


SIEMENS

RS 2032 CL
10 kW
Metal-Ceramic Tetrode



A new forced-air cooled power tetrode
power gain 25 dB operation up to 100 MHz
with solid-state driver

Properties

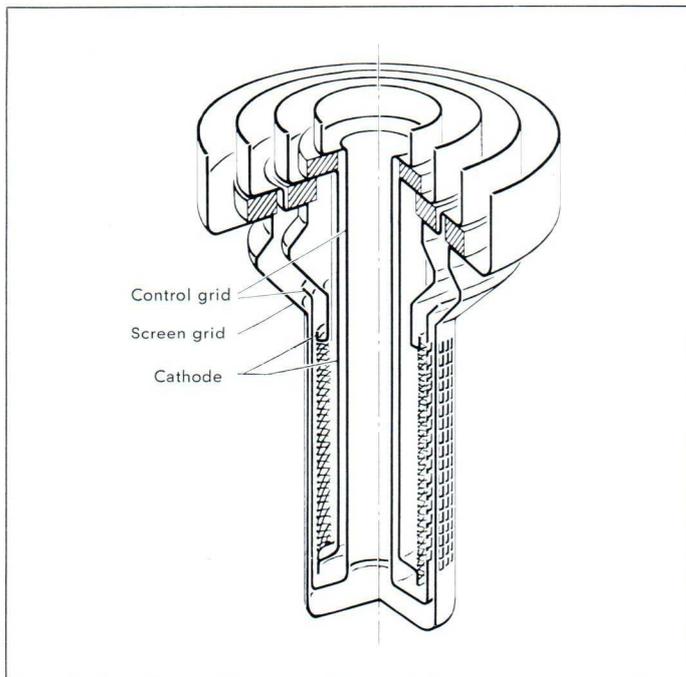
The RS 2032 CL is a metal-ceramic power tetrode especially designed for VHF broadcast transmitter output stages operating in the grounded cathode configuration. To simplify the coaxial circuit design, the grid terminal of this tube is brought out inside the cathode terminal. This permits screen grid blocking directly to the cathode. This arrangement also prevents coupling between the input and output circuits by the common cathode lead inductance. A damping resistor built into the control grid lead improves the operating stability by eliminating self-oscillations. At an operating frequency of 110 MHz and output power of 12 kW this resistor dissipates about 30 W.

The RS 2032 CL features a rugged electrode construction especially resistant to vibration. The use of seamless drawn molybdenum tubes with punched apertures for the control and screen grids allows precise grid manufacture. This type of grid design offers the tube user the following important advantages:

1. With a suitable combination of grid aperture and stiffening struts, the stability and hence reliability of the punched grid considerably exceeds that of conventional wire grids.
2. The punched holes of the screen and control grids are exceptionally true to size and can be reproduced in fabrication. This results in constant characteristic curves and consequently very small spreads.

The RS 2032 CL contains the well-proven mesh cathode used for many years in Siemens power tubes. Together with its tubular molybdenum supports, this cathode represents a very robust construction. Fig. 1 shows the grid-cathode structure of the RS 2032 CL.

Fig. 1 Cutaway schematic of the RS 2032 CL electrode structure



Application

As a typical application for the tetrode RS 2032 CL, fig. 3 shows the circuit diagram of a 10 kW power amplifier for a VHF FM broadcast transmitter covering the frequency range 87 to 108 MHz.

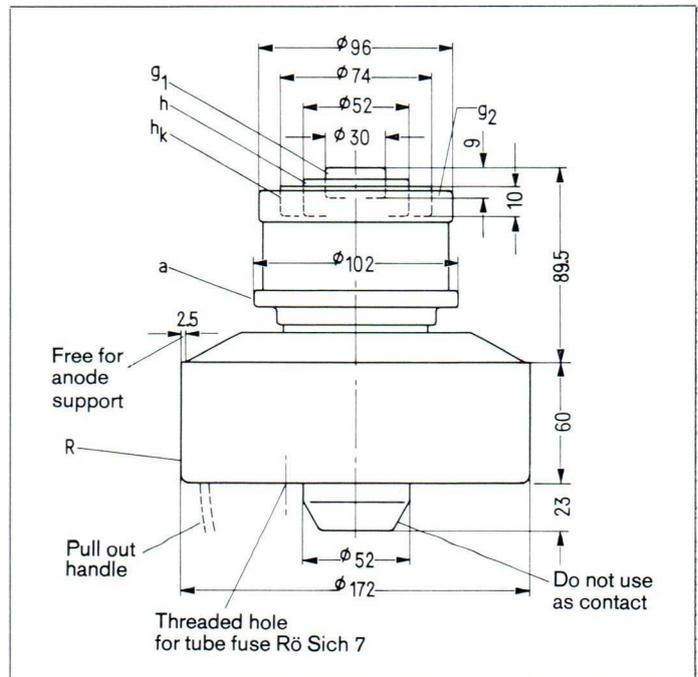
Because of its low grid-plate capacitance, the RS 2032 CL can be operated in the grounded cathode configuration up to 110 MHz. With the present state of the art, a transistor driver is capable of supplying the required 30 W of drive power, thereby appreciably simplifying the transmitter design. As the grid lead of the RS 2032 CL contains a damping resistor, the transistor requires no additional load resistor. This represents a further simplification to the amplifier. The RS 2032 CL amplifies the power from the transistor driver to 12 kW.

The grid circuit is tuned by the inductance L1. The capacitor C1 matches the grid circuit to the characteristic impedance of the input line. L2 tunes the plate circuit, and with L3 the output coupling can be adjusted. C9 is the plate circuit blocking capacitor.

The arrangement of the control grid as the inner cylinder further simplifies the cavity design because the control grid and cathode leads need not cross over. This grid construction, as already mentioned, prevents current coupling between the input and output circuits. Such current coupling requires a drive voltage between control grid and ground that increases with frequency if the output power is to be kept constant. This in turn produces higher circuit losses and hence an input power to the output stage which increases with the frequency.

Fig. 2 Outline drawing RS 2032 CL

Dimensions in mm



Technical data RS 2032 CL

High frequency amplifier Class B operation, grounded cathode circuit

General data (preliminary)

Filament Characteristic values

$E_f = 10\text{ V}$ $I_e = 35\text{ A}$ at $E_b = E_{c2} = E_{c1} = 300\text{ V}$
 $I_f = 86\text{ A}$ $\mu_{g1g2} = 8$ at $E_b = 2\text{ kV}$, $E_{c2} = 600$ to 1000 V ,
 $I_b = 2\text{ A}$
 $S = 53,000\ \mu\text{mhos}$ at $E_b = 2\text{ kV}$, $E_{c2} = 800\text{ V}$,
 $I_b = 1.5$ to 2.5 A

Directly heated thoriated tungsten cathode

Capacitances

| | | |
|------------|------|----|
| C_{ag2} | 22 | pF |
| C_{g1g2} | 76 | pF |
| C_{kg2} | 45 | pF |
| C_{kg1} | 95 | pF |
| C_{ag1} | 0.32 | pF |
| C_{ak} | 0.04 | pF |

Air cooling (sea level, 25° C ambient temperature)

| | | | | |
|-------------------|------------|------------------|------------------|---------------------|
| Plate dissipation | P_p | 12 | 7 | kW |
| Air flow rate | V | 12 | 7.3 | m ³ /min |
| | | 424 | 258 | cfm |
| Pressure drop | Δp | 88 | 35 | mm H ₂ O |
| | | 3 ^{1/2} | 1 ^{3/8} | in H ₂ O |

Preliminary data

Maximum ratings

| | | |
|-----------|------|-----|
| F | 110 | MHz |
| E_b | 8 | kV |
| E_{c2} | 1000 | V |
| E_{c1} | -250 | V |
| I_k | 6 | A |
| i_{kpk} | 35 | A |
| P_p | 12 | kW |
| P_{g2} | 250 | W |
| P_{g1} | 70 | W |

Operating data

| | | |
|-----------|--------|------------------|
| F | 110 | MHz |
| P_o | 12 | kW ¹⁾ |
| E_b | 7.5 | kV |
| E_{c2} | 800 | V |
| E_{c1} | -100 | V |
| e_{c1s} | 110 | V |
| I_b | 2.3 | A ²⁾ |
| I_{c2} | ≈ 200 | mA |
| I_{c1} | ≈ 50 | mA |
| P_a | ≈ 17.2 | kW |
| P_i | ≈ 30 | W ³⁾ |
| P_p | ≈ 5.2 | kW |
| P_{g2} | ≈ 160 | W |
| η | 70 | % |
| R_p | 1800 | Ω |

¹⁾ Circuit losses not included

²⁾ Quiescent plate current 0.4 A

³⁾ Drive power including grid circuit damping

Fig. 3 Circuit diagram of a 10 kW output stage for a VHF FM broadcast transmitter

