



ELECTRONIC TUBE REFERENCE

1605

Power - Triode electronic tube

CONSOLIDATED TECHNICAL DATA

1 SECTION

CONSTRUCTION

TRIODE

High-power directly heated audio triode related to the PX25 family. Published Class A operation at 580 V and 110 mA produces about 22 W into a 2.7 k Ω load, with 64 W maximum plate dissipation.

GENERAL CHARACTERISTICS

BASE DESIGNATION	UX4	BASE PINS	4
NOMINAL HEATER	5 V / 2.1 A	PARALLEL HEATER	– / –
HEATING	Direct	SERIES OPERATION	Not specified
CATHODE ARRANGEMENT	Separate cathodes	SECTION CONSTRUCTION	Similar

SECTION RATINGS

SECTION 1 Triode	
PLATE RESISTANCE	861 Ω
TRANSCONDUCTANCE	0.0088 S
AMPLIFICATION FACTOR	7.5
MAXIMUM PLATE VOLTAGE	650 V
MAXIMUM PLATE DISSIPATION	64 W
MAXIMUM CATHODE CURRENT	160 mA

1605 — High-Power Medium-Gain Triode

The **1605** (including the **EML1605** and **EML1605-V4** variants) is a high-power, medium-gain triode designed for high-fidelity audio amplification. Rather than belonging to the [300B](#) family of vacuum tubes, the 1605 is closely related to the classic Marconi [PX25](#), sharing its characteristic sonic signature while operating at significantly higher power levels. The tube is engineered to deliver high linearity, excellent emission, and robust performance in single-ended and push-pull amplifier configurations.

Construction and Mechanical Design

The 1605 features a highly robust mechanical construction designed to minimize microphonics and ensure long-term parameter stability. The physical assembly incorporates several premium materials and structural design choices:

- **Anode Structure:** The tube utilizes 0.5 mm thick, wide, box-shaped anodes similar to those of the Marconi [PX25](#). To manage heat dissipation, the anode is equipped with 12 coolers (6 on each side).
- **Grid Design:** The grid is constructed using Wolfram (tungsten) wire, which provides extreme hardness and allows for highly precise grid wire spacing. The grid is gold-plated to improve bias stability, provide protection against accidental overload, and enhance the linearity of the tube curves.
- **Suspension and Bulb:** The tube features an anti-microphonic anode and grid suspension system, a double mica top, and a soft rubber suspended base. The envelope is a hand-blown glass bulb.
- **Getters:** Vacuum integrity is maintained using three getters: two side-mounted getters and one top-mounted getter.
- **Physical Dimensions:** The tube has a maximum size of 200 mm in height (including the socket but excluding the pins) and 68 mm in diameter. The weight of a single tube is approximately 190 grams.

Heater and Filament Configurations

The 1605 is available in two distinct heater configurations: the standard **EML1605** (V3-version) and the cathode-tapped **EML1605-V4** (V4-version). Both versions utilize slow-start filaments to maximize tube lifetime.

Standard Filament (EML1605)

The standard version features a conventional directly heated filament design. It requires a stable voltage source and must not be operated at reduced filament voltage in an attempt to extend lifetime.

Cathode-Tapped Filament (EML1605-V4)

The V4-version introduces a center-tapped filament design that functions as a true cathode. In traditional directly heated triodes, biasing requires an artificial center tap created by an external resistor network, which forces the AC signal current to pass through these resistors. The EML1605-V4 serializes the heater wires and taps them in the center, providing a direct cathode connection. This eliminates the need for centering resistors and allows the tube to behave like an indirectly heated triode with a real cathode.

If desired, the cathode tap on the V4-version can be left disconnected, allowing the tube to be operated in a classic 4-wire configuration like a standard directly heated triode.

Filament Ratings

Parameter	Standard EML1605	Cathode-Tapped EML1605-V4
Filament Voltage (AC or DC)	5.0 V	5.0 V (with balanced heater, 2x 2.5 V)

Parameter	Standard EML1605	Cathode-Tapped EML1605-V4
Filament Current	2.1 A	2.1 A
Filament Voltage Tolerance	4%	4%
Heater Module Requirement	Voltage source only	Voltage source only
Calculated Filament Power	10.5 W	10.5 W

Note: Filament power is calculated as 5.0 V multiplied by 2.1 A to yield 10.5 W.

Base and Pin Connections

The two heater versions utilize different bases to accommodate their respective connection requirements.

Ceramic UX4 Base (Standard EML1605)

The standard EML1605 uses a 4-pin ceramic UX4 base with gold-plated pins. Viewed from the bottom, the pin assignments are:

- **Pin 1:** Filament
- **Pin 2:** Anode (Plate)
- **Pin 3:** Grid
- **Pin 4:** Filament

Ceramic Octal Base (EML1605-V4)

Because the cathode-tapped V4-version requires five electrical connections, it cannot use the 4-pin UX4 base. Instead, it is fitted with an octal base. To minimize contact resistance, the heater connections (H1 and H2) are each allocated two pins. Viewed from the bottom, the pin assignments are:

- **Pin 1:** Heater 1 (H1)
- **Pin 2:** Heater 1 (H1)
- **Pin 3:** Cathode Tap (K)
- **Pin 4:** Anode (A)
- **Pin 5:** Grid (G)
- **Pin 6:** Heater 2 (H2)
- **Pin 7:** Heater 2 (H2)
- **Pin 8:** Cathode Tap (K)

Electrical Characteristics and Operating Points

The 1605 is designed to operate at higher anode voltages and higher impedances than standard triodes like the 300B. This design choice increases plate dissipation without requiring an increase in anode current, which prevents excessive DC current from saturating single-ended output transformers. The

higher impedance also allows for higher transformer inductance. Additionally, the 1605 operates with a lower bias voltage, reducing the voltage dropped (and wasted) across the bias resistor, thereby improving power supply efficiency.

Maximum Ratings (Not Simultaneous)

- **Anode Voltage:** 650 V
- **Anode Current:** 160 mA
- **Power Output (Class A):** 30 W
- **Grid Resistor:** 50 k Ω (maximum)

Recommended Typical Operating Point

- **Anode Voltage:** 580 V
- **Anode Dissipation:** 64 W (*Calculated: 580 V multiplied by 110 mA yields 63.8 W*)
- **Anode Current:** 110 mA
- **Control Grid Voltage:** -82 V
- **Anode Impedance (Rp):** 861 Ω
- **Amplification Factor (μ):** 7.5
- **Transconductance (Gm):** 8.8 mA/V
- **Power Output (Class A):** 22 W
- **Input Signal for Full Output:** 57 V AC (RMS)
- **Load Impedance (Ra):** 2700 to 5600 Ω
- **Grid Resistor to Ground:** 100 k Ω (maximum)

Single-Ended Amplifier Application

In a typical single-ended Class A amplifier application, the 1605 can be paired with a high-quality output transformer such as the Lundahl LL1623-120mA. The recommended operating parameters for this configuration are:

- **Primary Impedance:** 3000 Ω
- **Secondary Impedance Options:** 4 Ω (Alt.B), 8 Ω (Alt.C), or 16 Ω (Alt.D)
- **Auto-Bias Cathode Resistor:** 800 Ω
- **Anode Current:** 110 mA
- **Anode Voltage to Ground:** 668 V

The lower input signal requirement (57 V RMS) resulting from the tube's higher gain makes the preceding driver stage significantly easier to design and build compared to stages driving lower-gain triodes.

Technical Summary

The **1605** is a premium, high-power, medium-gain triode designed for uncompromising audio amplification. It is characterized by a linear, sweet sound reminiscent of the Marconi [PX25](#), but with

substantially higher power capabilities. Available in both a standard UX4-based configuration and an innovative cathode-tapped octal-based configuration (EML1605-V4), it offers circuit designers flexibility in biasing and layout. With a maximum anode voltage of 650 V, a typical transconductance of 8.8 mA/V, and an amplification factor of 7.5, the 1605 provides an efficient, high-performance solution for modern single-ended triode amplifiers.

SOURCE OPERATING CONDITIONS

[SOURCE PDF](#)

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Published test conditions and operating points. Values on this page are preserved as reported by this source.

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Section 1 · Triode

CHARACTERISTICS		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Filament voltage	5 V	—
Filament current	2.1 A	—
Plate resistance	861 ohm	ClassA
Amplification factor	7.5	ClassA
Transconductance	8800 uS	ClassA

OTHER		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Plate voltage	580 V	ClassA
Plate current	110 mA	ClassA
Grid voltage	-82 V	ClassA
Load resistance	2700 ohm	ClassA
Output power	22 W	ClassA

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