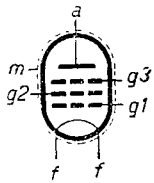
# KF 4 R.F. pentode



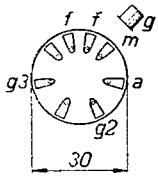




Fig. 2
Arrangement of base connections and electrodes.

The R.F. pentode KF 4 has no control characteristic; it can be employed for R.F. or I.F. amplification, anode-bend or grid detection, and as resistance-coupled A.F. amplifier.

When used for the last-mentioned function it should follow the indirectly-heated double-diode KB 2 for driving a Class A output stage using the pentode KL 4 or, with the necessary driver transformer, a Class B stage comprising two valves of the latter type.

The KF 4 gives excellent results on short waves; this is mainly due to the use of the P-type base with which it is fitted, and a separate contact for the suppressor grid connection. In the design of this valve output capacitances have been kept as low as possible.

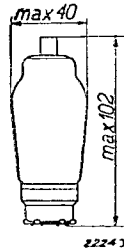



Fig. 1
Dimensions in mm.

## FILAMENT RATINGS

Heating: direct by battery; parallel supply.

| | |
|---|---|
| Filament voltage . . . . . | $V_f$ = 2.0 V |
| Filament current . . . . . | $I_f$ = 0.065 A |

## CAPACITANCES

| | |
|---|---|
| $C_{ag_1}$ | < 0.008 $\mu\mu$F |
| $C_{g_1}$ | = 6.0 $\mu\mu$F |
| $C_a$ | = 5.0 $\mu\mu$F |

## MAXIMUM RATINGS

| | |
|---|---|
| $V_a$ | = max. 135 V |
| $W_a$ | = max. 0.5 W |
| $V_{g_2}$ | = max. 135 V |
| $W_{g_2}$ | = max. 0.25 W |
| $I_k$ | = max. 5 mA |
| $V_{g_1}$ ($I_{g_1}$ = + 0.3 $\mu$A) | = max. —0.2 V |
| $R_{g_1k}$ | = max. 3 M ohms |

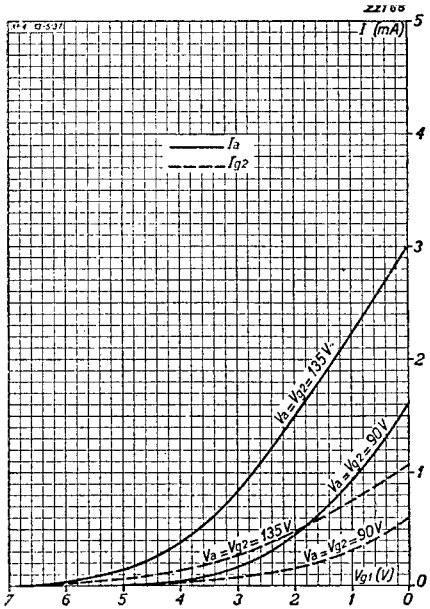



Fig. 3
Anode and screen-grid current as functions of the grid bias.

## STATIC DATA

| | | | |
|---|---|---|---|
| Anode voltage | $V_a$ | = 90 V | 135 V |
| Screen-grid voltage | $V_{g2}$ | = 90 V | 135 V |
| Suppressor-grid voltage | $V_{g3}$ | = 0 | 0 V |
| Grid bias | $V_{g1}$ | = —0.5 V | —0.5 V |
| Anode current | $I_a$ | = 1.2 mA | 2.6 mA |
| Screen-grid current | $I_{g2}$ | = 0.4 mA | 1.0 mA |
| Amplification factor | $\mu$ | = 800 | 700 |
| Mutual conductance | $S$ | = 0.7 mA/V | 0.8 mA/V |
| Internal resistance | $R_i$ | = 0.9 M ohms | 0.8 M ohms |

### TABLE I

KF 4 used as grid detector with resistance coupling (connected as pentode); grid leak of following valve = 1 megohm.

| Battery voltage | Coupling resistor | Anode current | Screen-series resistor | Screen-grid current | Detector amplification; modulation depth 30 % | | Alternating output voltage; modulation depth 30 % | |
|---|---|---|---|---|---|---|---|---|
| | | | | | Altern. output voltage | Stage gain | Altern. output voltage | Altern. grid voltage |
| $Vb$ (V) | $Ra$ (M ohm) | $Ia$ (mA) | $Rg_2$ (M ohm) | $Ig_2$ (mA) | $Vo$ (V*eff*) | | $Vo$ (V*eff*) | $Vi$ (V*eff*) |
| 135 | 0.32 | 0.37 | 0.64 | 0.15 | 2 | 6.6 | 4.8 | 0.64 |
| 90 | 0.32 | 0.24 | 0.5 | 0.11 | 2 | 4.8 | 2.6 | 0.56 |
| 135 | 0.10 | 1.05 | 0.5 | 0.16 | 2 | 7.3 | 6.4 | 1.0 |
| 90 | 0.04 | 2.1 | 0.032 | 1.05 | 2 | 4.4 | 5.1 | 1.6 |
| 135 | 0.10 | 0.71 | 0.10 | 0.41 | 2 | 4.9 | 4.5 | 1.0 |
| 90 | 0.04 | 1.5 | 0.016 | 0.75 | 2 | 3.9 | 3.8 | 1.1 |

### TABLE II

KF 4 used as grid detector with reaction and resistance coupling (connected as triode).

| Battery voltage | Coupling resistor | Anode current | Detector amplification at m = 0.3 | | Alternating output voltage at m = 0.3 | | | Alternating output voltage at $m$ = 0.1 | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Altern. output volts | Stage gain | Altern. output volts | Altern. grid volts | Distortion | Altern. output volts | Altern. grid volts | Distortion |
| $Vb$ (V) | $Ra$ (Ohms) | $Ia$ (mA) | $Vo$ (V*eff*) | | $Vo$ (V*eff*) | $Vi$ (V*eff*) | % | $Vo$ (V*eff*) | $Vi$ (V*eff*) | % |
| 135 | 20,000 | 2.6 | 0.5 | 1.9 | 2.2 [1] | 1.1 | 2 | 0.85 | 1.5 | 0.9 |
| 135 | 40,000 | 1.8 | 0.5 | 2.2 | 2.2 [1] | 1.0 | 3.6 | 0.86 | 1.5 | 2 |
| 90 | 20,000 | 1.5 | 0.5 | 1.6 | 1.4 [2] | 0.95 | 5 [3] | — | — | — |
| 90 | 40,000 | 1.1 | 0.5 | 2.0 | 1.4 [2] | 0.8 | 4 | — | — | — |

[1]) Max. excitation of the stage KC 3 + KDD 1 at $Va$ = 135 V is reached at an alternating grid voltage of 2.2V(*eff*)

[2]) Max. excitation of the stage KC 3 + KDD 1 at $Va$ = 90 V is reached at an alternating grid voltage of 1.4 V(*eff*).

[3]) Maximum alternating output voltage.

## TABLE III

KF 4 used as A.F. amplifier (connected as pentode). Grid leak of following valve 1 megohm.

| Battery voltage | Coupling resistor | Anode current | Screen series resistor | Screen-grid current | Grid bias | With an alternating output voltage of 10 Veff: | | With an alternating output voltage of 14 Veff: | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Gain factor | Distortion | Gain factor | Distortion |
| $V_b$ (V) | $R_a$ (M ohm) | $I_a$ (mA) | $R_{g_2}$ (M ohm) | $I_{g_2}$ (mA) | $V_{g_1}$ (V) | | $d$ (%) | | $d$ (%) |
| 135 | 0.32 | 0.30 | 0.64 | 0.11 | —1.5 | 72 | 0.5 | 72 | 0.7 |
| 90 | 0.32 | 0.18 | 0.4 | 0.10 | —1.5 | 52 | 1.5 | 52 | 1.8 |
| 135 | 0.20 | 0.41 | 0.4 | 0.15 | —1.5 | 62 | 0.8 | 62 | 1.0 |
| 90 | 0.20 | 0.24 | 0.25 | 0.10 | —1.5 | 48 | 1.2 | 48 | 1.9 |
| 135 | 0.10 | 0.64 | 0.2 | 0.23 | —1.5 | 47 | 0.9 | 47 | 1.6 |
| 90 | 0.10 | 0.50 | 0.05 | 0.20 | —1.5 | 37 | 0.9 | 37 | 1.8 |

## TABLE IV

KF 4 used as A.F amplifier (connected as triode). Grid leak of the following valve 1 megohm.

| Battery voltage | Coupling resistor | Anode current | Grid bias | With an alternating output voltage of 7 Veff: [1] | | | With an alternating output voltage of 10 Veff: [2] | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Altern. grid volts | Stage gain | Distortion | Altern. grid volts | Stage gain | Distortion |
| $V_b$ (V) | $R_a$ (M ohm) | $I_a$ (mA) | $V_{g_1}$ (V) | $V_i$ (Veff) | | $d$ (%) | $V_i$ (Veff) | | $d$ (%) |
| 135 | 0.32 | 0.25 | —1.5 | 0.39 | 18 | 0.8 | 0.56 | 18 | 0.8 |
| 135 | 0.32 | 0.15 | —3.0 | 0.43 | 16.2 | 1.5 | 0.62 | 16.2 | 2.8 |
| 90 | 0.32 | 0.13 | —1.5 | 0.43 | 16.2 | 2 | — | — | — |
| 90 | 0.32 | 0.05 | —3.0 | 0.62 | 11.5 | 10 | — | — | — |
| 135 | 0.20 | 0.35 | —1.5 | 0.39 | 18 | 0.8 | 0.56 | 18 | 0.8 |
| 135 | 0.20 | 0.21 | —3.0 | 0.45 | 16 | 1.7 | 0.63 | 16 | 3.0 |
| 90 | 0.20 | 0.17 | —1.5 | 0.43 | 16.2 | 2 | — | — | — |
| 90 | 0.20 | 0.07 | —3.0 | 0.65 | 10.5 | 13 | — | — | — |
| 135 | 0.10 | 0.56 | —1.5 | 0.42 | 16.6 | 0.8 | 0.60 | 16.6 | 1.0 |
| 135 | 0.10 | 0.33 | —3.0 | 0.48 | 14.5 | 2.4 | 0.70 | 14.5 | 4.0 |
| 90 | 0.10 | 0.28 | —1.5 | 0.48 | 14.5 | 1.5 | — | — | — |
| 90 | 0.10 | 0.09 | —3.0 | 0.76 | 9.5 | 18 | — | — | — |

[1]) Max. excitation of the KL 2 at $V_a = V_{g_2} =$ 90 V is reached at an alternating input of 7 Veff.
Max. excitation of the KL 4 at $V_a = V_{g_2} =$ 90 V is reached at an alternating input of 2 Veff.
[2]) Max. excitation of the KL 2 at $V_a = V_{g_2} =$ 135 V is reached at an alternating input of 10 Veff.
Max. excitation of the KL 4 at $V_a = V_{g_2} =$ 135 V is reached at an alternating input of 3.5 Veff.

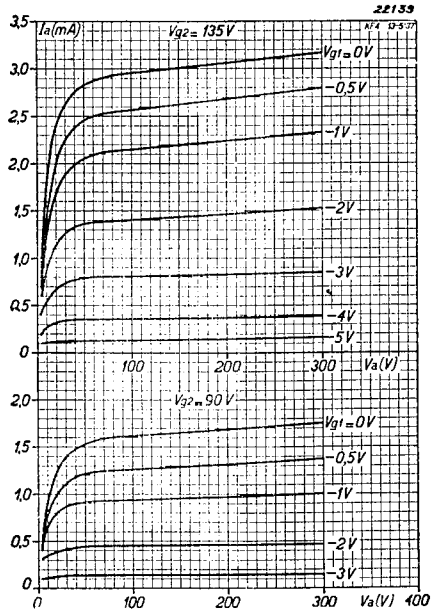



Fig. 4
Anode current as a function of the anode voltage, with grid bias as parameter, at $Vg_2 = 90$ V and 135 V.

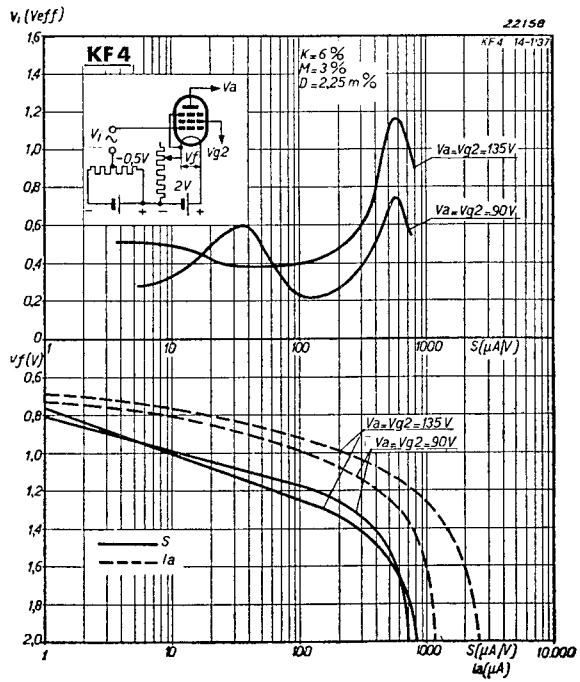



Fig. 5
*Upper diagram.* Maximum permissible effective value of the alternating grid voltage with 6 % cross-modulation (0.5 % 3rd harmonic), as a function of the mutual conductance controlled by varying the filament voltage.
*Lower diagram.* Mutual conductance and anode current as functions of the filament voltage.