Chapter 1

RESISTOR UNITS, BERCO SERIES

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Introduction

1. The Berco types of fixed and semi-adjustable resistors are many and varied and are used extensively in aircraft for a variety of control equipment.

DESCRIPTION

Vitreous enamelled resistors

2. These are divided into three groups as follows:—

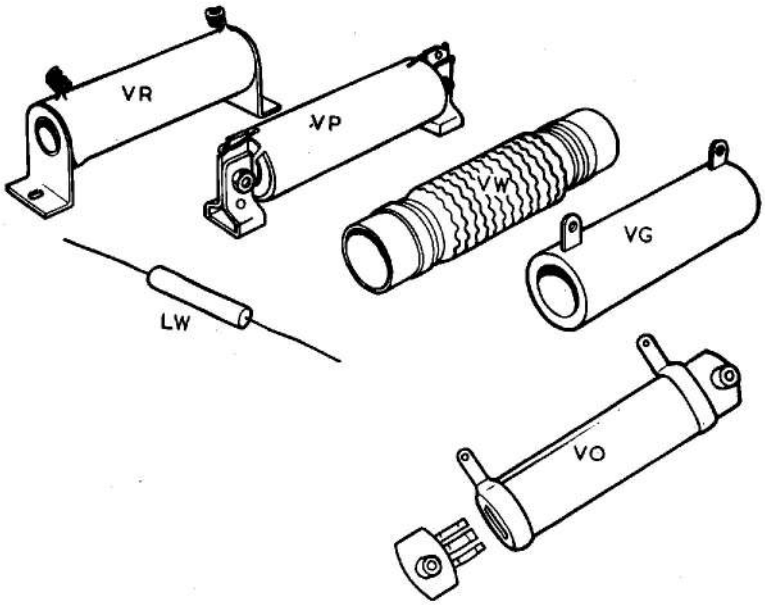

Fig. 1. Vitreous enamelled resistors

(1) Type 'LW'—fixed—6 to 30 watts.

(2) Type 'K'—fixed and semi-adjustable, with a wide variety of mountings and fittings; their ratings vary from 20 to 180 watts.

(3) Type 'VO'—fixed and semi-adjustable flat oval units; their rating varies from 30 to 75 watts.

'LW' resistors

3. LW resistors consist of a length of small gauge tinned copper wire, wound on a ceramic former; they are light enough to be mounted on their end leads and are intended for mounting by this method only.

'K' resistors

4. The K range is manufactured in various models, as illustrated in figures 1 and 2.

(1) V.G.—the connections are brought out in the form of stiff tinned lugs suitable for soldering, or through which terminals may be fitted.

(2) V.R.—are provided with flexible leads up to 3½ in. long.

(3) V.W.—for low resistance values and heavy currents in which the element consists of corrugated resistance tape wound on edge, giving the maximum dissipating surface and brought out to terminal lugs as for the V.G. type.

5. The K type resistor may be provided with tappings, or a number of separate windings to suit specific applications.

6. *'K' mountings.* Each of these K type resistors VG, VR and VW can be provided with H (horizontal) or U (upright) mountings, and is denoted by the appropriate suffix letter added to the type number as shown in figure 2.

7. The VP type resistor is provided with flat blades for mounting in flat clips, whilst the VS type has round ferrules for mounting in clips. The SB resistor has a screw base for screw type holders, whilst the BC type has a bayonet cap for bayonet joint holders, again illustrated in figure 2.

'VO' resistors

8. These units are specially suited to equipments where the available space is limited, and are designed to give maximum dissipating

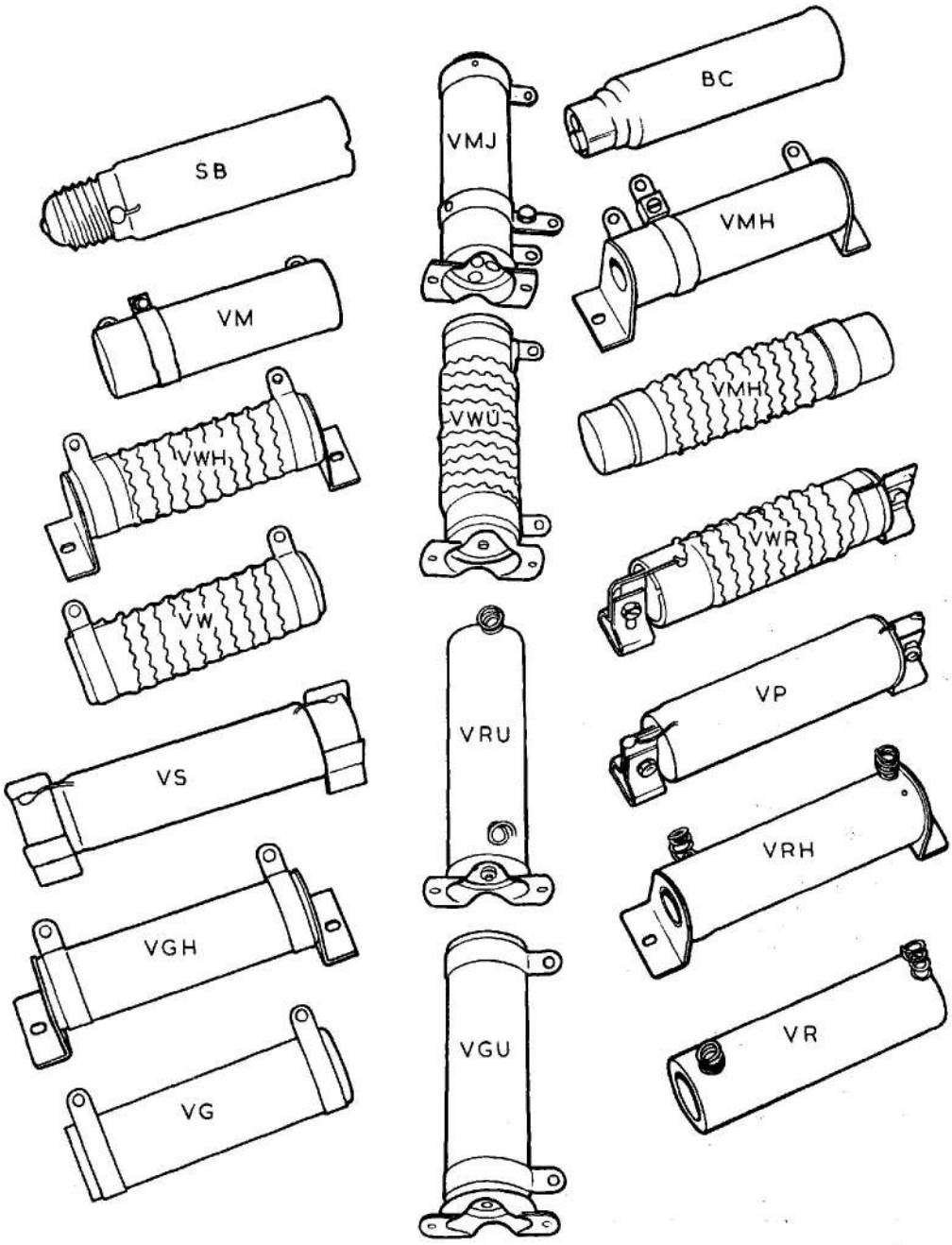

Fig. 2. 'K' type tubular resistors and mountings

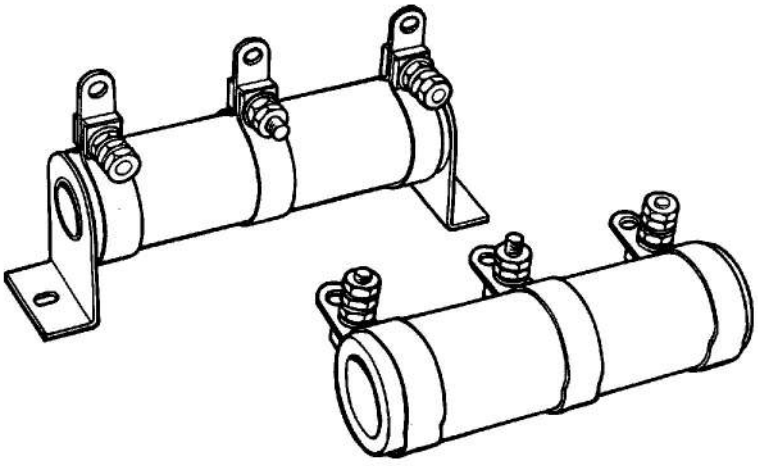

Fig. 3. Bare tubular 'RA' resistors

surface in relation to volume, without impairing mechanical strength; they are made in five sizes, with ratings of 30, 40, 55, 65 and 75 watts. The VOM and VOT units are of the same design, but have different uses. The VOM unit is provided with a bare track on the winding and an adjustable clip, whilst the VOT unit is supplied with tappings by means of terminals similar to those at the ends.

9. *'VO' mountings.* The simple standard mounting bracket, enables this type of resistor to be mounted singly, or in banks, without the use of additional fittings. The brackets are sprung into the rectangular bore of the tube so that slight variations of length can be accommodated; this type of mounting acts as a cooling radiator.

Bare tubular 'RA' resistors

10. These units can be fixed or semi-adjustable in the R.A. series; they have a low temperature co-efficient and vary in rating from 20 to 180 watts. These resistors are close wound on ceramic formers with iron-free oxidized nickle copper wire. The maximum electrical stability is obtained by the use of a close winding. These units are particularly suitable as preset series resistors, or potential dividers.

11. Nickle-plated brass bands, with terminal screws, nuts and washers provide the terminal connections, the bands incorporate provision for a soldered connection, or extra screws.

12. The RA fixed and pre-set resistors vary in size and rating as follows:—

Size	KO	K1	K2	K8	K3
Rating (watts)	20	30	40	45	60
Size	K9	K4	K7	K5	K6
Rating (watts)	60	90	90	130	180

This type of resistor can also be adapted for H (horizontal) and U (upright) mountings; the mounting fitted to the unit is shown by the suffix letter H or U after the type number.

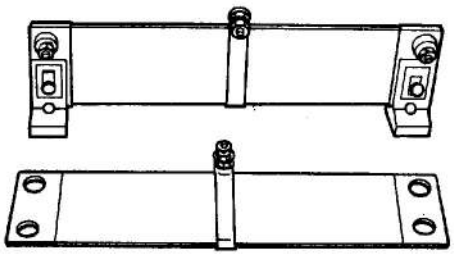

Fig. 4. Bare flat 'mica card' resistors

Bare flat 'mica card' resistors

13. These units are wound with nickel copper wire, on mica formers and are of two types, B and C, fixed and semi-adjustable, with a low temperature co-efficient; they vary in size and their ratings vary from 45 to 260 watts.

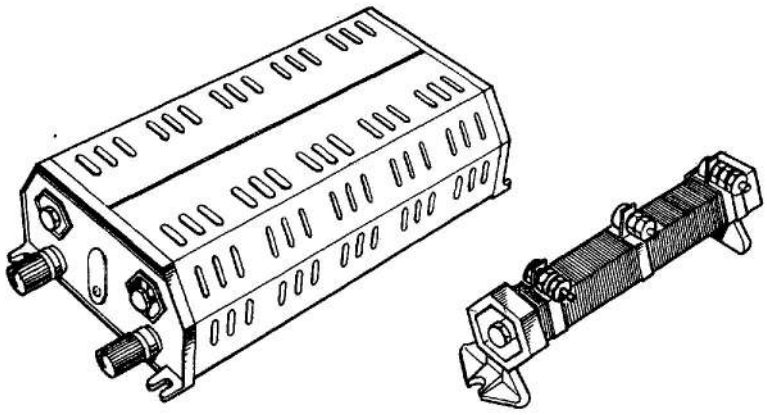

Fig. 5. Heavy duty 'open and enclosed' type resistors

14. One tapping band is normally supplied, but it should be realized that the use of such bands reduces the overall ohmic value in proportion to the length of winding shorted out.

15. This type of resistor should be mounted horizontally on edge, as shown in figure 4, to obtain the minimum temperature rise.

Heavy duty 'open' and 'enclosed' type resistors

16. This range of units wound on hexagonal tubes is intended for general use, such as battery charging resistances, potential dividers, motor starting resistances and control gear. By combinations of single and multiple tubes a wide range of ratings can be obtained.

17. These resistors which can be fixed or semi-adjustable, are divided into four groups as follows:—

(1) SOF—single tube, open type.

(2) SEF—single tube, enclosed type

(3) DOF—double tube, open type

(4) DEF—double tube, enclosed type

'SOF' and 'DOF' open types

18. These resistor units are of the open hexagonal tubular type and provide fixed resistances for use in control equipment. The type number gives the size of the tube upon which the resistance element is wound; e.g., the type SOF 6 x 1½ resistor has a tube of 6 inches in length and 1½ inches in diameter.

19. The resistance winding is of nickel-copper alloy which is heavily oxidized to provide satisfactory insulation between adjacent turns. Having a negligible temperature coefficient, the resistance value of the winding remains approximately constant under load. The winding is terminated at its ends by nickel plated brass bands and, where necessary, is fitted with an adjustable tapping by means of a band or clip.

20. The tube former is constructed of solid drawn hexagonal steel tube, which ensures rigidity and prevents rotation and movement of the tapping bands in use. The tube is mounted in hexagonal end castings, which are provided with slotted securing lugs. The ohmic value and rating of the resistor is stamped on a plate fixed to the end casting.

'SEF' and 'DEF' enclosed types

21. These resistor units are constructed in the same way as described for the open types, but they are enclosed by a protective and ventilated cover, they are fitted with bakelite shrouded terminals and are adaptable for conduit entry, or bushed entry for rubber cable.

Heavy duty Type J grid resistors

22. These resistors, which have type J grid coils, vary in size from 150 to 1200 watts; they can also be mounted in multiple open banks or drift proof enclosures.

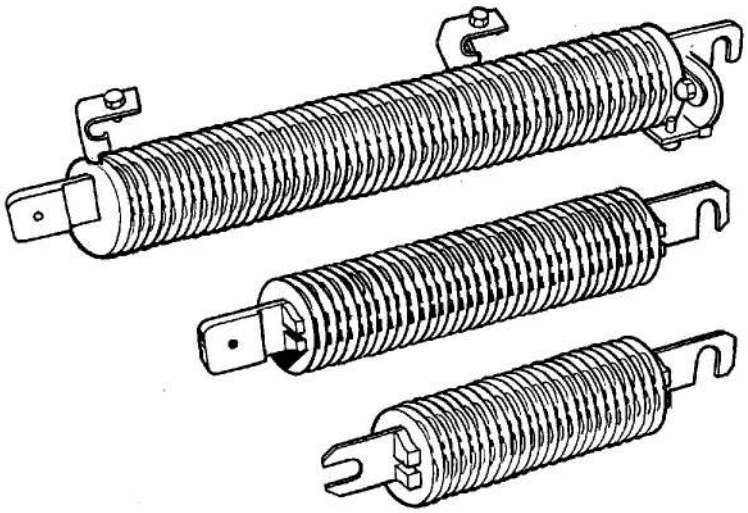

Fig. 6. Heavy duty J type, grid resistors

23. This type of grid resistor, consists of an helix of edge-wound tape, mounted on porcelain insulators, which are located on a steel support. The insulators are arranged with teeth to keep the coil turns apart. The maximum surface area of the resistance is exposed to the cooling air to give the highest possible rating. Connections to the winding are made by pressed steel clips to avoid perforations in the material and the formation of hot spots. These units are particularly suited for heavy duty requirements and conditions of severe vibration and shock.

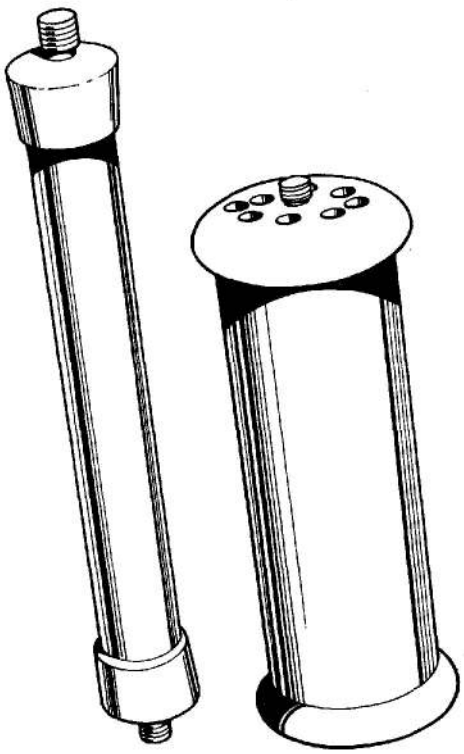

Fig. 7. High tension resistors

High tension resistors

24. These resistors are designed for X-ray and high voltage equipment and in similar gear where surge arrestors and current limiting resistors are required to work at extra high voltages; they vary in two types as follows:—

(1) XR.1—100 watts

(2) XR.2—200 watts.

25. The resistance wire is wound on a porcelain tube and is protected by a high temperature resisting enamel. The winding ends are reinforced by connecting them to copper leads which are brought out through the end cap studs and secured. The fine winding therefore, is not subjected to mechanical strain.

26. A list of various types of resistors used in aircraft, together with their performance rating is detailed in Appendix 1.

SERVICING

27. These resistors are normally components of larger items of equipment and are tested when the main equipment involved is serviced, at the periods prescribed in the relevant Servicing Schedule.

Appendix 1

LEADING PARTICULARS

Resistor Type	Current rating (amps)	Resistance (ohms)	Working Voltage	Power absorbed (watts)	Ref. No. 5CZ/
SOF (10 x 1½)	16	0·92	500	—	5359
SOF (10 x 1½)	16	1·21	500	—	5419
SOF-101	—	10·1	—	—	6269
K1-VWH	5·5	1·0	—	20	6627
K1-VGH	5·5	1·0	—	30	6229
K1-RAH	—	1·42	4·6	30	6271
VWH-K6	—	1·5	—	—	7302
K1-VWH	4·5	1·5	—	30	7292
K1-VRBH	—	1·5	—	30	5957
K7-VWH	—	1·5 tap 0·65	—	90	6538
K6-VWH	—	1·25	—	—	5857
VWH-K5	—	2·7	—	—	7623
K6-RAH	5·5	5·84	—	—	5020
RAH-K1	—	6·0	—	30	5294
Type B (Micacard)	60	6·5	—	—	6615
KH-RAH/10	—	10	—	—	5904
RAH-KO	—	12·0	—	—	5397
LW-12	0·89	15·0	—	12	4628
KO.V/GH	—	20·0	—	20	5737
K1-RAH	—	20·0	—	30	5031
VGTH-K3	—	20·0	—	60 centre top	6537
VO-30	—	22·0	—	30	5667
K7-VP	—	23·0	—	—	5395
RAH-KO	0·93	23·0	—	—	4671
K6-RAH-29	—	29·0	—	—	5905
KO-VGH	—	30·0	—	20	5424
VO-30	—	30·0	—	30	5743
LW-6	—	33·0	—	—	5967
VP-K7	—	33·0	—	90	7529
RAH-KO	—	38·0	—	0·73	5462
RAH-KO	0·55	67·0	—	—	5548
KO-VGH-20	—	67·0	—	20	5736
LW-12	—	150	—	12	6355
VWH-K6	—	180	—	—	7574
LW6-390	—	390	—	—	5741
KIVS	25	440	—	30	4653
KI-VGH	—	680	—	—	5633
LW6	—	680	—	—	5666
VGTH-K1	—	2,200	—	—	6652
K8-VP-1000	—	1,000	—	—	5499
VGH-KO	—	1,000	—	—	6787
VGH-KO-1200	—	1,200	—	—	660
VGH-KO-1500	—	1,500	—	—	6605
KOV-S-330	—	330	—	—	6496
KO-VGH-4700	—	4,700	—	—	5640
RAH-KO	—	15	—	—	5924

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