

## S.Q. TUBE

Special quality pentode designed for use as wide band amplifier

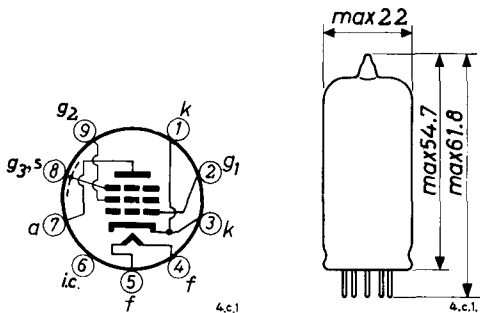
### QUICK REFERENCE DATA

|                             |                                           |     |          |
|-----------------------------|-------------------------------------------|-----|----------|
| Life test                   | 10 000 hours                              |     |          |
| Low interface resistance    |                                           |     |          |
| Base                        | Noval. Gold plated pins                   |     |          |
| Heating                     | Indirect<br>A.C. or D.C.; Parallel supply |     |          |
| Heater voltage              | $V_f$                                     | 6.3 | V        |
| Heater current              | $I_f$                                     | 315 | mA       |
| Anode current               | $I_a$                                     | 22  | mA       |
| Mutual conductance          | $S$                                       | 35  | mA/V     |
| Equivalent noise resistance | $R_{eq}$                                  | 150 | $\Omega$ |

### DIMENSIONS AND CONNECTIONS

Dimensions in mm

Base: Noval



## CHARACTERISTICS

Column I Nominal value or setting of the tube

II Range values for equipment design: Initial spread

III Range values for equipment design: End of life

|                                                                   |              | I   | II        | III       |            |
|-------------------------------------------------------------------|--------------|-----|-----------|-----------|------------|
| Heater voltage                                                    | $V_f$        | 6.3 |           |           | V          |
| Heater current                                                    | $I_f$        | 315 | 299       | 331       | mA         |
| Anode supply voltage                                              | $V_{ba}$     | 190 |           |           | V          |
| Grid No.2 supply voltage                                          | $V_{bg2}$    | 160 |           |           | V          |
| Grid No.3 voltage                                                 | $V_{g3}$     | 0   |           |           | V          |
| Grid No.1 supply voltage                                          | $+V_{bg1}$   | 10  |           |           | V          |
| Cathode resistor                                                  | $R_k$        | 400 |           |           | $\Omega$   |
| Anode current                                                     | $I_a$        | 22  | 21 - 23   | min. 20   | mA         |
| Grid No.2 current                                                 | $I_{g2}$     | 6.0 | 5.4 - 6.6 |           | mA         |
| Internal resistance                                               | $R_i$        | 120 |           |           | k $\Omega$ |
| Mutual conductance                                                | $S$          | 35  | 30 - 40   | min. 24.5 | mA/V       |
| Amplification factor                                              | $\mu_{g2g1}$ | 80  |           |           |            |
| <u>Negative grid current</u>                                      | $-I_{g1}$    |     | max. 0.3  | max. 1.0  | $\mu A$    |
| <u>Equivalent noise resistance</u>                                | $R_{eq}$     | 150 |           |           | $\Omega$   |
| <u>Input resistance</u>                                           | $R_{g1}$     | 1   |           |           | k $\Omega$ |
| Frequency = 100 MHz<br>pin No.1 connected to pin No.3             |              |     |           |           |            |
| $\frac{S}{2\pi} \cdot \frac{1}{C_{g1(hot)} + C_a + 5 \text{ pF}}$ |              | 230 |           |           | MHz        |
| <u>Noise factor</u>                                               | $F$          | 7   |           |           | dB         |
| Frequency = 100 MHz<br>(Adapted to minimum noise)                 |              |     |           |           |            |
| <u>Phase angle of slope</u>                                       | $\varphi_s$  | 22  |           |           | o          |
| Frequency = 100 MHz                                               |              |     |           |           |            |

**CHARACTERISTICS** (continued)

As triode (grid No.2 connected to anode)

|                             |            | I   | II |            |
|-----------------------------|------------|-----|----|------------|
| Anode supply voltage        | $V_{ba}$   | 160 |    | V          |
| Grid No.3 voltage           | $V_{g3}$   | 0   |    | V          |
| Grid No.1 supply voltage    | $+V_{bg1}$ | 10  |    | V          |
| Cathode resistor            | $R_k$      | 470 |    | $\Omega$   |
| Anode current               | $I_a$      | 24  |    | mA         |
| Mutual conductance          | $S$        | 41  |    | mA/V       |
| Amplification factor        | $\mu$      | 77  |    |            |
| Internal resistance         | $R_i$      | 1.9 |    | k $\Omega$ |
| Equivalent noise resistance | $R_{eq}$   | 65  |    | $\Omega$   |

Insulation resistance between anode and other electrodes

 $R_{ins}$ min. 500 M $\Omega$ 

Voltage between electrodes = 300 V

Insulation resistance between grid No.1 and other electrodes

 $R_{ins}$ min. 200 M $\Omega$ 

Voltage between electrodes = 50 V

Leakage current between cathode and heater

 $I_{kf}$ max. 5  $\mu$ A

Voltage between cathode and heater = 100 V

**CAPACITANCES**Without external shield.

Grid No.1 to grid No.2, grid No.3, cathode, heater and screen

 $C_{g1/g2g3kfs}$ 

10 9- 11 pF

Grid No.1 to grid No.2, grid No.3, cathode, heater and screen  
Cathode current = 28 mA $C_{g1/g2g3kfs}$ 

17 pF

Anode to grid No.2, grid No.3, cathode, heater and screen

 $C_{a/g2g3kfs}$ 

2.1 1.8- 2.4 pF

**CAPACITANCES** (continued)

|                                                                                          |                     | I    | II        |     |
|------------------------------------------------------------------------------------------|---------------------|------|-----------|-----|
| Anode to grid No.1                                                                       | $C_{ag_1}$          |      | max. 40   | mpF |
| Anode to cathode                                                                         | $C_{ak}$            |      | max. 50   | mpF |
| Anode to cathode and grid No.2                                                           | $C_{a/kg_2}$        | 0.32 | 0.28-0.36 | pF  |
| Anode to cathode, grid No.2 and grid No.3                                                | $C_{a/kg_2g_3}$     | 2.0  | 1.7- 2.3  | pF  |
| Anode to heater                                                                          | $C_{af}$            |      | max. 100  | mpF |
| Grid No.1 to cathode                                                                     | $C_{g_1k}$          | 6.8  | 6.1- 7.5  | pF  |
| Grid No.1 to cathode and grid No.2                                                       | $C_{g_1/kg_2}$      | 9.5  | 8.5-10.5  | pF  |
| Grid No.1 to cathode, grid No.2 and grid No.3                                            | $C_{g_1/kg_2g_3}$   | 10   | 9- 11     | pF  |
| <u>With external shield.</u>                                                             |                     |      |           |     |
| Grid No.1 to grid No.2, grid No.3, cathode, heater and screen                            | $C_{g_1/g_2g_3kfs}$ | 10.1 | 9.1-11.1  | pF  |
| Grid No.1 to grid No.2, grid No.3, cathode, heater and screen<br>Cathode current = 28 mA | $C_{g_1/g_2g_3kfs}$ | 17.1 |           | pF  |
| Anode to grid No.2, grid No.3, cathode, heater and screen                                | $C_{a/g_2g_3kfs}$   | 3.3  | 2.9- 3.7  | pF  |
| Anode to grid No.1                                                                       | $C_{ag_1}$          |      | max. 35   | mpF |
| <u>As triode. Without external shield.</u>                                               |                     |      |           |     |
| Grid No.3 connected to cathode                                                           |                     |      |           |     |
| Grid No.1 to grid No.3, cathode, heater and screen                                       | $C_{g_1/g_3kfs}$    | 7.3  |           | pF  |
| Anode and grid No.2 to grid No.3, cathode, heater and screen                             | $C_{ag_2/g_3kfs}$   | 3.1  |           | pF  |
| Anode and grid No.2 to grid No.1                                                         | $C_{ag_2/g_1}$      | 2.7  |           | pF  |
| <u>As triode. Without external shield</u>                                                |                     |      |           |     |
| Grid No.3 connected to anode                                                             |                     |      |           |     |
| Grid No.1 to cathode, heater and screen                                                  | $C_{g_1/kfs}$       | 6.7  |           | pF  |
| Anode, grid No.2 and grid No.3 to cathode, heater and screen                             | $C_{ag_2g_3/kfs}$   | 1.0  |           | pF  |
| Anode, grid No.2 and grid No.3 to grid No.1                                              | $C_{ag_2g_3/g_1}$   | 3.3  |           | pF  |

**LIFE**

Production samples are tested to be within the end of life values (column III) during 10 000 hours.

**LIMITING VALUES** (Design centre rating system, if not otherwise specified)

|                                                        |             |            |      |                     |
|--------------------------------------------------------|-------------|------------|------|---------------------|
| Anode voltage                                          |             | $V_{a0}$   | max. | 400 V               |
|                                                        |             | $V_a$      | max. | 220 V               |
| Anode dissipation                                      | Des. centre | $W_a$      | max. | 4.2 W               |
|                                                        | Abs. max.   | $W_a$      | max. | 4.5 W               |
| Grid No.2 voltage                                      |             | $V_{g20}$  | max. | 400 V               |
|                                                        |             | $V_{g2}$   | max. | 180 V               |
| Grid No.2 dissipation                                  | Des. centre | $W_{g2}$   | max. | 1.0 W <sup>1)</sup> |
|                                                        | Abs. max.   | $W_{g2}$   | max. | 1.1 W <sup>1)</sup> |
| Anode plus grid No.2 dissipation<br>(triode connected) |             | $W_{a+g2}$ | max. | 4.5 W               |
| Grid No.1 voltage                                      |             | $-V_{g1}$  | max. | 30 V                |
|                                                        |             | $+V_{g1}$  | max. | 0 V                 |
| Cathode current                                        | Des. centre | $I_k$      | max. | 30 mA               |
|                                                        | Abs. max.   | $I_k$      | max. | 33 mA               |
| Grid resistor (Automatic bias)                         |             | $R_{g1}$   | max. | 0.5 M $\Omega$      |
| Voltage between cathode and heater                     |             |            |      |                     |
| cathode positive                                       |             | $V_{kf}$   | max. | 120 V               |
| cathode negative                                       |             | $V_{kf}$   | max. | 60 V                |
| Bulb temperature                                       | Abs. max.   | $t_{bulb}$ | max. | 190 °C              |

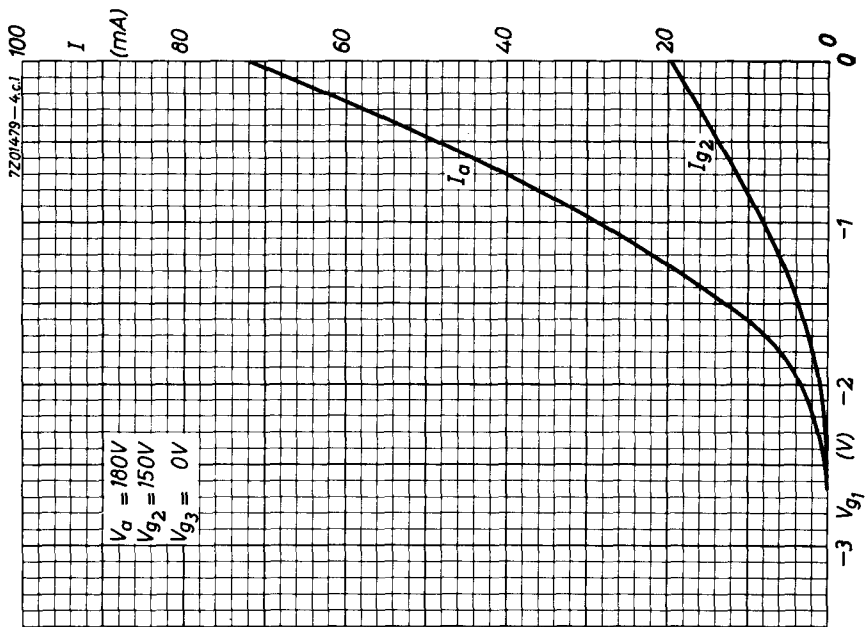
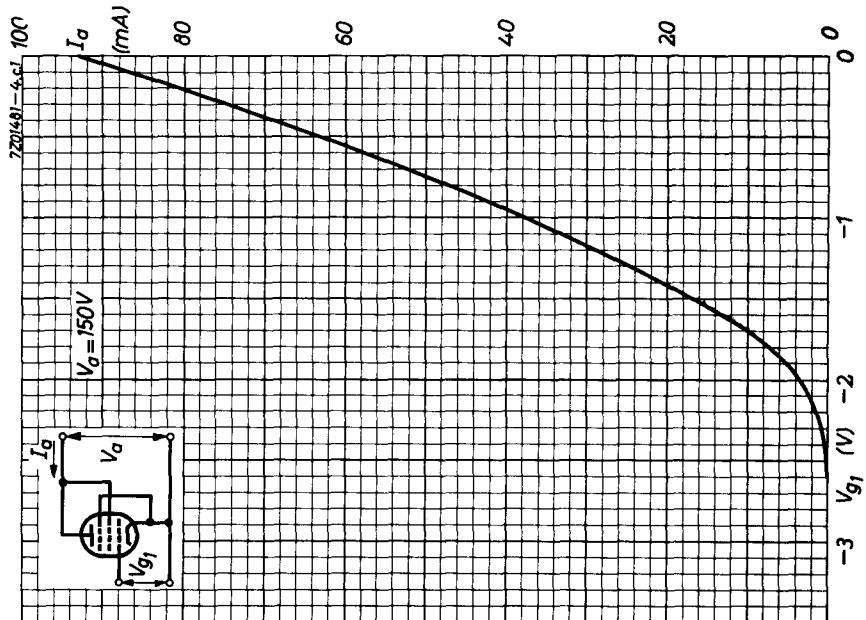
Heater voltage: The average heater voltage should be 6.3 V.

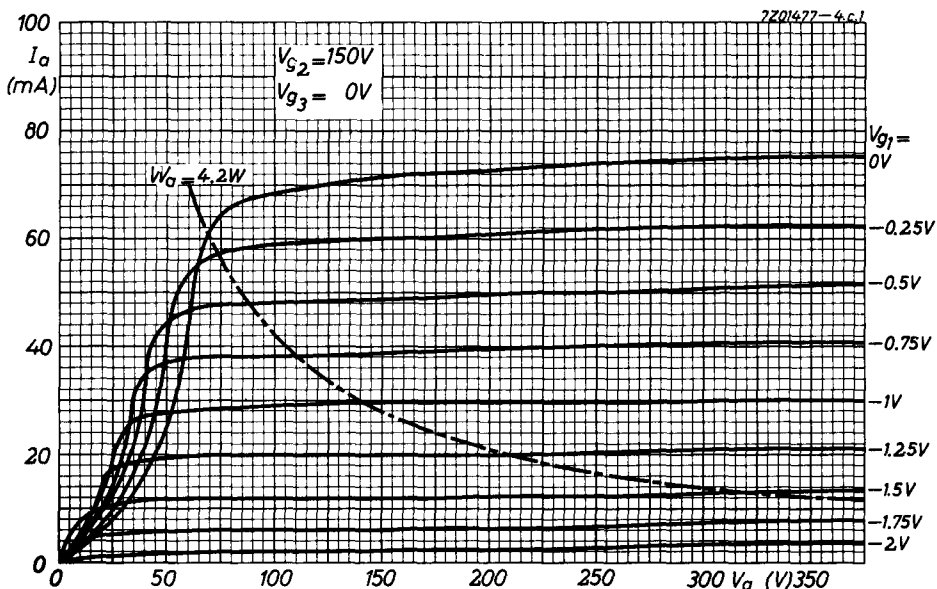
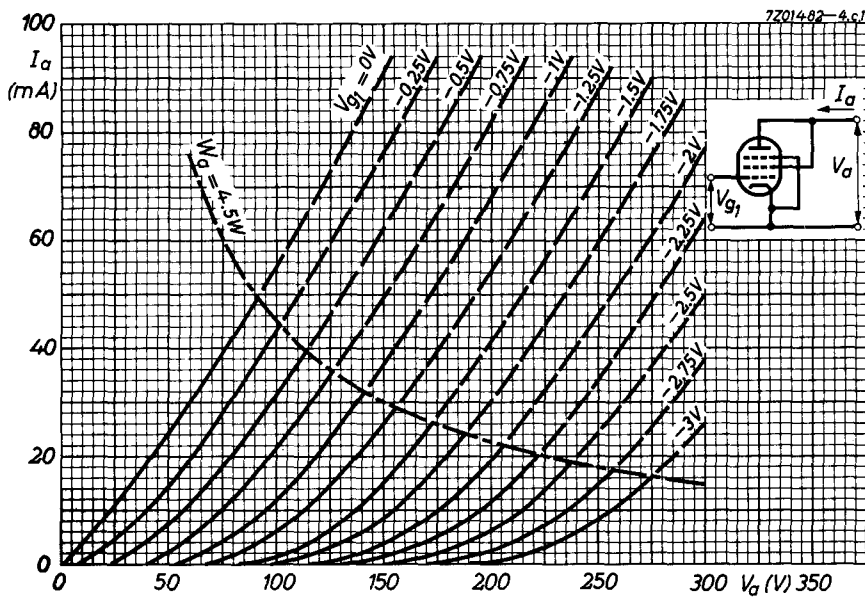
Variations of the heater voltage exceeding the range of 6.0 V to 6.6 V will shorten the tube life.

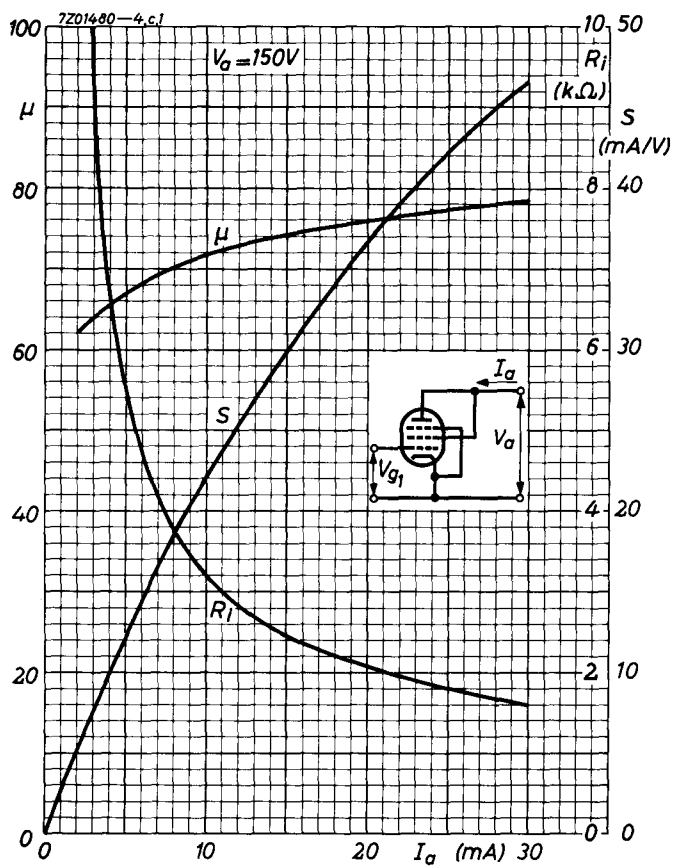
The tolerance of heater current (column II) should be taken into account.

<sup>1)</sup> Care should be taken not to exceed the rated  $W_{g2}$  values due to switching of positive supply voltages.

If the cathode is shunted by a capacitance > 10  $\mu$ F a series resistor of minimum 1 k $\Omega$  should be inserted in the grid No.1 lead.







# PHILIPS

## Data handbook



**Electronic  
components  
and materials**

### D3a

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|------|-------|------------|
| 1    | 1     | 1968.12    |
| 2    | 2     | 1968.12    |
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| 6    | 6     | 1968.12    |
| 7    | 7     | 1968.12    |
| 8    | 8     | 1968.12    |
| 9    | FP    | 2000.11.10 |