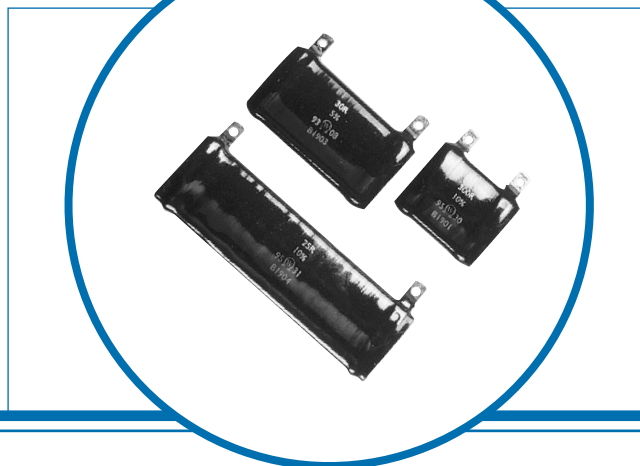


# Elliptical Vitreous Enamelled Wirewound Resistors

1900 Series

**OBSOLETE**

- High power-to-size ratio
- Fixed or tapped versions
- Pigtail, lug or wire terminations
- Mounting devices suitable for stacking of resistors
- Withstands high mechanical shock loads
- Suitable for pulse applications



## Electrical Data

Size ref.			1900	1901	1902	1903	1904
*Dissipation	200°C		8.5	9.5	11.0	12.0	20.0
to produce	ambient = 20°C	300°C	16	18	21	24	40
operating hotspot		375°C	23	26	30	35	56
temperature of	ambient = 70°C	375°C	18.5	21.0	24.0	27.0	43.0
Resistance range		±10%	1	1	2	2	4
	Min. resistance at	±5%	4	6	10	14	30
		±2%	20	40	60	60	60
		±1%	40	70	70	100	100
Limiting element voltage			140	250	400	530	1100

\*The stated dissipation applies to single resistors mounted as shown in Figure 5. See also graph of temperature rise/dissipation. See Application Notes for derating information concerning other mounting arrangements and for stacked resistors.

## Physical Data

Dimensions (mm) Table 1 (see figures 1 and 5)		
Size ref.	Resistor length A max	Fixing centres B nom.
1900	26.5	45
1901	32.5	51
1902	43.0	61
1903	52.0	70
1904	89.5	108

## Mechanical Data

### Terminations

#### Lugs (Figure 1)

Solder coated nickel iron.

Denoted by prefix 'B' to size reference, thus: B1902.

#### Lugs with screws, nuts and washers (Figure 2)

Screws and nuts are brass, nickel plated.

Denoted by prefix '4B', thus: 4B1902.

#### Pigtails (Figure 3)

14/193mm tinned copper, 160mm minimum length.

Denoted by prefix 'AP', thus: AP1902.

#### Rigid wires (Figure 4)

1.2mm diameter solder coated copper, 32mm minimum length.

Denoted by prefix 'AW', thus: AW1902.

### General Note

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

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Telephone: +44 (0) 1670 822181 · Facsimile: +44 (0) 1670 829465 · Email: info@welwyn-tt.com · Website: www.welwyn-tt.com

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## Manufactured Values

Available in any value within the specified resistance range.

## Standard Selection Tolerances

±10%, ±5%, ±2%, ±1%.

## Temperature Coefficient of Resistance

Typically +75ppm/°C and will not exceed +120ppm/°C

## Insulation Resistance

See Application Notes on page 133.

## Voltage Coefficient

Negligible.

## Noise

Current noise is zero.

**Vitreous enamelled wirewound resistors** are capable of withstanding a higher dissipation, size for size, than any other protected type; this is attributable to the higher operating temperature which the wire and enamel can withstand. The vitreous enamel provides exceptionally good protection to the wire element, and the resistors can safely be used in a wide range of harsh environmental conditions.

**The elliptical shape** of the former makes the 1900 Series suitable for positions with limited head clearance. The mounting bracket, which inserts into the tube bore and is in intimate contact with the ceramic, removes heat to the mounting plate while the aerofoil shape assists the passage of cooling air over the resistor surface.

**The Welwyn elliptical range** is based on five sizes of tube, each having a recommended maximum dissipation which will limit operating surface temperature to 375°C maximum.

Resistors can be supplied with fixed windings, or they may be tapped, and each is available with lug or wire terminations for soldered connections, or pigtailed for flexible connections. Suitable screws, nuts and spring washers can be supplied for the lugs.

**Mounting devices** are available which permit resistors to be stacked to provide a higher packing density.

**The stability and high reliability** of Welwyn elliptical vitreous enamelled resistors is a direct result of the best quality materials being used in their construction. High purity ceramic tubes have been matched to nickel iron alloy bands and specially formulated enamel to ensure that the resistors can withstand repeated heat cycling without damage. Connections between the resistance element and end bands are welded; terminations are brazed.

Figure 1

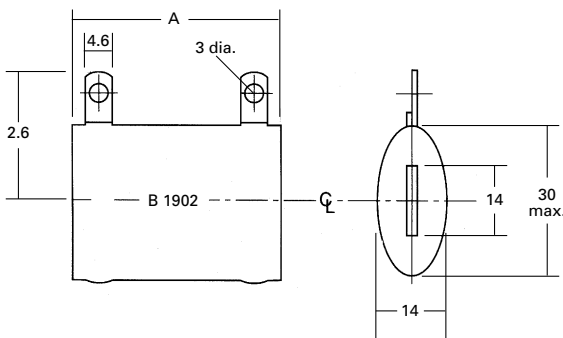


Figure 2

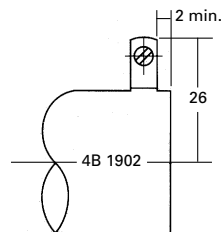


Figure 3

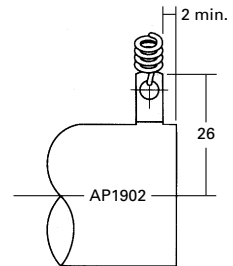


Figure 4

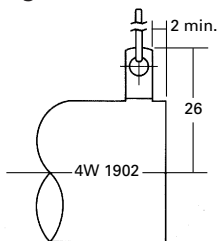


Figure 5

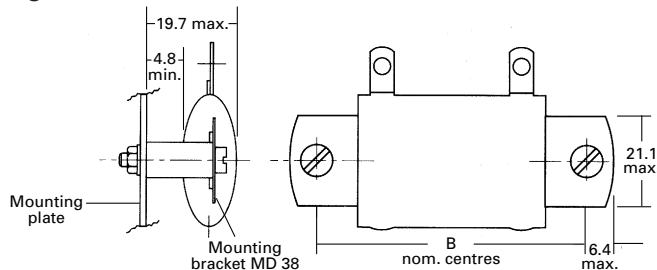
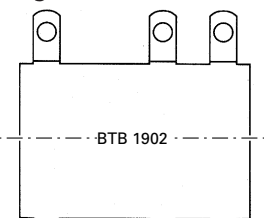


Figure 6



## Environmental Data

### Endurance

When operated at the recommended maximum dissipation, which will limit the hotspot temperature to 375°C, the change in resistance after 1,000 hours operation will not exceed ±5%. A lower hotspot temperature will give improved stability.

### Shelf Stability, 12 Months

The change in resistance will be less than 1%.

### Performance Under Humid Conditions

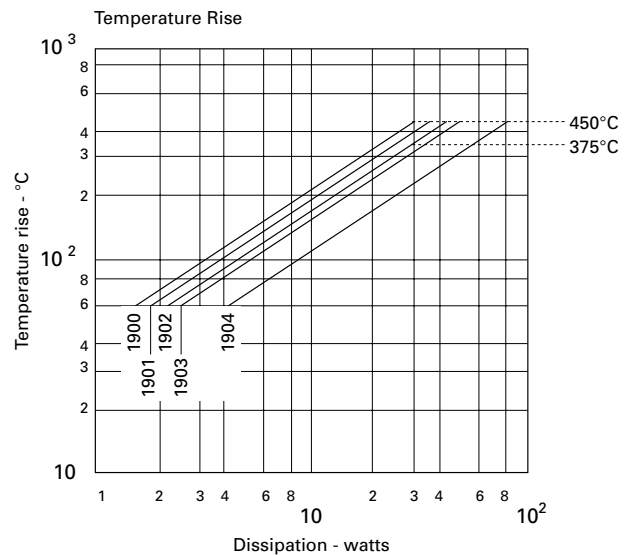
After 56 days in ambient and 90% to 95% relative humidity, the change in resistance will be less than 2%.

### Ordering Procedure

Specify full type reference, resistance value and tolerance, using IEC resistance code. E.g. B1902/10R ±5% is a resistor of size 1902 with B style lugs, 10Ω ±5%. Mounting devices are fully described below. See the section for ordering procedure, also Fig. 5.

### Pulse Handling Data

Contact factory for details.



## Tapped Resistors

Resistors can be supplied with tapping points. (See Figure 6). The addition of an extra terminal restricts the available winding length, hence the maximum total resistance is less than offered for a two terminal resistor of the same size. The reduction will be proportional to the number of taps and Table 3 is intended as a guide. For any section the minimum resistance is 1Ω and the standard selection tolerance ±10%.

Enquiries for tapped resistors should state the following details:

- Resistance per section. Maximum dissipation per section.
- Maximum operating temperature. Maximum permissible dimensions, if important.
- Type of terminations required.
- Proposed method of mounting; vertical or horizontal axis; flat or on edge. Details of stacking, where applicable.

Size ref.		1902	1903	1904
Maximum total dissipation with single tap	watts	21	5.8K	1
Maximum total resistance with single tap	ohms	5.8K	9.0K	22.0K

## Mounting Devices

The specially designed mounting device incorporates a formed ear which forces the support plate against the inside of the ceramic former. This materially assists the removal of heat to the mounting platform or chassis.

The spacing bush is rivetted to the support plate. When mounted in the recommended manner, the resistors will withstand high mechanical shock. See Figure 5 and Table 1 on page 131.

Figure 7

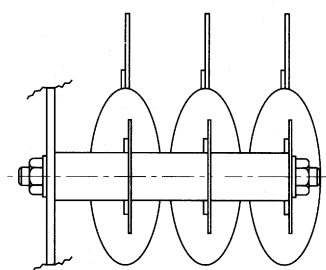
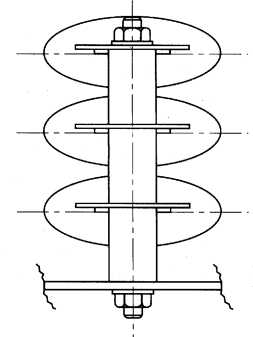


Figure 8



## Application Notes

When cold, vitreous enamel has excellent insulation resistance. In common with all insulants the specific resistance of the enamel decreases with increased temperature; therefore, if operated at any temperature approaching the maximum, the resistors cannot be classed as an insulated type and should not be used in contact with any conducting material. The recommended dissipation for each of the listed resistor hotspot temperatures applies to resistors when mounted singly and as shown in Figure 5. If the resistors are mounted horizontally, or stacked, derating should be applied as recommended in Table 4.

For improved stability the resistors should be operated at a lower hotspot temperature.

This may be achieved by

- a) Mounting singly, as in Figure 5.
- b) Forced cooling.
- c) Reduced dissipation.

Resistors mounted singly will benefit most from the heat sink effect of the mounting plate.

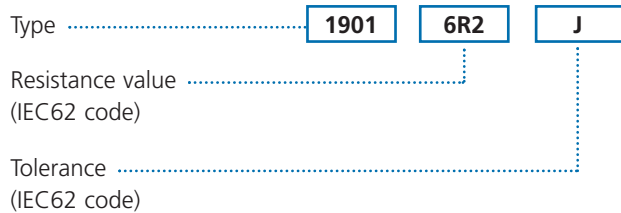
Appreciable reduction of hotspot temperature can be achieved by arranging that resistors are subjected to some measure of forced draught. In general, it is most efficient to extract air from the top of the resistor enclosure and arrange that the air inlet is adjacent to the bottom of the resistors.

If soft soldered connections are used, resistors should be derated, where applicable, to limit the hotspot temperature 300°C

Mounting method		No. of resistors in stack		
		1	2	3 or more
% derating for each resistor	Figure 7	0	30%	45%
when mounted as in	Figure 8	10%	40%	55%

## Ordering Procedure

Specify type reference, value and tolerance as shown in this example of 1901 6R2 5%:



F	1%
G	2%
J	5%