

S.Q. TUBE

Special quality double triode designed for use as A.F. amplifier, phase inverter and amplifier in measuring equipment.

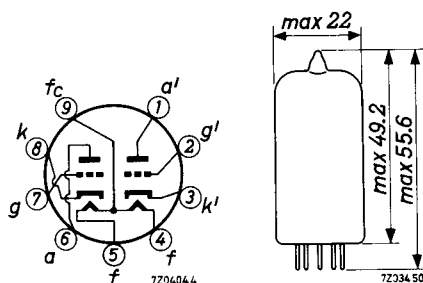
QUICK REFERENCE DATA

Life test	10 000 hours
Low interface resistance	
Low microphony level	
Mechanical quality	Shock and vibration resistant
Base	Noval
Heating	Indirect A.C. or D.C.; parallel supply
Heater voltage	V_f 6.3 V or 12.6 V
Heater current	I_f 300 mA or 150 mA
Anode current	I_a 1.25 mA
Mutual conductance	S 1.6 mA/V
Amplification factor	μ 100

DIMENSIONS AND CONNECTIONS

Dimensions in mm

Base: Noval



CHARACTERISTICS (Both systems if applicable)

Column I Nominal value 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 pin 9 and 4 + 5	V_f	6.3			V
Heater current	I_f	300	285 - 315		mA
Heater voltage pin 4 and 5	V_f	12.6			V
Heater current	I_f	150			mA
Anode voltage	V_a	250			V
Cathode resistor	R_k	1.6			k Ω
Anode current	I_a	1.25	1.1 - 1.4	min. 0.8	mA
Mutual conductance	S	1.6	1.3 - 1.95	min. 1.05	mA/V
Amplification factor	μ	100			
Internal resistance	R_i	62.5			k Ω
<u>Negative grid current</u>	$-I_g$		max. 0.2	max. 0.5	μ A
<u>Cut-off voltage</u>	$-V_g$		max. 4		V
Anode current $I_a = 20 \mu$ A					
Anode voltage	V_a	100			V
Anode current	I_a	0.5			mA
Cathode resistor	R_k	2			k Ω
Mutual conductance	S	1.25			mA/V
Amplification factor	μ	100			
Internal resistance	R_i	80			k Ω
<u>Leakage current between cathode and heater</u>	I_{kf}		max. 5		μ A
Voltage between cathode and heater $V_{kf} = 100$ V					

CHARACTERISTICS (continued)Insulation resistance:

Between grid and other electrodes

	I	II	
R_{ins}		max. 300	$M\Omega$
R_{ins}		max. 300	$M\Omega$

Voltage between electrodes = 100 V

Between anode and other electrodes

Voltage between electrodes = 300 V

Vibrational noise output (20 to 5000 Hz) V_o max. 10 mV_{RMS} Anode supply voltage $V_{ba} = 250$ VAnode resistor $R_a = 5$ $k\Omega$ Grid voltage $-V_g = 2$ V

Vibration frequency = 25 Hz

Acceleration = 2.5 g

Units in parallel

CAPACITANCES

Grid to cathode and heater

 $C_{g/kf}$ 1.6 pF

Anode to cathode and heater

 $C_{a/kf}$ 0.46 pF $C_{a'/'kf}$ 0.34 pF

Anode to grid

 C_{ag} 1.7 pF

Grid to heater

 C_{gf} max. 0.15 pF

Anode to anode other system

 $C_{aa'}$ max. 0.6 pF

Grid to grid other system

 $C_{gg'}$ max. 10 mpF

Anode to grid other system

 $C_{ag'}$ max. 60 mpF $C_{ga'}$ max. 60 mpF**LIMITING VALUES** (Absolute max. rating system) (Each unit)

Anode voltage

 V_{a0} max. 600 V V_a max. 330 V

Anode dissipation

 W_a max. 1.2 W

Grid voltage

 $-V_g$ max. 55 V $+V_g$ max. 0.5 V

Cathode current

 I_k max. 9 mA

LIMITING VALUES (continued)

Grid resistor: fixed bias	R_g	max. 1.2 M Ω
automatic bias	R_g	max. 2.2 M Ω
grid current bias	R_g	max. 25 M Ω
Voltage between cathode and heater	V_{kf}	max. 200 V
Resistance in cathode heater circuit in case of phase inverter circuit	R_{kf}	max. 135 k Ω
Bulb temperature	t_{bulb}	max. 170 °C
Microphony:		
Input voltage required for 50 mW output	V_i	min. 0.5 mV

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 the heater current (column II) should be taken into account.

OPERATING CHARACTERISTICSA.F. amplifier - circuit fig.1

Anode supply voltage	V_{ba}	200	250	300	350	400	V
Anode resistor	R_a	47	47	47	47	47	k Ω
Cathode resistor	R_k	1500	1200	1000	820	680	Ω
Grid resistor next stage	$R_{g'}$	150	150	150	150	150	k Ω
Anode current	I_a	0.86	1.18	1.55	1.98	2.45	mA
Output voltage (Grid current = 0.3 μ A)	V_o	18	23	26	33	37	V _{RMS}
Voltage gain	V_o/V_i	34.0	37.5	40.0	42.5	44.0	
Total distortion	d_{tot}	8.5	7.0	5.0	4.4	3.6	%

OPERATING CHARACTERISTICS (continued)

A.F. amplifier - circuit fig.1 (continued)

Anode supply voltage	V_{ba}	200	250	300	350	400	V
Anode resistor	R_a	100	100	100	100	100	k Ω
Cathode resistor	R_k	1800	1500	1200	1000	820	Ω
Grid resistor next stage	$R_{g'}$	330	330	330	330	330	k Ω
Anode current	I_a	0.65	0.86	1.11	1.40	1.72	mA
Output voltage (Grid current = 0.3 μ A)	V_o	20	26	30	36	38	V _{RMS}
Voltage gain	V_o/V_i	50	54.5	57.0	61.0	63.0	
Total distortion	d_{tot}	4.8	3.9	3.7	2.2	1.7	%

Anode supply voltage	V_{ba}	200	250	300	350	400	V
Anode resistor	R_a	220	220	220	220	220	k Ω
Cathode resistor	R_k	3300	2700	2200	1500	1200	Ω
Grid resistor next stage	$R_{g'}$	680	680	680	680	680	k Ω
Anode current	I_a	0.36	0.48	0.63	0.85	1.02	mA
Output voltage (Grid current = 0.3 μ A)	V_o	24	28	36	37	38	V _{RMS}
Voltage gain	V_o/V_i	56	66.5	72.0	75.5	76.5	
Total distortion	d_{tot}	4.6	3.4	2.6	1.6	1.1	%

A.F. amplifier - circuit fig.2.

Anode supply voltage	V_{ba}	200	250	300	350	400	V
Anode resistor	R_a	47	47	47	47	47	k Ω
Grid resistor next stage	$R_{g'}$	150	150	150	150	150	k Ω
Anode current	I_a	1.02	1.45	2.02	2.50	3.10	mA
Output voltage	V_o	18	23	26	33	37	V _{RMS}
Voltage gain	V_o/V_i	37	39	41	44	45	
Total distortion	d_{tot}	5.6	4.2	2.9	2.7	2.5	%

OPERATING CHARACTERISTICS (continued)

A.F. amplifier - circuit fig.2. (continued)

Anode supply voltage	V_{ba}	200	250	300	350	400	V
Anode resistor	R_a	100	100	100	100	100	k Ω
Grid resistor next stage	$R_{g'}$	330	330	330	330	330	k Ω
Anode current	I_a	0.70	1.00	1.29	1.62	1.95	mA
Output voltage	V_o	20	26	30	36	38	V_{RMS}
Voltage gain	V_o/V_i	50	51	54	56	58	
Total distortion	d_{tot}	3.9	2.6	2.0	1.8	1.6	%

Anode voltage	V_{ba}	200	250	300	350	400	V
Anode resistor	R_a	220	220	220	220	220	k Ω
Grid resistor next stage	$R_{g'}$	680	680	680	680	680	k Ω
Anode current	I_a	0.39	0.56	0.75	0.88	1.09	mA
Output voltage	V_o	24	28	36	37	38	V
Voltage gain	V_o/V_i	58	62	66	67	68	
Total distortion	d_{tot}	4.6	2.7	2.2	1.7	1.4	%

A.F. amplifier - circuit fig.3.

Anode supply voltage	V_{ba}	100	150	200	250	300	350	400	V
Anode resistor	R_a	47	47	47	47	47	47	47	k Ω
Grid resistor next stage	$R_{g'}$	150	150	150	150	150	150	150	k Ω
Anode current	I_a	0.35	0.84	1.40	1.95	2.52	3.19	3.80	mA
Voltage gain	V_o/V_i	25	33	34	36	38	40	41	

Total distortion:

at $V_o = 2 V_{RMS}$	d_{tot}	1.7	2.5	2.4	2.3	2.2	2.2	2.1	%
at $V_o = 4 V_{RMS}$	d_{tot}	2.1	4.6	4.7	4.6	4.5	4.2	4.2	%
at $V_o = 6 V_{RMS}$	d_{tot}	6.0	5.2	5.6	5.6	5.5	5.5	5.4	%

OPERATING CHARACTERISTICS (continued)A.F. amplifier - circuit fig.3. (continued)

Anode supply voltage	V_{ba}	100	150	200	250	300	350	400	V
Anode resistor	R_a	100	100	100	100	100	100	100	k Ω
Grid resistor next stage	$R_{g'}$	330	330	330	330	330	330	330	k Ω
Anode current	I_a	0.24	0.56	0.88	1.23	1.58	1.92	2.29	mA
Voltage gain	V_o/V_i	34	43	46	48	50	51	52	

Total distortion:

at $V_o = 2 V_{RMS}$	d_{tot}	1.6	1.9	1.9	1.8	1.8	1.8	1.7	%
at $V_o = 4 V_{RMS}$	d_{tot}	2.3	3.0	3.8	3.8	3.6	3.6	3.5	%
at $V_o = 6 V_{RMS}$	d_{tot}	2.6	4.7	5.1	5.1	5.0	4.9	4.8	%

Anode supply voltage	V_{ba}	100	150	200	250	300	350	400	V
Anode resistor	R_a	220	220	220	220	220	220	220	k Ω
Grid resistor next stage	$R_{g'}$	680	680	680	680	680	680	680	k Ω
Anode current	I_a	0.14	0.32	0.49	0.67	0.85	1.05	1.23	mA
Voltage gain	V_o/V_i	42	51	54	57	58	59	60	

Total distortion:

at $V_o = 2 V_{RMS}$	d_{tot}	1.6	1.7	1.7	1.6	1.6	1.6	1.6	%
at $V_o = 4 V_{RMS}$	d_{tot}	2.5	3.0	3.0	2.9	2.9	2.8	2.7	%
at $V_o = 6 V_{RMS}$	d_{tot}	3.2	4.4	4.4	4.4	4.4	4.3	4.2	%

Phase inverter - circuit fig.4

Supply voltage	V_b	250	350	V
Anode voltage	V_a	65	90	V
Anode resistor	$R_a, R_{a'}$	100	150	k Ω
Cathode resistor	R_k	68	82	k Ω
Anode current	$I_a+I_{a'}$	1.0	1.2	mA
Voltage gain	V_o/V_i	$\underbrace{25}$	$\underbrace{27}$	
Output voltage (Grid current = 0.3 μ A)	V_o	7 20	10 35	V_{RMS}
Total distortion	d_{tot}	0.6 1.8	0.5 1.8	%

V_a should be adjusted to the specified value for $I_a + I_{a'}$

OPERATING CHARACTERISTICS (continued)

Phase inverter - circuit fig.5.

Supply voltage	V_b	250	350	V
Cathode resistor	R_k	1200	820	Ω
Anode current	$I_a + I_{a'}$	1.08	1.7	mA
Voltage gain	V_o/V_i	58	62	
Output voltage	V_o	7	9	V_{RMS}
(Grid current = 0.3 μA)		35	45	
Total distortion	d_{tot}	1.1	0.7	%
		5.5	3.5	

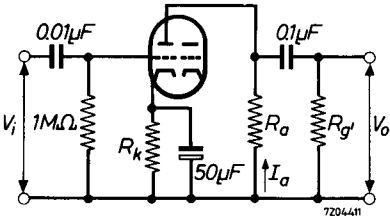


Fig. 1

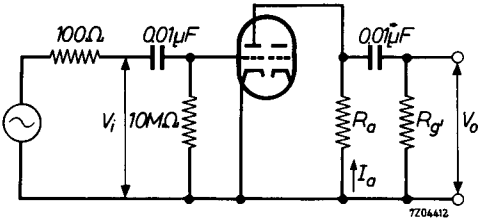


Fig. 2

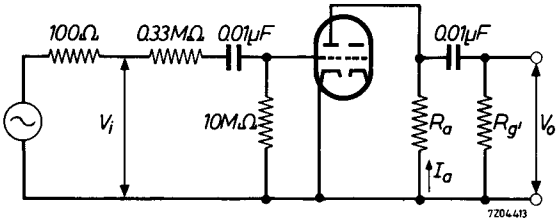


Fig. 3

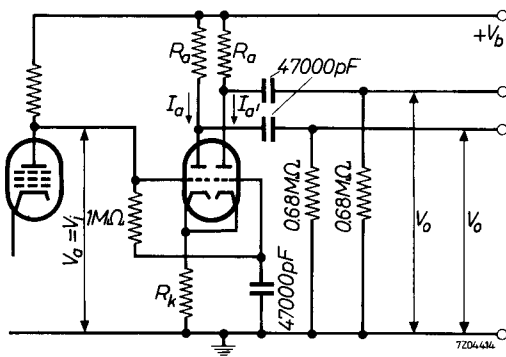


Fig. 4

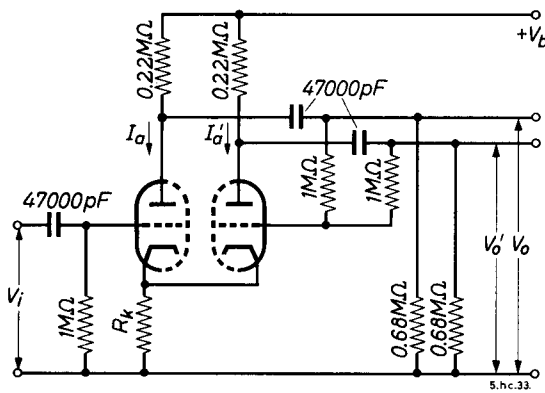
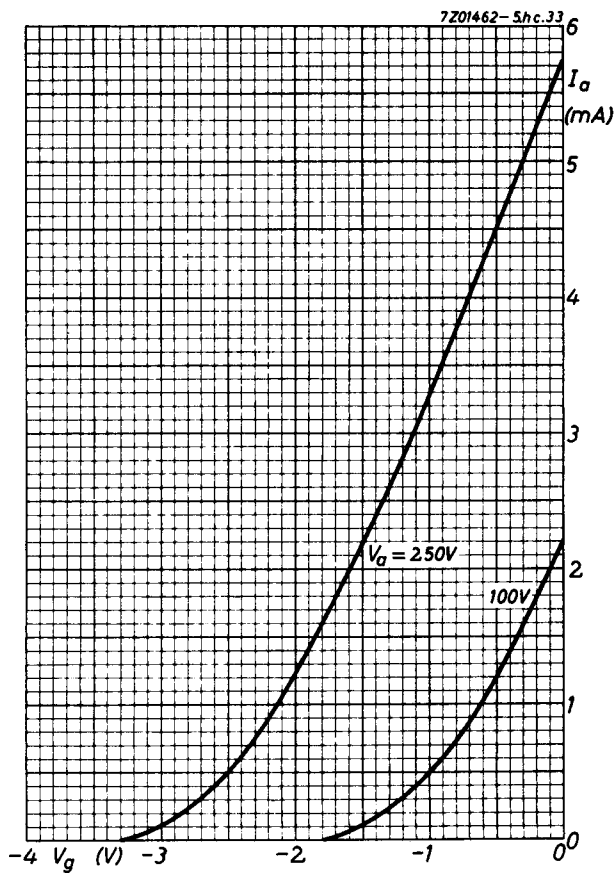
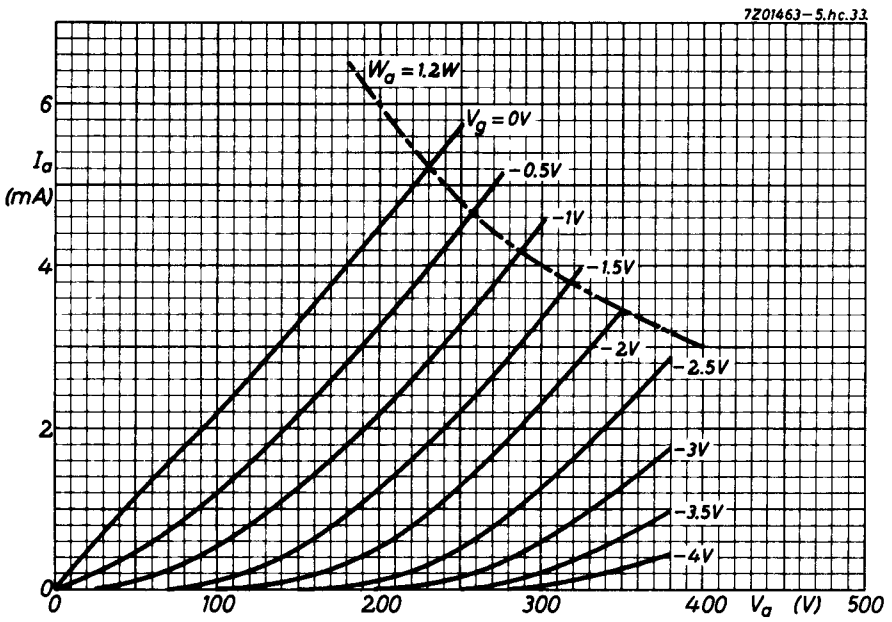
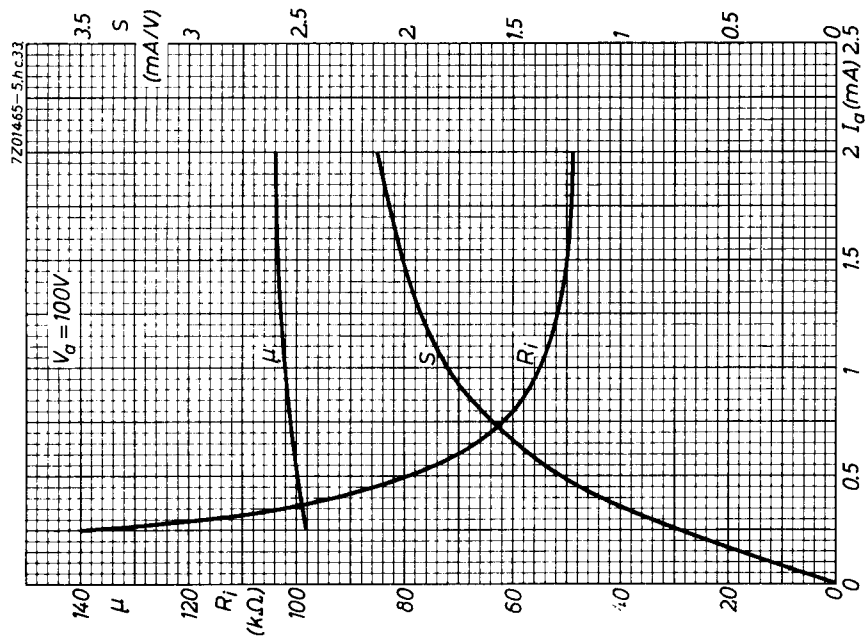
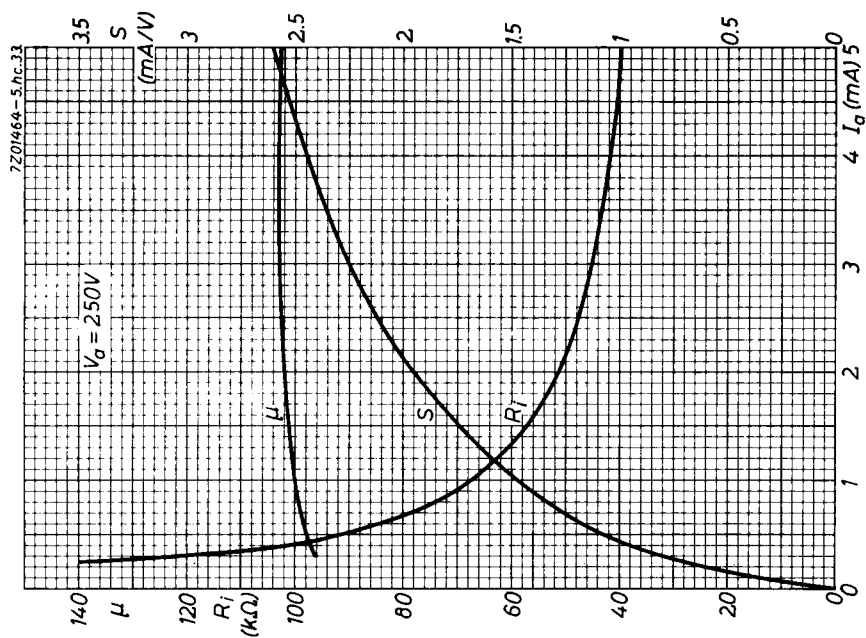


Fig. 5







PHILIPS

Data handbook



**Electronic
components
and materials**

E83CC

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