

## RF POWER TRIODE

| QUICK REFERENCE DATA |                |                       |                       |                       |                                     |                       |                       |                       |                       |
|----------------------|----------------|-----------------------|-----------------------|-----------------------|-------------------------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| $\lambda$<br>(m)     | Freq.<br>(MHz) | C telegr.             |                       | C grounded<br>grid    |                                     | C <sub>a</sub> mod.   |                       | B mod. <sup>2)</sup>  |                       |
|                      |                | V <sub>a</sub><br>(V) | W <sub>o</sub><br>(W) | V <sub>a</sub><br>(V) | W <sub>o</sub> <sup>1)</sup><br>(W) | V <sub>a</sub><br>(V) | W <sub>o</sub><br>(W) | V <sub>a</sub><br>(V) | W <sub>o</sub><br>(W) |
| 3                    | 100            | 4000                  | 1690                  | 4000                  | 1950                                | 3000                  | 1050                  | 4000                  | 2290                  |
|                      |                | 3500                  | 1430                  | 3500                  | 1650                                |                       |                       | 3500                  | 2440                  |
|                      |                | 3000                  | 1175                  | 3000                  | 1375                                |                       |                       | 3000                  | 2310                  |
|                      |                | 2500                  | 950                   | 2500                  | 1120                                |                       |                       | 2500                  | 2000                  |

**HEATING:** direct; filament thoriated tungsten

Filament voltage  $V_f = 10 \text{ V}$

Filament current  $I_f = 9.9 \text{ A}$

### CAPACITANCES

Anode to all other elements except grid  $C_a = 0.17 \text{ pF}$

Grid to all other elements except anode  $C_g = 8.0 \text{ pF}$

Anode to grid  $C_{ag} = 7.0 \text{ pF}$

### TYPICAL CHARACTERISTICS

Amplification factor  $\mu = 28$

Mutual conductance  $S (I_a = 125 \text{ mA}) = 4.5 \text{ mA/V}$

### TEMPERATURE LIMITS (Absolute limits)

Temperature of anode seal  $= \text{max. } 220 \text{ }^\circ\text{C}$

Temperature of bottom pin seals  $= \text{max. } 180 \text{ }^\circ\text{C}$

Bulb temperature  $= \text{max. } 250 \text{ }^\circ\text{C}$

<sup>1)</sup> Power transferred from driving stage included

<sup>2)</sup> Two tubes

# COOLING

In general cooling of the tube is not necessary at normal ambient temperature at frequencies below 50 MHz.

When the tube is used at or near the limiting values at frequencies above 50 Mc/s, it will be necessary to direct a low-velocity air flow on the anode seal and the bottom of the envelope.

# MECHANICAL DATA

Dimensions in mm

Socket : 2422 512 00001

Anode connector: 40626

Net mass : 420 g

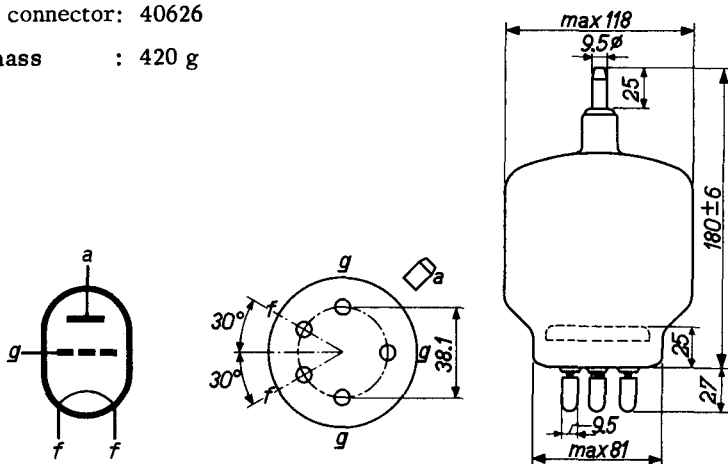


Fig. 1 Mechanical outline.

Mounting position: vertical with base up or down

## RF CLASS C TELEGRAPHY

## LIMITING VALUES (Absolute limits)

| Frequency         | f     | up to  | 100  | MHz |
|-------------------|-------|--------|------|-----|
| Anode voltage     | $V_a$ | = max. | 4000 | V   |
| Anode dissipation | $W_a$ | = max. | 450  | W   |
| Grid dissipation  | $W_g$ | = max. | 50   | W   |
| Grid current      | $I_g$ | = max. | 115  | mA  |
| Cathode current   | $I_k$ | = max. | 650  | mA  |

## OPERATING CONDITIONS (controlled)

|                      |           |   |      |      |      |      |    |
|----------------------|-----------|---|------|------|------|------|----|
| Wavelength           | $\lambda$ | = | 3    | 3    | 3    | 3    | m  |
| Anode voltage        | $V_a$     | = | 4000 | 3500 | 3000 | 2500 | V  |
| Grid voltage         | $V_g$     | = | -350 | -300 | -250 | -200 | V  |
| Anode current        | $I_a$     | = | 535  | 535  | 535  | 535  | mA |
| Grid current         | $I_g$     | = | 115  | 115  | 115  | 115  | mA |
| Peak grid AC voltage | $V_{gp}$  | = | 580  | 520  | 460  | 405  | V  |
| Grid input power     | $W_{ig}$  | = | 60   | 54   | 48   | 42   | W  |
| Anode input power    | $W_{ia}$  | = | 2140 | 1880 | 1600 | 1340 | W  |
| Anode dissipation    | $W_a$     | = | 450  | 450  | 425  | 390  | W  |
| Output power         | $W_o$     | = | 1690 | 1430 | 1175 | 950  | W  |
| Efficiency           | $\eta$    | = | 79   | 76   | 73.5 | 71   | %  |

## OPERATING CONDITIONS (self excited)

|                      |           |   |      |      |      |      |          |
|----------------------|-----------|---|------|------|------|------|----------|
| Wavelength           | $\lambda$ | = | 3    | 3    | 3    | 3    | m        |
| Anode voltage        | $V_a$     | = | 4000 | 3500 | 3000 | 2500 | V        |
| Grid resistor        | $R_g$     | = | 3000 | 2600 | 2200 | 1800 | $\Omega$ |
| Anode current        | $I_a$     | = | 535  | 535  | 535  | 535  | mA       |
| Grid current         | $I_g$     | = | 115  | 115  | 115  | 115  | mA       |
| Peak grid AC voltage | $V_{gp}$  | = | 580  | 520  | 460  | 405  | V        |
| Grid input power     | $W_{ig}$  | = | 60   | 54   | 48   | 42   | W        |
| Anode input power    | $W_{ia}$  | = | 2140 | 1880 | 1600 | 1340 | W        |
| Anode dissipation    | $W_a$     | = | 450  | 450  | 425  | 390  | W        |
| Output power         | $W_o$     | = | 1630 | 1376 | 1127 | 908  | W        |
| Efficiency           | $\eta$    | = | 76.5 | 73   | 70.5 | 67.5 | %        |

## OPERATING CONDITIONS RF CLASS C TELEGRAPHY (continued)

Grounded grid circuit, two tubes

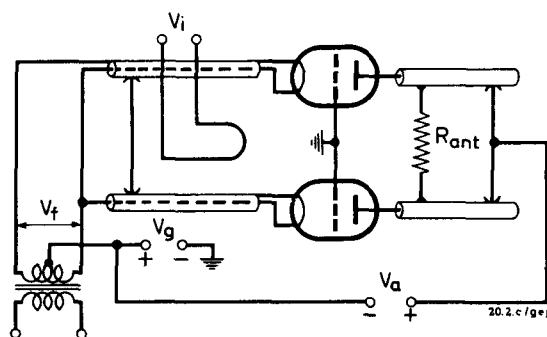


Fig. 2 Grounded grid configuration.

|                   |           |   |          |          |          |          |                 |
|-------------------|-----------|---|----------|----------|----------|----------|-----------------|
| Wavelength        | $\lambda$ | = | 3        | 3        | 3        | 3        | m               |
| Anode voltage     | $V_a$     | = | 4000     | 3500     | 3000     | 2500     | V               |
| Grid voltage      | $V_g$     | = | -350     | -300     | -250     | -200     | V               |
| Anode current     | $I_a$     | = | 2x535    | 2x535    | 2x535    | 2x535    | mA              |
| Grid current      | $I_g$     | = | 2x115    | 2x115    | 2x115    | 2x115    | mA              |
| Peak grid voltage | $V_{gp}$  | = | 580      | 520      | 460      | 405      | V               |
| Grid input power  | $W_{ig}$  | = | 2x320    | 2x274    | 2x248    | 2x212    | W               |
| Anode input power | $W_{ia}$  | = | 2x2140   | 2x1880   | 2x1600   | 2x1340   | W               |
| Anode dissipation | $W_a$     | = | 2x450    | 2x450    | 2x425    | 2x390    | W               |
| Output power      | $W_o$     | = | 3380+520 | 2860+440 | 2350+400 | 1900+340 | W <sup>1)</sup> |
| Efficiency        | $\eta$    | = | 79       | 76       | 73.5     | 71       | % <sup>2)</sup> |

1) Power transferred from driving stage included

2) Pure tube efficiency

\* See Fig. 6 for operation above 100 MHz.

## RF CLASS C ANODE MODULATION

## LIMITING VALUES (Absolute limits)

| Frequency         | f     | up to  | 100  | MHz |
|-------------------|-------|--------|------|-----|
| Anode voltage     | $V_a$ | = max. | 3000 | V   |
| Anode dissipation | $W_a$ | = max. | 300  | W   |
| Grid dissipation  | $W_g$ | = max. | 50   | W   |
| Grid current      | $I_g$ | = max. | 115  | mA  |
| Cathode current   | $I_k$ | = max. | 550  | mA  |

## OPERATING CONDITIONS

|                      |           |   |      |    |
|----------------------|-----------|---|------|----|
| Wavelength           | $\lambda$ | = | 3    | m  |
| Anode voltage        | $V_a$     | = | 3000 | V  |
| Grid voltage         | $V_g$     | = | -375 | V  |
| Anode current        | $I_a$     | = | 450  | mA |
| Grid current         | $I_g$     | = | 85   | mA |
| Peak grid AC voltage | $V_{gp}$  | = | 580  | V  |
| Grid input power     | $W_{ig}$  | = | 42   | W  |
| Anode input power    | $W_{ia}$  | = | 1350 | W  |
| Anode dissipation    | $W_a$     | = | 300  | W  |
| Output power         | $W_o$     | = | 1050 | W  |
| Efficiency           | $\eta$    | = | 78   | %  |
| Modulation factor    | m         | = | 100  | %  |
| Modulation power     | $W_{mod}$ | = | 675  | W  |

## AF CLASS B AMPLIFIER AND MODULATOR

## LIMITING VALUES (Absolute limits)

|                         |          |   |      |      |            |
|-------------------------|----------|---|------|------|------------|
| Anode voltage           | $V_a$    | = | max. | 4000 | V          |
| Anode dissipation       | $W_a$    | = | max. | 450  | W          |
| Grid dissipation        | $W_g$    | = | max. | 50   | W          |
| Cathode current         | $I_k$    | = | max. | 700  | mA         |
| Peak cathode current    | $I_{kp}$ | = | max. | 5    | A          |
| Grid current            | $I_g$    | = | max. | 130  | mA         |
| Grid circuit resistance | $R_g$    | = | max. | 50   | k $\Omega$ |

## OPERATING CONDITIONS, two tubes

|                           |              |   |                 |                 |            |
|---------------------------|--------------|---|-----------------|-----------------|------------|
| Anode voltage             | $V_a$        | = | 4000            | 3500            | V          |
| Grid voltage              | $V_g$        | = | -135            | -114            | V          |
| Load resistance           | $R_{aa\sim}$ | = | 14.5            | 10.2            | k $\Omega$ |
| Peak grid to grid voltage | $V_{ggp}$    | = | 0      566      | 0      563      | V          |
| Anode current             | $I_a$        | = | 2x70    2x368   | 2x70    2x442   | mA         |
| Grid current              | $I_g$        | = | 0      2x93     | 0      2x115    | mA         |
| Grid input power          | $W_{ig}$     | = | 0      2x24     | 0      2x29     | W          |
| Anode input power         | $W_{ia}$     | = | 2x280    2x1474 | 2x245    2x1550 | W          |
| Anode dissipation         | $W_a$        | = | 2x280    2x329  | 2x245    2x330  | W          |
| Output power              | $W_o$        | = | 0      2290     | 0      2440     | W          |
| Total distortion          | $d_{tot}$    | = | -      5        | -      5        | %          |
| Efficiency                | $\eta$       | = | -      77.7     | -      78.8     | %          |
| Anode voltage             | $V_a$        | = | 3000            | 2500            | V          |
| Grid voltage              | $V_g$        | = | -94             | -75             | V          |
| Load resistance           | $R_{aa\sim}$ | = | 7.5             | 5.2             | k $\Omega$ |
| Peak grid to grid voltage | $V_{ggp}$    | = | 0      560      | 0      530      | V          |
| Anode current             | $I_a$        | = | 2x70    2x500   | 2x70    2x555   | mA         |
| Grid current              | $I_g$        | = | 0      2x130    | 0      2x126    | mA         |
| Grid input power          | $W_{ig}$     | = | 0      2x33     | 0      2x30     | W          |
| Anode input power         | $W_{ia}$     | = | 2x210    2x1500 | 2x175    2x1387 | W          |
| Anode dissipation         | $W_a$        | = | 2x210    2x345  | 2x175    2x387  | W          |
| Output power              | $W_o$        | = | 0      2310     | 0      2000     | W          |
| Total distortion          | $d_{tot}$    | = | -      5        | -      3.5      | %          |
| Efficiency                | $\eta$       | = | -      77       | -      72       | %          |

**RF CLASS C OSCILLATOR FOR INDUSTRIAL USE** with anode voltage from two-phase half-wave rectifier without filter

**LIMITING VALUES** (Absolute limits)

| Frequency             | f        | up to  | 100  | MHz |
|-----------------------|----------|--------|------|-----|
| Anode voltage         | $V_a$    | = max. | 3600 | V   |
| Negative grid voltage | $-V_g$   | = max. | 320  | V   |
| Anode current         | $I_a$    | = max. | 475  | mA  |
| Grid current          | $I_g$    | = max. | 100  | mA  |
| Anode input power     | $W_{ia}$ | = max. | 2200 | W   |
| Anode dissipation     | $W_a$    | = max. | 450  | W   |
| Grid dissipation      | $W_g$    | = max. | 50   | W   |

**OPERATING CONDITIONS**

|                     |          |                      |                    |                 |
|---------------------|----------|----------------------|--------------------|-----------------|
| Transformer voltage | $V_{tr}$ | = 4000 <sup>1)</sup> | 3350 <sup>2)</sup> | $V_{RMS}$       |
| Anode voltage       | $V_a$    | = 3600               | 3000               | V <sup>3)</sup> |
| Anode current       | $I_a$    | = 450                | 400                | mA              |
| Grid current        | $I_g$    | = 100                | 85                 | mA              |
| Grid resistor       | $R_g$    | = 3.0                | 3.0                | k $\Omega$      |
| Anode input power   | $W_{ia}$ | = 2000               | 1480               | W               |
| Anode dissipation   | $W_a$    | = 450                | 400                | W               |
| Output power        | $W_o$    | = 1500               | 1040               | W               |
| Efficiency          | $\eta$   | = 75                 | 70                 | %               |

<sup>1)</sup> Care must be taken that under these operating conditions the absolute limiting values are not exceeded by variation of the supply voltage or the load or by tolerances in the circuit elements.

<sup>2)</sup> Under these conditions normal deviations of voltages and load are permissible. The absolute limiting values of the tube must, however, not be exceeded.

<sup>3)</sup> DC value.

**RF CLASS C OSCILLATOR FOR INDUSTRIAL USE** with anode voltage from three-phase half-wave rectifier without filter

**LIMITING VALUES** (Absolute limits)

| Frequency             | f        | up to  | 100  | MHz |
|-----------------------|----------|--------|------|-----|
| Anode voltage         | $V_a$    | = max. | 4000 | V   |
| Negative grid voltage | $-V_g$   | = max. | 500  | V   |
| Anode current         | $I_a$    | = max. | 535  | mA  |
| Grid current          | $I_g$    | = max. | 115  | mA  |
| Anode input power     | $W_{ia}$ | = max. | 2200 | W   |
| Anode dissipation     | $W_a$    | = max. | 450  | W   |
| Grid dissipation      | $W_g$    | = max. | 50   | W   |

**OPERATING CONDITIONS**

|                     |          |                      |                    |                 |
|---------------------|----------|----------------------|--------------------|-----------------|
| Transformer voltage | $V_{tr}$ | = 3400 <sup>1)</sup> | 2900 <sup>2)</sup> | $V_{RMS}$       |
| Anode voltage       | $V_a$    | = 4000               | 3400               | V <sup>3)</sup> |
| Anode current       | $I_a$    | = 535                | 450                | mA              |
| Grid current        | $I_g$    | = 115                | 100                | mA              |
| Grid resistor       | $R_g$    | = 3.0                | 3.0                | k $\Omega$      |
| Anode input power   | $W_{ia}$ | = 2140               | 1530               | W               |
| Anode dissipation   | $W_a$    | = 450                | 390                | W               |
| Output power        | $W_o$    | = 1630               | 1090               | W               |
| Efficiency          | $\eta$   | = 76.5               | 71                 | %               |

1) Care must be taken that under these operating conditions the absolute limiting values are not exceeded by variation of the supply voltage or the load or by tolerances in the circuit elements.

2) Under these conditions normal deviations of voltages and load are permissible. The absolute limiting values of the tube must, however, not be exceeded.

3) DC value.

## RF CLASS C OSCILLATOR FOR INDUSTRIAL USE with self rectification

## LIMITING VALUES (Absolute limits)

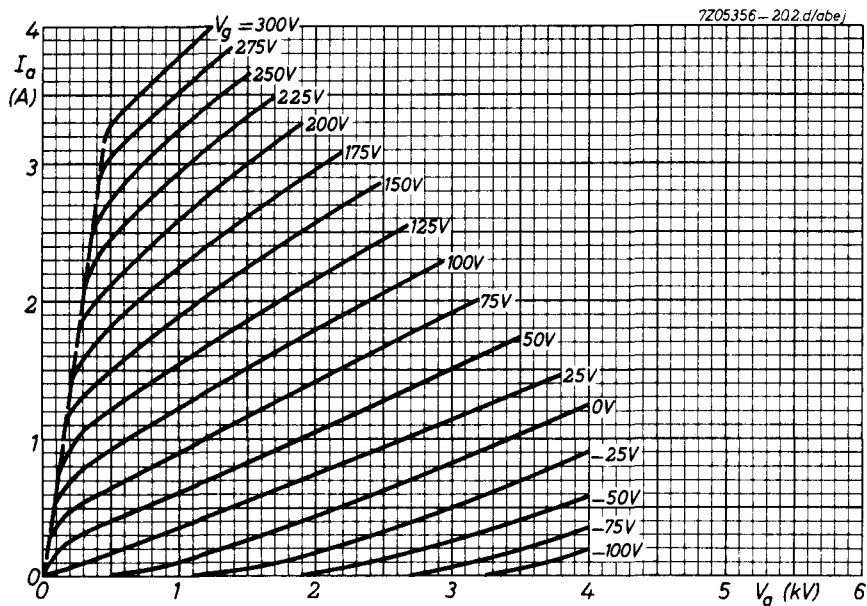
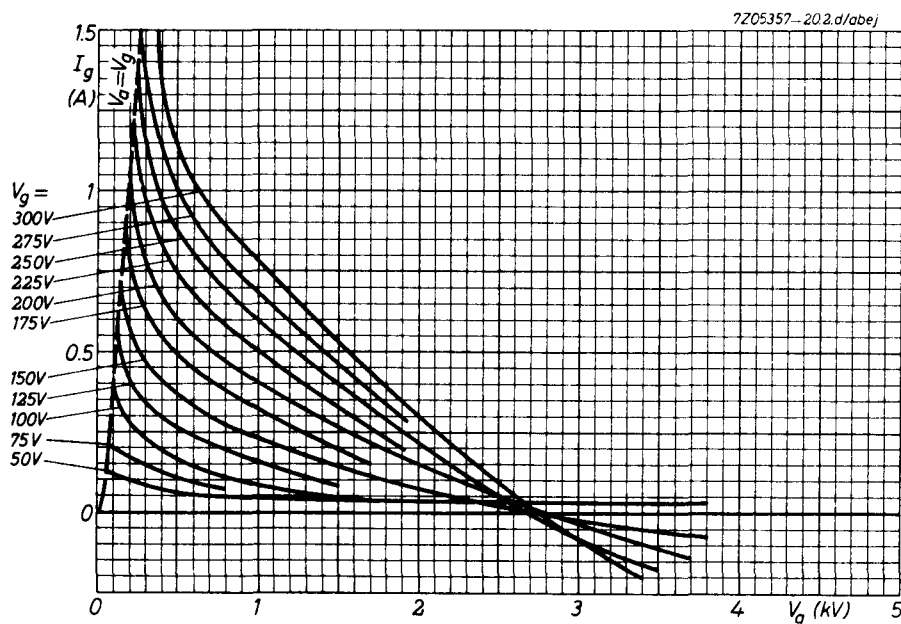
| Frequency             | f        | up to  | 100  | MHz       |
|-----------------------|----------|--------|------|-----------|
| Transformer voltage   | $V_{tr}$ | = max. | 4500 | $V_{RMS}$ |
| Negative grid voltage | $-V_g$   | = max. | 500  | V         |
| Anode current         | $I_a$    | = max. | 280  | mA        |
| Grid current          | $I_g$    | = max. | 55   | mA        |
| Anode input power     | $W_{ia}$ | = max. | 1450 | W         |
| Anode dissipation     | $W_a$    | = max. | 450  | W         |
| Grid dissipation      | $W_g$    | = max. | 50   | W         |

## OPERATING CONDITIONS

|                     |          |   |             |             |           |
|---------------------|----------|---|-------------|-------------|-----------|
| Transformer voltage | $V_{tr}$ | = | $4500^{1)}$ | $3800^{2)}$ | $V_{RMS}$ |
| Anode current       | $I_a$    | = | 280         | 240         | mA        |
| Grid current        | $I_g$    | = | 55          | 47          | mA        |
| Grid resistor       | $R_g$    | = | 3.4         | 3.4         | $k\Omega$ |
| Anode input power   | $W_{ia}$ | = | 1400        | 1010        | W         |
| Anode dissipation   | $W_a$    | = | 350         | 295         | W         |
| Output power        | $W_o$    | = | 1000        | 670         | W         |
| Efficiency          | $\eta$   | = | 71.5        | 66          | %         |

<sup>1)</sup> Care must be taken that under these operating conditions the absolute limiting values are not exceeded by variation of the supply voltage or the load or by tolerances in the circuit elements.

<sup>2)</sup> Under these conditions normal deviations of voltages and load are permissible. The absolute limiting values of the tube must, however, not be exceeded.

Fig. 3  $I_a/V_a$  characteristics.Fig. 4  $I_a/V_a$  characteristics.

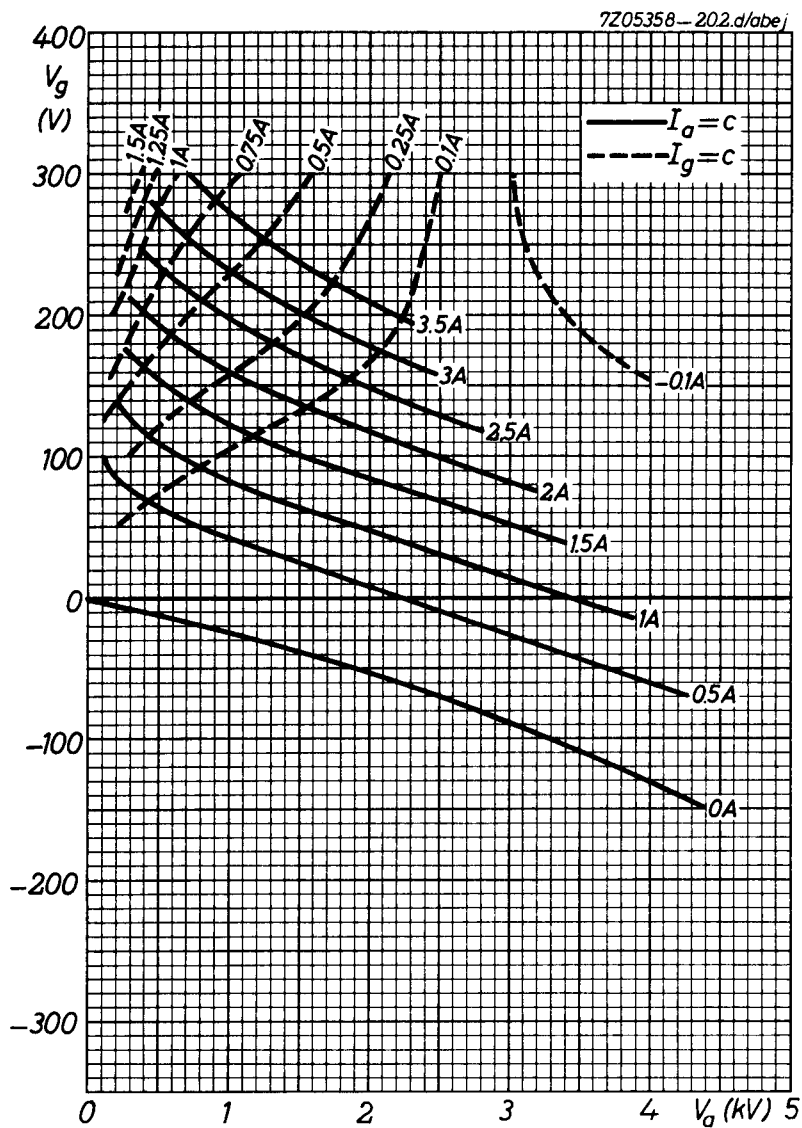


Fig. 5 Constant current characteristics.

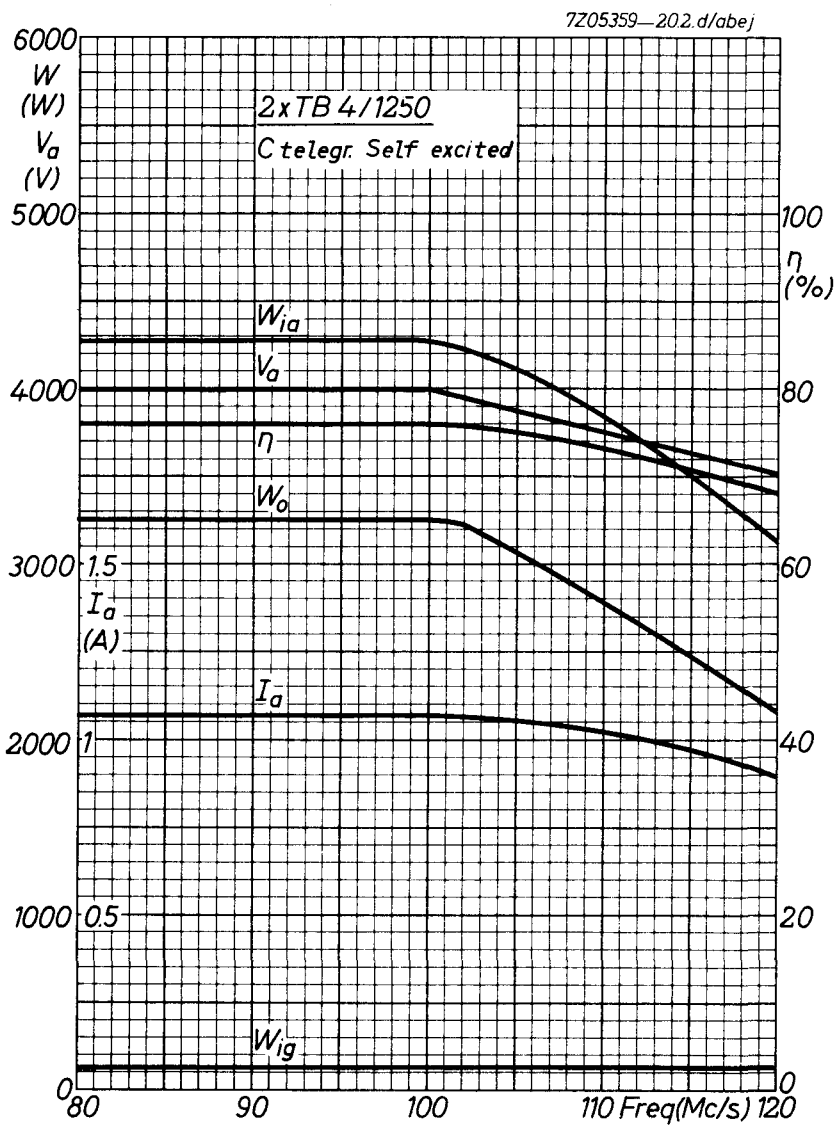


Fig. 6 Characteristics at frequencies above 100 MHz.

# PHILIPS

## Data handbook



**Electronic  
components  
and materials**

**TB4/1250**

| <b>page</b> | <b>sheet</b> | <b>date</b> |
|-------------|--------------|-------------|
| 1           | 59           | 1988.02     |
| 2           | 60           | 1988.02     |
| 3           | 61           | 1988.02     |
| 4           | 62           | 1988.02     |
| 5           | 63           | 1988.02     |
| 6           | 64           | 1988.02     |
| 7           | 65           | 1988.02     |
| 8           | 66           | 1988.02     |
| 9           | 67           | 1988.02     |
| 10          | 68           | 1988.02     |
| 11          | 69           | 1988.02     |
| 12          | 70           | 1988.02     |
| 13          | FP           | 2000.09.15  |