B17</th>
<th>B25</th>
<th>B27</th>
<th>B37</th>
<th>B47</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dimensions</td>
<td>A</td>
<td>483</td>
<td>483</td>
<td>483</td>
<td>483</td>
<td>483</td>
<td>483</td>
<td>483</td>
<td>483</td>
</tr>
<tr>
<td></td>
<td>B</td>
<td>240</td>
<td>330</td>
<td>430</td>
<td>530</td>
<td>740</td>
<td>740</td>
<td>740</td>
<td>740</td>
</tr>
<tr>
<td></td>
<td>C</td>
<td>301</td>
<td>301</td>
<td>301</td>
<td>301</td>
<td>301</td>
<td>601</td>
<td>601</td>
<td>1022</td>
</tr>
<tr>
<td></td>
<td></td>
<td>740</td>
<td>740</td>
<td>740</td>
<td>740</td>
<td>740</td>
<td>740</td>
<td>740</td>
<td>1322</td>
</tr>
<tr>
<td>Fastening dimensions</td>
<td>D_a</td>
<td>9</td>
<td>9</td>
<td>9</td>
<td>9</td>
<td>9</td>
<td>9</td>
<td>9</td>
<td>9</td>
</tr>
<tr>
<td></td>
<td>E</td>
<td>380</td>
<td>380</td>
<td>380</td>
<td>380</td>
<td>380</td>
<td>380</td>
<td>380</td>
<td>380</td>
</tr>
<tr>
<td></td>
<td>F</td>
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<td>300</td>
<td>400</td>
<td>500</td>
<td>700</td>
<td>700</td>
<td>700</td>
<td>700</td>
</tr>
<tr>
<td>Ground stud</td>
<td></td>
<td>M8</td>
<td>M6</td>
<td>M6</td>
<td>M6</td>
<td>M8</td>
<td>M8</td>
<td>M8</td>
<td>M8</td>
</tr>
<tr>
<td>Metric thread</td>
<td></td>
<td>M12xM2</td>
<td>0</td>
<td>M16xM2</td>
<td>0</td>
<td>M20xM2</td>
<td>0</td>
<td>M16xM2</td>
<td>0</td>
</tr>
<tr>
<td>Mounting</td>
<td></td>
<td>The minimum distance to other bodies shall be 200 mm on all sides that have ventilation slots</td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>
GINO Series GWG …

The typical field of application for cast iron resistors of the GEW series are short, high-energy impulse loads. With their highly active resistance material the cast iron resistor elements are arranged in series on insulated support brackets and mounted in a painted steel sheet casing with cable box. Cast iron resistors are resistant to climatic impact pursuant to DIN 50 010 T1 and suited for indoor and outdoor climates at varying conditions of condensation, without weathering protection and with low pollutant impact. Cast iron resistors in alternative designs such as in the systems by AEG, BBC, Siemens and Wiemann, are suited for a wide range of applications as braking, starting, damping, industrial-type and grounding resistors.

Cast iron resistor element

Technical data
Resistance tolerance: +/- 10 % of the nominal value
Operating voltage: ≤ 1000 V AC or 1200 V DC
Insulation test voltage: 3.5 kV, 50 Hz, 60 s

System characteristics
- Impulse capacity, e.g. 500 kW for t = 2 sec.
- Highest impulse resistance and overload capacity
- Optional temperature control
- Robust and shock-proof design
- Wall mounting possible
- Protection IP00, IP20 and IP23
Braking resistors for frequency converters

General
Braking resistors are used in the d.c. link of the frequency converter. A braking chopper activates the resistor. If the output frequency of the frequency converter drops – be it by a control process, a drop in speed or a braking operation – below the current operating frequency of the motor, the motor takes on the function of a generator. The consequence is a rise in the link voltage. If this voltage exceeds the specific value of the unit in question, the chopper will activate the braking resistor. If the voltage drops to a value just above the grid voltage of the link, the chopper will interrupt the circuit. This process will be repeated until the motor speed once again matches the applied operating frequency.

The braking resistor takes on the energy and converts it into heat.

Braking resistor operating modes
Braking resistors are usually only activated for a short time, save the braking energy and give off the stored heat to the environment during the breaks when they are inactive. This is an intermittent operation with a cyclic duration factor (c.d.f.) indicated in % of the duty cycle time.

The duty cycle time \( t_d \) is calculated from the total of the braking time \( t_b \) plus resting time \( t_r \). The overload capacity of the resistors is dependent on the thermal time constant and thus on the design, among others.

The resistance value of the braking resistors
In general, the resistance value of a braking resistor is not critical. It may range between the lowest value of the admissible value for the braking chopper and a maximum value where the required braking performance is still achieved. Assuming a standard reserve of 25 % which takes into account the manufacturing tolerances and the resistance change due to heating up as well as the lower mean value of the link voltage as compared with the chopper activating voltage, the maximum value for the braking resistor is calculated as:

\[
R_{BR} = \frac{U_Z^2}{P_{BR}} \times 0.75
\]

\( U_Z \) indicates the chopper activating voltage and \( P_{BR} \) the braking capacity in Watt.