

## S.Q. TUBE

Special quality output pentode designed for use as wide band amplifier, series regulator tube and power output tube.

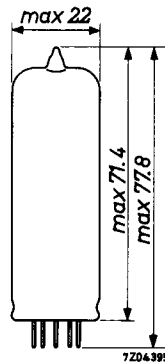
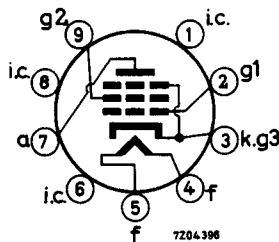
### QUICK REFERENCE DATA

Life test	10 000 hours	
Low interface resistance		
Mechanical quality	Shock and vibration resistant	
Base	Noval	
Heating	Indirect A. C. or D. C.; parallel supply	
Heater voltage	$V_f$	6.3 V
Heater current	$I_f$	760 mA
Anode current	$I_a$	48 mA
Mutual conductance	S	11.3 mA/V
Output power, one tube	$W_o$	6 W

### DIMENSIONS AND CONNECTIONS

Dimensions in mm

Base: Noval



## CHARACTERISTICS

Column I Nominal values 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	$I_f$	760	720 - 800		mA
Anode voltage	$V_a$	250			V
Grid No. 2 voltage	$V_{g_2}$	250			V
Cathode resistor	$R_k$	135			$\Omega$
Anode current	$I_a$	48	42 - 54	min. 32	mA
Grid No. 2 current	$I_{g_2}$	5.5	4 - 7		mA
Mutual conductance	$S$	11.3	9.2 - 13.4	min. 7.5	mA/V
Amplification factor	$\mu_{g_2g_1}$	19			
Internal resistance	$R_i$	40			k $\Omega$
Negative grid current	$-I_{g_1}$		max. 0.5	max. 1.0	$\mu$ A
<u>As triode</u>					
Anode voltage	$V_a$	250			V
Cathode resistor	$R_k$	270			$\Omega$
Anode current	$I_a$	34			mA
Mutual conductance	$S$	10.2			mA/V
Amplification factor	$\mu$	18.5			
Internal resistance	$R_i$	1.8			k $\Omega$
<u>Leakage current between cathode and heater</u>					
	$I_{kf}$		max. 12.5		$\mu$ A
Voltage between cathode and heater $V_{kf} = 100$ V					
<u>Insulation resistance between electrodes</u>					
	$R$		min. 100		M $\Omega$
Voltage between electrodes = 300 V					

**CAPACITANCES**

		I	II	
Anode to grid No.2, grid No.3 cathode and heater	$C_{a/g_2g_3kf}$	6.0	5.2 - 6.8	pF
Grid No.1 to grid No.2, grid No.3 cathode and heater	$C_{g_1/g_2g_3kf}$	10	9 - 11	pF
Anode to grid No.1	$C_{ag_1}$		max. 0.5	pF
Grid No.1 to heater	$C_{g_1f}$		max. 0.25	pF

**SHOCK AND VIBRATION RESISTANCE**

The following test conditions are applied to assess the mechanical quality of the tube. These conditions are not intended to be used as normal operating conditions.

Shock

The tube is subjected 5 times in each of 4 positions to an acceleration of 500 g supplied by an NRL shock machine with the hammer lifted over an angle of 30°.

Vibration

The tube is subjected during 32 hours in each of 3 positions to a vibration frequency of 50 Hz with an acceleration of 2.5 g.

**LIFE**

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

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

Anode voltage	$V_{a_0}$	max.	600 V
	$V_a$	max.	450 V
Anode dissipation	$W_a$	max.	13.5 W
Grid No.2 voltage	$V_{g_{20}}$	max.	600 V
	$V_{g_2}$	max.	450 V
Grid No.2 dissipation		Continuously	$W_{g_2}$ max. 2.2 W
		Peak value in case of excitation by speech and music	$W_{g_{2p}}$ max. 4.4 W

**LIMITING VALUES** (continued)

Grid No. 1 dissipation	$W_{g1}$	max.	0.5 W
Grid No. 1 voltage	$-V_{g1}$	max.	100 V
Cathode current	$I_k$	max.	75 mA
Grid resistor			
Fixed bias	$R_{g1}$	max.	0.5 MΩ
Automatic bias	$R_{g1}$	max.	1.0 MΩ
Voltage between cathode and heater	$V_{kf}$	max.	100 V
Bulb temperature	$t_{bulb}$	max.	225 °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.

**OPERATING CHARACTERISTICS**

Output tube class A (one tube) 2)3)

Anode voltage	$V_a$	250	V
Grid No. 2 voltage	$V_{g2}$	250	V
Cathode resistor	$R_k$	135	Ω
Load resistance	$R_{a\sim}$	4.5	kΩ
-----			
Input voltage	$V_i$	0 0.3 3.5 4.4 4.8 <sup>1</sup>	$V_{RMS}$
Anode current	$I_a$	48	50.5 50.5 mA
Grid No. 2 current	$I_{g2}$	5.5	10.0 11.0 mA
Output power	$W_o$	0 0.05 4.5 5.7 6.0	W
Total distortion	$d_{tot}$	7.5 10	%
Second harmonic	$d_2$	5.7 5.0	%
Third harmonic	$d_3$	4.5 8.0	%

## OPERATING CHARACTERISTICS (continued)

Output tube class A (one tube) 2)3)

Anode voltage	$V_a$	250			V	
Grid No. 2 voltage	$V_{g2}$	250			V	
Cathode resistance	$R_k$	135			$\Omega$	
Load resistance	$R_{a\sim}$	5.2			$k\Omega$	
-----						
Input voltage	$V_i$	0	0.3	3.4	4.3	4.7 <sup>1)</sup> $V_{RMS}$
Anode current	$I_a$	48			49.5	49.2 mA
Grid No. 2 current	$I_{g2}$	5.5			10.8	11.6 mA
Output power	$W_o$	0	0.05	4.5	5.7	6.0 W
Total distortion	$d_{tot}$			6.8	10	%
Second harmonic	$d_2$			3.0	2.0	%
Third harmonic	$d_3$			5.8	9.5	%
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Anode voltage	$V_a$			250		V
Grid No. 2 voltage	$V_{g2}$			250		V
Cathode resistance	$R_k$			210		$\Omega$
Load resistance	$R_{a\sim}$			7.0		$k\Omega$
-----						
Input voltage	$V_i$	0	0.3		3.5	5.5 <sup>1)</sup> $V_{RMS}$
Anode current	$I_a$	36			36.8	36 mA
Grid No. 2 current	$I_{g2}$	4.1			8.5	14.6 mA
Output power	$W_o$	0	0.05		4.2	5.6 W
Total distortion	$d_{tot}$				10	%
Second harmonic	$d_2$				1.7	%
Third harmonic	$d_3$				8.7	%

**OPERATING CHARACTERISTICS (continued)**

Output tube class A (one tube) <sup>2)</sup>

Anode voltage	$V_a$	250	V
Grid No.2 voltage	$V_{g2}$	210	V
Cathode resistor	$R_k$	160	$\Omega$
Load resistance	$R_{a\sim}$	7.0	$k\Omega$

Input voltage	$V_i$	0	0.3	3.4	3.8 <sup>1)</sup>	$V_{RMS}$
Anode current	$I_a$	36		36.6	36.5	mA
Grid No.2 current	$I_{g2}$	3.9		7.3	8.0	mA
Output power	$W_o$	0	0.05	4.3	4.7	W
Total distortion	$d_{tot}$			10		%
Second harmonic	$d_2$			1.8		%
Third harmonic	$d_3$			9.3		%

Output tube class AB (two tubes) <sup>2)</sup>

Anode voltage	$V_a$	250		300	V	
Grid No.2 voltage	$V_{g2}$	250		300	V	
Cathode resistor	$R_k$	130		130	$\Omega$	
Load resistance	$R_{aa\sim}$	8		8	$k\Omega$	
Input voltage	$V_i$	0	8	0	10 <sup>3)</sup>	$V_{RMS}$
Anode current	$I_a$	2x31	2x37.5	2x36	2x46	mA
Grid No.2 current	$I_{g2}$	2x3.5	2x7.5	2x4	2x11	mA
Output power	$W_o$	0	11	0	17	W
Total distortion	$d_{tot}$		3		4	%

## OPERATING CHARACTERISTICS (continued)

Output tube class B (two tubes)

Anode voltage	$V_a$	250		300	V
Grid No. 2 voltage	$V_{g2}$	250		300	V
Grid No. 1 voltage	$-V_{g1}$	11.6		14.7	V
Load resistance	$R_{aa\sim}$	8		8 k $\Omega$	
Input voltage	$V_i$	0	8	0	$10^3$ ) $V_{RMS}$
Anode current	$I_a$	2x10	2x37.5	2x7.5	2x46 mA
Grid No. 2 current	$I_{g2}$	2x1.1	2x7.5	2x0.8	2x11 mA
Output power	$W_o$	0	11	0	17 W
Total distortion	$d_{tot}$		3		4 %

As triodeOutput tube class A (one tube)

Anode voltage	$V_a$		250		V
Cathode resistor	$R_k$		270		$\Omega$
Load resistance	$R_{a\sim}$		3.5		k $\Omega$
Input voltage	$V_i$		0	1.0	6.7 $V_{RMS}$
Anode current	$I_a$		34		36 mA
Output power	$W_o$		0	0.05	1.95 W
Total distortion	$d_{tot}$				9.0 %

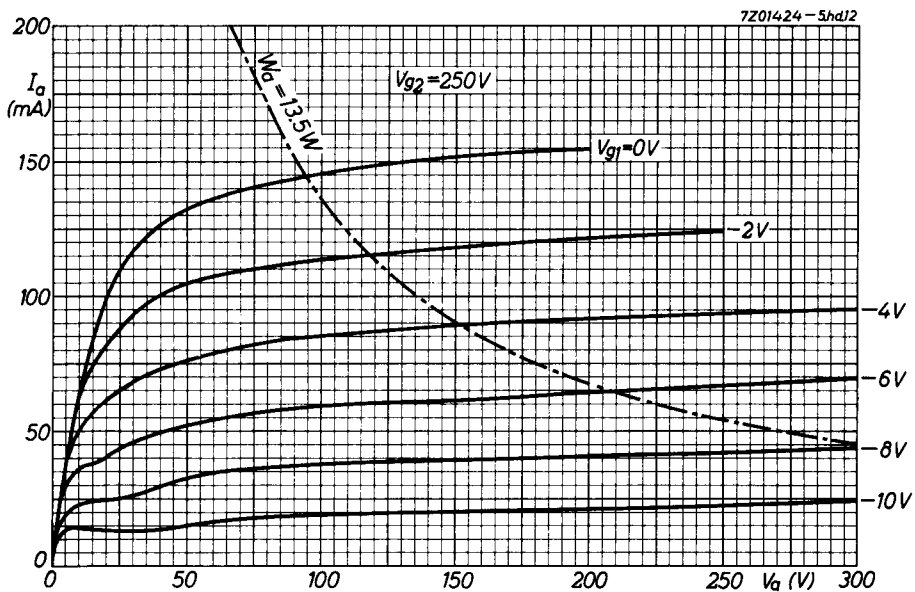
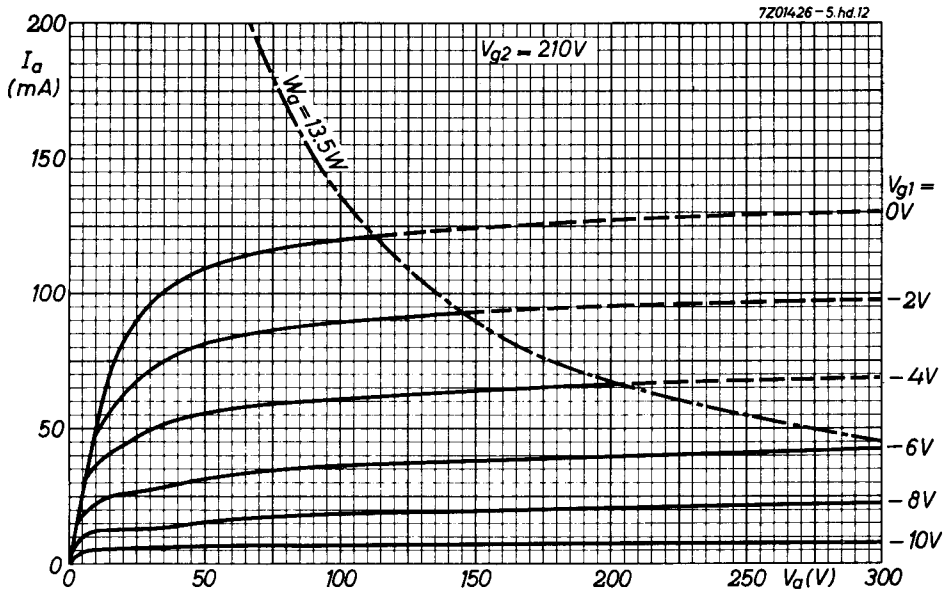
Output tube class AB (2 tubes)

Anode voltage	$V_a$	250		300	V		
Cathode resistor	$R_k$	270		270	$\Omega$		
Load resistance	$R_{aa\sim}$	10		10 k $\Omega$			
Input voltage	$V_i$	0	0.95	8.3	0	0.9	10 $V_{RMS}$
Anode current	$I_a$	2x20		2x21.7	2x24		2x26 mA
Output power	$W_o$	0	0.05	3.4	0	0.05	5.2 W
Total distortion	$d_{tot}$			2.5			2.5 %

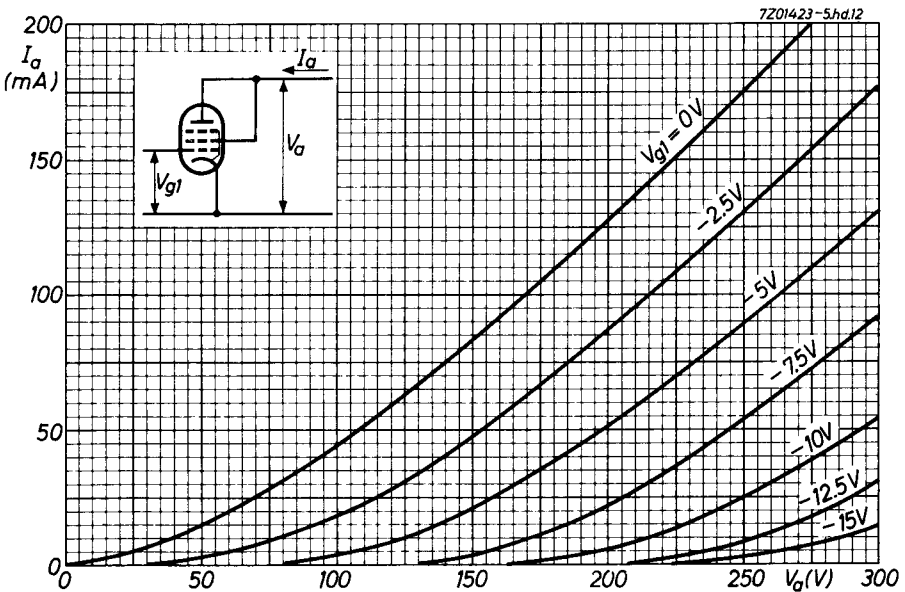
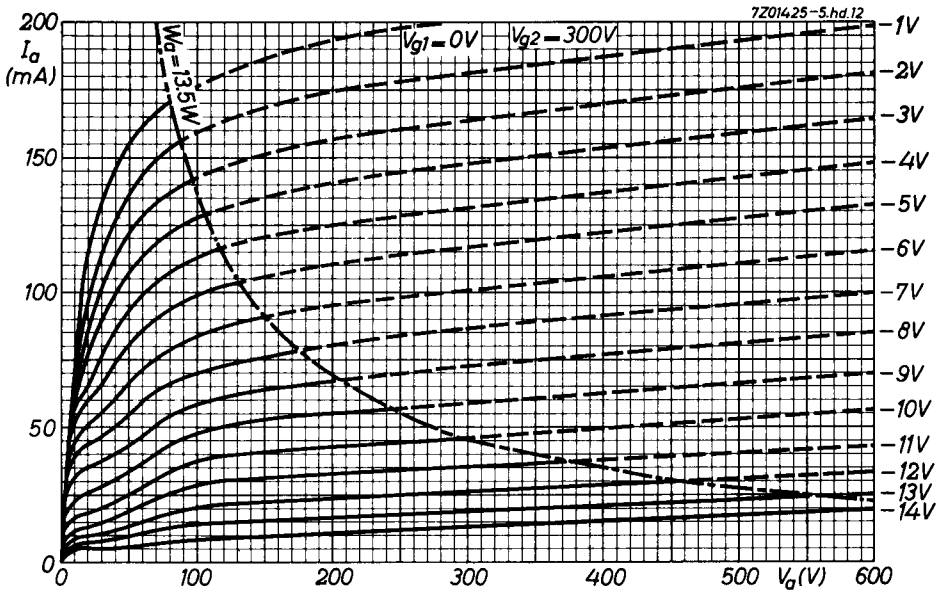
1) Grid No. 1 current  $I_{g1} = 0.3 \mu A$ 

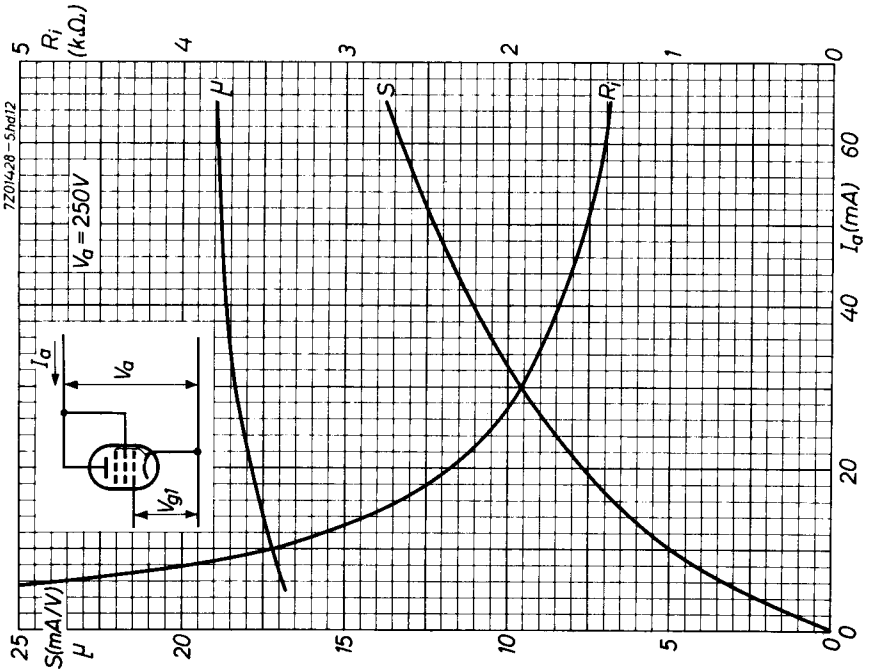
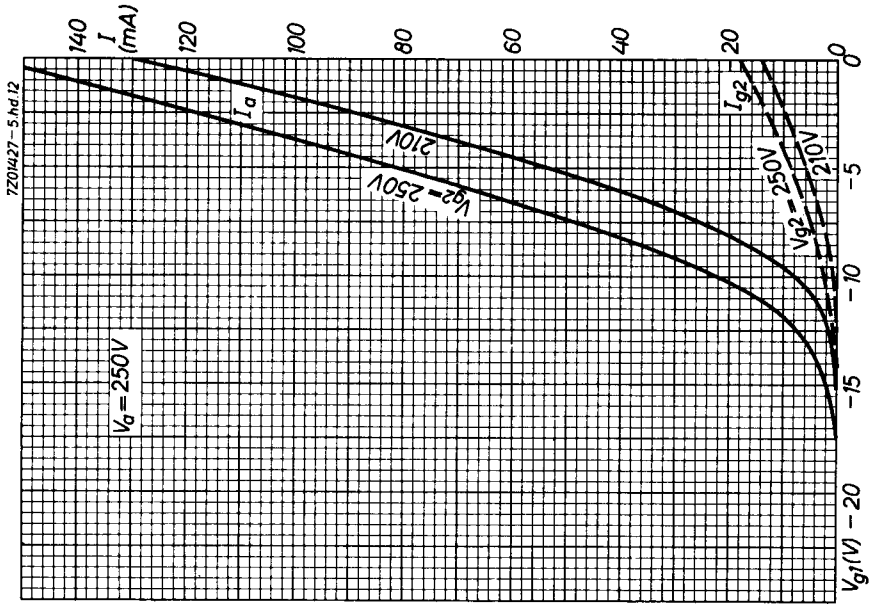
2) Measured with fixed bias

3) With speech and music signal









# PHILIPS

Data handbook



Electronic  
components  
and materials

## E84L

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