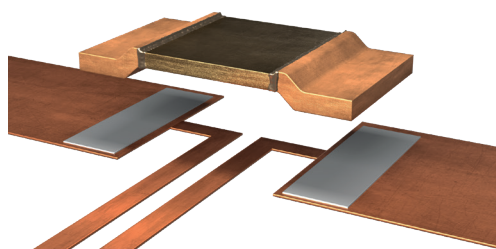




## ISA-WELD® // PRECISION RESISTORS



### BVS (3920)



#### Features

- Power rating up to 12 W<sup>1</sup>
- Continuous current load up to 245 A (0.2 mOhm)
- Heavy copper connectors
- Excellent long-term stability
- Max. solder temperature up to 350 °C / 30 sec
- AEC-Q200 qualified
- RoHS 2011/65/EU compliant



#### Applications

- Current sensor for power hybrid applications
- High current applications for the automotive market
- Frequency converters
- Power modules

#### Technical data <sup>1</sup>

|  |              |  |
|--|--------------|--|
| Resistance values                                | <b>mOhm</b>  | 0.1 to 5   |
| Tolerance  | <b>%</b>     | 1 / 5  |
| Temperature coefficient (20-60 °C)               | <b>ppm/K</b> | from 0 ± 50  |
| Applicable temperature range                     | <b>°C</b>    | -65 to +170  |
| Power rating <b>P<sub>70°C</sub></b>             | <b>W</b>     | up to 12   |
| Internal heat resistance (R <sub>thi</sub> )     | <b>K/W</b>   | from 2   |
| Inductance                                       | <b>nH</b>    | <3   |
| Stability (at rated power) deviation after 2000h | <b>%</b>     | <0.5 (T <sub>max.</sub> =140 °C)<br><1.0 (T <sub>max.</sub> =170 °C) |

<sup>1</sup> For detailed information see table on page 3

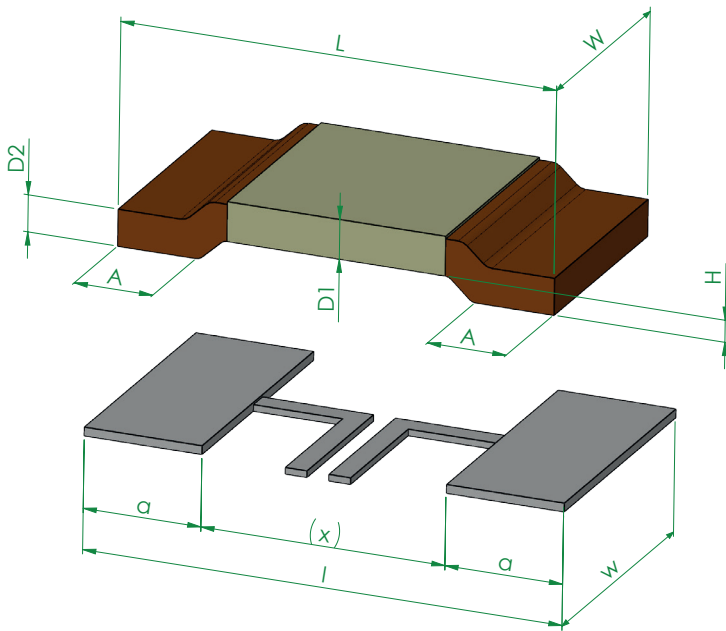
#### Ordering code

BVS - M - R0005 - 1.0

|       |   |
|-------|---|
| ..... | Tolerance   |
| ..... | Resistance value [Ohm] / „R” represents decimal point |
| ..... | Material (MANGANIN®)                                  |
| ..... | Type  |



**Mechanical dimensions and pcb-layout proposal (Reflow-soldering) [mm]**



**Mechanical dimensions**

| Type        | Value [mΩ] | L       | W             | H        | A              | D1         | D2         |
|-------------|------------|---------|---------------|----------|----------------|------------|------------|
| BVS-K-R000  | <0.2       | 10 +0.3 | 5.2 +0.3/-0.2 | 0.5 ±0.1 | 2 -0.5         | 1 ±0.1     | 1 ±0.1     |
| BVS-Z-R0001 | 0.1        | 10 +0.3 | 5.2 +0.3/-0.2 | 0.5 ±0.1 | 2.25 +0.3/-0.5 | 1.42 ±0.1  | 1.42 ±0.1  |
| BVS-Z-R0002 | 0.2        | 10 +0.3 | 5.2 +0.3/-0.2 | 0.5 ±0.1 | 2 -0.5         | 1.49 ±0.1  | 1.42 ±0.1  |
| BVS-M-R0003 | 0.3        | 10 +0.3 | 5.2 +0.3/-0.2 | 0.5 ±0.1 | 2 -0.5         | 1.42 ±0.1  | 1.42 ±0.1  |
| BVS-M-R0005 | 0.5        | 10 +0.3 | 5.2 +0.3/-0.2 | 0.5 ±0.1 | 2 -0.5         | 0.84 ±0.1  | 0.84 ±0.1  |
| BVS-M-R0007 | 0.7        | 10 +0.3 | 5.2 +0.3/-0.2 | 0.5 ±0.1 | 2 -0.5         | 0.6 ±0.1   | 0.64 ±0.1  |
| BVS-M-R001  | 1          | 10 +0.3 | 5.2 +0.3/-0.2 | 0.5 ±0.1 | 2 -0.5         | 0.42 ±0.05 | 0.42 ±0.05 |
| BVS-A-R001  | 1          | 10 +0.3 | 5.2 +0.3/-0.2 | 0.5 ±0.1 | 2 -0.5         | 1.32 ±0.1  | 1.30 ±0.1  |
| BVS-I-R001  | 1          | 10 +0.3 | 5.2 +0.3/-0.2 | 0.5 ±0.1 | 2 -0.5         | 1.32 ±0.1  | 1.30 ±0.1  |
| BVS-A-R0015 | 1.5        | 10 +0.3 | 5.2 +0.3/-0.2 | 0.5 ±0.1 | 2 -0.5         | 0.91 ±0.1  | 0.84 ±0.1  |
| BVS-A-R002  | 2          | 10 +0.3 | 5.2 +0.3/-0.2 | 0.5 ±0.1 | 2 -0.5         | 0.64 ±0.1  | 0.64 ±0.1  |
| BVS-I-R002  | 2          | 10 +0.3 | 5.2 +0.3/-0.2 | 0.5 ±0.1 | 2 -0.5         | 0.66 ±0.1  | 0.64 ±0.1  |
| BVS-V-R002  | 2          | 10 +0.3 | 5.2 +0.3/-0.2 | 0.5 ±0.1 | 2 -0.5         | 0.44 ±0.1  | 0.42 ±0.1  |
| BVS-A-R0028 | 2.8        | 10 +0.3 | 5.2 +0.3/-0.2 | 0.5 ±0.1 | 2 -0.5         | 0.44 ±0.05 | 0.64 ±0.1  |
| BVS-A-R003  | 3          | 10 +0.3 | 5.2 +0.3/-0.2 | 0.5 ±0.1 | 2 -0.5         | 0.44 ±0.05 | 0.42 ±0.05 |
| BVS-I-R003  | 3          | 10 +0.3 | 5.2 +0.3/-0.2 | 0.5 ±0.1 | 2 -0.5         | 0.44 ±0.05 | 0.42 ±0.05 |
| BVS-A-R004  | 4          | 10 +0.3 | 5.2 +0.3/-0.2 | 0.5 ±0.1 | 2 -0.5         | 0.31 ±0.05 | 0.4 ±0.05  |
| BVS-I-R004  | 4          | 10 +0.3 | 5.2 +0.3/-0.2 | 0.5 ±0.1 | 2 -0.5         | 0.36 ±0.05 | 0.4 ±0.1   |
| BVS-I-R005  | 5          | 10 +0.3 | 5.2 +0.3/-0.2 | 0.5 ±0.1 | 2 -0.5         | 0.35 ±0.05 | 0.4 ±0.05  |

**Solder pad dimensions**

| Type        | l  | w   | a   | x   |
|-------------|----|-----|-----|-----|
| BVS         | 11 | 6.2 | 2.7 | 5.6 |
| BVS-Z-R0001 | 11 | 6.2 | 3.6 | 3.8 |



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**Recommended solder profile**

Reflow-, IR-soldering

|             |     |      |     |     |
|-------------|-----|------|-----|-----|
| Temperature | °C  | 260  | 255 | 217 |
| Time        | sec | peak | 40  | 90  |

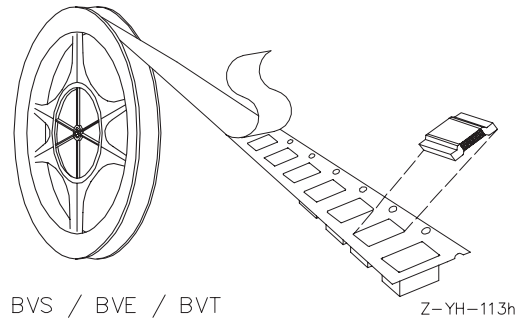
**Alternative solder profile**

H2 soldering under vacuum

|             |     |     |
|-------------|-----|-----|
| Temperature | °C  | 350 |
| Time        | min | 20  |

**Tape and reel information**

|                  |                |      |  |
|------------------|----------------|------|--|
| Specification    | DIN EN 60286-3 |      |  |
| Tape width       | mm             | 16   |  |
| Reel size        | inch           | 13   |  |
| Parts per reel   | pcs            | 3000 |  |
| Packaging weight | g              | 474  |  |



**Electrical specification**

| Type        | Material         | Value [mΩ] | $R_{thi}$ [K/W] | TCR [ppm/K] | $P_{70°C}^*$ [W]  | $P_{>100°C}^*$ [W] | Note   |
|-------------|------------------|------------|-----------------|-------------|-------------------|--------------------|--|
| BVS-Z-R0001 | ZERANIN®30       | 0.1        | 2.0             | 300 ± 50    | 12                | 7                  | C-samples available, qualification in process  |
| BVS-Z-R0002 | ZERANIN®30       | 0.2        | 3               | 150 ± 50    | 12                | 5                  |  |
| BVS-M-R0003 | MANGANIN®        | 0.3        | 4.5             | 100 ± 50    | 10                | 5                  |  |
| BVS-M-R0005 | MANGANIN®        | 0.5        | 8               | 20 ± 50     | 9                 | 5                  |  |
| BVS-M-R0007 | MANGANIN®        | 0.7        | 11              | 10 ± 50     | 8                 | 5                  |  |
| BVS-M-R001  | MANGANIN®        | 1          | 15              | 0 ± 50      | 7                 | 4                  |  |
| BVS-A-R001  | Aluchrom         | 1          | 9               | 0 ± 50      | 8                 | 5                  | Aluchrom material has ferromagnetic properties and should not be used in AC-applications |
| BVS-A-R0015 | Aluchrom         | 1.5        | 12              | 0 ± 50      | 7                 | 4.5                |  |
| BVS-A-R002  | Aluchrom         | 2          | 16              | 0 ± 50      | 6                 | 4                  |  |
| BVS-A-R0028 | Aluchrom         | 2.8        | 21              | 0 ± 50      | 5                 | 3                  |  |
| BVS-A-R003  | Aluchrom         | 3          | 22              | 0 ± 50      | 5                 | 3                  |  |
| BVS-A-R004  | Aluchrom         | 4          | 30              | 0 ± 50      | 4                 | 2.5                |  |
| BVS-I-R001  | ISAOHM®          | 1          | 9               | 0 ± 50      | 8                 | 5                  |  |
| BVS-I-R002  | ISAOHM®          | 2          | 16              | 0 ± 50      | 6                 | 4                  |  |
| BVS-I-R003  | ISAOHM®          | 3          | 22              | 0 ± 50      | 5                 | 3                  |  |
| BVS-I-R004  | ISAOHM®          | 4          | 30              | 0 ± 50      | 3.5               | 2.5                |  |
| BVS-I-R005  | ISAOHM®          | 5          | 38              | 0 ± 50      | 2.5               | 2                  |  |
| BVS-V-R002  | NOVENTIN®        | 2          | 20              | 0 ± 50      | 5                 | 3.5                |  |
| BVS-K-R000  | SF-copper tinned | <0.2 mΩ    |                 |             | $I_{max} = 160 A$ |                    |  |

\* Recommended max. power (limited by thermal conditions of the assembly)

**Note:** For calculation of the maximum derating terminal temperature ( $T_K$ ) the following formula can be used:  $T_K = T_{max} - (R_{thi} \times P)$ .

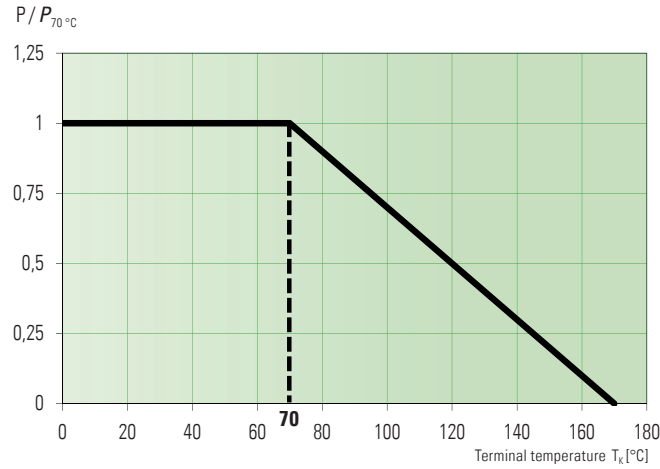
Example for BVS-M-R0005:  $T_K = 170 °C - (8 K/W \times 5 W) = 130 °C$ .



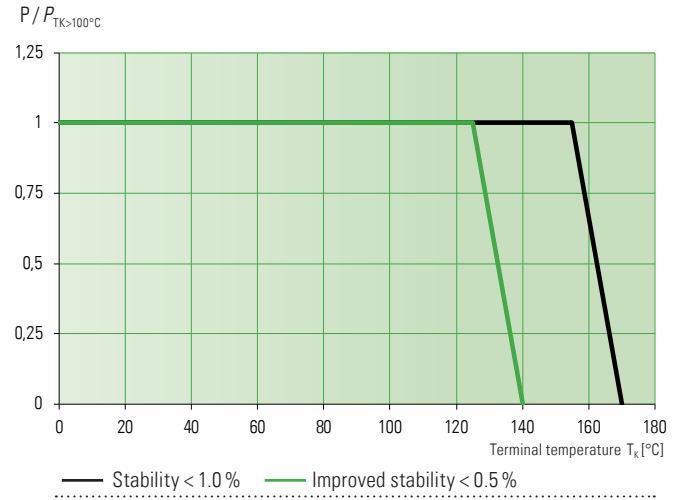
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**Power derating curve at 70°C**

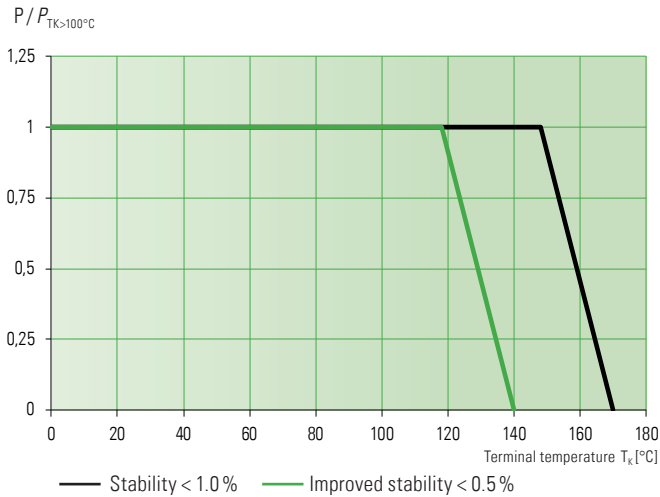
For detailed information see table "Electrical specification"



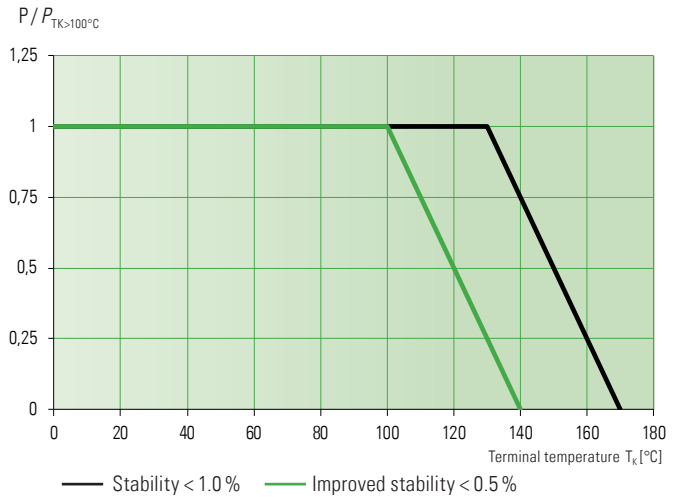
**Power derating curve BVS-Z-R0001 / BVS-Z-R0002**



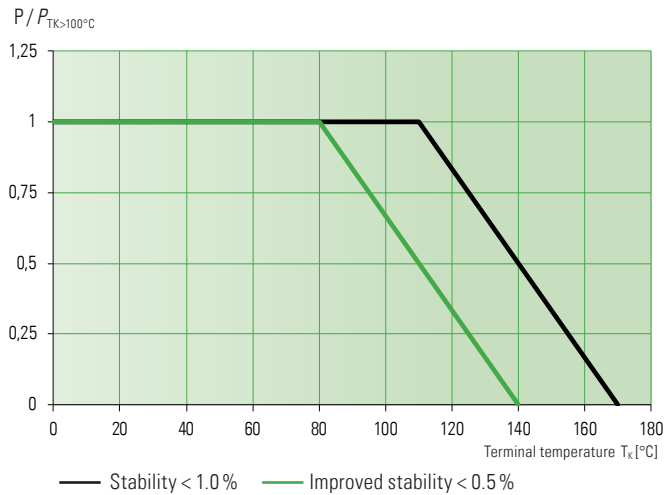
**Power derating curve BVS-M-R0003**



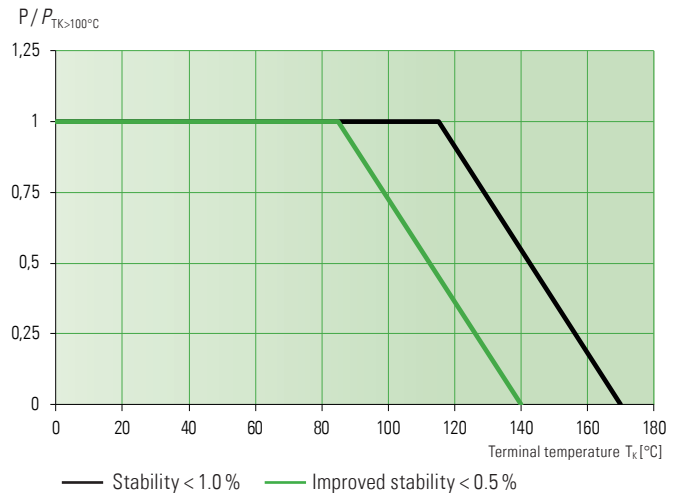
**Power derating curve BVS-M-R0005**



**Power derating curve BVS-M-R001**



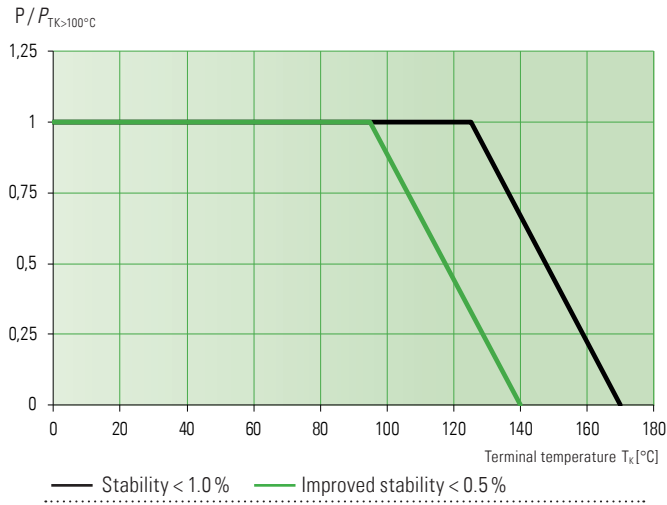
**Power derating curve BVS-M-R0007**



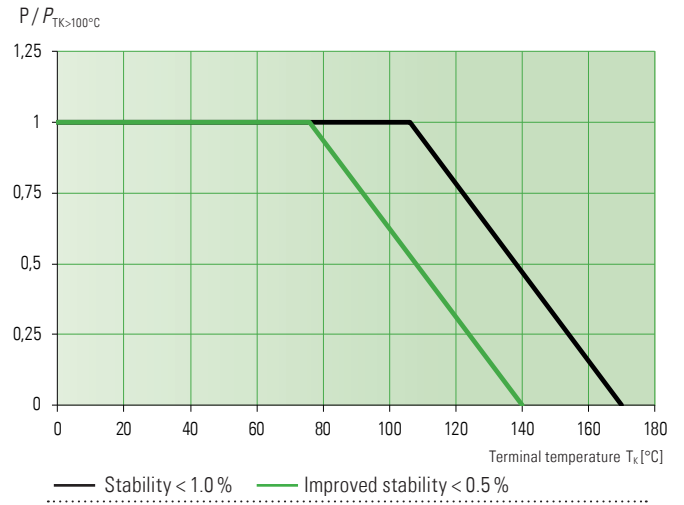


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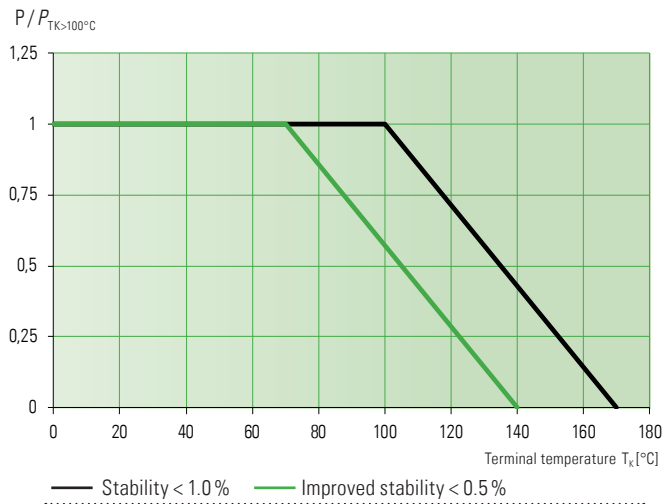
**Power derating curve BVS-I-R001**



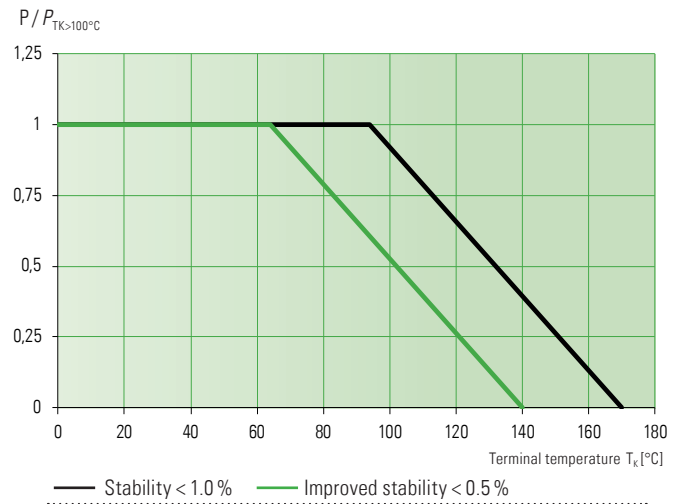
**Power derating curve BVS-I-R002 / BVS-I-R003**



**Power derating curve BVS-V-R002 / BVS-I-R004**



**Power derating curve BVS-I-R005**

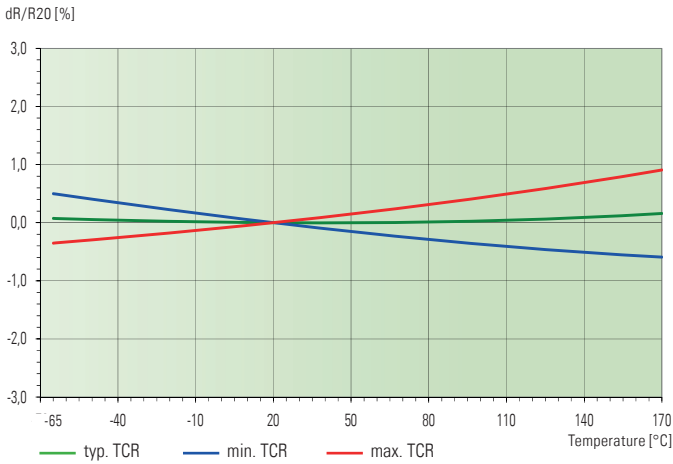


Further power derating curves on request.

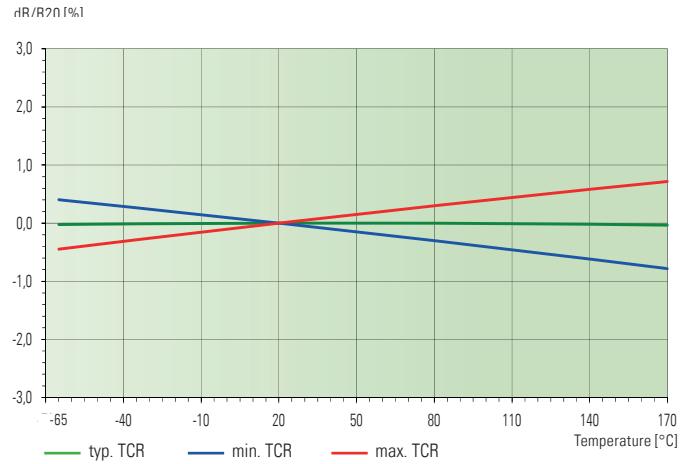


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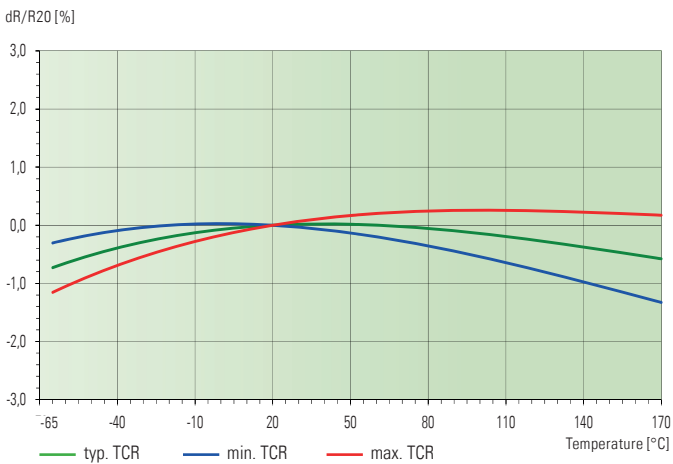
**Temperature dependence of the electrical resistance of Aluchrom resistors**



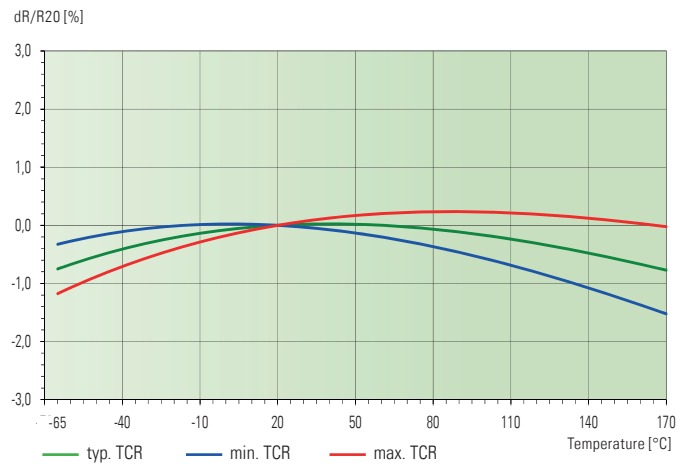
**Temperature dependence of the electrical resistance of ISAOHM® resistors**



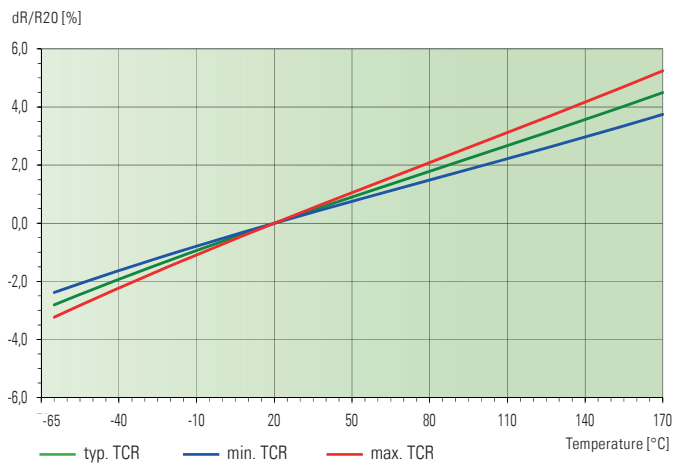
**Temperature dependence of the electrical resistance of MANGANIN® resistors. Example: BVS-M-R001**



**Temperature dependence of the electrical resistance of NOVENTIN® resistors**



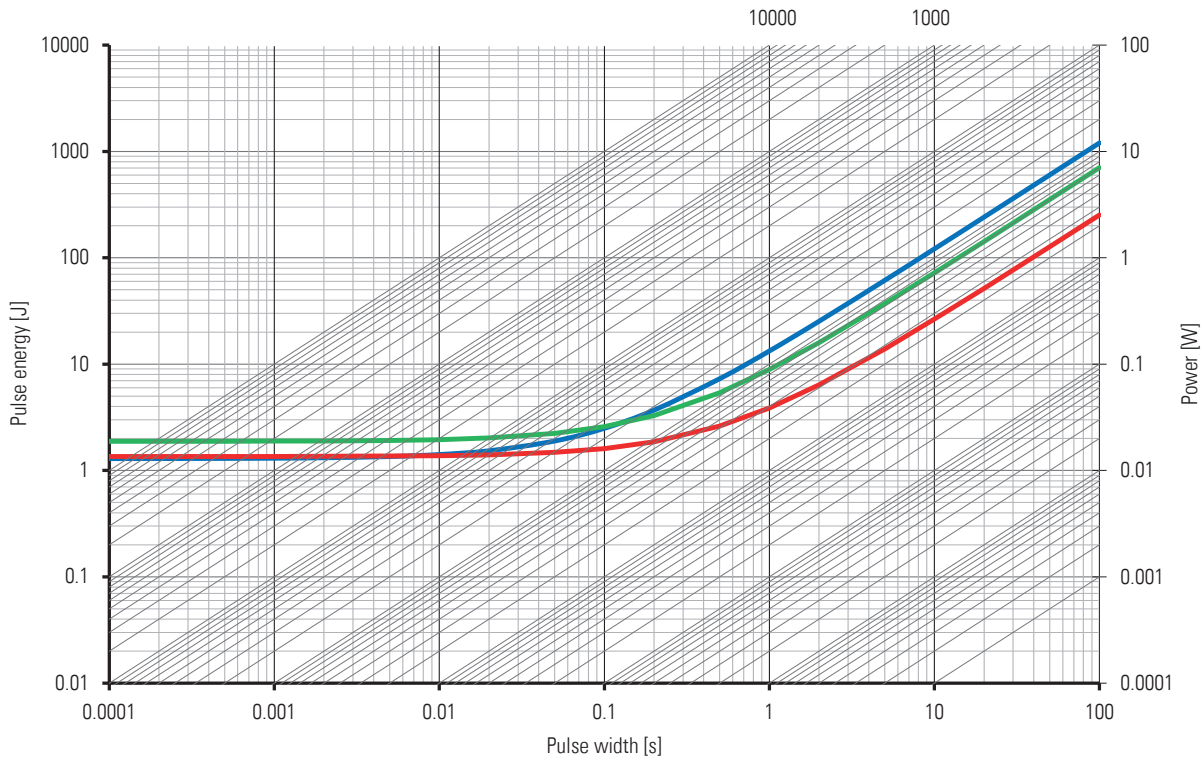
**Temperature dependence of the electrical resistance of ZERANIN® resistors. Example: BVS-Z-R0001**





Maximum pulse energy respectively pulse power for permanent operation

**BVS-I-R005**                      **BVS-Z-R0001**                      **BVS-M-R001**  
 Maximum pulse energy / power for continuous operation ( $T_K = 70\text{ °C}$ )



**Test specification**

| Parameters                            | Test conditions                         | Specified values |
|---------------------------------------|---|------------------|
| Temperature Cycling                   | 2000 cycles (-55 °C to +150 °C)         | ±0.5 %           |
| Low Temperature Storage and Operation | -65 °C for 250 h                        | ±0.1 %           |
| Resistance to Soldering Heat          | 260 °C for 10 sec / 8h steam aging      | n.a.             |
| Moisture Resistance                   | MIL-STD-202 method 106                  | ±0.1 %           |
| Mechanical Shock                      | 100 g, 6 ms half sine                   | ±0.2 %           |
| Vibration, High Frequency             | 10 g, 10-2000 Hz, 24 h each axis        | ±0.2 %           |
| Operational Life                      | 2000 h, max. $T_K$ at rated power       | ±1.0 %           |
| High Temperature Exposure             | 2000 h / 170 °C (in covered condition)* | ±1.0 %           |
| Bias Humidity                         | +85 °C, 85 r.F., 1000 h                 | ±0.5 %           |

\* for MANGANIN® and ZERANIN®30

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