

SPECIAL QUALITY, LONG LIFE, SHOCK AND VIBRATION RESISTANT
PENTODE for use as wide band amplifier in professional
equipment

HEATING

Indirect by A.C. or D.C.; parallel supply

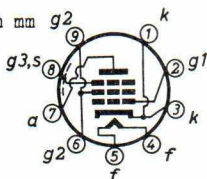
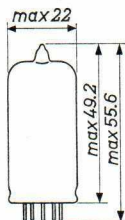
Heater voltage $V_f = 6.3 \text{ V}$

Heater current $I_f = 340 \text{ mA}$

In order to obtain a prolonged tube life, the deviation of the heater voltage should not exceed 5 % of the nominal value

Dimensions in mm

Base: NOVAL



CHARACTERISTICS

Column I: Setting of the tube and typical (average) measuring results of new tubes

II: Characteristics range values for equipment design

III: Data indicating the end point of life

Heater current

	I	II
Heater voltage V_f	$= 6.3$	V
Heater current I_f	$= 340$	$320-360 \text{ mA}$

Capacitances

A. Without external shield

	I	II
Grid No.1 to all other elements except anode	$C_{g1} = 14.5$	$13-16 \text{ pF}$
The same at $I_k = 40 \text{ mA}$ and $f = 100 \text{ Mc/s}$	$C_{g1} = 24$	$22-26 \text{ pF}$
Anode to all other elements except grid No.1	$C_a = 3.5$	$3.2-3.8 \text{ pF}$
Anode to grid No.1	$C_{ag1} =$	$< 0.036 \text{ pF}$
Anode to cathode	$C_{ak} = 0.060$	$0.053-0.067 \text{ pF}$
Anode to heater	$C_{af} = 0.031$	$0.026-0.036 \text{ pF}$
Grid No.1 to heater	$C_{g1f} = 0.060$	$0.040-0.080 \text{ pF}$

CHARACTERISTICS (continued)Capacitances (continued)

B. With external shield (Inner diameter 22.2 mm, length 44.5 mm)

	I	II	
Grid No.1 to all other elements except anode	$C_{g1} = 14.5$	13-16	pF
The same at $I_k = 40$ mA and $f = 100$ Mc/s	$C_{g1} = 24$	22-26	pF
Anode to all other elements except grid No.1	$C_a = 4.1$	3.9-4.3	pF
Anode to grid No.1	$C_{ag1} =$	< 0.032	pF
Anode to cathode	$C_{ak} = 0.033$	0.026-0.040	pF
Anode to heater	$C_{af} = 0.020$	0.012-0.028	pF
Grid No.1 to heater	$C_{g1f} = 0.055$	0.035-0.075	pF
Cathode to heater	$C_{kf} = 5.2$	4.2-6.2	pF

Typical characteristics

	I	II	III
Anode supply voltage	$V_{ba} = 135$		V ¹⁾
Grid No.3 voltage	$V_{g3} = 0$		V ¹⁾
Grid No.2 supply voltage	$V_{bg2} = 165$		V ¹⁾
Grid No.1 supply voltage	$V_{bg1} = +12.5$		V ¹⁾
Cathode resistor	$R_k = 360$		Ω ¹⁾
Anode current	$I_a = 35$	2)	mA
Grid No.2 current	$I_{g2} = 5.0$	4.4-5.6	mA
Mutual conductance	$S = 50$	42-58	35 mA/V
Internal resistance	$R_i = 42$		k Ω
Amplification factor of grid No.2 with respect to grid No.1	$\mu_{g2g1} = 57$		
Negative grid current	$-I_{g1} =$	< 0.1	0.2 μ A
Equivalent noise resistance at $f = 45$ Mc/s	$R_{eq} = 110$		Ω
Input conductance at $f = 100$ Mc/s	$g_{g1} = 2400$		μ A/V
Quality factor			
A. Without shield $\frac{S}{2\pi(C_{g1}+C_a+5)}$	= 250		Mc/s
B. With shield ³⁾ $\frac{S}{2\pi(C_{g1}+C_a+5)}$	= 245		Mc/s

¹⁾ Recommended operating conditions

²⁾ The spread of anode current is negligible

³⁾ Inner diameter 22.2 mm, length 44.5 mm

CHARACTERISTICS (continued)

Typical characteristics (continued)

		I	II	III
Anode supply voltage	$V_{ba} = 120$			V
Grid No.3 voltage	$V_{g3} = 0$			V
Grid No.2 supply voltage	$V_{bg2} = 150$			V
Cathode resistor	$R_k = 47$			Ω
Anode current	$I_a = 35$	31-39		25 mA

Hum voltage measured with centre tap of heater transformer earthed

		I	II
Anode supply voltage	$V_{ba} = 120$		V
Grid No.3 voltage	$V_{g3} = 0$		V
Grid No.2 supply voltage	$V_{bg2} = 150$		V
Cathode resistor	$R_k = 47$		Ω
Cathode capacitor	$C_k = 1000$		μF
Grid No.1 resistor	$R_{g1} = 0.5$		M Ω
Hum voltage	$V_{g1hum} =$		< 150 μV

Vibrational noise ¹⁾

		I	II
Anode supply voltage	$V_{ba} = 155$		V
Grid No.3 voltage	$V_{g3} = 0$		V
Grid No.2 supply voltage	$V_{bg2} = 160$		V
Grid No.1 supply voltage	$V_{bg1} = +7$		V
Cathode resistor	$R_k = 220$		Ω
Anode resistor	$R_a = 680$		Ω
Vibrational acceleration	$= 10$		g
(Frequency	$f = 50$		c/s
(Vibrational noise output	$V_{noise} =$		< 25 mV(RMS)
(Frequency	$f = 50-2000$		c/s
(Vibrational noise output	$V_{noise} =$		< 500 mV(RMS)

¹⁾ These test conditions are only given for evaluation of the ruggedness of the tube and should by no means be interpreted as suitable operating conditions.

CHARACTERISTICS (continued)Distortion in class A operation

		I	II
Anode supply voltage	$V_{ba} =$	155	V
Grid No.3 voltage	$V_{g3} =$	0	V
Grid No.2 supply voltage	$V_{bg2} =$	165	V
Grid No.1 supply voltage	$V_{bg1} =$	+12.5	V
Cathode resistor	$R_k =$	360	Ω
Cathode capacitor	$C_k =$	1000	μF
Anode resistor	$R_a =$	560	Ω
Anode current	$I_a =$	35	mA
Anode peak to peak current	$I_{app} =$	40	mA
Harmonic distortion	$d_{tot} =$	7.5	%

Insulation between heater and cathode

		I	II	III
Heater voltage	$V_f =$	6.3		V
Voltage between heater and cathode	$V_{kf} =$	100		V
Leakage current	$I_{kf} =$		< 10	20 μA

Insulation between electrodes (except between cathode and grid No.1)

		I	II	III
Heater voltage	$V_f =$	6.3		V
Voltage between two electrodes	$V =$	250		V
Insulation resistance	$R_{isol} =$		>100	40 M Ω

SHOCK RESISTANCE: about 500 g ¹⁾

Forces as applied by the NRL impact machine for electronic devices caused by 5 blows of the hammer lifted over an angle of 30° in each of four different positions of the tube

VIBRATION RESISTANCE: 2.5 g ¹⁾

Vibrational forces for a period of 32 hours at a frequency of 50 c/s in each of three directions

¹⁾ These test conditions are only given for evaluation of the ruggedness of the tube and should by no means be interpreted as suitable operating conditions

LIFE EXPECTANCY: 10 000 hours under the following life-test conditions:

Heater voltage	$V_f = 6.3 \text{ V} \pm 5 \%$
Anode supply voltage	$V_{ba} = 165 \text{ V}$
Anode resistor	$R_a = 820 \Omega$
Grid No.3 voltage	$V_{g3} = 0 \text{ V}$
Grid No.2 supply voltage	$V_{bg2} = 165 \text{ V}$
Grid No.1 supply voltage	$V_{bg1} = +14 \text{ V}$
Cathode resistor	$R_k = 390 \Omega$
Voltage between heater and cathode	$V_{kf} = 100 \text{ V}$
Anode current	$I_a = 35 \text{ mA}$

The data indicating the end point of life are given in column III under the heading "Characteristics"

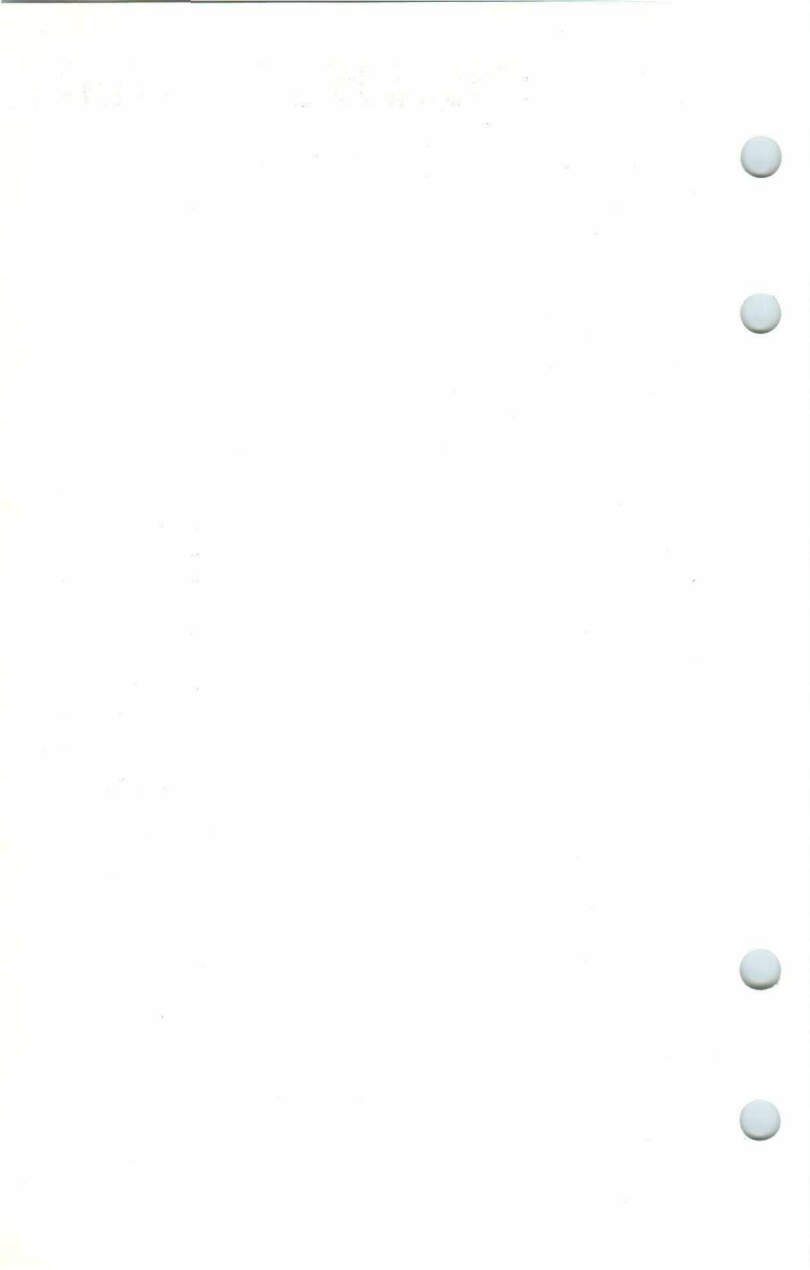
LIMITING VALUES (Absolute limits)

Anode voltage in cold condition	$V_{a0} = \text{max. } 400 \text{ V}$
Anode voltage	$V_a = \text{max. } 250 \text{ V}$
Anode dissipation	$W_a = \text{max. } 5 \text{ W}$
Grid No.2 voltage in cold condition	$V_{g20} = \text{max. } 400 \text{ V}$
Grid No.2 voltage	$V_{g2} = \text{max. } 200 \text{ V}$
Grid No.2 dissipation	$W_{g2} = \text{max. } 1 \text{ W } ^1)$
Negative grid No.1 voltage	$-V_{g1} = \text{max. } 25 \text{ V}$
Peak negative grid No.1 voltage	$-V_{g1p} = \text{max. } 50 \text{ V}$
Peak positive grid No.1 voltage	$+V_{g1p} = \text{max. } 50 \text{ V}$
Grid No.1 circuit resistance with fixed bias	$R_{g1} = \text{max. } 0.2 \text{ M}\Omega$
Grid No.1 circuit resistance with cathode resistor of 47Ω	$R_{g1} = \text{max. } 0.6 \text{ M}\Omega$
Grid No.1 circuit resistance with cathode resistor of 360Ω	$R_{g1} = \text{max. } 3.5 \text{ M}\Omega$
Grid No.1 dissipation	$W_{g1} = \text{max. } 10 \text{ mW } ^2)$
Cathode current	$I_k = \text{max. } 50 \text{ mA}$
Cathode current	$I_k = \text{max. } 65 \text{ mA } ^3)$
Voltage between heater and cathode	$V_{kf} = \text{max. } 100 \text{ V}$
Bulb temperature	$t_{bulb} = \text{max. } 200 \text{ }^\circ\text{C}$
Bulb temperature	$t_{bulb} = \text{max. } 220 \text{ }^\circ\text{C } ^3)$

¹⁾ Care should be taken not to exceed the rated value due to switching of positive supply voltages

²⁾ Averaged over any period of 1 sec

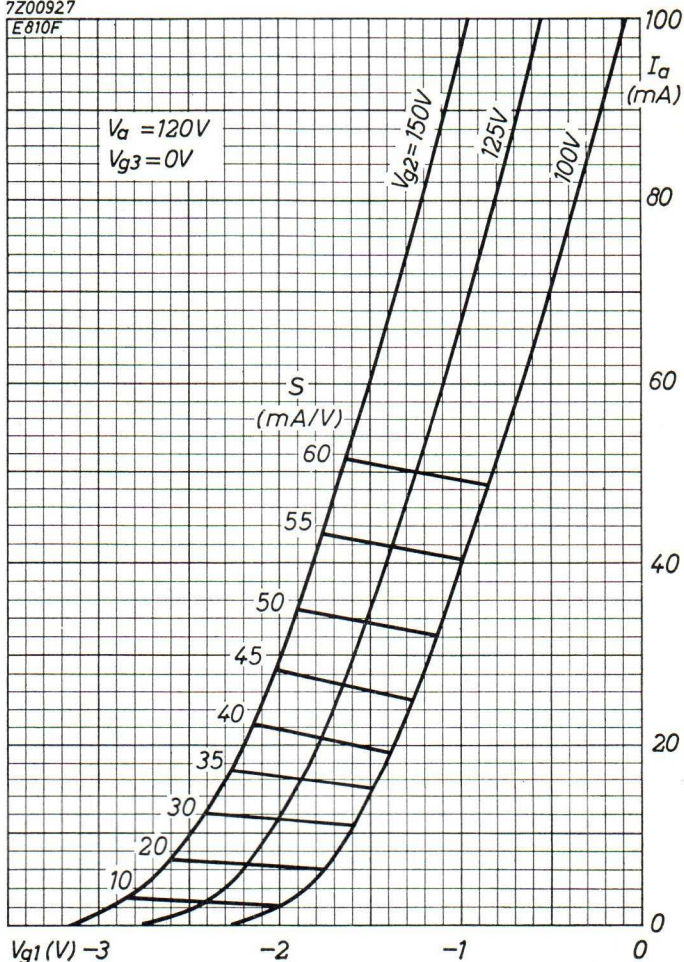
³⁾ When a life expectancy of 1000 hours suffices



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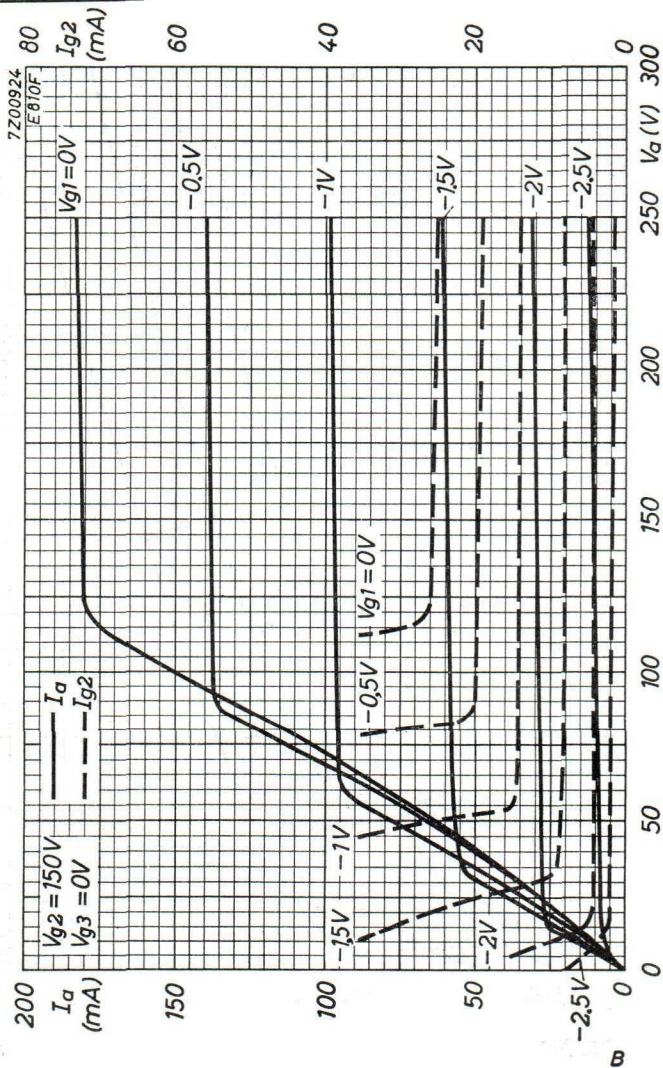
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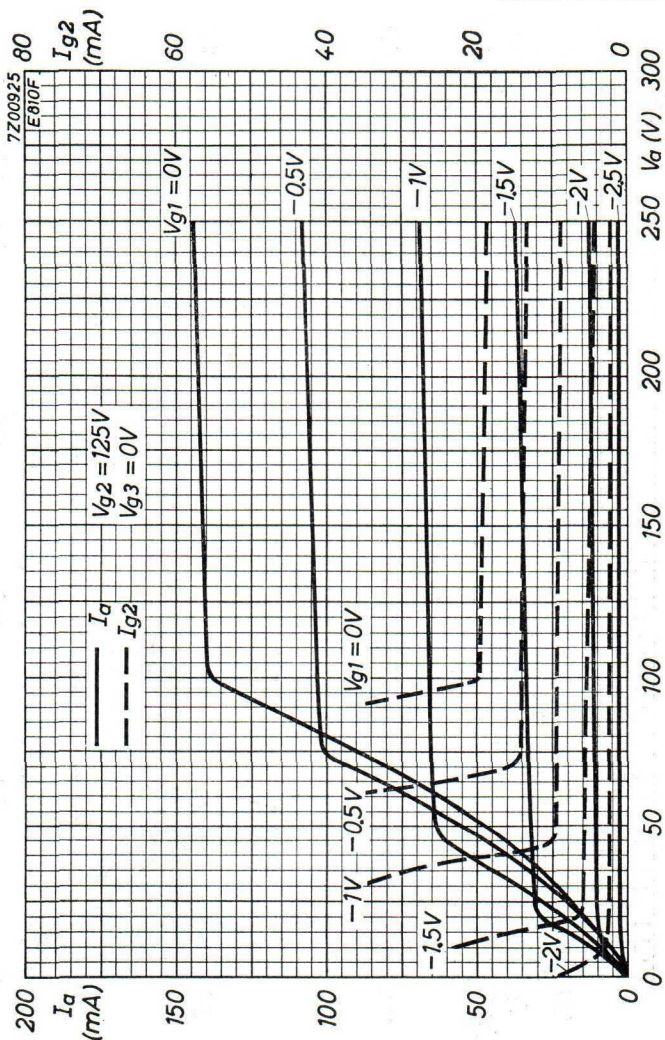
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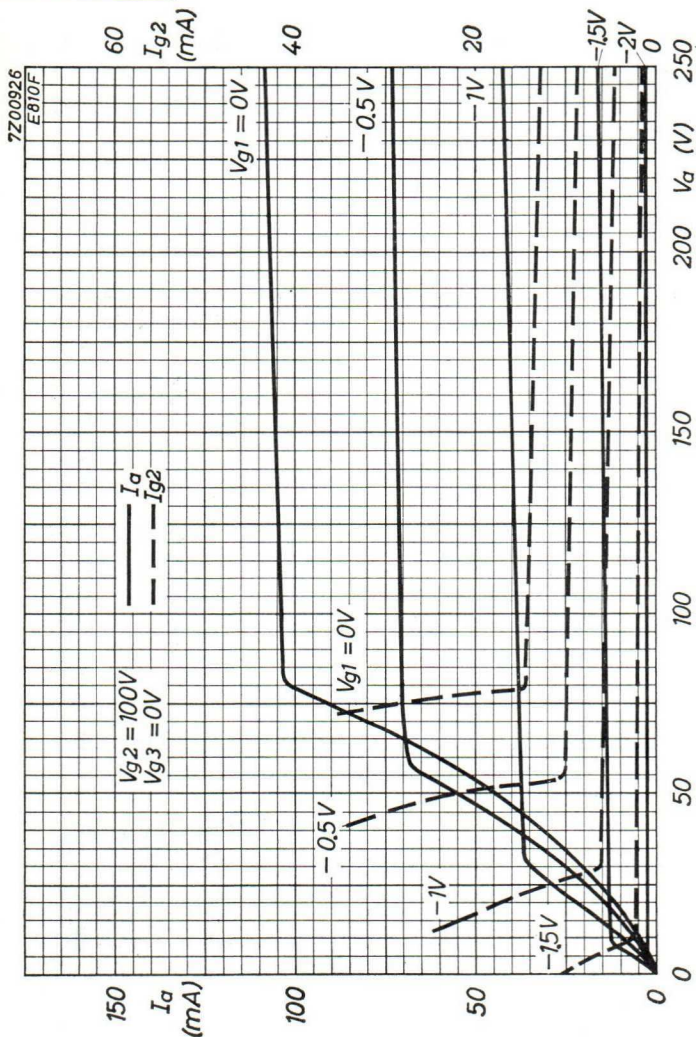
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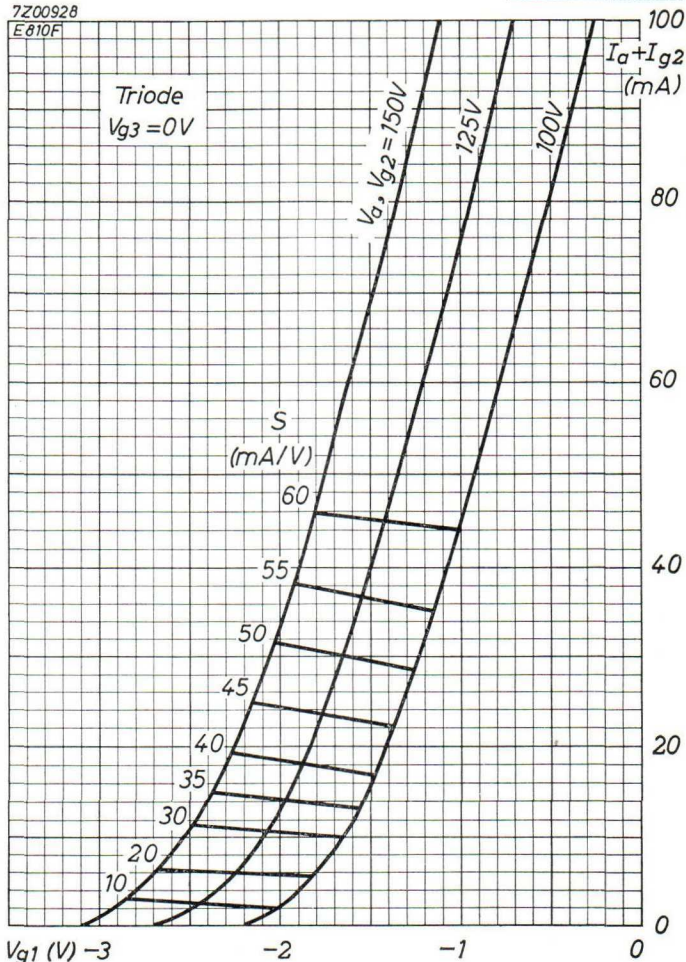
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