

## RF POWER TRIODE

Triodes in metal-ceramic construction intended for use as industrial oscillators.

The YD1180 is forced-air cooled

The YD1182 is water cooled by an integral cooler.

### QUICK REFERENCE DATA

|   |                  |          |     |
|---|------------------|----------|-----|
| Oscillator output power ( $W_o - W_{\text{feedb}}$ ), typical | $W_{\text{osc}}$ | 31,6     | kW  |
| Frequency for full ratings                                    | f                | max. 100 | MHz |

To be read in conjunction with "General Operational Recommendations".

### RF CLASS C OSCILLATOR FOR INDUSTRIAL USE OPERATING CONDITIONS

|  |                     |      |          |
|--|---------------------|------|----------|
| Frequency  | f                   | 90   | MHz      |
| Oscillator output power ( $W_o - W_{\text{feedb}}$ ) | $W_{\text{osc}}$    | 31,6 | kW       |
| Anode voltage  | $V_a$               | 7,5  | kV       |
| Anode current  | $I_a$               | 5,4  | A        |
| Anode input power                                    | $W_{ia}$            | 40,5 | kW       |
| Anode dissipation                                    | $W_a$               | 7,5  | kW       |
| Anode output power                                   | $W_o$               | 33   | kW       |
| Anode efficiency                                     | $\eta_a$            | 81,5 | %        |
| Oscillator efficiency                                | $\eta_{\text{osc}}$ | 78   | %        |
| Feedback ratio                                       | $V_{gp}/V_{ap}$     | 14,8 | %        |
| Grid resistor  | $R_g$               | 450  | $\Omega$ |
| Grid current, on load                                | $I_g$               | 1,45 | A        |
| Grid voltage, negative                               | $-V_g$              | 652  | V        |
| Grid dissipation                                     | $W_g$               | 450  | W        |
| Grid resistor dissipation                            | $W_{Rg}$            | 946  | W        |

**LIMITING VALUES** (Absolute max. rating system)

|                                       |                       |       |      |             |
|---------------------------------------|-----------------------|-------|------|-------------|
| Frequency                             | f                     | up to | 100  | MHz         |
| Anode voltage                         | $V_a$                 | max.  | 9    | kV          |
| Anode current                         | $I_a$                 | max.  | 6    | A           |
| Anode input power                     | $W_{ia}$              | max.  | 45   | kW          |
| Anode dissipation: continuous service | (YD1180)*<br>(YD1182) | $W_a$ | max. | 15 kW       |
|                                       |                       |       | max. | 20 kW       |
| Grid voltage                          | $-V_g$                | max.  | 1,5  | kV          |
| Grid current, on load<br>of load      | $I_g$                 | max.  | 1,6  | A           |
|                                       | $I_g$                 | max.  | 2,4  | A           |
| Grid dissipation                      | $W_g$                 | max.  | 500  | W           |
| Grid circuit resistance               | $R_g$                 | max.  | 10   | k $\Omega$  |
| Cathode current, mean<br>peak         | $I_k$                 | max.  | 7,5  | A           |
|                                       | $I_{kp}$              | max.  | 40   | A           |
| Envelope temperature                  | $t_{env}$             | max.  | 240  | $^{\circ}C$ |

**HEATING** : direct; thoriated tungsten filament, mesh construction

|                                |          |      |      |            |
|--------------------------------|----------|------|------|------------|
| Filament voltage               | $V_f$    |      | 7    | V          |
| Filament current               | $I_f$    |      | 175  | A          |
| Peak filament starting current | $I_{fp}$ | max. | 1000 | A          |
| Cold filament resistance       | $R_{f0}$ |      | 4,2  | m $\Omega$ |

The filament is designed to accept temporary fluctuations of +5% and -10%. To ensure that the cathode temperature remains constant irrespective of the operating frequency, it may be necessary to reduce the filament voltage at higher frequencies. When doing so it must be borne in mind that the filament voltage-to-current ratio measured with only the filament voltage applied should remain constant under all operating conditions.

It is extremely important that the filament be properly decoupled. This should be done so that the resonance of the circuit formed by the filament and the decoupling elements remain below the fundamental oscillator frequency. In grounded-grid circuits this resonance should be below the grid-cathode resonance. For further information please see Application Book "Tubes for RF heating" or contact the manufacturer.

**CAPACITANCES**

|                   |          |  |    |    |
|-------------------|----------|--|----|----|
| Anode to filament | $C_{af}$ |  | 1  | pF |
| Grid to filament  | $C_{gf}$ |  | 66 | pF |
| Anode to grid     | $C_{ag}$ |  | 32 | pF |

\* See Fig. 4.

**CHARACTERISTICS** measured at  $V_a = 7$  kV,  $I_a = 2, 4$  A

|                      |       |         |
|----------------------|-------|---------|
| Transconductance     | S     | 40 mA/V |
| Amplification factor | $\mu$ | 33      |

**COOLING**

To obtain optimum life, the temperature of the seals and of the envelope should, under normal operating conditions, be kept below 200 °C.

To maintain these temperatures additional cooling may be necessary.  
At frequencies higher than about 4 MHz cooling of the seals becomes mandatory.

**YD1180**

Direction of airflow: see outline drawing.

See also cooling curves

With insulating pedestal type 40648

**Table 1** Air cooling characteristics

| Anode+grid<br>dissipation<br>$W_a+W_g$<br>(kW) | Altitude<br>h<br>(m) | Inlet<br>temperature<br>$T_i$<br>(°C) | Rate of<br>flow<br>$q_{min}$<br>(m <sup>3</sup> /min) | Pressure<br>drop<br>$\Delta P$<br>(Pa*) | Outlet<br>temperature<br>$T_o$<br>(°C) |
|--|----------------------|---------------------------------------|---|---|--|
| 15   | 0                    | 35                                    | 15  | 850                                     | 92                                     |
| 10   | 0                    | 35                                    | 9,3   | 320                                     | 99                                     |
| 8  | 0                    | 35                                    | 7   | 200                                     | 104                                    |
| 15   | 0                    | 45                                    | 17,3  | 1060                                    | 98                                     |
| 10   | 0                    | 45                                    | 10,7  | 400                                     | 104                                    |
| 8  | 0                    | 45                                    | 8,1   | 250                                     | 108                                    |
| 15   | 1500                 | 35                                    | 18  | 970                                     | 93                                     |
| 10   | 1500                 | 35                                    | 11,2  | 460                                     | 100                                    |
| 8  | 1500                 | 35                                    | 8,4   | 230                                     | 104                                    |
| 15   | 3000                 | 25                                    | 19  | 950                                     | 90                                     |
| 10   | 3000                 | 25                                    | 11,8  | 450                                     | 95                                     |
| 8  | 3000                 | 25                                    | 8,9   | 230                                     | 99                                     |

\* 1 Pa  $\approx$  0,1 mm H<sub>2</sub>O

**YD1182**

**Table 2** Water cooling characteristics

| Anode + grid<br>dissipation<br>W <sub>a</sub> + W <sub>g</sub><br>(kW) | Inlet<br>temperature<br>t <sub>i</sub><br>(°C) | Rate of<br>flow<br>q <sub>min</sub><br>(ℓ/min) | Pressure<br>drop<br>P <sub>i</sub><br>(kPa*) | Outlet<br>temperature<br>t <sub>o</sub><br>(°C) |
|--|--|--|--|---|
| 20   | 20   | 10   | 40   | 51  |
|  | 50   | 15   | 80   | 71  |
| 15   | 20   | 7,5  | 22   | 54  |
|  | 50   | 10,5   | 43   | 73  |
| 10   | 20   | 4,5  | 10   | 58  |
|  | 50   | 6,7  | 20   | 75  |

Absolute max. water inlet temperature

T<sub>i</sub> max. 50 °C

Absolute max. water pressure

P max. 600 kPa(abs)

**ACCESSORIES**

|  |                      |                     |     |
|--|----------------------|---------------------|-----|
| Filament connector with cable          | type 40708A net mass | 600                 | g   |
| Filament /cathode connector with cable | type 40709A net mass | 640                 | g   |
| Grid connector f ≤ 4 MHz               | type 40710 net mass  | 60                  | g   |
|  | f > 4 MHz            | type 40711 net mass | 310 |
| Insulating pedestal (YD1180 only)      | type 40648 net mass  | 7,15                | kg  |

\* 100 kPa ≈ 1 at.

## MECHANICAL DATA

Dimensions in mm

## YD1180

Mounting position : vertical with anode up or down

Net mass : approx. 12 kg

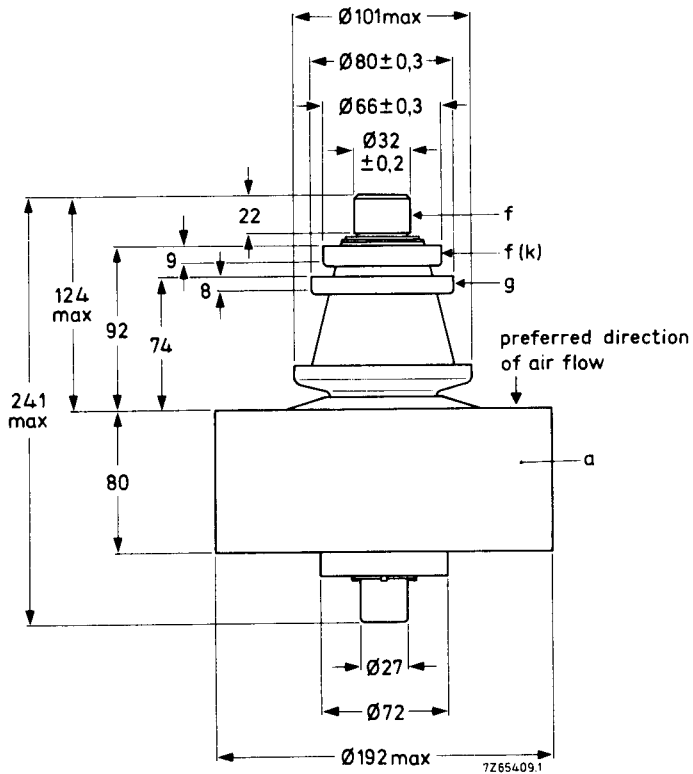


Fig. 1 Mechanical outline.

YD1182

Mounting position : vertical with anode up or down

Net mass : approx. 3,5 kg

Dimensions in mm

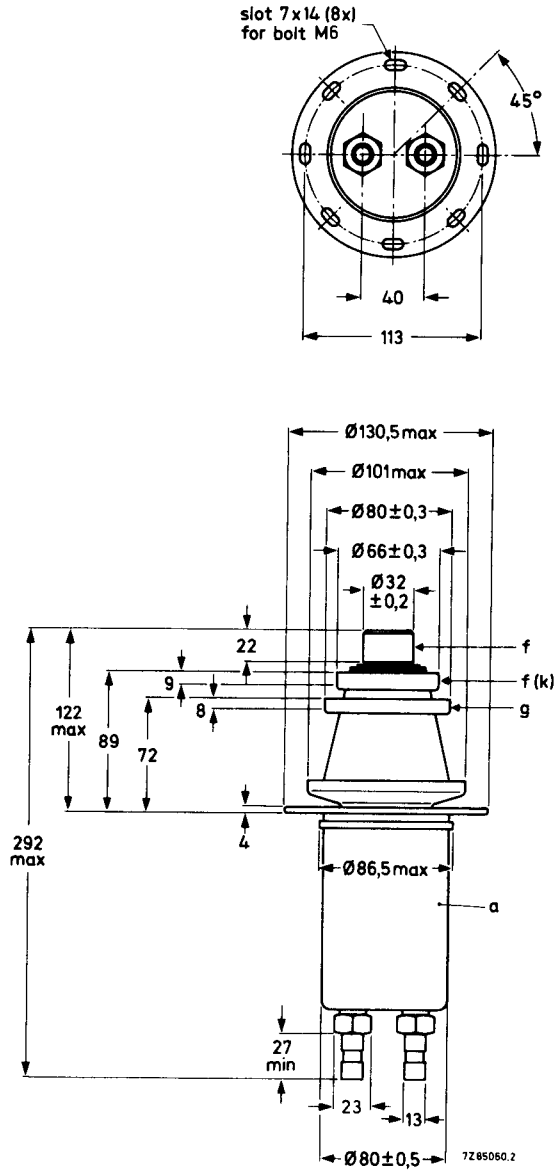


Fig. 2 Mechanical outline – YD1182.

Thread of water connections BSP 1/2 in

With anode up the inlet and outlet connections should be interchanged.

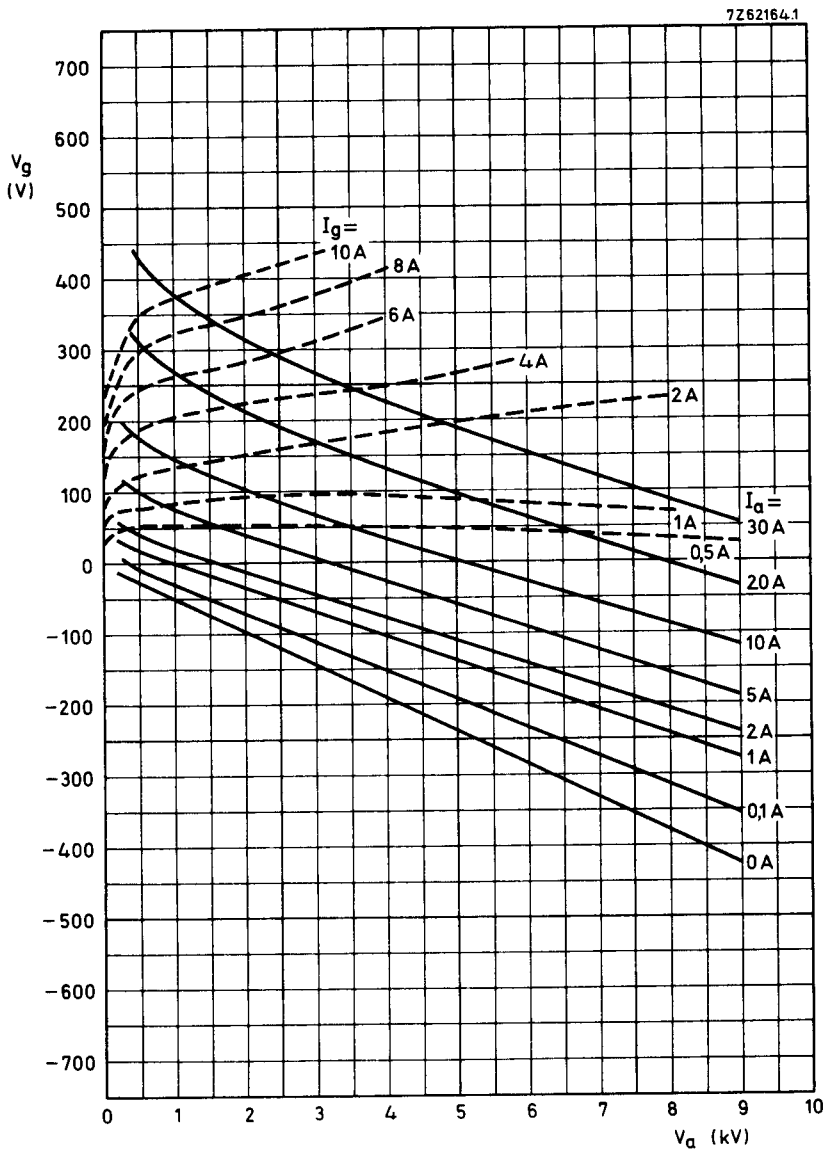
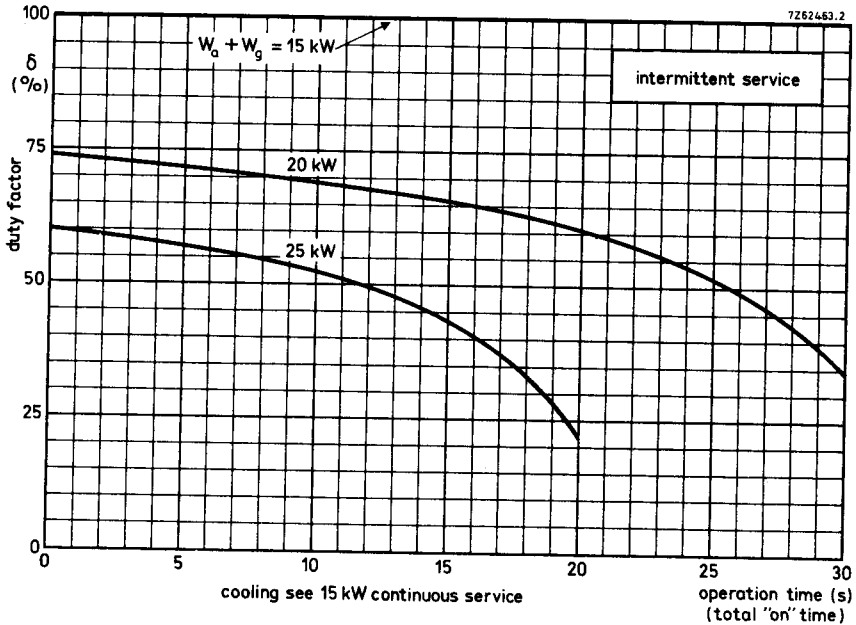
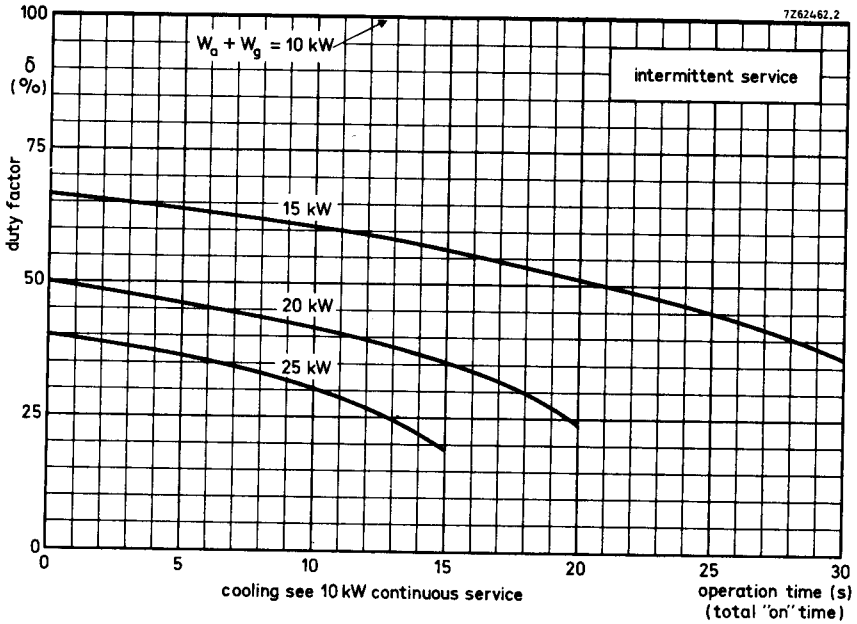


Fig. 3 Constant current characteristics.

Fig. 4 (YD1180 only). Intermittent service. Limits of anode dissipation and cooling.

YD1180





# PHILIPS

Data handbook



Electronic  
components  
and materials

YD 1180 YD1182

| <b>page</b> | <b>sheet</b> | <b>date</b> |
|-------------|--------------|-------------|
| 1           | 231          | 1988.02     |
| 2           | 232          | 1988.02     |
| 3           | 233          | 1988.02     |
| 4           | 234          | 1988.02     |
| 5           | 235          | 1988.02     |
| 6           | 236          | 1984.08     |
| 7           | 237          | 1988.02     |
| 8           | 238          | 1988.02     |
| 9           | FP           | 2000.09.09  |