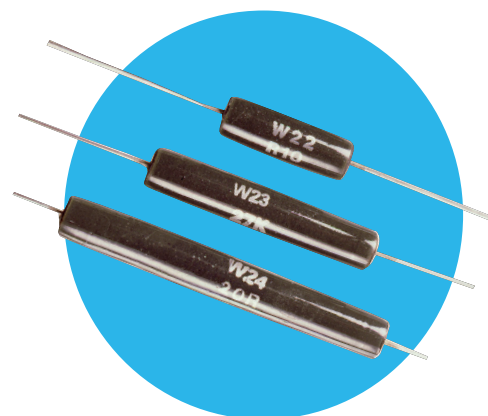


## Vitreous Enamelled Wirewound Resistors

### W20 Series

- CECC approved
- Suitable for harsh environments
- Impervious lead free vitreous enamel coating
- Overload characteristics ideal for protection circuits
- High stability and reliability
- High power dissipation for size



 All Pb-free parts comply with EU Directive 2011/65/EU amended by (EU) 2015/863 (RoHS3)

## Electrical Data

| Commercial           |              |        | W21             | W215       | W22        | W23           | W24         |
|----------------------|--------------|--------|-----------------|------------|------------|---------------|-------------|
| Power rating at 25°C |              | watts  | 3.0             | 5.0        | 7.0        | 10.5          | 14.0        |
| Resistance range at  | 1% tolerance | ohms   | 1R to 10K       | 1R to 15K  | 1R to 22K  | 1R to 60K     | 1R to 100K  |
|                      | 2% tolerance | ohms   | 0R5 to 10K      | 0R5 to 15K | 0R5 to 22K | 1R to 60K     | 1R to 100K  |
|                      | 5% tolerance | ohms   | 0R1 to 10K      | 0R1 to 15K | 0R1 to 22K | 0R15 to 60K   | 0R2 to 100K |
| TCR (-55° to 200°C)  |              | ppm/°C | Typically: <+75 |            |            | Maximum: +200 |             |

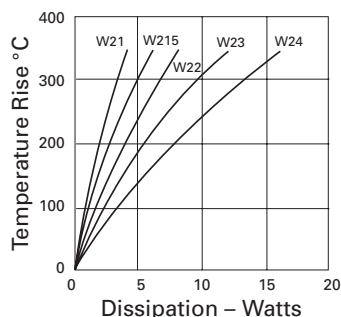
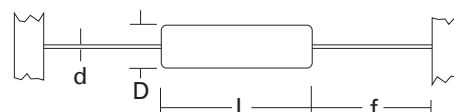
| BS CECC 40-201-002 Requirements |              |        | JB                      | HB         | KB         | LB             | MB          |
|---------------------------------|--------------|--------|-------------------------|------------|------------|----------------|-------------|
| Power rating at 25°C            |              | watts  | 2.9                     | 5.0        | 7.0        | 10.5           | 14.0        |
| Power rating at 70°C            |              | watts  | 2.5                     | 4.3        | 6.0        | 9.0            | 12.0        |
| Resistance range at             | 1% tolerance | ohms   | 1R to 10K               | 1R to 15K  | 1R to 20K  | 1R to 56K      | 1R to 100K  |
|                                 | 2% tolerance | ohms   | 0R5 to 10K              | 0R5 to 15K | 0R5 to 20K | 1R to 56K      | 1R to 100K  |
|                                 | 5% tolerance | ohms   | 0R1 to 10K              | 0R1 to 15K | 0R1 to 20K | 0R15 to 56K    | 0R2 to 100K |
| TCR (-55° to 200°C)             |              | ppm/°C | ≥5 ohms < 10 ohms: ±400 |            |            | ≥10 ohms: ±200 |             |

This table indicates the CECC specification requirements, and these are met or exceeded by the corresponding W20 series products

| Applicable to commercial and approved ranges |         |                                              |     |     |     |     |
|----------------------------------------------|---------|----------------------------------------------|-----|-----|-----|-----|
| Limiting element voltage                     | volts   | 100                                          | 160 | 200 | 500 | 750 |
| Standard values                              |         | E24 preferred. Other values to special order |     |     |     |     |
| Thermal impedance                            | °C/watt | 88                                           | 58  | 44  | 29  | 22  |
| Ambient temperature range                    | °C      | -55 to 200                                   |     |     |     |     |

## Physical Data

| Dimensions (mm) and Weight (g) |       |       |       |       |        |
|--------------------------------|-------|-------|-------|-------|--------|
| Type                           | L max | D max | f min | d nom | Wt.nom |
| W21                            | 12.7  | 5.6   | 22.75 | 0.8   | 1      |
| W215                           | 22.0  | 7.0   | 23.1  | 0.8   | 2      |
| W22                            | 22.0  | 8.0   | 23.1  | 0.8   | 2      |
| W23                            | 38.0  | 8.0   | -     | 0.8   | 3.5    |
| W24                            | 53.5  | 8.0   | -     | 0.8   | 5      |



### Construction

A high purity ceramic substrate is assembled with interference fit end caps to which are welded the termination wires. The resistive element is wound on the substrate and welded to the caps; the vitreous enamel protective coating is then applied.

### Terminations

**Material** Copper clad steel wire, nickel plated and solder-coated.

**Strength** The terminations meet the requirements of IEC 68.2.21.

**Solderability** The terminations meet the requirements of IEC 115-1, Clause 4.17.3.2.

**Length** W23's and W24's are not supplied on tape. Minimum lead length is 30 mm.

### Marking

The resistors are legend marked with type reference, resistance value and tolerance. Values are marked in accordance with IEC 62.

### General Note

TT Electronics reserves the right to make changes in product specification without notice or liability.

All information is subject to TT Electronics' own data and is considered accurate at time of going to print.

## W20 Series

### Solvent Resistance

The body protection and marking are resistant to all normal industrial cleaning solvents suitable for printed circuits

### Flammability

All materials used in the construction of W20 series resistors are inorganic and inherently non-burning.

## Performance Data

|                                             |              | CECC 40201-002     | Actual Performance |          |
|---------------------------------------------|--------------|--------------------|--------------------|----------|
|                                             |              | Requirements       | Maximum            | Typical  |
| Load at commercial rating: 1000 hrs at 25°C | $\Delta R\%$ |                    | 5                  | 3.5      |
| Load at CECC rating: 1000 hours at 25°C     | $\Delta R\%$ | 5                  | 5                  | 3.5      |
| Dry heat: 1000 hours at 200°C               | $\Delta R\%$ | 5                  | 2                  | 1        |
| Shelf life: 12 months at room temperature   | $\Delta R\%$ | not specified      | 0.03               | 0.02     |
| Derating                                    |              | see derating curve |                    |          |
| Short term overload                         | $\Delta R\%$ | 1                  | 1.0                | 0.2      |
| Climatic                                    | $\Delta R\%$ | 5                  | 0.5                | 0.2      |
| Climatic category                           | $\Delta R\%$ | 55/200/56          |                    |          |
| Long term damp heat                         | $\Delta R\%$ | 5                  | 0.05               | 0.02     |
| Temperature rapid change                    | $\Delta R\%$ | 1                  | 0.5                | 0.2      |
| Resistance to solder heat                   | $\Delta R\%$ | 1                  | 0.25               | 0.03     |
| Vibration and bump                          | $\Delta R\%$ | 1                  | 0.25               | 0.05     |
| Noise (in decade of frequency)              | $\mu v/v$    | not specified      | zero               | zero     |
| Robustness                                  | $\Delta R\%$ | 1                  | 0.4                | 0.05     |
| Insulation resistance                       | ohms         | not specified      | > 1G ohm           | > 1G ohm |
| Voltage Proof                               | volts        | not specified      | 500 min            | 500 min  |
| Pulse handling                              |              |                    |                    |          |

Data available at: <https://www.ttelectronics.com/TTElectronics/media/ProductFiles/Resistors/ApplicationNotes/Wirewound-Pulse-Overload-Resistors.pdf>

## Application Notes

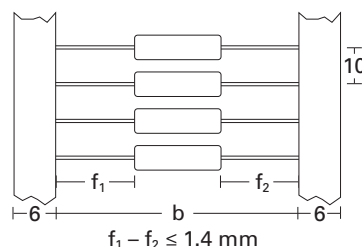
The termination should not be bent closer than 1.6mm from the body, and the recommended minimum bend radius is 1.2mm. The terminations are solderable to within 4mm from the body. When cold, vitreous enamel has excellent insulation resistance. In common with all insulants the specific resistance of the enamel decreases with increase in temperature.

Therefore, resistors operated at near maximum temperature cannot be classed as insulated and should not be used in contact with any conducting material. Care must be taken when determining clearance distance between the resistor body and the printed circuit board or other components to ensure these are not over heated. Resistance is measured 6mm from body.



### Packaging

For W21 and W215 the standard method of packaging is taped in Ammo Packs. For W22 the standard method of packaging is taped and reeled. W23's and W24's are available only as loose packed in boxes.



| Type | b    |
|------|------|
| W21  | 63±2 |
| W215 | 73±2 |
| W22  | 73±2 |

### General Note

TT Electronics reserves the right to make changes in product specification without notice or liability.  
All information is subject to TT Electronics' own data and is considered accurate at time of going to print.

W20 Series

Ordering Procedure

Example: W22-3K3JI (W22, 3.3 kilohms  $\pm 5\%$ , Pb-free)

|   |   |   |   |   |   |   |   |   |
|---|---|---|---|---|---|---|---|---|
| W | 2 | 2 | - | 3 | K | 3 | J | I |
| 1 |   |   |   | 2 |   | 3 | 4 |   |

| 1<br>Type | 2<br>Value           | 3<br>Tolerance | 4<br>Packing & Termination Finish |          |
|-----------|----------------------|----------------|-----------------------------------|----------|
| W21       | E24 = 3/4 characters | F = $\pm 1\%$  | I = Standard packing & Pb-free    |          |
| W215      | R = ohms             | G = $\pm 2\%$  | PB = Standard packing & SnPb      |          |
| W22       | K = kilohms          | J = $\pm 5\%$  | W21, W215                         | 1000/box |
| W23       |                      |                | W22                               | 700/reel |
| W24       |                      |                | W23, W24                          | 50/box   |

For CECC released product state on order the CECC number and style. Example: W22-3K3JI CECC40201-002 KB

General Note

TT Electronics reserves the right to make changes in product specification without notice or liability.  
All information is subject to TT Electronics' own data and is considered accurate at time of going to print.



**Стандарт  
Электрон  
Связь**

Мы молодая и активно развивающаяся компания в области поставок электронных компонентов. Мы поставляем электронные компоненты отечественного и импортного производства напрямую от производителей и с крупнейших складов мира.

Благодаря сотрудничеству с мировыми поставщиками мы осуществляем комплексные и плановые поставки широчайшего спектра электронных компонентов.

Собственная эффективная логистика и склад в обеспечивает надежную поставку продукции в точно указанные сроки по всей России.

Мы осуществляем техническую поддержку нашим клиентам и предпродажную проверку качества продукции. На все поставляемые продукты мы предоставляем гарантию .

Осуществляем поставки продукции под контролем ВП МО РФ на предприятия военно-промышленного комплекса России , а также работаем в рамках 275 ФЗ с открытием отдельных счетов в уполномоченном банке. Система менеджмента качества компании соответствует требованиям ГОСТ ISO 9001.

Минимальные сроки поставки, гибкие цены, неограниченный ассортимент и индивидуальный подход к клиентам являются основой для выстраивания долгосрочного и эффективного сотрудничества с предприятиями радиоэлектронной промышленности, предприятиями ВПК и научно-исследовательскими институтами России.

С нами вы становитесь еще успешнее!

**Наши контакты:**

**Телефон:** +7 812 627 14 35

**Электронная почта:** [sales@st-electron.ru](mailto:sales@st-electron.ru)

**Адрес:** 198099, Санкт-Петербург,  
Промышленная ул, дом № 19, литера Н,  
помещение 100-Н Офис 331