

## RF POWER TRIODE

## QUICK REFERENCE DATA

| freq.<br>MHz | class-C              |                     |                      |                       |                      |                       |                        |                     |                      |                     | class-B              |                       |
|--------------|----------------------|---------------------|----------------------|-----------------------|----------------------|-----------------------|------------------------|---------------------|----------------------|---------------------|----------------------|-----------------------|
|              | telegraphy           |                     | grounded grid        |                       | oscillator           |                       | oscillator, industrial |                     |                      |                     | modulator            |                       |
|              | V <sub>a</sub><br>kV | W <sub>o</sub><br>W | V <sub>a</sub><br>kV | W <sub>o</sub> *<br>W | V <sub>a</sub><br>kV | W <sub>o</sub> *<br>W | V <sub>a</sub><br>kV   | W <sub>o</sub><br>W | V <sub>a</sub><br>kV | W <sub>o</sub><br>W | V <sub>a</sub><br>kV | W <sub>o</sub> *<br>W |
| 100          | 4                    | 1200                |                      |                       | 4                    | 2320                  |                        |                     |                      |                     | 4                    | 1500                  |
|              | 3                    | 840                 | 3                    | 1936                  | 3                    | 1626                  |                        |                     |                      |                     | 3                    | 1360                  |
|              | 2,5                  | 750                 | 2,5                  | 1747                  |                      |                       |                        |                     |                      |                     | 2,5                  | 1140                  |
|              | 2                    | 585                 | 2                    | 1374                  |                      |                       |                        |                     |                      |                     |                      |                       |
|              | 1,5                  | 425                 | 1,5                  | 1040                  |                      |                       |                        |                     |                      |                     |                      |                       |
| 50           |                      |                     |                      |                       |                      |                       | 3,5                    | 1100                | 4                    | 630                 |                      |                       |
|              |                      |                     |                      |                       |                      |                       | 2,25                   | 685                 | 3                    | 415                 |                      |                       |

**HEATING:** direct, parallel supply; thoriated tungsten filament

Filament voltage  $V_f = 5 \text{ V}$

Filament current  $I_f = 14,1 \text{ A}$

The filament is designed to accept temporary fluctuations of +5% and -10%

**CAPACITANCES**

Anode to all other elements except grid  $C_a = 0,16 \text{ pF}$

Grid to all other elements except anode  $C_g = 6,3 \text{ pF}$

Anode to grid  $C_{ag} = 5,0 \text{ pF}$

**TYPICAL CHARACTERISTICS**

Anode voltage  $V_a = 3 \text{ kV}$

Anode current  $I_a = 90 \text{ mA}$

Mutual conductance  $S = 5 \text{ mA/V}$

Amplification factor  $\mu = 25$

\* Two tubes.

### Absolute maximum rating system

$T_{\text{bulb}}$  max. 350 °C

$T_a$  max. 220 °C

$T_{pin}$  max. 180 °C

In cases where the maximum permissible temperatures are likely to be exceeded, as would normally be the case at frequencies above 30 MHz with full ratings, a low-velocity air flow has to be directed onto the anode seal and the bottom of the envelope. The cooling will be facilitated by the use of a blower and a glass chimney type 40666.

|                        |                |
|------------------------|----------------|
| Socket                 | 2422 512 01001 |
| Anode connector (clip) | 40624          |
| Chimney                | 40666          |

|          |            |
|----------|------------|
| Base     | Giant 5 p. |
| Net mass | 190 g      |

**Dimensions in mm**

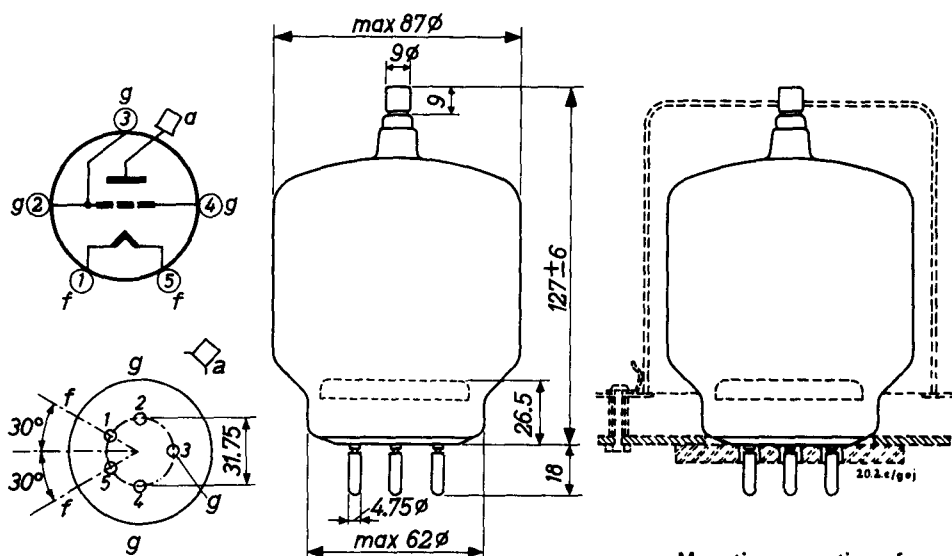


**Fig. 1 Mechanical outline.**

### Mounting position

**vertical with base up or down**

Mounting suggestion of tube with chimney.

In order to prevent overheating of the grid pins by high-frequency current it is recommended to include the three grid socket connections in the circuit.

## RF CLASS C TELEGRAPHY OR F.M. TELEPHONY

## LIMITING VALUES (Absolute limits)

| Frequency               | f        | up to  | 100  | MHz        |
|-------------------------|----------|--------|------|------------|
| Anode voltage           | $V_a$    | = max. | 4    | kV         |
| Anode input power       | $W_{ia}$ | = max. | 1550 | W          |
| Anode dissipation       | $W_a$    | = max. | 350  | W          |
| Negative grid voltage   | $-V_g$   | = max. | 500  | V          |
| Grid dissipation        | $W_g$    | = max. | 40   | W          |
| Grid circuit resistance | $R_g$    | = max. | 100  | k $\Omega$ |
| Cathode current         | $I_k$    | = max. | 500  | mA         |

## OPERATING CONDITIONS

|                      |          |   |      |      |      |      |      |     |
|----------------------|----------|---|------|------|------|------|------|-----|
| Frequency            | f        | = | 100  | 100  | 100  | 100  | 100  | MHz |
| Anode voltage        | $V_a$    | = | 4    | 3    | 2.5  | 2    | 1.5  | kV  |
| Grid voltage         | $V_g$    | = | -350 | -250 | -200 | -150 | -120 | V   |
| Peak grid AC voltage | $V_{gp}$ | = | 535  | 430  | 380  | 320  | 295  | V   |
| Anode current        | $I_a$    | = | 380  | 363  | 400  | 400  | 400  | mA  |
| Grid current         | $I_g$    | = | 80   | 69   | 69   | 80   | 80   | mA  |
| Driving power        | $W_{dr}$ | = | 40   | 27   | 23.5 | 23   | 21.5 | W   |
| Anode input power    | $W_{ia}$ | = | 1520 | 1090 | 1000 | 800  | 600  | W   |
| Anode dissipation    | $W_a$    | = | 320  | 250  | 250  | 215  | 175  | W   |
| Output power         | $W_o$    | = | 1200 | 840  | 750  | 585  | 425  | W   |
| Efficiency           | $\eta$   | = | 79   | 77   | 75   | 73   | 71   | %   |

## RF CLASS C TELEGRAPHY OR FM TELEPHONY (continued)

OPERATING CONDITIONS, grounded grid, two tubes

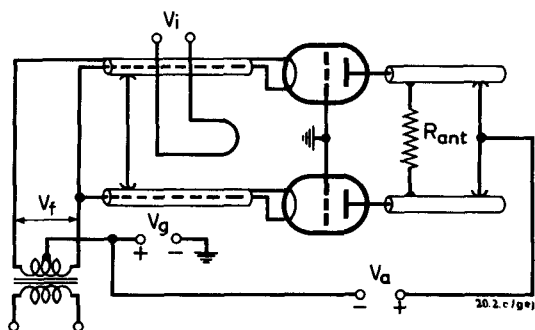


Fig. 2 Ground grid configuration.

|                   |          |   |          |          |          |         |                 |
|-------------------|----------|---|----------|----------|----------|---------|-----------------|
| Frequency         | $f$      | = | 100      | 100      | 100      | 100     | MHz             |
| Anode voltage     | $V_a$    | = | 3        | 2.5      | 2        | 1.5     | kV              |
| Grid voltage      | $V_g$    | = | -250     | -200     | -150     | -120    | V               |
| Peak grid         |          |   |          |          |          |         |                 |
| AC voltage        | $V_{gp}$ | = | 430      | 380      | 320      | 295     | V               |
| Anode current     | $I_a$    | = | 726      | 800      | 800      | 800     | mA              |
| Grid current      | $I_g$    | = | 138      | 138      | 160      | 160     | mA              |
| Driving power     | $W_{dr}$ | = | 310      | 294      | 250      | 233     | W               |
| Anode input power | $W_{ia}$ | = | 2180     | 2000     | 1600     | 1200    | W               |
| Anode dissipation | $W_a$    | = | 500      | 500      | 430      | 350     | W               |
| Output power      | $W_o$    | = | 1680+256 | 1500+247 | 1170+204 | 850+190 | W <sup>1)</sup> |
| Efficiency        | $\eta$   | = | 77       | 75       | 73       | 71      | %               |

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

## RF CLASS C OSCILLATOR

## LIMITING VALUES (Absolute limits)

| Frequency               | f        | up to  | 100  | MHz        |
|-------------------------|----------|--------|------|------------|
| Anode voltage           | $V_a$    | = max. | 4    | kV         |
| Anode input power       | $W_{ia}$ | = max. | 1550 | W          |
| Anode dissipation       | $W_a$    | = max. | 350  | W          |
| Negative grid voltage   | $-V_g$   | = max. | 500  | V          |
| Grid dissipation        | $W_g$    | = max. | 40   | W          |
| Grid circuit resistance | $R_g$    | = max. | 100  | k $\Omega$ |
| Cathode current         | $I_k$    | = max. | 500  | mA         |

## OPERATING CONDITIONS, two tubes

|                   |          |   |      |      |          |
|-------------------|----------|---|------|------|----------|
| Frequency         | f        | = | 100  | 100  | MHz      |
| Anode voltage     | $V_a$    | = | 4    | 3    | kV       |
| Anode current     | $I_a$    | = | 760  | 726  | mA       |
| Grid current      | $I_g$    | = | 160  | 138  | mA       |
| Grid resistor     | $R_g$    | = | 2200 | 1800 | $\Omega$ |
| Driving power     | $W_{dr}$ | = | 80   | 54   | W        |
| Anode input power | $W_{ia}$ | = | 3040 | 2180 | W        |
| Anode dissipation | $W_a$    | = | 640  | 500  | W        |
| Output power      | $W_o$    | = | 2320 | 1626 | W        |
| Efficiency        | $\eta$   | = | 77   | 75   | %        |

**R F CLASS C OSCILLATOR FOR INDUSTRIAL USE** with anode voltage from single-phase full-wave rectifier without filter

**LIMITING VALUES** (Absolute limits)

| Frequency               | f        | up to 50    | up to 100 | up to 150 | MHz        |
|-------------------------|----------|-------------|-----------|-----------|------------|
| Anode voltage           | $V_a$    | = max. 3.8  | max. 2.7  | max. 1.8  | kV         |
| Anode input power       | $W_{ia}$ | = max. 1500 | max. 975  | max. 650  | W          |
| Anode dissipation       | $W_a$    | = max. 350  | max. 350  | max. 350  | W          |
| Negative grid voltage   | $-V_g$   | = max. 500  | max. 500  | max. 500  | V          |
| Grid dissipation        | $W_g$    | = max. 40   | max. 40   | max. 40   | W          |
| Grid circuit resistance | $R_g$    | = max. 100  | max. 100  | max. 100  | k $\Omega$ |
| Cathode current         | $I_k$    | = max. 450  | max. 450  | max. 450  | mA         |

**OPERATING CONDITIONS**

|                          |          |   |      |      |          |
|--------------------------|----------|---|------|------|----------|
| Frequency                | f        | = | 50   | 50   | MHz      |
| Anode voltage            | $V_a$    | = | 3.5  | 2.25 | kV       |
| Anode current            | $I_a$    | = | 325  | 340  | mA       |
| Grid current             | $I_g$    | = | 65   | 60   | mA       |
| Grid resistor            | $R_g$    | = | 4500 | 3330 | $\Omega$ |
| Anode input power        | $W_{ia}$ | = | 1400 | 935  | W        |
| Anode dissipation        | $W_a$    | = | 300  | 250  | W        |
| Output power             | $W_o$    | = | 1100 | 685  | W        |
| Efficiency               | $\eta$   | = | 78   | 73   | %        |
| Output power in the load | $W_l$    | = | 900  | 560  | W        |

**RF CLASS C OSCILLATOR FOR INDUSTRIAL USE** with self rectification,  
180° phase shift between  $V_a$  and  $V_g$

**LIMITING VALUES** (Absolute limits)

| Frequency               | f        | up to 50   | up to 100 | up to 150 | MHz               |
|-------------------------|----------|------------|-----------|-----------|-------------------|
| Transformer voltage     | $V_{tr}$ | = max. 4.5 | max. 3.5  | max. 2.25 | kV <sub>RMS</sub> |
| Anode input power       | $W_{ia}$ | = max. 900 | max. 730  | max. 500  | W                 |
| Anode dissipation       | $W_a$    | = max. 350 | max. 350  | max. 350  | W                 |
| Negative grid voltage   | $-V_g$   | = max. 500 | max. 500  | max. 500  | V                 |
| Grid dissipation        | $W_g$    | = max. 40  | max. 40   | max. 40   | W                 |
| Grid circuit resistance | $R_g$    | = max. 100 | max. 100  | max. 100  | kΩ                |
| Cathode current         | $I_k$    | = max. 285 | max. 285  | max. 285  | mA                |

**OPERATING CONDITIONS**

|                          |          |   |      |      |                   |
|--------------------------|----------|---|------|------|-------------------|
| Frequency                | f        | = | 50   | 50   | MHz               |
| Transformer voltage      | $V_{tr}$ | = | 4    | 3    | kV <sub>RMS</sub> |
| Anode current            | $I_a$    | = | 190  | 180  | mA                |
| Driving voltage          | $V_g$    | = | 280  | 110  | V <sub>RMS</sub>  |
| Grid current             | $I_g$    | = | 35   | 32   | mA                |
| Grid resistor            | $R_g$    | = | 5500 | 3000 | Ω                 |
| Anode input power        | $W_{ia}$ | = | 840  | 600  | W                 |
| Anode dissipation        | $W_a$    | = | 210  | 185  | W                 |
| Output power             | $W_o$    | = | 630  | 415  | W                 |
| Efficiency               | $\eta$   | = | 75   | 69   | %                 |
| Output power in the load | $W_l$    | = | 515  | 350  | W                 |

**AF CLASS B AMPLIFIER AND MODULATOR**, two tubes in push-pull

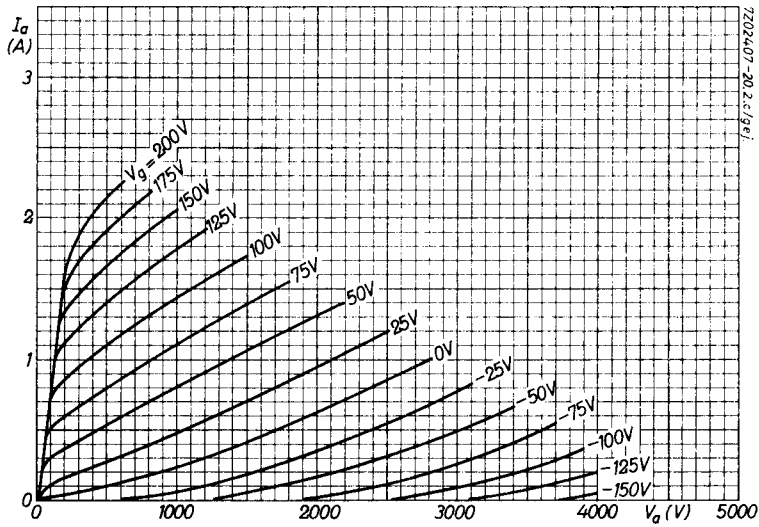
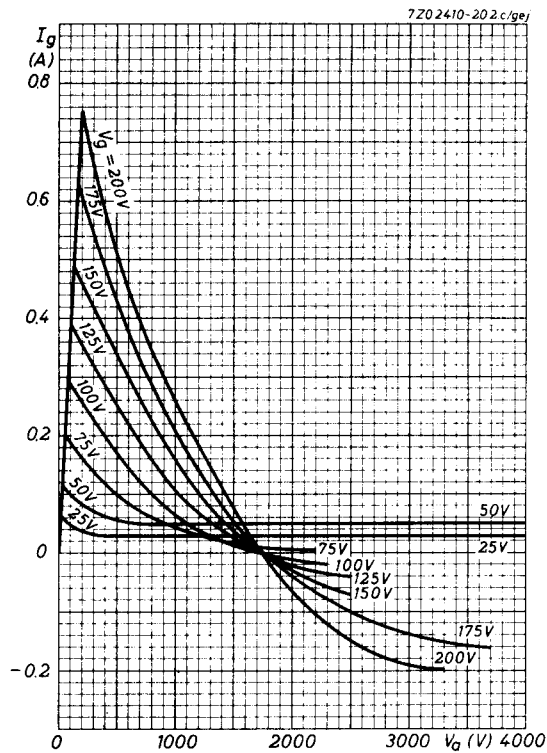
**LIMITING VALUES** (Absolute limits)

|                         |          |   |      |      |            |
|-------------------------|----------|---|------|------|------------|
| Anode voltage           | $V_a$    | = | max. | 4    | kV         |
| Anode input power       | $W_{ia}$ | = | max. | 1550 | W          |
| Anode dissipation       | $W_a$    | = | max. | 350  | W          |
| Negative grid voltage   | $-V_g$   | = | max. | 500  | V          |
| Grid dissipation        | $W_g$    | = | max. | 40   | W          |
| Grid circuit resistance | $R_g$    | = | max. | 100  | k $\Omega$ |
| Cathode current         | $I_k$    | = | max. | 500  | mA         |

**OPERATING CONDITIONS**

|              |   |              |             |             |                 |
|--------------|---|--------------|-------------|-------------|-----------------|
| $V_a$        | = | 4            | 3           | 2.5         | kV              |
| $V_g$        | = | -135         | -102        | -77.5       | V <sup>1)</sup> |
| $R_{aa\sim}$ | = | 20           | 14.5        | 12          | k $\Omega$      |
| $V_{ggp}$    | = | 0 485        | 0 475       | 0 400       | V               |
| $I_a$        | = | 2x88 2x270   | 2x60 2x290  | 2x90 2x300  | mA              |
| $I_g$        | = | 0 2x30       | 0 2x60      | 0 2x55      | mA              |
| $W_{dr}$     | = | 0 2x7        | 0 2x13      | 0 2x10      | W               |
| $W_{ia}$     | = | 2x350 2x1080 | 2x180 2x870 | 2x225 2x750 | W               |
| $W_a$        | = | 2x350 2x305  | 2x180 2x190 | 2x225 2x180 | W               |
| $W_o$        | = | 0 1550       | 0 1360      | 0 1140      | W               |
| $d_{tot}$    | = | - < 2.5      | - < 2.5     | - < 2.5     | %               |
| $\eta$       | = | - 71.7       | - 78.1      | - 76        | %               |

<sup>1)</sup> To be adjusted for zero signal anode current

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

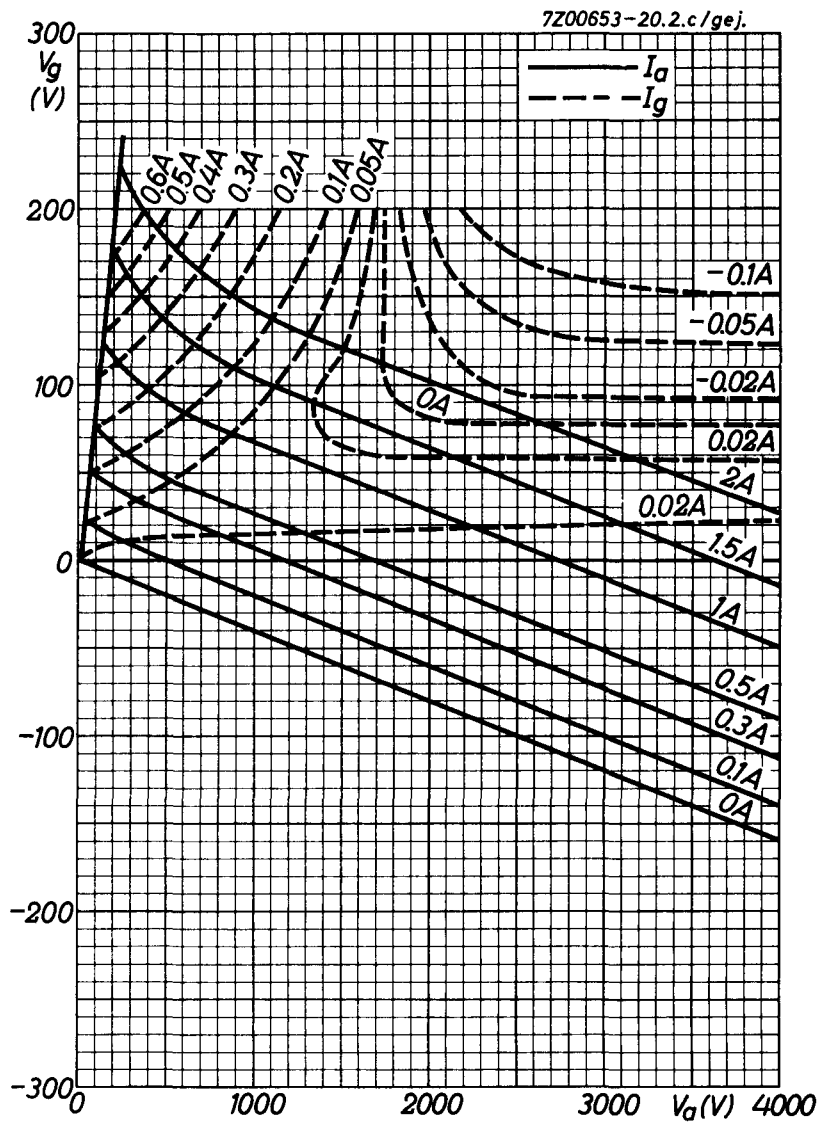


Fig. 5 Constant current characteristics.

# PHILIPS

## Data handbook



**Electronic  
components  
and materials**

**TB3/750**

| <b>page</b> | <b>sheet</b> | <b>date</b> |
|-------------|--------------|-------------|
| 1           | 49           | 1988.02     |
| 2           | 50           | 1988.02     |
| 3           | 51           | 1988.02     |
| 4           | 52           | 1988.02     |
| 5           | 53           | 1988.02     |
| 6           | 54           | 1988.02     |
| 7           | 55           | 1988.02     |
| 8           | 56           | 1988.02     |
| 9           | 57           | 1988.02     |
| 10          | 58           | 1988.02     |
| 11          | FP           | 2000..09.14 |