

## Cemented Wirewound Resistors with Lugs



### FEATURES

- Lugs with various termination styles suitable for soldering or bolt connection
- Excellent pulse load capability
- Adjustable type (E) available
- Non inductive type (Ni) available
- Non-flammable coating according to UL94-V0
- Material categorization: for definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)



**RoHS**  
COMPLIANT  
HALOGEN  
**FREE**  
**GREEN**  
(5-2008)

The ZWS series, with a completely welded construction, is the perfect choice for high continuous power dissipation up to 250 W with the option for adjustable (ZWS E) and non-inductive (ZWS Ni) types. With their extremely high pulse power capability, they are the ideal choice as inrush current limiters. Typical applications include but are not limited to drive systems, power supplies, frequency inverters, AC and DC filters, and as snubber resistors. For a given application, requirements of ohmic value, rated power, peak voltage, pulse shape, pulse duration, termination style, and environmental conditions may be submitted to recommend the most suitable product.

### APPLICATIONS

- Inrush current limiter
- Capacitor charge / discharge
- Snubber resistor
- Brake resistor
- Filter resistor

### TECHNICAL SPECIFICATION

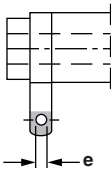
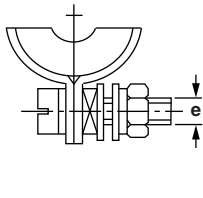
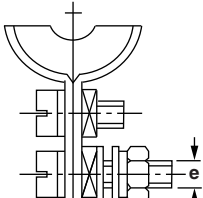
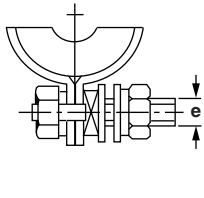
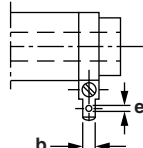
| TYPE / VARIANT | RATED DISSIPATION $P_{40}$ | RESISTANCE RANGE <sup>(1)</sup><br>TCR<br>-10 ppm/K to -80 ppm/K<br>WM50 | RESISTANCE RANGE <sup>(1)</sup><br>TCR<br>+100 ppm/K to +180 ppm/K<br>WM110 | RESISTANCE TOLERANCE     | OPERATING VOLTAGE <sup>(2)</sup><br>$U_{max}$ |
|----------------|----------------------------|--------------------------------------------------------------------------|-----------------------------------------------------------------------------|--------------------------|-----------------------------------------------|
| ZWS 6          | 6 W                        | 0.82 $\Omega$ to 5.1 k $\Omega$                                          | 1.8 $\Omega$ to 13 k $\Omega$                                               | $\pm 5 \%$ , $\pm 10 \%$ | 250 V                                         |
|                |                            | 2.7 $\Omega$ to 5.1 k $\Omega$                                           | -                                                                           | $\pm 2 \%$               | 150 V                                         |
| ZWS 6 E        | 6 W                        | 0.82 $\Omega$ to 130 $\Omega$                                            | 1.8 $\Omega$ to 4.7 k $\Omega$                                              | $\pm 5 \%$ , $\pm 10 \%$ | 150 V                                         |
| ZWS 6 Ni       | 6 W                        | 0.15 $\Omega$ to 910 $\Omega$                                            | 0.33 $\Omega$ to 2.4 k $\Omega$                                             | $\pm 10 \%$              | 100 V                                         |
|                |                            | 1.0 $\Omega$ to 910 $\Omega$                                             | 2.0 $\Omega$ to 2.4 k $\Omega$                                              | $\pm 5 \%$               |                                               |
| ZWS 8          | 8 W                        | 0.68 $\Omega$ to 7.5 k $\Omega$                                          | 1.8 $\Omega$ to 20 k $\Omega$                                               | $\pm 5 \%$ , $\pm 10 \%$ | 400 V                                         |
|                |                            | 3.3 $\Omega$ to 7.5 k $\Omega$                                           | -                                                                           | $\pm 2 \%$               | 200 V                                         |
| ZWS 8 E        | 8 W                        | 0.62 $\Omega$ to 200 $\Omega$                                            | 1.8 $\Omega$ to 6.8 k $\Omega$                                              | $\pm 5 \%$ , $\pm 10 \%$ | 200 V                                         |
| ZWS 8 Ni       | 8 W                        | 0.24 $\Omega$ to 1.3 k $\Omega$                                          | 0.56 $\Omega$ to 3.6 k $\Omega$                                             | $\pm 10 \%$              | 150 V                                         |
|                |                            | 1.0 $\Omega$ to 1.3 k $\Omega$                                           | 2.0 $\Omega$ to 3.6 k $\Omega$                                              | $\pm 5 \%$               |                                               |
| ZWS 12         | 12 W                       | 0.62 $\Omega$ to 10 k $\Omega$                                           | 1.8 $\Omega$ to 27 k $\Omega$                                               | $\pm 5 \%$ , $\pm 10 \%$ | 550 V                                         |
|                |                            | 3.0 $\Omega$ to 10 k $\Omega$                                            | -                                                                           | $\pm 2 \%$               | 300 V                                         |
| ZWS 12 E       | 12 W                       | 0.56 $\Omega$ to 270 $\Omega$                                            | 1.8 $\Omega$ to 9.1 k $\Omega$                                              | $\pm 5 \%$ , $\pm 10 \%$ | 300 V                                         |
| ZWS 12 Ni      | 12 W                       | 0.33 $\Omega$ to 1.8 k $\Omega$                                          | 0.75 $\Omega$ to 5.1 k $\Omega$                                             | $\pm 10 \%$              | 200 V                                         |
|                |                            | 1.0 $\Omega$ to 1.8 k $\Omega$                                           | 2.0 $\Omega$ to 5.1 k $\Omega$                                              | $\pm 5 \%$               |                                               |
| ZWS 15         | 15 W                       | 0.68 $\Omega$ to 12 k $\Omega$                                           | 2.2 $\Omega$ to 33 k $\Omega$                                               | $\pm 5 \%$ , $\pm 10 \%$ | 700 V                                         |
|                |                            | 2.2 $\Omega$ to 12 k $\Omega$                                            | -                                                                           | $\pm 2 \%$               | 400 V                                         |
| ZWS 15 E       | 15 W                       | 0.68 $\Omega$ to 330 $\Omega$                                            | 2.2 $\Omega$ to 11 k $\Omega$                                               | $\pm 5 \%$ , $\pm 10 \%$ | 400 V                                         |
| ZWS 15 Ni      | 15 W                       | 0.39 $\Omega$ to 2.2 k $\Omega$                                          | 0.82 $\Omega$ to 6.2 k $\Omega$                                             | $\pm 10 \%$              | 300 V                                         |
|                |                            | 1.0 $\Omega$ to 2.2 k $\Omega$                                           | 2.0 $\Omega$ to 6.2 k $\Omega$                                              | $\pm 5 \%$               |                                               |



| TECHNICAL SPECIFICATION |                            |                                                                          |                                                                             |                          |                                                |
|-------------------------|----------------------------|--------------------------------------------------------------------------|-----------------------------------------------------------------------------|--------------------------|------------------------------------------------|
| TYPE / VARIANT          | RATED DISSIPATION $P_{40}$ | RESISTANCE RANGE <sup>(1)</sup><br>TCR<br>-10 ppm/K to -80 ppm/K<br>WM50 | RESISTANCE RANGE <sup>(1)</sup><br>TCR<br>+100 ppm/K to +180 ppm/K<br>WM110 | RESISTANCE TOLERANCE     | OPERATING VOLTAGE <sup>(2)</sup><br>$U_{max.}$ |
| ZWS 20                  | 20 W                       | 0.62 $\Omega$ to 16 k $\Omega$                                           | 1.3 $\Omega$ to 43 k $\Omega$                                               | $\pm 5 \%$ , $\pm 10 \%$ | 900 V                                          |
|                         |                            | 2.7 $\Omega$ to 16 k $\Omega$                                            | -                                                                           | $\pm 2 \%$               | 550 V                                          |
| ZWS 20 E                | 20 W                       | 0.62 $\Omega$ to 430 $\Omega$                                            | 1.3 $\Omega$ to 15 k $\Omega$                                               | $\pm 5 \%$ , $\pm 10 \%$ | 500 V                                          |
| ZWS 20 Ni               | 20 W                       | 0.47 $\Omega$ to 2.7 k $\Omega$                                          | 1.1 $\Omega$ to 8.2 k $\Omega$                                              | $\pm 10 \%$              | 400 V                                          |
|                         |                            | 1.0 $\Omega$ to 2.7 k $\Omega$                                           | 2.0 $\Omega$ to 8.2 k $\Omega$                                              | $\pm 5 \%$               |                                                |
| ZWS 35                  | 35 W                       | 1.1 $\Omega$ to 30 k $\Omega$                                            | 2.7 $\Omega$ to 82 k $\Omega$                                               | $\pm 5 \%$ , $\pm 10 \%$ | 1500 V                                         |
|                         |                            | 1.3 $\Omega$ to 30 k $\Omega$                                            | -                                                                           | $\pm 2 \%$               | 1000 V                                         |
| ZWS 35 E                | 35 W                       | 1.1 $\Omega$ to 750 $\Omega$                                             | 2.7 $\Omega$ to 27 k $\Omega$                                               | $\pm 5 \%$ , $\pm 10 \%$ | 950 V                                          |
| ZWS 35 Ni               | 35 W                       | 0.91 $\Omega$ to 5.1 k $\Omega$                                          | 2.0 $\Omega$ to 15 k $\Omega$                                               | $\pm 5 \%$ , $\pm 10 \%$ | 700 V                                          |
| ZWS 50                  | 50 W                       | 1.3 $\Omega$ to 33 k $\Omega$                                            | 3.0 $\Omega$ to 91 k $\Omega$                                               | $\pm 5 \%$ , $\pm 10 \%$ | 2100 V                                         |
|                         |                            | 2.2 $\Omega$ to 33 k $\Omega$                                            | -                                                                           | $\pm 2 \%$               | 1250 V                                         |
| ZWS 50 E                | 50 W                       | 1.3 $\Omega$ to 910 $\Omega$                                             | 3.0 $\Omega$ to 33 k $\Omega$                                               | $\pm 5 \%$ , $\pm 10 \%$ | 1250 V                                         |
| ZWS 50 Ni               | 50 W                       | 1.1 $\Omega$ to 6.2 k $\Omega$                                           | 2.4 $\Omega$ to 16 k $\Omega$                                               | $\pm 5 \%$ , $\pm 10 \%$ | 850 V                                          |
| ZWS 100                 | 100 W                      | 2.7 $\Omega$ to 68 k $\Omega$                                            | 6.2 $\Omega$ to 200 k $\Omega$                                              | $\pm 5 \%$ , $\pm 10 \%$ | 4450 V                                         |
|                         |                            |                                                                          | -                                                                           | $\pm 2 \%$               | 2600 V                                         |
| ZWS 100 E               | 100 W                      | 2.7 $\Omega$ to 1.8 k $\Omega$                                           | 6.2 $\Omega$ to 68 k $\Omega$                                               | $\pm 5 \%$ , $\pm 10 \%$ | 2600 V                                         |
| ZWS 100 Ni              | 100 W                      | 2.2 $\Omega$ to 13 k $\Omega$                                            | 4.7 $\Omega$ to 33 k $\Omega$                                               | $\pm 5 \%$ , $\pm 10 \%$ | 1800 V                                         |
| ZWS 150                 | 150 W                      | 4.7 $\Omega$ to 130 k $\Omega$                                           | 11.0 $\Omega$ to 360 k $\Omega$                                             | $\pm 5 \%$ , $\pm 10 \%$ | 7300 V                                         |
|                         |                            |                                                                          | -                                                                           | $\pm 2 \%$               | 4400 V                                         |
| ZWS 150 E               | 150 W                      | 4.7 $\Omega$ to 3.3 k $\Omega$                                           | 11.0 $\Omega$ to 120 k $\Omega$                                             | $\pm 5 \%$ , $\pm 10 \%$ | 4200 V                                         |
| ZWS 150 Ni              | 150 W                      | 3.9 $\Omega$ to 22 k $\Omega$                                            | 9.1 $\Omega$ to 62 k $\Omega$                                               | $\pm 5 \%$ , $\pm 10 \%$ | 3000 V                                         |
| ZWS 250                 | 250 W                      | 8.2 $\Omega$ to 220 k $\Omega$                                           | 20.0 $\Omega$ to 620 k $\Omega$                                             | $\pm 5 \%$ , $\pm 10 \%$ | 12400 V                                        |
|                         |                            |                                                                          | -                                                                           | $\pm 2 \%$               | 7400 V                                         |
| ZWS 250 E               | 250 W                      | 8.2 $\Omega$ to 6.2 k $\Omega$                                           | 20.0 $\Omega$ to 220 k $\Omega$                                             | $\pm 5 \%$ , $\pm 10 \%$ | 7400 V                                         |
| ZWS 250 Ni              | 250 W                      | 6.8 $\Omega$ to 39 k $\Omega$                                            | 15.0 $\Omega$ to 110 k $\Omega$                                             | $\pm 5 \%$ , $\pm 10 \%$ | 5200 V                                         |
| ZWS 30/100              | 75 W                       | 2.4 $\Omega$ to 62 k $\Omega$                                            | 5.1 $\Omega$ to 180 k $\Omega$                                              | $\pm 5 \%$ , $\pm 10 \%$ | 3650 V                                         |
|                         |                            | 3.0 $\Omega$ to 62 k $\Omega$                                            | -                                                                           | $\pm 2 \%$               | 2150 V                                         |
| ZWS 30/100 E            | 75 W                       | 2.4 $\Omega$ to 1.6 k $\Omega$                                           | 5.1 $\Omega$ to 56 k $\Omega$                                               | $\pm 5 \%$ , $\pm 10 \%$ | 2000 V                                         |
| ZWS 30/100 Ni           | 75 W                       | 2.0 $\Omega$ to 11 k $\Omega$                                            | 4.3 $\Omega$ to 30 k $\Omega$                                               | $\pm 5 \%$ , $\pm 10 \%$ | 1500 V                                         |
| ZWS 30/133              | 110 W                      | 3.3 $\Omega$ to 91 k $\Omega$                                            | 7.5 $\Omega$ to 240 k $\Omega$                                              | $\pm 5 \%$ , $\pm 10 \%$ | 5100 V                                         |
|                         |                            |                                                                          | -                                                                           | $\pm 2 \%$               | 3150 V                                         |
| ZWS 30/133 E            | 110 W                      | 3.3 $\Omega$ to 2.4 k $\Omega$                                           | 7.5 $\Omega$ to 82 k $\Omega$                                               | $\pm 5 \%$ , $\pm 10 \%$ | 3000 V                                         |
| ZWS 30/133 Ni           | 110 W                      | 2.7 $\Omega$ to 16 k $\Omega$                                            | 6.2 $\Omega$ to 43 k $\Omega$                                               | $\pm 5 \%$ , $\pm 10 \%$ | 2150 V                                         |

**Notes**

- The operating temperature range for these resistors is from -55 °C up to 250 °C.
- (1) Resistance values are to be selected for  $\pm 10 \%$  from the E12 series, and for  $\pm 5 \%$  and  $\pm 2 \%$  from the E24 series.
- (2) Depending on the resistance value, limited by  $\sqrt{P \times R}$

| TERMINALS                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                           |  |  |
|---------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|---------------------------|--|--|
|                                             | SL                                                                                | SS                                                                                | SB                                                                                 | SSB                                                                                 | FST                                                                                 |                           |  |  |
|                                             |  |  |  |  |  |                           |  |  |
| TYPE / VARIANT                              | Lug for soldering                                                                 | Screw terminal                                                                    | Terminal with 2 screws, one for electrical, and one for mechanical connection      | Terminal with bolt and 2 hexnuts                                                    | Fast on terminal with 6.3 mm x 0.8 mm DIN 46244                                     |                           |  |  |
| ZWS 6<br>ZWS 6 E<br>ZWS 6 Ni                | e = 1.5 mm                                                                        | -                                                                                 | -                                                                                  | -                                                                                   | -                                                                                   |                           |  |  |
| ZWS 8<br>ZWS 8 E<br>ZWS 8 Ni                | e = 2.0 mm                                                                        | e = M3 x 16                                                                       |                                                                                    |                                                                                     |                                                                                     |                           |  |  |
| ZWS 12<br>ZWS 12 E<br>ZWS 12 Ni             |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                           |  |  |
| ZWS 15<br>ZWS 15 E<br>ZWS 15 Ni             |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                           |  |  |
| ZWS 20<br>ZWS 20 E<br>ZWS 20 Ni             |                                                                                   |                                                                                   | e = M3 x 16                                                                        |                                                                                     |                                                                                     | e = 1.65 mm<br>b = 6.3 mm |  |  |
| ZWS 35<br>ZWS 35 E<br>ZWS 35 Ni             |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                           |  |  |
| ZWS 50<br>ZWS 50 E<br>ZWS 50 Ni             | -                                                                                 | e = M4 x 20                                                                       | e = M4 x 20                                                                        | e = M4 x 20                                                                         |                                                                                     |                           |  |  |
| ZWS 100<br>ZWS 100 E<br>ZWS 100 Ni          |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                           |  |  |
| ZWS 150<br>ZWS 150 E<br>ZWS 150 Ni          |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                           |  |  |
| ZWS 250<br>ZWS 250 E<br>ZWS 250 Ni          |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                           |  |  |
| ZWS 30/100<br>ZWS 30/100 E<br>ZWS 30/100 Ni |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                           |  |  |
| ZWS 30/133<br>ZWS 30/133 E<br>ZWS 30/133 Ni |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                           |  |  |

**PACKAGING**

| TYPE | PACKAGING CODE | QUANTITY | FORMAT                             | DIMENSION OF PACKAGE                                      |
|------|----------------|----------|------------------------------------|-----------------------------------------------------------|
| All  | LX             | Variable | Bulk, separately packed with paper | Box size selection according to quantity and product size |

**PART NUMBER AND PRODUCT DESCRIPTION**

Part Number: ZWS006331001KLX000

|   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Z | W | S | 0 | 0 | 6 | 3 | 3 | 1 | 0 | 0 | 1 | K | L | X | 0 | 0 | 0 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|

| TYPE                                                                                                                                                                                                                                                                                                                          | VARIANT / TERMINAL                                                                                                                                                                   | TCR / MATERIAL                                                                                  | RESISTANCE                                                                                                                                                                                                                                                            | TOLERANCE                                                             | PACKAGING                                        | SPECIAL                                                                                           |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------|--------------------------------------------------|---------------------------------------------------------------------------------------------------|
| <b>ZWS006</b> = ZWS 6<br><b>ZWS008</b> = ZWS 8<br><b>ZWS012</b> = ZWS 12<br><b>ZWS015</b> = ZWS 15<br><b>ZWS020</b> = ZWS 20<br><b>ZWS035</b> = ZWS 35<br><b>ZWS050</b> = ZWS 50<br><b>ZWS100</b> = ZWS 100<br><b>ZWS150</b> = ZWS 150<br><b>ZWS250</b> = ZWS 250<br><b>ZWSN84</b> = ZWS 30/100<br><b>ZWSN91</b> = ZWS 30/133 | <b>3</b> = SL<br><b>4</b> = SS<br><b>5</b> = SB<br><b>6</b> = SSB<br><b>7</b> = FST<br><b>8</b> = E SL<br><b>9</b> = E SS<br><b>A</b> = E SB<br><b>B</b> = E SSB<br><b>C</b> = E FST | <b>1</b> = WM50<br>-10 ppm/K to<br>-80 ppm/K<br><b>3</b> = WM110<br>+100 ppm/K to<br>+180 ppm/K | <b>3 digit value</b><br><b>1 digit multiplier</b><br>MULTIPLIER<br><b>7</b> = $\cdot 10^{-3}$<br><b>8</b> = $\cdot 10^{-2}$<br><b>9</b> = $\cdot 10^{-1}$<br><b>0</b> = $\cdot 10^0$<br><b>1</b> = $\cdot 10^1$<br><b>2</b> = $\cdot 10^2$<br><b>3</b> = $\cdot 10^3$ | <b>G</b> = $\pm 2\%$<br><b>J</b> = $\pm 5\%$<br><b>K</b> = $\pm 10\%$ | <b>LX</b> =<br>loose pack<br>without<br>quantity | <b>000</b> = standard<br><b>3 digit code</b> =<br>customized version<br>Ni version <sup>(1)</sup> |

Product Description: ZWS 6 SL 3 1K0 10 %

| ZWS6                                                                                                                                                                                                  | SL                                                                                                                                           | 3                                   | 1K0                                                        | 10 %                                 |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------|------------------------------------------------------------|--------------------------------------|
| TYPE                                                                                                                                                                                                  | VARIANT / TERMINAL                                                                                                                           | TCR / MATERIAL                      | RESISTANCE                                                 | TOLERANCE                            |
| <b>ZWS6</b><br><b>ZWS8</b><br><b>ZWS12</b><br><b>ZWS15</b><br><b>ZWS20</b><br><b>ZWS35</b><br><b>ZWS50</b><br><b>ZWS100</b><br><b>ZWS150</b><br><b>ZWS250</b><br><b>ZWS30/100</b><br><b>ZWS30/133</b> | <b>SL</b><br><b>SS</b><br><b>SB</b><br><b>SSB</b><br><b>FST</b><br><b>E SL</b><br><b>E SS</b><br><b>E SB</b><br><b>E SSB</b><br><b>E FST</b> | <b>1</b> = WM50<br><b>3</b> = WM110 | <b>R15</b> = 0.15 $\Omega$<br><b>620K</b> = 620 k $\Omega$ | $\pm 2\%$<br>$\pm 5\%$<br>$\pm 10\%$ |

**Notes**

- The products can be ordered using either the PRODUCT DESCRIPTION or the PART NUMBER.
- <sup>(1)</sup> For special windings or the non-inductive (ZWS Ni) versions, please contact: [ww1resistors@vishay.com](mailto:ww1resistors@vishay.com).



## DESCRIPTION

The rugged design of cemented wirewound resistors enable them to withstand extreme high pulses and makes them well suited for use in high power / high current applications. Production is strictly controlled and follows an extensive set of instructions established for reproducibility. The winding is done with specific materials on a specially developed fine ceramic body ( $\text{Al}_2\text{O}_3$ ). With different diameters and turn spacings, a large ohmic value range can be offered. The ceramic used meets the highest requirements against mechanical resistance, thermal shock shocks, dielectric strength, and insulation resistance at high temperatures. The cement coating is fired layer by layer several times at high temperatures. The resulting cement coating is resistant to the cleaning solvents specified in IEC 60115-1 <sup>(1)</sup>.

The resistors are marked with type, resistance, and tolerance.

Product quality is verified by testing procedures, performed on all individual resistors.

The ZWS series meet single lot / date code packaging requirements.

## MATERIALS

Vishay acknowledges the following systems for the regulation of hazardous substances:

- IEC 62474, Material Declaration for Products of and for the Electrotechnical Industry, with the list of declarable substances given therein <sup>(2)</sup>
- The Global Automotive Declarable Substance List (GADSL) <sup>(3)</sup>
- The REACH regulation (1907/2006/EC) and the related list of substances with very high concern (SVHC) <sup>(4)</sup> for its supply chain

The products do not contain any of the banned substances as per IEC 62474, GADSL, or the SVHC list, see [www.vishay.com/how/leadfree](http://www.vishay.com/how/leadfree).

Hence the products fully comply with the following directives:

- 2000/53/EC End-of-Life Vehicle Directive (ELV) and Annex II (ELV II)
- 2011/65/EU Restriction of the Use of Hazardous Substances Directive (RoHS) with amendment 2015/863/EU
- 2012/19/EU Waste Electrical and Electronic Equipment Directive (WEEE)

Vishay pursues the elimination of conflict minerals from its supply chain, see the Conflict Minerals Policy at [www.vishay.com/doc?49037](http://www.vishay.com/doc?49037).

## Notes

- <sup>(1)</sup> Other cleaning solvents with aggressive chemicals should be evaluated in actual cleaning process for their suitability.
- <sup>(2)</sup> The IEC 62474 list of declarable substances is maintained in a dedicated database, which is available at <http://std.iec.ch/iec62474>.
- <sup>(3)</sup> The Global Automotive Declarable Substance List (GADSL) is maintained by the American Chemistry Council, and available at [www.gadsl.org](http://www.gadsl.org).
- <sup>(4)</sup> The SVHC list is maintained by the European Chemical Agency (ECHA) and available at <http://echa.europa.eu/candidate-list-table>.

## ASSEMBLY

The resistors are available with lug style terminals (SL style) for soldering, multiple screw terminal options (SS style, SB style, or SSB style) for mechanical and electrical fixing, or fast plug terminals (FST style) for assembly / disassembly processes. The terminals of the resistors are completely lead (Pb)-free. The special tin plating used provides compatibility with lead (Pb)-free and lead-containing soldering processes.

3D-Models are available on request, please inquire at [ww1resistors@vishay.com](mailto:ww1resistors@vishay.com).

Different mounting accessories are available, see the datasheet: [www.vishay.com/doc?21015](http://www.vishay.com/doc?21015).

The slider of the adjustable type should be only moved after removal of voltage and sufficient loosening of the screw.

## APPLICATION INFORMATION

The power dissipation of the resistor generates a temperature rise with respect to the ambient. The permissible dissipation is derated for temperatures above 40°C, as shown in the derating diagram, in order to avoid overheating of the resistor. The heat dissipated from the resistor may affect adjacent components, hence proper clearance will be required in order to avoid overheating.

All materials used are non-flammable and inorganic according to UL 94-V0.

These resistors do not feature a limited lifetime when operated within the permissible limits. However, resistance value drift increasing over operating time may result in exceeding a limit acceptable to the specific application, thereby establishing a functional lifetime.

## RELATED PRODUCTS

In higher continuous power applications and more demanding environmental conditions the vitreous coated alternative, like the GWS series might be suitable, see the datasheet:

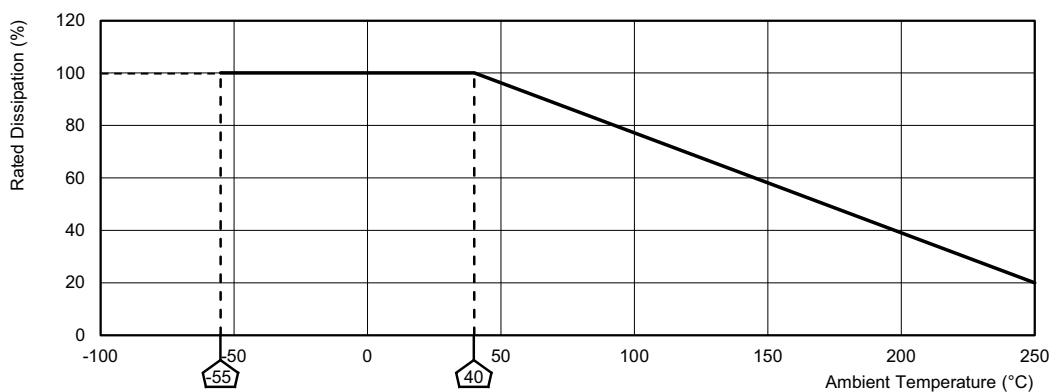
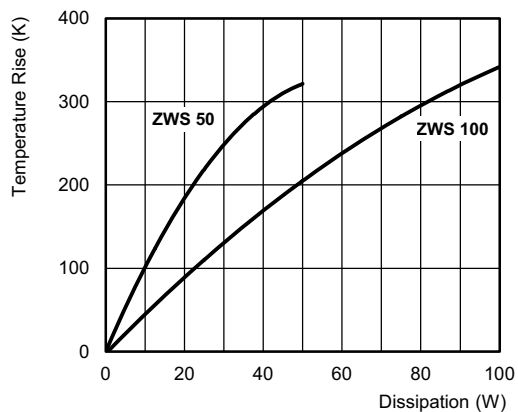
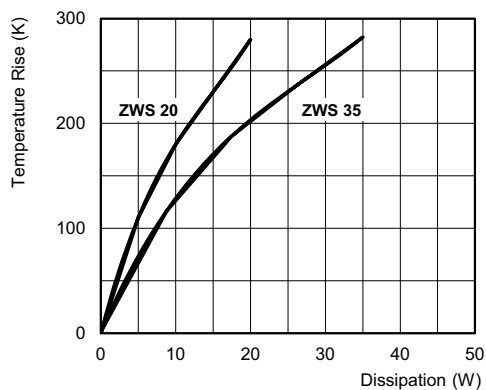
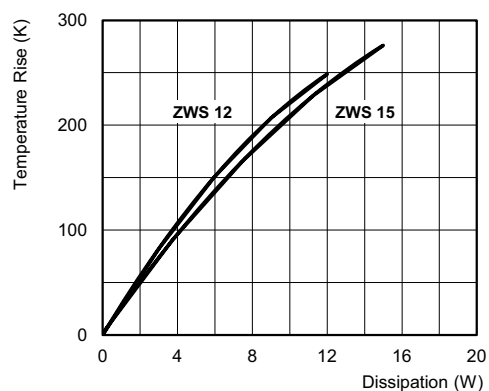
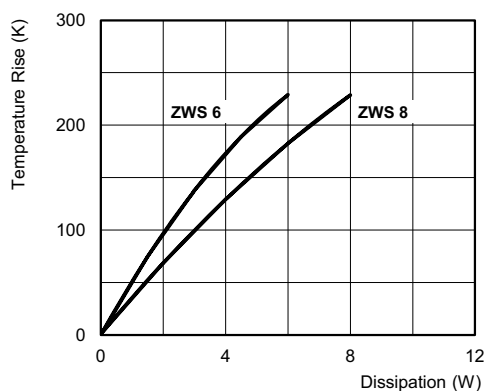
“Vitreous Wirewound Resistors with Lugs”

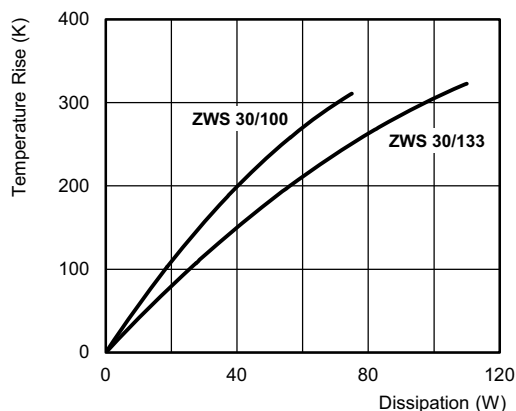
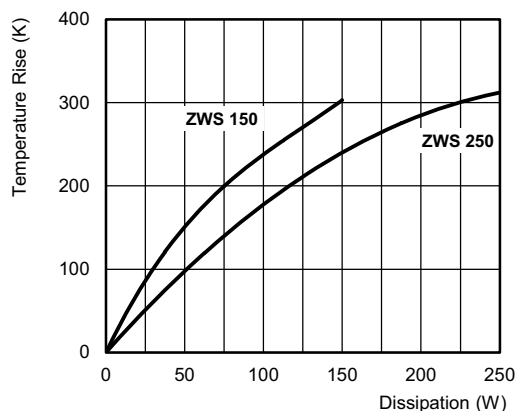
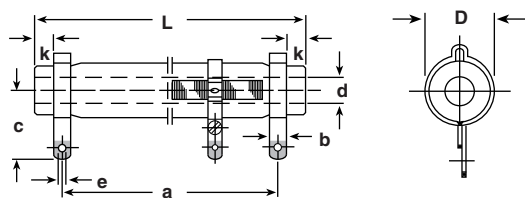
[www.vishay.com/doc?21003](http://www.vishay.com/doc?21003)

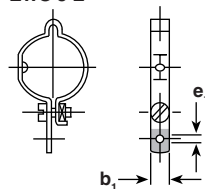
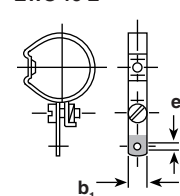
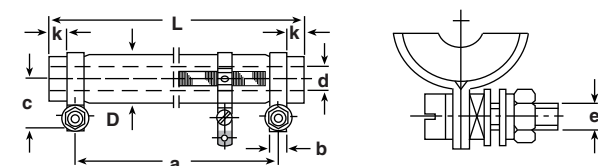
For low ohmic values and rated dissipation up to 500 W, there is the cemented coated ZBS series, see the datasheet:

“Cemented Wirewound Resistors with Corrugated Ribbon”

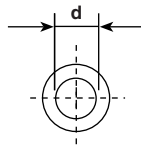
[www.vishay.com/doc?21011](http://www.vishay.com/doc?21011)

**DERATING**

**TEMPERATURE RISE**


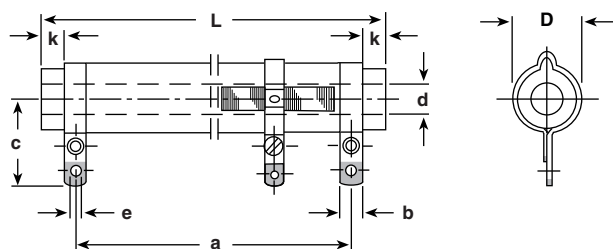
**TEMPERATURE RISE**

**DIMENSIONS AND MASS for ZWS 6, ZWS 8, ZWS 12, and ZWS 15**
**PRODUCTS WITH SL TERMINALS**

**ADJUSTABLE LUGS**

ZWS 6 E  
ZWS 8 E

ZWS 12 E  
ZWS 15 E

**PRODUCTS WITH SS TERMINALS**

**CORE SECTION**

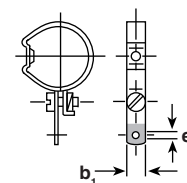
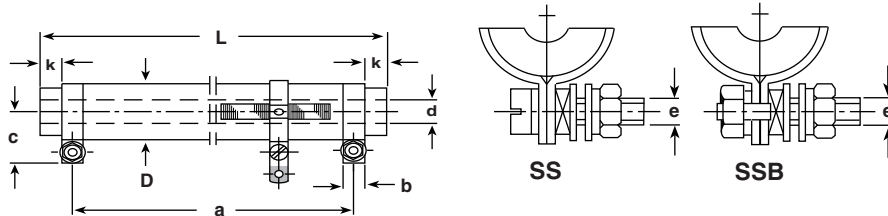
ZWS 6 ... ZWS15



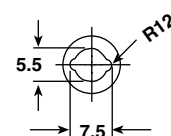
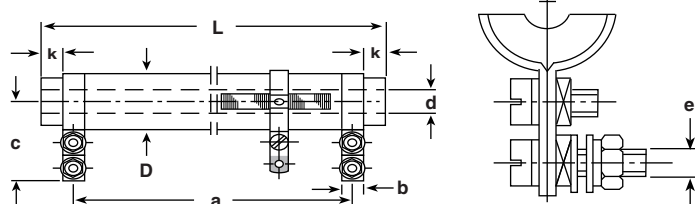
| TYPE / VARIANT                  | TERMINAL | D (mm)     | L (mm)     | a (mm)     | b (mm) | b <sub>1</sub> (mm) | c (mm) | d (mm) | e (mm)  | e <sub>1</sub> (mm) | k (mm) | MASS (g) |
|---------------------------------|----------|------------|------------|------------|--------|---------------------|--------|--------|---------|---------------------|--------|----------|
| ZWS 6<br>ZWS 6 E<br>ZWS 6 Ni    | SL       | 7.5 ± 0.5  | 45.0 ± 1.5 | 36.0 ± 2.0 | 4.0    | 4.0                 | 15.5   | 2.6    | 1.5     | 2.8                 | 2.5    | 5.0      |
| ZWS 8<br>ZWS 8 E<br>ZWS 8 Ni    | SL       | 9.5 ± 0.5  | 50.0 ± 1.5 | 39.0 ± 2.0 | 4.0    | 4.0                 | 18.0   | 3.5    | 2.0     | 2.8                 | 3.5    | 6.5      |
|                                 | SS       |            |            | 40.0 ± 2.0 | 5.0    | 4.0                 | 10.5   | 3.5    | M3 x 12 | 2.8                 | 2.5    |          |
| ZWS 12<br>ZWS 12 E<br>ZWS 12 Ni | SL       | 11.8 ± 0.8 | 55.0 ± 1.5 | 43.0 ± 2.0 | 4.0    | 5.0                 | 19.0   | 5.5    | 2.0     | 2.8                 | 4.0    | 11.5     |
|                                 | SS       |            |            | 44.0 ± 2.0 | 5.0    | 5.0                 | 11.5   | 5.5    | M3 x 12 | 2.8                 | 3.0    |          |
| ZWS 15<br>ZWS 15 E<br>ZWS 15 Ni | SL       | 11.8 ± 0.8 | 62.0 ± 2.0 | 50.0 ± 2.0 | 4.0    | 5.0                 | 19.0   | 5.5    | 2.0     | 2.8                 | 4.0    | 12.5     |
|                                 | SS       |            |            | 51.0 ± 2.0 | 5.0    | 5.0                 | 11.5   | 5.5    | M3 x 12 | 2.8                 | 3.0    |          |

**DIMENSIONS AND MASS for ZWS 20, ZWS 35, and ZWS 50**
**PRODUCTS WITH SL TERMINALS**

**ADJUSTABLE LUGS**

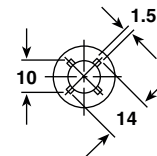
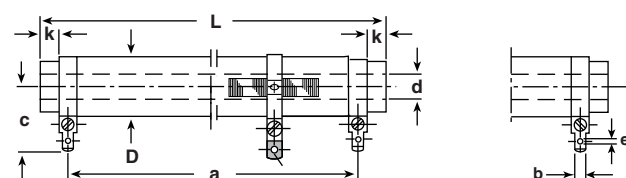
ZWS 20 E ... ZWS 50 E


**PRODUCTS WITH SS AND SSB TERMINALS**

**CORE SECTION**

ZWS 20 ... ZWS 35

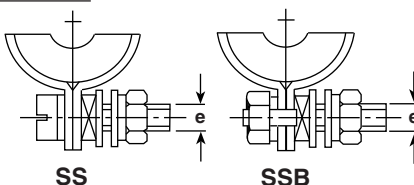
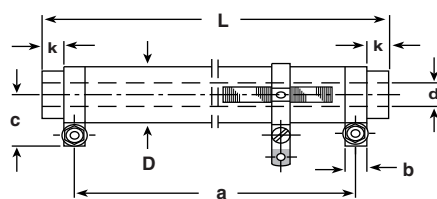

**PRODUCTS WITH SB TERMINALS**

**CORE SECTION**

ZWS 50

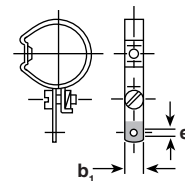
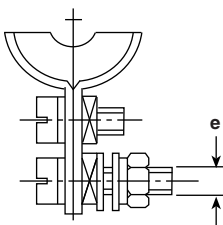
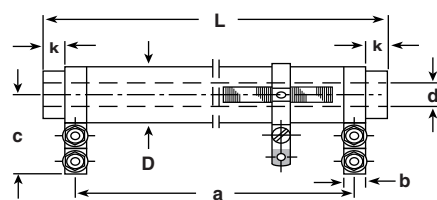

**PRODUCTS WITH FST TERMINALS**


| TYPE / VARIANT                  | TERMINAL | D (mm)     | L (mm)      | a (mm)     | b (mm) | b <sub>1</sub> (mm) | c (mm) | d (mm) | e (mm)  | e <sub>1</sub> (mm) | k (mm) | MASS (g) |
|---------------------------------|----------|------------|-------------|------------|--------|---------------------|--------|--------|---------|---------------------|--------|----------|
| ZWS 20<br>ZWS 20 E<br>ZWS 20 Ni | SL       | 14.8 ± 0.8 | 62.0 ± 2.0  | 50.0 ± 2.0 | 4.0    | 5.0                 | 20.5   | 5.5    | 2.0     | 3.2                 | 4.0    | 25.0     |
|                                 | SS       |            |             | 51.0 ± 2.0 | 5.0    | 5.0                 | 13.0   | 5.5    | M3 x 12 | 3.2                 | 3.0    |          |
|                                 | SB       |            |             | 51.0 ± 2.0 | 5.0    | 5.0                 | 23.0   | 5.5    | M3 x 12 | 3.2                 | 3.0    |          |
|                                 | FST      |            |             | 48.0 ± 2.0 | 6.3    | 5.0                 | 23.5   | 5.5    | 1.65    | 3.2                 | 3.0    |          |
| ZWS 35<br>ZWS 35 E<br>ZWS 35 Ni | SL       | 14.8 ± 0.8 | 100.0 ± 2.0 | 86.0 ± 2.0 | 4.0    | 5.0                 | 20.5   | 5.5    | 2.0     | 3.2                 | 5.0    | 33.0     |
|                                 | SS       |            |             | 87.0 ± 2.0 | 5.0    | 5.0                 | 13.0   | 5.5    | M3 x 12 | 3.2                 | 4.0    |          |
|                                 | SB       |            |             | 87.0 ± 2.0 | 5.0    | 5.0                 | 23.0   | 5.5    | M3 x 12 | 3.2                 | 4.0    |          |
|                                 | FST      |            |             | 84.0 ± 2.0 | 6.3    | 5.0                 | 23.5   | 5.5    | 1.65    | 3.2                 | 4.0    |          |
| ZWS 50<br>ZWS 50 E<br>ZWS 50 Ni | SS       | 22.3 ± 1.3 | 100.0 ± 2.0 | 72.0 ± 2.0 | 8.0    | 5.0                 | 18.5   | 10.0   | M4 x 16 | 3.2                 | 10.0   | 80.0     |
|                                 | SSB      |            |             | 72.0 ± 2.0 | 8.0    | 5.0                 | 18.5   | 10.0   | M4 x 16 | 3.2                 | 10.0   |          |
|                                 | SB       |            |             | 72.0 ± 2.0 | 8.0    | 5.0                 | 29.5   | 10.0   | M4 x 16 | 3.2                 | 10.0   |          |
|                                 | FST      |            |             | 72.0 ± 2.0 | 6.3    | 5.0                 | 27.0   | 10.0   | 1.65    | 3.2                 | 10.0   |          |

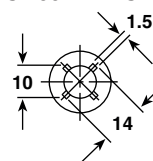
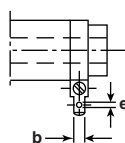
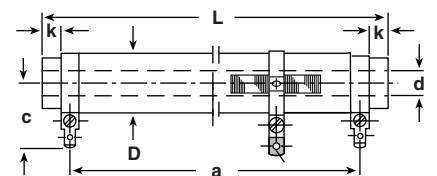
**DIMENSIONS AND MASS** for ZWS 100, ZWS 150, and ZWS 250

**PRODUCTS WITH SS AND SSB TERMINALS**

**ADJUSTABLE LUGS**

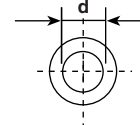
ZWS 100 E...ZWS 250 E


**PRODUCTS WITH SB TERMINALS**

**CORE SECTION**

ZWS 100 ... ZWS 150

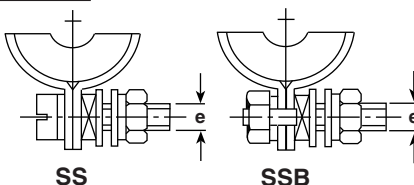
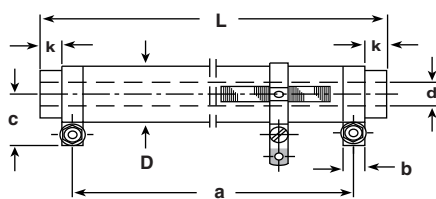

**PRODUCTS WITH FST TERMINALS**

**CORE SECTION**

ZWS 250

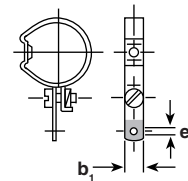
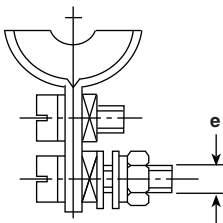
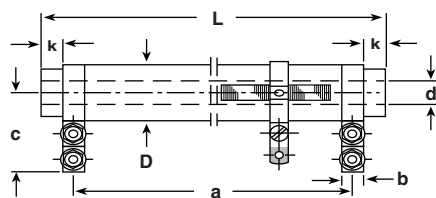


| TYPE / VARIANT                     | TERMINAL | D (mm)     | L (mm)      | a (mm)      | b (mm) | b <sub>1</sub> (mm) | c (mm) | d (mm) | e (mm)  | e <sub>1</sub> (mm) | k (mm) | MASS (g) |
|------------------------------------|----------|------------|-------------|-------------|--------|---------------------|--------|--------|---------|---------------------|--------|----------|
| ZWS 100<br>ZWS 100 E<br>ZWS 100 Ni | SS       | 22.3 ± 1.3 | 165.0 ± 2.0 | 136.0 ± 2.0 | 8.0    | 5.0                 | 18.5   | 10.0   | M4 x 16 | 3.2                 | 10.5   | 113.0    |
|                                    | SSB      |            |             |             | 8.0    | 5.0                 | 18.5   | 10.0   | M4 x 18 | 3.2                 | 10.5   |          |
|                                    | SB       |            |             |             | 8.0    | 5.0                 | 29.5   | 10.0   | M4 x 16 | 3.2                 | 10.5   |          |
|                                    | FST      |            |             |             | 6.3    | 5.0                 | 27.0   | 10.0   | 1.65    | 3.2                 | 10.5   |          |
| ZWS 150<br>ZWS 150 E<br>ZWS 150 Ni | SS       | 22.3 ± 1.3 | 265.0 ± 4.0 | 235.0 ± 2.0 | 8.0    | 5.0                 | 18.5   | 10.0   | M4 x 16 | 3.2                 | 10.5   | 194.0    |
|                                    | SSB      |            |             |             | 8.0    | 5.0                 | 18.5   | 10.0   | M4 x 18 | 3.2                 | 10.5   |          |
|                                    | SB       |            |             |             | 8.0    | 5.0                 | 29.5   | 10.0   | M4 x 16 | 3.2                 | 10.5   |          |
|                                    | FST      |            |             |             | 6.3    | 5.0                 | 27.0   | 10.0   | 1.65    | 3.2                 | 10.5   |          |
| ZWS 250<br>ZWS 250 E<br>ZWS 250 Ni | SS       | 32.5 ± 1.5 | 330.0 ± 5.0 | 280.0 ± 2.0 | 8.0    | 8.0                 | 23.5   | 20.0   | M4 x 16 | 4.2                 | 21.0   | 375.0    |
|                                    | SSB      |            |             |             | 8.0    | 8.0                 | 23.5   | 20.0   | M4 x 18 | 4.2                 | 21.0   |          |
|                                    | SB       |            |             |             | 8.0    | 8.0                 | 35.0   | 20.0   | M4 x 16 | 4.2                 | 21.0   |          |
|                                    | FST      |            |             |             | 6.3    | 8.0                 | 31.5   | 20.0   | 1.65    | 4.2                 | 21.0   |          |

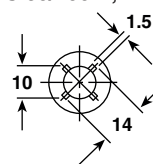
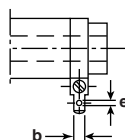
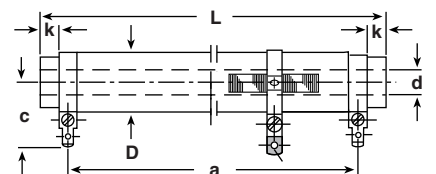
**DIMENSIONS AND MASS** for ZWS 30/100, and ZWS 30/133

**PRODUCTS WITH SS AND SSB TERMINALS**

**ADJUSTABLE LUGS**

ZWS 30/100 E; ZWS 30/133 E


**PRODUCTS WITH SB TERMINALS**

**CORE SECTION**

ZWS 30/100 E; ZWS 30/133 E


**PRODUCTS WITH FST TERMINALS**


| TYPE / VARIANT                              | TERMINAL | D (mm)     | L (mm)      | a (mm)      | b (mm) | b <sub>1</sub> (mm) | c (mm) | d (mm) | e (mm)  | e <sub>1</sub> (mm) | k (mm) | MASS (g) |
|---------------------------------------------|----------|------------|-------------|-------------|--------|---------------------|--------|--------|---------|---------------------|--------|----------|
| ZWS 30/100<br>ZWS 30/100 E<br>ZWS 30/100 Ni | SS       | 32.5 ± 1.5 | 100.0 ± 2.5 | 85.0 ± 2.0  | 8.0    | 8.0                 | 23.5   | 14.0   | M4 x 16 | 4.2                 | 3.5    | 167.0    |
|                                             | SSB      |            |             |             | 8.0    | 8.0                 | 23.5   |        | M4 x 18 | 4.2                 | 3.5    |          |
|                                             | SB       |            |             |             | 8.0    | 8.0                 | 35.0   |        | M4 x 16 | 4.2                 | 3.5    |          |
|                                             | FST      |            |             |             | 6.3    | 8.0                 | 31.5   |        | 1.65    | 4.2                 | 3.5    |          |
| ZWS 30/133<br>ZWS 30/133 E<br>ZWS 30/133 Ni | SS       | 32.5 ± 1.5 | 133.0 ± 3.0 | 118.0 ± 2.0 | 8.0    | 8.0                 | 23.5   | 14.0   | M4 x 16 | 4.2                 | 3.5    | 212.0    |
|                                             | SSB      |            |             |             | 8.0    | 8.0                 | 23.5   |        | M4 x 18 | 4.2                 | 3.5    |          |
|                                             | SB       |            |             |             | 8.0    | 8.0                 | 35.0   |        | M4 x 16 | 4.2                 | 3.5    |          |
|                                             | FST      |            |             |             | 6.3    | 8.0                 | 31.5   |        | 1.65    | 4.2                 | 3.5    |          |



## Disclaimer

ALL PRODUCT, PRODUCT SPECIFICATIONS AND DATA ARE SUBJECT TO CHANGE WITHOUT NOTICE TO IMPROVE RELIABILITY, FUNCTION OR DESIGN OR OTHERWISE.

Vishay Intertechnology, Inc., its affiliates, agents, and employees, and all persons acting on its or their behalf (collectively, "Vishay"), disclaim any and all liability for any errors, inaccuracies or incompleteness contained in any datasheet or in any other disclosure relating to any product.

Vishay makes no warranty, representation or guarantee regarding the suitability of the products for any particular purpose or the continuing production of any product. To the maximum extent permitted by applicable law, Vishay disclaims (i) any and all liability arising out of the application or use of any product, (ii) any and all liability, including without limitation special, consequential or incidental damages, and (iii) any and all implied warranties, including warranties of fitness for particular purpose, non-infringement and merchantability.

Statements regarding the suitability of products for certain types of applications are based on Vishay's knowledge of typical requirements that are often placed on Vishay products in generic applications. Such statements are not binding statements about the suitability of products for a particular application. It is the customer's responsibility to validate that a particular product with the properties described in the product specification is suitable for use in a particular application. Parameters provided in datasheets and / or specifications may vary in different applications and performance may vary over time. All operating parameters, including typical parameters, must be validated for each customer application by the customer's technical experts. Product specifications do not expand or otherwise modify Vishay's terms and conditions of purchase, including but not limited to the warranty expressed therein.

Hyperlinks included in this datasheet may direct users to third-party websites. These links are provided as a convenience and for informational purposes only. Inclusion of these hyperlinks does not constitute an endorsement or an approval by Vishay of any of the products, services or opinions of the corporation, organization or individual associated with the third-party website. Vishay disclaims any and all liability and bears no responsibility for the accuracy, legality or content of the third-party website or for that of subsequent links.

Vishay products are not designed for use in life-saving or life-sustaining applications or any application in which the failure of the Vishay product could result in personal injury or death unless specifically qualified in writing by Vishay. Customers using or selling Vishay products not expressly indicated for use in such applications do so at their own risk. Please contact authorized Vishay personnel to obtain written terms and conditions regarding products designed for such applications.

No license, express or implied, by estoppel or otherwise, to any intellectual property rights is granted by this document or by any conduct of Vishay. Product names and markings noted herein may be trademarks of their respective owners.