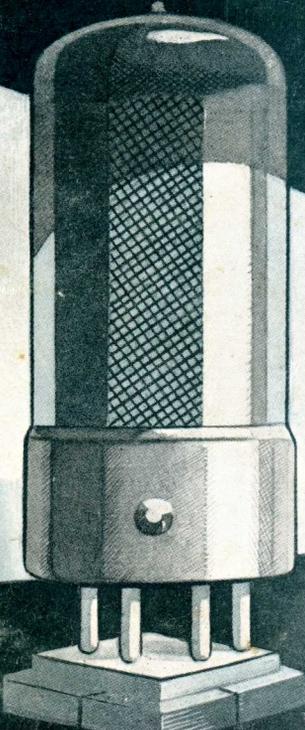


THE BRIDGE

TO BETTER
ELECTRONIC
EQUIPMENT
EDITION 1950



PHILIPS "MINIWATT" VALVE CATALOGUE

????

*Other L. v. d. Donk.
T. C. Sender*

DATA OF

PHILIPS "MINIWATT"

RADIO VALVES

AND

SPECIAL TUBES



Introduction

There is no need to give a lengthy introduction to this catalogue. Since years "The Bridge" is a popular guide for everyone interested in radio and electronic equipment. This new "Bridge", however, must be accompanied by a short explanation because the layout is completely altered.

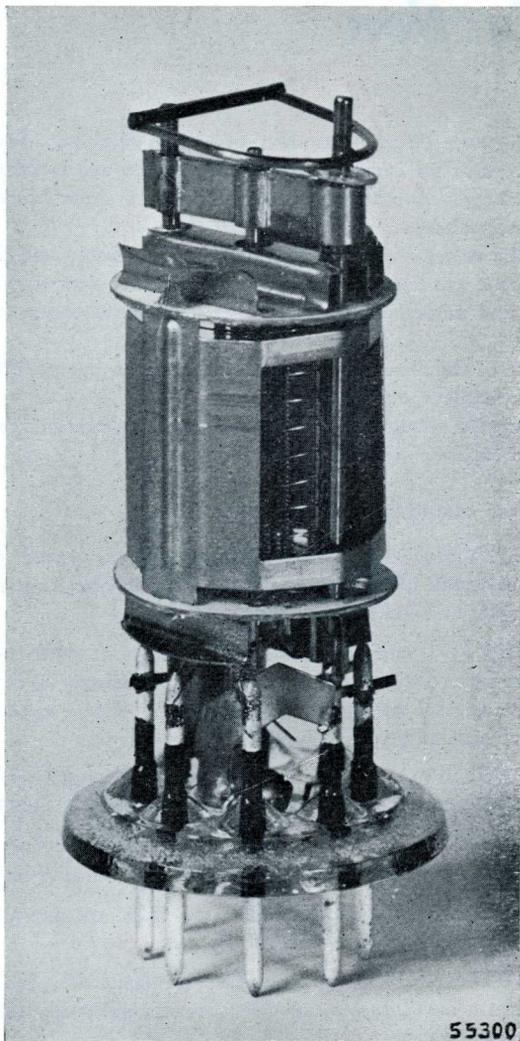
In former editions the valves were arranged according to bases and filament supply. To find a certain valve it was necessary to look up the index. Now the valves are classified in alphabetical and numerical order, so that it becomes easier to consult "The Bridge".

Furthermore the data of the most important obsolete valves are included, which is of great importance for retailers and servicemen.

In addition to the popular "Miniwatt" radio and amplifier valves, the technical data of the Philips special tubes are included.

Under this heading are comprised, amongst others:

- 1) PRE-AMPLIFIER VALVES for the amplification of very small voltages such as are obtained from crystal microphones, photocells, etc. Special attention has been paid to a low noise and hum level.
- 2) POWER VALVES FOR AMPLIFIERS. A full range of these valves for amplifiers with outputs up to 100 W are indicated in this catalogue. For amplifiers with still larger outputs several stages with the EL 34 should be connected in parallel, or small types of transmitting valves should be used.
- 3) SPECIAL RECTIFIERS. Gas-filled and high-vacuum rectifying valves for use in amplifiers and rectifiers for high-voltage circuits as used in oscillographs and in television receiving sets.
- 4) SUBMINIATURE VALVES for hearing aids and other compact portable equipment.
- 5) AMPLIFIER AND DETECTOR VALVES for H.F. and for V.H.F., such as television receiving valves, microwave valves, etc.
- 6) CATHODE-RAY TUBES. Electrostatic and electromagnetic types for oscillographs and oscilloscopes as well as for television direct-viewing and projection-receiving sets.
- 7) PHOTO-ELECTRIC CELLS for cinema equipment and industrial purposes.
- 8) VOLTAGE-STABILIZING TUBES for voltages from 85 V up to 170 V and currents up to 200 mA.
- 9) HIGH-VACUUM THERMO COUPLES.
- 10) REPEATER AND OTHER VALVES FOR TELEPHONE EQUIPMENT.



The rigid construction of the "Miniwatt"
Rimlock valve EAF 42.
(Enlargement $2\frac{1}{2} \times$)

CODING OF THE "MINIWATT" VALVES

The type numbers of the "Miniwatt" radio valves consist of some letters and a number¹⁾ The first letter indicates the method of the filament supply, the second and subsequent letters indicate the systems in the envelope, while the number is a serial number. The exact meaning of the letters is given in the following tables:

First letter	Filament supply method
A	4 volts A.C.
C	200 mA A.C. or D.C.
D	Battery up to 1.4 volts
E	6.3 volts A.C. or 6.3 volts car battery
K	2 volts battery
U	100 mA A.C. or D.C.

The type number of the current stabilizers consists of one letter with a serial number. This letter indicates the value of the regulated current according to the table above.

Second and third letters	Type of valve
A	single diode
B	double diode
C	triode (with the exception of output triode)
D	output triode
E	tetrode
F	pentode (with the exception of the output pentode)
H	hexode or heptode
K	octode
L	output pentode
M	cathode-ray indicator
P	secondary emission
Q	enneode
W	half-wave gas-filled rectifier
X	full-wave gas-filled rectifier
Y	half-wave high-vacuum rectifier
Z	full-wave high-vacuum rectifier

¹⁾ The older obsolete types of valves are indicated with another type number system (A 409, B 443 etc.)

CODING OF PHILIPS CATHODE-RAY TUBES

A letter and number code has also been introduced for coding cathode-ray tubes. Here the first letter signifies the manner of deflection of the electron ray, electrostatic or electromagnetic. The second letter indicates the colour of the light spot on the screen. The number before the hyphen indicates the screen diameter and the numbers behind the hyphen are serial numbers representing the various designs or new types.

EXAMPLES:

The type number DN 9-5 indicates that the tube has a double electrostatic deflection system (letter D), a persistent screen (letter N) and the diameter of the screen is 9 cm. It is the fifth design of this type. MW 22-14 means that this is a cathode-ray tube with double magnetic deflection (letter M), the screen spot is white (letter W) and the screen diameter is 22 cm. (number 22).

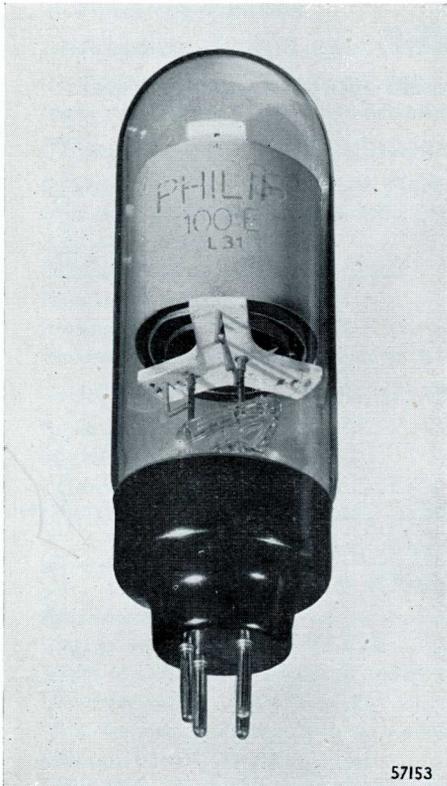
THE MEANING OF THE VARIOUS LETTERS IS INDICATED IN THE TABLE BELOW

First letter	Second letter	First number	Second number
Manner of deflection of the electron ray	Colour of light spot on screen, properties of screen	Diameter of screen	Serial number
D = double electrostatic deflection M = magnetic deflection in both directions. S = electrostatic deflection only in one direction; deflection in the other direction can be effected electromagnetically	B = blue G = green N = screen of long persistence R = screen of very long persistence W = white	The diameter is indicated in cm.	When a certain tube is produced in a new design it is given the next serial number. The first design is numbered 1, the second numbered 2 and so on.

CODING OF PHILIPS STABILIZER VALVES

The type number of the new stabilizer valves consists of a numeral, a letter and a serial number. The numeral indicates the mean value of the stabilized voltage in volts. The letter indicates the highest current for which the valve has been designed. The meaning of the various letters is given in the table below:

A	=	0	—	8	mA
B	=	8	—	20	mA
C	=	20	—	40	mA
D	=	40	—	100	mA
E	=	100	—	200	mA



EXAMPLE:

The type number 100E1 indicates a valve for a mean voltage of 100 V and highest current of 200 mA, this being the first design of its type.

LIST OF SYMBOLS AND INDICATIONS USED

1. INDICATION OF THE ELECTRODES

Anode	a
Anode of a diode	d
Deflection plates of cathode-ray tube	D
Filament	f
Grid	g
Cathode	k
Secondary emission cathode	k ₂
Fluorescent screen	l
Metallisation	m
Inside shield	s

2. INDICATION OF THE VALVE SYSTEMS

For combination valves the electrodes of the separate valve types are indicated as follows:

for a diode by	D
for a triode by	T
for a tetrode by	Q
for a pentode by	P
for a hexode or heptode by	H

3. INDICATION OF THE VOLTAGES

Anode voltage	V _a
Arc voltage	V _{arc}
Supply voltage	V _b
Range of current regulating tube	V _{conlr}
Diode voltage	V _d
Heating voltage	V _j
Voltage between filament and cathode	V _{fk}
Grid voltage	V _g
Input alternating voltage	V _i
Inverse voltage	V _{inv}
Voltage on fluorescent screen	V _l
Output voltage	V _o
Oscillator voltage	V _{osc}
Transformer voltage	V _{tr}

4. INDICATION OF THE CURRENTS

Anode current	I_a
Anode current without input signal (with push-pull circuits)	I_{amin}
Anode current at full load (with push-pull circuits)	I_{amax}
Diode current	I_d
Filament current	I_f
Grid current	I_g
Screen grid current without input signal (with push-pull circuits)	I_{g2min}
Screen grid current at full load (with push-pull circuits)	I_{g2max}
Current to the fluorescent screen	I_l
Direct current supplied by a rectifying valve	I_o
Regulated current of a current-regulating tube	I_{reg}
Saturation current	I_{sat}

5. INDICATION OF POWER

Maximum anode dissipation	W_a
Maximum output power	W_o

6. INDICATION OF THE CAPACITANCES

Capacitance between anode and grid	C_{ag}
Input capacitance of the filter behind a rectifying valve	C_{filt}

7. INDICATION OF THE RESISTANCES

External resistance in the anode circuit or optimum matching resistance	R_a
Optimum matching resistance with push-pull amplifiers	R_{aa}
Equivalent noise resistance	R_{eq}
External resistor in the grid circuit	R_g
Internal resistance	R_i
Resistor in the cathode circuit	R_k
Protective resistor in anode lead of a rectifying valve	R_t

8. INDICATION OF VARIOUS VALUES

Inner screening	s
Mutual conductance	S
Conversion conductance	S_c
Mutual conductance of oscillator triode et $V_g = 0$ V and $V_{osc} = 0$ V	S_o
Effective slope $\left(= \frac{\text{anode current of fundamental frequency}}{\text{grid voltage of fundamental frequency}} \right)$	S_{eff}
Amplification factor	μ
Voltage amplification (= $V_o : V_i$)	g
Angle of the shadow sector of tuning indicator	α
Distortion	d
Max. frequency	f_{max}
Resonance wave length	λ_{res}
Connection pin which must not be connected externally	i.c.

SURVEY OF THE MOST IMPORTANT "MINIWATT" RADIO VALVES AND PHILIPS SPECIAL TUBES

The following table lists the "Miniwatt" radio valves and Philips special tubes which are still of importance. Several, however, are obsolete and out of production and they are marked with an asterisk. Of some of these obsolete types there is still a considerable stock, of others, however, the stock is exhausted and a replacement type has to be used. In the second column a possible replacement type is recommended. A few alterations in the set are usually necessary because of base, filament supply or resistors. The replacement types must therefore be regarded as a possibility, not as a hard and fast rule.

Where direct replacement is possible the replacement type is printed in italics.

Type	Replacement type	Type	Replacement type	Type	Replacement type
A 409*	KBC 1	AZ 31		C/EM 2*	EBC 3 + EM 1
A 415*	KBC 1	AZ 41		CF 1*	EF 6
A 425*	KBC 1	AZ 50		CF 2*	EF 9
A 442*	DF 21			CF 3*	EF 9
AB 1*	AB 2	B 405*	KL 4	CF 7*	EF 6
AB 2		B 406*	KL 4	CF 50	
ABC 1		B 409*	KL 4	CK 1*	ECH 3
ABL 1		B 424*	KBC 1	CL 1*	EL 2
AC 2*	ABC 1	B 438*	KBC 1	CL 2*	EL 2 or CBL 1
ACH 1*	AK2	B 442*	DF 21	CL 4*	CBL 1
AD 1*	<i>4683</i>	B 443*	4682 or AL 4	CL 6*	CBL 1
AF 2*	AF 3	B 543*	DLL 21	CY 1*	CY 2
AF 3				CY 2	
AF 7		C 1*	C 8		
AH 1*	AK 2	C 2*	<i>C 10</i>	D1F*	none
AK 1*	AK 2	C 3*	C 8	D2F*	none
AK 2		C 4*	<i>C 10</i>	D 404*	none
AL 1*	4682	C 8		DA 50	
AL 2*	<i>4682</i>	C 9*	C 10	DAC 21	
AL 4		C 10		DAC 25*	DAC 21
AL 5*	<i>4688</i>	C 12		DAF 40	
AM 1*	none	C 243N*	KL 4	DAF 41	
AM 2*	none	C 408*	none	DAF 91	
AX 1/4652		C 443*	4682, AL 4	DAH 50*	none
AX 50		CB 1*	EB 4	DB 7-1	
AZ 1		CB 2*	EB 4	DB 7-2	
AZ 4		CBC 1*	EBC 3	DB 7-3	
AZ 11		CBL 1		DB 7-4	
AZ 12		CC 2*	EBC 3	DB 9-3	

Type	Replacement type	Type	Replacement type	Type	Replacement type
DB 9—4		E 444*	ABC 1	EF 39	
DB 9—5		E 445*	AF 3	EF 40	
DB 16—1		E 446*	4636	EF 41	
DB 16—2		E 447*	AF 3	EF 42	
DBC 21*	DAC 21	E 449*	AK 2	EF 50	
DC 25*	DAC 21	E 452T*	AF 7	EF 51	
DCH 25*	DK 21	E 453*	4682	EFF 50*	EFF 51
DDD 25*	none	E 455*	AF 3	EFF 51	
DF 21		E 462*	AF 7	EFM 1	
DF 22		E 463*	4682	EFM 11	
DF 25*	DF 21	E 499*	4657	EFP 60	
DF 70		EA 40		EH 2*	ECH 4
DF 91		EA 50		EK 2	
DG 7—1		EAB 1*	EBC 3	EK 3*	ECH 3 or EK 2
DG 7—2		EAF 41 ¹⁾	EAF 42	EL 2	
DG 7—3		EAF 42 ¹⁾		EL 3 N	
DG 7—4		EB 4		EL 5*	4689
DG 9—3		EB 11*	EB 4	EL 6*	4699
DG 9—4		EB 41		EL 11	
DG 16—1		EBC 3		EL 12	
DG 16—2		EBC 11*	EBC 3	EL 33	
DK 21		EBC 33		EL 34	
DK 40		EBC 41		EL 38	
DK 91		EBF 2		EL 41	
DL 21		EBF 11		EL 42	
DL 25*	DL 21 or DL 41	EBF 32		EL 50	
DL 41		EBL 1		EL 51	
DL 71		EBL 21		EL 60*	EL 34
DL 72		EC 50		ELL 1*	2 × EL 2 or 2 × EL 42
DL 92		EC 80			
DLL 21		EC 81		EM 1	
DN 7—1		ECC 40		EM 4	
DN 7—2		ECF 1		EM 11*	EM 4
DN 7—3		ECH 3		EM 34	
DN 7—4		ECH 4		EQ 80	
DN 9—3		ECH 11		EY 1	
DN 9—4		ECH 21		EY 51	
DN 9—5		ECH 35		EZ 2	
DN 16—1		ECH 41		EZ 3*	AZ 1 or AZ 4
DN 16—2		ECH 42		EZ 4*	AZ 4
		ECL 11		EZ 11*	EZ 2
E 406N*	4613	EE 50*	EEP 1	EZ 12*	AZ 4
E 408N*	4683	EEP 1		EZ 40	
E 409*	4614	EF 5*	EF 9	E1C/4671	
E 424N*	ABC 1	EF 6		E1F/4672	
E 428*	ABC 1	EF 8*	EF 9		
E 438*	ABC 1	EF 9		F 410*	4641
E 442*	AF 7	EF 11			
E 442S*	AF 7	EF 12		KB 2	
E 443H*	4682, AL 4	EF 13*	EF 11	KBC 1	
E 443N*	4682, 4688	EF 22		KC 1*	KBC 1

¹⁾ If the EAF 41 is replaced by the EAF 42, the contacts 4 and 7 under the valve holder must be interconnected.

Type	Replacement type	Type	Replacement type	Type	Replacement type
KC 3*	KBC 1	150A1		4630	
KC 4*	KBC 1	150C1		4631	
KCH 1*	KK 2	1561		4632*	none
KDD 1*	DLL 21	1805		4636	
KF 3		1832		4641	
KF 4*	KF 3	1875		4646	
KK 2		1876		4650	
KL 4		1877		4652/AX 1	
KL 5*	KL 4	1904H		4654K	
		1910		4654P	
MW 6-2		1927		4657	
MW 22-1*	MW 22-7	1928		4662	
MW 22-3*	MW 22-7	1941		4671/EIC	
MW 22-5*	MW 22-7	1945		4672/EIF	
MW 22-7		3510		4673	
MW 31-5*	MW 31-7	3512		4674	
MW 31-6		3520*	none	4675*	none
MW 31-7		3530		4676*	none
		3533		4682	
TH 1		3534		4683	
TH 2		3537		4684*	
TH 3		3538		4686*	4690
TH 4		3541		4687	
TH 5		3543		4688	
		4060		4689K	
UAF 41 ¹⁾	UAF 42	4317*	none	4689P	
UAF 42 ¹⁾		4357*	4687	4690	
UBC 41		4369		4694	
UBF 11		4370		4695*	none
UBL 1		4371		4696*	none
UBL 21		4372		4698*	none
UCH 4		4376*	none	4699	
UCH 11		4377*	none	7475	
UCH 21		4378		7678*	none
UCH 41		4379		13201	
UCH 42		4380		13202X	
UCL 11		4383		18004	
UF 9		4390		18013	
UF 11		4397		18014	
UF 21		4496*	none	18015	
UF 41		4606		18016	
UF 42		4607		18040	
UFM 11*	none	4608*	none	18500	
UL 41		4609		18501	
UM 4		4610*			
UY 1 (N)		4613			
UY 11		4614			
UY 21*	UY 1 (N)	4617			
UY 41		4620*	none		
85A1		4623			
100E1		4624			

¹⁾ If the UAF 41 is replaced by the UAF 42, the contacts 4 and 7 under the valve holder must be interconnected.

Type	Filament data	Application	Voltages Resistors	Currents (mA)	Characteristic data	Base connections
A 409 Triode	$V_f = 4\text{ V}$ $I_f = 65\text{ mA}$	Typical characteristics	$V_a = 150\text{ V}$ $V_g = -9\text{ V}$	$I_a = 3.5$	$S = 0.9\text{ mA/V}$ $R_i = 10\text{ k}\Omega$ $\mu = 9$	
A 415 Triode	$V_f = 4\text{ V}$ $I_f = 85\text{ mA}$	Typical characteristics	$V_a = 150\text{ V}$ $V_g = -4.5\text{ V}$	$I_a = 4$	$S = 1.5\text{ mA/V}$ $R_i = 10\text{ k}\Omega$ $\mu = 15$	
A 425 Triode	$V_f = 4\text{ V}$ $I_f = 65\text{ mA}$	Typical characteristics	$V_a = 200\text{ V}$ $V_g = -2.5\text{ V}$	$I_a = 2.3$	$S = 1.1\text{ mA/V}$ $R_i = 23\text{ k}\Omega$ $\mu = 25$	
A 442 Tetrode	$V_f = 4\text{ V}$ $I_f = 60\text{ mA}$	H.F. amplifier	$V_a = 200\text{ V}$ $V_{g2} = 100\text{ V}$ $V_{g1} = -1\text{ V}$	$I_a = 4$	$S = 0.7\text{ mA/V}$ $R_i = 0.4\text{ M}\Omega$ $C_{ag1} < 0.01\text{ pF}$	
AB 1 Double diode	$V_f = 4\text{ V}$ $I_f = 0.65\text{ A}$	Detector and A.V.C.				
AB 2 Double diode	$V_f = 4\text{ V}$ $I_f = 0.65\text{ A}$	Detector and A.V.C.				
ABC 1 Double diode-triode	$V_f = 4\text{ V}$ $I_f = 0.65\text{ A}$	Typical characteristics	$V_a = 250\text{ V}$ $V_g = -7\text{ V}$	$I_a = 4$	$S = 2.0\text{ mA/V}$ $R_i = 13.5\text{ k}\Omega$ $\mu = 27$	
ABL 1 Double diode-output pentode	$V_f = 4\text{ V}$ $I_f = 2.4\text{ A}$	Class A output amplifier	$V_a = 250\text{ V}$ $V_{g2} = 250\text{ V}$ $V_{g1} = -6\text{ V}$ $R_k = 150\text{ }\Omega$	$I_a = 36$ $I_{g2} = 4$	$S = 9\text{ mA/V}$ $R_i = 50\text{ k}\Omega$ $R_a = 7\text{ k}\Omega$ $W_a = 9\text{ W}$ $W_o = 4.5\text{ W}$	
AC 2 Triode	$V_f = 4\text{ V}$ $I_f = 0.65\text{ A}$	Typical characteristics	$V_a = 250\text{ V}$ $V_g = -5.5\text{ V}$	$I_a = 6$	$S = 2.5\text{ mA/V}$ $R_i = 12\text{ k}\Omega$ $\mu = 30$	
ACH 1 Triode-hexode	$V_f = 4\text{ V}$ $I_f = 1\text{ A}$	Frequency changer (hexode section)	$V_a = 300\text{ V}$ $V_{g2+g4} = 70\text{ V}$ $V_{g1} = -2\text{ V}$ $R_{g3+g} T = 20\text{ k}\Omega$	$I_a = 2.5$ $I_{g3+g} T = 0.75$	$S_c = 0.75\text{ mA/V}$ $R_i = 0.8\text{ M}\Omega$	
		Oscillator (triode section)	$V_a = 150\text{ V}$ $R_{g3+g} T = 20\text{ k}\Omega$	$I_a = 5$ $I_{g3+g} T = 0.75$	$S = 2.0\text{ mA/V}$ $R_i = 6.5\text{ k}\Omega$ $\mu = 13$	

Type	Filament data	Application	Voltages Resistors	Currents (mA)	Characteristic data	Base connections
AD 1 Output triode	$V_f = 4\text{ V}$ $I_f = 0.95\text{ A}$	Class A output amplifier	$V_a = 250\text{ V}$ $V_g = -45\text{ V}$	$I_a = 60$	$S = 6\text{ mA/V}$ $R_i = 0.67\text{ k}\Omega$ $R_a = 2.3\text{ k}\Omega$ $W_a = 15\text{ W}$ $W_o = 4.2\text{ W}$	
		Class AB push-pull amplifier	$V_a = 250\text{ V}$ $R_k = 375\ \Omega$	$I_{a\ min} = 2 \times 60$ $I_{a\ max} = 2 \times 64$	$R_{aa} = 4\text{ k}\Omega$ $W_o = 9.5\text{ W}$	
AF 2 Variable mu pentode	$V_f = 4\text{ V}$ $I_f = 1.1\text{ A}$	H.F. or I.F. amplifier	$V_a = 200\text{ V}$ $V_{g2} = 100\text{ V}$ $V_{g1} = -2\text{ V}$	$I_a = 4.2$ $I_{g2} = 1.8$	$S = 2.5\text{ mA/V}$ $R_i = 1.4\text{ M}\Omega$ $C_{ag1} < 0.006\text{ pF}$	
AF 3 Variable mu pentode	$V_f = 4\text{ V}$ $I_f = 0.65\text{ A}$	H.F. or I.F. amplifier	$V_a = 250\text{ V}$ $V_{g2} = 100\text{ V}$ $V_{g1} = -3\text{ V}$	$I_a = 8$ $I_{g2} = 2.6$	$S = 1.8\text{ mA/V}$ $R_i = 1.2\text{ M}\Omega$ $C_{ag1} < 0.003\text{ pF}$	
AF 7 Pentode	$V_f = 4\text{ V}$ $I_f = 0.65\text{ A}$	H.F. amplifier	$V_a = 250\text{ V}$ $V_{g2} = 100\text{ V}$ $V_{g1} = -2\text{ V}$	$I_a = 3$ $I_{g2} = 1.1$	$S = 2.1\text{ mA/V}$ $R_i = 2\text{ M}\Omega$ $C_{ag1} < 0.003\text{ pF}$	
AH 1 Hexode	$V_f = 4\text{ V}$ $I_f = 0.65\text{ A}$	Frequency changer	$V_a = 250\text{ V}$ $V_{g2+g4} = 80\text{ V}$ $V_{g1} = -2\text{ V}$ $V_{osc} = 9V_{eff}$	$I_a = 1.7$ $I_{g2+g4} = 2.6$	$S_c = 0.55\text{ mA/V}$ $R_i = 2\text{ M}\Omega$ $C_{ag1} < 0.003\text{ pF}$	
		H.F. amplifier	$V_a = 250\text{ V}$ $V_{g2+g4} = 80\text{ V}$ $V_{g1} = -2\text{ V}$	$I_a = 3$ $I_{g2+g4} = 1.1$	$S = 1.8\text{ mA/V}$ $R_i = 2\text{ M}\Omega$ $C_{ag1} < 0.003\text{ pF}$	
AK 1 Octode	$V_f = 4\text{ V}$ $I_f = 0.65\text{ A}$	Frequency changer	$V_a = 200\text{ V}$ $V_{g3+g5} = 70\text{ V}$ $V_{g4} = -1.5\text{ V}$ $V_{g2} = 90\text{ V}$ $R_{g1} = 50\text{ k}\Omega$	$I_a = 1.6$ $I_{g3+g5} = 3.8$ $I_{g2} = 2.0$ $I_{g1} = 0.19$	$S_c = 0.6\text{ mA/V}$ $R_i = 1.5\text{ M}\Omega$	
AK 2 Octode	$V_f = 4\text{ V}$ $I_f = 0.65\text{ A}$	Frequency changer	$V_a = 250\text{ V}$ $V_{g3+g5} = 70\text{ V}$ $V_{g4} = -1.5\text{ V}$ $V_{g2} = 90\text{ V}$ $R_{g1} = 50\text{ k}\Omega$	$I_a = 1.6$ $I_{g3+g5} = 3.8$ $I_{g2} = 2.0$ $I_{g1} = 0.19$	$S_c = 0.6\text{ mA/V}$ $R_i = 1.6\text{ M}\Omega$	
AL 1 Output pentode	$V_f = 4\text{ V}$ $I_f = 1.1\text{ A}$	Class A output amplifier	$V_a = 250\text{ V}$ $V_{g2} = 250\text{ V}$ $V_{g1} = -15\text{ V}$ $R_k = 350\ \Omega$	$I_a = 36$ $I_{g2} = 6.8$	$S = 2.8\text{ mA/V}$ $R_i = 43\text{ k}\Omega$ $R_a = 7\text{ k}\Omega$ $W_a = 9\text{ W}$ $W_o = 3.1\text{ W}$	
AL 2 Output pentode	$V_f = 4\text{ V}$ $I_f = 1.0\text{ A}$	Class A output amplifier	$V_a = 250\text{ V}$ $V_{g2} = 250\text{ V}$ $V_{g1} = -25\text{ V}$ $R_k = 625\ \Omega$	$I_a = 36$ $I_{g2} = 4$	$S = 2.6\text{ mA/V}$ $R_i = 60\text{ k}\Omega$ $R_a = 7\text{ k}\Omega$ $W_a = 9\text{ W}$ $W_o = 3.8\text{ W}$	

Type	Filament data	Application	Voltages Resistors	Currents (mA)	Characteristic data	Base connections
AL 4 Output pentode	$V_f = 4\text{ V}$ $I_f = 1.75\text{ A}$	Class A output amplifier	$V_a = 250\text{ V}$ $V_{g2} = 250\text{ V}$ $V_{g1} = -6\text{ V}$ $R_k = 150\Omega$	$I_a = 36$ $I_{g2} = 5$	$S = 9.5\text{ mA/V}$ $R_i = 50\text{ k}\Omega$ $R_a = 7\text{ k}\Omega$ $W_a = 9\text{ W}$ $W_o = 4.3\text{ W}$	
AL 5 Output pentode	$V_f = 4\text{ V}$ $I_f = 2.0\text{ A}$	Class A output amplifier	$V_a = 250\text{ V}$ $V_{g2} = 275\text{ V}$ $V_{g1} = -14\text{ V}$ $R_k = 175\Omega$	$I_a = 72$ $I_{g2} = 7$	$S = 8.5\text{ mA/V}$ $R_i = 22\text{ k}\Omega$ $R_a = 3.5\text{ k}\Omega$ $W_a = 18\text{ W}$ $W_o = 8.8\text{ W}$	
AM 1 Tuning indicator	$V_f = 4\text{ V}$ $I_f = 0.3\text{ A}$	Tuning indicator	$V_b = 250\text{ V}$ $V_i = 250\text{ V}$ $V_g = 0/-5\text{ V}$ $R_a = 2\text{ M}\Omega$	$I_a = 0.095/0.021$ $I_l = 0.13/0.14$	$\alpha = 75/0^\circ$	
AM 2 Tuning indicator	$V_f = 4\text{ V}$ $I_f = 0.32\text{ A}$	Typical characteristics (triode section)	$V_a = 250\text{ V}$ $V_g = -3.5\text{ V}$	$I_a = 3$	$S = 2.0\text{ mA/V}$ $R_i = 25\text{ k}\Omega$ $\mu = 50$	
		Tuning indicator (indicator section)	$V_b = 250\text{ V}$ $V_l = 250\text{ V}$ $V_{g'} = +3/-6\text{ V}$	$\alpha = 20/175^\circ$		
AX 1 /4652 Gas-filled full wave rectifier	$V_f = 4\text{ V}$ $I_f = 2.4\text{ A}$	Rectifier	$V_{tr} = 2 \times 500V_{eff}$ $V_{arc} = 15\text{ V}$	$I_o = \text{max. } 125$	$C_{filt} = \text{max } 64\mu\text{F}$ $R_t = \text{min } 200\ \Omega$ $C_{filt} = \text{max } 32\mu\text{F}$ $R_t = \text{min } 150\ \Omega$ $C_{filt} = \text{max } 16\mu\text{F}$ $R_t = \text{min } 100\ \Omega$	
AX 50 Gas-filled full wave rectifier	$V_f = 4\text{ V}$ $I_f = 3.75\text{ A}$	Rectifier	$V_{tr} = 2 \times 500V_{eff}$ $V_{arc} = \text{max. } 15\text{ V}$	$I_o = \text{max. } 275$	$C_{filt} = \text{max } 64\mu\text{F}$ $R_t = \text{min } 200\ \Omega$ $C_{filt} = \text{max } 32\mu\text{F}$ $R_t = \text{min } 150\ \Omega$ $C_{filt} = \text{max } 16\mu\text{F}$ $R_t = \text{min } 100\ \Omega$	
AZ 1 Full wave rectifier	$V_f = 4\text{ V}$ $I_f = 1.1\text{ A}$	Rectifier	$V_{tr} = 2 \times 500V_{eff}$ $= 2 \times 400V_{eff}$ $= 2 \times 300V_{eff}$	$I_o = \text{max. } 60$ $= \text{max. } 75$ $= \text{max. } 100$	$C_{filt} = \text{max. } 60\mu\text{F}$	
AZ 4 Full wave rectifier	$V_f = 4\text{ V}$ $I_f = 2.3\text{ A}$	Rectifier	$V_{tr} = 2 \times 500V_{eff}$ $= 2 \times 400V_{eff}$ $= 2 \times 300V_{eff}$	$I_o = \text{max. } 120$ $= \text{max. } 150$ $= \text{max. } 200$	$C_{filt} = \text{max. } 60\mu\text{F}$	
AZ 11 Full wave rectifier	$V_f = 4\text{ V}$ $I_f = 1.1\text{ A}$	Rectifier	$V_{tr} = 2 \times 500V_{eff}$ $= 2 \times 400V_{eff}$ $= 2 \times 300V_{eff}$	$I_o = \text{max. } 70$ $= \text{max. } 90$ $= \text{max. } 120$	$C_{filt} = \text{max. } 32\mu\text{F}$	
AZ 12 Full wave rectifier	$V_f = 4\text{ V}$ $I_f = 2.3\text{ A}$	Rectifier	$V_{tr} = 2 \times 500V_{eff}$ $= 2 \times 400V_{eff}$ $= 2 \times 300V_{eff}$	$I_o = \text{max. } 120$ $= \text{max. } 150$ $= \text{max. } 200$	$C_{filt} = \text{max. } 32\mu\text{F}$	

Type	Filament data	Application	Voltages Resistors	Currents (mA)	Characteristic data	Base connections
AZ 31 Full wave rectifier	$V_f = 4\text{ V}$ $I_f = 1.1\text{ A}$	Rectifier	$V_{tr} = 2 \times 500V_{eff}$ $= 2 \times 400V_{eff}$ $= 2 \times 300V_{eff}$	$I_o = \text{max. } 60$ $= \text{max. } 75$ $= \text{max. } 100$	$C_{filt} = \text{max. } 60\mu\text{F}$	
AZ 41 Full wave rectifier	$V_f = 4\text{ V}$ $I_f = 0.72\text{ A}$	Rectifier	$V_{tr} = 2 \times 500V_{eff}$ $= 2 \times 400V_{eff}$ $= 2 \times 300V_{eff}$	$I_o = \text{max. } 60$ $= \text{max. } 60$ $= \text{max. } 70$	$C_{filt} = \text{max. } 50\mu\text{F}$	
AZ 50 Full wave rectifier	$V_f = 4\text{ V}$ $I_f = 3\text{ A}$	Rectifier	$V_{tr} = 2 \times 500V_{eff}$ $= 2 \times 400V_{eff}$ $= 2 \times 300V_{eff}$	$I_o = \text{max. } 250$ $= \text{max. } 275$ $= \text{max. } 300$	$C_{filt} = \text{max. } 64\mu\text{F}$ $R_t = \text{min. } 200\Omega$ $C_{filt} = \text{max. } 32\mu\text{F}$ $R_t = \text{min. } 150\Omega$ $C_{filt} = \text{max. } 16\mu\text{F}$ $R_t = \text{min. } 100\Omega$	
B 405 Output triode	$V_f = 4\text{ V}$ $I_f = 150\text{ mA}$	Typical characteristics	$V_a = 150\text{ V}$ $V_g = -18\text{ V}$	$I_a = 11$	$S = 1.6\text{ mA/V}$ $R_t = 3\text{ k}\Omega$ $\mu = 5$	
B 406 Output triode	$V_f = 4\text{ V}$ $I_f = 100\text{ mA}$	Typical characteristics	$V_a = 150\text{ V}$ $V_g = -15\text{ V}$	$I_a = 8$	$S = 1.3\text{ mA/V}$ $R_t = 4.5\text{ k}\Omega$ $\mu = 6$	
B 409 Output triode	$V_f = 4\text{ V}$ $I_f = 150\text{ mA}$	Class A output amplifier	$V_a = 250\text{ V}$ $V_g = -16\text{ V}$	$I_a = 12$	$S = 1.8\text{ mA/V}$ $R_t = 5\text{ k}\Omega$ $R_a = 12\text{ k}\Omega$ $W_a = 3\text{ W}$ $W_o = 0.65\text{ W}$	
B 424 Triode	$V_f = 4\text{ V}$ $I_f = 100\text{ mA}$	Typical characteristics	$V_a = 200\text{ V}$ $V_g = -3\text{ V}$	$I_a = 6$	$S = 2.5\text{ mA/V}$ $R_t = 9\text{ k}\Omega$ $\mu = 24$	
B 438 Triode	$V_f = 4\text{ V}$ $I_f = 100\text{ mA}$	Typical characteristics	$V_a = 200\text{ V}$ $V_g = -1.6\text{ V}$	$I_a = 2.5$	$S = 1.5\text{ mA/V}$ $R_t = 25\text{ k}\Omega$ $\mu = 38$	
B 442 Tetrode	$V_f = 4\text{ V}$ $I_f = 100\text{ mA}$	H.F. amplifier	$V_a = 200\text{ V}$ $V_{g2} = 100\text{ V}$ $V_{g1} = -1\text{ V}$	$I_a = 4.5$	$S = 0.9\text{ mA/V}$ $R_t = 0.4\text{ M}\Omega$ $C_{ag1} < 0.005\text{ pF}$	
B 443 Output pentode	$V_f = 4\text{ V}$ $I_f = 150\text{ mA}$	Class A output amplifier	$V_a = 250\text{ V}$ $V_{g2} = 150\text{ V}$ $V_{g1} = -19\text{ V}$	$I_a = 12$ $I_{g2} = 2.4$	$S = 1.3\text{ mA/V}$ $R_t = 45\text{ k}\Omega$ $R_a = 20\text{ k}\Omega$ $W_a = 3\text{ W}$ $W_o = 1.3\text{ W}$	

Type	Filament data	Application	Voltages Resistors	Currents (mA)	Characteristic data	Base connections
B 543 Output pentode	$V_f = 5\text{ V}$ $I_f = 100\text{ mA}$	Class A output amplifier	$V_a = 200\text{ V}$ $V_{g2} = 150\text{ V}$ $V_{g1} = -15\text{ V}$	$I_a = 12$	$S = 1.3\text{ mA/V}$ $R_i = 45\text{ k}\Omega$	
C 1 Current regulator tube		Current regulator	$V_{contr} = 80-200\text{ V}$	$I_{reg} = 200$		
C 2 Current regulator tube		Current regulator	$V_{contr} = 35-100\text{ V}$	$I_{reg} = 200$		
C 3 Current regulator tube		Current regulator with switching-on current limiting resistance	$V_{contr} = 100-200\text{ V}$	$I_{reg} = 200$		
C 4 Current regulator tube		Current regulator	$V_{contr} = 55-105\text{ V}$	$I_{reg} = 200$		
C 8 Current regulator tube		Current regulator	$V_{contr} = 80-200\text{ V}$	$I_{reg} = 200$		
C 9 Current regulator tube		Current regulator	$V_{contr} = 35-100\text{ V}$	$I_{reg} = 200$		
C 10 Current regulator tube		Current regulator	$V_{contr} = 35-100\text{ V}$	$I_{reg} = 200$		
C 12 Current regulator tube		Current regulator	r1: $V_{contr} = 80-200\text{ V}$ r2: $V_{contr} = 35-100\text{ V}$	$I_{reg} = 200$ $I_{reg} = 200$		
C 243 N Output pentode	$V_f = 2\text{ V}$ $I_f = 0.2\text{ A}$	Class A output amplifier	$V_a = 150\text{ V}$ $V_{g2} = 150\text{ V}$ $V_{g1} = -4.5\text{ V}$	$I_a = 9.5$ $I_{g2} = 2.2$	$S = 2.4\text{ mA/V}$ $R_i = 75\text{ k}\Omega$ $R_a = 15\text{ k}\Omega$ $W_a = 1.5\text{ W}$ $W_o = 0.58\text{ W}$	
C 408 Triode for valve voltmeter	$V_f = 4\text{ V}$ $I_f = 0.25\text{ A}$	Typical Characteristics	$V_a = 150\text{ V}$ $V_g = -7\text{ V}$	$I_a = 14$	$S = 2.7\text{ mA/V}$ $R_i = 3\text{ k}\Omega$ $\mu = 8$	

Type	Filament data	Application	Voltages Resistors	Currents (mA)	Characteristic data	Base connections
C 443 Output pentode	$V_f = 4 \text{ V}$ $I_f = 0.25 \text{ A}$	Class A output amplifier	$V_a = 300 \text{ V}$ $V_{g2} = 200 \text{ V}$ $V_{g1} = -25 \text{ V}$	$I_a = 20$ $I_{g2} = 4.5$	$S = 1.7 \text{ mA/V}$ $R_i = 35 \text{ k}\Omega$ $R_c = 15 \text{ k}\Omega$ $W_a = 6 \text{ W}$ $W_o = 2.8 \text{ W}$	
CB 1 Double diode	$V_f = 13 \text{ V}$ $I_f = 0.2 \text{ A}$	Detector and A.V.C.				
CB 2 Double diode	$V_f = 13 \text{ V}$ $I_f = 0.2 \text{ A}$	Detector and A.V.C.				
CBC 1 Double diode-triode	$V_f = 13 \text{ V}$ $I_f = 0.2 \text{ A}$	Typical characteristics	$V_a = 200 \text{ V}$ $V_g = -5.5 \text{ V}$	$I_a = 4$	$S = 2.0 \text{ mA/V}$ $R_i = 13.5 \text{ k}\Omega$ $\mu = 27$	
			$V_a = 100 \text{ V}$ $V_g = -2.5 \text{ V}$	$I_a = 2.0$	$S = 1.8 \text{ mA/V}$ $R_i = 15 \text{ k}\Omega$ $\mu = 27$	
CBL 1 Double diode-output pentode	$V_f = 44 \text{ V}$ $I_f = 0.2 \text{ A}$	Class A output amplifier	$V_a = 200 \text{ V}$ $V_{g2} = 200 \text{ V}$ $V_{g1} = -8.5 \text{ V}$ $R_k = 170 \Omega$	$I_a = 45$ $I_{g2} = 6$	$S = 8 \text{ mA/V}$ $R_i = 40 \text{ k}\Omega$ $R_a = 4.5 \text{ k}\Omega$ $W_a = 9 \text{ W}$ $W_o = 4 \text{ W}$	
			$V_a = 100 \text{ V}$ $V_{g2} = 100 \text{ V}$ $V_{g1} = -4 \text{ V}$ $R_k = 170 \Omega$	$I_a = 21$ $I_{g2} = 3$	$S = 6.5 \text{ mA/V}$ $R_i = 48 \text{ k}\Omega$ $R_a = 4.5 \text{ k}\Omega$ $W_o = 0.85 \text{ W}$	
CC 2 Triode	$V_f = 13 \text{ V}$ $I_f = 0.2 \text{ A}$	Typical characteristics	$V_a = 200 \text{ V}$ $V_g = -4 \text{ V}$	$I_a = 6$	$S = 2.5 \text{ mA/V}$ $R_i = 12 \text{ k}\Omega$ $\mu = 30$	
			$V_a = 100 \text{ V}$ $V_g = -2.5 \text{ V}$	$I_a = 2.0$	$S = 1.8 \text{ mA/V}$ $R_i = 16 \text{ k}\Omega$ $\mu = 30$	
C/EM 2 Tuning indicator	$V_f = 6.3 \text{ V}$ $I_f = 0.2 \text{ A}$	Typical characteristics (triode section)	$V_a = 250 \text{ V}$ $V_g = -3.5 \text{ V}$	$i_a = 3$	$S = 2.0 \text{ mA/V}$ $R_i = 25 \text{ k}\Omega$ $\mu = 50$	
			$V_a = 200 \text{ V}$ $V_g = -2.5 \text{ V}$	$i_a = 3$	$S = 2.0 \text{ mA/V}$ $R_i = 25 \text{ k}\Omega$ $\mu = 50$	
		Tuning indicator (indicator section)	$V_b = V_l = 250 \text{ V}$ $V_a, T = 250 \text{ V}$ $V_k = -6/+3 \text{ V}$		$\alpha = 175/20^6$	
		Tuning indicator (indicator section)	$V_b = V_l = 200 \text{ V}$ $V_a, T = 200 \text{ V}$ $V_g = -4.5/+5 \text{ V}$		$\alpha = 175/20^6$	

Type	Filament data	Application	Voltages Resistors	Currents (mA)	Characteristic data	Base connections
CF 1 Pentode	$V_f = 13\text{ V}$ $I_f = 0.2\text{ A}$	H.F. amplifier	$V_a = 200\text{ V}$ $V_{g2} = 100\text{ V}$ $V_{g1} = -2\text{ V}$	$I_a = 3$ $I_{g2} = 0.9$	$S = 2.3\text{ mA/V}$ $R_i = 1.7\text{ M}\Omega$ $C_{ag1} < 0.003\text{ pF}$	
CF 2 Variable mu pentode	$V_f = 13\text{ V}$ $I_f = 0.2\text{ A}$	H.F. or I.F. amplifier	$V_a = 200\text{ V}$ $V_{g2} = 100\text{ V}$ $V_{g1} = -2\text{ V}$	$I_a = 4.5$ $I_{g2} = 1.4$	$S = 2.2\text{ mA/V}$ $R_i = 1.4\text{ M}\Omega$ $C_{ag1} < 0.003\text{ pF}$	
CF 3 Variable mu pentode	$V_f = 13\text{ V}$ $I_f = 0.2\text{ A}$	H.F. or I.F. amplifier	$V_a = 200\text{ V}$ $V_{g2} = 100\text{ V}$ $V_{g1} = -3\text{ V}$	$I_a = 8$ $I_{g2} = 2.6$	$S = 1.8\text{ mA/V}$ $R_i = 0.9\text{ M}\Omega$ $C_{ag1} < 0.003\text{ pF}$	
CF 7 Pentode	$V_f = 13\text{ V}$ $I_f = 0.2\text{ A}$	H.F. amplifier	$V_a = 200\text{ V}$ $V_{g2} = 100\text{ V}$ $V_{g1} = -2\text{ V}$	$I_a = 3$ $I_{g2} = 1.1$	$S = 2.1\text{ mA/V}$ $R_i = 2\text{ M}\Omega$ $C_{ag1} < 0.003\text{ pF}$	
		L.F. amplifier	$V_b = 200\text{ V}$ $R_a = 0.2\text{ M}\Omega$ $R_{g2} = 0.25\text{ M}\Omega$ $R_k = 4\text{ k}\Omega$	$I_a = 1.0$ $I_{g2} = 0.3$	$g = 135$	
CF 50 L.F. Pentode	$V_f = 30\text{ V}$ $I_f = 0.2\text{ A}$	Typical characteristics	$V_a = 250\text{ V}$ $V_{g2} = 100\text{ V}$ $V_{g1} = -2\text{ V}$	$I_a = 1.5$ $I_{g2} = 0.3$	$S = 3.3\text{ mA/V}$ $R_i = 2.5\text{ M}\Omega$ $\mu_{g2g1} = 45$	
		Microphone amplifier	$V_a = 250\text{ V}$ $R_a = 0.3\text{ M}\Omega$ $R_{g2} = 0.9\text{ M}\Omega$ $R_k = 2\text{ k}\Omega$	$I_a = 0.7$ $I_{g2} = 0.18$	$g = 315$	
CK 1 Octode	$V_f = 13\text{ V}$ $I_f = 0.2\text{ A}$	Frequency changer	$V_a = 200\text{ V}$ $V_{g3+g5} = 70\text{ V}$ $V_{g4} = -1.5\text{ V}$ $V_{g2} = 90\text{ V}$ $V_{g1} = 50\text{ k}\Omega$	$I_a = 1.6$ $I_{g3+g5} = 3.8$ $I_{g2} = 2.0$ $I_{g1} = 0.19$	$S_c = 0.6\text{ mA/V}$ $R_i = 1.5\text{ M}\Omega$	
			$V_a = 100\text{ V}$ $V_{g3+g5} = 70\text{ V}$ $V_{g4} = -1.5\text{ V}$ $V_{g2} = 90\text{ V}$ $V_{g1} = 50\text{ k}\Omega$	$I_a = 1.6$ $I_{g3+g5} = 3.8$ $I_{g2} = 2.0$ $I_{g1} = 0.19$	$S_c = 0.55\text{ mA/V}$ $R_i = 1\text{ M}\Omega$	

Type	Filament data	Application	Voltages Resistors	Currents (mA)	Characteristic data	Base connections
CL 1 Output pentode	$V_f = 13 \text{ V}$ $I_f = 0.2 \text{ A}$	Class A output amplifier	$V_a = 200 \text{ V}$ $V_{g2} = 200 \text{ V}$ $V_{g1} = -14 \text{ V}$ $R_k = 500 \Omega$	$I_a = 25$ $I_{g2} = 2.5$	$S = 2.5 \text{ mA/V}$ $R_i = 50 \text{ k}\Omega$ $R_a = 8 \text{ k}\Omega$ $W_a = 5 \text{ W}$ $W_o = 1.7 \text{ W}$	
CL 2 Output pentode	$V_f = 24 \text{ V}$ $I_f = 0.2 \text{ A}$	Class A output amplifier	$V_a = 200 \text{ V}$ $V_{g2} = 100 \text{ V}$ $V_{g1} = -19 \text{ V}$ $R_k = 420 \Omega$	$I_a = 40$ $I_{g2} = 5.7$	$S = 3.1 \text{ mA/V}$ $R_i = 23 \text{ k}\Omega$ $R_a = 5 \text{ k}\Omega$ $W_a = 8 \text{ W}$ $W_o = 3 \text{ W}$	
			$V_a = 100 \text{ V}$ $V_{g2} = 100 \text{ V}$ $V_{g1} = -15 \text{ V}$ $R_k = 260 \Omega$	$I_a = 50$ $I_{g2} = 8$	$S = 3.8 \text{ mA/V}$ $R_i = 16 \text{ k}\Omega$ $R_a = 2 \text{ k}\Omega$ $W_a = 8 \text{ W}$ $W_o = 1.7 \text{ W}$	
CL 4 Output pentode	$V_f = 33 \text{ V}$ $I_f = 0.2 \text{ A}$	Class A output amplifier	$V_a = 200 \text{ V}$ $V_{g2} = 200 \text{ V}$ $V_{g1} = -8.5 \text{ V}$ $R_k = 170 \Omega$	$I_a = 45$ $I_{g2} = 6$	$S = 8 \text{ mA/V}$ $R_i = 35 \text{ k}\Omega$ $R_a = 4.5 \text{ k}\Omega$ $W_a = 9 \text{ W}$ $W_o = 4 \text{ W}$	
		Class AB push-pull amplifier	$V_a = 200 \text{ V}$ $V_{g2} = 200 \text{ V}$ $R_k = 140 \Omega$	$I_a \text{ min} = 2 \times 33$ $I_a \text{ max} = 2 \times 40$ $I_{g2} \text{ min} = 2 \times 3.5$ $I_{g2} \text{ max} = 2 \times 6$	$R_{aa} = 4.5 \text{ k}\Omega$ $W_o = 8 \text{ W}$	
CL 6 Output pentode	$V_f = 35 \text{ V}$ $I_f = 0.2 \text{ A}$	Class A output amplifier	$V_a = 200 \text{ V}$ $V_{g2} = 100 \text{ V}$ $V_{g1} = -9.5 \text{ V}$ $R_k = 190 \Omega$	$I_a = 45$ $I_{g2} = 5.5$	$S = 8 \text{ mA/V}$ $R_i = 22 \text{ k}\Omega$ $R_a = 4.5 \text{ k}\Omega$ $W_a = 9 \text{ W}$ $W_o = 4 \text{ W}$	
			$V_a = 100 \text{ V}$ $V_{g2} = 100 \text{ V}$ $V_{g1} = -8.3 \text{ V}$ $R_k = 140 \Omega$	$I_a = 50$ $I_{g2} = 9$	$S = 8.5 \text{ mA/V}$ $R_i = 12 \text{ k}\Omega$ $R_a = 2 \text{ k}\Omega$ $W_o = 2.1 \text{ W}$	
		Class AB push-pull amplifier	$V_a = 200 \text{ V}$ $R_{g2} = 10 \text{ k}\Omega$ $R_k = 2 \times 190 \Omega$	$I_a \text{ min} = 2 \times 45^1$ $I_a \text{ max} = 2 \times 40^1$ $I_{g2} \text{ min} = 2 \times 5.2$ $I_{g2} \text{ max} = 2 \times 6.2$	$R_{aa} = 6 \text{ k}\Omega$ $W_o = 6.8 \text{ W}$	
			$V_a = 100 \text{ V}$ $V_{g2} = 100 \text{ V}$ $R_k = 2 \times 190 \Omega$	$I_a \text{ min} = 2 \times 42$ $I_a \text{ max} = 2 \times 42$ $I_{g2} \text{ min} = 2 \times 7.5$ $I_{g2} \text{ max} = 2 \times 12.5$	$R_{aa} = 3 \text{ k}\Omega$ $W_o = 4 \text{ W}$	
CY 1 Half-wave rectifier	$V_f = 20 \text{ V}$ $I_f = 0.2 \text{ A}$	Rectifier	$V_i = 250 \text{ V}_{eff}$	$I_o = \text{max. } 80$	$C_{filt} = 32/16 \mu\text{F}$ $R_t = \text{min. } 125/75 \Omega$	

¹⁾ $I_a \text{ min.}$ in this case will mean that $V_i = 0$.

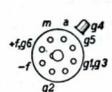
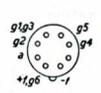
$I_a \text{ max.}$ in this case will mean that $W_o = \text{max.}$

Type	Filament data	Application	Voltages Resistors	Currents (mA)	Characteristic data	Base connections
CY 1 Continued	$V_f = 20\text{ V}$ $I_f = 0.2\text{ A}$	Rectifier	$V_i = 127\text{ V}_{eff}$	$I_o = \text{max. } 80$	$C_{filt} = \text{max. } 32\mu\text{F}$ $R_t = 0\Omega$	
CY 2 Double half-wave rectifier	$V_f = 30\text{ V}$ $I_f = 0.2\text{ A}$	Rectifier (Cathodes and anodes interconnected)	$V_i = 250\text{ V}_{eff}$	$I_o = \text{max. } 120$	$C_{filt} = 32/16\mu\text{F}$ $R_t = \text{min. } 125/75\Omega$	
		Voltage doubler	$V_i = 127\text{ V}_{eff}$	$I_o = \text{max. } 60$	$C_{filt} = \text{max. } 32\mu\text{F}$ $R_t = 0\Omega$	
D 404 Output triode	$V_f = 4\text{ V}$ $I_f = 0.65\text{ A}$	Class A output amplifier	$V_a = 250\text{ V}$ $V_g = -40\text{ V}$	$I_a = 40$	$S = 2.7\text{ mA/V}$ $R_i = 1.3\text{ k}\Omega$ $R_a = 3.5\text{ k}\Omega$ $W_a = 10\text{ W}$ $W_o = 1.7\text{ W}$	
D 1 F Variable mu pentode (Acorn valve)	$V_f = 1.4\text{ V}$ $I_f = 100\text{ mA}$	H.F. or I.F. amplifier	$V_a = 150\text{ V}$ $R_{g2} = 50\text{ k}\Omega$ $V_{g1} = -1.5\text{ V}$	$I_a = 3$ $I_{g2} = 1$	$S = 1.8\text{ mA/V}$ $R_i = 0.5\text{ M}\Omega$	Connections see on page 61
		Modulator	$V_a = 150\text{ V}$ $R_{g2} = 38\text{ k}\Omega$ $V_{g1} = -1.5\text{ V}$	$I_a = 1$ $I_{g2} = 1.3$	$S_c = 500\mu\text{A/V}$ $V_{osc}(\text{on } \epsilon_3) = 12\text{ V}_{eff}$ $R_i = 0.4\text{ M}\Omega$	
		Output amplifier	$V_a = 150\text{ V}$ $V_{g2} = 150\text{ V}$ $V_{g1} = -2.5\text{ V}$	$I_a = 5$ $I_{g2} = 1.8$	$S = 2.2\text{ mA/V}$ $R_i = 0.3\text{ M}\Omega$ $R_a = 30\text{ k}\Omega$ $W_o = 0.28\text{ W}$	
D 2 F H.F. pentode (Acorn valve)	$V_f = 1.4\text{ V}$ $I_f = 240\text{ mA}$	Class A output amplifier	$V_a = 250\text{ V}$ $V_{g2} = 250\text{ V}$ $V_{g1} = -5.5\text{ V}$	$I_a = 10$ $I_{g2} = 1.8$	$S = 3.4\text{ mA/V}$ $R_i = 0.5\text{ M}\Omega$ $R_a = 25\text{ k}\Omega$ $W_o = 1.2\text{ W}$	Connections see on page 61
		Class AB push pull amplifier	$V_a = 250\text{ V}$ $V_{g2} = 250\text{ V}$ $V_{g1} = -7\text{ V}$	$I_a \text{ min.} = 2 \times 4$ $I_a \text{ max.} = 2 \times 12$ $I_{g2} \text{ min.} = 2 \times 0.8$ $I_{g2} \text{ max.} = 2 \times 3.1$	$R_{aa} = 20\text{ k}\Omega$ $W_o = 3.4\text{ W}$	
DA 50 Diode for measuring apparatus	$V_f = 1.2\text{ V}$ $I_f = 300\text{ mA}$	Typical characteristics	$V_d = \text{max. } 125\text{ V}$	$I_d = \text{max. } 0.2$	$C_{df} = 0.16\text{ pF}$ $\lambda_{res} = \pm 18\text{ cm}$	

Type	Filament data	Application	Voltages Resistors	Currents (mA)	Characteristic data	Base connections
DAC 21 Diode-triode	$V_f = 1.4 \text{ V}$ $I_f = 25 \text{ mA}$	Typical characteristics	$V_a = 120 \text{ V}$ $V_g = 0 \text{ V}$	$I_a = 0.75$	$S = 0.4 \text{ mA/V}$ $R_t = 0.1 \text{ M}\Omega$ $\mu = 40$	
			$V_a = 90 \text{ V}$ $V_g = 0 \text{ V}$	$I_a = 0.45$	$S = 0.3 \text{ mA/V}$ $R_t = 0.13 \text{ M}\Omega$ $\mu = 40$	
		L.F. amplifier	$V_b = 120 \text{ V}$ $V_g = 0 \text{ V}$ $R_a = 0.5 \text{ M}\Omega$	$I_a = 0.12$	$g = 25$	
			$V_b = 90 \text{ V}$ $V_g = 0 \text{ V}$ $R_a = 0.5 \text{ M}\Omega$	$I_a = 0.08$	$g = 23$	
DAC 25 Diode-triode	$V_f = 1.2 \text{ V}$ $I_f = 25 \text{ mA}$	Typical characteristics	$V_a = 120 \text{ V}$ $V_g = 0 \text{ V}$	$I_a = 0.6$	$S = 0.35 \text{ mA/V}$ $R_t = 0.11 \text{ M}\Omega$ $\mu = 40$	
			$V_a = 90 \text{ V}$ $V_g = 0 \text{ V}$	$I_a = 0.35$	$S = 0.3 \text{ mA/V}$ $R_t = 0.13 \text{ M}\Omega$ $\mu = 40$	
DAF 40 Diode-H.F. pentode	$V_f = 1.4 \text{ V}$ $I_f = 25 \text{ mA}$	H.F. or I.F. amplifier	$V_a = 120 \text{ V}$ $R_{g2} = 0.27 \text{ M}\Omega$ $V_{g1} = 0 \text{ V}$	$I_a = 0.85$ $I_{g2} = 0.20$	$S = 0.7 \text{ mA/V}$ $R_t = 2.5 \text{ M}\Omega$ $C_{ag1} < 0.007 \text{ pF}$	
			$V_a = 67.5 \text{ V}$ $V_{g2} = 67.5 \text{ V}$ $V_{g1} = 0 \text{ V}$	$I_a = 0.85$ $I_{g2} = 0.20$	$S = 0.7 \text{ mA/V}$ $R_t = 1.7 \text{ M}\Omega$ $C_{ag1} < 0.007 \text{ pF}$	
DAF 41 Diode-L.F. pentode	$V_f = 1.4 \text{ V}$ $I_f = 25 \text{ mA}$	L.F. amplifier	$V_b = 150 \text{ V}$ $R_a = 0.47 \text{ M}\Omega$ $R_{g2} = 2.2 \text{ M}\Omega$ $V_{g1} = 0 \text{ V}$	$I_a = 0.24$ $I_{g2} = 0.05$	$g = 112$	
			$V_b = 90 \text{ V}$ $R_a = 0.47 \text{ M}\Omega$ $R_{g2} = 2.2 \text{ M}\Omega$ $V_{g1} = 0 \text{ V}$	$I_a = 0.13$ $I_{g2} = 0.03$	$g = 83$	
			$V_b = 67.5 \text{ V}$ $R_a = 0.22 \text{ M}\Omega$ $R_{g2} = 0.82 \text{ M}\Omega$ $V_{g1} = 0 \text{ V}$	$I_a = 0.17$ $I_{g2} = 0.04$	$g = 60$	
DAF 91 Diode pentode	$V_f = 1.4 \text{ V}$ $I_f = 50 \text{ mA}$	Typical characteristics	$V_a = 67.5 \text{ V}$ $V_{g2} = 67.5 \text{ V}$ $V_{g1} = 0 \text{ V}$	$I_a = 1.6$ $I_{g2} = 0.4$	$S = 0.62 \text{ mA/V}$ $R_t = 0.6 \text{ M}\Omega$	

Type	Filament data	Application	Voltages Resistors	Currents (mA)	Characteristic data	Base connections
DAF 91 Continued	$V_f = 1.4 \text{ V}$ $I_f = 50 \text{ mA}$	L. F. amplifier	$V_b = 90 \text{ V}$ $R_a = 1 \text{ M}\Omega$ $R_{g2} = 3.3 \text{ M}\Omega$ $V_{g1} = 0 \text{ V}$ $R_{g1} = 10 \text{ M}\Omega$	$I_b = 0.10$	$g = 67$	
			$V_b = 67.5 \text{ V}$ $R_a = 1 \text{ M}\Omega$ $R_{g2} = 3.3 \text{ M}\Omega$ $V_{g1} = 0 \text{ V}$ $R_{g1} = 10 \text{ M}\Omega$	$I_b = 0.08$	$g = 60$	
			$V_b = 45 \text{ V}$ $R_a = 1 \text{ M}\Omega$ $R_{g2} = 3.3 \text{ M}\Omega$ $V_{g1} = 0 \text{ V}$ $R_{g1} = 10 \text{ M}\Omega$	$I_b = 0.05$	$g = 45$	
DBC 21 Double diode-triode	$V_f = 1.4 \text{ V}$ $I_f = 50 \text{ mA}$	Typical characteristics	$V_a = 120 \text{ V}$ $V_g = -1.5 \text{ V}$	$I_a = 1.6$	$S = 0.9 \text{ mA/V}$ $R_i = 28 \text{ k}\Omega$ $\mu = 25$	
			$V_a = 90 \text{ V}$ $V_g = -0.5 \text{ V}$	$I_a = 1.4$	$S = 0.85 \text{ mA/V}$ $R_i = 30 \text{ k}\Omega$ $\mu = 25$	
		L. F. amplifier	$V_b = 120 \text{ V}$ $R_a = 0.5 \text{ M}\Omega$ $V_g = -1 \text{ V}$	$I_a = 0.14$	$g = 19.5$	
			$V_b = 90 \text{ V}$ $R_a = 0.5 \text{ M}\Omega$ $V_g = -0.5 \text{ V}$	$I_a = 0.09$	$g = 19$	
DC 25 Triode	$V_f = 1.2 \text{ V}$ $I_f = 25 \text{ mA}$	Typical characteristics	$V_a = 120 \text{ V}$ $V_g = -5.5 \text{ V}$	$I_a = 2.1$	$S = 0.85 \text{ mA/V}$ $R_i = 15 \text{ k}\Omega$ $\mu = 13$	
			$V_a = 90 \text{ V}$ $V_g = -3.5 \text{ V}$	$I_a = 1.8$	$S = 0.8 \text{ mA/V}$ $R_i = 16 \text{ k}\Omega$ $\mu = 13$	
DCH 25 Triode-hexode	$V_f = 1.2 \text{ V}$ $I_f = 100 \text{ mA}$	Frequency changer	$V_a = 120 \text{ V}$ $V_{g2+g4} = 60 \text{ V}$ $R_{gT+g3} = 50 \text{ k}\Omega$ $V_{osc} = 4.5 \text{ V}_{eff}$ $V_{g1} = 0 \text{ V}$	$I_a = 1$ $I_{g2+g4} = 1$ $I_{gT+g3} = 0.1$	$S_c = 280 \mu\text{A/V}$ $R_i = 1.3 \text{ M}\Omega$	
			$V_a = 90 \text{ V}$ $V_{g2+g4} = 50 \text{ V}$ $R_{gT+g3} = 50 \text{ k}\Omega$ $V_{osc} = 3.5 \text{ V}_{eff}$ $V_{g1} = 0 \text{ V}$	$I_a = 0.75$ $I_{g2+g4} = 0.8$ $I_{gT+g3} = 0.08$	$S_c = 250 \mu\text{A/V}$ $R_i = 1 \text{ M}\Omega$	

Type	Filament data	Application	Voltages Resistors	Currents (mA)	Characteristic data	Base connections
DCH 25 Continued	$V_f = 1.2V$ $I_f = 100mA$	Triode oscillator	$V_b = 120V$ $R_a = 43k\Omega$ $R_{gT+g3} = 50k\Omega$	$I_a = 1.4$ $I_{gT+g3} = 0.1$		
			$V_b = 90V$ $R_a = 21k\Omega$ $R_{gT+g3} = 50k\Omega$	$I_a = 1.4$ $I_{gT+g3} = 0.08$		
DDD 25 Double output triode	$V_f = 1.2V$ $I_f = 100mA$	Push-pull output amplifier	$V_a = 120V$ $V_g = -5.5V$	$I_a \text{ min.} = 2 \times 1.1$ $I_a \text{ max.} = 2 \times 9.5$	$R_{aa} = 14k\Omega$ $W_o = 1.4W$	
			$V_a = 90V$ $V_g = -3.5V$	$I_a \text{ min.} = 2 \times 1.2$ $I_a \text{ max.} = 2 \times 5.5$	$R_{aa} = 18k\Omega$ $W_o = 0.55W$	
DF 21 Pentode	$V_f = 1.4V$ $I_f = 25mA$	H.F. or I.F. amplifier	$V_a = 120V$ $R_{g2} = 0.12M\Omega$ $V_{g1} = 0V$	$I_a = 1.2$ $I_{g2} = 0.25$	$S = 0.7mA/V$ $R_i = 2.5M\Omega$ $C_{ag1} < 0.006pF$	
			$V_a = 90V$ $V_{g2} = 90V$ $V_{g1} = 0V$	$I_a = 1.2$ $I_{g2} = 0.25$	$S = 0.7mA/V$ $R_i = 2M\Omega$ $C_{ag1} < 0.006pF$	
		L.F. amplifier	$V_b = 120V$ $R_a = 0.5M\Omega$ $R_{g2} = 2M\Omega$ $V_{g1} = -0.5V$	$I_a = 0.15$ $I_{g2} = 0.03$	$g = 85$	
			$V_b = 90V$ $R_a = 0.5M\Omega$ $R_{g2} = 2M\Omega$ $V_{g1} = -0.5V$	$I_a = 0.10$ $I_{g2} = 0.02$	$g = 69$	
DF 22 Variable mu pentode	$V_f = 1.4V$ $I_f = 50mA$	H.F. or I.F. amplifier	$V_a = 120V$ $R_{g2} = 0.1M\Omega$ $V_{g1} = -1.5V$	$I_a = 1.4$ $I_{g2} = 0.3$	$S = 1.1mA/V$ $R_i = 2.5M\Omega$ $C_{ag1} < 0.005pF$	
			$V_a = 90V$ $V_{g2} = 90V$ $V_{g1} = -1.5V$	$I_a = 1.4$ $I_{g2} = 0.3$	$S = 1.1mA/V$ $R_i = 1.5M\Omega$ $C_{ag1} < 0.005pF$	
DF 25 Variable mu pentode	$V_f = 1.2V$ $I_f = 25mA$	H.F. or I.F. amplifier	$V_a = 120V$ $V_{g2} = 60V$ $V_{g1} = -0.5V$	$I_a = 1$ $I_{g2} = 0.22$	$S = 0.63mA/V$ $R_i = 2.5M\Omega$ $C_{ag1} < 0.01pF$	
			$V_a = 90V$ $V_{g2} = 50V$ $V_{g1} = -0.5V$	$I_a = 0.65$ $I_{g2} = 0.15$	$S = 0.58mA/V$ $R_i = 2.5M\Omega$ $C_{ag1} < 0.01pF$	
DF 70 Pentode for hearing aids	$V_f = 0.625V$ $I_f = 25mA$	Typical characteristics	$V_a = 30V$ $V_{g2} = 30V$ $V_{g1} = -1.85V$	$I_a = 0.05$ $I_{g2} = 0.018$	$S = 0.1mA/V$ $\mu_{g2g1} = 12.5$ $R_i = 2.5M\Omega$	

Type	Filament data	Application	Voltages Resistors	Currents (mA)	Characteristic data	Base connections
DF 91 Variable mu pentode	$V_f = 1.4\text{ V}$ $I_f = 50\text{ mA}$	H.F. or I.F. amplifier	$V_a = 90\text{ V}$ $V_{g2} = 67.5\text{ V}$ $V_{g1} = 0\text{ V}$	$I_a = 3.5$ $I_{g2} = 1.4$	$S = 0.9\text{ mA/V}$ $R_i = 0.5\text{ M}\Omega$ $C_{ag1} < 0.01\text{ pF}$	
			$V_a = 67.5\text{ V}$ $V_{g2} = 67.5\text{ V}$ $V_{g1} = 0\text{ V}$	$I_a = 3.4$ $I_{g2} = 1.5$	$S = 0.87\text{ mA/V}$ $R_i = 0.25\text{ M}\Omega$ $C_{ag1} < 0.01\text{ pF}$	
			$V_a = 45\text{ V}$ $V_{g2} = 45\text{ V}$ $V_{g1} = 0\text{ V}$	$I_a = 1.7$ $I_{g2} = 0.7$	$S = 0.7\text{ mA/V}$ $R_i = 0.35\text{ M}\Omega$ $C_{ag1} < 0.01\text{ pF}$	
DK 21 Octode	$V_f = 1.4\text{ V}$ $I_f = 50\text{ mA}$	Frequency-changer	$V_a = 120\text{ V}$ $R_{g5} = 0.12\text{ M}\Omega$ $V_{g4} = 0\text{ V}$ $R_{g2} = 25\text{ k}\Omega$ $R_{g1+g3} = 35\text{ k}\Omega$	$I_a = 1.5$ $I_{g5} = 0.25$ $I_{g2} = 2.4$ $I_{g1+g3} = 0.2$	$S_c = 0.5\text{ mA/V}$ $R_i = 1.5\text{ M}\Omega$	
			$V_a = 90\text{ V}$ $V_{g5} = 90\text{ V}$ $V_{g4} = 0\text{ V}$ $R_{g2} = 12.5\text{ k}\Omega$ $R_{g1+g3} = 35\text{ k}\Omega$	$I_a = 1.5$ $I_{g5} = 0.25$ $I_{g2} = 2.4$ $I_{g1+g3} = 0.2$	$S_c = 0.5\text{ mA/V}$ $R_i = 1.2\text{ M}\Omega$	
DK 40 Octode	$V_f = 1.4\text{ V}$ $I_f = 50\text{ mA}$	Frequency-changer	$V_a = 135\text{ V}$ $R_{g5} = 270\text{ k}\Omega$ $V_{g4} = 0\text{ V}$ $R_{g2} = 26\text{ k}\Omega$ $R_{g1+g3} = 35\text{ k}\Omega$ $V_{osc} = 8\text{ V}_{eff}$	$I_a = 1.0$ $I_{g5} = 0.25$ $I_{g2} = 2.6$	$S_c = 0.42\text{ mA/V}$ $R_i = 1.0\text{ M}\Omega$	
			$V_a = 90\text{ V}$ $R_{g5} = 90\text{ k}\Omega$ $V_{g4} = 0\text{ V}$ $R_{g2} = 8.5\text{ k}\Omega$ $R_{g1+g3} = 35\text{ k}\Omega$ $V_{osc} = 8\text{ V}_{eff}$	$I_a = 1.0$ $I_{g5} = 0.25$ $I_{g2} = 2.6$	$S_c = 0.42\text{ mA/V}$ $R_i = 1.0\text{ M}\Omega$	
			$V_a = 67.5\text{ V}$ $V_{g5} = 67.5\text{ V}$ $V_{g4} = 0\text{ V}$ $V_{g2} = 67.5\text{ V}$ $R_{g1+g3} = 35\text{ k}\Omega$ $V_{osc} = 8\text{ V}_{eff}$	$I_a = 1.0$ $I_{g5} = 0.25$ $I_{g2} = 2.6$	$S_c = 0.42\text{ mA/V}$ $R_i = 0.9\text{ M}\Omega$	
DK 91 Heptode	$V_f = 1.4\text{ V}$ $I_f = 50\text{ mA}$	Frequency-changer	$V_a = 90\text{ V}$ $V_{g2+g4} = 67.5\text{ V}$ $V_{g3} = 0\text{ V}$ $R_{g1} = 0.1\text{ M}\Omega$	$I_a = 1.6$ $I_{g2+g4} = 3.2$ $I_{g1} = 0.25$	$S_c = 0.30\text{ mA/V}$ $R_i = 0.6\text{ M}\Omega$	

Type	Filament data	Application	Voltages Resistors	Currents (mA)	Characteristic data	Base connections
DK 91 Continued	$V_f = 1.4 \text{ V}$ $I_f = 50 \text{ mA}$	Frequency-changer	$V_a = 67.5 \text{ V}$ $V_{g2+g4} = 67.5 \text{ V}$ $V_{g3} = 0 \text{ V}$ $R_{g1} = 0.1 \text{ M}\Omega$	$I_a = 1.4$ $I_{g2+g4} = 3.2$ $I_{g1} = 0.25$	$S_c = 0.28 \text{ mA/V}$ $R_i = 0.5 \text{ M}\Omega$	
			$V_a = 45 \text{ V}$ $V_{g2+g4} = 45 \text{ V}$ $V_{g3} = 0 \text{ V}$ $R_{g1} = 0.1 \text{ M}\Omega$	$I_a = 0.7$ $I_{g2+g4} = 1.9$ $I_{g1} = 0.15$	$S_c = 0.23 \text{ mA/V}$ $R_i = 0.6 \text{ M}\Omega$	
DL 21 Output pentode	$V_f = 1.4 \text{ V}$ $I_f = 50 \text{ mA}$	Class A output amplifier	$V_a = 120 \text{ V}$ $V_{g2} = 120 \text{ V}$ $V_{g1} = -4.8 \text{ V}$	$I_a = 5$ $I_{g2} = 0.9$	$S = 1.4 \text{ mA/V}$ $R_i = 0.35 \text{ M}\Omega$ $R_a = 24 \text{ k}\Omega$ $W_o = 0.27 \text{ W}$	
			$V_a = 90 \text{ V}$ $V_{g2} = 90 \text{ V}$ $V_{g1} = -3 \text{ V}$	$I_a = 4$ $I_{g2} = 0.7$	$S = 1.3 \text{ mA/V}$ $R_i = 0.3 \text{ M}\Omega$ $R_a = 22.5 \text{ k}\Omega$ $W_o = 0.16 \text{ W}$	
DL 41 Output pentode	$V_f = 1.4 \text{ V}$ $I_f = 50 \text{ mA}$	Class A output amplifier (current saving circuit)	$V_a = 120 \text{ V}$ $V_{g2} = 120 \text{ V}$ $V_{g1} = -5.8 \text{ V}$	$I_a = 5$ $I_{g2} = 0.82$	$S = 1.35 \text{ mA/V}$ $R_i = 0.16 \text{ M}\Omega$ $R_a = 24 \text{ k}\Omega$ $W_a = 0.6 \text{ W}$ $W_o = 0.3 \text{ W}$	
			$V_a = 90 \text{ V}$ $V_{g2} = 90 \text{ V}$ $V_{g1} = -3.6 \text{ V}$	$I_a = 4$ $I_{g2} = 0.65$	$S = 1.25 \text{ mA/V}$ $R_i = 0.17 \text{ M}\Omega$ $R_a = 22.5 \text{ k}\Omega$ $W_o = 0.18 \text{ W}$	
	$V_f = 1.4 \text{ V}$ $I_f = 100 \text{ mA}$	Class A output amplifier	$V_a = 120 \text{ V}$ $V_{g2} = 120 \text{ V}$ $V_{g1} = -5.7 \text{ V}$	$I_a = 10$ $I_{g2} = 1.65$	$S = 2.55 \text{ mA/V}$ $R_i = 80 \text{ k}\Omega$ $R_a = 12 \text{ k}\Omega$ $W_a = 1.2 \text{ W}$ $W_o = 0.6 \text{ W}$	
			$V_a = 90 \text{ V}$ $V_{g2} = 90 \text{ V}$ $V_{g1} = -3.6 \text{ V}$	$I_a = 8$ $I_{g2} = 1.3$	$S = 2.45 \text{ mA/V}$ $R_i = 90 \text{ k}\Omega$ $R_a = 11 \text{ k}\Omega$ $W_o = 0.36 \text{ W}$	
	$V_f = 1.4 \text{ V}$ $I_f = 100 \text{ mA}$	class B push-pull amplifier	$V_a = 150 \text{ V}$ $V_{g2} = 150 \text{ V}$ $V_{g1} = -13.2 \text{ V}$ $V_i = 10.6 \text{ V}_{eff}$	$I_a \text{ min} = 2 \times 1.5$ $I_a \text{ max} = 2 \times 11.5$ $I_{g2 \text{ min}} = 2 \times 0.25$ $I_{g2 \text{ max}} = 2 \times 4$	$R_{aa} = 15 \text{ k}\Omega$ $W_o = 2.1 \text{ W}$	
DL 71 Output pentode for hearing-aids	$V_f = 1.25 \text{ V}$ $I_f = 25 \text{ mA}$	Typical characteristics	$V_a = 45 \text{ V}$ $V_{g2} = 45 \text{ V}$ $V_{g1} = -1.25 \text{ V}$	$I_a = 0.6$ $I_{g2} = 0.15$	$S = 0.5 \text{ mA/V}$ $R_i = 0.35 \text{ M}\Omega$ $R_a = 0.1 \text{ M}\Omega$ $W_a = 30 \text{ mW}$ $W_o = 6 \text{ mW}$	

Type	Filament data	Application	Voltages Resistors	Currents (mA)	Characteristic data	Base connections
DL 72 Output pentode for hearing-aids	$V_f = 1.25V$ $I_f = 25mA$	Typical characteristics	$V_a = 45V$ $V_{g2} = 45V$ $V_{g1} = -4.5V$	$I_a = 1.25$ $I_{g2} = 0.4$	$S = 0.5 mA/V$ $R_i = 225 k\Omega$ $R_a = 30 k\Omega$ $W_a = 60 mW$ $W_o = 23 mW$	
DL 92 Output pentode	$V_f = 1.4V$ $I_f = 100mA$	Class A output amplifier	$V_a = 90V$ $V_{g2} = 67.5V$ $V_{g1} = -7V$	$I_a = 7.4$ $I_{g2} = 1.4$	$S = 1.575 mA/V$ $R_i = 0.1 M\Omega$ $R_a = 8 k\Omega$ $W_a = 0.7 W$ $W_o = 270 mW$	
			$V_a = 67.5V$ $V_{g2} = 67.5V$ $V_{g1} = -7V$	$I_a = 7.2$ $I_{g2} = 1.5$	$S = 1.55 mA/V$ $R_i = 0.1 M\Omega$ $R_a = 5 k\Omega$ $W_o = 180 mW$	
	$V_a = 90V$ $V_{g2} = 67.5V$ $V_{g1} = -7V$		$I_a = 6.1$ $I_{g2} = 1.1$	$S = 1.425 mA/V$ $R_i = 0.1 M\Omega$ $R_a = 8 k\Omega$ $W_o = 235 mW$		
	$V_a = 67.5V$ $V_{g2} = 67.5V$ $V_{g1} = -7V$		$I_a = 6$ $I_{g2} = 1.2$	$S = 1.4 mA/V$ $R_i = 0.1 M\Omega$ $R_a = 5 k\Omega$ $W_o = 160 mW$		
DLL 21 Double output pentode	$V_f = 1.4V$ $I_f = 100mA$	Class AB push-pull amplifier	$V_a = 120V$ $V_{g2} = 120V$ $V_{g1} = -8.7V$	$I_a min = 2 \times 1.0$ $I_a max = 2 \times 4.1$ $I_{g2 min} = 2 \times 0.16$ $I_{g2 max} = 2 \times 1.1$	$R_{aa} = 30 k\Omega$ $W_o = 0.6 W$	
			$V_a = 90V$ $V_{g2} = 90V$ $V_{g1} = -5.7V$	$I_a min = 2 \times 1.0$ $I_a max = 2 \times 3.0$ $I_{g2 min} = 2 \times 0.16$ $I_{g2 max} = 2 \times 0.7$	$R_{aa} = 30 k\Omega$ $W_o = 0.3 W$	
	$V_a = 135V$ $V_{g2} = 135V$ $V_{g1} = -9.4V$		$I_a min = 2 \times 2.0$ $I_a max = 2 \times 8.8$ $I_{g2 min} = 2 \times 0.35$ $I_{g2 max} = 2 \times 2.3$	$R_{aa} = 15 k\Omega$ $W_o = 1.5 W$		
	$V_a = 120V$ $V_{g2} = 120V$ $V_{g1} = -8.2V$		$I_a min = 2 \times 2.0$ $I_a max = 2 \times 7.5$ $I_{g2 min} = 2 \times 0.35$ $I_{g2 max} = 2 \times 2.0$	$R_{aa} = 15 k\Omega$ $W_o = 1.2 W$		
	$V_a = 135V$ $V_{g2} = 135V$ $V_{g1} = -9.5V$		$I_a min = 2 \times 1.5$ $I_a max = 2 \times 8.2$ $I_{g2 min} = 2 \times 0.25$ $I_{g2 max} = 2 \times 2.4$	$R_{aa} = 15 k\Omega$ $W_o = 1.5 W$		
	$V_a = 120V$ $V_{g2} = 120V$ $V_{g1} = -8.1V$		$I_a min = 2 \times 1.5$ $I_a max = 2 \times 7.1$ $I_{g2 min} = 2 \times 0.25$ $I_{g2 max} = 2 \times 1.9$	$R_{aa} = 15 k\Omega$ $W_o = 1.1 W$		
	$V_a = 90V$ $V_{g2} = 90V$ $V_{g1} = -5.9V$		$I_a min = 2 \times 1.0$ $I_a max = 2 \times 4.4$ $I_{g2 min} = 2 \times 0.2$ $I_{g2 max} = 2 \times 1.3$	$R_{aa} = 20 k\Omega$ $W_o = 0.5 W$		
	$V_a = 120V$ $V_{g2} = 120V$ $V_{g1} = -8.1V$		$I_a min = 2 \times 1.5$ $I_a max = 2 \times 7.1$ $I_{g2 min} = 2 \times 0.25$ $I_{g2 max} = 2 \times 1.9$	$R_{aa} = 15 k\Omega$ $W_o = 1.1 W$		

Type	Filament data	Application	Voltages Resistors	Currents (mA)	Characteristic data	Base connections
E 1 C Acorn triode	$V_f = 6.3 \text{ V}$ $I_f = 0.15 \text{ A}$	Typical characteristics	$V_a = 180 \text{ V}$ $V_g = -5 \text{ V}$	$I_a = 4.5$	$S = 2 \text{ mA/V}$ $R_i = 12.5 \text{ k}\Omega$ $\mu = 25$	see page 61
E 1 F Acorn pentode	$V_f = 6.3 \text{ V}$ $I_f = 0.15 \text{ A}$	H.F. amplifier	$V_a = 250 \text{ V}$ $V_{g2} = 100 \text{ V}$ $V_{g1} = -3 \text{ V}$	$I_a = 2$ $I_{g2} = 0.7$	$S = 1.4 \text{ mA/V}$ $R_i = 1.5 \text{ M}\Omega$ $C_{ag1} < 0.007 \text{ pF}$	see page 61
E 406 N Output triode	$V_f = 4 \text{ V}$ $I_f = 1.0 \text{ A}$	Class A output amplifier	$V_a = 250 \text{ V}$ $V_g = -22 \text{ V}$	$I_a = 48$	$S = 3.5 \text{ mA/V}$ $R_i = 1.7 \text{ k}\Omega$ $R_a = 1.6 \text{ k}\Omega$ $W_a = 12 \text{ W}$ $W_o = 1.5 \text{ W}$	
			$V_a = 500 \text{ V}$ $V_g = -68 \text{ V}$	$I_a = 24$	$S = 3.0 \text{ mA/V}$ $R_i = 2.0 \text{ k}\Omega$ $R_a = 11.5 \text{ k}\Omega$ $W_o = 5.3 \text{ W}$	
E 408 N Output triode	$V_f = 4 \text{ V}$ $I_f = 1.0 \text{ A}$	Class A output amplifier	$V_a = 400 \text{ V}$ $V_g = -36 \text{ V}$	$I_a = 30$	$S = 2.7 \text{ mA/V}$ $R_i = 3.0 \text{ k}\Omega$ $R_a = 6 \text{ k}\Omega$ $W_a = 12 \text{ W}$ $W_o = 2.6 \text{ W}$	
E 409 Triode	$V_f = 4 \text{ V}$ $I_f = 1.0 \text{ A}$	Typical characteristics	$V_a = 200 \text{ V}$ $V_g = -16 \text{ V}$	$I_a = 12$	$S = 1.3 \text{ mA/V}$ $R_i = 7 \text{ k}\Omega$ $\mu = 9$	
E 424 N Triode	$V_f = 4 \text{ V}$ $I_f = 1.0 \text{ A}$	Typical characteristics	$V_a = 200 \text{ V}$ $V_g = -3.5 \text{ V}$	$I_a = 6$	$S = 2.4 \text{ mA/V}$ $R_i = 12.5 \text{ k}\Omega$ $\mu = 30$	
E 428 Triode	$V_f = 4 \text{ V}$ $I_f = 1.0 \text{ A}$	Typical characteristics	$V_a = 200 \text{ V}$ $V_g = -3.5 \text{ V}$	$I_a = 6$	$S = 2.4 \text{ mA/V}$ $R_i = 11.5 \text{ k}\Omega$ $\mu = 28$	
E 438 Triode	$V_f = 4 \text{ V}$ $I_f = 1.0 \text{ A}$	Typical characteristics	$V_a = 200 \text{ V}$ $V_g = -2.5 \text{ V}$	$I_a = 2.5$	$S = 1.0 \text{ mA/V}$ $R_i = 38 \text{ k}\Omega$ $\mu = 38$	
E 442 Tetrode	$V_f = 4 \text{ V}$ $I_f = 1.0 \text{ A}$	H.F. amplifier	$V_a = 200 \text{ V}$ $V_{g2} = 100 \text{ V}$ $V_{g1} = -1.3 \text{ V}$	$I_a = 1.5$ $I_{g2} = 0.6$	$S = 0.9 \text{ mA/V}$ $R_i = 0.8 \text{ M}\Omega$ $C_{ag1} < 0.005 \text{ pF}$	
E 442 S Tetrode	$V_f = 4 \text{ V}$ $I_f = 1.0 \text{ A}$	H.F. amplifier	$V_a = 200 \text{ V}$ $V_{g2} = 60 \text{ V}$ $V_{g1} = -2 \text{ V}$	$I_a = 4$ $I_{g2} = 0.5$	$S = 1.0 \text{ mA/V}$ $R_i = 0.4 \text{ M}\Omega$ $C_{ag1} < 0.02 \text{ pF}$	

Type	Filament data	Application	Voltages Resistors	Currents (mA)	Characteristic data	Base connections
E 443 H Output pentode	$V_f = 4\text{ V}$ $I_f = 1.1\text{ A}$	Class A output amplifier	$V_a = 250\text{ V}$ $V_{g2} = 250\text{ V}$ $V_{g1} = -15\text{ V}$	$I_a = 36$ $I_{g2} = 6.8$	$S = 3\text{ mA/V}$ $R_i = 43\text{ k}\Omega$ $R_a = 7\text{ k}\Omega$ $W_a = 9\text{ W}$ $W_o = 3.1\text{ W}$	
E 443 N Output pentode	$V_f = 4\text{ V}$ $I_f = 1.1\text{ A}$	Class A output amplifier	$V_a = 400\text{ V}$ $V_{g2} = 200\text{ V}$ $V_{g1} = -40\text{ V}$	$I_a = 30$ $I_{g2} = 5.2$	$S = 1.8\text{ mA/V}$ $R_i = 55\text{ k}\Omega$ $R_a = 13.5\text{ k}\Omega$ $W_a = 12\text{ W}$ $W_o = 5.4\text{ W}$	
E 444 Diode-tetrode	$V_f = 4\text{ V}$ $I_f = 1.1\text{ A}$	L.F. amplifier	$V_b = 200\text{ V}$ $R_a = 0.3\text{ M}\Omega$ $V_{g2} = 33\text{ V}$ $V_{g1} = -2.3\text{ V}$	$I_a = 0.35$		
E 445 Variable mu tetrode	$V_f = 4\text{ V}$ $I_f = 1.1\text{ A}$	H.F. amplifier	$V_a = 200\text{ V}$ $V_{g2} = 100\text{ V}$ $V_{g1} = -2\text{ V}$	$I_a = 6$ $I_{g2} = 0.8$	$S = 1.0\text{ mA/V}$ $R_i = 0.3\text{ M}\Omega$	
E 446 Pentode	$V_f = 4\text{ V}$ $I_f = 1.1\text{ A}$	H.F. amplifier	$V_a = 200\text{ V}$ $V_{g2} = 100\text{ V}$ $V_{g1} = -2\text{ V}$	$I_a = 3$ $I_{g2} = 1.2$	$S = 2.3\text{ mA/V}$ $R_i = 2.2\text{ M}\Omega$ $C_{ag1} < 0.006\text{ pF}$	
E 447 Variable mu pentode	$V_f = 4\text{ V}$ $I_f = 1.1\text{ A}$	H.F. amplifier	$V_a = 200\text{ V}$ $V_{g2} = 100\text{ V}$ $V_{g1} = -2\text{ V}$	$I_a = 4.5$ $I_{g2} = 1.9$	$S = 2.3\text{ mA/V}$ $R_i = 1.0\text{ M}\Omega$ $C_{ag1} < 0.006\text{ pF}$	
E 449 Hexode	$V_f = 4\text{ V}$ $I_f = 1.2\text{ A}$	H.F. amplifier	$V_a = 200\text{ V}$ $V_{g4} = V_{g3} = 80\text{ V}$ $V_{g3} = -2\text{ V}$ $V_{g1} = -2\text{ V}$	$I_a = 3$	$S = 2.0\text{ mA/V}$ $R_i = 0.5\text{ M}\Omega$ $C_{ag1} < 0.001\text{ pF}$	
E 452 T Tetrode	$V_f = 4\text{ V}$ $I_f = 1.0\text{ A}$	H.F. amplifier	$V_a = 200\text{ V}$ $V_{g2} = 100\text{ V}$ $V_{g1} = -2\text{ V}$	$I_a = 3$ $I_{g2} = 0.7$	$S = 2.0\text{ mA/V}$ $R_i = 0.45\text{ M}\Omega$ $C_{ag1} < 0.003\text{ pF}$	
E 453 Output pentode	$V_f = 4\text{ V}$ $I_f = 1.1\text{ A}$	Class A output amplifier	$V_a = 250\text{ V}$ $V_{g2} = 250\text{ V}$ $V_{g1} = -15\text{ V}$	$I_a = 24$ $I_{g2} = 10$	$S = 2.5\text{ mA/V}$ $R_i = 70\text{ k}\Omega$ $R_a = 11\text{ k}\Omega$ $W_a = 6\text{ W}$ $W_o = 2.9\text{ W}$	
E 455 Variable mu tetrode	$V_f = 4\text{ V}$ $I_f = 1.0\text{ A}$	H.F. amplifier	$V_a = 200\text{ V}$ $V_{g2} = 100\text{ V}$ $V_{g1} = -1.5\text{ V}$	$I_a = 3$ $I_{g2} = 0.8$	$S = 2.0\text{ mA/V}$ $R_i = 0.35\text{ M}\Omega$ $C_{ag1} < 0.003\text{ pF}$	
E 462 Tetrode	$V_f = 4\text{ V}$ $I_f = 1.0\text{ A}$	H.F. amplifier	$V_a = 200\text{ V}$ $V_{g2} = 100\text{ V}$ $V_{g1} = -2\text{ V}$	$I_a = 3$ $I_{g2} = 0.7$	$S = 2.0\text{ mA/V}$ $R_i = 0.45\text{ M}\Omega$ $C_{ag1} < 0.003\text{ pF}$	

Type	Filament data	Application	Voltages Resistors	Currents (mA)	Characteristic data	Base connections
E 463 Output pentode	$V_f = 4\text{ V}$ $I_f = 1.35\text{ A}$	Class A output amplifier	$V_a = 250\text{ V}$ $V_{g2} = 250\text{ V}$ $V_{g1} = -22\text{ V}$	$I_a = 36$ $I_{g2} = 3.2$	$S = 2.7\text{ mA/V}$ $R_i = 37\text{ k}\Omega$ $R_a = 8\text{ k}\Omega$ $W_a = 9\text{ W}$ $W_o = 4.1\text{ W}$	
E 499 Triode	$V_f = 4\text{ V}$ $I_f = 1.0\text{ A}$	Typical characteristics	$V_a = 200\text{ V}$ $V_g = -1\text{ V}$	$I_a = 2.5$	$S = 3.5\text{ mA/V}$ $R_i = 27\text{ k}\Omega$ $\mu = 99$	
EA 40 efficiency diode	$V_f = 6.3\text{ V}$ $I_f = 0.2\text{ A}$	Efficiency diode	$V_{dino}(\text{peak}) = \text{max. } 6.5\text{ kV}$	$I_d(\text{peak}) = 100$ $I_d = 25$	$C_{dk} < 5\text{ pF}$ $R_i = 300\ \Omega$	
EA 50 Television diode	$V_f = 6.3\text{ V}$ $I_f = 0.15\text{ A}$	Detection	$V_d = \text{max } 200\text{ V}$ $V_{fk} = \text{max } 50\text{ V}$ $R_{fk} = \text{max } 20\text{ k}\Omega$	$I_d = \text{max } 5$	$C_{dk} = 2.1\text{ pF}$	for connections see page 61
EAB 1 Triple diode	$V_f = 6.3\text{ V}$ $I_f = 0.2\text{ A}$	Detection and A.V.C.				
EAF 41 Diode-variable mu pentode	$V_f = 6.3\text{ V}$ $I_f = 0.2\text{ A}$	H.F.- or I.F. amplifier	$V_a = 250\text{ V}$ $R_{g2} = 95\text{ k}\Omega$ $V_{g1} = -2\text{ V}$	$I_a = 5$ $I_{g2} = 1.6$	$S = 1.8\text{ mA/V}$ $R_i = 1.2\text{ M}\Omega$ $C_{ag1} < 0.002\text{ pF}$	
		L.F. amplifier	$V_b = 250\text{ V}$ $R_a = 0.2\text{ M}\Omega$ $R_{g2} = 0.8\text{ M}\Omega$ $R_k = 1.6\text{ k}\Omega$	$I_a = 0.86$ $I_{g2} = 0.28$	$g = 105$	
EAF 42 Diode-variable mu pentode	$V_f = 6.3\text{ V}$ $I_f = 0.2\text{ A}$	H.F.- or I.F. amplifier	$V_a = 250\text{ V}$ $R_{g2} = 110\text{ k}\Omega$ $V_{g1} = -2\text{ V}$	$I_a = 5$ $I_{g2} = 1.5$	$S = 2.0\text{ mA/V}$ $R_i = 1.4\text{ M}\Omega$ $C_{ag1} < 0.002\text{ pF}$	
		L.F. amplifier	$V_b = 250\text{ V}$ $R_a = 0.22\text{ M}\Omega$ $R_{g2} = 0.82\text{ M}\Omega$ $R_k = 1.5\text{ k}\Omega$	$I_a = 0.80$ $I_{g2} = 0.26$	$g = 120$	
EB 4 Double diode	$V_f = 6.3\text{ V}$ $I_f = 0.2\text{ A}$	Detection and A.V.C.				
EB 11 Double diode	$V_f = 6.3\text{ V}$ $I_f = 0.2\text{ A}$	Detection and A.V.C.				

Type	Filament data	Application	Voltages Resistors	Currents (mA)	Characteristic data	Base connections
EB 41 Double diode	$V_f = 6.3 \text{ V}$ $I_f = 0.3 \text{ A}$	Detection and A.V.C.				
EBC 3 Double diode-triode	$V_f = 6.3 \text{ V}$ $I_f = 0.2 \text{ A}$	Typical characteristics	$V_a = 250 \text{ V}$ $V_g = -5.5 \text{ V}$	$I_a = 5$	$S = 2.0 \text{ mA/V}$ $R_i = 15 \text{ k}\Omega$ $\mu = 30$	
		Typical characteristics	$V_a = 200 \text{ V}$ $V_g = -4.3 \text{ V}$	$I_a = 4$	$S = 2.0 \text{ mA/V}$ $R_i = 15 \text{ k}\Omega$ $\mu = 30$	
		Typical characteristics	$V_a = 100 \text{ V}$ $V_g = -2.1 \text{ V}$	$I_a = 2$	$S = 1.6 \text{ mA/V}$ $R_i = 19 \text{ k}\Omega$ $\mu = 30$	
		L.F. amplifier	$V_b = 250 \text{ V}$ $R_a = 0.2 \text{ M}\Omega$ $R_k = 4 \text{ k}\Omega$	$I_a = 0.75$	$g = 26$	
			$V_b = 200 \text{ V}$ $R_a = 0.2 \text{ M}\Omega$ $R_k = 12.5 \text{ k}\Omega$	$I_a = 0.35$	$g = 22$	
			$V_b = 100 \text{ V}$ $R_a = 0.2 \text{ M}\Omega$ $R_k = 12.5 \text{ k}\Omega$	$I_a = 0.2$	$g = 19$	
EBC 11 Double diode-triode	$V_f = 6.3 \text{ V}$ $I_f = 0.2 \text{ A}$	L.F. amplifier	$V_b = 250 \text{ V}$ $R_a = 0.2 \text{ M}\Omega$ $R_k = 5 \text{ k}\Omega$	$I_a = 0.75$	$g = 18$	
EBC 33 Double diode-triode	$V_f = 6.3 \text{ V}$ $I_f = 0.2 \text{ A}$	Typical characteristics	$V_a = 250 \text{ V}$ $V_g = -5.5 \text{ V}$	$I_a = 5$	$S = 2.0 \text{ mA/V}$ $R_i = 15 \text{ k}\Omega$ $\mu = 30$	
		Typical characteristics	$V_a = 200 \text{ V}$ $V_g = -4.3 \text{ V}$	$I_a = 4$	$S = 2.0 \text{ mA/V}$ $R_i = 15 \text{ k}\Omega$ $\mu = 30$	
		Typical characteristics	$V_a = 100 \text{ V}$ $V_g = -2.1 \text{ V}$	$I_a = 2$	$S = 1.6 \text{ mA/V}$ $R_i = 19 \text{ k}\Omega$ $\mu = 30$	
		L.F. amplifier	$V_b = 250 \text{ V}$ $R_a = 0.2 \text{ M}\Omega$ $R_k = 4 \text{ k}\Omega$	$I_a = 0.75$	$g = 26$	
			$V_b = 200 \text{ V}$ $R_a = 0.2 \text{ M}\Omega$ $R_k = 12.5 \text{ k}\Omega$	$I_a = 0.35$	$g = 22$	

Type	Filament data	Application	Voltages Resistors	Currents (mA)	Characteristic data	Base connections
EBC 33 Continued	$V_f = 6.3 \text{ V}$ $I_f = 0.2 \text{ A}$	L.F. amplifier	$V_b = 100 \text{ V}$ $R_a = 0.2 \text{ M}\Omega$ $R_k = 12.5 \text{ k}\Omega$	$I_a = 0.2$	$g = 19$	
EBC 41 Double diode triode	$V_f = 6.3 \text{ V}$ $I_f = 0.23 \text{ A}$	Typical characteristic	$V_a = 250 \text{ V}$ $V_g = -3 \text{ V}$	$I_a = 1$	$S = 1.2 \text{ mA/V}$ $R_i = 58 \text{ k}\Omega$ $\mu = 70$	
		L.F. amplifier	$V_b = 250 \text{ V}$ $R_a = 0.22 \text{ M}\Omega$ $R_k = 1.8 \text{ k}\Omega$	$I_a = 0.7$	$g = 51$	
EBF 2 Double diode-variable mu pentode	$V_f = 6.3 \text{ V}$ $I_f = 0.2 \text{ A}$	I.F. amplifier	$V_a = 250 \text{ V}$ $R_{g2} = 95 \text{ k}\Omega$ $V_{g1} = -2 \text{ V}$	$I_a = 5$ $I_{g2} = 1.6$	$S = 1.8 \text{ mA/V}$ $R_i = 1.3 \text{ M}\Omega$ $C_{ag1} < 0.002 \text{ pF}$	
			$V_a = 100 \text{ V}$ $V_{g2} = 100 \text{ V}$ $V_{g1} = -2 \text{ V}$	$I_a = 5$ $I_{g2} = 1.6$	$S = 1.8 \text{ mA/V}$ $R_i = 0.4 \text{ M}\Omega$ $C_{ag1} < 0.002 \text{ pF}$	
EBF 11 Double diode-variable mu pentode	$V_f = 6.3 \text{ V}$ $I_f = 0.2 \text{ A}$	I.F. amplifier	$V_a = 250 \text{ V}$ $R_{g2} = 85 \text{ k}\Omega$ $V_{g1} = -2 \text{ V}$	$I_a = 5$ $I_{g2} = 1.8$	$S = 1.8 \text{ mA/V}$ $R_i = 2.0 \text{ M}\Omega$ $C_{ag1} < 0.002 \text{ pF}$	
		L.F. amplifier	$V_b = 250 \text{ V}$ $R_a = 0.2 \text{ M}\Omega$ $R_{g2} = 0.8 \text{ M}\Omega$ $R_k = 2 \text{ k}\Omega$	$I_a = 0.8$ $I_{g2} = 0.24$	$g = 98$	
EBF 32 Double diode-variable mu pentode	$V_f = 6.3 \text{ V}$ $I_f = 0.2 \text{ A}$	I.F. amplifier	$V_a = 250 \text{ V}$ $R_{g2} = 95 \text{ k}\Omega$ $V_{g1} = -2 \text{ V}$	$I_a = 5$ $I_{g2} = 1.6$	$S = 1.8 \text{ mA/V}$ $R_i = 1.3 \text{ M}\Omega$ $C_{ag1} < 0.002 \text{ pF}$	
			$V_a = 100 \text{ V}$ $V_{g2} = 100 \text{ V}$ $V_{g1} = -2 \text{ V}$	$I_a = 5$ $I_{g2} = 1.6$	$S = 1.8 \text{ mA/V}$ $R_i = 0.4 \text{ M}\Omega$ $C_{ag1} < 0.002 \text{ pF}$	
FBL 1 Double diode-output pentode	$V_f = 6.3 \text{ V}$ $I_f = 1.18 \text{ A}$	Class A output amplifier	$V_a = 250 \text{ V}$ $V_{g2} = 250 \text{ V}$ $V_{g1} = -6 \text{ V}$ $R_k = 150 \Omega$	$I_a = 36$ $I_{g2} = 4$	$S = 9 \text{ mA/V}$ $R_i = 50 \text{ k}\Omega$ $R_a = 7 \text{ k}\Omega$ $W_a = 9 \text{ W}$ $W_o = 4.5 \text{ W}$	
		Class AB push-pull amplifier	$V_a = 250 \text{ V}$ $V_{g2} = 250 \text{ V}$ $R_k = 140 \Omega$	$I_{a \text{ min}} = 2 \times 24$ $I_{a \text{ max}} = 2 \times 28.5$ $I_{g2 \text{ min}} = 2 \times 2.8$ $I_{g2 \text{ max}} = 2 \times 4.6$	$R_{aa'} = 10 \text{ k}\Omega$ $W_o = 8.2 \text{ W}$	
EBL 21 Double diode-output pentode	$V_f = 6.3 \text{ V}$ $I_f = 0.8 \text{ A}$	Class A output amplifier	$V_a = 250 \text{ V}$ $V_{g2} = 250 \text{ V}$ $V_{g1} = -6 \text{ V}$ $R_k = 150 \Omega$	$I_a = 36$ $I_{g2} = 4.5$	$S = 9 \text{ mA/V}$ $R_i = 50 \text{ k}\Omega$ $R_a = 7 \text{ k}\Omega$ $W_o = 4.5 \text{ W}$	
			$V_a = 250 \text{ V}$ $V_{g2} = 275 \text{ V}$ $V_{g1} = -6.2 \text{ V}$ $R_k = 125 \Omega$	$I_a = 44$ $I_{g2} = 5.8$	$S = 9.5 \text{ mA/V}$ $R_i = 50 \text{ k}\Omega$ $R_a = 5.7 \text{ k}\Omega$ $W_a = 11 \text{ W}$ $W_o = 5.5 \text{ W}$	

Type	Filament data	Application	Voltages Resistors	Currents (mA)	Characteristic data	Base connections
EBL 21 Continued	$V_f = 6.3 \text{ V}$ $I_f = 0.8 \text{ A}$	Class AB push-pull amplifier	$V_a = 300 \text{ V}$ $V_{g2} = 300 \text{ V}$ $R_k = 130 \Omega$	$I_{a \text{ min}} = 2 \times 30$ $I_{a \text{ max}} = 2 \times 36$ $I_{g2 \text{ min}} = 2 \times 3.8$ $I_{g2 \text{ max}} = 2 \times 6.5$	$R_{aa} = 9 \text{ k}\Omega$ $W_o = 13.2 \text{ W}$	
EC 50 Gas triode	$V_f = 6.3 \text{ V}$ $I_f = 1.3 \text{ A}$	Time base generator	$V_{ag} (\text{peak}) = \text{max. } 1500 \text{ V}$ $V_{ak} (\text{peak}) = \text{max. } 1000 \text{ V}$ $V_{arc} = 33 \text{ V}$ $V_{fk} (\text{peak}) = \text{max. } 100 \text{ V}$	$I_a (\text{peak}) = \text{max. } 750$ $I_a (\text{average}) = \text{max. } 10$ $I_{g \text{ max}} = 14$	Control ratio = 35 $f_{\text{max}} = 150 \text{ kc/s}$	
EC 80 Grounded grid triode	$V_f = 6.3 \text{ V}$ $I_f = 0.45 \text{ A}$	Amplifier and frequency changer for U.H.F.	$V_a = 250 \text{ V}$ $V_g = -1.5 \text{ V}$	$I_a = 15$	$S = 12 \text{ mA/V}$ $\mu = 80$	
EC 81 Oscillator triode (U.H.F. ³⁾)	$V_f = 6.3 \text{ V}$ $I_f = 0.2 \text{ A}$	Typical characteristics	$V_a = 150 \text{ V}$ $V_g = -2 \text{ V}$	$I_a = 30$	$S = 5.5 \text{ mA/V}$ $\mu = 16$	
ECC 40 Double triode	$V_f = 6.3 \text{ V}$ $I_f = 0.6 \text{ A}$	Typical characteristics (each system)	$V_a = 250 \text{ V}$ $V_g = -5.2 \text{ V}$ $R_k = 870 \Omega$	$I_a = 6$	$S = 2.7 \text{ mA/V}$ $R_i = 11 \text{ k}\Omega$ $\mu = 30$	
ECF 1 Triode-variable mu pentode	$V_f = 6.3 \text{ V}$ $I_f = 0.2 \text{ A}$	I.F. amplifier (pentode section)	$V_a = 250 \text{ V}$ $R_{g2} = 75 \text{ k}\Omega$ $V_{g1} = -2 \text{ V}$	$I_a = 5$ $I_{g2} = 2$	$S = 2.0 \text{ mA/V}$ $R_i = 1.6 \text{ M}\Omega$ $C_{ag1} < 0.004 \text{ pF}$	
		Typical characteristics (triode section)	$V_a = 150 \text{ V}$ $V_g = -3 \text{ V}$	$I_a = 8$	$S = 2.2 \text{ mA/V}$ $R_i = 9 \text{ k}\Omega$ $\mu = 20$	
ECH 3 Triode-hexode	$V_f = 6.3 \text{ V}$ $I_f = 0.2 \text{ A}$	Frequency-changer (hexode section)	$V_a = 250 \text{ V}$ $R_1^{1)} = 24 \text{ k}\Omega$ $R_2^{2)} = 33 \text{ k}\Omega$ $R_{g3+gT} = 50 \text{ k}\Omega$ $V_{g1} = -2 \text{ V}$	$I_a = 3$ $I_{g2+g4} = 3$ $I_{g3+gT} = 0.2$	$S_c = 0.65 \text{ mA/V}$ $R_i = 1.3 \text{ M}\Omega$	
			$V_a = 200 \text{ V}$ $R_1^{1)} = 19 \text{ k}\Omega$ $R_2^{2)} = 54 \text{ k}\Omega$ $R_{g3+gT} = 50 \text{ k}\Omega$ $V_{g1} = -2 \text{ V}$	$I_a = 3$ $I_{g2+g1} = 3$ $I_{g3+gT} = 0.2$	$S_c = 0.65 \text{ mA/V}$ $R_i = 0.9 \text{ M}\Omega$	
			$V_a = 100 \text{ V}$ $R_1^{1)} = 19 \text{ k}\Omega$ $R_2^{2)} = 54 \text{ k}\Omega$ $R_{g3+gT} = 50 \text{ k}\Omega$ $V_{g1} = -1.25 \text{ V}$	$I_a = 1.0$ $I_{g2+g4} = 1.4$ $I_{g3+gT} = 0.2$	$S_c = 0.45 \text{ mA/V}$ $R_i = 1.3 \text{ M}\Omega$	

¹⁾ R_1 is a resistor between + V_b and the screen grids.

²⁾ R_2 is a resistor between the screen grids and chassis.

³⁾ U.H.F. = ultra high frequencies.

Type	Filament data	Application	Voltages Resistors	Currents (mA)	Characteristic data	Base connections
ECH 3 Continued	$V_f = 6.3V$ $I_f = 0.2A$	Oscillator (triode section)	$V_b = 250V$ $R_a = 45k\Omega$ $R_{g3+gT} = 50k\Omega$	$I_a = 3.3$ $I_{g3+gT} = 0.2$	$S_o = 2.8mA/V$ $\mu = 24$	
			$V_a = 100V$ $R_{g3+gT} = 50k\Omega$	$I_a = 3.3$ $I_{g3+gT} = 0.2$	$S_o = 2.8mA/V$ $\mu = 24$	
ECH 4 Triode-heptode	$V_f = 6.3V$ $I_f = 0.35A$	Frequency-changer (heptode section)	$V_a = 250V$ $R_{g2+g4} = 24k\Omega$ $R_{g3+gT} = 50k\Omega$ $V_{g1} = -2V$	$I_a = 3.0$ $I_{g2+g4} = 6.2$ $I_{g3+gT} = 0.19$	$S_c = 0.75mA/V$ $R_i = 1.4M\Omega$	
		Oscillator (triode section)	$V_b = 250V$ $R_a = 20k\Omega$ $R_{g3+gT} = 50k\Omega$	$I_a = 4.5$ $I_{g3+gT} = 0.19$	$V_{osc} = 7.5V_{eff}$	
		I.F. amplifier (heptode section)	$V_a = 250V$ $R_{g2+g4} = 45k\Omega$ $V_{g3} = 0V$ $V_{g1} = -2V$	$I_a = 5.3$ $I_{g2+g4} = 3.5$	$S = 2.2mA/V$ $R_i = 0.9M\Omega$ $C_{ag1} < 0.002pF$	
		L.F. amplifier (triode section)	$V_b = 250V$ $R_a = 0.2M\Omega$ $V_g = -2V$	$I_a = 1.0$	$g = 13$	
		Typical characteristics (triode section)	$V_a = 100V$ $V_g = 0V$	$I_a = 12$	$S = 3.2mA/V$ $\mu = 22$	
ECH 11 Triode-hexode	$V_f = 6.3V$ $I_f = 0.2A$	Frequency-changer (hexode section)	$V_a = 250V$ $R_{g2+g4} = 50k\Omega$ $R_{g3+gT} = 30k\Omega$ $V_{g1} = -2V$	$I_a = 2.3$ $I_{g2+g4} = 3.0$ $I_{g3+gT} = 0.33$	$S_c = 0.65mA/V$ $R_i = 1.2M\Omega$	
		Oscillator (triode section)	$V_b = 250V$ $R_a = 30k\Omega$ $R_{g3+gT} = 30k\Omega$	$I_a = 3.4$ $I_{g3+gT} = 0.33$	$S_o = 2.8mA/V$ $\mu = 17$	
ECH 21 Triode-heptode	$V_f = 6.3V$ $I_f = 0.33A$	Frequency-changer (heptode section)	$V_a = 250V$ $R_{g2+g4} = 24k\Omega$ $R_{g3+gT} = 50k\Omega$ $V_{g1} = -2V$	$I_a = 3.0$ $I_{g2+g4} = 6.2$ $I_{g3+gT} = 0.19$	$S_c = 0.75mA/V$ $R_i = 1.4M\Omega$	
		Oscillator (triode section)	$V_b = 250V$ $R_a = 20k\Omega$ $R_{g3+gT} = 50k\Omega$	$I_a = 4.5$ $I_{g3+gT} = 0.19$	$V_{osc} = 7.5V_{eff}$	
		I.F. amplifier (heptode section)	$V_a = 250V$ $R_{g2+g4} = 45k\Omega$ $V_{g3} = 0V$ $V_{g1} = -2V$	$I_a = 5.3$ $I_{g2+g4} = 3.5$	$S = 2.2mA/V$ $R_i = 0.9M\Omega$ $C_{ag1} < 0.002pF$	
		L.F. amplifier (triode section)	$V_b = 250V$ $R_a = 0.2M\Omega$ $V_g = -2V$	$I_a = 1.0$	$g = 13$	
		Typical characteristics (triode section)	$V_a = 100V$ $V_g = 0V$	$I_a = 12$	$S = 3.2mA/V$ $\mu = 22$	

Type	Filament data	Application	Voltages Resistors	Currents (mA)	Characteristic data	Base connections
ECH 35 Triode-hexode	$V_f = 6.3 \text{ V}$ $I_f = 0.2 \text{ A}$	Frequency-changer (hexode section)	$V_a = 250 \text{ V}$ $R_{1^1}) = 24 \text{ k}\Omega$ $R_{2^2}) = 33 \text{ k}\Omega$ $R_{g3+gT} = 50 \text{ k}\Omega$ $V_{g1} = -2 \text{ V}$	$I_a = 3.0$ $I_{g2+g4} = 3.0$ $I_{g3+gT} = 0.20$	$S_c = 0.65 \text{ mA/V}$ $R_i = 1.3 \text{ M}\Omega$	
		Oscillator (triode section)	$V_b = 250 \text{ V}$ $R_a = 45 \text{ k}\Omega$ $R_{g3+gT} = 50 \text{ k}\Omega$	$I_a = 3.3$ $I_{g3+gT} = 0.20$	$S_o = 2.8 \text{ mA/V}$ $\mu = 24$	
ECH 41 Triode-hexode	$V_f = 6.3 \text{ V}$ $I_f = 0.23 \text{ A}$	Frequency-changer (hexode section)	$V_a = 250 \text{ V}$ $R_{1^1}) = 33 \text{ k}\Omega$ $R_{2^2}) = 47 \text{ k}\Omega$ $R_{g3+gT} = 20 \text{ k}\Omega$ $V_{g1} = -2 \text{ V}$	$I_a = 3.0$ $I_{g2+g4} = 2.2$ $I_{g3+gT} = 0.35$	$S_c = 0.5 \text{ mA/V}$ $R_i = 2 \text{ M}\Omega$ $V_{osc} = 8 \text{ V}_{eff}$	
		Oscillator (triode section)	$V_b = 250 \text{ V}$ $R_a = 30 \text{ k}\Omega$ $R_{g3+gT} = 20 \text{ k}\Omega$	$I_a = 4.9$ $I_{g3+gT} = 0.35$	$S_o = 1.9 \text{ mA/V}$ $S_{eff} = 0.55 \text{ mA/V}$ $\mu = 19$	
ECH 42 Triode-hexode	$V_f = 6.3 \text{ V}$ $I_f = 0.23 \text{ A}$	Frequency-changer (hexode section)	$V_b = 250 \text{ V}$ $R_{1^1}) = 27 \text{ k}\Omega$ $R_{2^2}) = 27 \text{ k}\Omega$ $R_{g3+gT} = 47 \text{ k}\Omega$ $V_{g1} = -2 \text{ V}$	$I_a = 3.0$ $I_{g2+g4} = 3.0$ $I_{g3+gT} = 0.2$	$S_c = 0.75 \text{ mA/V}$ $R_i = 1.7 \text{ M}\Omega$	
		Oscillator (triode section)	$V_b = 250 \text{ V}$ $R_a = 33 \text{ k}\Omega$ $R_{g3+gT} = 47 \text{ k}\Omega$ $V_{osc} = 8 \text{ V}_{eff}$	$I_a = 4.8$ $I_{g3+gT} = 0.2$	$S_o = 2.8 \text{ mA/V}$ $S_{eff} = 0.55 \text{ mA/V}$ $\mu = 22$	
ECL 11 Triode-output-tetrode	$V_f = 6.3 \text{ V}$ $I_f = 1.0 \text{ A}$	Class A output amplifier (tetrode section)	$V_a = 250 \text{ V}$ $V_{g2} = 250 \text{ V}$ $V_{g1} = -6 \text{ V}$	$I_a = 36$ $I_{g2} = 4$	$S = 9 \text{ mA/V}$ $R_i = 25 \text{ k}\Omega$ $R_a = 7 \text{ k}\Omega$ $W_a = 9 \text{ W}$ $W_o = 3.8 \text{ W}$	
		Typical characteristics (triode section)	$V_a = 250 \text{ V}$ $V_g = -2.5 \text{ V}$	$I_a = 2$	$S = 2 \text{ mA/V}$ $R_i = 35 \text{ k}\Omega$ $\mu = 70$	
ECP 1 (EE 1) Secondary emission tetrode (phase inverter)	$V_f = 6.3 \text{ V}$ $I_f = 0.6 \text{ A}$	Typical characteristics	$V_a = 250 \text{ V}$ $V_{g2} = 150 \text{ V}$ $V_{k2} = 150 \text{ V}$ $V_{g1} = -2.5 \text{ V}$	$I_a = 8$ $I_{g2} = 0.45$ $I_{k2} = -6.5$	$S = 17 \text{ mA/V}$ $R_i = 50 \text{ k}\Omega$	
EF 5 Variable mu pentode	$V_f = 6.3 \text{ V}$ $I_f = 0.2 \text{ A}$	H.F. or I.F. amplifier	$V_a = 250 \text{ V}$ $V_{g2} = 100 \text{ V}$ $V_{g1} = -3 \text{ V}$	$I_a = 8$ $I_{g2} = 2.6$	$S = 1.7 \text{ mA/V}$ $R_i = 1.2 \text{ M}\Omega$ $C_{a51} < 0.003 \text{ pF}$	

1) R_1 is a resistor between + V_b and the screen grids.

2) R_2 is a resistor between the screen grids and chassis.

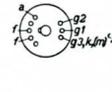
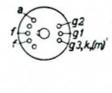
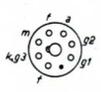
Type	Filament data	Application	Voltages Resistors	Currents (mA)	Characteristic data	Base connections
EF 6 Pentode	$V_f = 6.3 \text{ V}$ $I_f = 0.2 \text{ A}$	H.F. amplifier	$V_a = 250 \text{ V}$ $V_{g2} = 100 \text{ V}$ $V_{g1} = -2 \text{ V}$	$I_a = 3.0$ $I_{g2} = 0.8$	$S = 1.8 \text{ mA/V}$ $R_i = 2.5 \text{ M}\Omega$ $C_{ag1} < 0.003 \text{ pF}$	
			$V_a = 200 \text{ V}$ $V_{g2} = 100 \text{ V}$ $V_{g1} = -2 \text{ V}$	$I_a = 3.0$ $I_{g2} = 0.8$	$S = 1.8 \text{ mA/V}$ $R_i = 2.0 \text{ M}\Omega$ $C_{ag1} < 0.003 \text{ pF}$	
			$V_a = 100 \text{ V}$ $V_{g2} = 100 \text{ V}$ $V_{g1} = -2 \text{ V}$	$I_a = 3.0$ $I_{g2} = 0.8$	$S = 1.8 \text{ mA/V}$ $R_i = 1.0 \text{ M}\Omega$ $C_{ag1} < 0.003 \text{ pF}$	
		L.F. amplifier	$V_b = 250 \text{ V}$ $R_a = 0.2 \text{ M}\Omega$ $R_{g2} = 0.4 \text{ M}\Omega$ $R_k = 3 \text{ k}\Omega$	$I_a = 0.9$ $I_{g2} = 0.35$	$g = 140$	
			$V_b = 200 \text{ V}$ $R_a = 0.2 \text{ M}\Omega$ $R_{g2} = 0.4 \text{ M}\Omega$ $R_k = 5 \text{ k}\Omega$	$I_a = 0.6$ $I_{g2} = 0.23$	$g = 115$	
			$V_b = 100 \text{ V}$ $R_a = 0.2 \text{ M}\Omega$ $R_{g2} = 0.4 \text{ M}\Omega$ $R_k = 5 \text{ k}\Omega$	$I_a = 0.30$ $I_{g2} = 0.12$	$g = 100$	
EF 8 Variable mu hexode	$V_f = 6.3 \text{ V}$ $I_f = 0.2 \text{ A}$	H.F. amplifier	$V_a = 250 \text{ V}$ $V_{g4} = 0 \text{ V}$ $V_{g3} = 250 \text{ V}$ $V_{g2} = 0 \text{ V}$ $V_{g1} = -2.5 \text{ V}$	$I_a = 8$ $I_{g3} = 0.2$	$S = 1.8 \text{ mA/V}$ $R_i = 0.45 \text{ M}\Omega$ $C_{ag1} < 0.007 \text{ pF}$	
EF 9 Variable mu pentode	$V_f = 6.3 \text{ V}$ $I_f = 0.2 \text{ A}$	H.F.- or I.F. amplifier	$V_a = 250 \text{ V}$ $R_{g2} = 90 \text{ k}\Omega$ $V_{g1} = -2.5 \text{ V}$	$I_a = 6$ $I_{g2} = 1.7$	$S = 2.2 \text{ mA/V}$ $R_i = 1.25 \text{ M}\Omega$ $C_{ag1} < 0.002 \text{ pF}$	
			$V_a = 200 \text{ V}$ $R_{g2} = 60 \text{ k}\Omega$ $V_{g1} = -2.5 \text{ V}$	$I_a = 6$ $I_{g2} = 1.7$	$S = 2.2 \text{ mA/V}$ $R_i = 0.9 \text{ M}\Omega$ $C_{ag1} < 0.002 \text{ pF}$	
			$V_a = 100 \text{ V}$ $V_{g2} = 100 \text{ V}$ $V_{g1} = -2.5 \text{ V}$	$I_a = 6$ $I_{g2} = 1.7$	$S = 2.2 \text{ mA/V}$ $R_i = 0.4 \text{ M}\Omega$ $C_{ag1} < 0.002 \text{ pF}$	
		L.F. amplifier	$V_b = 250 \text{ V}$ $R_a = 0.2 \text{ M}\Omega$ $R_{g2} = 0.8 \text{ M}\Omega$ $R_k = 1.8 \text{ k}\Omega$	$I_a = 0.87$ $I_{g2} = 0.26$	$g = 105$	

Type	Filament data	Application	Voltages Resistors	Currents (mA)	Characteristic data	Base connections
EF 11 Variable mu pentode	$V_f = 6.3 \text{ V}$ $I_f = 0.2 \text{ A}$	H.F. or I.F. amplifier	$V_a = 250 \text{ V}$ $R_{g2} = 75 \text{ k}\Omega$ $V_{g1} = -2 \text{ V}$	$I_a = 6$ $I_{g2} = 2.0$	$S = 2.2 \text{ mA/V}$ $R_i = 2.0 \text{ M}\Omega$ $C_{ag1} < 0.002 \text{ pF}$	
			$V_a = 200 \text{ V}$ $R_{g2} = 50 \text{ k}\Omega$ $V_{g1} = -2 \text{ V}$	$I_a = 6$ $I_{g2} = 2.0$	$S = 2.2 \text{ mA/V}$ $R_i = 1.5 \text{ M}\Omega$ $C_{ag1} < 0.002 \text{ pF}$	
			$V_a = 100 \text{ V}$ $V_{g2} = 100 \text{ V}$ $V_{g1} = -2 \text{ V}$	$I_a = 6$ $I_{g2} = 2.0$	$S = 2.2 \text{ mA/V}$ $R_i = 0.45 \text{ M}\Omega$ $C_{ag1} < 0.002 \text{ pF}$	
		L.F. amplifier	$V_b = 250 \text{ V}$ $R_a = 0.2 \text{ M}\Omega$ $R_{g2} = 0.6 \text{ M}\Omega$ $R_k = 1.5 \text{ k}\Omega$	$I_a = 1.0$ $I_{g2} = 0.35$	$g = 98$	
EF 12 Pentode	$V_f = 6.3 \text{ V}$ $I_f = 0.2 \text{ A}$	H.F. amplifier	$V_a = 250 \text{ V}$ $V_{g2} = 100 \text{ V}$ $V_{g1} = -2 \text{ V}$	$I_a = 3.0$ $I_{g2} = 1.0$	$S = 2.1 \text{ mA/V}$ $R_i = 2.0 \text{ M}\Omega$ $C_{ag1} < 0.002 \text{ pF}$	
		L.F. amplifier	$V_b = 250 \text{ V}$ $R_a = 0.2 \text{ M}\Omega$ $R_{g2} = 0.5 \text{ M}\Omega$ $R_k = 1.6 \text{ k}\Omega$	$I_a = 0.9$ $I_{g2} = 0.37$	$g = 151$	
		L.F. amplifier	$V_b = 200 \text{ V}$ $R_a = 0.2 \text{ M}\Omega$ $R_{g2} = 0.5 \text{ M}\Omega$ $R_k = 2.2 \text{ k}\Omega$	$I_a = 0.67$ $I_{g2} = 0.27$	$g = 166$	
		L.F. amplifier	$V_b = 100 \text{ V}$ $R_a = 0.2 \text{ M}\Omega$ $R_{g2} = 0.5 \text{ M}\Omega$ $R_k = 2.2 \text{ k}\Omega$	$I_a = 0.32$ $I_{g2} = 0.14$	$g = 128$	
EF 13 Variable mu pentode	$V_f = 6.3 \text{ V}$ $I_f = 0.2 \text{ A}$	H.F. amplifier	$V_a = 250 \text{ V}$ $V_{g2} = 100 \text{ V}$ $V_{g1} = -2 \text{ V}$	$I_a = 4.5$ $I_{g2} = 0.6$	$S = 2.3 \text{ mA/V}$ $R_i = 0.5 \text{ M}\Omega$ $C_{ag1} < 0.005 \text{ pF}$	

Type	Filament data	Application	Voltages Resistors	Currents (mA)	Characteristic data	Base connections
EF 36 Pentode	$V_f = 6.3 \text{ V}$ $I_f = 0.2 \text{ A}$	H.F. amplifier	$V_a = 250 \text{ V}$ $V_{g2} = 100 \text{ V}$ $V_{g1} = -2 \text{ V}$	$I_a = 3$ $I_{g2} = 0.8$	$S = 1.8 \text{ mA/V}$ $R_i = 2.5 \text{ M}\Omega$ $C_{ag1} < 0.003 \text{ pF}$	
			$V_a = 200 \text{ V}$ $V_{g1} = 100 \text{ V}$ $V_{g2} = -2 \text{ V}$	$I_a = 3$ $I_{g2} = 0.8$	$S = 1.8 \text{ mA/V}$ $R_i = 2 \text{ M}\Omega$ $C_{ag1} < 0.003 \text{ pF}$	
			$V_a = 100 \text{ V}$ $V_{g2} = 100 \text{ V}$ $V_{g1} = -2 \text{ V}$	$I_a = 3$ $I_{g2} = 0.8$	$S = 1.8 \text{ mA/V}$ $R_i = 1 \text{ M}\Omega$ $C_{ag1} < 0.003 \text{ pF}$	
		L.F. amplifier	$V_b = 250 \text{ V}$ $R_a = 0.3 \text{ M}\Omega$ $R_{g2} = 0.8 \text{ M}\Omega$ $R_k = 4 \text{ k}\Omega$	$I_a = 0.6$ $I_{g2} = 0.2$	$g = 165$	
			$V_b = 200 \text{ V}$ $R_a = 0.3 \text{ M}\Omega$ $R_{g2} = 0.6 \text{ M}\Omega$ $R_k = 6.4 \text{ k}\Omega$	$I_a = 0.45$ $I_{g2} = 0.17$	$g = 130$	
			$V_b = 100 \text{ V}$ $R_a = 0.3 \text{ M}\Omega$ $R_{g2} = 0.6 \text{ M}\Omega$ $R_k = 6.4 \text{ k}\Omega$	$I_a = 0.22$ $I_{g2} = 0.08$	$g = 105$	
EF 37 Pentode		Non-microphonic execution of the EF 36 All the electrical data are equal to EF 36.				
EF 39 Variable mu pentode	$V_f = 6.3 \text{ V}$ $I_f = 0.2 \text{ A}$	H.F. or I.F. amplifier	$V_a = 250 \text{ V}$ $R_{g2} = 90 \text{ k}\Omega$ $V_{g1} = -2.5 \text{ V}$	$I_a = 6$ $I_{g2} = 1.7$	$S = 2.2 \text{ mA/V}$ $R_i = 1.25 \text{ M}\Omega$ $C_{ag1} < 0.003 \text{ pF}$	
			$V_a = 200 \text{ V}$ $R_{g2} = 60 \text{ k}\Omega$ $V_{g1} = -2.5 \text{ V}$	$I_a = 6$ $I_{g2} = 1.7$	$S = 2.2 \text{ mA/V}$ $R_i = 0.9 \text{ M}\Omega$ $C_{ag1} < 0.003 \text{ pF}$	
			$V_a = 100 \text{ V}$ $V_{g2} = 100 \text{ V}$ $V_{g1} = -2.5 \text{ V}$	$I_a = 6$ $I_{g2} = 1.7$	$S = 2.2 \text{ mA/V}$ $R_i = 0.4 \text{ M}\Omega$ $C_{ag1} < 0.003 \text{ pF}$	
		L.F. amplifier	$V_b = 250 \text{ V}$ $R_a = 0.2 \text{ M}\Omega$ $R_{g2} = 0.8 \text{ M}\Omega$ $R_k = 1.8 \text{ k}\Omega$	$I_a = 0.87$ $I_{g2} = 0.26$	$g = 105$	
EF 40 Low noise pre-amplifier pentode	$V_f = 6.3 \text{ V}$ $I_f = 0.2 \text{ A}$	Typical characteristics	$V_a = 250 \text{ V}$ $V_{g2} = 140 \text{ V}$ $V_{g1} = -2 \text{ V}$	$I_a = 3$ $I_{g2} = 0.55$	$S = 1.85 \text{ mA/V}$ $R_i = 2.5 \text{ M}\Omega$ $C_{ag1} < 0.025 \text{ pF}$	
		L.F. amplifier	$V_b = 250 \text{ V}$ $R_a = 0.22 \text{ M}\Omega$ $R_{g2} = 1.0 \text{ M}\Omega$ $R_k = 1.5 \text{ k}\Omega$	$I_a = 0.9$ $I_{g2} = 0.2$	$g = 180$	

Type	Filament data	Application	Voltages Resistors	Currents (mA)	Characteristic data	Base connections
EF 40 Continued	$V_f = 6.3V$ $I_f = 0.2A$	L.F. amplifier	$V_b = 250V$ $R_a = 0.33 M\Omega$ $R_{g2} = 1.5 M\Omega$ $R_k = 2.2 k\Omega$	$I_a = 0.58$ $I_{g2} = 0.12$	$g = 210$	
EF 41 Variable mu pentode	$V_f = 6.3V$ $I_f = 0.2A$	H.F. or I.F. amplifier	$V_a = 250V$ $R_{g2} = 90 k\Omega$ $V_{g1} = -2.5V$	$I_a = 6$ $I_{g2} = 1.7$	$S = 2.2 mA/V$ $R_i = 1.0 M\Omega$ $C_{ag1} < 0.002 pF$	
EF 42 Television pentode	$V_f = 6.3V$ $I_f = 0.33A$	Wide band amplifier	$V_a = 250V$ $V_{g2} = 250V$ $V_{g1} = -2V$	$I_a = 10$ $I_{g2} = 2.3$	$S = 9.5 mA/V$ $R_i = 0.5 M\Omega$ $\mu_{g2g1} = 83$ $R_{eq} = 750 \Omega$ $C_{ag1} < 0.005 pF$	
EF 50 H.F. pentode	$V_f = 6.3V$ $I_f = 0.3A$	Wide band amplifier	$V_a = 250V$ $V_{g2} = 250V$ $V_{g1} = -2V$	$I_a = 10$ $I_{g2} = 3$	$S = 6.5 mA/V$ $R_i = 1 M\Omega$ $\mu_{g2g1} = 75$ $R_{eq} = 1.4 k\Omega$ $C_{ag1} < 0.007 pF$	
EF 51 V.H.F. Variable mu pentode	$V_f = 6.3V$ $I_f = 0.35A$	H.F. or I.F. amplifier	$V_a = 250V$ $V_{g2} = 250V$ $V_{g1} = -2.25V$	$I_a = 14$ $I_{g2} = 2.8$	$S = 9.5 mA/V$ $R_i = 0.5 M\Omega$ $R_{eq} = 1 k\Omega$ $C_{ag1} < 0.007 pF$	
EFF 50 H.F. double pentode	$V_f = 6.3V$ $I_f = 0.6A$	Typical characteristics (each system)	$V_a = 250V$ $V_{g2} = 200V$ $V_{g1} = -2V$	$I_a = 6$ $I_{g2} = 0.8$	$S = 8 mA/V$ $R_i = 0.35 M\Omega$ $R_{eq} = 600 \Omega$ $C_{ag1} < 0.04 pF$	
EFF 51 H.F. double pentode	$V_f = 6.3V$ $I_f = 0.75A$	Typical characteristics (each system)	$V_a = 250V$ $V_{g2} = 200V$ $V_{g1} = -2V$	$I_a = 6$ $I_{g2} = 1.2$	$S = 7.5 mA/V$ $R_i = 0.35 M\Omega$ $R_{eq} = 800 \Omega$ $C_{ag1} < 0.04 pF$	
EFM 1 Variable mu pentode and tuning indicator	$V_f = 6.3V$ $I_f = 0.2A$	L.F. amplifier + tuning indicator	$V_b = V_l = 250V$ $R_a = 0.13 M\Omega$ $R_{g2} = 0.35 M\Omega$ $V_{g1} = -2/-20V$	$I_a = 0.8/0.5$ $I_{g2} = 0.6/0.2$ $I_l = 0.65/0.8$	$g = 60/13$ $\alpha = 70/5^0$	
EFM 11 Variable mu pentode and tuning indicator	$V_f = 6.3V$ $I_f = 0.2A$	L.F. amplifier + tuning indicator	$V_b = V_l = 250V$ $R_a = 0.13 M\Omega$ $R_{g2} = 0.35 M\Omega$ $V_{g1} = -1.5/-20V$	$I_a = 1.0/0.58$ $I_{g2} = 0.63/0.26$ $I_l = 0.65/1.0$	$g = 80/12$ $\alpha = 70/3^0$	

Type	Filament data	Application	Voltages Resistors	Currents (mA)	Characteristic data	Base connections
EFP 60 Secondary emission pentode	$V_f = 6.3 \text{ V}$ $I_f = 0.37 \text{ A}$	H.F. or I.F. television amplifier	$V_a = 250 \text{ V}$ $V_{g2} = 250 \text{ V}$ $V_{k2} = 150 \text{ V}$ $V_{g1} = -2 \text{ V}$ $V_{g3} = 0 \text{ V}$	$I_a = 20$ $I_{g2} = 1.5$ $I_{k2} = -15.6$	$S = 25 \text{ mA/V}$ $R_i = 70 \text{ k}\Omega$ $C_{ag1} < 0.004 \text{ pF}$	
EH 2 Variable mu heptode	$V_f = 6.3 \text{ V}$ $I_f = 0.2 \text{ V}$	Frequency changer	$V_a = 250 \text{ V}$ $V_{g2} + g_4 = 100 \text{ V}$ $R_{g3} = 0.5 \text{ M}\Omega$ $V_{g1} = -3 \text{ V}$	$I_a = 1.85$ $I_{g2} + g_4 = 3.8$ $I_{g3} = 0.025$	$S_c = 0.4 \text{ mA/V}$ $R_i = 2 \text{ M}\Omega$	
		H.F.- or I.F. amplifier	$V_a = 250 \text{ V}$ $V_{g2} + g_4 = 100 \text{ V}$ $V_{g1} = V_{g3} = -3 \text{ V}$	$I_a = 4.2$ $I_{g2} + g_4 = 2.8$	$S = 1.4 \text{ mA/V}$ $R_i = 1.0 \text{ M}\Omega$ $C_{ag1} < 0.0015 \text{ pF}$	
EK 2 Octode	$V_f = 6.3 \text{ V}$ $I_f = 0.2 \text{ A}$	Frequency changer	$V_a = 200-250 \text{ V}$ $V_{g3} + g_5 = 50 \text{ V}$ $V_{g4} = -2 \text{ V}$ $V_{g2} = 200 \text{ V}$ $R_{g1} = 50 \text{ k}\Omega$	$I_a = 1.0$ $I_{g3} + g_5 = 1.1$ $I_{g2} = 2.5$ $I_{g1} = 0.30$	$S_c = 0.55 \text{ mA/V}$ $R_i = 2 \text{ M}\Omega$	
			$V_a = 100 \text{ V}$ $V_{g3} + g_5 = 50 \text{ V}$ $V_{g4} = -2 \text{ V}$ $V_{g2} = 100 \text{ V}$ $R_{g1} = 50 \text{ k}\Omega$	$I_a = 1.0$ $I_{g3} + g_5 = 1.0$ $I_{g2} = 1.5$ $I_{g1} = 0.20$	$S_c = 0.55 \text{ mA/V}$ $R_i = 1.2 \text{ M}\Omega$	
EK 3 Octode	$V_f = 6.3 \text{ V}$ $I_f = 0.6 \text{ A}$	Frequency changer	$V_a = 250 \text{ V}$ $V_{g3} + g_5 = 100 \text{ V}$ $V_{g4} = -2.5 \text{ V}$ $V_{g2} = 100 \text{ V}$ $R_{g1} = 50 \text{ k}\Omega$	$I_a = 2.5$ $I_{g3} + g_5 = 5.5$ $I_{g2} = 5$ $I_{g1} = 0.30$	$S_c = 0.65 \text{ mA/V}$ $R_i = 2.0 \text{ M}\Omega$	
EL 2 Output pentode	$V_f = 6.3 \text{ V}$ $I_f = 0.2 \text{ A}$	Class A output amplifier	$V_a = 250 \text{ V}$ $V_{g2} = 250 \text{ V}$ $V_{g1} = -18 \text{ V}$ $R_k = 480 \Omega$	$I_a = 32$ $I_{g2} = 5$	$S = 2.8 \text{ mA/V}$ $R_i = 70 \text{ k}\Omega$ $R_a = 8 \text{ k}\Omega$ $W_a = 8 \text{ W}$ $W_o = 3.6 \text{ W}$	
			$V_a = 200 \text{ V}$ $V_{g2} = 200 \text{ V}$ $V_{g1} = -14 \text{ V}$ $R_k = 480 \Omega$	$I_a = 25$ $I_{g2} = 4$	$S = 3.0 \text{ mA/V}$ $R_i = 70 \text{ k}\Omega$ $R_a = 8 \text{ k}\Omega$ $W_o = 2.3 \text{ W}$	
		Class AB push-pull amplifier	$V_a = 250 \text{ V}$ $V_{g2} = 250 \text{ V}$ $R_k = 300 \Omega$	$I_a \text{ min} = 2 \times 27.5$ $I_a \text{ max} = 2 \times 32.5$ $I_{g2 \text{ min}} = 2 \times 4.5$ $I_{g2 \text{ max}} = 2 \times 8$	$R_{aa} = 8 \text{ k}\Omega$ $W_o = 8 \text{ W}$	
			$V_a = 200 \text{ V}$ $V_{g2} = 200 \text{ V}$ $R_k = 320 \Omega$	$I_a \text{ min} = 2 \times 21$ $I_a \text{ max} = 2 \times 24.5$ $I_{g2 \text{ min}} = 2 \times 3.5$ $I_{g2 \text{ max}} = 2 \times 6$	$R_{aa} = 9 \text{ k}\Omega$ $W_o = 5 \text{ W}$	

Type	Filament data	Application	Voltages Resistors	Currents (mA)	Characteristic data	Base connections
EL 3 N Output pentode	$V_f = 6.3 \text{ V}$ $I_f = 0.9 \text{ A}$	Class A output amplifier	$V_a = 250 \text{ V}$ $V_{g2} = 250 \text{ V}$ $V_{g1} = -6 \text{ V}$ $R_k = 150 \Omega$	$I_a = 36$ $I_{g2} = 4$	$S = 9 \text{ mA/V}$ $R_i = 50 \text{ k}\Omega$ $R_a = 7 \text{ k}\Omega$ $W_a = 9 \text{ W}$ $W_o = 4.5 \text{ W}$	
		Class AB push-pull amplifier	$V_a = 250 \text{ V}$ $V_{g2} = 250 \text{ V}$ $R_k = 140 \Omega$	$I_a \text{ min} = 2 \times 24$ $I_a \text{ max} = 2 \times 28.5$ $I_{g2 \text{ min}} = 2 \times 2.8$ $I_{g2 \text{ max}} = 2 \times 4.6$	$R_{aa} = 10 \text{ k}\Omega$ $W_o = 8.2 \text{ W}$	
EL 5 Output pentode	$V_f = 6.3 \text{ V}$ $I_f = 1.35 \text{ A}$	Class A output amplifier	$V_a = 250 \text{ V}$ $V_{g2} = 275 \text{ V}$ $V_{g1} = -14 \text{ V}$ $R_k = 175 \Omega$	$I_a = 72$ $I_{g2} = 7$	$S = 8.5 \text{ mA/V}$ $R_i = 22 \text{ k}\Omega$ $R_a = 3.5 \text{ k}\Omega$ $W_a = 18 \text{ W}$ $W_o = 8.8 \text{ W}$	
		Class AB push-pull amplifier	$V_a = 250 \text{ V}$ $V_{g2} = 275 \text{ V}$ $R_k = 120 \Omega$	$I_a \text{ min} = 2 \times 58$ $I_a \text{ max} = 2 \times 65$ $I_{g2 \text{ min}} = 2 \times 6.3$ $I_{g2 \text{ max}} = 2 \times 10.5$	$R_{aa} = 4.5 \text{ k}\Omega$ $W_o = 19.5 \text{ W}$	
EL 6 Output pentode	$V_f = 6.3 \text{ V}$ $I_f = 1.2 \text{ A}$	Class A output amplifier	$V_a = 250 \text{ V}$ $V_{g2} = 250 \text{ V}$ $V_{g1} = -7 \text{ V}$ $R_k = 90 \Omega$	$I_a = 72$ $I_{g2} = 8$	$S = 14.5 \text{ mA/V}$ $R_i = 20 \text{ k}\Omega$ $R_a = 3.5 \text{ k}\Omega$ $W_a = 18 \text{ W}$ $W_o = 8 \text{ W}$	
		Class AB push-pull amplifier	$V_a = 250 \text{ V}$ $V_{g2} = 250 \text{ V}$ $R_k = 90 \Omega$	$I_a \text{ min} = 2 \times 45$ $I_a \text{ max} = 2 \times 53$ $I_{g2 \text{ min}} = 2 \times 5.1$ $I_{g2 \text{ max}} = 2 \times 8.5$	$R_{aa} = 5 \text{ k}\Omega$ $W_o = 14.5 \text{ W}$	
EL 11 Output pentode	$V_f = 6.3 \text{ V}$ $I_f = 0.9 \text{ A}$	Class A output amplifier	$V_a = 250 \text{ V}$ $V_{g2} = 250 \text{ V}$ $V_{g1} = -6 \text{ V}$ $R_k = 150 \Omega$	$I_a = 36$ $I_{g2} = 4$	$S = 9 \text{ mA/V}$ $R_i = 50 \text{ k}\Omega$ $R_a = 7 \text{ k}\Omega$ $W_a = 9 \text{ W}$ $W_o = 4.5 \text{ W}$	
EL 12 Output pentode	$V_f = 6.3 \text{ V}$ $I_f = 1.2 \text{ A}$	Class A output amplifier	$V_a = 250 \text{ V}$ $V_{g2} = 250 \text{ V}$ $V_{g1} = -7 \text{ V}$ $R_k = 90 \Omega$	$I_a = 72$ $I_{g2} = 8$	$S = 15 \text{ mA/V}$ $R_i = 25 \text{ k}\Omega$ $R_a = 3.5 \text{ k}\Omega$ $W_a = 18 \text{ W}$ $W_o = 8 \text{ W}$	
EL 33 Output pentode	$V_f = 6.3 \text{ V}$ $I_f = 0.9 \text{ A}$	Class A output amplifier	$V_a = 250 \text{ V}$ $V_{g2} = 250 \text{ V}$ $V_{g1} = -6 \text{ V}$ $R_k = 150 \Omega$	$I_a = 36$ $I_{g2} = 4$	$S = 9 \text{ mA/V}$ $R_i = 50 \text{ k}\Omega$ $R_a = 7 \text{ k}\Omega$ $W_a = 9 \text{ W}$ $W_o = 4.5 \text{ W}$	
		Class AB push-pull amplifier	$V_a = 250 \text{ V}$ $V_{g2} = 250 \text{ V}$ $R_k = 140 \Omega$	$I_a \text{ min} = 2 \times 24$ $I_a \text{ max} = 2 \times 28.5$ $I_{g2 \text{ min}} = 2 \times 2.8$ $I_{g2 \text{ max}} = 2 \times 4.6$	$R_{aa} = 10 \text{ k}\Omega$ $W_o = 8.2 \text{ W}$	

Type	Filament data	Application	Voltages Resistors	Currents (mA)	Characteristic data	Base connections
EL 34 Output pentode	$V_f = 6.3 \text{ V}$ $I_f = 1.5 \text{ A}$	Class A output amplifier	$V_a = 250 \text{ V}$ $V_{g2} = 250 \text{ V}$ $R_k = 107 \Omega$	$I_a = 100$ $I_{g2} = 12$	$S = 11 \text{ mA/V}$ $R_i = 15 \text{ k}\Omega$ $R_a = 2.5 \text{ k}\Omega$ $W_a = 25 \text{ W}$ $W_o = 12 \text{ W}$	
		Class AB push-pull amplifier	$V_b = 375 \text{ V}$ $R_{g2}^{2)} = 500 \Omega$ $R_k = 132 \Omega$	$I_a \text{ min} = 2 \times 75$ $I_a \text{ max} = 2 \times 90$ $I_{g2 \text{ min}} = 2 \times 10$ $I_{g2 \text{ max}} = 2 \times 22$	$R_{aa} = 4 \text{ k}\Omega$ $W_o = 37 \text{ W}$	
		Class B push-pull amplifier	$V_b = 425 \text{ V}$ $R_{g2}^{2)} = 800 \Omega$ $V_{g1} = -42 \text{ V}$	$I_a \text{ min} = 2 \times 20$ $I_a \text{ max} = 2 \times 106$ $I_{g2 \text{ min}} = 2 \times 2.4$ $I_{g2 \text{ max}} = 2 \times 28$	$R_{aa} = 4.4 \text{ k}\Omega$ $W_o = 58 \text{ W}$	
			$V_{ba} = 800 \text{ V}$ $V_{bg2} = 400 \text{ V}$ $V_{g1} = -41 \text{ V}$	$I_a \text{ min} = 2 \times 20$ $I_a \text{ max} = 2 \times 98$ $I_{g2 \text{ min}} = 2 \times 2$ $I_{g2 \text{ max}} = 2 \times 27.5$	$R_{aa} = 11 \text{ k}\Omega$ $W_o = 108 \text{ W}$	
EL 38 ¹⁾ Line output valve	$V_f = 6.3 \text{ V}$ $I_f = 1.4 \text{ A}$	Typical characteristics	$V_o = 250 \text{ V}$ $V_{g2} = 250 \text{ V}$ $V_{g1} = -7 \text{ V}$	$I_a = 100$ $I_{g2} = 13$	$S = 14.3 \text{ mA/V}$ $R_i = 21 \text{ k}\Omega$ $C_{ag1} = 1.2 \text{ pF}$	
EL 41 Output pentode	$V_f = 6.3 \text{ V}$ $I_f = 0.71 \text{ A}$	Class A output amplifier	$V_a = 250 \text{ V}$ $V_{g2} = 250 \text{ V}$ $R_k = 170 \Omega$	$I_a = 36$ $I_{g2} = 5.2$	$S = 10 \text{ mA/V}$ $R_i = 40 \text{ k}\Omega$ $R_a = 7 \text{ k}\Omega$ $W_a = 9 \text{ W}$ $W_o = 4.8 \text{ W}$	
		Class AB push-pull amplifier	$V_a = 250 \text{ V}$ $V_{g2} = 250 \text{ V}$ $R_k = 85 \Omega$	$I_a \text{ min} = 2 \times 36$ $I_a \text{ max} = 2 \times 39.5$ $I_{g2 \text{ min}} = 2 \times 5.2$ $I_{g2 \text{ max}} = 2 \times 8$	$R_{aa} = 7 \text{ k}\Omega$ $W_o = 9.4 \text{ W}$	
EL 42 Output pentode	$V_f = 6.3 \text{ V}$ $I_f = 0.2 \text{ A}$	Class A output amplifier	$V_a = 225 \text{ V}$ $V_{g2} = 225 \text{ V}$ $R_k = 360 \Omega$	$I_a = 26$ $I_{g2} = 4.1$	$S = 3.2 \text{ mA/V}$ $R_i = 90 \text{ k}\Omega$ $R_a = 9 \text{ k}\Omega$ $W_a = 6 \text{ W}$ $W_o = 2.8 \text{ W}$	
			$V_a = 200 \text{ V}$ $V_{g2} = 200 \text{ V}$ $R_k = 360 \Omega$	$I_a = 22.5$ $I_{g2} = 3.5$	$S = 3.2 \text{ mA/V}$ $R_i = 90 \text{ k}\Omega$ $R_a = 9 \text{ k}\Omega$ $W_o = 2.1 \text{ W}$	
		Class AB push-pull amplifier	$V_a = 250 \text{ V}$ $V_{g2} = 250 \text{ V}$ $R_k = 310 \Omega$	$I_a \text{ min} = 2 \times 20$ $I_a \text{ max} = 2 \times 21.5$ $I_{g2 \text{ min}} = 2 \times 3.2$ $I_{g2 \text{ max}} = 2 \times 6.7$	$R_{aa} = 15 \text{ k}\Omega$ $W_o = 7 \text{ W}$	

¹⁾ Provisional data.

²⁾ Common screen grid resistor.

Type	Filament data	Application	Voltages Resistors	Currents (mA)	Characteristic data	Base connections
EL 42 Continued	$V_f = 6.3V$ $I_f = 0.2A$	Class AB push-pull amplifier	$V_a = 200V$ $V_{g2} = 200V$ $R_k = 310\Omega$	$I_a \min = 2 \times 16$ $I_a \max = 2 \times 17$ $I_{g2 \min} = 2 \times 2.6$ $I_{g2 \max} = 2 \times 5.6$	$R_{aa} = 15 k\Omega$ $W_o = 4.1 W$	
		Class B push-pull amplifier	$V_a = 250V$ $V_{g2} = 250V$ $V_{g1} = -22.5V$	$I_a \min = 2 \times 5$ $I_a \max = 2 \times 20$ $I_{g2 \min} = 2 \times 0.8$ $I_{g2 \max} = 2 \times 6.5$	$R_{aa} = 16 k\Omega$ $W_o = 6.5 W$	
EL 50 Output pentode	$V_f = 6.3V$ $I_f = 1.35A$	Typical characteristics	$V_a = 800V$ $V_{g2} = 400V$ $V_{g1} = -37V$	$I_a = 22.5$ $I_{g2} = 2.5$	$S = 4 mA/V$ $R_i = 50 k\Omega$ $W_a = 18 W$	
		Class AB push-pull amplifier	$V_a = 800V$ $V_{g2} = 400V$ $V_{g1} = -37.5V$	$I_a \min = 2 \times 15$ $I_a \max = 2 \times 70$ $I_{g2 \min} = 2 \times 1.25$ $I_{g2 \max} = 2 \times 20$	$R_{aa} = 16 k\Omega$ $W_o = 84 W$	
			$V_a = 400V$ $V_{g2} = 425V$ $V_{g1} = -35V$	$I_a \min = 2 \times 25$ $I_a \max = 2 \times 95$ $I_{g2 \min} = 2 \times 2.5$ $I_{g2 \max} = 2 \times 22$	$R_{aa} = 5 k\Omega$ $W_o = 50 W$	
EL 51 Output pentode	$V_f = 6.3V$ $I_f = 1.9A$	Typical characteristics	$V_a = 750V$ $V_{g2} = 750V$ $V_{g1} = -37.5V$	$I_a = 60$ $I_{g2} = 10$	$S = 8 mA/V$ $R_i = 50 k\Omega$ $W_a = 45 W$	
		Class AB push-pull amplifier	$V_a = 500V$ $V_{g2} = 500V$ $R_k = 100\Omega$	$I_a \min = 2 \times 87$ $I_a \max = 2 \times 110$ $I_{g2 \min} = 2 \times 13$ $I_{g2 \max} = 2 \times 23$	$R_{aa} = 4.8 k\Omega$ $W_o = 67.5 W$	
		Class B push-pull amplifier	$V_a = 750V$ $V_{g2} = 750V^1$ $V_{g1} = -40V$	$I_a \min = 2 \times 40$ $I_a \max = 2 \times 145$ $I_{g2 \min} = 2 \times 7.5$ $I_{g2 \max} = 2 \times 30$	$R_{aa} = 6 k\Omega$ $W_o = 140 W$	
EL 60 Output pentode	EL 60 = EL 34 with different base					
ELL 1 Double output pentode	$V_f = 6.3V$ $I_f = 0.45A$	Class AB push-pull amplifier	$V_a = 250V$ $V_{g2} = 250V$ $R_k = 560\Omega$	$I_a \min = 2 \times 15$ $I_a \max = 2 \times 17$ $I_{g2 \min} = 2 \times 2.5$ $I_{g2 \max} = 2 \times 5$	$S = 1.7 mA/V$ $R_i = 110 k\Omega$ $R_{aa} = 16 k\Omega$ $W_a = 2 \times 4.5 W$ $W_o = 4.5 W$	
EM 1 Tuning indicator	$V_f = 6.3V$ $I_f = 0.2A$	Tuning indicator	$V_b = V_l = 250V$ $R_a = 2 M\Omega$ $V_g = 0/-5V$	$I_a = 0.095/0.021$ $I_l = 0.13/0.14$	$\alpha = 74/0^\circ$	
			$V_b = V_l = 200V$ $R_a = 2 M\Omega$ $V_g = 0/-4V$	$I_a = 0.075/0.02$ $I_l = 0.13/0.14$	$\alpha = 70/0^\circ$	

¹⁾ In the screen-grid circuit a lamp of 550 V/68 W must be inserted.

Type	Filament data	Application	Voltages Resistors	Currents (mA)	Characteristic data	Base connections
EM 4 Tuning indicator with two sensitivities	$V_f = 6.3 \text{ V}$ $I_f = 0.2 \text{ A}$	Tuning indicator (sensitive section)	$V_b = V_l = 250 \text{ V}$ $R_a = 1 \text{ M}\Omega$ $V_g = 0/-5 \text{ V}$	$I_l = 2.0/2.5$	$\alpha = 90/5^\circ$	
			$V_b = V_l = 200 \text{ V}$ $R_a = 1 \text{ M}\Omega$ $V_g = 0/-4.2 \text{ V}$	$I_l = 1.4/1.8$	$\alpha = 90/5^\circ$	
		Tuning indicator (insensitive section)	$V_b = V_l = 250 \text{ V}$ $R_{a'} = 1 \text{ M}\Omega$ $V_g = 0/-16 \text{ V}$	$I_l = 2.0/2.7$	$\alpha' = 90/5^\circ$	
			$V_b = V_l = 200 \text{ V}$ $R_{a'} = 1 \text{ M}\Omega$ $V_g = 0/-12.5 \text{ V}$	$I_l = 1.4/2.0$	$\alpha' = 90/5^\circ$	
EM 11 Tuning indicator with two sensitivities	$V_f = 6.3 \text{ V}$ $I_f = 0.2 \text{ A}$	Tuning indicator (sensitive section)	$V_b = V_l = 250 \text{ V}$ $R_a = 1.5 \text{ M}\Omega$ $V_g = 0/-5 \text{ V}$	$I_l = 0.35$	$\alpha = 75/5^\circ$	
		Tuning indicator (insensitive section)	$V_b = V_l = 250 \text{ V}$ $R_{a'} = 1 \text{ M}\Omega$ $V_g = 0/-16 \text{ V}$	$I_l = 0.35$	$\alpha = 75/5^\circ$	
EM 34 Tuning indicator with two sensitivities	$V_f = 6.3 \text{ V}$ $I_f = 0.2 \text{ A}$	Tuning indicator (sensitive section)	$V_b = V_l = 250 \text{ V}$ $R_a = 1 \text{ M}\Omega$ $V_g = 0/-5 \text{ V}$	$I_l = 2.0/2.5$	$\alpha = 90/5^\circ$	
			$V_b = V_l = 200 \text{ V}$ $R_a = 1 \text{ M}\Omega$ $V_g = 0/-4.2 \text{ V}$	$I_l = 1.4/1.8$	$\alpha = 90/5^\circ$	
		Tuning indicator (insensitive section)	$V_b = V_l = 250 \text{ V}$ $R_{a'} = 1 \text{ M}\Omega$ $V_g = 0/-16 \text{ V}$	$I_l = 2.0/2.7$	$\alpha' = 90/5^\circ$	
			$V_b = V_l = 200 \text{ V}$ $R_{a'} = 1 \text{ M}\Omega$ $V_g = 0/-12.5 \text{ V}$	$I_l = 1.4/2.0$	$\alpha' = 90/5^\circ$	
EQ 80 Enneode	$V_f = 6.3 \text{ V}$ $I_f = 0.2 \text{ A}$	Frequency modulation limiter and detector	$V_b = 250 \text{ V}$ $R_a = 0.47 \text{ M}\Omega$ $R_1 = 34 \text{ k}\Omega^{1)}$ $R_2 = 3.9 \text{ k}\Omega^{1)}$ $R_3 = 560 \Omega^{1)}$ $V_{ig3} = 12 \text{ V}_{eff}$ $V_{ig5} = 12 \text{ V}_{eff}$ $\varphi (V_{ig3} - V_{ig5})^{2)}$ $= 90^\circ$	$I_a = 0.28$ $I_{g2+g4+g6} = 1.5$ $I_{g3} = 0.09$ $I_{g5} = 0.03$		

¹⁾ $g2+g4+g6$ and the cathode are tapped on a potentiometer between $+V_b$ and $-V_b$ consisting of R_1, R_2 and R_3 .

²⁾ φ = phase angle between V_{ig3} and V_{ig5} .

Type	Filament data	Application	Voltages Resistors	Currents (mA)	Characteristic data	Base connections
EY 1 E.H.T. rectifier (high tension rectifier for television)	$V_f = 6.3 \text{ V}$ $I_f = 80 \text{ mA}$	Rectifier 50–150 c/s	$V_{tr} = \text{max } 5 \text{ kV}_{eff}$	$I_o = \text{max } 0.5$ $I_o (\text{peak}) = 4 \text{ mA}$	$C_{filt} = \text{max } 0.1 \mu\text{F}$ $R_t = \text{min } 0.1 \text{ M}\Omega$	
		Impulse rectification	$V_a (\text{peak}) = \text{max } 17 \text{ kV}$	$I_o = 0.2 (\text{average})$ $I_o (\text{peak}) = 80$	$C_{filt} = \text{max } 5000 \text{ pF}$	
EY 51 E.H.T. rectifier (high tension rectifier for television)	$V_f = 6.3 \text{ V}$ $I_f = 80 \text{ mA}$	The EY 51 is the EY 1 but uncapped and with wire connections. (see page 61) All electrical data are equal to EY 1				
EZ 2 Full wave rectifier	$V_f = 6.3 \text{ V}$ $I_f = 0.4 \text{ A}$	Rectifier	$V_{tr} = 2 \times 300 \text{ V}_{eff}$ $= 2 \times 350 \text{ V}_{eff}$	$I_o = \text{max } 60$ $= \text{max } 60$	$R_t = \text{min } 500 \Omega$ $= \text{min } 500 \Omega$	
EZ 3 Full wave rectifier	$V_f = 6.3 \text{ V}$ $I_f = 0.65 \text{ A}$	Rectifier	$V_{tr} = 2 \times 300 \text{ V}_{eff}$ $= 2 \times 350 \text{ V}_{eff}$ $= 2 \times 400 \text{ V}_{eff}$	$I_o = \text{max } 100$ $= \text{max } 100$ $= \text{max } 100$	$R_t = \text{min } 200 \Omega$ $= \text{min } 250 \Omega$ $= \text{min } 300 \Omega$	
EZ 4 Full wave rectifier	$V_f = 6.3 \text{ V}$ $I_f = 0.9 \text{ A}$	Rectifier	$V_{tr} = 2 \times 300 \text{ V}_{eff}$ $= 2 \times 350 \text{ V}_{eff}$ $= 2 \times 400 \text{ V}_{eff}$	$I_o = \text{max } 175$ $= \text{max } 175$ $= \text{max } 175$	$R_t = \text{min } 200 \Omega$ $= \text{min } 250 \Omega$ $= \text{min } 300 \Omega$	
EZ 11 Full wave rectifier	$V_f = 6.3 \text{ V}$ $I_f = 0.29 \text{ A}$	Rectifier	$V_{tr} = 2 \times 250 \text{ V}_{eff}$	$I_o = \text{max } 60$	$R_t = \text{min } 600 \Omega$	

Type	Filament data	Application	Voltages Resistors	Currents (mA)	Characteristic data	Base connections
EZ 12 Full wave rectifier	$V_f = 6.3 \text{ V}$ $I_f = 0.85 \text{ A}$	Rectifier	$V_{tr} = 2 \times 400 \text{ V}_{eff}$ $= 2 \times 500 \text{ V}_{eff}$	$I_o = \begin{matrix} = \max 125 \\ = \max 100 \end{matrix}$	$R_t = \begin{matrix} = \min 300 \Omega \\ = \min 300 \Omega \end{matrix}$	
EZ 40 Full wave rectifier	$V_f = 6.3 \text{ V}$ $I_f = 0.6 \text{ A}$	Rectifier	$V_{tr} = 2 \times 250 \text{ V}_{eff}$ $= 2 \times 300 \text{ V}_{eff}$ $= 2 \times 350 \text{ V}_{eff}$ $V_{fk} = \max 500 \text{ V}$ (peak)	$I_o = \begin{matrix} = \max 90 \\ = \max 90 \\ = \max 90 \end{matrix}$	$R_t = \begin{matrix} = \min 2 \times 125 \Omega \\ = \min 2 \times 215 \Omega \\ = \min 2 \times 300 \Omega \end{matrix}$ $C_{filt} = \max 50 \mu\text{F}$	
KB 2 Double diode	$V_f = 2 \text{ V}$ $I_f = 95 \text{ mA}$	Detector and A.V.C.				
KBC 1 Double diode-triode	$V_f = 2 \text{ V}$ $I_f = 115 \text{ mA}$	Typical characteristics	$V_a = 135 \text{ V}$ $V_g = -4.5 \text{ V}$	$I_a = 2.5$	$S = 1.0 \text{ mA/V}$ $R_t = 16 \text{ k}\Omega$ $\mu = 16$	
			$V_a = 90 \text{ V}$ $V_g = -3.4 \text{ V}$	$I_a = 1.0$	$S = 0.7 \text{ mA/V}$ $R_t = 23 \text{ k}\Omega$ $\mu = 16$	
		L.F. amplifier	$V_b = 135 \text{ V}$ $R_a = 0.2 \text{ M}\Omega$ $V_g = -2.0 \text{ V}$	$I_a = 0.35$	$g = 12.5$	
			$V_b = 90 \text{ V}$ $R_a = 0.2 \text{ M}\Omega$ $V_g = -2.0 \text{ V}$	$I_a = 0.19$	$g = 11$	
KC 1 Triode	$V_f = 2 \text{ V}$ $I_f = 65 \text{ mA}$	Typical characteristics	$V_a = 135 \text{ V}$ $V_g = -1.5 \text{ V}$	$I_a = 1.2$	$S = 0.6 \text{ mA/V}$ $R_t = 40 \text{ k}\Omega$ $\mu = 25$	
			$V_a = 90 \text{ V}$ $V_g = -1.5 \text{ V}$	$I_a = 0.3$	$S = 0.4 \text{ mA/V}$ $R_t = 60 \text{ k}\Omega$ $\mu = 25$	
KC 3 Triode	$V_f = 2 \text{ V}$ $I_f = 210 \text{ mA}$	Typical characteristics	$V_a = 135 \text{ V}$ $V_g = -2.8 \text{ V}$	$I_a = 3.0$	$S = 2.5 \text{ mA/V}$ $R_t = 12 \text{ k}\Omega$ $\mu = 30$	
			$V_a = 90 \text{ V}$ $V_g = -1.6 \text{ V}$	$I_a = 2.0$	$S = 2.2 \text{ mA/V}$ $R_t = 14 \text{ k}\Omega$ $\mu = 30$	
KC 4 Triode	$V_f = 2 \text{ V}$ $I_f = 100 \text{ mA}$	Typical characteristics	$V_a = 135 \text{ V}$ $V_g = -1.5 \text{ V}$	$I_a = 2.2$	$S = 1.4 \text{ mA/V}$ $R_t = 22 \text{ k}\Omega$ $\mu = 30$	
			$V_a = 90 \text{ V}$ $V_g = -1.5 \text{ V}$	$I_a = 0.5$	$S = 0.8 \text{ mA/V}$ $R_t = 38 \text{ k}\Omega$ $\mu = 30$	
KCH 1 Triode-hexode	$V_f = 2 \text{ V}$ $I_f = 180 \text{ mA}$	Frequency changer (hexode section)	$V_a = 135 \text{ V}$ $V_{g2+g4} = 55 \text{ V}$ $V_{g1} = -0.5 \text{ V}$ $R_{g3+gT} = 25 \text{ k}\Omega$ $V_{csc} = 8.5 \text{ V}_{eff}$	$I_a = 1.0$ $I_{g2+g4} = 1.2$ $I_{g3+gT} = 0.28$	$S_c = 0.32 \text{ mA/V}$ $R_t = 1.5 \text{ M}\Omega$	

Type	Filament data	Application	Voltages Resistors	Currents (mA)	Characteristic data	Base connections
KCH 1 Continued	$V_f = 2V$ $I_f = 180mA$	Frequency changer (hexode section)	$V_a = 90V$ $V_{g2+g4} = 55V$ $V_{g1} = -0.5V$ $R_{g3+gT} = 25k\Omega$ $V_{osc} = 8.5V_{eff}$	$I_a = 1.0$ $I_{g2+g4} = 1.2$ $I_{g3+gT} = 0.28$	$S_c = 0.32mA/V$ $R_i = 0.7M\Omega$	
		Oscillator (triode section)	$V_b = 135V$ $R_a = 22k\Omega$ $R_{g3+gT} = 25k\Omega$	$I_a = 3.0$ $I_{g3+gT} = 0.28$	$S_o = 1.3mA/V$ $\mu = 28$	
KDD 1 Double output triode	$V_f = 2V$ $I_f = 220mA$	Class B push-pull amplifier	$V_a = 135V$ $V_g = 0V$	$I_a min = 2 \times 1.5$ $I_a max = 2 \times 14$	$S = 1.0mA/V$ $R_i = 60k\Omega$ $R_{aa'} = 10k\Omega$ $W_a = 2 \times 1.5W$ $W_o = 2W$	
			$V_a = 90V$ $V_g = 0V$	$I_a min = 2 \times 0.8$ $I_a max = 2 \times 8.5$	$S = 0.8mA/V$ $R_i = 70k\Omega$ $R_{aa} = 10k\Omega$ $W_o = 0.72W$	
KF 3 Variable mu pentode	$V_f = 2V$ $I_f = 45mA$	H.F. or I.F. amplifier	$V_a = 135V$ $V_{g2} = 135V$ $V_{g1} = -0.5V$	$I_a = 2.0$ $I_{g2} = 0.6$	$S = 0.65mA/V$ $R_i = 1.3M\Omega$ $C_{a\beta 1} < 0.006pF$	
			$V_a = 90V$ $V_{g2} = 90V$ $V_{g1} = -0.5V$	$I_a = 1.0$ $I_{g2} = 0.2$	$S = 0.5mA/V$ $R_i = 2M\Omega$ $C_{a\beta 1} < 0.006pF$	
KF 4 Pentode	$V_f = 2V$ $I_f = 65mA$	H.F. or I.F. amplifier	$V_a = 135V$ $V_{g2} = 135V$ $V_{g1} = -0.5V$	$I_a = 2.6$ $I_{g2} = 1.0$	$S = 0.8mA/V$ $R_i = 0.8M\Omega$ $C_{a\beta 1} < 0.008pF$	
			$V_a = 90V$ $V_{g2} = 90V$ $V_{g1} = -0.5V$	$I_a = 1.2$ $I_{g2} = 0.4$	$S = 0.7mA/V$ $R_i = 0.9M\Omega$ $C_{a\beta 1} < 0.008pF$	
KK 2 Octode	$V_f = 2V$ $I_f = 130mA$	Frequency changer	$V_a = 135V$ $V_{g3+g5} = 45V$ $V_{g4} = -0.5V$ $V_{g2} = 135V$ $R_{g1} = 50k\Omega$ $V_{osc} = 8.5V_{eff}$	$I_a = 0.7$ $I_{g3+g5} = 1.0$ $I_{g2} = 2.2$ $I_{g1} = 0.16$	$S_c = 0.27mA/V$ $R_i = 2.5M\Omega$	
			$V_a = 90V$ $V_{g3+g5} = 45V$ $V_{g4} = -0.5V$ $V_{g2} = 90V$ $R_{g1} = 50k\Omega$ $V_{osc} = 8.5V_{eff}$	$I_a = 0.7$ $I_{g3+g5} = 1.0$ $I_{g2} = 1.6$ $I_{g1} = 0.16$	$S_c = 0.27mA/V$ $R_i = 2.0M\Omega$	

Type	Filament data	Application	Voltages Resistors	Currents (mA)	Characteristic data	Base connections
KL 4 Output pentode	$V_f = 2\text{ V}$ $I_f = 150\text{ mA}$	Class A output amplifier	$V_a = 135\text{ V}$ $V_{g2} = 135\text{ V}$ $V_{g1} = -5\text{ V}$	$I_a = 7$ $I_{g2} = 1.1$	$S = 2.1\text{ mA/V}$ $R_i = 130\text{ k}\Omega$ $R_a = 19\text{ k}\Omega$ $W_a = 1\text{ W}$ $W_o = 0.44\text{ W}$	
			$V_a = 90\text{ V}$ $V_{g2} = 90\text{ V}$ $V_{g1} = -2.6\text{ V}$	$I_a = 4.7$ $I_{g2} = 0.8$	$S = 1.8\text{ mA/V}$ $R_i = 150\text{ k}\Omega$ $R_a = 19\text{ k}\Omega$ $W_o = 0.16\text{ W}$	
KL 5 Output pentode	$V_f = 2\text{ V}$ $I_f = 100\text{ mA}$	Class A output amplifier	$V_a = 90\text{ V}$ $V_{g2} = 90\text{ V}$ $V_{g1} = -4\text{ V}$	$I_a = 4.8$ $I_{g2} = 0.9$	$S = 1.4\text{ mA/V}$ $R_i = 180\text{ k}\Omega$ $R_a = 19\text{ k}\Omega$ $W_o = 0.2\text{ W}$	
U 30 Current regulator		Current regulator	$V_{contr} = 70-122\text{ V}$	$I_{reg} = 100$		
UAF 41 Diode-variable mu pentode	$V_f = 12.6\text{ V}$ $I_f = 0.1\text{ A}$	H.F. or I.F. amplifier	$V_a = 170\text{ V}$ $R_{g2} = 44\text{ k}\Omega$ $V_{g1} = -2\text{ V}$	$I_a = 5$ $I_{g2} = 1.6$	$S = 1.8\text{ mA/V}$ $R_i = 1.2\text{ M}\Omega$ $C_{a\beta 1} < 0.002\text{ pF}$	
			$V_a = 100\text{ V}$ $R_{g2} = 44\text{ k}\Omega$ $V_{g1} = -1.1\text{ V}$	$I_a = 2.8$ $I_{g2} = 0.9$	$S = 1.65\text{ mA/V}$ $R_i = 1.0\text{ M}\Omega$ $C_{a\beta 1} < 0.002\text{ pF}$	
		L.F. amplifier	$V_b = 170\text{ V}$ $R_a = 0.2\text{ M}\Omega$ $R_{g2} = 0.73\text{ M}\Omega$ $R_k = 2.7\text{ k}\Omega$	$I_a = 0.58$ $I_{g2} = 0.18$	$g = 78$	
			$V_b = 100\text{ V}$ $R_a = 0.2\text{ M}\Omega$ $R_{g2} = 0.73\text{ M}\Omega$ $R_k = 2.7\text{ k}\Omega$	$I_a = 0.34$ $I_{g2} = 0.10$	$g = 73$	
UAF 42 Diode-variable mu pentode	$V_f = 12.6\text{ V}$ $I_f = 0.1\text{ A}$	H.F. or I.F. amplifier	$V_a = 170\text{ V}$ $R_{g2} = 56\text{ k}\Omega$ $V_{g1} = -2.0\text{ V}$	$I_a = 5$ $I_{g2} = 1.5$	$S = 2.0\text{ mA/V}$ $R_i = 0.9\text{ M}\Omega$ $C_{a\beta 1} < 0.002\text{ pF}$	
			$V_a = 100\text{ V}$ $R_{g2} = 56\text{ k}\Omega$ $V_{g1} = -1.2\text{ V}$	$I_a = 2.8$ $I_{g2} = 0.9$	$S = 1.7\text{ mA/V}$ $R_i = 0.85\text{ M}\Omega$ $C_{a\beta 1} < 0.002\text{ pF}$	
		L.F. amplifier	$V_b = 170\text{ V}$ $R_a = 0.22\text{ M}\Omega$ $R_{g2} = 0.82\text{ M}\Omega$ $R_k = 2.7\text{ k}\Omega$	$I_a = 0.5$ $I_{g2} = 0.17$	$g = 80$	
			$V_b = 100\text{ V}$ $R_a = 0.22\text{ M}\Omega$ $R_{g2} = 0.82\text{ M}\Omega$ $R_k = 2.7\text{ k}\Omega$	$I_a = 0.29$ $I_{g2} = 0.09$	$g = 75$	

Type	Filament data	Application	Voltages Resistors	Currents (mA)	Characteristic data	Base connections
UBC 41 Double diode-triode	$V_f = 14 \text{ V}$ $I_f = 0.1 \text{ A}$	Typical characteristics	$V_a = 170 \text{ V}$ $V_g = -1.5 \text{ V}$	$I_a = 1.5$	$S = 1.65 \text{ mA/V}$ $R_i = 42 \text{ k}\Omega$ $\mu = 70$	
			$V_a = 100 \text{ V}$ $V_g = -1.0 \text{ V}$	$I_a = 0.8$	$S = 1.4 \text{ mA/V}$ $R_i = 50 \text{ k}\Omega$ $\mu = 70$	
		L.F. amplifier	$V_b = 170 \text{ V}$ $R_a = 0.1 \text{ M}\Omega$ $R_k = 3.9 \text{ k}\Omega$	$I_a = 0.45$	$g = 37$	
			$V_b = 100 \text{ V}$ $R_a = 0.1 \text{ M}\Omega$ $R_k = 3.9 \text{ k}\Omega$	$I_a = 0.28$	$g = 34$	
UBF 11 Double diode-variable mu pentode	$V_f = 20 \text{ V}$ $I_f = 0.1 \text{ A}$	H.F. or I.F. amplifier	$V_a = 200 \text{ V}$ $R_{g2} = 70 \text{ k}\Omega$ $V_{g1} = -2 \text{ V}$	$I_a = 5$ $I_{g2} = 1.7$	$S = 1.8 \text{ mA/V}$ $R_i = 1.5 \text{ M}\Omega$ $C_{a\delta 1} < 0.002 \text{ pF}$	
			$V_a = 100 \text{ V}$ $R_{g2} = 70 \text{ k}\Omega$ $V_{g1} = -1 \text{ V}$	$I_a = 2.6$ $I_{g2} = 0.85$	$S = 1.3 \text{ mA/V}$ $R_i = 0.9 \text{ M}\Omega$ $C_{a\delta 1} < 0.002 \text{ pF}$	
		L.F. amplifier	$V_b = 200 \text{ V}$ $R_a = 0.2 \text{ M}\Omega$ $R_{g2} = 0.7 \text{ M}\Omega$ $R_k = 2.4 \text{ k}\Omega$	$I_a = 0.66$ $I_{g2} = 0.24$	$g = 82$	
			$V_b = 100 \text{ V}$ $R_a = 0.2 \text{ M}\Omega$ $R_{g2} = 0.7 \text{ M}\Omega$ $R_k = 2.4 \text{ k}\Omega$	$I_a = 0.33$ $I_{g2} = 0.12$	$g = 76$	
UBL 1 Double diode-output pentode	$V_f = 55 \text{ V}$ $I_f = 0.1 \text{ A}$	Class A output amplifier	$V_a = 200 \text{ V}$ $V_{g2} = 200 \text{ V}$ $V_{g1} = -11.5 \text{ V}$ $R_k = 175 \Omega$	$I_a = 55$ $I_{g2} = 11$	$S = 8.5 \text{ mA/V}$ $R_i = 20 \text{ k}\Omega$ $R_a = 3.5 \text{ k}\Omega$ $W_a = 11 \text{ W}$ $W_o = 5.2 \text{ W}$	
			$V_a = 185 \text{ V}$ $V_{g2} = 185 \text{ V}$ $V_{g1} = -10 \text{ V}$ $R_k = 140 \Omega$	$I_a = 59$ $I_{g2} = 11.3$	$S = 8.8 \text{ mA/V}$ $R_i = 23 \text{ k}\Omega$ $R_a = 3 \text{ k}\Omega$ $W_o = 5 \text{ W}$	
			$V_a = 100 \text{ V}$ $V_{g2} = 100 \text{ V}$ $V_{g1} = -5 \text{ V}$ $R_k = 145 \Omega$	$I_a = 28.5$ $I_{g2} = 5.3$	$S = 7 \text{ mA/V}$ $R_i = 25 \text{ k}\Omega$ $R_a = 3 \text{ k}\Omega$ $W_o = 1.05 \text{ W}$	
UBL 21 Double diode-output pentode	$V_f = 55 \text{ V}$ $I_f = 0.1 \text{ A}$	Class A output amplifier	$V_a = 180 \text{ V}$ $V_{g2} = 180 \text{ V}$ $V_{g1} = -10 \text{ V}$ $R_k = 140 \Omega$	$I_a = 61$ $I_{g2} = 10$	$S = 9 \text{ mA/V}$ $R_i = 22 \text{ k}\Omega$ $R_a = 3 \text{ k}\Omega$ $W_a = 11 \text{ W}$ $W_o = 4.8 \text{ W}$	
			$V_a = 100 \text{ V}$ $V_{g2} = 100 \text{ V}$ $V_{g1} = -5.3 \text{ V}$ $R_k = 140 \Omega$	$I_a = 32.5$ $I_{g2} = 5.5$	$S = 7.5 \text{ mA/V}$ $R_i = 25 \text{ k}\Omega$ $R_a = 3 \text{ k}\Omega$ $W_o = 1.35 \text{ W}$	

Type	Filament data	Application	Voltages Resistors	Currents (mA)	Characteristic data	Base connections
UCH 11 Continued	$V_f = 20V$ $I_f = 0.1A$	Oscillator (triode section)	$V_b = 100V$ $R_a = 30k\Omega$ $R_{g3+gT} = 50k\Omega$	$I_a = 1.4$ $I_{g3+gT} = 0.10$		
UCH 21 Triode-heptode	$V_f = 20V$ $I_f = 0.1A$	Frequency changer (heptode section)	$V_a = 200V$ $R_{g2+g4} = 15.5k\Omega$ $R_{g3+gT} = 50k\Omega$ $V_{g1} = -2V$	$I_a = 3.5$ $I_{g2+g4} = 6.5$ $I_{g3+gT} = 0.19$	$S_c = 0.75mA/V$ $R_i = 1.0M\Omega$	
			$V_a = 100V$ $R_{g2+g4} = 15.5k\Omega$ $R_{g3+gT} = 50k\Omega$ $V_{g1} = -1V$	$I_a = 1.5$ $I_{g2+g4} = 3.0$ $I_{g3+gT} = 0.095$	$S_c = 0.58mA/V$ $R_i = 1.0M\Omega$	
		Oscillator (triode section)	$V_b = 200V$ $R_a = 20k\Omega$ $R_{g3+gT} = 50k\Omega$	$I_a = 4.1$ $I_{g3+gT} = 0.19$	$S_{eff} = 0.45mA/V$ $V_{osc} = 7.5V_{eff}$	
			$V_b = 100V$ $R_a = 20k\Omega$ $R_{g3+gT} = 50k\Omega$	$I_a = 1.9$ $I_{g3+gT} = 0.095$	$S_{eff} = 0.44mA/V$ $V_{osc} = 4V_{eff}$	
		I.F. amplifier (heptode section)	$V_a = 200V$ $R_{g2+g4} = 30k\Omega$ $V_{g3} = 0V$ $V_{g1} = -2V$	$I_a = 5.2$ $I_{g2+g4} = 3.5$	$S = 2.2mA/V$ $R_i = 0.7M\Omega$ $C_{ag1} < 0.002pF$	
			$V_a = 100V$ $R_{g2+g4} = 30k\Omega$ $V_{g3} = 0V$ $V_{g1} = -1V$	$I_a = 2.6$ $I_{g2+g4} = 1.9$	$S = 2.0mA/V$ $R_i = 0.7M\Omega$ $C_{ag1} < 0.002pF$	
L.F. amplifier (triode section)	$V_b = 200V$ $R_a = 100k\Omega$ $V_g = -2V$	$I_a = 1.5$	$g = 10.5$			
	$V_b = 100V$ $R_a = 100k\Omega$ $V_g = -1V$	$I_a = 0.68$	$g = 10.5$			
Typical characteristics (triode section)	$V_a = 100V$ $V_g = 0V$	$I_a = 12$	$S = 3.2mA/V$ $R_i = 6k\Omega$ $\mu = 19$			
UCH 41 Triode-hexode	$V_f = 14V$ $I_f = 0.1A$	Frequency changer (hexode section)	$V_a = 170V$ $R_1^1) = 22k\Omega$ $R_2^2) = 47k\Omega$ $R_{g3+gT} = 20k\Omega$ $V_{g1} = -1.8V$	$I_a = 2.2$ $I_{g2+g4} = 1.9$ $I_{g3+gT} = 0.32$	$S_c = 0.45mA/V$ $R_i = 1.2M\Omega$	
			$V_a = 100V$ $R_1^1) = 22k\Omega$ $R_2^2) = 47k\Omega$ $R_{g3+gT} = 20k\Omega$ $V_{g1} = -1.0V$	$I_a = 1.0$ $I_{g2+g4} = 1.0$ $I_{g3+gT} = 0.20$	$S_c = 0.32mA/V$ $R_i = 1.4M\Omega$	

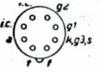
¹⁾ R_1 is a resistor between $+V_b$ and the screen grids.

²⁾ R_2 is a resistor between the screen grids and chassis.

Type	Filament data	Application	Voltages Resistors	Currents (mA)	Characteristic data	Base connections
UCH 41 Continued	$V_f = 14V$ $I_f = 0.1A$	Oscillator (triode section)	$V_b = 170V$ $R_a = 10k\Omega$ $R_{g3+gT} = 20k\Omega$ $V_{osc} = 7V_{eff}$	$I_a = 4.9$ $I_{g3+gT} = 0.32$	$S_{eff} = 0.6mA/V$	
			$V_b = 100V$ $R_a = 10k\Omega$ $R_{g3+gT} = 20k\Omega$ $V_{osc} = 4V_{eff}$	$I_a = 2.8$ $I_{g3+gT} = 0.20$	$S_o = 1.9mA/V$ $S_{eff} = 0.56mA/V$ $\mu = 19$	
UCH 42 Triode-hexode	$V_f = 14V$ $I_f = 0.1A$	Frequency changer (hexode section)	$V_a = 170V$ $R_1^1) = 18k\Omega$ $R_2^2) = 27k\Omega$ $R_{g3+gT} = 47k\Omega$ $V_{g1} = -1.85V$	$I_a = 2.1$ $I_{g2+g4} = 2.6$ $I_{g3+gT} = 0.20$	$S_c = 670\mu A/V$ $R_i = 1.0M\Omega$	
			$V_a = 100V$ $R_1^1) = 18k\Omega$ $R_2^2) = 27k\Omega$ $R_{g3+gT} = 47k\Omega$ $V_{g1} = -1.0V$	$I_a = 1.2$ $I_{g2+g4} = 1.5$ $I_{g3+gT} = 0.10$	$S_c = 530\mu A/V$ $R_i = 1.2M\Omega$	
		Oscillator (triode section)	$V_b = 170V$ $R_a = 10k\Omega$ $R_{g3+gT} = 47k\Omega$ $V_{osc} = 8V_{eff}$	$I_a = 5.7$ $I_{g3+gT} = 0.20$	$S_{eff} = 0.5mA/V$	
			$V_b = 100V$ $R_a = 10k\Omega$ $R_{g3+gT} = 47k\Omega$ $V_{osc} = 4V_{eff}$	$I_a = 3.1$ $I_{g3+gT} = 0.10$	$S_o = 2.8mA/V$ $S_{eff} = 0.6mA/V$ $\mu = 22$	
UCL 11 Triode-output tetrode	$V_f = 60V$ $I_f = 0.1A$	Typical characteristics (triode section)	$V_a = 200V$ $V_g = -2V$	$I_a = 2.0$	$S = 2.1mA/V$ $R_i = 30k\Omega$ $\mu = 65$	
		Class A output amplifier (tetrode section)	$V_a = 200V$ $V_{g2} = 200V$ $V_{g1} = -8.5V$	$I_a = 45$ $I_{g2} = 6$	$S = 9mA/V$ $R_i = 18k\Omega$ $R_a = 4.5k\Omega$ $W_o = 4W$	
UF 9 Variable mu pentode	$V_f = 12.6V$ $I_f = 0.1A$	H.F. or I.F. amplifier	$V_a = 200V$ $R_{g2} = 60k\Omega$ $V_{g1} = -2.5V$	$I_a = 6$ $I_{g2} = 1.7$	$S = 2.2mA/V$ $R_i = 1.2M\Omega$ $C_{ag1} < 0.002pF$	
			$V_a = 100V$ $R_{g2} = 60k\Omega$ $V_{g1} = -1.3V$	$I_a = 3.2$ $I_{g2} = 0.85$	$S = 2.0mA/V$ $R_i = 1.0M\Omega$ $C_{ag1} < 0.002pF$	
		L.F. amplifier	$V_b = 200V$ $R_a = 0.2M\Omega$ $R_{g2} = 0.8M\Omega$ $R_k = 2.5k\Omega$	$I_a = 0.65$ $I_{g2} = 0.17$	$g = 88$	
			$V_b = 100V$ $R_a = 0.2M\Omega$ $R_{g2} = 0.8M\Omega$ $R_k = 2.5k\Omega$	$I_a = 0.33$ $I_{g2} = 0.08$	$g = 82$	

¹⁾ R_1 is a resistor between + V_b and the screen grids.

²⁾ R_2 is a resistor between the screen grids and chassis.

Type	Filament data	Application	Voltages Resistors	Currents (mA)	Characteristic data	Bcs ₂ connections
UF 11 Variable mu pentode	$V_f = 15\text{ V}$ $I_f = 0.1\text{ A}$	H.F. or I.F. amplifier	$V_a = 200\text{ V}$ $R_{g2} = 70\text{ k}\Omega$ $V_{g1} = -2\text{ V}$	$I_a = 6$ $I_{g2} = 1.7$	$S = 2.2\text{ mA/V}$ $R_i = 1.5\text{ M}\Omega$ $C_{ag1} < 0.002\text{ pF}$	
			$V_a = 100\text{ V}$ $R_{g2} = 70\text{ k}\Omega$ $V_{g1} = -1\text{ V}$	$I_a = 2.8$ $I_{g2} = 0.95$	$S = 1.8\text{ mA/V}$ $R_i = 1.1\text{ M}\Omega$ $C_{ag1} < 0.002\text{ pF}$	
		L.F. amplifier	$V_b = 200\text{ V}$ $R_a = 0.2\text{ M}\Omega$ $R_{g2} = 0.6\text{ M}\Omega$ $R_k = 2\text{ k}\Omega$	$I_a = 0.76$ $I_{g2} = 0.26$	$g = 77$	
			$V_b = 100\text{ V}$ $R_a = 0.2\text{ M}\Omega$ $R_{g2} = 0.6\text{ M}\Omega$ $R_k = 2\text{ k}\Omega$	$I_a = 0.37$ $I_{g2} = 0.12$	$g = 66$	
UF 21 Variable mu pentode	$V_f = 12.6\text{ V}$ $I_f = 0.1\text{ A}$	H.F. or I.F. amplifier	$V_a = 200\text{ V}$ $R_{g2} = 60\text{ k}\Omega$ $V_{g1} = -2.5\text{ V}$	$I_a = 6$ $I_{g2} = 1.7$	$S = 2.2\text{ mA/V}$ $R_i = 1.0\text{ M}\Omega$ $C_{ag1} < 0.002\text{ pF}$	
			$V_a = 100\text{ V}$ $R_{g2} = 60\text{ k}\Omega$ $V_{g1} = -1.3\text{ V}$	$I_a = 3.2$ $I_{g2} = 0.85$	$S = 2.0\text{ mA/V}$ $R_i = 1.0\text{ M}\Omega$ $C_{ag1} < 0.002\text{ pF}$	
		L.F. amplifier	$V_b = 200\text{ V}$ $R_a = 0.2\text{ M}\Omega$ $R_{g2} = 0.8\text{ M}\Omega$ $R_k = 2.5\text{ k}\Omega$	$I_a = 0.65$ $I_{g2} = 0.17$	$g = 88$	
			$V_b = 100\text{ V}$ $R_a = 0.2\text{ M}\Omega$ $R_{g2} = 0.8\text{ M}\Omega$ $R_k = 2.5\text{ k}\Omega$	$I_a = 0.33$ $I_{g2} = 0.08$	$g = 82$	
UF 41 Variable mu pentode	$V_f = 12.6\text{ V}$ $I_f = 0.1\text{ A}$	H.F. or I.F. amplifier	$V_a = 170\text{ V}$ $R_{g2} = 40\text{ k}\Omega$ $V_{g1} = -2.5\text{ V}$	$I_a = 6$ $I_{g2} = 1.75$	$S = 2.2\text{ mA/V}$ $R_i = 1.0\text{ M}\Omega$ $C_{ag1} < 0.002\text{ pF}$	
			$V_a = 100\text{ V}$ $R_{g2} = 40\text{ k}\Omega$ $V_{g1} = -1.4\text{ V}$	$I_a = 3.3$ $I_{g2} = 1.0$	$S = 1.9\text{ mA/V}$ $R_i = 0.8\text{ M}\Omega$ $C_{ag1} < 0.002\text{ pF}$	

Type	Filament data	Application	Voltages Resistors	Currents (mA)	Characteristic data	Base connections
UF 42 Television pentode	$V_f = 21 \text{ V}$ $I_f = 0.1 \text{ A}$	Wide band amplifier	$V_a = 170 \text{ V}$ $V_{g2} = 170 \text{ V}$ $V_{g1} = -2 \text{ V}$	$I_a = 10$ $I_{g2} = 2.3$	$S = 8.5 \text{ mA/V}$ $R_i = 0.3 \text{ M}\Omega$ $C_{ag1} < 0.005 \text{ pF}$ $R_{eq} = 940 \Omega$	
UFM 11 Tuning indicator and pentode	$V_f = 15 \text{ V}$ $I_f = 0.1 \text{ A}$	L.F. amplifier + tuning indicator	$V_b = V_l = 200 \text{ V}$ $R_a = 0.17 \text{ M}\Omega$ $R_{g2} = 0.5 \text{ M}\Omega$ $V_{g1} = 0/-11 \text{ V}$	$I_a = 0.95/0.45$ $I_{g2} = 0.37/0.18$	$\alpha = 85/20^\circ$ $g = 95/12$	
			$V_b = V_l = 100 \text{ V}$ $R_a = 0.17 \text{ M}\Omega$ $R_{g2} = 0.5 \text{ M}\Omega$ $V_{g1} = 0/-6 \text{ V}$	$I_a = 0.50/0.24$ $I_{g2} = 0.18/0.08$	$\alpha = 80/15^\circ$ $g = 75/9$	
UL 41 Output pentode	$V_f = 45 \text{ V}$ $I_f = 0.1 \text{ A}$	Class A output amplifier	$V_a = 165 \text{ V}$ $V_{g2} = 165 \text{ V}$ $V_{g1} = -9.5 \text{ V}$ $R_k = 140 \Omega$	$I_a = 54.5$ $I_{g2} = 9$	$S = 9.5 \text{ mA/V}$ $R_i = 20 \text{ k}\Omega$ $R_a = 3 \text{ k}\Omega$ $W_a = 9 \text{ W}$ $W_o = 4.5 \text{ W}$	
			$V_a = 110 \text{ V}$ $V_{g2} = 110 \text{ V}$ $V_{g1} = -5.9 \text{ V}$ $R_k = 140 \Omega$	$I_a = 36$ $I_{g2} = 6$	$S = 8.6 \text{ mA/V}$ $R_i = 18 \text{ k}\Omega$ $R_a = 3 \text{ k}\Omega$ $W_o = 1.7 \text{ W}$	
			$V_a = 100 \text{ V}$ $V_{g2} = 100 \text{ V}$ $V_{g1} = -5.3 \text{ V}$ $R_k = 140 \Omega$	$I_a = 32.5$ $I_{g2} = 5.5$	$S = 8.5 \text{ mA/V}$ $R_i = 18 \text{ k}\Omega$ $R_a = 3 \text{ k}\Omega$ $W_o = 1.35 \text{ W}$	
		Class AB push-pull amplifier	$V_a = 165 \text{ V}$ $V_{g2} = 165 \text{ V}$ $R_k = 70 \Omega$	$I_a \text{ min} = 2 \times 54.5$ $I_a \text{ max} = 2 \times 57$ $I_{g2 \text{ min}} = 2 \times 9$ $I_{g2 \text{ max}} = 2 \times 17.5$	$R_{oa} = 3.6 \text{ k}\Omega$ $W_o = 9 \text{ W}$	
			$V_a = 100 \text{ V}$ $V_{g2} = 100 \text{ V}$ $R_k = 70 \Omega$	$I_a \text{ min} = 2 \times 32.5$ $I_a \text{ max} = 2 \times 34$ $I_{g2 \text{ min}} = 2 \times 5.5$ $I_{g2 \text{ max}} = 2 \times 8$	$R_{oa} = 3.6 \text{ k}\Omega$ $W_o = 2.3 \text{ W}$	
UM 4 Tuning indicator with two sensitivities	$V_f = 12.6 \text{ V}$ $I_f = 0.1 \text{ A}$	Tuning indicator (sensitive section)	$V_b = V_l = 200 \text{ V}$ $R_a = 1.0 \text{ M}\Omega$ $V_g = 0/-4.2 \text{ V}$	$I_l = 1.4/1.8$	$\alpha = 90/5^\circ$	
			$V_b = V_l = 100 \text{ V}$ $R_a = 1.0 \text{ M}\Omega$ $V_g = 0/-2.5 \text{ V}$	$I_l = 0.40/0.52$	$\alpha = 90/5^\circ$	
		Tuning indicator (insensitive section)	$V_b = V_l = 200 \text{ V}$ $R_a' = 1.0 \text{ M}\Omega$ $V_g = 0/-12.5 \text{ V}$	$I_l = 1.4/2.0$	$\alpha' = 90/5^\circ$	
			$V_b = V_l = 100 \text{ V}$ $R_a' = 1.0 \text{ M}\Omega$ $V_g = 0/-8 \text{ V}$	$I_l = 0.40, 0.61$	$\alpha' = 90/5^\circ$	

Type	Filament data	Application	Voltages Resistors	Currents (mA)	Characteristic data	Base connections
UY 1 (N) Half wave rectifier	$V_f = 50 \text{ V}$ $I_f = 0.1 \text{ A}$	Rectifier	$V_i = 250 \text{ V}_{eff}$ $= 127 \text{ V}_{eff}$	$I_o = \text{max } 140$ $= \text{max } 140$	$R_t = \text{min } 175 \Omega$ $= 0 \Omega$ $C_{filt} = \text{max } 60 \mu\text{F}$	
UY 11 Half wave rectifier	$V_f = 50 \text{ V}$ $I_f = 0.1 \text{ A}$	Rectifier	$V_i = 250 \text{ V}_{eff}$	$I_o = \text{max } 140$	$R_t = \text{min } 175 \Omega$ $C_{filt} = \text{max } 60 \mu\text{F}$	
UY 21 Half wave rectifier	$V_f = 50 \text{ V}$ $I_f = 0.1 \text{ A}$	Rectifier	$V_i = 250 \text{ V}_{eff}$	$I_o = \text{max } 140$	$R_t = \text{min } 175 \Omega$ $C_{filt} = \text{max } 60 \mu\text{F}$	
UY 41 Half wave rectifier	$V_f = 31 \text{ V}$ $I_f = 0.1 \text{ A}$	Rectifier	$V_i = 220 \text{ V}_{eff}$ $= 127 \text{ V}_{eff}$	$I_o = \text{max } 100$ $= \text{max } 100$	$R_t = \text{min } 160 \Omega$ $= 0 \Omega$ $C_{filt} = \text{max } 50 \mu\text{F}$	
UY 42 Half wave rectifier	$V_f = 31 \text{ V}$ $I_f = 0.1 \text{ A}$	Rectifier	$V_i = \text{max } 110 \text{ V}_{eff}$	$I_o = \text{max } 100$	$C_{filt} = \text{max } 50 \mu\text{F}$	
328 Gasfilled full wave rectifier	$V_f = 1.85 \text{ V}$ $I_f = 2.8 \text{ A}$	Rectifier for battery chargers	$V_{tr} = \text{max } 2 \times 28 \text{ V}_{eff}$ $V_{arc} = 7 \text{ V}$	$I_o = \text{max } 1300$		
329 Current regulator		Current regulator	$r_1 + r_2:$ $V_{contr} = 10-30 \text{ V}$ $r_1 \text{ or } r_2:$ $V_{contr} = 5-15 \text{ V}$	$I_{reg} = 1150$		
367 Gasfilled full wave rectifier	$V_f = 1.85 \text{ V}$ $I_f = 8 \text{ A}$	Rectifier for battery chargers	$V_{tr} = \text{max } 2 \times 45 \text{ V}_{eff}$ $V_{arc} = 8 \text{ V}$	$I_o = \text{max } 6000$		
451 Gasfilled full wave rectifier	$V_f = 1.85 \text{ V}$ $I_f = 2.8 \text{ A}$	Rectifier for battery chargers	$V_{tr} = \text{max } 2 \times 16 \text{ V}_{eff}$ $V_{arc} = 6 \text{ V}$	$I_o = \text{max } 1300$		
452 Current regulator		Current regulator	$r_1 + r_2:$ $V_{contr} = 7-20 \text{ V}$ $r_1 \text{ or } r_2:$ $V_{contr} = 3.5-10 \text{ V}$	$I_{reg} = 1150$		
1002 Gasfilled full wave rectifier	$V_f = 1.85 \text{ A}$ $I_f = 2.8 \text{ A}$	Rectifier for battery chargers	$V_{tr} = \text{max } 160 \text{ V}_{eff}$ $V_{arc} = 7 \text{ V}$	$I_o = \text{max } 100$		
1010 Gasfilled full wave rectifier	$V_f = 1.85 \text{ V}$ $I_f = 3.5 \text{ A}$	Rectifier for battery chargers	$V_{tr} = \text{max } 2 \times 60 \text{ V}_{eff}$ $V_{arc} = 8 \text{ V}$	$I_o = \text{max } 1300$		

Type	Filament data	Application	Voltages Resistors	Currents (mA)	Characteristic data	Base connections
1011 Resistance tube		Resistor	$r_1:$ $V_{contr} = 20-130\text{ V}$ $r_2 + r_3:$ $V_{contr} = 5-25\text{ V}$	$r_1:$ $I_{reg} = 1.0-240$ $r_2 + r_3:$ $I_{reg} = 750-17.00$		
1111 Resistance tube		Resistor	$r_1:$ $V_{contr} = 10-80\text{ V}$ $r_2 + r_3:$ $V_{contr} = 2-12\text{ V}$	$r_1:$ $I_{reg} = 600$ $r_2 + r_3:$ $I_{reg} = 2000$		
1119 Gasfilled full wave rectifier	$V_f = 1.5\text{ V}$ $I_f = 5.5\text{ A}$	Rectifier for battery-chargers	$V_{tr} =$ $max\ 2 \times 45\ V_{eff}$ $V_{arc} =$ 9 V	$I_o = max\ 3000$		
1173 Gasfilled half wave rectifier with auxiliary ignition	$V_f = 1.92\text{ V}$ $I_f = 12\text{ A}$	Industrial rectifier	$V_{tr} = max\ 220\ V_{eff}$ $V_{arc} = 12\text{ V}$ $V_{aux.} = 45\text{ V}$	$I_o = max\ 4000$ $I_{aux.} = 10$		
1331 Current regulator		Current regulator	$V_{contr} = 15-40\text{ V}$	$I_{reg} = 1450$		
1561 Full wave rectifier	$V_f = 4\text{ V}$ $I_f = 2\text{ A}$	Rectifier	$V_{tr} = 2 \times 500\ V_{eff}$ $= 2 \times 400\ V_{eff}$ $= 2 \times 300\ V_{eff}$	$I_o = max\ 120$ $= max\ 140$ $= max\ 160$	$C_{filt} < 60\ \mu\text{F}$ $R_t = min\ 50\ \Omega$ $C_{filt} > 60\ \mu\text{F}$ $R_t = min\ 100\ \Omega$	
1805 Full wave rectifier	$V_f = 4\text{ V}$ $I_f = 1\text{ A}$	Rectifier	$V_{tr} = 2 \times 500\ V_{eff}$ $= 2 \times 300\ V_{eff}$	$I_o = max\ 60$ $= max\ 100$		
1832 Full wave rectifier	$V_f = 4\text{ V}$ $I_f = 1.3\text{ A}$	Rectifier	$V_{tr} = 700\ V_{eff}$ $= 800\ V_{eff}$	$I_o = max\ 120$ $= max\ 100$		
1875 Half wave rectifier	$V_f = 4\text{ V}$ $I_f = 2.3\text{ A}$	Rectifier	$V_{tr} = 5000\ V_{eff}$	$I_o = max\ 5$	$C_{filt} = max\ 0.5\ \mu\text{F}$ $R_t = min\ 10\ \text{k}\Omega$	
1876 Half wave rectifier	$V_f = 4\text{ V}$ $I_f = 0.3\text{ A}$	Rectifier	$V_{tr} = 850\ V_{eff}$	$I_o = max\ 5$		
1877 Half wave rectifier	$V_f = 4\text{ V}$ $I_f = 0.65\text{ A}$	Rectifier	$V_{tr} = 5000\ V_{eff}$	$I_o = max\ 3$	$C_{filt} = max\ 0.5\ \mu\text{F}$ $R_t = min\ 20\ \text{k}\Omega$	
1904 Current regulator		Current regulator	$V_{contr} = 30-80\text{ V}$	$I_{reg} = 100$		

Type	Filament data	Application	Voltages Resistors	Currents (mA)	Characteristic data	Bas ₂ connections
1910 Current regulator		Current regulator	$V_{contr} = 5-15\text{ V}$	$I_{reg} = 1400$		
1927 Current regulator		Current regulator	$V_{contr} = 40-120\text{ V}$	$I_{reg} = 180$		
1928 Current regulator		Current regulator	$V_{contr} = 80-240\text{ V}$	$I_{reg} = 180$		
1941 Current regulator		Current regulator	$V_{contr} = 80-200\text{ V}$	$I_{reg} = 300$		
1945 Resistance tube		Resistor	$V_{contr} = 80-120\text{ V}$	$I_{reg} = 275$		
4060 Triode	$V_f = 0.7\text{ V}$ $I_f = 0.6\text{ A}$	Typical characteristics	$V_a = 4\text{ V}$ $V_g = -2.5\text{ V}$	$I_g < 10^{-11}$	$S = 0.028\text{ mA/V}$ $\mu = 0.5$ approx.	
4606 4607 4609	} See repeater valves page 62.					
4610 H. F. Tetrode	$V_f = 4\text{ V}$ $I_f = 1.0\text{ A}$	Typical characteristics	$V_a = 200\text{ V}$ $V_{g2} = 100\text{ V}$ $V_{g1} = -1.3\text{ V}$	$I_a = 1.5$ $I_{g2} = 0.6$	$S = 0.9\text{ mA/V}$ $R_i = 0.8\text{ M}\Omega$ $C_{ag1} < 0.005\text{ pF}$	
4613 Output triode	$V_f = 4\text{ V}$ $I_f = 1.0\text{ A}$	Class A output amplifier	$V_a = 500\text{ V}$ $V_g = -68\text{ V}$	$I_a = 24$	$S = 3\text{ mA/V}$ $R_i = 2\text{ k}\Omega$ $R_a = 11.5\text{ k}\Omega$ $W_a = 12\text{ W}$ $W_o = 5.3\text{ W}$	
4614 Triode	$V_f = 4\text{ V}$ $I_f = 1.0\text{ A}$	Typical characteristics	$V_a = 200\text{ V}$ $V_g = -16\text{ V}$	$I_a = 12$	$S = 1.3\text{ mA/V}$ $R_i = 7\text{ k}\Omega$ $\mu = 9$	
4617	See repeater valves page 62.					
4623 Television diode	$V_f = 6.3\text{ V}$ $I_f = 0.15\text{ A}$	Detector				see page 61

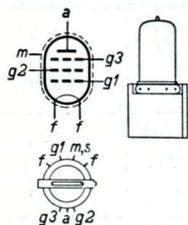
Type	Filament data	Application	Voltages Resistors	Currents (mA)	Characteristic data	Base connections
4624 Output triode	$V_f = 7.2 \text{ V}$ $I_f = 1.1 \text{ A}$	Class A output amplifier	$V_a = 800 \text{ V}$ $V_g = -90 \text{ V}$	$I_a = 35$	$S = 2.3 \text{ mA/V}$ $R_i = 3 \text{ k}\Omega$ $R_a = 11 \text{ k}\Omega$ $\mu = 7$ $W_a = 32 \text{ W}$ $W_o = 9 \text{ W}$	
4630 4631	} See repeater valves page 62.					
4636 H.F. and preamplifier pentode	$V_f = 4 \text{ V}$ $I_f = 1.1 \text{ A}$	Typical characteristics	$V_a = 200 \text{ V}$ $V_{g2} = 100 \text{ V}$ $V_{g1} = -2 \text{ V}$	$I_a = 3$ $I_{g2} = 1.2$	$S = 2.3 \text{ mA/V}$ $R_i = 2.2 \text{ M}\Omega$ $C_{ag1} < 0.006 \text{ pF}$	
4641 Output triode	$V_f = 4 \text{ V}$ $I_f = 2.1 \text{ A}$	Typical characteristics	$V_a = 1500 \text{ V}$ $V_{g1} = -140 \text{ V}$	$I_a = 15$	$S = 2 \text{ mA/V}$ $R_i = 4.6 \text{ k}\Omega$ $\mu = 10$ $W_a = 25 \text{ W}$	
4646 Half wave rectifier	$V_f = 4 \text{ V}$ $I_f = 1.3 \text{ A}$	Rectifier	$V_{tr} = \text{max } 1000 \text{ V}_{eff}$	$I_o = \text{max } 75$		
4650 Output pentode	$V_f = 4 \text{ V}$ $I_f = 2.0 \text{ A}$	Class A output amplifier	$V_a = 550 \text{ V}$ $V_{g2} = 200 \text{ V}$ $V_{g1} = -30 \text{ V}$	$I_a = 45$ $I_{g2} = 1.4$	$S = 3.2 \text{ mA/V}$ $R_i = 30 \text{ k}\Omega$ $R_a = 12 \text{ k}\Omega$ $W_a = 25 \text{ W}$ $W_o = 12 \text{ W}$	
4652/AX 1 Gasfilled full wave rectifier	$V_f = 4 \text{ V}$ $I_f = 2.4 \text{ A}$	Rectifier	$V_{tr} = 2 \times 500 \text{ V}_{eff}$ $V_{arc} = \text{max } 15 \text{ V}$	$I_o = \text{max } 125$	$R_{t \text{ min}} = 200 \Omega$ $C_{filt \text{ max}} = 64 \mu\text{F}$ $R_{t \text{ min}} = 150 \Omega$ $C_{filt \text{ max}} = 32 \mu\text{F}$ $R_{t \text{ min}} = 100 \Omega$ $C_{filt \text{ max}} = 16 \mu\text{F}$	
4654 Output pentode	$V_f = 6.3 \text{ V}$ $I_f = 1.35 \text{ A}$	Class A output amplifier	$V_a = 250 \text{ V}$ $V_{g2} = 275 \text{ V}$ $R_k = 175 \Omega$	$I_a = 72$ $I_{g2} = 8$	$S = 8.5 \text{ mA/V}$ $R_i = 22 \text{ k}\Omega$ $R_a = 3.5 \text{ k}\Omega$ $W_a = 18 \text{ W}$ $W_o = 8.6 \text{ W}$	
		Class AB push pull amplifier	$V_b = 375 \text{ V}$ $R_{g2} = 500 \Omega$ $R_k = 195 \Omega$	$I_a \text{ min} = 2 \times 53$ $I_a \text{ max} = 2 \times 67$ $I_{g2 \text{ min}} = 2 \times 6.5$ $I_{g2 \text{ max}} = 2 \times 16$	$R_{aa} = 5 \text{ k}\Omega$ $W_o = 26 \text{ W}$	

1) Common screen grid resistor.

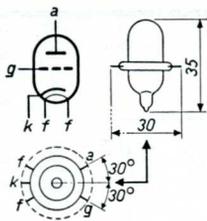
Type	Filament data	Application	Voltages Resistors	Currents (mA)	Characteristic data	Base connections
4684 Output pentode	$V_f = 4\text{ V}$ $I_f = 1.75\text{ A}$	Class AB push-pull amplifier	$V_a = 375\text{ V}$ $V_{g2} = 250\text{ V}$ $R_k = 142\Omega$	$I_a \text{ min} = 2 \times 24$ $I_a \text{ max} = 2 \times 30$ $I_{g2} \text{ min} = 2 \times 3.2$ $I_{g2} \text{ max} = 2 \times 5.3$	$R_{aa} = 13\text{ k}\Omega$ $W_o = 12\text{ W}$	
4686 Gasfilled triode	$V_f = 4\text{ V}$ $I_f = 1.2\text{ A}$	Time base generator	$V_a \text{ peak} = \text{max } 350\text{ V}$ $V_{arc} = 17\text{ V}$ $V_{fk} \text{ peak} = \text{max } 100\text{ V}$	$I_a \text{ peak} = 300$ $I_a \text{ average} = 3$ $I_g \text{ peak} = 1.4$	Control ratio = 20 $f_{\text{max}} = 50\text{ kc/s}$	
4688 Output pentode	$V_f = 4\text{ V}$ $I_f = 2\text{ A}$	Class AB push-pull amplifier	$V_a = 375\text{ V}$ $V_{g2} = 275\text{ V}$ $R_k = 165\Omega$	$I_a \text{ min} = 2 \times 48$ $I_a \text{ max} = 2 \times 62$ $I_{g2} \text{ min} = 2 \times 5$ $I_{g2} \text{ max} = 2 \times 9$	$R_{aa} = 6.5\text{ k}\Omega$ $W_o = 28.5\text{ W}$	
4689 Output pentode	$V_f = 6.3\text{ V}$ $I_f = 1.35\text{ A}$	Class AB push-pull amplifier	$V_a = 375\text{ V}$ $V_{g2} = 275\text{ V}$ $R_k = 165\Omega$	$I_a \text{ min} = 2 \times 48$ $I_a \text{ max} = 2 \times 62$ $I_{g2} \text{ min} = 2 \times 5$ $I_{g2} \text{ max} = 2 \times 9$	$R_{aa} = 6.5\text{ k}\Omega$ $W_o = 28.5\text{ W}$	
4690 Gasfilled triode	$V_f = 4\text{ V}$ $I_f = 1.3\text{ A}$	Time base generator	$V_a \text{ peak} = \text{max } 500\text{ V}$ $V_{arc} = 50\text{ V}$	$I_a \text{ peak} = \text{max } 750$ $I_a \text{ average} = \text{max } 10$	Control ratio = 35 $f_{\text{max}} = 150\text{ kc/s}$	
4694 Output pentode	$V_f = 6.3\text{ V}$ $I_f = 0.9\text{ A}$	Class AB push-pull amplifier	$V_a = 375\text{ V}$ $V_{g2} = 250\text{ V}$ $R_k = 145\Omega$	$I_a \text{ min} = 2 \times 24$ $I_a \text{ max} = 2 \times 30$ $I_{g2} \text{ min} = 2 \times 2.5$ $I_{g2} \text{ max} = 2 \times 5$	$R_{aa} = 13\text{ k}\Omega$ $W_o = 12\text{ W}$	
4695 Acorn variable mu pentode	$V_f = 6.3\text{ V}$ $I_f = 150\text{ mA}$	H.F. amplifier	$V_a = 250\text{ V}$ $V_{g2} = 100\text{ V}$ $V_{g1} = -3\text{ V}$	$I_a = 6.7$ $I_{g2} = 2.7$	$S = 1.7\text{ mA/V}$ $R_i = 0.6\text{ M}\Omega$ $C_{ag1} < 0.007\text{ pF}$	see page 61
4696 Secondary emission tetrode	$V_f = 6.3\text{ V}$ $I_f = 0.6\text{ A}$	Typical characteristics	$V_a = 250\text{ V}$ $V_{g2} = 150\text{ V}$ $V_{g1} = -2.5\text{ V}$ $V_{k2} = 150\text{ V}$	$I_a = 8$ $I_{g2} = 0.45$ $I_{k2} = -6.5$	$S = 17\text{ mA/V}$ $R_i = 50\text{ k}\Omega$ $C_{ag1} < 0.006\text{ pF}$	
4699 Output pentode	$V_f = 6.3\text{ V}$ $I_f = 1.5\text{ A}$	Class A output amplifier	$V_a = 250\text{ V}$ $V_{g2} = 250\text{ V}$ $R_k = 90\Omega$	$I_a = 72$ $I_{g2} = 8$	$S = 14.5\text{ mA/V}$ $R_i = 20\text{ k}\Omega$ $R_a = 3.5\text{ k}\Omega$ $W_a = 18\text{ W}$ $W_o = 8\text{ W}$	
		Class AB push-pull amplifier	$V_b = 375\text{ V}$ $R_{g2}^{(1)} = 700\Omega$ $R_k = 125\Omega$	$I_a \text{ min} = 2 \times 52$ $I_a \text{ max} = 2 \times 64$ $I_{g2} \text{ min} = 2 \times 6.5$ $I_{g2} \text{ max} = 2 \times 17$	$R_{aa} = 6\text{ k}\Omega$ $W_o = 27.5\text{ W}$	

¹⁾ Common screen grid resistor.

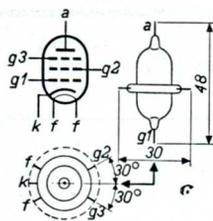
Connections of valves without base



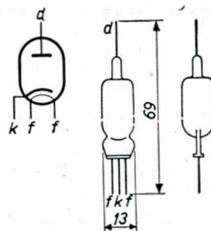
D 1 F
D 2 F



E 1 C
4671
4675



E 1 F
4672
4676
4695



EA 50
4623



EY 51

THERMOCOUPLES

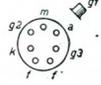
Type	E.M.F. of approx. 12 mV with current through heater of: (mA)	The deviation of the instrument varies proportionally with the square of the current to a maximum error of 2% up to: (mA)	Continuous load with current through heater up to: (mA)	Brief overload with current through heater up to: (mA)	Resistance of heater (approx.) (Ω)	Resistance of thermocouple (approx.) (Ω)
TH 1	10	5	15	20	75	5.5
TH 2	20	10	30	40	23	3.0
TH 3	40	20	75	100	7.3	3.0
TH 4	100	50	150	200	2.2	3.0
TH 5	200	100	300	350	1.1	3.0

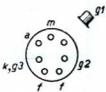
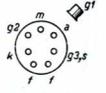
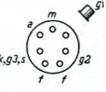
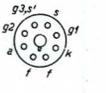
"A" base



Base connections for all the thermocouples mentioned above.

REPEATER VALVES

Type	Filament data	Application	Voltages Resistors	Currents (mA)	Characteristic data	Base connections
4606 Triode	$V_f = 4.5 \text{ V}$ $I_f = 1.0 \text{ A}$	Pre-amplifier	$V_a = 130 \text{ V}$ $R_a = 6 \text{ k}\Omega$ $V_g = -9 \text{ V}$	$I_a = 8.5$	$S = 1.0 \text{ mA/V}$ $R_i = 5.5 \text{ k}\Omega$ $g = 1.1 \text{ N}$ $W_a = 1.2 \text{ W}$	
4607 Triode	$V_f = 2.1 \text{ V}$ $I_f = 1.0 \text{ A}$	Pre-amplifier	$V_a = 130 \text{ V}$ $R_a = 0.6 \text{ M}\Omega$ $V_g = -1.6 \text{ V}$	$I_a = 0.7$	$S = 0.5 \text{ mA/V}$ $R_i = 60 \text{ k}\Omega$ $g = 3.3 \text{ N}$ $W_a = 1.1 \text{ W}$	
4609 Triode	$V_f = 4.2 \text{ V}$ $I_f = 0.25 \text{ A}$	Pre-amplifier	$V_a = 130 \text{ V}$ $R_a = 6 \text{ k}\Omega$ $V_g = -5 \text{ V}$	$I_a = 8$	$S = 2.3 \text{ mA/V}$ $R_i = 4.8 \text{ k}\Omega$ $g = 1.8 \text{ N}$ $W_a = 1.2 \text{ W}$	
4617 Triode	$V_f = 4.0 \text{ V}$ $I_f = 0.25 \text{ A}$	Pre-amplifier	$V_a = 130 \text{ V}$ $R_a = 2.2 \text{ k}\Omega$ $V_g = -8 \text{ V}$	$I_a = 25$	$S = 3 \text{ mA/V}$ $R_i = 2.2 \text{ k}\Omega$ $g = 1.1 \text{ N}$ $W_a = 3.3 \text{ W}$	
		Output amplifier	$V_a = 130 \text{ V}$ $V_g = -8 \text{ V}$	$I_a = 25$	$S = 3 \text{ mA/V}$ $R_i = 2.2 \text{ k}\Omega$ $R_a = 2.2 \text{ k}\Omega$ $W_a = 3.3 \text{ W}$ $W_o = 0.2 \text{ W}$ $d_{tot} < 10\%$	
4630 Triode	$V_f = 4.2 \text{ V}$ $I_f = 0.25 \text{ A}$	Pre-amplifier	$V_a = 130 \text{ V}$ $R_a = 6 \text{ k}\Omega$ $V_g = -8.4 \text{ V}$	$I_a = 8.5$	$S = 1.3 \text{ mA/V}$ $R_i = 5.5 \text{ k}\Omega$ $g = 1.3 \text{ N}$ $W_a = 1.1 \text{ W}$	
4631 Triode	$V_f = 2 \text{ V}$ $I_f = 0.25 \text{ A}$	Pre-amplifier	$V_a = 130 \text{ V}$ $R_a = 0.6 \text{ M}\Omega$ $V_g = -1.5 \text{ V}$	$I_a = 0.7$	$S = 0.5 \text{ mA/V}$ $R_i = 55 \text{ k}\Omega$ $g = 3.24 \text{ N}$ $W_a = 1.1 \text{ W}$	
18004 Triode	$V_f = 4.4 \text{ V}$ $I_f = 0.97 \text{ A}$	Output amplifier	$V_a = 130 \text{ V}$ $V_g = -25 \text{ V}$	$I_a = 22$	$S = 1.0 \text{ mA/V}$ $R_i = 2.3 \text{ k}\Omega$ $R_a = 2.1 \text{ k}\Omega$ $W_a = 3.5 \text{ W}$ $W_o = 0.2 \text{ W}$ $d_{tot} < 5\%$	
18013 Pentode	$V_f = 4 \text{ V}$ $I_f = 1.3 \text{ A}$	Pre-amplifier	$V_a = 200 \text{ V}$ $R_a = 20 \text{ k}\Omega$ $V_{g2} = 200 \text{ V}$ $R_k = 265 \Omega$	$I_a = 8$ $I_{g2} = 1.5$	$S = 5 \text{ mA/V}$ $R_i = 1 \text{ M}\Omega$ $g = 4.5 \text{ N}$ $W_a = 1.8 \text{ W}$	
		Output amplifier	$V_a = 200 \text{ V}$ $V_{g2} = 200 \text{ V}$ $R_k = 265 \Omega$	$I_a = 8$ $I_{g2} = 1.5$	$S = 5 \text{ mA/V}$ $R_i = 1 \text{ M}\Omega$ $R_a = 30 \text{ k}\Omega$ $W_a = 1.8 \text{ W}$ $W_o = 0.1 \text{ W}$ $d_{tot} < 5\%$	

Type	Filament data	Application	Voltages Resistors	Currents (mA)	Characteristic data	Base connections
18014 Pentode	$V_f = 4\text{ V}$ $I_f = 1.6\text{ A}$	Pre-amplifier	$V_a = 200\text{ V}$ $R_a = 8\text{ k}\Omega$ $V_{g2} = 200\text{ V}$ $R_k = 125\ \Omega$	$I_a = 35$ $I_{g2} = 4.6$	$S = 8\text{ mA/V}$ $R_i = 50\text{ k}\Omega$ $g = 4\text{ N}$ $W_a = 7\text{ W}$	
		Output amplifier	$V_a = 200\text{ V}$ $V_{g2} = 200\text{ V}$ $R_k = 125\ \Omega$	$I_a = 35$ $I_{g2} = 4.6$	$S = 8\text{ mA/V}$ $R_i = 50\text{ k}\Omega$ $R_a = 8\text{ k}\Omega$ $W_a = 7\text{ W}$ $W_o = 0.8\text{ W}$ $d_{tot} < 3\%$	
18015 Pentode	$V_f = 21\text{ V}$ $I_f = 285\text{ mA}$	Pre-amplifier	$V_a = 125\text{ V}$ $R_a = 16\text{ k}\Omega$ $V_{g2} = 125\text{ V}$ $R_k = 440\ \Omega$	$I_a = 4.5$ $I_{g2} = 1.3$	$S = 5.5\text{ mA/V}$ $R_i = 0.55\text{ M}\Omega$ $g = 4.35\text{ N}$ $W_a = 1.2\text{ W}$	
		Output amplifier	$V_a = 125\text{ V}$ $V_{g2} = 125\text{ V}$ $R_k = 200\ \Omega$	$I_a = 8$ $I_{g2} = 2.5$	$S = 8.3\text{ mA/V}$ $R_i = 0.35\text{ M}\Omega$ $R_a = 30\text{ k}\Omega$ $W_a = 1.2\text{ W}$ $W_o = 0.1\text{ W}$ $d_{tot} < 5\%$	
18016 Pentode	$V_f = 21\text{ V}$ $I_f = 335\text{ mA}$	Pre-amplifier	$V_a = 125\text{ V}$ $R_a = 3.3\text{ k}\Omega$ $V_{g2} = 125\text{ V}$ $R_k = 115\ \Omega$	$I_a = 48$ $I_{g2} = 9.5$	$S = 9\text{ mA/V}$ $R_i = 16.5\text{ k}\Omega$ $g = 3.15\text{ N}$ $W_a = 5.6\text{ W}$	
		Output amplifier	$V_a = 125\text{ V}$ $V_{g2} = 125\text{ V}$ $R_k = 115\ \Omega$	$I_a = 48$ $I_{g2} = 9.5$	$S = 9\text{ mA/V}$ $R_i = 16.5\text{ k}\Omega$ $R_a = 3.3\text{ k}\Omega$ $W_a = 5.6\text{ W}$ $W_o = 0.8\text{ W}$ $d_{tot} < 3\%$	
18040 Pentode	$V_f = 18\text{ V}$ $I_f = 270\text{ mA}$	Pre-amplifier	$V_a = 210\text{ V}$ $R_a = 20\text{ k}\Omega$ $V_{g2} = 210\text{ V}$ $R_k = 185\ \Omega$	$I_a = 15$ $I_{g2} = 4$	$S = 10\text{ mA/V}$ $R_i = 0.3\text{ M}\Omega$ $g = 5.15\text{ N}$ $W_a = 4.5\text{ W}$	
		Output amplifier	$V_a = 210\text{ V}$ $V_{g2} = 210\text{ V}$ $R_k = 120\ \Omega$	$I_a = 20$ $I_{g2} = 5.3$	$S = 11\text{ mA/V}$ $R_i = 0.25\text{ M}\Omega$ $R_a = 15\text{ k}\Omega$ $W_a = 4.5\text{ W}$ $W_o = 2.1\text{ W}$ $d_{tot} < 20\%$	

HIGH VACUUM CATHODE-RAY

Type	Properties of the screens		Deflection system	Heater characteristic:		Operating	
	Colour	Max. diam. (mm)		Indir.		Voltage on 2nd anode V_{a2} (V)	Voltage on 1st anode V_{a1} (V)
				Filament voltage V_f (V)	Filament current I_f (A)		
M W 6-2 for projection	White	70.5	Double magnetic	6.3	0.75	—	25000
M W 22-5	White	231	Double magnetic	6.3	0.6	7000	250
M W 22-7	White	231	Double magnetic	6.3	0.6	7000	200
M W 22-14	White	231	Double magnetic	6.3	0.30	7000	160
M W 31-6	White	308	Double magnetic	6.3	0.6	7000	250
M W 31-7	White	308	Double magnetic	6.3	0.6	7000	200
M W 31-14	White	308	Double magnetic	6.3	0.30	7000	250

¹⁾ Expressed in cm deflection per cm coil width per gauss of mean field strength.

²⁾ The number of ampere turns required for the magnetic concentration amounts to about 550-750 when a coil without iron casing is used.

³⁾ The number of ampere turns required for the magnetic concentration amounts to about 850 when a coil without iron casing is used.

⁴⁾ See remarks on page 68

TUBES FOR TELEVISION RECEIVERS

characteristics		Focusing	Capacitance of the grid to all other electrodes C_g (pF)	Overall length excl. pins		Base connections	Type
Max. neg. grid bias V_g (V)	Sensitivity N^1			Max. (mm)	Min. (mm)		
-90 ⁴)		magn. ³)	8.7	268	256	 Spark trap	MW 6-2 for projection
-200	0.076	magn. ²)	1	376	368		MW 22-5
-200	0.076	magn. ²)	8	363	354		MW 22-7
-200	0.076	magn. ²)	8	363	354		MW 22-14
-200	0.1	magn. ²)	12	465	455		MW 31-6
-200	0.1	magn. ²)	8	452	441		MW 31-7
-200	0.1	magn. ²)	7	452	441		MW 31-14

HIGH-VACUUM CATHODE-RAY

Type	Properties of the screens		Deflection system	Heater charact.		Operating		
	Colour	Max. diam. (mm)		Indir.		Voltage on the 3rd anode V_{a_3} (V)	Voltage on the 2nd anode V_{a_2} (V)	Voltage on the 1st anode V_{a_1} (V)
				Fila-ment voltage V_f (V)	Fila-ment current I_f (A)			
DB 7-1 DG 7-1	Blue Green	71	Double electrostatic, symmetrical	4.0	1.0	—	800	150—350
DB 7-2 DG 7-2	Blue Green	71	Double electrostatic, Pair of plates D_2D_2' asymmetrical ¹⁾	4.0	1.0	—	800	150—350
DB 7-3 DG 7-3 DR 7-3	Blue Green Long Persistent	71	Double electrostatic, symmetrical	6.3	0.4	—	800	200—300
DB 7-4 DG 7-4 DR 7-4	Blue Green Long Persistent	71	Double electrostatic, Pair of plates D_2D_2' asymmetrical ¹⁾	6.3	0.4	—	800	200—300
DB 9-3 DG 9-3 DN 9-3	Blue Green Persistent	98	Double electrostatic, Pair of plates D_2D_2' asymmetrical ¹⁾	4.0	1	—	1000	200—400
DB 9-4 DG 9-4 DN 9-4	Blue Green Persistent	98	Double electrostatic symmetrical	4.0	1	—	1000	200—400

¹⁾ See remarks on page 68.

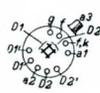
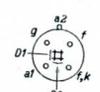
TUBES FOR OSCILLOGRAPHS

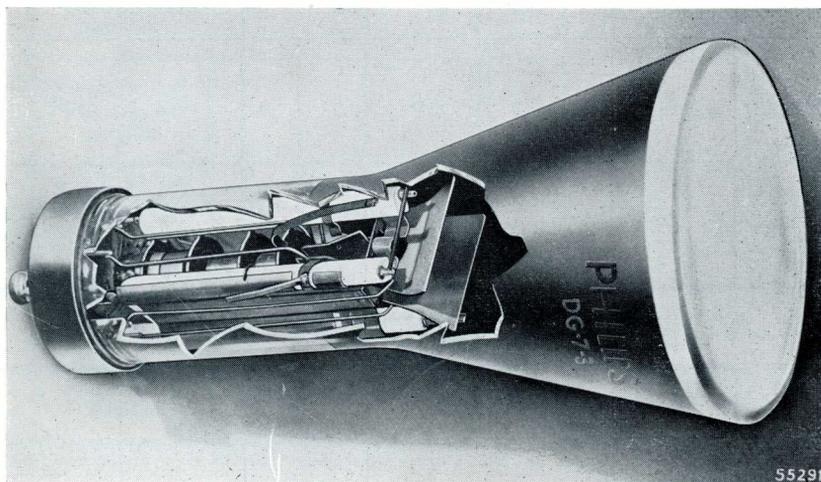
characteristics			Capacitances			Base connections	Overall length excl. pins		Type
Max. neg. grid bias V_g (V)	Sensitivity N_1 (mm/V)	Sensitivity N_2 (mm/V)	of grid C_g (pf)	of deflecting plates $C_{D_1D_1'}$ (pF)	of deflecting plates $C_{D_2D_2'}$ (pF)		max. (mm)	min. (mm)	
-30	0.22	0.14	7	0.7	0.85		163	151	DB 7-1 DG 7-1
-30	0.22	0.14	7	0.65	2.5		163	151	DB 7-2 DG 7-2
-50	0.26	0.16	9	0.6	0.6		145	139	DB 7-3 DG 7-3 DR 7-3
-50	0.26	0.16	9	0.5	0.8		145	139	DB 7-4 DG 7-4 DR 7-4
-40	0.40	0.31	8	1.1	1.4		327	312	DB 9-3 DG 9-3 DN 9-3
-40	0.40	0.31	8	1.1	1.3		327	312	DB 9-4 DG 9-4 DN 9-4

Type	Properties of the screens		Deflection system	Heater charact.		Operating		
	Colour	Max. diam. (mm)		Indir.		Voltage on the 3rd anode	Voltage on the 2nd anode	Voltage on the 1st anode
				Fila-ment voltage	Fila-ment current			
DB 9-5	Blue	98	Double electrostatic, with accelerating anode; Pair of plates D ₂ D ₂ ' asymmetrical	4.0	1	5000	1000	230—430
DG 9-5	Green							
DN 9-5	Persistent							
DB 16-1	Blue	167	Double electrostatic, symmetrical	4.0	1	—	2000	350—500
DG 16-1	Green							
DN 16-1	Persistent							
DB 16-2	Blue	167	Double electrostatic, symmetrical	4.0	1	—	2000	350—500
DG 16-2	Green							
DN 16-2	Persistent							

REMARKS

The max. negative grid bias V_g given in the tables is the grid voltage necessary for suppression of the electron ray. The light-intensity of the spot can be adjusted with the aid of the grid voltage; it must be borne in mind however that the grid voltage must never be positive. An asymmetrical pair of plates D_2D_2' permits of asymmetrical control when using a simple time-base generator or amplifier. The plate D_2 may then be connected to the asymmetrical time base or to the output voltage of the amplifier.

characteristics			Capacitances			Base connections	Overall length excl. pins		Type
Max. neg. grid bias V_{g_1} (V)	Sensitivity N_1 (mm/V)	Sensitivity N_2 (mm/V)	of grid C_g (pF)	of deflecting plates $C_{D_1 D_1'}$ (pF)	of deflecting plates $C_{D_2 D_2'}$ (pF)		max. (mm)	min. (mm)	
-40	0.18	0.15	7	1.5	2.0		327	312	DB 9-5 DG 9-5 DN 9-5
-40	0.25	0.17	9.5	1.2	2		440	415	DB 16-1 DG 16-1 DN 16-1
-40	0.25	0.17	7.3	2.1	2.7		450	425	DB 16-2 DG 16-2 DN 16-2



55291

VOLTAGE STABILIZING TUBES

Type	Operating voltage at stated quiescent current (V)	Maximum starting voltage (V)	Quiescent current (mA)	Upper current limit for stabilisation (mA)	Lower current limit for stabilisation (mA)	Limit value of the A.C. resistance (Ω)	Base connections
4357	85—100	125	20	40	10	75	
4687	85—100	115	20	40	10	250	
7475	90—110	140	4	8	1	700	
13201	90—110	140	100	200	15	90	
100E1	90—105	140	125	200	50	30	
150A1	150—170	205	4	8	1	1140	
150C1	146—166	205	20	40	5	200	

VOLTAGE REFERENCE TUBE

85A1¹⁾	83—87	125	4	8	1	430	
--------------------------	-------	-----	---	---	---	-----	--

¹⁾ Voltage variation less than 1 V per 5000 operating hours. In general this variation is no more than a few tenths of a volt.

PHOTO-ELECTRIC CELLS

Type	Description	Normal anode voltage	Sensitivity	Maximum anode voltage	Maximum cathode current density	Minimum load resistance	Anode-cathode capacity	Overall dimensions excl. pins	Base connections
		V _a (V)	(μ A/lm)	V _{amax} (V)	I _{amax} (μ A)	(M Ω)	C _{ak} (pF)	(mm)	
3510	High-vacuum cell with potassium cathode	100	3 ¹⁾	500	3	—	3	163×66	
3512	High-vacuum cell with caesium cathode	100	20 ¹⁾	500	5	—	3	120×58	
3530	Gas-filled cell with caesium cathode	100	150	100	7.5	1	3	59×23	
3533	Gas-filled cell with caesium cathode	100 ²⁾	150	100	7.5	1	3.4	62×28	
3534	Gas-filled cell with caesium cathode	90 ³⁾	150	90	7.5	1	5	89×30	
3537	Gas-filled cell with caesium cathode	100	150	100	7.5	1	2.5	43×23	
3538	Gas-filled cell with caesium cathode	100	150	100	7.5	1	2.5	56×23	
3541	Gas-filled cell with caesium cathode	100	150	100	7.5	1	3.4	62×28	
3543	Gas-filled cell with caesium cathode	90	150	90	6	1	0.5	32×17	no base
3546	Gas-filled cell with caesium cathode	90	150	90	7.5	1	2.5	55x17	

The ambient temperature for all PHILIPS photo-electric cells is max. 50° C.

¹⁾ Measured with a tungsten filament lamp. The temperature of the filament is 2600° K, the luminous flux (measured statically) being 0.1 lumen, for the others being 0.025 lumen.

²⁾ Type 3533 for V_a = 140 V is called 3533 sp.

³⁾ Type 3534 for V_a = 90 V is called 3534 sp.

→ Direction of light.

RARE GAS CARTRIDGES

Type	Breakdown voltage limits	Min. Ext. Volt.	Maximum load conditions in case				
			A (continual)	B (temporary)	C (fuse)	D (condenser)	E (coil discharges)
4370	80-120	60	6 W/50 mA	10 amps f. 3 sec.	10 amp	10 W-s.	200 000
4378	80-120	60	6 W/50 mA	10 amps f. 3 sec.	10 amp	10 W-s.	(10 W-s) or 50 000 (25 W-s)
4369	150-200	110	6 W/50 mA	10 amps f. 3 sec.	10 amp	10 W-s.	50 000
4371	150-200	110	3 W/25 mA	5 amps f. 3 sec.	6 amp	10 W-s.	(10 W-s)
4379	280-350	130	6 W/50 mA	10 amps f. 3 sec.	10 amp	10 W-s.	50 000
4383	280-350	130	3 W/25 mA	5 amps f. 3 sec.	6 amp	10 W-s.	(10 W-s)
4372	280-350	250	3 W/25 mA	2.5 amps f. 1 sec.	10 amp	10 W-s.	
4397	400-500	200	6 W/25 mA	5 amps f. 1 sec.	10 amp	10 W-s.	
4380	280-350	250	3 W/15 mA	2.5 amps f. 1 sec.	6 amp	10 W-s.	
4390	700-850	300	20 W/60 mA			500 W-s.	

Min. Ext. Volt. Lower limit of extinguishing voltage. This, and the breakdown-voltage limits are D.C. values.

A (continual) indicates the max. watts and the max. milliamps which the rare gas cartridges will carry continually.

B (temporary) is the max. load in amps which the cartridge will carry for the time indicated.

C (fuse) is the maximum rated value of the fuse which should be put in series with the cartridge if this has to be protected against destruction by a continuous discharge exceeding A.

D (condenser) is the condenser discharge (in watts-sec.) which can pass repeatedly through the cartridge.

E (coil discharges) is the number of times the cartridge can support a certain discharge of 10 and 25 watts-sec. respectively produced when the supply of energy to a coil with iron core is suddenly cut off (e.g. in magnetic brakes).

I N D E X

Introduction	3
Coding of the "Miniwatt" valves	5
Coding of Philips cathode-ray tubes	6
Coding of Philips stabilizer valves	7
List of symbols and indications used	8
Survey of the most important "Miniwatt" radio valves and Philips special tubes.	10
Receiving and amplifying valves.	13
Connections of valves without base	61
Thermocouples	61
Repeater valves	62
High vacuum cathode-ray tubes for television receivers	64
High vacuum cathode-ray tubes for oscillographs	66
Voltage stabilizing tubes	70
Voltage reference tube.	70
Photo-electric cells	71
Rare gas cartridges	72

THE UNIVERSITY OF CHICAGO

PHYSICS DEPARTMENT

PHYSICS 341

LECTURE 1

MECHANICS

LECTURE 2

LECTURE 3

LECTURE 4

LECTURE 5

LECTURE 6

LECTURE 7

LECTURE 8

LECTURE 9

LECTURE 10

LECTURE 11

LECTURE 12

LECTURE 13

LECTURE 14



PHILIPS ELECTRONIC TUBE DIVISION

RL 1151 / E 4/50