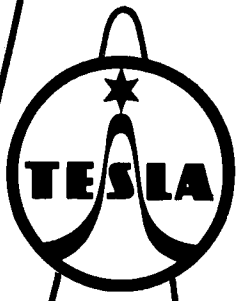

MANUAL

of
electronic
tubes

RECEIVING TUBES

PICTURE TUBES

CATHODE-RAY TUBES

RECTIFIER TUBES

TRANSMITTING TUBES

MODULATING TUBES

IMPULSE TUBES

KLYSTRONS

MAGNETRONS

TRAVELLING WAVE TUBES

CARCINOTRONS

TR AND ATR SWITCH TUBES

VACUUM CONDENSERS

SPECIAL TUBES

CAMERA TUBES

SEMICONDUCTOR DIODES

SEMICONDUCTOR RECTIFIERS

SEMICONDUCTOR PHOTODIODES

A. F. TRANSISTORS

H. F. TRANSISTORS

POWER TRANSISTORS

INTEGRATED CIRCUITS

MANUAL

OF ELECTRONIC TUBES

TESLA

1969

TESLA ROŽNOV

Editor:
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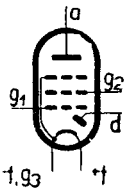
This manual of TESLA electronic tubes and semi-conductor devices contains all basic technical data required for general information. It does not list detailed data required for the development and design of new electronic instruments. A concise catalogue of tubes compiled specially for the use of designers contains, in addition to all data, also the characteristics.

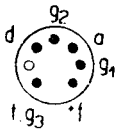
This catalogue is printed on loose leaves and is kept up-to-date by additions. Receiving tubes intended for use in newly designed receivers, instruments, etc., are listed in a table of preferred types.

KOVO, Foreign Trade Co.,
Dept. 8, Prague 7
Czechoslovakia

Type Application	Dimensions Base	Heating Static data	Operational Data	Maximum Ratings

1AF33 Size max
1AF34 Ø 19×49 mm





Diode -
AF pentode,
AF amplifier,
AM demodulator

1AF33

U_f	1,4	V
I_f	25	mA

Direct heating

U_a	67,5	V
U_{g2}	67,5	V
U_{g1}	−1	V
I_a	1,4	mA
I_{g2}	<0,4	mA
S [1]	>0,3	mA/V
R_i	0,6	MΩ
μ	300	
I_d	>0,1	mA
U_d	3	V

1) U_{g1} = −0,5 V

Capacitances

C_{g1}	2,4	pF
C_a	4,6	pF
$C_{a/g1}$	<0,3	pF
$C_{d/f}$	1,5	pF

1AF34

U_f	1,2	V
I_f	30	mA

Direct heating

AF resistance-coupled amplifier

U_b	45	67,5	90	V
R_a	1	1	1	MΩ
R_{g2}	3,3	3,3	3,3	MΩ
R_{g1}	10	10	10	MΩ
R_{g1}'	2,2	2,2	2,2	MΩ
I_b	0,05	0,075	0,1	mA
U_o/U_i	45	60	67	
k	2	3	5	%
$U_{o\,ef}$	5	5	5	V

AF resistance-coupled amplifier triode connection

U_b	90	90	V
R_a	0,22	0,47	MΩ
R_{g1}	10	10	MΩ
R_{g1}'	0,68	1,5	MΩ
U_b	0,25	0,13	mA
U_o/U_i	11	11,6	
k	1	0,8	%
$U_{o\,ef}$	5	5	V

Pentode

U_{ao}	250	V
U_a	90	V
U_{g2o}	250	V
U_{g2}	67,5	V
U_{g1}	0	V
I_k	4,5	mA
R_{g1}	3	MΩ
R_{g1} [1]	22	MΩ
U_f	1,6	V
U_f	>1,1	V

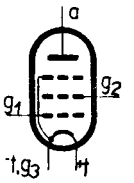
Diode

$U_{d\,sp}$	50	V
I_d	0,2	mA
$I_{d\,sp}$	1,2	mA

1) U_{g1} produced by R_{g1}

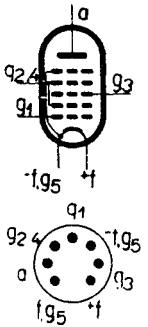
1AF34

U_f	1,4	V
U_f	>0,9	V

Type / Application	Dimensions / Base	Heating / Static data	Operational Data	Maximum Ratings
1F33 **1F34**	Size max Ø 19×49 mm	**1F33** U_f 1,4 V I_f 25 mA Direct heating	**RF and IF amplifier**	U_{a0} 150 V U_a **90** V U_{g20} 150 V U_{g2} **67,5** V I_k 5,5 mA U_{g1} **0** V W_a 0,3 W W_{g2} 0,1 W R_{g1} 3 MΩ U_f 1,6 V U_f >1,1 V
		U_a 67,5 V U_{g2} 67,5 V U_{g1} −1 V I_a 2,5 mA I_{g2} <1,3 mA S [1] >0,6 mA/V R_i >250 kΩ μ 400 [1] U_{g1} = −0,5 V	U_a 45 — 67,5 V U_{g2} 45 — 67,5 V U_{g1} 0 −10 — 0 −16 — V I_a 1,7 — — 3,4 — — mA I_{g2} 0,7 — — 1,5 — — mA S 0,65 0,01 — 0,75 0,01 — mA/V R_i 0,35 >10 — 0,25 >10 — MΩ $\mu_{g2/g1}$ 22 — — 22 — —	**Capacitances** C_{g1} 4,2 pF C_a 7,5 pF $C_{a/g1}$ <0,012 pF
Variable-mu pentode RF, IF amplifier		**1F34** U_f 1,2 V I_f 30 mA Direct heating	U_a 90 — 90 V U_{g2} 45 — 67,5 V U_{g1} 0 −10 — 0 −16 — V I_a 1,8 — — 3,5 — — mA I_{g2} 0,65 — — 1,4 — — mA S 0,7 0,01 — 0,75 0,01 — mA/V R_i 0,8 >10 — 0,5 >10 — MΩ $\mu_{g2/g1}$ 22 — — 22 — —	**1F34** U_f 1,4 V U_f >0,9 V

Type / Application	Dimensions / Base	Heating	Operational Data				Maximum Ratings
		Static data					

1H33 Size max
1H34 Ø 19×49 mm



Variable-mu
heptode
Mixer

1H33

U_f	1,4	V
I_f	25	mA

Direct heating

●

U_a	90	V
U_{g3}	−0,5	V
U_{g2+4}	67,5	V
U_{g1}	−0,5	V
I_a	3,2	mA
I_{g2+4}	4,0	mA
$S_{g1/g2+g4}$	>0,45	mA/V
R_i	>250	kΩ

1H34

U_f	1,2	V
I_f	30	mA

Direct heating

Mixer

U_a	45		67,5		V
U_{g2+4}	45		67,5		V
R_{g1}	100		100		kΩ
I_{g1}	150		250		µA
U_{g3}	0	−9	0	−14	V
I_a	0,57	—	1,4	—	mA
I_{g2+4}	1,8	—	3,2	—	mA
S_c	235	5	280	5	µA/V
R_i	0,6	>10	0,5	>10	MΩ
I_k	2,5	—	5	—	mA
U_a	90		90		V
U_{g2+4}	45		67,5		V
R_{g1}	100		100		kΩ
I_{g1}	150		250		µA
U_{g3}	0	−9	0	−14	V
I_a	0,8	—	1,6	—	mA
I_{g2+4}	1,9	—	3,2	—	mA
S_c	250	5	300	5	µA/V
R_i	0,8	>10	0,6	>10	MΩ
I_k	2,75	—	5	—	mA

U_{ao}	250	V
U_a	90	V
U_{g2+4o}	90	V
U_{g2+4}	67,5	V
U_{g3}	0	V
I_k	5,5	mA
R_{g3}	3	MΩ
U_f	1,6	V
U_f	>1,1	V

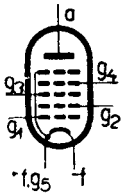
Capacitances

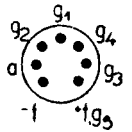
C_{g1}	3,8	pF
C_{g3}	6,2	pF
C_a	9	pF
C_{g2+4}	12,5	pF
C_a/g_1	<0,1	pF
C_a/g_3	<0,4	pF
C_{g1}/g_2	<0,2	pF

1H34

U_f	1,4	V
U_f	>0,9	V

Type / Application	Dimensions / Base	Heating	Operational Data			Maximum Ratings	
		Static data					
1H35	Size max Ø 19×49 mm	U_f 1,4 V I_f 25 mA Direct heating	**Mixer**			U_f	1,6 V
			U_a	64	85 V	U_f min	1,1 V
			U_{g3}	0	0 V	U_a	90 V
			R_{g2}	18	33 kΩ	W_a	0,15 W
		U_a 67,5 V	R_{g4}	0	120 kΩ	U_{g4}	67,5 V
		U_{g4} 45 V	$R_{g1}/_f$	27	27 kΩ	W_{g4}	0,03 W
		U_{g3} −0,5 V	U_{g2}	35	35 V	U_{g3}	0 V
		U_{g2} 45 V	U_{g4}	64	68 V	U_{g2}	67,5 V
		U_{g1} −0,5 V	$U_{g1\,ef}$	4	4 V	W_{g2}	0,1 W
		I_a 1,9 mA	I_a	0,55	0,6 mA	U_{g1}	0 V
		I_{g4} <1 mA	I_{g2}	1,6	1,5 mA	I_k	3 mA
		I_{g2} 1,85 mA	I_{g4}	0,12	0,14 mA	$R_{g3}/_f$	3 MΩ
		$S_{g1}/_{g2}$ 0,4 mA/V	I_k	2,45	2,4 mA	$R_{g1}/_f$	0,1 MΩ
			I_{g1}	85	85 µA	**Capacitances**	
			S_c	130	160 µA/V	C_{g3}	6,5 pF
			R_i	0,9	1 MΩ	C_a	12 pF
			U_{g3} (S_c=2 µA/V)	−4,5	−6,5 V	$C_a/_{g3}$	<0,4 pF



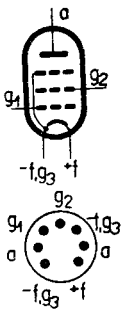


Variable-mu heptode Mixer

Type / Application	Dimensions / Base	Heating / Static data	Operational Data	Maximum Ratings

1L33
1L34

Size max
Ø 19×49 mm



Output pentode
Power amplifier

1L33

U_f	1,4	V
I_f	50	mA

Direct heating

U_a	90	V
U_{g_2}	67,5	V
U_{g1}	−7	V
I_a	7,5	mA
I_{g_2}	1,5	mA
S	1,4	mA/V
R_i	100	kΩ
μ	140	
I_{ax} (U_{g_1}=−15 V)	<0,6	mA

1L34

U_f	1,2	V
I_f	60	mA

Direct heating

AF power amplifier class A

U_a	45	67,5	90	V
U_{g_2}	45	67,5	67,5	V
U_{g1}	−4,5	−7	−7	V
I_a	3,8	7,2	7,4	mA
I_{g_2}	0,8	1,5	1,4	mA
S	1,25	1,3	1,4	mA/V
R_a	8	5	8	kΩ
$U_{g1\,ef}$	3,2	5	5	V
P_o	65	160	230	mW
k	12	10	12	%

AF push-pull power amplifier, class B

U_b		90		V
U_a		80		V
U_{g_2}		57,5		V
U_{g_1}		−9,9		V
$R_{a\text{-}a'}$		16		kΩ
$U_{g1\,ef}$	0		7,3	V
I_a	2×1,5		2×4,4	mA
I_{g_2}	2×0,3		2×1,35	mA
P_o	0		325	mW
k	—		5	%

U_{ao}	250	V
U_a	90	V
U_{g2o}	250	V
U_{g_2}	67,5	V
W_a	0,7	W
W_{g_2} (U_{g_1}∼−0 V)	0,12	W
W_{g_2} (U_{g_1}=max)	0,2	W
I_k (U_{g_1}∼−0 V)	9	mA
I_k (U_{g_1}∼max)	12	mA
R_{g_1}	2	MΩ
U_f	1,6	V
U_f	>1,1	V

Capacitances

C_{g_1}	5	pF
C_a	6	pF
C_{a/g_1}	<0,45	pF

1L34

U_f	1,4	V
U_f	>0,9	V

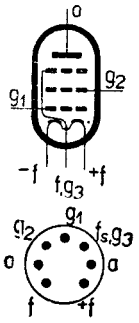
Type Application	Dimensions Base	Heating Static data	Operational Data	Maximum Ratings
1Y32 **1Y32T**	Size M 4	**1Y32** U_f 1,4 V I_f 265 mA Direct heating Thoriated tungsten cathode ● I_a 4 mA U_a 45 V	Half-wave HT rectifier U_{ss} max 8 kV (I_{ss}=2 mA) U_{ss} max 10 kV Z_{trafo} 500 kΩ C_N (f = 50 c/s) 50 kpF C_N (vf) 500 pF To be replace by 1Y32T	U_{inv} 20 kV I_{sp} 10 mA I_{ss} 2 mA f 300 kc/s **Capacitances** $C_{a/k}$ 0,6 pF
1Y32T		**1Y32T** U_f 1,4 V I_f 265 mA Direct heating Oxide-coated filament ● I_a >5 mA U_a 150 V		U_f 1,7 V U_f min 1,1 V U_{inv} 20 kV U_{ss} 15 kV I_{ss} 0,2 mA C_N 2500 pF **Capacitances** $C_{a/k}$ 1,5 pF

HT diode
Half-wave rectifier for TV receiver HT sources

Type / Application	Dimensions / Base	Heating / Static data	Operational Data	Maximum Ratings

3L31

Size max
Ø 19 × 49 mm



Pentode
AF, RF power amplifier

Heating

Static data

U_f	2,8	V
I_f	50	mA
U_f	1,4	V
I_f	100	mA

Indirect heating

U_a	150	V
U_{g3}	0	V
U_{g2}	90	V
U_{g1}	−8,5	V
I_a	14	mA
I_{g2}	2,2	mA
S	1,9	mA/V
R_i	100	kΩ
μ	190	

Capacitances

C_{g1}	4,2	pF
C_a	4,9	pF
$C_{a/g1}$	<0,38	pF

Operational Data

AF power amplifier, class A

U_f	1,4		1,4		V
U_a	135		150		V
U_{g2}	90		90		V
U_{g1}	−8		−8,8		V
$U_{g1\,ef}$	0	5,5	0	6	V
I_{g2}	2,8	3,5	2,2	3,5	mA
I_a	14,8	15	14,2	14,2	mA
S	2,1		2,1		mA/V
R_i	44		50		kΩ
R_a	8		8		kΩ
P_o	0,6		0,7		W
k	10		10		%

RF power amplifier — f = 10 Mc/s

U_f	1,4	V
U_a	150	V
U_{g2}	135	V
R_{g1}	0,2	MΩ
I_a	18,5	mA
I_{g2}	6,5	mA
I_{g1}	0,13	mA
P_o	1	W

Maximum Ratings

AF amplifier

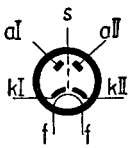
U_a	150	V
U_{g2}	90	V
W_a	2	W
W_{g2}	0,4	W
I_k	18	mA
R_{g1} [1]	0,7	MΩ
R_{g1} [2]	0,5	MΩ

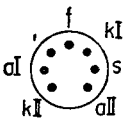
1) U_{g1} automatic
2) U_{g1} fixed

RF amplifier

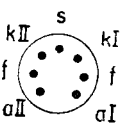
U_a	150	V
U_{g2}	135	V
U_{g1}	−30	V
I_a	20	mA
I_{g1}	0,25	mA
I_k	25	mA
W_{g2}	0,9	W
W_a	2	W

Type / Application	Dimensions / Base	Heating / Static data	Operational Data			Maximum Ratings		
6B31 **6B32**	Size M 1	U_f 6,3 V I_f 0,3 A I_f 0,3 A U_f 6,3 V Indirect heating	**Half-wave rectifier**			Each section		
			$U_{a\,ef}$	150	V	U_{inv}	420	V
			R_O	300	Ω	I_{sp}	54	mA
			I_{ss}	9	mA	I_{ss}	9	mA
			I_{sp}	54	mA	W_a	0,5	W
			Full-wave rectifier			$U_{k/f}$	300	V
			$U_{a\,ef}$	2×150	V	$R_{k/f}$	20	kΩ
			R_O	2×300	Ω	C_N	8	µF
			C_N	8	µF	R_O	>300	Ω
			R_z	10	kΩ			
			I_{ss}	>17	mA			
		U_a 4 V I_a >10 mA	**Capacitances**					
			$C_{aI/kI+s+f}$	3,2	pF			
			$C_{aII/kII+s+f}$	3,2	pF			
			$C_{kI/aI+s+f}$	3,6	pF			
			$C_{kII/aII+s+f}$	3,6	pF			
			$C_{aI/aII}$	<0,05	pF			





Twin diode with separate cathodes
AM, FM demodulator, ratio detector, full-wave rectifier

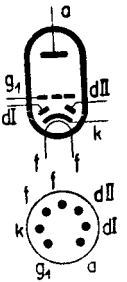


6B31

Type Application	Dimensions Base	Heating Static data	Operational Data	Maximum Ratings

6BC32
EBC91

Size M 3



AF triode-twin diode
AF resistance-coupled amplifier
and RF rectifier

Heating — Static data

U_f	6,3	V
I_f	0,3	A
I_f	0,3	A
U_f	6,3	V

Indirect heating

U_a	250	V
U_{g1}	−2	V
I_a	1	mA
S	1,55	mA/V
μ	100	
R_i	62,5	kΩ
I_{az}	(U_{g1} = −4,5 V)	
	<0,15	mA
U_d	4	V
I_d	>0,15	mA

Operational Data

AF resistance-coupled amplifier

U_b	180	300	300	V
R_a	0,22	0,22	0,47	MΩ
R_k	3,9	3,1	5,9	kΩ
R_{g1}	1	1	1	MΩ
R_{g1}'	1	1	2,2	MΩ
C_k	1,8	2,1	1,1	µF
C_v [1]	3	3	2	kpF
$U_{a\,sp}$	39	79	92	V
V	63	68	75	

1) Coupling capacitor

Kapacitances

C_{g1}	2	pF
C_a	0,65	pF
$C_{a/g1}$	2	pF
$C_{d/g1}$	<0,04	pF
$C_{d/k}$	<1,2	pF

Maximum Ratings

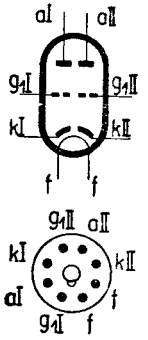
Triode

U_{ao}	500	V
U_a	330	V
W_a	0,5	W
$+U_{g1}$	0	V
$-U_{g1}$	−50	V
R_{g1} (p)	1	MΩ
R_{g1}	3	MΩ
R_{g1} [1]	10	MΩ
$R_k/_f$	20	kΩ
$U_{k/f}$	90	V
I_k	8	mA

Diodes

$U_{d\,sp}$	90	V
I_d	1	mA
$I_{d\,sp}$	6	mA

1) U_{g1} produced by R_{g1}

Type Application	Dimensions Base	Heating Static data	Operational Data	Maximum Ratings
6CC10 Size O 1		U_f 6,3 V I_f 0,6 A Indirect heating	AF resistance - coupled amplifier	U_{ao} 330 V U_a 275 V W_a 2,75 W U_{g1} min −0,5 V U_{g1} −100 V R_{g1} 2 MΩ I_k 10 mA $U_{k/f}$ 100 V $R_{k/f}$ 20 kΩ I_{g1} 2 mA
		● U_a 250 V U_{g1} −8 V I_a 9,5 mA S 2,6 mA/V μ 20 R_i 7,7 kΩ I_{az} (U_{g1} = −24 V) <0,005 mA		
Twin triode with separate cathodes AF amplifier				

	180	300	
U_b			V
R_a	0,1	0,1	MΩ
R_k	3,23	2,44	kΩ
R_{g1}	1	1	MΩ
R_{g1}'	0,5	0,25	MΩ
C_k	1,15	1,42	μF
C_v	6	12,5	kpF
$U_{a\,sp}$	38	56	V
V	14	14	

Capacitances

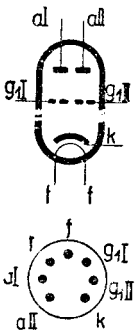
Triode	I	II	
C_{g1}	2,1	1,85	pF
C_a	2,5	2,4	pF
C_a/g_1	3,6	3,6	pF

Only for information. – No on stock!

Type / Application	Dimensions / Base	Heating / Static data	Operational Data	Maximum Ratings

6CC31 ECC91

Size M 2



Twin triode
RF, AF amplifier, oscillator, mixer, phase invertor

Heating

Static data

U_f	6,3	V
I_f	0,45	A

Indirect heating

U_a	100	V
$-U_{g1}$	0,85	V
I_a	8,5	mA
S	5,3	mA/V
μ	38	
R_i	7,1	kΩ

Operational Data

RF amplifier, class C

U_a	150	V
U_{g1}	−10	V
(R_{g1}	625 Ω	or
R_k	220 Ω)	
$I_{aI}+I_{aII}$	30	mA
$I_{g1I}+I_{g1II}$	16	mA
P_i	0,35	W
P_o	3,5	W

Mixer

U_a	150	V
R_k	800	Ω
I_a	4,8	mA
S_c	1,9	mA/V
R_i	10,2	kΩ
$U_{osc\ ef}$	3	V
R_{g1}	0,5	MΩ

Phase invertor

U_b	250	V
R_{aI}	25	kΩ
R_{aII}	25	kΩ
R_k	200	Ω
C_k	100	µF
R_{g1I}	0,5	MΩ
R_{g1II}	25	kΩ
$I_{aI}+I_{aII}$	10	mA

U_{g1}~	0,5	0,9	V
U_a~	12	19,6	V
V	24	21,8	
k	<0,3	3,2	%

Maximum Ratings

U_{ao}	500	V
U_a	300	V
W_a	1,5	W
I_a	15	mA
I_{g1}	8	mA
R_{g1} (k)	0,5	MΩ
U_{g1}	−40	V
$U_k/_f$	100	V
λ min	0,5	m
R_k	>50	Ω

Capacitances 1)

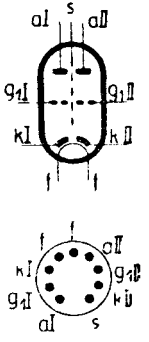
C_{g1}	2,2	pF
C_a	0,55	pF
$C_a/_{g1}$	1,6	pF

1) Without screening

Type / Application	Dimensions / Base	Heating / Static data	Operational Data	Maximum Ratings

6CC41

Size N 1



Twin triode with separate cathodes AF amplifier, phase invertor

Heating

Static data

U_f	6,3	V
I_f	0,3	A

Indirect heating

●

U_a	250	V
I_a	2,3	mA
S	2	mA/V
μ	100	
R_i	50	kΩ
U_{g1}	−1,5	V
I_{az} (U_{g1} = −5,5)	<0,02	mA

Operational Data

AF resistance-coupled amplifier

U_b	180	300	300	V
R_a	0,22	0,22	0,47	MΩ
R_k	3,5	2,8	5,2	kΩ
R_{g1}	1	1	1	MΩ
R_{g1}'	0,47	0,47	1	MΩ
C_k	2,1	2,3	1,3	µF
C_v 1)	6	6	3	kpF
$U_{a\sim sp}$	34	69	77	V
V	59	65	73	

1) Coupling capacitor

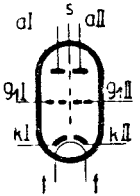
Maximum Ratings

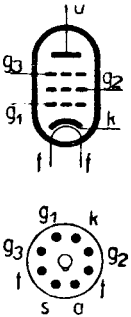
U_{ao}	500	V
U_a	300	V
W_a	1	W
R_{g1} (k)	2	MΩ
R_{g1} 1)	10	MΩ
I_k	10	mA
R_{g1} (p)	0,5	MΩ
$U_k/_f$	±100	V

1) U_{g1} produced by I_{g1}

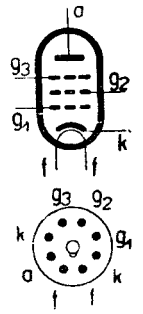
Capacitances

C_{g1}	1,75	pF
C_a	1,0	pF
$C_a/_{g1}$	2,2	pF
$C_{aI}/_{aII}$	<0,05	pF
$C_{aI}/_{g1II}$	<0,01	pF
$C_{aII}/_{g1I}$	<0,01	pF

Type / Application	Dimensions / Base	Heating Static data	Operational Data	Maximum Ratings
6CC42 Twin triode with separate cathodes HF, VHF amplifier, mixer, oscillator	Size max ∅ 22,2×55 mm  	U_f 6,3 V I_f 0,35 A Indirect heating U_a 150 V R_k 240 Ω I_a 8 mA S 5,5 mA/V μ 35 R_i 6,7 kΩ I_{ag} (U_{g1} = −10 V) <80 μA	**HF and VHF amplifier** U_b 250 V R_a 1) 12,5 kΩ U_a 150 V R_k 240 Ω I_a 8 mA S 5,5 mA/V R_i 6,7 kΩ 1) R_a shunted by C_a = 1 kpF	U_{ao} 550 V U_a 300 V W_a 1,5 W I_k 18 mA R_{g1} 1 MΩ $U_k/_f$ 100 V **Capacitances** 1) C_{g1} 2,2 pF C_a 0,4 pF $C_a/_{g1}$ <1,6 pF $C_{aI}/_{aII}$ <0,3 pF 1) Without screening

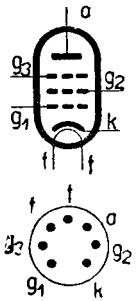
Type / Application	Dimensions / Base	Heating Static data	Operational Data	Maximum Ratings
6F10 RF pentode RF, IF, wideband amplifier	Size O 2  	U_f 6,3 V I_f 0,45 A Indirect heating ● U_a 300 V U_{g3} 0 V U_{g2} 150 V R_k 160 Ω I_a 10,25 mA I_{g2} 2,2 mA S 9 mA/V $\mu_{g2/g1}$ 50 R_i 300 kΩ	**RF amplifier** U_b 300 V U_a 300 300 V U_{g3} 0 0 V U_{g2} 150 V R_{g2} 0 60 kΩ R_k 160 160 Ω I_a 10,25 10,25 mA I_{g2} 2,5 2,5 mA S 9 9 mA/V R_i 300 300 kΩ Z_{g1} (f=100 Mc/s) 540 Ω R_{ekv} 650 Ω **RF amplifier, g2 and g3 connected to a** U_a 150 V μ 40 R_k 160 Ω R_i 3.6 kΩ I_a 12,5 mA S 11 mA/V Only for information. – No on stock!	U_{ao} 550 V U_a 310 V W_a 3,3 W U_{g2o} 550 V U_{g2} 165 V W_{g2} (U_{g1} ~ = 0 V) 0,45 W W_{g2} (U_{g1} ~ max) 0,8 W I_k 25 mA $-U_{g1}$ 30 mA R_{g1} 0,5 MΩ R_{g1} [1] 0,25 MΩ $U_{k/f}$ 100 V $R_{k/f}$ 20 kΩ Triode connection U_a 165 V 1) U_{g1} fixed **Capacitances** C_{g1} 11 pF C_a 5 pF $C_{a/g1}$ <0,015 pF

Type / Application	Dimensions / Base	Static data / Heating	Operational Data	Maximum Ratings
6F24	Size L 3	U_f 6,3 V I_f 0,45 A Indirect heating	RF amplifier class A U_a 250 V U_{g3} 0 V U_{g2} 200 V R_k 120 Ω I_a 15 mA I_{g2} 2,1 mA S 10 mA/V R_i 0,3 MΩ	U_{ao} 400 V U_a 250 V W_a 4 W U_{g2} 250 V W_{g2} 0,45 W I_k 20 mA R_{g1} 0,5 MΩ $U_k/_f$ 50 V
		U_a 250 V U_{g3} 0 V U_{g2} 200 V U_{g1} −2 V I_a 15 mA I_{g2} 2,1 mA S 10 mA/V R_i 0,3 MΩ I_{ax} (U_{g1} = −7 V) <0,5 mA		**Capacitances** C_{g1} 10,5 pF C_a 5,9 pF $C_a/_{g1}$ <0,035 pF



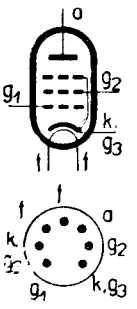
RF high-slope pentode
RF, IF, wideband amplifier

Type / Application	Dimensions / Base	Heating / Static data	Operational Data	Maximum Ratings
6F31 **6BA6**	Size M 2	U_f 6,3 V I_f 0,3 A Indirect heating U_a 250 V U_{g3} 0 V U_{g2} 100 V R_k 68 Ω I_a 11 mA I_{g2} 4,2 mA S 4,4 mA/V R_i 1,5 MΩ I_{az} (U_{g1} = −20 V) <0,4 mA	**RF and IF amplifier** U_a 100 250 V U_{g3} 0 0 V U_{g2} 100 100 V R_k 68 68 Ω I_a 10,8 11 mA I_{g2} 4,4 4,2 mA S 4,3 4,4 mA/V R_i 0,25 1,5 MΩ U_{g1} (S=44 µA/V) −20 −20 V	U_{ao} 500 V U_z 300 V W_a 3 W U_{g2o} 300 V U_{g2} 125 V W_{g2} 0,6 W $-U_{g1}$ −50 V R_{g1} 3 MΩ $U_k/_f$ 150 V T_b 150 °C **Capacitances** C_{g1} 5,5 pF C_a 5 pF $C_a/_{g1}$ <0,005 pF



RF variable-mu pentode
RF, IF amplifier

Type / Application	Dimensions / Base	Heating / Static data	Operational Data			Maximum Ratings		
6F32 **EF95**	Size max ∅ 19×45,2 mm	U_f 6,3 V I_f 0,175 A Indirect heating ●	**RF amplifier, class A**			U_{ao} 320 V U_a 200 V W_i 1,7 W U_{g2o} 320 V U_{g2} 150 V W_{g2} 0,5 W I_k 18 mA R_{g1} 1 MΩ $U_k/_f$ 100 V $R_k/_f$ 20 kΩ		
		U_a 120 V U_{g2} 120 V R_k 200 Ω I_a 7,5 mA I_{g2} <3,5 mA S 5,2 mA/V $\mu_{g2/g1}$ 25 R_i >0,25 MΩ	U_a	120	180 V			
			U_{g2}	120	120 V			
			R_k	200	200 Ω			
			I_a	7,5	7,7 mA			
			I_{g2}	2,5	2,4 mA			
			S	5	5,1 mA/V			
			R_i	0,34	0,69 MΩ			
			Z_{g1} (f=50 Mc/s)	25	25 kΩ			
			R_{ekv}	2	2 kΩ			
			RF amplifier, class A – Triode connection					
			U_a	120	180 V			
			U_{g1}	−2,65	−6 V			
			R_k	265	925 Ω			
			I_a	10	6,5 mA			
			S	6	3,5 mA/V			
			R_i	5	6,66 kΩ			
			μ	30	23,3			
			Z_{g1} (f=100 Mc/s)	9,5	kΩ			
			R_{ekv}	700	Ω			

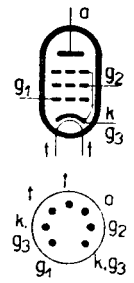


RF high-slope pentode
RF, IF, wideband amplifier

Capacitances

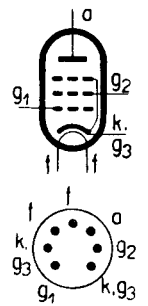
C_{g1}	4,5 pF
C_a	2,8 pF
$C_{a/g1}$	<0,025 pF

Type / Application	Dimensions / Base	Heating / Static data	Operational Data			Maximum Ratings	
6F32V	Size M 1	U_f 6,3 V I_f 0,175 A Indirect heating ●	**RF amplifier, class A**			U_a 200 V W_a 1,8 W U_{g_2} 150 V W_{g_2} 0,55 W I_k 20 mA R_{g_1} 1 MΩ $U_{k/f}$ ±120 V $R_{k/f}$ 20 kΩ U_f 7 V U_f >5,7 V	
		U_a 120 V U_{g_2} 120 V R_k 200 Ω I_a 7,5 ± 2,5 mA I_{g_2} <3,5 mA S 5,2 ± 1,4 mA/V R_i >250 kΩ I_{az} (R_a=100 kΩ U_{g_1} = −10 V) <200 µA	U_a	120	180 V		
			U_{g_2}	120	120 V		
			R_k	200	200 Ω		
			I_a	7,5	7,7 mA		
			I_{g_2}	2,5	2,4 mA		
			S	5,2	5,1 mA/V		
			R_i	300	500 kΩ		
			Z_{g_1} (f=50 Mc/s)	25	kΩ		
			R_{ekv}	1	kΩ		
			High-reliability tube Vibration and shock proofed Exacting tolerances Stabilized			**Capacitances** C_{g_1} 4,3 ± 0,5 pF C_a 3,4 ± 0,6 pF C_{a/g_1} <0,02 pF	



RF high-slope pentode
RF, IF, wideband amplifier

Type / Application	Dimensions / Base	Heating / Static data	Operational Data	Maximum Ratings
6F35 **6AJ5**	Size max ∅ 19×45,2 mm	U_f 6,3 V I_f 0,175 A Indirect heating (A6) U_a 28 V U_{g2} 28 V U_{g1} −0,8 V I_a 3 mA I_{g2} 1,3 mA S 2,8 mA/V I_{az} (U_{g1} = −3 V) <0,5 mA	**RF and IF amplifier, class A** U_a 28 V U_{g2} 28 V R_k 270 Ω I_a 2,7 mA I_{g2} 1 mA S 2,7 mA/V R_i 100 kΩ	U_{ao} 250 V U_a 180 V W_a 1,7 W U_{g2o} 250 V U_{g2} 75 V W_{g2} 0,5 W U_{g1} 0 V I_k 18 mA $U_{k/f}$ 90 V **Capacitances** C_{g1} 5,5 pF C_a 2,8 pF $C_{a/g1}$ <0,03 pF

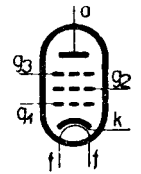


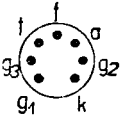
RF high-slope pentode
RF, IF amplifier

Type / Application	Dimensions / Base	Heating / Static data	Operational Data	Maximum Ratings

6F36
6AH6

Size M 3





RF high-slope pentode
RF, IF, wideband amplifier

Heating

Static data

U_f	6,3	V
I_f	0,45	A

Indirect heating

U_a	300	V
U_{g3}	0	V
U_{g2}	150	V
R_k	160	Ω
I_a	10,25	mA
I_{g2}	2,2	mA
S	9	mA/V
R_i	1	MΩ
I_{az} (U_{g1} = −6 V)	<0,6	mA

Capacitances

C_{g1}	13,2	pF
C_a	6,5	pF
$C_{a/g1}$ [1]	<0,015	pF

1) With screening

Operational Data

RF amplifier

U_b		300	V
U_a	300	300	V
U_{g3}	0	0	V
U_{g2}	150		V
R_{g2}	0	60	kΩ
R_k	160	160	Ω
I_a	10,25	10,25	mA
I_{g2}	2,2	2,2	mA
S	9	9	mA/V
R_i	0,5	0,5	MΩ

RF amplifier, g2 and g3 connected to a

U_a	150	V
R_k	160	Ω
I_a	12,5	mA
S	11	mA/V
μ	40	
R_i	3,6	kΩ
U_{g1} (I_a = 10 μA)	−7	V

Maximum Ratings

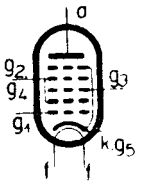
U_{ao}	550	V
U_a	300	V
W_a	3,3	W
U_{g2o}	550	V
U_{g2}	165	V
W_{g2} (U_{g1} ~ = 0 V)	0,45	W
W_{g2} (U_{g1} ~ max)	0,8	W
I_k	25	mA
$-U_{g1}$	−30	V
R_{g1}	0,5	MΩ
R_{g1} [1]	0,25	MΩ
$U_{k/f}$	100	V
$R_{k/f}$	20	kΩ

Triode connection

U_a	165	V

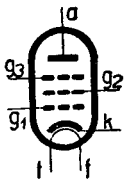
1) U_{g1} fixed

Type / Application	Dimensions / Base	Heating	Operational Data			Maximum Ratings	
		Static data					
6H31 **6BE6**	Size M 2	U_f 6,3 V I_f 0,3 A Indirect heating ●	U_a	100	250 V	U_{ao}	550 V
			U_{g2+g4}	100	100 V	U_a	300 V
			U_{g3}	−1,5	−1,5 V	W_a	1 W
			$U_{g1\ ef}$	10	10 V	U_{g2+g4o}	300 V
		U_a 250 V	I_a	2,8	3 mA	U_{g2+g4}	100 V
		U_{g2+g4} 100 V	I_{g2+g4}	7,3	7,1 mA	W_{g2+g4}	1 W
		U_{g3} −1,5 V	I_{g1}	0,5	0,5 mA	U_{g1}	0 V
		I_{g1} 0,5 mA	I_k	10,6	10,6 mA	U_{g1}	−50 V
		I_a 3 mA	R_{g1}	20	20 kΩ	U_{g3}	0 V
		I_{g2+g4} <9,5 mA	R_i	0,5	1 MΩ	$-U_{g3}$	−50 V
		R_{g1} 20 kΩ	S_c	0,455	0,475 mA	I_k	14 mA
		C_{g1} 4 µF	U_{g3} (S_c=10 µA/V)	−30	−30 V	$U_{k/f}$	90 V
		$U_{g1\ ef}$ 10 V				R_{g3}	20 kΩ
		f 50 Hz	**Capacitances**				
		S_c >0,3 mA/V	C_{g3}	7,15	pF		
		$U_{g3\ ef}$ 0,354 V	C_a	8,6	pF		
			C_{g1}	5,5	pF		
			C_a/g_3	<0,35	pF		
			C_{g1}/g_3	<0,15	pF		
			C_a/g_1	<0,06	pF		



Variable-mu heptode
Mixer

Type Application	Dimensions Base	Static data Heating	Operational Data	Maximum Ratings
6L10	Size O 2	U_f 6,3 V I_f 0,65 A Indirect heating	**Wideband amplifier output stage:** U_a 300 V S 11 mA/V U_{g3} 0 V R_i 90 kΩ U_{g2} 150 V R_a 7 kΩ R_k 80 Ω P_o 3,5 W I_{ao} 30 mA k 10 % I_a 30,5 mA $U_{g1\,ef}$ 2 V I_{g2o} 7 mA I_{g2} 9 mA	U_{ao} 550 V U_a 330 V W_a 9 W U_{g2o} 550 V U_{g2} 330 V W_{g2} (U_{g1} ~ = 0 V) 1,5 W W_{g2} (U_{g1} ~ max) 3 W I_k 50 mA R_{g1} 0,1 MΩ $U_k/_f$ 100 V $R_k/_f$ 20 kΩ
		U_a 300 V U_{g3} 0 V U_{g2} 150 V U_{g1} −3 V I_a 30 mA I_{g2} 7 mA S 11 mA/V $\mu_{g2/g1}$ 20 R_i 90 kΩ	**Video amplifier output stage:** U_b 300 300 V U_a 145 200 V U_{g3} 0 0 V R_{g2} 0 25 kΩ U_{g2} 115 (125) V R_k 0 57 Ω R_{g1} 0,1 – MΩ U_{g1} 0 (−2) V I_a 45 28 mA I_{g2} 13 7 mA R_a 3,5 3,5 kΩ $U_{a\sim sp/sp}$ 135 140 V $U_{g1\sim sp/sp}$ 4 4 V Only for information. – No on stock!	**Capacitances** C_{g1} 13 pF C_a 6,5 pF $C_a/_{g1}$ <0,06 pF

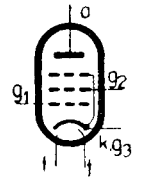


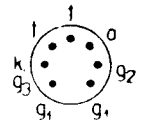
Power pentode for wideband amplifiers

Type / Application	Dimensions / Base	Heating / Static data	Operational Data	Maximum Ratings

6L31
6AQ5

Size M 2





Output beam tetrode
AF power amplifier

Heating

U_f	6,3	V
I_f	0,45	A

Indirect heating

Static data

U_a	250	V
U_{g2}	250	V
U_{g1}	−12,5	V
I_a	45	mA
I_{g_2}	<8,5	mA
S	4,1	mA/V
R_i	52	kΩ
I_{az} (U_{g_1} = −30 V)	<8	mA

Operational Data

AF power amplifier, class A

U_a	180	250	V
U_{g2}	180	250	V
U_{g1}	−8,5	−12,5	V
I_{ao}	29	45	mA
I_a	30	47	mA
I_{g2o}	3	4,5	mA
I_{g_2}	4	7	mA
R_i	58	52	kΩ
S	3,7	4,1	mA/V
R_a	5,5	5	kΩ
P_o	2	4,5	W
k	8	8	%

AF push-pull amplifier, class AB

U_a	250	V
U_{g2}	250	V
U_{g1}	−15	V
I_{ao}	2×35	mA
I_a	2×39,5	mA
I_{g2o}	2×2,5	mA
I_{g2}	2×6,5	mA
$R_{a-a'}$	10	kΩ
$U_{g1\,ef}$	10,5	V
P_o	10	W
k	5	%

Maximum Ratings

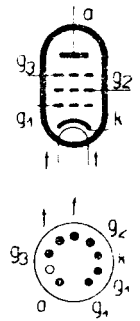
U_{ao}	500	V
U_a	315	V
W_a	12	W
U_{g2o}	500	V
U_{g_2}	285	V
W_{g2o}	2,5	W
W_{g_2}	3	W
I_k	60	mA
R_{g1}	0,5	MΩ
R_{g1} [1]	0,1	MΩ
$U_k/_f$	100	V

1) U_{g_1} fixed

Capacitances

$C_a/_{g1}$	<0,6	pF

Type / Application	Dimensions / Base	Heating / Static data	Operational Data	Maximum Ratings
6L41	Size max Ø 22×70 mm	U_f 6,3 V I_f 0,75 A Indirect heating	**Oscillator or power amplifier – f = 50 Mc/s** U_a 300 V; R_{g1} 22 kΩ U_{g2} 250 V; I_{g1} 3 mA U_{g1} −60 V; $U_{g1\ šp}$ 80 V I_a 50 mA; W_{g1} 0,35 W I_{g2} 5 mA; P_o 8 W	U_a 300 V W_a 12 W U_{g2} 250 V W_{g2} 2,0 W I_{g1} 5 mA I_k 55 mA $I_{k\ šp}$ 100 mA U_k/f 100 V f 175 Mc/s T_b 250 °C
		U_a 300 V U_{g3} 0 V U_{g2} 250 V U_{g1} −6 V I_a 50 mA I_{g2} 5 mA S 7 mA/V $\mu_{g1/g2}$ 16 S/C 0,5 I_{az} (U_{g1} = −25 V) <3 mA	**Frequency multiplier – f max = 175 Mc/s** Doubler / Trebler U_a 300 / 300 V U_{bg2} 300 / 300 V R_{g2} 12,5 / 12,5 kΩ U_{g1} −75 / −100 V I_a 40 / 35 mA I_{g2} 4 / 5 mA R_{g1} 75 / 100 kΩ I_{g1} 1 / 1 mA $U_{g1\ sp}$ 95 / 120 V W_{g1} 0,6 / 0,6 W P_o 3,6 / 2,8 W	**Capacitances** C_{g1} 9,5 pF C_a 5,4 pF $C_{a/g1}$ <0,45 pF

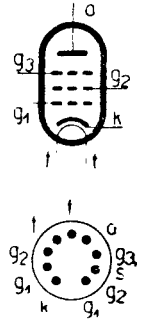


Beam tetrode
AF, RF power amplifier, frequency multiplier

Type / Application	Dimensions / Base	Heating / Static data	Operational Data	Maximum Ratings

6L43

Size N 4



Power pentode for video and wideband amplifiers

Heating — Static data

U_f	6,3	V
I_f	0,65	A

Indirect heating

U_a	300	V
U_{g3}	0	V
U_{g2}	150	V
U_{g1}	−3	V
I_a	30	mA
I_{g2}	7	mA
S	11	mA/V
$\mu_{g2/g1}$	20	
R_i	90	kΩ
I_{az} (U_{g1} = −20 V)	<0,1	mA

Operational Data

Wideband amplifier output stage

U_a	300	V	S	11	mA/V
U_{g3}	0	V	R_i	90	kΩ
U_{g2}	150	V	R_a	7	kΩ
R_k	80	Ω	P_o	3,5	W
I_{ao}	30	mA	k	10	%
I_a	30,5	mA	$U_{g1\ ef}$	2	V
I_{g2o}	7	mA			
I_{g2}	9	mA			

Video amplifier output stage

U_b	300	300	V
U_a	145	200	V
U_{g3}	0	0	V
R_{g2}	0	25	kΩ
U_{g2}	115	(125)	V
R_k	0	57	Ω
R_{g1}	0,1	–	MΩ
I_a	45	28	mA
I_{g2}	13	7	mA
R_a	3,5	3,5	kΩ
$U_{a\ sp/sp}$	135	140	V
$U_{g1\ sp/sp}$	4	4	V

Maximum Ratings

U_{ao}	550	V
U_a	330	V
W_a	9	W
U_{g2o}	550	V
U_{g2}	330	V
W_{g2} ($U_{g1\ ef}$ = 0 V)	1,5	W
W_{g2} ($U_{g1\ ef}$ max)	3	W
I_k	50	mA
R_{g1}	0,1	MΩ
$U_k/_f$	100	V
$R_k/_f$	20	kΩ

Capacitances

C_{g1}	11	pF
C_a	5,5	pF
$C_a/_{g1}$	<0,1	pF

Type / Application	Dimensions / Base	Heating / Static data	Operational Data	Maximum Ratings

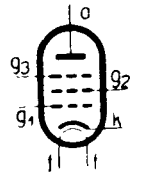
6L50

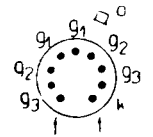
Size R 2

U_f	6,3	V
I_f	1,0	A
t_f	25	s

Indirect heating

U_a	400	V
U_{g3}	0	V
U_{g2}	250	V
U_{g1}	−25	V
I_a	30	mA
I_{g2}	2	mA
S	3,5	mA/V
R_i	75	kΩ





Beam tetrode
AF, RF power amplifier

AF and RF amplifier, class A

U_a	250	300	325	350	V
U_{g2}	250	200	250	250	V
R_k	180	250	165	320	Ω
I_{ao}	72	48	80	54	mA
I_a	79	55	88	66	mA
I_{g2o}	5	2,5	5	2,5	mA
I_{g2}	7,3	4,7	7,5	7	mA
S	6	5,3	5,5	5,2	mA/V
R_i	22,5	35	25	33	kΩ
R_a	2,5	4,5	3	4,2	kΩ
P_o	6,5	6,5	7	10,8	W
$U_{g1\ sp}$	14	12,5	14	18	V
k	10	11	8,5	15	%

AF push-pull amplifier, class AB2

U_a	360	V	I_{g2}	16	mA
U_{g2}	270	V	$R_{a-a'}$	3,8	kΩ
U_{g1}	−22,5	V	P_o	47	W
I_{ao}	88	mA	$U_{g1\ sp}$	72	V
I_a	205	mA	k	2	%
I_{g2o}	5	mA			

Maximum Ratings

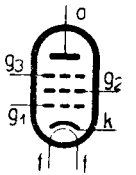
U_a	1000	V
U_{g2}	400	V
W_a	25	W
W_{g2}	3,5	W
I_k	125	mA
$I_{k\ sp}$	300	mA
$I_{k\ \pi}$ 1)	1,5	A
R_{g1} 2)	0,1	MΩ
R_{g1}	0,25	MΩ
$U_k/_f$	80	V
$R_k/_f$	20	kΩ

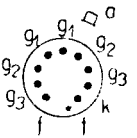
1) $t_{ip} = 1$ µs
2) U_{g1} fixed

Capacitances

C_{g1}	9,7	pF
C_a	7,3	pF
$C_a/_{g1}$	<0,35	pF

Type / Application	Dimensions / Base	Heating / Static data	Operational Data	Maximum Ratings
6L50S (6L50V)	Size R 2	U_f 6,3 V I_f 1,0 A t_f 25 s Indirect heating Ⓑ U_a 400 V U_{g3} 0 V U_{g2} 250 V U_{g1} −25 V I_a 30 mA I_{g2} 2 mA S 3,5 mA/V R_i 75 kΩ	**Pulse operation** U_a 3000 V U_{g2} 250 V U_{g1} −70 V $U_{g1\ ip}$ až +20 V I_a 330 mA I_{g2} 30 mA I_{g1} 30 mA	U_a 4500 V 1) U_{g2} 800 V W_a 18 W W_{g2} 3 W I_k 100 mA $I_{k\ šp}$ 300 mA $I_{k\text{-}rt}$ 2) 1500 mA R_{g1} 3) 100 kΩ R_{g1} 250 kΩ $U_{k/f}$ 80 V $R_{k/f}$ 20 kΩ





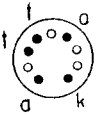
Beam tetrode
AF, RF power amplifier
for pulse operation

1) Pulse duration max 10 μs, max 15 % per.
2) $t_{ip} = 1$ μs
3) U_{g1} fixed

Capacitances

C_{g1}	9,7	pF
C_a	7,3	pF
C_a/g_1	<0,3	pF

Type / Application	Dimensions / Base	Heating / Static data	Operational Data	Maximum Ratings
6Y50	Size R 1	U_f 6,3 V I_f 1,65 A t_f 1 min Indirect heating	**Half-wave rectifier** $U_a \sim_{ef}$ [1] 1200 V I_{ss} 220 mA U_{ss} 1350 V R_t 150 Ω C_N 4 µF **Full-wave rectifier** $U_a \sim_{ef}$ [1] 2×850 V I_{ss} 400 mA U_{ss} 800 V R_t 2×150 Ω C_N 4 µF	U_{inv} 3500 V W_a 10 W I_{ss} 220 mA I_{sp} 700 mA R_t >150 Ω $U_k/_f$ 50 V **Capacitances** $C_{a/k}$ 5 pF
		U_a 30 V I_a >200 mA		



HT diode
Half-wave rectifier
full-wave rectifier
(two tubes)

1) U_a must be connected after heating the cathode, otherwise U_{inv} must be reduced to 2000 V.

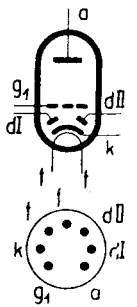
Type / Application	Dimensions / Base	Heating — Static data	Operational Data			Maximum Ratings	
6Z31	Size M 3	U_f 6,3 V I_f 0,6 A Indirect heating ● I_d 50 mA R_i 250 Ω	**Filter input:**	**Capacitive**	**Inductive**	U_{inv} 1000 V I_{sp} 300 mA I_{ss} 70 mA $U_k/_f$ 450 V C_N 16 µF
			$U_a{\sim}_{ef}$	2×325	2×450 V	
			C_N	max 4	– µF	
			R_i	150	– Ω	
			L	–	min 8 H	
			I_{ss}	70	70 mA	
			U_{ss}	355	375 V	

Twin diode
Full-wave rectifier

Type / Application	Dimensions / Base	Heating / Static data	Operational Data	Maximum Ratings

12BC32

Size max
Ø 19×57 mm



Twin diode-AF triode
RF rectifier
AF resistance-coupled amplifier

Heating

I_f	150	mA
U_f	12,6	V

Indirect heating

U_a	100	V
U_{g1}	−1	V
I_a	0,5	mA
S	1,25	mA/V
μ	100	
R_i	80	kΩ
U_d	4	V
I_d	>0,15	mA

Operational Data

AF resistance-coupled amplifier

U_b	180	300	300	V
R_a	0,22	0,22	0,47	MΩ
R_k	3,9	3,1	5,9	kΩ
R_{g1}	1	1	1	MΩ
R_{g1}'	1	1	2,2	MΩ
C_k	1,8	2,1	1,1	µF
C_v 1)	3	3	2	kpF
$U_{a\sim sp}$	39	79	92	V
V	63	68	75	

1) Coupling capacitor

Capacitances

C_{g1}	2	pF
C_a	0,65	pF
C_a/g_1	2	pF
C_d/g_1	<0,04	pF
C_d/k	<1,2	pF

Maximum Ratings

Triode

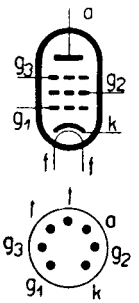
U_f	14	V
U_f	>11,4	V
U_{ao}	500	V
U_a	330	V
W_a	0,5	W
$+U_{g1}$	0	V
$-U_{g1}$	−50	V
R_{g1}	3	MΩ
R_{g1} 1)	10	MΩ
$R_k/_f$	20	kΩ
$U_k/_f$	150	V
I_k	8	mA

Diode

$U_{d\ sp}$	90	V
I_d	1	mA
$I_{d\ sp}$	6	mA

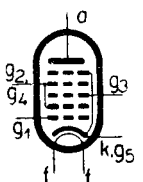
1) U_{g1} produced by R_{g1}

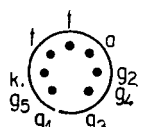
Type / Application	Dimensions / Base	Heating / Static data	Operational Data	Maximum Ratings
12F31	Size M 3	I_f 150 mA U_f 12,6 V Indirect heating ●	**RF and IF amplifier** U_a 100 250 V U_{g_3} 0 0 V U_{g_2} 100 100 V R_k 68 68 Ω I_a 10,8 11 mA I_{g_2} 4,4 4,2 mA S 4,3 4,4 mA/V R_i 0,25 1,5 MΩ	U_{ao} 500 V U_a 300 V W_a 3 W U_{g_2o} 300 V U_{g_2} 125 V W_{g_2} 0,6 W U_{g_1} 0 V $-U_{g_1}$ –50 V R_{g_1} 3 MΩ $U_{k/f}$ 150 V T_b 150 °C
		U_a 250 V U_{g_3} 0 V U_{g_2} 100 V R_k 68 Ω I_a 11 mA I_{g_2} 4,2 mA R_i 1,5 MΩ S 4,4 mA/V I_{az} (U_{g_1} = –20 V) <0,4 mA		**Capacitances** C_{g_1} 5,5 pF C_a 5 pF C_{a/g_1} <0,005 pF



Variable-mu pentode
RF, IF amplifier

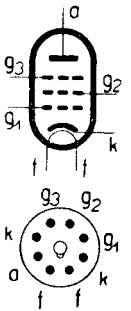
Type / Application	Dimensions / Base	Heating / Static data	Operational Data			Maximum Ratings	
12H31	Size max Ø 19×57 mm	I_f 150 mA U_f 12,6 V Indirect heating ⑨	**Mixer**			U_{ao} 500 V U_a 300 V W_a 1 W U_{g2+g4o} 300 V U_{g2+g4} 100 V W_{g2+g4} 1 W U_{g1} 0 V $-U_{g1}$ −50 V U_{g3} 0 V $-U_{g3}$ −50 V R_{g1} 1 MΩ R_{g3} 1 MΩ I_k 14 mA $U_k/_f$ 150 V U_f 14 V U_f >11,4 V
		U_a 250 V U_{g2+g4} 100 V U_{g3} −1,5 V R_{g1} 20 kΩ I_{g1} 0,5 mA I_a 3 mA I_{g2+g4} <9,5 mA R_{g1} 20 kΩ C_{g1} 4 µF $U_{g1\,ef}$ 10 V f 50 Hz	U_a 100 250 V U_{g2+g4} 100 100 V U_{g3} −1,5 −1,5 V $U_{g1\,ef}$ 10 10 V I_a 2,8 3 mA I_{g2+g4} 7,3 7,1 mA I_{g1} 0,5 0,5 mA I_k 10,6 10,6 mA R_{g1} 20 20 kΩ R_i 0,5 1 MΩ S_c 0,455 0,475 mA/V U_{g3} (S_c=4 µA/V) −30 −30 V		
		I_{az} (U_{g3} = −30 V) <0,4 mA	**Capacitances** C_{g3} 7,15 pF C_a 8,6 pF C_{g1} 5,5 pF $C_a/_{g3}$ <0,35 pF $C_{g1}/_{g3}$ <0,15 pF $C_a/_{g1}$ <0,05 pF $C_{g1}/_k$ 2,75 pF C_k 13,5 pF		





Variable-mu heptode
Mixer

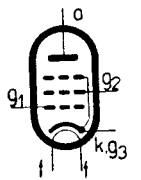
Type / Application	Dimensions / Base	Heating / Static data	Operational Data	Maximum Ratings
18F24	Size L 3	U_f 18 V I_f 0,165 A Indirect heating ●	**RF amplifier, class A** U_a 250 V U_{g3} 0 V U_{g2} 200 V R_k 120 Ω I_a 15 mA I_{g2} 2,1 mA S 10 mA/V R_i 0,3 MΩ	U_{ao} 400 V U_a 250 V W_a 4 W U_{g2} 250 V W_{g2} 0,45 W I_k 20 mA R_{g1} 0,5 MΩ $U_k/_f$ 50 V **Capacitances** C_{g1} 10,5 pF C_a 5,9 pF $C_a/_{g1}$ <0,035 pF
		U_a 250 V U_{g3} 0 V U_{g2} 200 V U_{g1} −2 V I_a 15 mA I_{g2} 2,1 mA S 10 mA/V R_i 0,3 MΩ I_{az} (U_{g1} = −7 V) <0,5 mA		

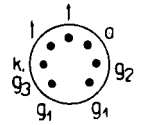


RF high-slope pentode
RF, IF, wideband amplifier

Type / Application	Base / Dimensions	Heating / Static data	Operational Data	Maximum Ratings
35L31 Size M 4		I_f 150 mA U_f 35 V Indirect heating ●	AF power amplifier, class A	U_{ao} 550 V U_a 250 V W_a 11 W U_{g2o} 550 V U_{g2} 250 V W_{g2} (U_{g1} ~ 0 V) 1,9 W W_{g2} (U_{g1} ~ max) 3,5 W R_{g1} 1 MΩ $U_k/_f$ 150 V $R_k/_f$ 20 kΩ U_f 38,5 V **U_f >31,5 V**
		U_a 200 V U_{g2} 200 V U_{g1} −13 V I_a 55 mA I_{g2} 9,5 mA S 8 mA/V R_i 25 kΩ I_a (U_{g1} = −28 V) <10 mA		**Capacitances** $C_a/_{g1}$ <1,2 pF

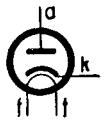
	100	180	200	
U_a	100	180	200	V
U_{g2}	100	180	200	V
R_k	140	140	200	Ω
I_a	32,5	61	55	mA
I_{g2}	5,5	10	9,5	mA
S	7,5	9	8	mA/V
R_i	25	22	25	kΩ
R_a	3	3	3,5	kΩ
P_o	1,35	4,8	4,8	W
k	10	10	10	%
$U_{g1\,ef}$	3,8	6,2	6,2	V
$U_{g1\,ef}$ (P_o = 50 mW)	0,55	0,5	0,5	V

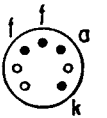




Output pentode
AF power amplifier

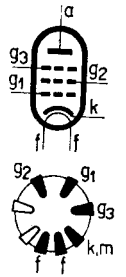
Type / Application	Dimensions / Base	Heating / Static data	Operational Data			Maximum Ratings	
35Y31	Size M 4	I_f 150 mA U_f 35 V Indirect heating	$U_{a\,ef}$	127–170	170–250 V	U_{inv}	700 V
			R_o (C_N=60 µF)	100	175 Ω	$U_{a\,ef}$	250 V
			(C_N=32 µF)	75	125 Ω	I_{ss}	140 mA
			(C_N=16 µF)	30	75 Ω	$I_{šp}$	850 mA
			(C_N= 8 µF)	0	0 Ω	W_a	2,5 W
			C_N	32	32 µF	$U_k/_f$	550 V
			I_{ss}	140	140 mA	U_f	38,5 V
			U_{ss}	103	165 V	U_f	>31,5 V





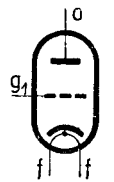
Diode
Half-wave rectifier

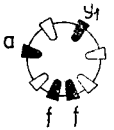
Type / Application	Dimensions / Base	Heating / Static data	Operational Data				Maximum Ratings	
4654	Size P 4	U_f 6,3 V I_f 1,35 A Indirect heating (K8)	**AF push-pull power amplifier, class AB**				U_{a0} 1200 V U_a 600 V W_a 18 W U_{g2o} 1000 V U_{g2} 425 V U_{g2o} 3 W W_{g2} 10 W I_k 120 mA $U_{k/f}$ 50 V $R_{g1(k)}$ 0,7 MΩ $R_{g1(p)}$ 0,5 MΩ $R_{k/f}$ 10 kΩ	
		U_a 400 V U_{g3} 0 V U_{g2} 425 V U_{g1} −33 V I_a 45 mA I_{g2} 5 mA S 6 mA/V R_i 30 kΩ I_{az} (U_{g1} = −45) <15 mA	U_a	400	400	600 V		
			U_{g3}	0	0	0 V		
			U_{g2}	425	425	400 V		
			U_{g1}	—	−30	−33 V		
			R_k	315	—	— Ω		
			I_{a0}	2×45	2×27,5	2×26 mA		
			I_a	2×50	2×97	2×80 mA		
			I_{g20}	2×5	2×3	2×2,5 mA		
			I_{g2}	2×13	2×23	2×20 mA		
			R_{a-a}	10	5	10 kΩ		
			P_o	25	52,5	69 W		
			k	4	3,5	5 %		
			$U_{g1\,ef}$	18,5	22	22 V		
							Capacitances	
							C_{g_1} 15,5 pF C_a 10 pF $C_{g1/a}$ <0,9 pF	



Power pentode
AF power amplifier

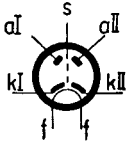
Type / Application	Dimensions / Base	Heating	Operational Data	Maximum Ratings
AD1N Size P 1		**Static data**		
		U_f 4 V	**AF power amplifier, class A**	U_{ao} 550 V
		I_f 2 A	U_b 295 V	U_a 250 V
		t_f 16 s	U_{g1} −45 V	W_a 15 W
		Indirect heating	I_a 60 mA	I_k 90 mA
		●	R_a 2300 Ω	R_{g1} 1) 0,3 MΩ
		U_a 250 V	R_k 750 Ω	R_{g1} 2) 0,7 MΩ
		U_{g1} −45 V	P_o 4,2 W	
		I_a 60 mA	$U_{g1\,ef}$ 30 V	1) U_{g1} fixed
		S 4,3 mA/V	k 5 %	2) U_{g1} automatic
		R_i 1035 Ω	**AF push-pull power amplifier**	**Capacitances**
		μ 4,4	U_b 295 V	C_{g1} 14,4 pF
		I_{az} (U_{g1} = −70 V) 10 mA	R_k 375 Ω	C_a 10 pF
			$R_{a-a'}$ 4 kΩ	C_a/g_1 6,9 pF
			I_{ao} 2×60 mA	
			I_a 2×64 mA	
			P_o 9,5 W	
			$U_{g1\,ef}$ 30 V	
			k 1,5 %	

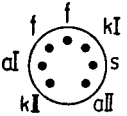




Power triode
AF power amplifier

Type / Application	Dimensions / Base	Heating	Operational Data			Maximum Ratings		
		Static data						
EAA91 **6B32**	Size max Ø 19×48 mm	U_f 6,3 V I_f 0,3 A I_f 0,3 A U_f 6,3 V Indirect heating U_a 4 V I_a >10 mA	**Half-wave rectifier**			**Each section**		
			$U_{a\,ef}$	150	V	U_{inv}	420	V
			R_o	300	Ω	I_{ss}	9	mA
			I_{ss}	9	mA	I_{sp} 1)	90	mA
			I_{sp}	54	mA	W_a	0,5	W
			Full-wave rectifier			$U_{+k/f-}$	330	V
			$U_{a\,ef}$	2×150	V	$U_{-k/f+}$	150	V
			R_o	2×300	Ω	$R_{k/f}$	20	kΩ
			C_N	1	µF	U_{di} ($I_d \leqq 0{,}3$ µA)	−1,3	V
			R_z	15	kΩ	C_N	8	µF
			U_{ss}	130	V	R_o	>200	Ω
			Capacitances					
			$C_{aI/kI+s+f}$	2,2	pF			
			$C_{aII/kII+s+f}$	2,2	pF			
			$C_{kI/aI+s+f}$	3,3	pF			
			$C_{kII/aII+s+f}$	3,3	pF			
			$C_{aI/aII}$	<0,05	pF			

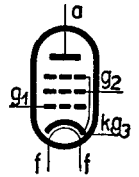


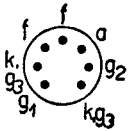


Twin diode with separate cathodes, AM, FM, demodulator, ratio detector, full-wave rectifier

1) Max, 18 µs, max 18% of a cycle

Type / Application	Dimensions / Base	Heating — Static data	Operational Data			Maximum Ratings		
EF95 **6F32**	Size max Ø 19×45,2 mm	U_f 6,3 V I_f 0.175 A Indirect heating ●	**RF amplifier, class A**			U_{ao} 320 V U_a 200 V W_a 1,7 W U_{g2o} 320 V U_{g_2} 150 V W_{g_2} 0,5 W I_k 18 mA R_{g_1} 1 MΩ $U_k/_f$ 100 V $R_k/_f$ 20 kΩ	
		U_a 120 V U_{g_2} 120 V R_k 200 Ω I_a 7,5 mA I_{g_2} <3,5 mA S 5,2 mA/V μ_{g_2/g_1} 25 R_i >0,25 MΩ	U_a	120	180 V			
			U_{g_2}	120	120 V			
			R_k	200	200 Ω			
			I_a	7,5	7,7 mA			
			I_{g_2}	2,5	2,5 mA			
			S	5	5,1 mA/V			
			R_i	0,34	0,69 MΩ			
			Z_{g_1} (f=50 Mc/s)	25	25 kΩ			
			R_{ekv}	2	2 kΩ			
			RF amplifier, class A – triode connection					
			U_a	120	180 V			
			U_{g_1}	−2,65	−6 V			
			R_k	265	925 Ω			
			I_a	10	6,5 mA			
			S	6	3,5 mA/V			
			R_i	5	6,66 kΩ			
			μ	30	23,3			
			Z_{g_1} (f=100 Mc/s)	9,5	kΩ			
			R_{ekv}	700	Ω			





RF high-slope pentode
PF, IF, wideband amplifier

Capacitances

C_{g_1}	4,5	pF
C_a	2,8	pF
$C_a/_{g_1}$	<0,025	pF

Table of receiving tube equivalents

TESLA	European designation	Marconi	CV number	Other makers
1AF33	DAF96	ZD17 [1]	CV784 [1]	1FD1, 1FD9 [1], 1S5T
1AF34				1Б2П, 1Б1П [1],[3]
1F33	DF96	W17 [1]	CV785 [1]	1F3 [1], 1T4T
1F34				1К2П, 1К1П [1],[3]
1H33		X17 [1]	CV782 [1]	1C1 [1], 1R5T
1H34				1А2П, 1А1П [1],[3]
1H35	DK96			1AB6
1L33	DL91 [1]		CV783 [1]	1S4T
1NN41	OA160			
1Y32				1Z2
1Y32T				~1Z2
2NN41				1N51
3L31				3A4 [1]
3NN41	OA50			1N34
4NN41				1N48
5NN41	OA55			1N38
6B32	EAA91,	EB91 D77/D152	CV140, CV283	6D2, 6X2П
6BC32	EBC91			6AV6
6CC10	ECC33	B65	CV1988	6SN7, 6H8C
6CC31	ECC91		CV858	6H15П, 6J6
6CC41				6H2П, 12AX7 [2]
6CC42				6385, 2C51, 5760, 6H3П
6F10			CV660	6AC7, 6Ж4
6F31	EF93	W727	CV454	6BA6, 6K4П
6F32	EF95		CV850	6AK5, 6Ж1П
6F32V				5654, 6AK5W, 6AK5WA
6F35				6AJ5
6F36				6AH6, 6Ж5П
6H31	EK90	X727	CV453	6A2П, 6BE6
6L10			CV1882	6AG7, 6П9
6L31	EL90	N727	CV1862	6005, 6AQ5, 6П1П [4]
6L41			CV2129	5763
6L43				6CL6
6NN41				1N64
6Z31				6X4, 6Ц4П

TESLA	European designation	Marconi	CV number	Other makers
7QR28	~DG7-6 [4]			~3BP1, ~3QP1 [4]
12BC32	HBC91			12AV6
12F31	HF93		CV1928	12BA6
12H31	HK90			12BE6
12QR50			CV1069 [4]	5JP1 [4]
12QR51				~OE411PAV [4]
25QP20				10BP4
25QP21				10BP7
251QQ44	A25-10W			
280QQ44	A28-13W			
470QQ44	AW47-91			19ALP4, 19AQP4, 19BEP4
472QQ44	A47-11W			
502QQ44	A50-12W			
590QQ44	AW59-90			23AJP4, 23AMP4, 23AQP4, 23BCP4
592QQ44	A59-12W/2, A59-11W			23DEP4, 23DRP4, 23FQP4 23HBP4
AZ1			CV2860	
DY86				1S2
E88CC				6922, CCa
E180F				6688, 5A/170K, EF861
EAA91				6AL5
EABC80		DH719		6LD12, 6T8, 6AK8
EBF89				7125, 6DC8
EC86				6CM4
EC88				6DL4, 6LD4
ECC82		B329	CV491	12AU7
ECC83		B339	CV492	12AX7, 6L13
ECC84				6CW7, 6H14П
ECC85		B719		6L12, 6AQ8
ECC88				6DJ8, 6H23П
ECC91				6J6, 6H15П
ECC189				6ES8
ECC802S				12AU7WA, 6067
ECC803S				12AX7WA, 6057

TESLA	European designation	Marconi	CV number	Other makers
ECH81		X719	CV2128	6C12, 6AJ8, 6И1П
ECH84				6JX8
ECF82				6U8
ECL82				6BM8
ECL84				6DX8
ECL86				6GW8
EF80		Z719, Z152		64SPT, 6BX6
EF86		Z729		6267, 6Ж32П
EF89			CV2901	6DA6
EF183				6EH7, 6F29
EF184				6EJ7, 6F30
EF800				EF860
EF806S				6267
EL34				6CA7
EL36				6CM5
EL81			CV2721	6CJ6
EL82				6DY5
EL83			CV2726	6CK6, 6CN6
EL84		N709	CV2975	6P15, 6BQ5, 6П14П, 6L40
EL86				6CW5
EL500				6GB5A
EM4n			~CV1434	
EM80			CV1352	65ME, 6BR5, 6E1П
EM81				6DA5
EM84				6FG6
EY82				6H3
EY83				6Ц10П [1]
EY88				6AL3
EY86				6S2
EZ80				6V4
EZ81		U709		UU12, 6CA4
PABC80				9AK8
PCC84				30L1, 7AN7
PC86				4CM4
PC88				4DL4
PCC85				9AQ8

TESLA	European designation	Marconi	CV number	Other makers
PCC88				7DJ8
PCC189				7ES8
PCF82				9U8
PCF200				8X9
PCF801				8GJ7
PCF802				8JW8
PCL82		~LN309		16A8, 30P12
PCH200				9V9
PCL85				18GV8
PCL86				14GW8
PL36				25E5, 30P4
PL81		N152, N359		213Pen, 21A6
PL82		N154, N329		30P16, 16A5
PL83		N153		15A6
PL84				30P18
PL500				28GB5
PY82		U152		19SU, 19Y3
PY83				17Z3
PY88				30AE3
UABC80				10LD12
UBF89				10FD12, 19DC8, 19FL8
UCC85				10L14
UCH81				10C14, 19D8, 19AJ8
UCL82				10PL12, 50BM8
UL84				10P18, 45B5
UY85				38A3
UM80				19BR5
UY82				55N3

1. Double heating current, TESLA type more economical
2. Different socket
3. Different heating voltage
4. Different external design