

**SPECIAL QUALITY, LONG LIFE PENTODE** for use in telephone equipment

### HEATING

Indirect by A.C. or D.C.; series or parallel supply

Heater voltage  $V_f = 6.3 \text{ V}$

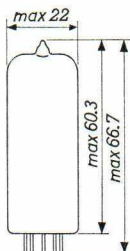
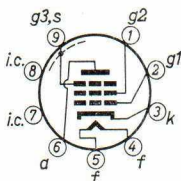
Heater current  $I_f = 0.3 \text{ A}$

The maximum deviation of the heater current at  $V_f = 6.3 \text{ V}$  is  $\pm 15 \text{ mA}$ .

In order to obtain a useful life of 10 000 hours in the case of parallel supply, the maximum variation of the heater voltage should be less than  $\pm 5 \%$  (absolute limits)

In order to obtain a useful life of 10 000 hours in the case of series supply, the maximum variation of the heater current due to voltage fluctuations and tolerances in the parts should be less than  $1.5 \%$  (absolute limits)

Dimensions in mm



Base: NOVAL

### CHARACTERISTICS

Column I: Setting of the tube and typical (average) measuring results of new tubes

II: Characteristics range values for equipment design

III: Data indicating the end point of life

#### Heater current

|                | I           | II         |
|----------------|-------------|------------|
| Heater voltage | $V_f = 6.3$ | V          |
| Heater current | $I_f = 300$ | 285-315 mA |

## CHARACTERISTICS (continued)

## Capacitances

|                                              |           | I      | II      | III              |
|----------------------------------------------|-----------|--------|---------|------------------|
| Grid No.1 to all other elements except anode | $C_{g1}$  | = 8.0  | < 8.7   | pF               |
| The same at $I_k = 12.1$ mA                  | $C_{g1}$  | = 10.8 |         | pF               |
| Anode to all other elements except grid No.1 | $C_a$     | = 3.5  | < 4.1   | pF               |
| Anode to grid No.1                           | $C_{ag1}$ | =      | < 0.015 | pF               |
| Grid No.1 to heater                          | $C_{g1f}$ | =      | < 0.15  | pF               |
| Cathode to heater                            | $C_{kf}$  | = 4    |         | pF               |
| Radiation capacitance grid No.1              | $C_{rg1}$ | =      | < 0.025 | pF <sup>1)</sup> |
| Radiation capacitance anode                  | $C_{ra}$  | =      | < 0.025 | pF <sup>1)</sup> |

## Typical characteristics

|                                                             |              | I     | II       | III        |
|-------------------------------------------------------------|--------------|-------|----------|------------|
| Anode voltage                                               | $V_a$        | = 210 |          | V          |
| Grid No.3 voltage                                           | $V_{g3}$     | = 0   |          | V          |
| Grid No.2 voltage                                           | $V_{g2}$     | = 120 |          | V          |
| Cathode resistor                                            | $R_k$        | = 165 |          | $\Omega$   |
| Anode current                                               | $I_a$        | = 10  | 8.7-11.3 | 7 mA       |
| Grid No.2 current                                           | $I_{g2}$     | = 2.1 | 1.7-2.5  | 1.25 mA    |
| Mutual conductance                                          | $S$          | = 9   | 7.8-10.2 | 6.4 mA/V   |
| Internal resistance                                         | $R_i$        | = 0.5 | > 0.3    | M $\Omega$ |
| Amplification factor of grid No.2 with respect to grid No.1 | $\mu_{g2g1}$ | = 38  |          |            |
| Equivalent noise resistance (R.F.)                          | $R_{eq}$     | = 750 | < 1000   | $\Omega$   |
| Equivalent noise resistance ( $f = 0-10\ 000$ c/s)          | $R_{eq}$     | =     | < 36     | k $\Omega$ |

|                   |           | I     | II     | III |
|-------------------|-----------|-------|--------|-----|
| Anode voltage     | $V_a$     | = 210 |        | V   |
| Grid No.3 voltage | $V_{g3}$  | = 0   |        | V   |
| Grid No.2 voltage | $V_{g2}$  | = 120 |        | V   |
| Anode current     | $I_a$     | = 0.5 |        | mA  |
| Grid No.1 voltage | $-V_{g1}$ | = 5   | < 5.25 | V   |

<sup>1)</sup> Capacitance of the concerning electrode to a surrounding metal box with an inner diameter of 52 mm and a height of 98 mm, the other electrodes being earthed

CHARACTERISTICS (continued)Negative grid current

|                       |                | I | II    | III    |
|-----------------------|----------------|---|-------|--------|
| Anode voltage         | $V_a = 210$    |   |       | V      |
| Grid No.3 voltage     | $V_{g3} = 0$   |   |       | V      |
| Grid No.2 voltage     | $V_{g2} = 120$ |   |       | V      |
| Grid No.1 resistor    | $R_{g1} = 0.1$ |   |       | MΩ     |
| Cathode resistor      | $R_k = 165$    |   |       | Ω      |
| Negative grid current | $-I_{g1} =$    |   | < 0.5 | 1.0 μA |

Grid current starting point

|                       |                 | I | II    | III |
|-----------------------|-----------------|---|-------|-----|
| Anode voltage         | $V_a = 210$     |   |       | V   |
| Grid No.3 voltage     | $V_{g3} = 0$    |   |       | V   |
| Grid No.2 voltage     | $V_{g2} = 120$  |   |       | V   |
| Positive grid current | $+I_{g1} = 0.3$ |   |       | μA  |
| Negative grid voltage | $-V_{g1} =$     |   | < 1.1 | V   |

Hum voltage

|                    |                | I | II            |
|--------------------|----------------|---|---------------|
| Anode voltage      | $V_a = 210$    |   | V             |
| Grid No.3 voltage  | $V_{g3} = 0$   |   | V             |
| Grid No.2 voltage  | $V_{g2} = 120$ |   | V             |
| Grid No.1 resistor | $R_{g1} = 0.5$ |   | MΩ            |
| Cathode resistor   | $R_k = 165$    |   | Ω             |
| Hum voltage        | $V_{g1hum} =$  |   | < 0.5 mV(RMS) |

Insulation between heater and cathode

|                                    |                | I | II      |
|------------------------------------|----------------|---|---------|
| Voltage between heater and cathode | $V_{kf} = 100$ |   | V       |
| Series resistor                    | $R = 1$        |   | MΩ      |
| Current from cathode to heater     | $I_{kf} =$     |   | < 15 μA |

Insulation between the electrodes

|                                                        |              | I | II       |
|--------------------------------------------------------|--------------|---|----------|
| Insulation resistance between two arbitrary electrodes | $R_{isol} =$ |   | > 100 MΩ |

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LIFE EXPECTANCY: 10 000 hours under the following life-test conditions:

|                   |                          |
|-------------------|--------------------------|
| Heater voltage    | $V_f = 6.3 \text{ V}$    |
| Anode voltage     | $V_a = 210 \text{ V}$    |
| Grid No.3 voltage | $V_{g3} = 0 \text{ V}$   |
| Grid No.2 voltage | $V_{g2} = 120 \text{ V}$ |
| Cathode resistor  | $R_k = 165 \Omega$       |

The data indicating the end point of life are given in column III under the heading "Characteristics"

OPERATING CHARACTERISTICS, class A

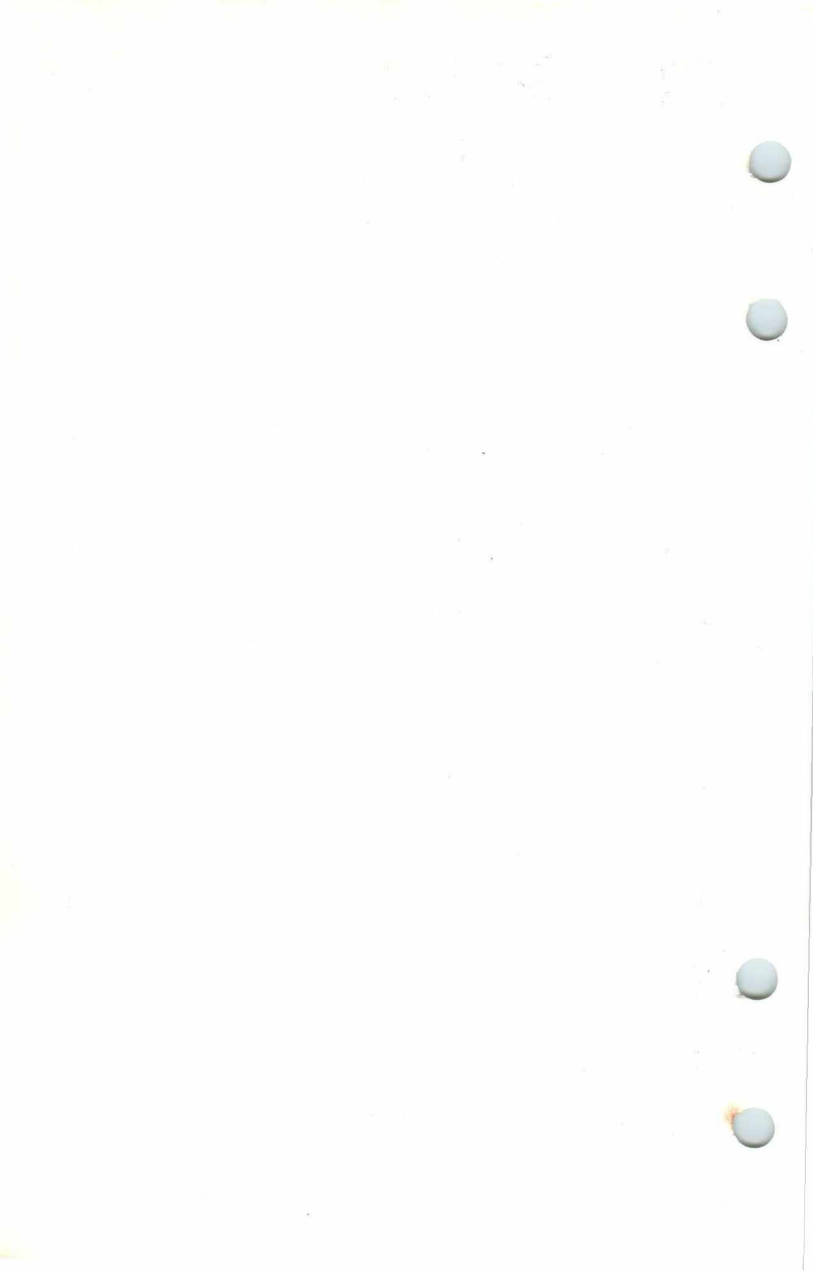
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|--------------------------|---------------|------|-----------------|
| Anode voltage            | $V_a =$       | 120  | 210 V           |
| Grid No.3 voltage        | $V_{g3} =$    | 0    | 0 V             |
| Grid No.2 supply voltage | $V_{bg2} =$   | 120  | 120 V           |
| Grid No.2 resistor       | $R_{g2} =$    | 5.6  | 5.6 k $\Omega$  |
| Cathode resistor         | $R_k =$       | 180  | 180 $\Omega$    |
| Anode current            | $I_a =$       | 8.3  | 8.3 mA          |
| Grid No.2 current        | $I_{g2} =$    | 1.7  | 1.7 mA          |
| Mutual conductance       | $S =$         | 8.2  | 8.2 mA/V        |
| Internal resistance      | $R_i =$       | 0.42 | 0.44 M $\Omega$ |
| Load resistance          | $R_{a\sim} =$ | 10   | 20 k $\Omega$   |
| Input voltage            | $V_1 =$       | 1.1  | 1.1 V(RMS)      |
| Output power             | $W_o =$       | 340  | 660 mW          |
| Total distortion         | $dt_{tot} =$  | 10   | 10 %            |
| Grid No.1 resistor       | $R_{g1} =$    | 0.33 | 0.33 M $\Omega$ |
| Grid No.1 current        | $I_{g1} =$    | +0.3 | +0.3 $\mu$ A    |
| Output power             | $W_o =$       | 400  | 870 mW          |
| Input power              | $V_1 =$       | 0.35 | 0.25 V(RMS)     |
| Output power             | $W_o =$       | 50   | 50 mW           |

LIMITING VALUES (Design centre limits)

|                                                  |            |        |                      |
|--------------------------------------------------|------------|--------|----------------------|
| Anode voltage in cold condition                  | $V_{a0}$   | = max. | 550 V                |
| Anode voltage                                    | $V_a$      | = max. | 210 V                |
| Anode dissipation                                | $W_a$      | = max. | 2.1 W                |
| Grid No.2 voltage in cold condition              | $V_{g20}$  | = max. | 550 V                |
| Grid No.2 voltage                                | $V_{g2}$   | = max. | 210 V                |
| Grid No.2 dissipation                            | $W_{g2}$   | = max. | 0.35 W               |
| Negative grid No.1 voltage                       | $-V_{g1}$  | = max. | 100 V                |
| Peak negative grid No.1 voltage                  | $-V_{g1p}$ | = max. | 200 V <sup>1)</sup>  |
| Grid No.1 dissipation                            | $W_{g1}$   | = max. | 50 mW                |
| Grid No.1 circuit resistance with automatic bias | $R_{g1}$   | = max. | 1 M $\Omega$         |
| Cathode current                                  | $I_k$      | = max. | 16 mA                |
| Peak cathode current                             | $I_{kp}$   | = max. | 80 mA <sup>1)</sup>  |
| Voltage between heater and cathode               | $V_{kf}$   | = max. | 100 V                |
| Circuit resistance between heater and cathode    | $R_{kf}$   | = max. | 20 k $\Omega$        |
| Bulb temperature                                 | $t_{bulb}$ | = max. | 170 °C <sup>2)</sup> |

<sup>1)</sup> Pulse duration max. 200  $\mu$ sec at a duty factor of 10%.

<sup>2)</sup> Absolute limit



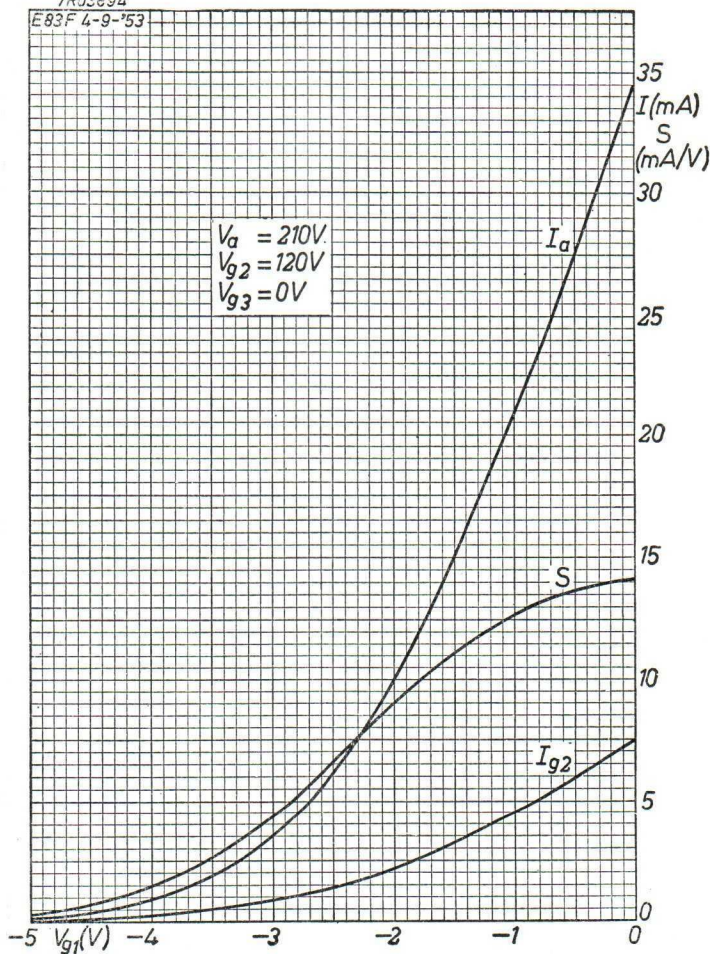
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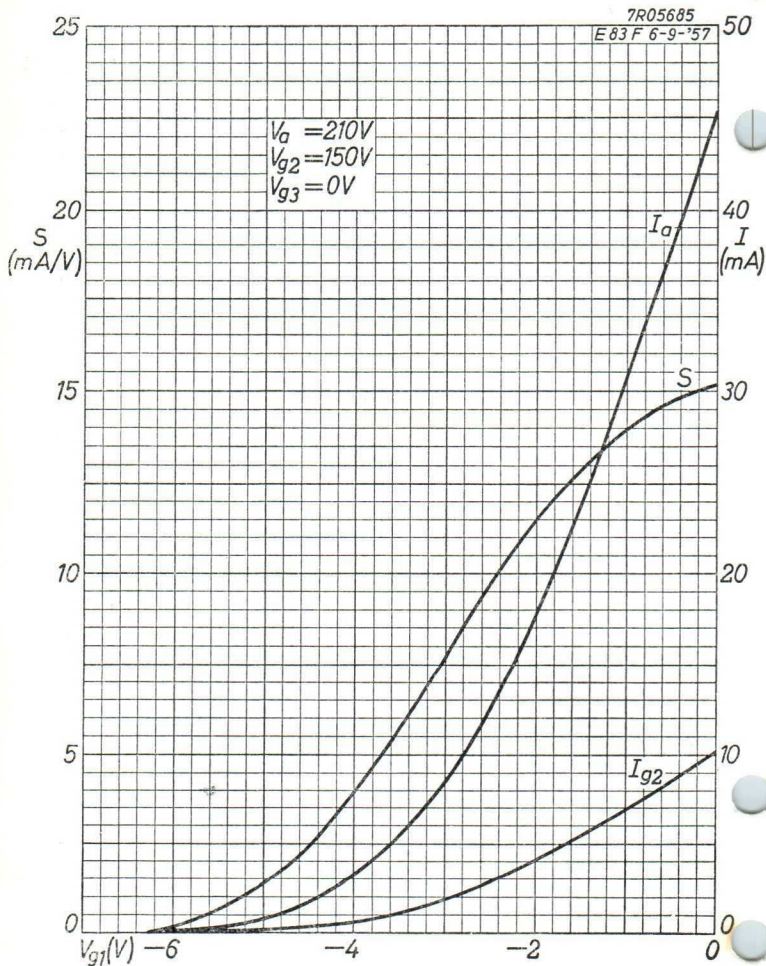
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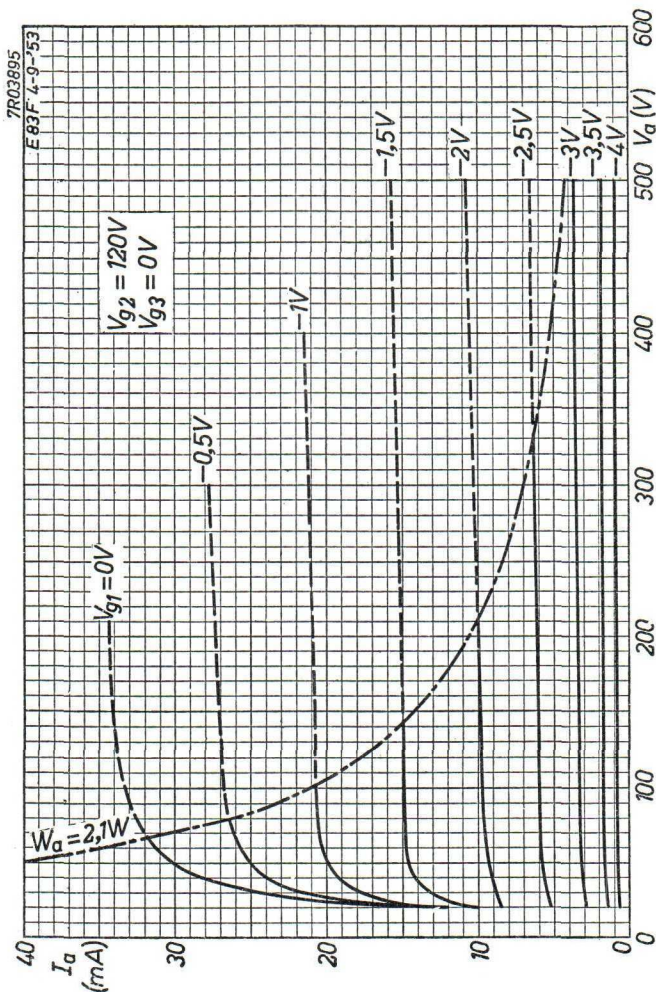
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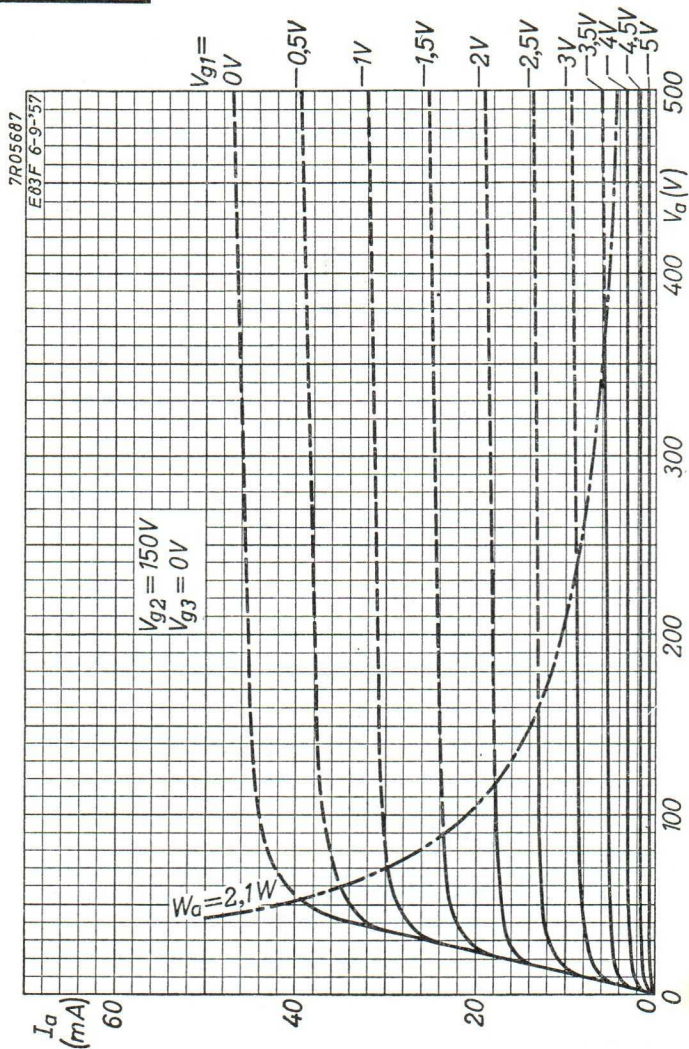
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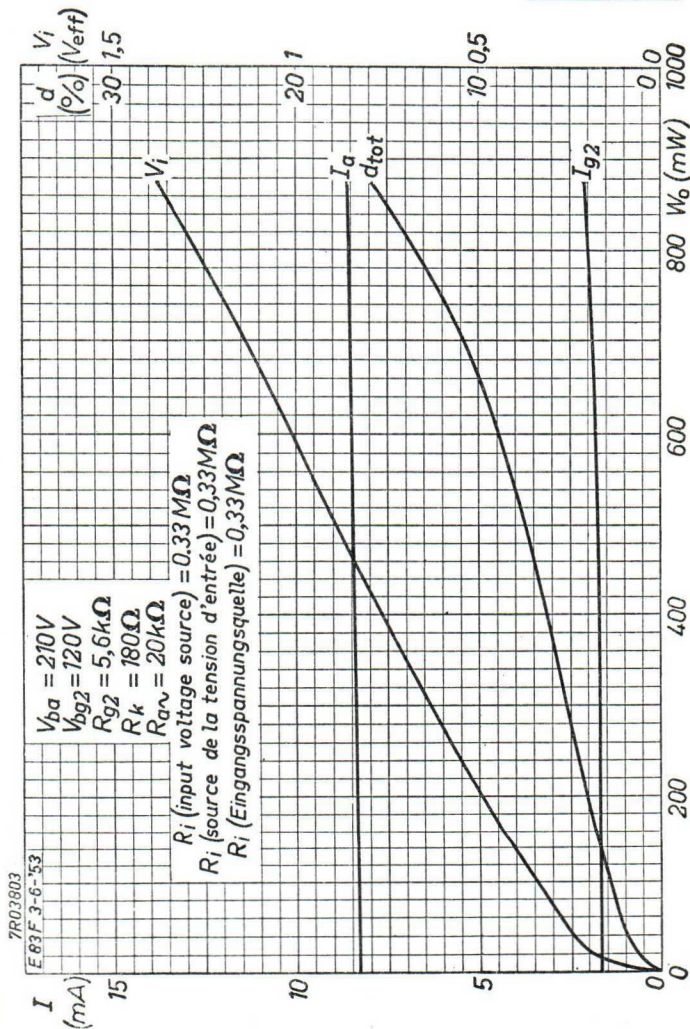
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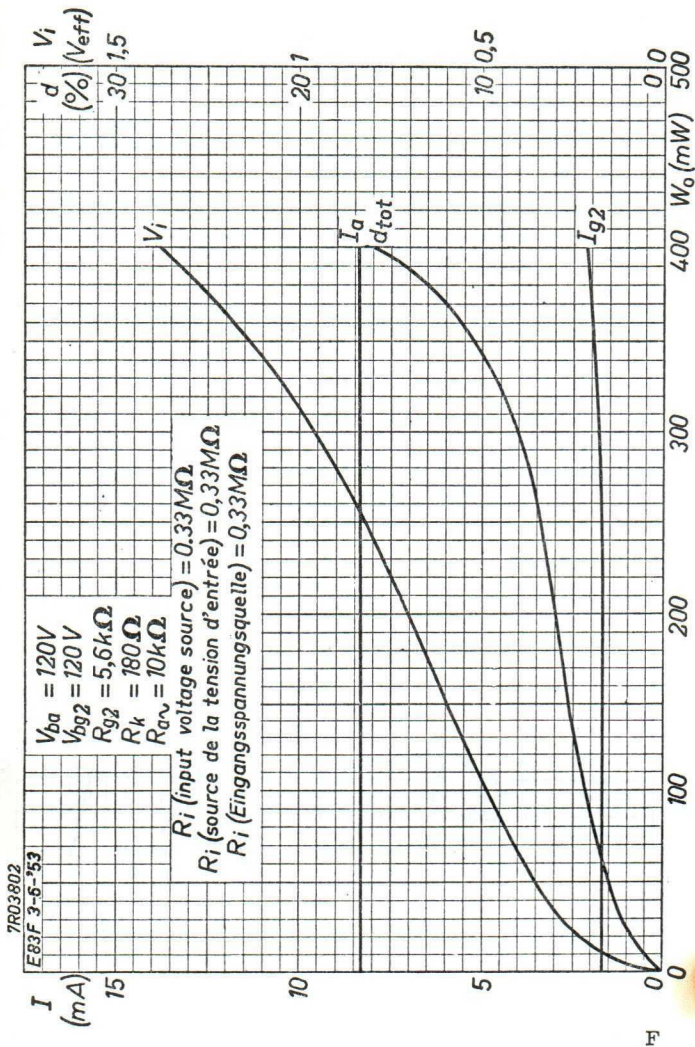
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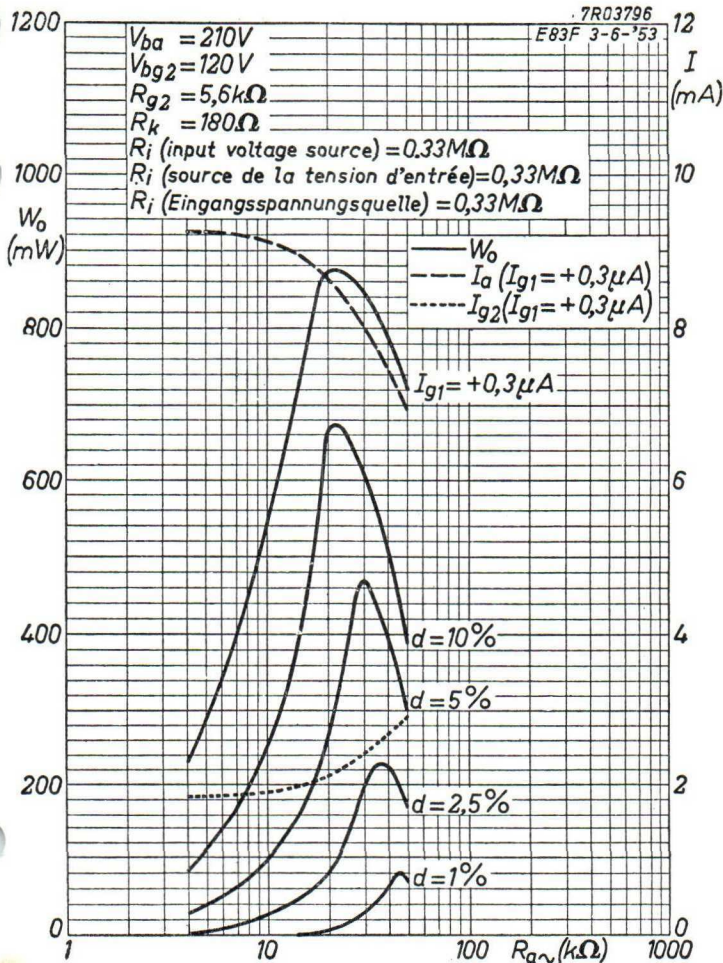
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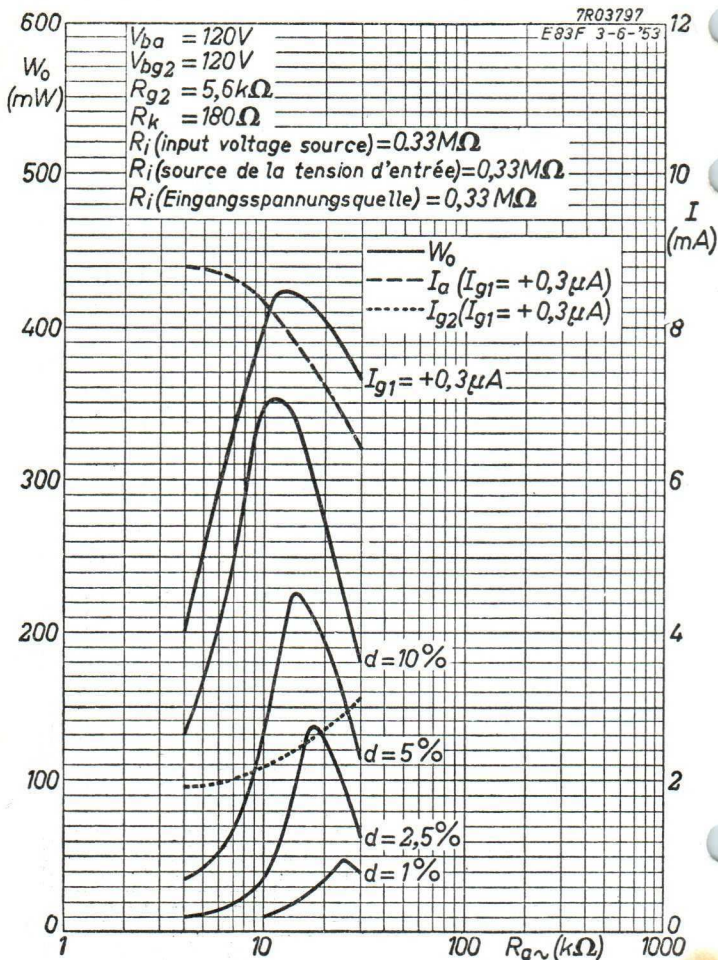
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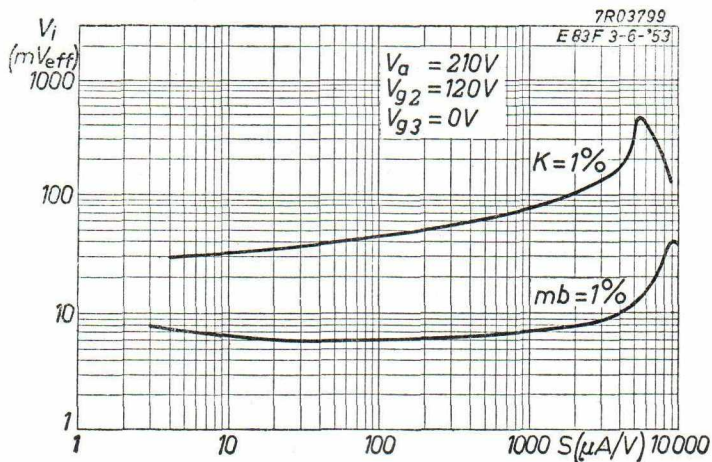


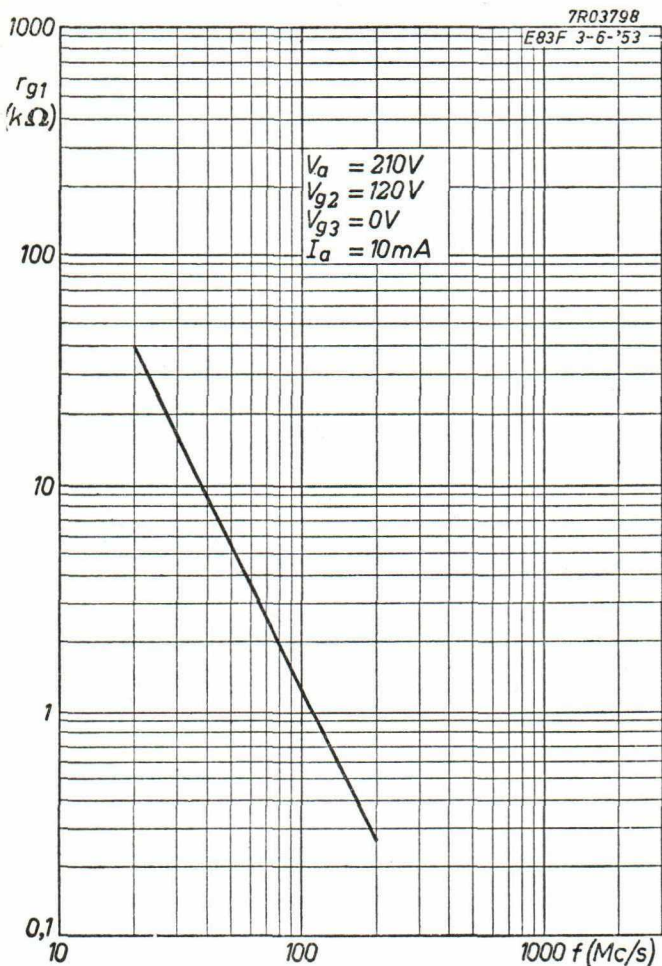
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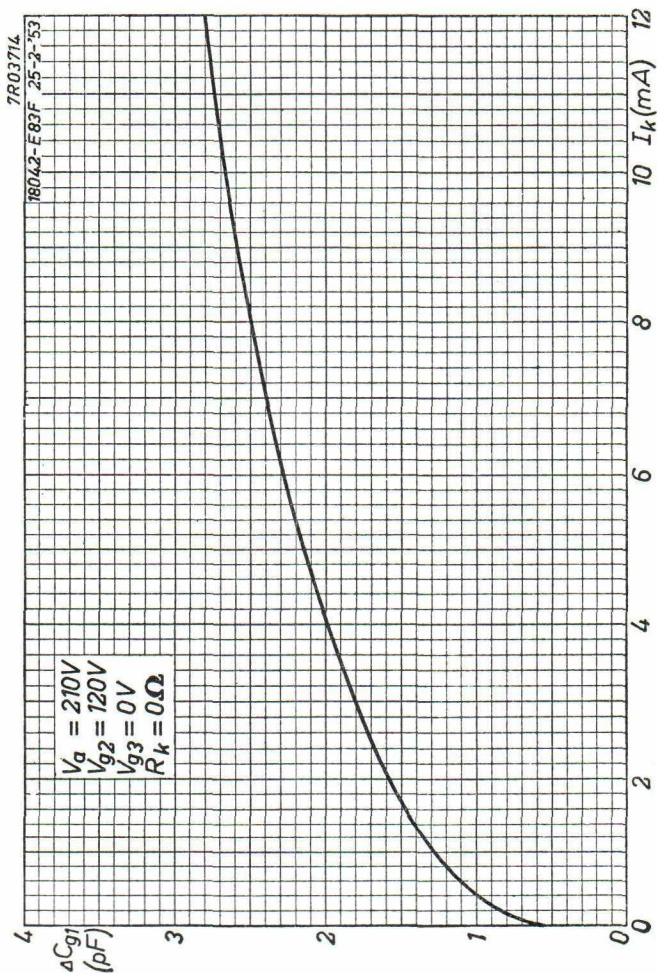


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Upper and lower current limits are indicated by arrows

Les limites supérieures et inférieures du courant sont indiquées par des flèches

Die oberen und unteren Stromgrenzen sind mittels Pfeile angegeben

