

REFLEX KLYSTRONS 2 K 25 and 723 A/B

The 2K25 and 723A/B (see fig. 49) are indirectly heated tunable reflex klystrons with internal cavity, intended for use as local oscillators in radar receivers, spectrum analyzers and test equipment.

The construction of both types is identical. They only differ in the frequency range covered and the power output.

Fig. 50 shows a cross section of the tube which displays the electrode arrangement. The electron gun consists of the cathode *k*, the focusing screen *sc* and the accelerator grid *g*₁. The screen is internally connected to the cathode. The three grids, of which the numbers 2 and 3 are part of the cavity resonator, are directly connected to the metal envelope, which is earthed and

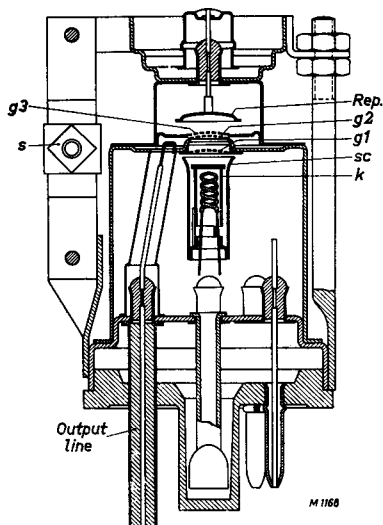


Fig. 50. Cross section of the 2K25 and 723 A/B.

¹⁾ To avoid mechanical defects, the cavity should not be tuned to frequencies beyond the specified frequency band.

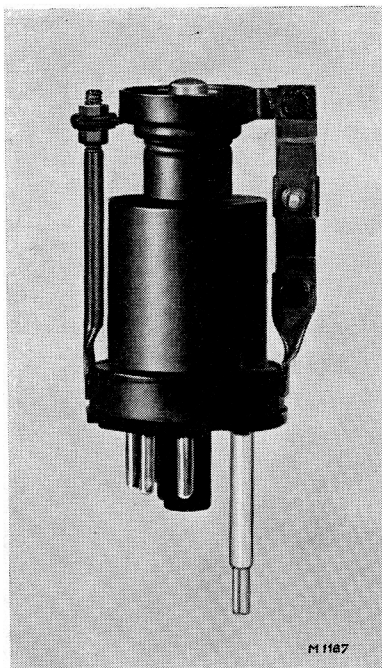


Fig. 49. Photograph of the tubes 2K25 and 723A/B (actual size).

has a potential of 300 V positive with respect to the cathode.

Mechanical tuning is accomplished by moving the membrane-shaped upper part of the resonant cavity by means of the setting screw *s*, thus varying the capacitive element of the resonator. For proper frequency adjustment, the screw should be turned alternately above and below the desired frequency with gradually decreasing deviation ¹⁾.

In order to compensate frequency variations due to temperature changes, part of

the tuning mechanism is made of invar. The relative frequency shift thus obtained is less than 0.2 Mc/s per degree centigrade.

Electronic tuning is possible by varying the negative voltage applied to the repeller, which is connected to the top cap.

The coaxial output line protruding through the base is inductively coupled to the resonator by means of a loop. At the lower side of this line the inner conductor projects beyond the outer and acts like an aerial.

For good wide-band performance the tube should be inserted in a suitable mount. The mount recommended, shown in fig. 51, consists of a section of 3 cm waveguide (outside dimensions $1' \times \frac{1}{2}'$) short-circuited at one side, into which the aerial of the tube penetrates.

The outer conductor of the output line should reach to the inner side of the waveguide. A good r.f. contact between the outer conductor and the guide is accomplished by a wave trap (fig. 52).

The tube socket, the hole of which corresponding to pin No. 4 of the base has been drilled in order to pass the coaxial output line, is fixed rigidly to the waveguide, to ensure proper installation.

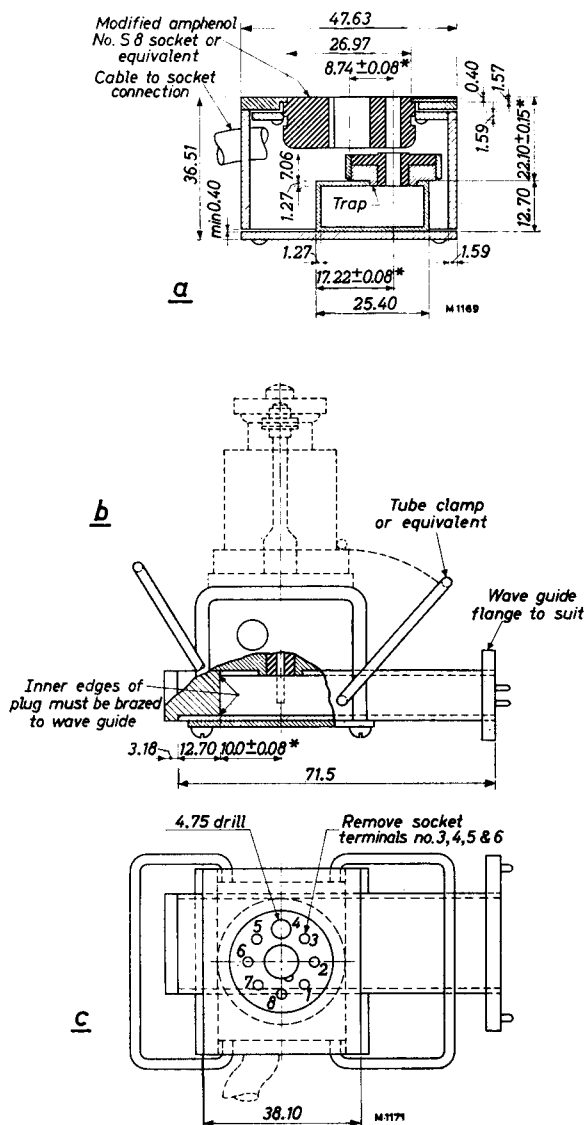


Fig. 51. Recommended mount.
 (a) cross section,
 (b) side view,
 (c) top view.

The tube should be fixed firmly in the socket by clamps which make contact at the lower platform of the tube only.

Fig. 53 shows a typical graph of output power and frequency shift versus repeller voltage. The mechanical tuning is adjusted to 9300 Mc/s.

For use as a continuous oscillator, mode 'A' is recommended, the output coupling being designed for this purpose.

The values of the output power shown in fig. 53 are those delivered in a load presenting a unity standing-wave ratio in the waveguide. When the guide is not correctly terminated, output and frequency deviations will generally occur. These phenomena are shown in fig. 54, a so-called 'Rieke diagram', in which loci of constant power and frequency are drawn according to certain values of the amplitude and phase angle of the reflection coefficient which also corresponds to the standing-wave ratios indicated

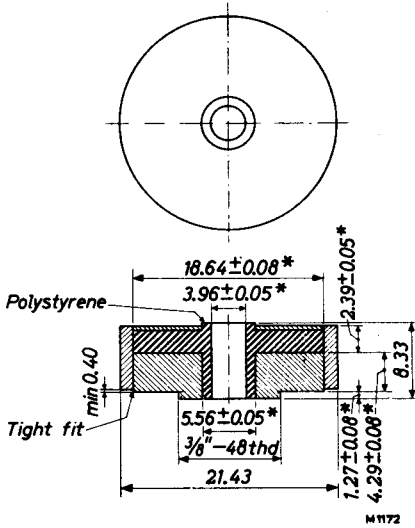


Fig. 52. Wave trap.

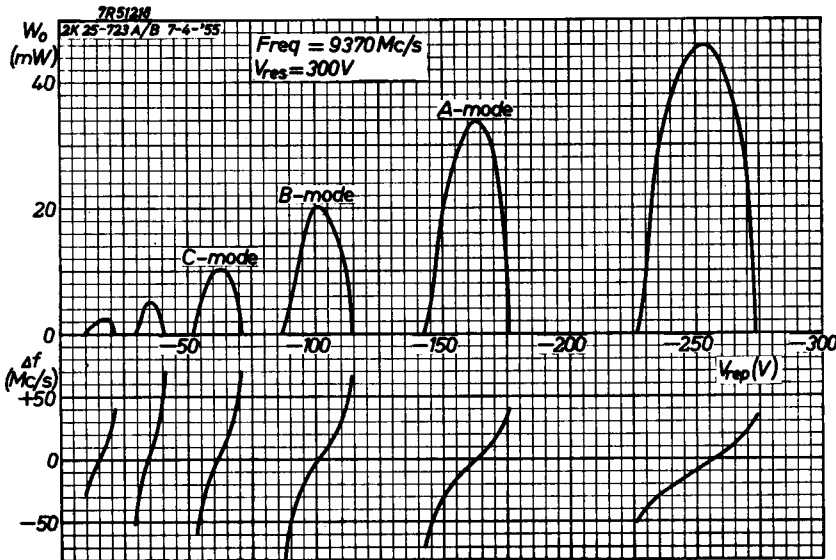


Fig. 53. Power output W_o and frequency shift Δf as functions of the repeller voltage.

in the diagram. The minimum standing-wave ratio at which oscillation stops, is called 'sink margin'. The 2K25 and 723A/B are designed to have a minimum sink margin of 8 dB and 4 dB respectively.

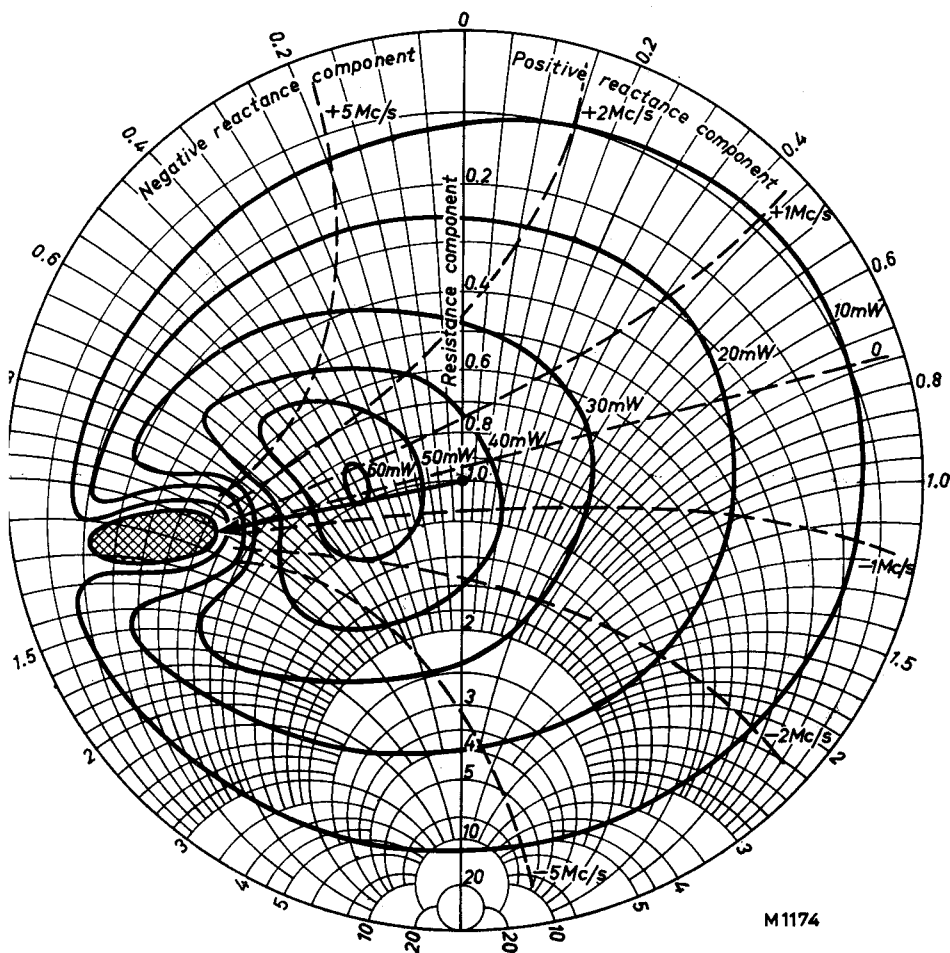


Fig. 54. Typical Rieke diagram. The drawn curves are loci of constant power, and the dashed curves loci of constant frequency deviation. The sink margin is indicated by an arrow point. Within the batched area no oscillations occur.

REMARKS

In order to prevent undesired frequency modulation, care should be taken to employ well stabilized repeller and resonator voltages, and the connecting leads should be shielded.

It may happen that the waveguide is not terminated in a matched load, which causes frequency instability. When, however, very good frequency stability is

required, an attenuator of 6 dB may be inserted in the guide between the aerial and the load.

The resistance of the repeller voltage supply should not exceed 150 k Ω .

To prevent sudden cooling due to air-blow, the whole tube may be shielded. Care should be taken not to exceed the permissible temperature of the output line, and not to introduce parasitic resonant circuits outside the tube.

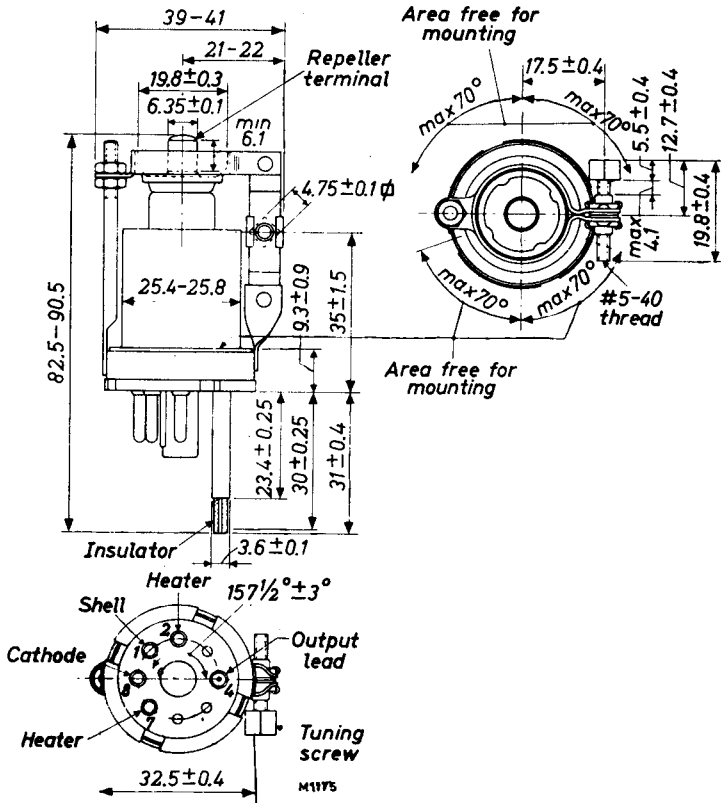


Fig. 55. Dimensional drawing; dimensions in mm.

TECHNICAL DATA of the 2 K 25

HEATER DATA

Heating: indirect by a.c. or d.c.; parallel supply

Heater voltage $V_f = 6.3 \text{ V} \pm 8\%$

Heater current $I_f = 0.44 \text{ A}$

Reflex klystrons 2 K 25 and 723 A/B

MOUNTING POSITION: any

ELECTRODE ARRANGEMENT

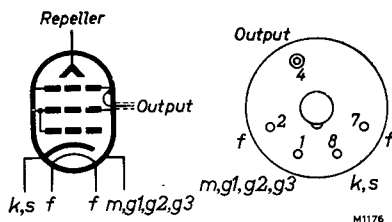


Fig. 56. Electrode arrangement and base connections.

TYPICAL OPERATING CONDITION: (frequency 8500-9660 Mc/s, mode A)

D.C. resonator voltage	$V_{res} =$	300 V
D.C. repeller voltage range	$V_{rep} =$	-85 to -200 V ¹⁾
D.C. resonator current	$I_{res} =$	25 mA
Half-power electronic tuning frequency change	$\Delta f =$	35 Mc/s ²⁾
Power output	$W_o =$	25 mW

LIMITING VALUES (absolute maxima)

D.C. resonator voltage	$V_{res} =$ max.	330 V
D.C. repeller voltage neg.	$-V_{rep} =$ max.	400 V
D.C. repeller voltage pos.	$V_{rep} =$ max.	0 V
D.C. resonator current	$I_{res} =$ max.	37 mA
Voltage between cathode and heater	$V_{kf} =$ max.	50 V
Temperature of coaxial output line	$T =$ max.	70 °C

TECHNICAL DATA of the 723 A/B

The reflex klystron type 723 A/B is specially designed for operation at 9370 Mc/s. Its frequency range is smaller than that of the 2K25; viz. 8702-9548 Mc/s.

HEATER DATA

Heating: indirect by a.c. or d.c.: parallel supply

Heater voltage	$V_f =$	6.3 V $\pm$ 8%
Heater current	$I_f =$	0.44 A

¹⁾ Adjusted for maximum power output at the given operating frequency.

²⁾ Change in frequency between the two half-power points when the repeller voltage is varied above and below the point of maximum power output corresponding to the given frequency.

