PHILIPS

PHILIPS NEDERLAND N.V.
AFD. ELONCO EINDHOVEN

POCKETBOOK

1969

POCKETBOOK 1969

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1969

electron tubes
semiconductors
integrated circuits
components
materials

PREFACE

The 1969 edition of the Pocketbook is a completely revised version of the preceding one, containing brief data on the majority of the products of the Electronic Components and Materials Division of NV Philips' Gloeilampenfabrieken.
Unless otherwise specified all dimensions are given in mm. The European projection method is employed in the dimensional drawings.
The Pocketbook does not give information on availability or terms of delivery, and is subject to change without notice. Please regard it as a guide only and, for a comprehensive source of information on electronic components and materials, refer to our Data Handbook system, made up of three series of handbooks, which will be issued annually.
The three series, identified by the colours noted, each comprise the following parts:

ELECTRON TUBES (blue)

		latest issue
Part 1	Transmitting tubes for communication (pentode, tetrodes)	Dec. 1968
Part 2	Tubes for microwave equipment	Jan. 1969
Part 3	Special quality tubes Miscellaneous devices	Feb. 1968
Part 4	Receiving tubes	Mar. 1968
Part 5	Cathode ray tubes Camera tubes Photo tubes Photoconductive devices	Apr. 1968

		latest issue
Part 6	Photomultiplier tubes Devices for nuclear equipment	July 1968
Part 7	Voltage stabilizing and reference tubes Counter, selector and indicator tubes Trigger tubes and switching diodes Thyratrons Industrial rectifying tubes Ignitrons High voltage rectifying tubes Miscellaneous	May 1968
Part 8	T.V. picture tubes	(4) Mar. 1968
Part 9	Transmitting tubes for communication Tubes for r.f. heating (triodes)	Dec. 1968

SEMICONDUCTORS AND INTEGRATED CIRCUITS (red)

Part 1	Diodes and thyristors Rectifier stacks Accessories and heatsinks	Sep. 1968
Part 2	Germanium transistors Photo devices Accessories and heatsinks	Oct. 1968
Part 3-4	Silicon transistors Accessories and heatsinks	Nov. 1968
Part 5	Digital integrated circuits Linear integrated circuits	Jan. 1969

COMPONENTS AND MATERIALS (green)

Part 1	Circuit blocks Input/Output devices	Sep. 1968

		latest issue
Part 2	Resistors Capacitors	Nov. 1968
Part 3	Components and subassemblies for radio, audio and television	Jan. 1969
Part 4	Magnetic materials and white ceramics	Mar. 1968
Part 5	Memory products Magnetic heads Quartz crystal units Microwave devices Variable mains transformers Electro-mechanical components	June 1968

The above subdivision of our Data Handbook system is valid at the date of issue of this Pocketbook; minor changes may be introduced before next issue.

CONTENTS

TYPE DESIGNATION CODES AND SYMBOLS FOR ELECTRON TUBES

TYPE DESIGNATION CODE FOR RADIO AND TELEVISION RECEIVING TUBES

This type designation code relates to tubes designed for use primarily in reproducing and recording equipment for domestic applications such as: radio and television receivers, record players, tape recorders and audio amplifiers, home cinema projectors, hearing aids, and similar equipment.

The type designation consists of: TWO OR MORE LETTERS FOLLOWED BY A SERIAL NUMBER

Example and explanation:

PL500

First letter indicates the heater voltage or current	Second and subsequent letters indicate the construction and/or application of the tube. (If there is more than one electrode system these letters are placed in alphabetical order.)	Serial number
D $\leqslant$1.4 V; series or parallel supply **E** 6.3 V; series or parallel supply **G** miscellaneous; parallel supply **L** 450 mA; series supply **P** 300 mA; series supply **U** 100 mA; series supply The use of letters A (4 V), B (180 mA), C (200 mA), F (12.6 V), K (2 V), V (50 mA), and Y (450 mA) has been discontinued.	**A** diode (excluding rectifiers) **B** double diode with common cathode (excluding rectifiers) **C** triode (excluding power output triodes) **D** power output triode **E** tetrode (excluding power output tetrodes) **F** pentode (excluding power output pentodes) **H** hexode or heptode (of the hexode type) **K** octode or heptode (of the octode type) **L** power output tetrode or power output pentode **M** tuning indicator **Y** half-wave rectifier **Z** full-wave rectifier	The serial number consists of three figures the first figure indicating the type of base:[1]) **1** miscellaneous base types **2** miniature 10-pin base **3** octal base **5** magnoval base **8** noval base **9** miniature 7-pin base The last figure of tetrodes and pentodes (excluding power output tubes) indicates the type of characteristic, as follows: **even figure**: sharp cutoff characteristic odd figure: variable-mu characteristic

[1]) The use of remaining figures for other base types and the use of serial numbers of one and two figures has been discontinued.

TYPE DESIGNATION CODE FOR PROFESSIONAL RECEIVING-TYPE TUBES

This type designation code relates to professional receiving-type vacuum tubes designed for use primarily in communication equipment, data processing equipment or in other industrial applications.

The type designation consists of: TWO OR MORE LETTERS FOLLOWED BY A SERIAL NUMBER

Example and explanation:

ECC2000

First letter indicates the heater voltage	Second and subsequent letters indicate the construction and/or application of the tube. (If there is more than one electrode system these letters are placed in alphabetical order.)	Serial number
E 6.3 V; parallel or series supply	**A** diode **C** triode (excluding power output triodes) **D** power output triode **E** tetrode (excluding power output tetrodes) **F** pentode (excluding power output pentodes) **H** heptode **L** power output tetrode or power output pentode **M** tuning indicator	The serial number consists of four figures, the first figure indicating the type of base: [1]) **1** miscellaneous base types **2** miniature 10-pin base **3** octal base **5** magnoval base **8** noval base **9** miniature 7-pin base

Serial numbers for prototypes always end in zero, those for variants in one of the figures 1 to 9. The other first figures will be used for new base types as required.

TYPE DESIGNATION CODE FOR CATHODE-RAY TUBES

This type designation code relates to cathode-ray tubes for all applications such as: television and radar display tubes. oscilloscope tubes. monitor tubes and view finders.

The type designation consists of: ONE LETTER FOLLOWED BY TWO GROUPS OF FIGURES JOINED BY A HYPHEN, AND ONE OR TWO LETTERS

Example and explanation:

D10-11GH
A59-11W

First letter indicates the application and/or construction of tube	First figure or group of figures indicates the screen dimensions	Second figure or group of figures	Final letters indicate the screen properties
A TV display tube for domestic applications **D** Oscilloscope tube, single trace **E** Oscilloscope tube, multiple trace **F** Radar display tube, direct view **L** Display storage tube **M** TV display tube for professional applications, direct view **P** Display tube for professional applications, projection **Q** Flying spot scanner	For rectangular screens the screen diagonal in cm For circular screens the screen diameter in cm	Serial number	The first letter denotes the colour of the fluorescence (or phosphorescence in the case of long or very long persistence screens) according to the regions of the Kelly Chart of colour designations for lights, where applicable: **A** Reddish-purple, purple, bluish-purple **B** Purplish-blue, blue, greenish-blue **D** Blue-green **G** Bluish-green, green, yellowish-green **K** Yellow-green **L** Orange, orange-pink **R** Reddish-orange, red, pink, purplish-pink, purplish-red, red-purple **Y** Greenish-yellow, yellow, yellowish-orange **W** indicates the "standard white" television display tube phosphor **X** indicates tri-colour screens The second letter is a serial letter to denote other specific differences in screen properties. Word description of persistence (Time to decay to 10% of initial light output) less than 1 μs — very short; 1 ms to 100 ms — medium 1 μs to 10 μs — short; 100 ms to 1 s — long 10 μs to 1000 μs — medium short; more than 1 s — very long

TYPE DESIGNATION CODE FOR PROFESSIONAL TUBES

This type designation code relates to tubes designated for use primarily in radio or television transmitting equipment, in navigation or communication equipment or in other industrial applications.

The type designation consists of: TWO LETTERS FOLLOWED BY A SERIAL NUMBER

Example and explanation:

YK1000

First letter indicates the category	Second letter indicates the construction and/or application	Serial number
X Tubes employing photosensitive materials **Y** Vacuum tubes for transmitting, microwave or industrial applications **Z** Gasfilled tubes (except tubes employing photosensitive material)	**A** diode **C** trigger tube **D** triode (including double triodes) **G** miscellaneous **H** travelling wave tube **J** magnetron **K** klystron **L** tetrode or pentode (including double tetrodes or double pentodes) **M** cold cathode indicator or counter tube **P** photomultiplier tube, radiation counter tube **Q** camera tube **T** thyratron **X** ignitron, image intensifier or image converter **Y** rectifier **Z** voltage stabiliser	The serial number consists of four figures. Serial numbers for prototypes always end in zero, those for variants in one of the figures 1 to 9.

GROUPS OF LETTERS ALLOCATED TO EXISTING PHOSPHORS

Designation		*E.I.A. number*	*Colour*		*Persistence (10%)*
New	*Old*		*Fluorescence*	*Phosphorescence*	
BA	C		purplish blue		very short
BC	V		purplish blue		
BD	A		blue		very short
BE	B	P11	blue	blue	medium short
BF	U		blue		medium short
GB	M	P32	purplish blue	yellowish green	long
GE	K	P24	green	green	short
GH	H	P31	green	green	medium short
GJ	G	P1	yellowish green	yellowish green	medium
GK	G [1])		yellowish green	yellowish green	medium
GL	N	P2	yellowish green	yellowish green	medium short
GM	P	P7	purplish blue	yellowish green	long
GN	J		blue	green	[2])
GP			bluish green/green	green	medium short
LA	D		orange	orange	medium
LB	E		orange	orange	long
LC	F		orange	orange	very long
LD	L	P33	orange	orange	very long
RA			reddish orange		medium
YA	Y		yellowish orange	yellowish orange	medium
W	W		white for TV display tubes		
X	X		three-colour for TV display tubes		

[1]) Used for colour TV. [2]) Depends on external stimulation.

CATHODE-RAY TUBES (Old system)

The type number consists of two capital letters followed by two sets of figures (e.g. DG13-2, MW31-16).

First letter: indicates the method of focusing and deflection.
Second letter: indicates properties of the screen.
First group of figures: indicates dimensions of the screen.
Second group of figures: indicates a serial number.

The key to this system is given in the following tables.

First letter

A — Electrostatic focusing and electromagnetic deflection.
D — Electrostatic focusing and electrostatic deflection in two directions.
M — Electromagnetic focusing and electromagnetic deflection.

Second letter

Indicates the phosphor screen properties.

First group of figures

For round tubes : screen diameter in cm
For rectangular tubes: screen diagonal in cm

Second group in figures

Serial number

TRANSMITTING TUBES (Old system)

The type number consists of two or three capital letters followed by two sets of figures. For some types a group of letters is added (e.g. TAL12/10, DCG4/1000G).

First letter: indicates the tube classification.
Second letter: indicates type of filament or cathode.

First group of figures: indicates operating voltage.
Second group of figures: indicates power.
Added letters: indicate the tube base.

The key to this system is given in the following tables.

First letter

D —Rectifying tube (included grid-controlled tubes)
M—Triode (A.F. amplifying tube or modulator)
P —Pentode
Q —Tetrode
T —Triode (R.F., A.F. or oscillator tube)

For tubes having dual systems two of the above mentioned letters are used (e.g. QQC04/15).

Second letter
(third letter for tubes having dual systems)

A—Directly-heated tungsten filament
B—Directly-heated thoriated tungsten filament
C—Directly-heated oxide-coated filament
E—Indirectly-heated oxide-coated cathode

Third letter
(fourth letter for tubes having dual systems)

G —Mercury-vapour filling
H —Helix or other integral cooler
L —Forced air cooling
W—Water cooling
X —Xenon filling

When the type number does not contain a letter indicating the cooling, the tube is radiation-cooled.

First group of figures

Rectifying tubes: Approx. d.c. output voltage in kilovolts in a threephase half-wave rectifying circuit.
Transmitting tubes: Approx. max. anode voltage in kilovolts.

Second group of figures

Rectifying tubes:	Approx. d.c. output power in watts or kilowatts per tube in a three-phase half-wave rectifying circuit.
R.F. tubes:	Approx. output power in watts or kilowatts in class C telegraphy.
Modulators:	Approx. anode dissipation in watts or kilowatts.

Added letters

B —Cables
E —Medium 7p.-base
ED—Edison base
EG—Goliath base
G —Medium 4p.-base
GB—Jumbo 4p.-base
GS—Super jumbo 4p.-base
N —Medium 5p.-base
P —P-base

PHOTOTUBES AND PHOTOMULTIPLIERS (old system)

The type number consists of two figures followed by two letters (e.g. 90AV).

First figure : indicates the tube base.
Second figure: indicates a serial number.
First letter : indicates the type of cathode.
Second letter : indicates the class of phototube.
Third letter : letter P only for photomultipliers

The key for this system is given in the following tables.

First figure

2—Loctal 8p.-base
3—Octal 8p.-base
5—Special base
8—Noval 9p.-base
9—Miniature 7p.-base

Second figure—Serial number

First letter

A —Caesium-antimony cathode (blue sensitive)
C —Caesium-on-oxidized-silver cathode (red sensitive)
T —Tialkali cathode
U—Caesium-antimony cathode with quartz window

Second letter

G—Gasfilled V—High vacuum

VOLTAGE STABILIZERS (Old system)

The type number consists of a number followed by a capital letter, a figure and in some cases by a second capital letter (e.g. 85A2, 150C1K).

Number: indicates burning voltage.
First letter: indicates the current range.
Figure: indicates a serial number.
Second letter: indicates the tube base.

The key for this system is given in the following tables.

Number

Average burning voltage in volts

First letter

A —max. 10 mA
B —max. 22 mA
C —max. 40 mA
D—max. 100 mA
E —max. 200 mA

Second letter

E —Edison
K—Octal 8p.-base
P —P-base

Figure

Serial number

SYMBOLS

Electrodes

a	Anode
ah	Auxiliary anode
a_{ign}	Ignition anode
d	Anode of detection diode
D	Deflection plate or rod
f	Filament or resistance wire
fc	Filament tap or star point of three star connected filaments
g	Grid
$i.c.$	Internal connection (not to be connected externally)
k	Cathode
$k_{(i)}$	Input cathode lead of U.H.F. tube
$k_{(o)}$	Output cathode lead of U.H.F. tube
l	Fluorescent screen
m	External conducting coating
$n.c.$	Tube pin which may be connected externally
pr	Primer (auxiliary electrode of cold cathode tubes to ensure safe triggering)
s	Internal shield
S	Switch
st	Starter or trigger electrode of cold cathode tubes

Electrode systems

D	Diode
H	Hexode or Heptode
P	Pentode
Q	Tetrode
T	Triode

Voltages

V_a	Anode voltage Burning voltage of voltage stabilizer
ΔV_a	Burning voltage variation of voltage stabilizer in stabilizing range
V_{arms}	A.C. anode voltage (rms value)

$V_{a\mathrm{invp}}$ Peak value of inverse anode voltage
$V_{a\mathrm{p}}$ Peak value of anode voltage
V_{arc} Arc voltage
V_b Supply voltage
V_{ba} Anode supply voltage
V_{bg2} Supply voltage of second grid
V_{contr} Voltage range of current regulator
V_d Anode voltage of detection diode
$V_{d\mathrm{inv}}$ Inverse anode voltage of detection diode
$V_{d\mathrm{invp}}$ Peak value of inverse anode voltage of detection diode
V_{eff} RMS value of a voltage
V_{ext} Extinguishing voltage
V_f Filament or heater voltage
V_{fwd} Forward voltage
V_g Grid voltage
$V_{g(\mathrm{arc})}$ Grid voltage of conducting tube
$V_{g\mathrm{invp}}$ Peak value of inverse grid voltage
$V_{g\mathrm{p}}$ Peak value of grid voltage
V_i A.C. input voltage per tube
V_{ign} Voltage necessary for breakdown to the concerning electrode
V_{invp} Peak value of inverse voltage
V_k Voltage between cathode and chassis
V_{kf} Voltage between cathode and filament
$V_{kf\mathrm{p}}$ Peak value of voltage between cathode and filament
V_l Voltage of fluorescent screen
V_m Maintaining voltage
V_o A.C. output voltage: d.c. output voltage
V_{osc} Oscillator voltage
V_{pr} Primer voltage of a cold cathode tube
V_{r} Regulation voltage
V_{res} Resonator voltage
V_{st} Starter voltage of a cold cathode tube
V_{tr} Secondary transformer voltage (without load)

Currents

I_a Anode current
I_{a0} Dark current

$I_{a\max}$	Anode current at full drive
$I_{a\min}$	Anode current without drive
I_{ah}	Auxiliary anode current
I_{ap}	Peak value of anode current
I_b	Supply current
I_{contr}	Current range of voltage stabilizer
I_d	Anode current of detection diode
I_{dp}	Peak value of anode current of detection diode
I_f	Filament current
I_g	Grid current
$I_{g\max}$	Grid current at full drive
$I_{g\min}$	Grid current without drive
I_{gp}	Peak value of grid current
I_k	Cathode current
I_l	Current of fluorescent screen
I_o	D.C. output current per tube
I_{pr}	Primer current of a cold cathode tube
I_{rec}	Recommended current
I_{reg}	Stabilized current of current regulator
I_{st}	Starter current
$I_{st\,transf}$	Starter current required to initiate the main discharge
I_{surge}	Surge current

Powers

W_a	Anode dissipation
W_g	Grid dissipation
W_{ig}	Driving power
W_o	Max. output power

Resistances

R_a	External anode resistor; Matching resistance Total anode resistance of rectifying tube
$R_{a\sim}$	External a.c. resistance or load resistance in an anode lead
R_{aa}	Load resistance of push-pull amplifier (anode to anode)
$R_{damping}$	Damping resistance
R_{eq}	Equivalent noise resistance

R_E	Resistance of thermo-element
R_f	Resistance of filament
R_g	External resistance between grid and cathode
$R_{g'}$	External resistance between grid and cathode of next tube
R_i	Internal resistance
R_{id}	Internal resistance of detection diode
R_k	Resistance between cathode and chassis
R_{kf}	External resistance between cathode and filament
R_{st}	External resistor in the starter lead of a cold cathode tube
R_t	Total anode resistance of rectifying tube
R_1	External resistance between $+V_b$ and g_2 } potentiometer
R_2	External resistance between g_2 and chassis } potentiometer
R_3	External resistance between g_2 and k } potentiometer
R_4	External resistance between k and chassis } potentiometer

Capacitances

C_a	Anode to all other elements except control grid
C_{ag}	Anode to grid, all other elements earthed
C_{ak}	Anode to cathode, all other elements earthed
C_{dk}	Anode to cathode of detection diode } all other elements earthed
C_{x1x2}	Deflection plate x_1 to deflection plate x_2 } all other elements earthed
C_{y1y2}	Deflection plate y_1 to deflection plate y_2 } all other elements earthed
C_{filt}	Input capacitor of smoothing filter } all other elements earthed
C_g	Grid to all other elements except anode

Miscellaneous

d_{tot}	Total distortion
f	Frequency
F	Noise level
g	Voltage gain per stage
G	Current amplification (Gain)
m	Number of anodes of rectifying tubes
M	Deflection factor
N	Sensitivity
N_a	Luminous anode sensitivity
N_k	Luminous cathode sensitivity

S	Mutual conductance
S_c	Conversion conductance
S_{eff}	Effective slope of oscillator tube
S_o	Mutual conductance of oscillator triode at $V_g = 0$ V and $V_{osc} = 0$ V
t_{amb}	Ambient temperature
t_{bulb}	Bulb or envelope temperature
t_{Hg}	Temperature of condensed mercury (at the cathode)
t_{rec}	Recommended temperature
T_{av}	Averaging time
T_{dion}	Deionization time
T_{imp}	Pulse duration
T_h	Heating time of tube
T_{ion}	Ionization time
T_{imp}	Pulse time
T_w	Waiting time of a tube = time which has to pass between switching on of the filament (or heater) voltage and switching on of the voltages on the other electrodes
α	Shadow section on fluorescent screen
β	Light sector on a fluorescent screen
η	Efficiency
μ	Gain factor
μ_{g2g1}	Gain factor of grid No. 2 with respect to grid No. 1

REPLACEMENT GUIDE FOR ELECTRON TUBES

INTRODUCTION

The guide presents a survey of all types of electron tubes for which our tubes can be used as replacements.

Types for which a suitable replacement is sought are listed alphabetically and numerically in the first column; where applicable, alternative CV numbers of our corresponding tubes are listed in the second column; and the type numbers of our equivalent or replacement tubes in the third column.

Type numbers printed between brackets in the third column are near equivalents of the types to be replaced; however, in almost all cases the circuits in which they are to be fitted can be adapted to make use of them as replacements.

Replacements for obsolete types are also listed. In many cases the recommended replacement can be used without modifying the circuit or equipment in which it is to be fitted. In some cases, however, it may be necessary to change or rewire the socket, fit an adapter, or alter the circuit slightly. Where an obsolete triode is to be replaced by a pentode, the latter can be used in triode connection.

The fact that a tube is listed does not imply that it can always be supplied.

The guide can be found in this book on pages B193 to B268.

TYPE DESIGNATION CODES, RATING SYSTEMS AND LETTER SYMBOLS FOR SEMICONDUCTORS AND INTEGRATED CIRCUITS

TYPE DESIGNATION CODE

FOR SEMICONDUCTOR DEVICES

This type designation code applies to discrete devices either with or without junctions, and to multiple devices[1])
The type designation consists of:

TWO LETTERS FOLLOWED BY A SERIAL NUMBER

The first letter distinguishes between junction and non-junction devices and gives an indication of the material

A. Devices with one or more junctions, using material with a band gap of 0.6 to 1.0 eV, such as germanium
B. Devices with one or more junctions, using material with a band gap of 1.0 to 1.3 eV, such as silicon
C. Devices with one or more junctions, using material with a band gap of 1.3 eV and more, such as gallium arsenide
D. Devices with one or more junctions, using material with a band gap of less than 0.6 eV, such as indium antimonide
R. Devices without junction, using materials such as those employed in Hall generators and photoconductive cells

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[1]) A multiple device is defined as a combination of similar or dissimilar active devices, contained in a common encapsulation that cannot be dismantled, and of which all electrodes of the individual devices are accessible from the outside.
Multiples of similar devices as well as multiples consisting of a main device and an auxiliary device are designated according to the code for discrete devices described above.
Multiples of dissimilar devices of other nature are designated by the second letter G.

The second letter indicates primarily the main application respectively main application and construction if a further differentiation is essential

A. Detection diode, high speed diode, mixer diode
B. Variable capacitance diode
C. Transistor for a.f. applications ($R_{th\ j\text{-}mb} > 15\,^{\circ}C/W$)
D. Power transistor for a.f. applications ($R_{th\ j\text{-}mb} \leqslant 15\,^{\circ}C/W$)
E. Tunnel diode
F. Transistor for r.f. applications ($R_{th\ j\text{-}mb} > 15\,^{\circ}C/W$)
G. Multiple of dissimilar devices
H. Field probe
K. Hall generator in an open magnetic circuit, e.g. magnetogram or signal probe
L. Power transistor for r.f. applications ($R_{th\ j\text{-}mb} \leqslant 15\,^{\circ}C/W$)
M. Hall generator in a closed electrically energised magnetic circuit, e.g. Hall modulator or multiplier
P. Radiation sensitive device
Q. Radiation generating device
R. Electrically triggered controlling and switching device having a breakdown characteristic ($R_{th\ j\text{-}mb} > 15\,^{\circ}C/W$)
S. Transistor for switching applications ($R_{th\ j\text{-}mb} > 15\,^{\circ}C/W$)
T. Electrically, or by means of light, triggered controlling and switching power device having a breakdown characteristic ($R_{th\ j\text{-}mb} \leqslant 15\,^{\circ}C/W$)
U. Power transistor for switching applications ($R_{th\ j\text{-}mb} \leqslant 15\,^{\circ}C/W$)
X. Multiplier diode, e.g. varactor, step recovery diode
Y. Rectifying diode, booster diode, efficiency diode
Z. Voltage reference or voltage regulator diode

The serial number consists of:

Three figures for semiconductor devices designed for use primarily in consumer goods
One letter and two figures for semiconductor devices designed for use primarily in professional equipment

EXAMPLES

AF139 Germanium r.f. transistor intended primarily for "entertainment" applications

BYX27 Silicon rectifying diode intended primarily for "industrial" applications

TYPE DESIGNATION FOR A RANGE OF SEMICONDUCTOR DEVICES

The type designation of a range of variants of:

1. voltage reference or voltage regulator diodes
2. rectifying diodes
3. thyristors

distinctly belonging to one basic type may be qualified by a suffix part which is clearly separated from the basic part by a dash (–).

The basic part being the same for the whole range, is in accordance with the designation code for discrete devices.

The suffix part consists of:

1. *for voltage reference or voltage regulator diodes*
   one letter followed by the typical zener voltage and where appropriate the letter R[1])
   The first letter indicates the nominal tolerance of the zener voltage in %.
   A = 1 %; B = 2 %; C = 5 %; D = 10 %; E = 15 %
   The typical zener voltage is related to the nominal current rating for the whole range. The letter V is used to denote the decimal point when this occurs.
2. *for rectifying diodes*
   a number and where appropriate the letter R[1])
   The number generally indicates the maximum repetitive peak reverse voltage.
   For controlled avalanche types it indicates the maximum crest working reverse voltage

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[1]) The letter R indicates reverse polarity (stud anode). The normal polarity (stud cathode) and symmetrical executions are not specially indicated.

3. *for thyristors*

a number and where appropriate the letter R [1]) (see foregoing page). The number generally indicates either the maximum repetitive peak reverse voltage or the maximum repetitive peak off-state voltage, whichever is lower.

For controlled avalanche types it indicates the maximum crest working reverse voltage.

EXAMPLES

BZY88series	Range of silicon voltage regulator diodes for industrial applications
BZY88-C9V1	The particular type out of the range with a typical zener voltage of 9.1 V ±5 %
BYX13-1200	The particular normal polarity type out of the BYX13series with a maximum repetitive peak reverse voltage of 1200 V
BTX13-200R	The particular reverse polarity type out of the BTX13 thyristor range of which the lower maximum repetitive peak voltage is 200 V

OLD SYSTEM

The first letter is always "O", indicating a semiconductor device. *The second* (*and third*) *letter*(*s*) indicate the general class of device.

A - diode or rectifier	C - transistor
AP - photodiode	CP - phototransistor
AZ - zener diode	RP - photoconductive cell

The group of figures is a serial number indicating a particular design or development.

EXAMPLES

OA81	Semiconductor diode
OAZ200	Zener diode
OC72	Transistor

TYPE DESIGNATION FOR SEMICONDUCTOR RECTIFIER STACKS

The type designation consists of:

THREE LETTERS FOLLOWED BY A SERIAL NUMBER

The first 2 letters indicate the type of stack:

OS. Denotes a semiconductor rectifier diode stack
OT. Denotes a semiconductor stack in which also thyristors are used

The third letter indicates the type of circuit:

A. Single phase half wave
B. Two phase half wave
C. Three phase half wave (three phase star)
D. Four phase half wave (four phase star)
E. Six phase half wave (six phase star)
F. Three phase double Y with interphase transformer
H. Single phase full wave (single phase bridge)
J. Single phase magnetic amplifier bridge
K. Three phase full wave (three phase bridge)
L. Four phase full wave (four phase bridge)
M. Voltage doubler (half a single phase full wave)
S. Miscellaneous (such as combinations of single diodes and passive components)

The serial number is sometimes followed by a suffix letter for the indication of variants.

RATING SYSTEMS

ACCORDING TO I.E.C. PUBLICATION 134

1. DEFINITIONS OF TERMS USED

1.1 *Electronic device.* An electronic tube or valve, transistor or other semiconductor device.

Note: This definition excludes inductors, capacitors, resistors and similar components.

1.2 *Characteristic.* A characteristic is an inherent and measurable property of a device. Such a property may be electrical, mechanical, thermal, hydraulic, electro-magnetic, or nuclear, and can be expressed as a value for stated or recognized conditions. A characteristic may also be a set of related values, usually shown in graphical form.

1.3 *Bogey electronic device.* An electronic device whose characteristics have the published nominal values for the type. A bogey electronic device for any particular application can be obtained by considering only those characteristics which are directly related to the application.

1.4 *Rating.* A value which establishes either a limiting capability or a limiting condition for an electronic device. It is determined for specified values of environment and operation, and may be stated in any suitable terms.

Note: Limiting conditions may be either maxima or minima.

1.5 *Rating system.* The set of principles upon which ratings are established and which determine their interpretation.

NOTE. The rating system indicates the division of responsibility between the device manufacturer and the circuit designer, with the object of ensuring that the working conditions do not exceed the ratings.

2. ABSOLUTE MAXIMUM RATING SYSTEM

Absolute maximum ratings are limiting values of operating and environmental conditions applicable to any electronic device of a specified type as defined by its published data, which should not be exceeded under the worst probable conditions.

These values are chosen by the device manufacturer to provide acceptable serviceability of the device, taking no responsibility for equipment variations, environmental variations, and the effects of changes in operating conditions due to variations in the characteristics of the device under consideration and of all other electronic devices in the equipment.

The equipment manufacturer should design so that, initially and throughout life, no absolute maximum value for the intended service is exceeded with any device under the worst probable operating conditions with respect to supply voltage variation, equipment component variation, equipment control adjustment, load variations, signal variation, environmental conditions, and variations in characteristics of the device under consideration and of all other electronic devices in the equipment.

3. DESIGN MAXIMUM RATING SYSTEM

Design maximum ratings are limiting values of operating and environmental conditions applicable to a bogey electronic device of a specified type as defined by its published data, and should not be exceeded under the worst probable conditions.

These values are chosen by the device manufacturer to provide acceptable serviceability of the device, taking responsibility for the effects of changes in operating conditions due to variations in the characteristics of the electronic device under consideration.

The equipment manufacturer should design so that, initially and throughout life, no design maximum value for the intended service is exceeded with a bogey device under the worst probable operating conditions with respect to supply voltage variation, equipment component variation, variation in characteristics of all other devices in the equipment, equipment control adjustment, load variation, signal variation and environmental conditions.

4. DESIGN CENTRE RATING SYSTEM

Design centre ratings are limiting values of operating and environmental conditions applicable to a bogey electronic device of a specified type as defined by its published data, and should not be exceeded under normal conditions.

These values are chosen by the device manufacturer to provide acceptable serviceability of the device in average applications, taking responsibility for normal changes in operating conditions due to rated supply voltage variation, equipment component variation, equipment control adjustment, load variation, signal variation, environmental conditions, and variations in the characteristics of all electronic devices.

The equipment manufacturer should design so that, initially, no design centre value for the intended service is exceeded with a bogey electronic device in equipment operating at the stated normal supply voltage.

NOTE. It is common use to apply the Absolute Maximum System in semiconductor published data.

LETTER SYMBOLS FOR SEMICONDUCTOR DEVICES
excluding power diodes and thyristors

This system is based on the Recommendations of the INTERNATIONAL ELECTROTECHNICAL COMMISSION as published in I.E.C. Publication 148.

QUANTITY SYMBOLS

1. Instantaneous values of current, voltage and power, which vary with time are represented by the appropriate lower case letter.

   Examples: i, v, p

2. Maximum (peak), average, d.c. and root-mean-square values are represented by the appropriate upper case letter.

   Examples: I, V, P

SUBSCRIPTS FOR QUANTITY SYMBOLS

1. Total values are indicated by upper case subscripts.

   Examples: I_C, I_{CM}, I_{CAV}, i_C, V_{EB}

2. Values of varying components are indicated by lower case subscripts.

   Examples: i_c, I_c, v_{eb}, V_{eb}

3. To distinguish between maximum (peak), average, d.c. and root-mean-square values, the following subscripts are added:
   For maximum (peak) values: M or m
   For average values : AV or av (only if it is necessary to distinguish between d.c. and average)
   For d.c. values : no additional subscript
   For root-mean-square values: (rms)

   Examples: I_C, I_{cm}, I_{CAV}, $I_{c(rms)}$, $I_{C(RMS)}$

4. List of subscripts (examples, see figure 1).

A, a	=	Anode terminal
K, k	=	Cathode terminal
E, e	=	Emitter terminal
B, b	=	Base terminal
C, c	=	Collector terminal
(BR)	=	Break-down
X, x	=	Specified circuit
M, m	=	Maximum (peak) value
AV, av	=	Average value
(RMS), (rms)	=	R.M.S. value
F, f	=	Forward
R, r	=	As first subscript: Reverse. As second subscript: Repetitive
O	=	As third subscript: The terminal not mentioned is open circuited
S	=	As second subscript: Non repetitive As third subscript: Short circuit between the terminal not mentioned and the reference terminal
Z	=	Zener. (Replaces R to indicate the actual zener voltage, current or power of voltage reference or voltage regulator diodes)

5. Examples of the application of the rules:
Figure 1 represents a transistor collector current, consisting of a direct current and a signal, as a function of time.

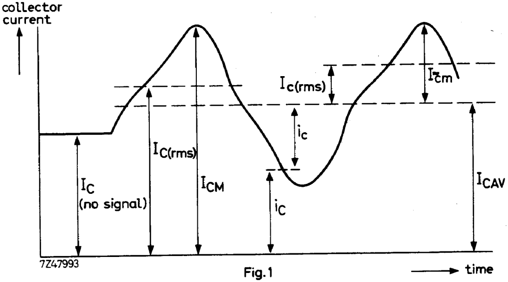


Fig.1

CONVENTIONS FOR SUBSCRIPT SEQUENCE

1. *Currents*

For transistors the first subscript indicates the terminal carrying the current (conventional current flow from the external circuit into the terminal is positive).

For diodes a forward current (conventional current flow into the anode terminal) is represented by the subscript F or f; a reverse current (conventional current flow out of the anode terminal) is represented by the subscript R or r.

2. *Voltages*

For transistors normally, two subscripts are used to indicate the points between which the voltage is measured. The first subscript indicates one terminal point and the second the reference terminal.

Where there is no possibility of confusion, the second subscript may be omitted.

For diodes a forward voltage (anode positive with respect to cathode) is represented by the subscript F or f and a reverse voltage (anode negative with respect to cathode) by the subscript R or r.

3. *Supply voltages*

Supply voltages may be indicated by repeating the terminal subscript.

Examples: V_{EE}, V_{CC}, V_{BB}

The reference terminal may then be indicated by a third subscript.

Examples: V_{EEB}, V_{CCB}, V_{BBC}

4. In devices having more than one terminal of the same type, the terminal subscripts are modified by adding a number following the subscript and on the same line.

Example: $V_{B2\text{-}E}$ voltage between second base and emitter

In multiple unit devices, the terminal subscripts are modified by a number preceding the terminal subscripts:

Example: $V_{1B\text{-}2B}$ voltage between the base of the first unit and that of the second one.

ELECTRICAL PARAMETER SYMBOLS

1. The values of four pole matrix parameters or other resistances, impedances, admittances, etc... inherent in the device, are represented by the lower case symbol with the appropriate subscripts.

Examples: h_{ib}, z_{fb}, y_{oc}, h_{FE}

2. The four pole matrix parameters of external circuits and of circuits in which the device forms only a part are represented by the upper case symbols with the appropriate subscripts.

Examples: H_i, Z_o, H_F, Y_R

SUBSCRIPTS FOR PARAMETER SYMBOLS

1. The static values of parameters are indicated by upper case subscripts.

Examples: h_{IB}, h_{FE}

Note: The static value is the slope of the line from the origin to the operating point on the appropriate characteristic curve, i.e. the quotient of the appropriate electrical quantities at the operating point.

2. The small signal values of parameters are indicated by lower case subscripts.

Examples: h_{ib}, z_{ob}

3. The first subscript, in matrix notation identifies the element of the four pole matrix.

i (for 11) = input	f (for 21) = forward transfer
o (for 22) = output	r (for 12) = reverse transfer

Examples: $V_1 = h_i I_1 + h_r V_2$
$I_2 = h_f I_1 + h_o V_2$

Notes 1) The voltage and current symbols in matrix notation are indicated by a single digit subscript.
The subscript 1 = input; the subscript 2 = output

2) The voltages and currents in these equations may be complex quantities.

4. The second subscript identifies the circuit configuration.

e = common emitter	c = common collector
b = common base	j = common terminal, general

Examples: (common base) $I_1 = y_{ib} V_{1b} + y_{rb} V_{2b}$
$I_2 = y_{fb} V_{1b} + y_{ob} V_{2b}$

When the common terminal is understood, the second subscript may be omitted.

5. If it is necessary to distinguish between real and imaginary parts of the four pole parameters, the following notations may be used.

$\mathrm{Re}(h_{ib})$ etc... for the real part
$\mathrm{Im}(h_{ib})$ etc... for the imaginary part

LIST OF LETTER SYMBOLS
excluding power diodes and thyristors

Letter symbol	*Definition*
b_{ib}, b_{ie}, b_{ob}, b_{oe}	See *y* parameters
C_c [1])	Collector capacitance (emitter open-circuited to a.c. and d.c.)
C_d [1])	Diode capacitance
C_e [1])	Emitter capacitance (collector open-circuited to a.c. and d.c.)
C_{ib}, C_{ie}, C_{ob}, C_{oe} [1])	See *y* parameters
d	Distortion
F	Noise figure
f	Frequency
F_c	Conversion noise figure
f_{hfb}, f_{hfe}, f_{yfe}	Cut-off frequency (frequency at which the parameter indicated by the subscript is 0.7 of its low frequency value)
f_T	Transition frequency (gain-bandwidth product)
g_{ie}, g_{ib}, g_{oe}, g_{ob}	See *y* parameters
G_p	Power gain
G_S	Source conductance
G_{tr}	Transducer gain
G_{UM}	Maximum unilateralised power gain
h_{FB}, h_{FC}, h_{FE}	Static value of the forward current transfer ratio or d.c. current gain (output voltage held constant)
h_{fb}, h_{fc}, h_{fe}	Small signal value of the forward current transfer ratio or small signal current gain (output short-circuited to a.c.)

[1]) As an exception to the general rule for electrical parameters capacitances are represented by the upper-case letter.

Letter symbol	Definition
h_{IB}, h_{IC}, h_{IE}	Static value of the input resistance (output voltage held constant)
h_{ib}, h_{ic}, h_{ie}	Small signal value of the input impedance (output short-circuited to a.c.)
h_{OB}, h_{OC}, h_{OE}	Static value of the output conductance (input current held constant)
h_{ob}, h_{oc}, h_{oe}	Small signal value of the output admittance (input open-circuited to a.c.)
h_{RB}, h_{RC}, h_{RE}	Static value of the reverse voltage transfer ratio (input current held constant)
h_{rb}, h_{rc}, h_{re}	Small signal value of the reverse voltage transfer ratio (input open-circuited to a.c.)
I_B, I_C, I_E	Total d.c. (or average) current
I_b, I_c, I_e	Varying component of the current
i_B, i_C, i_E	Instantaneous total value of the current
i_b, i_c, i_e	Instantaneous value of the varying component of the current
I_{BAV}, I_{CAV}, I_{EAV}	Total average current (to distinguish between average and d.c. if necessary)
I_{BEX}, I_{CEX}	Total base, respectively collector current under specified conditions. These symbols are commonly used in case of a reverse biased emitter junction
I_{BM}, I_{CM}, I_{EM}	Maximum (peak) value of the total current
I_{bm}, I_{cm}, I_{em}	Maximum (peak) value of the varying component of the current
I_{CBO}	Collector cut-off current (open emitter)
I_{CEO}	Collector cut-off current (open base)
I_{CBS} or I_{CES}	Collector cut-off current (emitter short-circuited to base)
I_{EBO}	Emitter cut-off current (open collector)
I_F	Total forward current of a diode (d.c. or average)
i_F	Instantaneous total value of the forward current of a diode

Letter symbol	*Definition*
I_{FAV}	Total average forward current of a diode (to distinguish between average and d.c. if necessary)
I_{FM}	Peak forward current of a diode
I_i, I_o	Input, respectively output current of a specified circuit
I_R	Total reverse (cut-off) current of a diode
i_R	Instantaneous total value of the reverse current of a diode
I_{RRM}	Repetitive peak reverse current of a diode
I_{RSM}	Non repetitive peak reverse current of a diode
I_Z	Zener current (d.c. or average)
I_{ZM}	Peak zener current
I_{ZS}	Non repetitive zener current
P_i, P_o	Input, respectively output power of a specified circuit
P_{tot}	Total power dissipation in the device
P_Z	Zener power dissipation
P_{ZM}	Peak zener power dissipation
P_{ZSM}	Non repetitive peak zener power dissipation
Q_s	Recovered charge
r_D	Diode (internal) series resistance
R_S	Source resistance
R_{th}	Thermal resistance
$R_{th\ j\text{-}a}$	Thermal resistance from junction to ambient
$R_{th\ j\text{-}mb}$	Thermal resistance from junction to mounting base
$R_{th\ j\text{-}c}$	Thermal resistance from junction to case
$R_{th\ mb\text{-}h}$	Thermal resistance from mounting base to heat-sink
r_z	Dynamic-slope resistance of a zener diode
S_z	Temperature coefficient of the operating voltage of a zener diode

Letter symbol	Definition
T_{amb}	Ambient temperature
T_{case}	Case temperature
t_d	Delay time
t_f	Fall time
t_{fr}	Forward recovery time of a diode
T_j	Junction temperature
t_{off}	Turn off time ($t_{off}=t_s+t_f$)
t_{on}	Turn on time ($t_{on}=t_d+t_r$)
t_r	Rise time
t_{rr}	Reverse recovery time of a diode
t_s	Storage time
T_{stg}	Storage temperature
V_{BB}, V_{CC}, V_{EE}	Supply voltage
V_{BE}, V_{CB}, V_{CE}, V_{EB}	Total value of the voltage (d.c. or average)
V_{be}, V_{cb}, V_{ce}, V_{eb}	Varying component of the voltage
v_{BE}, v_{CB}, v_{CE}, v_{EB}	Instantaneous value of the total voltage
v_{be}, v_{cb}, v_{ce}, v_{eb}	Instantaneous value of the varying component of the voltage
V_{BEfl}	Base-emitter floating voltage (open base)
V_{BEsat}, V_{CEsat}	Saturation voltage at specified bottoming conditions
$V_{(BR)}$	Breakdown voltage
$V_{(BR)CBO}$, $V_{(BR)CEO}$, $V_{(BR)EBO}$	Breakdown voltage between the terminal indicated by the first subscript and the reference terminal (second subscript) when the third terminal is open circuited
$V_{(BR)CER}$	Collector-emitter breakdown voltage with a specified resistance between emitter and base
$V_{(BR)CES}$	Collector-emitter breakdown voltage with the emitter short circuited to the base
V_{CBO}, V_{CEO}, V_{EBO}	Voltage of the terminal indicated by the first subscript w.r.t. the reference terminal (second subscript) with the third terminal open circuited
V_{CEK}	Knee voltage at specified conditions

Letter symbol	*Definition*
V_{CER}	Collector-emitter voltage with a specified resistance between emitter and base
V_{CES}	Collector-emitter voltage with the emitter short circuited to the base
$V_{CE.\mathrm{sust}}$	Collector-emitter sustaining voltage under the condition, indicated by the third subscript
V_{CEX}	Collector-emitter voltage in a specified circuit. This symbol is commonly used to indicate a reverse biased emitter junction
V_{EBfl}	Emitter-base floating voltage (open emitter)
V_F	Continuous forward voltage of a diode
V_{FM}	Peak forward voltage of a diode
V_i, V_o	Input, respectively output voltage of a specified circuit
V_{pt}	Punch through voltage
V_R	Continuous reverse voltage of a diode
V_{RM}	Peak reverse voltage of a diode
V_{RSM}	Non repetitive peak reverse voltage of a diode
V_Z	Operating voltage (zener voltage) of a zener diode
y_{ib}, y_{ie}	Input admittance } Output short circuited to a.c.
g_{ib}, g_{ie}	Input conductance } Output short circuited to a.c.
C_{ib}, C_{ie}	Input capacitance } Output short circuited to a.c.
b_{ib}, b_{ie}	Input susceptance } Output short circuited to a.c.
φ_{ib}, φ_{ie}	Phase angle of input admittance } Output short circuited to a.c.
y_{fb}, y_{fe}	Transfer admittance } Output short circuited to a.c.
g_{fb}, g_{fe}	Transfer conductance } Output short circuited to a.c.
C_{fb}, C_{fe}	Transfer capacitance } Output short circuited to a.c.
φ_{fb}, φ_{fe}	Phase angle of transfer admittance } Output short circuited to a.c.

Letter symbol	Definition	
y_{ob}, y_{oe}	Output admittance	Input short circuited to a.c.
g_{ob}, g_{oe}	Output conductance	
C_{ob}, C_{oe}	Output capacitance	
b_{ob}, b_{oe}	Output susceptance	
φ_{ob}, φ_{oe}	Phase angle of output admittance	
y_{rb}, y_{re}	Feedback admittance	Input short circuited to a.c.
g_{rb}, g_{re}	Feedback conductance	
C_{rb}, C_{re}	Feedback capacitance	
φ_{rb}, φ_{re}	Phase angle of feedback admittance	

LETTER SYMBOLS
for power diodes and thyristors

This system is based on the Recommendations of the INTERNATIONAL ELECTROTECHNICAL COMMISSION.

QUANTITY SYMBOLS

1. Instantaneous values of current, voltage and power, which vary with time are represented by the appropriate lower case letter.

   Examples: i, v, p

2. Maximum (peak), average, d.c. and root-mean-square values are represented by the appropriate upper case letter.

   Examples: I, V, P

SUBSCRIPTS FOR QUANTITY SYMBOLS

1. Total values are indicated by upper case subscripts.
2. Values of varying components are indicated by lower case subscripts.
3. For power rectifier diodes and thyristors the terminal(s) are *not* indicated in the subscripts, except for the gate-terminal of thyristors.
4. List of subscripts:

   G, g = Gate terminal
   F, f = Forward[1])
   D, d = Forward off-state[1]); non trigger (gate voltage or current)
   T, t = Forward on-state[1]); trigger (gate voltage or current)
   R, r = As first subscript; Reverse
   As second subscript: Repetitive

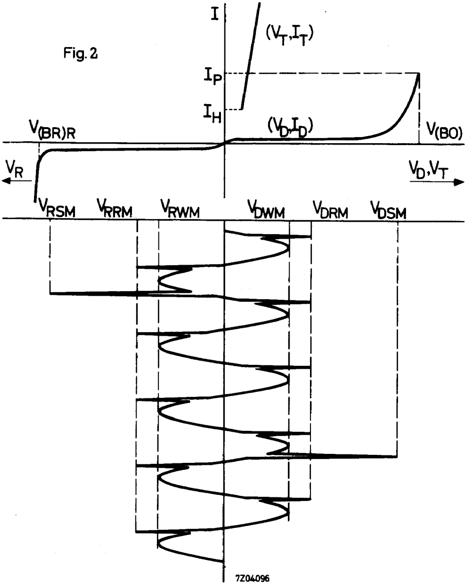
---

[1]) For the anode-cathode voltage of thyristors F is replaced either by D or by T, to distinguish between "off-state" (non triggered) and "on-state" (triggered).

AV, av = Average value
M, m = Maximum (peak or crest) value
(RMS), (rms) = R.M.S. value
(BR) = Breakdown
(BO) = Breakover
H = Holding
P = Pick-up
Q = Turn off
S = As a second subscript: Non repetitive
W = Working

5. Examples of the application of the rules.
The figure represents a simplified thyristor characteristic together with an anode-cathode voltage as a function of time (no gate signal).

Fig. 2



LIST OF LETTER SYMBOLS IN ALPHABETICAL ORDER
for rectifier diodes (R) and thyristors (T)

Instantaneous values (i, p, v) and a.c. components (lower case subscripts) have been omitted:

Letter symbol	*R*	*T*	*Description*
I_D	—	T	Off-state current (d.c.)
I_F	R	—	Forward current (d.c. or average)
I_{FAV}	R	—	Total average forward current (to distinguish between average and d.c. if necessary)
I_{FGM}	—	T	Forward peak gate current
I_{FRM}	R	—	Repetitive peak forward current
I_{FSM}	R	—	Non repetitive peak forward current
I_H	—	T	Holding current
I_{GT}	—	T	Gate current to trigger the device
I_P	—	T	Pick up current
I_R	R	T	Reverse current (d.c.)
I_{RG}	—	T	Reverse gate current
I_{RRM}	R	T	Repetitive peak reverse current
I_T	—	T	Forward on-state current (d.c.)
I_{TAV}	—	T	Average (forward) on-state current
$I_{T(RMS)}$	—	T	R.M.S. value of the (forward) on-state current
I_{TRM}	—	T	Repetitive peak (forward) on-state current
I_{TSM}	—	T	Non repetitive peak (forward) on-state current
P_{GAV}	—	T	Average gate power dissipation
P_{GM}	—	T	Peak gate power dissipation
P_{RAV}	R	T	Average reverse power dissipation
P_{RRM}	R	T	Repetitive peak reverse power dissipation
P_{RSM}	R	T	Non repetitive peak reverse power dissipation

Letter symbol	*R*	*T*	*Description*
$V_{(BO)}$	—	T	Breakover voltage
$V_{(BR)R}$	R	T	Reverse breakdown voltage
V_D	—	T	Continuous off-state voltage
V_{DRM}	—	T	Repetitive peak off-state voltage
V_{DSM}	—	T	Non repetitive peak off-state voltage
V_{DWM}	—	T	Crest working off-state voltage
V_F	R	—	Continuous forward voltage
V_{FGM}	—	T	Forward peak voltage, gate-cathode
V_{GD}	—	T	Gate-cathode voltage not to trigger the device
V_{GT}	—	T	Gate-cathode voltage to trigger the device
V_R	R	T	Continuous reverse voltage
V_{RGM}	—	T	Reverse peak voltage, gate-cathode
V_{RRM}	R	T	Repetitive peak reverse voltage
V_{RSM}	R	T	Non repetitive peak reverse voltage
V_{RWM}	R	T	Crest working reverse voltage
V_T	—	T	Continuous (forward) on-state voltage

TYPE DESIGNATION CODE

FOR NETWORKS

This code applies to networks in non-accessible envelopes, such as integrated circuit devices.
The type designations according to this code distinguish between solitary networks and networks belonging to a family. A family is defined as a group of networks which are related in their specifications, and primarily designed to be mutually connected.
The type designation consists of:

THREE LETTERS FOLLOWED BY THREE FIGURES

The first two letters indicate a family respectively a solitary type
Family types: FA, FB, FC, etc.
GA, GB, GC, etc.
Solitary types: TA, TB, TC, etc.

The third letter indicates the circuit function in categories
A. Linear amplification
B. Frequency conversion/demodulation
C. Oscillating/generating (continuous)
D. Multiples of dissimilar linear networks
G. Multiple of non-interconnected discrete devices when belonging to a family of networks
H. Logic
J. Storage (continuous)
K. Timing (incl. temporary storage)
L. Digital level conversion
Y. Miscellaneous

The first two figures represent the serial number

The third figure indicates the temperature range
1. 0 to +75°C
2. −55 to +125°C
0. other temperature ranges

REPLACEMENT GUIDE FOR SEMICONDUCTORS

INTRODUCTION

Semiconductors listed alphabetically and numerically in the left-hand column of this guide can be replaced by our own types listed opposite them in the right-hand column. If the type numbers in both columns are the same, the recommended replacement completely satisfies the specification of the semiconductor listed in the left-hand column and is its equivalent.

If the type numbers in both columns differ, the specifications or characteristic data of the recommended replacement may differ in some respect from those of the type listed on the left. Compare their respective data sheets or consult the abridged data in this book.

Type numbers given in parentheses are near equivalents of their counterparts in the left-hand column, one or more of the electrical or mechanical data of the two types differing by at least 20 per cent.

The replacement guide for transistors begins on page B366.
The replacement guide for small signal diodes begins on page B374.
The replacement guide for integrated circuits is given on page B377.
The replacement guide for voltage regulator (zener) diodes begins on page B378.
Field effect transistors, thyristors, and rectifier diodes are not listed.

The fact that a semiconductor is listed does not imply that it can always be supplied.

EXPLANATION OF THE TECHNICAL DATA OF ELECTRON TUBES

1. SPECIFICATIONS (static data)

The specifications refer to the average values for a *new* tube. The reference value is usually the anode current. In this case, the bias of the control grid should be set such that the given anode current is obtained; therefore, the bias given will generally be only an indicative value. For indirectly heated tubes, the electrode d.c. voltage refers to the cathode and for directly heated tubes, to the (negative) end of the filament.

2. SERVICE DATA

The service data provides the most favourable settings for the tubes in the respective fields of application. It is recommended that the settings indicated be adhered to as strictly as possible. Divergences should lie within the limits given.

The output W_o represents the maximum capacity of the tubes; in most cases, the effective output will be somewhat lower due to, for instance, losses in the anode circuit, etc.

3. LIMITING VALUES

Limiting values are maximum values unless expressely stated otherwise. For receiving tubes, the limiting values may be surpassed within the specified tolerances (see following paragraphs); for special tubes, specific instructions are valid and will be provided upon request.

a) Anode and screen grid load

The limits for the anode[1]) and screen grid dissipation may be surpassed by a maximum of 10% due to the tolerances of the component parts. The screen grid dissipation for final amplifier tubes is given as the dissipation without signal. Surpassing this value with signals within the range of normal musical transmission is permissible.

b) Electrode direct voltage

For variable tubes in their lowest state, as well as all tubes at the moment of being switched on or with dead electrodes, the electrode direct voltages may surpass their nominal values.

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[1]) $W_a = V_a \cdot I_a - W_o$

c) Potential between filament and cathode

The limits set for the potential between filament and cathode, V_{kf}, refer to that end of the filament having the higher potential with respect to the cathode. Unless stated otherwise, the value of the potential, V_{kf}, holds for either direct or alternating voltage or for a combination of direct and alternating voltage. The direct voltage component may not surpass the limiting value for V_{kf}. When using alternating voltage, or direct voltage plus ripple voltage, the peak value may reach $2 \times V_{kf\,\max}$, but may not surpass 315 Volts unless the limiting values for that tube type indicate specifically otherwise. If not specifically mentioned the limits hold for any polarity with the following restriction: unless otherwise stated for the given type of tube, an additional direct voltage component is not permissible when the cathode is negative with respect to the filament and the filament-cathode potential is more than 100 V. If a limiting value of the peak value for the filament-cathode potential ($V_{kf\mathrm{p}}$) is given, it indicates the total of direct voltage plus the peak value of the ripple voltage.

d) Control grid bleeder resistance

Unless otherwise stated, the limiting value of the control grid bleeder resistance refers to the automatic bias generation (by the cathode resistance). If no limit is given for operation with a fixed bias, then the grid bleeder resistance may reach a maximum of one-half the value for automatic bias generation. With semi-automatic bias generation (emission currents from all tubes flow through resistance in common negative conductor), the limiting value will be: $R_{g1} = \frac{1}{2}\{1 + (I_a + I_{g2})/I_{\mathrm{tot}}\}R_{g1}$, where R_{g1} is the limiting value with automatic bias generation, I_a and I_{g2} are the currents of the respective tubes, and I_{tot} is the total current of all tubes.

If the grid bias is generated only at the grid bleeder resistance, then the latter may reach a maximum of 22 MΩ.

e) Suppressor grid bleeder resistance

If no limit is given for the resistance between the suppressor grid and the cathode, then the suppressor grid should be connected directly to the cathode (maximum resistance permitted between suppressor grid and cathode is 1 kΩ).

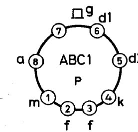
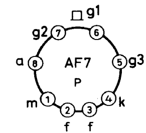
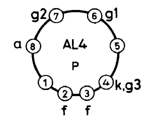
f) *Resistance between filament and cathode*
The resistance between the filament and the cathode should be as small as possible and should not surpass 20 kΩ unless a higher value is expressly stated (for instance, for phase reversing circuits).
g) *Surge limiting resistor for rectifier tubes*
Every anode conductor of a rectifier tube should contain a surge limiting resistor R_t. The required minimum values are indicated in the data. When feeding from a transformer, this resistance is already partially given by the d.c. resistance of the transformer winding.

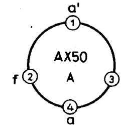
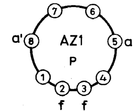
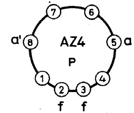
4. HEATING DATA

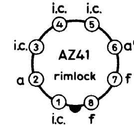
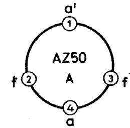
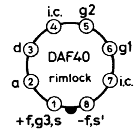
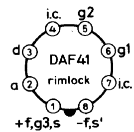
For special tubes, specific instructions are provided upon request.
a) *Indirectly heated tubes, parallel feed*
For indirectly heated receiving tubes in parallel feed, the data for the tube holds for the given filament voltage. Because of the deviation of the transformer from the given nominal value, the filament voltage may not deviate more than $+7\%$ from the rated value. The fluctuation of the mains may then reach a maximum of $\pm 10\%$. When operating on a 6.3 or 12.6 Volt battery, the voltage may not fall below 5.5, respectively 11 Volts nor surpass 8, respectively 16 Volts.
b) *Indirectly heated tubes, series feed*
For indirectly heated receiving tubes in series feed, the data for the tube holds for the given filament voltage. When using a fixed series resistance, the filament voltage may not deviate more than $\pm 3.5\%$ from its rated value; when using a voltage regulator, the maximum deviation may be $\pm 5\%$. In this case, mains current fluctuations of maximum $\pm 10\%$ are permitted.

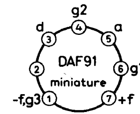
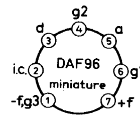
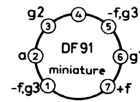
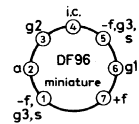
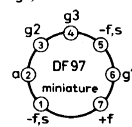
ELECTRON TUBES

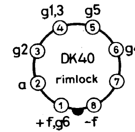
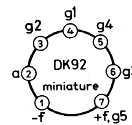
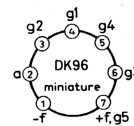
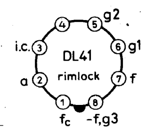
RECEIVING AND AMPLIFYING TUBES

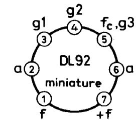
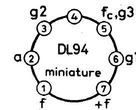
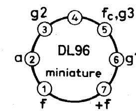
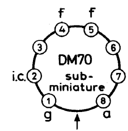
Type and application	V_f *(V)* I_f *(A)*	*Characteristic data*			*Limiting values*	*Base connections*
ABC1 Double diode triode	4 0.65	*Typical (triode)* $V_a = 250$ V $V_g = -7$ V	$I_a = 4$ mA $S = 2$ mA/V	$R_i = 13.5$ kΩ $\mu = 27$	$W_a = 1.5$ W $I_k = 10$ mA $V_{kf} = 50$ V	
AF7 R.F. pentode	4 0.65	*Typical* $V_a = 250$ V $V_{g2} = 90$ V $V_{g3} = 0$ V	$V_{g1} = -2$ V $I_a = 3$ mA $I_{g2} = 1.1$ mA	$S = 2.1$ mA/V $R_i = 2$ MΩ $C_{ag1} = <0.003$ pF	$W_a = 1$ W $I_k = 6$ mA $V_{kf} = 50$ V	
AL4 Output pentode	4 1.75	*Operating class A* $V_a = 250$ V $V_{g2} = 250$ V $R_k = 150$ Ω	$I_a = 36$ mA $I_{g2} = 4$ mA $S = 9$ mAV	$R_i = 50$ kΩ $R_a = 7$ kΩ $W_o = 4.5$ W	$W_a = 9$ W $I_k = 55$ mA $V_{kf} = 100$ V	

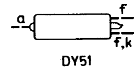
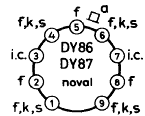
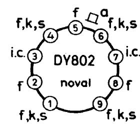
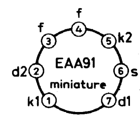
		Operating and Limiting				
AX50 Gasfilled Double anode rectifier	4 3.75	$V_{tr} = 2 \times 500\ V_{rms}$ $I_o = \leqslant 275$ mA	$I_{ap} = \leqslant 1$ A $V_{arc} = 15$ V	$R_t = >2 \times 100\ \Omega$ at $C_{filt} = 16\ \mu F$	$R_t = >2 \times 200\ \Omega$ at $C_{filt} = <64\ \mu F$	
		Operating and Limiting				
AZ1 Double anode rectifier	4 1.1	$V_{tr} = 2 \times 300\ V_{rms}$ $V_{tr} = 2 \times 500\ V_{rms}$	$I_o = \leqslant 100$ mA $I_o = \leqslant 60$ mA	$R_t = \geqslant 2 \times 60\ \Omega$ $R_t = \geqslant 2 \times 100\ \Omega$	$C_{filt} = 60\ \mu F$	
		Operating and Limiting				
AZ4 Double anode rectifier	4 2.3	$V_{tr} = 2 \times 300\ V_{rms}$ $V_{tr} = 2 \times 500\ V_{rms}$	$I_o = \leqslant 200$ mA $I_o = \leqslant 120$ mA	$R_t = \geqslant 2 \times 60\ \Omega$ $R_t = \geqslant 2 \times 100\ \Omega$	$C_{filt} = 60\ \mu F$	

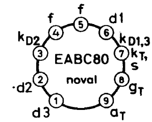
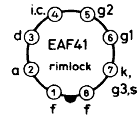
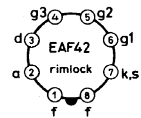
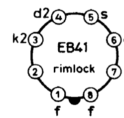
Type and application	V_f (V) I_f (A)	Characteristic data			Limiting values	Base connections
		Operating and Limiting				
AZ41 Double anode rectifier	4 0.72	$V_{tr}=2\times 300\ V_{rms}$ $V_{tr}=2\times 500\ V_{rms}$	$I_o=\leqslant 70$ mA $I_o=\leqslant 60$ mA	$R_t=\geqslant 2\times 100\ \Omega$ $R_t=\geqslant 2\times 200\ \Omega$	$C_{filt}=50\ \mu F$	
		Operating and Limiting				
AZ50 Double anode rectifier	4 3	$V_{tr}=2\times 300\ V_{rms}$ $V_{tr}=2\times 500\ V_{rms}$	$I_o=\leqslant 300$ mA $I_o=\leqslant 250$ mA	$R_t=\geqslant 2\times 100\ \Omega$ $R_t=\geqslant 2\times 200\ \Omega$	$C_{filt}=16\ \mu F$ $C_{filt}=64\ \mu F$	
		Typical (pentode)				
DAF40 Diode-pentode	1.4 0.025	$V_a=67.5$ V $V_{g2}=67.5$ V $V_{g1}=0$ V	$I_a=0.85$ mA $I_{g2}=0.2$ mA $S=0.7$ mA/V	$R_i=1.6\ M\Omega$ $\mu_{g2g1}=32$ $R_{eq.}=8.7\ k\Omega$	$W_a=0.2$ W $I_k=1.2$ mA $I_d=0.2$ mA	
		Operating (pentode)				
DAF41 Diode-A.F. pentode	1.4 0.025	$V_b=67.5$ V $V_{g1}=0$ V	$R_a=0.22\ M\Omega$ $R_{g2}=0.82\ M\Omega$	$I_a=0.17$ mA $I_{g2}=0.04$ mA $V_o/V_i=60$	$W_a=0.1$ W $I_k=0.5$ mA $I_d=0.2$ mA	

		Typical (pentode)				
DAF91 Diode- A.F. pentode	1.4 0.05	V_a =67.5 V V_{g2}=67.5 V V_{g1}= 0 V	I_a =1.6 mA I_{g2}=0.4 mA S =0.62 mA/V	R_i = 0.6 MΩ μ_{g2g1}=13.5	W_a=0.25 W I_k =4.5 mA I_d =0.2 mA	
		Operating (pentode)				
		V_b =67.5 V V_{g1}= 0 V R_a = 1 MΩ	R_{g1}=10 MΩ R_{g2}=3.9 MΩ I_b =60 μA	V_o/V_i=55 d_{tot} =3 %		
		Operating (pentode)				
DAF96 Diode- A.F. pentode	1.4 0.025	V_b =85 V R_a = 1 MΩ R_{g2}=2.7 MΩ	R_{g1}=10 MΩ R_{g1}=2.2 MΩ I_a =64 μA	I_{g2} =21 μA V_o/V_i=70 d_{tot} =2.4 %	W_a=30 mW I_k = 1 mA I_d =0.2 mA	
		Typical				
DF91 Remote cut-off pentode	1.4 0.05	V_a =90 V V_{g2}=45 V V_{g1}= 0 V	I_a =1.8 mA I_{g2}=0.65 mA S =0.75 mA/V	R_i =0.8 MΩ μ_{g2g1}=11 $R_{eq.}$ =16 kΩ	W_a =0.5 W I_k =5.5 mA C_{ag1}=0.01 pF	
		Typical				
DF96 Remote cut-off pentode	1.4 0.025	V_b =85 V V_{g1}= 0 V R_{g2}=39 kΩ	I_a =1.65 mA I_{g2}=0.55 mA S =0.85 mA/V	R_i = 1 MΩ μ_{g2g1}=14 $R_{eq.}$ =14 kΩ	W_a =0.25 W I_k =2.2 mA C_{ag1}=0.01 pF	
		Typical				
DF97 Remote cut-off pentode	1.4 0.025	V_b =85 V V_{g1}= 0 V V_{g3}= 0 V	R_{g2}=33 kΩ I_a =1.7 mA I_{g2} =0.7 mA	S =0.94 mA/V R_i =0.45 MΩ μ_{g2g1}=20	W_a=0.25 W I_k =2.5 mA	

Type and application	V_f (*V*) I_f (*A*)	*Characteristic data*			*Limiting values*	*Base connections*
DK40 Octode	1.4 0.05	*Operating* $V_a = V_b = 67.5$ V $V_{g2} = 67.5$ V $V_{g4} = 0$ V $V_{g5} = 67.5$ V	$R_{g1+g3} = 35$ kΩ $V_{osc} = 8\ V_{rms}$ $I_a = 1$ mA $I_{g2} = 2.6$ mA	$I_{g5} = 0.25$ mA $S_c = 0.43$ mA/V $R_i = 0.9$ MΩ $R_{eq.} = 67$ kΩ	$W_a = 0.2$ W $W_{g2} = 0.2$ W $W_{g5} = 0.02$ W $I_k = 5$ mA	
DK92 Heptode	1.4 0.05	*Operating* $V_b = 85$ V $V_{g4} = 60$ V $V_{g3} = 0$ V $V_{g2} = 30$ V $V_{osc} = 4\ V_{rms}$	$R_{g1} = 27$ kΩ $I_a = 0.65$ mA $I_{g1} = 0.13$ mA $I_{g2} = 1.65$ mA	$I_{g4} = 0.14$ mA $S_c = 0.32$ mA/V $R_i = 1$ MΩ $R_{eq.} = 0.1$ MΩ	$W_a = 0.2$ W $W_{g2} = 0.2$ W $W_{g4} = 0.1$ W $I_k = 4$ mA	
DK96 Heptode	1.4 0.025	*Operating* $V_a = V_b = 85$ V $V_{g3} = 0$ V $V_{osc} = 4\ V_{rms}$ $R_{g1} = 27$ kΩ $R_{g2} = 33$ kΩ	$R_{g4} = 0.12$ MΩ $I_a = 0.6$ mA $I_{g1} = 85\ \mu$A $I_{g2} = 1.5$ mA	$I_{g4} = 0.14$ mA $S_c = 0.3$ mA/V $R_i = 0.8$ MΩ $R_{eq.} = 0.1$ MΩ	$W_a = 0.15$ W $W_{g2} = 0.1$ W $W_{g4} = 0.03$ W $I_k = 2.6$ mA	
DL41 Output pentode	1.4 0.1 pins: 1-(7+8)	*Operating class A* $V_a = 90$ V $V_{g2} = 90$ V $V_{g1} = -3.6$ V $V_i = 3.1\ V_{rms}$	$R_a = 11.3$ kΩ $I_a = 8$ mA $I_{g2} = 1.3$ mA $S = 2.45$ mA/V	$R_i = 90$ kΩ $\mu_{g2g1} = 10$ $W_o = 0.33$ W $d_{tot} = 10\%$	$W_a = 1.2$ W $W_{g2} = 0.6$ W $I_k = 12$ mA	

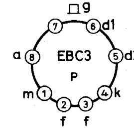
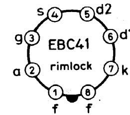
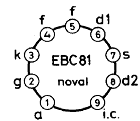
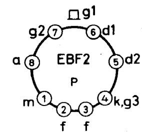
DL92 Output pentode	1.4 0.1 Pins: 5-(1+7)	*Operating class A* $V_a = V_b = 84$ V $V_{g1} = -6.5$ V $V_i = 5.1\ V_{rms}$ $R_{g2} = 10$ kΩ	$R_a = 7$ kΩ $I_a = 8$ mA $I_{g2} = 1.7$ mA $S = 1.55$ mA/V	$R_i = 0.1$ MΩ $\mu_{g2g1} = 4.5$ $W_o = 0.19$ W $d_{tot} = 13\,\%$	$W_a = 0.7$ W $W_{g2} = 0.15$ W $I_k = 11$ mA	
DL94 Output pentode	1.4 0.1 Pins: 5-(1+7)	*Operating class A* $V_a = 86$ V $V_{g2} = 86$ V $V_{g1} = -4.5$ V $V_i = 4\ V_{rms}$	$I_a = 8$ mA $I_{g2} = 1.8$ mA $S = 2$ mA/V $R_i = 110$ kΩ	$\mu_{g2g1} = 7.3$ $R_a = 8$ kΩ $W_o = 0.28$ W $d_{tot} = 10\,\%$	$W_a = 1.2$ W $W_{g2} = 0.45$ W $I_k = 12$ mA	
DL96 Output pentode	1.4 0.05 Pins: 5-(1+7)	*Operating class A* $V_a = 85$ V $V_{g2} = 85$ V $V_{g1} = -5.2$ V $V_i = 3.5\ V_{rms}$	$I_a = 5$ mA $I_{g2} = 0.9$ mA $S = 1.4$ mA/V $R_i = 150$ kΩ	$\mu_{g2g1} = 7$ $R_a = 13$ kΩ $W_o = 0.2$ W $d_{tot} = 10\,\%$	$W_a = 0.6$ W $W_{g2} = 0.2$ W $I_k = 6$ mA	
DM70 Tuning indicator	1.4 0.025 (Pin 5 pos.)	*Operating* $V_a = 85$ V $V_g = 0$ V	$I_a = 0.17$ mA	$V_g = -10$ V (for complete extinction)	$W_a = 75$ mW $I_k = 0.6$ mA $V_a =$ min. 45 V	

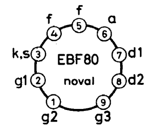
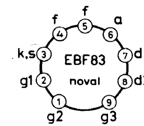
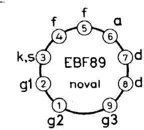
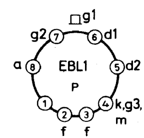
Type and application	V_f (*V*) I_f (*A*)	*Characteristic data*			*Limiting values*	*Base connections*
DM71 = DM70 with short leads						
		Typical and Limiting				
DY51 E.H.T. Single anode rectifier	1.4 0.55	V_a = 100 V I_a = 13 mA C_a = 0.8 pF	$-V_{ap}$ = ⩽15 kV I_a = ⩽0.35 mA	I_{ap} = ⩽40 mA [1]) C_{filt} = ⩽2000 pF	V_f = <1.6 V V_f = >1.3 V	
		Operating and Limiting				
DY86-DY87 E.H.T. Single anode rectifier	1.4 0.55	V_o = 18 kV I_o = 0.15 mA	R_i (at I_a = 1 mA) 20 kΩ	$V_{a\,inv.}$ = ⩽18 kV [2]) I_o = <0.5 mA [3])	I_{ap} = <40 mA [1]) C_{filt} = <2000 pF	
		Operating and Limiting				
DY802 E.H.T. Single anode rectifier	1.4 0.6	V_o = 20 kV I_o = 0.2 mA	$V_{a\,inv.}$ = ⩽20 kV [2]) $V_{a\,inv.p}$ = ⩽25 kV [4])	I_o = ⩽0.5 mA [3])	I_{op} = <50 mA C_{filt} = <3000 pF	
		Operating and Limiting				
EAA91 Double diode	6.3 0.3	V_{tr} = 150 V_{rms} I_o = 9 mA	R_t = ⩾300 Ω C_{filt} = ⩽ 8 μF	$V_{+k/-f}$ = 330 V $V_{-k/+f}$ = 150 V	$-V_{dp}$ = 420 V I_{dp} = 54 mA	

EABC80 Triple diode triode	6.3 0.48	*Operating (triode)* V_b = 170 V R_a = 0.1 MΩ $R_{g'}$ = 0.33 MΩ I_a = 0.82 mA V_o/V_i = 42	V_b = 200 V R_a = 0.1 MΩ $R_{g'}$ = 0.33 MΩ I_a = 1 mA V_o/V_i = 44	V_b = 250 V R_a = 0.1 MΩ $R_{g'}$ = 0.33 MΩ I_a = 0.76 mA V_o/V_i = 47	W_a = 1 W I_k = 5 mA V_{kf} = 150 V	
		Typical (diodes) R_{iD1} (at V_{d1} = +10 V) = 5 kΩ	R_{iD2} (at V_{d2} = +5 V) = 200 Ω	R_{iD3} (at V_{d3} = +5 V) = 200 Ω	$V_{d\,inv.p}$ = 350 V I_{d1} = 1 mA I_{d2}, I_{d3} = 10 mA	
EAF41 Diode- Remote cut-off pentode	6.3 0.2	*Typical (pentode)* $V_a = V_b$ = 250 V V_{g1} = −2 V R_{g2} = 95 kΩ	I_a = 5 mA I_{g2} = 1.6 mA S = 1.8 mA/V	R_i = 1.2 MΩ μ_{g2g1} = 19 $R_{eq.}$ = 9 kΩ	W_a = 2 W I_k = 10 mA V_{kf} = 50 V	
EAF42 Diode- Remote cut-off pentode	6.3 0.2	*Typical (pentode)* $V_a = V_b$ = 250 V V_{g1} = −2 V V_{g3} = 0 V R_{g2} = 110 kΩ	I_a = 5 mA I_{g2} = 1.5 mA S = 2 mA/V	R_i = 1.4 MΩ μ_{g2g1} = 16 $R_{eq.}$ = 7.5 kΩ	W_a = 2 W I_k = 10 mA V_{kf} = 100 V	
EB41 Double diode	6.3 0.3	*Operating and Limiting* V_{tr} = 150 V_{rms} I_o = 9 mA	R_t = ⩾300 Ω C_{filt} = 8 μF	V_{kf} = 150 V	$-V_{dp}$ = 420 V I_{dp} = 54 mA	

[1]) Max. duration is 10% of a line scanning cycle, but max. 10 μs. [2]) D.C. component. [3]) During short periods as in T.V. operation I_o = <0.8 mA. [4]) Max. duration 22% of a line scanning cycle and max. 18 μs.

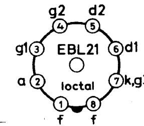
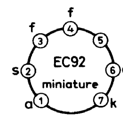
RECEIVING AND AMPLIFYING TUBES

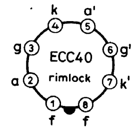
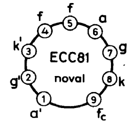
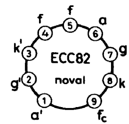
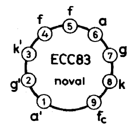
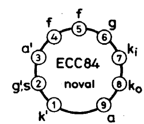
Type and application	V_f *(V)* I_f *(A)*	*Characteristic data*			*Limiting values*	*Base connections*
EBC3 Double diode triode	6.3 0.2	*Typical (triode)* $V_a = 200$ V $V_g = -4.3$ V	$I_a = 4$ mA $S = 2$ mA/V	$R_i = 15$ kΩ $\mu = 30$	$W_a = 1.5$ W $I_k = 10$ mA $V_{kf} = 75$ V	
EBC41 Double diode triode	6.3 0.23	*Typical (triode)* $V_a = 250$ V $V_g = -3$ V	$I_a = 1$ mA $S = 1.2$ mA/V	$R_i = 58$ kΩ $\mu = 70$ $R_{eq.} = < 150$ kΩ	$W_a = 0.5$ W $I_k = 5$ mA $V_{kf} = 100$ V	
EBC81 Double diode triode	6.3 0.23	*Typical (triode)* $V_a = 250$ V $V_g = -3$ V *Operating (triode)* $V_b = 250$ V $R_a = 22$ kΩ $R_k = 1.8$ kΩ	$I_a = 1$ mA $S = 1.2$ mA/V $R_g = 1$ MΩ $R_{g'} = 0.68$ MΩ	$R_i = 58$ kΩ $\mu = 70$ $R_{eq.} = \leqslant 150$ kΩ $I_a = 0.7$ mA $V_o/V_i = 51$	$W_a = 0.5$ W $I_k = 5$ mA $V_{kf} = 100$ V	
EBF2 Double diode Remote cut-off pentode	6.3 0.2	*Typical (pentode)* $V_a = V_b = 250$ V $V_{g1} = -2$ V $R_{g2} = 95$ kΩ	$I_a = 5$ mA $I_{g2} = 1.6$ mA	$S = 1.8$ mA/V $R_i = 1.3$ MΩ	$W_a = 1.5$ W $I_k = 10$ mA $V_{kf} = 100$ V	

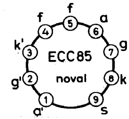
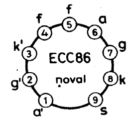
EBF80 Double diode Remote cut-off pentode	6.3 0.3	*Typical (pentode)* $V_a = V_b = 250$ V $V_{g1} = -2$ V $V_{g3} = 0$ V $R_{g2} = 95$ kΩ	 $I_a = 5$ mA $I_{g2} = 1.75$ mA $S = 2.2$ mA/V	 $R_i = 1.4$ MΩ $\mu_{g2g1} = 18$ $R_{eq.} = 6.8$ kΩ	 $W_a = 1.5$ W $I_k = 10$ mA $V_{kf} = 100$ V	
		Operating (pentode) $V_b = 250$ V $R_a = 0.22$ MΩ $R_{g2} = 0.82$ MΩ	 $R_{g1} = 1$ MΩ $R_{g1'} = 0.68$ MΩ $R_k = 1.8$ kΩ	 $I_a = 0.75$ mA $I_{g2} = 0.3$ mA $V_o/V_i = 110$		
EBF83 Double diode Remote cut-off pentode	6.3 0.3	*Typical (pentode)* $V_a = 12.6$ V $V_{g2} = 12.6$ V $V_{g3} = 0$ V	 $V_{g1} =$ [1]) V $I_a = 0.45$ mA $I_{g2} = 0.14$ mA	 $S = 1$ mA/V $R_i = 1$ MΩ $C_{ag1} = < 2.5$ mpF	 $I_k = 5$ mA $V_{kf} = 50$ V	
EBF89 Double diode Remote cut-off pentode	6.3 0.3	*Typical (pentode)* $V_a = 250$ V $V_{g2} = 100$ V $V_{g3} = 0$ V	 $V_{g1} = -2$ V $I_a = 9$ mA $I_{g2} = 2.7$ mA	 $S = 3.8$ mA/V $R_i = 1$ MΩ $\mu_{g2g1} = 20$	 $W_a = 2.25$ W $I_k = 16.5$ mA $V_{kf} = 100$ V	
EBL1 Double diode Output pentode	6.3 1.18	*Operating class A (pentode)* $V_a = 250$ V $V_{g2} = 250$ V $V_{g1} = -6$ V $V_i = 4.2\ V_{rms}$	 $I_a = 36$ mA $I_{g2} = 4$ mA $S = 9$ mA/V $R_i = 50$ kΩ	 $\mu_{g2g1} = 23$ $R_a = 7$ kΩ $W_o = 4.5$ W $d_{tot} = 10\%$	 $W_a = 9$ W $I_k = 55$ mA $V_{kf} = 50$ V	

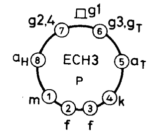
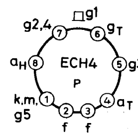
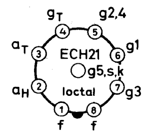
[1]) Obtained by grid current biasing, $R_{g1} = 2.2$ MΩ.

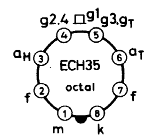
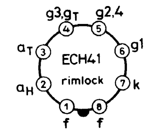
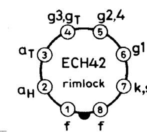
RECEIVING AND AMPLIFYING TUBES

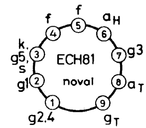
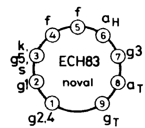
Type and application	V_f *(V)* I_f *(A)*	*Characteristic data*			*Limiting values*	*Base connections*
		Operating class A (pentode)				
EBL21 Double diode Output pentode	6.3 0.8	V_a =250 V V_{g2}=250 V V_{g1}= −6 V V_i =4.2 V_{rms}	I_a =36 mA I_{g2} =4.5 mA S =9 mA/V R_i =50 kΩ	μ_{g2g1}=23 R_a =7 kΩ W_o =4.5 W d_{tot} =10%	W_a =11 W I_k =60 mA V_{kf}=50 V	
EC86	6.3 0.2	For further data see PC86			$V_{+k/-f}$=100 V $V_{-k/+f}$= 50 V	
EC88	6.3 0.165	For further data see PC88				
		Typical				
EC92 R.F. triode	6.3 0.15	V_a=250 V V_g= −2 V	I_a=10 mA S =5.5 mA/V	R_i=11 kΩ μ =60	W_a =2.5 W I_k =15 mA V_{kf}=100 V	
		V_a=100 V V_g= −1 V	I_a= 3 mA S =3.8 mA/V	R_i=16.5 kΩ μ = 62		
EC97	6.3 0.215	For further data see PC97				
EC900	6.3 0.18	For further data see PC900				

		Operating				
ECC40	6.3	$V_b = 250$ V	$R_{g'} = 0.33$ MΩ	$V_a \;= 44\ V_{rms}$	$W_a = 1.5$ W	
A.F. double-triode	0.6	$R_a = 0.1$ MΩ	$R_k = 2.2$ kΩ	$V_o/V_i = 24$	$I_k \;= 10$ mA	
		$R_g = 1$ MΩ	$I_a \;= 1.4$ mA	$d_{tot} \;= 3.7\,\%$	$V_{kf} = 100$ V	
		Typical				
ECC81	6.3	$V_a = 250$ V	$I_a = 10$ mA	$R_i = 11$ kΩ	$W_a = 2.5$ W	
R.F. double-triode	0.3	$V_g = -2$ V	$S = 5.5$ mA/V	$\mu \;= 60$	$I_k \;= 15$ mA	
	or				$V_{kf} = 90$ V	
	12.6	$V_a = 100$ V	$I_a = 3$ mA	$R_i = 16.5$ kΩ		
	0.15	$V_g = -1$ V	$S = 3.8$ mA/V	$\mu \;= 6.2$		
		Typical				
ECC82	6.3	$V_a = 250$ V	$I_a = 10.5$ mA	$R_i = 7.7$ kΩ	$W_a = 2.75$ W	
A.F. double triode	0.3	$V_g = -8.5$ V	$S = 2.2$ mA/V	$\mu \;= 17$	$I_k \;= 20$ mA	
	or	*Operating*			$V_{kf} = 180$ V	
	12.6	$V_b = 250$ V	$R_{g'} = 0.33$ MΩ	$V_o \;= 32\ V_{rms}$		
	0.15	$R_a = 0.1$ MΩ	$R_k = 2.2$ kΩ	$V_o/V_i = 14$		
		$R_g = 1$ MΩ	$I_a \;= 1.63$ mA	$d_{tot} \;= 5.9\,\%$		
		Typical				
ECC83	6.3	$V_a = 250$ V	$I_a = 1.2$ mA	$R_i = 62.5$ kΩ	$W_a = 1$ W	
A.F. double-triode	0.3	$V_g = -2$ V	$S = 1.6$ mA/V	$\mu \;= 100$	$I_k \;= 8$ mA	
	or	*Operating*			$V_{kf} = 180$ V	
	12.6	$V_b = 250$ V	$R_{g'} = 0.33$ MΩ	$V_a \;= 26\ V_{rms}$		
	0.15	$R_a = 0.1$ MΩ	$R_k = 1.5$ kΩ	$V_o/V_i = 54.5$		
		$R_g = 1$ MΩ	$I_a \;= 0.86$ mA	$d_{tot} \;= 3.9\,\%$		
		Typical				
ECC84	6.3	$V_a = 90$ V	$I_a = 12$ mA	$R_i = \ 4$ kΩ	$W_a = \ 2$ W	
Double-triode	0.33	$V_g = -1.5$ V	$S = \ 6$ mA/V	$\mu \;= 24$	$I_k \;= \ 22$ mA	
					$V_{kf} = 100$ V	

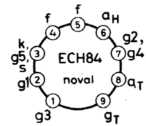
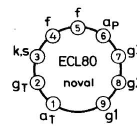
Type and application	V_f (V) I_f (A)	Characteristic data			Limiting values	Base connections
ECC85 R.F. double-triode	6.3 0.435	*Typical* $V_a = 250$ V $V_g = -2.7$ V	$I_a = 10$ mA $S = 6.1$ mA/V	$R_i = 9$ kΩ $\mu = 55$	$W_a = 2.5$ W $I_k = 15$ mA $V_{kf} = 90$ V	
ECC86 Double-triode	6.3 0.33	*Typical* $V_a = 6.3$ V $V_g = -0.4$ V	$I_a = 0.9$ mA $S = 2.6$ mA/V	$R_i = 5.4$ kΩ $\mu = 14$	$W_a = 0.6$ W $I_k = 20$ mA $V_{kf} = 30$ V	
ECC88	6.3 0.365	For further data see PCC88				
ECC189	6.3 0.365	For further data see PCC189			$V_{kf} = 50$ V	
ECF80	6.3 0.43	For further data see PCF80			$V_{kf} = 100$ V	
ECF86	6.3 0.39	For further data see PCF86			$V_{kf} = 100$ V	
ECF200	6.3 0.41	For further data see PCF200				
ECF201	6.3 0.41	For further data see PCF201				
ECF801	6.3 0.41	For further data see PCF801				

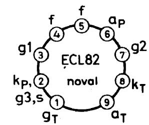
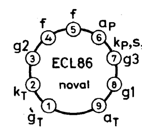
ECF802	6.3 0.43	For further data see PCF802			$V_{kf}=100$ V	
ECH3 Triode- hexode	6.3 0.2	*Frequency changer (hexode)* $V_a=V_b=250$ V $R_1=25$ kΩ $R_2=33$ kΩ $R_{gT+g3}=50$ kΩ	 $V_{g1}=-2$ V $I_a=3$ mA $I_{g2+g4}=3$ mA	 $I_{gT+g3}=0.2$ mA $S_c=0.65$ mA/V $R_i=1.3$ MΩ	 $W_a=1.2$ W $I_k=15$ mA $V_{kf}=100$ V	
		Oscillator (triode) $V_b=250$ V $V_{osc}=8$ V_{rms}	 $R_a=45$ kΩ $R_{gT+g3}=50$ kΩ	 $I_{gT+g3}=0.2$ mA $I_a=3.3$ mA	 $W_a=1.5$ W	
ECH4 Triode- heptode	6.3 0.35	*Frequency changer (heptode)* $V_a=V_b=250$ V $R_{g2+g4}=24$ kΩ $R_{g3+gT}=50$ kΩ $V_{g1}=-2$ V	 $I_a=3$ mA $I_{g2+g4}=6.2$ mA $I_{g3+gT}=0.19$ mA	 $S_c=0.75$ mA/V $R_i=1.4$ MΩ $R_{eq.}=55$ kΩ	 $W_a=1.5$ W $I_k=15$ mA $V_{kf}=50$ V	
		Oscillator (triode) $V_b=250$ V $R_a=20$ kΩ	 $R_{gT+g3}=50$ kΩ $I_{gT+g3}=0.19$ mA	 $I_a=4.5$ mA $S_{eff}=0.55$ mA/V	 $W_a=0.8$ W	
ECH21 Triode- heptode	6.3 0.33	*Frequency changer (heptode)* $V_a=V_b=250$ V $R_{g2+g4}=24$ kΩ $R_{gT+g3}=50$ kΩ $V_{g1}=-2$ V	 $I_a=3$ mA $I_{g2+g4}=6.2$ mA $I_{gT+g3}=0.19$ mA	 $S_c=0.75$ mA/V $R_i=1.4$ MΩ $R_{eq.}=55$ kΩ	 $W_a=1.5$ W $I_k=15$ mA $V_{kf}=50$ V	
		Oscillator (triode) $V_b=250$ V $R_a=20$ kΩ	 $R_{gT+g3}=50$ kΩ $I_{gT+g3}=0.19$ mA	 $I_a=4.5$ mA $S_{eff}=0.55$ mA/V	 $W_a=0.8$ W	

Type and application	V_f *(V)* I_f *(A)*	*Characteristic data*			*Limiting values*	*Base connections*
ECH35 Triode- hexode	6.3 0.2	*Frequency changer (hexode)* $V_a = V_b = 250$ V $R_1 = 24$ kΩ $R_2 = 33$ kΩ $R_{gT+g3} = 50$ kΩ	 $V_{g1} = -2$ V $I_a = 3$ mA $I_{g2+g4} = 3$ mA	 $I_{gT+g3} = 0.2$ mA $S_c = 0.65$ mA/V $R_i = 1.3$ MΩ	 $W_a = 1.2$ W $I_k = 15$ mA $V_{kf} = 100$ V	
		Oscillator (triode) $V_b = 250$ V $R_a = 45$ kΩ	 $R_{gT+g3} = 50$ kΩ $I_{gT+g3} = 0.2$ mA	 $I_a = 3.3$ mA $V_{osc} = 8\ V_{rms}$	 $W_a = 1.5$ W	
ECH41 Triode hexode	6.3 0.225	*Frequency changer (hexode)* $V_a = V_b = 250$ V $R_1 = 33$ kΩ $R_2 = 47$ kΩ $R_{gT+g3} = 20$ kΩ	 $V_{g1} = -2$ V $I_a = 3$ mA $I_{g2+g4} = 2.2$ mA $I_{gT+g3} = 0.35$ mA	 $S_c = 0.5$ mA/V $R_i = 2$ MΩ $R_{eq.} = 170$ kΩ	 $W_a = 0.8$ W $I_k = 7$ mA $V_{kf} = 100$ V	
		Oscillator (triode) $V_b = 250$ V $R_a = 30$ kΩ $I_a = 4.9$ mA	 $R_{gT+g3} = 20$ kΩ $I_{gT+g3} = 0.35$ mA	 $V_{osc} = 8\ V_{rms}$ $S_{eff} = 0.55$ mA/V	 $W_a = 0.9$ W $I_k = 5.5$ mA	
ECH42 Triode- hexode	6.3 0.23	*Frequency changer (hexode)* $V_a = V_b = 250$ V $R_1 = 27$ kΩ $R_2 = 27$ kΩ $R_{gT+g3} = 22$ kΩ	 $V_{g1} = -2$ V $I_a = 3$ mA $I_{g2+g4} = 3$ mA $I_{gT+g3} = 0.35$ mA	 $S_c = 0.75$ mA/V $R_i = \geqslant 1$ MΩ $R_{eq.} = 0.1$ MΩ	 $W_a = 1.5$ W $I_k = 10$ mA $V_{kf} = 100$ V	

		Oscillator (triode)				
		V_b =250 V	I_{gT+g3} =0.35 mA	V_{osc} =8 V_{rms}	W_a =0.8 W	
		R_a =33 kΩ	I_a =5.1 mA	S_{eff} =0.6 mA/V	I_k = 6 mA	
		R_{gT+g3} = 22 kΩ				
		Frequency changer (heptode)				
ECH81	6.3	V_b =250 V	I_a =3.3 mA	S_c =1.1 mA/V	W_a = 2 W	
Triode-	0.3	R_a =8.2 kΩ	I_{g2+g4} =7.8 mA	R_i =0.8 MΩ	I_k =18 mA	
heptode		R_{g2+g4} =22 kΩ	I_{gT+g3} =0.2 mA	$R_{eq.}$ =30 kΩ	V_{kf} =100 V	
		R_{gT+g3} =47 kΩ	I_{g1} =0.5 μA [1]			
		Operating (heptode)				
		V_b =250 V	I_a =11 mA	R_i =0.24 MΩ		
		R_a =8.2 kΩ	I_{g2+g4} =7 mA	μ_{g2g1} =25		
		R_{g2+g4} =22 kΩ	I_{g1} =0.5 μA [1]	$R_{eq.}$ =4.5 kΩ		
		V_{g3} =0 V	S =4.5 mA/V			
		Oscillator (triode)				
		V_b =250 V	R_{gT+g3} =47 kΩ	I_a =4.5 mA	W_a =0.8 W	
		R_a = 33 kΩ	I_{gT+g3} =0.2 mA	S_{eff} =0.65 mA/V	I_k =6.5 mA	
		Frequency changer (heptode)				
ECH83	6.3	V_a =12.6 V	R_{g3} = 47 kΩ	I_{g3} = 18 μA	I_k = 5 mA	
Triode-	0.3	V_{g2+g4} =12.6	I_a =0.17 mA	S_c = 0.22 mA/V	V_{kf} =150 V	
heptode		V_{g1} = [2]) V	I_{g2+g4} = 0.3 mA	R_i = 1.5 MΩ		
		V_{osc} =1.7 V_{rms}				

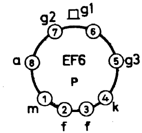
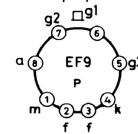
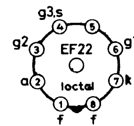
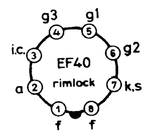
[1]) Grid current bias obtained with R_{g1} =1 MΩ and with zero Volts a.g.c. voltage; resulting grid one voltage: −0.5 V
[2]) Obtained by grid current biasing; R_{g1} =1 MΩ.

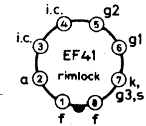
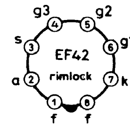
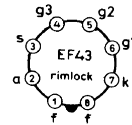
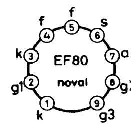
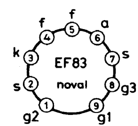
Type and application	V_f (V) I_f (A)	Characteristic data			Limiting values	Base connections
		Operating (heptode)				
ECH83 *(continued)*		$V_a = 12.6$ V $V_{g2+g3+g4} = 12.6$ V $V_{g1} =$ [1]) V	$I_a = 0.4$ mA $I_{g2+g3+g4} = 0.25$ mA $S = 0.75$ mA/V	$R_i = 0.85$ MΩ $R_{eq.} = 6.5$ kΩ		
		Typical (triode)				
		$V_a = 12.6$ V $V_{g1} =$ [2]) V	$I_a = 0.75$ mA $S = 1.4$ mA/V	$R_i = 13$ kΩ $\mu = 18.3$	$W_a = 0.8$ W $I_k = 6.5$ mA	
		Typical (heptode)				
ECH84 Triode- heptode	6.3 0.3	$V_a = 135$ V $V_{g3} = 0$ V $V_{g2+g4} = 14$ V	$V_{g1} = 0$ V $I_a = 1.7$ mA	$I_{g2+g4} = 0.9$ mA $S = 2.2$ mA/V	$W_a = 1.7$ W $I_k = 12.5$ mA $V_{kf} = 100$ V	
		Typical (triode)				
		$V_a = 50$ V $V_g = 0$ V	$I_a = 3$ mA $S = 3.7$ mA/V	$R_i = 13.5$ kΩ $\mu = 50$	$W_a = 1.3$ W $I_k = 10$ mA	
ECH200	6.3 0.435	For further data see PCH200			$V_{kf} = 100$ V	
		Operating class A (pentode)				
ECL80 Triode- output pentode	6.3 0.3	$V_a = 200$ V $V_{g2} = 200$ V $V_{g3} = 0$ V $V_{g1} = -8$ V	$I_a = 17.5$ mA $I_{g2} = 3.3$ mA $S = 3.3$ mA/V $R_i = 0.15$ MΩ	$\mu_{g2g1} = 14$ $R_{a\sim} = 11$ kΩ $W_o = 1.75$ W $V_i = 5.1\ V_{rms}$	$W_a = 3.5$ W $I_k = 25$ mA $V_{kf} = 150$ V	

		Operating (triode) V_b =200 V R_a = 0.1 MΩ R_g =0.33 MΩ	 I_a =1.2 mA V_o =29 V_{rms}	 V_o/V_i =10 d_{tot} =8 %	 W_a =1 W I_k =8 mA	
ECL82 Triode- output pentode	6.3 0.78	*Operating class A (pentode)* $V_{ba}=V_{bg2}$ =272 V R_{g2} = 2.2 kΩ R_k =650 Ω $R_{a\sim}$ = 8 kΩ *Operating (triode)* V_b =200 V R_a =0.22 MΩ R_g = 3 MΩ $R_{g'}$ =0.68 MΩ	 I_a =28 mA I_{g2} =6.5 mA at V_i=0 V I_a =27 mA R_k = 2.2 kΩ R_s =0.22 MΩ I_a =0.52 mA	 I_{g2} =10.8 mA at V_i=9.5 V_{rms} W_o =3.5 W d_{tot} =10 % V_o =26 V_{rms} V_o/V_i =51 d_{tot} =1.6 %	 W_a = 5 W I_k = 50 mA V_{kf} =150 V W_a = 1 W I_k = 15 mA V_{kf} =100 V	
ECL84	6.3 0.72	For further data see PCL84			V_{kf} =200 V	
ECL85 **ECL805**	6.3 0.875	For further data see PCL85			V_{kf} =100 V	
ECL86 Triode- output pentode	6.3 0.66	*Operating class A (pentode)* V_a =250 V V_{g2} =250 V R_k =170 V $R_{a\sim}$ =7 kΩ *Operating (triode)* V_b =250 V R_g =0.22 MΩ $R_{g'}$ =0.68 MΩ	 I_a =36 mA I_{g2} = 6 mA at V_i=0 V I_a =37 mA R_k =1.75 kΩ I_a = 0.6 mA	 I_{g2} =10.2 mA at V_i=3.2 V_{rms} W_o =4 W d_{tot} =10 % V_o =3.2 V_{rms} V_o/V_i =70 d_{tot} =0.4 %	 W_a = 9 W I_k = 55 mA V_{kf} =100 V W_a = 0.5 W I_k = 4 mA V_{kf} =100 V	

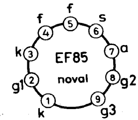
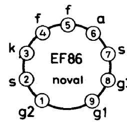
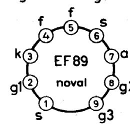
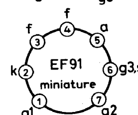
[1]) Obtained by grid current biasing; R_{g1} =1 MΩ. [2]) Obtained by grid current biasing; R_{g1} =47 kΩ.

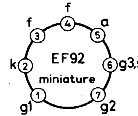
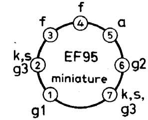
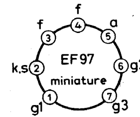
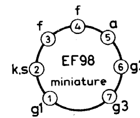
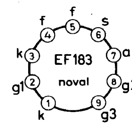
RECEIVING AND AMPLIFYING TUBES

Type and application	V_f (V) I_f (A)	Characteristic data			Limiting values	Base connections
ED500	6.3 0.35	For further data see PD500				
EF6 Sharp cut-off pentode	6.3 0.2	*Typical* V_a =250 V V_{g2}=100 V V_{g1}= −2 V	V_{g3}= 0 V I_a = 3 mA I_{g2} =0.8 mA	S =1.8 mA/V R_i =1.2 MΩ C_{ag1}= <3 mpF	W_a=1 W I_k =6 mA	
EF9 Remote cut-off pentode	6.3 0.2	*Typical* V_a=V_b=250 V R_{g2}= 90 kΩ V_{g3} = 0 V	V_{g1}= −2.5 V I_a =6 mA I_{g2} =1.7 mA	S =2.2 mA/V R_i =1.2 MΩ C_{ag1}= <2 mpF	W_a = 2 W I_k = 10 mA V_{kf}=100 V	
EF22 Remote cut-off pentode	6.3 0.2	*Typical* V_a=V_b=250 V R_{g2}= 90 kΩ V_{g3} = 0 V	V_{g1}= −2.5 V I_a =6 mA I_{g2} =1.7 mA	S =2.2 mA/V R_i =1.2 MΩ C_{ag1}= <2 mpF	W_a = 2 W I_k =10 mA V_{kf}=50 V	
EF40 A.F. pentode	6.3 0.2	*Operating* V_b =250 V R_a =0.1 MΩ R_{g2}=0.39 MΩ	R_{g1} =1 MΩ $R_{g1'}$=0.33 MΩ R_k =1 kΩ	I_k = 2 mA V_o/V_i=112	W_a = 1 W I_k = 6 mA V_{kf}=100 V	

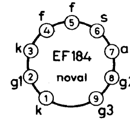
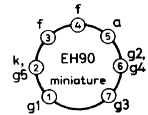
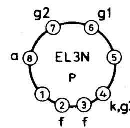
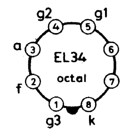
		Typical				
EF41 Remote cut-off pentode	6.3 0.2	$V_a = V_b = 250$ V $R_{g2} = 90$ kΩ $V_{g1} = -2.5$ V	$I_a = 6$ mA $I_{g2} = 1.7$ mA $S = 2.2$ mA/V	$R_i = 1.1$ MΩ $\mu_{g2g1} = 18$ $R_{eq.} = 6.5$ kΩ	$W_a = 2$ W $I_k = 10$ mA $V_{kf} = 100$ V	
		Typical				
EF42 Wide band sharp cut-off pentode	6.3 0.33	$V_a = 250$ V $V_{g2} = 250$ V $V_{g3} = 0$ V $V_{g1} = -2$ V	$I_a = 10$ mA $I_{g2} = 2.4$ mA $S = 9$ mA/V	$R_i = 0.5$ MΩ $\mu_{g2g1} = 83$ $R_{eq.} = 840$ Ω	$W_a = 3.5$ W $I_k = 25$ mA $V_{kf} = 100$ V	
		Typical				
EF43 Wide band remote cut-off pentode	6.3 0.33	$V_a = V_b = 250$ V $V_{g3} = 0$ V $V_{g1} = -2$ V	$R_{g2} = 33$ kΩ $I_a = 15$ mA $I_{g2} = 3.5$ mA	$S = 6.4$ mA/V $R_i = 0.5$ MΩ $R_{eq.} = 1.7$ kΩ	$W_a = 3.75$ W $I_k = 20$ mA $V_{kf} = 100$ V	
		Typical				
EF80 Sharp cut-off pentode	6.3 0.3	$V_a = 170$ V $V_{g2} = 170$ V $V_{g3} = 0$ V $V_{g1} = -2$ V	$I_a = 10$ mA $I_{g2} = 2.5$ mA $S = 7.4$ mA/V	$R_i = 0.5$ MΩ $\mu_{g2g1} = 50$ $R_{eq.} = 1$ kΩ	$W_a = 2.5$ W $I_k = 15$ mA $V_{kf} = 150$ V	
		Typical				
EF83 Remote cut-off pentode	6.3 0.2	$V_a = 250$ V $V_{g2} = 50$ V $V_{g3} = 0$ V	$V_{g1} = -1.6$ V $I_a = 4$ mA $I_{g2} = 1.15$ mA	$S = 1.6$ mA/V $R_i = 1.6$ MΩ $\mu_{g2g1} = 10$	$W_a = 1$ W $I_k = 6$ mA $V_{kf} = 100$ V	

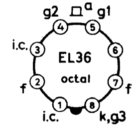
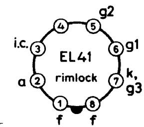
RECEIVING AND AMPLIFYING TUBES

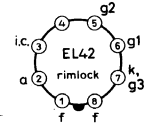
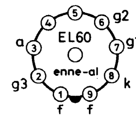
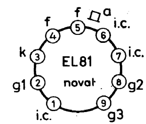
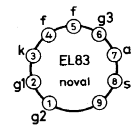
Type and application	V_f *(V)* I_f *(A)*	*Characteristic data*			*Limiting values*	*Base connections*
EF85 Remote cut-off wide band pentode	6.3 0.3	*Typical* $V_a = V_b = 250$ V $R_{g2} = 60$ kΩ $V_{g3} = 0$ V $V_{g1} = -2$ V	$I_a = 10$ mA $I_{g2} = 2.5$ mA $S = 6$ mA/V	$R_i = 0.6$ MΩ $\mu_{g2g1} = 26$ $R_{eq.} = 1.4$ kΩ	$W_a = 2.5$ W $I_k = 15$ mA $V_{kf} = 150$ V	
EF86 A.F. pentode	6.3 0.2	*Operating* $V_b = 250$ V $R_a = 0.1$ MΩ $R_{g2} = 0.39$ MΩ	$R_k = 1$ kΩ $R_{g1'} = 0.33$ MΩ $I_k = 2$ mA	$V_o = 50\ V_{rms}$ $V_o/V_i = 123$ $d_{tot} = 5\%$	$W_a = 1$ W $I_k = 6$ mA $V_{kf} = 100$ V	
EF89 Remote cut-off pentode	6.3 0.2	*Typical* $V_a = V_b = 250$ V $R_{g2} = 50$ kΩ $V_{g3} = 0$ V	$V_{g1} = -2$ V $I_a = 9$ mA $I_{g2} = 3$ mA	$S = 3.5$ mA/V $R_i = 0.9$ MΩ $R_{eq.} = 4.2$ kΩ	$W_a = 2.25$ W $I_k = 16.5$ mA $V_{kf} = 100$ V	
EF91 Sharp cut-off pentode	6.3 0.3	*Typical* $V_a = 250$ V $V_{g2} = 250$ V $V_{g3} = 0$ V $V_{g1} = -2$ V	$I_a = 10$ mA $I_{g2} = 2.55$ mA $S = 7.6$ mA/V	$R_i = 1$ MΩ $\mu_{g2g1} = 70$ $R_{eq.} = 1.2$ kΩ	$W_a = 2.5$ W $I_k = 15$ mA $V_{kf} = 150$ V	

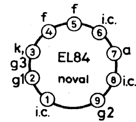
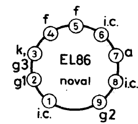
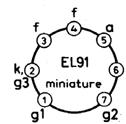
EF92 Remote cut-off	6.3 0.2	*Typical* $V_a = 250$ V $V_{g2} = 150$ V $V_{g3} = 0$ V	$V_{g1} = -0.65$ V $I_a = 8$ mA $I_{g2} = 2$ mA	$S = 2.5$ mA/V $\mu_{g2g1} = 30$	$W_a = 2.5$ W $I_k = 12$ mA $V_{kf} = 100$ V	
EF95 Sharp cut-off pentode	6.3 0.175	*Typical* $V_a = 180$ V $V_{g2} = 120$ V $R_k = 200\ \Omega$	$I_a = 7.7$ mA $I_{g2} = 2.4$ mA $S = 5.1$ mA/V	$R_i = 0.69\ \text{M}\Omega$ $R_{eq.} = 2\ \text{k}\Omega$	$W_a = 1.7$ W $I_k = 18$ mA $V_{kf} = 90$ V	
EF97 Remote cut-off pentode	6.3 0.3	*Typical* $V_a = 12.6$ V $V_{g2} = 6.3$ V $V_{g3} = 0$ V	$V_{g1} = -0.7$ V $I_a = 3.3$ mA $I_{g2} = 0.95$ mA	$S = 2.1$ mA/V $R_i = 50\ \text{k}\Omega$ $R_{eq.} = 5\ \text{k}\Omega$	$W_a = 0.5$ W $I_k = 15$ mA $V_{kf} = 50$ V	
EF98 Sharp cut-off pentode	6.3 0.3	*Typical* $V_a = 12.6$ V $V_{g2} = 6.3$ V $V_{g3} = 0$ V	$V_{g1} = -0.75$ V $I_a = 2$ mA $I_{g2} = 0.7$ mA	$S = 2$ mA/V $R_i = 0.2\ \text{M}\Omega$ $\mu_{g2g1} = 4.1$	$W_a = 0.5$ W $I_k = 15$ mA $V_{kf} = 50$ V	
EF183 Remote cut-off pentode	6.3 0.3	*Typical* $V_a = 200$ V $V_{g2} = 90$ V $V_{g3} = 0$ V	$V_{g1} = -2$ V $I_a = 12$ mA $I_{g2} = 4.5$ mA	$S = 12.5$ mA/V $R_i = 0.5\ \text{M}\Omega$ $R_{eq.} = 490\ \Omega$	$W_a = 2.5$ W $I_k = 20$ mA $V_{kf} = 150$ V	

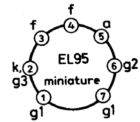
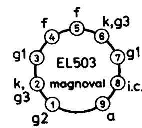
RECEIVING AND AMPLIFYING TUBES

Type and application	V_f (*V*) I_f (*A*)	*Characteristic data*			*Limiting values*	*Base connections*
EF184 Sharp cut-off pentode	6.3 0.3	*Typical* $V_a = 200$ V $V_{g2} = 200$ V $V_{g3} = 0$ V $V_{g1} = -2.5$ V	$I_a = 10$ mA $I_{g2} = 4.1$ mA $S = 15$ mA/V	$R_i = 380$ kΩ $\mu_{g2g1} = 60$ $R_{eq.} = 330$ Ω	$W_a = 2.5$ W $I_k = 25$ mA $V_{kf} = 150$ V	
EFL200	6.3 0.85	For further data see PFL200				
EH90 Dual controle heptode	6.3 0.3	*Operating* $V_a = 100$ V $V_{g2+g4} = 30$ V $V_{g1} = -1$ V	$V_{g3} = 0$ V $I_a = 0.75$ mA $I_{g2+g4} = 1.1$ mA	$S_{g1} = 1.1$ mA/V $R_i = 0.9$ MΩ	$W_a = 1$ W $I_k = 14$ mA $V_{+k/-f} = 200$ V $V_{-k/+f} = 100$ V	
EL3N Output pentode	6.3 0.9	*Operating class A* $V_a = 250$ V $V_{g2} = 250$ V $R_k = 150$ Ω $I_a = 36$ mA	$I_{g2} = 4$ mA $S = 9$ mA/V $R_i = 50$ kΩ $\mu_{g2g1} = 23$	$R_a = 7$ kΩ $W_o = 4.5$ W $V_i = 4.2$ V_{rms} $d_{tot} = 10\%$	$W_a = 9$ W $I_k = 55$ mA $V_{kf} = 100$ V	
EL34 A.F. output pentode	6.3 1.5	*Operating class A* $V_a = 250$ V $V_{g2} = 265$ V $V_{g1} = -13.5$ V $V_{g3} = 0$ V	$I_a = 100$ mA $I_{g2} = 15$ mA $S = 12.5$ mA/V $R_i = 17$ kΩ	$R_{a\sim} = 2$ kΩ $W_o = 11$ W $V_i = 8.7$ V_{rms} $d_{tot} = 10\%$	$W_a = 25$ W $I_k = 150$ mA $V_{kf} = 100$ V	

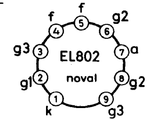
		Class AB V_b = 375 V $R_{aa\sim}$ = 3.4 kΩ R_k = 130 Ω R_{g2} = 470 Ω V_{g3} = 0 V	I_a = 2 × 75 mA I_{g2} = 2 × 11 mA at V_i = 0 V I_a = 2 × 95 mA	I_{g2} = 2 × 22 mA at V_i = 21 V_{rms} W_o = 35 W d_{tot} = 10 %		
EL36 Line and A.F. output pentode	6.3 1.25	*Typical* V_a = 100 V V_{g2} = 100 V V_{g1} = −8.2 V	I_a = 100 mA I_{g2} = 7 mA S = 14 mA/V	R_i = 5 kΩ μ_{g2g1} = 5.6	W_a = 12 W W_{g2} = 5 W I_k = 200 mA V_{kf} = 100 V	
		Operating class A V_a = 300 V V_{g2} = 150 V V_{g1} = −29 V $R_{aa\sim}$ = 3.5 kΩ	I_a = 2 × 18 mA I_{g2} = 2 × 0.5 mA at V_i = 0 V I_a = 2 × 100 mA	I_{g2} = 2 × 19 mA at V_i = 20 V_{rms} W_o = 44.5 W d_{tot} = 7.2 %		
EL41 A.F. output pentode	6.3 0.71	*Operating class A* V_a = 250 V V_{g2} = 250 V R_k = 170 Ω I_a = 36 mA	I_{g2} = 5.2 mA S = 10 mA/V R_i = 40 kΩ μ_{g2g1} = 22	$R_{a\sim}$ = 7 kΩ W_o = 3.9 W V_i = 3.8 V_{rms} d_{tot} = 10 %	W_a = 9 W I_k = 55 mA V_{kf} = 100 V	

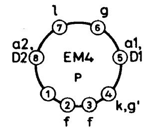
Type and application	V_f (V) I_f (A)	Characteristic data			Limiting values	Base connections
EL42 A.F. output pentode	6.3 0.2	*Operating class A* V_a =225 V V_{g2}=225 V R_k =360 Ω I_a = 26 mA	 I_{g2} =4.1 mA S =3.2 mA/V R_i =90 kΩ μ_{g2g1}=11	 $R_{a\sim}$= 9 kΩ W_o =2.8 W V_i =8 V_{rms} d_{tot} =12 %	W_a = 6 W I_k = 35 mA V_{kf}=100 V	
EL60=EL34 with different base						
EL81 Line time base and A.F. output pentode	6.3 1.05	*Typical* V_a =250 V V_{g2}=250 V V_{g3}= 0 V *Operating class B* V_a =200 V V_{bg2} =200 V R_{g2} =1 kΩ $R_{aa\sim}$=2.5 kΩ	 V_{g1}=−38.5 V I_a = 32 mA I_{g2} = 2.4 mA V_{g1}=−31.5 V I_a =2×25 mA I_{g2} =2×2 at V_i=0 V	 S =4.6 mA/V R_i =15 kΩ μ_{g2g1}=5.1 I_a =2×87 mA I_{g2} =2×12.5 mA at V_i=22.5 V_{rms} W_o =20 W d_{tot}=5.2 %	W_a = 8 W I_k =180 mA V_{kf}=100 V	
EL82	6.3 0.8	For further data see PL82			V_{kf}=100 V	
EL83 Video output pentode	6.3 0.71	*Typical* V_a =250 V V_{g2}=250 V V_{g3}= 0 V	 V_{g1}=−5.5 V I_a = 36 mA I_{g2} = 5 mA	 S =10 mA/V R_i =0.13 MΩ μ_{g2g1}=24	W_a = 9 W I_k = 70 mA V_{kf}=100 V	

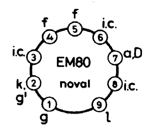
		Operating class A				
EL84	6.3	V_a = 250 V	I_{g2} = 5.5 mA	$R_{a\sim}$ = 5.2 kΩ	W_a = 12 W	
A.F. output	0.76	V_{g2} = 250 V	S = 11.3 mA/V	W_o = 5.7 W	I_k = 65 mA	
pentode		R_k = 135 Ω	R_i = 38 kΩ	V_i = 4.3 V_{rms}	V_{kf} = 100 V	
		I_a = 48 mA	μ_{g2g1} = 19	d_{tot} = 10 %		
		Class B				
		V_a = 300 V	I_a = 2 × 7.5 mA	I_{g2} = 2 × 11 mA		
		V_{g2} = 300 V	I_{g2} = 2 × 0.8 mA	at V_i = 10 V_{rms}		
		V_{g1} = −14.7 V	at V_i = 0 V	W_o = 17 W		
		$R_{aa\sim}$ = 8 kΩ	I_a = 2 × 46 mA	d_{tot} = 4 %		
		Operating class A				
EL86	6.3	V_b = 200 V	$R_{a\sim}$ = 2.5 kΩ	V_i = 7 V_{rms}	W_a = 12 W	
Frame and A.F.	0.76	R_{g2} = 470 Ω	I_a = 64 mA	W_o = 5.3 W	I_k = 100 mA	
output pentode		R_k = 215 Ω	I_{g2} = 11.4 mA	d_{tot} = 10 %	V_{kf} = 200 V	
		Class AB				
		V_{ba} = 250 V	I_a = 2 × 50 mA	I_{g2} = 2 × 13 mA		
		V_{bg2} = 200 V	I_{g2} = 2 × 2 mA	at V_i = 13 V_{rms}		
		R_k = 150 Ω	at V_i = 0 V	W_o = 18.5 W		
		$R_{aa\sim}$ = 5.5 kΩ	I_a = 2 × 55 mA	d_{tot} = 4.5 %		
		Operating class A				
EL91	6.3	V_a = 250 V	I_a = 16 mA	W_o = 1.4 W	W_a = 4 W	
A.F. output	0.2	V_{g2} = 250 V	I_{g2} = 2.4 mA	V_i = 5.3 V_{rms}	I_k = 25 mA	
pentode		R_k = 740 Ω	R_a = 16 kΩ	d_{tot} = 10 %	$V_{+k/-f}$ = 150 V	

Type and application	V_f *(V)* I_f *(A)*	*Characteristic data*			*Limiting values*	*Base connections*
EL95 A.F. output pentode	6.3 0.2	*Typical* V_a =250 V V_{g2}=250 V V_{g1}= −9 V	 I_a =24 mA I_{g2}=4.5 mA S =5 mA/V	 μ_{g2g1}=17 R_i =80 kΩ	W_a = 6 W I_k = 35 mA V_{kf}=100 V	
		Operating class A V_a =250 V V_{g2}=250 V R_k =320 Ω	 I_a =24 mA I_{g2} =4.5 mA $R_{a\sim}$=10 kΩ	 V_i =5 V_{rms} W_o =3 W d_{tot}=12 %		
EL500	6.3 1.38	For further data see PL500				
EL503 A.F. output pentode	6.3 1.2	*Typical* V_a =250 V V_{g2}=250 V V_{g1}= −13.2 V	 I_a =100 mA I_{g2}= 8.5 mA S = 23 mA/V	 μ_{g2g1}=13 R_i =7.3 kΩ	W_a = 27 W I_k =200 mA V_{kf}=100 V	
		Operating class AB V_{ba} =265 V V_{bg2} =265 V R_k = 56 Ω $R_{aa\sim}$= 2.4 kΩ	 I_a =2 × 100 mA I_{g2}=2 × 8.5 mA at V_i=0 V I_a =2 × 118 mA	 I_{g2} =2 × 32 mA at V_i=11.5 V_{rms} W_o =40 W d_{tot}=5 %		
EL504	6.3 1.38	For further data see PL504				

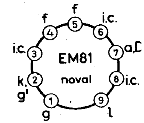
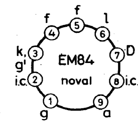
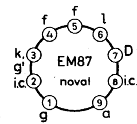
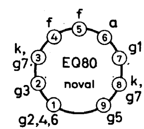
EL505	6.3 2.0	For further data see PL505			
EL508	6.3 0.825	For further data see PL508			$V_{kf}=100$ V
EL509	6.3 2.0	For further data see PL509			$V_{kf}=100$ V
EL802 Video Output pentode	6.3 0.8	*Typical* $V_a=170$ V $V_{g2}=170$ V $V_{g3}=0$ V	 $R_k=36\ \Omega$ $I_a=30$ mA $I_{g2}=6.5$ mA	 $S=40$ mA/V $\mu_{g2g1}=70$	 $W_a=6$ W $I_k=100$ mA $V_{kf}=200$ V
EM4 Tuning indicators	6.3 0.2	*Operating* (1) $V_b=V_l=250$ V $R_{a1}=1$ MΩ	 $V_g=0$ V $I_l=2$ mA $\alpha=90°$	 $V_g=-5$ V $I_l=2.5$ mA $\alpha=5°$	 $R_g=3$ MΩ $V_{kf}=100$ V
		Operating (2) $V_b=V_l=250$ V $R_{a2}=1$ MΩ	 $V_g=0$ V $I_l=2$ mA $\alpha=90°$	 $V_g=-16$ V $I_l=2.7$ mA $\alpha=5°$	
EM80 Tuning indicator	6.3 0.3	*Operating* $V_b=V_l=250$ V $R_a=0.5$ MΩ $R_g=3$ MΩ	 $V_{bg}=-1$ V $I_a=0.37$ mA $I_l=2$ mA $\beta=5°$	 $V_{bg}=-14$ V $I_a=0.01$ mA $I_l=2.3$ mA $\beta=50°$	 $W_a=0.2$ W $I_k=3$ mA $V_{kf}=100$ V

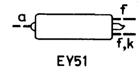
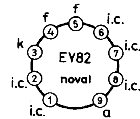
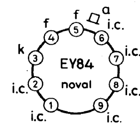


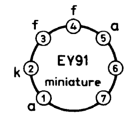
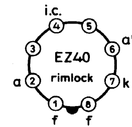
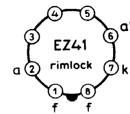
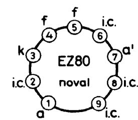


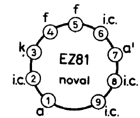
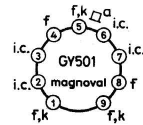
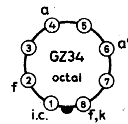
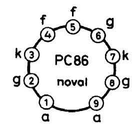


RECEIVING AND AMPLIFYING TUBES

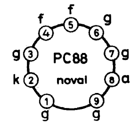
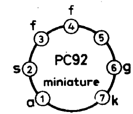
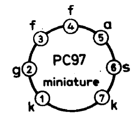
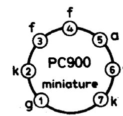
Type and application	V_f *(V)* I_f *(A)*	*Characteristic data*			*Limiting values*	*Base connections*
EM81 Tuning indicator	6.3 0.3	*Operating* $V_b = V_l = 250$ V $R_a = 0.5$ MΩ $R_g = 3$ MΩ	$V_{bg} = -1$ V $I_a = 0.37$ mA $I_l = 2$ mA $\alpha = 65°$	$V_{bg} = -10.5$ V $I_a = 0.02$ mA $I_l = 2.3$ mA $\alpha = 5°$	$W_a = 0.2$ W $I_k = 3$ mA $V_{kf} = 100$ V	
EM84 Tuning indicator	6.3 0.21	*Operating* $V_b = V_l = 250$ V $R_{a,D} = 470$ kΩ $R_g = 3$ MΩ	$V_{bg} = 0$ V $I_{a+D} = 0.45$ mA $I_l = 1$ mA $\alpha = 21$ mm	$V_{bg} = -22$ V $I_{a+D} = 0.06$ mA $I_l = 1.8$ mA $\alpha = 0$ mm	$W_a = 0.5$ W $I_k = 3$ mA $V_{kf} = 100$ V	
EM87 Tuning indicator	6.3 0.3	*Operating* $V_b = V_l = 250$ V $R_{a,D} = 100$ kΩ $R_g = 3$ MΩ	$V_{bg} = 0$ V $I_{a+D} = 2$ mA $I_l = 1$ mA $\alpha = 21$ mm	$V_{bg} = -15$ V $I_{a+D} = 0.2$ mA $I_l = 2$ mA $\alpha = -1.5$ mm	$W_a = 0.6$ W $I_k = 5$ mA $V_{kf} = 250$ V	
EQ80 Enneode F.M. detector	6.3 0.2	*Operating* $V_b = 250$ V $R_a = 0.47$ MΩ $R_1 = 34$ kΩ $R_3 = 3.9$ kΩ	$R_4 = 560$ Ω $I_q = 0.28$ mA $I_{g2} = 1.5$ mA	$I_{g3} = 0.09$ mA $I_{g5} = 0.03$ mA $R_1 = 5$ MΩ	$W_a = 0.1$ W $I_k = 3$ mA $V_{kf} = 100$ V	

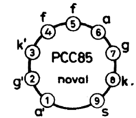
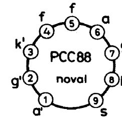
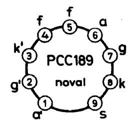
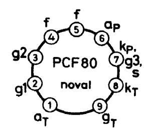
EY51 E.H.T. rectifier diode	6.3 0.09	*Operating and Limiting* $V_{tr} = \leqslant 5\ kV_{rms}$ $I_o = \leqslant 3$ mA $R_t = \geqslant 0.1$ MΩ $C_{filt} = \leqslant 0.1\ \mu F$ $f = 50$ Hz	 $V_{ainv.p} = <17$ kV $I_o = \leqslant 3$ mA $R_t = \geqslant 0.1$ MΩ $C_{filt} = \leqslant 0.01\ \mu F$ $f = 10–500$ KHz	 $V_{ainv.p} = <17$ kV $I_o = \leqslant 0.35$ mA $I_{op} = \leqslant 80$ mA $C_{filt} = \leqslant 5000$ pF		
EY81	6.3 0.81	For further data see PY81				
EY82 High-vacuum single anode	6.3 0.9	*Operating (two tubes)* $V_{tr} = 2 \times 250\ V_{rms}$ $V_o = 225$ V $I_o = 360$ mA $R_t = 2 \times 75\ \Omega$	 $V_{tr} = 280\ V_{rms}$ $V_o = 250$ V $I_o = 360$ mA $R_t = 2 \times 95\ \Omega$	 $V_{tr} = 2 \times 300\ V_{rms}$ $V_o = 268$ V $I_o = 360$ mA $R_t = 2 \times 110\ \Omega$	 $V_{a\,inv.p} = 850$ V $I_o = 360$ mA $I_{ap} = 1.1$ A $V_{kf\,p} = 450$ V $C_{filt} = 60\ \mu F$	
EY84 Single anode rectifier	6.3 1.0	*Operating (two tubes)* $V_{tr} = 2 \times 500\ V_{rms}$ $V_o = 500$ V $I_o = 300$ mA $R_t = 2 \times 150\ \Omega$	 $V_{tr} = 2 \times 625\ V_{rms}$ $V_o = 635$ V $I_o = 250$ mA $R_t = 2 \times 250\ \Omega$	 $C_{filt} = 16\ \mu F$ at $f = 50$ Hz $C_{filt} = 0.5\ \mu F$ at $f = 1600$ Hz	 $V_{a\,inv.p} = 2$ kV $I_o = 150$ mA $V_{kf\,p} = 500$ V	
EY86-EY87	6.3 0.09	For further data see DY86–DY87				
EY88	6.3 1.55	For further data see PY88				

Type and application	V_f (*V*) I_f (*A*)	*Characteristic data*			*Limiting values*	*Base connections*
EY91 Single anode rectifier	6.3 0.42	*Operating* V_{tr} = 200 V_{rms} I_o = 75 mA R_t = ⩾ 50 Ω C_{filt} = 16 μF	V_{tr} = 250 V_{rms} I_o = 75 mA R_t = ⩾30 Ω C_{filt} = 16 μF		V_i = 250 V_{rms} I_o = 75 mA C_{filt} = 32 μF V_{kf} = 300 V	
EY500	6.3 2.1	For further data see PY500				
EZ40 Double anode rectifier	6.3 0.6	*Operating* V_{tr} = 2 × 250 V_{rms} I_o = 90 mA R_t = 2 × 125 Ω	V_{tr} = 2 × 300 V_{rms} I_o = 90 mA R_t = 2 × 215 Ω	V_{tr} = 2 × 350 V_{rms} I_o = 90 mA R_t = 2 × 300 Ω	V_{tr} = 2 × 350 V_{rms} I_o = 90 mA C_{filt} = 50 μF $V_{kf\,p}$ = 500 V	
EZ41 Double anode rectifier	6.3 0.4	*Operating* V_{tr} = 2 × 250 V_{rms} V_o = 253 V	I_o = 60 mA R_t = 2 × 150 Ω	C_{filt} = 8 μF	V_{tr} = 250 V_{rms} I_o = 60 mA V_{kf} = 350 V	
EZ80 Double anode rectifier	6.3 0.6	*Operating* V_{tr} = 2 × 250 V_{rms} V_o = 260 V I_o = 90 mA R_t = 2 × 125 Ω	V_{tr} = 2 × 300 V_{rms} V_o = 310 V I_o = 90 mA R_t = 2 × 215 Ω	V_{tr} = 2 × 350 V_{rms} V_o = 360 V I_o = 90 mA R_t = 2 × 300 Ω	V_{tr} = 2 × 350 V_{rms} I_o = 90 mA V_{kf} = 500 V C_{filt} = 50 μF	

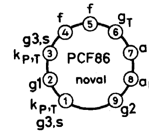
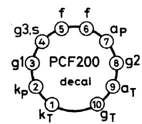
Type	V_f (V) / I_f (A)					Base
EZ81 Double anode rectifier	6.3 1.0	*Operating* $V_{tr} = 2 \times 250\ V_{rms}$ $V_o = 245$ V $I_o = 160$ mA $R_t = 2 \times 150\ \Omega$	$V_{tr} = 2 \times 350\ V_{rms}$ $V_o = 352$ V $I_o = 150$ mA $R_t = 2 \times 230\ \Omega$	$V_{tr} = 2 \times 450\ V_{rms}$ $V_o = 497$ V $I_o = 100$ mA $R_t = 2 \times 310\ \Omega$	$V_{a\,invp} = 1300$ V $I_{ap} = 500$ mA $V_{kf} = 500$ V $C_{filt} = 50\ \mu F$	
GY501 Single-anode E.H.T. rectifier	3.15 0.4	*Operating* $V_o = 25$ kV	$I_a = 1.5$ mA		$-V_{ap} = 35$ kV [1] $V_o = 27.5$ kV [1] $I_a = 1.7$ mA	
GZ34 Double anode rectifier	5.0 1.9	*Operating* $V_{tr} = 2 \times 300\ V_{rms}$ $V_o = 330$ V $I_o = 250$ mA $R_t = 2 \times 75\ \Omega$	$V_{tr} = 2 \times 400\ V_{rms}$ $V_o = 430$ V $I_o = 250$ mA $R_t = 2 \times 125\ \Omega$	$V_{tr} = 2 \times 550\ V_{rms}$ $V_o = 640$ V $I_o = 160$ mA $R_t = 2 \times 200\ \Omega$	$V_{a\,invp} = 1500$ V $I_{ap} = 750$ mA $C_{filt} = 60\ \mu F$	
PABC80	9.5 0.3	For further data see UABC80				
PC86 U.H.F. triode	3.8 0.3	*Typical* $V_a = 175$ V $V_g = -1.5$ V	$I_a = 12$ mA $S = 14$ mA/V	$\mu = 68$ $R_{eq.} = 230\ \Omega$	$W_a = 2.2$ W $I_k = 20$ mA $V_{+k/-f} = 100$ V [2]	

[1] Absolute max. [2] A.C. component max. 50 V_{rms}

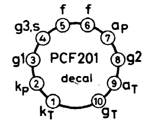
Type and application	V_f (V) I_f (A)	Characteristic data			Limiting values	Base connections
PC88 U.H.F. triode	3.8 0.3	*Typical* $V_a = 160$ V $R_k = 100\ \Omega$	$I_a = 12.5$ mA $S = 13.5$ mA/V	$\mu = 65$ $R_{eq.} = 240\ \Omega$	$W_a = 2$ W $I_k = 13$ mA $V_{kf} = 100$ V [1])	
PC92 H.F. triode	3.1 0.3	*Typical* $V_a = 200$ V $V_g = -0.9$ V $V_a = 100$ V $V_g = -0.9$ V	$I_a = 12$ mA $S = 7.2$ mA/V $I_a = 3$ mA $S = 3.8$ mA/V	$\mu = 67$ $R_{eq.} = 400\ \Omega$ $\mu = 58$	$W_a = 2.5$ W $I_k = 15$ mA $V_{kf} = 250$ V [2])	
PC97 V.H.F. triode	4.5 0.3	*Typical* $V_a = 135$ V $V_g = -1$ V	$I_a = 11$ mA $S = 13$ mA/V	$R_i = 5$ kΩ $\mu = 65$	$W_a = 2.2$ W $I_k = 20$ mA $V_{kf} = 100$ V	
PC900 V.H.F. triode	3.9 0.3	*Typical* $V_a = 135$ V $V_s = 0$ V *Operating* $V_{ba} = 135$ V $V_s = 0$ V $R_a = 1.5$ kΩ	$V_{g1} = -1$ V $I_a = 11.5$ mA $R_k = 0\ \Omega$ $I_a = 16.5$ mA $I_g = 20\ \mu$A	$S = 14.5$ mA/V $\mu = 76$ $S = 20$ mA/V $\mu = 84$	$W_a = 2.2$ W $I_k = 20$ mA $V_{kf} = 100$ V	

PCC85 R.F. double triode	9.0 0.3	*Typical* $V_a = 170$ V $V_g = -1.75$ V	$I_a = 10$ mA $S = 6.7$ mA/V	$\mu = 48$	$W_a = 2.5$ W $I_k = 15$ mA $V_{kf} = 90$ V	
PCC88 R.F. double triode (cascode)	7.6 0.3	*Typical* $V_a = 90$ V $V_g = -1.3$ V	$I_a = 15$ mA $S = 12.5$ mA/V	$\mu = 33$ $R_{eq.} = 300\ \Omega$	$W_a = 1.8$ W $I_k = 25$ mA $V_{kf} = 50$ V	
PCC189 R.F. double triode (cascode)	7.6 0.3	*Typical* $V_a = 90$ V $V_g = -1.4$ V	$I_a = 15$ mA $S = 12.5$ mA/V	$R_i = 2.5\ k\Omega$ $\mu = 32$	$W_a = 1.8$ W $I_k = 22$ mA $V_{kf} = 80$ V	
PCF80 Triode- Pentode	9.0 0.3	*Typical (pentode)* $V_a = 170$ V $V_{g2} = 170$ V $V_{g1} = -2$ V	$I_a = 10$ mA $I_{g2} = 2.8$ mA $S = 6.2$ mA/V	$R_i = 0.4\ M\Omega$ $\mu_{g2g1} = 47$ $R_{eq.} = 1.5\ k\Omega$	$W_a = 1.7$ W $I_k = 14$ mA $V_{+k^{\prime}-f} = 200$ V	
		Freq. changer (pentode) $V_a = 170$ V $V_{g2} = 170$ V $V_{osc} = 3.5\ V_{rms}$	$R_k = 330\ \Omega$ $R_{g1} = 0.1\ M\Omega$ $I_a = 6.5$ mA	$I_{g2} = 2$ mA $I_{g1} = 20\ \mu A$ $S_c = 2.2$ mA/V		
		Typical (triode) $V_a = 100$ V $V_g = -2$ V	$I_a = 14$ mA $S = 5$ mA/V	$R_i = 4\ k\Omega$ $\mu = 20$	$W_a = 1.5$ W $I_k = 14$ mA	

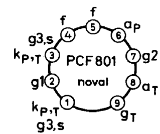
[1]) A.C. component max. 50 V_{rms}. [2]) D.C. component max. 100 V_{rms}.

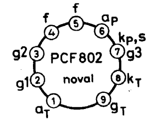
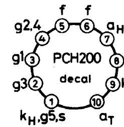
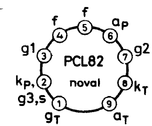
Type and application	V_f (V) I_f (A)	Characteristic data			Limiting values	Base connections
		Typical (pentode)				
PCF86	8.0	V_a = 170 V	I_a = 10 mA	R_i = >350 kΩ	W_a = 2 W	
Triode-	0.3	V_{g2} = 150 V	I_{g2} = 3.3 mA	μ_{g2g1} = 70	I_k = 18 mA	
pentode		V_{g1} = −1.2 V	S = 12 mA/V	$R_{eq.}$ = 1 kΩ	V_{kf} = 100 V	
		Freq. changer (pentode)				
		V_{ba} = 190 V	R_{g2} = 18 kΩ	I_{g2} = 2.7 mA		
		V_{bg2} = 190 V	R_{g1} = 0.1 MΩ	I_{g1} = 30 μA		
		V_{osc} = 2.3 V_{rms}	I_a = 8.5 mA	S_c = 4.5 mA/V		
		Typical (triode)				
		V_a = 100 V	I_a = 14 mA	R_i = 3 kΩ	W_a = 1.5 W	
		V_g = −3 V	S = 5.7 mA/V	μ = 17	I_k = 15 mA	
		Typical (pentode)				
PCF200	8.5	V_a = 160 V	V_{g1} = −1.7 V	S = 14 mA/V	W_a = 2.1 W	
Triode	0.3	V_{g2} = 135 V	I_a = 13 mA	μ_{g2g1} = 53	I_k = 20 mA	
pentode		V_{g3} = 0 V	I_{g2} = 5.3 mA		V_{kf} = 150 V	
		Operating (pentode)				
		V_b = 230 V	R_k = 83 Ω	S = 14 mA/V		
		R_a = 5.6 kΩ	I_a = 12.5 mA	r_{g1} = 6.6 kΩ		
		R_{g2} = 22 kΩ	I_{g2} = 5.1 mA	(at f = 40 MHz)		
		Typical (triode)				
		V_a = 170 V	I_a = 8.5 mA	R_i = 11 kΩ	W_a = 1.5 W	
		V_g = −1 V	S = 5.2 mA/V	μ = 57	I_k = 18 mA	

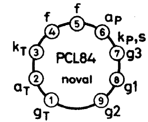
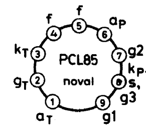
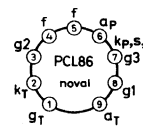
		Typical (pentode)			
PCF201	8.5	$V_a = 160$ V	$V_{g1} = -1.4$ V	$S = 12.6$ mA/V	$W_a = 2.1$ W
Triode-	0.3	$V_{g2} = 110$ V	$I_a = 13$ mA	$\mu_{g2g1} = 45$	$I_k = 20$ mA
pentode		$V_{g3} = 0$ V	$I_{g2} = 5.3$ mA		$V_{kf} = 150$ V
		Operating (g3 to earth)			
		$V_b = 250$ V	$R_k = 76\ \Omega$	$S = 12.6$ mA/V	
		$R_a = 6.8$ kΩ	$I_a = 12.8$ mA	$r_{g1} = 7.4$ kΩ	
		$R_{g2} = 27$ kΩ	$I_{g2} = 5.2$ mA	(at $f = 40$ MHz)	
		Typical (triode)			
		$V_a = 100$ V	$I_a = 14$ mA	$R_i = 3.6$ kΩ	$W_a = 1.5$ W
		$V_g = -2$ V	$S = 4.8$ mA/V	$\mu = 17.5$	$I_k = 18$ mA



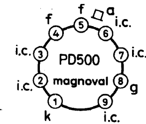
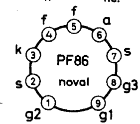
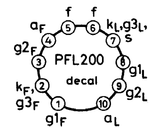
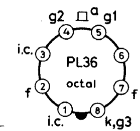
		Typical (pentode)			
PCF801	8.5	$V_a = 170$ V	$I_a = 10$ mA	$R_i = >350$ kΩ	$W_a = 2$ W
Triode-	0.3	$V_{g2} = 120$ V	$I_{g2} = 3$ mA	$\mu_{g2g1} = 55$	$I_k = 18$ mA
pentode		$V_{g1} = -1.4$ V	$S = 11$ mA/V	$R_{eq.} = 1.5$ kΩ	$V_{kf} = 100$ V
		Freq. changer (pentode)			
		$V_{ba} = 200$ V	$R_a = 2.7$ kΩ	$I_{g2} = 3$ mA	
		$V_{bg2} = 200$ V	$R_{g2} = 27$ kΩ	$I_{g1} = 8\ \mu$A	
		$V_{osc} = 1.6\ V_{rms}$	$R_{g1} = 0.1$ MΩ	$S_c = 5$ mA/V	
		$V_{bg1} = -1.4$ V	$I_a = 10$ mA		
		Typical (triode)			
		$V_a = 100$ V	$I_a = 15$ mA	$R_i = 2.2$ kΩ	$W_a = 1.5$ W
		$V_g = -3$ V	$S = 9$ mA/V	$\mu = 20$	$I_k = 20$ mA

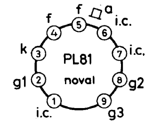
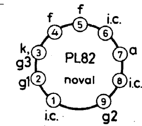
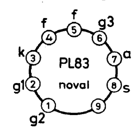
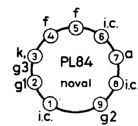


Type and application	V_f *(V)* I_f *(A)*	*Characteristic data*			*Limiting values*	*Base connections*
		Typical (pentode)				
PCF802	9.0	$V_a = 100$ V	$I_a = 6$ mA	$R_i = 0.4$ MΩ	$W_a = 1.2$ W	
Triode-	0.3	$V_{g2} = 100$ V	$I_{g2} = 1.7$ mA	$\mu_{g2g1} = 47$	$I_k = 15$ mA	
pentode		$V_{g1} = -1$ V	$S = 5.5$ mA/V		$V_{kf} = 100$ V [1])	
		Typical (triode)				
		$V_a = 200$ V	$I_a = 3.5$ mA	$R_i = 20$ kΩ	$W_a = 1.4$ W	
		$V_g = -2$ V	$S = 3.5$ mA/V	$\mu_{g2g1} = 70$	$I_k = 10$ mA	
		Typical (heptode)				
PCH200	8.5	$V_a = 14$ V	$V_a = 14$ V	$V_a = 14$ V	$W_a = 0.5$ W	
Triode-	0.3	$V_{g2,g4} = 14$ V	$V_{g2,g4} = 14$ V	$V_{g2,g4} = 14$ V	$I_k = 8$ mA	
heptode		$V_{g3} = 0$ V	$V_{g3} = 0$ V	$V_{g3} = -1.8$ V(<2.2)	$V_{kf} = 100$ V	
		$V_{g1} = 0$ V	$V_{g1} = -1.8$ V	$V_{g1} = 0$ V		
		$I_a = 1.5$ mA	$I_a = 20$ μA	$I_a = 20$ μA		
		$I_{g2} = 1.3$ mA				
		Typical (triode)				
		$V_a = 100$ V	$S = 8.8$ mA/V	$V_a = 200$ V	$W_a = 1.5$ W	
		$V_g = -1$ V	$\mu = 50$	$V_g = -7$ V (<11)	$I_k = 20$ mA	
		$I_a = 9$ mA		$I_a = 0.1$ A		
		Operating class A (pentode)				
PCL82	16	$V_{ba} = V_{bg2} = 230$ V	$I_a = 30$ mA	$I_{g2} = 11$ mA	$W_a = 7$ W	
Triode	0.3	$R_{g2} = 1.2$ kΩ	$I_{g2} = 6.6$ mA	at $V_i = 7.8$ V_{rms}	$I_k = 50$ mA	
output pentode		$R_k = 490$ Ω	at $V_i = 0$ V	$W_a = 3.25$ W	$V_{kf} = 200$ V	
		$R_{a\sim} = 6$ kΩ	$I_a = 31$ mA	$d_{tot} = 10\%$		

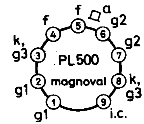
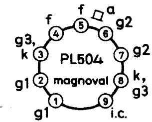
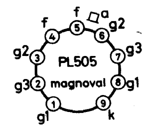
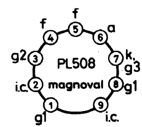
		Operating (triode) V_b = 200 V R_a = 220 kΩ R_k = 2.2 kΩ R_s = 0.22 MΩ	 R_g = 3 MΩ $R_{g'}$ = 0.68 MΩ I_a = 0.52 mA	 V_o/V_i = 52 V_o = <26 V_{rms} d_{tot} = 1.6 %	 W_a = 1 W I_k = 15 mA	
PCL84 Triode Video output pentode	15 0.3	*Operating (pentode)* V_b = 220 V V_{g2} = 220 V R_a = 3 kΩ *Typical (triode)* V_a = 200 V V_g = 1.7 V	 V_{g1} = −3.3 V I_a = 18 mA I_a = 3 mA S = 4 mA/V	 I_{g2} = 3.1 mA S = 9.7 mA/V μ = 65	 W_a = 4 W I_k = 40 mA V_{kf} = 200 V W_a = 1 W I_k = 12 mA	
PCL85 **PCL805** Triode-frame output pentode	17.5 0.3	*Operating (pentode)* V_a = 50 V V_{g2} = 170 V *Typical (triode)* V_a = 100 V V_g = 0 V	 V_{g1} = −1 V I_{ap} = 200 mA I_a = 10.5 mA S = 7 mA/V	 I_{g2p} = 35 mA R_i = 9 kΩ μ = 63	 W_a = 8 W I_k = 75 mA V_{kf} = 200 V W_a = 0.5 W I_k = 15 mA	
PCL86 Triode- output pentode	13.3 0.3	*Operating class A (pentode)* V_a = 230 V V_{g2} = 230 V R_k = 125 Ω $R_{a\sim}$ = 5.1 kΩ *Operating (triode)* V_b = 200 V R_a = 220 kΩ R_k = 2.6 kΩ	 I_a = 39 mA I_{g2} = 6.5 mA at V_i = 0 V I_a = 40.7 mA $R_{g'}$ = 680 kΩ I_a = 0.42 mA V_o = 3.2 V_{rms}	 I_{g2} = 10.5 mA at V_i = 3.6 V_{rms} W_o = 4.1 W d_{tot} = 10 % V_o/V_i = 66 d_{tot} = 0.6 %	 W_a = 9 W I_k = 55 mA V_{kf} = 100 V W_a = 0.5 W I_k = 4 mA	

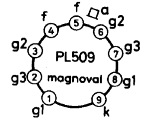
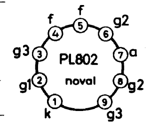
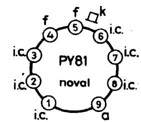
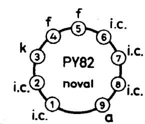
[1]) A.C. component max. 65 V_{rms}.

Type and application	V_f *(V)* I_f *(A)*	*Characteristic data*			*Limiting values*	*Base connections*
PD500 Shunt stabilizer triode	7.3 0.3	*Typical* $V_a = 25$ kV $V_s = 0$ V	$-V_g$(at $I_a = 1.5$ mA) $= 7-30$ V	$-V_g$(at $I_a = 0.1$ mA) $= <40$ V	$W_a = 30$ W $I_a = 1.6$ mA $V_{kf} = 250$ V	
PF86 Pentode	4.5 0.3	*Typical* $V_a = 250$ V $V_{g2} = 140$ V $V_{g3} = 0$ V	$V_{g1} = -2.2$ V $I_a = 3$ mA $I_{g2} = 0.6$ mA	$S = 2.2$ mA/V $R_i = 2.5$ MΩ $\mu_{g2g1} = 38$	$W_a = 1$ W $I_k = 4$ mA $V_{kf} = 100$ V	
PFL200 Double pentode	17 0.3	*Typical (L section)* $V_a = 170$ V $V_{g2} = 170$ V $V_{g1} = -2.7$ V	$I_a = 30$ mA $I_{g2} = 7$ mA $S = 22$ mA/V	$R_i = 33$ kΩ $\mu_{g2g1} = 38$	$W_a = 5.1$ W $I_k = 60$ mA $V_{kf} = 200$ V	
		Typical (F section) $V_a = 150$ V $V_{g2} = 150$ V $V_{g1} = -2.1$ V	$I_a = 10$ mA $I_{g2} = 3$ mA $S = 8.5$ mA/V	$R_i = 150$ kΩ $\mu_{g2g1} = 38$	$W_a = 1.5$ W $I_k = 15$ mA $V_{kf} = 200$ V	
PL36 Line output pentode	25 0.3	*Typical* $V_a = 100$ V $V_{g2} = 100$ V $V_{g1} = -8.2$ V	$I_a = 100$ mA $I_{g2} = 7$ mA $S = 14$ mA/V	$R_i = 5$ kΩ $\mu_{g2g1} = 5.6$	$W_a = 12$ W $I_k = 200$ mA $V_{kf} = 250$ V $V_{ap} = 7$ kV	

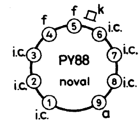
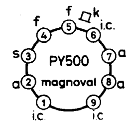
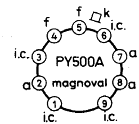
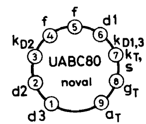
Type	V_f / I_f					Base
PL81 Line time base and A.F. Output pentode	21.5 0.3	*Typical* V_a = 170 V V_{g2} = 170 V V_{g3} = 0 V	V_{g1} = −22 V I_a = 45 mA I_{g2} = 2.9 mA	S = 6.2 mA/V R_i = 10 kΩ μ_{g2g1} = 5.3	W_a = 7.5 W I_k = 180 mA V_{kf} = 200 V V_{ap} = 7 kV	
		Operating class B V_a = 170 V V_{bg2} = 170 V V_{g3} = 0 V R_{g2} = 1 kΩ $R_{aa\sim}$ = 2.5 kΩ	V_{g1} = −27 V I_a = 2 × 20 mA I_{g2} = 2 × 1.5 mA at V_i = 0 V	I_a = 2 × 73 mA I_{g2} = 2 × 10 mA at V_i = 19 V_{rms} W_o = 13.5 W d_{tot} = 5.2 %		
PL82 Frame and A.F. output pentode	16.5 0.3	*Operating class A* $V_a = V_b$ = 200 V R_{g2} = 680 Ω V_{g1} = −13.9 V I_a = 45 mA	I_{g2} = 8.5 mA S = 8.6 mA/V R_i = 24 kΩ μ_{g2g1} = 10	$R_{a\sim}$ = 4 kΩ W_o = 4.2 W V_i = 7 V_{rms} d_{tot} = 10 %	W_a = 9 W I_k = 75 mA V_{kf} = 200 V	
PL83 Video output pentode	15 0.3	*Typical* V_a = 170 V V_{g2} = 170 V V_{g3} = 0 V	V_{g1} = 2.3 V I_a = 36 mA I_{g2} = 5 mA	S = 10.5 mA/V R_i = 0.1 MΩ μ_{g2g1} = 24	W_a = 9 W I_k = 70 mA V_{kf} = 250 V [1])	
PL84 Frame and A.F. output pentode	15 0.3	*Operating class AB* V_{ba} = 230 V V_{bg2} = 220 V R_k = 130 Ω $R_{aa\sim}$ = 4 kΩ	I_a = 2 × 56 mA I_{g2} = 2 × 2.3 mA at V_i = 0 V I_a = 2 × 61 mA	I_{g2} = 2 × 17.5 mA at V_i = 14.6 V_{rms} W_o = 17.5 W d_{tot} = 5.4 %	W_a = 10 W I_k = 100 mA V_{kf} = 200 V	

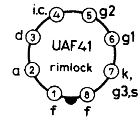
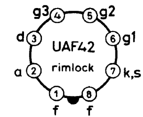
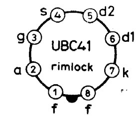
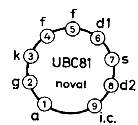
[1]) D.C. component max. 150 V

Type and application	V_f (V) I_f (A)	Characteristic data			Limiting values	Base connections
PL500 Line output pentode	27 0.3	*Typical (dynamic)* V_a = 50 V V_{g2} = 200 V	V_{g1} = −10 V I_{ap} = 420 mA	I_{g2p} = 37 mA	W_a = 12 W W_{g2} = 4 W I_k = 250 mA V_{kf} = 220 V	
PL504 Line output pentode	27 0.3	*Typical (dynamic)* V_a = 50 V V_{g2} = 200 V	V_{g1} = −10 V I_{ap} = 420 mA	I_{g2p} = 37 mA	W_a = 16 W W_{g2} = 4 W I_k = 250 mA V_{kf} = 220 V	
PL505 Line output pentode	40 0.3	*Typical (dynamic)* (1) V_a = 160 V V_{g2} = 160 V $V_{g1} = V_{g3}$ = 0 V	I_a = 1.4 A I_{g2} = 45 mA	(2) V_a = 50 V V_{g2} = 175 V V_{g1} = −10 V I_a = 0.8 A	W_a = 25 W I_k = 500 mA V_{kf} = 250 V	
PL508 Frame output pentode	17 0.3	*Typical (dynamic)* (1) $V_a = V_{g2}$ = 190 V V_{g1} = −17 V I_a = 60 mA	I_{g2} = 5 mA S = 9 mA/V μ_{g2g1} = 8	(2) V_a = 50 V V_{g2} = 190 V V_{g1} = −1 V I_{ap} = 320 mA I_{g2} = 60 mA	W_a = 12 W I_k = 100 mA V_{kf} = 220 V	

		Typical (dynamic)				
		(1)		(2)		
PL509 Line output pentode	40 0.3	$V_a = 160$ V $V_{g2} = 160$ V $V_{g1} = V_{g3} = 0$ V	$I_a = 1.4$ A $I_{g2} = 45$ mA	$V_a = 50$ V $V_{g2} = 175$ V $V_{g1} = -10$ V $I_a = 0.8$ A $I_{g2} = 70$ mA	$W_a = 30$ W $I_k = 500$ mA $V_{kf} = 250$ V	
		Typical				
PL802 Video output pentode	16 0.3	$V_a = 170$ V $V_{g2} = 170$ V $V_{g3} = 0$ V	$V_{bg1} = 0$ V $R_k = 25\ \Omega$ $I_a = 30$ mA	$I_{g2} = 6.5$ mA $S = 40$ mA/V $\mu_{g2g1} = 70$	$W_a = 6$ W $I_k = 100$ mA $V_{kf} = 200$ V	
PM84	4.2 0.3	For further data see UM84				
		Limiting				
PY81 Booster diode	17 0.3	$V_{bo} = \leqslant 550$ V $V_b = \leqslant 250$ V $W_a = \leqslant 3.5$ W	$I_a = \leqslant 150$ mA $I_{ap} = \leqslant 450$ mA $V_{ap} = \leqslant 5$ kV [1] [2]	$V_{kfp} = < 5$ kV [1] $R_s = \geqslant 80\ \Omega$ V_f/earth $\leqslant 220\ V_{rms}$		
		Operating				
PY82 Single anode rectifier	19 0.3	$V_{tr} = 127\ V_{rms}$ $V_o = 127$ V $I_o = 180$ mA $R_t = 0\ \Omega$	$V_{tr} = 220\ V_{rms}$ $V_o = 195$ V $I_o = 180$ mA $R_t = 65\ \Omega$	$V_{tr} = 250\ V_{rms}$ $V_o = 195$ V $I_o = 180$ mA $R_t = 125\ \Omega$	$V_{a\,invp} = 700$ V $I_o = 180$ mA $V_{+k/-fp} = 550\ V$ [3] $C_{filt} = 60\ \mu F$	

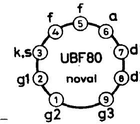
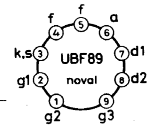
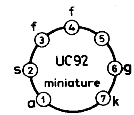
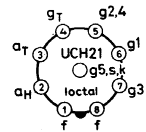
[1]) Max. pulse duration 22% of a cycle with a max. of 18 μs. [2]) Cathode pos. with respect to the anode. [3]) Max. 220 V_{rms} A.C. voltage + max. 250 V D.C. voltage.

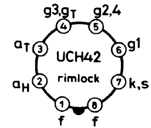
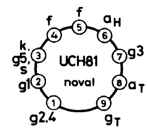
Type and application	V_f *(V)* I_f *(A)*	*Characteristic data*			*Limiting values*	*Base connections*
		Limiting				
PY88 Booster diode	30 0.3	$V_{bo} = \leqslant 550$ V $V_b = \leqslant 250$ V $W_a = \leqslant 5$ W	$I_a = \leqslant 220$ mA $I_{ap} = \leqslant 550$ mA $V_{ap} = \leqslant 6$ kV [1] [2]	$V_{kfp} = 6.6$ kV $R_s = \geqslant 80\ \Omega$ V_f/earth $< 220\ V_{rms}$		
		Typical and Limiting				
PY500 Booster diode	42 0.3	$R_i = 45.5\ \Omega$ at $C_{kf} = 3.7$ pF $C_{ak} = 13$ pF	$W_a = \leqslant 11$ W $I_a = \leqslant 440$ mA $I_{ap} = \leqslant 800$ mA	$-V_{ap} = 5.6$ kV [1] [2] $V_{kfp} = 6.3$ kV [1] $R_s = \geqslant 100\ \Omega$		
PY500A Booster diode	See PY500					
		Operating (triode)				
UABC80 Triple diode triode	28 0.1	$V_b = 100$ V $R_a = 0.1$ MΩ $R_{g'} = 0.33$ MΩ $I_a = 0.35$ mA $V_o/V_i = 35$	$V_b = 170$ V $R_a = 0.1$ MΩ $R_{g'} = 0.33$ MΩ $I_a = 0.82$ mA $V_o/V_i = 42$	$V_b = 200$ V $R_a = 0.1$ MΩ $R_{g'} = 0.33$ MΩ $I_a = 1$ mA $V_o/V_i = 44$	$W_a = 1$ W $I_k = 5$ mA $V_{kf} = 150$ V	
		Typical (diodes)				
		R_{iD1} (at $V_{d1} =$ $+10$ V) $= 5$ kΩ	R_{iD2} (at $V_{d2} =$ $+5$ V) $= 200\ \Omega$	R_{iD3} (at $V_{d3} =$ $+5$ V) $= 200\ \Omega$	$V_{dinvp} = 350$ V $I_{d1} = 1$ mA $I_{d2}, I_{d3} = 10$ mA	

UAF41 Diode-pentode	12.6 0.1	*Typical (pentode)* $V_a = V_b = 170$ V $R_{g2} = 44$ kΩ $V_{g1} = -2$ V	 $I_a = 5$ mA $I_{g2} = 1.6$ mA $S = 1.8$ mA/V	 $R_i = >1.2$ MΩ $\mu_{g2g1} = 19$ $R_{eq.} = 9$ kΩ	 $W_a = 2$ W $I_k = 10$ mA $V_{kf} = 150$ V	
UAF42 Diode-pentode	12.6 0.1	*Typical (pentode)* $V_a = V_b = 170$ V $R_{g2} = 56$ kΩ $V_{g3} = 0$ V $V_{g1} = -2$ V	 $I_a = 5$ mA $I_{g2} = 1.5$ mA $S = 2$ mA/V	 $R_i = >0.9$ MΩ $\mu_{g2g1} = 16$ $R_{eq.} = 7.5$ kΩ	 $W_a = 2$ W $I_k = 10$ mA $V_{kf} = 150$ V	
UB41	19 0.1	For further data see EB41				
UBC41 Double diode-triode	14 0.1	*Typical (triode)* $V_a = 170$ V $V_g = -1.55$ V	 $I_a = 1.5$ mA $S = 1.65$ mA/V	 $R_i = 42$ kΩ $\mu = 70$	 $W_a = 0.5$ W $I_k = 5$ mA $V_{kf} = 150$ V	
UBC81 Double diode-triode	14 0.1	*Typical (triode)* $V_a = 170$ V $V_g = -1.55$ V	 $I_a = 1.5$ mA $S = 1.65$ mA/V	 $R_i = 42$ kΩ $\mu = 70$	 $W_a = 0.5$ W $I_k = 5$ mA $V_{kf} = 100$ V	
		Operating (triode) $V_b = 170$ V $R_a = 0.1$ MΩ $R_k = 3.9$ kΩ	 $R_g = 1$ MΩ $R_{g'} = 0.33$ MΩ	 $I_a = 0.45$ mA $V_o/V_i = 37$		

[1]) Max. pulse duration 22% of a cycle with a max. of 18 μs. [2]) Cathode pos. with respect to the anode.

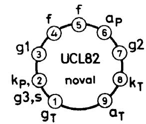
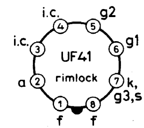
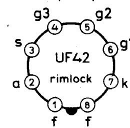
RECEIVING AND AMPLIFYING TUBES

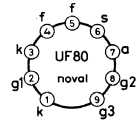
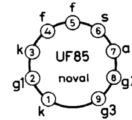
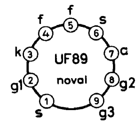
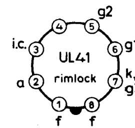
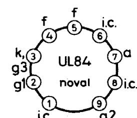
Type and application	V_f *(V)* I_f *(A)*	*Characteristic data*			*Limiting values*	*Base connections*
UBF80 Double diode-pentode	17 0.1	*Typical (pentode)* $V_a = V_b = 170$ V $R_{g2} = 47$ kΩ $V_{g3} = 0$ V $V_{g1} = -2$ V	$I_a = 5$ mA $I_{g2} = 1.75$ mA $S = 2.2$ mA/V	$R_i = 0.9$ MΩ $\mu_{g2g1} = 18$ $R_{eq.} = 6.2$ kΩ	$W_a = 1.5$ W $I_k = 10$ mA $V_{kf} = 150$ V	
UBF89 Double diode-pentode	19 0.1	*Typical (pentode)* $V_a = 170$ V $V_{g2} = 100$ V $V_{g3} = 0$ V	$V_{g1} = -1$ V $I_a = 12$ mA $I_{g2} = 4$ mA	$S = 5$ mA/V $\mu_{g2g1} = 20$ $R_i = 0.4$ MΩ	$W_a = 2.25$ W $I_k = 16.5$ mA $V_{kf} = 100$ V	
UC92 R.F. triode	9.5 0.1	*Typical* $V_a = 170$ V $V_g = -1$ V	$I_a = 8.5$ mA $S = 5.9$ mA/V	$R_i = 11$ kΩ $\mu = 65$	$W_a = 2.5$ W $I_k = 15$ mA $V_{kf} = 90$ V	
UCC85	26 0.1	For further data see PCC85				
UCH21 Triode-heptode	14 0.1	*Freq. changer (heptode)* $V_a = V_b = 200$ V $R_{g2+g4} = 15.5$ kΩ $R_{gT+g3} = 50$ kΩ $V_{g1} = -2$ V	$I_a = 5.2$ mA $I_{g2+g4} = 3.5$ mA $I_{gT+g3} = 0.19$ mA	$S_c = 0.75$ mA/V $R_i = 1$ MΩ $R_{eq.} = 55$	$W_a = 1.5$ W $I_k = 15$ mA $V_{kf} = 150$ V	

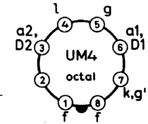
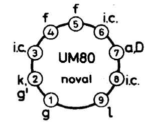
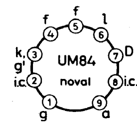
		Oscillator (triode)				
		$V_b = 200$ V	$R_{gT+g3} = 50$ kΩ	$I_a = 4.1$ mA		
		$R_a = 20$ kΩ	$I_{gT+g3} = 0.19$ mA	$S_{eff} = 0.45$ mA/V		
		Freq. changer (hexode)				
UCH42	14	$V_b = 170$ V	$V_{g1} = -1.85$ V	$S_c = 0.67$ mA/V	$W_a = 1.5$ W	
Triode-	0.1	$R_1 = 18$ kΩ	$I_a = 2.1$ mA	$R_i = >1$ MΩ	$I_k = 10$ mA	
hexode		$R_2 = 27$ kΩ	$I_{g2+g4} = 2.6$ mA	$R_{eq.} = 65$ kΩ	$V_{kf} = 150$ V	
		$R_{gT+g3} = 22$ kΩ	$I_{gT+g3} = 0.35$ mA			
		Oscillator (triode)				
		$V_b = 170$ V	$R_{gT+g3} = 22$ kΩ	$I_a = 6.5$ mA	$W_a = 1.5$ W	
		$R_a = 10$ kΩ	$I_{gT+g3} = 0.35$ mA	$S_{eff} = 0.75$ mA/V	$I_k = 10$ mA	
		Freq. changer (heptode)				
UCH81	19	$V_b = 170$ V	$I_a = 3.3$ mA	$S_c = 1.1$ mA/V	$W_a = 1.8$ W	
Triode	0.1	$R_{g2+g4} = 10$ kΩ	$I_{g2+g4} = 8.2$ mA	$R_i = 0.8$ MΩ	$I_k = 18$ mA	
heptode		$R_{gT+g3} = 47$ kΩ	$I_{gT+g3} = 0.2$ mA	$R_{eq.} = 30$ kΩ	$V_{kf} = 100$ V	
		$I_{g1} = 0.5\ \mu$A [1]				
		Operating (heptode)				
		$V_b = 170$ V	$I_a = 8$ mA	$R_i = 0.4$ MΩ		
		$R_{g2+g4} = 18$ kΩ	$I_{g2+g4} = 5$ mA	$\mu_{g2g1} = 25$		
		$V_{g3} = 0$ V	$S = 3.9$ mA/V	$R_{eq.} = 4$ kΩ		
		$I_{g1} = 0.5\ \mu$A [1]				
		Oscillator (triode)				
		$V_b = 170$ V	$R_{gT+g3} = 47$ kΩ	$I_a = 4.5$ mA	$W_a = 0.8$ W	
		$R_a = 15$ kΩ	$I_{gT+g3} = 0.2$ mA	$S_{eff} = 0.65$ mA/V	$I_k = 6.5$ mA	
					$V_{kf} = 100$ V	

[1]) Grid current bias obtained with $R_{g1} = 1$ MΩ and with zero volts a.g.c. voltage; resulting grid No 1 voltage: −0.5 V.

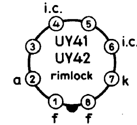
RECEIVING AND AMPLIFYING TUBES

Type and application	V_f *(V)* I_f *(A)*	*Characteristic data*			*Limiting values*	*Base connections*
		Operating class A (pentode)				
UCL82 Triode output pentode	50 0.1	$V_{ba} = V_{bg2} = 200$ V $R_{g2} = 470\ \Omega$ $R_k = 330\ \Omega$ $R_{a\sim} = 4.5$ kΩ	$I_a = 35$ mA $I_{g2} = 7.8$ mA at $V_i = 0$ V $I_a = 37$ mA	$I_{g2} = 13.3$ mA at $V_i = 6.7\ V_{rms}$ $W_o = 3.3$ W $d_{tot} = 10\%$	$W_a = 7$ W $I_k = 50$ mA $V_{kf} = 200$ V	
		Operating (triode)				
		$V_b = 170$ V $R_a = 220$ kΩ $R_k = 2.7$ kΩ $R_s = 0.22$ MΩ	$R_{g1} = 3$ MΩ $R'_g = 0.68$ MΩ $I_a = 0.43$ mA	$V_o/V_i = 51$ $V_o = <25\ V_{rms}$ $d_{tot} = 2.3\%$	$W_a = 1$ W $I_k = 15$ mA $V_{kf} = 200$ V	
		Typical				
UF41 R.F. pentode	12.6 0.1	$V_b = 170$ V $R_{g2} = 40$ kΩ $V_{g1} = -2.5$ V	$I_a = 6$ mA $I_{g2} = 1.75$ mA $S = 2.2$ mA/V	$R_i = 1$ MΩ $\mu_{g2g1} = 18$ $R_{eq.} = 6.5$ kΩ	$W_a = 2$ W $I_k = 10$ mA $V_{kf} = 150$ V	
		Typical				
UF42 R.F. pentode	21 0.1	$V_a = 170$ V $V_{g2} = 170$ V $V_{g3} = 0$ V $V_{g1} = -2$ V	$I_a = 10$ mA $I_{g2} = 2.8$ mA $S = 8$ mA/V	$R_i = 300$ kΩ $\mu_{g2g1} = 52$ $R_{eq.} = 1.06$ kΩ	$W_a = 2$ W $I_k = 15$ mA $V_{kf} = 150$ V	

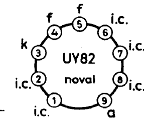
UF80 R.F. pentode	19 0.1	*Typical* V_a = 170 V V_{g2} = 170 V V_{g3} = 0 V V_{g1} = −2 V	I_a = 10 mA I_{g2} = 2.5 mA S = 7.4 mA/V	R_i = 0.4 MΩ μ_{g2g1} = 50 $R_{eq.}$ = 1.0 kΩ	W_a = 2.5 W I_k = 15 mA V_{kf} = 150 V	
UF85 R.F. pentode	19 0.1	*Typical* $V_a = V_b$ = 170 V R_{g2} = 27 kΩ V_{g3} = 0 V V_{g1} = −2 V	I_a = 9.7 mA I_{g2} = 2.6 mA S = 5.9 mA/V	R_i = 0.3 MΩ $R_{eq.}$ = 1.4 kΩ	W_a = 2.5 W I_k = 15 mA V_{kf} = 150 V	
UF89 R.F. pentode	12.6 0.1	*Typical* $V_a = V_b$ = 170 V R_{g2} = 15 kΩ V_{g3} = 0 V V_{g1} = −1.95 V	I_a = 11 mA I_{g2} = 3.9 mA S = 3.8 mA/V	R_i = 0.45 MΩ $R_{eq.}$ = 4.5 kΩ	W_a = 2.25 W I_k = 16.5 mA V_{kf} = 150 V	
UL41 A.F. output pentode	45 0.1	*Operating class A* V_a = 170 V V_{g2} = 170 V V_{g1} = −10.4 V I_a = 53 mA	I_{g2} = 10 mA S = 9.5 mA/V R_i = 20 kΩ μ_{g2g1} = 10	$R_{a\sim}$ = 3 kΩ V_i = 6 V_{rms} W_o = 4 W d_{tot} = 10%	W_a = 9 W I_k = 75 mA V_{kf} = 150 V	
UL84 A.F. output pentode	45 0.1	*Operating class A* V_a = 170 V V_{g2} = 170 V V_{g1} = −12.5 V I_a = 70 mA	I_{g2} = 3.5 mA S = 11 mA/V R_i = 26 kΩ μ_{g2g1} = 8	$R_{a\sim}$ = 2 kΩ V_i = 6.1 V_{rms} W_a = 5.1 W d_{tot} = 10%	W_a = 12 W I_k = 100 mA V_{kf} = 200 V	

Type and application	V_f (*V*) I_f (*A*)	*Characteristic data*			*Limiting values*	*Base connections*
UM4 Tuning indicators	12.6 0.1	*Operating* $V_b = V_l = 200$ V $R_{a1,a2} = 1$ MΩ	$V_g = 0$ V $I_l = 1.4$ mA $\alpha = 90°$	$V_g = -4.2$ V $I_l = 1.8$ mA $\alpha = 5°$	$R_g = 3$ MΩ $V_{kf} = 150$ V	
UM80 Tuning indicator	19 0.1	*Operating* $V_b = V_l = 170$ V $R_a = 0.5$ MΩ $R_g = 3$ MΩ	$V_{bg} = -1$ V $I_a = 0.3$ mA $I_l = 4.5$ mA $\beta = 5°$	$V_{bg} = -12$ V $I_a = 0.01$ mA $I_l = 5.7$ mA $\beta = 50°$	$W_a = 0.2$ W $I_k = 10$ mA $V_{kf} = 150$ V	
UM84 Tuning indicator	12 0.1	*Operating* $V_b = V_l = 170$ V $R_{gD} = 470$ kΩ $R_g = 3$ MΩ	$V_{bg} = 0$ V $I_{a+D} = 0.3$ mA $I_l = 0.6$ mA $\alpha = 20$ mm	$V_{bg} = -15$ V $I_{a+D} = 0.04$ mA $I_l = 1.05$ mA $\alpha = 0$ mm	$W_a = 0.5$ W $I_k = 3$ mA $V_{+k/-f} = 250$ V	

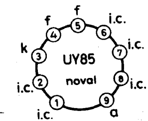
UY41-UY42 Single anode rectifiers	31 0.1	*Operating* $V_{tr} = 127\ V_{rms}$ $V_o = 135$ V $I_o = 100$ mA $R_t = 0\ \Omega$	$V_{tr} = 220\ V_{rms}$ $V_o = 188$ V $I_o = 100$ mA $R_t = 160\ \Omega$	$V_{tr} = 250\ V_{rms}$ $V_o = 205$ V $I_o = 100$ mA $R_t = 210\ \Omega$	$V_{a\,invp} = 700$ V $I_{ap} = 660$ mA $V_{+k/-f} = 550$ V $C_{filt} = 50\ \mu F$



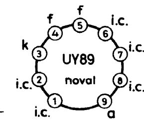
UY82 Single anode rectifier	55 0.1	*Operating* $V_{tr} = 127\ V_{rms}$ $V_o = 127$ V $I_o = 180$ mA $R_t = 0\ \Omega$	$V_{tr} = 220\ V_{rms}$ $V_o = 195$ V $I_o = 180$ mA $R_t = 65\ \Omega$	$V_{tr} = 250\ V_{rms}$ $V_o = 195$ V $I_o = 180$ mA $R_t = 125\ \Omega$	$V_{a\,invp} = 700$ V $I_{ap} = 1.1$ A $V_{+k/-f} = 550$ V $C_{filt} = 60\ \mu F$



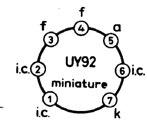
UY85 Single anode rectifier	38 0.1	*Operating* $V_{tr} = 127\ V_{rms}$ $V_o = 135$ V $I_o = 110$ mA $R_t = 0\ \Omega$	$V_{tr} = 220\ V_{rms}$ $V_o = 215$ V $I_o = 110$ mA $R_t = 90\ \Omega$	$V_{tr} = 250\ V_{rms}$ $V_o = 245$ V $I_o = 110$ mA $R_t = 100\ \Omega$	$V_{a\,invp} = 700$ V $I_{ap} = 660$ mA $V_{+k/-f} = 550$ V $C_{filt} = 100$ pF



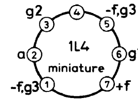
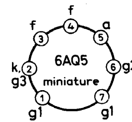
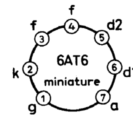
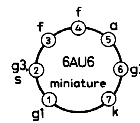
UY89 Single anode rectifier	31 0.1	*Operating* $V_{tr} = 127\ V_{rms}$ $V_o = 135$ V $I_o = 100$ mA $R_t = 0\ \Omega$	$V_{tr} = 220\ V_{rms}$ $V_o = 188$ V $I_o = 100$ mA $R_t = 160\ \Omega$	$V_{tr} = 250\ V_{rms}$ $V_o = 205$ V $I_o = 100$ mA $R_t = 210\ \Omega$	$V_{a\,invp} = 700$ V $I_{ap} = 600$ mA $V_{+k/-f} = 550$ V $C_{filt} = 50\ \mu F$

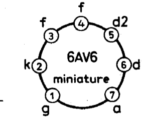
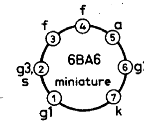
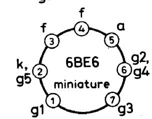
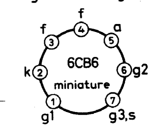
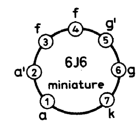


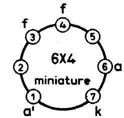
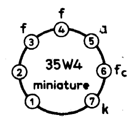
UY92 Single anode rectifier	26 0.1	*Operating* $V_{tr} = 110\ V_{rms}$ $V_o = 115$ V $I_o = 70$ mA $R_t = 0\ \Omega$	$V_{tr} = 127\ V_{rms}$ $V_o = 137$ V $I_o = 70$ mA $R_t = 0\ \Omega$	$V_{tr} = 145\ V_{rms}$ $V_o = 160$ V $I_o = 70$ mA $R_t = 0\ \Omega$	$V_{a\,invp} = 400$ V $I_{ap} = 450$ mA $V_{+k/-f} = 400$ V $C_{filt} = 100\ \mu F$

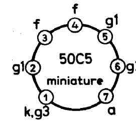
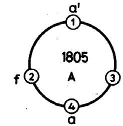
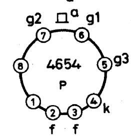
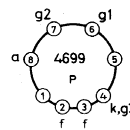


RECEIVING AND AMPLIFYING TUBES

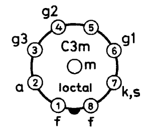
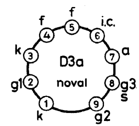
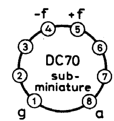
Type and application	V_f (*V*) I_f (*A*)	*Characteristic data*			*Limiting values*	*Base connections*
		Typical				
1L4 Sharp cut-off pentode	1.4 0.05	V_a =90 V V_{g2}=90 V V_{g1}= 0 V	I_a =4.5 mA I_{g2}= 2 mA	S = 1 mA/V R_i=0.35 MΩ	V_a =110 V V_{g2}= 90 V I_k = 6.5 mA	
		Operating class A				
6AQ5 Output pentode	6.3 0.45	V_a =250 V V_{g2}=250 V V_{g1}= −12.5 V I_a =45 mA	I_{g2} =4.5 mA S =4.1 mA/V R_i =52 kΩ $R_{a\sim}$=5 kΩ	I_a =47 mA I_{g2} = 7 mA W_o =4.5 W V_i =8.8 V_{rms} d_{tot}=8 %	W_a=12 W V_{kf}=100 V	
		Typical (triode)				
6AT6 Double diode Triode	6.3 0.3	V_a=250 V V_g= −3 V	I_a= 1 mA S =1.2 mA/V	R_i=58 kΩ μ =70	W_a =0.5 W $V_{kf\,p}$=90 V	
		V_a=100 V V_g= −1 V	I_a=0.8 mA S =1.3 mA/V	R_i=54 kΩ μ =70		
		Typical				
6AU6 Sharp cut-off pentode	6.3 0.3	V_a =250 V V_{g2}=150 V V_{g1}= −1 V	V_{g3}= 0 V I_a =10.6 mA I_{g2}=4.3 mA	S =5.2 mA/V R_i= 1 MΩ	W_a = 3.5 W V_{kf}=100 V	

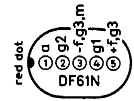
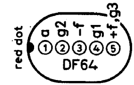
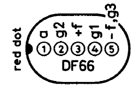
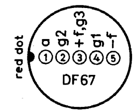
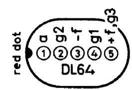
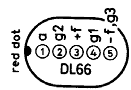
6AV6 Double diode Triode	6.3 0.3	*Typical (triode)* $V_a = 250$ V $V_g = -2$ V	$I_a = 1.2$ mA $S = 1.6$ mA/V	$R_i = 62.5$ kΩ $\mu = 100$	$W_a = 0.55$ W $V_{kf} = 100$ V	
6BA6 Remote cut-off pentode	6.3 0.3	*Typical* $V_a = 250$ V $V_{g2} = 100$ V $V_{g3} = 0$ V	$R_k = 68$ Ω $I_a = 11$ mA $I_{g2} = 4.2$ mA	$S = 4.4$ mA/V $R_i = 1$ MΩ $R_{eq.} = 4$ kΩ	$W_a = 3.4$ W $V_{kf} = 100$ V	
6BE6 Heptode	6.3 0.3	*Operating* $V_a = 250$ V $V_{g2+g4} = 100$ V $V_{g3} = -1.5$ V	$R_{g1} = 20$ kΩ $I_a = 2.9$ mA $I_{g2+g4} = 6.8$ mA	$I_{g1} = 0.5$ μA $S_c = 475$ μA/V $R_i = 1$ MΩ	$W_a = 1.1$ W $I_k = 20$ mA $V_{kf} = 100$ V	
6CB6 Sharp cut-off pentode	6.3 0.3	*Typical* $V_a = 200$ V $V_{g2} = 150$ V $V_{g3} = 0$ V	$R_k = 180$ Ω $I_a = 9.5$ mA $I_{g2} = 2.8$ mA	$S = 6.2$ mA/V $R_i = 0.6$ MΩ	$W_a = 2$ W $V_{kf} = 100$ V	
6J6 Double triode	6.3 0.45	*Typical* $V_a = 100$ V $I_a = 8.5$ mA	$R_k = 100$ Ω $S = 5.3$ mA/V	$R_i = 7.1$ kΩ $\mu = 38$	$W_a = 1.5$ W $I_k = 25$ mA $V_{kf\,p} = 100$ V	
		Operating $V_a = 150$ V $V_g = -10$ V $R_g = 625$ Ω	$I_a = 2 \times 15$ mA $I_g = 2 \times 8$ mA	$W_{ig} = 0.35$ W $W_o = 3.5$ W		

Type and application	V_f *(V)* I_f *(A)*	*Characteristic data*			*Limiting values*	*Base connections*
6X4 Double anode rectifier	6.3 0.6	*Operating* $V_{tr} = 2 \times 325\ V_{rms}$ $I_o = 70$ mA	$R_t = 2 \times 520\ \Omega$	$C_{filt} = 10\ \mu F$	$V_{a\,invp} = 1.25$ kV $I_{ap} = 210$ mA	
12AT6	12.6 0.15	For further data see 6AT6				
12AU6	12.6 0.15	For further data see 6AU6				
12AV6	12.6 0.15	For further data see 6AV6				
12BA6	12.6 0.15	For further data see 6BA6				
12BE6	12.6 0.15	For further data see 6BE6				
35W4 Single anode rectifier	35 0.15 pins: 3+4	*Operating* $V_{tr} = 117\ V_{rms}$ $I_o = 90$ mA	$R_t = \geqslant 15\ \Omega$	$C = 40\ \mu F$	$V_{a\,invp} = 330$ V $I_{ap} = 0.6$ A	

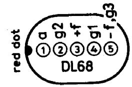
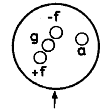
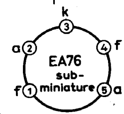
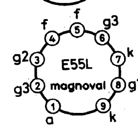
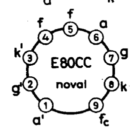
50C5 Output pentode	50 0.15	*Operating class A* $V_a = 110$ V $V_{g2} = 110$ V $V_{g1} = -7.5$ V	 $I_a = 49$ mA $I_{g2} = 4$ mA $S = 7.5$ mA/V	 $R_i = 14$ kΩ $R_{a\sim} = 2.5$ kΩ $W_o = 1.9$ W	 $W_a = 5.5$ W	
1805 Double anode rectifier	4 1	*Operating* $V_{tr} = 2 \times 300\ V_{rms}$ $I_o = \leqslant 100$ mA $R_t = \geqslant 2 \times 60\ \Omega$	 $V_{tr} = 2 \times 400\ V_{rms}$ $I_o = \leqslant 75$ mA $R_t = \geqslant 2 \times 80\ \Omega$	 $V_{tr} = 2 \times 500\ V_{rms}$ $I_o = \leqslant 60$ mA $R_t = \geqslant 2 \times 100\ \Omega$	 $V_{tr} = 2 \times 500\ V_{rms}$ $C_{filt} = 60\ \mu F$	
4654 Output pentode	6.3 1.5	*Operating class A* $V_a = 250$ V $V_{g2} = 275$ V $V_{g3} = 0$ V $R_k = 175\ \Omega$	 $I_a = 72$ mA $I_{g2} = 8$ mA $S = 8.5$ mA/V $R_i = 22$ kΩ	 $R_{a\sim} = 3.5$ kΩ $V_i = 11.5\ V_{rms}$ $W_o = 9.2$ W $d_{tot} = 11.4\%$	 $W_a = 18$ W $I_k = 120$ mA $V_{kf} = 50$ V	
4699 Output pentode	6.3 1.5	*Operating class AB* $V_{ba} = 425$ V $V_{bg2} = 425$ V $R_{g2} = 22$ kΩ $R_k = 170\ \Omega$ $R_{aa\sim} = 8$ kΩ	 $I_a = 2 \times 46$ mA $I_{g2} = 2 \times 5$ mA at $V_i = 0$ V $I_a = 2 \times 58$ mA	 $I_{g2} = 2 \times 14.5$ mA at $V_i = 17\ V_{rms}$ $W_o = 29$ W $d_{tot} = 5\%$	 $W_a = 18$ W $I_k = 90$ mA $V_{kf} = 50$ V	

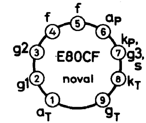
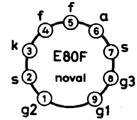
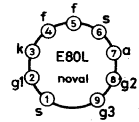
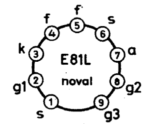
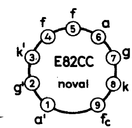
SPECIAL QUALITY TUBES

Type and application	V_f *(V)* I_f *(A)*	*Characteristic data*			*Limiting values*	*Base connections*
C3m A.F.–R.F. output pentode	20 0.125	*Operating* V_{ba} =225 V V_{bg2} =155 V V_{g3} = 0 V R_k =250 Ω	 I_a = 16 mA I_{g2} = 3 mA S = 6.5 mA/V R_i =250 kΩ	 μ_{g2g1} =19 $R_{a\sim}$ =10 kΩ W_o =1.5 W d_{tot} =10%	W_a = 4 W I_k = 30 mA V_{kf} =120 V	
D3a Wide band pentode	6.3 0.315	*Typical* V_{ba} =190 V V_{bg2} =160 V V_{g3} = 0 V V_{bg1} = +10 V	 R_k =400 Ω I_a = 22 mA I_{g2} = 6 mA S = 35 mA/V	 R_i =120 kΩ μ_{g2g1} = 80 $R_{eq.}$ =150 Ω	W_a =4.2 W I_k =30 mA V_{kf} =60 V	
DC70 U.H.F. Osc. triode	1.25 0.2	*Typical* V_a = 150 V V_g = −4.5 V *Oscillator* V_a =150 V I_k =20 mA	 I_a =12 mA S =3.4 mA/V W_o =0.45 W	 R_i = 4 kΩ μ =14 f =500 MHz	W_a =2.4 W I_k =20 mA I_g = 5 mA	

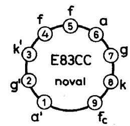
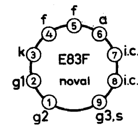
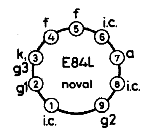
DF61N R.F. pentode	1.25 0.025	*Typical* $V_a=67.5$ V, $V_{g2}=67.5$ V, $V_{g1}=0$ V	$I_a=1.7$ mA, $I_{g2}=0.45$ mA, $S=0.95$ mA/V	$R_i=1$ MΩ, $\mu_{g2g1}=21$	$I_k=2.5$ mA, $C_{ag1}=0.01$ pF	
DF64 A.F. pentode	0.625 0.01	*Operating* $V_b=15$ V, $R_a=2.2$ MΩ, $R_{g2}=4.5$ MΩ	$V_{g1}=0$ V, $R_{g1}=10$ MΩ, $R_{g1'}=5$ MΩ	$I_k=6.4$ μA, $V_o/V_i=25$	$W_a=1.5$ mW, $W_{g2}=0.5$ mW, $I_k=85$ μA	
DF66 A.F. pentode	0.625 0.015	*Operating* $V_b=22.5$ V, $R_a=1$ MΩ, $R_{g2}=2$ MΩ	$V_{g1}=-0.62$ V, $R_{g1}=5$ MΩ, $R_{g1'}=5$ MΩ	$I_k=16$ μA, $V_o/V_i=33$	$V_a=45$ V, $V_{g2}=45$ V, $I_k=100$ μA	
DF67 A.F. pentode	0.625 0.133	*Operating* $V_b=22.5$ V, $R_a=1$ MΩ, $R_{g2}=3.3$ MΩ	$V_{g1}=0$ V, $R_{g1}=10$ MΩ, $R_{g1'}=5$ MΩ	$I_a=11.7$ μA, $I_{g2}=2.5$ μA, $V_o/V_i=31$	$W_a=1.5$ mW, $I_k=75$ μA, $R_{g1}=10$ MΩ	
DL64 Output pentode	1.25 0.01	*Operating* $V_b=15$ V, $V_{g2}=15$ V, $V_{g1}=-1.5$ V	$I_a=160$ μA, $I_{g2}=40$ μA, $S=180$ μA/V	$R_i=0.4$ MΩ, $R_{a\sim}=0.1$ MΩ, $W_o=0.95$ mW	$V_a=45$ V, $V_{g2}=45$ V, $I_k=0.6$ mA	
DL66 Output pentode	1.25 0.015	*Operating* $V_b=22.5$ V, $V_{g2}=22.5$ V, $V_{g1}=-1.4$ V	$I_a=300$ μA, $I_{g2}=75$ μA, $S=350$ μA/V	$R_i=0.3$ MΩ, $R_{a\sim}=75$ kΩ, $W_o=2.7$ mW	$V_a=45$ V, $V_{g2}=45$ V, $I_k=1$ mA	

SPECIAL QUALITY TUBES

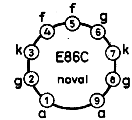
Type and application	V_f *(V)* I_f *(A)*	*Characteristic data*			*Limiting values*	*Base connections*
DL68 Output pentode	1.25 0.025	*Operating* $V_a = 22.5$ V $V_{g2} = 22.5$ V $V_{g1} = -2.2$ V	$R_{a\sim} = 37.5$ kΩ $I_a = 600$ μA $I_{g2} = 150$ μA	$V_i = 1.3\ V_{rms}$ $W_o = 5$ mW $d_{tot} = 10\%$	$W_a = 0.1$ W $W_{g2} = 0.025$ W $I_k = 2.3$ mA	
DM160 Computer indicator	1.0 0.03	*Operating* $V_a = 50$ V $R_g = 0.1$ MΩ	$V_{bg} = 0$ V $I_a = 585$ μA	$V_{bg} = -3$ V $I_a = 5$ μA	$V_a = 100$ V $I_a = 850$ μA $R_g = \leqslant 1.1$ MΩ $R_g = \geqslant 0.09$ MΩ	DM160 
EA76 Diode	6.3 0.15	*Operating and limiting* $V_{d\,invp} = \leqslant 420$ V	$I_d = \leqslant 9$ mA	$I_{dp} = \leqslant 54$ mA		
E55L Wide band Output pentode	6.3 0.6	*Typical* $V_a = 125$ V $V_{g2} = 125$ V $V_{g1} = -3$ V	$V_{g3} = 0$ V $I_a = 50$ mA $I_{g2} = 5.5$ mA	$S = 45$ mA/V $R_i = 20$ kΩ $\mu_{g2g1} = 30$	$W_a = 10$ W $I_k = 75$ mA $V_{kf} = 200$ V	
E80CC Double triode	6.3 0.6 or 12.6 0.3	*Typical* $V_a = 250$ V $R_k = 920$ Ω	$I_a = 6$ mA $S = 2.7$ mA/V	$R_i = 10$ kΩ $\mu = 2.7$	$W_a = 2$ W $I_k = 12$ mA $V_{kf} = 120$ V	

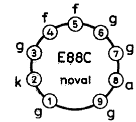
E80CF Triode pentode	6.3 0.33	*Typical (pentode)* $V_{ba} = 170$ V $V_{bg2} = 170$ V $R_k = 155\ \Omega$	 $I_a = 10$ mA $I_{g2} = 2.8$ mA $S = 6.2$ mA/V	 $R_i = 0.4$ MΩ $\mu_{g2g1} = 40$	 $W_a = 2.15$ W $I_k = 18$ mA $V_{kf} = 100$ V	
		Typical (triode) $V_{ba} = 100$ V $R_k = 120\ \Omega$	 $I_a = 14$ mA $S = 5$ mA/V	 $R_i = 3.6$ kΩ $\mu = 18$	 $W_a = 1.75$ W $I_k = 18$ mA	
E80F A.F. pentode	6.3 0.3	*Operating* $V_{ba} = 250$ V $V_{bg2} = 250$ V $R_a = 0.22$ MΩ $R_{g2} = 1.2$ MΩ	 $R_k = 1.5$ kΩ $R_{g1} = 1$ MΩ $R_{g1'} = 0.68$ MΩ	 $I_a = 0.8$ mA $I_{g2} = 0.17$ mA $V_o/V_i = 175$	 $W_a = 1.3$ W $I_k = 9$ mA $V_{+k/-f} = 120$ V $V_{-k/+f} = 60$ V	
E80L Output pentode	6.3 0.7	*Operating class A* $V_a = 200$ V $V_{g2} = 200$ V $V_{g3} = 0$ V $R_k = 130\ \Omega$	 $I_a = 30$ mA $I_{g2} = 4.1$ mA $S = 9$ mA/V $R_i = 52$ kΩ	 $R_{a\sim} = 7$ kΩ $W_o = 2.7$ W $d_{tot} = 10\%$	 $W_a = 8$ W $I_k = 50$ mA $V_{kf} = 120$ V	
E81L Output pentode	6.3 0.375	*Operating class A* $V_a = 210$ V $V_{g2} = 210$ V $V_{g3} = 0$ V	 $R_k = 120\ \Omega$ $R_{a\sim} = 15$ kΩ $I_a = 20$ mA	 $I_{g2} = 5.3$ mA $W_o = 1$ W $d_{tot} = 5\%$	 $W_a = 4.5$ W $I_k = 30$ mA $V_{kf} = 120$ V	
E82CC Double triode	6.3 0.3 or 12.6 0.15	*Typical* $V_a = 250$ V $R_k = 800\ \Omega$	 $I_a = 10.5$ mA $S = 2.2$ mA/V	 $R_i = 7.7$ kΩ $\mu = 17$	 $W_a = 3$ W $I_k = 22$ mA $V_{kf} = 100$ V	

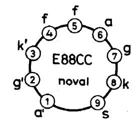
SPECIAL QUALITY TUBES

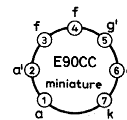
Type and application	V_f *(V)* I_f *(A)*	*Characteristic data*			*Limiting values*	*Base connections*
E83CC Double triode	6.3 0.3 or 12.6 0.15	*Typical* $V_a = 250$ V $R_k = 1.6$ kΩ	$I_a = 1.25$ mA $S = 1.6$ mA/V	$R_i = 62.5$ kΩ $\mu = 100$	$W_a = 1.2$ W $I_k = 9$ mA $V_{kf} = 200$ V	
E83F Pentode	6.3 0.3	*Typical* $V_a = 210$ V $V_{g2} = 120$ V $V_{g3} = 0$ V $R_k = 165$ Ω	$I_a = 10$ mA $I_{g2} = 2.1$ mA $S = 9$ mA/V	$R_i = 0.5$ MΩ $\mu_{g2g1} = 38$ $R_{eq.} = 750$ Ω	$W_a = 2.1$ W $I_k = 16$ mA $V_{kf} = 100$ V	
E84L Output pentode	6.3 0.76	*Operating class A* $V_a = 250$ V $V_{g2} = 250$ V $R_k = 135$ Ω $I_a = 48$ mA	$I_{g2} = 5.5$ mA $S = 11.3$ mA/V $R_i = 40$ kΩ $\mu_{g2g1} = 19$	$R_{a\sim} = 4.5$ kΩ $W_o = 5.7$ W $d_{tot} = 10\%$ $V_i = 4.4$ V_{rms}	$W_a = 13.5$ W $I_k = 75$ mA $V_{kf} = 100$ V	
		Class B $V_a = 300$ V $V_{g2} = 300$ V $V_{g1} = -14.7$ V $R_{aa\sim} = 8$ kΩ	$I_a = 2 \times 7.5$ mA $I_{g2} = 2 \times 0.8$ mA at $V_i = 0$ V $I_a = 2 \times 46$ mA	$I_{g2} = 2 \times 11$ mA at $V_i = 10$ V_{rms} $W_o = 17$ W $d_{tot} = 4\%$		

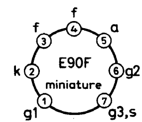
E86C U.H.F. triode	6.3 0.165	*Typical* $V_{ba} = 185$ V $V_{bg} = +8$ V $R_k = 800\ \Omega$	$I_a = 12$ mA $S = 14$ mA/V $R_i = 4.8$ kΩ	$\mu = 68$ $R_{eq.} = 250\ \Omega$	$W_a = 2.4$ W $I_k = 20$ mA $V_{kf} = 100$ V $f = 800$ MHz
E88C U.H.F. triode	6.3 0.155	*Typical* $V_a = 160$ V $V_g = -1.25$ V $I_a = 12.5$ mA	$S = 13.5$ mA/V $R_i = 5.2$ kΩ $\mu = 70$	$R_{eq.} = 240\ \Omega$ $F = 9.6$ dB at $f = 850$ MHz	$W_a = 2.6$ W $I_k = 16.5$ mA $V_{+k/-f} = 125$ V $V_{-k/+f} = 60$ V
E88CC Double triode	6.3 0.3	*Typical* $V_{ba} = 100$ V $V_{bg} = +9$ V $R_k = 680\ \Omega$	$I_a = 15$ mA $S = 12.5$ mA/V $\mu = 33$	$R_{eq.} = 300\ \Omega$ $F = 4.6$ dB at $f = 200$ MHz	$W_a = 1.8$ W $I_k = 20$ mA $V_{+k/-f} = 150$ V $V_{-k/+f} = 100$ V
E90CC Double triode computer application	6.3 0.4	*Typical* $V_a = 100$ V $V_g = -2.1$ V	$I_a = 8.5$ mA $S = 6$ mA/V	$R_i = 4.5$ kΩ $\mu = 27$	$W_a = 2$ W $I_k = 15$ mA $V_{kf} = 100$ V
E90F Sharp cut-off pentode	6.3 0.15	*Typical* $V_{ba} = 250$ V $V_{g2} = 150$ V $V_{g3} = 0$ V $R_k = 100\ \Omega$	$I_a = 7.4$ mA $I_{g2} = 2.9$ mA $S = 4.6$ mA/V	$R_i = 1.3$ MΩ $\mu_{g2g1} = 48$ $R_{eq.} = 2.5$ kΩ	$W_a = 2.6$ W $I_k = 15$ mA $V_{kf} = 100$ V

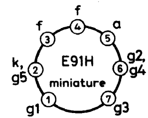
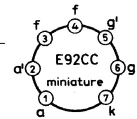
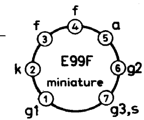
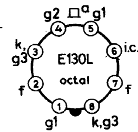


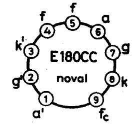
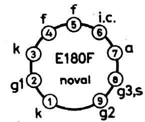
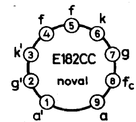
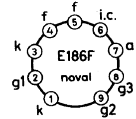


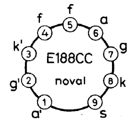
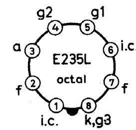
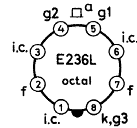
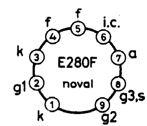


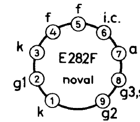
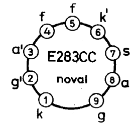
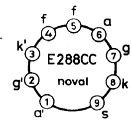
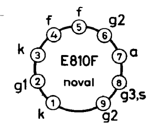
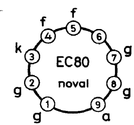




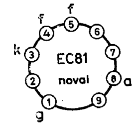
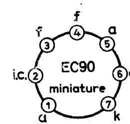
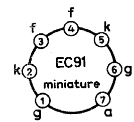
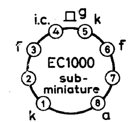
Type and application	V_f (V) I_f (A)	Characteristic data			Limiting values	Base connections
E91H Dual control heptode computer application	6.3 0.27	*Operating* $V_{ba}=150$ V $V_{bg2g4}=75$ V 1. $V_{bg1}=0$ V $V_{bg3}=0$ V I_a = >5.5 mA < 7 mA	$R_a=20$ kΩ $R_{g2g4}=470$ Ω 2. $V_{bg1}=0$ V $V_{bg3}=-10$ V I_a = <0.2 mA	$R_{g1}=47$ kΩ $R_{g3}=47$ kΩ 3. $V_{bg1}=-10$ V $V_{bg3}=$ 0 V I_a = <0.2 mA	$W_a=1$ W $W_{g2g4}=1$ W I_k = 20 mA $V_{kf}=120$ V	
E92CC Double triode computer application	6.3 0.4	*Typical* $V_a=$ 150 V $V_g=-1.7$ V	$I_a=8.5$ mA $S=$ 6 mA/V	$R_i=7.5$ kΩ μ = 45	$W_a=$ 2 W $I_k=$ 5 mA $V_{kf}=100$ V	
E99F Remote cut-off pentode	6.3 0.15	*Typical* V_{ba} = 250 V $V_{bg2}=100$ V V_{g3} = 0 V R_k = 80 Ω	I_a = 9.2 mA $I_{g2}=3.3$ mA S = 3.8 mA/V	R_i = 1 MΩ $\mu_{g2g1}=25$ $R_{eq.}$ = 3.5 kΩ	$W_a=$ 3.3 W $I_k=$ 17 mA $V_{kf}=100$ V	
E130L Output pentode	6.3 1.7	*Operating class A* V_a = 250 V $V_{g2}=150$ V $V_{g1}=-15.5$ V	$R_{a\sim}=2.7$ kΩ V_i = 3.8 V_{rms} I_a = 100 mA	$I_{g2}=$ 18 mA $W_o=11.5$ W $d_{tot}=$ 10%	$W_a=27.5$ W I_k = 300 mA $V_{+k/f-}=200$ V $V_{-k/f+}=100$ V	

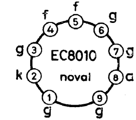
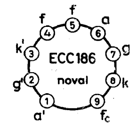
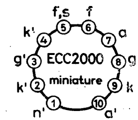
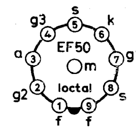
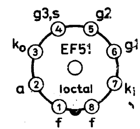
E130L (continued)		*Class AB* $V_a = 300$ V $V_{g2} = 150$ V $V_{g1} = -17$ V $R_{aa\sim} = 1.6$ kΩ	$I_a = 2 \times 80$ mA $I_{g2} = 2 \times 2.5$ mA at $V_i = 0$ V $I_a = 2 \times 182$ mA	$I_{g2} = 2 \times 22$ mA at $V_i = 9V_{rms}$ $W_o = 60$ W $d_{tot} = 5\%$		
E180CC Double triode computer application	6.3 0.4 or 12.6 0.2	*Typical* $V_a = 150$ V $V_g = -1.85$ V	$I_a = 8.5$ mA $S = 6.4$ mA/V	$R_i = 7.2$ kΩ $\mu = 46$	$W_a = 2$ W $I_k = 20$ mA $V_{+k/f-} = 200$ V $V_{-k/f+} = 100$ V	
E180F Wide band pentode	6.3 0.3	*Typical* $V_{ba} = 190$ V $V_{bg2} = 160$ V $V_{g3} = 0$ V $V_{bg1} = +9$ V	$R_k = 630$ Ω $I_a = 13$ mA $I_{g2} = 3.3$ mA $S = 16.5$ mA/V	$R_i = 90$ kΩ $\mu_{g2g1} = 50$ $R_{eq.} = 330$ Ω	$W_a = 3$ W $I_k = 25$ mA $V_{kf} = 60$ V	
E182CC Double triode computer application	6.3 0.64 or 12.6 0.32	*Typical* $V_a = 120$ V $V_g = -2$ V	$I_a = 36$ mA $S = 15$ mA/V	$R_i = 1.6$ kΩ $\mu = 24$	$W_a = 4.5$ W $I_k = 60$ mA $V_{kf} = 200$ V	
E186F Wide band pentode	6.3 0.32	*Typical* $V_{ba} = 190$ V $V_{bg2} = 160$ V $V_{g3} = 0$ V $V_{bg1} = +9$ V	$R_k = 630$ Ω $I_a = 13$ mA $I_{g2} = 3.3$ mA $S = 16.5$ mA/V	$R_i = 100$ kΩ $\mu_{g2g1} = 53$ $R_{eq.} = 330$ Ω	$W_a = 3$ W $I_k = 25$ mA $V_{kf} = 60$ V	

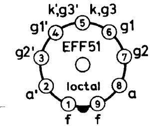
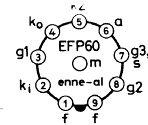
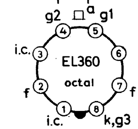
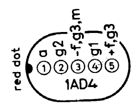
Type and application	V_f *(V)* I_f *(A)*	*Characteristic data*			*Limiting values*	*Base connections*
E188CC Double triode	6.3 0.335	*Typical* $V_{ba} = 100$ V $V_{bg} = +9$ V $R_k = 680\ \Omega$	$I_a = 15$ mA $S = 12.5$ mA/V $\mu = 33$	$R_{eq.} = 250\ \Omega$ $F = 4.6$ dB at $f = 200$ MHz	$W_a = 1.65$ W $I_k = 22$ mA $V_{+k/-f} = 150$ V $V_{-k/+f} = 100$ V	
E235L Output pentode	6.3 1.2	*Typical* $V_a = 100$ V $V_{g2} = 100$ V $R_k = 75\ \Omega$	$I_a = 100$ mA $I_{g2} = 5.2$ mA $S = 14$ mA/V	$R_i = 5$ kΩ $\mu_{g2g1} = 5.6$	$W_a = 15$ W $I_k = 220$ mA $V_{+k/-f} = 250$ V $V_{-k/+f} = 200$ V	
E236L Output pentode	6.3 1.2	*Typical* $V_a = 100$ V $V_{g2} = 100$ V $R_k = 75\ \Omega$	$I_a = 100$ mA $I_{g2} = 5.2$ mA $S = 14$ mA/V	$R_i = 5$ kΩ $\mu_{g2g1} = 5.6$	$W_a = 15$ W $I_k = 220$ mA $V_{ap} = 7$ kV $V_{+k/-f} = 250$ V	
E280F Wide band pentode	6.3 0.315	*Typical* $V_{ba} = 190$ V $V_{bg2} = 160$ V $V_{g3} = 0$ V $V_{bg1} = +8$ V	$R_k = 370\ \Omega$ $I_a = 20$ mA $I_{g2} = 6$ mA $S = 26$ mA/V	$R_i = 100$ kΩ $\mu_{g2g1} = 60$ $R_{eq.} = 220\ \Omega$	$W_a = 4$ W $I_k = 30$ mA $V_{+k/-f} = 120$ V $V_{-k/+f} = 60$ V	

E282F Wide band pentode	6.3 0.35	*Typical* V_{ba} = 125 V V_{bg2} = 125 V V_{g3} = 0 V V_{bg1} = +12 V	R_k = 300 Ω I_a = 35 mA I_{g2} = 11 mA S = 26 mA/V	μ_{g2g1} = 27 $R_{eq.}$ = 200 Ω F = 7 dB at f = 100 MHz	W_a = 4.2 W I_k = 50 mA V_{kf} = 100 V	
E283CC A.F. double triode	6.3 0.33	*Typical* V_a = 250 V R_k = 1.6 kΩ *Operating* V_{ba} = 250 V R_a = 47 kΩ R_k = 1.2 kΩ	I_a = 1.25 mA S = 1.6 mA/V R_a = 150 kΩ I_a = 1.18 mA V_o = 23 V_{rms}	R_i = 62.5 kΩ μ = 100 V_o/V_i = 37.5 d_{tot} = 7%	W_a = 1.2 W I_k = 9 mA V_{kf} = 200 V	
E288CC R.F. double triode	6.3 0.475	*Typical* V_{ba} = 100 V V_{bg} = +9 V R_k = 350 Ω	I_a = 30 mA S = 20 mA/V R_i = 1.25 kΩ	μ = 25 $R_{eq.}$ = 200 Ω F = 5.7 dB	W_a = 3 W I_k = 40 mA V_{kf} = 150 V	
E810F Wide band pentode	6.3 0.34	*Typical* V_{ba} = 135 V V_{bg2} = 165 V V_{g3} = 0 V V_{bg1} = +12.5 V	R_k = 360 Ω I_a = 35 mA I_{g2} = 5 mA S = 50 mA/V	R_i = 42 kΩ μ_{g2g1} = 57 $R_{eq.}$ = 110 Ω	W_a = 5 W I_k = 50 mA V_{kf} = 100 V	
EC80 U.H.F. triode	6.3 0.34	*Typical* V_a = 250 V V_g = −1.5 V	I_a = 15 mA S = 12 mA/V	μ = 80 f = <500 MHz	W_a = 4 W I_k = 15 mA V_{kf} = 100 V	

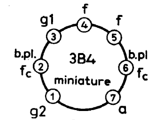
SPECIAL QUALITY TUBES

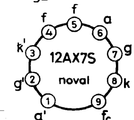
Type and application	V_f (*V*) I_f (*A*)	*Characteristic data*			*Limiting values*	*Base connections*
EC81 U.H.F. oscillator triode	6.3 0.175	*Typical* $V_a = 150$ V $V_g = -2$ V	$I_a = 30$ mA $S = 5.5$ mA/V	$\mu = 16$ $f = <750$ MHz	$W_a = 3.5$ W $I_k = 30$ mA $V_{kf} = 100$ V	
EC90 R.F. triode	6.3 0.15	*Typical* $V_a = 250$ V $V_g = -8.5$ V	$I_a = 10.5$ mA $S = 2.2$ mA/V	$R_i = 7.7$ kΩ $\mu = 17$	$W_a = 3.5$ W $I_k = 30$ mA $V_{kf} = 150$ V	
		Operating $f = 100$ MHz $V_a = 300$ V $V_g = -27$ V	$I_a = 17$ mA $+I_g = 2.9$ mA	$W_o = 3.3$ W $\eta = 55\%$		
EC91 U.H.F. triode	6.3 0.3	*Typical* $V_a = 250$ V $V_g = -1.5$ V $I_a = 10$ mA	$S = 8.5$ mA/V $R_i = 12$ kΩ	$\mu = 100$ $R_{eq.} = 400$ Ω	$W_a = 2.5$ W $I_k = 15$ mA $V_{kf} = 150$ V	
EC1000 Triode measuring application	6.3 0.185	*Typical* $V_a = 80$ V $V_g = -2$ V $I_a = 14$ mA	$S = 14.5$ mA/V $\mu = 27.5$	$-I_g = \leqslant 0.01$ μA $f = 400$ MHz	$W_a = 1.5$ W $I_k = 22$ mA $V_{kf} = 55$ V	

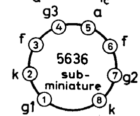
EC8010 U.H.F. triode	6.3 0.28	*Typical* $V_{ba} = 200$ V $R_a = 2.4$ kΩ	$R_k = 47$ Ω $I_a = 25$ mA	$S = 28$ mA/V $\mu = 60$	$W_a = 4.5$ W $I_k = 35$ mA $V_{kf} = 100$ V	
ECC186 Double triode computer application	6.3 0.3 or 12.6 0.15	*Typical* $V_a = 250$ V $V_g = -8.5$ V $R_g = 0.1$ MΩ	$I_a = 10.5$ mA $S = 2.2$ mA/V	$R_i = 7.7$ kΩ $\mu = 17$	$W_a = 2.75$ W $I_k = 20$ mA $V_{kf} = 90$ V	
ECC2000 V.H.F. double triode	6.3 0.335	*Typical* $V_a = 90$ V $V_g = -1.4$ V $V_{a'} = 90$ V $V_{sn} = 0$ V $V_{g'} = -1.4$ V	$I_a = 27$ mA $S = 22$ mA/V $I_a = 27$ mA $S = 17.5$ mA/V	$\mu = 28$ $R_{eq.} = 150$ Ω $\mu = 27$ $R_{eq.} = 200$ Ω	$W_a = 2.7$ W $I_k = 40$ mA $V_{+k/-f} = 150$ V	
EF50 Wide band pentode	6.3 0.3	*Operating* $V_a = 250$ V $V_{g2} = 250$ V $V_{g3} = 0$ V $R_k = 32$ Ω	$C_k = 50$ pF $V_R = -1.55$ V $I_a = 10$ mA	$I_{g2} = 3$ mA $S = 6.5$ mA/V $R_i = 1$ MΩ	$W_a = 3$ W $I_k = 15$ mA $V_{kf} = 100$ V	
EF51 V.H.F. pentode	6.3 0.35	*Typical* $V_a = 250$ V $V_{g2} = 250$ V $V_{g3} = 0$ V $V_{g1} = -2$ V	$I_a = 14$ mA $I_{g2} = 2.6$ mA $S = 9.5$ mA/V	$R_i = 0.5$ MΩ $\mu_{g2g1} = 65$ $R_{eq.} = 1$ kΩ	$W_a = 4.5$ W $I_k = 20$ mA $V_{kf} = 50$ V	

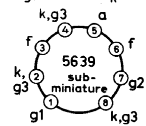
Type and application	V_f (V) I_f (A)	Characteristic data			Limiting values	Base connections
EFF51 H.F. double pentode	6.3 0.75	*Operating* V_a = 300 V V_{g2} = 225 V R_{g2} = 42 kΩ	V_{g1} = −2 V I_a = 10 mA I_{g2} = 1.8 mA	S = 9 mA/V R_i = 0.25 MΩ $R_{eq.}$ = 750 Ω	W_a = 3 W I_k = 15 mA V_{kf} = 50 V	
EFP60 Secondary emission pentode	6.3 0.37	*Typical* V_a = 250 V V_{g2} = 250 V V_{g3} = 0 V V_{k3} = 150 V	V_{g1} = −2 V I_a = 20 mA I_{g2} = 1.5 mA I_{k3} = −15.6 mA	S = 25 mA/V R_i = 70 μ_{g2g1} = 110	W_a = 2 W W_{k3} = 1 W I_{k1} = 8 mA V_{k1f} = 50 V	
EL360 Output pentode	6.3 1.27	V_a = 250 V V_{g2} = 250 V	V_{g1} = −46 V I_a = 48 mA	I_{g2} = 5.5 mA S = 6.9 mA/V	W_a = 15 W I_k = 200 mA V_{kf} = 200 V	
1AD4 Sharp cut-off pentode	1.25 0.1	*Typical* V_a = 90 V V_{g2} = 90 V V_{g1} = −1.6 V	I_a = 5.7 mA I_{g2} = 1.5 mA S = 2.6 mA/V	R_i = 0.5 MΩ μ_{g2g1} = 18	W_a = 0.55 W I_k = 8.5 mA V_a = 90 V	
3B4 Output pentode	2.5 0.165 or 1.25 0.33	*Typical* V_a = 150 V V_{g2} = 135 V	V_{g1} = −38 V I_a = 25 mA	I_{g2} = 6.2 mA S = 1.7 mA/V	W_a = 4 W I_k = 35 mA	

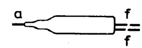
12AX7S A.F. double triode	6.3 0.3 or 12.6 0.15	*Typical* $V_a = 250$ V $V_g = -2$ V	$I_a = 1.2$ mA $S = 1.6$ mA/V	$R_i = 62.5$ kΩ $\mu = 100$	$W_a = 1.1$ W $I_k = 20$ mA $V_{kf} = 100$ V
5636 Dual control pentode	6.3 0.15	*Typical* $V_a = 100$ V $V_{g2} = 100$ V $V_{g3} = 0$ V	$R_k = 150$ Ω $I_a = 5.3$ mA $I_{g2} = 4$ mA	$S_{ag1} = 3.2$ mA/V $S_{ag3} = 0.5$ mA/V $R_i = 110$ kΩ	$W_a = 1.1$ W $I_k = 16$ mA $V_{kf} = 200$ V
5639 Output pentode	6.3 0.45	*Operating class A* $V_a = 150$ V $V_{g2} = 100$ V $R_k = 100$ Ω	$I_a = 21$ mA $I_{g2} = 4$ mA $S = 9$ mA/V	$R_i = 50$ kΩ $R_{a\sim} = 9$ kΩ $W_o = 1$ W	$W_a = 4$ W $I_k = 40$ mA $V_{kf} = 200$ V
5642 E.H.T. rectifier	1.25 0.2				$V_{a\,invp} = 10$ kV $I_a = 250$ μA $I_{ap} = 1.5$ mA
5654 Wide band pentode	6.3 0.175	*Typical* $V_a = 120$ V $V_{g2} = 120$ V $V_{g1} = -2$ V	$I_a = 7.5$ mA $I_{g2} = 2.5$ mA	$S = 5$ mA/V $R_i = 0.25$ MΩ	$W_a = 1.65$ W $I_k = 20$ mA $V_{kf} = 135$ V











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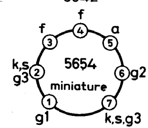
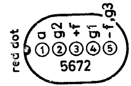
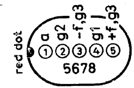
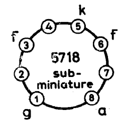
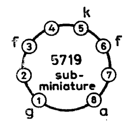
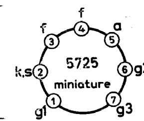
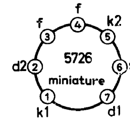
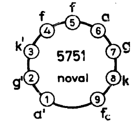
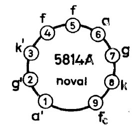
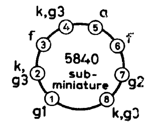
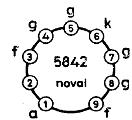
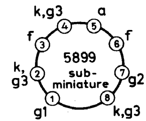
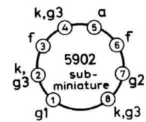
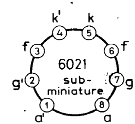
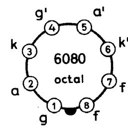


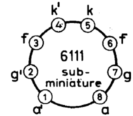
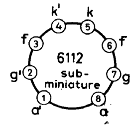
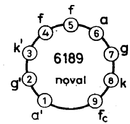
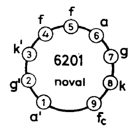
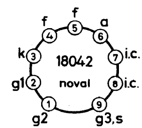
SPECIAL QUALITY TUBES

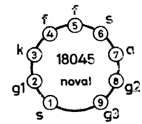
Type and application	V_f *(V)* I_f *(A)*	*Characteristic data*			*Limiting values*	*Base connections*
5672 A.F. power pentode	1.25 0.05	*Operating class A* $V_a = 67.5$ V $V_{g2} = 67.5$ V $V_{g1} = -6.5$ V	$I_a = 3.1$ mA $I_{g2} = 0.95$ mA $S = 0.65$ mA/V	$R_a = 20$ kΩ $W_o = 65$ mW $d_{tot} = 10\%$	$V_a = 90$ V $V_{g2} = 90$ V $I_k = 5$ mA	
5678 pentode	1.25 0.05	*Typical* $V_a = 67.5$ V $V_{g2} = 67.5$ V $V_{g1} = 0$ V	$I_a = 1.8$ mA $I_{g2} = 0.48$ mA	$S = 1.1$ mA/V $R_i = 1$ MΩ	$V_a = 90$ V $V_{g2} = 67.5$ V	
5718 U.H.F. oscillator triode	6.3 0.15	*Typical* $V_a = 100$ V $R_k = 150$ Ω $I_a = 8.5$ mA	$S = 5.8$ mA/V $R_i = 4.7$ kΩ	$\mu = 27$ $f = < 1000$ MHz	$W_a = 3.3$ W $I_k = 22$ mA $V_{kf} = 200$ V	
5719 A.F. triode	6.3 0.15	*Typical* $V_{ba} = 100$ V $R_k = 1.5$ kΩ	$I_a = 0.73$ mA $S = 1.7$ mA/V	$R_i = 41$ kΩ $\mu = 70$	$W_a = 0.55$ W $I_k = 3.3$ mA $V_{kf\,p} = 200$ V	
5725 Sharp cut-off pentode	6.3 0.175	*Typical* $V_a = 120$ V $V_{g2} = 120$ V $V_{g3} = 0$ V	$V_{g1} = -2$ V $I_a = 5.2$ mA $I_{g2} = 3.5$ mA	$S_{g1} = 3.2$ mA/V $S_{g3} = 0.47$ mA/V $R_i = 150$ kΩ	$W_a = 1.85$ W $I_k = 20$ mA $V_{kf} = 100$ V	

5726 Double diode	6.3 0.3	*Operating* $V_{tr} = 2 \times 165\ V_{rms}$ $C = 8\ \mu F$	$R_s = 300\ \Omega$	$I_o = \geqslant 16$ mA	$V_{inv\,p} = 360$ V $I_{d\,p} = 60$ mA $V_{kf\,p} = 360$ V	
5751 A.F. double triode	6.3 0.35 or 12.6 0.175	*Typical* $V_{ba} = 250$ V $R_k = 3\ k\Omega$ $V_{bg} = 0$ V	$I_a = 1$ mA $S = 1.2$ mA/V	$R_i = 58\ k\Omega$ $\mu = 70$	$W_a = 0.8$ W $V_{kf} = 100$ V	
5814A Double triode	6.3 0.35 or 12.6 0.175	*Typical* $V_{ba} = 250$ V $R_k = 800\ \Omega$ $V_{bg} = 0$ V	$I_a = 10.5$ mA $S = 2.2$ mA/V	$R_i = 7.7\ k\Omega$ $\mu = 17$	$W_a = 3$ W $I_k = 22$ mA $V_{kf} = 100$ V	
5840 R.F. pentode	6.3 0.15	*Typical* $V_{ba} = 100$ V $V_{bg2} = 100$ V $R_k = 150\ \Omega$	$I_a = 7.5$ mA $I_{g2} = 2.4$ mA	$S = 5$ mA/V $R_i = 260\ k\Omega$	$W_a = 1.1$ W $I_k = 16.5$ mA $V_{kf} = 200$ V	
5842 Wide band triode	6.3 0.3	*Typical* $V_a = 150$ V $R_k = 60\ \Omega$	$I_a = 26$ mA $S = 24$ mA/V	$R_i = 2.1\ k\Omega$ $\mu = 50$	$W_a = 4.5$ W $I_k = 38$ mA $V_{kf} = 60$ V	

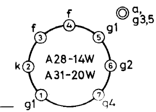
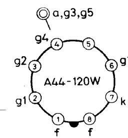
SPECIAL QUALITY TUBES

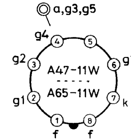
Type and application	V_f (*V*) I_f (*A*)	*Characteristic data*			*Limiting values*	*Base connections*
5899 Remote cut-off pentode	6.3 0.15	*Typical* $V_a = 100$ V $V_{g2} = 100$ V $R_k = 120\ \Omega$	$I_a = 7.2$ mA $I_{g2} = 2$ mA	$S = 4.5$ mA/V $R_i = 260\ k\Omega$	$W_a = 1.1$ W $I_k = 16.5$ mA $V_{kf} = 200$ V	
5902 Output pentode	6.3 0.45	*Operating class A* $V_{ba} = 109$ V $V_{bg2} = 109$ V $R_k = 270\ \Omega$	$I_a = 30$ mA $I_{g2} = 2.2$ mA $S = 4.2$ mA/V	$R_i = 15\ k\Omega$ $R_{a\sim} = 3\ k\Omega$ $W_o = 1$ W	$W_a = 4$ W $I_k = 50$ mA $V_{kf} = 200$ V	
6021 Double triode	6.3 0.3	*Typical* $V_a = 100$ V $R_k = 150\ \Omega$	$I_a = 6.5$ mA $S = 5.4$ mA/V	$R_i = 6.5\ k\Omega$ $\mu = 35$	$W_a = 0.7$ W $I_k = 22$ mA $V_{kf} = 200$ V	
6080 Double triode Series regulator	6.3 2.5	*Typical* $V_a = 100$ V $R_k = 300\ \Omega$	$I_a = 100$ mA $S = 6.5$ mA/V	$R_i = 300\ \Omega$ $\mu = 2$	$W_a = 13$ W $I_k = 125$ mA $V_{kf\,p} = 300$ V	

6111 Double triode	6.3 0.3	*Typical* $V_a = 100$ V $V_g = -1.9$ V	$I_a = 8.5$ mA $S = 5$ mA/V	$R_i = 4$ kΩ $\mu = 20$	$W_a = 1.1$ W $I_k = 22$ mA $V_{kf\,p} = 200$ V	
6112 Double triode	6.3 0.3	*Typical* $V_a = 100$ V $V_g = -1.2$ V	$I_a = 0.8$ mA $S = 1.8$ mA/V	$R_i = 38.8$ kΩ $\mu = 70$	$W_a = 0.55$ W $I_k = 3.3$ mA $V_{kf\,p} = 200$ V	
6189 Double triode	6.3 0.3 or 12.6 0.15	*Typical* $V_a = 250$ V $V_g = -8.5$ V $I_a = 10.5$ mA	$S = 2.2$ mA/V $R_i = 7.7$ kΩ	$\mu = 17$ $-I_g = <0.5\ \mu$A	$W_a = 3$ W $I_k = 22$ mA $V_{kf} = 110$ V	
6201 Double triode	6.3 0.3 or 12.6 0.15	*Typical* $V_a = 250$ V $R_k = 200\ \Omega$ $I_a = 10$ mA	$S = 5.5$ mA/V $R_i = 10.9$ kΩ	$\mu = 60$ $-I_{g1} = <0.7\ \mu$A	$W_a = 2.8$ W $I_k = 18$ mA $V_{kf} = 100$ V	
18042 pentode	18 0.1	*Typical* $V_a = 210$ V $V_{g2} = 120$ V $V_{g3} = 0$ V $R_k = 165\ \Omega$	$I_a = 10$ mA $I_{g2} = 2.1$ mA $S = 9$ mA/V	$R_i = 0.5$ MΩ $\mu_{g2g1} = 38$ $R_{eq.} = 750\ \Omega$	$W_a = 2.1$ W $I_k = 16$ mA $V_{kf} = 100$ V	

Type and application	V_f *(V)* I_f *(A)*	*Characteristic data*			*Limiting values*	*Base connections*
18045 Output pentode	18 0.13	*Operating class A* $V_a = 210$ V $V_{g2} = 210$ V $V_{g3} = 0$ V $R_k = 120\ \Omega$ $I_a = 20$ mA	$I_{g2} = 5.3$ mA $S = 11$ mA/V $R_i = 0.3$ MΩ $\mu_{g2g1} = 36$	$R_{eq.} = 1.2$ kΩ $R_{a\sim} = 15$ kΩ $W_o = 1$ W $d_{tot} = 5\%$	$W_a = 4.5$ W $I_k = 30$ mA $V_{kf} = 120$ V	

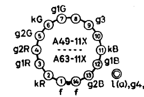
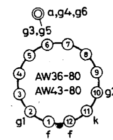
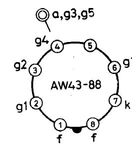
CATHODE-RAY TUBES — T.V. Picture tubes

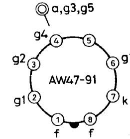
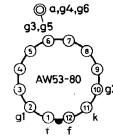
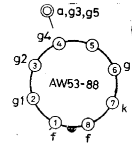
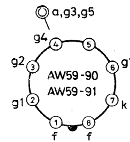
Type Deflection angle Transmission	V_f (V) I_f (A)	Typical operating characteristics	Min. useful screen diag.	width	height	Max. overall length	Base connections
A28-14W[1] 90° 50 %	11 0.068	$V_{a,g3,g5} = 11$ kV $V_{g4} = 0$–350 V[2] $V_{g2} = 250$ V $-V_{g1} = 35$–69 V[3] $V_k = 36$–66 V[4]	263	228	171	250	
A31-20W[1] 90° 50 %			295	257	195	277	
A44-120W[1] 110° 48 %	6.3 0.3	$V_{a,g3,g5} = 18$ kV $V_{g4} = 0$–400 V[2] $V_{g2} = 400$ V $-V_{g1} = 40$–77 V[3] $V_k = 36$–66 V[4]	413	346	270	291	
A47-11W[1] 110° 48 %			446	384	305	309	
A47-14W 110° 48 %			446	384	305	309	
A47-26W[1] 110° 48 %			446	384	305	309	

A50-120W[1]) 110° 45 %			473	394	308	319	
A59-11W[1]) 110° 45 %	6.3	$V_{a,g3,g5}$ = 20 kV	566	489	385	367	
	0.3	V_{g4} = 0–400 V[2])					
		V_{g2} = 400 V					
A59-15W 110° 45 %		$-V_{g1}$ = 40–77 V[3])	566	489	385	367	
		V_k = 36–66 V[4])					
A59-16W[1]) 110° 45 %			567	491	388	375	
A59-23W[1]) 110° 45 %			566	489	385	367	
A61-120W[1]) 110° 42 %			578	481	375	370	
A65-11W[1]) 110° 43 %			617	530	416	391	

[1]) Tube can be used without safety panel. [2]) Voltage range to obtain optimum overall focus at 100 μA beam current. [3]) Grid voltage for visual cut-off. [4]) Cathode voltage for visual cut-off.

CATHODE-RAY TUBES - T.V. Picture tubes

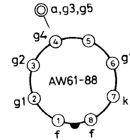
Type *Deflection angle* *Transmission*	V_f *(V)* I_f *(A)*	*Typical operating characteristics*	*Min. useful screen* *diag.*	*width*	*height*	*Max. overall length*	*Base connections*
A49-11X[1]) 90° 54 %	*Colour tubes*		459	396	309	458	
A56-11X[1]) 90° 53 %	6.3 0.9	$V_{a,g4,g5}$ = 25 kV V_{g3} = 4.2–5.0 kV V_{g2} = 210–495 V $-V_{g1}$ = 70–140 V[3])	533	447	337	482	
A56-120X[1]) 90° 53 %			534	447	337	482	
A63-11X[1]) 90° 52,5 %			584	504	396	531	
AW36-80 90° 75 %	6.3 0.3	$V_{a,g4,g6}$ = 12 kV $V_{g3,g5}$ = −70 to 230 V[2]) V_{g2} = 300 V $-V_{g1}$ = 40–80 V[3])	330	306.5	241	369	
AW43-80 90° 75 %	6.3 0.3	$V_{a,g4,g6}$ = 16 kV $V_{g3,g5}$ = −75 to 235 V[2]) V_{g2} = 300 V $-V_{g1}$ = 40–80 V[3])	390	362	273	397	
AW43-88 110° 75 %	6.3 0.3	$V_{a,g3,g5}$ = 16 kV V_{g2} = 300 V V_{g4} = 0–400 V[2]) $-V_{g1}$ = 30–72 V[3]) V_k = 28–60 V[4])	400	374.5	295	326	

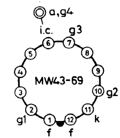
AW47-91 110° 75%	6.3 0.3	$V_{a,g3,g5}$ = 20 kV V_{g4} = 0–400 V[2] V_{g2} = 400 V $-V_{g1}$ = 40–77 V[3] V_k = 36–66 V[4]	446	384	305	309	
AW53-80 90° 70%	6.3 0.3	$V_{a,g4,g6}$ = 16 kV $V_{g3,g5}$ = −75 to 235 V[2] V_{g2} = 300 V $-V_{g1}$ = 40–80 V[3]	511	482	378	492	
AW53-88 110° 75%	6.3 0.3	$V_{a,g3,g5}$ = 16 kV V_{g4} = 0–400 V[2] V_{g2} = 300 V $-V_{g1}$ = 30–72 V[3] V_k = 28–60 V[4]	514.5	484	382.5	381	
AW59-90 110° 75%	6.3 0.3	$V_{a,g3,g5}$ = 18 kV V_{g4} = 0–400 V[2] V_{g2} = 300 V $-V_{g1}$ = 30–72 V[3] V_k = 28–60 V[4]	566	489	385	386	
AW59-91 110° 75%	6.3 0.3	$V_{a,g3,g5}$ = 20 kV V_{g4} = 0–400 V[2] V_{g2} = 400 V $-V_{g1}$ = 40–77 V[3] V_k = 36–66 V[4]	566	489	385	366	

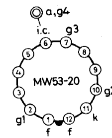
[1]) Tube can be used without safety panel. [2]) Voltage range to obtain optimum overall focus at 100 μA beam current. [3]) Grid voltage for visual cut-off. [4]) Cathode voltage for visual cut-off.

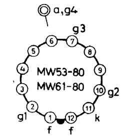
CATHODE-RAY TUBES — T.V. Picture tubes

Type *Deflection angle* *Transmission*	V_f *(V)* I_f *(A)*	*Typical operating characteristics*	*Min. useful screen* *diag.*	*width*	*height*	*Max. overall length*	*Base connections*
AW61-88 110° 75 %	6.3 0.3	$V_{a,g3,g5}$ = 16 kV V_{g2} = 300 V V_{g4} = 0–400 V [1]) $-V_{g1}$ = 30–72 V [2]) V_k = 28–60 V [3])	579.5	544.5	428.5	411	see diagram AW61-88
MW43-69 70° 66 %	6.3 0.3	$V_{a,g4}$ = 14 kV V_{g3} = 0–250 V V_{g2} = 300 V $-V_{g1}$ = 40–86 V [2])	390	362	272	495	see diagram MW43-69
MW53-20 70° 70 %	6.3 0.3	$V_{a,g4}$ = 16 kV V_{g3} = 0–300 V V_{g2} = 300 V $-V_{g1}$ = 40–80 V [2])	506	485	360	591	see diagram MW53-20
MW53-80 90° 75 %	6.3 0.3	$V_{a,g4}$ = 16 kV V_{g3} = 0–300 V V_{g2} = 300 V $-V_{g1}$ = 40–80 V [2])	511	482	378	514	



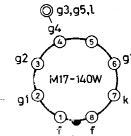
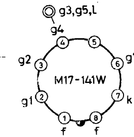
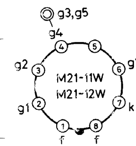
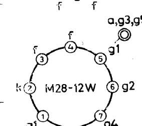


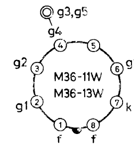
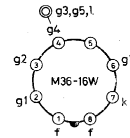


MW61-80 90° 75%	6.3 0.3	$V_{a,g4} = 16$ kV $V_{g3} = 0–300$ V $V_{g2} = 300$ V $-V_{g1} = 40–80$ V [2])	576.5	544.5	428.5	543	

[1]) Voltage range to obtain optimum overall focus at 100 μA beam current. [2]) Grid voltage for visual cut-off. [3]) Cathode voltage for visual cut-off.

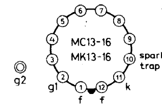
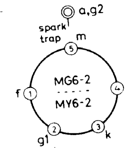
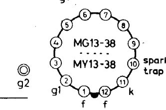
CATHODE-RAY TUBES — Monitor tubes

Type *Deflection angle* *Resolution (min)*	V_f *(V)* I_f *(A)*	*Typical operating characteristics*	*Min. useful screen (mm)*			*Max. overall length*	*Base connections*
			diag.	*width*	*height*		
M17-140W 70° 1000 lines	6.3 0.3	$V_{g3,g5(l)} = 14$ kV $V_{g4} = 0$–400 V $V_{g2} = 400$ V $-V_{g1} = 30$–62 V	155	124	93	232	
M17-141W 70° 1000 lines	6.3 0.3	$V_{g3,g5(l)} = 16$ kV $V_{g4} = 0$–400 V $V_{g2} = 600$ V $-V_{g1} = 40$–90 V	155	124	93	237	
M21-11W 90° 650 lines	11 0.07	$V_{g3,g5(l)} = 12$ kV $V_{g4} = 0$–400 V $V_{g2} = 400$ V $-V_{g1}$ 2) $= 32$–69 V V_k 3) $= 29$–62 V	195	180	135	222	
M21-12W 110° 525 lines	6.3 0.3	$V_{g3,g5(l)} = 16$ kV $V_{g4} = 0$–400 V $V_{g2} = 300$ V $-V_{g1}$ 2) $= 35$–72 V	200	190.5	149.2	205	
M28-12W 90° 350 lines	11 0.07	$V_{a,g3,g5} = 13$ kV V_{g4} 1) $= 50$–400 V $V_{g2} = 350$ V $-V_{g1}$ 2) $= 46$–91 V	262.5	228	171	250	

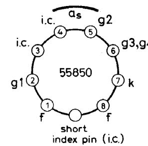
M36-11W 90° 650 lines	11 0.07	$V_{g3,g5(l)} = 16$ kV V_{g4} 1) $= 0–500$ V $V_{g2} = 600$ V $-V_{g1}$ 2) $= 43–98$ V V_k 3) $= 40–90$ V	330	306.5	241	317	
M36-13W 110° 625 lines	6.3 0.3	$V_{g3,g5(l)} = 16$ kV $V_{g4} = 0–400$ V $V_{g2} = 400$ V $-V_{g1}$ 2) $= 40–85$ V	333.4	314.3	250.8	269	
M36-16W 90° 650 lines	11 0.068	$V_{g3,g5(l)} = 16$ kV $V_{g4} = 0–500$ V $V_{g2} = 600$ V $-V_{g1} = 43–98$ V $V_k = 40–90$ V	329	305	241	317	

1) Voltage range to obtain optimum overall focus at 100 μA beam current. 2) Grid voltage for visual cut-off.
3) Cathode voltage for visual cut-off.

CATHODE-RAY TUBES — Flying spot scanners and Projection tubes

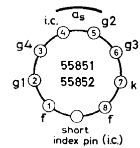
Type *Deflection angle* *Resolution (min)*	V_f *(V)* I_f *(A)*	*Typical operating characteristics*	*Min. useful screen (mm)* *diag.*	*width*	*height*	*Max. overall length*	*Base connections*
MC13-16 **MK13-16** 40° 1000 lines	6.3 0.3	$V_{g2(l)} = 25$ kV $I_l = 50$–$150\ \mu A$ $-V_{g1}(I_l=0) = 50$–100 V	Useful screen diam. min. 108 mm			347	
MG6-2 **MU6-2** **MW6-2** **MY6-2** 67.5°	6.3 0.3	$V_{g2(l)} = 25$ kV $-V_{g1}$[1] $= 40$–90 V	Useful screen diam. min. 55 mm			268	
MG13-38 **MU13-38** **MW13-38** **MY13-38** 47°	6.3 0.3	$V_{g2(l)} = 50$ kV $-V_{g1}$[1] $= 100$–170 V $I_{g2\,p}$ = min. 2.5 mA	Useful diam. min. 69×92 mm²			374	

[1]) Grid voltage for visual cut-off.

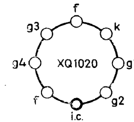
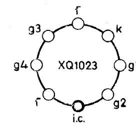
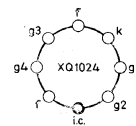
Type / *Resolution*	V_f *(V)* / I_f *(mA)*	*Applications*		*Dimensions diam.*	*Dimensions length*	*Base connections*
55850 600–900 lines	6.3 / 90	for use in black and white or colour T.V. cameras	focusing: magn. deflection: magn.	25.4	158	

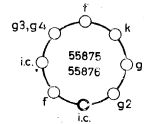
The **55850** has 5 grades namely:

55850AM:	low cost tube for experiments, amateur use etc.
55850F :	for use in film scanners.
55850N :	for normal industrial applications.
55850S :	for industrial and broadcast applications in which a higher picture quality is required.
55850SR :	for use in X-ray medical equipment

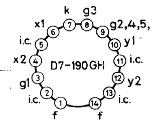
Type / *Resolution*	V_f *(V)* / I_f *(mA)*	*Applications*		*Dimensions diam.*	*Dimensions length*	*Base connections*
55851 1000 lines	6.3 / 90	for industrial, medical and broadcast applic.	focusing: magn. deflection: magn.	25.4	158	
55852 1000 lines	6.3 / 300					

CATHODE-RAY TUBES - Camera tubes (Plumbicons)

Type Resolution	V_f (V) I_f (mA)	Applications		Dimensions diam.	Dimensions length	Base connections
XQ1020	6.3 300	for use in black and white studio cameras	focusing: magn. deflection: magn. >275 μA/lm	30.6	220	
XQ1020L **XQ1020R** **XQ1020G** **XQ1020B**		for use in colour studio cameras	>275 μA/lm $>$ 60 μA/lm >125 μA/lm $>$ 32 μA/lm			
XQ1023	6.3 300	for use in black and white studio cameras	focusing: magn. deflection: magn. 450 μA/lm	30.6	220	
XQ1023L **XQ1023R**		for use in colour studio cameras	450 μA/lm 160 μA/lm			
XQ1024	6.3 300	for use in black and white cameras in industrial, educational and medical applications	focusing: magn. deflection: magn. 450 μA/lm	30.6	220	
XQ1024R		for use in the chrominance channel of industrial, educational and medical cameras	160 μA/lm			
55875	6.3 90	for use in black and white studio cameras	focusing: magn. deflection: magn. >275 μA/lm	30.6	220	

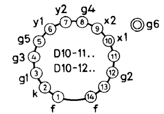
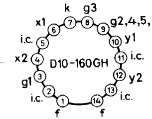
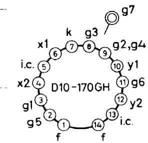
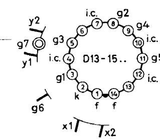
55875L **55875R** **55875G** **55875B**		for use in colour studio cameras	> 275 μA/lm > 60 μA/lm > 125 μA/lm > 32 μA/lm			
55876	6.3 90	for use with X-ray image intensifier in medical equipment	focusing: magn. deflection: magn. > 175 μA/lm	30.6	220	

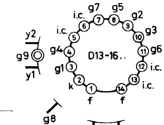
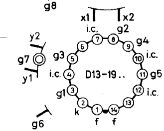
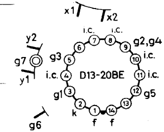
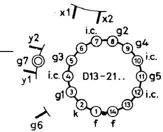
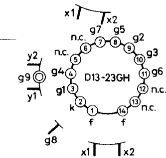
CATHODE-RAY TUBES - Instrument tubes

Type	V_f *(V)* I_f *(A)*	*Typical operating conditions*		*Display area* *Deflection factor* *hor.* *vert.*	*Max. overall length*	*Base connections*
D7-190GH	6.3 0.3	$V_{g2,g4,g5(l)} = 1$ kV $V_{g3} = 150$ V	$-V_{g1} = 30$ V [1]	6 cm × 5 cm $M_x =$ 29 V/cm $M_y =$ 12 V/cm	225	

[1]) Grid voltage for visual cut-off.

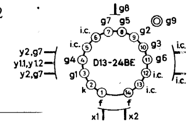
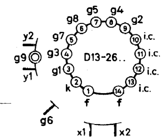
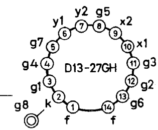
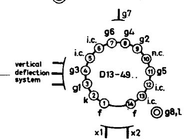
CATHODE-RAY TUBES - Instrument tubes

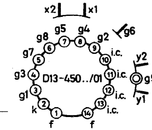
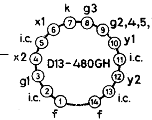
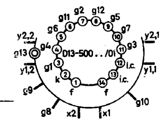
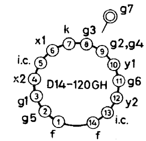
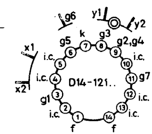
Type	V_f (*V*) I_f (*A*)	*Typical operating conditions*		*Display area Deflection factor hor.*	*vert.*	*Max. overall length*	*Base connections*
D10-11BE **D10-11GH** **D10-11GM** **D10-11GP** **D10-12BE** **D10-12GH** **D10-12GM** **D10-12GP**	6.3 0.095 6.3 0.3	$V_{g6(l)} = 4$ kV $V_{g5} = 1$ kV $V_{g4} = 1$ kV	$V_{g3} = 50$–200 V $V_{g2} = 1$ kV $-V_{g1} = 25$–67 V [1])	full scan × $M_x =$ 27.5 V/cm	6 cm $M_y =$ 9.8 V/cm	320	 
D10-160GH	6.3 0.3	$V_{g2,g4,g5(l)} = 1.5$ kV $V_{g3} = 225$ V	$-V_{g1} = 50$ V [1])	8 cm × $M_x =$ 33 V/cm	6 cm $M_y =$ 14.5 V/cm	260	
D10-170GH	6.3 0.3	$V_{g7(l)} = 6$ kV $V_{g6} = 1$ kV $V_{g5} = 1$ kV	$V_{g3} = 170$–230 V $V_{g2,g4} = 1$ kV $-V_{g1} = 16$–40 V [1])	8 cm × $M_x =$ 13 V/cm	6 cm $M_y =$ 3.5 V/cm	335	
D13-15BE **D13-15GH** **D13-15GM** **D13-15GP**	6.3 0.3	$V_{g7(l)} = 4$ kV $V_{g6} = 2$ kV $V_{g5} = 2$ kV $V_{g4} = 2$ kV	$V_{g3} = 220$–710 V $V_{g2} = 2$ kV $-V_{g1} = 60$–96 V [1])	10 cm × $M_x =$ 23 V/cm	6 cm $M_y =$ 5.9 V/cm	468	

D13-16BE **D13-16GH** **D13-16GP**	6.3 0.3	$V_{g9(l)} = 10$ kV $V_{g8} = 1.67$ kV $V_{g7} = 1.67$ kV $V_{g6} = 1.67$ kV $V_{g5} = 1.67$ kV	$V_{g4} = 230–500$ V $V_{g3} = 1.67$ kV $V_{g2} = 1.67$ kV $-V_{g1} = 50–120$ V [1])	10 cm × $M_x =$ < 18 V/cm	6 cm $M_y =$ 6 V/cm	600	
D13-16../01	Equivalent to D13-16 . . but for internal graticule						
D13-19BE **D13-19GH** **D13-19GM** **D13-19GP**	6.3 0.3	$V_{g7(l)} = 10$ kV $V_{g6} = 1.67$ kV $V_{g5} = 1.67$ kV $V_{g4} = 1.67$ kV	$V_{g3} = 320–500$ V $V_{g2} = 1.67$ kV $-V_{g1} = 53–82$ V [1])	10 cm × $M_x =$ 30 V/cm	6 cm $M_y =$ 10.9 V/cm	452	
D13-20BE	6.3 0.3	$V_{g7(l)} = 24$ kV $V_{g6} = 4$ kV $V_{g5} = 4$ kV	$V_{g4,g2} = 4$ kV $V_{g3} = 0.77–1.2$ kV $-V_{g1} = 120–192$ V [1])	8 cm × $M_x =$ 74 V/cm	4 cm $M_y =$ 16 V/cm	468	
D13-21BE **D13-21GH** **D13-21GM** **D13-21GP**	6.3 0.3	$V_{g7(l)} = 10$ kV $V_{g6} = 1.67$ kV $V_{g5} = 1.67$ kV $V_{g4} = 1.67$ kV	$V_{g3} = 320–500$ V $V_{g2} = 1.67$ kV $-V_{g1} = 50–80$ V [1])	10 cm × $M_x =$ 30 V/cm	4 cm $M_y =$ 6.4 V/cm	468	
D13-23GH	6.3 0.3	$V_{g9(l)} = 6$ kV $V_{g8} = 1.3$ kV $V_{g7} = 1.3$ kV $V_{g6} = 1.3$ kV $V_{g5} = 1.3$ kV	$V_{g4} = 180–390$ V $V_{g3} = 1.3$ kV $V_{g2} = 1.3$ kV $-V_{g1} = 31–93$ V [1])	10 cm × $M_x =$ < 14 V/cm	5 cm	600	

[1]) Grid voltage for visual cut-off.

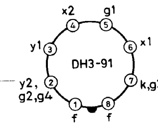
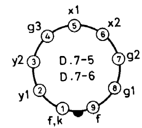
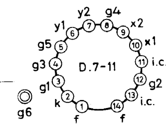
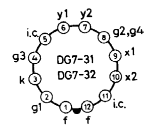
CATHODE-RAY TUBES - Instrument tubes

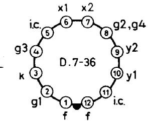
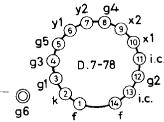
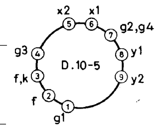
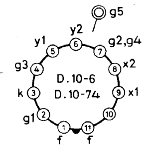
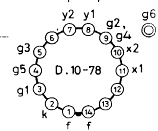
Type	V_f (V) I_f (A)	Typical operating conditions		Display area Deflection factor hor.	 vert.	Max. overall length	Base connections
D13-24BE	6.3 0.3	$V_{g9(l)} = 24$ kV $V_{g8} = 3$ kV $V_{g7} = 3$ kV $V_{g6} = 3$ kV $V_{g5} = 3$ kV	$V_{g4} = 400$–900 V $V_{g3} = 3$ kV $V_{g2} = 3$ kV $-V_{g1} = 60$–250 V [1])	6 cm × $M_x =$ <32 V/cm	2 cm $M_y =$ <8 V/cm	642	
D13-26GH **D13-26GP**	6.3 0.3	$V_{g9(l)} = 15$ kV $-V_{g8} = 12$–18 V $V_{g7} = 1.5$ kV $V_{g6} = 1.5$ kV $V_{g5} = 1.5$ kV	$V_{g4} = 1.5$ kV $V_{g3} = 375$–625 V $V_{g2} = 1.5$ kV $-V_{g1} = 40$–90 V [1])	10 cm × $M_x =$ <11.5 V/cm	6 cm $M_y =$ 2.9 V/cm	460	
D13-26../01		Equivalent to D13-26.. but for internal graticule					
D13-27GH	6.3 0.3	$V_{g8(l)} = 3$ kV $V_{g7} = 1.5$ kV $V_{g6} = 1.5$ kV $V_{g5} = 1.5$ kV	$V_{g4} = 300$–550 V $V_{g3} = 1.5$ kV $V_{g2} = 1.5$ kV $-V_{g1} = 38$–135 V [1])	full scan × $M_x =$ 24 V/cm	8 cm $M_y =$ 11.5 V/cm	350	
D13-49BE	6.3 0.3	$V_{g8(l)} = 24$ kV $V_{g7} = 4.0$ kV $V_{g6} = 4.0$ kV $V_{g5} = 4.0$ kV	$V_{g4} = 4.0$ kV $V_{g3} = 500$–1200 V $V_{g2} = 4.0$ kV $-V_{g1} = 90$–300 V [1])	2 cm × $M_x =$ 32 V/cm	6 cm $M_y =$ 10 V/cm	625	

D13-450GH/01	6.3 0.3	$V_{g9(l)} = 15$ kV $-V_{g8/g7} = 12$–18 V $V_{g7} = 1.5$ kV $V_{g6} = 1.5$ kV $V_{g5} = 1.5$ kV	$V_{g4} = 1.5$ kV $V_{g3} = 450$–550 V $V_{g2} = 1.5$ kV $-V_{g1} = 50$–100 V [1])	10 cm × 6 cm $M_x =$ 9.9 V/cm $M_y =$ 3 V/cm	459	
D13-480GH	6.3 0.3	$V_{g2,g4,g5(l)} = 2$ kV $V_{g3} = 300$ V	$-V_{g1} = 65$ V [1])	10 cm × 8 cm $M_x =$ 30 V/cm $M_y =$ 15 V/cm	310	
D13-500GH/01	6.3 0.3	$V_{g13(l)} = 15$ kV $-V_{g12-g11} = 9$–15 V $V_{g11} = 2.5$ kV $V_{g10} = 2.5$ kV $-V_{g9-g2} = 250$–375 V $V_{g8-g2} = 200$ V $V_{g7} = 2.5$ kV	$-V_{g6-g2} = 400$–600 V $V_{g5} = 2.5$ kV $-V_{g4-g2} = 600$–800 V $V_{g3} = 2.5$ kV $V_{g2} = 2.5$ kV $-V_{g1} = 50$–150 V [1])	10 cm × 6 cm $M_x =$ 15 V/cm $M_y =$ 2 V/cm	493	
D14-120GH	6.3 0.3	$V_{g7(l)} = 10$ kV $V_{g6} = 1.5$ kV $V_{g5} = 1.5$ kV	$V_{g3} = 360$ V $V_{g2,g4} = 1.5$ kV $-V_{g1} = 60$ V [1])	10 cm × 8 cm $M_x =$ 15.5 V/cm $M_y =$ 4 V/cm	385	
D14-121GH	6.3 0.3	$V_{g8(l)} = 10$ kV $V_{g7} = 1.5$ kV $V_{g6} = 1.5$ kV $V_{g5} = 1.5$ kV	$V_{g3} = 310$ V $V_{g2,g4} = 1.5$ kV $-V_{g1} = 60$ V [1])	10 cm × 8 cm $M_x =$ 15.5 V/cm $M_y =$ 4.2 V/cm	385	

[1]) Grid voltage for visual cut-off. [2]) X plates asymmetrical.

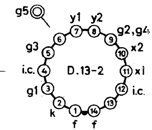
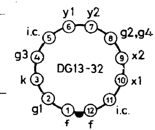
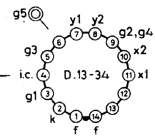
CATHODE-RAY TUBES - Instrument tubes

Type	V_f (*V*) I_f (*A*)	*Typical operating conditions*		*Display area Deflection factor* *hor.*	*vert.*	*Max. overall length*	*Base connections*
DH3-91	6.3 0.3	$V_{g4,g2,y2(l)} = 500$ V	$-V_{g1} = 8–27$ V [1])	full scan × $M_x =$ 56.5 V/cm	full scan $M_y =$ 49 V/cm	105	
DB7-5 **DG7-5** **DP7-5** **DB7-6** **DG7-6** [2]) **DP7-6**	6.3 0.3	$V_{g3(l)} = 800$ V $V_{g2} = 200–300$ V	$-V_{g1} = 0–50$ V [1])	full scan × $M_x =$ 62.5 V/cm	full scan $M_y =$ 40 V/cm	160	
DB7-11 **DH7-11** **DN7-11** **DP7-11**	6.3 0.095	$V_{g6(l)} = 1.2$ kV $V_{g5} = 300$ V $V_{g4} = 300$ V	$V_{g3} = 20–150$ V $V_{g2} = 1.2$ kV $-V_{g1} = 30–80$ V [1])	6 cm × $M_x =$ 10.7 V/cm	4.5 cm $M_y =$ 3.7 V/cm	296	
DG7-31 [2]) **DG7-32**	6.3 0.3	$V_{g4,g2(l)} = 500$ V $V_{g3} = 0–120$ V	$-V_{g1} = 50–100$ V [1])	full scan × $M_x =$ 37 V/cm	full scan $M_y =$ 21 V/cm	172	

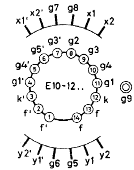
DB7-36 **DG7-36** **DN7-36**	6.3 0.3	$V_{g4,g2(l)} = 1.5$ kV $V_{g3} = 247$–397 V	$-V_{g1} = 40$–80 V [1])	6.8 cm $M_x =$ 27.3 V/cm	× 5.7 cm $M_y =$ 18.8 V/cm	296	
DB7-78 **DH7-78** **DN7-78** **DP7-78**	6.3 0.3	$V_{g6(l)} = 1.2$ $V_{g5} = 300$ $V_{g4} = 300$ $V_{g3} = 20$–150 $V_{g2} = 1.2$ $-V_{g1} = 36$–72	4.0 kV 1000 V 1000 V 35–165 V 1.0 kV 30–60 V [1])	6 cm $M_y =$ 10.7 V/cm at $V_{g6(l)} = 1.2$ kV 35.6 V/cm at $V_{g6(l)} = 4$ kV	× 4.5 cm $M_y =$ 3.7 V/cm 12.2 V/cm	296	
DB10-5 **DG10-5**	4.0 0.56	$V_{g5(l)} = 2.5$ kV $V_{g4,g2} = 1.0$ kV	$V_{g3} = 200$–340 V $-V_{g1} = 18$–46 V [1])	full scan $M_x =$ 27 V/cm	× full scan $M_y =$ 21 V/cm	344	
DB10-6 **DG10-6** **DP10-6**	6.3 0.3	$V_{g5(l)} = 4$ kV $V_{g4,g2} = 2$ kV	$V_{g3} = 400$–720 V $-V_{g1} = 45$–100 V [1])	full scan $M_x =$ 46 V/cm	× full scan $M_y =$ 36 V/cm	341	
DB10-74 **DG10-74** **DP10-74**	6.3 0.3	$V_{g5(l)} = 4$ kV $V_{g4,g2} = 2$ kV	$V_{g3} = 400$–720 V $-V_{g1} = 45$–100 V [1])	full scan $M_x =$ 46 V/cm	× full scan $M_y =$ 36 V/cm	341	
DB10-78 **DH10-78** **DN10-78** **DP10-78**	6.3 0.3	$V_{g6(l)} = 4$ kV $V_{g5} = 1$ kV $V_{g4,g2} = 1$ kV	$V_{g3} = 150$–350 V $-V_{g1} = 22$–38 V [1])	7.5 cm $M_x =$ 34 V/cm	× 5.5 cm $M_y =$ 11 V/cm	305	

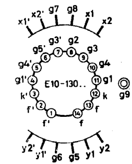
[1]) Grid voltage for visual cut-off. [2]) X plates asymmetrical.

CATHODE-RAY TUBES - Instrument tubes

Type	V_f *(V)* I_f *(A)*	*Typical operating conditions*		*Display area Deflection factor hor.*		*vert.*	*Max. overall length*	*Base connections*
DB13-2 **DG13-2** **DP13-2**	6.3 0.3	$V_{g5(l)}$ =4 kV $V_{g4,g2}$ =2 kV	V_{g3} =400–720 V $-V_{g1}$ =45–100 V [1])	full scan M_x = 31 V/cm	×	full scan M_y = 27 V/cm	435	
DG13-32	6.3 0.6	$V_{g4,g2(l)}$ =2 kV V_{g3} =340–640 V	$-V_{g1}$ = ≤90 V [1])	full scan M_x = 26 V/cm	×	full scan M_y = 21 V/cm	385	
DB13-34 **DG13-34** **DP13-34**	6.3 0.6	$V_{g5(l)}$ =4 kV $V_{g4,g2}$ =2 kV	V_{g3} =400–690 V $-V_{g1}$ =45–75 V [1])	10.2 cm M_x = 23.7 V/cm	×	10.2 cm 17.7 V/cm	430	
E10-12BE **E10-12GH** **E10-12GM** **E10-12GP**	6.3 0.3	$V_{g8(l)}$ =3 kV V_{g7} =1 kV V_{g6} =1 kV V_{g5} =1 kV	V_{g4} =220–320 V V_{g3} =1 kV V_{g2} =1 kV $-V_{g1}$ =25–90 V [1])	full scan M_x = 15 V/cm	×	7 cm M_y = 7 V/cm	410	

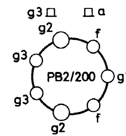
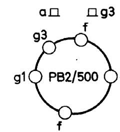
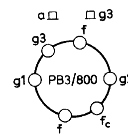
E10-130BE	6.3	$V_{g8(l)} = 4$ kV	$V_{g4} = 200$–320 V	full scan ×	7 cm	410
E10-130GH	0.3	$V_{g7} = 1$ kV	$V_{g3} = 1$ kV	$M_x =$	$M_y =$	
E10-130GM		$V_{g6} = 1$ kV	$V_{g2} = 1$ kV	17 V/cm	7.4 V/cm	
E10-130GP		$V_{g5} = 1$ kV	$-V_{g1} = 25$–90 V [1]			

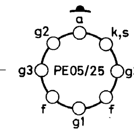
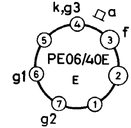
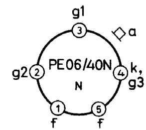
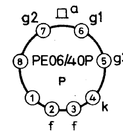
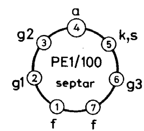




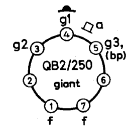
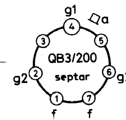
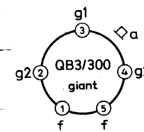
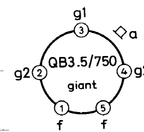
[1]) Grid voltage for visual cut-off.

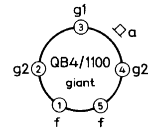
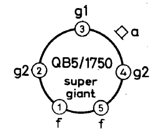
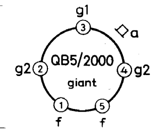
TRANSMITTING TUBES

Type and application	V_f (V) I_f (A)	Operating conditions	f (MHz)	V_a (kV)	V_{g2} (V)	I_a (mA)	W_o (W)	Limiting values V_a (kV)	Limiting values W_a (W)	Accessories	Base connections Max. dimensions diam. length
PB 2/200	12	C telegr.	20	2.0	300	190	270	2.0	110	An. conn.:	
R.F. power	3.35	C telegr. [1])	60	1.5	200	350	305	2.0	110	40600	
pentode		C ag_2 mod.	20	1.8	300	114	147	2.0	110	Socket:	
		B mod. [1])	—	2.0	400	284	400	2.0	110	40207	
PB2/500	12	C telegr.	10	2.5	400	340	600	2.5	250	An. conn.:	
R.F. power	7.3	C telegr. [1])	60	1.5	450	750	625	2.5	250	40600	
pentode		C ag_2 mod.	10	2.0	300	235	325	2.5	250	Socket:	
		B mod. [1])	—	2.5	500	566	1000	2.5	250	40200	
PB3/800	12	C telegr.	10	3.0	300	550	1200	3.0	450	An. conn.:	
R.F. power	8.5	C telegr. [1])	60	1.8	300	985	975	3.0	450	40626	
pentode		C ag_2 mod.	20	2.0	500	315	425	3.0	450	Socket:	
		B mod. [1])	—	3.0	600	770	1600	3.0	450	40201	

PE05/25 R.F. power pentode	12.6 0.7	C telegr. C ag_2 mod.	100 100	0.5 0.4	250 200	90 70	33 20	0.5 0.5	12 12	Socket: 40210/02	
PE06/40E R.F. power pentode	12.6 0.65	C telegr. [1] C ag_2 mod. [1] B mod. [1]	60 60 —	0.6 0.5 0.6	300 160 [2] 300	195 146 230	72 40 100	0.6 0.6 0.6	25 25 25	An. conn.: 28906022 Socket: 40220	
PE06/40N	6.3 1.3	For further data see PE06/40E								Socket: 2422 512 03001	
PE06/40P	6.3 1.3	For further data see PE06/40E								Socket: 2422 514 00001	
PE1/100 R.F. power pentode	12.6 1.3	C telegr. C ag_2 mod. B mod. [1]	60 60 —	1.0 0.8 1.0	250 250 250	177 120 268	132 75 194	1.0 1.0 1.0	45 45 45	Socket: 2422 513 00001	

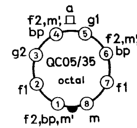
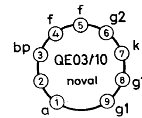
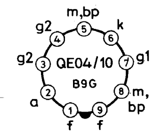
[1] Two tubes. [2] $R_{g2} = 34\ k\Omega$

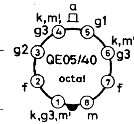
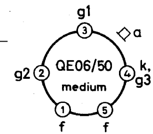
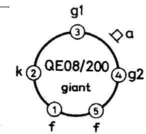
Type and application	V_f (V) / I_f (A)	Operating conditions	f (MHz)	V_a (kV)	V_{g2} (V)	I_a (mA)	W_o (W)	Limiting values V_a (kV)	Limiting values W_a (W)	Accessories	Base connections / Max. dimensions (diam. / length)
QB2/250 R.F. beam power pentode	10 / 5	C telegr.	30	2.0	400	180	275	2.0	100	An. conn.: 40619	
		C ag_2 mod.	30	1.6	300	150	180	1.6	67		
		AB mod.[1]	—	2.5	750	290	490	2.5	125		
QB3/200 R.F. power tetrode	6 / 3.5	C telegr.	50	3.0	250	115	280	3.0	65	An. conn.: 40624 Socket: 2422 513 01001	
		C telegr.	220	1.5	250	117	110	1.5	65		
		C ag_2 mod.	50	2.5	250	110	230	2.5	45		
		C ag_2 mod.	220	1.5	250	80	75	1.5	45		
		B mod.[1]	—	1.75	500	170	175	3.0	65		
QB3/300 R.F. power tetrode	5 / 6.5	C telegr.	120	3.0	350	167	375	3.0	125	An. conn.: 40624 Socket: 2422 512 01001	
		C ag_2 mod.	120	2.5	350	152	300	2.5	83		
		B mod.[1]	—	2.5	600	216	345	3.0	125		
QB3/300GA		Metal-shell giant base. For further data see QB3/300									
QB3.5/750 R.F. power tetrode	5 / 14.1	C telegr.	75	4.0	500	312	1000	4.0	250	An. conn.: 40624 Socket: 2422 512 01001	
		C ag_2 mod.	75	3.0	400	225	510	3.2	165		
		B mod.[1]	—	3.0	300	550	1240	4.0	250		
QB3.5/750GA		Metal-shell Giant base. For further data see QB3.5/750									

QB4/1100	5	C telegr.	75	4.0	500	350	1100	4.0	400	An. conn.: 40624			
R.F. power	14.1	C telegr.	100	3.5	500	250	650	4.0	400	Chimney: 40666			
tetrode		C ag_2 mod.	75	3.0	500	275	630	3.2	270	Socket:			
		B mod. [1])	—	4.0	750	586	1540	4.0	400	2422 512 01001			
QB4/1100GA		Metal-shell Giant base											
		For further data see QB4/1100											
QB5/1750	10	C telegr.	60	5.0	600	440	1760	5.0	500	An. conn.:			
R.F. power	9.9	C ag_2 mod.	60	4.0	600	380	1200	4.0	330	40626			
tetrode		SSB [2])	60	5.0	700	56	0	5.0	500	Socket:			
		SSB [3])	60	5.0	700	280	900	5.0	500	2422 512 00001			
		B mod. [1])	—	5.0	600	580	2220	5.0	500				
QB5/2000	7.5	C telegr.	30	5.0	600	600	2400	5.5	800	An. conn.:			
R.F. power	22.6	SSB [2])	30	4.0	600	150	0	5.5	800	40665			
tetrode		SSB [4])	30	4.0	600	465	1300	5.5	800	Socket:			
		SSB [3])	30	4.0	600	330	650	5.5	800	2422 512 00001			
QBL3.5/2000	3.6	C telegr.	800	4.3[5])	600[6])	850	2100[7])	4.5	1500		89	215	
Coaxial U.H.F.	58												
power tetrode													
QBL4/800	5	C telegr.	110	4.0	500	315	930	4.0	500		67	120	
R.F. power	13.5	C telegr.	110	2.5	500	310	530	4.0	500				
tetrode													
QBL5/3500	6.3	C telegr.	75	5.0	800	1100	4100	5.0	3000	Fil. conn.: 40634	97	169	
Air cooled R.F.	32.5	C telegr.	220	4.0	800	1100	2900	4.0	3000	g2 conn.: 40622			
power tetrode		C ag_2 mod.	110	4.0	800	900	2700	4.0	2000	Ins. pedestal: 40635			

[1]) Two tubes. [2]) Zero signal. [3]) Double tone. [4]) Single tone. [5]) V_{a-g1}. [6]) V_{g2-g1}. [7]) Power in the load

TRANSMITTING TUBES

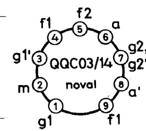
Type and application	V_f *(V)* I_f *(A)*	*Operating conditions*	*f (MHz)*	V_a *(kV)*	V_{g2} *(V)*	I_a *(mA)*	W_o *(W)*	*Limiting values* V_a *(kV)*	W_a *(W)*	*Accessories*	*Base connections / Max. dimensions* *diam.*	*length*
QBW5/3500 Water cooled		For further data see QBL5/3500								Water jacket: K713	70.5	160
QC05/35 R.F. beam power tetrode for mobile equipment	1.6 3.2	C telegr. C telegr. C ag_2 mod.	60 175 60	0.60 0.40 0.48	180 190 135	150 150 94	65 35 34	0.65 0.65 0.48	25 25 14	An. conn.: 28 906 022 Socket: 2422 501 03001		
QE03/10 R.F. tetrode	6 0.75	C telegr. C telegr.	30 50	0.3 0.3	250 250	50 50	10 8	0.3 0.3	12 12	Socket: 2422 502 01003		
QE04/10 R.F. tetrode	6.3 0.6	C telegr. C telegr. C ag_2 mod.	60 150 60	0.30 0.30 0.25	250 250 200	43 46 38	8.0 6.3 5.8	0.4 0.4 0.4	7.5 7.5 7.5	Socket: 2422 502 04001		
QE05/40 R.F. beam power tetrode	6.3 1.25	C telegr. C telegr. C ag_2 mod. AB mod. [1])	60 175 60 —	0.60 0.32 0.48 0.60	150 180 135 180	112 140 94 200	52 25 34 82	0.60 0.32 0.48 0.60	20.0 20.0 13.3 20.0	An. conn.: 28 906 022 Socket: 2422 501 03001		

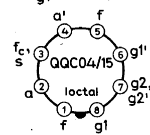
QE05/40F	12.6 0.62	For further data see QE05/40										
QE05/40H	26.5 0.3	For further data see QE05/40										
QE05/40K	13.5 0.58	For further data see QE05/40										
QE06/50 R.F. beam power tetrode	6.3 0.9	C telegr. C ag_2 mod. AB mod. [1])	60 60 —	0.60 0.48 0.60	250 250 300	100 83 200	40 28 80	0.60 0.48 0.60	25 16.5 25	An. conn.: 28 906 022 Socket: 2422 512 03001		
QE08/200 R.F. beam power tetrode	6.3 3.9	C telegr. C ag_2 mod. SSB [2]) SSB [3]) B mod. [1])	30 30 30 30 —	0.75 0.60 0.75 0.75 0.75	250 250 310 310 250	385 300 130 270 560	200 130 0 220 300	1.10 0.65 0.83 0.83 0.83	100 67 100 100 100	An. conn.: 40680 Socket: 2422 512 01001		
QE08/200H	26.5 0.85	For further data see QE08/200										
QEL1/150 Air cooled R.F. power tetrode	6 2.6	C telegr. C ag_2 mod. SSB [2]) SSB [4]) SSB [3])	150 150 175 175 175	2.0 1.6 2.0 2.0 2.0	250 250 300 300 300	250 200 75 250 160	370 230 0 300 150	2.0 1.6 2.0 2.0 2.0	250 165 250 250 250	Chimney: 4322 026 11701 Socket: 2422 513 01001	42	63
QEL1/150H	26.5 0.58	For further data see QEL1/150										

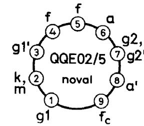
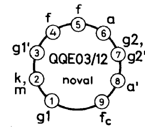
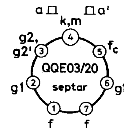
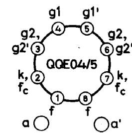
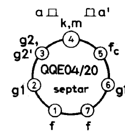
[1]) Two tubes. [2]) Zero signal. [3]) Double tone. [4]) Single tone.

TRANSMITTING TUBES

Type and application	V_f (V) I_f (A)	Operating conditions	f (MHz)	V_a (kV)	V_{g2} (V)	I_a (mA)	W_o (W)	Limiting values V_a (kV)	Limiting values W_a (W)	Accessories	Max. dimensions diam.	Max. dimensions length	Base connections
QEL2/200 V.H.F./U.H.F. tetrode	6 2.6	SSB 1)	30	2.0	400	70	0	2.0	250	Chimney: 4322 026 11701 Socket: 2422 513 01001	42	63	
		SSB 2)	30	2.0	400	350	400 3)	2.0	250				
		SSB 4)	30	2.0	400	225	400 3)	2.0	250				
		A.M. teleph.	30	2.0	400	175	105	2.0	250				
QEL2/275 V.H.F./U.H.F. tetrode	6 2.6	C telegr.	175	2.0	250	250	390	2.0	250	Chimney: 4322 026 11701 Socket: 2422 513 01001	42	63	
		C telegr.	500	2.0	300	250	250	2.0	250				
		C ag_2 mod.	175	1.5	250	200	235	1.5	165				
		SSB 1)	175	2.0	350	100	0	2.0	250				
		SSB 2)	175	2.0	350	250	300	2.0	250				
QEL2/275H	26.5 0.58	For further data see QEL2/275											
QQC03/14 Quick heating double tetrode	3.15 1.65	C telegr. 5) 6)	200	0.25	250	90	11 3)	0.3	14	Tube retainer: 40647 Socket: 2422 502 01003			
QQC04/15 Quick heating double tetrode	3.15 1.36 or 6.3 0.68	C telegr. 5)	60	0.60	200	60	26.6	0.6	12	Socket: 2422 501 05001			
		C telegr. 5)	60	0.25	175	60	10.6	0.6	12				

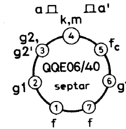




QQE02/5	6.3	C telegr.[5])	500	0.18	180	56	5.8	0.25	6	Socket:	
R.F. double	0.6 or	C ag_2 mod.[5])	500	0.18	180	40	4.2	0.20	4	2422 502 01003	
tetrode	12.6	C freq. mult.[5])	167	0.18	180	40	2.35	0.25	6		
	0.3		−500								
QQE03/12	6.3	C telegr.[5])	200	0.3	175	76	14.5	0.30	10.0	Tube retainer:	
R.F. double	0.82	C ag_2 mod.[5])	200	0.2	200	86	9.8	0.24	9.2	40647	
tetrode	or 12.6	C freq. mult.[5])	67	0.3	150	48	6.5	0.30	10.0	Socket:	
	0.41		−200							2422 502 01003	
QQE03/20	6.3	C telegr.[5])	200	0.6	250	100	48	0.6	20	An. conn.	
R.F. double	1.3 or	C ag_2 mod.[5])	200	0.5	250	80	31	0.5	20	40623	
tetrode	12.6	C freq. mult.[5])	67	0.3	250	90	10	0.6	20	Socket:	
	0.65		−200							2422 513 00001	
QQE03/32		See QQE03/20 except for neutralizing cap.									
QQE04/5	6.3	C telegr.[5])	960	0.25	160	70	7.0	0.4	16	Socket:	
R.F. double	0.6 or	C freq. mult.[5])	320	0.25	150	76	2.8	0.4	16	B8 700 71	
tetrode	12.6		−960								
	0.3										
QQE04/20	6.3	C telegr.[5])	200	0.75	200	48	26	0.75	15	An. conn.:	
R.F. double	1.6 or	C telegr.[5])	250	0.40	200	80	17	0.67	15	40615	
power tetrode	12.6	C ag_2 mod.[5])	200	0.60	200	36	17	0.60	10	Socket:	
	0.8									2422 513 00001	

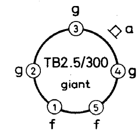
[1]) Zero signal. [2]) Single tone. [3]) Power in the load. [4]) Double tone. [5]) Two systems in push-pull
[6]) Intermittent service.

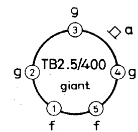
TRANSMITTING TUBES

Type and application	V_f (V) I_f (A)	Operating conditions	f (MHz)	V_a (kV)	V_{g2} (V)	I_a (mA)	W_o (W)	Limiting values V_a (kV)	Limiting values W_a (W)	Accessories	Base connections Max. dimensions diam.	length
QQE06/40	6.3	C telegr. [1])	200	0.6	250	200	90	0.75	40	An. conn.		
R.F. double	1.8 or	C telegr. [1])	500	0.5	250	200	60	0.60	40	40623		
power tetrode	12.6	C ag_2 mod. [1])	250	0.6	250	150	64	0.60	28	Socket:		
	0.9	B mod. [1])	—	0.6	250	200	86	0.60	40	2422 513 00001		

Type and application	V_f (V) I_f (A)	Operating conditions	f (MHz)	V_a (kV)	I_a (A)	W_o (kW)	Limiting values V_a (kV)	Limiting values W_a (kW)	Accessories	Base connections Max. dimensions diam.	length
TAL12/10	22	C telegr.	5	12	1.21	10.5	12	4	Fil. conn.: 40604	194	471
R.F. power	38 [2])	C telegr.	20	10	1.45	10.5	12	4	Ins. pedestal: K501		
triode									Supp. ring: 40603		
									Protect. cap. for grid seals: 40632		
TAL12/20	21.5	C telegr.	28	12	2.7	22	12	18	Fil. conn.: 40662	125	567
R.F. power	78	C an. mod.	28	10	1.4	9.5	12	18	Grid. conn.: 40664		
triode									Cooling house: K503/01		

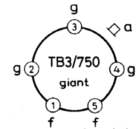
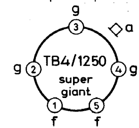
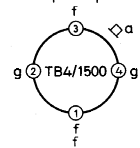
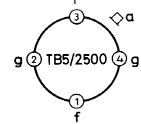
TAL12/35 Air cooled R.F. power triode	28.3 48.5 [2])	C telegr. C telegr.	20 37.5	15 10	4.2 4.2	48.5 26	15 15	18 18	Fil. conn.: 40606 Protect. cap for seals: 40632 Cooling house: K505	226	630
TAW12/10 R.F. power triode	22 38 [2])	C telegr. C telegr.	5 75	12 4	1.7 1.7	15 3.5	12 12	7.5 7.5	Fil. conn.: 40604 Water jacket: K700 Prot. cap for seals: 40632	194	440
TAW12/20	For further data see TAL12/20								Water jacket: K707	108	578
TAW12/35G	For further data see TAL12/35							30	Water jacket: K715	226	650
TB2/500 R.F. power triode	12 7.3	C telegr. C telegr.	20 100	2.0 1.7	0.46 0.46	0.64 0.40	2.0 2.0	0.3 0.3	An. conn.: 40626 Socket: 40204	86	243
TB2.5/300 R.F. power triode	6.3 5.4	C telegr. C an. mod. [3]) B mod. [3])	75 75 —	2.5 2.0 2.5	0.205 0.255 0.356	0.39 0.41 0.70	2.5 2.5 2.5	0.14 0.14 0.14	An. conn.: 40624 Socket: 2422 512 01001		
TB2.5/400 R.F. power triode	6.3 5.8	C telegr. C an. mod. B mod. [3])	150 150 —	2.5 2.0 2.5	0.205 0.128 0.356	0.39 0.20 0.70	3.0 2.4 3.0	0.15 0.10 0.15	An. conn.: 40624 Socket: 2422 512 01001		





[1]) Two systems in push-pull. [2]) Per phase. [3]) Two tubes.

TRANSMITTING TUBES

Type and application	V_f *(V)* I_f *(A)*	*Operating conditions*	*f (MHz)*	V_a *(kV)*	I_a *(A)*	W_o *(kW)*	*Limiting values* V_a *(kV)*	W_a *(kW)*	*Accessories*	*Base connections Max. dimensions diam. length*
TB3/750 R.F. power triode	5 14.1	C telegr. C osc.[1]) B mod.[1])	100 100 —	4.0 4.0 4.0	0.38 0.76 0.54	1.20 2.32 1.55	4.0 4.0 4.0	0.35 0.35 0.35	An. conn.: 40624 Chimney: 40666 Socket: 2422 512 01001	
TB4/1250 R.F. power triode	10 9.9	C telegr. C an. mod. B mod.[1])	100 100 —	4.0 3.0 4.0	0.535 0.450 0.736	1.70 1.05 2.30	4.0 3.0 4.0	0.45 0.30 0.45	An. conn.: 40626 Socket: 2422 512 00001	
TB4/1500 Industrial R.F. power triode	5 32.5	Ind. osc. Ind. osc.	50 50	5.4 4.5	0.220 0.380	1.64 1.60	6.3 6.3	0.5 0.5	An. conn.: 40665 Socket: 2422 511 05001	
TB5/2500 Industrial R.F. power triode	6.3 32.5	Ind. osc. Ind. osc.	50 50	5.4 4.5	0.53 0.60	2.75 2.55	6.3 6.3	0.8 0.8	An. conn.: 40665 Socket: 2422 511 05001	

TBH6/14	as	**TBL6/14**	However with integral helical water cooler and different dimensions								185	351
TBH6/6000	as	**TBL6/6000**									130	219
TBH7/8000	as	**TBL7/8000**									130	219
TBH7/9000	as	**TBL7/9000**									130	211
TBH12/25	as	**TBL12/25**									185	410
TBH12/38	as	**TBL12/38**									185	422
TBL2/300	3.4	C telegr.	175	2.50	0.26	0.48	2.5	0.3			41.5	72
Air cooled	19	C telegr.	900	1.30	0.35	0.16	1.3	0.3				
coaxial R.F.		Ind. osc.	470	1.75	0.34	0.38	1.8	0.3				
power triode												
TBL2/400	3.4	C telegr.	470	2.0	0.40	0.6	2.2	0.4			41.5	83
Air cooled	19	C telegr.	810	1.8	0.40	0.41	2.0	0.4				
coaxial R.F.		Ind. osc.	470	2.0	0.38	0.48	2.2	0.4				
power triode		Ind. osc.	810	1.8	0.38	0.28	2.0	0.4				
TBL2/500	3.4	C telegr.	400	2.5	0.38	0.67	2.7	0.5			41.5	83
Air cooled	19	C telegr.	625	2.2	0.38	0.58	2.0	0.5				
coaxial R.F.												
power triode												
TBL6/14	6.3	Ind. osc.	30	7.0	3.5	17.7	8.0	10		Fil. conn.: 40662	115	315
Air cooled	130	Ind. osc.	30	6.0	3.3	14.3	8.0	10		Grid conn.: 40664		
industrial R.F.										Ins. pedestal:		
power triode										K508		

[1]) Two tubes.

TRANSMITTING TUBES

Type and application	V_f (V) / I_f (A)	Operating conditions	f (MHz)	V_a (kV)	I_a (A)	W_o (kW)	Limiting values V_a (kV)	Limiting values W_a (kW)	Accessories	Base connections / Max. dimensions diam.	length
TBL6/20	6.3	C telegr.	110	5.0	4.8	17	5.5	10	Fil. conn.: 40652	170	277
Air cooled coaxial R.F.	154	B teleph.[1])	170 –220	4.0	4.8	12	4.5	10	Fil. conn.: 40653 Grid and anode conn.: 40651		
power triode		B teleph.[2])	170 –220	4.0	4.8	12	4.5	10	Insp. pedest.: 40654		
TBL6/4000	6.3	Ind. osc.	50	7.0	0.9	4.9	8.0	1.7	Socket:	86	178
Air cooled industrial R.F. power triode	65	Ind. osc.	50	6.0	0.9	4.1	8.0	1.7	2422 511 05001		
TBL6/6000	12.6	C telegr.	75	6.0	1.5	6.9	6.0	5.0	Fil. conn.: 40634	123	195
Air cooled R.F.	33	C an. mod.	75	5.0	1.2	4.7	5.0	3.4	Grid conn.: 40622		
power triode		B mod.[3])	—	6.0	3.0	13.3	6.0	5.0	Grid conn.[4]): 40650 Insp. pedest.: 40630		
TBL7/8000	12.6	C telegr.	30	6.5	2.0	9.5	7.2	6.0	Fil. conn.: 40634	123	195
Air cooled R.F. power triode	33	Ind. osc.	50	6.0	1.5	6.0	7.0	6.0	Grid conn.: 40622 Grid conn.[4]): 40650 Ins. pedest.: 40630		

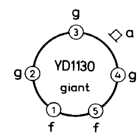
TBL7/9000 Air cooled industrial R.F. power triode	12.6 32	Ind. osc. Ind. osc.	50 50	7.2 6.2	1.5 1.4	6.1[5] 5.0[5]	8.0 8.0	6.0 6.0	Grid and fil. conn.: 40634 Ins. pedestal: 40630	123	186
TBL12/25 Air cooled industrial R.F. power triode	8 98	Ind. osc. Ind. osc.	30 30	12 8	3.2 3.2	29 18	13 13	15 15	Fil. conn.: 40662 Grid conn.: 40663 Ins. pedestal: 40648	198	378
TBL12/38 Air cooled industrial R.F. power triode	8 130	Ind. osc. Ind. osc.	30 30	12 8	4.5 4.5	39 23	13 13	15 15	Fil. conn.: 40662 Grid conn.: 40663 Ins. pedestal: 40648	198	404
TBL12/40 Air cooled R.F. power triode	8 130	C telegr. C an mod. B mod.[3]	30 30 —	12 10 10	4.5 3.5 3.2	41 27 19	13 10 13	15 10 15	Fil. conn.: 40662 Grid conn.: 40663 Ins. pedestal: 40648	225	392
TBL12/100 Air cooled R.F. power triode	17.5 196	C telegr. C an. mod. B mod.[3]	15 15 —	12 10 12	12 10.5 24	108 80 202	13.5 10.0 15.0	45 30 45	Fil. conn.: 40628 Air jacket: K506	286	660
TBL15/125		$V_f = 17.5$ V[6], $I_f = 196$A; $V_f = 15.5$ V[7], $I_f = 131$ A For further data see TBL12/100									
TBW6/14 Water cooled		For further data see TBL6/14						15	Water jacket: K720	115	330

[1]) Neg. mod.; pos. sync. [2]) Pos. mod.; neg. sync. [3]) Two tubes. [4]) $f = <30$ MHz. [5]) Power in the load.
[6]) Single phase filament energizing. [7]) Three phase filament energizing.

TRANSMITTING TUBES

Type and application	V_f (V) I_f (A)	Operating conditions: f (MHz), V_a (kV), I_a (A), W_o (kW)	Limiting values V_a (kV)	Limiting values W_a (kW)	Accessories	Base connections Max. dimensions diam.	length
TBW6/20 Water cooled		For further data see TBL6/20		12	Water jacket: K718	128	238
TBW6/6000 Water cooled		For further data see TBL6/6000		6	Water jacket: K713	71	190
TBW7/8000 Water cooled		For further data see TBL7/8000			Water jacket: K713	71	190
TBW7/9000 Water cooled		For further data see TBL7/9000			Water jacket: K721	86	224
TBW12/25 Water cooled		For further data see TBL12/25		20	Water jacket: K717	145	376
TBW12/38 Water cooled		For further data see TBL12/38		20	Water jacket: K722	145	422
TBW12/100 Water cooled		For further data see TBL12/100		50	Water jacket: K714	240	620
TBW15/125 Water cooled		$V_f=17.5$ V[1]), $I_f=196$ A; $V_f=15.5$ V[2]), $I_f=131$ A For further data see TBL12/100		50	Water jacket: K714		

YD1000	12.6	C telegr.	10	15	9.75	120	15	45	Fil. conn.: 40670	140	380
Water cooled R.F.	160	C telegr.	30	8	8.75	55	12	45	Grid conn.: 40671		
power triode		C an. mod.	30	11	7.60	66	11	30	Water jacket:		
		B mod.³)	—	12	9.40	78	12	45	K724		
YD1001		For further data see YD1000						35	Ins. pedestal:	300	380
Air cooled									40672		
YD1002		For further data see YD1000						60	Vap. cooling	218	380
Vapour cooled									system: K728		
YD1010	18	C telegr.	10	15	29.3	360	15	120	Fil. conn.: 40667	218	656
Water cooled R.F.	280	C telegr.	30	12	24.7	245	12	120	Water jacket: K723		
power triode		C an. mod.	30	11	19.0	165	11	80			
		B mod.³)	—	12	52.0	450	12	120			
YD1012		For further data see YD1010						180	Vap. cooling	315	650
Vapour cooled									system: K729		
YD1120	12.6	C telegr.	30	6.0	1.50	6.9	6.2	5.0		119	200
Air cooled R.F.	33	C telegr.	220	3.0	1.25	2.7	4.0	5.0			
power triode		C an. mod.	75	5.0	1.20	4.7	5.0	3.4			
		B mod.³)	—	6.0	3.0	13.3	6.0	5.0			
YD1130	5	SSB ⁴)	30	2.5	0.07	0	3.0	4.0	An. conn.: 40624		
R.F. power	14.1	SSB ⁵)	30	2.5	0.40	0.64	3.0	4.0	Chimney: 40666		
triode		SSB ⁶)	30	2.5	0.27	0.64	3.0	4.0	Socket:		
		B mod.³)	—	3.0	0.67	1.30	3.0	4.0	2422 512 01001		



[1]) Single phase filament energizing. [2]) Three phase filament energizing. [3]) Two tubes. [4]) Zero signal.
[5]) Single tone. [6]) Double tone.

TRANSMITTING TUBES

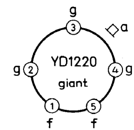
Type and application	V_f (V) I_f (A)	Operating conditions	f (MHz)	V_a (kV)	I_a (A)	W_o (kW)	Limiting values V_a (kV)	Limiting values W_a (kW)	Accessories	Base connections Max. dimensions diam.	length
YD1140 Water cooled R.F. power triode	17.5 196	C telegr. C an. mod. Ind. osc. B mod. [1])	30 30 30 —	12 10 12 10	12.0 10.5 14.0 16.0	108 83 124 106	12.5 10.5 13.0 15.0	100 66 100 100	Fil. conn.: 40628 Water jacket: K714	240	620
YD1141 Air cooled		For further data see YD1140						45	Air jacket: K506	286	660
YD1150 Air cooled R.F. industrial power triode	6.3 33	Ind. osc. Ind. osc.	27.12 160	6.0 5.0	5.0 3.97	4.9 3.9	7.2 6.0	2.5 2.5	Fil. conn.: 40688 Fil. conn.[2]) : 40689 Grid conn.[3]) : 40686 Grid conn.[4]) : 40687 Ins. pedest.: 40630	123	172
YD1151 Water cooled		For further data see YD1150							Water jacket: K713	62	172
YD1152 Water cooled		As YD1150 however with integral helical water cooler								131	207
YD1160 Air cooled R.F. industrial power triode	6.3 66	Ind. osc. Ind. osc.	27.12 150	6.5 5.0	1.8 2.0	9.2 7.5	7.2 6.0	5.0 5.0	Fil. conn.: 40688 Fil. conn.[2]): 40689 Grid conn.[3]) : 40686 Grid conn.[4]) : 40687 Ins. pedest.: 40630	123	192

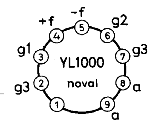
YD1161 Water cooled		For further data see YD1160							Water jacket: K726	62	192
YD1162 Water cooled		As YD1160 however with integral helical water cooler								131	227
YD1170 Air cooled R.F. industrial power triode	5.8 130	Ind. osc.	120	6.0	3.4	16.2	7.2	10	Fil. conn.: 40692 Fil. conn.: 40693 Grid conn.[5]): 40690 Grid conn.[6]): 40691 Ins. pedest.: 40654	159	217
YD1171 Water cooled		For further data see YD1170							Water jacket: K727	84	217
YD1172 Water cooled		As YD1170 however with integral helical water cooler								114	217
YD1173 Air cooled R.F. industrial power triode	5.4 65	Ind. osc.	50	10	1.75	13.5	12	10	Fil. conn.: 40692 Fil. conn.: 40693 Grid conn.[5]): 40690 Grid conn.[6]): 40691 Ins. pedest.: 40654	159	217
YD1180 Air cooled R.F. industrial power triode	7.0 175	Ind. osc.	90	7.5	5.4	33	9.0	15	Fil. conn. 40708 Fil. conn. 40709 Grid conn. 40710[1]) Grid conn. 40711[2])	192	243

[1]) Two tubes. [2]) Filament/cathode connector. [3]) $f = <30$ MHz. [4]) $f = >30$ MHz. [5]) $f = <4$ MHz.
[6]) $f = >4$ MHz

TRANSMITTING TUBES

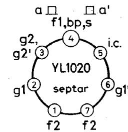
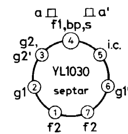
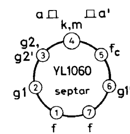
Type and application	V_f (V) / I_f (A)	*Operating conditions*	*f* (MHz)	V_a (kV)	I_a (A)	W_o (kW)	*Limiting values* V_a (kV)	W_a (kW)	*Accessories*	*Base connections / Max. dimensions* diam.	length
YD1182 Water cooled R.F. industrial power triode	7 175	Ind. osc.	90	7.5	5.4	32.4	9	20	Fil. conn.: 40708 Fil. conn.: 40709 Grid conn.[1]): 40710 Grid conn.[2]): 40711	130	270
YD1192 Water cooled R.F. industrial power triode	8.4 235	Ind. osc.	30	8.0	10	64	9.6	40	Fil. conn.: 40705 Fil. conn.: 40706 Grid conn.[1]): 40707 Grid conn.[2]): 40736	160	319
YD1202 Water cooled industrial power triode	12.2 250	Ind. osc. Ind. osc.	30 30	10 12	16 13	122 122	14 14	80 80	Fil. conn.: 40695 Fil. conn.: 40696 Grid conn.[1]): 40694 Grid conn.[2]): 40737	190	443
YD1203 Vapour cooled		For further data see YD1202							Grid conn.: 40737 Boiler: K733	290	415
YD1212 Water cooled R.F. industrial power triode	12.6 380	Ind. osc.	30	14	23.5	247	16.8	120	Fil. conn.: 40695 Fil. conn.: 40696 Grid conn.[1]): 40694 Grid conn.[2]): 40737	190	443
YD1213 Vapour cooled		For further data see YD1212							Boiler: K733		

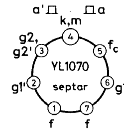
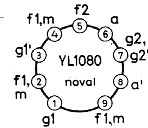
YD1220 Industrial triode	5 14	Ind. osc.	85	4.0	0.38	1.18	4.2	0.35	Chimney: 40666 Socket: 2422 512 01001	

Type and application	V_f (V) I_f (A)	Operating conditions	f (MHz)	V_a (kV)	V_{g2} (V)	I_a (mA)	W_o (W)	Limiting values V_a (kV)	Limiting values W_a (W)	Accessories	Base connections Max. dimensions diam.	length
YL1000 Quick heating R.F. pentode	1.1 0.88	C telegr. C telegr.	50 175	0.3 0.3	150 150	40 30	8.0[3]) 3.3[3])	0.3	5.0	Socket: 2422 502 01003		
YL1010 Water cooled coaxial R.F. power tetrode	10 200	SSB[4]) SSB[5]) SSB[6])	30 30 30	8.0 8.0 8.0	1200 1200 1200	2000 5900 3800	0 30 kW[7]) 30 kW[7])	12 12 12	30 kW 30 kW 30 kW	Connectors: Inner fil.: 40725 Outer fil.: 40726 Grid No. 1: 40727 Grid No. 2: 40728 Water jacket: K732	140	315

[1]) $f = <4$ MHz. [2]) $f = >4$ MHz. [3]) Power in the load. [4]) Zero signal. [5]) Single tone. [6]) Double tone.
[7]) Peak envelope power.

TRANSMITTING TUBES

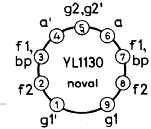
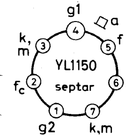
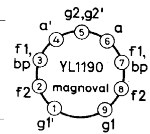
Type and application	V_f *(V)* I_f *(A)*	*Operating conditions*	*f* *(MHz)*	V_a *(kV)*	V_{g2} *(V)*	I_a *(mA)*	W_o *(W)*	*Limiting values* V_a *(kV)*	W_a *(W)*	*Accessories*	*Max. dimensions* *diam.*	*length*	*Base connections*
YL1011		For further data see YL1010								Ins. pedestal:	215	315	
Air cooled										40729			
YL1012		For further data see YL1010							45 kW	Boiler: K728			
Vapour cooled													
YL1020	1.6	C telegr. [1])	200	0.30	250	100	19	0.60	20	An. conn.: 40623			
Quick	4.25	C telegr. [1])	460	0.40	250	100	21	0.45	20	Socket:			
heating		C ag_2 mod.[1])	200	0.30	250	80	16	0.50	14	2422 513 00001			
R.F. double		C fr. tripler[1])	66.7	0.30	250	90	9	0.60	20				
tetrode			−200										
YL1030	2.1	C telegr.[1])	180	0.40	250	200	53	0.75	40	An. conn.: 40623			
Quick	4.5	C telegr.[1])	475	0.35	250	200	38	0.50	40	Socket:			
heating		C ag_2 mod.[1])	180	0.40	250	150	39	0.60	28	2422 513 00001			
R.F. double		C fr. tripler[1])	50	0.50	250	120	20	0.75	40				
tetrode			−150										
YL1060	6.3	C telegr. [1])	175	1.0	230	200	146	1.0	60	An. conn.: 40681			
R.F. double	1.8 or	C ag_2 mod.[1])	175	0.75	250	180	97	0.8	180	Socket:			
tetrode	12.6									2422 513 00001			
	0.9												

YL1070	6.3	SSB[3][6]	7	1.0	250	50	0	1.0	60	An. conn.: 40681			
Double	1.8 or	SSB[4][6]	7	1.0	250	195	141	1.0	60	Socket:			
tetrode	12.6	SSB[5][6]	7	1.0	250	131	141[7]	1.0	60	2422 513 00001			
	0.9												
YL1071		$V_f = 13.25$ V; $I_f = 0.86$ A or $V_f = 26.5$ V; $I_f = 0.43$ A For further data see YL1070											
YL1080	1.6	C telegr.[1]	200	0.3	300	75	12 [2]	0.30	5.0	Retainer: 40647			
Quick	2.5	C ag_2 mod.[1]	200	0.2	200	68	7.0[2]	0.24	3.3	Socket:			
heating		C fr. tripler[1]	67	0.3	150	48	3.5[2]	0.30	5.0	2422 502 01003			
R.F. double			−200										
tetrode													
YL1090	21	SSB[3]	30	9	1500	5 A	0	15	120 kW	Connectors:	260	507	
Water cooled	350	SSB[4]	30	9	1500	21 A	120 kW[7]	15	120 kW	Fil.: 40732			
coaxial R.F.		SSB[5]	30	9	1500	13.2 A	120 kW[7]	15	120 kW	Grid No. 1: 40733			
power tetrode		C ag_2 mod.	30	11	800	25 A	220 kW	11.5	80 kW	Grid No. 2: 40734			
YL1091		For further data see YL1090							150 kW	Boiler: K729	315	507	
Vapour cooled													
YL1100	26.5	C telegr.	400	0.90	300	170	80[2]	1.0	115		32.2	50	
Air cooled	0.52	C telegr.	1200	0.90	300	170	40[2]	1.0	115				
coaxial beam		C ag_2 mod.	400	0.70	250	130	45[2]	0.8	75				
power tetrode		SSB[3]	60	0.85	300	40	0	1.0	115				
		SSB[5]	60	0.85	300	100	40[7]	1.0	115				

[1]) Two systems in push-pull. [2]) Power in the load. [3]) Zero signal. [4]) Single tone. [5]) Double tone.
[6]) Two sections in parallel. [7]) Peak envelope power

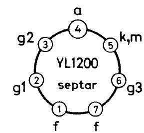
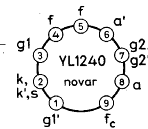
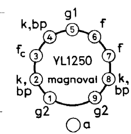
TRANSMITTING TUBES

Type and application	V_f (V) I_f (A)	Operating conditions	f (MHz)	V_a (kV)	V_{g2} (V)	I_a (mA)	W_o (W)	Limiting values V_a (kV)	Limiting values W_a (W)	Accessories	Base connections Max. dimensions diam.	length
YL1101	6.3 2.1	For further data see YL1100										
YL1102 Heatsink cooling	26.5 0.52	For further data see YL1100									28	50
YL1103 Heatsink cooling	6.3 2.1	For further data see YL1100									28	50
YL1110 Air cooled coaxial beam power tetrode	6.3 7.85	C telegr. C ag_2 mod. SSB [2]) SSB [5])	470 400 30 30	2.5 2.0 2.5 2.5	400 400 450 450	500 500 160 350	730 [1]) 600 [1]) 0 680 [4])	2.5 2.0 2.5 2.5	700 400 600 600		53	61
YL1120 Air cooled coaxial R.F. power tetrode	16 16.5	SSB [2]) SSB [3]) SSB [5])	13 13 13	5.0 5.0 5.0	700 700 700	700 1800 1260	0 5100 [1]) 5100 [1])	5.5 5.5 5.5	4000 4000 4000	Socket: 40682 Air duct: 40683 or Ins. pedestal: 40654	159	202
YL1121 Air cooled R.F. power tetrode	12.6 14.5	SSB [2]) SSB [3]) SSE [5])	30 30 30	5.0 5.0 5.0	650 650 650	700 1850 1300	0 5000 [1]) 5000 [4])	5.5 5.5 5.5	4000 4000 4000	Socket: 40699 Air duct: 40683 or Ins. pedestal: 40654	159	229

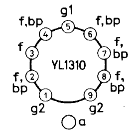
YL1130 Quick heating R.F. double tetrode	1.1 2.9	C telegr.[6]) C telegr.[6]) Freq. tripler[6])	200 500 167 – 500	0.28 0.18 0.18	275 175 175	84 80 60	16 8.0 3.5	0.3 0.2 0.2	8.0 8.0 8.0	Socket: 2422 502 01004			
YL1150 R.F. beam power tetrode	6.3 1.62 or 12.6 0.81	SSB[2]) SSB[3]) SSB[5]) AB mod.[7])	30 30 30 —	0.6 0.6 0.6 0.6	250 250 250 250	100 325 220 520	0 110[1]) 110[1])[4]) 200	0.75 0.75 0.75 0.75	75 75 75 75	An. conn.: 40634 Socket: 2422 513 00001			
YL1170		Ruggedized version of QEL2/200											
YL1181 Air cooled coaxial R.F. power tetrode	5 64	SSB[2]) SSB[3]) SSB[5])	30 30 30	4.5 4.5 4.5	800 800 800	500 1330 930	0 3000[1])[4]) 3000[1])[4])	6.0 6.0 6.0	4000 4000 4000	Connectors: Fil.: 40721 Grid No. 1: 40722 Grid No. 2: 40723 Ins. pedestal: 40724	100	180	
YL1182 Vapour cooled		For further data see YL1181							6000	Boiler: K731	122	180	
YL1190 Quick heating R.F. double tetrode	1.1 4.2	C telegr.[6]) C telegr.[6]) C ag_2 mod.[6])	200 500 175	0.35 0.26 0.28	350 260 150	140 140 100	33 19 19	0.4 0.3 0.33	16 16 11	Socket: 2422 502 05001			

1) Power in the load. 2) Zero-signal. 3) Single tone. 4) Peak envelope power output. 5) Double tone.
6) Two systems in push-pull. 7) Two tubes in push-pull.

TRANSMITTING TUBES

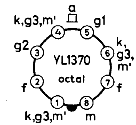
Type and application	V_f (V) / I_f (A)	Operating conditions	f (MHz)	V_a (kV)	V_{g2} (V)	I_a (mA)	W_o (W)	Limiting values V_a (kV)	Limiting values W_a (W)	Accessories	Base connections	Max. dimensions diam.	Max. dimensions length
YL1200 R.F. power pentode	12.6 1.3	SQ tube for special pulse or static application								Socket: 2422 513 00001			
YL1210		$V_f = 6.75$ V; $I_f = 0.72$ A or $V_f = 13.5$ V; $I_f = 0.36$ A For further data see QQE03/12											
YL1220		$V_f = 6.75$ V; $I_f = 0.56$ A or $V_f = 13.5$ V; $I_f = 0.28$ A For further data see QQE02/5											
YL1230 Air cooled R.F. power tetrode	5 18	SSB[1]) SSB[2]) SSB[3])	1–30 1–30 1–30	3.0 3.0 3.0	550 550 550	380 750 570	0 1050[4]) 1050[4])[5])	3.5 3.5 3.5	1500 1500 1500	Socket: 40704		95.3	85
YL1240 R.F. double tetrode	6.75 0.8 or 13.5 0.4	C telegr.[6]) C ag_2 mod.[6]) C fr. tripler[6])	175 175 58 –174	0.40 0.32 0.35	180 140 165	90 76 86	21[4]) 13.5[4]) 10[4])	0.40 0.32 0.40	15 10 15	Socket: B8 702 16			
YL1250 R.F. beam power tetrode	6.75 1.2 or 13.5 0.6	C telegr. C telegr.	75 175	0.55 0.40	235 230	136 150	52[4]) 38[4])	0.55 0.45	25 25	Socket: 40685			

YL1280	5.5	C telegr.	600	2.5	500	1000	1600	2.5	1500	Socket: 40704		
Air cooled	17.3	C ag_2 mod.	600	2.0	500	830	940	2.0	1000		95.3	85
R.F. beam												
power tetrode												
YL1290	19	For further data see QE08/200										
	1.3											
YL1310	1.2	SSB [1]	30	0.6	240	41	0	0.7	25	Socket: 40685		
Quick heating	4.2	SSB [2]	30	0.6	240	92	36	0.7	25			
beam power		SSB [3]	30	0.6	240	68	36	0.7	25			
tetrode												
YL1320	6	C telegr.	175	2.0	200	250	270	2.0		Socket: 40739	41.6	62.6
Heatsink	2.6	C telegr.	470	0.8	[7]	250	100	2.0				
cooled												
R.F. power												
tetrode												
YL1330	7	C telegr.	220	7.0	1260	3800	17 kW	8.6	10 kW	Chimney: 40683	159	263
Air cooled	127	SSB [1]	1–30	6.0	1350	1300	0	7.2	10 kW	Socket: 40699		
coaxial tetrode		SSB [3]	1–30	6.0	1350	3500	10.8 kW[4]	7.2	10 kW	Ins. pedestal:		
		SSB [3]	1–30	6.0	1350	2400	10.8 kW[4]	7.2	10 kW	40654		
YL1340	6	SSB [1]	30	2.2	300	100	0	2.5	350	Chimney:	42	63
Air cooled	3.2	SSB [2]	30	2.2	300	215	318[4]	2.5	350	4322 026 11701		
R.F. beam		SSB [3]	30	2.2	300	167	318[4]	2.5	350	Socket:		
power tetrode		AB mod.[8]	—	2.2	400	580	770	2.5	350	2422 513 01001		
YL1341	26.5	For further data see YL1340										
	0.73											



[1]) Zero signal. [2]) Single tone. [3]) Double tone. [4]) Power in the load. [5]) Peak envelope power output.
[6]) Two systems in push-pull. [7]) Adjust for operating conditions. [8]) Two tubes in push-pull.

TRANSMITTING TUBES

Type and application	V_f (V) / I_f (A)	Operating conditions	f (MHz)	V_a (kV)	V_{g2} (V)	I_a (mA)	W_o (W)	Limiting values V_a (kV)	Limiting values W_a (W)	Accessories	Base connections / Max. dimensions diam.	length
YL1360	13.5 0.28	For further data see QQE04/5										
YL1370 R.F. beam power tetrode	6.3 1.125	C telegr. C ag_2 mod. SSB [1] SSB [2] SSB [3]	60 60 30 30 30	0.60 0.48 0.60 0.60 0.60	200 165 200 200 200	150 125 24 125 86	63 42 0 49 [5] 49 [5]	0.60 0.48 0.60 0.60 0.60	27 18 27 27 27	Socket: 2422 501 03001		
YL1371	12.6 0.562	For further data see YL1370										
YL1372	26.5 0.3	For further data see YL1370										
YL1420 Air cooled V.H.F. power tetrode	6.3 120	Class AB Class B	175 230	3.75 5.5	600 600	750 1700	6250 6300	6.0 6.0	6000 6000		110	174
YL1430 Air cooled V.H.F. power tetrode	8.0 120	Class AB Class B	175 230	5.5 7.5	650 650	750 2500	13 kW [4] 13 kW [4]	8.0 8.0	12 kW 12 kW		164	208

YL1440	4.2	Class AB	175	3.0	500	700	1550	4.0	1500		64	125
Air cooled	53	Class AB	175	2.5	500	500	600	4.0	1500			
V.H.F. power												
tetrode												
7609	26.5	C telegr.	150	2.0	250	250	370	2.0	250	Chimney:	42	63
Air cooled	0.57	C ag_2 mod.	150	1.6	250	200	230	1.6	165	4322 026 11701		
R.F. power		AB mod.	—	2.0	300	470	580	2.0	250	Socket:		
tetrode										2422 513 01001		
8621	25.6	SSB [1])	7	2.0	350	100	0	2.0	250	Chimney:		
Air cooled	0.56	SSB [2])	7	2.0	350	250	270 [4])	2.0	250	4322 026 11701	42	63
R.F. power		SSB [3])	7	2.0	350	174	270 [4])	2.0	250	Socket:		
tetrode										2422 513 01001		

1) Zero signal. 2) Single tone. 3) Double tone. 4) Power in the load. 5) Peak envelope power.

MICROWAVE TUBES - Pulsed magnetrons

Type	V_f (*V*) I_f (*A*)	*Frequency* *Pulse duration* (T_{imp}) *Duty factor* (δ)	*Characteristics*	*Limiting values*
JP9-2.5D **JP9-2.5E**	6.3 0.5	9.415 -9475 GHz 0.1 μs 0.0002	V_{ap} =3.5 kV I_{ap} =3 A W_{op}=3 kW	I_{ap} =3.5 A T_{imp}=1.0 μs δ =0.001
JP9-7A air cooled	6.3 0.6	9.21 -9.27 GHz 1 μs 0.001	V_{ap} =5.5 kV I_{ap} =4.5 A W_{op}=7.5 kW	I_{ap} =5.5 A T_{imp}=2.5 μs δ =0.0025
JP9-7D air cooled	6.3 0.6	9.345 -9.405 GHz 0.1 μs 0.0001	V_{ap} =5.7 kV I_{ap} =6.0 A W_{op}=9.5 kW	I_{ap} =7.0 A T_{imp}=1.0 μs δ =0.002
JP9-15 **JP9-15B**	6.3 0.55	9.345 -9.405 GHz 9.415 -9.475 GHz 0.1 μs 0.0002	V_{ap} =7.6 kV I_{ap} =7.5 A W_{op}=21 kW	I_{ap} =9.0 A T_{imp}=2.5 μs δ =0.0015
YJ1000	6.3 0.5	9.19 -9.32 GHz 0.1 μs 0.0002	V_{ap} =3.4 kV I_{ap} =3.0 A W_{op}=3 kW	I_{ap} =3.5 A T_{imp}=1.0 μs δ =0.001

YJ1010 **YJ1011** tunable air cooled	13.75 3.1	8.5 –9.6 GHz 0.6 μs 0.001	V_{ap} = 21.5 kV I_{ap} = 27.5 A W_{op} = 225 kW	I_{ap} = 30 A T_{imp} = 2.75 μs δ = 0.0011
YJ1020	4.0 3.4	32.7 –33.4 GHz 0.04 μs 0.0001	V_{ap} = 12.5 kV I_{ap} = 10.5 A W_{op} = 25 kW	I_{ap} = 16 A T_{imp} = 0.05 μs δ = 0.0003
YJ1021	4.0 3.4	32.7 –33.4 GHz 0.1 μs 0.0002	V_{ap} = 12.5 kV I_{ap} = 12.5 A W_{op} = 30 kW	I_{ap} = 16 A T_{imp} = 0.5 μs δ = 0.0003
YJ1030	5.0 0.5	5.4–5.9 GHz 1.0 μs 0.002	V_{ap} = 1.2 kV I_{ap} = 0.8 A W_{op} = 160 W	I_{ap} = 1.0 A T_{imp} = 3.0 μs δ = 0.002
YJ1060	6.3 0.55	9.345 –9.405 GHz 2.5 μs 0.001	V_{ap} = 7.2 kV I_{ap} = 7.5 A W_{op} = 20 kW	I_{ap} = 8.0 A T_{imp} = 2.5 μs δ = 0.002
YJ1071	6.3 0.55	9.380 –9.440 GHz 0.1 μs 0.0001	V_{ap} = 5.7 kV I_{ap} = 6 A W_{op} = 10.5 kW	I_{ap} = 7.0 A T_{imp} = 0.1 μs δ = 1.0
YJ1110	6.3 0.55	9.345 –9.405 GHz 0.1 μs 0.0001	V_{ap} = 7.8 kV I_{ap} = 7.5 A W_{op} = 20 kW	I_{ap} = 9.0 A T_{imp} = 2.5 μs δ = 0.0015
YJ1111	6.3 0.55	9.415–9.475 GHz 0.1 μs 0.0001	V_{ap} = 7.8 kV I_{ap} = 7.5 A W_{op} = 20 kW	I_{ap} = 9.0 A T_{imp} = 2.5 μs δ = 0.0015

MICROWAVE TUBES - Pulsed magnetrons

Type	V_f *(V)* I_f *(A)*	*Frequency* *Pulse duration* (T_{imp}) *Duty factor* (δ)	*Characteristics*	*Limiting values*
YJ1120	6.3 0.55	9.38 – 9.44 GHz 0.15 μs 0.00015	V_{ap} = 8.2 kV I_{ap} = 8.0 A W_{op} = 25 kW	I_{ap} = 9.5 A T_{imp} = 1.5 μs δ = 0.0015
YJ1121	6.3 0.6	9.415–9.475 GHz 0.15 μs 0.00015	V_{ap} = 8.3 kV I_{ap} = 9.0 A W_{op} = 26 kW	I_{ap} = 10 A T_{imp} = 1.5 μs δ = 0.0015
YJ1140	12.6 3.2	16.35–16.65 GHz 0.5 μs 0.0004	V_{ap} = 12 kV I_{ap} = 15 A W_{op} = 45 kW	I_{ap} = 15 A T_{imp} = 1 μs δ = 0.001
2J42	6.3 <0.6	9.345 –9.405 GHz 1 μs 0.001	V_{ap} = 5.5 kV I_{ap} = 4.5 A W_{op} = 7.5 kW	I_{ap} = 5.5 A T_{imp} = 2.5 μs δ = 0.0025
2J51A tunable air cooled	6.3 1.0	8.5 –9.6 GHz 0.1 μs 0.00033	V_{ap} = 14 kV I_{ap} = 14 A W_{op} = 60 kW	I_{ap} = 15.5 A T_{imp} = 3.6 μs δ = 0.0012
2J55	6.3 1.0	9.345 –9.405 GHz 0.1 μs 0.00033	V_{ap} = 12 kV I_{ap} = 12 A W_{op} = 50 kW	I_a = 15 A T_{imp} = 2.5 μs δ = 0.001
4J50	13.75 3.5	9.345 –9.405 GHz 1 μs 0.001	V_{ap} = 21.5 kV I_{ap} = 27.5 A W_{op} = >225 kW	I_{ap} = 27.5 A T_{imp} = 1.2 μs δ = 0.001

4J52A air cooled	12.6 2.2	9.35 –9.40 GHz 4–5 μs 0.001	V_{ap} = 15 kV I_{ap} = 15 A W_{op} = 80 kW	I_{ap} = 16 A T_{imp} = 5 μs δ = 0.003
5J26 tunable air cooled	23.5 2.2	1.22 –1.35 GHz 1 μs 0.001	V_{ap} = 28 kV I_{ap} = 46 A W_{op} = 450 kW	I_a = 55 A T_{imp} = 1–6 μs δ = 0.0025
725A	6.3 1.0	9.345 –9.405 GHz 1 μs 0.0012	V_{ap} = 12 kV I_{ap} = 12 A W_{op} = 50 kW	I_{ap} = 16 A T_{imp} = 2.5 μs δ = 0.0012
5586 tunable	16 3.2	2.7 –2.9 GHz 2.5 μs 0.001	V_{ap} = 28.5 kV I_{ap} = 70 A W_{op} = 800 kW	I_{ap} = 70 A T_{imp} = 2.5 μs δ = 0.001
6972 air cooled	10 2.85	9.345 –9.405 GHz 0.1 μs 0.0002	V_{ap} = 15 kV I_{ap} = 15 A W_{op} = 80 kW	I_{ap} = 18 A T_{imp} = 5.5 μs δ = 0.002
7028	6.3 0.5	9.345 –9.475 GHz 0.1 μs 0.0002	V_{ap} = 3.4 kV I_{ap} = 3.0 A W_{op} = 3.0 kW	I_{ap} = 3.5 A T_{imp} = 0.02–1.0 μs δ = 0.001
7093 air cooled	5.0 3.9	34.512 –35.208 GHz 0.1 μs 0.0002	V_{ap} = 12.5 kV I_{ap} = 12.5 A W_{op} = 40 kW	I_{ap} = 16 A T_{imp} = 0.4 μs δ = 0.0003

MICROWAVE TUBES - Pulsed magnetrons

Type	V_f (*V*) I_f (*A*)	*Frequency* *Pulse duration* (T_{imp}) *Duty factor* (δ)	*Characteristics*	*Limiting values*
55029 **55030** **55031/02** **55031/01** **55032/02** **55032/01** air-cooled	13.75 3.0–3.75	9.405–9.505 GHz 9.345–9.405 GHz 9.260–9.345 GHz 9.168–9.260 GHz 9.085–9.168 GHz 9.003–9.085 GHz 0.25 μs-0.0005	V_{ap} = 21.5 kV I_{ap} = 24 A W_{op} = 220 kW	I_{ap} = 27.5 A T_{imp} = 1 μs δ = 0.001

MICROWAVE TUBES - Continuous-wave magnetrons

Type	V_f (*V*) I_f (*A*)	*Frequency*	*Characteristics*	*Limiting values*
DX206 air cooled	4.0 30	2.425–2.475 GHz	V_a = 5.4–5.8 kV I_a = 380 mA W_o = 1.2 kW	I_{ap} = 1.3 A
JPT9-01 tunable air cooled	6.3 1.2	9.15–9.60 GHz	V_a = 0.9-–1.1 kV I_a = 50 mA W_o = 10 W	I_{ap} = 0.1 A
YJ1160	4.8 35	2.425–2.475 GHz	V_a = 4.45–4.85 kV I_a = 750 mA W_o = 2.0 kW	I_{ap} = 2.1 A

YJ1162 air cooled	4.8 35	2.425–2.475 GHz	V_a = 4.45–4.85 kV I_a = 750 mA W_o = 2.0 kW	I_{ap} = 2.1 A
YJ1190 water and air cooled	5.5 66	2.425–2.475 GHz	V_a = 6.8–7.2 kV I_a = 1.25 A W_o = 5.0 kW	I_{ap} = 2.7 A
YJ1191 Water and air cooled	5.5 44	2.425–2.475 GHz	V_a = 6.8–7.2 kV I_a = 1.25 A W_o = 5.0 kW	I_{ap} = 2.6 A
YJ1280 air cooled	5.0 28	2.425–2.475 GHz	V_a = 5.4–5.8 kV I_a = 380 mA W_o = 1.2 kW	I_{ap} = 0.8 A
7090	5.3 3.5	2.425–2.475 GHz	V_a = 1.65 kV I_a = 200 mA W_o = 0.2 kW	I_{ap} = 1.4 A

MICROWAVE TUBES - Klystrons

Type	V_f *(V)* I_f *(A)*	*Frequency*	*Characteristics*	*Limiting values*
KS9-40 tunable	6.3 <0.7	9.3–9.5 GHz	W_o = 40 mW V_{res} = 300 V	V_{kf} = 50 V t_{shell} = 150°C
KS9-40D tunable	6.3 <0.7	9.38–9.51 GHz	W_o = 35 mW V_{res} = 300 V	V_{kf} = 50 V t_{shell} = 150°C
YK1000 [3]) **YK1004** [3])	7.75 32	0.4–0.62 GHz 0.61–0.79 GHz	W_o = 11 kW Gain = 30 dB	Coll. dissip. = 50 kW
YK1001 [1]) **YK1002** [2])	7.75 32	0.47–0.86 GHz	W_o = 11 kW Gain = 30 dB	Coll. dissip. = 36 kW Coll. dissip = 40 kW
YK1010 tunable	3.5 1.75	67–74 GHz	W_o = 100 mW V_{res} = 2.5 kV	t_{res} = 80°C
YK1090 tunable	6.3 1.2	10.5–12.2 GHz	W_o = 400 mW V_{res} = 400 V	t = 200°C
YK1091 tunable	6.3 1.2	10.5–12.2 GHz	W_o = 400 mW V_{res} = 400 V	t = 200°C
YK1110	3.8 76	2.993–3.003 GHz	W_{op} = 6 MW Gain = 30 dB	W_{op} = 8 MW
2K25 tunable	6.3 0.45	8.50–9.66 GHz	W_o = 50 mW V_{res} = 300 V	V_{kf} = 50 V t_{shell} = 110°C
723A/B tunable	6.3 0.6	8.702–9.548 GHz	W_o = 25 mW V_{res} = 300 V	V_{kf} = 50 V t_{shell} = 110°C

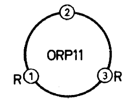
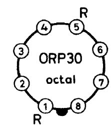
6975 tunable	6.3 0.45	8.5–9.6 GHz	$W_o = 40$ mW $V_{res} = 300$ V	$t = 200°C$ $h = 18$ km
55335 tunable	6.3 0.8	31–36 GHz	$W_o = >100$ mW $V_{res} = 2.25$ kV	$t = 80°C$

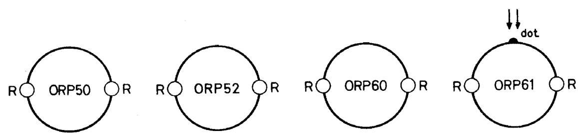
MICROWAVE TUBES - Travelling-wave tubes

LB6-25	6.3 0.95	5.925–6.425 GHz	$W_o = 25$ W Gain = 38 dB	$t_{amb} = -10$ to $+65°C$
YH1090	6.3 1.0	3.4–4.2 GHz	$W_o = 25$ W Gain = 42 dB	$t_{coll.} = 140°C$ $I_k = 65$ mA
7537	6.3 0.8	4.4–5.0 GHz	$W_o = >6$ W Gain = >36 dB	$t_{coll.} = 175°C$ $I_k = 55$ mA
55340	6.3 0.8	3.8–4.2 GHz	$W_o = >8$ W Gain = >39 dB	$t_{coll.} = 175°C$ $I_k = 55$ mA
YH1100[4])	6.3 0.8	8.0–12.4 GHz	$W_o = 50$ mW	$t_{amb} = -10$ to $+65°C$

[1]) Air cooled drift tubes and cooled collector. [2]) Air cooled drift tubes and water cooled collector.
[3]) Water cooled collector, drift tubes and output resonator. [4]) Backward wave oscillator tube.

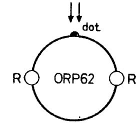
PHOTOSENSITIVE DEVICES - Cadmium sulphide photoconductive cells

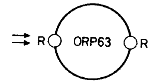
Type	$P_{max.}$ *at* $t_{amb}=25°C$	*Cell voltage d.c. and repetitive peak (max.)*	*Cell resistance at 50 lux; 2700°K colour temp.*	*Sensitive area*	*Max. dimensions* *diam.*	*length*	*Base connections*
ORP11 [1]	400 mW	300 V	1.7 kΩ	1.25 cm^2	17	58	
ORP30 [1]	1.2 W	350 V	330 Ω	4.5 cm^2	38	75	
ORP50 [1] [2]	400 mW	300 V	2.7 kΩ	50 mm^2	16	44	
ORP52 [1]	400 mW	200 V	1.2 kΩ	50 mm^2	16	44	
ORP60 [1] **ORP61** [2]	70 mW	350 V	60 kΩ	0.25 mm^2	6	16.5	

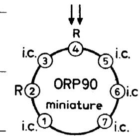


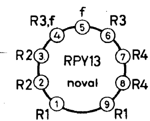
ORP62 [2])	100 mW	350 V	46 kΩ	1.5 mm^2	6	16.5
ORP63 [2])	75 mW	100 V	1.6 kΩ	15 mm^2	6	26
ORP90 [2])	1 W	350 V	1 kΩ	3.2 cm^2 (total area)	19	60.3
RPY13 Cds cells-lamp combination	150 mW (each cell)	200 V	15 Ω	lamp filam. $V_f = 24$ V $I_f = 54$–66 mA	22	55.6
RPY17 [2])	225 mW	400 V	7 kΩ	64 mm^2 (total area)	10.3 × 4.3	22
RPY18 [2])	500 mW 2 W [3])	100 V	25 Ω	1.5 cm^2 (total area)	16.3 × 6	27
RPY19 [2])	500 mW 2 W [3])	400 V	3 kΩ	1.5 cm^2 total area	16.3 × 6	27

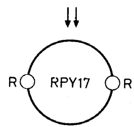
[1]) Top sensitivity. [2]) Side sensitivity. [3]) With a heatsink with $K = 5\,°C/W$.

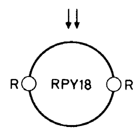


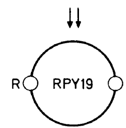








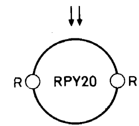


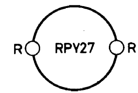


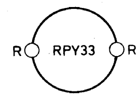
PHOTOSENSITIVE DEVICES - Cadmium sulphide photoconductive cells

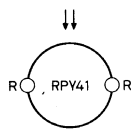
Type	$P_{max.}$ *at* $t_{amb}=25°C$	*Cell voltage d.c. and repetitive peak (max.)*	*Cell resistance at 50 lux; 2700°K colour temp.*	*Sensitive area*	*Max. dimensions* *diam.*	*length*
RPY20[2])	1 W 3 W[3])	400 V	1.5 kΩ	3 cm^2 (total area)	16.3 × 6	43
RPY27[1])	1 W	400 V	650 Ω	3.2 cm^2 (total area)	32	23
RPY33[1])	75 mW	50 V	1.33–4.4 kΩ	15 mm^2	9.4	3.4
RPY41[2])	225 mW	100 V	1.6 kΩ	64 mm^2 (total area)	10.3 × 4.3	22
RPY43[2])	750 mW	400 V	1.5 kΩ		13.5 × 2	30.5
RPY54[2])	500 mW	200 V	1.5 kΩ	1.5 cm^2	16.3 × 6	27

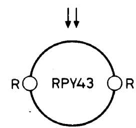
Base connections

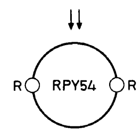


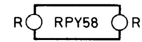


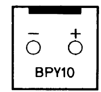
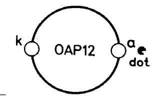
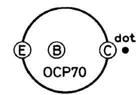






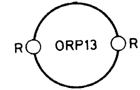
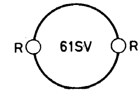


RPY55 [1]	1 W	200 V	420 Ω	3.2 cm^2 (tot. area)	32	7.6	
RPY58 [2]	200 mW	50 V	600 Ω		6 × 2	6	

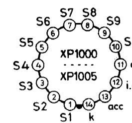
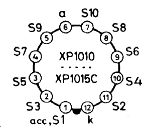
Type and application	*Sensitive area (mm^2)*	*Light sensitivity μA/lux.*	*Peak spectral response (μm)*	*Dark current (μA)*	*Cut-off frequency (kHz)*	*Outlines (mm)*	*Base connections*
BPY10 photo voltaic cell; tape and card readers	2.8	0.016 (2700°K)	$\lambda_m = 0.8$	at $V_R = 1$ V $I_R = <10$	$C_d < 1$ nF	length < 7.6 width < 2.2 height < 2.5 leads > 37	
	Ratings:	$V_R = 1$ V	$I_F = 10$ mA	$T_j = 100$°C			
OAP12 Photo-diode General purpose	1	0.1 (2500°K)	$\lambda_m = 1.55$	at $V_R = 10$ V $I_R = <15$	at $V_R = 10$ V $f_C = 50$	length < 9.4 width < 2.8 leads > 28	
	Ratings:	$V_R = 30$ V	$I_R = 3$ mA	$P_{tot} = 30$ mW			
OCP70 Photo transistor General purpose	7	0.9 (2700°K)	$\lambda_m = 1.43$	at $I_B = 0$ $-V_{CE} = 4.5$ V $-I_{CEO} < 325$	for modulated light $f_C > 3$	length < 15 width < 6 leads > 37	
	Ratings:	$-V_{CEO} = 7.5$ V	$-I_{CM} = 20$ mA	$P_{tot} = 100$ mW	$T_j = 65$°C		

[1]) Top sensitivity. [2]) Side sensitivity. [3]) With a heatsink with $K = 5$°C/W.

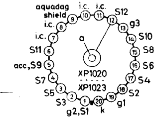
PHOTOSENSITIVE DEVICES - Photoconductive cells

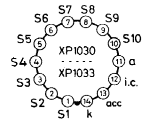
Type	*Spectral response range*	*Sensitive area*	*Max. current*	*Cell resistance*	*Max. temperature*	*Base connections*
ORP10	visible to 7.5 μm	3 mm²	100 mA at $t_{amb} = 20°C$	30–120 Ω	70°C	
ORP13	visible to 5.6 μm	3 mm²	5 mA at $t_{amb} = 77°K$	20–60 kΩ	77°K	
61SV	0.3 to 3.5 μm	36 mm²	5 mA	1–4 MΩ	60°C	

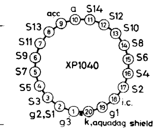
PHOTOSENSITIVE DEVICES - Photomultipliers

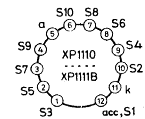
Type	*Spectral response*	*Useful diam.*	*N_a A/lumen or G(ain)*	*at V_b (V)*	*Dark curr. (μA)*	*at N_a A/lm or G(ain)*	*Max. length*	*Base connections*
10 stages								
XP1000	A(S11)	44	700	1800	0.015	100	148	
XP1001[4])	A(S11)	44	700	1800	0.015	100	148	
XP1002	T(S20)	44	400	1800	0.015	60	148	
XP1003	TU	44	400	1800	0.015	60	148	
XP1004	U(S13)	44	700	1800	0.015	100	148	
XP1005	C(S1)	44	100	1800	<10	20	148	
10 stages								
XP1010[5])	A(S11)	32	700	1800	0.01	60	127	
XP1011[6])	A(S11)	32	700	1800	0.01	60	127	
XP1015[6])	A(S11)	32	700	1800	0.01	60	219	
XP1015C[6])	A(S11)	32	700	1800	0.01	60	219	

12 stages							
XP1020	A(S11)	42	$G=10^8$	2500	<5	$G=10^8$	197
XP1021	A(S11)	42	$G=10^8$	2500	<5	$G=10^8$	207
XP1023	U(S13)	42	$G=10^8$	2500	<5	$G=10^8$	207
10 stages							
XP1030	A(S11)	63.5	250	1800	<0.2	100	159
XP1031[4]	A(S11)	63.5	250	1800	<0.2	100	159
XP1032	U(S13)	63.5	250	1800	<0.2	100	198
XP1033	U(S13)	63.5	250	1800	<0.2	100	205
14 stages							
XP1040	A(S11)	110	$G=10^8$	2400	2	$G=10^8$	281
10 stages							
XP1110	A(S11)	14	250	1800	0.02	30	105
XP1111	A(S11)	14	250	1800	0.02	30	105
XP1111B[7]	A(S11)	14	250	1800	0.02	30	105



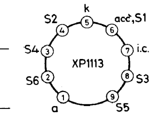
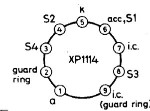
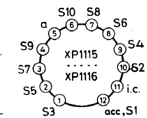
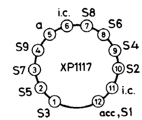
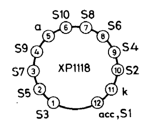




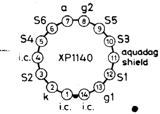


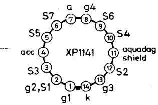
[4]) Energy resolution for 0.661–Mev Cs^{137}line$=8.5\%$. [5]) Low noise. [6]) Ruggedized. [7]) With flying leads.

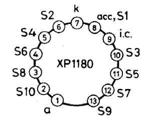
PHOTOSENSITIVE DEVICES - Photomultipliers

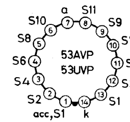
Type	Spectral response	Useful diam.	N_a A/lumen or G(ain)	at V_b (V)	Dark curr. (μA)	at N_a A/lm or G(ain)	Max. length	Base connections
6 stages **XP1113**	A(S11)	14	0.9	1200	0.01	0.3	70	
4 stages **XP1114**	A(S11)	14	20 mA/lm	900	<0.1 nA	4 mA/lm	70	
10 stages								
XP1115A [3] [2]	A(S11)	14	250	1800	0.02	30	105	
XP1115B [3] [2]	A(S11)	14	200	1800	0.02	30	105	
XP1115C [3]	A(S11)	14	200	1800	0.02	30	200	
XP1116 [3]	C(S1)	14	100	1800	10	20	105	
9 stages **XP1117** [3]	T(S20)	14	100	1800	0.01	30	105	
10 stages **XP1118**	U(S13)	14	250	1800	0.02	30	105	

6 stages **XP1140**	S4	150 mm²	$G=10^4$	3750	0.03	$G=10^4$	123
7 stages **XP1141**	A(S11)	42	$G=10^4$	3500	0.1	$G=10^4$	167
6 stages **XP1143**	S4	280 mm²	$G=10^4$	3500	1	$G=10^4$	160
10 stages **XP1180**	A(S11)	20	200	1800	5 nA	30	98
10 stages **XP1210**	A(S11)	42	$G=10^7$	4000	<1	$G=10^7$	177
10 stages **XP1220**	A(S11)	14	$G=10^7$	3000	<1	$G=10^7$	95
11 stages **53AVP**	A(S11)	44	400	1800	0.015	60	153
53UVP	U(S13)	44	400	1800	0.015	60	153





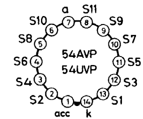


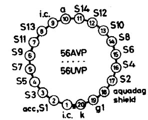


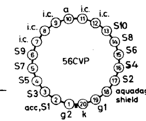
²) With flying leads. ³) Ruggedized.

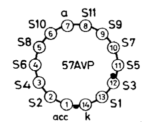
PHOTOSENSITIVE DEVICES - Photomultipliers

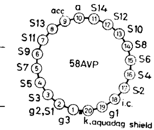
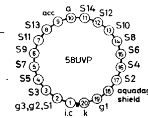
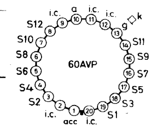
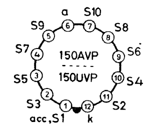
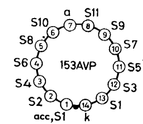
Type	*Spectral response*	*Useful diam.*	*N_a A/lumen or G(ain)*	*at V_b (V)*	*Dark curr. (μA)*	*at N_a A/lm or G(ain)*	*Max. length*	*Base connections*
11 stages								
54AVP	A(S11)	111	500	1800	0.2	250	235	
54UVP	U(S13)	111	500	1800	0.2	250	235	
14 stages								
56AVP	A(S11)	42	$G = 10^8$	2200	0.5	$G = 10^8$	192	
56AVP/03	A(S11)	42	$G = 10^8$	2150	0.1	$G = 10^8$	192	
56AVP/05	A/05	42	$G = 10^8$	2200	0.5	$G = 10^8$	192	
56UVP	U(S13)	42	$G = 10^8$	2200	0.5	$G = 10^8$	190	
10 stages								
56CVP	C(S1)	42	100	2750	<10	20	17'	
14 stages								
56DUVP	DU	42	$G = 10^8$	2100	0.2	$G = 10^8$	192	
56DVP	D	42	$G = 10^8$	2100	0.2	$G = 10^8$	192	
56DVP/03	D	42	$G = 10^8$	2100	0.2	$G = 10^8$	192	
14 stages								
56TUVP	TU	42	$G = 10^8$	2500	<5	$G = 10^8$	192	
56TVP	T(S20)	42	$G = 10^8$	2500	<5	$G = 10^8$	192	
11 stages								
57AVP	A(S11)	200	250	1800	<1	60	325	



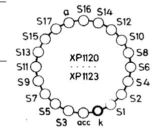
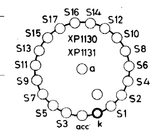






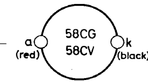
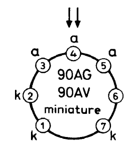
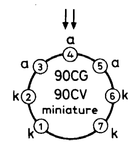
14 stages **58AVP**	A(S11)	110	$G=10^8$	2400	2	$G=10^8$	281	
14 stages **58UVP**	U(S13)	110	$G=10^8$	2400	2	$G=10^8$	340	
12 stages **60AVP**	A(S11)	200	$G=10^8$	3000	<50	$G=10^8$	318	
10 stages **150AVP** **150CVP** **150UVP**	A(S11) C(S1) U(S13)	32 32 32	700 100 700	1800 1800 1800	0.01 <10 0.01	60 20 60	127 127 127	
11 stages **153AVP**	A(S11)	44	400	1800	0.015	60	153	

PHOTOSENSITIVE DEVICES - Windowless photomultipliers

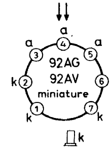
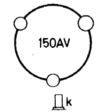
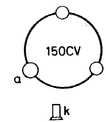
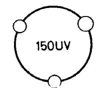
Type[1]	*Cathode*[2] / *Dynode*	*Pressure (mm Hg)* / *Quant. eff. UV*	*Gain at* $V_b = 4\ kV$	*Dark curr. at Gain* $= 10^6$	*Max. dimensions* diam.	*Max. dimensions* length	*Base connections*
XP1120	Ni Cu-Be-O	10^{-5}–10^{-6} 10% at 80 nm	$5 \cdot 10^7$	10^{-10} A	60.5	325	
XP1121	Cu-Be-O Cu-Be-O	10^{-5}–10^{-6} 20% at 68 nm	$5 \cdot 10^7$	10^{-10} A	60.5	325	
XP1122	Ni Cu-Be-O	10^{-5}–10^{-6} 10% at 80 nm	$5 \cdot 10^7$	10^{-10} A	60.5	325	
XP1123	Cu-Be-O Cu-Be-O	10^{-5}–10^{-6} 20% at 68 nm	$5 \cdot 10^7$	10^{-10} A	60.5	325	
XP1130	Ni Cu-Be-O	10^{-5}–10^{-10} 10% at 80 nm	$5 \cdot 10^7$	10^{-10} A	90.5	321	
XP1131	Cu-Be-O Cu-Be-O	10^{-5}–10^{-10} 20% at 68 nm	$5 \cdot 10^7$	10^{-10} A	90.5	321	

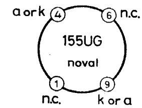
[1]) Potted voltage dividers; [2]) Minimum useful area $22 \times 22\ mm^2$.

PHOTOSENSITIVE DEVICES - Photo tubes

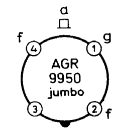
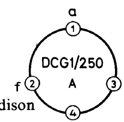
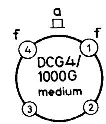
Type	Sensitivity sensitivity area	Operating characteristics	Limiting values	Max. dimensions diam.	Max. dimensions height	Base connections
58CG Gasfilled	red 1.1 cm^2	V_b = 85 V R_a = 1 MΩ N = 100 μA/lm I_{dark} = max. 0.1 μA	V_b = 90 V I_k = 1.5 μA t_{amb} = 100°C	17	33	
58CV Vacuum	red 1.1 cm^2	V_b = 50 V R_a = 1 MΩ N = 20 μA/lm I_{dark} = max. 0.05 μA	V_b = 250 V I_k = 3 μA t_{amb} = 100°C	17	33	
90AG Gasfilled	blue 4.0 cm^2	V_b = 85 V R_a = 1 MΩ N = 130 μA/lm I_{dark} = max. 0.1 μA	V_b = 90 V I_k = 2.5 μA t_{amb} = 70°C	19	54	
90AV Vacuum	blue 4.0 cm^2	V_b = 100 V R_a = 1 MΩ N = 45 μA/lm I_{dark} = max. 0.05 μA	V_b = 100 V I_k = 5 μA t_{amb} = 70°C	19	54	
90CG Gasfilled	red 3.0 cm^2	V_b = 90 V R_a = 1 MΩ N = 125 μA/lm I_{dark} = max. 0.1 μA	V_b = 90 V I_k = 2 μA t_{amb} = 100°C	19	54	

PHOTOSENSITIVE DEVICES - Photo tubes

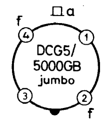
Type	*Sensitivity* / *sensitivity area*	*Operating characteristics*	*Limiting values*	*Max. dimensions* diam.	height	*Base connections*
90CV Vacuum	red 3.0 cm²	V_b = 50 V R_a = 1 MΩ N = 20 μA/lm I_{dark} = max. 0.05 μA	V_b = 250 V I_k = 10 μA t_{amb} = 100°C	19	54	
92AG Gasfilled	blue 2.1 cm²	V_b = 85 V R_a = 1 MΩ N = 130 μA/lm I_{dark} = max. 0.1 μA	V_b = 90 V I_k = 0.0125 μA/mm² t_{amb} = 70°C	19	54	
92AV Vacuum	blue 2.1 cm²	V_b = 85 V R_a = 1 MΩ N = 45 μA/lm I_{dark} = 0.05 μA	V_b = 100 V I_k = 0.025 μA/mm² t_{amb} = 70°C	19	54	
150AV Vacuum	blue 7.1 cm²	V_a = 6–90 $V_{d.c.}$ I_a = max. 50 × 10^{-9} A I_{ap} = max. 35 × 10^{-6} A N = 60 × 10^{-6} A/lm	V_a = 100 $V_{d.c.}$ I_{kp} = 50 × 10^{-9} A/mm² t_{bulb} > −90°C < +60°C	52	82	
150CV Vacuum	red 5.3 cm²	V_a = 6–90 $V_{d.c.}$ I_a = max. 35 × 10^{-9} A I_{ap} = max. 25 × 10^{-6} A N = 20 × 10^{-6} A/lm	V_a = 100 $V_{d.c.}$ I_{kp} = 50 × 10^{-9} A/mm² t_{bulb} = > −90°C < +60°C	52	82	
150UV Vacuum	blue 7.1 cm²	V_a = 6–90 $V_{d.c.}$ I_a = max. 50 × 10^{-9} A I_{ap} = max. 35 × 10^{-6} A N = 35 × 10^{-6} A/lm	V_a = 100 $V_{d.c.}$ I_{kp} = 50 × 10^{-9} A/mm² t_{bulb} = > −90°C < +60°C	52	110	

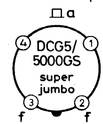
155UG Gasfilled	Ultra-violet	$V_m = 180–220$ V Spectral response = 200–290 nm	$t_{amb} = > -25°C$ $< +70°C$	30	35	

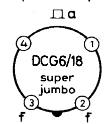
GAS-FILLED TUBES -High voltage rectifiers

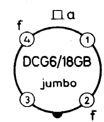
Type and application	V_f *(V)* I_f *(A)*	*Circuit*	$V_{tr\,rms}$ *(kV)*	V_o *(kV)*	I_o *(A)*	W_o *(kW)*	*Limiting* values	*Accessories*	*Base*
AGR9950 Grid-controlled mercury-vapour rectifier	5.0 6.5	1) 2) 3)	4.6 5.3 9.2	4.1 6.2 12.4	2 3 3	8.3 18.6 37.2	f = 150 Hz V_{ainvp} = 13 kV I_o = 1 A I_{ap} = 4 A	Anode cap heat container: 40616 Socket: 2422 511 02001	
DCG1/250 Mercury-vapour rectifier	4.0 2.5	1) 2) 3)	1.06 1.22 2.12	0.95 1.43 2.86	0.5 0.75 0.75	0.48 1.07 2.15	f = 150 Hz V_{ainvp} = 3 kV I_o = 0.25 A I_{ap} = 1.25 A	Socket: 2422 512 02001	 Edison
DCG4/1000ED Mercury-vapour rectifier	2.5 4.8	1) 2) 3)	3.5 4.1 7.1	3.3 4.8 9.6	0.5 0.75 0.75	1.59 3.6 7.2	f = 150 Hz V_{ainvp} = 10 kV I_o = 0.25 A I_{ap} = 1 A	An. conn.: 40619 Socket: 40418	
DCG4/1000G		For further data see DCG4/1000ED						Socket: 2422 511 04001	

DCG4/5000 Mercury-vapour rectifier	4.0 7.0	[1]) [2]) [3])	4.6 5.3 9.3	4.1 6.2 12.4	2.5 3.75 3.75	10.3 23.3 46.6	$f = 150$ Hz $V_{ainvp} = 13$ kV $I_o = 1.25$ A $I_{ap} = 5$ A	An. conn.: 40619 Socket: 65909 BG/01	Goliath
DCG5/30 Mercury-vapour rectifier	5.0 30	[1]) [2]) [3])	4.6 5.3 9.2	4.1 6.2 12.4	12 18 18	50 112 224	$f = 150$ Hz $V_{ainvp} = 13$ kV $I_o = 6$ A $I_{ap} = 25$ A	An. conn.: 40612 Plug pin for grid conn.: 0828172	
DCG5/5000EG Mercury-vapour rectifier	5.0 7.0	[1]) [2]) [3])	4.6 5.3 9.2	4.1 6.2 12.4	3 4.5 4.5	12.4 27.8 55.6	$f = 150$ Hz $V_{ainvp} = 13$ kV $I_o = 1.5$ A $I_{ap} = 6$ A	An. conn.: 40619 Socket: 65909BG/01	Goliath
DCG5/5000GB		For further data see DCG5/5000EG						Socket: 2422 511 02001	
DCG5/5000GS		For further data see DCG5/5000EG						Socket: 2422 511 01001	
DCG6/18 Mercury-vapour rectifier	5.0 11.5	[1]) [2]) [3])	5.3 6.1 10.6	4.8 7.2 14.4	6 9 9	28.8 65 130	$f = 150$ Hz $V_{ainvp} = 15$ kV $I_o = 3$ A $I_{ap} = 12$ A	An. conn.: 40619 Socket: 2422 511 01001	
DCG6/18GB		For further data see DCG6/18						Socket: 2422 511 02001	



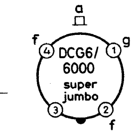
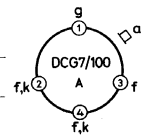
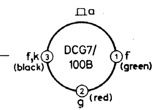
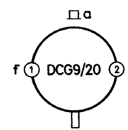




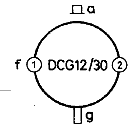


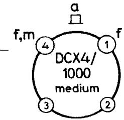
[1]) Two phase-half wave (2 tubes). [2]) Three phase-half wave (3 tubes). [3]) Three phase-full wave (6 tubes).

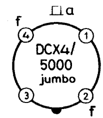
GAS-FILLED TUBES - High voltage rectifiers

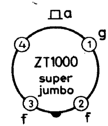
Type and application	V_f *(V)* I_f *(A)*	*Circuit*	$V_{tr.rms}$ *(kV)*	V_o *(kV)*	I_o *(A)*	W_o *(kW)*	*Limiting values*	*Accessories*	*Base*
DCG6/6000	5.0	1)	4.6	4.1	2	8.3	f = 150 Hz	Anode cap heat	
Grid controlled	6.5	2)	5.3	6.2	3	18.6	V_{ainvp} = 13 kV	container: 40616	
mercury-vapour		3)	9.2	12.4	3	37.2	I_o = 1 A	Socket:	
rectifier							I_{ap} = 4 A	2422 511 02001	
DCG7/100	5.0	1)	5.3	4.8	20	96	f = 150 Hz	An. conn.: 40620	
Grid controlled	14	2)	6.1	7.2	30	216	V_{ainvp} = 15 kV	Socket: 40409	
mercury-vapour		3)	10.6	14.4	30	432	I_o = 10 A		
rectifier							I_{ap} = 45 A		
DCG7/100B		See DCG7/100 except for socket							
DCG9/20	5.0	1)	7.4	6.7	5	33.5	f = 150 Hz	An. conn.: 40620	
Mercury-vapour	13.5	2)	8.6	10	7.5	75	V_{ainvp} = 21 kV	An. cap heat	
rectifier		3)	14.8	20	7.5	150	I_o = 2.5 A	container: 40616	
							I_{ap} = 10 A	Socket: 40209	

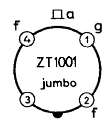
DCG12/30	5.0	1)	9.5	8.6	5	43	$f = 150$ Hz	An. conn.: 40620
Grid controlled	13.5	2)	11	12.9	7.5	97	$V_{ainvp} = 27$ kV	An. cap heat
mercury-vapour		3)	19.1	25.8	7.5	194	$I_o = 2.5$ A	container: 40616
rectifier							$I_{ap} = 10$ A	Socket: 40209
DCX4/1000	2.5	1)	3.5	3.2	0.5	1.6	$f = 150$ Hz	An. conn.: 40619
Xenon-filled	5.0	2)	4.1	4.8	0.75	3.6	$V_{ainvp} = 10$ kV	Socket:
rectifier		3)	7.1	9.6	0.75	7.2	$I_o = 0.25$ A	2422 511 04001
							$I_{ap} = 1$ A	
DCX4/5000	5.0	1)	3.5	3.2	2.5	8	$f = 150$ Hz	An. conn.: 40619
Xenon-filled	7.1	2)	4.1	4.8	3.75	18	$V_{ainvp} = 10$ kV	Socket:
rectifier		3)	7.1	9.6	3.75	36	$I_o = 1.25$ A	2422 511 02001
							$I_{ap} = 5$ A	
ZT1000	5.0	1)	7.4	6.7	5	33.5	$f = 150$ Hz	An. conn. 40620
Grid controlled	13	2)	8.5	10	7.5	75	$V_{ainvp} = 21$ kV	An. cap heat
mercury-vapour		3)	14.8	20	7.5	150	$I_o = 2.5$ A	container: 40616
rectifier							$I_{ap} = 10$ A	Socket:
								2422 511 01001
ZT1001		For further data see ZT1000						Socket:
								2422 511 02001





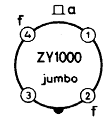
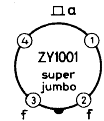




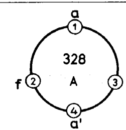


[1]) Two phase-half wave (2 tubes). [2]) Three phase-half wave (3 tubes). [3]) Three phase-full wave (6 tubes).

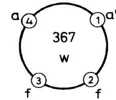
GAS-FILLED TUBES - High voltage rectifiers

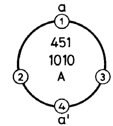
Type and application	V_f *(V)* I_f *(A)*	*Circuit*	$V_{tr.rms}$ *(kV)*	V_o *(kV)*	I_o *(A)*	W_o *(kW)*	*Limiting values*	*Accessories*	*Base*
ZY1000 Mercury-vapour rectifier	5.0 7.0	1) 2) 3)	4.75 5.5 9.5	4.3 6.45 12.9	3 4.5 4.5	12.9 29 58	f = 150 Hz V_{ainvp} = 13.5 kV I_o = 1.5 A I_{ap} = 6 A	An. conn.: 40619 Socket: 2422 511 02001	
ZY1001		For further data see ZY1000						Socket: 2422 511 01001	
ZY1002		For further data see ZY1000						Socket: 65909BG/01	Goliath

GAS-FILLED TUBES - Low voltage rectifiers

Type	V_f *(V)* I_f *(A)*	T_w *(s)*	*Typical characteristics*	*Limiting values*		*Max. dimensions* *diam.*	*length*	*Base*
328 Double anode rectifier	1.9 3.0	15	V_{arc} = 7 V V_{ign} = 16 V	V_{ainvp} = 90 V I_a = 0.65 A I_{ap} = 4.0 A	R_t ≟ min 3 Ω t_{amb} = −55°C, +75°C	33	112	

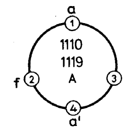
354 Single anode rectifier	1.9 5.5	30	$V_{arc} = 8$ V $V_{ign} = 16$ V	$V_{ainvp} = 400$ V $I_a = 0.25$ A $I_{ap} = 1.25$ A	R_t = min. 50 Ω $t_{amb} = -55°C \ldots +75°C$	62	120	Edison
367 Double anode rectifier	1.9 8.0	30	$V_{arc} = 9$ V $V_{ign} = 16$ V	$V_{ainvp} = 140$ V $I_a = 3$ A $I_{ap} = 18$ A	R_t = min. 1 Ω $t_{amb} = -55°C \ldots +75°C$	81	170	
451 Double anode rectifier	1.9 2.8	15	$V_{arc} = 7$ V $V_{ign} = 11$ V	$V_{ainvp} = 50$ V $I_a = 0.65$ A $I_{ap} = 4.0$ A	R_t = min. 3 Ω $t_{Hg} = 30–75°C$	33	112	
1010 Double anode rectifier	1.9 3.5	15	$V_{arc} = 9$ V $V_{ign} = 16$ V	$V_{ainvp} = 185$ V $I_a = 0.65$ A $I_{ap} = 4.0$ A	R_t = min. 10 Ω $t_{amb} = -55°C \ldots +75°C$	37	120	
1037 Double anode rectifier	1.9 11	120	$V_{arc} = 9$ V $V_{ign} = 16$ V	$V_{ainvp} = 185$ V $I_a = 3.0$ A $I_{ap} = 18$ A	R_t = min. 1.75 Ω $t_{Hg} = 30–80°C$	85	240	Goliath
1039 Double anode rectifier	1.9 20	120	$V_{arc} = 9$ V $V_{ign} = 16$ V	$V_{ainvp} = 185$ V $I_a = 7.5$ A $I_{ap} = 45$ A	R_t = min. 075 Ω $t_{Hg} = 30–80°C$	94	264	Goliath
1049 Double anode rectifier	1.9 28.5	120	$V_{arc} = 9$ V $V_{ign} = 16$ V	$V_{ainvp} = 185$ V $I_a = 12.5$ A $I_{ap} = 75$ A	R_t = min. 0.3 Ω $t_{Hg} = 30–80°C$	101	280	Straps
1054 Double anode rectifier	1.9 68	120	$V_{arc} = 9$ V $V_{ign} = 16$ V	$V_{ainvp} = 150$ V $I_a = 20$ A $I_{ap} = 120$ A	R_t = min. 0.18 Ω $t_{Hg} = 30–80°C$	111	350	Straps

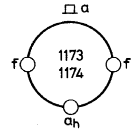
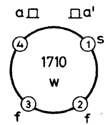
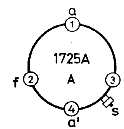




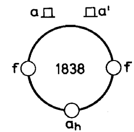
[1]) Two phase-half wave (2 tubes). [2]) Three phase-half wave (3 tubes). [3]) Three phase-full wave (6 tubes).

GAS-FILLED TUBES - Low voltage rectifiers

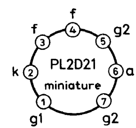
Type	V_f (V) / I_f (A)	T_w (s)	Typical characteristics	Limiting values		Max. dimensions diam.	Max. dimensions length	Base
1069K Double anode rectifier	3.25 70	120	$V_{arc} = 10$ V $V_{ign} = 16$ V	$V_{ainvp} = 170$ V $I_a = 30$ A $I_{ap} = 200$ A	R_t = min. 0.12 Ω $t_{Hg} = 30$–75 °C	114	365	Straps
1110 Double anode rectifier	1.9 3.5	15	$V_{arc} = 9$ V $V_{ign} = 16$ V	$V_{ainvp} = 185$ V $I_a = 0.85$ A $I_{ap} = 5.0$ A	R_t = min. 4 Ω $t_{amb} = -55$°C, +75°C	39	131	
1119 Double anode rectifier	1.9 5.8	30	$V_{arc} = 9$ V $V_{ign} = 16$ V	$V_{ainvp} = 140$ V $I_a = 1.5$ A $I_{ap} = 9.0$ A	R_t = min. 1.8 Ω $t_{amb} = -55$°C, +75°C	71	142	
1138 Single anode rectifier	2.5 27	120	$V_{arc} = 10$ V $V_{ign} = 16$ V	$V_{ainvp} = 275$ V $I_a = 15$ A $I_{ap} = 85$ A	R_t = min. 0.3 Ω $t_{Hg} = 30$–80°C	115	269	Goliath
1163 Single anode rectifier	2.25 17	3	$V_{arc} = 9$ V $V_{ign} = 16$ V	$V_{ainvp} = 375$ V $I_a = 6$ A $I_{ap} = 36$ A	R_t = min. 0.5 Ω $t_{amb} = -55$°C, +75 °C	83	178	Goliath
1164 Single anode rectifier	2.5 25	15	$V_{arc} = 9$ V $V_{ign} = 16$ V	$V_{ainvp} = 225$ V $I_a = 15$ A $I_{ap} = 90$ A	R_t = min. 0.3 Ω $t_{amb} = -55$°C, +75°C	98	220	Goliath

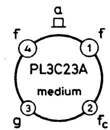
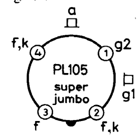
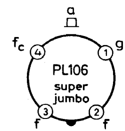
1173 Single anode rectifier	1.9 13	60	$V_{arc} = 12$ V $V_{ign} = 22$ V	$V_{ainvp} = 850$ V $I_a = 4$ A $I_{ap} = 20$ A	R_t = min. 0.75 Ω $t_{Hg} = 30$–75°C	62	189	
1174 Single anode rectifier	1.9 12	60	$V_{arc} = 12$ V $V_{ign} = 22$ V	$V_{ainvp} = 850$ V $I_a = 6$ A $I_{ap} = 30$ A	R_t = min. 0.5 Ω $t_{Hg} = 30$–75°C	77	218	
1176 Single anode rectifier	1.9 28	120	$V_{arc} = 12$ V $V_{ign} = 22$ V	$V_{ainvp} = 850$ V $I_a = 15$ A $I_{ap} = 75$ A	R_t = min. 0.2 Ω $t_{Hg} = 30$–75°C	92	301	Straps
1177 Single anode rectifier	1.9 60	120	$V_{arc} = 12$ V $V_{ign} = 28$ V	$V_{ainvp} = 850$ V $I_a = 25$ A $I_{ap} = 135$ A	R_t = min. 0.1 Ω $t_{Hg} = 30$–75°C	128	362	Straps
1710 Double anode rectifier	1.9 8.0	30	$V_{arc} = 10$ V $V_{ign} = 22$ V	$V_{ainvp} = 470$ V $I_a = 1.5$ A $I_{ap} = 9.0$ A	R_t = min. 2.5 Ω $t_{Hg} = 30$–80°C	69.5	205	
1725A Double anode rectifier	1.9 3.5	15	$V_{arc} = 10$ V $V_{ign} = 22$ V	$V_{ainvp} = 470$ V $I_a = 0.65$ A $I_{ap} = 4.0$ A	R_t = min. 5 Ω $t_{amb} = \begin{matrix} -55°C \\ +75°C \end{matrix}$	71	135	
1738 Double anode rectifier	1.9 18	120	$V_{arc} = 9$ V $V_{ign} = 20$ V	$V_{ainvp} = 300$ V $I_a = 7.5$ A $I_{ap} = 45$ A	R_t = min. 0.2 Ω $t_{Hg} = 30$–80°C	94	284	Goliath

GAS-FILLED TUBES - Low voltage rectifiers

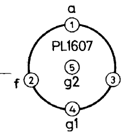
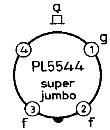
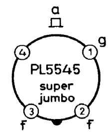
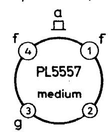
Type	V_f (V) / I_f (A)	T_w (s)	Typical characteristics	Limiting values		Max. dimensions diam.	Max. dimensions length	Base connections
1749A Double anode rectifier	1.9 / 25	120	$V_{arc}=10$ V $V_{ign}=22$ V	$V_{ainvp}=300$ V $I_a=12.5$ A $I_{ap}=75$ A	$R_t=$ min. 0.1 Ω $t_{Hg}=30$–80°C	101	290	Straps
1788 Double anode rectifier	1.9 / 11	120	$V_{arc}=9$ V $V_{ign}=22$ V	$V_{ainvp}=300$ V $I_a=5$ A $I_{ap}=30$ A	$R_t=$ min. 0.3 Ω $t_{Hg}=30$–80°C	94	284	Goliath 
1838 Double anode rectifier	1.9 / 21.5	120	$V_{arc}=10$ V $V_{ign}=22$ V	$V_{ainvp}=360$ V $I_a=7.5$ A $I_{ap}=45$ A	$R_t=$ min. 0.25 Ω $t_{Hg}=30$–80°C	97	262	
1849 Double anode rectifier	1.9 / 29	120	$V_{arc}=10$ V $V_{ign}=22$ V	$V_{ainvp}=360$ V $I_a=12.5$ A $I_{ap}=75$ A	$R_t=$ min. 0.2 Ω $t_{Hg}=30$–80°C	105	294	Straps
1859 Double anode rectifier	1.9 / 60	120	$V_{arc}=12$ V $V_{ign}=28$ V	$V_{ainvp}=360$ V $I_a=25$ A $I_{ap}=150$ A	$R_t=$ min. 0.1 Ω $t_{Hg}=30$–80°C	143	436	Straps

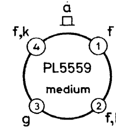
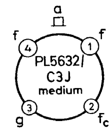
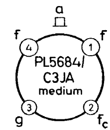
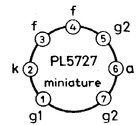
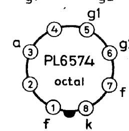
GAS-FILLED TUBES - Thyratrons

Type	V_f (V) / I_f (A)	T_w (s)	Typical characteristics	Limiting values		Max. dimensions diam.	Max. dimensions length	Base connections
PL2D21 Tetrode	6.3 / 0.6	20	$V_{arc}=8$ V $T_{ion}=0.5$ μs $T_{dion}=35$ μs	$V_{ap}=650$ V $V_{ainp}=1.3$ kV $I_k=0.1$ A	$I_{kp}=0.5$ A $t_{amb}=-75$°C / +90°C	19	54	

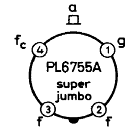
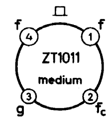
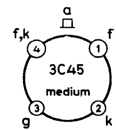
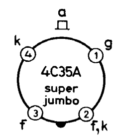
PL3C23A Triode	2.5 7.0	>15	$V_{arc} = 10$ V $T_{ion} = 10\ \mu s$ $T_{dion} = 1000\ \mu s$	$V_{ap} = 1.5$ kV $V_{ainvp} = 1.5$ kV $I_k = 1.6$ A $I_{kp} = 6.4$ A	$I_g = 10$ mA $I_{gp} = 50$ mA $t_{Hg} = -40°C\ +80°C$	52	155	
PL10 Triode	1.85 3.4	0	$V_{arc} = 20$–35 V at $I_a = 0.1$–0.4 A	$V_{ap} = 400$ V $V_{ainvp} = 400$ V $I_a = 100$ mA	$I_{ap} = 4$ A $t_{amb} = -75°C\ +90°C$	21.5	105	Mignon
PL105 Tetrode	5.0 10	>300	$V_{arc} = 12$ V $T_{ion} = 10\ \mu s$ $T_{dion} = 1000\ \mu s$	$V_{ap} = 2.5$ kV $V_{ainvp} = 2.5$ kV $I_a = 6.4$ A	$I_{ap} = 40$ A $t_{Hg} = 40$–$80°C$	123	288	
PL106 Triode	2.5 22	60	$V_{arc} = 12$ V $T_{ion} = 10\ \mu s$ $T_{dion} = 500\ \mu s$	$V_{ap} = 2$ kV $V_{ainvp} = 2$ kV $I_k = 6.4$ A	$I_{kp} = 80$ A $t_{Hg} = 25$–$80°C$	73	290	
PL150 Triode	1.9 26	>60	$V_{arc} = 12$ V $T_{ion} = 10\ \mu s$ $T_{dion} = 1000\ \mu s$	$V_{ap} = 120$ V $V_{ainvp} = 250$ V $I_a = 17$ A	$I_{ap} = 65$ A $t_{Hg} = 40$–$80°C$	92	293	Straps
PL255 Triode	5.0 11	>600	$V_{arc} = 10$ V $T_{ion} = 10\ \mu s$ $T_{dion} = 1000\ \mu s$	$V_{ap} = 1.5$ kV $V_{ainvp} = 2.5$ kV $I_k = 10$ A	$I_{kp} = 100$ A $t_{Hg} = 35$–$75°C$	102	334	Straps
PL260 Triode	5.0 19	>600	$V_{arc} = 10$ V $T_{ion} = 10\ \mu s$ $T_{dion} = 1000\ \mu s$	$V_{ap} = 2.0$ kV $V_{ainvp} = 2.5$ kV $I_k = 60$ A	$I_{kp} = 200$ A $t_{Hg} = 40$–$80°C$	127	405	Straps

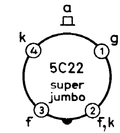
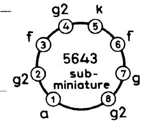
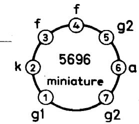
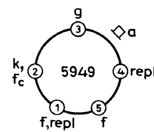
GAS-FILLED TUBES - Thyratrons

Type	V_f (V) I_f (A)	T_w (s)	Typical characteristics	Limiting values		Max. dimensions diam.	length	Base connections
PL1607 Tetrode	2.0 2.6	>30	V_{arc} = 15 V T_{dion} = 500 μs	V_{ap} = 650 V V_{ainvp} = 650 V I_a = 0.5 A	I_{ap} = 2 A t_{amb} = −75°C +90°C	48	142	
PL5544 Triode	2.5 12	>60	V_{arc} = 12 V T_{ion} = 10 μs T_{dion} = 400 μs	V_{ap} = 1.5 kV V_{ainvp} = 1.5 kV I_k = 3.2 A	I_{kp} = 40 A t_{amb} = −55°C +70°C	67	190	
PL5545 Triode	2.5 21	>60	V_{arc} = 12 V T_{ion} = 10 μs T_{dion} = 500 μs	V_{ap} = 1.5 kV V_{ainvp} = 1.5 kV I_k = 6.4 A	I_{kp} = 80 A t_{amb} = −55°C +70°C	67	229	
PL5557 Triode	2.5 5.0	10	V_{arc} = 12 V T_{ion} = 10 μs T_{dion} = 1000 μs	V_{ap} = 2.5 kV V_{ainvp} = 5.0 kV I_a = 0.5 A	I_{ap} = 2 A t_{Hg} = 35–80°C	52	155	

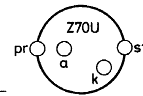
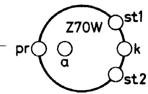
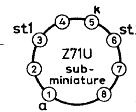
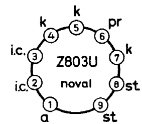
PL5559 Triode	[illegible] 4.5	>300	V_{arc} = 12 V T_{ion} = 10 μs T_{dion} = 1000 μs	V_{ap} = 1 kV V_{ainvp} = 1 kV I_k = 2.5 A	I_{kp} = 15 A t_{Hg} = 40–80 °C	76	185	
PL5632/ **C3J** Triode	2.5 9.0	60	V_{arc} = 10 V T_{ion} = 10 μs T_{dion} = 1000 μs	V_{ap} = 900 V V_{ainvp} = 1.25 kV J_k = 2.5 A	I_{kp} = 30 A t_{amb} = −55 °C / +75 °C	40	150	
PL5684/ **C3JA** Triode	2.5 9.0	60	V_{arc} = 10 V T_{ion} = 10 μs T_{dion} = 1000 μs	V_{ap} = 1 kV V_{ainvp} = 1.25 kV I_k = 2.5 A	I_{kp} = 30 A t_{amb} = −55 °C / +75 °C	40	150	
PL5727 Tetrode	6.3 0.6	20	V_{arc} = 8 V T_{ion} = 0.5 μs T_{dion} = 75 μs	V_{ap} = 650 V V_{ainvp} = 1.3 kV I_k = 0.1 A	I_{kp} = 0.5 A t_{amb} = −75 °C t_{bulb} = +150 °C	19	54	
PL6574 Tetrode	6.3 0.95	>15	V_{arc} = 10 V V_a/V_{g1} = 275 V_a/V_{g2} = 370	V_{ap} = 650 V V_{ainvp} = 1.3 kV I_k = 0.3 A	I_{kp} = 2 A t_{amb} = −75 °C / +90 °C	33	70	

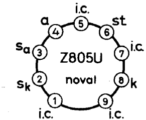
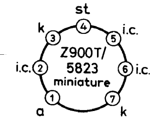
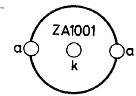
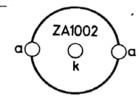
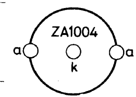
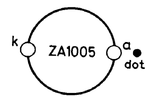
GAS-FILLED TUBES - Thyratrons

Type	V_f (V) I_f (A)	T_w (s)	*Typical characteristics*	*Limiting values*		*Max. dimensions diam.*	*length*	*Base connections*
PL6755A Triode	2.5 11	>30	V_{arc} = 12 V T_{ion} = 10 μs T_{dion} = 500 μs	V_{ap} = 2 kV V_{ainvp} = 2 kV I_k = 3.6 A	I_{kp} = 40 A t_{amb} = 0–55°C	59	228	
ZT1011 Triode	2.5 8.5	>10	V_{arc} = 10 V T_{dion} = 200–300 μs I_g = < 20 μA	V_{ap} = 1.5 kV V_{ainvp} = 1.5 kV I_k = 2.5 A	I_{kp} = 30 A t_{amb} = −55°C +75°C	40	120	
3C45 Hydrogen triode	6.3 2.25	>120	Oper. factor $V_{ap} \cdot I_{ap} \cdot f_{imp}$ = max. 0.3×10^9 VAHz	V_{ap} = 3 kV V_{ainvp} = 3 kV I_a = 45 mA	I_{ap} = 35 A t_{amb} = −50°C +90°C	40	132	
4C35A Hydrogen triode	6.3 6.1	>180	Oper. factor $V_{ap} \cdot I_{ap} \cdot f_{imp}$ = max. 2×10^9 VAHz	V_{ap} = 8 kV V_{ainvp} = 8 kV I_a = 100 mA	I_{ap} = 90 A t_{amb} = −50°C +90°C	65	174	

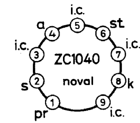
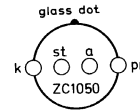
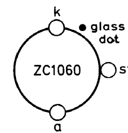
5C22 Hydrogen triode	6.3 10.6	>300	Oper. factor = $V_{ap} \cdot I_{ap} \cdot f_{imp} =$ max. 3.2×10^9 VAHz	V_{ap} = 16 kV V_{ainvp} = 16 kV I_a = 200 mA	I_{ap} = 325 A t_{amb} = −50°C +90°C	65	222	
5643 Tetrode	6.3 0.15	10	V_{arc} = 10 V I_a = 20 mA	V_{ap} = 500 V V_{ainvp} = 500 V I_k = 25 mA	I_{kp} = 100 mA t_{amb} = −55°C +100°C	10.16	34.9	
5696 Tetrode	6.3 0.15	10	V_{arc} = 10 V T_{dion} = 40 μs	V_{ap} = 500 V V_{ainvp} = 500 V I_k = 25 mA	I_{kp} = 100 mA t_{amb} = −55°C +90°C	19	44.5	
5949 Hydrogen triode	6.3 18.5	>900	Oper. factor $V_{ap} \cdot I_{ap} \cdot f_{imp} =$ max. 6.25×10^9 VAHz	V_{ap} = 25 kV V_{ainvp} = 25 kV I_a = 0.5 A	I_{kp} = 500 A t_{amb} = −55°C +75°C	84	317	

GAS-FILLED TUBES - Trigger tubes and switching diodes

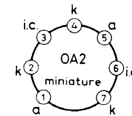
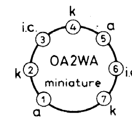
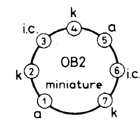
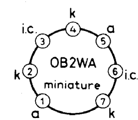
Type	Characteristics		Limiting values	Max. dimensions		Base connections
				diam.	length	
Z70U Trigger tube	$V_{ba} = 250$ V $V_m = 116$ V $I_k = 5$ mA	$V_{st\,ign} = 145$ V $C_{st} =$ min. 100 pF	$V_{ba} = 310$ V $I_{kp} = 200$ mA $t_{bulb} = -55\,°C$ … $+100\,°C$	10.16	23.5	
Z70W	The type Z70W is electrically identical with type Z70U but has two independent starter electrodes					
Z71U Trigger tube	$V_{ba} = 150$ V $V_m = 60$ V $I_k = 7$ mA	$V_{st\,ign} = 80$ V $I_{st} = 40\ \mu A$	$V_{ba} = 170$ V $I_{kp} = 12$ mA $t_{bulb} = -50\,°C$ … $+70\,°C$	10.16	45	
Z803U Trigger tube	$V_{ba} = 240$ V $V_m = 105$ V $I_k = 40$ mA	$V_{st\,ign} = 132$ V $C_{st} = 500$ pF $I_{st} = 45\ \mu A$	$V_{ba} = 290$ V $I_{kp} = 200$ mA $V_{a\,st} = 290$ V $-V_{a\,st} = 140$ V	22	45	

Z805U Trigger tube	$V_{ba} = 250\ V_{a.c.}$ $V_m = 122$ V $I_k = 25$ mA	$V_{st\,ign} = \begin{matrix} 104\ V_{a.c.} \\ 146\ V_{d.c.} \end{matrix}$ C_{st} = min. 330 pF $I_{st} = 50\ \mu A$	$V_{ba} = 275\ V_{a.c.}$ $I_{kp} = 150$ mA	22	52.8	
Z900T/ **5823** Trigger tube	$V_{ba} = 117\ V_{a.c.}$ $175\ V_{d.c.}$ $V_m = 62$ V $I_k = 15$ mA	$V_{st\,ign} = 80$ V C_{st} = min. 400 pF	$V_{ba} = 200$ V $I_{kp} = 150$ mA	19	54	
ZA1001 Switching diode	$V_{ign} = 128$ V $V_m = 93$ V	$I_k = 1.5$ mA r_{ins} = min. 300 MΩ	$-V_{ap} = 100$ V $t_{bulb} = \begin{matrix} -55°C \\ +70°C \end{matrix}$	6.5	25	
ZA1002 Switching and light diode	$V_{ign} = 170$ V $V_m = 109$ V	$I_k = 3.5$ mA r_{ins} = min. 300 MΩ	$-V_{ap} = 200$ V $I_{kp} = 50$ mA $t_{bulb} = \begin{matrix} -55°C \\ +70°C \end{matrix}$	6.5	25	
ZA1004 Indicator diode	$V_{ign} = 90$ V V_{ext} = min. 83.5 V $I_k = 1$ mA	$E = 60$ lux r_{ins} = min. 300 MΩ	$-V_{ap} = 70$ V $I_{kp} = 3$ mA $t_{bulb} = \begin{matrix} -55°C \\ +70°C \end{matrix}$	6.5	25	
ZA1005 Switching diode	$V_{ign} = 125$ V $V_m = 93$ V	$I_{p\,forw} = 170$ mA r_{ins} = min. 300 MΩ	$I_{p\,forw} = 300$ mA $t_{bulb} = \begin{matrix} -55°C \\ +70°C \end{matrix}$	6.5	25	

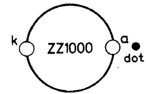
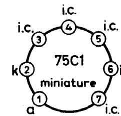
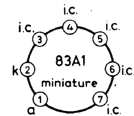
GAS-FILLED TUBES - Trigger tubes and switching diodes

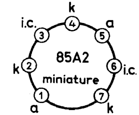
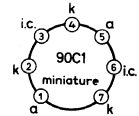
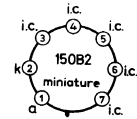
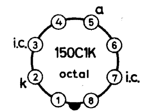
Type	Characteristics		Limiting values	Max. dimensions diam.	Max. dimensions length	Base connections
ZC1040 Trigger tube	$V_{ba} = 220\ V_{a.c.}$ $300\ V_{d.c.}$ $V_m = 112$ V	$V_{st\,ign} = 130$ V C_{st} = min. 200 pF $I_{st} = 200\ \mu A$	$V_a = 250\ V_{a.c.}$ $I_k = 40$ mA $I_{kp} = 200$ mA $t_{bulb} = -55°C\ +75°C$	22	55.6	
ZC1050 Trigger tube	$V_{ba} = 300$ V $V_m = 136$ V $I_k = 2$ mA	$V_{stign} = 180$ V C_{st} = min. 1 nF	$-V_a = 100$ V $-V_{st} = 100$ V $I_{kp} = 10$ mA $t_{bulb}\ -55°C\ +70°C$	6.5	31	
ZC1060 Trigger tube	$V_a = <800$ V >100 V	$I_k = <20$ mA $r_{ins} = >300\ M\Omega$	$I_{kp} = 5000$ A $t_{bulb} = -55°C\ +125°C$	12.5	31	

GAS-FILLED TUBES - Stabilizing and reference tubes

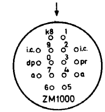
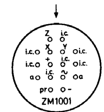
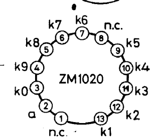
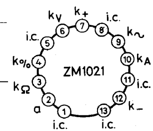
Type	*Characteristics and range values*	*Limiting values*	*Max. dimensions*		*Base connections*
			diam.	*length*	
OA2 Voltage stabilizing tube	V_{ign} = max. 180 V V_m (I_k = 5–30 mA) = 144–160 V V_r = max. 6 V r_a (I_k = 20 mA) = 80 Ω t_{amb} = 25°C	I_{kp} = 75 mA $-V_{ap}$ = 125 V t_{amb} = −55°C / +90°C	19	66.7	
OA2WA Voltage Stabilizing tube	V_{ign} = max. 165 V V_m (I_k = 5–30 mA) = 144–153 V V_r (I_k = 5–30 mA) = max. 5 V r_a (I_k = 20 mA) = 80 Ω t_{amb} = 25°C	I_{kp} = 75 mA $-V_{ap}$ = 125 V t_{amb} = − 55°C t_{bulb} = +150°C	19	66.7	
OB2 Voltage stabilizing tube	V_{ign} = max. 127 V V_m (I_k = 17.5 mA) = 106–111 V V_r (I_k = 5–30 mA) = max. 3.5 V r_a (I_k = 20 mA) = 80 Ω t_{amb} = 25°C	I_{kp} = 75 mA $-V_{ap}$ = 75 V t_{amb} = −55°C / +90°C	19	66.7	
OB2WA Voltage stabilizing tube	V_{ign} = max. 130 V V_m (I_k = 5–30 mA) = 105–111 V V_r (I_k = 5–30 mA) = max. 2.5 V r_a (I_k = 20 mA) = 80 Ω t_{amb} = 25°C	I_{kp} = 75 mA $-V_{ap}$ = 75 V t_{amb} = min. 55 °C t_{bulb} = max. 150°C	19	66.7	

GAS-FILLED TUBES - Stabilizing and reference tubes

Type	*Characteristics and range values*	*Limiting values*	*Max. dimensions diam.*	*Max. dimensions length*	*Base connections*
ZZ1000 Voltage reference tube	V_{ign} = max. 115 V V_m (I_k = 3.2 mA) = 80.1–82.5 V r_a = 200 Ω	I_{kp} = 20 mA $-V_{ap}$ = 100 V t_{bulb} = −55 °C, +125 °C	6.5	30	
75C1 Voltage stabilizing tube	V_{ign} = max. 115 V V_m (I_k = 30 mA) = 75–81 V V_r (I_k = 2–60 mA) = max. 8 V r_a = 130 Ω	I_{kp} = 100 mA $-V_{ap}$ = 50 V t_{bulb} = −55 °C, +140 °C	19	54.5	
83A1 Voltage reference tube	V_{ign} = max. 120 V V_m (I_k = 4.5 mA) = 83–84.5 V r_a = 250 Ω	I_{kp} = 10 mA $-V_{ap}$ = 50 V t_{bulb} = −55 °C, +150 °C	19	54	

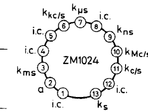
85A2 Voltage reference tube	V_{ign} = max. 115 V V_m (I_k = 5.5 mA) = 83–87 V r_a = 300 Ω	I_{kp} = 40 mA $-V_{ap}$ = 75 V t_{bulb} = −55°C +90°C	19	54	
90C1 Voltage stabilizing tube	V_{ign} = max. 115 V V_m (I_k = 20 mA) = 86–94 V V_r (I_k = 1–40 mA) max. 14 V r_a (I_k = 20 mA) = 300 Ω	I_{kp} = 100 mA $-V_{ap}$ = 75 V t_{bulb} = −55°C +110°C	19	54	
150B2 Voltage stabilizing tube	V_{ign} = max. 180 V V_m (I_k = 10 mA) = 146–154 V V_r (I_k = 5–15 mA) = max. 5 V r_a (I_k = 10 mA) = 350 Ω	I_{kp} = 40 mA $-V_{ap}$ = 130 V t_{bulb} = −55°C +110°C	19	54	
150C1K Voltage stabilizing tube	V_{ign} = max. 205 V V_m (I_k = 20 mA) = 144–164 V V_r (I_k = 5–40 mA) = max. 8 V	I_{kp} = 75 mA	43	114	

GAS-FILLED TUBES - Indicating tubes

Type		Characteristics	Limiting values	Base connections
ZM1000	Numerals 0–9 Numeral height 15 mm Side viewing	V_{ign} = max. 160 V V_m = 140 V I_a = min. 1.5 mA I_a = max. 4.5 mA V_{ext} = min. 118 V	I_{ap} = 20 mA t_{amb} = −50°C +70°C	
ZM1001	Characters +, −, ~v, x, y, z Character height 10–14 mm	For further data see ZM1000		
ZM1020 Indicator tube	Numerals 0–9 Numeral height 15 mm Top viewing	V_{ign} = max. 160 V V_m = 140 V I_a min. = 1 mA I_a max. = 3 mA $V_{ext.}$ = min. 118 V	I_{ap} = 10 mA t_{amb} = −50°C +70°C	
ZM1021 Indicator tube	Characters A, V, Ω, %, ~, +, −. Character height 15 mm Top viewing	V_{ign} = max. 160 V V_m = 140 V I_k min. 1 mA I_k max. 2.5 mA	I_{kp} = 10 mA t_{bulb} = −50°C +70°C	
ZM1022	The ZM1022 is electrically identical with type ZM1020 but has no filter coating			
ZM1023	The ZM1023 is electrically identical with type ZM1021 but has no filter coating			

ZM1024

Characters c/s, Kc/s, Mc/s, μs, ms, ns, s
For further data see ZM1020



ZM1025

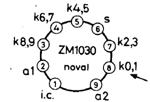
The ZM1025 is electrically identical with type
ZM1024 but has no filter coating

ZM1030
Indicator
tube

Numerals 0–9
Numeral height 15.5 mm
Side viewing

V_{ign} = max. 170 V
V_m = 140 V
I_a min. 3 mA
I_a max. 5 mA
$V_{ext.}$ = min. 110 V

I_{ap} = 12 mA
t_{bulb} = −55°C +70°C

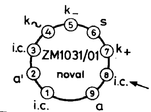


ZM1031/01
Indicator
tube

Signs +, −, ~.
Sign height 15 mm
Side viewing

V_{ign} = max. 170 V
V_m = 140 V
I_a = min. 2 mA
I_a = max. 3 mA
r_a = 4.5 kΩ

I_{ap} = 10 mA
t_{bulb} = −55°C +70°C



ZM1032

Signs 0–9
The ZM1032 is electrically identical with type
ZM1030 but has no filter coating

ZM1033/01

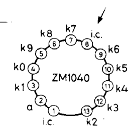
The ZM1033/01 is electrically identical with type
ZM1031/01 but has no filter coating

ZM1040
Indicator
tube

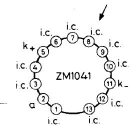
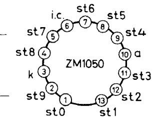
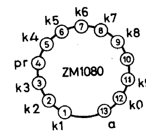
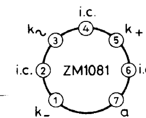
Numerals 0–9
Numeral height 30 mm
Side viewing

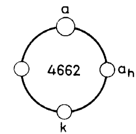
V_{ign} = max. 160 V
V_m = 140 V
I_k = min. 3 mA
I_k = max. 6 mA
$V_{ext.}$ = min. 120 V

I_{kp} = 20 mA
t_{bulb} = 0°C +70°C

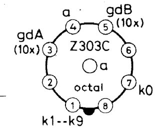
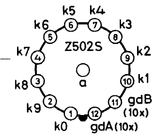
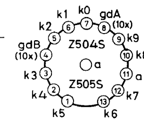


GAS-FILLED TUBES - Indicating tubes

Type		*Characteristics*	*Limiting values*	*Base connections*
ZM1041 Indicator tube	Signs +, −. Sign height 20 mm Side viewing	V_{ign} = max. 160 V V_m = 140 V I_k = min. 3 mA I_k = max. 6 mA	I_{kp} = 20 mA t_{bulb} = −50°C / +70°C	
ZM1042	The ZM1042 is electrically identical with type ZM1040 but has no filter coating			
ZM1043	The ZM1043 is electrically identical with type ZM1041 but has no filter coating			
ZM1050 Indicator tube	Numerals 0–9 Numeral height 3 mm Top viewing	V_{tr} = 110 V_{rms} R_k = 10 kΩ R_{st} = 330 kΩ C_k = 33 nF I_{st} = 50 μA V_m = 84 V I_k = 3 mA	V_{tr} = 150 V_{rms} I_k = 4 mA R_{st} = min. 0.1 MΩ / max. 0.47 MΩ t_{bulb} = −55°C / +70°C	
ZM1080 Indicator tube	Numerals 0–9 Numeral height 13 mm Side viewing	V_b = min. 170 V V_m = 140 V I_k = min. 1.5 mA I_k = max. 3.5 mA	I_{kp} = 12 mA t_{bulb} = −50°C / +70°C	
ZM1081 Indicator tube	Characters −, +, ∼. Character height 10.5 mm Side viewing	V_b = min. 170 V V_m = 140 V I_k = min. 1.5 mA I_k = max. 3.5 mA	I_{kp} = 12 mA t_{bulb} = −50°C / +70°C	

4662 Indicator tube	Neon light bar Side viewing	$V_{ign} = 165–190$ V $I_{ah} = 40–80$ V $V_m = 150–170$ V	$I_a = 2$ mA	

GAS-FILLED TUBES - Counter and selector tubes

Type	*Characteristics and operating conditions*		*Base connections*
Z303C Counter tube	Max. counting speed = 4 kHz Supply voltage = 475 V Output current = 340 μA Output voltage = 35 V	Bias voltage = −12 V Anode load resistance = 0.82 MΩ Output load resistance = 0.12 MΩ	
Z502S Selector tube	Max. counting speed = 4 kHz Supply voltage = 475 V Output current = 340 μA Output voltage = 35 V	Bias voltage = −12 V Anode load resistance = 0.82 MΩ Output load resistance = 0.12 MΩ	
Z504S Counter and selector tube	Max. counting speed = 5 kHz Supply voltage = 475 V Output current = 340 μA Output voltage = 35 V	Anode supply voltage = 375–1000 V Time constant rise of anode supply voltage when switching on V_{ba} < 550 V = 1.0 ms V_{ba} > 550 V = 6.0 ms	
Z505S Selector tube	Max. counting speed = 50 kHz Supply voltage = 500 V Output current = 800 μA Output voltage = 24 V	Anode supply voltage = 400–1000 V Time constant rise of anode supply voltage min. 2 ms	

Type	Ignitor characteristics		Single phase A.C. control (2 tubes in inverse parallel connection)					Water flow	Max. dimensions	
	$V_{ign.}$ (max.) (V)	$I_{ign.}$ (A)	V_{main} ($V_{a.c.}$)	T_{av} (max.) (s)	P(max.) (kVA)	I_{av} (max.) (A)	δ (%)	q (l/min)	diam.	length
PL5551A f=25–60 Hz	200	6–8	250	18.0	600	30.2	2.8	min.2	70	616
		<12	380	11.8	600	30.2	4.2			
			600	7.5	600	30.2	6.7			
PL5552A f=25–60 Hz	200	6–8	250	14.0	1200	75.6	3.5	min. 5	104	687
		<12	380	9.4	1200	75.6	5.3			
			600	5.8	1200	75.6	8.4			
PL5553B f=25–60 Hz	200	6–8	250	11.0	2400	192	4.4	min. 9	146	757
		<12	380	7.3	2400	192	6.8			
			600	4.6	2400	192	10.6			
PL5555 f=25–60 Hz	150	<40	2400	1.66	2400	135		min. 9	146	570
ZX1000 f=25–60 Hz			250	12.0	200	7		0.2–1.0	98	194
			380	10.0	200	7				
			500	8.0	200	7				
ZX1051 f=25–60 Hz	150	6–8	250	18.0	600	30.2	2.8	min. 2	70	600
		<12	380	11.8	600	30.2	4.2			
			600	7.5	600	30.2	6.7			

GAS-FILLED TUBES - Ignitrons

Type	*Ignitor characteristics*		*Single phase A.C. control (2 tubes in inverse parallel connection)*					*Water flow*	*Max. dimensions*	
	$V_{ign.}$ *(max.)* *(V)*	$I_{ign.}$ *(A)*	V_{main} $(V_{a.c.})$	T_{av} *(max.)* *(s)*	*P(max.)* *(kVA)*	I_{av} *(max)* *(A)*	δ (%)	*q* *(l/min.)*	*diam.*	*length*
ZX1052	150	6–8	250	14.0	1200	75.6	3.5	min. 5	104	600
f=25–60 Hz		<12	380	9.4	1200	75.6	5.3			
			600	5.8	1200	75.6	8.4			
ZX1061	150	6–8	250	24.0	630	38	3.3	min. 3	70	634
f=25–60 Hz		<12	380	15.8	850	38	3.8			
			600	10.0	1200	38	4.2			
ZX1062	150	6–8	250	21.0	1250	110	4.9	min. 6	104	600
f=25–60 Hz		<12	380	13.8	1650	110	5.6			
			600	8.7	2300	110	6.4			

Type	*Ignitor characteristics*		*Limiting values for intermittent rectifier service*						*Water flow*	*Max. dimensions*	
	$V_{ign.}$ *(max.)* *(V)*	$I_{ign.}$ *(A)*	$V_{aforw\,p.}$ *(V)*	V_{ainvp} *(V)*	I_{ap} *(A)*	$I_{acorresp.}$ *(A)*	T_{av} *(s)*	I_a/I_{ap} $T_{av}=0.25$	*q* *(l/min)*	*diam.*	*length*
PL5822A	200	6–8	1200	1200	1500	20	6.25	0.166	min. 6	104	687
f = 50–60 Hz		<12			420	70					
			1500	1500	1200	16	6.25	0.166	min. 6		
					336	56					

NUCLEAR DEVICES - Radiation counter tubes

Type	Description	Radiation sensitivity	Wall thickness (mg/cm²)	Anode resistor (MΩ)	Plateau Operating voltage (V)	Max. plateau slope (%/V)	Max. dead time (μs)	Max. backgr. (shielded) (counts/min.)	Eff. length Window diam. (mm)	Max. dimensions diam. (mm)	Max. dimensions length (mm)
ZP1000			0.4 mm	10	1600–2400	0.01		1.0	250	25.4	355
ZP1001	BF3	Slow	0.4 mm	10	1600–2400	0.01		1.0	250	25.4	318
ZP1010	counters	neu-	0.4 mm	10	900–1900	0.01		0.1	100	13.2	199
ZP1020		trons	1.0 mm	10	2300–3800	0.005		3.0	513	51.5	646
ZP1080	Dip counter								70	20	175
ZP1081	Pour-in counter	β,γ	30	3.9	450–600	0.15	60	50	66	56	147
ZP1082	Pour-in counter								66	28	147
ZP1083	Dip counter								70	35	145
ZP1100	Cylinder counter	γ	80–100	2.2	500–650	0.15	15	2	16	10	34
18503	Cylinder counter	γ	250	10	400–600	0.03	90	10	40	17	55
18504		β,γ	2.0–3.0 [1])	10	400–600	0.03	90	10	9∅	17	55
18505	Mica window counters	α,β,γ	1.5–2.0 [1])	10	450–700	0.02	175	15	19.8∅	26	57
18506		β,γ	2.5–3.5 [1])	10	450–700	0.035	190	25	27.8∅	34	57

18507	End window counter	X-ray	2.5–3.5 [1])	4.7	1600–2000	0.04	110	25	107	26	127
18508	For liquid or solid samples	γ	1.0 mm	4.7	800–1100	0.04	100	100	90	68	123
18509	High flux counter	β,γ	80–100	2.2	500–650	0.15	15	2	16	6.2	34
18510	Liquid flow counter	β	30	4.7	500–650	0.07	125	15	36	24	92
18511	Side window counter	X-ray	2.0–2.5 [1])		1500–1850				67	27	128
18515 **18516**	Low level mica window counters	α,β β	1.5–2.0 [1]) 10 [1])	10 10	500–700 500–750	0.03 0.03	65 70	5 9	19.8∅ 27.8∅	26 34	30 34
18517 **18518**	Guard counter for 18515 Guard counter for 18515 or 18536		1 mm	10	800–1200	0.03	1000	75 70		80	90
18520 **18522**	Cylinder counters	γ	0.7 mm 0.5 mm	2.7 10	375–475 600–1000	0.15 0.03	220 550	40 160	140 400	22.8 42	170 480
18526	End window counter	α,β,γ	1.5–2.0 [1])	10	450–700	0.035	190	25	27.8∅	34	57

[1]) Window thickness.

NUCLEAR DEVICES - Radiation counter tubes

Type	Description	Radiation sensitivity	Wall thickness (mg/cm²)	Anode resistor (MΩ)	Plateau Operating voltage (V)	Max. plateau slope (%/V)	Max. dead time (μs)	Max. backgr. (shielded) (counts/min)	Eff. length Window diam. (mm)	Max. dimensions diam. (mm)	Max. dimensions length (mm)
18527	End window counter	α,β,γ	1.5–2.0 [1]	10	450–700	0.035	190	25	37	35	86
18529	High flux counter	β,γ	80–100	2.2	500–600	0.3	11	1	8	6.2	27
18536	Low level mica window counter	α,β	1.5–2.0 [1]	10	500–750	0.07	60	9	27.8∅	34	34
18545	Cylinder counter	γ	525	2.7	380–480	0.1	200	75	240	22.8	270
18546	End window counter	β	3.5–4.0 [1]	4.7	700–1100	0.04	45	30	51∅	58	45
18548	Guard counter for 18546		1 mm	10	800–1200	0.03	850	90		104	111
18550	Thin wall cylinder counters	β,γ	32–40	4.7	500–650	0.04	45	4	28	10	52
18552			40–60	2.2	450–800	0.02	70	30	75	19	142
18553			40–60	2.2	450–800	0.02	100	60	185	19	290
18555			40–60	2.2	450–800	0.02	70	30	75	19	142

[1]) Window thickness.

NUCLEAR DEVICES - Scintillators

Type	Applications	Characteristics	
SAM series	Zn S-scintillator for α and $\alpha+\beta$ radiation detection	Time constant of fluorescence	10^{-6} s
		Wave length of a max. emission	4500 Å
		Max. amb. temperature	40°C
		Deflection efficiency min.	47.5%
		av.	55.0%
SIS series	NaI (TI) crystal scintillator for γ and X-rays detection and spectrometry	Time constant of fluorescence	$0.25 \cdot 10^{-6}$ s
		Time constant of phosphorescence	$2.5 \cdot 10^{-3}$ s
		Wavelength of max. emission	4100 Å
		Density	3.66
		Refractive index	1.77
		Max. temperature gradient	10°C min^{-1}
SPF series	Fluorescent plastic scintillator for α, β, γ, fast neutrons and cosmic rays detection	Time constant of fluorescence	0
		Wavelength of max. emission	4300 Å
		Density	1.06
		Refractive index	1.59
		Softening point	80–85°C
		Light output % Anthracene	55–65%
		Coefficient of linear expansion	6.10^{-5}–8.10^{-5}
		Ratio no. of H-atoms to no. of C atoms	≈1.0
SPH series	Plastic hornyak scintillator for fast neutrons measurement in nuclear reactors	Time constant of fluorescence	10^{-6} s
		Wavelength of max. emission	4500 Å
		Softening point	80–85°C
		Response to fast neutrons	1.5%
		Ratio no. of H-atoms to no. of C-atoms	≈1.0

Photoscintillators for X-ray spectrometry and medical applications

These types comprise a photomultiplier and a thin NaI (Tl) scintillator (with the exception of type PS 1014 SF) as well as a mu-metal screen.
The voltage divider is incorporated.
The envelope of the photoscintillator is made of stainless steel.
The scintillators have a Be window (thickness 0.2 mm) or an Al window (0.4 mm).

Type	*Photomultiplier tube type:*	*Scintillator*	*Max. dimensions*	
			diam.	*overall length*
PS1011	XP1010	SIS 32 × 2	46	181
PS1012	XP1010	SIS 32 × 2	46	192
PS1013	XP1010	SIS 32 × 6	48	167
PS1014	As type PS1013 but with a construction, which makes it possible to mount a collimator.			
PS1014SF	As type PS1013 but with accommodation for an interchangeable NaI (Tl) scintillator. These scintillators (to be ordered separately) are delivered in an adapted mount, which can be screwed into the probe. The max. diameter of the scintillator is 25 mm, the thickness depends on the application.			

Basic miniature probes for nuclear and photometric applications

These types comprise a photomultiplier, a voltage divider and a mu-metal screen.
They have accommodation to mount easily an alpha-, beta-, gamma- or fast neutron scintillator (to be ordered separately).
The envelope of the probe is made of stainless steel.

Type	*Photoscintillator tube Type:*	*Max. dimensions*	
		diam.	*overal length*
PS1520	XP1110/01	24	165
PS1521	XP1110	24	165

Photoscintillator for gamma-ray detection and -counting in liquids

This watertight type comprises a photomultiplier, a NaI (Tl) scintillator and a pre-amplifier as well as a mu-metal screen. The voltage divider is incorporated.
The envelope of the photoscintillator is made of stainless steel and provided with a flange for easy mounting.
The stainless steel window of the scintillator has a thickness of 0.5 mm.

Type	*Photomultiplier tube Type:*	*Scintillator*	*Max. dimensions*	
			diam.	*overall length*
PS1531	53AVP	SIS 44 × 50	130	303

Photoscintillators for gamma-ray spectrometry

These types comprise a photomultiplier and a NaI (Tl) scintillator (with or without well) as well as a mu-metal screen.
The voltage divider is not incorporated.
The envelope of the photoscintillator is made of aluminium.
The aluminium window of the scintillator has a thickness of 0.5 mm.

Type	*Photomultiplier tube type:*	*Scintillator*	*Resolution for* 137_{Cs}	*Max. dimensions*	
				diam.	*overal length*
XP1050	153AVP	SIS 44 × 50	≤9 %	63	202
XP1051	153AVP	SIS 44 × 50	≤10 %	63	202
XP1052	XP1001	SIS 44 × 50	≤8 %	63	202
XP1053	XP1001	SIS 44 × 50	≤10 %	63	202
XP1191	XP1031	SIS 75 × 75	≤8.5 %	82.5	238
XP1192	XP1031	SIS 75 × 75	≤11 %	82.5	238
XP1193	XP1031	SIS 75 × 75	≤9.5 %	82.5	211

Universal photoscintillator base assembly

This type is essentially a probe-like mechanical system with provisions for mounting a photomultiplier tube, a voltage divider, a limiter and a scintillator or lightguide.
The necessary wiring is already present as well as printed wiring boards carrying the limiter and voltage divider.
The photomultiplier, scintillator or lightguide must be ordered separately.

S5600:	HT supply of the photomultiplier	max. 2500 V
	HT supply current	1.05 mA/kV ± 10 %
	Limiter supply voltage	24 V
	Limiter supply current	35 mA

The following versions are available:

S5600/01: Complete assembly with:
- mu-metal and soft-iron shields
- fastening rings for lightguide or scintillator
- socket for the photomultiplier
- decoupling capacitors for the photomultiplier
- 2 printed circuit boards carrying the voltage divider
- 1 printed circuit board carrying the limiter.

This assembly is intended for use with a photomultiplier type 56 AVP, 56 DVP, 56 DUVP, 56 TVP, 56 TUVP or 56 UVP.

S5600/02: As type S5600/01 but for use with a photomultiplier type 56 CVP.

S5600/03: As type S5600/01 but for use with a photomultiplier type 58 AVP, 58 DVP, 58 UVP, XP1040 or XP1041.

M5600/01: As type S5600/01 but without the printed wiring boards carrying voltage divider and limiter.

M5600/02: As type S5600/02 but without the printed wiring boards carrying voltage divider and limiter.

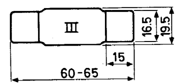
M5600/03: As type S5600/03 but without the printed wiring boards carrying voltage divider and limiter.

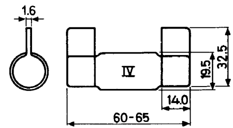
M5600/AR: As type M5600/01 but without anti-magnetic shields and without fastening rings for light guide or scintillator.

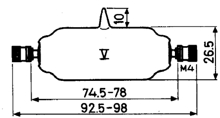
Type	*Typical operating*		*Max. dimensions*	
			diam.	*length*
18600 Neutron generator tube	$V_{ion\text{-}source} = 2$ kV d.c. $I_{ion\text{-}source} = 0.3$ mA d.c. $V_{replenisher} = 1.5$ V $I_{replenisher} = 3.5$ A	$V_{target} = -125$ kV d.c. $I_{target} = 100\ \mu$A d.c. Neutron yield min. 10^8 n/s	70	600
18600R	$R_a = 100$ kΩ for further data see 18600		70	726
18601 Neutron generator tube	Neutron output 2.10^8 n/s $V_{target} = -125$ kV $I_{target} = 100\ \mu$A $V_{ion\text{-}source} = 2$ kV	$I_{ion\text{-}source} = 10^{-4}$ A $I_{replenisher} = 3$ A Gas pressure $= 3.10^{-5}$ mmHg $t_{amb} = 25$ °C	70	900
18700 Thermolum. dosimeter	$I_f = 1.80$ to 1.84 A $R_f = 0.4$ Ω Range = 100 mR to 10^6 R	Energy independent within ±25% with correction filter from 25 KeV to 1.3 MeV	4	32

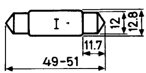
MISCELLANEOUS - Rare gas cartridges

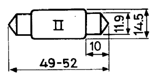
Type	Starting voltage (V)	Min. extinguishing voltage (V)	Max. surge current (A)	during (sec)	Max. fuse in series (A)	Capacitive discharge (Ws)	Max. line voltage ($V_=$)	($V_\sim$)	Dimensions see fig.:
4349	130–180	110	5	3	6	10	70	75	I
4369	150–200	110	10	3	10	10	70	75	IV
4370	80–120	60	10	3	10	10	36	50	IV
4371	150–250	110	5	3	6	10	70	75	II
4372	280–350	250	2.5	1	6	10	200	180	IV
4373	150–200	110	10	3	10	10	70	75	III
4378	80–120	60	10	3	10	10	36	50	III
4379	280–350	130	10	3	10	10	50	180	IV
4380	280–350	250	2.5	1	6	10	200	180	II
4383	280–350	130	5	3	6	10	50	180	II
4390	700–910	200	25	3	25	500	175	300	V
4397	400–500	200	5	1	6	10	150	230	IV







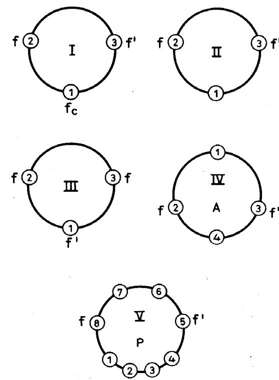




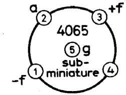
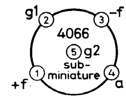
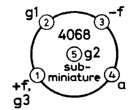
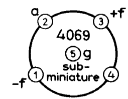
MISCELLANEOUS - Current regulators

Type	*V* (*V*)	$I_{tol.}$ (*A*)	*at V* (*V*)	*Max. dimensions* diam.	length	*Base*
329	10–30	1.08–1.22	20	34	119	I
340	3–10	5.5–6.3	7	53	156	Edison
1904	30–80	0.096–0.104	60	39	110	Swan + II
1905	2–6	0.96–1.04	4	35	100	Edison
1908	5–15	0.76–0.86	7	35	107	II
1909	5–45	0.60–0.67	30	56	123	II
1909A	5–45	0.60–0.67	30	56	123	III
1910	5–15	1.35–1.50	8.5	35	110	II
1913	4–12	1.92–2.08	8	41	129	Edison
1918-01	4–10	0.097–0.108	7	21.5	67	Mignon
1923	15–45	0.41–0.45	30	39	98	Edison
1926	8–26	0.168–0.192	16	33	101	V
1927	40–120	0.172–0.188	80	40.5	138	IV
1928	80–240	0.172–0.188	160	40.5	147	IV
1941	80–200	0.29–0.31	140	53	162	Edison + IV
1945	80–120	0.263–0.283	100	38	115	V

Base connections

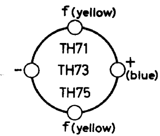


MISCELLANEOUS - Electrometer tubes

Type and application	V_f (*V*) I_f (*mA*)	*Characteristics data (Typical)*			*Limiting values*	*Base connections*
4065 Triode	1.25 13	$V_a = 9$ V $V_g = -2.5$ V	$I_a = 100\ \mu A$ $S = 80\ \mu A/V$	$\mu = 2$ $-I_g = 8.5 \times 10^{-14}$ A [1])	$V_a = 25$ V $I_a = 250\ \mu A$ $V_f = <1.5$ V >1.1 V	
4066 Tetrode	1.25 13	$V_a = 4.5$ V $V_{g2} = -3.2$ V $V_{g1} = 3$ V	$I_a = 20\ \mu A$ $-I_{g2} = 2.5 \times 10^{-15}$ A	$S_{ag2} = 17\ \mu A/V$ $I_{g1} = 250\ \mu A$ [1])	$V_a = 10$ V $I_k = 300\ \mu A$ $V_f = <1.5$ V >1.1 V	
4068 Pentode	1.25 8.2	$V_a = 10$ V $V_{g2} = 6.5$ V $V_{g1} = -2.5$ V	$I_a = 5\ \mu A$ $I_{g2} = 2.2\ \mu A$ $I_{g1} = 3 \times 10^{-15}$ A [1])	$S = 10.5\ \mu A/V$ $R_1 = 10.5\ M\Omega$ $\mu_{a-g1} = 110$	$V_a = 45$ V $V_{g2} = 45$ V $I_k = 180\ \mu A$ $V_f = <1.5$ V >1.1 V	
4069 Triode	1.25 14	$V_a = 9$ V $V_g = -2.7$ V	$I_a = 100\ \mu A$ $S = 80\ \mu A/V$	$-I_g = 1.6 \times 10^{-13}$ A [1]) $\mu = 2$	$V_a = 25$ V $I_a = 250\ \mu A$ $V_f = <1.5$ V >1.1 V	

[1]) Valid only in darkness

MISCELLANEOUS - Thermocouples

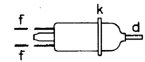
Type	*Characteristics and limiting values*								*Base connections*
	I_f (*mA*)	I_f[1] (*mA*)	I_f ($E = 12$ *mV*) (*mA*)	*Max.* I_f (*mA*) *t max. 1 min.*	R_f (Ω)	R_{th} (Ω)	*Max. dimensions* *diam.*	*length*	
TH71	0–15	0–5	10	20	68	6.0			
TH73	0–75	0–20	20	100	7.0	3.5	7.9	25	
TH75	0–300	0–100	40	350	1.2	3.5			

[1]) In this range V_o is proportional to the square of I_f

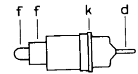
MISCELLANEOUS - Microwave tubes

Type and application	V_f (*V*) I_f (*A*)	*Characteristics data*			*Limiting values*
		Typical			
EA52 **EA53** Measuring diodes	6.3 0.3	I_d=0.5 mA	V_d= <3 V		V_{dinvp}= 1 kV I_k =0.3 mA I_{kp} = 5 mA f = 1 GHz
		Typical			
EC55 U.H.F. disc seal triode	6.3 0.4	V_a= 250 V V_g= −3.5 V	I_a=20 mA S =6 mA/V	μ=30	V_a =350 V I_k = 40 mA W_a= 10 W W_g= 0.1 W
		Typical	*Operating*		
EC157 Disc seal triode (metal-glass)	6.3 0.75	V_a=180 V I_a =60 mA V_g= −1.25 V S =21 mA/V μ =43	f =4 GHz V_{ba}=200 V I_a =30 mA B =50 MHz W_o=0.5 W G =6 dB	f =4 GHz V_{ba}=200 V I_a =60 mA B =50 MHz W_o=1.8 W G =8 dB	V_a =300 V I_k =70 mA W_a=12.5 W W_g=0.2 W

Base connections



EA52



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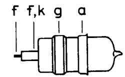
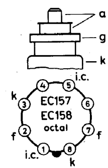
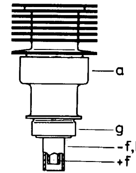


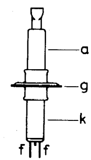
EC55



EC158 Disc seal triode (metal glass)	6.3 0.9	*Typical* $V_a = 180$ V $I_a = 140$ mA $V_g = -0$ V $S = 28$ mA/V $\mu = 30$	*Operating* $f =$ 4 GHz $V_{ba} =$ 200 V $V_{bg} = +20$ V $I_a =$ 140 mA	$B = 50$ MHz $W_o = 5.3$ W $G = 6$ dB	$V_a = 300$ V $I_k = 170$ mA $W_a = 30$ W $W_g = 0.35$ W
2C39A Disc seal power triode (air cooled)	6.3 1.03	*Typical* $V_a = 600$ V $R_k = 30\ \Omega$ $I_a = 75$ mA $S = 25$ mA/V $\mu = 100$	*C.W. oscillator* $f = 2.5$ GHz $V_f = 4.5$ V $V_a = 800$ V $I_a = 100$ mA $I_g = 8$ mA $W_o = 18$ W	*Freq. doubler* $f = 1$–2 GHz $V_f = 5.6$ V $V_a = 400$ V $V_g = -15$ V $I_a = 55$ mA $W_o = 4.1$ W	$V_a = 1$ kV $I_k = 125$ mA $W_a = 100$ W $W_g = 2$ W $f = 3.0$ GHz
2C39BA	6.0 0.98	for further data see 2C39A	$W_o = 24$ W	$W_o = 5.2$ W	$f = 3.5$ GHz
5876 Pencil type	6.3 0.135	*Typical* $V_a = 250$ V $R_k = 75\ \Omega$	$I_a = 18$ mA $S = 6.5$ mA/V	$R_i = 8.6$ kΩ $\mu = 56$	$V_a = 360$ V $I_a = 25$ mA $W_a = 6.25$ W $f = 1.7$ GHz
5876A	ruggedized version of the 5876				
5893 Pencil type	6.0 0.28	*Typical* $V_a = 200$ V $R_k = 100\ \Omega$	$I_a = 25$ mA $S = 6$ mA/V	$R_i = 4.5$ kΩ $\mu = 27$	$V_a = 330$ V $I_a = 35$ mA $W_a = 7$ W $f = 3.3$ GHz

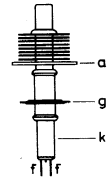


2C39A

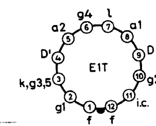


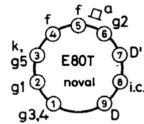
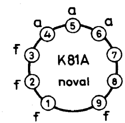
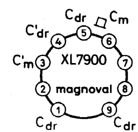
5876
5893

MISCELLANEOUS - Microwave tubes

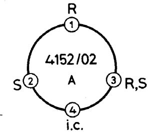
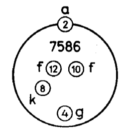
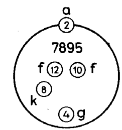
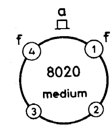
Type and application	V_f (V) I_f (A)	Characteristics data			Limiting values	Base connections
6263 Pencil type	6.0 0.28	*Typical* $V_a = 200$ V $R_k = 100\ \Omega$	$I_a = 27$ mA $S = 7$ mA/V	$R_i = 3.8$ kΩ $\mu = 27$	$V_a = 330$ V $I_a = 40$ mA $W_a = 8$ W $f = 1.7$ GHz	
6263A	ruggedized version of the 6263					
6264 Pencil type	6.0 0.28	*Typical* $V_a = 200$ V $R_k = 100\ \Omega$	$I_a = 18.5$ mA $S = 6.8$ mA/V	$R_i = 6.8$ kΩ $\mu = 40$	$V_a = 330$ V $I_a = 40$ mA $W_a = 8$ W $f = 1.7$ GHz	
6264A	ruggedized version of the 6264					

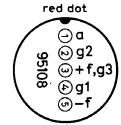
MISCELLANEOUS

Type	V_f (V) I_f (A)	Characteristics data			Limiting values	Base connections
E1T Decade-counter tube	6.3 0.3	*Operating* $V_b = 300$ V $V_{bg1} = 11.9$ V $V_{bg2} = 300$ V $V_D = 156$ V	$V_l = 300$ V $I_k = 0.95$ mA $I_{g2} = 0.1$ mA $R_k = 15\ \Omega$	$R_{g4} = 47$ kΩ $R_{a1} = 39$ kΩ $R_{a2} = 1$ MΩ	$V_b = 400$ V	

E80T Beam- deflection tube	6.3 0.15	*Typical* $V_a = 100$ V $V_{g3+4} = 250$ V $V_{g2} = 70$ V	$V_{g1} = 0$ V $V_D = 120$ V $V_D = 120$ V	$I_a = 1.35$ mA $I_k = 2.0$ mA	$V_a = 330$ V $I_k = 55$ mA $V_{kf} = 50$ V	
K50A Rare gas-filled noise diode	2.0 2.0	*Typical* $V_a = 165$ V $I_a = 125$ mA	$t_F = 21700$°K $F = 18.75$ dB	$V_{ign} = >6$ kV $\lambda = 3$ cm	$I_a =$ min. 50 mA max. 150 mA $t_{amb} = -55$°C +75°C	Diam. 14 Length 258
K51A Rare gas-filled noise diode	2.0 3.5	*Typical* $V_a = 140$ V $I_a = 200$ mA	$t_F = 16600$°K $F = 17.58$ dB	$V_{ign} = >6$ kV $\lambda = 10$ cm	$I_a =$ min. 100 mA max. 300 mA $t_{amb} = -55$°C +75°C	Diam. >17 Length 517
K81A Noise diode	1.85 2.5	*Typical* $V_a = 100$ V	$I_a = 15$ mA	$F = 13$ dB	$V_f = 2.0$ V $V_a = 150$ V $I_a = 20$ mA $W_a = 3$ W	
XL7900 Vibrating capacitor		Contact potential over C_m −50 to +50 mV Short term drift of contact potentional <100 μV	Insulation $>10^{15}$ Ω Temp. dependence 20 μV/°C		$V_{Cm} = 25$ V	

MISCELLANEOUS

Type	V_f *(V)* I_f *(A)*	*Characteristics data*			*Limiting values*	*Base connections*
4152/02 Bimetal relay	I_r 85–115 mA $R = 370\ \Omega$	$V_m = 220\ V_{d.c.}$ $V_m = 220\ V_{a.c.}$ $V_m = 380\ V_{a.c.}$	$I_{max.} = 1.5$ A $I_{max.} = 1.5$ A $I_{max.} = 0.7$ A When switching on	$I_{max.} = 250$ mA $I_{max.} = 250$ mA $I_{max.} = 75$ mA When switching off	$I_r = 125$ mA $t_{amb} = -10°C$ $+60°C$	
7586 Nuvistor triode	6.3 0.135	*Typical* $V_{ba} = 75$ V $V_{bg} = 0$ V $R_k = 100\ \Omega$	$C_k = 1300\ \mu F$ $I_a = 10.5$ mA $S = 11.5$ mA/V	$R_i = 3\ k\Omega$ $\mu = 35$	$V_a = 110$ V $I_k = 15$ mA $W_a = 1$ W	
7895 Nuvistor triode	6.3 0.135	*Typical* $V_{ba} = 110$ V $V_{bg} = 0$ V $R_k = 150\ \Omega$	$C_k = 1000\ \mu F$ $I_a = 7$ mA $S = 9.4$ mA/V	$R_i = 6.8\ k\Omega$ $\mu = 64$	$V_a = 110$ V $I_k = 15$ mA $W_a = 1$ W	
8020 High-vacuum high-voltage diode	5.0 6.0	*Typical* $V_a = 200$ V $I_a = 100$ mA	*Surge limiter* $V_f = 5.5$ V $V_{ap} = 10$ kV $I_{ap} = >2$ A	*Rectifier* $V_{ainvp} = <40$ kV $I_{ap} = <100$ mA $I_a = <750$ mA	*Surge limiter* $V_f = 5.8$ V $V_{ap} = 12.5$ kV $W_a = 75$ W $V_{ainvp} = 40$ kV	

95108 Transmitting pentode for use in radio sondes	1.25 0.045	*Typical* $V_a = 45$ V $V_{g2} = 45$ V $V_{g1} = -2.75$ V	$I_a = 875\ \mu$A $I_{g2} = 200\ \mu$A $S = 650\ \mu$A/V	$R_i = 0.75$ MΩ $\mu_{g2g1} = 9.3$	$V_a = 120$ V $I_k = 16$ mA $W_a = 1.0$ W $W_{g2} = 0.2$ W	

INTERCHANGEABILITY GUIDE
ELECTRON TUBES

Electronic Components and Materials Division.

INTRODUCTION

This guide presents a survey of all types of electron tubes for which our tubes can be used as replacements.

Types for which a suitable replacement is sought are listed alphabetically and numerically in the first column; where applicable, alternative CV numbers of our corresponding tubes are listed in the second column; and the type numbers of our equivalent or replacement tubes in the third column.

Type numbers printed between brackets in the third column are near equivalents of the types to be replaced; however, in almost all cases the circuits in which they are to be fitted can be adapted to make use of them as replacements.

Replacements for obsolete types are also listed. In many cases the recommended replacement can be used without modifying the circuit or equipment in which it is to be fitted. In some cases, however, it may be necessary to change or rewire the socket, fit an adapter, or alter the circuit slightly. Where an obsolete triode is to be replaced by a pentode, the latter can be used in triode connection.

For designers of electronic equipment reference is made to our issue: "DESIGNERS' GUIDE FOR ELECTRON TUBES".

The fact that a tube is listed does not imply that it can always be supplied.

REPLACEMENT GUIDE FOR ELECTRON TUBES

Type to be replaced	CV number	Replacement type
0.1NE3/1		(ZP1010)
1AB6		1AB6;DK96
1AC6		1AC6;DK92
1AD4	2237	1AD4;DF62
1AH5		1AH5;DAF96
1AJ4		1AJ4;DF96
1AN5		1AN5;DF97
1B3GT	1830	1B3GT;DY30
1BG2		1BG2;DY51
1BQ2		1BQ2;DY802
1C1		1R5;DK91
1C2		DK92;1AC6
1C3		DK96;1AB6
1CP31	2302	1CP31;DH3-91
*1E3		DC70;6375
1F1		1AJ4;DF96
1F2		1L4;DF92
1F3		1T4;DF91
1FD1		1AH5;DAF96
1FD9		1S5;DAF91
1G35P		4C35A;6268
1G45P		3C45
1H2		1S2;DY86
1M1		(1M3);(DM70)
1M3	2980	1M3;DM70
1N3		1N3;DM71
1N16		(RG1-240A)
1P1		3C4;DL96
1P10		3S4;DL92
1P11		3V4;DL94
1P23		(3554)
1P32		(3546PW)
1P37		(90AG)
1P41		(53CG)
1R5	782	1R5;DK91
1S2		1BQ2;DY802
1S2A		1BQ2;DY802
1S4	783	(3S4);(DL92)
1S5	784	1S5;DAF91
1T4	785;1971	1T4;DF91
1U4	2507	1U4
1U5	3912	1U5;DAF92
1X2		1X2B;DY80
1X2A		1X2B;DY80
1X2B		1X2B;DY80
1.5NG12		(ZP1010)

* Obsolete type with replacement type

Type to be replaced	CV number	Replacement type
2B3		(1B3GT);(DY30)
2B29		(5894);(QQE06/40)
2B32		832A;QQE04/20
2B46		6146;QE05/40
2B52		6252;QQE03/20
2B94		5894;QQE06/40
2C39A	2516	2C39A
2C39BA		2C39BA
2D21	797	PL2D21;EN91; PL5727;M8204
2D21W	2876	PL5727;M8204
2D21WA	4018	PL5727;M8204
2E24		(2E26);(QV05-10)
2E26	3990	2E26;QV05-10
2FY5		2FY5;XC97
2G57		PL5557
2G402A		DCX4/1000,3B28
2G/472B		DCX4/5000;4B32
2H28		3B28;DCX4/1000
2H66		866A;DCG4/1000G
2HA5		2HA5;XC900
2HR8		2HR8;XF86
2J42	3676	2J42
2J42A	3997	JP9-15
2J51	3560	2J51
2J51A	5134	2J51A
2J55		2J55
2K25	2792	2K25
2K26		KS7-85C
2V/400A	32	DCG4/1000G;866A
2V/400B		(DCG4/1000G);(866A)
2V/470C		(DCG4/5000)
2V/471A		(DCG4/5000)
2V/490C		(DCG4/5000)
2V/500C		(DCG4/5000)

Type to be replaced	CV number	Replacement type
2V/530A		(DCG9/20);(6508)
2V/530E		(DCG9/20);(6508)
2V/531E		(DCG9/20);(6508)
3-400Z		(YD1130)
3A3		3A3
3AJ8		3AJ8;XCH81
3AL5		3AL5;XAA91
3ALP1	2175	3ALP1;DG7-5
3ALP7	5171	3ALP7;DP7-5
3ALP11		3ALP11;DB7-5
3AMP1	2431	3AMP1
3AMP1A		3AMP1A;DG7-32
3AU6		3AU6;XF94
3B4	2240	3B4;DL98
3B28	1835	3B28;DCX4/1000
3BH2		3BH2;GY501
3BKP2		3BKP2;DN7-78
3BKP7		3BKP7;DP7-78
3BKP11		3BKP11;DB7-78
3BKP31		3BKP31;DH7-78
3BX6		3BX6;XF80
3BY7		3BY7;XF85
3BYP2		3BYP2;DN7-11

Type to be replaced	*CV number*	*Replacement type*
3BYP7		3BYP7;DP7-11
3BYP11		3BYP11;DB7-11
3BYP31		3BYP31;DH7-11
3BZ6		3BZ6
3C4		3C4;DL96
3C23A		PL3C23A
3C45	6007	3C45
3CB6		3CB6
3CJA		3CJA/5684
3E5		(3C4);(DL96)
3E29	2295;3599	3E29;QQV5-P10
3EH7		3EH7;XF183
3EJ7		3EJ7;XF184
3G49P		5949
3G/501A		PL5545A
3G/502A		PL6807
3GK5		3GK5
3HA5		3HA5;LC900
3S4	484;2370; 820	3S4;DL92
3V4	2983	3V4;DL94
3V/340B		(PL5557)
3V/390A	5027	PL5559
3V/490A		(PL105)
3V/531E		(DCG12/30;(5870)
3WP1	3946	3WP1;DG7-36
3WP2		3WP2;DN7-36
3WP7		3WP7;DP7-36
3WP11		3WP11;DB7-36

Type to be replaced	*CV number*	*Replacement type*
4-65A	1905	4-65A;QB3/200
4/100BU		AZ50
4-125A	2963	4-125A;QB3/300GA
4-250A	2964	4-250A;QB3.5/750GA
4-400A	3879	4-400A;QB4/1100GA
4B13		QB2/250
4B26	1836	1163
4B32	2518	4B32;DCX4/5000
4BL8		4BL8;XCF80
4C35	1787	4C35A;6268
4C35A	5247	4C35A;6268
4CM4		4CM4;PC86
4CX250B		4CX250B;QEL2/275
4CX250F		4CX250F;QEL2/275H
4CX250FG		4CX250FG;8621
4CX250R		4CX250R;7580W
4CX350A		8321;YL1340
4CX350F		8322;YL1341
4D21	2963	4-125A;QB3/300GA
4DL4		4DL4;PC88
4EH7		4EH7;LF183
4EJ7		4EJ7;LF184
4ER5		4ER5;PC95
4ES8		4ES8;XCC189
4F15K		4X150A;QEL1/150

Type to be replaced	*CV number*	*Replacement type*
4F15R		4X150A;QEL1/150
4F21		QB3/300;6155
4FY5		4FY5;PC97
4G/280K		PL2D21;EN91; PL5727;M8204
4GJ7		4GJ7;XCF801
4GK5		4GK5
4GTP		(3546PW)
4H/135M		QEL1/50;4X150A
4H/136M		QEL1/150H;4X150D
4H/160M		QEL2/250;4X250B
4HA5		4HA5;PC900
4J	2797	QQE06/40;5894
4J50		4J50
4J50A		4J50A
4J52A	5018	4J52A
4KM50000LA		(YK1000)
4KM50000LA3		(YK1000)
4KM50000LF		(YK1004)
4Q025		RG3-250
4X150A	2519	4X150A;QEL1/150
4X150D	3991	4X150D;QEL1/150H
4X250B	2487	4X250B;QEL2/250
4X500A		4X500A;QBL4/800

Type to be replaced	*CV number*	*Replacement type*
5/62CM		DH13-78;5BHP31
5A/160H		EF91;6AM6;M8083
5A/170K		E180F;6688
5ADP1	5035	5ADP1;DG13-34
5ADP2		5ADP2;DN13-34
5ADP7	5125	5ADP7;DP13-34
5ADP11		5ADP11;DB13-34
5AQ4	593	5AQ4;GZ32
5AR4	1377	5AR4;GZ34
5B21		1164
5B/250A	124	QE06/50;807
5BHP31	5168	5BHP31;DH13-78
5C21		PL5545A
5C22	2520	5C22;6279
5C/100A		QB2/250;813
5CBP2		5CBP2;(D13-15GP)
5CBP11		5CBP11;(D13-15BE)
5CBP31		5CBP31;(D13-15GH)
5CLP2		5CLP2;DN13-10
5CP1A		(DG13-2)
5CP7A	3954	(DP13-2)
5CP11A		(DB13-2)
5D22	2964	4-250A;QB3.5/750GA
5F22		QB3.5/750GA
5F23		QB4/1100GA
5GJ7		5GJ7;LCF801
5HG8		5HG8;LCF86
5J		(2xYL1230)
5J26	3602	5J26[1])
5T4	1846	(GZ34);(5AR4)
5T33		(TB4/1250);(5868)
5U4		5U4GB;(GZ34)
5U4GB		5U4GB;(GZ34)
5U8		5U8
5U9		5U9;LCF201

[1]) for certain applications DX267.

REPLACEMENT GUIDE FOR ELECTRON TUBES

Type to be replaced	*CV number*	*Replacement type*
5UP1		DG13-32
5V4GA		(GZ34);(5AR4)
5V4GB		(GZ34);(5AR4)
5V9		5V9;LCH200
5W4	1849	(5Y3GT)
5W4G		(5Y3GT)
5W4GT	503;842	(5Y3GT)
5X9		5X9;LCF200
5Y3G	1854	5Y3G
5Y3GA		(5Y3GT)
5Y3GB		5Y3GB
5Y3GT	1856	5Y3GT
5Z4	1864	GZ30
5Z4G	1863	GZ30
5Z4GT	2748	GZ30
6AB4		(EC92)
6AB8		6AB8;ECL80
6AF3		(EY81);(6R3)
6AF9		6AF9
6AG5		(6BA6);(EF93)
6AG5WA		(6BA6);(EF93)
6AG6G		(EL33)
6AJ8	2128	6AJ8;ECH81
6AJ9		6AJ9;ECF202

Type to be replaced	*CV number*	*Replacement type*
6AK5	850	6AK5;EF95; 6AK5W;E95F; 5654;M8100
6AK5W	4010;5216	6AK5W;E95F; 5654;M8100
6AK8		6AK8;EABC80
6AL3		6AL3;EY88
6AL5	283	6AL5;EAA91; 6AL5W;E91AA; 5726;M8212
6AL5W	4007;5189	6AL5W;5726; E91AA;M8212
6AM5	136	6AM5;EL91;M8082
6AM6	138	6AM6;EF91; 6AM6S;M8083
6AM6S		6AM6S;M8083
6AN7		6AN7;ECH80
6AQ4	417	6AQ4;EC91;M8099
6AQ5	1862	6AQ5;EL90
6AQ5A		(6AQ5);(EL90)
6AQ8		6AQ8;ECC85
6AR7GT		(EBF35)
6AS6	2522	6AS6;6AS6W; 5725;M8196
6AS6W	4011	6AS6W;5725
6AS7G		(6080)
6AS7GA		(6080)
6AS7GYB		(6080)
6AT6	452	6AT6;EBC90
6AU4GT		6AU4GTA
6AU4GTA		6AU4GTA
6AU6	2524	6AU6;EF94; 6AU6A
6AU6A		6AU6A
6AU6WA	4023	(6AU6);(EF94)

Type to be replaced	*CV number*	*Replacement type*
6AU6WB		(6AU6);(EF94)
6AU8		(6BL8);(ECF80)
6AU8A		(6BL8);(ECF80)
6AV6	2526	6AV6;EBC91
6AX4GT		6AX4GTB
6AX4GTA		6AX4GTB
6AX4GTB		6AX4GTB
6AX8		6U8;6U8A
6BA6	454	6BA6;EF93
6BA6W	5037;4009	6BA6W;5749
6BC5		(6BA6);(EF93)
6BD7		6BD7;EBC80
6BD7A		6BD7A;EBC81
6BE6	453	6BE6;EK90
6BE6W		(6BE6);(EK90)
6BE7		6BE7;EQ80
6BH5		6BH5;EF81
6BH6		(7693);(E90F)
6BJ6		(7694);(E99F)
6BJ6A		(7694);(E99F)
6BK4A		6BK4A
6BK6		6AV6;EBC91
6BK7A		6BK7A
6BK7B		6BK7B
6BK8		(6267);(EF86);(M8195)
6BL8	5215	6BL8;ECF80; 7643;E80CF
6BM8		6BM8;ECL82
6BN5	3526	6BN5;EL85
6BQ5	2975	6BQ5;EL84
6BQ6GT		6BQ6GT
6BR5	1352	6BR5;EM80
6BS8		(6DJ8);(ECC88); (6922);(E88CC)
6BT4	3891	6BT4;EZ40
6BT6		(6AT6);(EBC90)
6BW7		(6BX6);(EF80)
6BX6	1376	6BX6;EF80
6BY6		(6CS6);(EH90); (6687);(E91H)
6BY7	1375	6BY7;EF85
6BZ6		6BZ6
6C4	133	6C4;EC90; M8080
6C4W	2842	M8080
6C10		6CU7;ECH42
6C12		6AJ8;ECH81
6C16		6BL8;ECF80; 7643;E80CF
6C31		(ECH35)
6CA4	5072	6CA4;EZ81
6CA7	1741	6CA7;EL34
6CB6	3995	6CB6
6CB6A		6CB6A
6CD7	394	6CD7;EM34
6CE5		(6CB6)
6CF6		(6CB6)
6CG7		6CG7
6CG8A		6CG8A
6CH6	2127	6CH6;EL821
6CJ3		(6EC4);(EY500)
6CJ5	3886	6CJ5;EF41
6CJ6	2721	6CJ6;EL81
6CK5	3889	6CK5;EL41
6CK6	2726	6CK6;EL83
6CL6		6CL6
6CM4		6CM4;EC86
6CM5	2940	6CM5;EL36
6CN6	450	6CN6;EL38
6CQ6	131	6CQ6;EF92;M8161

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Type to be replaced	CV number	Replacement type
6CQ8		6CQ8
6CS6		6CS6;EH90
6CT7	3883	6CT7;EAF42
6CU5		6CU5
6CU7	3888	6CU7;ECH42
6CV7	3882	6CV7;EBC41
6CW5	5094	6CW5;EL86
6CW7	5281	6CW7;ECC84
6D2		EB91
6D4		6D4;EN93
6D5	1949	6D4;EN93
6DA5	5055	6DA5;EM81
6DA6	5156	6DA6;EF89
6DC8		6DC8;EBF89
6DE6		6DE6
6DJ8	5358	6DJ8;ECC88; (6922);(E88CC)
6DL4		6DL4;EC88
6DQ6B		6DQ6B
6DR8		6DR8;EBF83
6DS8		6DS8;ECH83
6DT6		6DT6
6DX8		6DX8;ECL84
6DY5		6DY5;EL82
6EA8		6EA8
6EC4		6EC4;EY500
6ED4		6ED4;ED500
6EH7		6EH7;EF183
6EJ7		6EJ7;EF184
6EL7		6BX6;EF80
6ES6		6ES6;EF97
6ES8		6ES8;ECC189
6ET6		6ET6;EF98
6EU7		6EU7

Type to be replaced	CV number	Replacement type
6F12		6AM6;EF91; 6AM6S;M8083
6F16		6CJ5;EF41
6F19		6BY7;EF85
6F21		6CQ6;EF92;M8161
6F23		6BX6;EF80
6F24		(EF184);(6EJ7)
6F25		(EF183);(6EH7)
6F29		EF183;6EH7
6F30		EF184;6EJ7
6F50R		QBL4/800;4X500A
6FC7		6FC7;ECC89
6FD12		6DC8;EBF89
6FG6		6FG6;EM84
6FW8		(6ES8);(ECC189)
6FY5		6FY5;EC97
6G45		PL5545A
6GB3A		(6CM5);(EL36)
6GB5		6GB5;EL500
6GB5A		6GB5A;EL504
6GH8A		6GH8A
6GJ7		6GJ7;ECF801
6GK6		6GK6
6GM8		6GM8;ECC86
6GV8		6GV8;ECL85
6GW8		6GW8;ECL86
6H51		(DCG6/18);(6693)
6HA5		6HA5;EC900
6HG8		6HG8;ECF86
6HU6		6HU6;EM87
6J4	1763	(EC98);(M8248)
6J4WA	5311	(M8248)
6J6	858	6J6;ECC91;M8081
6J6A		(6J6);(ECC91);(M8081)
6JE6		(6KG6);(EL505)

Type to be replaced	CV number	Replacement type
6JS6		(6LF6);(6KG6A/EL509)
6JW8		6JW8;ECF802
6JX8		6JX8;ECH84
6K4	468	EC70;6778
6KD6		6LF6
6KG6		6KG6;EL505
6KG6A		6KG6A;EL509
6KM6		(6LF6);(6KG6A/EL509)
6KN6		(6LF6);(6KG6A/EL509)
6KW6		6KW6;EL508
6L12		6AQ8;ECC85
6L13		12AX7;ECC83; 12AX7S;M8137
6L16		6CW7;ECC84
6L34		EC91;6AQ4; M8099
6LB6		(6LF6)
6LD3		6CV7;EBC41
6LD12		6AK8;EABC80
6LF6		6LF6
6LN8		6LN8;LCF80
6LX8		6LX8;LCF802
6M2		6CD7;EM34
6M5		6M5;EL80
6N3		6N3;EY82
6N8		6N8;EBF80
6P15		6BQ5;EL84
6P17		6AM5;EL91;M8082
6PX6G		(EL33)
6Q4	1886	6Q4;EC80
6R3		6R3;EY81
6R4	1865;1888	6R4;EC81
6RHH1		(6DJ8);(ECC88)
6RP15		(6BQ5);(EL84)

Type to be replaced	CV number	Replacement type
6S2	2966	6S2;EY86 6S2A;EY87
6S2A		6S2A;EY87
6SN7GT		6SN7GTB
6SN7GTB		6SN7GTB
6T8		(6AK8);(EABC80)
6U3		6U3;EY80
6U8	5065	6U8;ECF82
6U8A		6U8A
6U9		6U9;ECF201
6V4	1535	6V4;EZ80
6V9		6V9;ECH200
6X2	426	6X2;EY51
6X4	493	6X4;EZ90
6X9		6X9;ECF200
6Y9		6Y9;EFL200

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Type to be replaced	CV number	Replacement type
7AN7	5192	7AN7;PCC84
7AU7		7AU7;XCC82
7D9		6AM5;EL91;M8082
7D10		EL821;6CH6
7DJ8		7DJ8;PCC88
7EF7		7EF7;PCC89
7ES8		7ES8;PCC189
7F16		6CJ5;EF41
7HG8		8HG8;PCF86
8A		(3554)
8A1	1282	DG7-36;3WP1
8A8		9A8;PCF80
8B8		8B8;XCL82
8CW5		8CW5;XL86
8D3		6AM6;EF91; 6AM6S;M8083
8D8		(6267);(EF86);(M8195)
8DX8		8DX8;XCL84
8GJ7		8GJ7;PCF801
8GW8		8GW8;XCL86
8HG8		8HG8;PCF86
8NE31		(ZP1000)
8U9		8U9;PCF201
8X9		8X9;PCF200
9A8		9A8;PCF80
9AB4		9AB4;UC92
9AK8		9AK8;PABC80
9AQ8		9AQ8;PCC85
9D6		6CQ6;EF92;M8161

Type to be replaced	CV number	Replacement type
9ED4		9ED4;PD500
9GV8		9GV8;XCL85
9JW8		9JW8;PCF802
9Q205		(DCG6/18);(6693)
9U8		9U8;PCF82
9V9		9V9;PCH200
10C14		19D8;UCH81
10CW5		10CW5;LL86
10DX8		10DX8;LCL84
10FD12		19FL8;UBF89
10GK6		10GK6
10GV8		10GV8;LCL85
10L14		UCC85
10LD3		14L7;UBC41
10LD12		UABC80
10LD13		UBC81
10NE40		(ZP1000)
10P18		45B5;UL84
10PL12		UCL82;50BM8
11E13		QQE03/12;6360
11R3		11R3;LY81
11Y9		11Y9;LFL200

Type to be replaced	*CV number*	*Replacement type*
12AC5		12AC5;UF41
12AJ7		12AJ7;HCH81
12AQ5		12AQ5
12AT6		12AT6;HBC90
12AT7	455	12AT7;ECC81; (12AT7WA);(E81CC) 6201;M8162
12AT7WA	4024;5212	12AT7WA;E81CC; 6201;M8162
12AU6	1961	12AU6;HF94
12AU7	491	12AU7;ECC82 (12AU7WA);6189;M8136
12AU7WA	4003	12AU7WA;(M8136)
12AV6		12AV6;HBC91
12AX7	492	12AX7;ECC83 12AX7S;M8137
12AX7S		12AX7S;(M8137)
12AX7WA	4004	(M8137)
12BA6	1928	12BA6;HF93
12BE6		12BE6;HK90
12BY7A		12BY7A
12CU5		12CU5
12DM7		(ECC83);(12AX7); (12AX7S);(7025); (M8137)
12DS7A		12DS7A
12EB20		(ZP1010)
12S7		12S7;UAF42
12SJ7GT		12SJ7GT
12SN7GTA		12SN7GTA

Type to be replaced	*CV number*	*Replacement type*
13CM5		13CM5;XL36
13GB5		13GB5;XL500
14ABP4		14ABP4;AW36-21
14ABP4A		14ABP4A;AW36-20
14AHP4		14AHP4;AW36-81
14AHP4A		14AHP4A;AW36-80
14G6		14G6;UBC80;(UBC81)
14GW8		14GW8;PCL86
14K7		14K7;UCH42
14KP4		(MW36-44)
14KP4A		(MW36-44)
14L7		14L7;UBC41
14LP4		(MW36-44)
14Y7		14Y7;UCH80
15A6		15A6;PL83
15CW5		15CW5;PL84
15DQ8		15DQ8;PCL84

Type to be replaced	CV number	Replacement type
16A5		16A5;PL82
16A8		16A8;PCL82
16AQ3		16AQ3;XY88
16LD6		16LD6;PL802
16Y9		16Y9;PFL200
17		PL5557
17AP4		(MW43-69)
17BP4		(MW43-69)
17BQP4		17BQP4;MW43-69
17BTP4		17BTP4;AW43-80
17C8		17C8;UBF80
17CUP4		(17BTP4);(AW43-80)
17CVP4		17BTP4;AW43-80
17DCP4		(AW43-88)
17DJP4		17BTP4;AW43-80
17DYP4		(AW43-89)
17EW8		17EW8;HCC85
17KW6		17KW6;PL508
17QP4		(MW43-69)
17Z3		17Z3;PY81
18GB5		18GB5;LL500
18GV8		18GV8;PCL85
19ALP4		(AW47-91)
19AMP4		(19CWP4)
19AQP4		(AW47-91)
19ASP4		(19CWP4)
19BAP4		(19CWP4)
19BCP4		(19CWP4)
19BEP4		AW47-91
19BR5		19BR5;UM80
19CEP4		(19CWP4)
19CTP4		AW47-91
19CWP4		19CWP4
19CXP4		(AW47-91)
19D8		19D8;UCH81
19DJP4		AW47-91
19FL8		19FL8;UBF89
19KF6		19KF6
19SU		19Y3;PY82
19X3		19X3;PY80
19Y3		19Y3;PY82
20A2		PL6574
20A3	797	PL2D21;PL5727;M8204
20AQ3		20AQ3;LY88
20CG		20CG
20CV	5120	20CV
21A1		PL6574
21A6	5077	21A6;PL81
21AMP4		(MW53-80)
21ARP4		(MW53-20)
21AWP4		(MW53-20)
21B12A		PL5684
21BTP4		(MW53-80)
21CLP4		21CLP4;AW53-80
21CUP4		(MW53-80)
21DKP4		AW53-88

Type to be replaced	CV number	Replacement type
21DVP4		AW53-80
21DWP4		(AW53-88)
21ELP4		21CLP4;AW53-80
21ENP4		21CLP4;AW53-80
21EP4		(AW53-20)
21EXP4		(AW53-89)
21EZP4		(AW53-89)
21FCP4		(AW53-88)
21JP4		(MW53-20)
21WP4		(MW53-20)
21ZP4		(MW53-20)
22AL3		20AQ3;LY88
23ABP4		(AW59-90)
23ADP4		A59-16W
23AMP4		(AW59-90)
23AQP4		AW59-90
23AXP4		AW59-91
23AYP4		A59-16W
23BCP4		AW59-90
23BEP4		A59-16W
23BNP4		A59-16W
23BRP4		(A59-16W)
23BSP4		A59-16W
23BYP4		(A59-16W)
23CJP4		A59-16W
23CKP4		A59-16W
23CLP4		A59-16W
23CMP4		AW59-90;23CMP4
23CNP4		A59-16W
23CRP4		A59-16W
23CSP4		(A59-16W)
23CVP4		(AW59-91)

Type to be replaced	CV number	Replacement type
23CXP4		(AW59-91)
23DEP4		A59-11W
23DFP4		AW59-91
23DGP4		A59-16W
23DHP4		A59-16W
23DJP4		(A59-16W)
23DRP4		(A59-11W)
23EBP4		AW59-90
23EJP4		AW59-91
23FGP4		A59-11W
23KP4/03		AW59-90
23RP4		(A59-16W)
23SP4		A59-16W
23VP4		(AW59-91)
24ADP4		(MW61-80)
24AXP4		AW61-88
24CP4		(MW61-80)
25E5		25E5;PL36
25L6		25L6GT
25L6GT	553	25L6GT
25MP4		A65-11W

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Type to be replaced	*CV number*	*Replacement type*
27GB5		27GB5;PL500
27KG6		27KG6;LL505
27RP4		27RP4
28EB40/1B		(ZP1010)
28EC4		28EC4;LY500
30A5		30A5;HL94
30AE3		30AE3;PY88
30C1		9A8;PCF80
30L1		7AN7;PCC84
30P16		16A5;PL82
30P18		15CW5;PL84
31A3		31A3;UY41
31AV3		31AV3;UY89
31EB40		(ZP1000)
31EB70G		(ZP1000)
35FV5		35FV5;PL136
35L6GT		35L6GT
35W4		35W4;HY90
35Z5GT	568	35Z5GT
38A3		38A3;UY85
40KG6		40KG6;PL505
42EC4		42EC4;PY500
45A5	1977	45A5;UL41
45B5		45B5;UL84
45BA6		367
*50AVP		150AVP
*50AVP/02		XP1010
50B5		50B5
50BM8		50BM8;UCL82
50C5	1959	50C5;HL92
50L6GT	571	50L6GT
*51AVP		150AVP
*51UVP		150UVP
52AVP		52AVP;(XP1180)
52CG	2896	52CG
53AVP		53AVP;(XP1000)
53CG		53CG
53KU		GZ37;(GZ34);(5AR4)
53UVP		53UVP;(XP1004)
54AVP		54AVP
54KU		GZ32;5AQ4
54UVP		54UVP
*55AVP		56AVP
55N3		55N3;UY82
56AVP		56AVP
56AVP/03		56AVP/03
56AVP/05		56AVP/05
56CVP		56CVP
56DUVP		56DUVP
56DVP		56DVP
56DVP/03		56DVP/03
56TUVP		56TUVP
56TVP		56TVP
56UVP		56UVP
57		PL5559
57AVP		57AVP
58AVP		58AVP
58CG		58CG
58CV		58CV
58UVP		58UVP

* Obsolete type with replacement type

Type to be replaced	*CV number*	*Replacement type*
60AVP		60AVP
61SV		61SV;7634
62DDT		6CV7;EBC41
62TH		6CU7;ECH42
62VP		6CJ5;EF41
63SPT		EF50
63TP		6AB8;ECL80
64ME		6CD7;EM34
64SPT		6BX6;EF80
65ME		6BR5;EM80
66KU		6BT4;EZ40
67BT		6CK5;EL41
75B1	284	75B1
75C1	2454	75C1;M8225
76NB3		76NB3
83A1		83A1;7980
85A1	431	85A1;OE3
85A2	449	85A2;OG3; M8098
90AG	2270	90AG
90AV	2132	90AV
90C1	5173	90C1;M8206
90CG		90CG
90CV		90CV
90NB3		90NB3
90NS		90NS
92AG		92AG
92AV		92AV
95A1	286	95A1
100C		100C
100CB		100CB
100E1		100E1
100NB		100NB
100R		8020

Type to be replaced	*CV number*	*Replacement type*
100TH	2552	100TH;TB3/350
105A		PL105
108C1	1833	OB2;OB2WA; M8224
120C		120C
120NB		120NB
121VP		UF41;12AC5
141DDT		UBC41;14L7
141K		MW36-44
141TH		UCH42;14K7
150A1		150A1
150AV		150AV
150AVP		150AVP
*150AVP/02		XP1010
150B2	2225	150B2;6354;M8163
150C1		150C1
150C1K		150C1K
150C2	1832	OA2; OA2WA;M8223
150C3		150C3;OD3
150C4	1832	M8223
150CV		150CV
150CVP		150CVP
150UV		150UV
150UVP		150UVP

* Obsolete type with replacement type

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Type to be replaced	*CV number*	*Replacement type*
*152AVP		XP1110;(XP1115)
*152UVP		XP1118
153AVP		153AVP;(XP1001)
153C		153C
155N		155N
155UG		155UG
163Pen		PL82;16A5
171DDP		UBF80;17C8
172		(PL105)
172K		(MW43-69);(17BQP4)
173K		(MW43-69);(17BQP4)
200CB		200CB
200HB		200HB
200LB		200LB
200NB		200NB
210-0159		ZX1061
212K		MW53-80
213P		R142
213Pen		PL81;21A6
238B		PL5555
255F!M		(55850F)
255IND		(55850S)
255NOR		(55850S)
272		PL5557
287A		PL5557
300DC		62031
309		PL5557
311SU		UY41;31A3
323A,323B		(PL3C23)
328		328
329		329
340		340
367	2634	367
*373		AZ1
393A		(PL3C23)
404A		5847
417A	2642	417A;5842
442BU		(1561)
451		451
451PT		UL41;45A5
452		452
460BU	2644	1561
502A		(PL2D21);(PL5727);(M8204)
*505		AZ1
*506		AZ1
*506K		AZ1
575A		(7136);(DCG6/18GB)
631		PL5559
651		PL5552A
652		PL5551A
653B		PL5555
655		PL5553B
656		PL5552A
657		PL5551A
673		(6693);(DCG6/18)
676		(PL105)

* Obsolete type with replacement type

Type to be replaced	*CV number*	*Replacement type*
710		PL5684/C3JA
715		PL5557
723A/B	1795	723A/B
725A	722	725A
807	124	807;QE06/50
813	26	813;QB2/250
816	724	(866A);(DCG4/1000G)
829B		(5894);(QQE06/40)
832		832A;QQE04/20
832A	788	832A;QQE04/20
833A		833A
857B		(6786);(DCG7/100B)
866		866A;DCG4/1000G
866A	32	866A;DCG4/1000G
866B		(866A);(DCG4/1000G)
868	2680	(3554)
869;869A		(6508);(DCG9/20)
869B	2723	(6508);(DCG9/20)
872		872A;DCG5/5000GB
872A	642	872A;DCG5/5000GB
872B		ZY1000
873		(DCG6/6000)
884		(PL2D21);(PL5727);(M8204)
885		(PL2D21);(PL5727);(M8204)
912NB4		912NB4
918		(3554)
927		(3546PW)
966		866A;DCG4/1000G
967		PL5557
1010		1010
1018		1018
1037		1037
1038		1038
1039		1039
1049		1049
1054		1054
1069K		1069K
1110		1110
1119		1119
1129		1129
1138		1138
1163	1836	1163
1164		1164
1173		1173
1174		1174
1176		1176
1177		1177
1257		PL5559
1267		PL1267/Z300T
1319		(55850AM)
1331		1331
*1560		5Y3GT
1561		1561

* Obsolete type with replacement type

REPLACEMENT GUIDE FOR ELECTRON TUBES

Type to be replaced	CV number	Replacement type
1607		PL1607
1625		(PE06/40E)
1701		PL5557
1710		1710
1725A		1725A
1738		1738
1749A		1749A
*1759		1859 + 1289
1788		1788
1838		1838
1849		1849
1859		1859
1875		1875
1876	2718	1876
1877	1134	1877
1878		1878
1884		1884
1904H		1904H
1905		1905
1908		1908
*1909		1909H
1909A		1909A
1909H		1909H
1910		1910
1913		1913
1918-01		1918-01
1923		1923
1926		1926
1927		1927
1928		1928
1941A		1941A
1945		1945
2000		1163
2048		(55850)
2100A		8020
2183		1164
2255		55852;(55851)
3069		866A;DCG4/1000G
3070		872A;DCG5/5000GB
3078A		(6508);(DCG9/20)
3530		3530
3533A		3533A
*3534		3554
3538		3538
*3541		3533A
3545		3545
3545PW		3545PW
3546		3546
3546PW		3546PW
3554		3554
3572		866A;DCG4/1000G
3861B		QEL1/150;4X150A
3874A		QB2/250;813
3885A		3B28;DCX4/1000

* Obsolete type with replacement type

Type to be replaced	*CV number*	*Replacement type*
4049D		(DCG4/5000)
4065	495	4065
4066	2730	4066
4067		4067
4068	2348	4068
4069		4069
4070		4070
4078A		(DCG9/20);(6508)
4078GA		(DCG9/20);(6508)
4078Z		(DCG9/20);(6508)
4152/02		4152/02
4260		PL5557
4261		PL5557
4349		4349
4369		4369
4370		4370
4371		4371
4372		4372
*4373		4369
4378		4378
4379		4379
4390		4390
4397		4397
4438		(XP1011)
4439		(XP1011)
4440		XP1011
4441		(XP1011)
4459		(56TVP)
4460		(XP1115); (XP1111)
4461		(XP1011)
4463		(XP1002)
4478		(55850AM)
4488		(55850AM)
*4590		EC50

Type to be replaced	*CV number*	*Replacement type*
4613		4613
*4636		AF7
4641		4641
4646		4646
*4648		DCG1/250; DCG4/1000G;866A
*4649		DCG4/1000ED
*4652		AX50
4654K		4654K
*4654P		4654K
4657		4657
4659		4659
4662		4662
4682		4682
4683		4683
4699		4699

* Obsolete type with replacement type

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Type to be replaced	*CV number*	*Replacement type*
5021B		DCG4/1000G;866A
5031		DCG5/5000GB;872A
5121		DCX4/1000;3B28
5544	2210	PL5544
5545	2215	PL5545
5551		PL5551A
5551A		PL5551A
5551A/652		PL5551A
5552		PL5552A
5552A		PL5552A
5552A/651		PL5552A
5553,5553A		PL5553B
5553B		PL5553B
5553B/655		PL5553B
5555,5555A		PL5555
5557	2957	PL5557
5559		PL5559
5586	3611	5586
5632		PL5632;C3J
5636	3928	5636;EF730
5639	2662	5639
5641		5641
5642	2241	5642;DY70
5643	5079	5643
5644	3987	5644
5651	2573;5186	5651;M8098
5654	4010;5216	5654;E95F; 6AK5W;M8100
5672	2238	5672
5678	2254	5678;DF60
5684		PL5684/C3J/A
5696	3512	5696
5718	3930	5718;EC71
5719	4008	5719
5725	4011	5725;6AS6W

Type to be replaced	*CV number*	*Replacement type*
5726	4007;5189	5726(E91AA); (6AL5W);(M8212)
5727	4018	PL5727;M8204
5749	4009	5749;6BA6W
5750		(6BE6);(EK90)
5751	4017	5751
5762/7C24		(YD1120)
5763	2129	5763;QE03/10;M8096
5771		5771
5783		5783WA;M8190
5783W	3960;3933; 4066	5783WA;(M8190)
5819		(XP1000)
5822,5822A		PL5822A
5823		5823;Z900T
5840	3929	5840;(EF732)
5842	3789	5842;417A
5847	3905	5847;E182F
5855		5855;XR1-12
5861		5861;EC55
5866	1924	5866;TB2.5/300
5867	1350	5867;TB3/750
5868	1351	5868;TB4/1250
5869		5869;(DCG6/6000)
5870		5870;DCG12/30
5876		5876
5876A		5876A
5893		5893
5894	2797	5894;QQE06/40
5895	1838	5895;QQC04/15
5899	475;477	5899;(EF731)
5902	4029	5902
5915		(6687);(E91H)
5920	5214	5920;E90CC
5923		5923;TBW6/6000

Type to be replaced	CV number	Replacement type
5924	3926	5924;TBL6/6000
5949	3521	5949
5949A		5949A
5976		KS7-85E
6007		6007;DL67
6008		6008;DF67
6011		(PL5684/C3JA)
6021	3986	6021;(ECC70)
6027		JP9-15
6027H		YJ1060
6057		(M8137)
6058	4025	(M8079)
6060		M8162
6062	4039	6062
6064	4014	M8083
6065	4015	M8161
6067		M8136
6073	2903	M8223
6074		M8224
6075		6075;QBW5/3500
6076	5219	6076;QBL5/3500
6077		6077;TBW12/100
6078		6078;TBL12/100
6079	3522	6079;QB5/1750

Type to be replaced	CV number	Replacement type
6080	2984	6080
6083		6083;PE1/100
6084	2729	6084;E80F
6085		6085;E80CC
6086		6086;18042
6096	4010;5216	5654;E95F; 6AK5W;M8100
6097	4007	5726;E91AA; 6AL5W;M8212
6097B		XP1000
6097F		(XP1001)
6097G		(XP1000)
6099		M8081
6100	4058	M8080
6101	4031	M8081
6111		6111
6112		6112
6135	4022	M8080
6146	3523	6146;QE05/40
6146A		6146A;QE05/40
6146B		6146B;YL1370
6155	2130	6155;QB3/300
6156	2131	6156;QB3.5/750
6159		6159;QE05/40H
6159A		6159A;QE05/40H
6159B		6159B;YL1372
6187		M8196
6189	4003	6189;12AU7WA;M8136; E82CC
6198/A		(55850)
6199		150AVP
6201	4024;3508; 5212	6201;E81CC; 12AT7WA;M8162
6205	2432	6205;EF734
6206		6206

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Type to be replaced	*CV number*	*Replacement type*
6211		6211
6218		6218;E80T
6227		6227;E80L
6252	2799	6252;QQE03/20
6255B		(56AVP/05)
6255G		(56UVP)
6255S		(56AVP/03)
6263		6263
6263A		6263A
6264		6264
6264A		6264A
6267	2901	6267;EF86;M8195
6268	1787	6268;4C35A
6279	2520	6279;5C22
6286		6286
6291		150AVP
6292		
6308		(ZZ1000)
6326/A		(55850)
6334		56032
6342A		XP1001
6347		(PL5552A)
6348		PL5552A
6354	2225	6354;150B2; M8163
6360,6360A	2798	6360;QQE03/12
6362		XP1111;(XP1110)
6363		XP1030
6364		(54AVP)
6365		(XP1113)
6370	5106	6370;E1T
6373	2105	6373;DL70
6374	2235	6374;EY84;M8091
6375	2275	6375;DC70
6391	476	6391;EF74

Type to be replaced	*CV number*	*Replacement type*
6443	4044	M8091
6463	5304	6463
6467		150AVP;(XP1180)
6476		Z502S
6487	467	6487;EF70
6488	466	6488;EF73
6489	469	6489;EA76
6508		6508;DCG9/20
6524		(6252);(QQE03/20)
6538		6538;Z800U
6539		6539;Z80IU
6574	2253	PL6574
6587		(5C22);(6279)
6617		6617;TBW12/25
6618		6618;TBL12/25
6626		M8223
6627		M8224
6655A		XP1000
6681		6681;E83CC
6686		6686;E81L
6687		6687;E91H
6688	3998	6688;E180F; (E186F);(7737)
6689		6689;E83F
6693		6693;DCG6/18
6700	5277	6700;ET51
6755		PL6755
6778		6778;EC70
6779	2434	6779;Z803U
6786		6786;DCG7/100B
6807		PL6807
6810A		(56AVP);(56AVP/05)
6810B		(56AVP);(56AVP/05)
6816		6816; YL1101
6844A		ZM1020

Type to be replaced	*CV number*	*Replacement type*
6850		(6252);(QQE03/20)
6883		6883;QE05/40F
6883A		6883A;QE05/40F
6883B		6883B;YL1371
6884		6884;YL1100
6894		(7136);(DCG6/18GB)
6895		(6693);(DCG6/18)
6903		XP1004
6911		XP1005
6912		(55850)
6922	2492	6922;E88CC; (E188CC);(7308)
6923	5140	6923;EA52
6935		XP1111;(XP1110)
6939		6939;QQE02/5
6960		6960;TBW7/8000
6961		6961;TBL7/8000
6972		6972
6975	5249	6975
6977		6977;DM160

Type to be replaced	*CV number*	*Replacement type*
7004		7004;TBL2/300
7008		7008;YJ1010
7025		7025;12AX7S;M8137
7028		7028
7034		4X150A;QEL1/150
7035		4X150D;QEL1/150H
7038A		(XQ1040);(XP1050)
7046		(58AVP);(XP1040)
7062		7062;E180CC
7064		XP1000
7065		150AVP
7090		7090
*7091		YJ1162 1)
7092		7092;TB5/2500
7093		7093
7102		150CVP
7111		YJ1011
7119	5188	7119;E182CC
7136		7136;DCG6/18GB
7189		7189
7203		4CX250B;QEL2/275
7204		4CX250F; QEL2/275H
7213		7213;YL1280
7226/A		(55850)
7237		(TBL7/8000);(6961)
7247		7247
7262		(XQ1042);(XQ1043)
7262A		(XP1052);(XQ1053)
7263/A		(55850)
7264		(56AVP);(56AVP/05); (56AVP/SP)
7265		(56TVP)
7289		7289
7291/A		(XQ1049);(XQ1050)

* Obsolete type with replacement type

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Type to be replaced	CV number	Replacement type
7292		7292;YJ1160 [1]
7308	5231;4108	7308;E188CC
7316		7316;ECC186
7320		7320;E84L
7325		(55850)
7326		XP1002
7336		(XQ1040)
7351		(XQ1050)
7377		7377;QQE04/5
7378		7378;QE08/200
7386		PL5545A
7459		(YD1120)
7475	1070	7475
7522		XQ1010
7527		7527;QB4/1100
7534		7534;E130L
7537		7537
7580		7580;QEL2/200
7580W		YL1170;4CX250R
7609		7609
7632		7632;ORP10
7633		7633;ORP11
7634		7634;61SV
7643		7643;E80CF
7645		(6939);(QQE02/5)
7650		7650;YL1110
7664		XP1004
7693		7693;E90F
7694		7694;E99F
7696		XP1001
7697		(55850)
7704		7704;QBL5/4000
7709		7709;Z70W
7710		7710;Z70U
7711		7711;Z71U
7714		7714;Z805U
7721		D3a
7722		7722;E280F
7735A		(55850)
7737		7737;E186F
7746		(XP1001)
7751		7751;E235F
7753		7753;TBL6/4000
7764		(XP1113)
7767		XP1111;(XP1110)
7788		7788;E810F
7800		(TBL12/40)
7804		7804;TBL6/14
7805		7805;TBW6/14
7806		7806;TBL12/38
7807		7807;TBW12/38
7817		XP1000;(XP1001)
7818		XP1030;(XP1031)
7819		(54AVP)
7836		7836;QE08/200H
7843		YL1102;7843
7844		YL1103;7844
7850		(56AVP);(56AVP/05)
7854		7854;YL1060
7860		(XP1115)
7899		7899
7908		(XP1115)
7909		(XP1110);(XP1111)
7980		7980;83A1
7981		PL7981
7983		7983;QQC03/14
7986		7986;TB2.5/400

Type to be replaced	CV number	Replacement type
8008		8008;DCG5/5000GS
8008A		ZY1001
8020	2967	8020
8032		8032;QE05/40K
8032A		8032A;YL1371
8042		8042;QC05/35
8053		XP1001;(XP1000)
8054		XP1031;(XP1030)
8055		54AVP
8062		150CVP
8063	5234	PL5684/C3JA
8078		TB4/1500
8108	5397	8108;EC157
8116		8116;YL1071
8117		8117;YL1070
8118		8118;YL1020
8119		8119;TBL2/400
8120		8120;TBL2/500
8163		8163;YD1130
8165		8165;QB3/200
8177		8177;QBL3.5/2000
8179		8179;QB5/2000
8223		8223;E288CC
8228		8228;ZZ1000
8233		8233;E55L
8253/6587A		(5C22);(6279)
8254		8254;EC1000
8255		8255;E88C
8268		8268;TBW7/9000
8269		8269;TBL7/9000
8270		ZT1000
8278		8278;EL503
8298A		8298A;YL1370;6146B
8321		8321;YL1340
8322		8322;YL1341
8348		8348;YL1080
8356		YJ1040
8384		(55850N)
8408		8408;YL1130
8421		(ZM1020)
8429		8429;YL1120
8436		8436;EC158
8438		8438;QB4/1100GA
8453		8453;ZM1050
8457		8457;YL1210
8458		8458;YL1240
8463		8463;YL1000
8482		ZT1001
8483		55850N;(XQ1030);(XQ1040)
8484		(55851);(55852);(XQ1053)
8505		8505;YL1250
8507		(XQ1040);(XQ1050)
8511		(XQ1030)
8541		(XQ1040)
8544		8544;LCF80
8552		8552;YL1371
8560		8560;YL1320
8566		(XQ1040);(XQ1050)
8572		(XQ1040);(XQ1050)
8573		XQ1040

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Type to be replaced	*CV number*	*Replacement type*
8577		8577:YL1220
8579		8579;YL1150
8580		8580;YL1190
8591		8591;TBH6/14
8592		8592;TBH7/8000
8593		8593;TBH7/9000
8594		8594;TBH12/38
8603		8603;YL1310
8604		55851S
8610		8610;TBH6/6000
8621		8621;4CX250FG
8625		55851
8628		(55851)
8637		8637;YL1300
8654		8654;YL1230
8666		8666;YD1170
8667		8667;YD1171
8668		8668;YD1172
8679		8679;YL1121
8680		8680;YD1212
8681		YJ1080
8683		8683;YL1360
8728		8728;YD1150
8729		8729;YD1151
8730		8730;YD1152
8731		8731;YD1160
8732		8732;YD1161
8733		8733;YD1162
8734		8734;YD1173
8735		8735;YD1182
8736		8736;YD1192
8744		8744;YL1330
8752		8752;YD1202

Type to be replaced	*CV number*	*Replacement type*
9514B		(56AVP);(56AVP/05)
9514S		(56AVP/03)
9524B		(XP1180)
9530B		(54AVP)
9530Q		(54UVP)
9531A		(XP1031)
9531B		(XP1030)
9536B		XP1001
9545B		(57AVP)
9552B		XP1004
9553		XP1005
9558B		(XP1002)
9578B		XP1030
9578U		(XP1030)
9578X		XP1030
9579B		(54AVP)
9579U		(54AVP)
9583B		54AVP
9584B		53AVP;(XP1000)
9584X		53AVP;(XP1000)
9593B		(56AVP);(56AVP/05)
9594B		(56AVP);(56AVP/05)
9601B		(XP1180)
9607B		(XP1002)
9609		(XP1110);(XP1111)

Type to be replaced	CV number	Replacement type
9618B		(54AVP)
9623B		(57AVP)
9677		XQ1040;(XQ1050)
10667		(55850)
13201A		13201A
13201E		13201E
16907		16907
18014		18014
*18038		AZ1
18042		18042;6086
18045		18045
18503		18503
18504		18504
18505		18505
18506		18506
18507		18507
*18508		—
18509		18509
*18510		—
18511		18511
18515		18515
18516		18516
18517		18517

Type to be replaced	CV number	Replacement type
18518		18518
18520		18520
*18522		—
18524		18524;(ZP1082)
18525		18525;(ZP1082)
18526		18526
18529		18529
18533		18533;(ZP1083)
18536		18536
18537		18537
18538		18538
18545		18545
18546		18546
*18548		—
18550		18550
18552		18552
18553		18553
18600		18600
18600R		18600R
18601		18601
38116		1163
38166		866A;DCG4;/1000G
38172		872A;DCG5/5000GB

* Obsolete type with replacement type

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Type to be replaced	CV number	Replacement type
55029		55029
55030		55030
55031/01		55031/01
55031/02		55031/02
55032/01		55032/01
55032/02		55032/02
*55035		2J42
*55040		725A
55085/01		55085/01
55085/02		55085/02
55085/03		55085/03
55085/04		55085/04
55100/01		55100/01
55100/02		55100/02
55100/03		55100/03
55100/04		55100/04
*55125		YJ1190 1)
*55230		5J26
55305		55305
55306		55306
55335		55335
55340		55340
*55370		YK1010
*55390		2K25
*55391		723A/B
55850AM		(XQ1044)
55850F		(XQ1040)
55850N		(XQ1043)
55850S		(XQ1042)
55850SR		(XQ1041)
55851AM		XQ1044
55851F		XQ1040
55851N		XQ1043
55851S		XQ1042
55851SR		XQ1041

Type to be replaced	CV number	Replacement type
55852AM		XQ1054
55852F		XQ1050
55852N		XQ1053
55852S		XQ1052
55852SR		XQ1051
55875		55875
55875B		55875B
55875G		55875G
55875L		55875L
55875R		55875R
55876		55876
*56000		8020
56001		56001
56006		56006
56032		56032
56050		56050
56051		56051
62019		62019
62022		62022
62028		62028
62031		62031
68506	2775	1163
68508		1164

* Obsolete type with replacement type

Type to be replaced	CV number	Replacement type
95108		95108
95322		95322
*95398		—
178148		1163
178149		1163
180238		1164
189048		1163
189049		1163
217283		1164
289414		1163
289416		1163
766776		1164
A28-13W		A28-13W
A28-14W		A28-14W
A31-20W		A31-20W
A44-120W		A44-120W
A47-11W		A47-11W
A47-13W		19CWP4
A47-14W		A47-14W
A47-15W		19CWP4
A47-17W		A47-11W
A47-18W		A47-11W

Type to be replaced	CV number	Replacement type
A47-26W		A49-26W
A49-11X		A49-11X
A50-120W		A50-120W
A56-11X		A56-11X
A59-11W		A59-11W
A59-12W		A59-11W
A59-13W		A59-16W
A59-14W		A59-16W
A59-15W		A59-15W
A59-16W		A59-16W
A59-23W		A59-23W
A63-11X		A63-11X
A65-11W		A65-11W
A4051		QE06/50;807
AA91E		5726;E91AA; 6AL5W;M8212
*AB1		AB2;ABC1
AB2		AB2
ABC1		ABC1
ABL1		ABL1
ACS4		QBL5/3500;6076
ACT70		YD1120
ACT100		(TBL6/14);(7804)
*AF2		EF9
*AF3		EF9
AF7		AF7
AG3B28	1835	DCX4/1000;3B28
AG575A		(DCG6/18GB);(7136)
AG866A	32	DCG4/1000G;866A
AG869B		(DCG9/20);(6508)
AG872A	642	DCG5/5000GB;872A
AG5004		(DCG4/1000G);(866A)
AG5005		(DCG7/100)
AG5006		(DCG6/18);(6693)

* Obsolete type with replacement type

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Type to be replaced	*CV number*	*Replacement type*
AG5209		85A2;OG3;M8098
AG5210		OB2;OB2WA; M8224
AG5211		OA2;150C2; OA2WA;M8223
AG8008		DCG5/5000GS;8008
AGR9950		5869;(DCG6/6000)
AGR9951		5870;DCG12/30
*AH1		EK2
AH201		(866A);(DCG4/1000G)
AH205		(DCG7/100)
AH213		(DCG9/20);(6508)
AH217		DCG5/5000GB;872A
AH221	5	(DCG4/5000)
AH238		DCG4/5000
AJ5551		PL5551A
AJ5551A		PL5551A
AJ5552		PL5552A
AJ5552A		PL5552A
AJ5553B		PL5553B
AJ6346		(PL5551A)
AJ6347		PL5552A
AL4		AL4
AN1	1128	AN1
APY16		APY16
APY17		APY17
APY18		APY18
APY19		APY19
APY21		APY21
APY22		APY22
APY23		APY23
APY24		APY24
APY25		APY25
APY26		APY26
APY27		APY27
APY28		APY28
APY29		APY29
AR10		(PL5552A)
AR10T		(PL5552A)
AR14		PL5551A
AR14T		(PL5551A)
AR14TP		(PL5551A)
AR14TWS		(PL5551A)
AR21		EBC33
ARP34		EF39
ARP35		EF50
ART10TP		(PL5552A)
ART10TWS		(PL5552A)
ARTH2		(ECH35)
ASG5007		(DCG12/30);(5870)
ASG5017		PL5557
ASG5023		PL3C23
ASG5044B		PL6755
ASG5045B		PL106
ASG5121		PL2D21;EN91; PL5727;M8204
ASG5155A		(PL255)
ASG5544		PL5544
ASG5545		PL5545
ASG5696		5696
ASG5727		PL5727;M8204
ASG5823		5823;Z900T
ASG5830		(DCG7/100)
ASG6011		PL5684/C3JA
ASG6574		PL6574
ASG6807		PL6807
ATS25		807;QE06/50
AU1		AZ50
*AW21-10		M21-11W
AW36-20		AW36-20;14ABP4A
AW36-21		AW36-21;14ABP4

* Obsolete type with replacement type

Type to be replaced	*CV number*	*Replacement type*
AW36-80		AW36-80;14AHP4A
AW36-81		AW36-81;14AHP4
AW43-80		AW43-80:17BTP4
AW43-88		AW43-88
AW43-89		AW43-89
AW47-12		(AW47-91)
AW47-30		(AW47-91)
AW47-90		AW47-91
AW47-91		AW47-91
AW47-94		AW47-91
AW47-97		(AW47-91)
AW53-80		AW53-80;21CLP4
AW53-88		AW53-88
AW53-89		AW53-89
AW59-90		AW59-90;23CMP4
AW59-91		AW59-91
AW61-88		AW61-88
*AX1		AX50
AX3C23		PL3C23
AX4-125A	2130	6155;QB3/300
AX4-250A	2131	6156;QB3.5/750
AX50		AX50
AX105		PL105
AX195		AX195
AX224	1835	DCX4/1000;3B28
AX228		(DCX4/5000);(4B32)
AX230	2518	DCX4/5000:4B32
AX5551		PL5551A
AX5551A		PL5551A
AX5552		PL5552A
AX5552A		PL5552A
AX5553		PL5553A
AX5553B		PL5553B
AX5555		PL5555
AX5822		PL5822A

Type to be replaced	*CV number*	*Replacement type*
AX5822A		PL5822A
AX7585		PL5552A
AX9900		5866;TB2.5/300
AX9901		5867;TB3/750
AX9902		5868;TB4/1250
AX9903	2797	5894;QQE06/40
AX9904		5923;TBW6/6000
AX9904R		5924;TBL6/6000
AX9905		5895;QQC04/15
AX9906		6077;TBW12/100
AX9906R		6078;TBL12/100
AX9907		6075;QBW5/3500
AX9907R		6076;QBL5/3500
AX9908		6079;QB5/1750
AX9909		6083;PE1/100
AX9910		6252;QQE03/20
AX9911		4C35A;6268
AX9912		5C22
AZ1	2860	AZ1
AZ4		AZ4
AZ11		AZ11
AZ12		AZ12
*AZ21		AZ1;AZ41
AZ31	2862	AZ31
AZ41	3892	AZ41
AZ50	1264	AZ50

* Obsolete type with replacement type

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Type to be replaced	*CV number*	*Replacement type*
B6H		(18533);(ZP1083)
B65	1988	6SN7GT
B109		UCC85
B142	1927	(TB4/1250);(5868)
B152		ECC81;12AT7; 12AT7WA;E81CC; 6201;M8162
B309		ECC81;12AT7; 12AT7WA;E81CC; 6201;M8162
B319		(PCC84);(7AN7)
B329		ECC82;12AU7; 12AU7WA;6189; M8136
B339		ECC83;12AX7; 12AX7S;7025;M8137
B719		ECC85;6AQ8
B1135		TB3/750;5867
B5030		ZM1030
B5031		Z520M
B5032		Z521M
B5092		(ZM1020)
B5441		(ZM1000)
BF61		EL41;6CK5
BF62		EL42
BF451		UL41;45A5
BK24		PL5552A
BK24A		(PL5552A)
BK24B		(PL5552A)
BK24C		PL5552A
BK34		PL5553B
BK34A		(PL5553B)
BK34B		(PL5553B)
BK42		PL5551A

Type to be replaced	*CV number*	*Replacement type*
BK42A		(PL5551A)
BK42B		(PL5551A)
BK42C		PL5551A
BK46		PL5555
BK168B		(PL5822A)
BMQ10/14		(XP1118)
BMS10/14		(XP1110)
BMS11/23		(XP1180)
BPX10		BPX10
BPX12		BPX12
BPX13		BPX13
BPX14		BPX14
BPY51		BPY51
BPY53		BPY53
BPY54		BPY54
BPY55		BPY55
BPY58		BPY58
BPY59		BPY59
BPY81		BPY81
BPY83		BPY83
BPY84		BPY84
BPY85		BPY85
BPY88		BPY88
BPY89		BPY89
BR191B		YD1120
BR1126		YD1230
BT5		PL5559
BT17		(PL105)
BT19		(PL5557)
BT29		PL255
BT69		(DCG7/100B);(6786)
BT77		PL5545A
BT79		(3C45)
BT91		PL5544

Type to be replaced	CV number	Replacement type
C3J		PL5632/C3J
C3JA		PL5684/C3JA
C3m	5232	C3m
C6A		(PL5545A)
C6J		PL5545A
C6JA		(PL5545A)
C6L		(PL5545A)
C6M		(PL5545A)
C6P		(PL5545A)
C8		C8
C10		C10
C17-1A		MW43-69;17BQP4
C21-1A		MW53-80;21CLP4
C21AA		(AW53-88)
C21KM		(AW53-80);(21CLP4)
C36-24		(MW36-44)
C143	26	QB2/250;813
C144	2666	(QQE06/40);(5894)
C178A		QQE06/40;5894
C180	788	QQE04/20;832A
C350		(QE06/50);(807)
*C443		AL4
*C453		AL4
C866A		DCG4/1000G;866A
C872		DCG5/5000GB;872A
C1108		QB3/300;6155
C1112		QB3.5/750;6156
C1134		QQE03/20;6252
C1136		QB4/1100;7527
*CB1		EBF2
*CB2		EBF2
CBL1		CBL1
CBL6		CBL6
CBL31		CBL31
*CC2		EBC3

Type to be replaced	CV number	Replacement type
CC81E		12AT7WA;E81CC; 6201;M8162
CC86E		6463
CCa		E88CC;6922
CCH35		CCH35
CD18		ZM1020
CD26		ZM1020
CD64		ZM1080
CE225		1163
CE226		1163
CE235		1164
CE305		(PL5557)
CE306		(PL5545A)
CE308		(PL105)
CE309		PL5557
CE311		PL3C23A
CE866A		DCG4/1000G;866A
CE872A		DCG5/5000GB;872A
CE5685/C6J		PL5545A
*CF1		EF6
*CF2		EF9;UF9
CF50		CF50
*CK1		ECH3
*CK3		ECH3
CK1084		(ZM1080)
CK5651	3573;5186	5651;M8098
CK5654	4010;5216	5654;E95F; 6AK5W;M8100
CK5672	2238	5672
CK5678	2254	5678;DF60

* Obsolete type with replacement type

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Type to be replaced	*CV number*	*Replacement type*
CK5725	4011	5725;6AS6W; M8196
CK5726	4007;5189	5726 E91AA; 6AL5W;M8212
CK5783		5783WA;M8190
CK6021	3986	6021;ECC70
CK8650		(ZM1000)
CL4		CL4
CL1002		(XP1000)
CL1003		XP1030
CL1005		150CVP
CL1006		XP1005
CL1008		(XP1004)
CL1009		XP1032
CL1012		150AVP
CL1015		(56AVP)
CL1090		(56AVP)(56VP/05)
CME1901		(AW47-91)
CME1902		AW47-91
CME1903		AW47-91
CME1906		19CWP4
CME2301		AW59-90;23CMP4
CME2302		AW59-90;23CMP4
CME2303		AW59-91
CR1100	5219	QBL5/3500;6076
CRY1		CRY1
CRY2		CRY2
CRY3		CRY3
CRY4		CRY4
CST2/12		(PL255)
CT1/2500		PL5559
CW1100		QBW5/3500;6075
*CY1		CY2
CY2		CY2
D2M9		EAA91;6AL5; 6AL5W;(E91AA); 5726
D3a		7721
D7-190GH		D7-190GH
D10-11BE		D10-11BE
D10-11GH		D10-11GH
D10-11GM		D10-11GM
D10-11GP		D10-11GP
D10-12BE		D10-12BE
D10-12GH		D10-12GH
D10-12GM		D10-12GM
D10-12GP		D10-12GP
D10-160GH		D10-160GH
D10-170GH		D10-170GH
D13-15BE		D13-15BE;5CBP11
D13-15GH		D13-15GH
D13-15GL		D13-15GP
D13-15GM		D13-15GM
D13-15GP		D13-15GP

Type to be replaced	CV number	Replacement type	Type to be replaced	CV number	Replacement type
D13-16BE		D13-16BE	*DAC32		DAC21;DAF91;1S5; DAF96;1AH5
D13-16GH		D13-16GH	DAF40		DAF40
D13-16GH/01		D13-16GH/01	DAF41		DAF41
D13-16GM		D13-16GM	DAF91	784	DAF91;1S5
D13-16GP		D13-16GP	DAF92	3912	DAF92;1U5
D13-19BE		D13-19BE	DAF96		DAF96;1AH5
D13-19GH		D13-19GH	*DB7-1		DB7-5;3ALP11
D13-19GM		D13-19GM	*DB7-2		DB7-6
D13-19GP		D13-19GP	*DB7-3		DB7-5;3ALP11
D13-21BE		D13-21BE	*DB7-4		DB7-6
D13-21GH		D13-21GH	DB7-5		DB7-5;3ALP11
D13-21GL		D13-21GP	DB7-6		DB7-6
D13-21GM		D13-21GM	DB711		DB7-11
D13-21GP		D13-21GP	DB7-36		DB7-36;3WP11
D13-23GH		D13-23GH	DB7-78		DB7-78
D13-24BE		D13-24BE	*DB7-91		DB7-11
D13-26BE		D13-26BE	DB10-6		DB10-6
D13-26GH		D13-26GH	DB10-78		DB10-78
D13-26GH/01		D13-26GH/01	*DB10-94		DB10-78
D13-26GM		D13-26GM	DB13-2		DB13-2
D13-26GP		D13-26GP	DB13-34		DB13-34;5ADP11
D13-26GP/01		D13-26GP/01	*DB13-76		D13-15BE
D13-27GH		D13-27GH	*DB13-78		D13-21BE
D13-49BE		D13-49BE	*DB13-79		D13-21BE
D13-450GH/01		D13-450GH/01	*DC25		DF91;1T4; DF96;1AJ4;DAC21
D13-480GH		D13-480GH	DC70	2275	DC70;6375
D13-500GH/01		D13-500GH/01	*DC80		DC70;6375
D14-120GH		D14-120GH	DC90		DC90
D14-121GH		D14-121GH	DC96		DC96
D77		EAA91;6AL5	DCC90	808	DCC90;3A5
D152		EAA91;6AL5	DCG1/250		DCG1/250
DA90	753	DA90;1A3	DCG1.5/250		DCG1.5/250
DAC21		DAC21	DCG2/500		DCG2/500
*DAC25		DAC21;DAF91;1S5; DAF96;1AH5			

* Obselete type with replacement type

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Type to be replaced	*CV number*	*Replacement type*
DCG4/1000A		DCG4/1000A
DCG4/1000ED	1625	DCG4/1000ED
DCG4/1000G	32	DCG4/1000G;866A
DCG4/5000	1629	DCG4/5000
DCG5/30		DCG5/30
DCG5/5000EG		DCG5/5000 EG; ZY1002
DCG5/5000GB	642	DCG5/5000GB;872A; ZY1000
DCG5/5000GS		DCG5/5000GS;8008; ZY1001
DCG6/18		DCG6/18;6693
DCG6/18GB		DCG6/18GB;7136
DCG6/6000		DCG6/6000;(5869)
DCG7/100		DCG7/100
DCG7/100B		DCG7/100B;6786
DCG9/20		DCG9/20;6508
DCG12/30		DCG12/30;5870
*DCH25		DK92;1AC6; DK96;1AB6
DCX4/1000	1835	DCX4/1000;3B28
DCX4/5000	2518	DCX4/5000;4B32
DD6		EAA91;6AL5
DDB47		Z806W
DDB52		Z302C
DDB70		Z504S
DDPP39S		CBL1
*DE2/200		DCG1/250; DCG4/1000G;866A
DET22	273	EC55;5861
DF21		DF21
DF22		DF22
*DF26		DAF91;1S5; DAF96;1AH5
*DF33		DF92;1L4
DF60	2254	DF60;5678
DF61N	2371	DF61N
DF62	2237	DF62;1AD4
DF63	2433	DF63
*DF64		—
*DF66		—
DF67		DF67;6008
DF72	2101	DF72
DF73	2103	DF73
DF91	785;1971	DF91;1T4
DF92	1758; 2742;2795	DF92;1L4
DF96		DF96;1AJ4
DF97		DF97;1AN5
*DG7-1		DG7-5;3ALP1
*DG7-2		DG7-6
*DG7-3		DG7-5;3ALP1
*DG7-4		DG7-6
DG7-5	2175	DG7-5;3ALP1
DG7-6	5269	DG7-6
DG7-31		DG7-31
DG7-32		DG7-32;3AMP1A
DG7-36	3946	DG7-36;3WP1
DG10-2		DG10-2
DG10-3		DG10-3
DG10-5		DG10-5
DG10-6		DG10-6
DG10-74		DG10-74
DG13-2	2191	DG13-2
DG13-32		DG13-32
DG13-34	5035	DG13-34;5ADP1
*DG13-78		D13-21GH
DH3-91	2302	DH3-91;1CP31
DH7-11		DH7-11;3BYP31
DH7-78		DH7-78;3BKP31

* Obsolete type with replacement type

Type to be replaced	CV number	Replacement type
*DH7-91		DH7-11
DH10-78		DH10-78
*DH10-94		DH10-78
*DH13-76		D13-15GH;5CBP31
DH13-78		DH13-78;5BHP31
*DH13-79		D13-21GH
DH63	587	6Q7G
DH63(Met)		6Q7GT
DH77	452	EBC90;6AT6
DH109		UABC80
DH118		UBC41;14L7
DH119		UBC81
DH142		UBC41;14L7
DH147		EBC33
DH150		EBC41;6CV7
DH718		EBC41;6CV7
DH719		EABC80;6AK8
*DHM10-93		E10-12GH
DK21		DK21
DK40		DK40
DK92		DK92;1AC6
DK96		DK96;1AB6
DK97		(DK96);(1AB6)
DL21		DL21
DL41		DL41
DL63	2913	(EBC33)
DL64	2331	DL64
DL67		DL67;6007
DL68		DL68
DL69	2361	DL69
DL70	2105	DL70;6373
*DL91		DL94;3V4;DL96;3C4
DL92	2370;484 820	DL92;3S4
DL93	807;2390	DL93;3A4

Type to be replaced	CV number	Replacement type
DL94	2983	DL94;3V4
DL95	818	DL95;3Q4
DL96		DL96;3C4
DL98	2240	DL98;3B4
DL192		(DL92);(3S4)
DL620	2238	5672
DL652		DL69
DLL21		DLL21
DM70	2980	DM70;1M3
DM71		DM71;1N3
DM160		DM160;6977
*DN7-1		DG7-5;3ALP1
*DN7-2		DG7-6
*DN7-3		DG7-5;3ALP1
*DN7-4		DG7-6
*DN7-5		DG7-5;3ALP1
DN7-11		DN7-11;3BYP2
DN7-36		DN7-36;3BWP2
DN7-78		DN7-78;3BKP2
*DN9-4		DN10-78;DH10-78
*DN9-5		DG10-5
*DN10-5		DG10-5
*DN10-6		DG10-6
DN10-78		DN10-78
*DN10-94		DN10-78
DN13-34		DN13-34;5ADP2
*DN13-76		D13-15GP
*DN13-78		D13-21GP
*DN13-79		D13-21GP
DN143		EBL21
*DNM10-93		E10-12GP
DP7-5	5171	DP7-5;3ALP7
DP7-6		DP7-6
DP7-11		DP7-11
DP7-36		DP7-36;3WP7

* Obsolete type with replacement type

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Type to be replaced	*CV number*	*Replacement type*
DP7-78		DP7-78
*DP7-91		DP7-11
DP10-6		DP10-6
*DP10-78		DN10-78
*DP10-94		DN10-78
DP13-2		DP13-2
DP13-34		DP13-34;5ADP7
*DP13-76		D13-15GM
*DP13-78		D13-21GM
*DP13-79		D13-21GM
DP61		EF95;6AK5 E95F;6AK5W; 5654;M8100
*DPM10-93		E10-12GM
DQ2		DCG4/1000G;866A
DQ2a		DCG4/1000ED
DQ4		DCG5/5000GB;872A
DQ4a		DCG5/5000EG
DQ5		(DCG6/18);(6693)
DQ5B		(DCG6/18GB)
DQ5C		(DCG6/18)
DQ6		(DCG9/20);(ZT1000)
DQ7		(DCG7/100B);(6786)
DQ45		(ZY1000)
*DR7-3		DG7-5
*DR7-4		DG7-6
DR7-5		DG7-5
DR7-6		DG7-6
DR10-6		DG10-6
DR13-2		DG13-2
DR869B		(6508);(DCG9/20)
DW4-500		1561
DX2		DXC4/1000;3B28
DX144		EC157;8108
DX145		EC157;8108
DX145A		EC157;8108
DX151		YK1010
DX155		7093
DX184		55335
DX206		DX206
DX232		YD1110;8415
DX247		DX247
DX267		DX267
DX274		8603;YL1310
DX276		DX276
DY30		DY30;1B3GT
DY51		DY51;1BG2
DY70	2241	DY70;5642
DY80		DY80;1X2B
DY86		DY802
DY87		DY802
DY802		DY802;1BQ2

Type to be replaced	*CV number*	*Replacement type*
E1T	5106	E1T;6370
E10-12BE		E10-12BE
E10-12GH		E10-12GH
E10-12GM		E10-12GM
E10-12GP		E10-12GP
E10-130BE		E10-130BE
E10-130GH		E10-130GH
E10-130GM		E10-130GM
E10-130GP		E10-130GP
E55L		E55L;8233
E80CC		E80CC;6085
E80CF		E80CF;7643
E80F	2729	E80F;6084
E80L		E80L;6227
E80T	5724	E80T;6218
E81CC	4024;5212; 3508	E81CC;6201; (12AT7WA);(M8162)
E81L		E81L;6686
E82CC		E82CC
E83CC		E83CC;6681
E83F		E83F;6689
E84L		E84L;7320
E86C		E86C
E88C		E88C;8255
E88CC	2492	E88CC;6922
E90CC	5214	E90CC;5920
E90F		E90F;7693
E91AA	4007;5189	E91AA;5726; (6AL5W);(M8212)
E91H		E91H;6687
E91N	4018	PL5727;M8204
E92CC		E92CC
E95F	4010;5216	E95F; 5654; (6AK5W);(M8100)
E99F		E99F;7694

Type to be replaced	*CV number*	*Replacement type*
E125A		QB3/300;6155
E130L		E130L;7534
E180CC		E180CC;7062
E180F	3998	E180F;6688
E182CC	5188	E182CC;7119
E182F		E182F;5847
E186F		E186F;7737
E188CC	5231;4108	E188CC;7308
E235F		E235F;7751
E235L		E235L
E236L		E236L
E250A		QB3.5/750;6156
E280F		E280F;7722
E282F		E282F
E283CC		E283CC
E288CC		E288CC;8223
E810F		E810F;7788
E900		TB4/800;250TH
E1485	807	DL93;3A4
E1955	797	PL2D21;EN91; PL5727;E91N;M8204
E2016		EF92;6CQ6;M8161
E2134		(EL86);(6CW5)
E2157	455	ECC81;12AT7; 12AT7WA;M8162; 6201;E81CC
E2163	491	ECC82;12AU7; 12AU7WA;6189; M8136
E2164	492	ECC83;12AX7; 12AX7S;7025;M8137

* Obsolete type with replacement type

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Type to be replaced	*CV number*	*Replacement type*
E2385		(EY86);(6S2)
EA50		EA50
EA52	5140	EA52;6923
EA53		EA53
EA76	469	EA76;6489
EAA91	283	EAA91;6AL5; (E91AA);(5726); 6AL5W;M8212
EAA901		E91AA;5726; (6AL5W);(M8212)
EAA901S		E91AA;5726;6AL5W
*EAB1		EBC3;EBC81;6BD7A
EABC80		EABC80;6AK8
EAC91	137	EAC91;M8097
*EAF41		EAF42;6CT7
EAF42	3883	EAF42;6CT7
EAF801		EAF801
*EB1		EBF2
EB4		EB4
EB34	1054	EB34
EB41	3881	EB41
EB91	140	EAA91;6AL5
EBC3	1428	EBC3
EBC33	1055	EBC33
EBC41	3882	EBC41;6CV7
EBC80		EBC80;6BD7
EBC81		EBC81;6BD7A
EBC90	452	EBC90;6AT6
EBC91	2526	EBC91;6AV6
EBF2	2925	EBF2
EBF32	501	EBF32
EBF35		EBF35
EBF80		EBF80;6N8
EBF81		(EBF89);(6DC8)
EBF83		EBF83;6DR8

Type to be replaced	*CV number*	*Replacement type*
EBF89		EBF89;6DC8
EBL1		EBL1
EBL21		EBL21
EBL31	2926	EBL31
*EC40		EC80;6Q4
EC50	2927	EC50
EC52		EC52
EC54		EC54
EC55		EC55;5861
*EC56		EC157;8108
*EC57		EC157;8108
EC70	468	EC70;6778
EC71	3930	EC71;5718
EC80	1886	EC80;6Q4
EC81	1865;1888	EC81;6R4
EC86		EC86;6CM4
EC88		EC88;6DL4
EC90	133	EC90;6C4;M8080
EC91	417	EC91;6AQ4; M8099
EC92		EC92
EC93		EC93
EC97		EC97;6FY5
EC98		EC98;M8248
EC157	5397	EC157;8108
EC158		EC158;8436
EC900		EC900;6HA5
EC1000		EC1000;8254
EC8010		EC8010
ECC33	2821	ECC33
ECC34		ECC34
ECC35	569	ECC35
ECC40	3884	ECC40
ECC70	3986	ECC70;6021

Type to be replaced	*CV number*	*Replacement type*
ECC81	455	ECC81;12AT7; E81CC;6201; 12AT7WA;M8162
ECC82	491	ECC82;12AU7; (12AU7WA);6189; M8136
ECC83	492	ECC83;12AX7; (12AX7S);(7025);(M8137)
ECC84	5281	ECC84;6CW7
ECC85		ECC85;6AQ8
ECC86		ECC86;6GM8
ECC88	5358	ECC88;6DJ8; (E88CC);(6922)
ECC89		ECC89;6FC7
ECC91	858	ECC91;6J6;M8081
ECC186		ECC186;7316
ECC189	5331	ECC189;6ES8
ECC801		E81CC;6201; 12AT7WA;(M8162)
ECC801S		E81CC;6201; 12AT7WA;(M8162)
ECC802		12AU7WA;6189; (M8136)
ECC802S		12AU7WA;6189; (M8136)
ECC803		12AX7S;7025;M8137
ECC803S		12AX7S;7025;(M8137)
ECC808		ECC808
ECC960		E90CC;5920
ECC962		E92CC
ECC2000		ECC2000
ECF1		ECF1
ECF80	5215	ECF80;6BL8; E80CF;7643
ECF82	5065	ECF82;6U8
ECF86		ECF86;6HG8

Type to be replaced	*CV number*	*Replacement type*
ECF200		ECF200;6X9
ECF201		ECF201;6U9
ECF202		ECF202;6AJ9
ECF801		ECF801;6GJ7
ECF802		ECF802;6JW8
*ECH2		ECH3
ECH3	2929	ECH3
ECH4		ECH4
ECH21		ECH21
ECH33	2930	ECH33
ECH35	1347;1581	ECH35
*ECH41		ECH42;6CU7
ECH42	3888	ECH42;6CU7
ECH71		(ECH21)
ECH80		ECH80;6AN7
ECH81	2128	ECH81;6AJ8
ECH83		ECH83;6DS8
ECH84		ECH84;6JX8
ECH113		ECH42;6CU7
ECH200		ECH200;6V9
ECL11		ECL11
ECL80		ECL80;6AB8
ECL82		ECL82;6BM8
ECL83		ECL83
ECL84		ECL84;6DX8
ECL85		ECL85;6GV8
ECL86		ECL86;6GW8
ECL805		ECL805
ED500		ED500;6ED4
EE17		PL5557
EE575A		DCG6/18GB;7136
EE866		866A;DCG4/1000G
EE869B		(6508);(DCG6/20)
EEP1		EEP1
*EF1		EF6

* Obsolete type with replacement type

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Type to be replaced	CV number	Replacement type
*EF2		EF9;EF89;6DA6
*EF5		EF9;EF89;6DA6
EF6		EF6
*EF8		EF9;EF89;6DA6
EF9		EF9
EF22	303	EF22
*EF31		EF9;EF89;6DA6
EF37A	5080;358	EF37A
EF39	1053	EF39
EF40	3885	EF40
EF41	3886	EF41;6CJ5
EF42	3887	EF42
EF43		EF43
EF50		EF50
EF54	380;1136	EF54
EF55	173	EF55
EF70	467	EF70;6487
EF73	466	EF73;6488
EF74	472;476	EF74;6391
EF80	1376	EF80;6BX6
EF81		EF81;6BH5
EF83		EF83
EF85	1375	EF85;6BY7
EF86	2901	EF86;6267;M8195
EF89	5156	EF89;6DA6
EF91	138	EF91;6AM6; 6AM6S;M8083
EF92		EF92;6CQ6;M8161
EF93	454	EF93;6BA6
EF94	2524	EF94;6AU6; 6AU6A
EF95	850	EF95;6AK5;6AK5W; 5654;E95F;M8100
EF96		(EF91);(6BA6)
EF97		EF97;6ES6
EF98		EF98;6ET6
EF183		EF183;6EH7
EF184		EF184;6EJ7
EF730	3928	EF730;5636
EF731	477;475	EF731;5899
EF732	3929	EF732;5840
EF734		EF734;6205
EF861		E180F;6688
EF905		E95F;5654; 6AK5W;M8100
EFL200		EFL200;6Y9
EFM1		EFM1
EFM11		EFM11
*EH2		ECH3;ECH4
EH90		EH90;6CS6
EH900		(E91H);(6687)
*EK1		EK2
EK2	1426	EK2
*EK3		EK2
EK32	1057	EK32
EK90	453	EK90;6BE6
*EL1		EL2
EL2	1429	EL2
EL3N		EL3N
*EL5		4699
EL6		4699
EL11		EL11
EL12		EL12
EL32	1052;5233	EL32
EL33	2938	EL33
EL34	1741	EL34;6CA7
EL36	2940	EL36;6CM5
EL37	586	EL37

Type to be replaced	CV number	Replacement type
EL38		EL38;(EL505)
EL41	3889	EL41;6CK5
EL42	3890	EL42
*EL43		EL83;6CK6
*EL44		EL81;6CJ6
EL50	2941	EL50
EL51		EL51
EL60		EL60
EL71		EL71;5902
EL80		EL80;6M5
EL81	2721	EL81;6CJ6
EL82		EL82;6DY5
EL83	2726	EL83;6CK6
EL84	2975	EL84;6BQ5
EL85	3526	EL85;6BN5
EL86	5094	EL86;6CW5
EL90	1862	EL90;6AQ5
EL91	136	EL91;6AM5;M8082
EL95		EL95;6DL5
EL136		EL136;6FV5
EL183		EL183
EL360		EL360
EL500		EL500
EL503		EL503;8278
EL504		EL504;6GB5A
EL505		EL505;6KG6
EL508		EL508;6KW6
EL509		EL509;6KG6A
EL802		EL802;6LD6
EL803	5093	(EL83);(6CK6)
EL821	2127	EL821;6CH6
EL822	2382	EL822
EL861		E81L;6686
EL-C3J		PL5632/C3J
EL-C3JA		PL5684/C3JA
EL-C6A		(PL5545A)
EL-C6H-1		(PL5545A)
EL-C6J		(PL5545A)
EL-C6JA		(PL5545A)
EL-C6JK		(PL5545A)
EL-C6L		(PL5545A)
EL-C6M		(PL5545A)
ELL80		ELL80
EM1		EM1
*EM3		EM4
EM4	1434	EM4
EM34	394	EM34;6CD7
EM80	1352	EM80;6BR5
EM81	5055	EM81;6DA5
EM84		EM84;6FG6
EM87		EM87;6HU6
EN32	2253	PL6574
EN33		EN33
EN70	474	EN70
EN91	797	EN91;PL2D21; PL5727;M8204
EN92	3512	5696
EN93	1949	EN93;6D4
EQ80		EQ80;6BE7
ER21A		Z805U;7714
ES85		(TB2.5/300);(5866)
ES204A		TB3/750;5867
ES833		(TB4/1250);(5868)
ES833A		(TB4/1250);(5868)
ESU103		DCX4/1000;3B28
ESU150		(DCG4/5000)
ESU200	5	(DCG4/5000)
ESU575		(DCG6/18GB);(7136)
ESU673		(DCG6/18);(6693)

* Obsolete type with replacement type

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Type to be replaced	*CV number*	*Replacement type*
ESU866	32	DCG4/1000G;866A
ESU866ES		DCG4/1000ED
ESU872	642	DCG5/5000GB;872A
ESU8008		DCG5/5000GS;8008
ET51	5277	ET51;6700
EW3H		(18505);(18506)
EY51	426	EY51;6X2
EY70	473	EY70
EY80		EY80;6U3
EY81		EY81;6R3
EY82		EY82;6N3
EY83		(EY81);(6R3);
EY84	2235	EY84;6374;M8091
EY86	2966	EY86;6S2; EY87;6S2A
EY87		EY87;6S2A
EY88		EY88;6AL3
EY91	135	EY91
EY500		EY500;6EC4
*EZ1		EZ80;6V4;EZ2
EZ2		EZ2
*EZ3		EZ80;6V4;EZ2
*EZ4		EZ81;6CA4;GZ34;5AR4
EZ35	574	EZ35
EZ40	3891	EZ40;6BT4
EZ41		EZ41
EZ80	1535	EZ80;6V4
EZ81	5072	EZ81;6CA4
EZ90	493	EZ90;6X4
F2.5M1		55850
F16-10LD		F16-10LD
F21-10LD		F21-10LD
F31-10LC		F31-10LC
F41-10LC		F41-10LC
F41-11LC		F41-11LC
F353		872A;DCG5/5000GB
F353A		872A;DCG5/5000GB
F366A		866A;DCG4/1000G
F369A		(6508);(DCG9/20)
F369B		(6508);(DCG9/20)
F672B		872A;DCG5/5000GB
F869B		(6508);(DCG9/20)
FG17	2957	PL5557
FG27A		(PL5559)
FG57		PL5559
FG97		(PL5557)
FG98A		(PL5557)
FG105		PL105
FG172		(PL105)

Type to be replaced	CV number	Replacement type
FS9A		150AVP
FS10A/70		XP1030
FS12-A47		(XP1000)
FS12-A70		(XP1030)
FTL3-2		(TBL7/8000);(6961)
FW4-500	1264	AZ50
FX219	2520	5C22;6279
FX225	1787	6268;4C35A
FX227	372	3C45
FX229	3521	5949
FX231		5C22;6279
*FZ1		EZ2;EZ80;6V4
G1		3554
G4		(3554);3546PW)
G5H		(18503)
G9		(3554)
G10/1d		DCG4/1000G;866A
G10/1dv		DCX4/1000;3B28
G10/4d		(DCG5/5000GB)
G20/5d		(DCG9/20);(6508)
G24H		(18545)
G48		1163

Type to be replaced	CV number	Replacement type
G49		1163
G108/1K		OB2;OB2WA; M8224
G150/4K		OA2;OA2WA; M8223
G4120		1561
GA50		90AG
GA90		ZM1020
GC10B	2271	Z303C
GD83M		83A1;7980
GD85M/S		85A2;OG3;M8098
GD85WR		(ZZ1000)
GD90M		90C1;M8206
GD100A/S		7475
GD100B		7475
GD100B/S		7475
GD150A/S		150C3;OD3
GD150M		OA2;OA2WA;M8223
GD150M/S		150C2
GL2D21		PL2D21;EN91; PL5727;M8204
GL3C23		PL3C23A
GL57		PL5559
GL238A		PL5555
GL238B		PL5555
GL414		PL5559
GL415		PL5550
GL575A		(7136);(DCG6/18GB)
GL673		(6693);(DCG6/18)
GL807		807;QE6/50
GL813		813;QB2/250
GL829B		(5894);(QQE06/40)
GL832A		832A;QQE04/20
GL866A		866A;DCG4/1000G

* Obsolete type with replacement type

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Type to be replaced	CV number	Replacement type
GL872A		872A;DCG5/5000GB
GL5544		PL5544
GL5545		PL5545A
GL5551		PL5551A
GL5551/FG271		PL5551A
GL5551A		PL5551A
GL5552		PL5552A
GL5552/FG235A		PL5552A
GL5552A		PL5552A
GL5553		PL5553B
GL5553B		PL5553B
GL5555		PL5555
GL5555/FG238A		PL5555
GL5557		PL5557
GL5559		PL5559
GL5632		PL5632/C3J
GL5720		(PL5559)
GL5727		PL5727;M8204
GL5822		PL5822A
GL5822A		PL5822A
GL5855		(PL255)
GL6011		(PL5684/C3JA)
GL6159		6159;QE05/40H
GL6346		(PL5551A)
GL6347		(PL5552A)
GL6348		(PL5553B)
GL6511		(PL5822A)
GL6807		PL6807
GLE10000/025/1		DCG4/1000ED
GLE13000/1.5/6		DCG5/5000GB;872A
GLE15000/3/12		DCG6/18;6693
GLE20000/2.5/10		DCG9/20;6508
GN3		ZM1020
GN4		ZM1020

Type to be replaced	CV number	Replacement type
GN6		ZM1080
GR10A		Z503M
GR10M		ZM1022
GR16		ZC1040
GR41		(Z70W)
GR43		(Z70U)
GRG250/3000		PL5557
GS10C	2325	Z502S
GS10C/S		Z502S
GTR83X		(ZZ1000)
GU1		(DCG1/250)
GU12		(DCG4/1000G);(866A)
GU18		(DCG4/5000)
GU20/21		(DCG4/5000)
GU21SP		(DCG4/5000)
GXU1		DCX4/1000;3B28
GXU2		DCX4/5000;4B32
GY86		GY86
GY87		GY87
GY501		GY501;3BH2
GZ30	2748	GZ30
GZ32	593	GZ32;5AQ4
GZ33		GZ33
GZ34	1377	GZ34;5AR4
GZ37	378	GZ37
GZ41		GZ41

Type to be replaced	*CV number*	*Replacement type*
HBC90		HBC90;12AT6
HBC91		HBC91;12AV6
HC4		(18509)
HCC85		HCC85;17EW8
HCH81		HCH81;12AJ7
HF61		EF41
HF62		EF42
HF93	1928	HF93;12BA6
HF94	1961	HF94;12AU6
HF121		UF41
HF255		(6508);(DCG9/20)
HF258		(DCG4/1000G); (866A)
HK90		HK90;12BE6
HL92	1959	HL92;50C5
HL94		HL94;30A5
HM04		EK90;6BE6
HP6	138	EF91;6AM6; M8083
HT17		PL5557
HT415		5C22;6279
HVR2	1134	1877
HY90		HY90;35W4

Type to be replaced	*CV number*	*Replacement type*
J213AAA		1163
JNT1-500	3602	5J26
JP2-0.2		7090
JP2-1A		DX206
JP2-2.5A		YJ1162 [1])
JP2-2.5W		YJ1160 [1])
JP2-5W		YJ1190 [1])
JP8-02B		JP8-02B
JP9-2.5		7028
JP9-2.5B		YJ1000
JP9-2.5D		JP9-2.5D
JP9-2.5E		JP9-2.5E
JP9-7	3676	2J42
JP9-7A	370	JP9-7A
JP9-7D		JP9-7D
JP9-15	3997	JP9-15;YJ1110
JP9-15B		JP9-15B
JP9-15D	5123	JP9-15D;YJ1110
JP9-50A		2J55
JP9-75		JP9-75
JP9-80	5018	4J52A
JP9-250		4J50
JP35-30		7093
JPT9-01	2420	JPT9-01
JPT9-01C		JPT9-01C
JPT9-60	3560;5134	2J51A

[1]) Does not include accessories
type 55312, 55313, 40649 and/or 40634

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Type to be replaced	CV number	Replacement type
K50A		K50A
K51A		K51A
K81A		K81A
K1209		(54AVP)
K1213		(XP1030)
K1295		(XP1000)
K1299		(XP1001)
K1306		(XP1004)
K1361		150AVP;(XP1180)
K1384		(57AVP)
K1390		XP1030
K1391		(54AVP)
K1430		(150CVP)
K1566		(XP1118)
K1927		XP1002
K1961		XP1001
K2199		XP1001
K2244		(56TVP)
K2253		XP1030
K2276		150CVP
KB2		KB2
KBC1		KBC1
KF3		KF3
KK2		KK2
KL4		KL4
KM2290		XP1005
KM2334		(56AVP/05)
KM2368		(58AVP);(XP1040)
KS7-85		KS7-85
KS9-20	1795	723A/B
KS9-20A	2792	2K25
KS9-20B		KS9-20B
KS9-20D		KS9-20D
KS9-30		6975
KS9-40		KS9-40
KS9-40D		KS9-40D
KS35-50		55335
KT8		(QE06/50);(807)
KT32	1287	25L6GT
KT66		EL37
KU676		(PL5632);(C3J)
L77	133	EC90;6C4;M8080
LA9-3B		LA9-3B
LB3-250B		LB3-250B
LB4-8		55340
LB6-10		LB6-10
LB6-20		LB6-20
LB6-25		LB6-25
LC900		LC900;3HA5
LCC189		LCC189;5ES8
LCF80		LCF80;6LN8
LCF86		LCF86;5HG8
LCF200		LCF200;5X9
LCF201		LCF201;5U9
LCF801		LCF801;5GJ7
LCF802		LCF802;6LX8

Type to be replaced	CV number	Replacement type
LCH200		LCH200;5V9
LCL84		LCL84;10DX8
LCL85		LCL85;10GV8
LDR03		LDR03;CRP12
LF183		LF183;4EH7
LF184		LF184;4EJ7
LFL200		LFL200;11Y9
LL86		LL86;10CW5
LL500		LL500;18GB5
LL504		LL504
LL505		LL505;27KG6
LN119		UCL82
LN152		ECL80;6AB8
LN309		PCL82;16A8
LN329		PCL83;(PCL82);(16A8)
LY81		LY81;11R3
LY88		LY88;20AQ3
LY500		LY500;28EC4
LZ319		(PCF80);(9A8)
LZ329		PCF80;9A8
M6H		(18524)
M17-140W		M17-140W
M17-141W		M17-141W
M21-11W		M21-11W
M21-12W		M21-12W

Type to be replaced	CV number	Replacement type
M28-12W		M28-12W
M36-11W		M36-11W
M36-13W		M36-13W
M36-16W		M36-16W
M502	2284	4J50
M503A	1866	JP9-7D
M508	370	JP9-7A
M513		(JP9-15)
M513B		JP9-15
M526	3676	2J42
M541		5J26
M542	3611	5586
M551	5018	4J52A
M559		YJ1040
M575		6972
M8079	4025	M8079;5726;E91AA
M8080	4058	M8080
M8081	4031	M8081
M8082	4063	M8082
M8083	4014	M8083
M8091	4044	M8091
M8097	4059	M8097
M8098	4048	M8098
M8099	4070	M8099
M8100	4010	M8100;5654; 6AK5W;E95F
M8136	4003	M8136;(6189); 12AU7WA
M8137	4004	M8137;(7025);(12AX7S)
M8157	483	M8157
M8161	4015	M8161
M8162	4024	M8162;(12AT7WA); (6201);(E81CC)
M8163	4104;5132	M8163

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Type to be replaced	*CV number*	*Replacement type*
M8190	4066,3960	M8190;(5783WA)
M8195	4085	M8195
M8196	4011	M8196;(6AS6W);(5725)
M8204	4018	M8204
M8206		M8206
M8212	4007	M8212;(E91AA);(6AL5W);(5726)
M8214	4035	M8214
M8223	4020;4100	M8223;OA2WA
M8224	4028;4101	M8224;OB2WA
M8225	4080	M8225
M8248	5311	M8248
MAG3		2J42
MAG4		JP9-15
MC13-16		MC13-16
ME1001	273	EC55;5861
ME1100		723A/B
ME1101		2J42
ME1101A		JP9-15
ME1101D		JP9-7D
ME1401	495;2269	4065
ME1402	2730	4066
ME1403	2348	4068
ME1404		4069
ME1503		(4C35A)
ME1504		PL5559
MG6-2		MG6-2
MG10H		(18520)
MG13-38		MG13-38
Mi1050		PL5551A
Mi1100		PL5552A
MK13-16		MK13-16
ML4-125A		4-125A;QB3/300GA
ML4-250A		4-250A;QB3.5/750GA
ML4-400A		4-400A;QB4/1100GA
ML813		813;QB2/250
ML833A		(5868);(TB4/1250)
ML866A		866A;DCG4/1000G
ML869B		(6508);(DCG9/20)
ML872A		872A;DCG5/5000GB
ML8008		8008;DCG5/5000GS
M010		ET51;6700
MT17		PL5557
MT57	612	PL5559
MT105		PL105
MT5544	2210	PL5544
MT5545	2215	PL5545A
MT5557		PL5557
MT5559		PL5559
MU6-2		MU6-2
MU13-38		MU13-38
MV6-5	1976	MV6-5
MW6-2	1737	MW6-2
*MW13-32		MW13-38
MW13-38		MW13-38
*MW22-14		MW22-16
MW22-16		MW22-16
*MW31-7		MW31-74
*MW31-14		MW31-74
*MW31-16		MW31-74
MW31-74		MW31-74
*MW36-22		MW36-44
*MW36-24		MW36-44
MW36-44		MW36-44
*MW43-43		MW43-69;17BQP4
MW43-48		MW43-48
*MW43-64		MW43-69;17BQP4
MW43-69		MW43-69;17BQP4
MW53-20		MW53-20
*MW53-43		MW53-43/02;21AP4

* Obsolete type with replacement type

Type to be replaced	CV number	Replacement type
MW53-43/02		MW53-43/02
MW53-80		MW53-80;21CLP4
MW61-80		MW61-80
MX113		MX113
MX114		18506
MX118		18537
MX120		18520
MX120/01		18520/01
MX122		18538
MX124		18524;(ZP1082)
MX124/01		18525
MX133		18533;(ZP1083)
MX135		ZP1000
MX136		ZP1010
MX145		18545
MX146		18503
MX147		18504
MX148		18505
MX149		18506
MX151		18509
MX152		18515
MX153		18516
MX157		18515/17
MX158		18516/18
MX163		18529
MX164		18550
MX166		18536
MX167		18546
MX170		18510
MX175		18508
MX177		18552
MX178		18553
MX966B		DCG4/1000G;866A
MY6-2		MY6-2
MY13-38		MY13-38

Type to be replaced	CV number	Replacement type
N1-140/08		PL5552A
N17	820	DL92;3S4
N18	818	DL95;3Q4
N19		DL94;3V4
N25		DL96;3C4
N66		EL37
N77	136	EL91;6AM5;M8082
N119		UL84
N142		UL41;45A5
N144		EL91;6AM5;M8082
N150		EL41;6CK5
N151		EL42
N152		PL81;21A6
N153		PL83;15A6
N154		PL82;16A5

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Type to be replaced	*CV number*	*Replacement type*
N155		EL85;6BN5
N308		(PL36);(25E5)
N309		(PL83);(15A6)
N329		PL82;16A5
N339		(PL81);(21A6)
N359		PL81;21A6
N379		PL84;15CW5
N709		EL84;6BQ5
N727		EL90;6AQ5;M8245
NL575A		DCG6/18GB
NL673		(6693);(DCG6/10)
NL710		(PL5684);PL5559
NL714		(PL3C23)
NL715		PL5557
NL720		PL5684
NL730		(PL6755)
NL778		(PL106)
NL803		(ZM1080)
NL869B		(6508);(DCG9/20)
NL1022		PL5822A
NL1022A		PL5822A
NL1051		PL5551A
NL1051A		PL5551A
NL1052		PL5552A
NL1052A		PL5552A
NL1053		PL5553B
NL1053A		PL5553B
NL1082		ZX1062
NL5030		ZM1030
NL5551		PL5551A
NL5552		PL5552A
NL5684/Ne		(PL5684)
NL5822		PL5822A
NL6989/C6J/KL		PL5545
NL8421/5092		ZM1020

Type to be replaced	*CV number*	*Replacement type*
NL-C6JK/Ne		PL5545
NU807		807;QE06/50
NU813		813;QB2/250
NU832		832A;QQE04/20
NU866A		866A;DCG4/1000G
NU872A		872A;DCG5/5000GB
OA2	1832	OA2;OA2WA;M8223
OA2WA	4020;4100	OA2WA;M8223
OA3		(75C1)
OA4		PL1267/Z300T
OA4G	752	PL1267/Z300T
OB2	1833	OB2;OB2WA;M8224
OB2WA	4028;4101	OB2WA;M8224
OC3		(4687K)
OD3		OD3;150C3
OE3	431	85A1;OE3
OG3	449	85A2;OG3;M8098
*OH3		90C1
ORP10		ORP10;7632
ORP11		ORP11;7633
ORP12		ORP12;LDR03

* Obsolete type with replacement type

Type to be replaced	CV number	Replacement type
ORP13		ORP13
*ORP14		RPY14
ORP30		ORP30
ORP50		ORP50
ORP52		ORP52
ORP60		ORP60
ORP61		ORP61
ORP62		ORP62
ORP63		ORP63
*ORP80		RPY13
ORP90		ORP90
ORP93		ORP93
ORP94		ORP94
OT400		(TB4/1250);(5868)
P2-12		QQE04/20;832A
P2-40B		(QQE06/40);(5894)
P6		1163
P15		1164
P810		55850;(XQ1040)
P831		55851;(XQ1040)
P842		(55851);(XQ1040)
P847		(55851);(XQ1040)
P848		55851;(XQ1040)
P849		55851
P862		55850AM;(XQ1044)
PA5021		DCG4/1000G;866A
PABC80		PABC;9AK8
PB2/200		PB2/200
PB2/500		PB2/500
PB3/800		PB3/800
PC86		PC86;4CM4
PC88		PC88;4DL4
PC92		PC92
PC95		PC95;4ER5
PC97		PC97;4FY5
PC900		PC900;4HA5
PCC84	5192	PCC84;7AN7
PCC85		PCC85;9AQ8
PCC88		PCC88;7DJ8
PCC89		PCC89;7EF7
PCC189		PCC189;7ES8
PCF80		PCF80;9A8
PCF82		PCF82;(PCF80)
PCF86		PCF86;8HG
PCF200		PCF200;8X9
PCF201		PCF201.8U9
PCF801		PCF801;8GJ7
PCF802		PCF802;9JW8
PCH200		PCH200;9V9
PCL41		(PCL82);(16A8)
PCL81		(PCL82);(16A8)
PCL82		PCL82;16A8
PCL83	5144	PCL83
PCL84		PCL84;15DQ8
PCL85		PCL85;18GV8
PCL86		PCL86;14GW8
PCL805		PCL805
PD500		PD500;9ED4
PE05/25		PE05/25
PE06/40E		PE06/40E; PE06/40N
PE06/40P		PE06/40P
PE1/100		PE1/100;6083
PF83		PF83
PF86		PF86

* Obsolete type with replacement type

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Type to be replaced	*CV number*	*Replacement type*
PFL200		PFL200;16Y9
PJ23		(3554)
PL2D21		PL2D21;EN91; PL5727;M8204
*PL3C23		PL3C23A
PL3C23A		PL3C23A
PL5		PL5
PL10		PL10
PL17		PL5557
PL21		PL2D21;PL5727
PL33		PL33
PL36		PL36;25E5
*PL57		PL5559
PL81	5077	PL81;21A6
PL82		PL82;16A5
PL83		PL83;15A6
PL84		PL84;15CW5
PL105		PL105
PL106		P106
PL150		PL150
PL255		PL255
PL260		PL260
PL323		PL3C23
PL345	372	3C45
PL435	1787	4C35A;6268
PL435A	5247	4C35A;6268
PL500		PL500;27GB5
PL504		PL504
PL505		PL505;40KG6
PL508		PL508;17KW6
PL509		PL509
PL522	2520	5C22;6279
PL802		PL802;16LD6
PL820		PL820
PL1267	1992	PL1267/Z300T
PL1607		PL1607
PL5544	2210	PL5544
*PL5545	2215	PL5545A
PL5545A		PL5545A
*PL5551		PL5551A
PL5551A		PL551A
*PL5552		PL5552A
PL5552A		PL5552A
PL5553B		PL5553B
PL5555		PL5555
PL5557	2957	PL5557
PL5559		PL5559
PL5632		PL5632/C3J
PL5684		PL5684/C3JA
PL5727	4018	PL5727,M8204
*PL5822		PL5822A
PL5822A		PL5822A
PL6011		PL5684/C3JA
PL6549		(QB3/200)
PL6574	2253	PL6574
*PL6755		PL6755A
PL6755A		PL6755A
PL6807		PL6807
PL7981		PL7981
PM04		EF93;6BA6
PM05		EF95;6AK5
PM07		EF91;6AM6; 6AM6S,M8083
PM61		(XP1113)
PM84		PM84
PM101		(XP1110); (XP1111)
PP6BS		EL3N
PS1011		PS1011
PS1012		PS1012
PS1013		PS1013

Type to be replaced	CV number	Replacement type
PS1014		PS1014
PS1014SF		PS1014SF
PS1520		PS1520
PS1521		PS1521
PS1531		PS1531
PTW255		(XQ1030);(XQ1040)
PTW2255		XQ1050
PV30S		CY2
PV495		(AZ1)
PV4100		(AZ1)
PV4200		1561
PY31		PY31
PY80		PY80;19X3
PY81		PY81;17Z3
PY82		PY82;19Y3
PY83		PY83
PY88		PY88;30AE3
PY500		PY500;42EC4
PY500A		PY500A;42EC4
PY800		PY800
PZ30		PZ30
Q160-1		(QB3/300);(6155)
Q400-1		(QB4/1100);(7527)
QA2400		M8161
QA2401		M8080
QA2402		M8082

Type to be replaced	CV number	Replacement type
QA2403		M8083
QB2/250	26	QB2/250;813
QB3/200	1905	QB3/200;4-65A
QB3/300	2130	QB3/300;6155
QB3/300GA	2963	QB3/300GA;.4-125A
QB3.5/750	2131	QB3.5/750;6156
QB3.5/750GA	2964	QB3.5/750GA;4-250A
QB4/1100		QB4/1100;7527
QB4/1100GA		QB4/1100GA;4-400A
QB5/1750	3522	QB5/1750;6079
QB5/2000		QB5/2000;8179
QBL3.5/2000		QBL3.5/2000;8177
QBL4/800		QBL4/800;4X500A
QBL5/3500		QBL5/3500;6076
QBL5/4000		QBL5/4000;7704
QBW5/3500		QBW5/3500;6075
QC05/35		QC05/35;8042
QE03/10		QE03/10;5763;M8096
QE04/10	309;483;1510	QE04/10;M8157
QE05/40	3523	QE05/40;6146
QE05/40F		QE05/40F;6883
QE05/40H		QE05/40H;6159
QE05/40K		QE05/40K;8032
QE06/50	124	QE06/50;807
QE08/200		QE08/200;7378
QE08/200H		QE08/200H;7836
QEL1/150	2519	QEL1/150;4X150A
QEL1/150H		QEL1/150H;4X150D
QEL2/200		QEL2/200;7580
QEL2/275		QEL2/275;4CX250B
QEL2/275H		QEL2/275H;4CX250F
QQC03/14		QQC03/14;7983
QQC04/15	1838	QQC04/15;5895
QQE02/5		QQE02/5;6939
QQE03/12	2798	QQE03/12;6360

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Type to be replaced	*CV number*	*Replacement type*
QQE03/20	2799	QQE03/20;.6252
QQE04/5		QQE04/5;7377
QQE04/20	788	QQE04/20;832A
QQE06/40	2797	QQE06/40;5894
QQV02-6		QQE02/5;6939
QQV03-10	2798	QQE03/12;6360
QQV03-20A	2799	QQE03/20;6252
QQV04-15	788	QQE04/20;832A
QQV04-16		QQE04/5;7377
QQV06-40A	2797	(QQE06/40);(5894)
QQV07-40	2666	QQV07/40;829B
QQV5-P10	2295;3599	QQV5-P10;3E29
QQZ03-10		QQC03/14;7983
QQZ03-20		YL1020;8118
QQZ04-15	1838	QQC04/15;5895
QS75-20		75B1
QS83-3		(85A2);(OG3);M8098
QS92-10		7475
QS95-10		95A1
QS150-40		150C3;OD3
QS1200	2225	150B2;6354;M8163
QS1207	1832	OA2;OA2WA;M8223
QS1208	1833	OB2;OB2WA;M8224
QS1209		85A2
QS1210		OA2WA;M8223
QS1211		OB2WA;M8224
QS1212		M8098
QS1213		M8142
QS1215		90C1
QS1250		(5823);(Z900T)
QS2404		M8079
QS2406		M8162;6201; E81CC;12AT7WA
QV03-12	2129	QE03/10;5763
QV04-7	309;1510	QE04/10
QV05-10	3990	QV05-10;2E26
QV05-25	124	QE06/50;807
QV06-20	3523	QE05/40;6146
QV06-20B		QE05/40F;6883
QV06-20C		QE05/40H;6159
QV08-100		QE08/200
QV08-100B		YL1290
QV1-150A	2519	QEL1/150
QV1-150D		QEL1/150H;4X150D
QV2-250C		QEL2/275;4CX250B
QY2-100	26	QB2/250;813
QY3-65	1905	QB3/200;4-65A
QY3-125	2130	QB3/300;6155
QY3-125B	2963	QB3/300GA;4-125A
QY3-1000A		QBL3.5/2000;8177
QY4-250	2131	QB3.5/750;6156
QY4-250B	2964	QB3.5/750GA;4-250A
QY4-400		QB4/1100;7527
QY4-400B		QB4/1100GA;4-400A
QY4-500A		QBL4/800;4X500A
QY5-500	3522	QB5/1750;6079
QY5-800		QB5/2000;8179
QY5-3000A		QBL5/3500;6076
QY5-3000W		QBW5/3500;6075
QZ06-20		QC05/35;8042

Type to be replaced	CV number	Replacement type
R1	1443	(AZ1)
R3	1039	1561
R6A		1163
R12	426	EY51;6X2
R12A		EY51;6X2
R15A		1164
R17		(EY82);(6N3)
R18	2235	EY84;6374;M8091
R19		(DY86);(1S2); (DY87);(1S2A)
R52		(GZ34)
R120		(1725A)
R142		R142
R243	273	EC55;5861
R290		K81A
RG1-125		(DCG4/1000G);(866A)
RG1-250	3667	DCG1/250
RG3-250	1625	DCG4/1000ED
RG3-250A	32	DCG4/1000G;866A
RG3-1250		DCG4/5000
RG4-1250	5	RG4-1250
RG4-3000		DCG6/18;6693
RG250/1000		DCG1/250
RG250/3000		DCG4/1000G;866A
RG1000/3000		DCG5/5000GB;872A
RHK6332		723A/B
RK807		QE6/50;807
RK866		DCG4/1000G;866A
RL17		PL5557
RL21		PL2D21;EN91;PL5727
RL57		PL5559
RL105		PL105
RL1267		PL1267/Z300T
RL16989/Ne		(PL5545)
RPY13		RPY13

Type to be replaced	CV number	Replacement type
RPY14		RPY14
RPY17		RPY17
RPY18		RPY18
RPY19		RPY19
RPY20		RPY20
RPY27		RPY27
RPY33		RPY33
RPY37		RPY37
RPY40		RPY40
RPY41		RPY41
RPY43		RP43
RPY54		RPY54
RPY55		RPY55
RPY58		RPY58
RR3-250	1835	DCX4/1000;3B28
RR3-1250		DCX4/5000;4B32
RR3-1250A	2399	RR3-1250A
RR3-1250B		DCX4/5000;4B32
RS612		(TB2.5/400)
RS613		TB2.5/300;5866
RS614		TB2.5/400
RS630		TB3/750;5867
RS631		TB4/1250;5868
RS685		QB3/300;6155
RS686		QB3.5/750;6156
RS687		QB5/1750;6079
RS1002A		QB4/1100;7527
RS1003		(YL1200)
RS1006B		TB2.5/400
RS1007		QB3/300;6155
RS1009		QQE06/40;5894
RS1011L		(TBL6/20)
RS1011W		(TBW6/20)
RS1012L		YL1181
RS1012V		YL1182

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Type to be replaced	CV number	Replacement type
RS1016		TB4/1250;5868
RS1019		QQE03/20;6252
RS1026		TB3/750;5867
RS1029		QQE03/12;6360
RS1036		TB4/1500
RS1041V		YD1012
RS1041W		YD1010
RS1046		TB5/2500;7092
RS1082CL		YL1011
RS1082CV		YL1012
RS1082CW		YL1010
RS2002V		YL1091
RS2002W		YL1090
RS2021L		YD1001
RS2021V		YD1002
RS2021W		YD1000
RT47H4		A47-11W
RT47T1		(19CWP4)
RT59-H4		A59-11W
RT59T1		A59-16W
RV120/350		1561
RV120/350S		AZ1
RV120/500		1561
RV120/500S		AZ4
RV200/600		(AZ50)
RX120A		1164
RY12-100	2967	8020

Type to be replaced	CV number	Replacement type
S1.5/80dv		PL5545
S15/5d		(DCG12/30);(5870)
S15/40		(DCG7/100)
S15/40i		(DCG7/100)
S856		OA2;OA2WA;M8223
S860		OB2;OB2WA;M8224
S5600		S5600
S5600/02		S5600/02
S5600/03		S5600/03
SBS		PL5551A
SCS		PL5552A
SCS3		PL5822A
SD61		EA50
SDR		PL5555
SDS		PL5553B
SP4		SP4
SP6		EF91;6AM6
SR6		ZZ1000
SR44		ZZ1000
SR55		OB2
SR56		OA2
SRS360		TB3/750;5867
SRS361		TB2.5/300;5866
SRS362		TB4/1250;5868
SRS455		QB3/300;6155
SRS456		QB3.5/750;6156
SRS457		QB5/1750;6079
SRS4451		QQE06/40;5894
SRS4452		QQE3/20;6252
ST11		7475
Ste1000/2.5/15		PL5559
STe1300/01/05		PL2D21;PL5727;EN91
Stel1500/15/45		(DCG7/100)
Ste2500/6/40		PL105
STV85/10		85A2;OG3

Type to be replaced	CV number	Replacement type
STV108/30		OB2;OB2WA;M8224
STV150/30		OA2;OA2WA;M8223
SU61		EY51;6X2
T2M05		ECC91;6J6;M8081
T130-1		(TB2.5/400)
T300-1		(TB4/1250);(5868)
T350-1		(TB3/750);(5867)
T813		813;QB2/250
T866A		866A;DCG4/1000G
T872A		872A;DCG5/5000GB
*TA12/20000K		TAW12/20
TAL12/10		TAL12/10
TAL12/20		TAL12/20
TAL12/35		TAL12/35
TAW12/10		TAW12/10
TAW12/20		TAW12/20
TAW12/35G		TAW12/35G
TB2/500		TB2/500
TB2.5/300	1924	TB2.5/300;5866
TB2.5/400		TB2.5/400;7986
TB3/750	1350	TB3/750;5867
TB4/1250	1351	TB4/1250;5868
TB4/1500		TB4/1500
TB5/2500		TB5/2500;7092
TBH6/14		TBH6/14;8591
TBH6/6000		TBH6/6000;8610
TBH7/8000		TBH7/8000;8592
TBH7/9000		TBH7/9000;8593
TBH12/25		TBH12/25
TBH12/38		TBH12/38;8594
TBL2/300		TBL2/300;7004
TBL2/400		TBL2/400;8119
TBL2/500		TBL2/500;8120
TBL6/14		TBL6/14;7804
TBL6/20		TBL6/20

Type to be replaced	CV number	Replacement type
TBL6/4000		TBL6/4000;7753
TBL6/6000	3926	TBL6/6000;5924
TBL7/8000		TBL7/8000;6961
TBL7/9000		TBL7/9000;8269
TBL12/25		TBL12/25;6618
TBL12/38		TBL12/38;7806
TBL12/40		TBL12/40;7800
TBL12/100		TBL12/100;6078
TBL15/125		TBL15/125
TBW6/14		TBW6/14;7805
TBW6/20		TBW6/20
TBW6/6000		TBW6/6000;5923
TBW7/8000		TBW7/8000;6960
TBW7/9000		TBW7/9000;8268
TBW12/25		TBW12/25;6617
TBW12/38		TBW12/38;7807
TBW12/100		TBW12/100;6077
TBW15/125		TBW15/125
*TC2/250		TB3/750;5867
*TC2/3000		TB3/750;5867
TD03-10	273	TD03-10
TD03-10G		EC55;5861
TD2-300A		TBL2/300;7004
TD2-400A		TBL2/400;8119
TD2-500A		TBL2/500;8120
TFZ103B		(PL5544)
TFZ106B		(PL5545)

* Obsolete type with replacement type

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Type to be replaced	CV number	Replacement type
TG30		3C45
TG57		PL5559
TG200B		4C35A
TG1000		5C22
TG3000		5949
TH71		TH71
TH73		TH73
TH75		TH75
TH813	26	813;QB2/250
TH1450		4J50
TH1526		5J26
TH1725A		725A
TH2203		6975
TH2225		2K25
TH5021B		866A;DCG4/1000G
TH5021V		DCG4/1000ED
TH5031B		872A;DCG5/5000GB
TH5031V		DCG5/5000EG
TH5040		(6508);(DCG9/20)
TH5090		(7136);(DCG6/18GB)
TH5130		(6693);(DCG6/18)
TH5521V/B		3B28;DCX4/1000
TH6011		PL5557
TH6031		PL5559
TH6050		(PL5559)
TH6120		PL105
TH6220		PL5545A
TH6220A		PL5545A
TH6230		PL3C23
TH6345		3C45
TH6435		4C35A
TH6522		5C22
TH6907		5949
TH7020		PL5551A
TH7021		(PL5551A)
TH7030		PL5552A
TH7031		(PL5552A)
TH7040		PL5553B
TH7041		(PL5553B)
TH9800		(55850);(XQ1040)
TH9801		(55850);(XQ1040)
TH9804		(55850);(XQ1040)
TH9805		(55850N);(XQ1043)
TH9807		(55850S);(XQ1042)
TH9808		(55850N);(XQ1043)
TH9809		(55850S);(XQ1042)
TH9810		(55850);(XQ1040)
TH9811		(55850);(XQ1040)
TQ1/2		PL3C23A
TQ2		(PL5557)
TQ2/3		(PL6755A)
TQ2/6		(PL106)
TQ2/12		(PL255)
TQ6		(5870);(DCG12/30)
TQ7		(DCG7/100)
TS49		C3m
TS51/EF95		EF95;6AK5; E95F;5654; 6AK5W;M8100
TS52/ECC91		ECC91;6J6;M8081
TS53/18042		18042;6086
TS54/E83F		E83F;6689
TS56/18014		18014
TT10		QB2/250
TT15		(QQE04/20);(832A)
TT16		QB3/300GA;4-125A
TT16D		QB3/300;6155
TT17		PL5557
TT20		QQE03/20;6252
TX2/3		PL5544

* Obsolete type with replacement type

Type to be replaced	*CV number*	*Replacement type*
TX2/6		PL5545A
TX2/61		PL6807
TX12-20A		(TAL12/20)
TX12-20W		(TAW12/20)
TX920		PL5559
TXM100		PL2D21;EN91;PL5727
TY2-125	1924	TB2.5/300;5866
TY2-150		TB2.5/400
TY3-250	1350	TB3/750;5867
TY4-350		(TB4/1250);(5868)
TY4-400		TB3/750;5867
TY4-400C		YD1220;TY4-400C
TY4-500	1351	TB4/1250;5868
TY5-500		TB4/1500
TY6-12A		TBL6/20
TY6-12W		TBW6/20
TY6-800		TB5/2500;7092
TY6-1250A		TBL6/4000;7753
TY6-3000A		YD1230
TY6-5000A		TBL6/6000;5924
TY6-5000B		YD1120
TY6-5000W		TBW6/6000;5923
TY7-6000A		TBL7/8000;6961
TY7-6000W		TBW7/8000;6960
TY8-15A		TBL6/14;7804
TY8-15H		TBH6/14;8591
TY8-15W		TBW6/14;7805
TY8-6000A		TBL7/9000;8269
TY8-6000W		TBW7/9000;8268
TY8-6000H		TBH7/9000;8593
TY12-15A		TBL12/40
TY12-20A		TBL12/38;7806
TY12-20H		TBH12/38;8594
TY12-20W		TBW12/38;7807
TY12-25A		TBL12/25;6618

Type to be replaced	*CV number*	*Replacement type*
TY12-25W		TBW12/25;6617
TY12-50A		TBL12/100;6078
TY12-50W		TBW12/100;6077
TY12-120W		YD1010
TY74		(PL5557)
TY76		(PL5559)
TY77		(PL5559)
TY78		(PL5559)
TY84		(PL5559)
TY85		(PL105)
TY6030		(PL5559)
TY6050		(PL5559)
TY6100		(PL5559)
TY6120		(PL105)
TY6220		(PL5545)

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Type to be replaced	*CV number*	*Replacement type*
U9		(1561)
U10	1443	(1561);(AZ1)
U12		(1561)
U12/14		(1561)
U14		(1561)
U18		AZ50
U18/20	1264	AZ50
U20	31	(AZ50)
U30		U30
U43		EY51;6X2
U49		EY86;6S2;EY87;6S2A
U50		(5Y3GT)
U54		(GZ37)
U70		(EZ35)
U78	493	EZ90;6X4
U119		UY85;38A3
U142		UY41;31A3
U143		AZ31
U145		(UY41);(31A3)
U147		EZ35
U150		EZ40;6BT4
U151		EY51;6X2
U152		PY80;19X3
U153		PY81;17Z3
U154		PY82;19Y3
U192		PY82;19Y3
U309		(PY80);(19X3)
U319		(PY82);(19Y3)
U381		UY85;38A3
U709		EZ81;6CA4
UABC80		UABC80
UAF42		UAF42;12S7
UB41		UB41
UBC41		UBC41;14L7
UBC80		UBC80;14G6
UBC81		UBC81
*UBF11		UBF80;17C8
UBF80		UBF80;17C8
UBF89		UBF89;19FL8
UBL1		UBL1
UBL21		UBL21
UC92		UC92;9AB4
UCC85		UCC85
UCH4		UCH4
*UCH11		UCH81;19D8
UCH21		UCH21
*UCH41		UCH42;14K7
UCH42		UCH42;14K7
UCH71		(UCH21)
UCH80		UCH80;14Y7
UCH81		UCH81;19D8
UCL11		UCL11
UCL82		UCL82;50BM8
UE966A		866A;DCG4/1000G
UE967		PL5557
UE972A		872A;DCG5/5000GB
UF21		UF21
UF41		UF41;12AC5
UF42		UF42
UF80		UF80
UF85		UF85
UF86		UF86
UF89		UF89
UL41	1977	UL41;45A5
UL44		UL44
UL84		UL84;45B5
UM4		UM4
UM80		UM80;19BR5
UM84		UM84
UU9	1855	(EZ40);(6BT4)

* Obsolete type with replacement type

Type to be replaced	*CV number*	*Replacement type*
UU12		EZ81;6CA4
UX866		866A;DCG4/1000G
*UY1		UY1N;UY85;38A3
UY1N		UY1N
UY3		UY3
UY11		UY11
*UY21		UY1N;UY85;38A3
UY41		UY41;31A3
UY42		UY42
UY82		UY82;55N3
UY85		UY85;38A3
UY89		UY89;31AV3
UY92		UY92
UY807		807
V2M70		EZ90;6X4
V40		8020
V41		AZ41
V61		EZ40;6BT4
V311		(UY41);(31A3)
V312		(UY42)
V741	133	EC90;6C4;M8080
V884	131	EF92;6CQ6; M8161
V886	136	EL91;6AM5;M8082

* Obsolete type with replacement type

Type to be replaced	*CV number*	*Replacement type*
V1103		6360;QQE03/12
VA203B		6975
VH550		DCG4/1000ED
VH550H		DCG4/1000G;866A
VH7400		DCG5/5000GB;872A
VH7400A		DCG5/5000EG
VJ5551		PL5551A
VJ5551A		PL5551A
VJ5552A		PL5552A
VJ5553		PL5553B
VJ5553B		PL5553B
VMP11/30		(150AVP)
VMP11/44		(56AVP)
VMP11/44A		(XP1001)
VMP11/44B		(XP1000)
VMP11/44C		(XP1000)
VMP11/111		(54AVP)
VMP11/170		(57AVP)
VMP13/44		(56AVP/05)
VMQ11/44		(XP1004)
VMQ13/44		(56UVP)
VP6		EF92;6CQ6;M8161
VR53		EF93
VR55		EBC33
VR57		EK32
VR105-30		OB2;OB2WA;M8224
VR150-30	216	150C3;OD3
VS70		7475
[1])VT39		(6508);(DCG9/20)
VT39A		(6508);(DCG)9/20)
VT42A		(872A); (DCG5/5000GB)
VT46		(866A); (DCG4/1000G)
VT46A		866A;DCG4/1000G
[2])VT60A		(807);(QE06/50)
[2])VT79		(807);(QE06/50)

[1]) American VT-numbers unless otherwise stated
[2]) British VT-numbers

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Type to be replaced	*CV number*	*Replacement type*
VT88		(832A);(QQE04/20)
VT88A		832A;QQE04/20
VT100		807;QE06/50
VT100A		(807);(QE06/50)
VT118		832A;QQE04/20
VT144		QB2/250
[2]VT197		(DCG4/5000)
[2]VT199		807;QE06/50
VT259		(5894);(QQE06/40)
VT267	2967	8020
VT286		832A;QQE04/20
VT510		QE04/10
VTP7386		(PL5545)
VU134		1877
VX32B		(4065)
VX41		(4066)
[3]VX550A		DCX4/1000;3B28
[3]VX7400		DCX4/5000;4B32
W17	785	DF91;1T4
W25		DF96;1AJ4
W77	131	EF92;6CQ6;M8161
W81		EF22
W142		UF41;12AC5
W143		EF22
W147		EF39
W150		EF41;6CJ5
W719		EF85;6BY7
W727		6BA6;EF93
W729		(EF85);(6BY7)
WD119		UBF89;19FL8
WD142		UAF42;12S7
WD150		EAF42;6CT7
WD709		EBF80;6N8
WE12		EM4
WE17		PL5557
WE289A		1163
WL2D21		PL2D21;EN91; PL5727;M8204
WL17		PL5557
WL57		PL5559
WL105		PL105
WL172		(PL105)
WL414		(PL255)
WL502A		(PL5727);(M8204)
WL575A		DCG6/18GB);(7136)
WL624		(PL105)
WL631		PL5559
WL632A		(PL5559)
WL676		(PL105)
WL807		807;QE06/50
WL813		813;QB2/250
WL866A		866A;DCG4/1000G
WL869B		(6508);(DCG9/20)
WL872A		872A;DCG5/5000GB
WL885		(PL2D21);(EN91); (PL5727);(M8204)
WL5551		PL5551A
WL5551/652		PL5551A

2) British VT-numbers
3) SFR

Type to be replaced	*CV number*	*Replacement type*
WL5551A		PL5551A
WL5551A/652		PL5551A
WL5552		PL5552A
WL5552/651		PL5552
WL5552A		PL5552A
WL5552A/651		PL5552A
WL5553		PL5553B
WL5553/655		PL5553B
WL5553A/655		PL5553B
WL5553B/655		PL5553B
WL5555		PL5555
WL5555/653B		PL5555
WL5557/17		PL5557
WL5559/57		PL5559
WL5685		(PL5545A)
WL5720		(PL5559)
WL5822		PL5822A
WL5822A		PL5822A
WL6376		(ZP1010)
WL6998		(ZP1000)
WL7306		PL5684
WL289-416D		1163
WT210-0001		PL2D21;EN91; PL5727;M8204
WT210--0015		PL5557
WT210-0018		(150C1K)
WT210-0056		PL5559
WT210-0062		PL5557
WT210-0069		PL5557
WT210-0071		PL5551A
WT210-0072		(PL5552A)
WT210-0073		(PL5553B)
WT210-0074		PL105
WT210-0079		PL105
WT210-0091		(PL1267/Z300T)

Type to be replaced	*CV number*	*Replacement type*
WT272		PL5557
WTT108		PL3C23
WTT111		PL5559
WTT117		PL5557
WTT118		PL105
X17	782	DK91;1R5
X18		(DK92);(1AC6)
X20		DK92;1AC6
X25		DK96;1AB6
X61M	1347	ECH35
X77	453	6BE6;EK90
X81		(ECH21)
X119		UCH81;19D8
X142		UCH42;14K7
X143		ECH21
X150		ECH42;6CU7
X719		ECH81;6AJ8
X727		6BE6;EK90
XB767A		(PL2D21);(EN91); (PL5727);(M8204)
XC31		(Z70U)
XC97		XC97;2FY5
XC900		XC900;2HA5
XCC82		XCC82;7AU7
XCC189		XCC189;4ES8

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Type to be replaced	CV number	Replacement type
XCF80		XCF80;4BL8
XCF801		XCF801;4GJ7
XCH81		XCH81;3AJ8
XCL82		XCL82,8B8
XCL84		XCL84;8DX8
XCL85		XCL85;9GV8
XCL86		XCL86;8GW8
XF80		XF80;3BX6
XF85		XF85;3BY7
XF86		XF86;2HR8
XF183		XF183;3EH7
XF184		XF184;3EJ7
XG1-2500		PL5559
XG2		EN70
XG2-12		PL255
XG2-25		PL260
XG2-500	1144	(PL5557)
XG2-6400		(PL105)
XG5-500	2957	PL5557
XG15-10		6786;DCG7/100B
XG15-12		(DCG7/100B)
XGQ2-6400		PL105
XH3-045	372	3C45
XH8-100	1787	4C35A
XH16-200	2520	5C22
XH25-500	3521	5949
XL36		XL36;13CM5
XL86		XL86;8CW5
XL500		XL500;13GB5
XL7900/00		XL7900/00
XN3		ZM1080
XP1000		XP1000
XP1001		XP1001
XP1002		XP1002
XP1003		XP1003
XP1004		XP1004
XP1005		XP1005
XP1010		XP1010
XP1011		XP1011
XP1015		XP1015
XP1015C		XP1015C
XP1020		XP1020
XP1021		XP1021
XP1023		XP1023
XP1030		XP1030
XP1031		XP1031
XP1032		XP1032
XP1033		XP1033
XP1040		XP1040
XP1050		XP1050
XP1051		XP1051
XP1052		XP1052
XP1053		XP1053
XP1060		150AVP
XP1070		XP1030
XP1090		XP1000
XP1110		XP1110
XP1111		XP1111
XP1113		XP1113
XP1114		XP1114
XP1115A		XP1115A
XP1115B		XP1115B
XP1115C		XP1115C
XP1116		XP1116
XP1117		XP7117
XP1118		XP1118
XP1120		XP1120
XP1121		XP1121
XP1122		XP1122
XP1123		XP1123

Type to be replaced	CV number	Replacement type
XP1130		XP1130
XP1131		XP1131
XP1140		XP1140
XP1141		XP1141
XP1180		XP1180
XP1191		XP1191
XP1193		XP1193
XP1200		XP1200
XP1210		XP1210
XP1220		XP1220
XQ1010		XQ1010
XQ1020		XQ1020
XQ1020B		XQ1020B
XQ1020G		XQ1020G
XQ1020L		XQ1020L
XQ1020R		XQ1020R
XQ1021		XQ1021
XQ1022		XQ1022
XQ1023		XQ1023
XQ1023L		XQ1023L
XQ1023R		XQ1023R
XQ1024		XQ1024
XQ1024R		XQ1024R
XQ1030		XQ1030
XQ1040		XQ1041
XQ1041		XQ1041
XQ1042		XQ1042
XQ1043		XQ1043
XQ1044		XQ1044
XQ1050		XQ1050
XQ1051		XQ1051
XQ1052		XQ1052
XQ1053		XQ1053
XQ1054		XQ1054
XR1-12		XR1-12;5855

Type to be replaced	CV number	Replacement type
*XR1-1600		PL5684/C3JA
XR1-1600A	5234	PL5684/C3JA
XR1-3200	2210	PL5544
XR1-3200A		PL7981
XR1-6400	2215	PL5545A
XR1-6400A		PL6807;(PL5545A)
XR81		55335
XY88		XY88;16AQ3
Y25		DM71;1N3
Y119		UM80;19BR5
YD1000		YD1000
YD1001		YD1001
YD1002		YD1002
YD1010		YD1010
YD1012		YD1012
YD1051		YD1051
YD1120		YD1120
YD1130		YD1130;8163
YD1140		YD1140
YD1141		YD1141
YD1150		YD1150;8728
YD1151		YD1151;8729
YD1152		YD1152;8730
YD1160		YD1160;8731
YD1161		YD1161;8732
YD1162		YD1162;8733
YD1170		YD1170;8666
YD1171		YD1171;8667

* Obsolete type with replacement type

REPLACEMENT GUIDE FOR ELECTRON TUBES

Type to be replaced	CV number	Replacement type
YD1172		YD1172;8668
YD1173		YD1173;8734
YD1180		YD1180
YD1182		YD1182;8735
YD1192		YD1192;8736
YD1202		YD1202;8752
YD1212		YD1212;8680
YD1220		YD1220;TY4-400C
YD1230		YD1230
YH1080		YH1080
YH1090		YH1090
YH1100		YH1100
YJ1000		YJ1000
YJ1010		YJ1010
YJ1011		YJ1011
YJ1020		YJ1020
YJ1021		YJ1021
YJ1030		YJ1030
YJ1040		YJ1040
YJ1060		YJ1060
YJ1071		YJ1071
YJ1080 1)		YJ1080 1)
YJ1082 1)		YJ1082 1)
YJ1100		YJ1100
YJ1101		YJ1101
YJ1110		YJ1110
YJ1111		YJ1111
YJ1112		YJ1112
YJ1120		YJ1120
YJ1121		YJ1121
YJ1140		YJ1140
YJ1150		YJ1150
YJ1160 1)		YJ1160 1)
YJ1162 1)		YJ1162 1)
YJ1170		YJ1170
YJ1180		YJ1180
YJ1190 1)		YJ1190 1)
J11191		YJ1191
YJ1280		YJ1280
YK1000		YK1000
YK1000		YK1000
YK1001		YK1001
YK1002		YK1002
YK1004		YK1004
YK1010		YK1010
YK1060		YK1060
YK1061		YK1061
YK1062		YK1062
YK1090		YK1090
YK1091		YK1091
YK1110		YK1110
YL1000		YL1000;8463
YL1010		YL1010
YL1011		YL1011
YL1012		YL1012
YL1020		YL1020;8118
YL1030		YL1030
YL1060		YL1060;7854
YL1070		YL1070;8117
YL1071		YL1071;8116
YL1080		YL1080;8348
YL1090		YL1090
YL1091		YL1091
YL1100		YL1100;6884
YL1101		YL1101;6816
YL1102		YL1102;7843
YL1103		YL1103;7844
YL1110		YL1110;7650
YL1120		YL1120;8429
YL1121		YL1121

1) Does not include accessories type 55312, 55313, 40649 and/or 40634

Type to be replaced	*CV number*	*Replacement type*
YL1130		YL1130;8408
YL1150		YL1150;8579
YL1170		YL1170;7580W
YL1181		YL1181
YL1182		YL1182
YL1190		YL1190;8580
YL1200		YL1200
YL1210		YL1210;8457
YL1220		YL1220;8577
YL1230		YL1230;8654
YL1240		YL1240;8458
YL1250		YL1250;8505
YL1280		YL1280;7213
YL1290		YL1290
YL1300		YL1300;8637
YL1310		YL1310;8603
YL1320		YL1320;8560
YL1330		YL1330;8744
YL1340		YL1340;8321
YL1341		YL1341;8322
YL1360		YL1360;8683
YL1370		YL1370;6146B;8298A
YL1371		YL1371;6883B
YL1372		YL1372;6159B
YL1420		YL1420
YL1430		YL1430
YL1440		YL1440
YX1172		YX1172
YX1220		YX1220

Type to be replaced	*CV number*	*Replacement type*
*Z50T		Z71U;7711
Z70U		Z70U;7710
Z70W		Z70W;7709
Z71U		Z71U;7711
Z77	138	EF91;6AM6;M8083
Z90		EF50
Z142		UF42
Z150		EF42
Z152		EF80;6BX6
Z225		(DCG4/1000G)
Z300T	1992	PL1267/Z300T
Z302C		Z302C
Z303C	2271	Z303C
Z329		(EF80);(6BX6)
Z500T		Z500T
Z502S	2325	Z502S
Z504S		Z504S;ZM1070
Z505S		Z505S;ZM1060
*Z510M		ZM1020
*Z520M		ZM1020
*Z521M		ZM1021
*Z522M		ZM1040
*Z550M		ZM1050
Z700U		Z70U;7710
Z700W		Z70W;7709
Z701U		Z71U;7711
Z719		EF80;6BX6
Z729	2901	EF86;6267;M8195
Z800U		Z800U;6538
Z801U		Z801U;6539
Z803U	2434	Z803U;6779
*Z804U		—
Z805U		Z805U;7714
Z806W		Z806W
Z860X		(Z803U)

* Obsolete type with replacement type

REPLACEMENT GUIDE FOR ELECTRON TUBES

Type to be replaced	CV number	Replacement type
Z861X		(Z805U);(7714)
Z900T	5122	Z900T;5823
Z901T		Z801T
Z5823		Z900T;5823
ZA1000		ZA1000
ZA1001		ZA1001
ZA1002		ZA1002
ZA1003		ZA1003
ZA1004		ZA1004
ZA1005		ZA1005
ZC1010		(Z70W)
ZC1030		ZC1030
ZC1031		ZC1040
ZC1040		ZC1040
ZC1050		ZC1050
ZC1060		ZC1060
ZD17	784	DAF91;1S5
ZD25		DAF96;1AH5
ZD152		EBF80;6N8
ZM1000		ZM1000
ZM1001		ZM1001
ZM1020		ZM1020
ZM1021		ZM1021
ZM1022		ZM1022
ZM1023		ZM1023
ZM1024		ZM1024
ZM1025		ZM1025
ZM1030		ZM1030
ZM1031/01		ZM1031/01
ZM1032		ZM1032
ZM1033/01		ZM1033/01
ZM1040		ZM1040
ZM1041		ZM1041
ZM1042		ZM1042
ZM1043		ZM1043

Type to be replaced	CV number	Replacement type
ZM1050		ZM1050;8453
ZM1060		ZM1060;Z505S
ZM1070		ZM1070;Z504S
ZM1080		ZM1080
ZM1081		ZM1081
*ZP1000		—
*ZP1001		—
*ZP1010		—
*ZP1020		—
ZP1080		ZP1080
ZP1081		ZP1081
ZP1082		ZP1082
ZP1083		ZP1083
ZP1100		ZP1100
ZT1000		ZT1000;8270
ZT1001		ZT1001
ZT1011		PL5684/C3JA
ZX1000		ZX1000
ZX1040		(ZX1062)
ZX1051		ZX1051
ZX1052		ZX1052
ZX1060		ZX1060
ZX1061		ZX1061
ZX1062		ZX1062
ZY1000		ZY1000
ZY1001		ZY1001;8008A
ZY1002		ZY1002
ZZ1000		ZZ1000;8228
ZZ1010		(90C1)
ZZ1020		(ZZ1000)

* Obsolete type with replacement type

CV number	Comparable type
CV5	RG4-1250
CV26	QB2/250;813
CV31	FW4-800
CV32	DCG4/1000G;866A
CV124	QE06/50;807
CV131	6CQ6;EF92
CV133	6C4;EC90
CV135	EY91
CV136	EL91;6AM5
CV137	EAC91
CV138	6AM6;EF91
CV152	DCG4/5000
CV173	EF55
CV273	CV273
CV283	6AL5;EAA91
CV284	75B1
CV286	95A1
CV303	EF22
CV309	QE04/10
CV358	EF37A
CV370	JP9-7A
CV372	(3C45)
CV378	GZ37
CV380	EF54
CV394	EM34;6CD7
CV417	6AQ4;EC91
CV424	QQE06/40;5894
CV426	EY51;6X2
CV431	85A1;OE3
CV449	85A2;OG3
CV450	6CN6;EL38
CV452	6AT6;EBC90
CV453	EK90;6BE6
CV454	EF93;6BA6
CV455	ECC81;12AT7

CV number	Comparable type
CV466	EF73;6488
CV467	EF70;6487
CV468	EC70;6778
CV469	6489;EA76
CV472	EF74;6391
CV473	EY70
CV474	EN70
CV475	EF731;5899
CV476	EF74;6391
CV477	EF731;5899
CV483	QE04/10
CV484	3S4;DL92
CV491	ECC82;12AU7
CV492	ECC83;12AX7
CV493	EZ90;6X4
CV495	4065
CV501	EBF32
CV553	25L6GT
CV568	35Z5GT
CV569	ECC35
CV571	50L6GT
CV586	EL37
CV593	GZ32;5AQ4
CV635	(TB4/1250P);(5868)
CV642	DCG5/5000GB;872A
CV722	725A
CV753	1A3;DA90
CV782	1R5;DK91
CV784	1S5;DAF91
CV785	1T4;DF91
CV788	QQE04/20;832A
CV797	PL2D21;EN91; PL5727;M8204
CV807	3A4;DL93
CV808	3A5;DCC90

CV number	Comparable type
CV818	3Q4;DL95
CV820	3S4;DL92
CV850	EF95;6AK5
CV858	6J6;ECC91
CV1052	EL32
CV1053	EF39
CV1054	EB34
CV1055	EBC33
CV1057	EK32
CV1070	7475
CV1128	AN1
CV1134	1877
CV1136	EF54
CV1264	AZ50
CV1347	ECH35
CV1350	TB3/750;5867
CV1351	TB4/1250;5868
CV1352	6BR5;EM80
CV1355	RG4-1250
CV1375	6BY7;EF85
CV1376	6BX6;EF80
CV1377	5AR4;GZ34
CV1426	EK2
CV1428	EBC3
CV1429	EL2
CV1434	EM4
CV1449	DCG5/5000GB;872A
CV1453	4378
CV1510	QE04/10
CV1535	6V4;EZ80
CV1572	QE06/50;807
CV1581	ECH35
CV1625	DCG4/1000ED; RG3-250
CV1629	DCG4/5000

CV number	Comparable type
CV1737	MW6-2
CV1741	6CA7;EL34
CV1758	1L4;DF92
CV1787	4C35A
CV1795	723A/B
CV1830	1B3GT;DY30
CV1832	OA2;150C2;150C4
CV1833	OB2
CV1835	DCX4/1000;3B28
CV1836	1163
CV1838	QQC04/15;5895
CV1854	5Y3G
CV1856	5Y3GT
CV1862	6AQ5;EL90
CV1865	EC81;6R4
CV1866	CV1866
CV1886	EC80;6Q4
CV1887	6B6G
CV1888	EC81;6R4
CV1893	6B8G
CV1905	QB3/200;4-65A
CV1924	TB2.5/300;5866
CV1928	HF93;12BA6
CV1949	EN93;6D4
CV1959	HL92;50C5
CV1961	HF94;12AU6
CV1971	1T4;DF91
CV1976	MV6-5
CV1977	45A5;UL41
CV1992	PL1267/Z300T
CV2101	DF72
CV2103	DF73
CV2105	6373;DL70
CV2127	EL821;6CH6
CV2128	6AJ8;ECH81

CV number	Comparable type
CV2129	QE03/10;5763;M8096
CV2130	QB3/300;6155
CV2131	QB3.5/750;6156
CV2132	90AV
CV2133	90CG
CV2134	90CV
CV2175	DG7-5;3ALP1
CV2191	DG13-2
CV2210	PL5544
CV2215	PL5545A
CV2225	150B2;6354
CV2235	EY84;6374
CV2237	1AD4;DF62
CV2238	5672
CV2240	3B4;DL98
CV2241	5642;DY70
CV2253	PL6574
CV2254	DF60;5678
CV2270	90AG
CV2271	Z303C
CV2275	DC70;6375
CV2284	(4J50)
CV2295	QQV5-P10;3E29
CV2302	DH3-91;1CP31
CV2325	Z502S
CV2331	DL64
CV2348	4068
CV2361	DL69
CV2370	3S4;DL92
CV2371	DF61N
CV2382	EL822
CV2390	3A4;DL93
CV2399	RR3-1250A
CV2420	JPT9-01
CV2431	3AMP1

CV number	Comparable type
CV2432	6205
CV2433	DF63
CV2434	Z803U;6779
CV2454	75C1
CV2466	QQE02/5;6939
CV2487	QEL2/250;4X250B
CV2492	6922;E88CC
CV2507	1U4
CV2516	2C39A
CV2518	DCX4/5000;4B32
CV2519	QEL1/150;4X150A
CV2520	6279;5C22
CV2522	6AS6
CV2524	6AU6;EF94
CV2526	EBC91;6AV6
CV2573	5651
CV2634	367
CV2642	417A;5842
CV2662	5639
CV2718	1876
CV2721	EL81;6CJ6
CV2726	6CK6;EL83
CV2729	6084;E80F
CV2730	4066
CV2742	1L4;DF92
CV2748	GZ30
CV2753	PL5684/C3JA
CV2792	2K25
CV2795	1L4;DF92
CV2797	QQE06/40;5894
CV2798	QQE03/12;6360
CV2799	QQE03/20;6252
CV2821	ECC33
CV2860	AZ1
CV2862	AZ31

CV number	*Comparable type*
CV2876	PL5727;M8204
CV2896	52CG
CV2901	6267;EF86
CV2925	EBF2
CV2926	EBL31
CV2927	EC50
CV2929	ECH3
CV2930	ECH33
CV2938	EL33
CV2940	6CM5;EL36
CV2941	EL50
CV2957	PL5557
CV2963	QB3/300GA;4-125A
CV2964	QB3.5/750GA;4-250A
CV2966	EY86;6S2
CV2967	8020
CV2975	EL84;6BQ5
CV2980	1M3;DM70
CV2983	3V4;DL94
CV3508	M8162;E81CC;
	6201;12AT7WA
CV3512	5696;EN92
CV3521	5949
CV3522	6079;QB5/1750
CV3523	QE05/40;6146
CV3526	EL85;6BN5
CV3560	2J51
CV3599	QQV5-P10;3E29
CV3602	5J26
CV3611	5586
CV3676	2J42
CV3789	5842;417A
CV3879	QB4/1100GA;4-400A
CV3881	EB41
CV3882	EBC41;6CV7

CV number	*Comparable type*
CV3883	EAF42;6CT7
CV3884	ECC40
CV3885	EF40
CV3886	EF41;6CJ5
CV3887	EF42
CV3888	ECH42;6CU7
CV3889	6CK5;EL41
CV3890	EL42
CV3891	EZ40;6BT4
CV3892	AZ41
CV3893	4X150G;QV1-150G
CV3905	5847
CV3912	1U5;DAF92
CV3926	TBL6/6000;5924
CV3928	5636;EF730
CV3929	EF732;5840
CV3930	EC71;5718
CV3933	5783WA
CV3946	3WP1;DG7-36
CV3960	5783WA;M8190
CV3986	6021;ECC70
CV3987	5644
CV3990	2E26;QV05-10
CV3991	4X150D
CV3995	6CB6
CV3997	JP9-15
CV3998	E180F;6688
CV4003	M8136;6189;
	12AU7WA
CV4004	M8137
CV4007	5726;E91AA;
	6AL5W;M8212
CV4008	5719
CV4009	5749;6BA6W

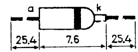
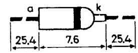
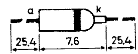
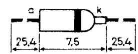
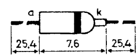
CV number	Comparable type
CV4010	6AK5W;E95F; 5654;M8100
CV4011	6AS6W;5725;M8196
CV4014	M8083
CV4015	M8161
CV4017	5751
CV4018	PL5727;M8204
CV4019	M8245
CV4020	M8223;OA2WA
CV4024	6201;E81CC; 12AT7WA;M8162
CV4025	5726;E91AA;M8079
CV4028	OB2WA;M8224
CV4031	M8081
CV4039	M8214
CV4044	M8091
CV4048	M8098
CV4058	M8080
CV4059	M8097
CV4063	M8082
CV4066	M8190;5783WA
CV4070	M8099
CV4080	M8225
CV4085	M8195
CV4100	M8223;OA2WA
CV4101	M8224;OB2WA
CV4104	M8163
CV5037	6BA6W;5749
CV4108	E188CC;7308
CV5018	4J52A
CV5027	PL5559
CV5035	DG13-34;5ADP1
CV5055	6DA5;EM81
CV5065	6U8;ECF82

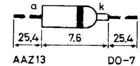
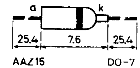
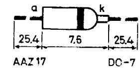
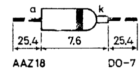
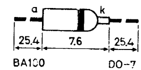
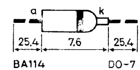
CV number	Comparable type
CV5072	6CA4;EZ81
CV5077	PL81;21A6
CV5079	5643
CV5080	EF37A
CV5094	6CW5;EL86
CV5106	6370;E1T
CV5120	20CV
CV5122	Z900T;5823
CV5123	JP9-15D
CV5125	DP13-34
CV5132	M8163
CV5134	2J51A
CV5135	JP9-15
CV5140	6923;EA52
CV5144	PCL83
CV5156	6DA6;EF89
CV5157	DP13-2
CV5171	DP7-5;3ALP7
CV5173	90C1
CV5186	5651
CV5188	7119;E182CC
CV5189	5726;6AL5W; E91AA;M8212
CV5190	M8245
CV5192	PCC84;7AN7
CV5212	12AT7WA;E81CC; 6201;M8162
CV5214	5920;E90CC
CV5215	6BL8;ECF80
CV5216	6AK5W;E95F; 5654;M8100
CV5231	7308;E188CC
CV5232	C3m
CV5233	EL32

CV number	*Comparable type*
CV5234	XR1-1600A;8063
CV5247	4C35A
CV5249	6975
CV5269	DG7-6
CV5277	6700;ET51
CV5278	Z510M
CV5281	6CW7;ECC84
CV5311	M8248
CV5331	ECC189;6ES8
CV5358	6DJ8;ECC88
CV5397	EC157;8108
CV5724	E80T;6218
CV5915	ECH21
CV6007	3C45

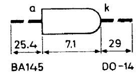
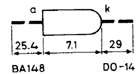
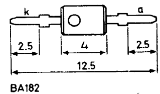
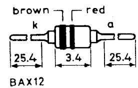
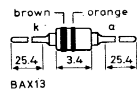
SEMICONDUCTORS
AND
INTEGRATED CIRCUITS

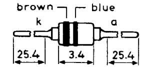
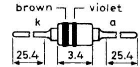
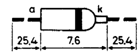
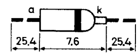
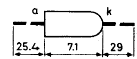
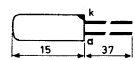
LOW POWER DIODES

Type and applications	*Ratings* (mA) (V)	(°C)	$R_{th\,j-a}$ (°C/mW)	V_F (V)	at I_F (mA)	I_R (μA)	at V_R (V)	*Char.*	*Outlines* (mm)
AA119 AM/FM detector germanium point contacted	$I_F = 35$ $I_{FRM} = 100$ $V_R = 30$ $V_{RRM} = 45$	$T_{amb} = 60$ $T_{stg} = +75$	0.45	$T_{amb} = 60°C$ 0.16 0.50 2.6	 0.1 1.0 30	$T_{amb} = 60°C$ 4.5 16 170	 0.1 10 45	matched pair 2-AA119	 AA119 DO-7
AAY11 switch germanium point contacted	$I_F = 35$ $I_{FRM} = 150$ $V_R = 60$ $V_{RRM} = 90$	$T_j = 75$ $T_{stg} = +75$	0.4	$T_j = 25°C$ 0.72 2.1	 5 30	$T_j = 25°C$ 25 130	 50 90		 AAY11 DO-7
AAY21 switch germanium point contacted	$I_F = 20$ $I_{FM} = 50$ $V_R = 15$	$T_{amb} = 60$ $T_j = 75$ $T_{stg} = +75$	0.75	$T_j = 60°C$ 0.27 0.53 0.95	 2 10 50	$T_j = 60°C$ 18 40	 5 15	$C_d < 1.2$ pF	 AAY21 DO-7
AAY30 switch germanium gold bonded	$I_F = 110$ $I_{FRM} = 400$ $V_R = 30$ $V_{RRM} = 50$	$T_j = 75$ $T_{stg} = +75$	0.45	$T_j = 60°C$ <0.14 <0.41 <0.99	 0.1 10 150	$T_j = 60°C$ <40 <60 <500	 1.5 10 50	$C_d < 1.0$ pF $Q_s < 500$ pC	 AAY30 DO-7
AAY32 switch germanium gold bonded	$I_F = 110$ $I_{FPM} = 150$ $V_R = 30$ $V_{RRM} = 30$	$T_j = 85$ $T_{stg} = +85$	0.45	$T_j = 60°C$ <0.14 <0.41 <0.99	 0.1 10 150	$T_j = 60°C$ <15 <30 <200	 1.5 10 30	$C_d < 1.5$ pF $Q_s < 150$ pC	 AAY32 DO-7

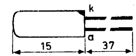
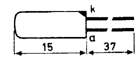
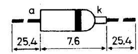
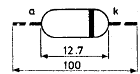
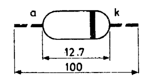
AAZ13 fast switch germanium gold bonded	$I_F = 30$ $I_{FRM} = 100$ $V_R = 8$	$T_j = 75$ $T_{stg} = +75$	0.5	$T_{amb} = 25°C$ 0.27 1 0.50 10 0.60 30	$T_{amb} = 60°C$ 30 3 190 8	$C_d = 3.3$ pF $Q_s = 20$ pC	
AAZ15 switch germanium gold bonded	$I_F = 140$ $I_{FRM} = 250$ $V_R = 75$ $V_{RRM} = 100$	$T_j = 85$ $T_{stg} = +85$	0.45	$T_j = 60°C$ <0.15 0.1 <0.40 10 <1.07 250	$T_j = 60°C$ <30 1.5 <80 50 <300 100	$C_d < 2$ pF $Q_s < 1800$ pC	
AAZ17 switch germanium gold bonded	$I_F = 140$ $I_{FRM} = 250$ $V_R = 50$ $V_{RRM} = 75$	$T_j = 85$ $T_{stg} = +85$	0.45	$T_j = 60°C$ <0.15 0.1 <0.40 10 <1.07 250	$T_j = 60°C$ <30 1.5 <300 50 <500 75	$C_d < 2$ pF $Q_s < 900$ pC	
AAZ18 switch germanium gold bonded	$I_F = 180$ $I_{FRM} = 300$ $V_R = 20$ $V_{RRM} = 20$	$T_j = 75$ $T_{stg} = +75$	0.45	$T_j = 60°C$ <0.14 0.1 <0.36 10 <0.76 300	$T_j = 60°C$ <30 1.5 <45 10 <100 20	$C_d < 1.5$ pF $Q_s < 200$ pC	
BA100 general purposes silicon junction	$I_F = 90$ $I_{FRM} = 100$ $I_{FSM} = 200$ $V_R = 60$	$T_j = 90$ $T_{stg} = +90$	0.4	$T_{amb} = 60°C$ 0.5 0.1 0.6 1.0 0.85 30	$T_{amb} = 75°C$ <10 10 <20 60	—	
BA114 stabilizer silicon alloyed	$I_F = 20$ $T_{amb} = 90$ $T_{stg} = +90$		0.4	$T_{amb} = 25°C$ <0.56 0.1 <0.7 1 <1.05 20	—	—	

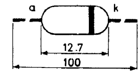
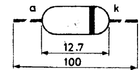
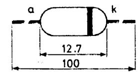
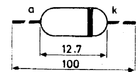
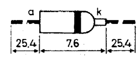
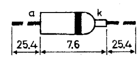
LOW POWER DIODES

Type and application	Ratings (mA) (V)	Ratings (°C)	$R_{th\,j-a}$ (°C/mW)	V_F at I_F (V) (mA)	I_R at V_R (μA) (V)	Char.	Outlines (mm)
BA145 clamping diode silicon double diffused	I_F = 300 I_{FRM} = 2000 V_{RWM} = 300 V_{RRM} = 350	T_j = 125 T_{stg} = +125	0.2	T_j = 125°C 0.3 1 0.4 10 0.56 100 1.0 2000	T_j = 125°C 10 10 25 100 52 300	C_d = 4 pF Q_s < 0.4 nC	
BA148 clamping diode silicon double diffused	I_{FAV} = 300 I_{FRM} = 2000 V_{RWM} = 300 V_{RRM} = 350	T_j = 125 T_{stg} = +125	0.2	T_j = 125°C < 0.6 25 < 1 200 < 1.5 2000	T_j = 125°C 10 10 25 100 52 300	C_d = 4 pF Q_s < 0.8 nC	
BA182 switch silicon planar	I_F = 100 V_R = 35	T_j = 100 T_{stg} = +100	0.4	T_j = 25°C 0.68 2 0.75 10 0.85 100	T_j = 60°C 50 pA 1 30 pA 10 1.1 nA 35	C_d < 1 pF	
BAX12 switch silicon whiskerless	I_F = 400 I_{FRM} = 800 I_{FSM} = 6000 V_R = 90	T_j = 200 T_{stg} = +200	0.3	T_j = 25°C < 0.75 10 < 0.90 100 < 1.25 400	T_j = 150°C 50 90 < 100 90	C_d < 35 pF Q_s < 0.5 nC	
BAX13 fast switch silicon whiskerless	I_F = 75 I_{FRM} = 150 V_R = 50 V_{RRM} = 50	T_j = 200 T_{stg} = +200	0.6	T_j = 25°C < 0.7 2 < 1.0 20 < 1.53 75	T_j = 150°C < 10 10 < 25 50	C_d < 3 pF Q_s < 45 pC	

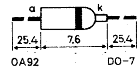
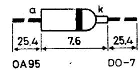
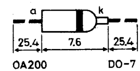
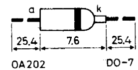
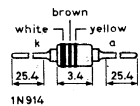
BAX16 general purpose silicon whiskerless	$I_F = 200$ $I_{FRM} = 300$ $V_R = 150$ $V_{RRM} = 150$	$T_j = 200$ $T_{stg} = +200$	0.4	$T_j = 25$ °C <0.65 1 <1.3 100 <1.5 200	$T_j = 150$°C <25 50 <100 150	$C_d < 10$ pF $Q_s < 0.7$ nC	 BAX16
BAX17 general purpose silicon whiskerless	$I_F = 200$ $I_{FRM} = 300$ $V_R = 200$ $V_{RRM} = 200$	$T_j = 200$ $T_{stg} = +200$	0.4	$T_j = 25$°C <0.65 1 <1.1 100 <1.2 200	$T_j = 150$°C <25 50 <100 200	$C_d < 10$ pF $Q_s < 0.7$ nC	 BAX17
BAX78 very fast switch silicon planar epitaxial	$I_F = 300$ $I_{FRM} = 600$ $V_R = 55$ $V_{RRM} = 55$	$T_j = 190$ $T_{stg} = +200$	0.4	$T_j = 25$°C <0.65 1 <0.95 100 <1.25 500	$T_j = 150$°C <25 10 <100 55	$C_d < 2$ pF $Q_s < 35$ pC	 BAX78 DO-7
BAY38 very fast switch silicon planar epitaxial	$I_F = 115$ $I_{FRM} = 225$ $V_R = 50$	$T_j = 190$ $T_{stg} = +200$	0.4	$T_j = 25$°C <0.57 0.1 <0.87 10 <1.4 250	$T_j = 190$°C <200 10 <400 50	$C_d < 2$ pF $Q_s < 35$ pC	 BAY38 DO-7
BR100 trigger device silicon	$I_{FRM} = 2$A $P_{tot} = 150$ mW	$T_j = 100$ $T_{stg} = +100$	0.2	$T_j = 25$°C $V_{(BO)} < 36$ $I_{(BO)} < 0.1$	$T_j = 25$°C $\Delta V > 6$		 BR100 DO-14
BRY39	See section MISCELLANEOUS TRANSISTORS						
OA5 general purposes germanium gold bonded	$I_{FAV} = 125$ $I_{FRM} = 350$ $V_R = 100$ $V_{RRM} = 100$	$T_{amb} = 75$ $T_{stg} = +90$	—	$T_{amb} = 60$°C <0.20 0.1 <0.50 10 <1.25 300	$T_{amb} = 60$°C <26 1.5 <30 10 <120 100	—	 OA5

LOW POWER DIODES

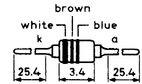
Type and applications	Ratings (mA) (V)	(°C)	$R_{th\,j-a}$ (°C/mW)	V_F (V) at	I_F (mA)	I_R (μA) at	V_R (V)	Char.	Outlines (mm)
OA7	I_F = 140	T_{amb} = 75	0.4	T_{amb} = 60 °C		T_{amb} = 60 °C		—	
switch	I_{FRM} = 250			< 0.19	0.1	< 20	1.5		
germanium	V_R = 25	T_{stg} = +75		< 0.28	10	< 30	10		
gold bonded	V_{RRM} = 25			< 0.75	50	< 150	25		OA7
OA9	I_F = 270	T_{amb} = 75	0.35	T_{amb} = 60 °C		T_{amb} = 60 °C		C_d < 7 pF	
switch	I_{FRM} = 500			< 0.15	0.1	< 20	1.5		
germanium	V_R = 25	T_{stg} = +90		< 0.35	10	< 45	10		
gold bonded	V_{RRM} = 25					< 100	25		OA9
OA47	I_F = 110	T_j = 75	0.45	T_j = 60 °C		T_j = 60 °C		C_d < 3.5 pF	
switch	I_{FRM} = 150			< 0.14	0.1	< 20	1.5	Q_s < 600 pC	
germanium	V_R = 25	T_{stg} = +75		< 0.43	10	< 90	20		
gold bonded	V_{RRM} = 25			< 1.1	150	< 160	25		OA47 DO-7
OA70	I_F = 50	T_{amb} = 75	—	T_{amb} = 25 °C		T_{amb} = 25 °C		C_d = 1 pF	
video detector	I_{FRM} = 150			0.15	0.1	5	1.5		
germanium	V_R = 15			0.43	1.0	30	10		
point contacted	V_{RRM} = 22.5			1.7	30	180	25		OA70
OA72	I_F = 10	—	—	T_{amb} = 25 °C		T_{amb} = 25 °C		matched	
AM/FM detector	I_{FM} = 100			0.2	0.1	0.8	1.5	pair	
germanium	V_R = 30			1.4	10	4.5	10	2-OA72	
	V_{RRM} = 45			2.4	30	130	45		OA72

OA73	I_F = 50	T_{amb}=75	—	T_{amb}=25°C		T_{amb}=25°C		C_d=1 pF	
video detector	I_{FM} =150			<0.2	0.1	<18	1.5		
germanium	V_R = 20			<1.0	8	<400	20		
	V_{RRM}= 30					<1200	30		OA73
OA79	I_F = 35	T_{amb}=60	—	T_{amb}=60°C		T_{amb}=60°C		matched	
AM/FM detector	I_{FRM} =100			0.16	0.1	4.5	0.1	pair	
germanium	V_R = 30			1.4	10	16	10	2-OA79	
point contacted	V_{RRM}= 45			2.6	30	170	45		OA79
OA81	I_F = 50	T_{amb}=75	—	T_{amb}=60°C		T_{amb}=60°C		—	
general purposes	I_{FRM} =150			0.13	0.1	15	1.5		
germanium	V_R = 90			1.3	10	20	10		
point contacted	V_{RRM}=115			2.3	30	190	100		OA81
OA85	I_F = 50	T_{amb}= 75	—	T_{amb}=60°C		T_{amb}=60°C		—	
general purposes	I_{FRM} =150			0.13	0.1	12	1.5		
germanium	V_R = 90			1.05	10	17	10		
point contacted	V_{RRM}=115			1.95	30	190	100		OA85
OA90	I_F = 8	T_{amb}= 75	—	T_{amb}=60°C		T_{amb}=60°C		—	
video detector	I_{FRM} =45			0.12	0.1	11	1.5		
germanium	V_R =20	T_{stg} = +90		0.95	10	45	10		
point contacted	V_{RRM}=30			1.95	30	400	30		OA90 DO-7
OA91	I_F = 50	T_{amb}= 75	0.4	T_{amb}=60°C		T_{amb}=60°C		—	
general purposes	I_{FRM} =150			0.1	0.1	15	1.5		
germanium	V_R = 90	T_{stg} = +75		1.05	10	20	10		
point contacted	V_{RRM}=115			1.9	30	190	100		OA91 DO-7

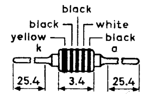
LOW POWER DIODES

Type and applications	*Ratings* (mA) (V)	(°C)	$R_{th\,j-a}$ (°C/mW)	V_F (V)	at I_F (mA)	I_R (µA)	at V_R (V)	*Char.*	*Outlines* (mm)
OA92 switch germanium point contacted	I_F = 10 I_{FRM} = 50 V_R = 15 V_{RRM} = 15	T_{amb} = 75 T_{stg} = +90	0.55	T_{amb} = 25°C <0.23 <0.6 <2.0	 0.1 1 10	T_{amb} = 25°C <6 <40 <85	 1.5 10 15	C_d < 0.5 pF	
OA95 general purposes germanium point contacted	I_F = 50 I_{FRM} = 150 V_R = 90 V_{RRM} = 115	T_{amb} = 75 T_{stg} = +75	0.4	T_{amb} = 60°C 0.1 0.95 1.75	 0.1 10 30	T_{amb} = 60°C 12 17 200	 1.5 10 100	—	
OA200 general purposes silicon junction	I_F = 160 I_{FRM} = 250 V_R = 50	T_{amb} = 125 T_{stg} = +125	0.4	T_{amb} = 125°C <0.30 <0.65 <0.80	 0.1 10 30	T_{amb} = 125°C 1 T_{amb} = 25°C 0.02	 50 50	C_d = 10 pF	
OA202 general purposes silicon junction	I_F = 160 I_{FRM} = 250 V_R = 150	T_{amb} = 125 T_{stg} = +125	0.4	T_{amb} = 125°C <0.30 <0.65 <0.80	 0.1 10 30	T_{amb} = 125°C 0.5 T_{amb} = 25°C 0.01	 150 150	C_d = 10 pF	
1N914 high speed silicon whiskerless	I_F = 75 I_{FRM} = 225 V_R = 75 V_{RRM} = 100	T_{amb} = 175 T_{stg} = +200	—	T_j = 25°C <1	 10	T_j = 25°C <5 T_j = 150°C <50	 75 20	C_d < 4 pF	
1N914A	Equivalent to 1N914 except for:			<1	20	band 4 added: brown			

1N914B	Equivalent to 1N914 except for:			< 1 100	< 100 100 band 4 added: red	
1N916 high speed silicon whiskerless	I_F = 75 I_{FRM} = 225 V_R = 75 V_{RRM} = 100	T_{amb} = 175 T_{stg} = +200	—	$T_j = 25°C$ < 1 10	$T_j = 25°C$ < 5 75 $T_j = 150°C$ < 50 20	$C_d < 2$ pF
1N916A	Equivalent to 1N916 except for:			< 1 20	band 4 added: brown	
1N916B	Equivalent to 1N916 except for:			< 1 30	band 4 added: red	
1N4009 general purpose ultra high speed silicon	V_R = 25 P_{tot} = 250	T_{stg} = +200	0.6	$T_{amb} = 25°C$ < 1 30	$T_{amb} = 25°C$ < 0.1 25 $T_{amb} = 150°C$ < 100 25	$C_d < 4$ pF

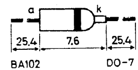
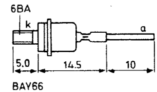
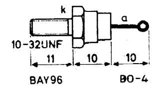
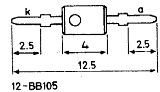


1N916

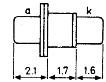


1N4009

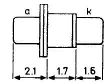
VARIABLE CAPACITANCE DIODES

Type and applications	*Ratings* (*mA*) (*V*)	(*W*) (*°C*)	R_{th} (*°C/W*)	I_R *at* V_R (*μA*) (*V*)	*Characteristics*	*Outlines* (*mm*)
BA102 variable capacitance silicon	I_R = 0.1 V_R = 20	T_j = 90 T_{stg} = +90	$R_{th\,j-a}$ = 400	T_j = 80°C < 5 20	$\frac{C_d(V_R = 10\ V)}{C_d(V_R = 4\ V)} < 0.7$ at $f \leqslant 300$MHz $r_D < 3\ \Omega$ at $V_R = 4$ V	
BAY66 varactor silicon double diffused	I_{FRM} = 400 V_R = 100 P_{tot} = 12	T_j = 150 T_{stg} = +150	$R_{th\,j-a}$ = 120 $R_{th\,j-mb}$ = 10	T_j = 25°C < 10 100 T_j = 150°C < 200 100	C_d = 65 pF at V_F = 0.5 V C_d = 25 pF at V_R = 0 C_d < 6 pF at V_R = 100 V $r_D < 2.0\ \Omega$ at V_R = 48 V; f = 200 MHz	
BAY96 varactor silicon planar epitaxial	V_R = 120 P_{tot} = 20 T_j = 175 T_{stg} = +175		$R_{th\,j-mb}$ = 7.5	—	C_d = 28 to 39 pF at V_R = 6 V; f = 1 MHz $r_D < 1.2\ \Omega$ at V_R = 6 V; f = 400 MHz	
12-BB105A variable capacitance silicon planar u.h.f. tuner	I_F = 20 V_R = 28 V_{RM} = 30	T_j = 60 T_{stg} = +60	$R_{th\,j-a}$ = 0.4	T_j = 25°C < 0.1 28 T_j = 60°C < 1 28	C_d = 11.5 pF at V_R = 3 V; f = 1 MHz C_d = 2.3 to 2.8 pF at V_R = 25 V; f = 1 MHz $r_D = 0.4\ \Omega$ at I_F = 5 mA; f = 200 MHz	
12-BB105B	Equivalent to 12-BB105A except for:				C_d = 2.0 to 2.3 pF at V_R = 25 V; f = 1 MHz	

12-BB105G	Equivalent to 12-BB105A except for:			$C_d = 1.8$ to 2.8 pF at $V_R = 25$ V; $f = 1$ MHz
BXY27 varactor silicon planar epitaxial	$V_R = 55$ $P_{tot} = 4$ $T_j = 175$	$R_{th\,j-pin} =$ 20	$T_{amb} = 25°C$ <1 6	$C_d = 3.0$ to 6.5 pF at $V_R = 6$ V; $f = 1$ MHz $r_D = 0.4\ \Omega$ at $V_R = 6$ V; $f = 2$ GHz
BXY28 varactor silicon planar epitaxial	$V_R = 45$ $P_{tot} = 3.5$ $T_j = 175$	$R_{th\,j-pin} =$ 30	$T_{amb} = 25°C$ <1 6	$C_d = 1.0$ to 2.5 pF at $V_R = 6$ V; $f = 1$ MHz $r_D = 0.9\ \Omega$ at $V_R = 6$ V; $f = 2$ GHz

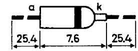
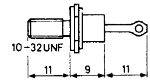
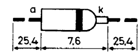


BXY27



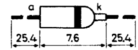
BXY28

ZENER DIODES

Type and applications	Ratings (mA)	Ratings (W) (°C)	R_{th} (°C/W)	V_F at (V)	I_F (mA)	V_Z, (V)	S_Z, (mV/°C)	r_Z at (Ω)	I_Z (mA)	Outlines (mm)
BZY56 5%						4.7	−2.0	370	1	
BZY57 5%	I_F = 50					5.1	−1.8	360	1	
BZY58 5%	I_Z = 25					5.6	−1.0	280	1	
BZY59 5%	P_{tot} = 0.28		$R_{th\,j-a}$ =	0.61	0.1	6.2	+0.5	200	1	
BZY60 5%	T_j = 150		450	0.76	10	6.8	+2.7	5.0	1	
BZY61 5%	T_{stg} = +150					7.5	+4.0	8.0	1	
BZY62 5%						8.2	+5.0	6.2	1	
BZY63 5%						9.1	+6.2	8.0	1	
BZY74 15%	I_{FAV} = 500	P_{tot} = 10	$R_{th\,j-a}$ =			6.2	+2.1	2.2	20	
BZY75 15%	I_{FRM} = 7000	P_{ZSM} = 45	70	< 1.0	200	7.5	+3.8	2.3	20	
BZY76 15%	I_{ZRM} = 7000	T_j = 150	$R_{th\,j-mb}$ =			9.1	+5.8	3.7	20	
power		T_{stg} = +150	10							
BZY78 1%	I_{FAV} = 50	P_{tot} = 0.28	$R_{th\,j-a}$ =	< 0.75	1	5.3		18	11.5	
	I_{FRM} = 50	T_j = 150	450		T_j = −40 to +25°C: S_Z = +0.32					
	I_Z = 25	T_{stg} = +150			T_j = +25 to +100°C: S_Z = −0.21					
	I_{ZRM} = 25									

5% means a tolerance of ±5 per cent of V_Z

BZY88-	C3V3	C3V6	C3V9	C4V3	C4V7	C5V1	C5V6	C6V2	C6V8	C7V5	C8V2	C9V1
at I_Z (mA)	5	5	5	5	5	5	5	5	5	5	5	5
V_Z (V)	3.3	3.6	3.9	4.3	4.7	5.1	5.6	6.2	6.8	7.5	8.2	9.1
S_Z (mV/°C)	−2.3	−2.0	−2.05	−1.8	−1.55	−1.2	−0.2	+2.0	+3.2	+4.2	+5.0	+6.0
r_Z (Ω)	83.5	76	76	70	62	46	22	7.0	3.0	3.0	3.5	4.75



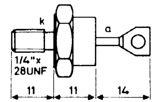
BZY88series DO-7

BZY88-	C10	C11	C12	C13	C15	C16	C18	C20	C22	C24	C27	C30
at I_Z (mA)	5	5	5	5	5	5	5	5	5	5	5	5
V_Z (V)	10	11	12	13	15	16	18	20	22	24	27	30
S_Z (mV/°C)	+7.0	+8.7	+9.0	+10.5	+12.5	+13	+15	+17	+19	+21	+23.5	+26
r_Z (Ω)	<25	<35	<35	<35	<40	<45	<50	<60	<65	<75	<85	<95

Ratings $I_{FRM}=250$ mA; $I_{ZRM}=250$ mA; $P_{tot}=0.4$ W; $P_{ZSM}=15$ W; $T_j=175°C$; $T_{stg}=+175°C$

Characteristics $R_{th\,j-a}=310°$ C/W; $V_F<0.9$ V at $I_F=10$ mA; tolerance of V_Z: 5 %

BZY91-	C10	C11	C12	C13	C15	C16	C18	C20	C22	C24	C27	C30	C33	C36
at I_Z (A)	2	2	2	2	2	2	2	[illegible]	1	1	1	1	1	1
V_Z (V)	10	11	12	13	15	16	18	20	22	24	27	30	33	36
S_Z (mV/°C)	9	10	11	12	13	15	16	15	17	19	22	25	28	32
r_Z (Ω)	<0.4	<0.4	<0.5	<0.5	<0.6	<0.6	<0.7	<0.8	<0.8	<0.9	<1.0	<1.1	<1.2	<1.3



BZY91series DO-5

BZY91-	C39	C43	C47	C51	C56	C62	C68	C75
at I_Z (A)	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
V_Z (V)	39	43	47	51	56	62	68	75
S_Z (mV/°C)	35	39	44	48	53	59	64	71
r_Z (Ω)	<1.4	<1.5	<1.7	<1.8	<2.0	<2.2	<2.4	<2.6

Ratings $I_{FAV}=10$ A; $I_{FRM}=30$ A; $I_{ZRM}=100$ A; $P_{tot}=75$ W; $T_j=175°C$; $T_{stg}=+175°C$
$P_{ZSM}=4400$ W (0.1 ms); 1480 W (1 ms); 500 W (10 ms); 170 W (100 ms)

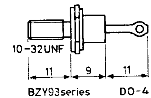
Characteristics $R_{th\,j-mb}=1.47°C/W$; $V_F<1.5$ V at $I_F=10$ A; tolerance of V_Z: 5 %
Reverse polarity types available

Type and applications													
BZY93-	**C6V8**	**C7V5**	**C8V2**	**C9V1**	**C10**	**C11**	**C12**	**C13**	**C15**	**C16**	**C18**	**C20**	**C22**
at I_Z (mA)	2	2	2	1	1	1	1	1	1	0.5	0.5	0.5	0.5
V_Z (V)	6.8	7.5	8.2	9.1	10	11	12	13	15	16	18	20	22
S_Z (mV/°C)	2.5	3	4	5	7	7.5	8	8.5	10	11	12	14	16
r_Z (Ω)	0.04	0.04	0.05	0.07	0.07	0.08	0.08	0.08	0.1	0.18	0.2	0.2	0.21
BZY93-	**C24**	**C27**	**C30**	**C33**	**C36**	**C39**	**C43**	**C47**	**C51**	**C56**	**C62**	**C68**	**C75**
at I_Z (mA)	0.5	0.5	0.5	0.5	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
V_Z (V)	24	27	30	33	36	39	43	47	51	56	62	68	75
S_Z (mV/°C)	18	21	25	30	32	35	40	45	50	55	60	65	70
r_Z	0.22	0.25	0.3	0.32	0.75	0.85	0.9	1.0	1.2	1.3	1.5	1.8	2.0

Ratings: $I_{FAV} = 5$ A; $I_{FRM} = 15$ A; $I_{ZRM} = 20$ A; $P_{tot} = 20$ W; $T_j = 175$ °C; $T_{stg} = +175$ °C

Characteristics: $R_{th\,j-mb} = 5$ °C/W; $V_F < 1.5$ V at $I_F = 5$ A; tolerance of V_Z: 5%

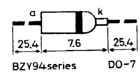
Outlines (mm)



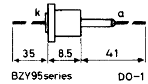
BZY94-	**C10**	**C11**	**C12**	**C13**	**C15**	**C16**	**C18**	**C20**	**C22**	**C24**	**C27**	**C30**	**C33**	**C36**
at I_Z (mA)	5	5	5	5	5	5	5	5	5	5	5	5	5	5
V_Z (V)	10	11	12	13	15	16	18	20	22	24	27	30	33	36
S_Z (mV/°C)	7	8.7	9	10.5	12.5	13	15	17	19	21	23.5	26	29	31
r_Z (Ω)	<25	<35	<35	<35	<40	<45	<50	<60	<65	<75	<85	<95	<110	<120
BZY94-	**C39**	**C43**	**C47**	**C51**	**C56**	**C62**	**C68**	**C75**						
at I_Z (mA)	2	2	2	2	2	2	2	2						
V_Z (V)	39	43	47	51	56	62	68	75						
S_Z (mV/°C)	34	37	40	44	47	51	56	60						
r_Z (Ω)	<130	<150	<170	<180	<200	<215	<240	<255						

Ratings: $I_{FAV} = 250$ mA; $I_{ZRM} = 250$ mA; $P_{tot} = 400$ mW; $P_{ZSM} = 15$ W; $T_j = 175$ °C; $T_{stg} = +175$ °C

Characteristics: $R_{th\,j-a} = 310$ °C/W; $V_F < 0.9$ V at $I_F = 10$ mA; tolerance of V_Z: 5%



BZY95-	C10	C11	C12	C13	C15	C16	C18	C20	C22	C24	C27	C30	C33	C36
at I_Z (mA)	50	50	50	50	50	20	20	20	20	20	20	20	20	20
V_Z (V)	10	11	12	13	15	16	18	20	22	24	27	30	33	36
S_Z (mV/°C)	7	7.5	8	8.5	10	11	12	14	16	18	20	25	30	32
r_Z (Ω)	0.75	0.80	0.85	0.90	1.0	2.4	2.5	2.8	3.0	3.4	3.8	4.5	5.0	5.5

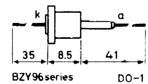


BZY95-	C39	C43	C47	C51	C56	C62	C68	C75
at I_Z (mA)	10	10	10	10	10	10	10	10
V_Z (V)	39	43	47	51	56	62	68	75
S_Z (mV/°C)	35	40	45	50	55	60	65	70
r_Z (Ω)	12	13	14	15	17	18	18	20

Ratings $I_{FAV}=1$ A; $I_{FRM}=3$ A; $I_{ZRM}=5$ A; $P_{tot}=1.5$ W; $P_{ZSM}=100$ W; $T_j=175$°C; $T_{stg}=+175$°C

Characteristics $R_{th\,j-a}=100$°C/W; $V_F<1.5$ V at $I_F=1$ A; tolerance of V_Z: 5%

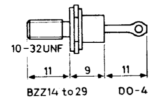
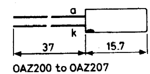
BZY96-	C4V7	C5V1	C5V6	C6V2	C6V8	C7V5	C8V2	C9V1
at I_Z (mA)	100	100	100	100	100	50	50	50
V_Z (V)	4.7	5.1	5.6	6.2	6.8	7.5	8.2	9.1
S_Z (mV/°C)	−0.6	+0.1	+1	+2	+3	+4	+5	+6.4
r_Z (Ω)	2.5	1.0	0.7	0.6	0.6	1.0	1.2	1.8



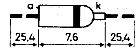
Ratings $I_{FAV}=1$ A; $I_{FRM}=3$ A; $I_{ZRM}=3.5$ A; $P_{tot}=1.5$ W; $P_{ZSM}=20$ W; $T_j=175$°C; $T_{stg}=+175$°C

Characteristics $R_{th\,j-a}=100$°C/W; $V_F<1.5$ V at $I_F=1$ A; tolerance of V_Z: 5%

ZENER DIODES

Type and applications		Ratings (mA) (W) (°C)	R_{th} (°C/W)	V_F at (V)	I_F (mA)	V_Z, (V)	S_Z, (mV/°C)	r_Z at (Ω)	I_Z (mA)	Outlines (mm)
BZZ14	5%					5.6	+0.7	4.5	20	
BZZ15	5%					6.2	+2.1	2.2	20	
BZZ16	5%					6.8	+2.9	2.07	20	
BZZ17	5%					7.5	+3.75	2.3	20	
BZZ18	5%					8.2	+4.7	2.6	20	
BZZ19	5%	I_{FAV} = 500				9.1	+5.8	3.18	20	
BZZ20	5%	I_{FRM} = 7000	$R_{th\,j-a}=70$			10	+7.0	3.8	20	
BZZ21	5%	I_{ZRM} = 7000				11	+7.5	4.4	20	
BZZ22	5%	P_{tot} = 10		<1.0	200	12	+8.8	5.25	20	
BZZ23	5%	P_{ZSM} = 45	$R_{th\,j-mb}=10$			13	+10.0	6.3	20	
BZZ24	5%	T_j = 150				15	+12.6	8.9	20	
BZZ25	5%	T_{stg} = +150				16	+13.8	10.5	20	
BZZ26	5%					18	+16.4	14.5	20	
BZZ27	5%					20	+19.0	19.5	20	
BZZ28	5%					22	+21.6	26	20	
BZZ29	5%					24	+24.2	33.5	20	
OAZ200	5%					4.7	−2.0	350	1	
OAZ201	5%	I_{FAV} = 100				5.1	−1.8	330	1	
OAZ202	5%	I_{FRM} = 250				5.6	−1.0	275	1	
OAZ203	5%	I_{ZRM} = 250				6.2	+0.5	215	1	
OAZ204	5%	I_{ZSM} = 10 000 (100 μs)	$R_{th\,j-a}=400$	0.73	10	6.8	+2.5	40	1	
OAZ205	5%	P_{tot} = 0.5	$R_{th\,j-c}=150$	0.80	100	7.5	+4.0	8.6	1	
OAZ206	5%	T_j = 150				8.2	+5.0	7.6	1	
OAZ207	5%	T_{stg} = +150				9.1	+6.2	9.6	1	

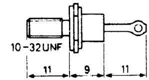
1N746A	5%				3.3	−2.05	<28	20	
1N747A	5%				3.6	−2.05	<24	20	
1N748A	5%				3.9	−1.90	<23	20	
1N749A	5%				4.3	−1.55	<22	20	
1N750A	5%	I_{FAV} = 250			4.7	−0.845	<19	20	
1N751A	5%	I_{ZRM} = 250			5.1	−0.405	<17	20	
1N752A	5%	P_{tot} = 0.4	$R_{th\,j-a}=310$	<0.9 10	5.6	+0.336	<11	20	
1N753A	5%	T_j = 175			6.2	+1.36	<7	20	
1N754A	5%	T_{stg} = +175			6.8	+2.38	<5	20	
1N755A	5%				7.5	+3.37	<6	20	
1N756A	5%				8.2	+4.26	<8	20	
1N757A	5%				9.1	+5.1	<10	20	
1N758A	5%				10	+6.0	<17	20	
1N759A	5%				12	+7.2	<30	20	



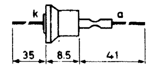
1N746A to
1N759A
DO-7

RECTIFIER DIODES

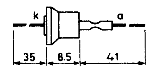
Type and applications	Ratings I_{FAV} (A)	I_{FRM} (A)	I_{FSM} (A)	V_{RWM} (V)	V_{RRM} (V)	V_{RSM} (V)	$^*R_{th\,j-a}$ $R_{th\,j-mb}$ (°C/W)	Outlines (mm)
AYY10-120 rectifier	3.8	12	90	95	120	120	*50 5	AYY10-120
BY100 mains rectifier	1.2	10	40	800	1250	1250	*60	BY100
BY114 mains rectifier	1.2	10	40	450	650	650	*60	BY114
BY118 booster diode	5	14	—	—	300	—	5	BY118
BY122	See section Rectifier stacks							
BY123	See section Rectifier stacks							
BY126 mains rectifier	1.2	10	40	450	650	650	*60	BY126



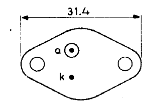
AYY10-120 DO-4



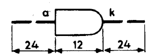
BY100 DO-1



BY114 DO-1

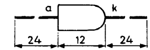


BY118

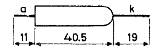


BY126

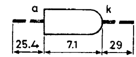
BY127 mains rectifier		1.2	10	40	800	1250	1250	*60
BY140 fast defl. diode		2.5 (mA)	0.25 $I_{RRM}=$ 0.15	1	15 (kV)	15 (kV)	15 (kV)	—
BY164	See section Rectifier Stacks							
BYX10 low current rect.		0.5	3	15	800	1600	1600	*150
BYX13 mains rectifier	**-400(R)** **-600(R)** **-800(R)** **-1000(R)** **-1200(R)**	20	100	400	200 300 400 500 600	400 600 800 1000 1200	400 600 800 1000 1200	1.1
BYX14 mains rectifier	**-400(R)** **-600(R)** **-800(R)** **-1000(R)** **-1200(R)**	150	750	3000	200 300 400 500 600	400 600 800 1000 1200	400 600 800 1000 1200	0.28
BYX21 autodiode	**-100(R)** **-200(R)**	25	80	250	50 100	100 200	100 200	$R_{th j-c}=$ 1.5



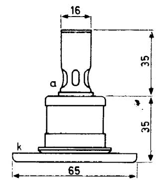
BY127



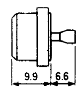
BY140



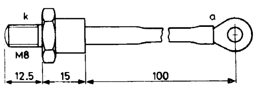
BYX10 DO-14



BYX14 series



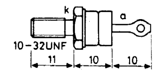
BYX21 series



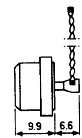
BYX13 series

RECTIFIER DIODES

Type and applications		*Ratings* I_{FAV} (*A*)	I_{FRM} (*A*)	I_{FSM} (*A*)	V_{RWM} (*V*)	V_{RRM} (*V*)	V_{RSM} (*V*)	*$R_{th\,j-a}$ / $R_{th\,j-mb}$ (°C/W)	*Outlines (mm)*
BYX23 mains rectifier	**-400** **-600** **-800** **-1000**	100	500	1600	400 600 800 1000	P_{RAV} = 30 W P_{RRM} = 8 kW P_{RSM} = 30 kW		0.4	
BYX24		See section Rectifier stacks							
BYX25 mains rectifier	**-600(R)** **-800(R)** **-1000(R)**	20	440	360	600 800 1000	P_{RAV} = 38 W P_{RRM} = 3 kW P_{RSM} = 18 kW		*50 1.3	BYX25series DO-4
BYX27 mains rectifier	**-400** **-600** **-800** **-1000**	250	1250	4000	400 600 800 1000	P_{RAV} = 80 W P_{RRM} = 20 kW P_{RSM} = 80 kW		0.2	
BYX28 autodiode	**-200(R)** **-400(R)**	25	80	300	100 200	200 400	200 400	$R_{th\,j-c}$ = 1.5	BYX28series
BYX29 high volt. in X-ray	**-75000** **-100000** **-125000** **-150000**	50 (mA)	0.25	5	75 kV 100 kV 125 kV 150 kV	—	—	$R_{th\,j-oil}$ = 3.2 2.7 1.6 1.6	

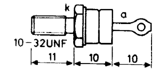


BYX25series DO-4

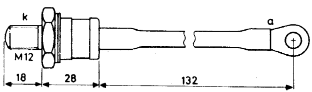


BYX28series

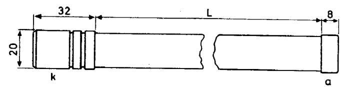
BYX30 fast switch	**-200(R)**		310		200	$P_{RAV}=30$ W		*50
	-300(R)				300	$P_{RRM}=5.5$ kW		1.3
	-400(R)	14	$I_{RRM}=20$	250	400	$P_{RSM}=18$ kW		
	-500(R)				500			
	-600(R)				600			
BYX32 mains rectifier	**-200(R)**				200	200	225	
	-400(R)				400	400	450	
	-600(R)				600	600	650	
	-800(R)	100	500	1600	800	800	900	0.4
	-1000(R)				1000	1000	1100	
	-1200(R)				1200	1200	1300	
	-1600(R)				1200	1600	1600	
BYX33 mains rectifier ●	**-200(R)**				200	200	225	
	-400(R)				400	400	450	
	-600(R)				600	600	650	
	-800(R)	400	2000	4000	800	800	900	0.2
	-1000(R)				1000	1000	1100	
	-1200 (R)				1200	1200	1300	
	-1600 (R)				1200	1600	1600	



BYX30series DO-4

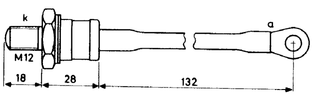


BYX23series

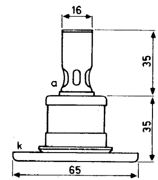


BYX29series

BYX29- 75000; L=102
BYX29-100000; L=130
BYX29-125000; L=190
BYX29-150000; L=190

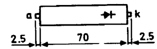
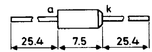
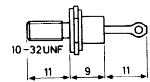
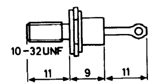


BYX32series

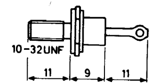


BYX27series
BYX33series

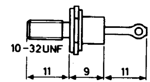
RECTIFIER DIODES

Type and applications		*Ratings* I_{FAV} *(A)*	I_{FRM} *(A)*	I_{FSM} *(A)*	V_{RWM} *(V)*	V_{RRM} *(V)*	V_{RSM} *(V)*	$*R_{th\,j-a}$ $R_{th\,j-mb}$ *(°C/W)*	*Outlines (mm)*
BYX34 fast switch	**-200** **-300** **-400** **-500**	60	1000 $I_{RRM}=$ 100	1200	200 300 400 500	$P_{RAV}=30$ W $P_{RRM}=$ 8 kW $P_{RSM}=30$ kW		0.4	
BYX35 high voltage in X-ray, LASER		50 (mA)	0.16	15	25 (kV)	37.5 (kV)	40 (kV)	$R_{th\,j-oil}=$ 8	 BYX35
BYX36 • general purpose	**-150** **-300** **-600**	0.8	5	30	100 200 400	150 300 600	150 300 600	*110	 BYX36series DO-15
BYX38 mains rectifier	**-300(R)** **-600(R)** **-900(R)** **-1200(R)**				200 400 600 800	300 600 900 1200	300 600 900 1200		 BYX38series DO-4
BYX39 power rectifier	**-600(R)** **-800(R)** **-1000(R)**	6	120	100	600 800 1000	$P_{RAV}=10$ W $P_{RRM}=$ 2 kW $P_{RSM}=$ 4 kW		*50 4.5	 BYX39series DO-4

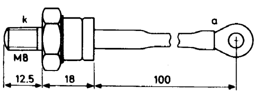
BYX42 mains rectifier	**-300(R)** **-600(R)** **-900(R)** **-1200(R)**	10	60	125	200 400 600 800	300 600 900 1200	300 600 900 1200	*50 3
BYX48 mains rectifier	**-300(R)** **-600(R)** **-900(R)** **-1200(R)**	6	36	90	200 400 600 800	300 600 900 1200	300 600 900 1200	*50 4.5
BYY15 mains rectifier		40	200	800	400	800	800	1.0
BYY16		reverse polarity version of BYY15						
BYY73 mains rectifier		40	200	800	300	600	600	1.0
BYY74		reverse polarity version of BYY73						
BYY75 mains rectifier		40	200	800	500	1000	1000	1.0
BYY76		reverse polarity version of BYY75						



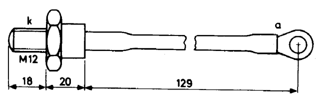
BYX42series DO-4



BYX48series DO-4



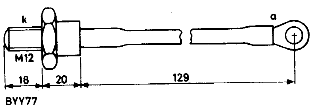
BYX34 series

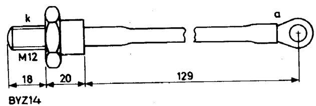


BYY15
BYY73
BYY75

RECTIFIER DIODES

Type and applications	Ratings I_{FAV} (A)	I_{FRM} (A)	I_{FSM} (A)	V_{RWM} (V)	V_{RRM} (V)	V_{RSM} (V)	*$R_{th\,j-a}$ $R_{th\,j-mb}$ (°C/W)	Outlines (mm)
BYY77 mains rectifier	40	200	800	600	1200	1200	1.0	
BYY78	reverse polarity version of BYY77							
BYZ14 mains rectifier	40	200	800	200	400	400	1.0	
BYZ15	reverse polarity version of BYZ14							

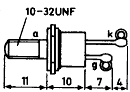




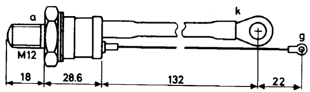
THYRISTORS

Type and applications	Ratings: I (A)	V_{RWM} V_{DWM} (V)	V_{DRM} (V)	V_{DSM} (V)	$*V_{FGM}$ V_{RGM} (V)	$*P_{GAV}$ P_{GM} (W)	T_j $(°C)$	$R_{th\,j-mb}$ $(°C/W)$	I_H (mA)	t_{on} (μs)	t_q (μs)
BT101-300R **-500R**	$I_{TAV}=6.4$ $I_{T(RMS)}=15$ $I_{TRM}=50$ $I_{TSM}=55$ $I_{FGM}=2$	200 400	300 500	300 500	*10 5	*0.5 5	125	3	—	—	—
BT102	Equivalent to BT101										
BTX13 -100R **-200R** **-300R** **-400R** **-500R** **-600R**	$I_{TAV}=30$ $I_{T(RMS)}=47$ $I_{TRM}=250$ $I_{TSM}=300$ $I_{FGM}=2$	100 200 300 400 500 600	100 200 300 400 500 600	500 500 500 500 700 700	*10 5	*0.5 5	125	0.90	40	4	6
BTX35 -500R **-600R** **-700R** **-800R**	$I_{TAV}=12$ $I_{T(RMS)}=19$ $I_{TRM}=140$ $I_{TSM}=140$ $I_{FGM}=2$	500 600 700 800	$P_{RSM}=18$ kW		*10 5	*0.5 5	125	2.0	10	2	7.5
BTX36 -500R **-600R** **-700R** **-800R**	$I_{TAV}=16$ $I_{T(RMS)}=25$ $I_{TRM}=150$ $I_{TSM}=200$ $I_{FGM}=2$	500 600 700 800	$P_{RSM}=18$ kW		*10 5	*0.5 5	125	2.0	10	2	10

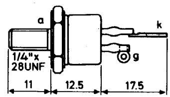
BTX37 -500R **-600R** **-700R** **-800R**	I_{TAV} = 50 $I_{T(RMS)}$ = 78 I_{TRM} = 700 I_{TSM} = 680 I_{FGM} = 2	500 600 700 800	$P_{RSM} = 40$ kW	*10 5	*0.5 5	125	0.6	10	3	10
BTX38 -500R **-600R** **-700R** **-800R**	I_{TAV} = 70 $I_{T(RMS)}$ = 110 I_{TRM} = 1000 I_{FGM} = 900 I_{FGM} = 2	500 600 700 800	$P_{RSM} = 40$ kW	*10 5	*0.5 5	125	0.4	10	3	10
BTX47-1000R **-1200R** **-1400R**	I_{TAV} = 16 $I_{T(RMS)}$ = 25 I_{TRM} = 160 I_{TSM} = 155 I_{FGM} = 2	800 800 800	$P_{RSM} = 18$ kW	*10 5	*0.5 5	125	1.0	10	5	25
BTX48	Equivalent to BTX47 except for:		$I_{TRM} = 200$ A		$I_{TSM} = 200$ A					



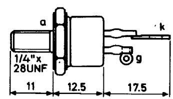
BT101



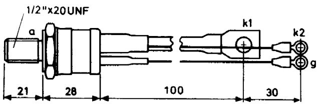
BTX13series



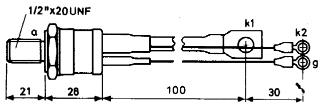
BTX35series



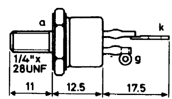
BTX36series



BTX37series



BTX38series

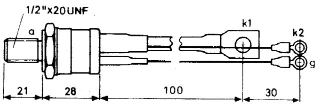


BTX47series

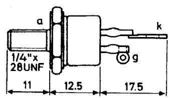
THYRISTORS

Type and applications	Ratings: I (A)	V_{RWM} V_{DWM} (V)	V_{DRM} (V)	V_{DSM} (V)	$*V_{FGM}$ V_{RGM} (V)	$*P_{GAV}$ P_{GM} (W)	T_j (°C)	$R_{th\,j-mb}$ (°C/W)	I_H (mA)	t_{on} (μs)	t_q (μs)
BTX49-1000R	I_{TAV} = 70	800	P_{RSM} = 40 kW		*10	*0.5	125	0.3	10	5	25
-1200R	$I_{T(RMS)}$ = 110	800			5	5					
-1400R	I_{TRM} = 1000	800									
	I_{TSM} = 1050										
	I_{FGM} = 2										
BTX64 -100R	I_{TAV} = 12	100	100	500	*20	*0.5	125	2.0	10	0.4	< 5
-200R	$I_{T(RMS)}$ = 19	200	200	500	5	5					
-300R	I_{TRM} = 140	300	300	500							
-400R	I_{TSM} = 140	400	400	500							
-500R	I_{FGM} = 2	500	500	500							
BTX66 -100R	I_{TAV} = 70	100	100	500	*20	*1.0	125	0.6	10	0.5	< 7.5
-200R	$I_{T(RMS)}$ = 110	200	200	500	5	5					
-300R	I_{TRM} = 1000	300	300	500							
-400R	I_{TSM} = 900	400	400	500							
-500R	I_{EGM} = 2	500	500	500							
BTX67 -100R	I_{TAV} = 70	100	100	600	*20	*1.0	125	0.4	10	0.5	< 7.5
-200R	$I_{T(RMS)}$ = 110	200	200	600	5	5					
-300R	I_{TRM} = 1000	300	300	600							
-400R	I_{TSM} = 900	400	400	600							
-500R	I_{FGM} = 2	500	500	600							

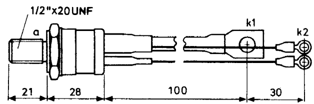
BTX68	**-500R**	$I_{TAV}=64$	500									
	-600R	$I_{TRM}=60$	600									
	-700R	$I_{TSM}=80$	700	$P_{RSM}=12$ kW		*10	*0.5	125	3.0	10	3	20
	-800R	$I_{FGM}=2$	800			5	5					
	-1000R		1000									
BTY79	**-100R**		100	100	500							
	-200R		200	200	500							
	-300R	$I_{TAV}=6.4$	300	300	500							
	-400R	$I_{T(RMS)}=10$	400	400	500	*10	*0.5					
	-500R	$I_{TRM}=57$	500	500	1100	5	5	125	3.0	10	3	15
	-600R	$I_{TSM}=80$	600	600	1100							
	-700R	$I_{FGM}=2$	700	700	1100							
	-800R		800	800	1100							
	-1000R		1000	1000	1100							



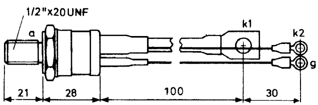
BTX49series



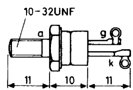
BTX64series



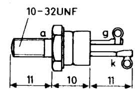
BTX66series



BTX67series



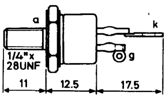
BTX68series



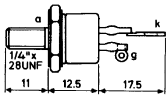
BTY79series

Type and applications	Ratings: I (A)	V_{RWM} V_{DWM} (V)	V_{DRM} (V)	V_{DSM} (V)	$*V_{FGM}$ V_{RGM} (V)	$*P_{GAV}$ P_{GM} (W)	T_j (°C)	$R_{th\,j-mb}$ (°C/W)	I_H (mA)	t_{on} (μs)	t_q (μs)
BTY87 -100R		100	100	500							
-200R		200	200	500							
-300R	I_{TAV} = 12	300	300	500	*10	*0.5					
-400R	$I_{T(RMS)}$ = 19	400	400	500	5	5	125	1.6	10	2	10
-500R	I_{TRM} = 140	500	500	850							
-600R	I_{TSM} = 140	600	600	850							
-700R	I_{FGM} = 2	700	700	850							
-800R		800	800	850							
BTY91 -100R		100	100	500							
-200R		200	200	500							
-300R	I_{TAV} = 16	300	300	500							
-400R	$I_{T(RMS)}$ = 25	400	400	500	*10	*0.5	125	1.6	10	2	10
-500R	I_{TRM} = 200	500	500	850	5	5					
-600R	I_{TSM} = 200	600	600	850							
-700R	I_{FGM} = 2	700	700	850							
-800R		800	800	850							
BTY95 -100R		100	100	850							
-200R		200	200	850							
-300R	I_{TAV} = 50	300	300	850							
-400R	$I_{T(RMS)}$ = 78	400	400	850	*10	*0.5	125	0.6	10	3	10
-500R	I_{TRM} = 700	500	500	850	5	5					
-600R	I_{TSM} = 680	600	600	850							
-700R	I_{FGM} = 2	700	700	850							
-800R		800	800	850							

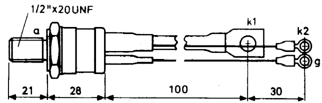
BTY99	**-100R**		100	100	850							
	-200R		200	200	850							
	-300R	I_{TAV} = 70	300	300	850							
	-400R	$I_{T(RMS)}$ = 110	400	400	850	*10	*0.5					
	-500R	I_{TRM} = 1000	500	500	850	5	5	125	0.4	10	3	10
	-600R	I_{TSM} = 900	600	600	850							
	-700R	I_{FGM} = 2	700	700	850							
	-800R		800	800	850							



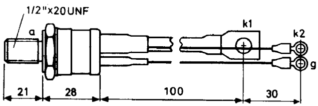
BTY87series



BTY91series



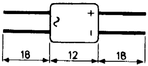
BTY95series



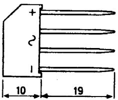
BTY99series

RECTIFIER STACKS

Type and applications	Ratings I_O (A)	I_{ORM} (A)	I_{ISM} (A)	$V_{I(RMS)}$ (V)	V_{IWM} (V)	V_{IRM} (V)	V_{ISM} (V)	P_{IRM} (kW)	P_{ISM} (kW)
BY122	0.8	3	15	42	60	120	120	—	—
BY123	0.7	3	15	280	400	800	800	—	—
BY164	1.4	5	25	42	60	120	120	—	—
BYX24	0.8	3	15	565	800	1600	1600	—	—
OSB9110 -4 -6 . . . -28 -30	12	120	85	1400 2100 . . . 9800 10500	2000 3000 . . . 14000 15000	—	—	3 4.5 . . . 21 22.5	6 9 . . . 42 45
OSB9210 -4 -6 . . . -28 -30	40	-440	360	1400 2100 . . . 9800 10500	2000 3000 . . . 14000 15000	—	—	10 15 . . . 70 75	26 39 . . . 182 195
OSH02 -200 -400 -800	2.0	15	18.5	140 280 560	200 400 800	300 600 1200	300 600 1200	—	



BY122
BY123
BYX24

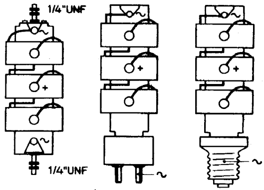


BY164

OSB9110-nA
OSB9210-nA

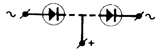
OSB9110-nB
OSB9210-nB

OSB9110-nC
OSB9210-nC

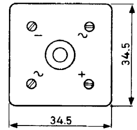


base:
super jumbo
with bayonet

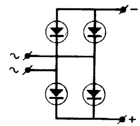
base:
goliath



centre tap

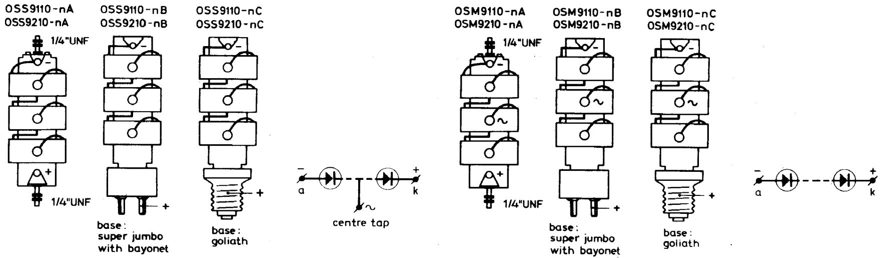


OSH02 series

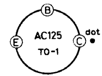
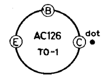
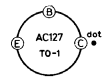
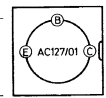
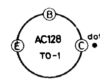


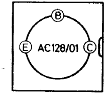
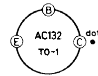
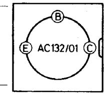
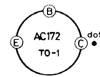
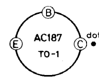
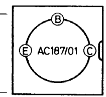
RECTIFIER STACKS

Type and applications	Ratings I_{FAV} (A)	I_{FRM} (A)	I_{FSM} (A)	V_{RWM} (kV)	P_{RRM} (kW)	P_{RSM} (kW)
OSM9110 -4				2	3	6
-6				3	4.5	9
. . .	3.5	120	85	. . .	. . .	. . .
-28				14	21	42
-30				15	22.5	45
OSM9210 -4				2	10	26
-6				3	15	39
. . .	20	440	360	. . .	. . .	. . .
-28				14	70	182
-30				15	75	195
OSS9110 -3				3	4.5	9
-4				4	6	12
. . .	6	120	85	. . .	. . .	. . .
-29				29	43.5	87
-30				30	45	90
OSS9210 -3				3	15	39
-4				4	20	52
. . .	20	440	360	. . .	. . .	. . .
-29				29	145	377
-30				30	150	390

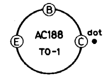
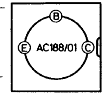
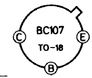
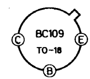
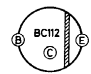

OSS9110-nA
OSS9210-nA
1/4"UNF
1/4"UNF
OSS9110-nB
OSS9210-nB
base:
super jumbo
with bayonet
OSS9110-nC
OSS9210-nC
base:
goliath
a
k
centre tap
OSM9110-nA
OSM9210-nA
1/4"UNF
1/4"UNF
OSM9110-nB
OSM9210-nB
base:
super jumbo
with bayonet
OSM9110-nC
OSM9210-nC
base:
goliath
a
k

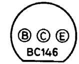
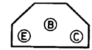
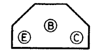
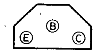
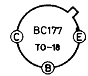
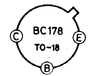
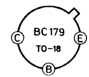
LOW FREQUENCY TRANSISTORS

Type and applications	Characteristics (mA; V; pF; MHz; dB; Ω; $\mu\Omega^{-1}$) $^*I_E$ / I_C	$^*V_{CB}$ / V_{CE}	parameter	$^*I_E$ / I_C	$^*V_{CB}$ / V_{CE}	parameter	$^*I_E$ / I_C	$^*V_{CB}$ / V_{CE}	parameter	Outlines (mm)	
AC125	*0	*−10	$-I_{CBO}<0.01$	*0	*−5	$C_c<50$	−0.5	−5	$F<10$	length <9.4	
p-n-p	−2	−5	$h_{FE}=100$	−10	−2	$f_T=1.7$	−2	−5	$h_{fe}<170$	width <6.1	
driver	*Ratings* (mA; V; mW; °C)									leads >38	
	$-I_C=100$		$-V_{CEO}=12$	$P_{tot}=500$		$T_j=90$	$R_{th\,j-a}=0.3$°C/mW				
AC126	*0	*−10	$-I_{CBO}<0.01$	*0	*−5	$C_c<50$	−0.5	−5	$F<10$	length <9.4	
p-n-p	−2	−5	$h_{FE}=140$	−10	−2	$f_T=2.3$	−2	−5	$h_{fe}<300$	width <6.1	
driver	*Ratings* (mA; V; mW; °C)									leads >38	
	$-I_C=100$		$-V_{CEO}=12$	$P_{tot}=500$		$T_j=90$	$R_{th\,j-a}=0.3$°C/mW				
AC127	*0	*0.5	$I_{CBO}<0.01$	*0	*5	$C_c=70$	0.5	5	$F<10$	length <9.4	
n-p-n	20	*0	$h_{FE}=100$	10	2	$f_T=2.5$				width <6.1	
driver	*Ratings* (mA; V; mW; °C)									leads >38	
output	$I_C=500$		$V_{CEO}=12$	$P_{tot}=340$		$T_j=90$	$R_{th\,j-a}=0.37$°C/mW				
	Matched pair		AC127/AC128	$\|I_C\|=300$		$V_{CB}=0$	$h_{FE1}/h_{FE2}=1.1$				
	Matched pair		AC127/AC132	$\|I_C\|=50$		$V_{CB}=0$	$h_{FE1}/h_{FE2}=1.1$				
AC127/01	Equivalent to AC127 except for:						$R_{th\,j-a}=0.25$°C/mW			length <15.7	
										width <7.2	
										leads >38	
AC128	*0	*−10	$-I_{CBO}<0.01$	−50	*0	$h_{FE}<175$	−10	−2	$f_T=1.5$	length <9.4	
p-n-p	*0	*−32	$-I_{CBO}<0.2$	*0	*−5	$C_c=100$	−60	−9	$h_{fe}=125$	width <6.1	
output	*Ratings* (mA; V; mW; °C)									leads >38	
	$-I_{CM}=2000$		$-V_{CEO}=16$	$P_{tot}=1000$		$T_j=90$	$R_{th\,j-a}=0.29$°C/mW				
	Matched pair		2−AC128	$-I_C=300$		$V_{CB}=0$	$h_{FE1}/h_{FE2}=1.1$				

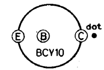
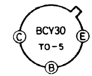
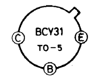
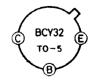
AC128/01	Equivalent to AC128 except for:						$R_{th\,j-a}=0.18\,°C/mW$			length < 15.7 width < 7.2 leads > 38	
AC132 p-n-p output	*0 *200	*−0.5 *0	$-I_{CBO}<0.01$ $V_{EB}<0.55$	−20 *0	*0 *−5	$h_{FE}=135$ $C_c=40$	−10 −0.5	−2 −5	$f_T=2$ $F<10$	length < 9.4 width < 6.1 leads > 38	
	Ratings (mA; V; mW; °C)										
	$-I_C=200$		$-V_{CEO}=12$	$P_{tot}=500$		$T_j=90$	$R_{th\,j-a}=0.30\,°C/mW$				
	Matched pair 2-AC132			$-I_C=200$		$V_{CB}=0$	$h_{FE1}/h_{FE2}=1.1$				
AC132/01	Equivalent to AC132 except for:						$R_{th\,j-a}=0.19\,°C/mW$			length < 15.7 width < 7.2 leads > 38	
AC172 n-p-n pre- amplifier	*0 1	*10 *5	$I_{CBO}<0.01$ $h_{FE}=110$	*0 10	*5 2	$C_c=70$ $f_T=2.5$	0.5 0.5	5 5	$F<4$ $h_{fe}<110$	length < 9.4 width < 6.1 leads > 38	
	Ratings (mA; V; mW; °C)										
	$I_C=10$		$V_{CEO}=12$	$P_{tot}=200$		$T_j=90$	$R_{th\,j-a}=0.37\,°C/mW$				
AC187 n-p-n medium power	*0 5	*25 10	$I_{CBO}<0.1$ $V_{BE}<0.135$	5 300	10 1	$h_{FE}>70$ $h_{FE}<500$	*0 10	*5 2	$C_c<180$ $f_T=5$	length < 9.4 width < 6.1 leads > 38	
	Ratings (mA; V; mW; °C)										
	$I_{CM}=2000$		$V_{CEO}=15$	$P_{tot}=800$		$T_j=90$	$R_{th\,j-a}=0.29\,°C/mW$				
	Matched pair AC187/AC188			$\|I_C\|=500$		$\|V_{CE}\|=1$	$h_{FE1}/h_{FE2}<1.25$				
AC187/01	Equivalent to AC187 except for:						$R_{th\,j-a}=0.18\,°C/mW$			length < 15.7 width < 7.2 leads > 38	

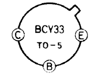
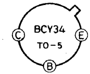
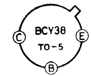
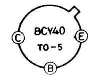
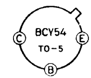
LOW FREQUENCY TRANSISTORS

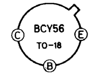
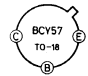
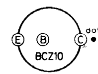
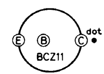
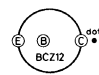
Type and applications	Characteristics (mA; V; pF; MHz; dB; Ω; $\mu\Omega^{-1}$) $^*I_E$ / I_C	$^*V_{CB}$ / V_{CE}	parameter	$^*I_E$ / I_C	$^*V_{CB}$ / V_{CE}	parameter	$^*I_E$ / I_C	$^*V_{CB}$ / V_{CE}	parameter	Outlines (mm)	
AC188	*0	*−25	$I_{CBO}<0.2$	−5	−10	$h_{FE}>70$	*0	*−5	$C_c<110$	length <9.4	
p-n-p	−5	−10	$-V_{BE}<0.145$	−300	−1	$h_{FE}<500$	−10	−2	$f_T=1.5$	width <6.1	
medium	*Ratings* (mA; V; mW; °C)									leads >38	
power	$-I_{CM}=2000$		$-V_{CEO}=15$	$P_{tot}=800$		$T_j=90$	$R_{th\,j-a}=0.29$°C/mW				
AC188/01	Equivalent to AC188 except for:						$R_{th\,j-a}=0.18$°C/mW			length <15.1 width <7.2 leads >38	
BC107(-A)(-B)	*0	*20	$I_{CBO}<15\ \mu A$	*0	*10	$C_c<4.5$	0.2	5	$F=2$	length <5.3	
n-p-n	2	5	$h_{fe}<500$	10	5	$f_T=300$	2	5	$A: h_{FE}<220$	width <4.8	
driver	*Ratings* (mA; V; mW; °C)								$B: h_{FE}<450$	leads >12.7	
	$I_{CM}=200$		$V_{CEO}=45$	$P_{tot}=300$		$T_j=175$	$R_{th\,j-a}=0.5$°C/mW				
BC108(-A)(-B)(-C)	Equivalent to BC107(-A)(-B) except for: $V_{CEO}=20$ V						2	5	$A,B: h_{fe}<900$		
							2	5	$C: h_{FE}<800$		
BC109(-B)(-C)	*0	*20	$I_{CBO}<15\ \mu A$	*0	*10	$C_c<4.5$	0.2	5	$F<4$	length <5.3	
n-p-n	2	5	$h_{fe}<900$	10	5	$f_T=300$	2	5	$B: h_{FE}<450$	width <4.8	
input	*Ratings* (mA; V; mW; °C)								$C: h_{FE}<800$	leads >12.7	
	$I_{CM}=200$		$V_{CEO}=20$	$P_{tot}=300$		$T_j=175$	$R_{th\,j-a}=0.5$°C/mW				
BC112	2	1	$V_{BE}=0.65$	*0	*5	$C_c=4$	2	5	$f_T=150$	length <2	
n-p-n red:	2	1	$h_{FE}>100$	0.2	5	$F=2$	0.2	0.5	$h_{fe}=130$	width <1.8	
yellow:	2	1	$h_{FE}>140$	0.2	5	$F<4$	0.2	0.5	$h_{fe}=220$	leads >18	
green:	2	1	$h_{FE}>280$	0.2	5	$F=2$	0.2	0.5	$h_{fe}=380$		
	Ratings (mA; V; mW; °C)										
	$I_{CM}=50$		$V_{CEO}=20$	$P_{tot}=50$		$T_j=125$	$R_{th\,j-a}=1.6$°C/mW				

BC146	Equivalent to BC112 except for:	2	1	$V_{BE}=0.63$							
BC147 n-p-n driver	2	5	$h_{fe}<500$	10	5	$f_T=300$	0.2	5	$F=2$	height < 5.1 width < 7.6 depth < 4.6 leads < 5.5	 BC147
	Ratings (mA; V; mW; °C)										
	$I_{CM}=200$		$V_{CEO}=45$	$P_{tot}=220$		$T_j=125$	$R_{th\,j-a}=0.45$°C/mW				
BC148 n-p-n driver jungle	2	5	$h_{fe}<900$	10	5	$f_T=300$	0.2	5	$F=2$	height < 5.1 width < 7.6 depth < 4.6 leads < 5.5	 BC148
	Ratings (mA; V; mW; °C)										
	$I_{CM}=200$		$V_{CEO}=20$	$P_{tot}=220$		$T_j=125$	$R_{th\,j-a}=0.45$°C/mW				
BC149 n-p-n input hi-fi	2	5	$h_{fe}<900$	10	5	$f_T=300$	0.2	5	$F<4$	height < 5.1 width < 7.6 depth < 4.6 leads < 5.5	 BC149
	Ratings (mA; V; mW; °C)										
	$I_{CM}=200$		$V_{CEO}=20$	$P_{tot}=220$		$T_j=125$	$R_{th\,j-a}=0.45$°C/mW				
BC177 p-n-p driver audio ampl.	*0	*−20	$-I_{CBO}<100$ nA	*0	*−10	$C_c=4.5$	−2	−5	$h_{fe}<260$	length < 5.3 width < 4.8 leads > 12.7	
	−2	−5	$-V_{BE}<0.75$	−0.2	−5	$F<10$					
	−2	−5	$h_{FE}=140$	−10	−5	$f_T=130$					
	Ratings (mA; V; mW; °C)										
	$-I_{CM}=200$		$-V_{CEO}=45$	$P_{tot}=300$		$T_j=175$	$R_{th\,j-a}=0.5$°C/mW				
BC178(-A)	Equivalent to BC177 except for:					$-V_{CEO}=25$	−2	−5	$h_{FE}=180$		
BC178(-B)	Equivalent to BC177 except for:					$-V_{CEO}=25$	−2 −2	−5 −5	$h_{FE}=290$ $h_{fe}<500$		
BC179(-A)	Equivalent to BC178(-A) except for:					$-V_{CEO}=20$	−0.2	−5	$F<4$		
BC179(-B)	Equivalent to BC178(-B) except for:					$-V_{CEO}=20$	−0.2	−5	$F<4$		

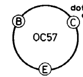
LOW FREQUENCY TRANSISTORS

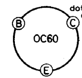
Type and applications	Characteristics (mA; V; pF; MHz; dB; Ω; $\mu\Omega^{-1}$) *I_E / I_C	*V_{CB} / V_{CE}	parameter	*I_E / I_C	*V_{CB} / V_{CE}	parameter	*I_E / I_C	*V_{CB} / V_{CE}	parameter	Outlines (mm)	
BCY10	*0	*−6	$-I_{CBO}<100$ nA	−150	−1	$h_{FE}=15$	−0.5	−2	$F<20$	length < 15.7	
p-n-p	−30	−2	$h_{FE}=24$	−1	−6	$f_T=1.5$	−10	−6	$h_{fe}=40$	width < 6.0	
medium	*Ratings* (mA; V; mW; °C)									leads > 37	
power	$-I_{CM}=500$		$-V_{CES}=32$	$P_{tot}=415$		$T_j=150$	$R_{th\,j-a}=0.4$°C/mW				
BCY11	Equivalent to BCY10 except for:					$-V_{CES}=60$ V					
BCY12	Equivalent to BCY10 except for:										
	−30	−2	$h_{FE}=40$	−150	−1	$h_{FE}=25$	−1	−6	$f_T=2$		
BCY30	*0	*−6	$-I_{CBO}<50$ nA	*0	*−6	$C_c<60$	*0.5	−2	$F<20$	length < 6.6	
p-n-p	−20	−4.5	$h_{FE}<35$	−1	−6	$f_T=1.2$	−1	−6	$h_{fe}<35$	width < 9.4	
switch	*Ratings* (mA; V; mW; °C)									leads > 38	
general	$-I_{CM}=100$		$-V_{CEO}=50$	$P_{tot}=250$		$T_j=150$	$R_{th\,j-a}=0.5$°C/mW				
BCY31	*0	*−6	$-I_{CBO}<50$ nA	*0	*−6	$C_c<60$	*0.5	−2	$F<20$	length < 6.6	
p-n-p	−20	−4.5	$h_{FE}<60$	−1	−6	$f_T=1.7$	−1	−6	$h_{fe}<60$	width < 9.4	
switch	*Ratings* (mA; V; mW; °C)									leads > 38	
general	$-I_{CM}=100$		$-V_{CEO}=50$	$P_{tot}=250$		$T_j=150$	$R_{th\,j-a}=0.5$°C/mW				
BCY32	*0	*−6	$-I_{CBO}<50$ nA	*0	*−6	$C_c<60$	*0.5	−2	$F<20$	length < 6.6	
p-n-p	−20	−4.5	$h_{FE}<70$	−1	−6	$f_T=2.5$	−1	−6	$h_{fe}<80$	width < 9.4	
switch	*Ratings* (mA; V; mW; °C)									leads > 38	
general	$-I_{CM}=100$		$-V_{CEO}=50$	$P_{tot}=250$		$T_j=150$	$R_{th\,j-a}=0.5$°C/mW				

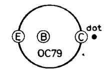
BCY33	*0	*−6	$-I_{CBO}<50$ nA	*0	*−6	$C_c<60$	*0.5	−2	$F<20$	length < 6.6	
p-n-p	−20	−4.5	$h_{FE}<35$	−1	−6	$f_T=1.5$	−1	−6	$h_{fe}<35$	width < 9.4	
switch	*Ratings* (mA; V; mW; °C)									leads > 38	
general	$-I_{CM}=100$		$-V_{CEO}=25$	$P_{tot}=250$		$T_j=150$	$R_{th\,j-a}=0.5$°C/mW				
BCY34	*0	*−6	$-I_{CBO}<50$ nA	*0	*−6	$C_c<60$	*0.5	−2	$F<20$	length < 6.6	
p-n-p	−20	−4.5	$h_{FE}<60$	−1	−6	$f_T=2.4$	−1	−6	$h_{fe}<60$	width < 9.4	
switch	*Ratings* (mA; V; mW; °C)									leads > 38	
general	$-I_{CM}=100$		$-V_{CEO}=25$	$P_{tot}=250$		$T_j=150$	$R_{th\,j-a}=0.5$°C/mW				
BCY38	*0	*−6	$-I_{CBO}<100$ nA	*0	*−6	$C_c<150$	−0.5	−2	$F<20$	length < 6.6	
p-n-p	−150	−1	$h_{FE}<30$	−1	−6	$f_T=1.5$	−10	−6	$h_{fe}<100$	width < 9.4	
switch	*Ratings* (mA; V; mW; °C)									leads > 38	
general	$-I_{CM}=500$		$-V_{CEO}=24$	$P_{tot}=410$		$T_j=150$	$R_{th\,j-a}=0.3$°C/mW				
BCY39	Equivalent to BCY38 except for:					$-V_{CEO}=60$	−150	−1	$h_{FE}<50$		
BCY40	*0	*−6	$-I_{CBO}<100$ nA	*0	*−6	$C_c<150$	−0.5	−2	$F<20$	length < 6.6	
p-n-p	−150	−1	$h_{FE}<120$	−1	−6	$f_T=2.5$	−10	−6	$h_{fe}<160$	width < 9.4	
switch	*Ratings* (mA; V; mW; °C)									leads > 38	
general	$-I_{CM}=500$		$-V_{CEO}=24$	$P_{tot}=410$		$T_j=150$	$R_{th\,j-a}=0.3$°C/mW				
BCY54	*0	*−6	$-I_{CBO}<100$ nA	*0	*−6	$C_c<150$	−0.5	−2	$F<20$	length < 6.6	
p-n-p	−150	−1	$h_{FE}<70$	−1	−6	$f_T=2.0$	−10	−6	$h_{fe}<120$	width < 9.4	
switch	*Ratings* (mA; V; mW; °C)									leads > 38	
general	$-I_{CM}=500$		$-V_{CEO}=50$	$P_{tot}=410$		$T_j=150$	$R_{th\,j-a}=0.3$°C/mW				

Type and applications	Characteristics (mA; V; pF; MHz; dB; Ω; $\mu\Omega^{-1}$) $*I_E$ / I_C	$*V_{CB}$ / V_{CE}	parameter	$*I_E$ / I_C	$*V_{CB}$ / V_{CE}	parameter	$*I_E$ / I_C	$*V_{CB}$ / V_{CE}	parameter	Outlines (mm)	
BCY56	*0	*20	$I_{CBO}<100$ nA	*0	*5	$C_c=4.5$	2	5	$h_{ie}=3500$	length < 5.3	
n-p-n	0.01	5	$h_{FE}>40$	10	5	$f_T=250$	2	5	$h_{fe}<500$	width < 4.8	
general	2	5	$h_{FE}<450$	0.2	5	$F<5$	2	5	$h_{oe}=17.5$	leads > 12.7	
	Ratings (mA; V; mW; °C)										
	$I_{CM}=100$		$V_{CEO}=45$	$P_{tot}=300$		$T_j=175$	$R_{th\,j-a}=0.5$°C/mW				
BCY57	*0	*20	$I_{CBO}<100$ nA	*0	*5	$C_c=4.5$	2	5	$h_{ie}=7500$	length < 5.3	
n-p-n	0.01	5	$h_{FE}>100$	10	5	$f_T=350$	2	5	$h_{fe}<900$	width < 4.8	
general	2	5	$h_{FE}<800$	0.2	5	$F<5$	2	5	$h_{oe}=35$	leads > 12.7	
	Ratings (mA; V; mW; °C)										
	$I_{CM}=100$		$V_{CEO}=20$	$P_{tot}=300$		$T_j=175$	$R_{th\,j-a}=0.5$°C/mW				
BCZ10	*0	* −10	$-I_{CBO}<100$ nA	−1	−6	$C_c<80$	−0.5	−2	$F=8.0$	length < 15.7	
p-n-p	−20	−4.5	$h_{FE}=17.5$	−1	−6	$f_{hfb}=1$	−1	−6	$h_{fe}<60$	width < 6.0	
general	Ratings (mA; V; mW; °C)									leads > 37	
	$-I_{CM}=50$		$-V_{CEO}=25$	$P_{tot}=250$		$T_j=150$	$R_{th\,j-a}=0.5$°C/mW				
BCZ11	*0	* −10	$-I_{CBO}<100$ nA	−1	−6	$C_c<80$	−0.5	−2	$F=6.0$	length < 15.7	
p-n-p	−20	−4.5	$h_{FE}=29$	−1	−6	$f_{hfb}=1.5$	−1	−6	$h_{fe}<60$	width < 6.0	
general	Ratings (mA; V; mW; °C)									leads > 37	
	$-I_{CM}=50$		$-V_{CEO}=25$	$P_{tot}=250$		$T_j=150$	$R_{th\,j-a}=0.5$°C/mW				
BCZ12	*0	* −10	$-I_{CBO}<100$ nA	−1	−6	$f_{hfb}=1$	−1	−6	$h_{fe}=15$	length < 15.7	
p-n-p	−1	−6	$C_c<80$	−0.5	−2	$F=8$				width < 6.0	
general	Ratings (mA; V; mW; °C)									leads > 37	
	$-I_{CM}=50$		$-V_{CEO}=60$	$P_{tot}=250$		$T_j=150$	$R_{th\,j-a}=0.5$°C/mW				

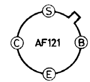
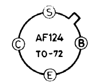
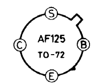
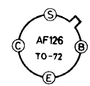
OC57	*0 *−2	$-I_{CBO}=1.5\ \mu A$	−0.25 −0.5	$h_{FE}=30$	*0.5 *−2	$F<10$	length < 4
p-n-p	−0.25 −0.5	$-V_{BE}=0.12$	−0.25 −0.5	$f_{hfe}>0.01$	−0.25 −0.5	$h_{fe}=35$	width < 3
hearing	*Ratings (mA; V; mW; °C)*						leads > 37
aids	$-I_{CM}=10$	$-V_{CEO}=3$	$P_{tot}=20$	$T_j=75$	$R_{th\,j-a}=1.5\,°C/mW$		
OC58	Equivalent to OC57 except for:				−0.25 −0.5	$h_{FE}=55$	
					−0.25 −0.5	$h_{fe}=55$	
OC59	Equivalent to OC57 except for:				−0.25 −0.5	$h_{FE}=70$	
					−0.25 −0.5	$h_{fe}=80$	
OC60	*0 *−2	$-I_{CBO}=1.5\ \mu A$	*0.5 *−2	$F<15$	−0.5 −2	$h_{fe}=60$	length < 4
p-n-p	−3 −2	$h_{FE}>60$					width < 3
hearing	*Ratings (mA; V; mW; °C)*						leads > 37
aids	$-I_{CM}=10$	$-V_{CEO}=3$	$P_{tot}=20$	$T_j=75$	$R_{th\,j-a}=1.5\,°C/mW$		
OC79	−50 −6	$h_{FE}<100$	−300 −1	$h_{FE}<75$	−50 −6	$f_{hfe}>0.008$	length < 15.7
p-n-p	*Ratings (mA; V; mW; °C)*						width < 6.0
driver	$-I_C=300$	$-V_{CEO}=13$	$P_{tot}=550$	$T_j=75$	$R_{th\,j-a}=0.22\,°C/mW$		leads > 37

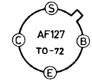
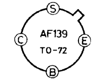
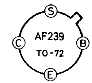
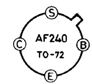
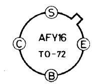




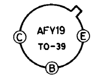
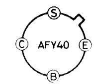
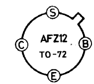
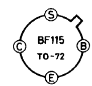


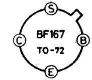
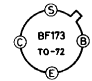
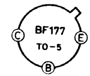
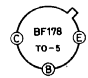
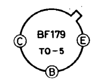
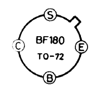
HIGH FREQUENCY TRANSISTORS

Type and applications	Characteristics ($mA; V; pF; MHz; dB; m\Omega^{-1}; \Omega; mW; \%$) $^*I_E$ / I_C	$^*V_{CB}$ / V_{CE}	parameter	$^*I_E$ / I_C	$^*V_{CB}$ / V_{CE}	parameter	$^*I_E$ / I_C	$^*V_{CB}$ / V_{CE}	parameter	Outlines (mm)	
AF121	*0	*−10	$-I_{CBO}<8\ \mu A$	−1	−10	$-C_{re}<0.65$	*2	*−5	$F<6$	length <9	
p-n-p	−3	−10	$h_{FE}=75$	−3	−10	$f_T=270$	−3	−10	$\|y_{fe}\|=80$	width <4.8	
tuners	*Ratings* ($mA; V; mW; °C$)									leads >12.7	
	$-I_{CM}=15$		$-V_{CER}=25$	$P_{tot}=140$		$T_j=75$	$R_{th\,j-a}=0.45°C/mW$				
AF124	*0	*−6	$-I_{CBO}<8\ \mu A$	−1	−6	$-C_{re}=1.5$	−1	−6	$h_{fe}=150$	length <5.3	
p-n-p	−1	−6	$-V_{BE}<0.33$	*1	*−6	$f_T=75$	*1	*−6	$\|y_{fb}\|=16$	width <4.8	
f.m.	*1	*−6	$h_{FE}=140$	*1	*−6	$F<9.5$	*1	*−6	$G_p=14$	leads >12.7	
	Ratings ($mA; V; mW; °C$)										
	$-I_C=10$		$-V_{CEO}=15$	$P_{tot}=60$		$T_j=75$	$R_{th\,j-a}=0.75°C/mW$				
AF125	*0	*−6	$-I_{CBO}<8\ \mu A$	*1	*−6	$f_T=75$	−1	−6	$\|y_{fe}\|=34$	length <5.3	
p-n-p	−1	−6	$-V_{BE}<0.33$	*1	*−6	$F=3$	−1	−6	$\|y_{re}\|=0.08$	width <4.8	
r.f.	*1	*−6	$h_{FE}=140$	*1	*−6	$F_c<5$	*1	*−6	$\|y_{fb}\|=15$	leads >12.7	
	−1	−6	$-C_{re}=1.5$	−1	−6	$h_{fe}=150$	*1	*−6	$G_p=13$		
	Ratings ($mA; V; mW; °C$)										
	$-I_C=10$		$-V_{CEO}=15$	$P_{tot}=60$		$T_j=75$	$R_{th\,j-a}=0.75°C/mW$				
AF126	*0	*−6	$-I_{CBO}<8\ \mu A$	*1	*−6	$f_T=75$	−1	−6	$h_{fe}=150$	length <5.3	
p-n-p	*1	*−6	$h_{FE}=140$	*1	*−6	$F<4.5$	−1	−6	$\|y_{fe}\|=32$	width <4.8	
i.f.	−1	−6	$-C_{re}=1.5$	*1	*−6	$F_c<5$	*1	*−6	$G_p=25$	leads >12.7	
	Ratings ($mA; V; mV; °C$)										
	$=10$		$-V_{CEO}=15$	$P_{tot}=60$		$T_j=75$	$R_{th\,j-a}=0.75°C/mW$				

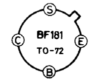
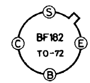
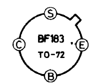
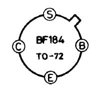
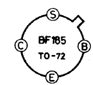
AF127	*0	*−6	$-I_{CBO} \sim 8\ \mu A$	−1	−6	$-C_{re}=1.5$	*1	*−6	$F_c<5$	length < 5.3	
p-n-p	−1	−6	$-V_{BE}<0.33$	*1	*−6	$f_T=75$	−1	−6	$\|y_{fe}\|=37$	width < 4.8	
i.f.	*1	*−6	$h_{FE}=140$	*1	*−6	$F<3$	*1	*−6	$G_p=42$	leads > 12.7	
r.f.	*Ratings (mA; V; mW; °C)*										
	$-I_C=10$		$-V_{CEO}=15$	$P_{tot}=60$		$T_j=75$	$R_{th\,j-a}=0.75°C/mW$				
AF139	*0	*−20	$-I_{CBO}<8\ \mu A$	−1.5	−12	$f_T=550$	*1.5	*−12	$G_{UM}=11.5$	length < 5.3	
p-n-p	*2	*−6	$h_{FE}=55$	*1.5	*−12	$F<8.2$	*1.5	*−12	$G_{tr}=11$	width < 4.8	
pre-ampl.	−1.5	−12	$-C_{re}=0.25$	*1.5	*−12	$\|y_{fb}\|=37$	*1.5	*−12	$G_{tr\,rev}=-23$	leads > 12.7	
mixer-	*Ratings (mA; V; mW; °C)*										
oscill.	$-I_{CM}=10$		$-V_{CEO}=15$	$P_{tot}=60$		$T_j=90$	$R_{th\,j-a}=0.75°C/mW$				
AF239	*0	*−20	$-I_{CBO}<8\ \mu A$	−2	−10	$-C_{re}=0.23$	*2	*−10	$\|y_{fb}\|=20$	length < 5.3	
p-n-p	*2	*−10	$V_{EB}=0.35$	−2	−10	$f_T=650$	*2	*−10	$G_{UM}=17$	width < 4.8	
tuner	*2	*−10	$h_{FE}=33$	*2	*−10	$F<6$	*2	*−10	$G_{tr}=14$	leads > 12.7	
	Ratings (mA; V; mW; °C)										
	$-I_{CM}=15$		$-V_{CEO}=15$	$P_{tot}=60$		$T_j=90$	$R_{th\,j-a}=0.75°C/mW$				
AF240	*0	*−20	$I_{CBO}<8\ \mu A$	−1	−10	$-C_{re}=0.26$	*2	*−10	$G_{tr}=14$	length < 5.3	
p-n-p	−2	−10	$-V_{BE}=0.37$	−2	−10	$f_T=650$				width < 4.8	
tuner	−2	−10	$h_{FE}=25$	*2	*−10	$F=5.5$				leads > 12.7	
	Ratings (mA; V; mW; °C)										
	$-I_{CM}=10$		$-V_{CEO}=15$	$P_{tot}=60$		$T_j=90$	$R_{th\,j-a}=0.75°C/mW$				
AFY16	*0	*−20	$-I_{CBO}<3\ \mu A$	−1.5	−12	$f_T=550$	*1.5	*−12	$G_{UM}=11.5$	length < 5.3	
p-n-p	*1.5	*−12	$h_{FE}=60$	*1.5	*−12	$F<8$	*1.5	*−12	$G_{tr}=11$	width < 4.8	
pre-ampl.	−1.5	−12	$-C_{re}=0.25$	*1.5	*−12	$\|y_{fb}\|=14$	*1.5	*−12	$G_{tr\,rev}=-23$	leads > 12.7	
	Ratings (mA; V; mW; °C)										
	$-I_{CM}=8$		$-V_{CEO}=25$	$P_{tot}=60$		$T_j=90$	$R_{th\,j-a}=0.75°C/mW$				

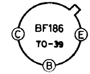
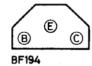
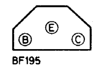
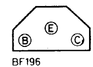
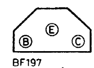
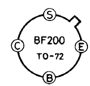
HIGH FREQUENCY TRANSISTORS

Type and applications	Characteristics (mA; V; pF; MHz; dB; $m\Omega^{-1}$; Ω; mW; %) *I_E / I_C	*V_{CB} / V_{CE}	parameter	*I_E / I_C	*V_{CB} / V_{CE}	parameter	*I_E / I_C	*V_{CB} / V_{CE}	parameter	Outlines (mm)	
AFY19	*0	*−10	$-I_{CBO}<0.01$	*0	*−10	$C_c=12$	*80	*−12	$P_o>500$	length < 6.6	
p-n-p	*80	*−12	$h_{FE}=80$	*100	*−5	$f_T=350$	*80	*−12	$G_p>10$	width < 8.5	
transmitter	Ratings (mA; V; mW; °C)									leads > 12.7	
	$-I_{CM}=300$		$-V_{CES}=32$	$P_{tot}=800$		$T_j=90$	$R_{th\,j-a}=0.25$°C/mW				
AFY40	*0	*−20	$-I_{CBO}<8\ \mu A$	*4	*−20	$h_{FE}>10$	*1.5	*−12	$F=7$	length < 9	
p-n-p	*4	*−20	$V_{EB}<0.45$	−1	−12	$-C_{re}=0.25$	*4	*−20	$P_o=2.7$	width < 4.8	
output	*1.5	*−12	$h_{FE}=50$	−6	−12	$f_T=700$	*4	*−20	$G_{tr}=12$	leads > 12.7	
aerial	Ratings (mA; V; mW; °C)										
	$-I_{CM}=20$		$-V_{CEO}=20$	$P_{tot}=140$		$T_j=90$	$R_{th\,j-a}=0.55$°C/mW				
AFZ12	*0	*−6	$-I_{CBO}<6\ \mu A$	−1	−6	$-C_{re}<1.5$	−1	−6	$h_{fe}=70$	length < 5.3	
p-n-p	−1	−6	$-V_{BE}<0.38$	−1	−6	$f_T=180$	−1	−12	$\lvert y_{fe}\rvert=34$	width < 4.8	
v.h.f.	−1	−6	$h_{FE}=60$	−1	−12	$F<7.5$	*1	*−10	$\lvert y_{fb}\rvert=30$	leads > 12.7	
	Ratings (mA; V; mW; °C)										
	$-I_C=10$		$-V_{CEO}=10$	$P_{tot}=85$		$T_j=75$	$R_{th\,j-a}=0.6$°C/mW				
BF115	*−1	*10	$-V_{EB}<0.74$	1	10	$-C_{re}=0.65$	1	10	$F_c=2.5$	length < 5.3	
n-p-n	1	10	$h_{FE}<165$	1	10	$f_T=230$	1	10	$\lvert y_{fe}\rvert=30$	width < 4.8	
general	20	2	$h_{FE}>40$	1	10	$F=3.5$	*−1	*10	$\lvert y_{fb}\rvert=30$	leads > 12.7	
	Ratings (mA; V; mW; °C)										
	$I_{CM}=30$		$V_{CEO}=30$	$P_{tot}=145$		$T_j=175$	$R_{th\,j-a}=0.9$°C/mW				

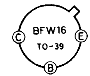
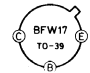
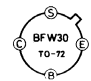
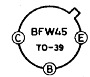
BF167	4	10	$V_{BE}=0.7$	4	10	$f_T=350$	4	10	$G_{UM}=42$	length < 5.3	
n-p-n	4	10	$h_{FE}=57$	4	10	$F=3$	4	10	$G_{tr}=26$	width < 4.8	
gain-control	1	10	$-C_{re}=0.15$	4	10	$\|y_{fe}\|=95$	4	10	$\Delta G_{tr}=60$	leads > 12.7	
video	*Ratings* (mA; V; mW; $°C$)										
	$I_{CM}=25$		$V_{CEO}=30$	$P_{tot}=130$		$T_j=175$	$R_{th\,j-a}=1.0°C/mW$				
BF173	7	10	$h_{FE}=85$	5	10	$f_T=550$	7	10	$G_{UM}=42.5$	length < 5.3	
n-p-n	1	10	$-C_{re}=0.23$	7	10	$\|y_{fe}\|=145$	7.2	16.6	$G_{tr}=26$	width < 4.8	
video	*Ratings* (mA; V; mW; $°C$)									leads > 12.7	
output	$I_{CM}=25$		$V_{CEO}=25$	$P_{tot}=260$		$T_j=175$	$R_{th\,j-a}=0.65°C/mW$				
BF177	15	10	$V_{BE}<1.2$	10	20	$-C_{re}<3.5$				length < 6.6	
n-p-n	15	10	$h_{FE}>20$	10	10	$f_T=120$				width < 8.5	
t.v.	*Ratings* (mA; V; mW; $°C$)									leads > 38.1	
	$I_{CM}=50$		$V_{CEO}=60$	$P_{tot}=600$		$T_j=200$	$R_{th\,j-a}=220°C/mW$				
BF178	30	20	$V_{BE}<1.2$	10	20	$-C_{re}<3.5$				length < 6.6	
	30	20	$h_{FE}>20$	10	10	$f_T=120$				width < 8.5	
	Ratings (mA; V; mW; $°C$)									leads > 38.1	
	$I_{CM}=50$		$V_{CEO}=115$	$P_{tot}=600$		$T_j=200$	$R_{th\,j-a}=220°C/mW$				
BF179	20	15	$V_{BE}<1.2$	10	20	$-C_{re}<3.5$				length < 6.6	
	20	15	$h_{FE}>20$	10	10	$f_T=120$				width < 8.5	
	Ratings (mA; V; mW; $°C$)									leads > 38.1	
	$I_{CM}=50$		$V_{CEO}=115$	$P_{tot}=600$		$T_j=200$	$R_{th\,j-a}=220°C/mW$				
BF180	*−2	*10	$h_{FE}=45$	2	10	$f_T=675$	*−2	*10	$G_{UM}=24$	length < 5.3	
n-p-n	1	10	$-C_{re}=0.28$	*−2	*10	$F=4.5$	*−2	*10	$G_{tr}=16.5$	width < 4.8	
television	*Ratings* (mA; V; mW; $°C$)									leads > 12.7	
tuner	$I_{CM}=20$		$V_{CEO}=20$	$P_{tot}=150$		$T_j=175$	$R_{th\,j-a}=1°C/mW$				

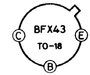
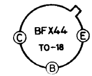
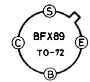
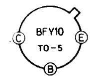
HIGH FREQUENCY TRANSISTORS

Type and applications	Characteristics (mA; V; pF; MHz; dB; $m\Omega^{-1}$; Ω; mW; %)									Outlines (mm)	
	$^*I_E$ / I_C	$^*V_{CB}$ / V_{CE}	parameter	$^*I_E$ / I_C	$^*V_{CB}$ / V_{CE}	parameter	$^*I_E$ / I_C	$^*V_{CB}$ / V_{CE}	parameter		
BF181	$^*-2$	^{*10}	$h_{FE}=28.5$	2	10	$f_T=600$	$^*-2$	^{*10}	$G_{UM}=11$	length < 5.3	
n-p-n	1	10	$-C_{re}=0.28$	$^*-2$	^{*10}	$\|y_{fb}\|=25$	$^*-2$	^{*10}	$G_{tr}=8$	width < 4.8	
u.h.f.	*Ratings* (mA; V; mW; °C)									leads > 12.7	
	$I_{CM}=20$		$V_{CEO}=20$	$P_{tot}=150$		$T_j=175$	$R_{th\,j-a}=1$°C/mW				
BF182	$^*-2$	^{*10}	$-V_{EB}=0.77$	2	10	$f_T=650$	$^*-2$	^{*10}	$\|y_{rb}\|=1.3$	length < 5.3	
n-p-n	$^*-2$	^{*10}	$h_{FE}=20$	$^*-2$	^{*10}	$F=7.4$	$^*-2$	^{*10}	$G_{UM}=11$	width < 4.8	
integrated	1	10	$-C_{re}=0.33$	$^*-2$	^{*10}	$\|y_{fb}\|=18$	$^*-2$	^{*10}	$G_{tr}=10$	leads > 12.7	
tuner	*Ratings* (mA; V; mW; °C)										
	$I_{CM}=15$		$V_{CEO}=20$	$P_{tot}=150$		$T_j=175$	$R_{th\,j-a}=1$°C/mW				
BF183	$^*-3$	^{*10}	$h_{FE}=25$	3	10	$f_T=800$	$^*-3$	^{*10}	$G_{UM}=13$	length < 5.3	
n-p-n	1	10	$-C_{re}=0.33$	$^*-3$	^{*10}	$\|y_{fb}\|=18$	$^*-3$	^{*10}	$G_{tr}=12$	width < 4.8	
integrated	*Ratings* (mA; V; mW; °C)									leads > 12.7	
tuner	$I_{CM}=15$		$V_{CEO}=20$	$P_{tot}=150$		$T_j=175$	$R_{th\,j-a}=1$°C/mW				
BF184	1	10	$V_{BE}<0.74$	1	10	$-C_{re}=0.65$	1	10	$F_c=3$	length < 5.3	
n-p-n	1	10	$h_{FE}=115$	1	10	$f_T=300$	1	10	$\|y_{fe}\|=35$	width < 4.8	
i.f.	*Ratings* (mA; V; mW; °C)									leads > 12.7	
	$I_{CM}=30$		$V_{CEO}=20$	$P_{tot}=145$		$T_j=175$	$R_{th\,j-a}=0.9$°C/mW				
BF185	1	10	$V_{BE}<0.74$	1	10	$-C_{re}=0.65$	1	10	$F=4$	length < 5.3	
n-p-n	1	10	$h_{FE}=67$	1	10	$f_T=220$	$^*-1$	^{*10}	$\|y_{fb}\|=33$	width < 4.8	
pre-ampl.	*Ratings* (mA; V; mW; °C)									leads > 12.7	
	$I_{CM}=30$		$V_{CEO}=20$	$P_{tot}=145$		$T_j=175$	$R_{th\,j-a}=0.9$°C/mW				

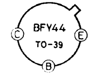
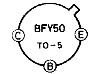
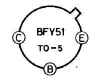
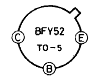
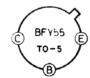
BF186	40	20	$V_{BE}<1.2$	10	20	$-C_{re}<3.5$				length < 6.6	
n-p-n	40	20	$h_{FE}>20$	10	10	$f_T=120$				width < 8.5	
t.v. output	*Ratings* (mA; V; mW; $°C$)									leads > 12.7	
luminance ampl.	$I_{CM}=60$		$V_{CBO}=190$	$P_{tot}=2.75$		$T_j=200$	$R_{th\,j-a}=200°C/mW$				
BF194	1	10	$h_{FE}=115$	1	10	$f_T=260$	1	10	$F_c=2$	length < 7.6	
n-p-n	1	10	$-C_{re}=0.95$	1	10	$F=1.2$	−1	10	$\lvert y_{fb}\rvert=33$	width < 4.6	
radio	*Ratings* (mA; V; mW; $°C$)									height < 5.1	
television	$I_{CM}=30$		$V_{CEO}=20$	$P_{tot}=220$		$T_j=125$	$R_{th\,j-a}=0.45°C/mW$			lock-fit	
BF195	1	10	$h_{FE}=67$	1	10	$f_T=200$	1	10	$F_c=2.5$	length < 7.6	
n-p-n	1	10	$-C_{re}=0.95$	1	10	$F=3.5$	−1	10	$\lvert y_{fb}\rvert=34$	width < 4.6	
radio	*Ratings* (mA; V; mW; $°C$)									height < 5.1	
television	$I_{CM}=30$		$V_{CEO}=20$	$P_{tot}=220$		$T_j=125$	$R_{th\,j-a}=0.45°C/mW$			lock-fit	
BF196	4	10	$V_{BE}<0.84$	1	10	$-C_{re}=0.2$	4	10	$\lvert y_{fe}\rvert=100$	length < 7.6	
n-p-n	6	2	$h_{FE}>20$	4	10	$f_T=400$	4	10	$G_{UM}=40$	width < 4.6	
gain-control	15	5	$h_{FE}>10$	4	10	$F=3$	4	a.g.c.	$G_{tr}=25.5$	leads < 5.1	
video	*Ratings* (mA; V; mW; $°C$)						4	a.g.c.	$\Delta G_{tr}=60$	lock-fit	
		$I_{CM}=25$		$V_{CEO}=30$		$P_{tot}=250$	$T_j=250$		$R_{th\,j-a}=0.4°C/mW$		
BF197	7	10	$V_{BE}<0.9$	1	10	$-C_{re}=0.3$	7	10	$\lvert y_{fe}\rvert=170$	length < 7.6	
n-p-n	7	10	$h_{FE}>38$	5	10	$f_T=550$	7	10	$G_{UM}=43$	width < 4.6	
video	*Ratings* (mA; V; mW; $°C$)									leads < 5.1	
output	$I_{CM}=25$		$V_{CEO}=25$	$P_{tot}=250$		$T_j=125$	$R_{th\,j-a}=0.4°C/mW$			lock-fit	
BF200	* −3	*10	$h_{FE}=30$	* −3	*10	$F=2.7$	* −3	*10	$G_{UM}=22$	length < 5.3	
n-p-n	1	10	$-C_{re}=0.28$	2	10	$\lvert y_{fe}\rvert=56$	* −2	*10	$G_{UM}=28$	width < 4.8	
gain-control	* −3	*10	$f_T=650$	* −3	*10	$\lvert y_{fb}\rvert=70$	* −3	a.g.c.	$G_{tr}=13$	leads > 12.7	
tuner	*Ratings* (mA; V; mW; $°C$)										
	$I_{CM}=20$		$V_{CEO}=20$	$P_{tot}=150$		$T_j=175$	$R_{th\,j-a}=1°C/mW$				

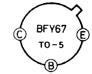
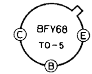
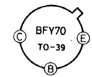
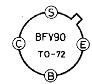
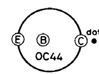
HIGH FREQUENCY TRANSISTORS

Type and applications	*Characteristics (mA; V; pF; MHz; dB; mΩ^{-1}; Ω; mW; %)* $*I_E$ / I_C	$*V_{CB}$ / V_{CE}	*parameter*	$*I_E$ / I_C	$*V_{CB}$ / V_{CE}	*parameter*	$*I_E$ / I_C	$*V_{CB}$ / V_{CE}	*parameter*	*Outlines (mm)*	
BFW10	See section: FIELD EFFECT TRANSISTORS										
BFW11	See section: FIELD EFFECT TRANSISTORS										
BFW16	*0	*20	$I_{CBO}<0.02$	150	15	$f_T=1200$	30	15	$F<6$	length < 6.6	
n-p-n	50	5	$h_{FE}>25$	*0	*15	$C_c<4$	70	18	$G_p=16$	width < 8.5	
band I to V	150	5	$h_{FE}>25$	10	15	$-C_{re}=1.7$	70	18	$P_o=150$	leads > 12.7	
	Ratings (mA; V; mW; °C)										
	$I_{CM}=300$		$V_{CEO}=25$	$P_{tot}=1500$		$T_j=200$	$R_{th\,j-a}=250°C/W$				
BFW17	*0	*20	$I_{CBO}<0.02$	150	15	$f_T=1100$	70	18	$G_p=16$	length < 6.6	
n-p-n	50	5	$h_{FE}>25$	*0	*15	$C_c<4$	70	18	$P_o=150$	width < 8.5	
band I to III	150	5	$h_{FE}>25$	10	15	$-C_{re}=1.7$				leads > 12.7	
	Ratings (mA; V; mW; °C)										
	$I_{CM}=300$		$V_{CEO}=25$	$P_{tot}=1500$		$T_j=200$	$R_{th\,j-a}=250°C/W$				
BFW30	*0	*10	$I_{CBO}<50$ mA	50	5	$f_T=1600$	2	5	$F<5$	length < 5.3	
n-p-n	25	5	$h_{FE}>25$	*0	*5	$C_c<1.5$	30	5	$G_p=21$	width < 4.8	
wide band	50	5	$h_{FE}>25$	2	5	$-C_{re}=0.8$	30	6	$d_{im}=-60$	leads > 12.7	
amplifier	*Ratings (mA; V; mW; °C)*										
	$I_{CM}=100$		$V_{CEO}=10$	$P_{tot}=250$		$T_j=200$	$R_{th\,j-a}=0.7°C/mW$				
BFW45	*0	*100	$I_{CBO}<100$ mA	50	20	$h_{FE}>20$	*0	*20	$C_c<6$	length < 6.6	
n-p-n	50	20	$V_{BE}<1.3$	10	20	$-C_{re}<3.5$	10	10	$f_T=120$	width < 8.5	
horizontal defl.	*Ratings (mA; V; mW; °C)*									leads > 12.7	
oscilloscopes	$I_{CM}=100$		$V_{CEO}=130$	$P_{tot}=2500$		$T_j=200$	$R_{th\,j-a}=200°C/W$				

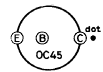
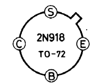
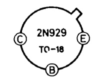
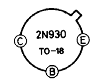
BFW61	See section: FIELD EFFECT TRANSISTORS										
BFX43	*0	*20	$I_{CBO}<100$ nA	*0	*5	$C_c<4$	40	10	$\|y_{fe}\|=108$	length < 5.3	
n-p-n	10	1	$h_{FE}<60$	10	10	$f_T>500$	40	10	$G_{tr}=10$	width < 4.8	
aerial	*Ratings (mA; V; mW; °C)*									leads > 12.7	
band I to III	$I_{CM}=250$		$V_{CEO}=15$	$P_{tot}=360$		$T_j=200$	$R_{th\,j-a}=0.48$ °C/mW				
BFX44	*0	*20	$I_{CBO}<100$ nA	100	1	$h_{FE}>20$	10	10	$f_T>500$	length < 5.3	
n-p-n	10	1	$h_{FE}<120$	*0	*5	$C_c<4$	100	3	$f_T>300$	width < 4.8	
wide-band	*Ratings (mA; V; mW; °C)*									leads > 12.7	
oscilloscope	$I_{CM}=250$		$V_{CEO}=15$	$P_{tot}=360$		$T_j=200$	$R_{th\,j-a}=0.48$ °C/mW				
BFX63	See section: FIELD EFFECT TRANSISTORS										
BFX89	25	1	$h_{FE}>20$	25	5	$f_T=1200$	8	10	$P_o=6$	length < 5.3	
n-p-n	*0	*10	$C_c<1.7$	2	5	$F<6.5$	8	10	$G_p=22$	width < 4.8	
v.h.f.	*Ratings (mA; V; mW; °C)*									leads > 12.7	
u.h.f.	$I_{CM}=50$		$V_{CEO}=15$	$P_{tot}=200$		$T_j=200$	$R_{th\,j-a}=0.88$ °C/mW				
BFY10	*0	*20	$I_{CBO}<2$ μA	*0	*10	$C_c<3$	5	5	$h_{fe}>20$	length < 6.6	
n-p-n	*−10	*5	$V_{BE}<1.5$	*−5	*10	$f_T=120$	5	10	$\|y_{fe}\|=22$	width < 8.5	
	*−10	*5	$h_{FE}<50$	*−5	*10	$F<40$	*−5	*10	$\|y_{fb}\|=22$	leads > 38	
	Ratings (mA; V; mW; °C)										
	$I_{CM}=75$		$V_{CEX}=45$	$P_{tot}=300$		$T_j=175$	$R_{th\,j-a}=0.5$ °C/mW				
BFY11	Equivalent to BFY10 except for:						*−10	*5	$h_{FE}<125$		
							5	5	$h_{fe}>35$		

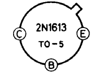
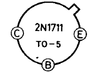
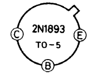
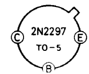
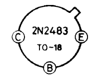
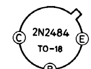
HIGH FREQUENCY TRANSISTORS

Type and applications	Characteristics (mA; V; pF; MHz; dB; $m\Omega^{-1}$; Ω; mW; %) $*I_E$ / I_C	$*V_{CB}$ / V_{CE}	parameter	$*I_E$ / I_C	$*V_{CB}$ / V_{CE}	parameter	$*I_E$ / I_C	$*V_{CB}$ / V_{CE}	parameter	Outlines (mm)	
BFY44	*0	*40	$I_{CBO} < 500$ nA	*0	*40	$C_c < 12$	—	40	$P_o = 2100$	length < 6.6	
n-p-n	150	10	$h_{FE} = 20$	100	10	$f_T = 210$	—	40	$G_p = 7$	width < 8.5	
v.h.f.	500	5	$h_{FE} = 20$	*−150	*24	$\lvert y_{fb}\rvert = 98$	—	40	$\eta = 50$	leads > 13	
transmitter	Ratings (mA; V; mW; °C)										
	$I_{CM} = 1000$		$V_{CEO} = 60$	$P_{tot} = 5000$		$T_j = 200$	$R_{th\,j-c} = 0.035$ °C/mW				
BFY50	*0	*60	$I_{CBO} < 50$ nA	*0	*12	$C_c < 12$	10	6	$h_{fe} = 45$	length < 6.6	
n-p-n	150	6	$h_{FE} = 55$	50	6	$f_T = 100$	1	6	$h_{fe} = 32$	width < 8.5	
general	Ratings (mA; V; mW; °C)									leads > 38	
	$I_{CM} = 1000$		$V_{CEO} = 35$	$P_{tot} = 4000$		$T_j = 200$	$R_{th\,j-a} = 0.22$ °C/mW				
BFY51	*0	*40	$I_{CBO} < 50$ nA	*0	*12	$C_c < 12$	10	6	$h_{fe} = 60$	length < 6.6	
n-p-n	150	6	$h_{FE} = 70$	50	6	$f_T = 110$	1	6	$h_{fe} = 42$	width < 8.5	
general	Ratings (mA; V; mW; °C)									leads > 38	
	$I_{CM} = 1000$		$V_{CEO} = 30$	$P_{tot} = 4000$		$T_j = 200$	$R_{th\,j-a} = 0.22$ °C/mW				
BFY52	*0	*30	$I_{CBO} < 50$ nA	*0	*12	$C_c < 12$	10	6	$h_{fe} = 120$	length < 6.6	
n-p-n	150	6	$h_{FE} = 130$	50	6	$f_T = 120$	1	6	$h_{fe} = 84$	width < 8.5	
general	Ratings (mA; V; mW; °C)									leads > 38	
	$I_{CM} = 1000$		$V_{CEO} = 20$	$P_{tot} = 4000$		$T_j = 200$	$R_{th\,j-a} = 0.22$ °C/mW				
BFY55	*0	*60	$I_{CBO} < 10$ nA	*0	*10	$C_c < 12$	10	6	$h_{fe} = 52$	length < 6.6	
n-p-n	150	10	$h_{FE} < 120$	50	10	$f_T > 60$	1	6	$h_{fe} = 36$	width < 8.5	
oscillator	Ratings (mA; V; mW; °C)									leads > 38	
	$I_{CM} = 1000$		$V_{CEO} = 35$	$P_{tot} = 4000$		$T_j = 200$	$R_{th\,j-a} = 0.22$ °C/mW				

BFY67	*0	*60	$I_{CBO}<10$ nA	500	10	$h_{FE}=43$	5	10	$h_{fe}<130$	length < 6.6	
n-p-n	1	5	$V_{BE}<0.9$	*0	*10	$C_c<25$	*−1	*5	$h_{ib}<34$	width < 8.5	
general	0.1	10	$h_{FE}=32$	50	10	$f_T=127$	*−5	*10	$h_{ib}<8$	leads > 38	
switch	10	10	$h_{FE}=73$	0.3	10	$F<12$	*−1	*5	$h_{ob}<0.0005$		
	150	10	$h_{FE}=62$	1	5	$h_{fe}<100$	*−5	*10	$h_{ob}<0.001$		
	Ratings (mA; V; mW; °C)										
	$I_{CM}=1000$		$V_{CEO}=30$	$P_{tot}=800$		$T_j=200$	$R_{th\,j-a}=0.22$ °C/mW				
BFY68	*0	*60	$I_{CBO}<10$ nA	500	10	$h_{FE}=80$	5	10	$h_{fe}<300$	length < 6.6	
n-p-n	1	5	$V_{BE}<0.9$	*0	*10	$C_c<25$	*−1	*5	$h_{ib}<34$	width < 8.5	
general	0.1	10	$h_{FE}=76$	50	10	$f_T=135$	*−5	*10	$h_{ib}<8$	leads > 38	
switch	10	10	$h_{FE}=148$	0.3	10	$F<8$	*−1	*5	$h_{ob}<0.0005$		
	150	10	$h_{FE}=135$	1	5	$h_{fe}<200$	*−5	*10	$h_{ob}<0.001$		
	Ratings (mA; V; mW; °C)										
	$I_{CM}=1000$		$V_{CEO}=30$	$P_{tot}=800$		$T_j=200$	$R_{th\,j-a}=0.22$ °C/mW				
BFY70	*0	*28	$I_{CBO}<500$ nA	*0	*28	$C_c<14$	—	28	$P_o=1500$	length < 6.6	
n-p-n	150	10	$h_{FE}=20$	100	10	$f_T=210$	—	28	$G_p=7$	width < 8.5	
v.h.f.	500	5	$h_{FE}=20$	*−150	*24	$\lvert y_{fb}\rvert=98$	—	28	$\eta=50$	leads > 13	
transmitter	*Ratings* (mA; V; mW; °C)										
	$I_{CM}=1000$		$V_{CEO}=40$	$P_{tot}=5000$		$T_j=200$	$R_{th\,j-c}=0.035$ °C/mW				
BFY90	*0	*15	$I_{CBO}<10$ nA	*0	*10	$C_c<1.5$	2	5	$\lvert y_{fe}\rvert=45$	length < 5.3	
n-p-n	2	1	$h_{FE}<150$	2	5	$f_T>1000$	2	5	$G_{UM}=22$	width < 4.8	
general	2	5	$-C_{re}<0.8$	2	5	$F<5$	14	10	$P_o=12$	leads > 12.7	
band	*Ratings* (mA; V; mW; °C)										
I to IV	$I_{CM}=50$		$V_{CEO}=15$	$P_{tot}=200$		$T_j=200$	$R_{th\,j-a}=0.88$ °C/mW				
OC44	*0	*−15	$-I_{CBO}<0.01$				*1	*−6	$f_{hfb}=15$	length < 15	
p-n-p	−1	−6	$-V_{BE}<0.185$				−1	−6	$\lvert y_{fe}\rvert=30$	width < 5.2	
mixer	*Ratings* (mA; V; mW; °C)									leads > 37	
oscillator	$-I_{CM}=10$		$-V_{CEO}=5$	$P_{tot}=85$		$T_j=75$	$R_{th\,j-a}=0.6$ °C/mW				

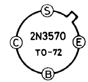
HIGH FREQUENCY TRANSISTORS

Type and applications	Characteristics (mA; V; pF; MHz; dB; mW) $^*I_E$ / I_C	$^*V_{CB}$ / V_{CE}	parameter	$^*I_E$ / I_C	$^*V_{CB}$ / V_{CE}	parameter	$^*I_E$ / I_C	$^*V_{CB}$ / V_{CE}	parameter	Outlines (mm)	
OC45	*0	*−15	$-I_{CBO}<0.01$				*1	*−6	$f_{hfb}=12$	length < 15	
p-n-p	−1	−6	$-V_{BE}<0.195$				−1	−6	$\lvert y_{fe}\rvert=28$	width < 5.2	
mixer-	*Ratings* (*mA*; *V*; *mW*; °*C*)									leads > 37	
oscillator	$-I_{CM}=10$		$-V_{CEO}=5$	$P_{tot}=85$		$T_j=75$	$R_{th\,j-a}=0.6$ °C/mW				
2N918	*0	*15	$I_{CBO}<10$ nA	*0	*0	$C_c<3$	6	12	$G_{UM}=36$	length < 5.3	
n-p-n	3	1	$h_{FE}>20$	6	10	$f_T>900$	*−8	*15	$P_o>30$	width < 4.8	
v.h.f.	*0	*10	$C_c<1.7$	1	6	$F<6$	6	–	$G_p>15$	leads > 12.7	
u.h.f.	*Ratings* (*mA*; *V*; *mW*; °*C*)										
	$I_C=50$		$V_{CEO}=15$	$P_{tot}=200$		$T_j=200$	$R_{th\,j-a}=0.88$ °C/mW				
2N929	*0	*45	$I_{CBO}<10$ nA	10	5	$h_{FE}>100$	0.5	5	$f_{hfe}>0.2$	length < 5.3	
n-p-n	*−0.5	*5	$-V_{EB}<0.8$	*0	*5	$C_c<8$	0.01	5	$F<4$	width < 4.8	
general	0.5	5	$h_{FE}>60$	0.5	5	$f_T>50$	1	5	$h_{fe}=200$	leads > 12.7	
	Ratings (*mA*; *V*; *mW*; °*C*)										
	$I_{CM}=60$		$V_{CEO}=45$	$P_{tot}=300$		$T_j=175$	$R_{th\,j-a}=0.5$ °C/mW				
2N930	*0	*45	$I_{CBO}<10$ nA	10	5	$h_{FE}>200$	0.5	5	$f_{hfe}>0.1$	length < 5.3	
n-p-n	*−0.5	*5	$-V_{EB}<0.8$	*0	*5	$C_c<8$	0.01	5	$F<3$	width < 4.8	
general	0.5	5	$h_{FE}>150$	0.5	5	$f_T>50$	1	5	$h_{fe}=350$	leads > 12.7	
	Ratings (*mA*; *V*; *mW*; °*C*)										
	$I_{CM}=60$		$V_{CEO}=45$	$P_{tot}=300$		$T_j=175$	$R_{th\,j-a}=0.5$ °C/mW				

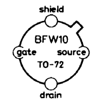
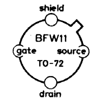
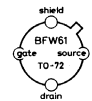
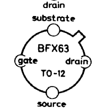
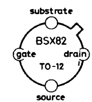
2N1613	*0	*60	$I_{CBO} < 10$ nA	500	10	$h_{FE} > 20$	0.3	10	$F < 12$	length < 6.6	
n-p-n	0.1	10	$h_{FE} > 20$	*0	*10	$C_c < 25$	1	5	$h_{fe} < 100$	width < 8.5	
general	150	10	$h_{FE} > 40$	50	10	$f_T > 60$	5	10	$h_{fe} < 150$	leads > 38	
	Ratings (A; V; W; °C)										
	$I_{CM} = 1$		$V_{CER} = 50$	$P_{tot} = 3$		$T_j = 200$	$R_{th\,j-a} = 220$°C/W				
2N1711	*0	*60	$I_{CBO} < 10$ nA	500	10	$h_{FE} > 40$	0.3	10	$F < 8$	length < 6.6	
n-p-n	0.1	10	$h_{FE} > 35$	*0	*10	$C_c < 25$	1	5	$h_{fe} < 200$	width < 8.5	
general	150	10	$h_{FE} > 100$	50	10	$f_T > 70$	5	10	$h_{fe} < 300$	leads > 38	
	Ratings (A; V; W; °C)										
	$I_{CM} = 1$		$V_{CER} = 50$	$P_{tot} = 3$		$T_j = 200$	$R_{th\,j-a} = 220$°C/W				
2N1893	*0	*90	$I_{CBO} < 10$ nA	150	10	$h_{FE} > 40$	5	10	$h_{fe} > 45$	length < 6.6	
n-p-n	10	10	$h_{FE} > 35$	*0	*10	$C_c < 15$	50	10	$h_{fe} > 2.5$	width < 8.5	
general	*Ratings* (mA; V; W; °C)									leads > 38	
	$I_C = 500$		$V_{CEO} = 80$	$P_{tot} = 3$		$T_j = 200$	$R_{th\,j-a} = 219$ °C/W				
2N2297	*0	*60	$I_{CBO} < 10$ nA	150	10	$h_{FE} > 40$	*0	*10	$C_c < 12$	length < 6.6	
n-p-n	10	10	$h_{FE} > 30$	1A	10	$h_{FE} > 15$	50	10	$f_T > 60$	width < 8.5	
v.h.f.	*Ratings* (A; V; W; °C)									leads > 38	
	$I_C = 1$		$V_{CEO} = 35$	$P_{tot} = 5$		$T_j = 200$	$R_{th\,j-a} = 220$°C/W				
2N2483	*0	*45	$I_{CBO} < 10$ nA	1	5	$h_{FE} > 175$	0.5	5	$f_T = 80$	length < 5.3	
n-p-n	0.01	5	$h_{FE} > 40$	10	5	$h_{FE} < 500$	0.01	5	$F < 4$	width < 4.8	
general	0.1	5	$h_{FE} > 75$	*0	*5	$C_c < 6$	1	5	$h_{fe} > 80$	leads > 12.7	
	Ratings (mA; V; mW; °C)										
	$I_{CM} = 50$		$V_{CEO} = 60$	$P_{tot} = 360$		$T_j = 200$	$R_{th\,j-a} = 0.48$°C/mW				
2N2484	*0	*45	$I_{CBO} < 10$ nA	1	5	$h_{FE} > 250$	0.5	5	$f_T = 80$	length < 5.3	
n-p-n	0.01	5	$h_{FE} > 100$	10	5	$h_{FE} < 800$	0.01	5	$F < 3$	width < 4.8	
general	0.1	5	$h_{FE} > 175$	*0	*5	$C_c < 6$	1	5	$h_{fe} > 150$	leads > 12.7	
	Ratings (mA; V; mW; °C)										
	$I_{CM} = 50$		$V_{CEO} = 60$	$P_{tot} = 360$		$T_j = 200$	$R_{th\,j-a} = 0.48$°C/mW				

HIGH FREQUENCY TRANSISTORS

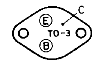
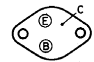
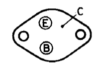
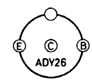
Type and applications	*Characteristics (mA; V; pF; MHz; dB; mW)*									*Outlines (mm)*
	$*I_E$ / I_C	$*V_{CB}$ / V_{CB}	*parameter*	$*I_E$ / I_C	$*V_{CB}$ / V_{CE}	*parameter*	$*I_E$ / I_C	$*V_{CB}$ / V_{CE}	*parameter*	
2N3570	*0	*6	$I_{CBO} < 10$ nA	*0	*6	$-C_{re} < 0.75$	*−2	*6	$F < 7$	length < 5.3
n-p-n	5	6	$h_{FE} > 20$	5	6	$f_T > 1500$	5	6	$h_{fe} > 20$	width < 4.8
v.h.f.	*Ratings (mA; V; mW; °C)*									leads > 12.7
u.h.f.	$I_C = 50$		$V_{CEO} = 15$	$P_{tot} = 200$		$T_j = 200$	$R_{th\,j-a} = 0.88\,°C/mW$			
2N3571	Equivalent to 2N3570 except for:			*0	*6	$-C_{re} < 0.85$	*−2	*6	$F < 4$	
				5	6	$f_T > 1200$				
2N3572	Equivalent to 2N3570 except for:			*0	*6	$-C_{re} < 0.85$	*−2	*6	$F < 6$	
				5	6	$f_T > 1000$			$V_{CEO} = 13$	

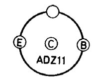
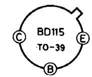
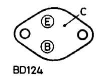
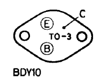
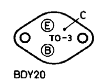


FIELD-EFFECT TRANSISTORS

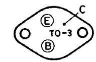
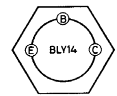
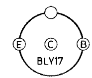
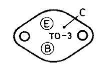
Type and applications	Characteristics (mA; V; pF; MHz; dB; $m\Omega^{-1}$; $G\Omega$) V_{DS}	V_{GS}	parameter	V_{DS}	V_{GS}	parameter	I_D	V_{DS}	parameter	Outlines (mm)	
BFW10	15	0	$I_{DSS} < 20$	15	0	$\lvert y_{fs}\rvert > 3.5$	0.4	15	$-V_{GS} < 7.5$	length < 5.3	
n-channel	15	0	$F < 2.5$				0.5 nA	15	$-V_{(P)GS} < 8$	width < 4.8	
	Ratings (mA; V; mW; °C)									leads > 12.7	
	$I_D = 20$		$\pm V_{DSS} = 30$	$P_{tot} = 300$		$T_j = 200$	$R_{th\,j-a} = 0.59$°C/mW				
BFW11	15	0	$I_{DSS} < 10$	15	0	$\lvert y_{fs}\rvert > 3.0$	0.05	15	$-V_{GS} < 4.0$	length < 5.3	
n-channel	15	0	$F < 2.5$				0.5 nA	15	$-V_{(P)GS} < 6$	width < 4.8	
	Ratings (mA; V; mW; °C)									leads > 12.7	
	$I_D = 20$		$\pm V_{DSS} = 30$	$P_{tot} = 300$		$T_j = 200$	$R_{th\,j-a} = 0.59$°C/mW				
BFW61	15	0	$I_{DSS} < 20$				0.2	15	$-V_{GS} < 7.5$	length < 5.3	
n-channel	15	0	$\lvert y_{fs}\rvert > 2$				1 nA	15	$-V_{(P)GS} < 8$	width < 4.8	
	Ratings (mA; V; mW; °C)									leads > 12.7	
	$I_D = 20$		$\pm V_{DSS} = 25$	$P_{tot} = 300$		$T_j = 200$	$R_{th\,j-a} = 0.59$°C/C/mW				
BFX63	15	−15	$I_{DSX} < 50$ nA	0	15	$r_{GS} > 100$	5	20	$V_{GS} < 6.5$	length < 6.6	
n-channel	30	0	$I_{DSS} < 30$				0.02	20	$-V_{(P)GS} < 4.5$	width < 8.5	
							5	20	$\lvert y_{fs}\rvert = 2.5$	leads = 20	
	Ratings (mA; V; mW; °C)										
	$\pm I_D = 50$		$\pm V_{DSM} = 30$	$P_{tot} = 250$		$T_j = 125$	$R_{th\,j-a} = 0.4$°C/mW				
BSX82	15	−15	$I_{DSX} < 50$ nA	0	15	$r_{GS} > 100$				length < 6.6	
n-channel	30	0	$I_{DSS} < 30$	0.1	−5	$r_{DS} > 0.02$				width < 8.5	
switch	*Ratings* (mA; V; mW; °C)									leads = 20	
	$\pm I_D = 50$		$\pm V_{DSM} = 30$	$P_{tot} = 250$		$T_j = 125$	$R_{th\,j-a} = 0.4$°C/mW				

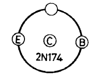
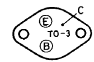
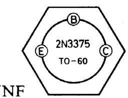
POWER TRANSISTORS

Type and applications	Characteristics (A; V; pF; MHz; dB; μs; $m\Omega^{-1}$; W; %)									Outlines (mm)	
	$*I_E$ / I_C	$*V_{CB}$ / V_{CE}	parameter	$*I_E$ / I_C	$*V_{CB}$ / V_{CE}	parameter	$*I_E$ / I_C	$*V_{CB}$ / V_{CE}	parameter		
AD149	*0	*−50	$-I_{CBO}<3$ mA	−1	*0	$h_{FE}<100$	*0	*−5	$C_c=220$	length < 39.5	
p-n-p	−3.5	−1	$-V_{BE}<1.2$	−3	*0	$h_{FE}<85$	−0.5	−2	$f_T=0.5$	width < 26.6	
class B	*Ratings* (A; V; W; °C)									height < 7.0	
push-pull	$-I_C=3.5$		$-V_{CEO}=30$	$P_{tot}=32.5$		$T_j=100$	$R_{th\,j-mb}=2.0$°C/W			leads < 13.0	AD149
l.f.	Matched pair 2-AD149;			−0.3		$h_{FE1}/h_{FE2}<1.25$					
				−3		$h_{FE1}/h_{FE2}<1.25$					
AD161	*0	*32	$I_{CBO}<500\ \mu A$	0.05	1	$h_{FE}<300$	*0	*5	$C_c=150$	length < 31.4	
n-p-n	2	1	$V_{BE}<1.1$	0.5	1	$h_{FE}<320$	0.01	2	$f_T=3$	width < 19	
class B	*Ratings* (A; V; W; °C)									height < 8.9	
l.f.	$I_{CM}=3$		$V_{CEO}=20$	$P_{tot}=4$		$T_j=90$	$R_{th\,j-mb}=4.5$°C/W			leads < 10.5	AD161
	Matched pair AD161/AD162;			|0.5|	|1|	$h_{FE1}/h_{FE2}<1.25$					
AD162	*0	*−32	$-I_{CBO}<200\ \mu A$	−0.05	−1	$h_{FE}<300$	*0	*−5	$C_c=115$	length < 31.4	
p-n-p	−2	−1	$-V_{BE}<0.85$	−0.5	−1	$h_{FE}<320$	−0.01	−2	$f_T=1.5$	width < 19	
class B	*Ratings* (A; V; W; °C)									height < 8.9	
l.f.	$-I_{CM}=3$		$-V_{CEO}=20$	$P_{tot}=6$		$T_j=90$	$R_{th\,j-mb}=4.5$°C/W			leads < 10.5	AD162
	Matched pair 2-AD162;			−0.05	−1	$h_{FE1}/h_{FE2}<1.25$					
				−0.5	−1	$h_{FE1}/h_{FE2}<1.25$					
ADY26	*0	*−2	$-I_{CBO}<200\ \mu A$	*5	*0	$h_{FE}<120$	−1	−12	$h_{fe}=1.7$	length < 10.5	
p-n-p	*5	*0	$-V_{BE}<1$	*25	*0	$h_{FE}=25$	−25	−18	$t_{on}=25$	width < 25	
l.f.	*25	*0	$-V_{BE}<2$	*0	*−12	$C_c=350$	−25	−18	$t_{off}=75$	leads > 16	
	Ratings (A; V; W; °C)										
	$-I_{CM}=30$		$-V_{CEO}=60$	$P_{tot}=100$		$T_j=90$	$R_{th\,j-mb}=0.6$°C/W				

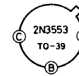
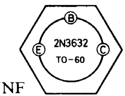
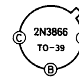
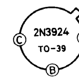
ADZ11	*0	*−2	$-I_{CBO}<200\ \mu A$	−1.2	*0	$h_{FE}<120$	−15	*0	$h_{FE}>15$	length < 10.5	
p-n-p	−15	*0	$-V_{BE}<2$	−5	*0	$h_{FE}>25$	*1	*−12	$f_{hfe}>0.08$	width < 25	
l.f.	*Ratings* $(A;\ V;\ W;\ °C)$									leads > 16	
	$-I_{CM}=20$		$-V_{CEO}=40$	$P_{tot}=45$		$T_j=90$	$R_{th\ j-mb}=0.8°C/W$				
ADZ12	Equivalent to ADZ11 except for:					$-V_{CEO}=60$	*1	*−12	$f_{hfe}>0.1$		
BD115	*0	*200	$I_{CBO}=0.55$	50	100	$h_{FE}>2.2$	30	100	$f_T=145$	length < 6.6	
n-p-n	50	100	$V_{BE}<1$	50	100	$h_{FE}=60$	10	20	$-C_{re}=3.5$	width < 8.5	
class A	*Ratings* $(A;\ V;\ W;\ °C)$									leads > 12.7	
a.f.	$I_{CM}=0.15$		$V_{CEO}=180$	$P_{tot}=6$		$T_j=200$	$R_{th\ j-mb}=12.5°C/W$				
BD124	*0	*45	$I_{CBO}=0.5\ \mu A$	0.05	5	$h_{FE}>25$	2	5	$h_{FE}>25$	length < 31.4	
n-p-n	2	5	$V_{BE}=1$	0.5	5	$h_{FE}>35$	0.25	5	$f_T=120$	width < 19	
hi-fi out-	*Ratings* $(A;\ V;\ W;\ °C)$									height < 8.9	
put stages	$I_{CM}=4$		$V_{CEO}=45$	$P_{tot}=15$		$T_j=175$	$R_{th\ j-mb}=7.5°C/W$			leads > 9	
	Matched pair 2-BD124;			0.5	5	$\lvert I_{B1}-I_{B2}\rvert<2$ mA					
BDY10	*0	*50	$I_{CBO}<300\ \mu A$	2	2	$h_{FE}=25$	*0	*20	$C_c<500$	length < 39.5	
n-p-n	2	2	$V_{BE}<3$	4	2	$h_{FE}=10$	0.2	5	$f_T>1$	width < 26.2	
general	*Ratings* $(A;\ V;\ W;\ °C)$									height < 9.5	
l.f.	$I_{CM}=4$		$V_{CEO}=40$	$P_{tot}=125$		$T_j=175$	$R_{th\ j-mb}=1°C/W$			leads < 13.0	
BDY11	Equivalent to BDY10 except for:					$V_{CEO}=70$	*0	*100	$I_{CBO}<300\ \mu A$		
BDY20	*0	*100	$I_{CBO}<5$ mA	4	4	$h_{FE}>20$	*0	*20	$C_c=250$	length < 39.5	
n-p-n	4	4	$V_{BE}<1.8$	1	4	$f_T=1$	1	4	$f_{hfe}=0.009$	width < 26.6	
hi-fi	*Ratings* $(A;\ V;\ W;\ °C)$									height < 9.5	
signal	$I_{CM}=15$		$V_{CEO}=60$	$P_{tot}=115$		$T_j=200$	$R_{th\ j-mb}=1.5°C/W$			leads > 11	
processing	Matched pair 2-BDY20;			0.4	4	$h_{FE1}/h_{FE2}<1.6$					
				4	4	$h_{FE1}/h_{FE2}<1.3$					

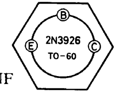
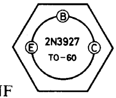
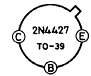
POWER TRANSISTORS

Type and applications	Characteristics (A; V; pF; MHz; dB; μs; $m\Omega^{-1}$; W; %) $*I_E$ / I_C	$*V_{CB}$ / V_{CE}	parameter	$*I_E$ / I_C	$*V_{CB}$ / V_{CE}	parameter	$*I_E$ / I_C	$*V_{CB}$ / V_{CE}	parameter	Outlines (mm)	
BDY38	*0	*50	$I_{CBO}<1$ mA	0.2	4	$h_{FE}>30$	*0	*20	$C_c=250$	length < 39.5	 BDY38
n-p-n	2	4	$V_{BE}<2$	1	4	$f_T=1$	1	4	$f_{hfe}=0.012$	width < 26.6	
hi-fi	Ratings (A; V; W; °C)									height < 9.5	
signal	$I_{CM}=6$		$V_{CEO}=40$	$P_{tot}=115$		$T_j=200$	$R_{th\,j-mb}=1.5$°C/W			leads > 11	
processing	Matched pair 2-BDY38;			0.2	4	$h_{FE1}/h_{FE2}<1.5$					
				2	4	$h_{FE1}/h_{FE2}<1.2$					
BLY14	*0	*40	$I_{CBO}<500$ nA	*0	*40	$C_c<10$	0.19	40	$P_o=3.6$	length = 12.6	
n-p-n	*−0.15	*10	$h_{FE}=11$	0.1	10	$f_T=190$	0.19	40	$G_p=7.6$	width = 10.7	
transmitter	*−0.5	*10	$h_{FE}=11$	*−0.15	*24	$\lvert y_{fb}\rvert=98$	0.19	40	$\eta=48$	stud = 11	
h.f.	Ratings (A; V; W; °C)									leads = 14.5	
	$I_{CM}=1$		$V_{CEO}=55$	$P_{tot}=8.75$		$T_j=200$	$R_{th\,j-mb}=20$°C/W			stud : M5	
BLY17	*0	*40	$I_{CBO}<10$ mA	*−10	*0	$h_{FE}=9$	1.8	40	$P_o=40$	length < 28.2	
n-p-n	*0	*100	$I_{CBO}<20$ mA	*0	*40	$C_c<150$	1.8	40	$G_p=7.5$	width < 28.2	
transmitter	*−5	*0	$h_{FE}=13$	1.5	10	$f_T=70$	1.8	40	$\eta=55$	height < 10.5	
h.f.	Ratings (A; V; W; °C)									leads = 17	
	$I_{CM}=10$		$V_{CER}=100$	$P_{tot}=100$		$T_j=175$	$R_{th\,j-mb}=1.5$°C/mW			collector: M5	
OC26	−1	−1	$h_{FE}<55$	−3	−1	$h_{FE}<45$	−1	−6	$f_{hfe}=0.0045$	length < 39.5	 OC26
p-n-p	Ratings (A; V; W; °C)									width < 26.2	
output	$-I_C=3.5$		$-V_{CEO}=20$	$P_{tot}=12.5$		$T_j=90$				height < 9.5	
l.f.	Matched pair 2-OC26									leads > 11	

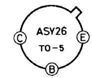
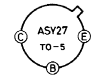
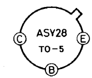
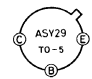
OC30	−0.1	−7	$h_{FE}=36$	−1.5	−1	$h_{FE}=22$	−0.1	−7	$f_{hfe}=0.009$	length = 30	
p-n-p	*Ratings* (A; V; W; °C)									width = 18.5	
output	$-I_C=1.4$		$-V_{CEO}=16$	$P_{tot}=4$		$T_j=75$				height = 9.4	
l.f.	Matched pair 2-OC30									leads = 9.5	
2N174	*0	*−2	$-I_{CBO}=100\ \mu A$	−12	−2	$h_{FE}=20$	−12	−12	$t_r=15$	length < 10.5	
p-n-p	−5	−2	$h_{FE}<50$	−5	−6	$f_{hfe}=0.01$	−12	−12	$t_f=15$	width < 25	
l.f.	*Ratings* (A; V; W; °C)									leads > 16	
	$I_E=15$		$-V_{CBX}=80$	$P_{tot}=150$		$T_j=100$	$R_{th\,j-mb}=0.5$°C/W				
2N277	Equivalent to 2N174 except for:			−5	−2	$h_{FE}<70$	$-V_{CBX}=40$				
				−12	−2	$h_{FE}=25$					
2N441	Equivalent to 2N174 except for:			−5	−2	$h_{FE}<40$	$-V_{CBX}=40$				
2N1100	Equivalent to 2N174 except for: $V_{CBX}=100$										
2N3055	4	4	$V_{BE}<1.8$	1	4	$f_T>0.8$				length < 39.5	
n-p-n	4	4	$h_{FE}>20$	1	4	$f_{hfe}>0.015$				width < 26.6	
hi-fi	*Ratings* (A; V; W; °C)									height < 9.5	
signal	$I_C=15$		$V_{CER}=70$	$P_{tot}=115$		$T_j=200$	$R_{th\,j-mb}=1.5$°C/W			leads > 11	2N3055
processing											
2N3375	0.5	5	$V_{BE}<1.5$	*0	*28	$C_c<10$	<0.41	28	$P_o=7.5$	length < 7.6	
n-p-n	0.125	5	$h_{FE}>15$	0.125	28	$f_T=500$	<0.41	28	$G_p>8.7$	width < 8.6	
transmitter	0.25	5	$h_{FE}>10$				<0.41	28	$\eta>65$	stud < 11.5	
v.h.f.	*Ratings* (A; V; W; °C)									leads 3.9	
u.h.f.	$I_{CM}=1.5$		$V_{CEO}=40$	$P_{tot}=11.6$		$T_j=200$	$R_{th\,j-mb}=15$°C/W			stud:10–32 UNF	

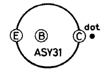
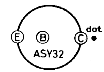
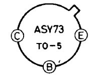
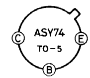
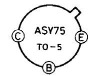
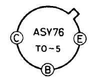
POWER TRANSISTORS

Type and applications	Characteristics (A; V; pF; MHz; dB; μs; $m\Omega^{-1}$; W; %) $*I_E$ / I_C	$*V_{CB}$ / V_{CE}	parameter	$*I_E$ / I_C	$*V_{CB}$ / V_{CE}	parameter	$*I_E$ / I_C	$*V_{CB}$ / V_{CE}	parameter	Outlines (mm)	
2N3553	0.25	5	$V_{BE}<1.5$	*0	*28	$C_c<10$	<0.18	28	$P_o=2.5$	length<6.6	
n-p-n	0.125	5	$h_{FE}>15$	0.125	28	$f_T=500$	<0.18	28	$G_p>10$	width<8.5	
transmitter	0.25	5	$h_{FE}>10$				<0.18	28	$\eta>50$	leads>12.7	
v.h.f.	Ratings (A; V; W; °C)										
u.h.f.	$I_{CM}=1$		$V_{CEO}=40$	$P_{tot}=7$		$T_j=200$	$R_{th\,j-mb}=25$°C/W				
2N3632	1	5	$V_{BE}<1.5$	*0	*28	$C_c<20$	0.69	28	$P_o>13.5$	length<7.6	
n-p-n	0.25	5	$h_{FE}>10$	0.25	28	$f_T=400$	0.69	28	$G_p>5.9$	width<8.6	
transmitter	1	5	$h_{FE}>5$				0.69	28	$\eta>70$	stud<11.5	
v.h.f.	Ratings (A; V; W; °C)									leads 3.9	
u.h.f.	$I_{CM}=3$		$V_{CEO}=40$	$P_{tot}=23$		$T_j=200$	$R_{th\,j-mb}=7.5$°C/W			stud:10–32 UNF	
2N3866	0.05	5	$h_{FE}>10$	0.025	15	$f_T=700$	<107	28	$P_o=1.8$	length<6.6	
n-p-n	0.36	5	$h_{FE}>5$	*0	*28	$C_c<3$	<107	28	$\eta>60$	width<8.5	
class A, B, C	Ratings (A; V; W; °C)									leads>12.7	
multiplier	$I_{CM}=0.4$		$V_{CEO}=30$	$P_{tot}=5$		$T_j=200$	$R_{th\,j-mb}=35$°C/W				
oscillator											
2N3924	0.25	5	$V_{BE}<1.5$	*0	*13.5	$C_c<20$	<0.42	14	$P_o=4$	length<6.6	
n-p-n	0.25	5	$h_{FE}>10$	0.1	13.5	$f_T>250$	<0.42	14	$G_p>6$	width<8.5	
transmitter							<0.42	14	$\eta>70$	leads>12.7	
v.h.f.	Ratings (A; V; W; °C)										
	$I_{CM}=1.5$		$V_{CEO}=18$	$P_{tot}=7$		$T_j=200$	$R_{th\,j-mb}=25$°C/W				

2N3926	0.5	5	$V_{BE}<1.5$	*0	*13.5	$C_c<20$	<0.74	14	$P_o=7$	length < 7.6	
n-p-n	0.5	5	$h_{FE}>5$	0.1	13.5	$f_T>250$	<0.74	14	$G_p>5.4$	width < 8.6	
transmitter							<0.74	14	$\eta>70$	stud < 11.5	
v.h.f.	*Ratings* (A; V; W; °C)									leads 3.9	
	$I_{CM}=3$		$V_{CEO}=18$	$P_{tot}=11.6$		$T_j=200$	$R_{th\,j-mb}=15$°C/W			stud:10–32 UNF	
2N3927	1	5	$V_{BE}<1.5$	*0	*13.5	$C_c<45$	<1.1	14	$P_o=12$	length < 7.6	
n-p-n	1	5	$h_{FE}>5$	0.2	13.5	$f_T>200$	<1.1	14	$G_p>4.8$	width < 8.6	
transmitter							<1.1	14	$\eta>80$	stud < 11.5	
v.h.f.	*Ratings* (A; V; W; °C)									leads 3.9	
	$I_{CM}=4.5$		$V_{CEO}=18$	$P_{tot}=23$		$T_j=200$	$R_{th\,j-mb}=7.5$°C/W			stud:10–32 UNF	
2N4427	0.1	5	$h_{FE}>10$	0.025	10	$f_T=700$	<167	12	$P_o=1$	length < 6.6	
n-p-n	0.36	5	$h_{FE}>5$	*0	*12	$C_c<4$	<167	12	$\eta>50$	width < 8.5	
class A, B, C	*Ratings* (A; V; W; °C)									leads > 12.7	
multiplier	$I_{CM}=0.4$		$V_{CEO}=20$	$P_{tot}=3.5$		$T_j=200$	$R_{th\,j-mb}=35$°C/W				
oscillator											

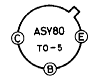
SWITCHING TRANSISTORS

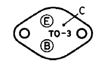
Type and applications	Characteristics (mA; V; pF; MHz; dB; ns; $m\Omega^{-1}$) $*I_E$ / I_C	$*V_{CB}$ / V_{CE}	parameter	$*I_E$ / I_C	$*V_{CB}$ / V_{CE}	parameter	I_C	I_B	parameter	Outlines (mm)
ASY26	*0	*−30	$-I_{CBO}<7\ \mu A$	*0	*−5	$C_c<16$	−50	−2	$-V_{CE\,sat}<0.25$	length < 6.6
p-n-p	−300	−1	$-V_{BE}<1.5$	−3	−5	$f_T=8$	−50	−2.4	$-V_{BE\,sat}<0.55$	width < 8.5
general	−20	−1	$h_{FE}<80$	−2	−5	$h_{fe}=50$	$t_d<90$		$t_s<1350$	leads > 38
	−200	−1	$h_{FE}=27$				$t_r<490$		$t_f<730$	
	Ratings (mA; V; mW; °C)									
	$-I_{CM}=300$		$-V_{CEO}=15$	$P_{tot}=150$		$T_j=85$	$R_{th\,j-a}=0.4$ °C/mW			
ASY27	*0	*−25	$-I_{CBO}<7\ \mu A$	*0	*−5	$C_c<16$	−50	−1.25	$-V_{CE\,sat}<0.25$	length < 6.6
p-n-p	−300	−1	$-V_{BE}<1.4$	−3	−5	$f_T=14$	−50	−1.55	$-V_{BE\,sat}<0.45$	width < 8.5
general	−20	−1	$h_{FE}<150$	−2	−5	$h_{fe}=90$	$t_d<75$		$t_s<1500$	leads > 38
	−200	−1	$h_{FE}=40$				$t_r<350$		$t_f<620$	
	Ratings (mA; V; mW; °C)									
	$-I_{CM}=300$		$-V_{CEO}=15$	$P_{tot}=150$		$T_j=85$	$R_{th\,j-a}=0.4$ °C/mW			
ASY28	*0	*30	$I_{CBO}<7\ \mu A$	*0	*5	$C_c<16$	50	2	$V_{CE\,sat}<0.25$	length < 6.6
n-p-n	300	1	$V_{BE}<1.5$	3	5	$f_T=14$	50	2.4	$V_{BE\,sat}<0.55$	width < 8.5
general	20	1	$h_{FE}<80$	2	5	$h_{fe}=50$	$t_d<90$		$t_s<700$	leads > 38
	200	1	$h_{FE}=32$				$t_r<400$		$t_f<620$	
	Ratings (mA; V; mW; °C)									
	$I_{CM}=300$		$V_{CEO}=15$	$P_{tot}=150$		$T_j=85$	$R_{th\,j-a}=0.4$ °C/mW			
ASY29	*0	*25	$I_{CBO}<7\ \mu A$	*0	*5	$C_c<16$	50	1.25	$V_{CE\,sat}<0.25$	length < 6.6
n-p-n	300	1	$V_{BE}<1.4$	3	5	$f_T=20$	50	1.55	$V_{BE\,sat}<0.45$	width < 8.5
general	20	1	$h_{FE}<150$	2	5	$h_{fe}=90$	$t_d<75$		$t_s<800$	leads > 38
	200	1	$h_{FE}=84$				$t_r<300$		$t_f<520$	
	Ratings (mA; V; mW; °C)									
	$I_{CM}=300$		$V_{CEO}=15$	$P_{tot}=150$		$T_j=85$	$R_{th\,j-a}=0.4$ °C/mW			

ASY31 p-n-p computer	*0 *−5 −100 *0 −10 *0	$-I_{CBO}<3\ \mu A$ $-V_{BE}<0.65$ $h_{FE}>30$	−100 *0 *0 *−5 −3 −5	$h_{FE}>20$ $C_c<16$ $f_T>4$	−50 −2 −50 −2.4	$-V_{CE\,sat}<0.25$ $-V_{BE\,sat}<0.55$	length < 15 width < 5.2 leads > 37	
	Ratings $(mA; V; mW; °C)$ $-I_{CM}=200$	$-V_{CEO}=15$	$P_{tot}=125$	$T_j=75$	$R_{th\,j-a}=0.4°C/mW$			
ASY32 p-n-p computer	*0 *−5 −100 *0 −10 *0	$-I_{CBO}<3\ \mu A$ $-V_{BE}<0.55$ $h_{FE}>50$	−100 *0 *0 *−5 −3 −5	$h_{FE}>30$ $C_c<16$ $f_T>6$	−50 −1.25 −50 −1.55	$-V_{CE\,sat}<0.25$ $-V_{BE\,sat}<0.45$	length < 15 width < 5.2 leads > 37	
	Ratings $(mA; V; mW; °C)$ $-I_{CM}=200$	$-V_{CEO}=15$	$P_{tot}=125$	$T_j=75$	$R_{th\,j-a}=0.4°C/mW$			
ASY73 n-p-n symmetrical	*0 *5 *−200 *0	$I_{CBO}<3\ \mu A$ $h_{FE}>20$	*0 *5 *−3 *5	$C_c<30$ $f_T>4$	200 10 200 12	$V_{CE\,sat}<0.30$ $V_{BE\,sat}<0.90$	length < 6.6 width < 8.5 leads > 38	
	Ratings $(mA; V; mW; °C)$ $I_C=400$	$V_{CEO}=15$	$P_{tot}=140$	$T_j=75$	$R_{th\,j-a}=0.35\ °C/mW$			
ASY74 n-p-n symmetrical	*0 *5 *−400 *0	$I_{CBO}<3\ \mu A$ $h_{FE}>20$	*0 *5 *−3 *5	$C_c<30$ $f_T>6$	400 20 200 7	$V_{CE\,sat}<0.37$ $V_{BE\,sat}<0.70$	length < 6.6 width < 8.5 leads > 38	
	Ratings $(mA; V; mW; °C)$ $I_C=400$	$V_{CEO}=15$	$P_{tot}=140$	$T_j=75$	$R_{th\,j-a}=0.35°C/mW$			
ASY75 n-p-n symmetrical	*0 *5 *−400 *0	$I_{CBO}<3\ \mu A$ $h_{FE}>30$	*0 *5 *−3 *5	$C_c<30$ $f_T>10$	400 13.5 200 5	$V_{CE\,sat}<0.37$ $V_{BE\,sat}<0.60$	length < 6.6 width < 8.5 leads > 38	
	Ratings $(mA; V; mW; °C)$ $I_C=400$	$V_{CEO}=15$	$P_{tot}=140$	$T_j=75$	$R_{th\,j-a}=0.35°C/mW$			
ASY76 p-n-p pulse- oscillator	*0 *−10 *300 *0 −10 −6 −300 *0	$-I_{CBO}<10\ \mu A$ $-V_{BE}<0.75$ $h_{FE}>45$ $h_{FE}<130$	*0 *−5 −10 −5 *0.5 *−2 −25 −5	$C_c<60$ $f_T>0.5$ $F<15$ $h_{fe}=81$	−300 −12	$-V_{CE\,sat}<0.3$	length < 6.6 width < 8.5 leads > 38	
	Ratings $(mA; V; mW; °C)$ $-I_{CM}=1000$	$-V_{CEX}=32$	$P_{tot}=500$	$T_j=85$	$R_{th\,j-a}=0.25°C/mW$			

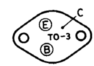
SWITCHING TRANSISTORS

Type and applications	Characteristics (mA; V; pF; MHz; dB; ns; $m\Omega^{-1}$) $*I_E$ / I_C	$*V_{CB}$ / V_{CE}	parameter	$*I_E$ / I_C	$*V_{CB}$ / V_{CE}	parameter	I_C	I_B	parameter	Outlines (mm)
ASY77	Equivalent to ASY76 except for;					$-V_{CEX}=60$				
ASY80	*0	*−10	$-I_{CBO}<10\ \mu A$	*0	*−5	$C_c<60$	−300	−6	$-V_{CE\,sat}<0.4$	length < 6.6
p-n-p	*300	*0	$-V_{BE}<0.75$	−10	−5	$f_T>0.7$				width < 8.5
pulse-	−50	*0	$h_{FE}>60$	*0.5	*−2	$F<15$				leads > 38
oscillator	−300	*0	$h_{FE}>50$	−25	−5	$h_{fe}=96$				
	Ratings (mA; V; mW; °C)									
	$-I_{CM}=1000$		$-V_{CEX}=40$	$P_{tot}=500$		$T_j=85$	$R_{th\,j-a}=0.25$°C/mW			
ASZ15	*0	*−0.5	$-I_{CBO}<0.1$	−6A	−1	$h_{FE}<30$	−10A	−1A	$-V_{CE\,sat}<0.4$	length < 39.5
p-n-p	−6A	*0	$-V_{BE}<1.6$	*0	*−5	$C_c=190$	−10A	−1A	$-V_{BE\,sat}<1.4$	width < 26.2
power	−1A	−1	$h_{FE}<55$	−1A	−5	$f_T=0.2$	$t_d<2\ \mu s$		$t_s<10\ \mu s$	height < 7.0
							$t_r<25\ \mu s$		$t_f<20\ \mu s$	leads < 13
	Ratings (A; V; W; °C)									
	$-I_{CM}=10$		$-V_{CEO}=60$	$P_{tot}=30$		$T_j=90$	$R_{th\,j-mb}=1.5$°C/W			
	Matched pair 2-ASZ15;			$-I_C=0.3$ A		$h_{FE1}/h_{FE2}<1.25$				
				$-I_C=6.0$ A		$h_{FE1}/h_{FE2}<1.25$				
ASZ16	*0	*−0.5	$-I_{CBO}<0.1$	−6A	−1	$h_{FE}<80$	−10A	−1A	$-V_{CE\,sat}<0.4$	length < 39.5
p-n-p	−6A	*0	$-V_{BE}<1.4$	*0	*−5	$C_c=190$	−10A	−1A	$-V_{BE\,sat}<1.4$	width < 26.2
power	−1A	−1	$h_{FE}<130$	−1A	−5	$f_T=0.25$	$t_d<2\ \mu s$		$t_s<10\ \mu s$	height < 7.0
							$t_r<25\ \mu s$		$t_f<20\ \mu s$	leads < 13
	Ratings (A; V; W; °C)									
	$-I_{CM}=10$		$-V_{CEO}=32$	$P_{tot}=30$		$T_j=90$	$R_{th\,j-mb}=1.5$°C/W			
	Matched pair 2-ASZ16;			$-I_C=0.3$ A		$h_{FE1}/h_{FE2}<1.25$				
				$-I_C=6.0$ A		$h_{FE1}/h_{FE2}<1.25$				



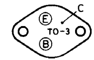


ASZ15

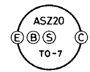


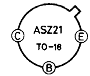
ASZ16

ASZ17	Equivalent to ASZ16 except for;			$-1A$	-1	$h_{FE}<75$				
				$-6A$	-1	$h_{FE}<45$				
				$-1A$	-5	$f_T=0.22$				
ASZ18	Equivalent to ASZ16 except for;			$-1A$	-1	$h_{FE}<110$				
				$-6A$	-1	$h_{FE}<65$				
				$-1A$	-5	$f_T=0.22$				
ASZ20	*0	*-6	$-I_{CBO}<4.5\ \mu A$	-10	*-2	$f_1>100$				length < 9.5
p-n-p	-1	*-6	$h_{FE}>40$	-1	-6	$F<6$				width < 8.6
wide-band	-10	*-2	$h_{FE}<500$	-1	-6	$h_{fe}>45$				leads > 38
	*0	*-6	$C_c<2.5$	-10	-6	$\lvert y_{fe}\rvert=310$				
	Ratings (mA; V; mW; °C)									
	$-I_C=25$		$-V_{CER}=40$	$P_{tot}=110$		$T_j=75$	$R_{th\ j-a}=0.6°C/mW$			
ASZ21	*0	*-0.5	$-I_{CBO}<3.5\ \mu A$	*0	*-6	$C_c<5$	-50	-3	$-V_{CE\,sat}<1.1$	length < 5.3
p-n-p	-10	-0.5	$h_{FE}>30$	-10	*-2	$f_T>300$	-30	-0.9	$-V_{BE\,sat}<0.75$	width < 4.8
fast	-30	-1.0	$h_{FE}>50$				$t_d=30$		$t_s=40$	leads > 12.7
							$t_r=20$		$t_f=40$	
	Ratings (mA; V; mW; °C)									
	$-I_{CM}=50$		$-V_{CEO}=15$	$P_{tot}=120$		$T_j=85$	$R_{th\ j-a}=0.5°C/mW$			

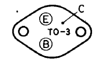
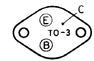
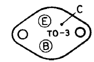


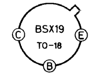
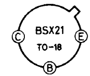
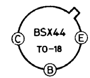
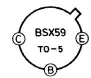
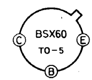
ASZ17
ASZ18

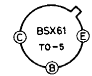
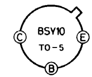
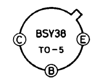


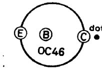
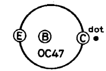
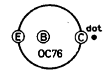
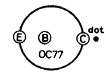
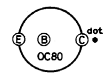
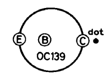


SWITCHING TRANSISTORS

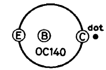
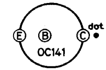
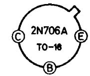
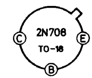
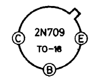
Type and applications	Characteristics (mA; V; pF; MHz; dB; ns; $m\Omega^{-1}$) *I_E / I_C	*V_{CB} / V_{CE}	parameter	*I_E / I_C	*V_{CB} / V_{CE}	parameter	I_C	I_B	parameter	Outlines (mm)	
AU103 p-n-p power line-defl.	*0 −10A *Ratings* (A; V; W; °C) $-I_{CM}=10$	*−155 *−0.5	$-I_{CBO}<10$ $-V_{BE}<0.75$ $-V_{CEX}=155$	−10A −0.5A $P_{tot}=10$	−1 −2	$h_{FE}>15$ $f_T=15$ $T_j=90$	−10A $t_s<3\,\mu s$ $R_{th\,j-mb}=1.5°C/W$	−0.8A	$-V_{CE\,sat}<0.7$ $t_f<1.7\,\mu s$	length < 39.5 width < 26.2 height < 9.5 leads < 13	 AU103
AU104 p-n-p power line-defl.	*0 −10A *Ratings* (A; V; W; °C) $-I_{CM}=12$	*−185 *−0.5	$-I_{CBO}<10$ $-V_{BE}<0.75$ $-V_{CEX}=185$	−10A −0.5A $P_{tot}=15$	−1 −2	$h_{FE}>15$ $f_T=15$ $T_j=90$	−12A $t_s<3\,\mu s$ $R_{th\,j-mb}=1.5°C/W$	−1.3A	$-V_{CE\,sat}<0.85$ $t_f<1.8\,\mu s$	length < 39.5 width < 26.2 height < 9.5 leads < 13	 AU104
AUY10 p-n-p power	*0 −600 *Ratings* (A; V; W; °C) $-I_C=0.7$	*−60 *−10	$-I_{CBO}<4.5$ $h_{FE}>40$ $-V_{CEX}=60$	*0 −300 $P_{tot}=6$	*−10 −10	$C_c<85$ $f_T=120$ $T_j=75$	$t_d<0.2\,\mu s$ $t_r<0.2\,\mu s$ $R_{th\,j-mb}=4°C/W$		$t_f<0.2\,\mu s$	length < 39.5 width < 26.2 height < 7.0 leads < 13	 AUY10
BCY30 to 34	See section: LOW FREQUENCY TRANSISTORS										
BCY38 to 40	See section: LOW FREQUENCY TRANSISTORS										
BCY54	See Section: LOW FREQUENCY TRANSISTORS										
BCY56	See section: LOW FREQUENCY TRANSISTORS										
BCY57	See section: LOW FREQUENCY TRANSISTORS										
BRY39	See section: MISCELLANEOUS TRANSISTORS										

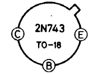
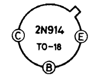
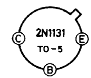
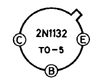
BSX19	*0	*20	$I_{CBO}<400$ nA	100	2	$h_{FE}>10$	10	1	$V_{CE\,sat}<0.25$	length < 5.3	
n-p-n	10	1	$V_{BE}=0.8$	*0	*5	$C_c<4$	10	1	$V_{BE\,sat}<0.85$	width < 4.8	
fast	10	1	$h_{FE}<60$	10	10	$f_T=500$	$t_s<10$			leads > 12.7	
	Ratings $(mA; V; mW; °C)$										
	$I_{CM}=500$		$V_{CEO}=15$	$P_{tot}=360$		$T_j=200$	$R_{th\,j-a}=0.48°C/mW$				
BSX20	Equivalent to BSX19 except for:			10	1	$h_{FE}<120$	$t_s<13$				
				100	2	$h_{FE}>20$					
				10	10	$f_T=600$					
BSX21	*0	*120	$I_{CBO}<40\ \mu A$	20	3	$h_{FE}=7$	10	1	$V_{CE\,sat}=1.8$	length < 5.3	
n-p-n	4	3	$V_{BE}<0.9$	*0	*10	$C_c=3.6$	10	1	$V_{BE\,sat}=0.9$	width < 4.8	
driver	10	3	$h_{FE}=32$	4	10	$f_T=120$				leads > 12.7	
	Ratings $(mA; V; mW; °C)$										
	$I_{CM}=50$		$V_{CEO}=80$	$P_{tot}=300$		$T_j=175$	$R_{th\,j-a}=0.5°C/mW$				
BSX44	*0	*5	$I_{CBO}<50$ nA	100	1	$h_{FE}=25$	50	5	$V_{CE\,sat}<0.45$	length < 5.3	
n-p-n	1	0.3	$h_{FE}=80$	*0	*5	$C_c<3$	50	5	$V_{BE\,sat}<1.30$	width < 4.8	
ultra	50	0.5	$h_{FE}=45$	20	2	$f_T=740$	$t_{on}=6$		$t_{off}=8$	leads > 12.7	
high-speed	*Ratings* $(mA; V; mW; °C)$										
	$I_{CM}=200$		$V_{CEO}=6$	$P_{tot}=300$		$T_j=200$	$R_{th\,j-a}=0.58°C/mW$				
BSX59	*0	*40	$I_{CBO}<500$ nA	500	1	$h_{FE}<90$	*0	*10	$C_c<10$	length < 6.6	
n-p-n	500	1	$h_{FE}>30$	50	10	$f_T=450$				width < 8.5	
high speed	*Ratings* $(A; V; W; °C)$									leads > 38.0	
core driver	$I_{CM}=1$		$V_{CEO}=45$	$P_{tot}=0.8$		$T_j=200$	$R_{th\,j-a}=220°C/W$				
BSX60	*0	*40	$I_{CBO}<500$ nA	500	1	$h_{FE}<90$	*0	*10	$C_c<10$	length < 6.6	
n-p-n	500	1	$h_{FE}>30$	50	10	$f_T=475$				width < 8.5	
high speed	*Ratings* $(A; V; W; °C)$									leads > 38.0	
core driver	$I_{CM}=1$		$V_{CEO}=30$	$P_{tot}=0.8$		$T_j=200$	$R_{th\,j-a}=200°C/W$				

BSX61	*0	*40	$I_{CBO} < 500$ nA	500	1	$h_{FE} < 90$	*0	*10	$C_c < 10$	length < 6.6	
n-p-n	500	1	$h_{FE} > 30$	50	10	$f_T = 475$				width < 8.5	
high speed	*Ratings* (A; V; W; °C)									leads > 38.0	
core driver	$I_{CM} = 1$		$V_{CEO} = 45$	$P_{tot} = 0.8$		$T_j = 200$	$R_{th\,j-a} = 220$°C/W				
BSX82	See section: FIELD EFFECT TRANSISTORS										
BSY10	*0	*20	$I_{CBO} < 2\ \mu$A	5	10	$f_T = 180$	10	1	$V_{CE\,sat} < 1$	length < 8.5	
n-p-n	10	5	$h_{FE} < 45$	5	10	$F < 40$	$t_d = 4.7$		$t_s = 35$	width < 6.6	
high-speed	*0	*5	$C_c = 5$	5	5	$h_{fe} > 40$	$t_r = 13$		$t_f = 75$	leads > 38	
	Ratings (mA; V; mW; °C)										
	$I_{CM} = 75$		$V_{CEX} = 60$	$P_{tot} = 300$		$T_j = 175$	$R_{th\,j-a} = 0.5$°C/mW				
BSY11	Equivalent to BSY10 except for:			10	5	$h_{FE} < 60$	$V_{CEX} = 45$				
				5	5	$h_{fe} > 55$					
BSY38	*0	*20	$I_{CBO} < 100$ nA	100	1	$h_{FE} < 45$	100	10	$V_{CE\,sat} < 0.6$	length < 5.3	
n-p-n	*−100	*0	$-V_{EB} = 0.95$	*0	*5	$C_c < 5$	100	10	$V_{BE\,sat} < 1.5$	width < 4.8	
very	10	0.35	$h_{FE} < 60$	10	2	$f_T = 350$	$t_{on} < 14$		$t_{off} < 45$	leads > 12.7	
high-speed	*Ratings* (mA; V; mW; °C)										
	$I_{CM} = 200$		$V_{CEX} = 15$	$P_{tot} = 300$		$T_j = 175$	$R_{th\,j-a} = 0.5$°C/mW				
BSY39	Equivalent to BSY38 except for:			10	0.35	$h_{FE} < 120$					
				100	1	$h_{FE} < 70$					

OC46	-15	*0	$h_{FE}<80$	*3	*-5	$f_{hfb}>3$				length < 15	
p-n-p	*Ratings (mA; V; mW; °C)*									width < 5.2	
high-speed	$-I_{CM}=125$		$-V_{CEX}=20$	$P_{tot}=80$		$T_j=90$	$R_{th\,j-a}=0.6$°C/mW			leads > 37	
OC47	-15	*0	$h_{FE}<200$	*3	*-5	$f_{hfb}>4.5$				length < 15	
p-n-p	*Ratings (mA; V; mW; °C)*									width < 5.2	
high-speed	$-I_{CM}=125$		$-V_{CEX}=20$	$P_{tot}=80$		$T_j=90$	$R_{th\,j-a}=0.6$°C/mW			leads > 37	
OC76	*0	*-10	$-I_{CBO}<10\ \mu A$	-250	-1	$h_{FE}<125$				length < 15.7	
p-n-p	-125	-0.7	$-V_{BE}<0.7$	*10	*-6	$f_{hfb}=0.9$				width < 6.0	
pulse-	-125	-0.7	$h_{FE}<170$	*0.5	-2	$F<15$				leads > 37	
oscillator	*Ratings (mA; V; mW; °C)*										
	$-I_{CM}=250$		$-V_{CEO}=16$	$P_{tot}=125$		$T_j=75$	$R_{th\,j-a}=0.4$°C/mW				
OC77	*0	*-10	$-I_{CBO}<10\ \mu A$	-250	-1	$h_{FE}>15$				length < 15.7	
p-n-p	-125	-0.7	$-V_{BE}<0.7$	*10	*-6	$f_{hfb}>0.35$				width < 6.0	
pulse-	-125	-0.7	$h_{FE}>25$	*0.5	-2	$F<15$				leads > 37	
oscillator	*Ratings (mA; V; mW; °C)*										
	$-I_{CM}=250$		$-V_{CEO}=15$	$P_{tot}=125$		$T_j=75$	$R_{th\,j-a}=0.4$°C/mW				
OC80	*0	*-12	$-I_{CBO}<20\ \mu A$	-600	*0	$h_{FE}=85$				length < 15.7	
p-n-p	-50	-6	$h_{FE}=180$	*50	*-6	$f_{hfb}=2$				width < 6.0	
pulse-	*Ratings (mA; V; mW; °C)*									leads > 37	
oscillator	$-I_{CM}=600$		$-V_{CES}=32$	$P_{tot}=550$		$T_j=75$	$R_{th\,j-a}=0.22$°C/mW				
OC139	*0	*5	$I_{CBO}<3\ \mu A$	200	*0	$h_{FE}>15$	50	3.1	$V_{CE\,sat}<0.22$	length < 15	
n-p-n	15	*0	$h_{FE}<84$	3	5	$f_T=6$	50	3.1	$V_{BE\,sat}<0.5$	width < 5.2	
symmetrical	*Ratings (mA; V; mW; °C)*									leads > 37	
high-speed	$I_C=250$		$V_{CEX}=20$	$P_{tot}=145$		$T_j=75$	$R_{th\,j-a}=0.35$°C/mW				

SWITCHING TRANSISTORS

Type and applications	*Characteristics* $(mA; V; pF; MHz; dB; ns; m\Omega^{-1})$ *I_E / I_C	*V_{CB} / V_{CE}	*parameter*	*I_E / I_C	*V_{CB} / V_{CE}	*parameter*	I_C	I_B	*parameter*	*Outlines (mm)*	
OC140	*0	*5	$I_{CBO}<3\ \mu A$	200	*0	$h_{FE}<67$	400	20	$V_{CE\,sat}<0.37$	length < 15	
n-p-n	15	*0	$h_{FE}<150$	3	5	$f_T=12$	400	20	$V_{BE\,sat}<0.90$	width < 5.2	
symmetrical	*Ratings* $(mA; V; mW; °C)$									leads > 37	
high-speed	$I_C=400$		$V_{CEX}=20$	$P_{tot}=145$		$T_j=75$	$R_{th\,j-a}=0.35°C/mW$				
OC141	*0	*5	$I_{CBO}<3\ \mu A$	200	*0	$h_{FE}<134$	400	13.3	$V_{CE\,sat}<0.37$	length < 15	
n-p-n	15	*0	$h_{FE}<200$	3	5	$f_T=20$	400	20	$V_{BE\,sat}<0.70$	width < 5.2	
symmetrical	*Ratings* $(mA; V; mW; °C)$									leads > 37	
high-speed	$I_C=400$		$V_{CEX}=20$	$P_{tot}=145$		$T_j=75$	$R_{th\,j-a}=0.35°C/mW$				
2N706A	*0	*25	$I_{CBO}<10\ \mu A$	*0	*5	$C_c<5$	10	1	$V_{CE\,sat}<0.6$	length < 5.3	
n-p-n	10	1	$h_{FE}<60$	10	10	$f_T>200$	10	1	$V_{BE\,sat}<0.9$	width < 4.8	
high-speed							$t_{on}<40$		$t_{off}<75$	leads > 12.7	
	Ratings $(mA; V; mW; °C)$										
	$I_C=50$		$V_{CEO}=15$	$P_{tot}=300$		$T_j=175$	$R_{th\,j-a}=0.5°C/mW$				
2N708	*0	*20	$I_{CBO}<25\ nA$	*0	*10	$C_c<6$	10	1	$V_{CE\,sat}<0.4$	length < 5.3	
n-p-n	0.5	1	$h_{FE}>15$	10	10	$f_T>300$	10	1	$V_{BE\,sat}<0.8$	width < 4.8	
very	10	1	$h_{FE}<120$				$t_s<25$			leads > 12.7	
high-speed	*Ratings* $(mA; V; mW; °C)$										
	$I_{CM}=500$		$V_{CEO}=15$	$P_{tot}=360$		$T_j=200$	$R_{th\,j-a}=0.48°C/mW$				
2N709	*0	*5	$I_{CBO}<50\ nA$	*0	*5	$C_c<3$	3	0.15	$V_{CE\,sat}<0.3$	length < 5.3	
n-p-n	10	0.5	$h_{FE}<120$	5	4	$f_T>600$	3	0.15	$V_{BE\,sat}<0.85$	width < 4.8	
ultra	30	1	$h_{FE}>15$				$t_{on}<15$		$t_{off}<15$	leads > 12.7	
high-speed	*Ratings* $(mA; V; mW; °C)$										
	$I_{CM}=200$		$V_{CEO}=6$	$P_{tot}=300$		$T_j=200$	$R_{th\,j-a}=0.58°C/mW$				

2N743	*0	*20	$I_{CBO}<1\ \mu A$	100	1	$h_{FE}>10$	100	10	$V_{CE\,sat}<1$	length < 5.3	
n-p-n	1	0.25	$h_{FE}>10$	*0	*5	$C_c<5$	100	10	$V_{BE\,sat}<1.5$	width < 4.8	
very	10	0.35	$h_{FE}>20$	10	10	$f_T>300$	$t_s<14$			leads > 12.7	
high-speed	*Ratings* (mA; V; mW; $°C$)										
	$I_C=200$		$V_{CEO}=12$	$P_{tot}=300$		$T_j=175$	$R_{th\,j-a}=0.5°C/mW$				
2N744	Equivalent to 2N743 except for:			1	0.25	$h_{FE}>20$	$t_s<18$				
				10	0.35	$h_{FE}>40$					
				100	1	$h_{FE}>20$					
2N753	Equivalent to 2N706A except for:			10	1	$h_{FE}<120$					
2N914	*0	*20	$I_{CBO}<25\ nA$	*0	*10	$C_c<6$	200	20	$V_{CE\,sat}<0.7$	length < 5.3	
n-p-n	10	1	$h_{FE}>30$	20	10	$f_T>300$	10	1	$V_{BE\,sat}<0.8$	width < 4.8	
very	500	5	$h_{FE}>10$				$t_{on}<40$		$t_{off}<40$	leads > 12.7	
high-speed	*Ratings* (mA; V; mW; $°C$)										
	$I_{CM}=500$		$V_{CEO}=15$	$P_{tot}=360$		$T_j=200$	$R_{th\,j-a}=0.48°C/mW$				
2N1131	*0	*−3	$-I_{CBO}<1\ \mu A$	−50	−10	$f_T>50$	−150	−15	$-V_{CE\,sat}<1.5$	length < 6.6	
p-n-p	−150	−10	$h_{FE}<45$	−1	−5	$h_{fe}<50$	−150	−15	$-V_{BE\,sat}<1.3$	width < 8.5	
high-speed	*0	*−10	$C_c<45$	−5	−10	$h_{fe}>20$				leads > 38	
	Ratings (A; V; W; $°C$)										
	$-I_C=0.6$		$-V_{CEO}=35$	$P_{tot}=2$		$T_j=175$	$R_{th\,j-a}=250°C/W$				
2N1132	*0	*−3	$-I_{CBO}<1$	−50	−10	$f_T>60$	−150	−15	$-V_{CE\,sat}<1.5$	length < 6.6	
p-n-p	−150	−10	$h_{FE}<90$	−1	−5	$h_{fe}<100$	−150	−15	$-V_{BE\,sat}<1.3$	width < 8.5	
high-speed	*0	*−10	$C_c<45$	−5	−10	$h_{fe}>30$				leads > 38	
	Ratings (A; V; W; $°C$)										
	$-I_C=0.6$		$-V_{CEO}=35$	$P_{tot}=2$		$T_j=175$	$R_{th\,j-a}=250°C/W$				

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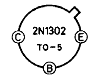
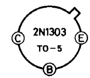
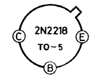
Type and applications	Characteristics (mA; V; pF; MHz; dB; ns; $m\Omega^{-1}$) $*I_E$ I_C	$*V_{CB}$ V_{CE}	parameter	$*I_E$ I_C	$*V_{CB}$ V_{CE}	parameter	I_C	I_B	parameter	Outlines (mm)	
2N1302 n-p-n medium speed	*0 200	*25 0.35	$I_{CBO}<6\ \mu A$ $h_{FE}=48$	*0 1	*5 5	$C_c<20$ $f_T=10$	10 10 $t_d=65$ $t_r=220$	0.5 0.5	$V_{CE\,sat}<0.2$ $V_{BE\,sat}<0.4$ $t_s=500$ $t_f=365$	length < 6.6 width < 8.5 leads > 38	
	Ratings (mA; V; mW; $°C$) $I_{CM}=300$		$V_{CEO}=25$	$P_{tot}=150$		$T_j=85$	$R_{th\,j-a}=0.4°C/mW$				
2N1303 p-n-p medium speed	*0 −200	*−25 −0.35	$-I_{CBO}<6\ \mu A$ $h_{FE}=35$	*0 −1	*−5 −5	$C_c<20$ $f_T=5$	−10 −10 $t_d=60$ $t_r=300$	−0.5 −0.5	$-V_{CE\,sat}<0.2$ $-V_{BE\,sat}<0.4$ $t_s=700$ $t_f=600$	length < 6.6 width < 8.5 leads > 38	
	Ratings (mA; V; mW; $°C$) $-I_{CM}=300$		$-V_{CEO}=25$	$P_{tot}=150$		$T_j=85$	$R_{th\,j-a}=0.4°C/mW$				
2N1304	Equivalent to 2N1302 except for:			200 1	0.35 5	$h_{FE}=65$ $f_T=15$	10 10	0.25 0.5	$V_{CE\,sat}<0.2$ $V_{BE\,sat}<0.35$	$t_d=60$ $t_r=210$ $t_f=350$	
2N1305	Equivalent to 2N1303 except for:			−200 −1	−0.35 −5	$h_{FE}=55$ $f_T=10$	−10 −10	−0.25 −0.5	$-V_{CE\,sat}<0.2$ $-V_{BE\,sat}<0.35$	$t_d=55$ $t_r=200$ $t_f=450$	
2N1306	Equivalent to 2N1302 except for:			200 1	0.35 5	$h_{FE}=95$ $f_T=20$	10 10	0.17 0.5	$V_{CE\,sat}<0.2$ $V_{BE\,sat}<0.35$	$t_d=55$ $t_r=170$ $t_f=315$	

2N1307	Equivalent to 2N1303 except for:			−200	−0.35	$h_{FE}=90$	−10	−0.17	$-V_{CE\,sat}<0.2$	$t_d=50$
				−1	−5	$f_T=15$	−10	−0.5	$-V_{BE\,sat}<0.35$	$t_r=180$
										$t_f=350$
2N1308	Equivalent to 2N1302 except for:			200	0.35	$h_{FE}=145$	10	0.13	$V_{CE\,sat}<0.2$	$t_d=55$
				1	5	$f_T=30$	10	0.5	$V_{BE\,sat}<0.35$	$t_r=165$
										$t_f=290$
2N1309	Equivalent to 2N1303 except for:			−200	−0.35	$h_{FE}=130$	−10	−0.13	$-V_{CE\,sat}<0.2$	$t_d=45$
				−1	−5	$f_T=20$	−10	−0.5	$-V_{BE\,sat}<0.35$	$t_r=155$
										$t_f=350$
2N2218	*0	*50	$I_{CBO}<10$ nA	500	10	$h_{FE}>20$	500	50	$V_{CE\,sat}<1.6$	length < 6.6
n-p-n	1	10	$h_{FE}>25$	*0	*10	$C_c<8$	500	50	$V_{BE\,sat}<2.6$	width < 8.5
high-speed	150	10	$h_{FE}>40$	20	20	$f_T>250$				leads > 38
	Ratings (A; V; W; °C)									
	$I_C=0.8$		$V_{CEO}=30$	$P_{tot}=0.8$		$T_j=175$	$R_{th\,j-a}=190$°C/W			
2N2219	Equivalent to 2N2218 except for:			1	10	$h_{FE}>50$				
				150	10	$h_{FE}>100$				
				500	10	$h_{FE}>30$				
2N2221	Equivalent to 2N2218 except for:			$P_{tot}=0.5$ W			$R_{th\,j-a}=300$°C/W			length < 5.3
										width < 4.8
										leads > 12.7
2N2222	Equivalent to 2N2218 except for:			1	10	$h_{FE}>50$	$P_{tot}=0.5$			length < 5.3
				150	10	$h_{FE}>100$	$R_{th\,j-a}=300$°C/W			width < 4.8
				500	10	$h_{FE}>30$				leads > 12.7



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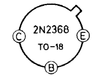
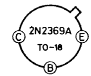
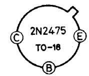
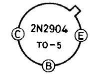
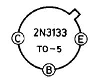
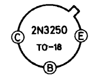
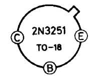
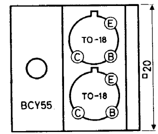
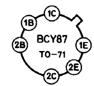
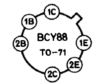
Type and applications	Characteristics (mA; V; pF; MHz; dB; ns; $m\Omega^{-1}$) $*I_E$ / I_C	$*V_{CB}$ / V_{CE}	parameter	$*I_E$ / I_C	$*V_{CB}$ / V_{CE}	parameter	I_C	I_B	parameter	Outlines (mm)	
2N2368	*0	*20	$I_{CBO}<0.4\ \mu A$	*0	*5	$C_c<4$	10	1	$V_{CE\,sat}<0.25$	length < 5.3	
n-p-n	100	2	$h_{FE}>10$	10	10	$f_T>400$	10	1	$V_{BE\,sat}<0.85$	width < 4.8	
very							$t_s<10$		$t_{off}<15$	leads > 12.7	
high-speed	Ratings (mA; V; mW; °C)										
	$I_{CM}=500$		$V_{CEO}=15$	$P_{tot}=360$		$T_j=200$	$R_{th\,j-a}=0.48$°C/mW				
2N2369	Equivalent to 2N2368 except for:			100	2	$h_{FE}>20$	$t_s<13$		$t_{off}<18$		
				10	10	$f_T>500$					
2N2369A	30	0.4	$h_{FE}>30$	*0	*5	$C_c<4$	100	10	$V_{CE\,sat}<0.5$	length < 5.3	
n-p-n	100	1	$h_{FE}>20$	10	10	$f_T>500$	100	10	$V_{BE\,sat}<1.6$	width < 4.8	
very							$t_s<13$		$t_{off}<18$	leads > 12.7	
high-speed	Ratings (mA; V; W; °C)										
	$I_{CM}=500$		$V_{CEO}=15$	$P_{tot}=360$		$T_j=200$	$R_{th\,j-a}=0.48$°C/mW				
2N2475	*0	*5	$I_{CBO}<50$ nA	50	0.5	$h_{FE}>20$	20	0.66	$V_{CE\,sat}<0.4$	length < 5.3	
n-p-n	1	0.3	$h_{FE}>20$	*0	*5	$C_c<3$	20	0.66	$V_{BE\,sat}<1.0$	width < 4.8	
high-speed	20	0.4	$h_{FE}>30$	20	2	$f_T>600$	$t_{on}<20$		$t_{off}<15$	leads > 12.7	
	Ratings (mA; V; mW; °C)										
	$V_{CEO}=6$		$P_{tot}=500$	$T_j=200$			$R_{th\,j-a}=0.58$°C/mW				

2N2904 p-n-p driver	*0	* −50	$-I_{CBO}<20$ nA	−500	−10	$h_{FE}>20$	−500	−50	$-V_{CE\,sat}<1.6$	length < 6.6	
	−10	−10	$h_{FE}>35$	*0	* −10	$C_c<8$	−500	−50	$-V_{BE\,sat}<2.6$	width < 8.5	
	−150	−10	$h_{FE}>40$	−50	−20	$f_T>200$	$t_d<10$		$t_s<80$	leads > 38	
							$t_r<40$		$t_f<30$		
	Ratings (*A*; *V*; *W*; °*C*)										
	$-I_C=0.6$		$-V_{CEO}=40$	$P_{tot}=3$		$T_j=200$	$R_{th\,j-a}=290$ °C/W				
2N2904A	Equivalent to 2N2904 except for:			*0	* −50	$-I_{CBO}<10$ nA	$-V_{CEO}=60$				
				−10	−10	$h_{FE}>40$					
				−500	−10	$h_{FE}>40$					
2N2905	Equivalent to 2N2904 except for:			−10	−10	$h_{FE}>75$					
				−150	−10	$h_{FE}>100$					
				−500	−10	$h_{FE}>30$					
2N2905A	Equivalent to 2N2904 except for:			*0	* −50	$-I_{CBO}<10$ nA	$-V_{CEO}=60$				
				−10	−10	$h_{FE}>100$					
				−150	−10	$h_{FE}>100$					
				−500	−10	$h_{FE}>50$					
2N3133 p-n-p high-speed	*0	* −30	$-I_{CBO}<50$ nA	−150	−10	$h_{FE}>40$	−150	−15	$-V_{CE\,sat}<0.6$	length < 6.6	
	−1	−10	$h_{FE}>25$	*0	* −10	$C_c<10$	−150	−15	$-V_{BE\,sat}<1.5$	width < 8.5	
	−150	−1	$h_{FE}>10$	−50	−20	$f_T>200$	$t_{on}<75$		$t_{off}<150$	leads > 38	
	Ratings (*A*; *V*; *W*; °*C*)										
	$-I_C=0.6$		$-V_{CEO}=35$	$P_{tot}=3$		$T_j=200$	$R_{th\,j-a}=290$ °C/W				
2N3134	Equivalent to 2N3133 except for:			−1	−10	$h_{FE}>50$					
				−150	−1	$h_{FE}>25$					
				−150	−10	$h_{FE}>100$					

SWITCHING TRANSISTORS

Type and applications	Characteristics (mA; V; pF; MHz; dB; ns; $m\Omega^{-1}$) *I_E / I_C	*V_{CB} / V_{CE}	parameter	*I_E / I_C	*V_{CB} / V_{CE}	parameter	I_C	I_B	parameter	Outlines (mm)	
2N3250	-1	-1	$h_{FE}>45$	-10	-20	$f_T>250$	-50	-5	$-V_{CE\,sat}<0.5$	length <5.3	
p-n-p	-15	-1	$h_{FE}>15$	-0.1	-5	$F<6$	-50	-5	$-V_{BE\,sat}<1.2$	width <4.8	
high-speed	*0	*-10	$C_c<6$	-1	-10	$h_{fe}>50$	$t_d<35$		$t_s<175$	leads >12.7	
							$t_r<35$		$t_f<50$		
	Ratings (mA; V; W; °C)										
	$-I_C=200$		$-V_{CEO}=40$	$P_{tot}=1.2$		$T_j=200$	$R_{th\,j-a}=0.485$°C/mW				
2N3250A	Equivalent to 2N3250 except for: $-V_{CEO}=60$										
2N3251	-1	-1	$h_{FE}>90$	-10	-20	$f_T>300$	-50	-5	$-V_{CE\,sat}<0.5$	length <5.3	
p-n-p	-15	-1	$h_{FE}>30$	-0.1	-5	$F<6$	-50	-5	$-V_{BE\,sat}<1.2$	width <4.8	
high-speed	*0	*-10	$C_c<6$	-1	-10	$h_{fe}>100$	$t_d<35$		$t_s<200$	leads >12.7	
							$t_r<35$		$t_f<50$		
	Ratings (mA; V; W; °C)										
	$-I_C=200$		$-V_{CEO}=40$	$P_{tot}=1.2$		$T_j=200$	$R_{th\,j-a}=0.485$°C/mW				
2N3251A	Equivalent to 2N3251 except for: $-V_{CEO}=60$										

MISCELLANEOUS TRANSISTORS

Type and applications	Characteristics (mA; V; pF; MHz; dB) *I_E / I_C	*V_{CB} / V_{CE}	parameter	*I_E / I_C	*V_{CB} / V_{CE}	parameter	*I_E / I_C	*V_{CB} / V_{CE}	parameter	Outlines (mm)
BCY55	*0	*45	$I_{CBO}<10$ nA	10	5	$h_{FE}>200$	0.5	5	$f_{hfe}>0.1$	
n-p-n	*−0.5	*5	$-V_{EB}<0.8$	*0	*5	$C_c<8$	0.01	5	$F<3$	
dual-tr.	0.01	5	$h_{FE}>100$	0.5	5	$f_T=80$	1	5	$h_{fe}>150$	
	Ratings of the individual transistors (mA; V; mW; °C)									
	$I_{CM}=60$		$V_{CEO}=450$	$P_{tot}=300$		$T_j=125$	$R_{th\,j-a}=0.33$°C/mW			
	Characteristics of the matched transistors									
	$\Delta V_{BE}<4$ mV; $I_{1C}/I_{2C}>0.85$; $\Delta V/\Delta T<3$ μV/°C; $\Delta I/\Delta T<1.5$ nA/°C									
BCY87	*0	*20	$I_{CBO}<5$ nA	0.05	*10	$h_{FE}<450$	*−0.5	*10	$f_T>50$	length > 5.3
n-p-n	0.05	*10	$h_{FE}>100$	*0	*10	$C_c<3.5$	0.05	5	$F<3$	width > 4.8
dual-tr.	*Ratings of the individual transistors (mA; V; mW; °C)*									leads < 12.7
	$I_C=30$		$V_{CEO}=40$	$P_{tot}=150$		$T_j=175$	$R_{th\,j-a}=1$°C/mW			
	Characteristics of the matched transistors									
	$\Delta V_{BE}<3$ mV; $I_{1C}/I_{2C}>0.9$; $\Delta V/\Delta T<3$ μV/°C; $\Delta I/\Delta T<0.5$ nA/°C									
BCY88	*0	*20	$I_{CBO}<20$ nA	0.5	*10	$h_{FE}<600$	*−0.5	*10	$f_T>50$	length > 5.3
n-p-n	0.5	*10	$h_{FE}>120$	*0	*10	$C_c<3.5$	0.05	5	$F<4$	width > 4.8
dual-tr.	*Ratings of the individual transistors (mA; V; mW; °C)*									leads < 12.7
	$I_C=30$		$V_{CEO}=40$	$P_{tot}=150$		$T_j=175$	$R_{th\,j-a}=1$°C/mW			
	Characteristics of the matched transistors									
	$\Delta V_{BE}<6$ mV; $I_{1C}/I_{2C}>0.8$; $\Delta V/\Delta T<6$ μV/°C; $\Delta I/\Delta T<2$ nA/°C									

BCY89 n-p-n dual-tr.

*0 *20 $I_{CBO} < 10$ nA 10 *10 $h_{FE} < 600$ * −0.5 *10 $f_T > 50$
10 *10 $h_{FE} > 100$ *0 *10 $C_c < 3.5$ 0.05 5 $F < 4$

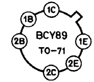
Ratings of the individual transistors (mA; V; mW; °C)

$I_C = 30$ $V_{CEO} = 40$ $P_{tot} = 150$ $T_j = 175$ $R_{th\,j-a} = 1$°C/mW

Characteristics of the matched transistors

$\Delta V_{BE} < 10$ mV; $I_{1C}/I_{2C} > 0.67$; $\Delta V/\Delta T < 10$ μV/°C; $\Delta I/\Delta T < 10$ nA/°C

length > 5.3
width > 4.8
leads < 12.7



BRY39 p-n-p-n driver numerical indicator tubes

n-p-n transistor:

10 2 $h_{FE} > 50$ *0 *20 $C < 5$ 10 2 $f_T = 300$

Ratings (mA; V)

$I_{CM} = 100$ $V_{CER} = 70$

p-n-p transistor:

*1 *0 $h_{FE} > 0.25$ *1 *0 $h_{FE} < 2.5$

Ratings (mA; V)

$I_{EM} = 500$ $-V_{CEO} = 70$

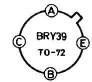
Combined device:

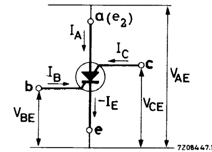
$I_A = 50$ mA; $I_C = 0$ $V_{AE} < 1.4$ V
$I_A = 1$ mA; $I_C = 10$ mA $V_{AE} < 1.2$ V

Ratings (mW; °C)

$P_{tot} = 250$ $T_j = 150$ $R_{th\,j-a} = 0.5$°C/mW

length < 5.3
width < 4.8
leads > 12.7





a = anode (emitter of p-n-p transistor)

40809 package l.f.

The package consists of: AC127; AC128; AC127/AC128
For data of mentioned types see section: LOW FREQUENCY TRANSISTORS
Performance of a class-B complementary output stage:

$P_o \leqslant 1.2$ W $I_{CM} = 470$ mA
$d_{tot} = 10$% $V_S = 9$ V
$V_{i(rms)} = 5.6$ mV

Type and applications	Characteristics (mA; V; pF; MHz; dB)									Outlines (mm)
	*I_E / I_C	*V_{CB} / V_{CE}	parameter	*I_E / I_C	*V_{CB} / V_{CE}	parameter	*I_E / I_C	*V_{CB} / V_{CE}	parameter	
40819 package l.f.	The package consists of: AC187; AC188; AC187/01; AC188/01									
	For data of mentioned types see section: LOW FREQUENCY TRANSISTORS									
	AC187 (pre-amplifier)			500	1	h_{FE} 100 to 200				
	AC188 (driver)			500	1	h_{FE} 100 to 200				
	AC187/01 (output stage)			500	1	h_{FE} 200 to 500				
	AC188/01 (output stage)			500	1	h_{FE} 200 to 500				
	Performance of an audio amplifier									
	$P_o \leqslant 3$ W		$I_{CM}=750$ mA			$P_o \leqslant 1$ W		$I_{CM}=710$ mA		
	$d_{tot}=10\%$		$V_S=15$ V			$d_{tot}=10\%$		$V_S=6$ V		
	$V_{i(rms)}=5.5$ mV					$V_{i(rms)}=41$ mV				
40820 package h.f.	The package consists of: BF194B (mixer oscillator transistor)									
	BF195C (controlled first i.f. transistor)									
	BF195D (second i.f. transistor)									
	For data of mentioned types see section: HIGH FREQUENCY TRANSISTORS									
	except for: BF194B			1	10	I_B 5–9 μA				
	BF195C			1	10	I_B 9–14 μA				
	BF195D			1	10	I_B 14–26 μA				
	Performance of a h.f. section of 6 V m.w. radio receiver:									
	Signal to obtain:									
	$V_o=10$ mV		$E=25$ μV/m			$I_{tot}=3$ mA				
	signal/noise = 26 dB		$E=500$ μV/m							

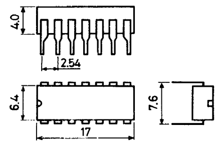
40822 package h.f.	The package consists of: BF179A (G-Y amplifier) BF179B (R-Y amplifier) BF179C (B-Y amplifier) Performance of a colour difference amplifier: G-Y: $V_{op-p}=100$ V Bandwidth $=1$ MHz R-Y: Gain $=30$ $V_{op-p}=170$ V Bandwidth $=1$ MHz B-Y: Gain $=50$ $V_{op-p}=200$ V Bandwidth $=1$ MHz Transient response: $t_r=t_f=300$ ns; overshoot $<5\%$

DIGITAL MONOLITHIC INTEGRATED CIRCUITS

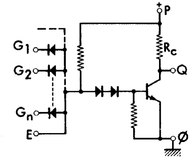
FC family (Diode-Transistor Logic)
Standard temperature range

Supply voltage	V_P	6.0 V
Operating ambient temperature	T_{amb}	0 to 75°C

* collector resistor R_c omitted



Package D1 (dual in-line)
Dimensions in mm



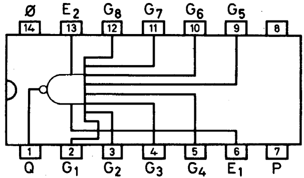
Basic gate circuit

CHARACTERISTICS at $T_{amb} = 25°C$ (each gate)

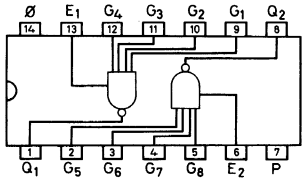
Type number	*Description (positive logic)*	*Propagation delay time typ. (ns)*	*Available fan-out min.*	*Noise margin min (V)*	*Noise margin typ. (V)*	*Power consumption typ. (mW)*	*Package*
FCH101*	Single 8-input	31	8	0.60	1.2	7.0	D1
FCH111	NAND gate	31	8	0.60	1.2	11.0	D1
FCH121*	Dual 4-input	31	8	0.60	1.2	7.0	D1
FCH131	NAND gate	31	8	0.60	1.2	11.0	D1
FCH141*	Triple 3-3-2 input	31	8	0.60	1.2	7.0	D1
FCH161	NAND gate	31	8	0.60	1.2	11.0	D1
FCH151*	Triple 3-input	31	8	0.60	1.2	7.0	D1
FCH171	NAND gate	31	8	0.60	1.2	11.0	D1
FCH181*	Quadruple 2-input	31	8	0.60	1.2	7.0	D1
FCH191	NAND gate	31	8	0.60	1.2	11.0	D1
FCH201*	Sextuple	31	8	0.60	1.2	7.0	D1
FCH211	inverter	31	8	0.60	1.2	11.0	D1

Terminal connections (top view)

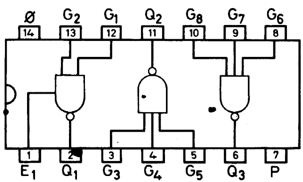
FCH101
FCH111



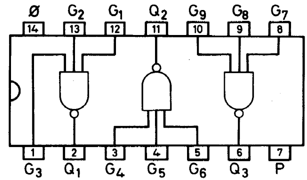
FCH121
FCH131



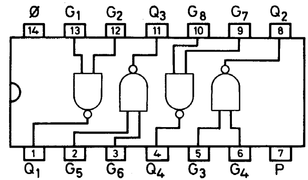
FCH141
FCH161



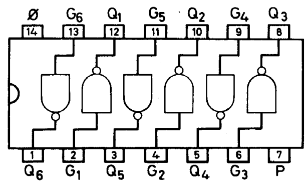
FCH151
FCH171



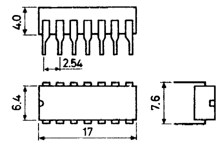
FCH181
FCH191



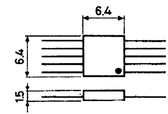
FCH201
FCH211



DIGITAL MONOLITHIC INTEGRATED CIRCUITS
FC family (Diode-Transistor Logic)
Standard temperature range



Package D1 (dual in-line)
Dimensions in mm



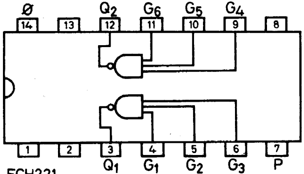
Package C1 (flat-pack)
Dimensions in mm

Supply voltage	V_P	6.0 V
Operating ambient temperature	T_{amb}	0 to 75°C

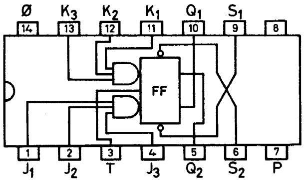
CHARACTERISTICS at $T_{amb} = 25°C$

Type number	*Description (positive logic)*	*Propagation delay time (ns)*	*Maximum clock rate min. (MHz)*	*Available fan-out min.*	*Noise margin min. (V)*	*Power consumption (mW)*	*Package*
FCH221	Dual 3-input line driver NAND gate	max. 93		16	0.60	typ. 11.0 (each gate)	D1
FCJ101	Single JK flip-flop	max. 110	7	6	0.45	max. 69	D1
FCJ111	Single JK master-slave flip-flop	typ. 110	3	8	0.60	typ. 73	D1
FCK101	Monostable multivibrator	typ. 75	2.5	8	0.60	typ. 110	D1
FCK101Q	Monostable multivibrator	typ. 75	2.5	8	0.60	typ. 110	C1
FCL101	Level detector (Schmitt trigger)		1	3		max. 19	D1
FCY101	Triple gate input expander (10-diode array)						D1

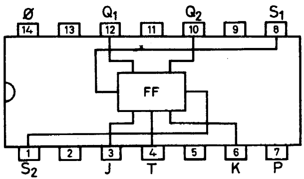
Terminal connections (top view)



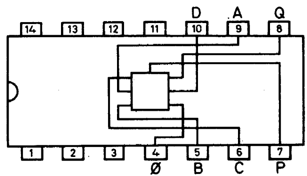
FCH221



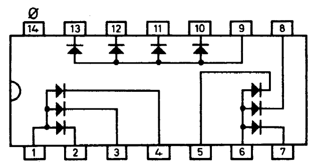
FCJ101



FCJ111

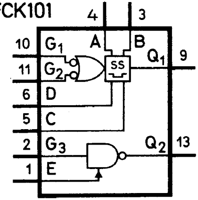


FCL101

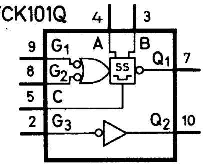


FCY101

FCK101



FCK101Q

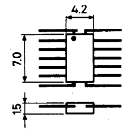


DIGITAL MONOLITHIC INTEGRATED CIRCUITS
FC family (Diode-Transistor Logic)
Extended temperature range

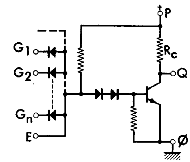
Supply voltage	V_P	6.0 V
Operating ambient temperature	T_{amb}	−55 to +125°C

* collector resistor-R_c omitted

CHARACTERISTICS at $T_{amb} = 25°C$ (each gate)



Package E2 (flat-pack)
Dimensions in mm

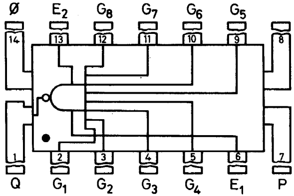


Basic gate circuit

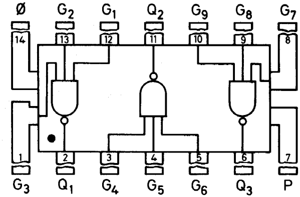
Type number	*Description (positive logic)*	*Propagation delay time typ. (ns)*	*Available fan-out min.*	*Noise margin min. (V)*	*Noise margin typ. (V)*	*Power consumption typ. (mW)*	*Package*
FCH102*	Single 8-input	32	11	0.55	1.2	7.0	E2
FCH112	NAND gate	32	11	0.55	1.2	10.5	E2
FCH122*	Dual 4-input	32	11	0.55	1.2	7.0	E2
FCH132	NAND gate	32	11	0.55	1.2	10.5	E2
FCH142*	Triple 3-3-2-input	32	11	0.55	1.2	7.0	E2
FCH162	NAND gate	32	11	0.55	1.2	10.5	E2
FCH152*	Triple 3-input	32	11	0.55	1.2	7.0	E2
FCH172	NAND gate	32	11	0.55	1.2	10.5	E2
FCH182*	Quadruple 2-input	32	11	0.55	1.2	7.0	E2
FCH192	NAND gate	32	11	0.55	1.2	10.5	E2
FCH202*	Sextuple	32	11	0.55	1.2	7.0	E2
FCH212	inverter	32	11	0.55	1.2	10.5	E2

Terminal connections (top view)

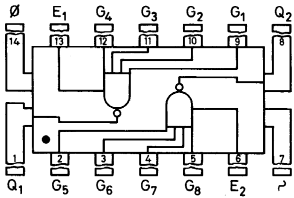
FCH102
FCH112



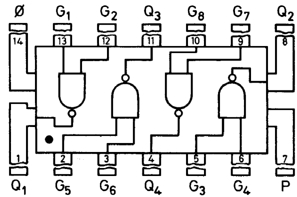
FCH152
FCH172



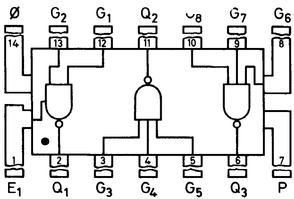
FCH122
FCH132



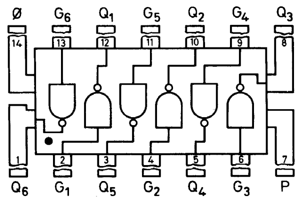
FCH182
FCH192



FCH142
. FCH162

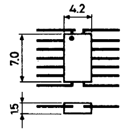


FCH202
FCH212

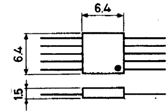


DIGITAL MONOLITHIC INTEGRATED CIRCUITS
FC family (Diode-Transistor Logic)
Extended temperature range

Supply voltage	V_P	6.0 V
Operating ambient temperature	T_{amb}	−55 to +125 °C



Package E2 (flat-pack)
Dimensions in mm



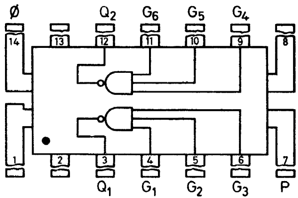
Package C1 (flat-pack)
Dimensions in mm

CHARACTERISTICS at $T_{amb} = 25\,°C$

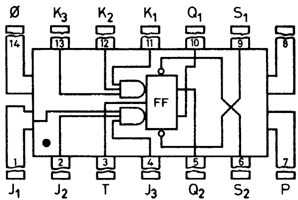
Type number	*Description (positive logic)*	*Propagation delay time (ns)*	*Maximum clock rate min. (MHz)*	*Available fan-out min.*	*Noise margin min. (V)*	*Power consumption (mW)*	*Package*
FCH222	Dual 3-input line driver NAND gate	max. 75		20	0.55	max. 17	E2
FCJ102	Single JK flip-flop	max. 60	10	10	0.55	max. 55	E2
FCK102	Monostable multivibrator	max. 100	2.5	11	0.55	typ. 105	E2
FCK102Q	Monostable multivibrator	max. 100	2.5	11	0.55	typ. 105	C1
FCL102	Level detector (Schmitt trigger)		1	3		max. 19	E2
FCY102	Triple gate input expander (10-diode array)						E2

Terminal connections (top view)

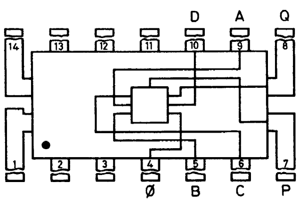
FCH222



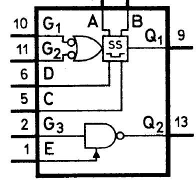
FCJ102



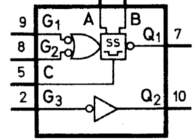
FCL102



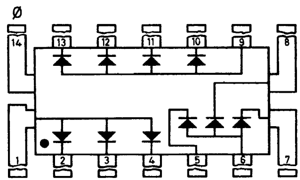
FCK102



FCK102Q



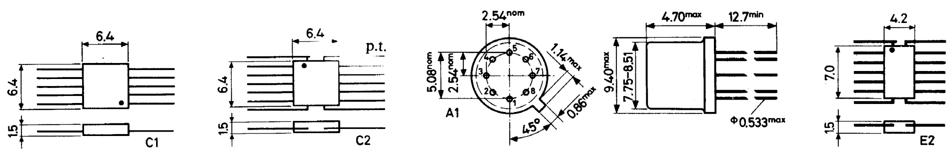
FCY102

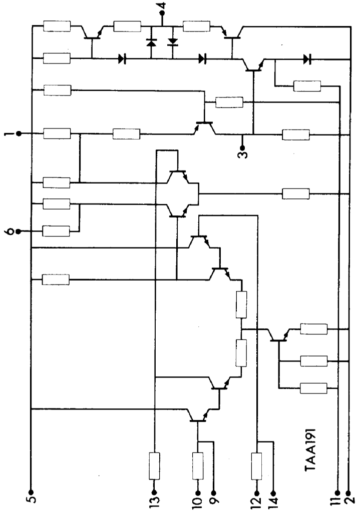


LINEAR MONOLITHIC INTEGRATED CIRCUITS

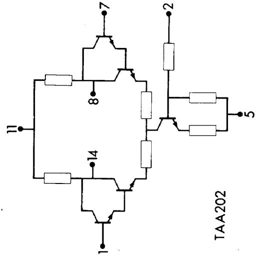
CHARACTERISTICS at $T_{amb} = 25\,°C$

Type number	*Description*	*Voltage gain typ.*	*Comm. mode rejection ratio min. (dB)*	*Input imped. typ. (kΩ)*	*Output imped. typ. (Ω)*	*Voltage drift typ. (µV/°C)*	*Cut-off frequency (−3 dB) typ. (kHz)*	*Supply voltages (V)*	*Operating ambient temperature (°C)*	*Package*
TAA182	Operational amplifier	1100	75	300	40	5	500	+10 −10	−55 to +125	C1
TAA191	Operational amplifier	45000	83	750	75	25	100	+15 −15	0 to +75	C2
TAA201	Differential amplifier	60	70	150	8000	10	300	+12 − 6	−55 to +75	A1
TAA202	Differential amplifier	50	70	1000	8000	10	150	+12 − 6	−55 to +125	E2

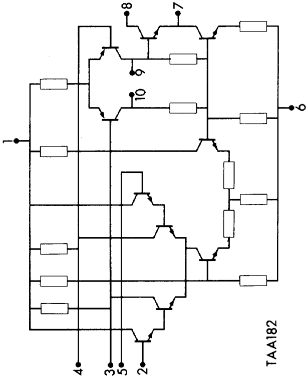




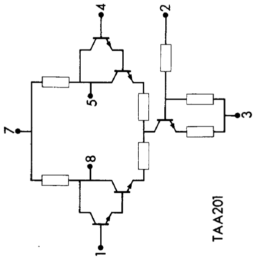
TAA191



TAA202



TAA182

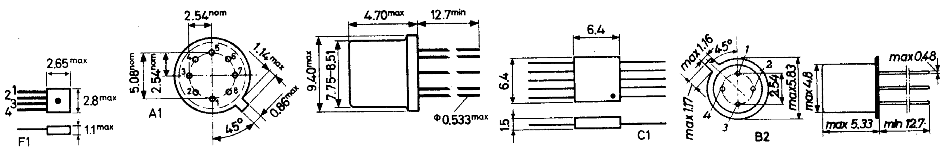


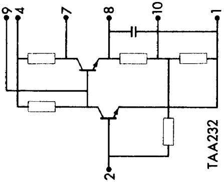
TAA201

LINEAR MONOLITHIC INTEGRATED CIRCUITS

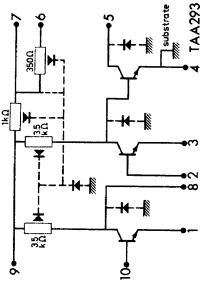
CHARACTERISTICS at $T_{amb} = 25°C$

Type number	*Description*	*Power gain typ. (dB)*	*Noise figure (dB)*	*Output*	*Cut-off frequency (−3 dB) typ.*	*Supply voltage (V)*	*Operating ambient temperature (°C)*	*Package*
OM200	Hearing-aid amplifier	80	max. 6	min. 0.2 mW	20 kHz	+1.3	−10 to +50	F1
TAA231	Wide-band amplifier	23	typ. 4	typ. 6 V_{p-p}	45 MHz	+12	0 to +75	A1
TAA232	Wide-band amplifier	23	typ. 4	typ. 6 V_{p-p}	45 MHz	+12	−55 to +125	C1
TAA263	General purp. amplifier	77	typ. 5	min. 10 mW	600 kHz	+6.0	−20 to +100	B2
TAA293	General purp. amplifier	80	typ. 6	min. 10 mW	600 kHz	+6.0	−20 to +100	A2 see TAA310

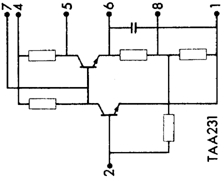




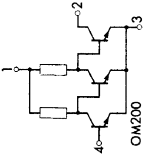
TAA232



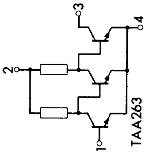
TAA293



TAA231



OM200

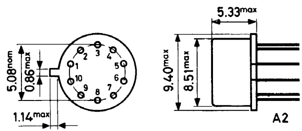


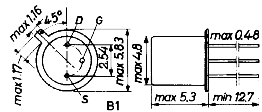
TAA263

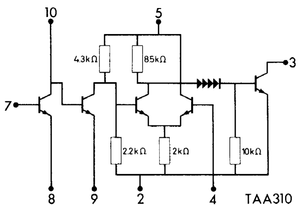
LINEAR MONOLITHIC INTEGRATED CIRCUITS

CHARACTERISTICS at $T_{amb} = 25\,°C$

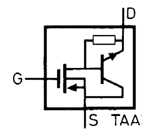
Type number	*Description*	*Noise figure*	*Input imped.* (Ω)	*Output*	*Trans-conductance* ($m\Omega^{-1}$)	*Supply voltage* (*V*)	*Operating ambient temperature* (°*C*)	*Package*
TAA310	A.F. tape recorder pre-amplifier	max. 4 dB	typ. $2 \cdot 10^4$	min. 1.8 V_{p-p}		+7.0	−20 to +75	A2
TAA320	A.F. MOS bifet pre-amplifier	Eqt. input noise signal B = 50–15000 Hz typ. 25 μV	min. 10^{11}	Output conductance typ. 650 $\mu\Omega^{-1}$	min. 40	−20	Junction temperature max. +125	B1







TAA310



TAA320

REPLACEMENT GUIDE SEMICONDUCTORS

REPLACEMENT GUIDE TRANSISTORS

Type to be replaced	Replacement type
2N85	(BSX19)
2N174	2N174
2N256	2N526;ASY80
2N441	2N441
2N442	2N442
2N527	2N527
2N696	2N696
2N697	2N697
2N698	2N1893
2N699	2N1893
2N706	2N706
2N706A	2N706A
2N708	2N708;BC107A;BCY56
	BSX20;BSY19
2N709	2N709;BSX20
2N726	BSY40
2N727	BSY41
2N735	BSX70
2N736	BSX71
2N736A	(BSX71)
2N743	BC108A;BCY57;BSX19
2N744	BC108A;BCY57
	BSX20;(BSY19)
2N753	2N753
2N760	BCY56;BC107A
2N760A	2N2483
2N849	(BSX19)
2N850	(BSX20)
2N851	(BSX19)
2N914	BSX20
2N916	(BF200)
2N918	2N918;BF180
2N929	2N929;(BC107A);BCY56
2N930	2N930;(BC107A);BCY56
2N956	2N956
2N1100	2N1100
2N1131	2N1131
2N1132	2N2904
2N1302	2N1302;ASY73
2N1304	2N1304;ASY74
2N1306	2N1306;ASY75
2N1308	2N1308
2N1487	BDY20
2N1488	BDY20
2N1489	BDY20
2N1490	BDY20
2N1566A	(BSX96)
2N1573	BFY67
2N1574	BFY68
2N1613	2N1613;BFY67
2N1711	2N1711;BFY68
2N1893	2N1893
2N1924	ASY77
2N1925	(ASY77)
2N1926	(ASY77)
2N1990N	BSX21
2N1990R	BSX21
2N2192	BSX96
2N2192A	BSX96
2N2193	BFY55;(BSX95)
2N2193A	BSX95
2N2194	BSX95
2N2194A	BSX95
2N2217	2N2218
2N2218	2N2218;(BSX60)
2N2218A	BSX61
2N2219	2N2219;(BSX96)
2N2219A	(BSX61)
2N2220	2N2221
2N2221	2N2221

Type to be replaced	Replacement type
2N2221A	(BSX70)
2N2222	2N2222
2N2222A	(BSX70)
2N2368	2N2368;BSX19
2N2369	2N2369;BSX20
2N2369A	2N2369;BSX20
2N2387	(2N929);(BCY56)
2N2388	(2N930)
2N2389	(2N1613);(BSX95)
2N2390	(2N1711);(BSX96)
2N2393	(2N1131)
2N2394	(2N2904)
2N2395	(2N696)
2N2396	(2N697)
2N2410	2N2410;(BSX95)
2N2432	(2N2570)
2N2483	2N2483
2N2484	2N2484
2N2537	BSX95
2N2538	BSX96
2N2539	BSX70
2N2540	BSX71
2N2586	2N2484
2N2604	(BCY70)
2N2605	(BCY71)
2N2692	2N930
2N2693	2N929;BCY56
2N2694	2N929;BCY56
2N2695	(BCY72)
2N2696	BCY72
2N2857	2N2857
2N2865	(BF180);(BF183)
2N2883	BFW17
2N2884	BFW17
2N2894	(BC177);(BCY72)

Type to be replaced	Replacement type
2N2904	2N2904
2N2904A	2N2904
2N2905	2N2904A
2N2905A	2N2904A
2N2906	(BCY70)
2N2906A	BCY70
2N2907	(BCY70)
2N2907A	BCY71
2N3009	(BSX20)
2N3010	BSX19
2N3011	BSX20
2N3013	(BSX20)
2N3014	(BSX20)
2N3015	2N2410
2N3037	(2N1893)
2N3055	BDY20
2N3252	2N3252
2N3253	(BSX59)
2N3375	2N3375
2N3485	(BCY70)
2N3485A	(BCY70)
2N3486	(BCY71)
2N3486A	(BCY71)
2N3502	2N3134
2N3503	2N2904A;2N2905
2N3504	BCY71
2N3505	(BCY71)
2N3553	2N3553
2N3554	BSX60
2N3570	2N3570
2N3571	2N3571
2N3572	2N3572
2N3632	2N3632
2N3702	(BC157)
2N3702	(BC177)

REPLACEMENT GUIDE TRANSISTORS

Type to be replaced	Replacement type
2N3703	(BC157);(BC177)
2N3704	(BC107A);(BC147A)
2N3705	(BC107A);(BC147A)
2N3706	(BC108A);(BC148A)
2N3707	(BC109C);(BC149C)
2N3708	(BC108A);(BC148A)
2N3709	(BC108A);(BC148A)
2N3710	(BC108A);(BC148A)
2N3711	(BC108B);(BC148B)
2N3712	(BF178)
2N3829	(BCY71)
2N3866	2N3866
2N3924	2N3924
2N3926	2N3926
2N3927	2N3927
2N4427	2N4427
AC116	(AC125)
AC117	AC128/01;(AC188/01)
AC121	AC128
AC122	AC125;AC126
AC124	(AC128/01)
AC127	AC127
AC131	AC128
AC131/30	(AC128)
AC150	AC125
AC151	(AC125)
AC152	AC128
AC153	AC128
AC153K	AC128/01;(AC188/01)
AC160	AC125;AC126
AC161	AC125
AC162	(AC125)
AC163	(AC126)
AC170	AC125
AC171	AC126

Type to be replaced	Replacement type
AC173	AC132
AC175	(AC187/01)
AC176K	(AC187/01)
AC178	AC128/01;(AC188/01)
AC179	(AC187/01)
AC180	AC128
AC180K	AC128/01
AC181	(AC127)
AC181K	(AC187/01)
AC184	AC128
AC185	AC127
AC186	(AC187/01)
AC187K	AC187/01
AC188K	AC188/01
ACY16	(AC128/01)
ACY23	AC125;AC132
ACY32	AC125;AC132
ACY33	AC128;(AC128/01)
ACY38	(AC125)
AD130	AD149
AD131	(AD149)
AD132	(ASZ15)
AD138	ASZ16;(AD149)
AD138/50	(ASZ15)
AD139	AD139
AD148	(AD139)
AD149	AD149
AD150	AD149
AD152	(AD162)
AD153	AD149
AD155	AD162;AD139
AD161	AD161
AD162	AD162
AD163	(ASZ15)
AD164	AD162

Type to be replaced	Replacement type
AD165	AD161
AD169	(AD162)
ADY27	AD149
ADY28	ASZ15
AF106	AF106
AF121	AF121
AF124	AF124
AF125	AF125
AF126	AF126
AF127	AF127
AF134	AF124
AF135	AF125;AF124
AF136	AF125
AF137	AF126
AF138	AF126
AF139	AF139
AF178	(AF106)
AF181	(AF121)
AF193	AF121
AF200	AF121
AF201	AF121
AF202	AF121
AF202S	AF121
AF239	AF239
AF240	AF240
AF279	(AF239S)
AF280	(AF240);(AF239)
AFY11	AFY19
AFY12	AF106
AFY13	(AF124)
AFY15	(AF126)
AFY16	AFY16
AFY29	(AF126)
AFY37	(AFY40)
AFY42	(AFY40)

Type to be replaced	Replacement type
ASY24B	(ASY26)
ASY26	ASY26
ASY27	ASY27
ASY28	ASY28;ASY74
ASY29	ASY29;ASY75
ASY70	ASY80
ASY81	ASY77
ASZ15	ASZ15
ASZ16	ASZ16
ASZ17	ASZ17
ASZ18	ASZ18
AUY19	ASZ15
AUY20	ASZ15
AUY21	ASZ15
AUY22	ASZ15
AUY28	ASZ15
AUY30	ASZ15
AUY31	ASZ16
AUY32	ASZ15
AUY33	ASZ16;(AD149)
BC107A	BC107A
BC107B	BC107B
BC108A	BC108A
BC108B	BC108B
BC108C	BC108C
BC109B	BC109B
BC109C	BC109C
BC113	(BC148B);BC108B
BC114 ●	(BC149B);BC109B
BC115	(BC147A);BC107A
BC116	(BC157);(BC177)
BC117	BF178
BC118	(BC147A);BC107A
BC119	BFY51;BSX95
BC120	BFY51;BSX95

REPLACEMENT GUIDE TRANSISTORS

Type to be replaced	Replacement type
BC121wsz	(BC146rd)
BC121gb	(BC146yw)
BC121gr	(BC146yw)
BC121bl	(BC146gn)
BC122wsz	(BC146rd)
BC122gb	(BC146yw)
BC122gr	(BC146yw)
BC122bl	(BC146gn)
BC125	(BC107A);(BC147A)
BC126	BSX95
BC127	BC146rd
BC128	BC146gn
BC129	(BC107)
BC130	(BC108)
BC131	(BC109)
BC132	(BC148A)
BC134	BC107B;(BC147B)
BC135	(BC107A);(BC147A)
BC136	(BC107A);(BC147A)
BC137	(BC177);(BC157)
BC138	BSX96
BC139	2N2904
BC140	BFY55
BC143	2N2904A
BC144	BFY50
BC147	BC147
BC148	BC148
BC149	BC149
BC153	(BC157);BC177 •
BC154	(BC157);BC177
BC155	(BC146)
BC156	BC146
BC157	BC157;(BC177)
BC158	BC158;(BC178)
BC159	BC159;(BC179)

Type to be replaced	Replacement type
BC167	(BC147)
BC168	(BC148)
BC169	(BC149)
BC170A	(BC108A)
BC170B	(BC108B)
BC170C	(BC108C)
BC171A	(BC147A)
BC171B	(BC147B)
BC172A	(BC148A)
BC172B	(BC148B)
BC172C	(BC148C)
BC173B	(BC149B)
BC173C	(BC149C)
BC177	BC177
BC178	BC178;(BC158)
BC179	(BC159);BC179
BC182	BC107B;(BC147B)
BC183	BC107B(BC147B)
BC184	(BC109C);(BC149C)
BC257	(BC157);(BC177)
BC258	(BC158);(BC178)
BC259	(BC159)
BC259	(BC179)
BCY58A	(BC107A)
BCY58B	(BC107B)
BCY58C	(BC107B)
BCY58D	(BC107C)
BCY59A	(BC107A)
BCY59B	(BC107B)
BCY59C	(BC107B)
BCY59D	(BC107C)
BCY65	(2N2484)
BCY66	(BC107B);(2N930)
BCY78	BC177
BCY79	BC177

Type to be replaced	Replacement type
BD106A	BD124
BD107A	(BD124)
BD109	BD124
BD130	BDY18;BDY20
BDY12	(BD124)
BDY15A	BD124
BDY16A	(BD124)
BDY34	BD124
BF110	(BF178)
BF114	BF178
BF117	BF178
BF118	BF179
BF121	(BF196)
BF123	BF197
BF125	(BF197)
BF127	BF196
BF140	BF178
BF140D	BF178
BF152	BF183
BF153	BF185;(BF195)
BF154	(BC108A);(BC148A)
BF155	(BF180);(BF181); (BF182);(BF183)
BF156	BF178
BF157	BF179
BF158	BF173;(BF197)
BF159	BF173;(BF197)
BF160	BF185;(BF195)
BF161	(BF180);(BF181);(BF182)
BF161	(BF183)
BF162	(BF200)
BF163	BF167;(BF196)
BF164	BF167;(BF196)
BF165	BF185;(BF195)
BF166	BF200

Type to be replaced	Replacement type
BF167	BF167
BF173	BF173
BF174	BF178
BF175	BF167;(BF196)
BF176	BF173;(BF197)
BF177	BF177
BF178	BF178
BF179	BF179
BF184	BF184
BF185	BF185
BF189	BF115;(BF184)
BF194	BF194
BF195	BF195
BF197	BF197
BF198	(BF196);(BF167)
BF199	(BF197);(BF173)
BF223	(BF197)
BF224	BF173;(BF197)
BF225	BF167;(BF196)
BF232	BF173
BFX37	(BC179B);BCY71
BFX39	2N2904
BFX41	2N2904A
BFX48	(BC177)
BFX60	BF173
BFX62	BF180
BFY19	BC108A;BCY57
BFY22	BC146rd
BFY23	BC146rd
BFY23a	BC146gn
BFY24	BC146rd
BFY29	(BC146rd)
BFY30	(BC146rd)
BFY33	BFY51;BSX95
BFY34	2N1613;BFY55; BFY67;BSX95

REPLACEMENT GUIDE TRANSISTORS

Type to be replaced	Replacement type
BFY37	BC108A;BCY57
BFY39-1	BC107A;BCY56
BFY39-2	BC107A;BCY56
BFY39-3	BC107B;(BCY56)
BFY40	(BFY50);BFY51;BSX95
BFY41	2N1889
BFY46	2N1711;BFY68;BSX96
BFY50	BFY50;BFY67; BSX60;BSX95
BFY51	BFY51;BSX95
BFY52	BFY52
BFY56	BSX61
BFY64	2N2905
BFY65	2N1893;BF178
BFY66	2N918;BF180
BFY69	(BC146)
BFY69A	(BC146)
BFY72	2N2219
BFY75	BC107A;(BCY56)
BFY77	BCY56;(BC109C)
BFY80	(BSX21)
BFY85	BCY87;BCY88;BCY89
BFY86	BCY87;BCY88;BCY89
BFY87	BC146
BFY87A	BC146
BFY88	(BFY90)
BFY91	BCY87;BCY88;BCY89
BFY92	BCY87;BCY88;BCY89
BSW19	BCY71
BSX24	BCY56;BC107A
BSX27	BSX20
BSX28	BSX20
BSX32	BSX96
BSX33	BSX70
BSX36	(BSY41)

Type to be replaced	Replacement type
BSX38	(2N2222)
BSX39	BSX19;BSX20
BSX40	2N2904
BSX41	2N2905
BSX45	BFY55
BSX46	BSW66
BSX48	(2N2221)
BSX49	(2N2222)
BSX53	2N2222
BSX54	2N2222
BSX72	2N2410
BSX79	(2N2222)
BSX80	BC148;BC147
BSY17	2N706A
BSY18	2N706A
BSY19	2N708;BC107A;BCY56; BSX20;BSY19
BSY21	2N914;BSX20
BSY34	(BSX61)
BSY44	2N1613;BFY55
BSY44	BFY67;BSX95
PSY45	2N1893
BSY46	BFY55;(BSX95)
BSY51	2N697;BFY51;BSX95
BSY52	BSX96
BSY53	(BFY51);(BFY50);BFY67; (BSX60);BSX95;2N1613
BSY54	BSX96;BFY68;2N1711
BSY55	2N1893
BSY58	(BSX60)
BSY61	BC108A;BC148A
BSY62	2N706A
BSY63	2N708
BSY70	2N706
BSY71	2N1711;BFY68;BSX96

Type to be replaced	Replacement type
BSY72	BC108A;BCY57
BSY73	BC108A;BCY57
BSY74	BC108A;BCY57
BSY75	BSX70
BSY76	BSX71
BSY80	BC108A;BCY57
BSY81	BFY52
BSY83	2N2297;BFY55; BFY67;BSX95
BSY84	BFY68;BSX96
BSY85	(2N1893)
BSY91	BFY51;BFY52
BSY92	BFY68
BSY95A	BC108A;BCY57;(BSX20)
BUY12	(BDY19)
BUY13	BDY18
OC303	(AC125)
OC304-1	(AC125)
OC304-2	(AC125)
OC304-3	(AC125)
OC305-1	(AC126)
OC306-1	(AC125)
OC306-2	(AC125)
OC306-3	(AC125)
OC307-1	(ASY76)
OC307-2	(ASY76)
OC307-3	(ASY80)
OC308	(ASY76)
OC309-1	(ASY77)
OC309-2	(ASY77)
OC309-3	(ASY80)
OC430	(BCY33)
OC440	(BCY30);(BCY31)
OC443	(BCY34);(BCY33)
OC445	(BCY30);(BCY31)

Type to be replaced	Replacement type
OC449	(BCY30)
OC450	(BCY30)
OC460	(BCY34)
OC463	(BCY34)
OC465	(BCY34)
OC466	(BCY34)
OC467	(BCY34)
OC468	(BCY32)
OC469	(BCY30)
OC470	(BCY31)
SFT223	2N1305
SFT229	ASY27
SFT321	AC125
SFT322	AC125
SFT323	AC125;AC126
SFT351	AC125
SFT352	AC125
SFT353	AC125;AC126
TIXS39	BFW17
TF78/30	(AD162)

REPLACEMENT GUIDE SMALL SIGNAL DIODES

Type to be replaced	Replacement type
1N54A	OA91;OA95
1N456	BAY38
1N643	(BAX16)
1N658	BAX16
1N659	BAX16
1N660	BAX16
1N661	(BAX16)
1N662	BAX16
1N663	BAX16
1N914	1N914
1N914A	1N914A
1N914B	1N914B
1N915	BAY38
1N916A	1N914A
1N917	BAY38
1N3062	BAY38
1N3063	BAY38
1N3064	BAY38
1N3070	BAX16
1N3600	BAY38
1N3604	1N3604
1N4009	1N4009
1N4148	(1N914)
1N4149	1N914B
1N4151	(1N3604)
1N4152	1N914B
1N4153	1N914B
1N4154	(1N4009)
1N4446	(1N914A)
1N4447	1N914B
1N4448	(1N914B)
1S920	(BA148)
1S921	(BA148)
1S922	(BA148)
1S923	(BA148)

Type to be replaced	Replacement type
AA111	OA90
AA112	OA90
AA113	(AA119)
AA114	OA90
AA116	OA90
AA117	OA91;OA95
AA118	OA95
AA119	AA119
AA130	OA90
AA131	AA119
AA132	OA91;OA95
AA133	(OA91);(OA95)
AA134	OA91;OA95
AA135	(AAZ18)
AA136	AAZ17
AA137	AA119
AA138	OA90
AA143	AAY32
AA144	AAZ15
AAY13	AAY32
AAY27	AAY32
AAY28	AAZ15
AAY41	(AAZ18)
AAY47	AAY30
AAY49	AAY30
AAZ10	(AAZ18)
AAZ15	AAZ15
AAZ18	AAZ18
BA101	(BA102)
BA103	(BAX16)
BA104	(BAX16)
BA105	(BYX10)
BA108	(BAX16)
BA125	BA102
BA127	(BA100);BAX16

Type to be replaced	Replacement type
BA128	BAX16
BA129	BA148
BA130	BAX13
BA133	(BYX10)
BA137	BAX16;(BA100)
BA139	(BB105A);(BB105B)
BA140	(BB105G)
BA141	(BB105A)
BA142	(BB105G)
BA147	BAX16;(BA100)
BA161	BB105A;BB105B
BA162	BB105G
BA164	BAX13
BA170	BAX16;(BA100)
BAW21	BAX16
BAX20	BAX16
BAX21	BAX16
BAX22	BAX16
BAY17	BAX16
BAY18	BAX16
BAY19	BAX16
BAY20	(BAX16)
BAY41	BAX78
BAY42	BAX78
BAY43	(BAX78)
BAY44	BAX16
BAY45	BAX16
BAY60	1N4009
BAY63	BAX78
BAY68	BAX78
BAY69	BAX78
BAY71	BAY38
BAY74	BAY38
BAY93	(BAY38)
BAY94	(1N4009)

Type to be replaced	Replacement type
BAY95	(1N3604)
BAY98	BAX16
BAY99	BAX16
BB103	(BB110)
BB104	BB104
BB105A	BB105A
BB105B	BB105B
BB105G	BB105G
BY103	(BY127)
BY133	(BY127)
BY134	BY127
BY135	BY127
BY144	BY140
BYY31	BY127
BYY32	BY127
BYY33	BY127
BYY34	BY127
BYY35	BY127
BYY36	BY127
BYY37	BY127
BYY88	(BY127)
BYY89	(BY127)
BYY90	(BY127)
BYY91	(BY127)
E11	BY127
E21	BY127
E41	BY127
E61	BY127
E81	BY127
E101	(BY127)
G498	AAZ17
G498.1	AAZ17
G580	AAZ18
ITT600DPD	(1N914B)
ITT601DPD	(1N914B)

REPLACEMENT GUIDE SMALL SIGNAL DIODES

Type to be replaced	Replacement type
ITT700	1N3604
ITT777	1N4009
ME120	(BY140)
OA127	BAX16
OA128	BAX16
OA129	BAX16
OA130	BAX16
OA150	OA91;OA95
OA159	AA119
OA160	OA90
OA161	(OA91);(OA95)
OA172	AA119
OA174	OA91;OA95
OA180	AAY30
OA182	AAZ15
SFD021	OA47
SFD037	OA47
SFD108	OA91;OA95
SFD122	AAY32
SFD135	AAZ15
SFD180	BAX16
SFD181	BAX16

REPLACEMENT GUIDE INTEGRATED CIRCUITS

Type to be replaced	Replacement type
CA3011	TAA380A
CA3013	TAA380
MEM3021	FEJ111
NE101G	FFH101
NE105G	FFY101
NE110G	FFH131
NE115G	FFH141
NE124G	FFJ101
NE150G	FFH121
NS701G	FFH111
NS709G	FFY111
SF252	FHJ101A
SF253	FHJ101B
SF262	FHJ121A
SF263	FHJ121B
SG212	FHH181A
SG213	FHH181B
SG222	FHH141A
SG223	FHH141B
SG232	FHY101
SG242	FHH121A
SG243	FHH121B
SG252	FHH161A
SG253	FHH161B
SG262	FHH101A
SG263	FHH101B
SG272	FHY121
SN7400N	FJH131
SN7401N	FJH231
SN7402N	FJH221
SN7410N	FJH121
SN7420N	FJH111
SN7430N	FJH101
SN7440N	FJH141
SN7450N	FJH151
SN7451N	FJH161
SN7453N	FJH171
SN7454N	FJH181
SN7460N	FJY101
SN7470N	FJJ101
SN7472N	FJJ111
SN7473N	FJJ121
SN7474N	FJJ131
SN7475N	FJJ181
SN7476N	FJJ191
SN7490N	FJJ141

Type to be replaced	Replacement type
SN14224N	FCH101
SN14306N	FCH141
SN14310N	FCH221
SN14316N	FCH161
SN14326N	FCH151
SN14327N	FCY101
SN14331N	FCH121
SN14336N	FCH171
SN14346N	FCH181
SN14361N	FCH131
SN14366N	FCH191
SN14386N	FCH201
SN14396N	FCH211
SNX7441N	FJL101
WC115	TAA201
WC206	FCH141
WC208D	FCL101
WC210	FCH221
WC216	FCH161
WC218	FCK101
WC224	FCH101
WC225	FCJ101
WC226	FCH151
WC227	FCY101
WC231	FCH121
WC234	FCH111
WC236	FCH171
WC245	FCJ121
WC246	FCH181
WC255	FCJ131
WC261	FCH131
WC265	FCJ211
WC266	FCH191
WC286	FCH201
WC296	FCH211
WC1146	TAA231
WC1709D	TAA521A
WC1709T	TAA521
WM1146	TAA232
WM1709K	TAA522
WS115	TAA202
WS161	TAA182
μA702A	TAA242
μA702C	TAA241
μA709	TAA522
μA709C	TAA521; TAA521A

REPLACEMENT GUIDE VOLTAGE REGULATOR (ZENER) DIODES

Type to be replaced	Replacement type
1N708	BZY88-C5V6
1N709	-C6V2
1N710	-C6V8
1N711	-C7V5
1N712	-C8V2
1N713	BZY88-C9V1
1N714	-C10
1N715	-C11
1N716	-C12
1N717	-C13
1N718	BZY88-C15
1N719	-C16
1N720	-C18
1N721	-C20
1N722	-C22
1N723	BZY88-C24
1N724	-C27
1N725	-C30
1N726	BZY94-C33
1N727	-C36
1N728	BZY94-C39
1N729	-C43
1N730	-C47
1N731	-C51
1N732	-C56
1N733	BZY94-C62
1N734	-C68
1N735	-C75
1N746	BZY88-C3V3
1N747	-C3V6
1N748	BZY88-C3V9
1N749	-C4V3
1N750	-C4V7
1N751	-C5V1
1N752	-C5V6

Type to be replaced	Replacement type
1N753	BZY88-C6V2
1N754	-C6V8
1N755	-C7V5
1N756	-C8V2
1N757	-C9V1
1N758	BZY88-C10
1N759	-C12
1N957	BZY88-C6V8
1N958	-C7V5
1N959	-C8V2
1N960	BZY88-C9V1
1N961	-C10
1N962	-C11
1N963	-C12
1N964	-C13
1N965	BZY88-C15
1N966	-C16
1N967	-C18
1N968	-C20
1N969	-C22
1N970	BZY88-C24
1N971	-C27
1N972	-C30
1N973	BZY94-C33
1N974	-C36
1N975	BZY94-C39
1N976	-C43
1N977	-C47
1N978	-C51
1N979	-C56
1N980	BZY94-C62
1N981	-C68
1N982	-C75
1N1816	BZY93-C13
1N1817	-C15

Type to be replaced	Replacement type
1N1818	BZY93-C16
1N1819	-C18
1N1820	-C20
1N1821	-C22
1N1822	-C24
1N1823	BZY93-C27
1N1824	-C30
1N1825	-C33
1N1826	-C36
1N1827	-C39
1N1828	BZY93-C43
1N1829	-C47
1N1830	-C51
1N1831	-C56
1N1832	-C62
1N1833	BZY93-C68
1N1834	-C75
1N2970	BZY93-C6V8
1N2971	-C7V5
1N2972	-C8V2
1N2973	BZY93-C9V1
1N2974	-C10
1N2975	-C11
1N2976	-C12
1N2977	-C13
1N2979	BZY93-C15
1N2980	-C16
1N2982	-C18
1N2984	-C20
1N2985	-C22
1N2986	BZY93-C24
1N2988	-C27
1N2989	-C30
1N2990	-C33
1N2991	-C36

Type to be replaced	Replacement type
1N2992	BZY93-C39
1N2993	-C43
1N2995	-C47
1N2997	-C51
1N2999	-C56
1N3000	BZY93-C62
1N3001	-C68
1N3002	-C75
1N3016	BZX29-C6V8
1N3017	-C7V5
1N3018	BZX29-C8V2
1N3019	-C9V1
1N3020	-C10
1N3021	-C11
1N3022	-C12
1N3023	BZX29-C13
1N3024	-C15
1N3025	-C16
1N3026	-C18
1N3027	-C20
1N3028	BZX29-C22
1N3029	-C24
1N3030	-C27
1N3031	-C30
1N3032	-C33
1N3033	BZX29-C36
1N3034	-C39
1N3035	-C43
1N3036	-C47
1N3037	-C51
1N3038	BZX29-C56
1N3039	-C62
1N3040	-C68
1N3041	-C75
1N3042	-C82

REPLACEMENT GUIDE VOLTAGE REGULATOR (ZENER) DIODES

Type to be replaced	Replacement type
1N3043	BZX29-C91
1N3044	-C100
1N3309	BZY91-C10
1N3311	-C12
1N3314	-C15
1N3317	BZY91-C18
1N3320	-C22
1N3323	-C27
1N3325	-C33
1N3327	-C39
1N3330	BZY91-C47
1N3334	-C56
1N3336	-C68
1N4158	BZX29-C6V8
1N4159	-C7V5
1N4160	BZX29-C8V2
1N4161	-C9V1
1N4162	-C10
1N4163	-C11
1N4164	-C12
1N4165	BZX29-C13
1N4166	-C15
1N4167	-C16
1N4168	-C18
1N4169	-C20
1N4170	BZX29-C22
1N4171	-C24
1N4172	-C27
1N4173	-C30
1N4174	-C33
1N4175	BZX29-C36
1N4176	-C39
1N4177	-C43
1N4178	-C47
1N4179	-C51

Type to be replaced	Replacement type
1N4180	BZX29-C56
1N4181	-C62
1N4182	-C68
1N4183	-C75
1N4184	-C82
1N4185	BZX29-C91
1N4186	-C100
1N4831	BZX29-C9V1
1N4832	-C10
1N4833	-C11
1N4834	BZX29-C12
1N4835	-C13
1N4836	-C15
1N4837	-C16
1N4838	-C18
1N4839	BZX29-C20
1N4840	-C22
1N4841	-C24
1N4842	-C27
1N4843	-C30
1N4844	BZX29-C33
1N4845	-C36
1N4846	-C39
1N4847	-C43
1N4848	-C47
1N4849	BZX29-C51
1N4850	-C56
1N4851	-C62
1N4852	-C68
1N4853	-C75
1N4854	BZX29-C82
1N4855	-C91
1N4856	-C100
11Z6	BZX29-C3V3
12Z6	-C3V6

Type to be replaced	Replacement type
13Z6	BZX29-C3V9
14Z6	-C4V3
15Z6	-C4V7
16Z6	-C5V1
17Z6	-C5V6
18Z6	BZX29-C6V2
19Z6	-C6V8
20Z6	-C7V5
21Z6	-C8V2
22Z6	-C9V1
23Z6	BZX29-C10
24Z6	-C11
25Z6	-C12
26Z6	-C13
28Z6	-C15
31Z6	BZY88-C3V3
32Z6	-C3V6
33Z6	-C3V9
34Z6	-C4V3
35Z6	-C4V7
36Z6	BZY88-C5V1
37Z6	-C5V6
38Z6	-C6V2
39Z6	-C6V8
40Z6	-C7V5
41Z6	BZY88-C8V2
42Z6	-C9V1
43Z6	-C10
79Z6	BZY93-C6V8
80Z6	-C7V5
81Z6	BZY93-C8V2
82Z6	-C9V1
83Z6	-C10
84Z6	-C11
85Z6	-C12

Type to be replaced	Replacement type
86Z6	BZY93-C13
88Z6	-C15
1102	BZY88-C3V3
1103	-C3V9
1104	-C4V7
1105	BZY88-C5V6
1106	-C6V8
1107	-C7V5
1108	-C8V2
1109	-C9V1
1110	BZY88-C10
1111	-C11
1112	-C12
1113	-C13
1115	-C15
1116	BZY88-C16
1118	-C18
1120	-C20
1122	-C22
1124	-C24
1127	BZY88-C27
1130	-C30
1133	BZY94-C33
1206	BZY93-C6V8
1207	-C7V5
1208	BZY93-C8V2
1209	-C9V1
1210	-C10
1211	-C11
1212	-C12
1213	BZY93-C13
1215	-C15
1216	-C16
1218	-C18
1220	-C20

REPLACEMENT GUIDE VOLTAGE REGULATOR (ZENER) DIODES

Type to be replaced	Replacement type
1222	BZY93-C22
1224	-C24
1227	-C27
1230	-C30
1233	-C33
1236	BZY93-C36
1239	-C39
1243	-C43
1247	-C47
1302	BZX29-C3V3
1303	BZX29-C3V9
1304	-C4V7
1305	-C5V6
1306	-C6V8
1307	-C7V5
1308	BZX29-C8V2
1309	-C9V1
1310	-C10
1311	-C11
1312	-C12
1313	BZX29-C13
1315	-C15
1316	-C16
1318	-C18
1320	-C20
1322	BZX29-C22
1324	-C24
1327	-C27
1330	-C30
1333	-C33
1336	BZX29-C36
1339	-C39
1343	-C43
1347	-C47
4120;4220	BZY93-C10(R)*

Type to be replaced	Replacement type
4121;4221	BZY93-C11(R)*
4122;4222	-C12(R)
4123;4223	-C13(R)
4124;4224	-C15(R)
4125;4225	-C16(R)
4126;4226	BZY93-C18(R)
4127;4227	-C20(R)
4128;4228	-C22(R)
4129;4229	-C24(R)
4130;4230	-C27(R)
4131;4231	BZY93-C30(R)
4132;4232	-C33(R)
4133;4233	-C36(R)
4134;4234	-C39(R)
4135;4235	-C43(R)
4136;4236	BZY93-C47(R)
4137;4237	-C51(R)
4138;4238	-C56(R)
4139;4239	-C62(R)
4140;4240	-C68(R)
4141;4241	BZY93-C75(R)
4320;4420	BZY91-C10(R)
4321;4421	-C11(R)
4322;4422	-C12(R)
4323;4423	-C13(R)
4324;4424	BZY91-C15(R)
4325;4425	-C16(R)
4326;4426	-C18(R)
4327;4427	-C20(R)
4328;4428	-C22(R)
4329;4429	BZY91-C24(R)
4330;4430	-C27(R)
4331;4431	-C30(R)
4332;4432	-C33(R)
4333;4433	-C36(R)

*) R denotes reversed polarity

Type to be replaced	Replacement type
4334;4434	BZY91-C39(R)*
4335;4435	-C43(R)
4336;4436	-C47(R)
4337;4437	-C51(R)
4338;4438	-C56(R)
4339;4439	BZY91-C62(R)
4340;4440	-C68(R)
4341;4441	-C75(R)
4520;4620	BZY91-C10(R)
4521;4621	-C11(R)
4522;4622	BZY91-C12(R)
4523;4623	-C13(R)
4524;4624	-C15(R)
4525;4625	-C16(R)
4526;4626	-C18(R)
4527;4627	BZY91-C20(R)
4528;4628	-C22(R)
4529;4629	-C24(R)
4530;4630	-C27(R)
4531;4631	-C30(R)
4532;4632	BZY91-C33(R)
4533;4633	-C36(R)
4534;4634	-C39(R)
4535;4635	-C43(R)
4536;4636	-C47(R)
4537;4637	BZY91-C51(R)
4538;4638	-C56(R)
4539;4639	-C62(R)
4540;4640	-C68(R)
4541;4641	-C75(R)
5320	BZX29-C10
5321	-C11
5322	-C12
5323	-C13
5324	-C15

*) R denotes reversed polarity

Type to be replaced	Replacement type
5325	BZX29-C16
5326	-C18
5327	-C20
5328	-C22
5329	-C24
5330	BZX29-C27
5331	-C30
5332	-C33
5333	-C36
5334	-C39
5335	BZX29-C43
5336	-C47
5337	-C51
5338	-C56
5339	-C62
5340	BZX29-C68
5341	-C75
5342	-C82
5343	-C91
5344	-C100
5508	BZY88-C3V3
5509	-C3V6
5510	-C3V9
5511	-C4V3
5512	-C4V7
5513	BZY88-C5V1
5514	-C5V6
5515	-C6V2
5516	-C6V8
5517	-C7V5
5518	BZY88-C8V2
5519	-C9V1
5520	-C10
5521	-C11
5522	-C12

REPLACEMENT GUIDE VOLTAGE REGULATOR (ZENER) DIODES

Type to be replaced	Replacement type
5523	BZY88-C13
5524	-C15
5525	-C16
5526	-C18
5527	-C20
5528	BZY88-C22
5529	-C24
5530	-C27
5531	-C30
5532	BZY94-C33
5533	BZY94-C36
5534	-C39
5535	-C43
5536	-C47
5537	-C51
5538	BZY94-C56
5539	-C62
5540	-C68
5541	-C75
7708	BZX29-C3V3
7709	BZX29-C3V6
7710	-C3V9
7711	-C4V3
7712	-C4V7
7713	-C5V1
7714	BZX29-C5V6
7715	-C6V2
7716	-C6V8
7717	-C7V5
7718	-C8V2
7719	BZX29-C9V1
7720	-C10
7721	-C11
7722	-C12
7723	-C13
7724	BZX29-C15
7725	-C16
7726	-C18
7727	-C20
7728	-C22
7729	BZX29-C24
7730	-C27
7731	-C30
7732	-C33
7733	-C36
7734	BZX29-C39
7735	-C43
7736	-C47
7737	-C51
7738	-C56
7739	BZX29-C62
7740	-C68
7741	-C75
9971	BZY88-C3V6
9972	-C4V3
9973	BZY88-C5V1
9974	-C6V2
9981	BZX29-C3V6
9982	-C4V3
9983	-C5V1
9984	BZX29-C6V2
BZX10	BZY88-C6V2
BZX11	-C6V8
BZX12	-C7V5
BZX13	-C8V2
BZX14	BZY88-C9V1
BZX15	-C10
BZX16	-C11
BZX17	-C12
BZX18	-C13

Type to be replaced	Replacement type
BZX19	BZY88-C15
BZX20	-C16
BZX21	-C18
BZX22	-C20
BZX23	-C22
BZX24	BZY88-C24
BZX25	-C27
BZX26	-C30
BZX27	BZY94-C33
BZY14	BZY88-C5V6
BZY15	BZY88-C6V8
BZY16	-C8V2
BZY17	-C10
BZY18	-C12
BZY19	-C15
BZY20	BZY88-C18
BZY21	-C22
BZY83-C4V7	BZY88-C4V7
-C5V1	-C5V1
-C5V6	-C5V6
BZY83-C6V2	BZY88-C6V2
-C6V8	-C6V8
-C7V5	-C7V5
-C8V2	-C8V2
-C8V1	-C9V1
BZY83-C10	BZY88-C10
-C11	-C11
-C12	-C12
-C13V5	-C13
-C15	-C15
BZY83-C16V5	BZY88-C16
-C18	-C18
-C20	-C20
-C22	-C22
-C24V5	-C24

Type to be replaced	Replacement type
BZY85-C3V3	BZY88-C3V3
-C3V6	-C3V3
-C3V9	-C3V9
-C4V3	-C4V3
-C4V7	-C4V7
BZY85-C5V1	BZY88-C5V1
-C5V6	-C5V6
-C6V2	-C6V2
-C6V8	-C6V8
-C7V5	-C7V5
BZY85-C8V2	BZY88-C8V2
-C9V1	-C9V1
-C10	-C10
-C11	-C11
-C12	-C12
BZY85-C13	BZY88-C13
-C13V5	-C13
-C15	-C15
-C16	-C16
-C16V5	-C16
BZY85-C18	BZY88-C18
-C20	-C20
-C22	-C22
-C24	-C24
-C24V5	-C24
BZY85-C27	BZY88-C27
-C30	-C30
-C33	BZY94-C33
BZY92-C3V9	BZX29-C3V9
-C4V3	-C4V3
BZY92-C4V7	BZX29-C4V7
-C5V1	-C5V1
-C5V6	-C5V6
-C6V2	-C6V2
-C6V8	-C6V8

REPLACEMENT GUIDE VOLTAGE REGULATOR (ZENER) DIODES

Type to be replaced	Replacement type
BZY92-C7V5	BZX29-C7V5
-C8V2	-C8V2
-C9V1	-C9V1
-C10	-C10
-C11	-C11
BZY92-C12	BZX29-C12
-C13	-C13
-C15	-C15
-C16	-C16
-C18	-C18
BZY92-C20	BZX29-C20
-C22	-C22
-C24	-C24
-C27	-C27
-C30	-C30
BZY92-C33	BZY29-C33
-C36	-C36
OA126-5	BZY88-C5V1
OA126-6	-C6V2
OA126-7	-C6V8
OA126-8	BZY88-C8V2
OA126-9	-C9V1
OA126-10	-C10
OA126-11	-C11
OA126-12	-C12
OA126-14	BZY88-C15
OA126-18	-C18
RZ10A	BZY93-C10
RZ12A	-C12
RZ15A	-C15
RZ18A	BZY93-C18
RZ22A	-C22
RZ27A	-C27
RZ33A	-C33
RZ39A	-C39

Type to be replaced	Replacement type
RZ47A	BZY93-C47
RZ56A	-C56
Z3	BZY88-C3V6
Z4	-C4V3
Z5	-C5V6
Z6	BZY88-C6V2
Z7	-C7V5
Z8	-C8V2
Z10	-C10
Z12	-C12
Z15	BZY88-C15
Z18	-C18
Z22	-C22
ZD3,9	BZX29-C3V9
ZD4,3	-C4V3
ZD4,7	BZX29-C4V7
ZD5,1	-C5V1
ZD5,6	-C5V6
ZD6,2	-C6V2
ZD6,8	-C6V8
ZD7,5	BZX29-C7V5
ZD8,2	-C8V2
ZD9,1	-C9V1
ZD10	-C10
ZD11	-C11
ZD12	BZX29-C12
ZD13	-C13
ZD15	-C15
ZD16	-C16
ZD18	-C18
ZD20	BZX29-C20
ZD22	-C22
ZD24	-C24
ZD27	-C27
ZD30	-C30

Type to be replaced	Replacement type
ZD33	BZX29-C33
ZD36	-C36
ZD39	-C39
ZD43	-C43
ZD47	-C47
ZD51	BZX29-C51
ZD56	-C56
ZD62	-C62
ZD68	-C68
ZD75	-C75
ZD82	BZX29-C82
ZD91	-C91
ZD100	-C100
Z-E6V9	BZY88-C6V8
Z-E9V4	-C9V1
Z-E12V7	BZY88-C13
Z-E17V2	-C18
Z-E23V2	-C24
Z-E31V	-C30
ZF3,3	BZY88-C3V3
ZF3,6	BZY88-C3V6
ZF3,9	-C3V9
ZF4,3	-C4V3
ZF4,7	-C4V7
ZF5,1	-C5V1
ZF5,6	BZY88-C5V6
ZF6,2	-C6V2
ZF6,8	-C6V8
ZF7,5	-C7V5
ZF8,2	-C8V2
ZF9,1	BZY88-C9V1
ZF10	-C10
ZF11	-C11
ZF12	-C12
ZF13	-C13

Type to be replaced	Replacement type
ZF15	BZY88-C15
ZF16	-C16
ZF18	-C18
ZF20	-C20
ZF22	-C22
ZF24	BZY88-C24
ZF27	-C27
ZF30	-C30
ZF33	BZY94-C33
ZG3,3	BZY88-C3V3
ZG3,9	BZY88-C3V9
ZG4,7	-C4V7
ZG5,6	-C5V6
ZG6,8	-C6V8
ZG8,2	-C8V2
ZG10	BZY88-C10
ZG12	-C12
ZG15	-C15
ZG18	-C18
ZG22	-C22
ZG27	BZY88-C27
ZG33	BZY94-C33
ZL6	BZY93-C6V8
ZL7	-C7V5
ZL8	-C8V2
ZL6,8	BZY93-C6V8
ZL8,2	-C8V2
ZL10	-C10
ZL12	-C12
ZL15	-C15
ZL18	BZY93-C18
ZL22	-C22
ZL27	-C27
ZL33	-C33
ZL39	-C39

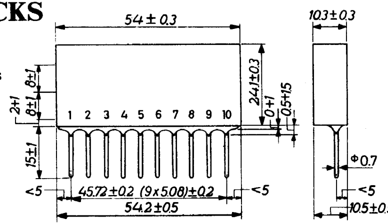
REPLACEMENT GUIDE VOLTAGE REGULATOR (ZENER) DIODES

Type to be replaced	Replacement type
ZL47	BZY93-C47
ZL56	-C56
ZL68	-C68
ZM3,9	BZX29-C3V9
ZM4,7	-C4V7
ZM5,6	BZX29-C5V6
ZM6,8	-C6V8
ZM8,2	-C8V2
ZM10	-C10
ZM12	-C12
ZM15	BZX29-C15
ZM18	-C18
ZM22	-C22
ZM27	-C27
ZM33	-C33
ZM39	BZX29-C39
ZM47	-C47
ZM56	-C56
ZM68	-C68
ZM82	-C82
ZM100	BZX29-C100
ZX6,8	BZY93-C6V8
ZX7,5	-C7V5
ZX8,2	-C8V2
ZX9,1	-C9V1
ZX10	BZY93-C10
ZX11	-C11
ZX12	-C12
ZX13	-C13
ZX15	-C15
ZX16	BZY93-C16
ZX18	-C18
ZX20	-C20
ZX22	-C22
ZX24	-C24

Type to be replaced	Replacement type
ZX27	BZY93-C27
ZX30	-C30
ZX33	-C33
ZX36	-C36
ZX39	-C39
ZX43	BZY93-C43
ZX47	-C47
ZX51	-C51
ZX56	-C56
ZX62	-C62
ZX68	BZY93-C68
ZX75	-C75

COMPONENTS AND MATERIALS

CIRCUIT BLOCKS



Circuit blocks 1-Series
Maximum pulse repetition frequency = 100 kHz, for triggered logic applications
Supply: $V_P = +6\ V \pm 5\%$, $V_N = -6\ V \pm 5\%$
Ambient temperature range: −20 to +60°C
Logic levels:
binary "1": 0.7 V_N to V_N
binary "0": 0 to 0.2 V

The 1-Series is composed of the following circuit blocks and assembled panels.

description	*abbreviation*	*colour*	*basic circuit*	*function*	*catalog number*
Circuit blocks					
Dual gate inverter	2.GI1	yellow	two gate inverting amplifiers	dual NAND or dual NOR, set/reset flip-flop, non-inverting amplifier, relay driver; furthermore it can be preceded by one or two level logic	2722 001 08001
Flip-flop	FF3	red	bi-stable multivibrator	memory, binary scaler-of-two	2722 001 00021
	FF4			memory, shift register	2722 001 00031
Dual negative gate	2.3N1	orange	two identical three-input diode gates	in conjunction with 2.GI1 two- or three-stage logic levels can be formed	2722 001 01001
	2.2N1		two identical two-input diode gates		2722 001 01011
Dual pulse logic	2.PL2	orange	two identical pulse gates	in conjunction with FF3 or FF4 a bi-directional shift register or a bi-directional counter can be formed	2722 001 03011

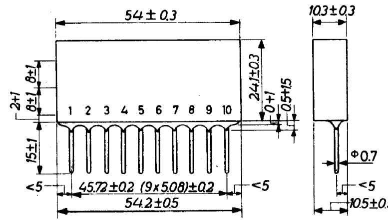
Pulse shaper	PS2	green	Schmitt trigger followed by an inverting amplifier	converting non-standard signals into standard signals	2722 001 11011
Positive reset unit	PR1	blue	non-inverting amplifier	resetting of max. 40 flip-flops FF3 or FF4	2722 001 22001
One-shot multivibrator	OS2	green	monostable multivibrator	generating positive and negative pulses with adjustable duration (max. 1 ms)	2722 001 10011
Pulse driver	PD1	green	monostable multivibrator with built-in trigger gate	generating pulses for triggering and resetting flip-flops FF3 or FF4	2722 001 13011
Printed-wiring board	PDA1			for mounting up to four units PD1	4322 026 34710
Power amplifier	PA1		non-inverting high-power amplifier	max. output: 60 V, 600 mA	2722 032 00011
Printed-wiring board	PAA1			for mounting up to four units PA1	4322 026 33630
Assembled panels					
Dual decade counter	2.DCA2		2 × four flip-flops FF3, mounted on a printed-wiring board	decade counter (1-2-4-8 code)	2722 009 00011
Reversible counter	BCA1		five flip-flops FF4 and five dual pulse logics 2.PL2, mounted on a printed-wiring board	bi-directional shift register, bi-directional decade counter	2722 009 00021

CIRCUIT BLOCKS

description	*abbreviation*	*colour*	*basic circuit*	*function*	*catalog number*
Dual numerical indicator tube driver assembly	2.ID1		two decoding and driving circuits for numerical indicator tubes (ZM1000, ZM1020, ZM1040 or ZM1080) mounted on a printed-wiring board	operating in conjunction with decade counters (1-2-4-8 or 1-2-4-2 code) for numerical display	2722 009 05001
Decade counter and numerical indicator tube driver assembly	DCA3		four flip-flops FF3 with a decoding and driving circuit ID1, mounted on a printed-wiring board	decade counter (1-2-4-8 code) with ID1 for numerical display	2722 009 00031

Circuit blocks for ferrite core memory drive

Maximum pulse repetition frequency = 100 kHz. These blocks have been designed for properly performing the specific functions in magnetic core memories. They should be used in conjunction with 1-Series circuit blocks.
Supply: $V_P = +6\ V \pm 5\%$, $V_N = -6\ V \pm 5\%$
Ambient temperature range: 0 to +60 °C
Logic levels:
  binary "1": 0.7 V_N to V_N
  binary "0": 0 to 0.2 V



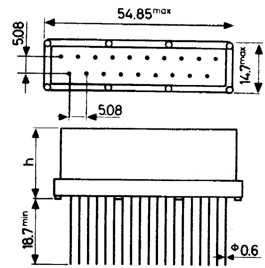
The series is composed of the following circuit blocks.

description	*abbreviation*	*colour*	*basic circuit*	*function*	*catalog number*
Dual selection switch	2.SS1	blue	two identical selection switch circuits	current switches in series with drive wires of a ferrite core memory	2722 001 14001
Selection gate	SG1	orange	AND-gate followed by a two-input AND-gate	two-level AND operation between address register and selection switches in ferrite core memories, read/write control	2722 001 04001
Pulse generator	PG1	green	pulse generating circuit	drive current switch for the drive wires and inhibit wires of a ferrite core memory	2722 001 12001
Read amplifier	RA2A	yellow	pre-amplifier followed by a full-wave rectifier	amplification of signals originating from the sense wire of ferrite core memories	2722 001 09011
	RA2B		strobing circuit followed by a pulse stretching circuit		2722 001 09021

Circuit blocks 10-Series

Maximum pulse repetition frequency = 30 kHz, for triggered logic applications.
Supply: $V_P = +12\ V \pm 5\%$, $V_N = -12\ V \pm 5\%$
Ambient temperature range: -25 to $+55°C$
Logic levels:
binary "1": $\frac{2}{3}\ V_P$ to V_P
binary "0": 0 to 0.3 V

The 10-Series is composed of the following circuit blocks and assembled panels.



h = max. 27.0 mm for high case
= max. 19.5 mm for low case

CIRCUIT BLOCKS

description	*abbreviation*	*case*	*basic circuit*	*function*	*catalog number*
Circuit blocks Dual positive gate inverter amplifier	2.GI10	low	two gate inverting amplifiers	dual NAND with four inputs in total	2722 004 08001
	2.GI11	high		dual NAND with six inputs in total	2722 004 08011
	2.GI12	high		dual NAND with eight inputs in total	2722 004 08021
Flip-flop	FF10	low	bi-stable multivibrator	memory, one stage of a binary counter or shift register, one stage of a bi-directional counter or bi-directional shift register	2722 004 00001
	FF11	high	bi-stable multivibrator with built-in trigger gates	memory, binary divider, two stages of a bi-directional counter or bi-directional shift register	2722 004 00011
	FF12	high	bi-stable multivibrator with built-in trigger gates and set/reset inputs	as FF11	2722 004 00021
Dual trigger gate	2.TG13	low	two pulse gate circuits	one stage of a bi-directional counter or bi-directional shift register in conjunction with FF11 or FF12, one stage of a binary counter or shift register in conjunction with FF10	2722 004 15001
	2.TG14	low	as 2.TG13 but with two separate built-in diodes for extension of the number of gate inputs	as 2.TG13	2722 004 15011

Quadruple trigger gate	4.TG15	high	four pulse gate circuits	two stages of a bi-directional counter or bi-directional shift register in conjunction with FF11 or FF12, one stage of a bi-directional counter or bi-directional shift register in conjunction with FF10	2722 004 15021
Timer unit	TU10	high	Schmitt trigger followed by an inverting amplifier, with built-in trigger gate	delay function; max. delay is 60 s	2722 004 18001
Gate amplifier	GA11	low	gate circuit followed by a non-inverting amplifier	AND-, AND-AND-, AND-OR, preceded by one-level or two-level logic circuits	2722 004 17001
One-shot multivibrator	OS11	high	monostable multivibrator with built-in trigger gate	generating positive and negative pulses with adjustable duration	2722 004 10011
Pulse driver	PD11	high	monostable multivibrator with built-in trigger gate	generating pulses for triggering and resetting flip-flops FF10, FF11 or FF12	2722 004 13011
Pulse shaper	PS10	low	Schmitt trigger followed by an inverting amplifier	converting non-standard signals into standard signals	2722 004 11001
Relay driver	RD10	low	non-inverting medium power amplifier	driving relays; output: 55 V, 200 mA (resistive loads) 30 V, 200 mA (inductive loads)	2722 004 16001
	RD11	low		driving relays; output: 55 V, 200 mA	2722 004 16011

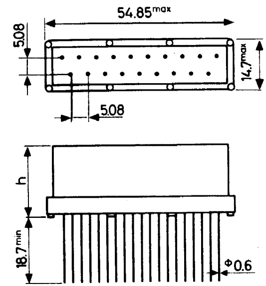
CIRCUIT BLOCKS

description	*abbreviation*	*case*	*basic circuit*	*function*	*catalog number*
Power amplifier Printed-wiring board	PA10 PAA10		high-power amplifier	output: 55 V/2 A for mounting up to four units PA10	2722 032 00021 4322 026 38680
Numerical indicator tube driver	ID10	high	decoding and driving circuit for numerical indicator tubes (ZM1000, ZM1020, ZM1040 or ZM1080)	operating in conjunction with decade counters (1-2-4-8 or 1-2-4-2 code) for numerical display	2722 004 20001
Assembled panels Decade counter and numerical indicator tube driver assembly	DCA10		four flip-flops FF12 with or without ID10, mounted on a printed-wiring board	DCA 10A: single decade counter with ID10	2722 009 02001
				DCA 10B: as DCA 10A, but without ID10	2722 009 02011
				DCA 10C: buffer memory with ID10	2722 009 02021
				DCA 10D: as DCA 10C, but without ID10	2722 009 02031
				DCA 10E: binary counter, scaler of 16	2722 009 02041
Dual decade counter and numerical indicator tube driver assembly	2.DCA11		2 × four flip-flops FF12, with or without ID10, mounted on a printed-wiring board	2.DCA 11A: dual decade counter with ID10	2722 009 02051
				2.DCA 11B: as 2.DCA 11A, but without ID10	2722 009 02061

Dual decade counter assembly	2.DCA12	2 × four flip-flops FF12, mounted on a printed-wiring board	2.DCA 12A : dual decade counter	2722 009 02071
			2.DCA 12B : decade counter and buffer memory	2722 009 02081
			2.DCA 12C : binary counter, scaler of 16, binary scaler of 256	2722 009 02091
Reversible decade counter and numerical indicator tube driver assembly	BCA10	four flip-flops FF12, two quadruple trigger gates 4.TG15, with or without 2.GI10 and/or ID10, mounted on a printed-wiring board	BCA 10A : reversible decade counter (1-2-4-8 code) with ID10	2722 009 02101
			BCA 10B : as BCA 10A, but without ID10	2722 009 02111
			BCA 10C : reversible decade counter (forward 1-2-4-8 code, reverse 1-2-4-2 code) without 2.GI10 and with ID10	2722 009 02121
			BCA 10D : as BCA 10C, but without ID10	2722 009 02131
Dual shift register assembly	2.SRA10	2 × five flip-flops FF12, mounted on a printed-wiring board	dual 5-stages one-directional shift register, dual one-directional decade ring counter, single 10-stages one-directional shift register	2722 009 03001
Reversible shift register assembly	RSR10	five flip-flops FF12, one dual trigger gate 2.TG13 and two quadruple trigger gates 4.TG15	5-stages reversible shift register, reversible decade ring counter, one-directional shift register with additional inputs for parallel information shift	2722 009 03011

CIRCUIT BLOCKS

Circuit blocks 20-Series



Maximum pulse repetition frequency = 1 MHz*), for triggered logic applications.
Supply: $V_{P1} = +12\ V \pm 5\%$, $V_{P2} = +6\ V \pm 10\%$, $V_N = -12\ V \pm 5\%$
Ambient temperature range: -25 to $+85\,^{\circ}C$
Logic levels:
- binary "1": V_{P2}
- binary "0": 0 to 0.5 V

The 20-Series is composed of the following circuit blocks.

h = max. 27.0 mm for high case
= max. 19.5 mm for low case

description	*abbreviation*	*case*	*basic circuit*	*function*	*catalog number*
Dual gate inverter	2.GI20	low	two gate inverting amplifiers	dual NAND (pos. logic) or dual NOR (neg. logic) with four inputs in total	2722 005 08001
	2.GI21			as 2.GI20 but with 6 inputs in total	2722 005 08011
	2.GI22			as 2.GI20 but with increased loadibility	2722 005 08021
Flip-flop	FF20	low	bi-stable multivibrator	memory	2722 005 00001
	FF22	high	bi-stable multivibrator	binary counter; shift register	2722 005 00011
	FF23	high	bi-stable multivibrator with built-in trigger gates		2722 005 00021

Dual trigger gate	2.TG23	low	two pulse gate circuits	in conjunction with FF23 a second pair of pulse inputs is formed to make one stage of a bi-directional counter or shift register	2722 005 15001
One-shot multivibrator	OS20	high	monostable multivibrator with built-in trigger gate	generating positive and negative pulses with adjustable duration (max. 50 ms)	2722 005 10001
Pulse shaper	PS20	low	Schmitt trigger followed by an inverting amplifier	converting non-standard signals into standard signals	2722 005 11001
Dual line driver	2.LD21	low	two driver circuits for terminated lines	driving 75 Ω cables with logic gating capability	2722 005 21001
Dual line receiver	2.LR22	low	two receiver circuits for terminated lines	converting 3 V-signal levels to standard system levels	2722 005 19011
Pulse driver	PD21	high	monostable multivibrator with built-in trigger gate	generating pulses for triggering and resetting flip-flops	2722 005 13001

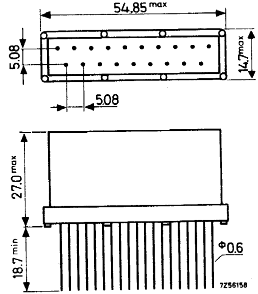
*) 3.5 MHz for circuit blocks FF22, 2.GI20, 2.GI21 and 2.GI22.

CIRCUIT BLOCKS

Circuit blocks 40-series

Supply: $V_P = +12\text{V} \pm 5\,\%$, $V_N = -12\text{V} \pm 5\,\%$

The 40-Series is composed of the following circuit blocks.



description	*abbreviation*	*basic circuit*	*application*	*catalog number*
Differential zero detector Temperature range 0 to 85°C	D2D40	2-stage d.c. coupled differential amplifier followed by an OR-gate and an inverting amplifier	for use as zero detector, voltage comparator, polarity, detector, adjustable discriminator differential amplifier	2722 010 00001
Operational amplifier Temperature range 0 to 85°C	DOA40	high gain, wide band, low drift d.c. differential amplifier	instrumentations and control circuits	2722 010 01011

Phase shift module Temperature range -25 to $+85°C$	PSM40	units produces line zero synchronized output pulses of which leading edge can be shifted by a control voltage	for use in conjunction with a trigger source for the control of the conduction angle of thyristors	2722 010 02001

CIRCUIT BLOCKS

60-Series NORBITS

These circuit blocks represent an important advance in static switching devices for industrial control systems. They use NOR logic as a basis of operation.

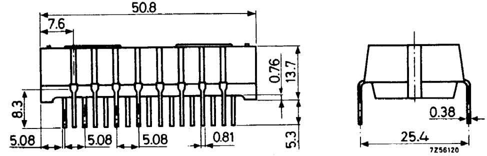
Supply: $V_S = +24\ V \pm 25\ \%$ or
$+12\ V \pm 5\ \%$ at reduced ratings

Ambient temperature range: -10 to $+70\ °C$

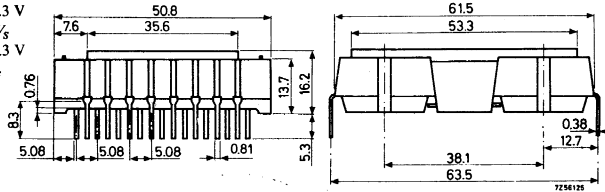
Logic levels:

at $V_S = 24\ V \pm 25\%$: $0\ V <$ binary "0" $< +0.3\ V$
$11.4\ V <$ binary "1" $< V_S$

at $V_S = 12\ V \pm 5\%$: $0\ V <$ binary "0" $< +0.3\ V$
$8.3\ V <$ binary "1" $< V_S$



Size A



Size B

The 60-Series NORBITS is composed of the following circuit blocks.

description	*abbreviation*	*case*	*colour*	*basic circuit*	*function*	*catalog number*
Dual four input NOR gate	2.NOR60	size A	black	two identical NOR-circuits, each with four inputs	dual NOR (positive logic)	2722 008 00001

Dual inverter amplifier	2.IA60	size A	blue	two identical inverting amplifiers	dual inverting amplifier or single inverting low power amplifier by connecting two units in tandem	2722 008 01001
Timer unit	TU60	size A	red	time delay circuit	following a "0" going input the output is a delayed "1"; no delay occurs when input returns to "1" (output goes "0" immediately)	2722 008 03001
Dual input switch filter	2.SF60	size A	green	two identical filters	eliminating the effects of contact bounce of mechanical switches and interference on input lines of same	2722 008 02001
Power amplifier	PA60	size B	blue	Schmitt trigger followed by a buffer and driver stage	power amplifier for load switching	2722 032 00031

ACCESSORIES FOR CIRCUIT BLOCKS

Power supplies

The following power supply units and sub-assemblies for power supplies are available:

Power supply units for digital circuit blocks

application	*fits 19″ chassis*	*dimensions (mm)*	*input*	*d.c. output*	*stability ratio*	*catalog number*
100 kHz & 1 Series circuit blocks	4322 026 38240	215 × 125 × 70	220 V, 235 V 50–60 Hz	−6 V, 600 mA +6 V, 150 mA	450 : 1 360 : 1	2722 151 00011
10-Series circuit blocks	4322 026 38240	214 × 123 × 91	105–120 V 200–240 V 45–65 Hz	−12 V, 400 mA +12 V, 1000 mA	350 : 1 1000 : 1	2722 151 00021
60-Series NORBITS		146 × 76 × 77	240, 230, 220, 120 or 100 V 47–440 Hz	+30 to +18 V for 0 to 500 mA		2722 151 00041
60-Series NORBITS		146 × 76 × 77	240, 230, 220, 120 or 100 V 47–440 Hz	+30 to +18 V for 0 to 500 mA, and +100 V, 25 mA		2722 151 00051

Sub-assemblies for power supplies

Type MF0.5A	: Mains filter for use between <250 V mains and mains input of control systems consuming less than 0.5 $A_{a.c.}$
Attenuation 0.1–10 MHz	: 50 dB.
Dimensions	: $88 \times 47 \times 39$ mm.

ACCESSORIES FOR CIRCUIT BLOCKS

Mounting chassis

delivered in kit form

max. accommodation	*dimensions (mm)*	*mounting*	*board spacing (mm)*	*matching connector*	*catalog number*	*extender boards for testing*
24 p.w. boards for circuit blocks of 100 kHz and 1-Series	133 × 214 × 442	to be used in 19″ rack	17.25	0.2″	4322 026 38210	
21 p.w. boards ditto			19.75	0.2″	4322 026 38220	
21 p.w. boards for any Series of circuit blocks and for	133 × 214 × 444	to be used in	19.35	0.156″	4322 026 38230	4322 026 44290
60-Series Norbits		19″ rack	19.35	0.2″	4322 026 38240	4322 026 03910
30 p.w. boards with	133 × 214 × 444	to be used in	12.9	0.156″	4322 026 38260	4322 026 44290
integrated circuits		19″ rack	12.9	0.2″	4322 026 38270	4322 026 03910
41 p.w. boards with	123 × 130 × 436	to be used in	10.16	0.1″	4322 026 38250	
D.I.L. packages		19″ rack			4322 026 38280	

Printed-wiring boards

	to fit chassis 4322 026	material	contacts	contact pitch	hole ø (mm)	with extractor	dimensions (mm)	cat. number 4322 026 .....
For general purposes								
exp., 0.1″ grid	38230	gl.	2 × 22	0.156″	0.8	×	121.8 × 207.0	38640
exp., 0.1″ grid	38240	gl.	2 × 23	0.2″	0.8	×	121.8 × 207.0	38650
For 100 kHz and								
1-*Series* (0.2″ grid)								
large exp.	—	ph.	1 × 38	0.2″	1.3	—	200 × 396	34900
			2 × 38		—			34910
exp.	38230	ph.	2 × 22	0.156″	1.3	×	121.8 × 207.0	38620
exp.	38240	ph.	2 × 23	0.2″	1.3	×	121.8 × 207.0	38630
exp.	38240	gl.	2 × 23	0.2″	1.3	×	121.8 × 207.0	38690
exp.		ph.	1 × 23	0.2″	1.3	—	121.8 × 180.3	34940
univ.		ph.	1 × 23	0.2″	1.3	—	121.8 × 180.3	34920
univ. (8 blocks)		ph.	1 × 23	0.2″	1.2 p.t.	—	121.8 × 180.3	34950
univ. (8 blocks)	38210	ph.	1 × 23	0.2″	1.2 p.t.	—	121.8 × 180.3	34960
univ.	38220	ph.	1 × 23	0.2″	1.2 p.t.	—	121.8 × 180.3	36310
for 4 blocks PA 1	and	ph.	1 × 23	0.2″	1.2 p.t.	—	121.8 × 180.3	33630
for 4 blocks PD 1	38240	ph.	1 × 23	0.2″	1.2 p.t.	—	121.8 × 180.3	34710
For 10-*Series* (0.1″ grid)								
exp. (20 blocks)	38240	gl.	2 × 23	0.2″	1.3 p.t.	×	121.8 × 207.0	38600
exp. (20 blocks)	38240	ph.	2 × 23	0.2″	1.3 p.t.	×	121.8 × 207.0	38610
exp. (10 low cases)	38220	ph.	2 × 23	0.2″	1.2 p.t.	—	121.8 × 200.6	36270
	38240							
for 4 blocks PA10	38240	gl.	2 × 23	0.2″	p.t.	×	121.8 × 207.0	38680
of assembly DCA10	38240	gl.	2 × 23	0.2″	p.t.	×	121.8 × 207.0	38700
of assembly 2.DCA11	38240	gl.	2 × 23	0.2″	p.t.	×	121.8 × 207.0	38710
of assembly 2.DCA12	38240	gl.	2 × 23	0.2″	p.t.	×	121.8 × 207.0	38720
of assembly BCA10	38240	gl.	2 × 23	0.2″	p.t.	×	121.8 × 207.0	38730
of assembly 2.SRA10	38240	gl.	2 × 23	0.2″	p.t.	×	121.8 × 207.0	38740
of assembly RSR10	38240	gl.	2 × 23	0.2″	p.t.	×	121.8 × 207.0	38750

ACCESSORIES FOR CIRCUIT BLOCKS

	to fit chassis 4322 026	*ma-terial*	*con-tacts*	*contact pitch*	*hole Ø (mm)*	*with extractor*	*dimensions (mm)*	*cat. number* 4322 026 . . . . .
For 20-Series								
exp. (20 blocks)	38240	ph.	2 × 23	0.2″	1.2 p.t.	×	121.8 × 207.0	38660
exp. (20 blocks)	38240	gl.	2 × 23	0.2″	1.2 p.t.	×	121.8 × 207.0	38670
For Norbits 60-Series								
exp.	38240	gl.	2 × 23	0.2″	1.2 p.t.	×	121.8 × 207.0	38600
exp.	38240	ph.	2 × 23	0.2″	1.2 p.t.	×	121.8 × 207.0	38610
with 0 V supply tracks	38230	gl.	2 × 22	0.156″	1.3 p.t.	—	121.8 × 204.2	39920
with 0 V supply tracks	38230	ph.	2 × 22	0.156″	1.3 p.t.	—	121.8 × 204.2	39930
with 0 V supply tracks	38240	gl.	2 × 23	0.2″	1.3 p.t.	—	121.8 × 204.2	39940
with 0 V supply tracks	38240	ph.	2 × 23	0.2″	1.3 p.t.	—	121.8 × 204.2	39950

The p.w. board thickness is 1.6 mm
The contacts are gold plated.
Abbreviations: exp. = experimenters' p.w. board
univ. = p.w. board universal for the given series of circuit blocks
gl. = glass epoxy
ph. = phenol paper
p.t. = plated-through

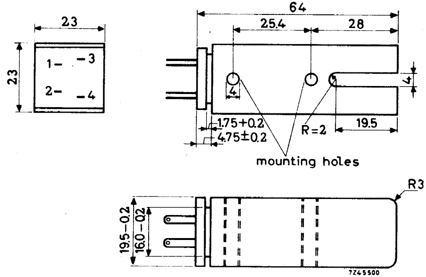
Locking aids
(to secure circuit blocks to the p.w. board)

Locking tag for the 100 kHz and 1-series	4322 026 33690
Locking cap for the 10-series and the 20-series	4322 026 32150
Soldering tag for locking cap	4322 026 32140

Stickers
These are drawing symbols of circuit blocks printed on self-adhesive, transparent material. They can be used for fast preparation of system drawings.
Stickers are available for each type of circuit block of the 100 kHz-, 1-, 10- and 20-Series in rolls of 1000 pieces, for 60-Series Norbits in sheets containing 24 pieces of the NOR60 and 2 pieces of each other type in this series.

INPUT/OUTPUT DEVICES

Vane switched oscillator VSO



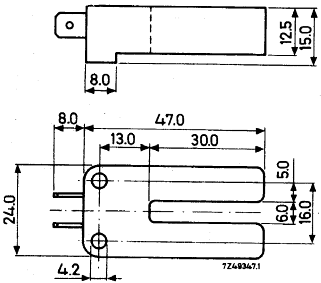
Catalog number 2722 031 00001

Application: This unit can be applied as a static switching device, the switching action being determined by the position of a vane. For the vane any metal can be used.

Technical performance

Vane material	any metal
Supply, terminals 2–1	12 $V_{d.c.}$, 12 mA
Output voltage, terminals 3–4	5.75 V ± 15% open circuit, isolated
Maximum permissible voltage between 1–2 and 3–4	100 V_p
Output impedance (without vane)	4.1 kΩ ± 10%
Maximum detection frequency	1 kHz
Operating temperature range	−25 to +85°C

Iron vane switched reed IVSR



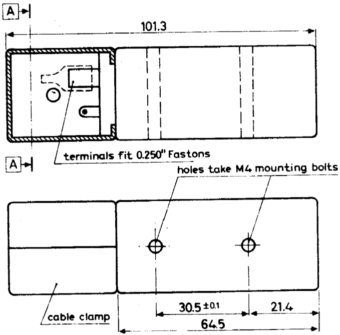
Catalog number 2722 031 00011

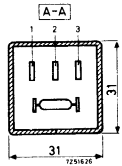
Application: It can be applied as a limit switch, position indicator or as a signal source for low counting speeds. In conjunction with a d.c. amplifier or with the TTM it can be used for power switching. It can succesfully replace micro switches.

Technical performance

Vane material	mild steel
Load switching capacity (non inductive)	≤1.2 VA
Voltage switching capacity	≤32 $V_{d.c.}$ ≤50 $V_{a.c.}$
Current switching capacity (non inductive)	≤0.1 $A_{d.c.}$
Switching frequency	≤100 Hz
Operating temperature range	−25 to +70°C

Electronic proximity detector EPD





1 = output
2 = + V_S
3 = −

Catalog number 2722 031 00021

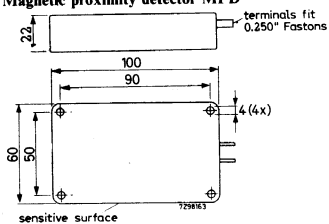
Application: The electronic proximity detector is a static switching device, the switching action being determined by the presence of a metallic object. The metal can be any electrically conducting material of rather arbitrary shape.

It can be applied as a detector for the presence, passage or position of metal parts and is a versatile tool in various industrial automation set-ups.

Technical performance

Supply voltage (V_S)	12 $V_{d.c.}$
Consumed current	16 mA
Output voltage, no object being detected	approximately $V_S - 0.5$ V
Output resistance	
no object being detected	680 Ω ± 10 %
object being detected	3.3 kΩ
Minimum load	1 kΩ
Maximum detection frequency	1 kHz
Operating temperature range	−25 to +85 °C

Magnetic proximity detector MPD



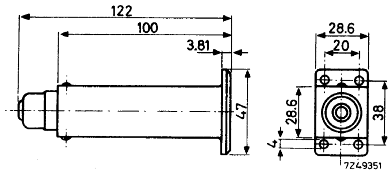
Catalog number 2722 031 00031

Application: This unit can be applied as a detector for the presence, passage or position of ferreous parts. It is a versatile tool in industrial automation set-ups.

Technical performance

Load switching capacity	≤25 W
Voltage switching capacity	≤200 $V_{d.c.}$
Current switching capacity	≤1 $A_{d.c.}$
Switching frequency	≤100 Hz
Contact resistance, initially	≤100 mΩ
Operating temperature range	−25 to +70 °C

Photo-electric detector CSPD



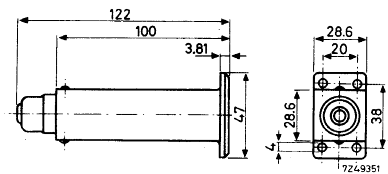
Catalog number 2722 031 00041

Application: Input device in digital systems. To be used in conjunction with lamp unit 1MLU.

Technical performance

Type of detector	cadmiumsulfide
Max. voltage	150 V_p
Max. dissipation at 40°C	0.2 W
Max. switching frequency	6 Hz
Max. operating distance (with 1 MLU)	1 m
Operating temperature range	−10 to +40°C

Lamp unit 1 MLU



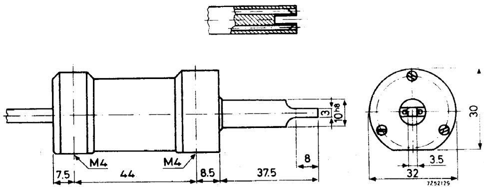
Catalog number 2722 031 00051

Application: To be used in conjunction with photo-electric detector CSPD

Technical performance

Supply voltage	$\leq 6\ V_{a.c.}$ or $6\ V_{d.c.}$
Max. operating distance (with CSPD)	1 m
Operating temperature range	−10 to +40°C

Light interruption probe L1P1



Catalog number 2722 031 00041

Application: The light interruption probe can be used for the detection of the presence or passage of small objects. Major applications are envisaged in the field of accurate positioning and revolution counting.

Connections: The unit is provided with a 4-core colour coded shielded cable with a length of 2 m:

White lead to +12 V
Yellow lead to +12 V via a resistor (supplied with the unit)
Brown lead common 0 V
Green lead to load

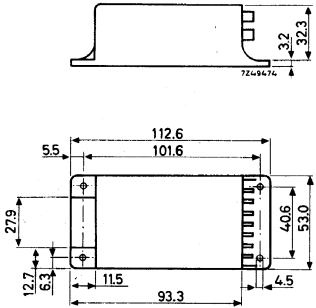
Technical performance

Output, unloaded	
no object	0 to +1.25 V
with object	+4.8 to +12 V
Output impedance	
no object	max. 2.1 kΩ
complete interception	max. 1.1 kΩ
Max. detection frequency	>10 kHz
Operating temperature range	0 to +50°C

Thyristor trigger module TTM

Catalog number 2722 032 00001

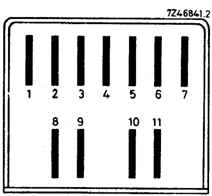
Application: The thyristor trigger module is intended for use as a supply of repetitive gate trigger pulses for one or two thyristors.
It can be applied in a variety of circuits.
The possibility of logic control (e.g. in conjunction with 60-series Norbits or with circuit blocks of the 10-series or 20-series) makes it well adapted for automation and control systems. In conjunction with a phase shift module (PSM, catalog number 2722 010 02001), linear conduction angle control over 10 to 170° is possible.
With three TTM's 3-phase operation of thyristors can be achieved.



Technical performance

Supply	12 $V_{d.c.}$, 35 mA
Operating temperature range	−25 to +85 °C
Number of outputs	2, isolated. Output voltages are in phase.
Isolation of outputs	rated at 500 V_{rms} operation
Voltage	⩽10 $V_{d.c.}$
Current (one output loaded with 16 Ω the other output short-circuited)	250 mA.
Impedance (both outputs or one output loaded with 16 Ω)	25 Ω
Nominal pulse frequency (both outputs loaded with 16 Ω)	2.3 kHz
Pulse width at 3 V (both outputs loaded with 16 Ω)	>20 μs
Pulse rise time	<0.5 μs

Terminal location



1 = supply +12 V
2 = } interconnected, except for on-off control
3 = } and conduction angle control with a potentiometer or a control voltage
4 = } interconnected, except for control
5 = } with a switch which is normally open
6 = supply 0 V
7 = safety-catch input
8 = gate thyristor 1
9 = cathode thyristor 1
10 = gate thyristor 2
11 = cathode thyristor 2

Thumbwheel switches

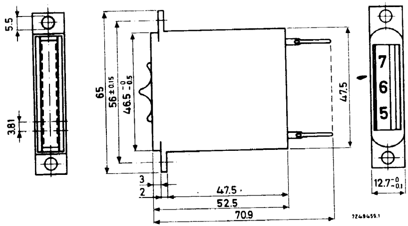


Fig. 1: Switch for façade mounting

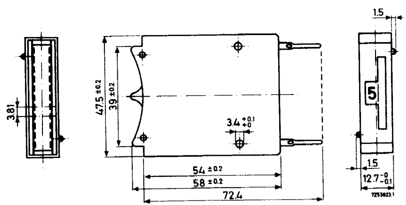


Fig. 2: Switch for block mounting

Catalog number 4311 027 8 . . . .

Application: These switches have been developed to be used as pre-set devices in digital control systems, in which numerical information is handled. Two versions are available, one for façade mounting and one for block mounting.

Technical performance

Working voltage	50 $V_{d.c.}$
Insulation resistance	$\geqslant 10^8\ \Omega$
Current switching capacity in purely resistive circuits	0.1 $A_{d.c.}$
Maximum current carrying capacity	0.5 $A_{d.c.}$
Contact resistance	$\leqslant$ 50 mΩ
Losses (tan δ), measured at 1 MHz	$\leqslant 25.10^{-4}$
Capacitance, measured at 1 MHz	$\leqslant$ 15 pF
Life	in excess of 100000 complete rotations, at a rate of 1 step/s
Operating torque	250 to 750 gcm
after 20000 rotations	150 to 650 gcm
Printed-wiring boards	glass-epoxy; goldplated tracks
Operating temperature range	−25 to +25°C

Façade mounting

The switches can be mounted in panels with a thickness up to 4 mm by means of mounting façades The following mounting façades are available

mounting façade	*number of switches*	*catalog number*
FMF1	1	4311 027 80598
FMF2	2	4311 027 80608
FMF3	3	4311 027 80618
FMF4	4	4311 027 80628
FMF5	5	4311 027 80638
FMF6	6	4311 027 80648
FMF7	7	4311 027 81162
FMF8	8	4311 027 81172
FMF9	9	4311 027 81182
FMF10	10	4311 027 81192

Block mounting

These switches which do not require a front façade can be "block mounted" by means of mounting brackets and 3 mm tie rods. Accessories include:

End piece (cat. no. 4311 027 82151)
Spacer (cat. no. 4311 027 82161)
Blank housing (cat. no. 4311 027 82141)

Survey of types

	description	*abbreviation*	*index*	*catalog number* 4311 027 ..... *façade mounting*	*block mounting*
decimal	10 position 2 pole switch	10P2C	0–9	82201	82521
and 2	10 position 1 pole switch	10P1C	0–9	82321	82401
position	2 position 4 pole sign switch	2P4+ −	+, −	82231	82641
switches	2 position 2 pole sign switch	2P2+ −	+, −	82341	82601
	2 position 4 pole sign switch	2P4× ÷	×, ÷	82311	82651
	2 position 2 pole sign switch	2P2× ÷	×, ÷	82351	82611
	2 position 4 pole sign switch	2P401	0, 1	82281	82661
	2 position 2 pole sign switch	2P201	0, 1	82361	82501
	2 position 4 pole sign switch	2P4MA	M, A*)	82291	82671
	2 position 2 pole sign switch	2P2MA	M, A*)	82371	82621
	2 position 4 pole sign switch	2P4AvAr	Av, Ar**)	82301	82681
	2 position 2 pole sign switch	2P2AvAr	Av, Ar**)	82381	82631
binary	decoding switch 1248 negative logic	1248N	0–9	82221	82391
decoding	decoding switch 1248 positive logic	1248P	0–9	82251	82411
switches	decoding switch 1242 (jump at 8) negative logic (Berkeley code)	1242N	0–9	82211	82711
(including	decoding switch 1242 (jump at 8) positive logic (Berkeley code)	1242P	0–9	82241	82721
4 diodes	decoding switch 1248 negative logic***)	1248N/C	0–9	82451	82541
BAX13 and	decoding switch 1248 positive logic***)	1248P/C	0–9	82431	82551
a resistor	decoding switch 1242 (jump at 8) negative logic***)	1242N/C	0–9	82441	82571
of 12 kΩ)	decoding switch 1242 (jump at 8) positive logic***)	1242P/C	0–9	82421	82581
	decoding switch 2 out of 5 plus 2 out of 2	2522 plus blank	0–9		82771

binary	coding switch 1248	1248C	0–9	82271	82531
coding	coding switch 1242 (jump at 8)	1242C	0–9	82261	82701
switches	coding switch 1248****)	1248C/C	0–9	82471	82561
	coding switch 1242 (jump at 8)****)	1242C/C	0–9	82461	82591
	coding switch 1248	1248S	0–9		82511

Note: The contacts of all switches break before make.
*) "Start" and "Stop" for latin-based languages.
**) "Forward" and "Reverse" for latin-based languages.
***) Switch decodes 9-complement of decimal digit on thumbwheel.
****) Switch encodes 9-complement of decimal digit on thumbwheel.

MEMORY PRODUCTS

Ferroxcube memory cores

minimum cycle times	*core size*	*core type*	*nominal operating conditions*					*relevant typical output characteristics*				
			T °C	I mA	DR	t_r μs	t_d μs	uV_1 mV	rV_1 mV	wV_z mV	t_p μs	t_s μs
6 μs	50 mil	6D5	40	365	0.50	0.2	1.5	64	60	7	0.54	1.15
5 μs	50 mil	6D9	40	450	0.50	0.2	1.5	60	58	8	0.55	1.20
5 μs	50 mil	6C1	40	500	0.50	0.2	1.1	63	60	8	0.48	0.93
5 μs	50 mil	6C2 [1])	0–70	755	0.50	0.25	1.2	66	65	7	0.50	0.95
2 μs	30 mil	6F7	25	500	0.50	0.1	0.6	52	50	5	0.235	0.49
1.5 μs	30 mil	6F8	40	655	0.50	0.1	0.5	55	53	6	0.20	0.39
1.5 μs	30 mil	6F3 [1])	10–70	740	0.50	0.15	0.6	50	48	5	0.28	0.50
1.0 μs	20 mil	6H1	40	833	0.50	0.05	0.2	55	53	6	0.085	0.17
1.0 μs	20 mil	6H2 [1])	10–70	900	0.50	0.05	0.28	48	45	4	0.110	0.22
0.3 μs	14 mil	6V1	40	1100	0.50	0.025	0.15	34	33	5	0.06	0.11

[1]) With this core a memory system can be operated over a wide temperature range without temperature compensation, air conditioning, or other alternatives.

NOTE: For cores differing from those of our range may be made on request.

Matrix planes and stacks

SYSTEMS We can supply matrix planes and stacks for the three following memory systems:
(A) 2D-systems (word organised memories)
(B) 3D-systems (bit organised memories)
(C) 2½D-systems
Matrix planes are available in frame construction, on a printed-wiring board and in a construction suitable for mounting on a printed-wiring board (Platrices).

A number of types have been standardised on core pattern, wiring, types of core and construction.

Matrix planes with 50 mil cores
Catalog number, for ordering: 2722 043 . . . . . (for suffix see Table)

core pattern preferred	*wiring X Y Z S*	*core type*	*unlacquered*		*lacquered*	
			left	*right*	*left*	*right*
			suffix	*suffix*	*suffix*	*suffix*
64 × 64	1 1 1 1	6C1	06001	06081	06011	06091
		6D5	06021	06101	06031	06111
		6C2	06041	06121	06051	06131
		6D9	06061	06141	06071	06151
4 × 16 × 16	1 1 4 4	6C1	25001		25011	
		6D5	25021		25031	
		6C2	25041		25051	
		6D9	25061		25071	
4 × 32 × 32	1 1 4 4	6C1	26001		26011	
		6D5	26021		26031	
		6C2	26041		26051	
		6D9	26061		26071	
4 × 64 × 64	1 1 4 4	6C1	27001		27011	
		6D5	27021		27031	
		6C2	27041		27051	
		6D9	27061		27071	

Dimensions in mm

The dimensions A to D refer to Figs. 1 and 2.

core pattern	A	B	C	D
64 × 64	120	120	100.2	100.2
4 × 16 × 16	85	85	64.5	64.5
4 × 32 × 32	125	125	105.2	105.2
4 × 64 × 64	208	208	186.7	186.7

$d = 3.2$
$H = 4.8$

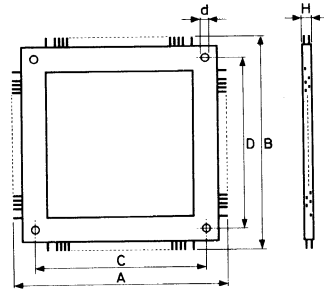


Fig. 1

$d = 4.2$
$H = 3.2$

Matrix planes with 30 mil cores
Catalog number, for ordering, 2722 044 . . . . . (for suffix see Table)

core pattern preferred	*wiring* X	Y	Z	S	*core type*	*lacquered left suffix*	*lacquered right suffix*	*dimensions in mm Figs. 1 and 2* A × B	C × D
64 × 64	1	1	1	1	6F8 6F3	06061 06081	06071 06091	85.5 × 85.5	65.5 × 65.5
4 × 64 × 64	1	1	4	4	6F8 6F3	27061 27081	27071 27091	138.3 × 138.3	118.1 × 118.1
2 × 64 × 128 [1])	1	1	4	4	6F8 6F3	35061 35081	35071 35091	138.3 × 139	118.1 × 118.8
128 × 128 [1])	1	1	4	4	6F8 6F3	08061 08081	08071 08091	139 × 139	118.8 × 118.8

Matrix planes with 20 mil cores
Catalog number, for ordering 2722 045 . . . . . (for suffix see Table)

$d = 4.2$
$H = 4.8$

core pattern preferred	*wiring* X	Y	Z	S	*core type*	*lacquered* *left* *suffix*	*lacquered* *right* *suffix*	*dimensions in mm Figs 1 and 2* $A \times B$	$C \times D$
64 × 64	1	1	1	1[2])	6H3	06021	06041	76 × 76	55.7 × 55.7
	1	1	1	1[2])	6H2	06031	06051		
	1	1	2	2	6H3	06061	06071		
	1	1	2	2	6H2	06081	06091		
64 × 128	1	1	2	2	6H3	36021	36031	76 × 120	55.7 × 100.1
	1	1	2	2	6H2	36041	36051		
	1	1	4	2	6H3	36061	36071		
	1	1	4	2	6H2	36081	36091		
128 × 128	1	1	4	4	6H3	08021	08031	120 × 120	100.1 × 100.1
	1	1	4	4	6H2	08041	08051		
	1	1	8	4	6H3	08061	08071		
	1	1	8	4	6H2	08081	08091		
2 × 64 × 128	1	1	4	4	6H3	35021	35031	119.3 × 120	99.5 × 100.1
	1	1	4	4	6H2	35041	35051		
	1	1	8	4	6H3	35061	35071		
	1	1	8	4	6H2	35081	35091		
4 × 64 × 64	1	1	4	4[2])	6H3	27021	27041	119.3 × 119.3	99.5 × 99.5
	1	1	4	4[2])	6H2	27031	27051	119.3 × 119.3	99.5 × 99.5
	1	1	8	8	6H3	27061	27071	122 × 122	102.1 × 102.1
	1	1	8	8	6H2	27081	27091	122 × 122	102.1 × 102.1

[1]) Planes with interlaced sense wiring. [2]) Matrices without interlaced sense wiring. Unlacquered planes can be supplied on request.

Stacks

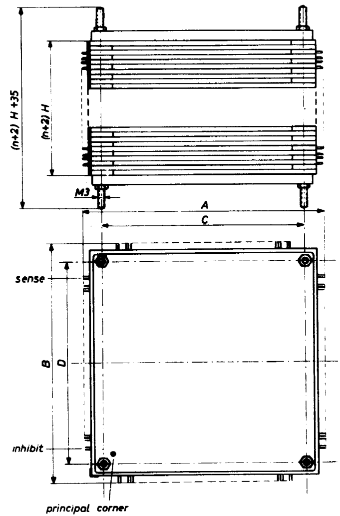
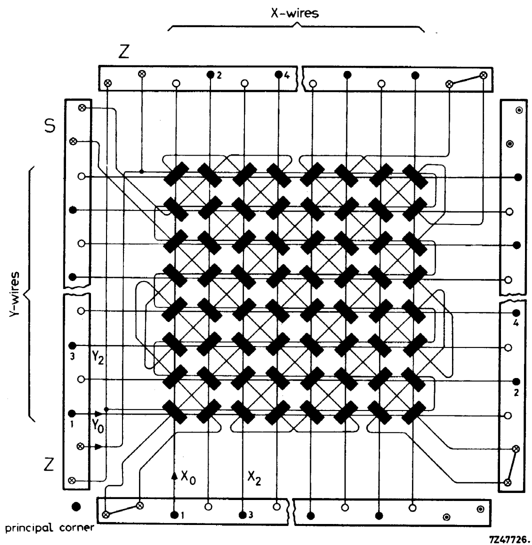


Fig. 2. Dimensions in mm
n = number of planes
Dimensions A to D: see Tables

Platrices with 50 mil cores, for direct mounting on printed wiring boards

Standard range
Preferred types (paper-base laminate frame, 6 C2 cores)

core pattern	*catalog number*		*outer dimensions over the tags (mm)*
	for 2.54 mm grid	*for 2.50 mm grid*	
16 × 16	2722 051 02051	2722 051 02041	82 × 82
16 × 32	2722 051 10051	2722 051 10041	82 × 122
32 × 32	2722 051 05051	2722 051 05041	122 × 122
4 × (4 × 16)	2722 051 28051	2722 051 28041	82 × 82
4 × 8 × 8	2722 051 22051	2722 051 22041	82 × 82
4 × 8 × 16	2722 051 29051	2722 051 29041	82 × 122
4 × 12 × 12	2722 051 24051	2722 051 24041	102 × 102
4 × 16 × 16	2722 051 25051	2722 051 25041	122 × 122
2 × 16 × 32	2722 051 20051	2722 051 20041	122 × 122

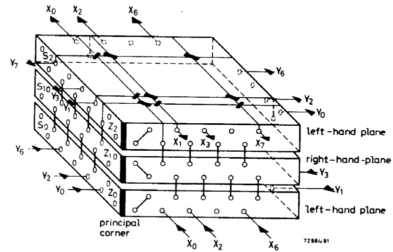


Wiring diagram of a matrix plane (50 mil)

● lower lugs
○ upper lugs
⊗ S and Z lugs

Left-hand plane

arrows show current flow in write direction



Principle of the connections to a stack having an odd number of single-matrix planes (50 mil)

MEMORY PRODUCTS

Complete magnetic core memories

memory type	*standard capacity range*		*standard operating modes*	*standard timing*		*standard operating environment*	*power-supplies required*
	words	*bits*		*access max.*	*full cycle*		
FX-12	128 to 1 024	max. 8	Random access Read-restore Clear-write	1.5 μs	10 μs	0–65°C	for 512 W/8b: +4.5 V, 250 mA −12 V, 250 mA +12 V, 2,5 A
F1-2	1 024 and multiples	8	Random access Read-restore Read-write Clear-write Split-cycle	0.6 μs	4 μs	0–55°C	+12 V, 3 A
F1-3	1 024 2 048 4 096 and multiples	max. 18 max. 18 max. 18	Random access Read-restore Clear-write Read-only Write only	1 μs	3 μs (half cycle 2 μs)	0–50°C	for 4K12 +6 V, 3 A −12 V, 2.3 A
F1-1	1 024 for multiples	1	Read-restore Clear-write Split-cycle	0.9 μs	2 μs	0–50°C	+6 V, 2 A −6 V, 1 A

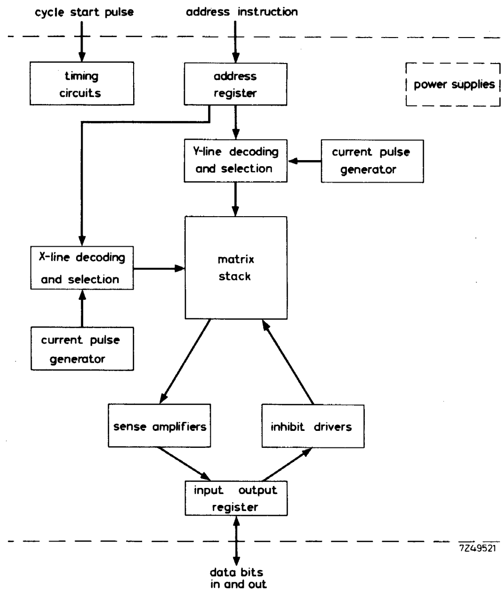
500G2	524 288 131 072 32 768 and multiples	9 36 144	Random access Read-restore Read-write Clear-write Split-cycle Read only Write only	1.2 μs	2.5 μs (half cycle 1.3 1.2)	10–40°C	3-phase a.c. mains 220 V or 380 V, 48 to 62 Hz
16D2	8 192 16 384	12–50 12–50	Random access Read-restore Clear-write Split-cycle	0.8 μs	2 μs	0–50°C	for 16K28: +12 V, 11 A −6 V, 4.8 A −12 V, 6.5 A +48 V, 5.8 A +10 V, 2.75 A
16F1	4 096 8 192 16 384	max. 36 max. 36 max. 36	Random access Clear-write Read-restore Split-cycle	0.45 μs	1 μs	10–40°C	

memory type	*approximate size*	*standard options*	*standard input/output signal characteristics*		*features*
			input	*output*	
FX-12	Height 120 mm Depth 229 mm Width 381 mm	Power supplies	"0" = 0 V (3 mA) "1" = 4.5 V (0.5 mA)	"0" = 0 V (2 mA) "1" = 4.5 V (0 mA)	Wire wrap back panel Accessible test points Only three different types of wiring board

MEMORY PRODUCTS

memory type	*approximate size*	*standard options*	*standard input/output signal characteristics*		*features*
			input	*output*	
F1-2	Height 120 mm Depth 200 mm Width 75 mm	Address register I/O register Smaller capacities Power supply	"0" = 0 V (2 mA) "1" = 4,5 V (25 μA)	"0" = 0 V (30 mA) "1" = 4 V (0 mA)	Information retention Multiplication of capacity by parallel connection.
F1-3	Height 133 mm Depth 328 mm Width 483 mm (including power supply)	Address register Power supply T_{amb} 0–65°C	"0" = 0 V (3 mA) "1" = 5 V (100 μA)	"0" = 0 V (10 mA) "1" = 5 V (12 mA)	Multiplication of capacity by parallel connection
F1-1	Height 138 mm Depth 283 mm Width 95 mm (with cover)		"0" = 0 V "1" = 5 V	"0" = 0 V "1" = 5 V	Spare board guide for adding logic. Rack mounting (without cover)
500G2	Height 1470 mm Depth 500 mm Width 445 mm		"0" ≥ 2.3 V "1" ≤ 1.2 V	"0" ≥ 2.5 V "1" ≤ 0.5 V	$2\frac{1}{2}$D system Information retention Multiplication of capacity by parallel connection.
16D2	Typical for 16K28 Height 800 mm Depth 268 mm Width 482 mm	Power supply control unit Parity check Level-shifting circuits	"0" = 0 V (3 mA) "1" = 6 V (0 mA)	"0" = 0 V (10 mA) "1" = 6 V (0 mA)	Information retention Cycle time 1.7 μs for capacities lower than 16K28
16F1					

Block diagram of a complete memory



Some definitions

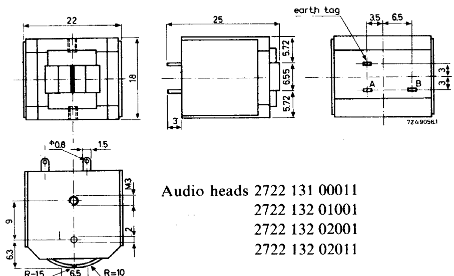
Cycle time : the minimum time between two successive cycle start pulses.

Access time: the time interval between receiving a cycle start pulse and the data output becoming available.

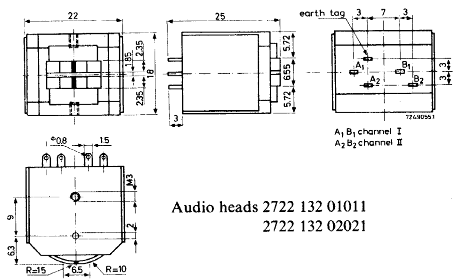
MAGNETIC HEADS

Audio heads (studio)

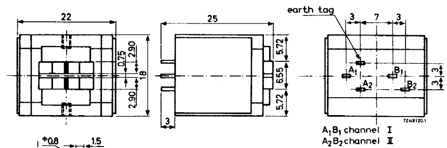
type	*tape width (inch)*	*number of tracks*	*track width (mm)*	*gap length (µm)*	*inductance (mH)*	*catalog number*
erase	$\frac{1}{4}$	1	6.55	2 × 100	1.7	2722 131 00011
record	$\frac{1}{4}$	1	6.55	6–7	7	2722 132 01001
reproduce	$\frac{1}{4}$	1	6.55	3–4	75	2722 132 02001
reproduce	$\frac{1}{4}$	1	6.55	3–4	40	2722 132 02011
record	$\frac{1}{4}$	2	2.35	6–7	7	2722 132 01011
reproduce	$\frac{1}{4}$	2	2.35	3–4	75	2722 132 02021
record (stereo)	$\frac{1}{4}$	2	2.90	6–7	7	2722 132 01021
reproduce (stereo)	$\frac{1}{4}$	2	2.90	3–4	40	2722 132 02031
reproduce (stereo)	$\frac{1}{4}$	2	2.90	3–4	75	2722 132 02081

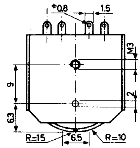


Audio heads 2722 131 00011
2722 132 01001
2722 132 02001
2722 132 02011



Audio heads 2722 132 01011
2722 132 02021



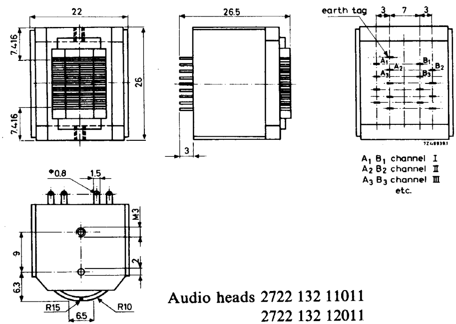


Audio heads 2722 132 01021
2722 132 02031
2722 132 02081

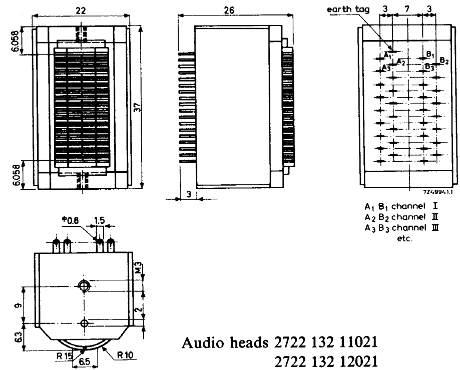
MAGNETIC HEADS

Audio heads (voice filing)

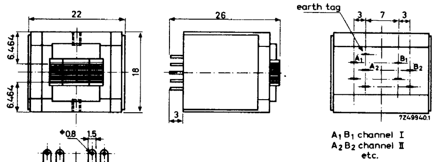
type	*tape width (inch)*	*number of tracks*	*track width (mm)*	*number of tracks on tape, interlaced use*	*gap length (μm)*	*inductance (mH)*	*catalog number*
record	$\frac{1}{4}$	4	0.5	7	6–7	6	2722 132 11001
reproduce	$\frac{1}{4}$	4	0.5	7	3–4	53	2722 132 12001
record	$\frac{1}{2}$	8	0.5	15	6–7	6	2722 132 11011
reproduce	$\frac{1}{2}$	8	0.5	15	3–4	53	2722 132 12011
record	1	17	0.5	31	6–7	6	2722 132 11021
reproduce	1	17	0.5	31	3–4	53	2722 132 12021

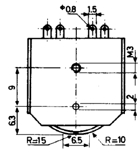


Audio heads 2722 132 11011
2722 132 12011



Audio heads 2722 132 11021
2722 132 12021

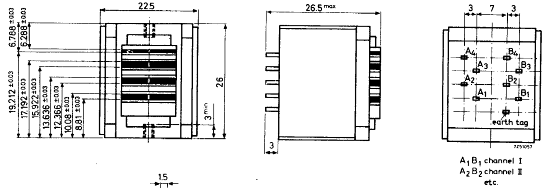


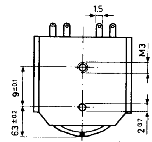


Audio heads 2722 132 11001
2722 132 12001

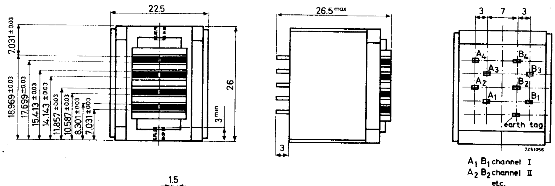
Instrumentation heads

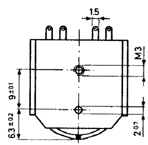
type	tape width (inch)	number of tracks (data + annotation)	track width (mm) data	track width (mm) annotation	number of tracks on tape, interlaced use (data + annotation)	gap length (μm)	inductance (mH)	catalog number
record	½	3 + 1	1.27	0.5	7 + 1	3–4	0.1	2722 133 01001
record	½	4	1.27		7 + 1	3–4	0.1	2722 133 01011
reproduce	½	3 + 1	1.27	0.5	7 + 1	1.5–2.5	2.0	2722 133 02001
reproduce	½	4	1.27		7 + 1	1.5–2.5	2.0	2722 133 02011
record	1	7 + 1	1.27	0.5	14 + 2	3–4	0.1	2722 133 01021
reproduce	1	7 + 1	1.27	0.5	14 + 2	1.5–2.5	2.0	2722 133 02021



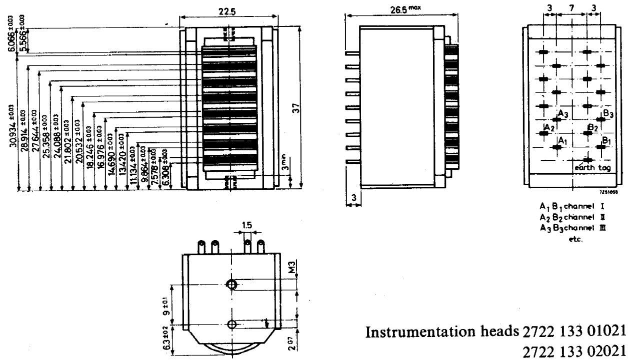


Instrumentation heads 2722 133 01001
2722 133 02001





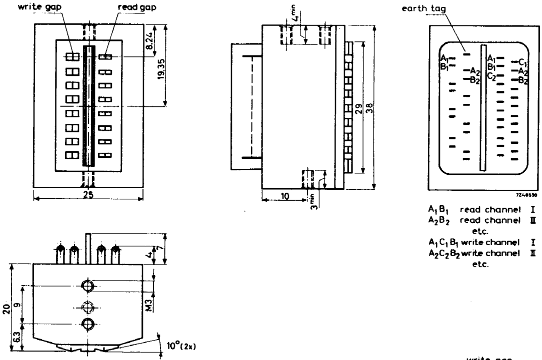
Instrumentation heads 2722 133 01011
2722 133 02011



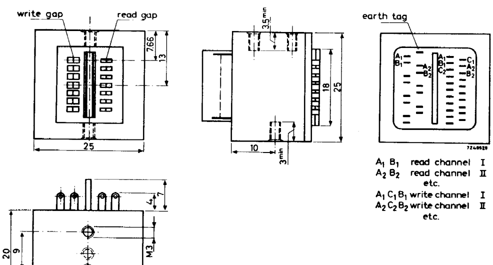
Instrumentation heads 2722 133 01021
2722 133 02021

Digital (tape) heads

type	*tape width (inch)*	*number of tracks*	*track width (mm) write*	*track width (mm) read*	*gap length (µm) write*	*gap length (µm) read*	*inductance (µH) write*	*inductance (µH) read*	*catalog number*
write/read	1	8	1.90	1.30	11–13	6–7	80	700	2722 135 03021
write/read	½	7	1.20	0.74	11–13	5–6	30	330	2722 135 03041
write/read	½	7	1.20	0.74	11–13	5–6	125	1000	2722 135 03071



Digital (tape) head 2722 135 03021



Digital (tape) heads 2722 135 03041
2722 135 03071

QUARTZ CRYSTAL UNITS AND CRYSTAL FILTERS

Quartz crystal units

A quartz crystal unit consists of a quartz crystal element with electrodes, mounted in a glass or metal holder having connecting pins or leads. In a quartz crystal unit the piezoelectric characteristics of quartz have been used to obtain a component that is equivalent to a stable resonance circuit with a very high Q-factor.

Types for general frequency stabilisation

crystal cut	*frequency range* (*kHz*)	*holder*		*type ref.*
XY	9–13	glass	- noval B9A, 72 mm	4322 131
NT	34–80	glass	- noval B9A, 72 mm	4322 132
X	60–180	glass	- noval B9A, 72 mm (60– 80 kHz) - noval B9A, 61 mm (80–180 kHz) - miniature B7G, 61 mm (80-120 kHz) - miniature B7G, 48 mm (120–180 kHz)	4322 133
	60–180	glass	- HC-28U, 63.5 mm (60– 70 kHz) , 51 mm (70–155 kHz) , 39 mm (155–180 kHz)	4322 134
	90–180	metal	- H2 (100–180 kHz) - HC-13/U	
DT	180–250	glass	- noval B9A, 61 mm - miniature B7G, 61 mm (180–190 kHz) - miniature B7G, 48 mm (190–250 kHz)	4322 135
	180–250	metal	- H2	4322 136
	200–400	metal	- HC-6/U, HC-17/U	4322 137

CT	250–550	glass	- noval B9A, 61 mm - miniature B7G, 61 mm (250–280 kHz) - miniature B7G, 48 mm (280–550 kHz)	4322 138
	250–550	metal	- H2	4322 139
	300–550	metal	- HC-6/U, HC-17/U	4322 140
HT	550–850	glass	- noval B9A, 61 mm - miniature B7G, 61 mm (550–800 kHz) - miniature B7G, 48 mm (800–850 kHz)	4322 141
	680–850	metal	- H2	4322 142
	(*MHz*)			
AT (fundamental)	1.8–20	metal	- HC-6/U, HC-17/U	4322 152
	7–20	metal	- HC-18/U, HC-25/U	4322 153
	2.3–20	all-glass	- HC-27/U	4322 154
	4.5–20	all-glass	- HC-26/U, HC-29/U	4322 155
AT (third overtone)	10–61	metal	- HC-6/U, HC-17/U	4322 157
	17–61	metal	- HC-18/U, HC-25/U	4322 158
	10–61	all-glass	- HC-27/U	4322 159
	10	all-glass	- HC-27/U	4322 159 00001
	20–61	all-glass	- HC-26/U, HC-29/U	4322 160
AT (fifth overtone)	50–87	metal	- HC-6/U, HC-17/U	4322 163
	50–87	metal	- HC-18/U, HC-25/U	4322 164
	50–87	all-glass	- HC-27/U	4322 165
	50–87	all-glass	- HC-26/U, HC-29/U	4322 166

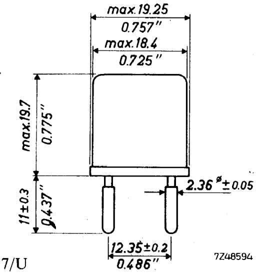
QUARTZ CRYSTAL UNITS AND CRYSTAL FILTERS

Types for special applications

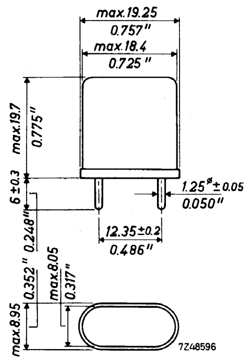
application	*holder*	*data*	*crystal cut*	*for further data see type*
steering of models	HC-6/U	27.125 MHz, 0/+60°C total tolerance $\pm 1000 \times 10^{-6}$ series resonance	AT	4322 157 00010
		40.68 MHz, 0/+60°C total tolerance $\pm 500 \times 10^{-6}$ series resonance	AT	4322 157 00020
		13.56 MHz, 0/+60°C total tolerance $\pm 500 \times 10^{-6}$ $C_L = 30$ pF in parallel	AT	4322 152 01300
measuring equipment	HC-6/U	1 MHz −20/+70°C 4.5 Total tol. 5.5 $\pm 100 \times 10^{-6}$ 6.75 $C_L = 30$ pF in 10.7 parallel	AT	4322 152 01240 01280 01250 01290 01260
decade counting unit type 88929/09.1	B9A	10 kHz, +10/+70°C total tolerance $\pm 100 \times 10^{-6}$ series resistance < 1500 Ω	XY	4322 131 00020
measuring and telecommunication equipment	B9A	100 kHz, 0/+60°C total tolerance $\pm 100 \times 10^{-6}$ $C_L = 75$ pF in series series resistance < 1000 Ω	X	4322 133 10000

Metal and all-glass holders

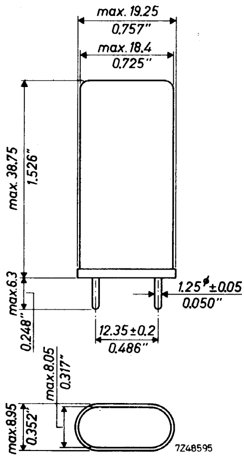
The following holders state the nominal frequency on the top, in kHz in the case of fundamental crystals and in MHz in the case of overtone items.
The figures on one of the faces constitute registration numbers that relate to the date and series of manufacture.



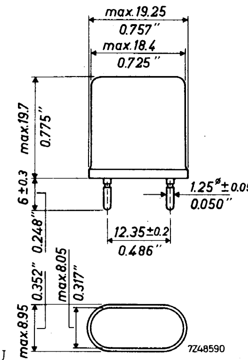
HC-17/U



HC-6/U



HC-13/U; HC-28/U

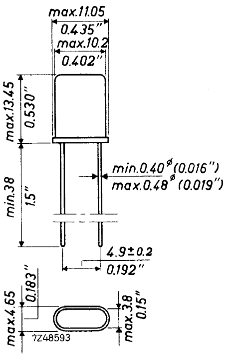


HC-27/U

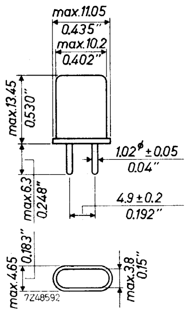
QUARTZ CRYSTAL UNITS AND CRYSTAL FILTERS

The four holders below state the nominal frequency on one of the faces, in kHz in the case of fundamental crystals and in MHz in the case of overtone items.

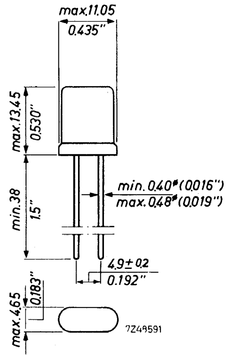
The figures on the other faces constitute registration numbers that relate to the date and series of manufacture.



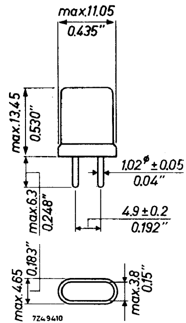
HC-18/U



HC-25/U



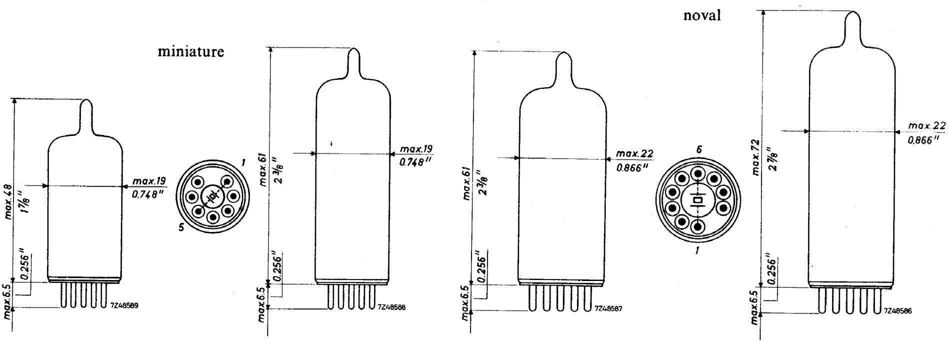
HC-26/U



HC-29/U

Glass holders

Glass holders for quartz-crystal units having a nominal frequency of up to 1 MHz, are provided with a label which states the nominal frequency and various other data.
Glass holders for AT-cut units contain a metal text plate which states - apart from registration figures that relate to the date and series of manufacture - the nominal frequency, in kHz in the case of fundamental crystals and in MHz in the case of overtone items.



B7G/48 B7G/61 B9A/61 B9A/72

QUARTZ CRYSTAL UNITS AND CRYSTAL FILTERS / MICROWAVE DEVICES

Crystal filters

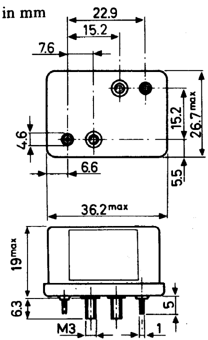
10.7 MHz-90 dB types

channel spacing (kHz)	*pass-band width (kHz)*	*terminating impedances (Ω//pF)*	*dimensions Fig.*	*type number*	*catalog number for ordering*
±50	±15 at 3 dB	2000//25	1	YL3620	4013 101 53031
		2000//25	2	YL3670	4013 101 53061
		910//25	1	YL3680	3513 199 30131
		910//25	2	YL3690	4013 101 53121
±25	±7.5 at 3 dB	910//25	1	YL3622	4013 101 53051
			2	YL3672	4013 101 53071
±20	±6 at 3 dB	825//25	1	YL3678	4013 101 53081
	±6 at 6 dB	825//25	2	YL3687	4013 101 53111
±12.5	±3.75 at 3 dB	560//25	1	YL3682	4013 101 53101
			2	YL4200	4013 101 53161

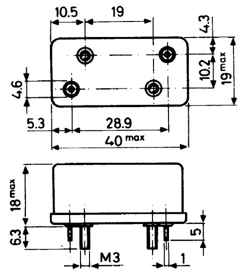
11.5 MHz–80/90 dB types

±50	±17.5 at 3 dB	2200//20	2	YL3619	4013 101 53021
		2700//41	1	YL3621	4013 101 53041

Dimensions in mm



mm	*inches*
1	0.04
4.6	0.18
5	0.2
5.5	0.22
6.3	0.25
6.6	0.26
7.6	0.300
15.2	0.600
19.0	0.75
22.9	0.900
26.7	1.05
36.2	1.42



mm	*inches*
1	0.04
4.3	0.17
4.6	0.18
5	0.2
5.3	0.21
6.3	0.25
10.2	0.400
10.5	0.41
18	0.71
19	0.75
28.9	1.140
40	1.57

MICROWAVE DEVICES

Coaxial 3-port circulators

frequency MHz	*catalog number*	*insertion loss* < (*dB*)	*isolation* > (*dB*)	*V.S.W.R. max.*	*max. power* (*W*)	*dimensions (mm)*	
						diameter	*height*
170– 200	2722 162 01191	0.4	20	1.2	500	185 [1]	96
200– 230	2722 162 01201	0.4	20	1.2	500	185 [1]	96
406– 470	2722 162 01151	0.4	22	1.2	100	80	57
406– 470	2722 162 01051	0.5	20	1.2	100	110	71
450– 550	2722 162 01091	0.6	20	1.2	100	110	71
470– 600	2722 162 01161	0.35	22	1.2	100	80	57
470– 600	2722 162 01061	0.5	20	1.2	100	110	71
470– 600	2722 162 01121	0.35	22	1.2	500	110	71
570– 720	2722 162 01131	0.35	22	1.2	500	110	71
590– 720	2722 162 01171	0.35	22	1.2	100	80	57
590– 720	2722 162 01071	0.5	20	1.2	100	110	71
608– 785	2722 162 01101	0.6	20	1.2	100	110	71
710– 860	2722 162 01081	0.5	20	1.2	100	110	71
710– 860	2722 162 01181	0.35	22	1.2	100	80	57
710– 860	2722 162 01141	0.35	22	1.2	500	110	71
1900–2300	2722 162 01001	0.5	20	1.15	50	110	30
2200–3000	2722 162 01041	0.5	20	1.2	50	110	30
2500–2900	2722 162 01211	0.5	20	1.2	50	72	27
3600–4300	2722 162 01111	0.5	25	1.15	50	72	27

All circulators have N-type 50 Ω female connectors. [1]) Triangular shape.

Waveguide 3-port circulators

frequency MHz	*catalog number*	*insertion loss < (dB)*	*isolation > (dB)*	*V.S.W.R. max.*	*max. power (W)*	*dimensions (mm)* [1]	*height*	*flange type*
3400– 3700	2722 161 02031	0.3	25	1.1	50	F–C = 50	74	C.C.T.U.no.6
3600– 3900	2722 161 02041	0.3	25	1.1	50	F–C = 50	74	C.C.T.U.no.6
3600– 4200	2722 161 02001	0.3	25	1.12	100	F–C = 58	55	I.E.C.–UER 40
5925– 6425	2722 161 02051	0.3	25	1.12	100	◫ 82.5	51	I.E.C.–UER 70
7700– 8500	2722 161 02021	0.3	25	1.1	50	57 × 65	57.5	I.E.C. UER 84 / UBR 84
8200–11200	2722 161 02071	0.5	22	1.18	10	F–C = 23.5	56	I.E.C.–UBR 100
10200–12400	2722 161 02061	0.5	23	1.15	10	F–C = 23.5	56	I.E.C.–UBR 100

Waveguide 4-port circulators

frequency MHz	*catalog number*	*insertion loss < (dB)*	*isolation α_{1-3} > (dB)*	*isolation α_{1-4} > (dB)*	*V.S.W.R. max.*	*max. power (W)*	*dimensions (mm)* ◫	*height*	*flange type (I.E.C.)*
5925– 6175	2722 161 03081	0.1	33	20	1.05	150	70	57	UER 70
5925– 6175	2722 161 03071	0.4	30	20	1.1	100	70	57	UER 70
6125– 6425	2722 161 03021	0.4	30	20	1.1	100	70	57	UER 70
6125– 6425	2722 161 03091	0.1	30	20	1.06	150	70	57	UER 70
6575– 6875	2722 161 03031	0.35	30	20	1.07	100	70	57	UER 70
6825– 7125	2722 161 03011	0.35	25	18	1.07	100	70	57	UER 70
7125– 7425	2722 161 03001	0.3	25	19	1.1	100	70	57	UER 70
7425– 7725	2722 161 03041	0.35	30	20	1.07	100	70	53	UER 70
10700–11700	2722 161 03061	0.3	30	18	1.07	25	44.5	46	UBR 100
12500–13500	2722 161 03051	0.3	25	20	1.1	25	38	45	UER 140 / UBR 140

[1]) F–C = flange to centre.

Waveguide isolators

frequency MHz	*catalog number*	*insertion loss* < (*dB*)	*isolation* > (*dB*)	*V.S.W.R. max.*	*max. power* (*W*)	*length* (*mm*)	*flange type I.E.C.*
3650– 3950	2722 161 01011	0.5	30	1.05	15	140	UER 40
3800– 4200	2722 161 01081	0.5	30	1.05	10	180	UER 40
3800– 4200	2722 161 01071	0.8	30	1.05	10	140	UER 48
3900– 4200	2722 161 01021	0.5	30	1.05	15	140	UER 40
4200– 4600	2722 161 01091	0.5	30	1.05	10	140	UER 48
4600– 5000	2722 161 01101	0.8	30	1.05	10	140	UER 48
5925– 6425	2722 161 01191	0.5	30	1.05	20	115	UER 70
6425– 7150	2722 161 01251	0.3	30	1.05	20	115	UER 70
6875– 7425	2722 161 01231	0.3	30	1.05	20	115	UER 70
7125– 7750	2722 161 01291	0.3	30	1.05	20	115	UER 70
7250– 7750	2722 161 01241	0.3	30	1.05	20	115	UER 70
7400– 8025	2722 161 01151	0.5	30	1.05	10	115	UER 70
7700– 8500	2722 161 01161	0.5	30	1.05	10	100	UBR 84
7700– 8500	2722 161 01051	0.5	30	1.05	10	100	UER 84
8200–12400	2722 161 01201	1	30	1.15	30	170	UBR 100
8500– 9600	2722 161 01211	0.5	30	1.05	10	76.2	UBR 100
8500– 9600	2722 161 01221	0.6	15	1.15	1	35	UBR 100
10700–11700	2722 161 01171	0.8	30	1.05	5	80	UBR 100
12500–13500	2722 161 01181	0.5	30	1.05	10	60	UBR 140

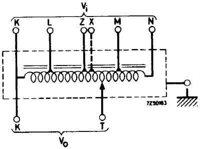
VARIABLE MAINS TRANSFORMERS

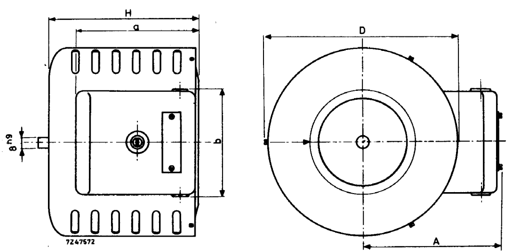
1–10 A (conventional types)

input voltage (V)	*output voltage (V)*	*nom. output current (A)*	*operating torque (kgcm)*	*catalog number 2422 530 . . . . .*					
				bench model		*panel model*		*laboratory model*	
				with knob	*without knob* [1])	*with knob*	*without knob* [1])	*with terminals*	*with socket*
130	0–150	2.5	1.5	02301		02302	02306		
		5	2	03301		03302	03306		
		10	2.5	04301		04302	04306	04304	
220	0–260	1	1.5	02401	02403	02402	02406		02405
		2.5	2	03401	03403	03402	03406		03405
		5	2.5	04401	04403	04402	04406	04404	04405
		8.5	3	05401	05403	05402	05406	05404	05405
240	0–270	1	1.5		02503		02506		
		2.5	2		03503		03506		
		5	2.5		04503		04506		
		8.5	3		05503		05506		

[1]) Knobs with scale are separately available.

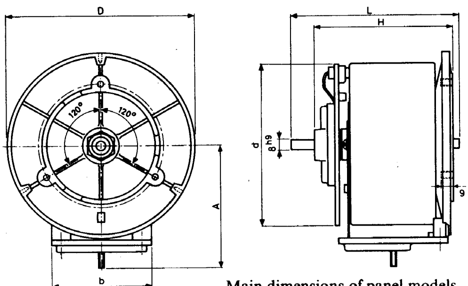
K-L = M-N = 18 % of K-N
Z = centre tap
X = optional tap





Main dimensions of bench models and laboratory models

catalog number				dimensions (mm)				
2422 530 0				H	D	A	a	b
2301	2401	2403	2503	122	113	79	99	77
3301	3401	3403	3503	123	134	93	100	77
4301	4401	4403	4503	131	166	117	106	92
	5401	5403	5503	133	193	134	106	92



Main dimensions of panel models

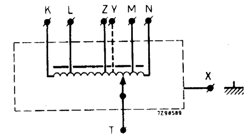
catalog number					dimensions (mm)					
2422 530 0					H	D	A	d	b	L
2302	2306	2402	2406	2506	110	106	63	93	71	153
3302	3306	3402	3406	3506	112	127	74	110	71	153
4302	4306	4402	4406	4506	117	158	92	140	84	157
		5402	5406	5506	120	185	106	168	84	157

VARIABLE MAINS TRANSFORMERS

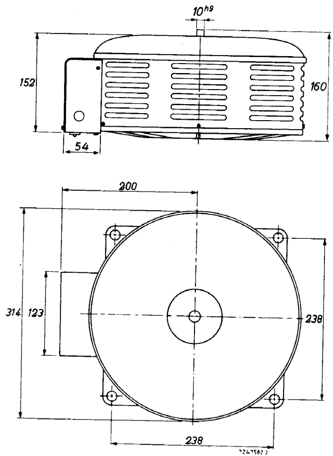
20 A (conventional types)

input voltage (V)	*output voltage (V)*	*nom. output current (A)*	*operating torque (kgcm)*	*catalog number 2422 530 . . . . .*			
				bench model		*panel model*	
				with knob	*without knob* [1])	*with knob*	*without knob* [1])
220	0–260	20	15	07401	07403	07402	07406
240	0–260	20	15		07503		07506

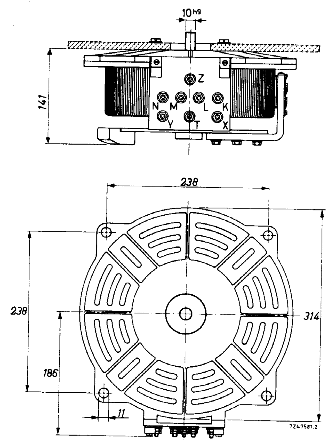
[1]) And without feet. A knob with dial is seperately available under No. 2922 511 90028.



K-L = M-N = 18 % of K-N
Z = centre tap
Y = optional tap



Main dimensions of bench models



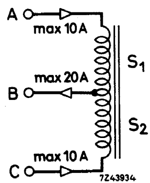
Main dimensions of panel models

Accessories for 1–10 A and 20 A conventional transformers

Chokes

For parallel mounting of two or three transformers, chokes should be inserted between the secondaries to prevent high interchange currents caused by small differences in the ganging.

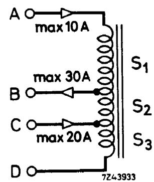
2x10A parallel



$S_1:S_2=1:1$

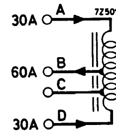
Catalog number
2422 532 00014

10A+20A parallel

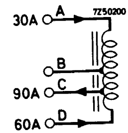


$S_1:S_2:S_3=2:1:1$

Catalog number
2422 532 00013



2x parallel



3x parallel

Catalog number
2422 532 00017

Ganging units

For ganging two or three transformers, sets of standard ganging units are available for bench and panel models.

Motor drive modules

All transformers, either stacked or individual. can be provided with remote controlled motor drives. These motor drives are supplied as modules with easy to assemble loose parts. Two types of synchronous motors together with a series of gear boxes permit a choice out of a large range of speeds.

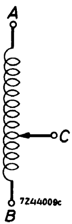
A.C. stabiliser module BEY 801

This module is capable of stabilising voltages to a value set by means of a control potentiometer.
Accuracy of stabilisation: ±1 V.
The voltage to be stabilised can vary between −15% and +10% of the desired value.

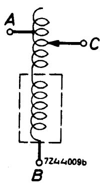
Miniature transformers

input voltage (V)	*output voltage (V)*	*nom. output current (A)*	*direction of rotation*[1]	*output connections*	*catalog number*
60	0–60	1.2	CW	CB	2422 530 00007
			CCW	CA	
110	0–110	0.6	CW	CB	2422 530 00107
			CCW	CA	
120	0–120		CW	CB	
			CCW	CA	
220	120–240	0.5	CW	CB	2422 530 90012
220	110–220	0.5	CW	CB	2422 530 00407
	0–110		CCW	CA	
240	120–240		CW	CB	
	0–120		CCW	CA	

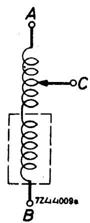
[1]) Seen from extending spindle end: CW = clockwise. CCW = counter clockwise.



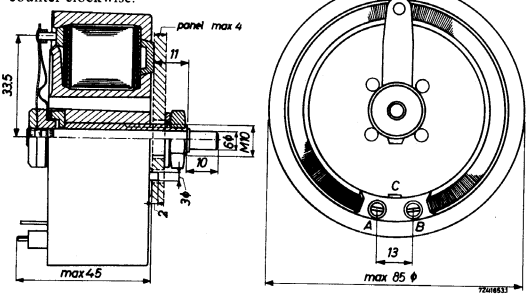
Transformers
2422 530 00007 and
2422 530 00107



Transformer
2422 530 90012



Transformer
2422 530 00407

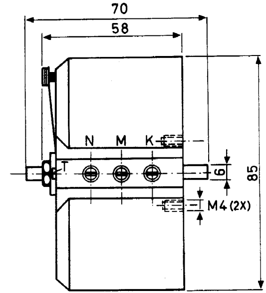


VARIABLE MAINS TRANSFORMERS

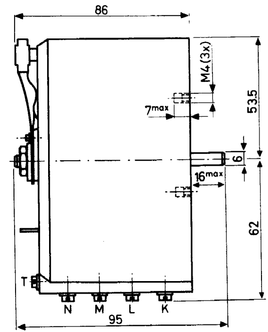
Moulded transformers

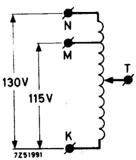
input voltage (V)	*output voltage (V)*	*nom. output current (A)*	*operating torque (gcm)*	*catalog number*
115/130	0–130	1.2	300– 700	2422 530 01607
		1.4		2422 530 11607
220	0–220	0.83	300– 700	2422 530 11407
		1.4	300– 700	2422 530 18407
		2.5	500–1000	2422 530 13407
220/240	0–240	0.7	300– 700	2422 530 01407
220/260	0–260	1.2	300– 700	2422 530 08407
		2.0	500–1000	2422 530 03407
240/260	0–260	2.0	500–1000	2422 530 03507

Transformers 2422 530 01407 and 2422 530 01607

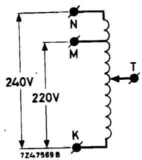


Transformers 2422 530 03407
2422 530 03507
2422 530 13407

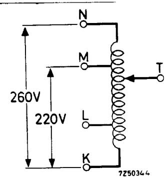




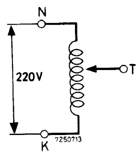
Transformer
2422 530 01607



Transformer
2422 530 01407



Transformer
2422 530 03407

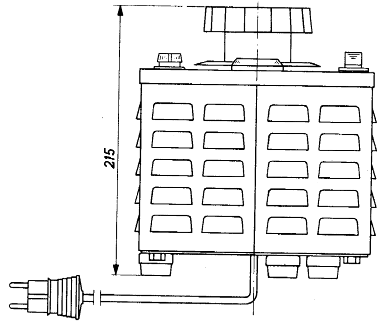


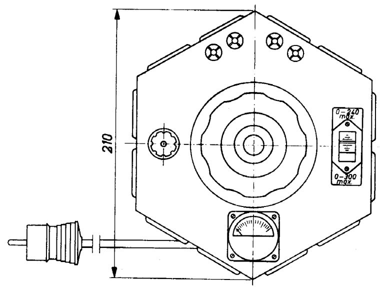
Transformer
2422 530 13407

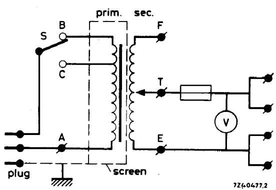
Transformers with separate windings

input voltage (V)	*output voltage (V)*	*range* [1]	*nom. output current (A)*	*operating torque (kgcm)*	*catalog number*
180	0–260	I	1.5	2	2422 529 00002
	0–215	II			
220	0–320	I			
	0–265	II			
240	0–350	I			
	0–285	II			
220	0–268		2	2	2422 529 00003

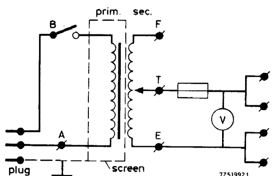
[1]) Range I: Line voltage connected to terminals A-C (0–300 V_{max} position on switch)
Range II: Line voltage connected to terminals A-B (0–240 V_{max} position on switch)







Transformer 2422 529 00002



Transformer 2422 529 00003

ELECTRO-MECHANICAL COMPONENTS

Printed-wiring connectors

Type number : F 044
Colour : black
Contact pitch : 0.1″ (2.54 mm)
Number of connections(n): 6 to 37 (double-sided bridged)
Max. voltage between adjacent contacts : 100 V_P
Max. current : 3 A
Material of body : synthetic resin

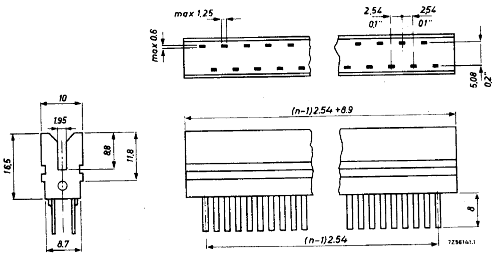
The connectors are available with or without brackets, with the kinds of terminations shown and with minimum 8, maximum 39 contact chambers. The two outermost contact chambers do not contain contact springs.

Catalog number: 2422 02 . . . 18

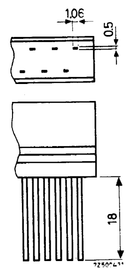
termination code
1 = short pins
2 = wire-wrap pins
3 = soldering lugs

3 = with fixed brackets
4 = without brackets

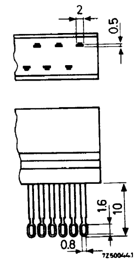
number of contact chambers
08, 09, 10, 11 or up to 39



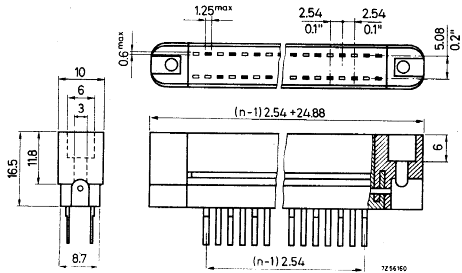
Connector with short pins, without brackets



Connector with wire-wrap pins, without brackets



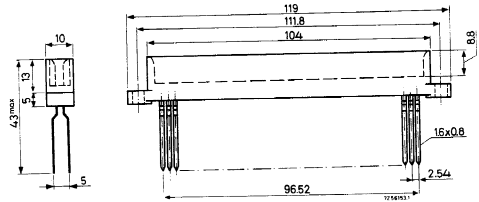
Connector with soldering lugs, without brackets



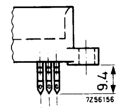
Connector with short pins and fixed brackets

ELECTRO-MECHANICAL COMPONENTS

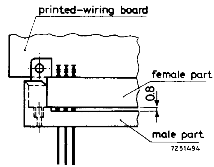
Type number	: F 059
Colour	: black
Contact pitch	: 0.1" (2.54 mm)
Number of connections	: 39 (double-sided bridged)
Max. voltage between adjacent contacts	: 100 V_P
Max. current	: 3 A
Material of body	: synthetic resin
Catalog number	: 2422 022 03916, connector with wire-wrap pins 2422 023 03916, connector with soldering lugs



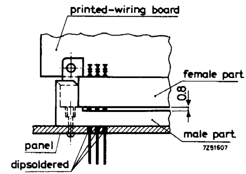
Connector with wire-wrap pins



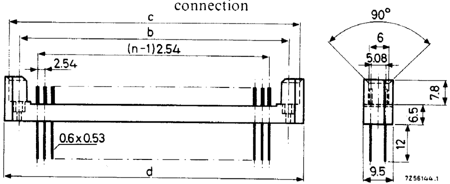
Type number : F 054
Colour : green
These connectors are composed of a male part and a female part.
Contact pitch : 0.1" (2.54 mm)
Number of connections : 32, 48, 64 (double sided)
Max. current : 1.5 A
Material of body : glass fibre filled diallyl phthalate
Contact termination of male part : for mini wire-wrap connection



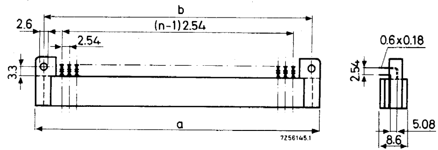
Connectors 2422 025 89082
2422 025 89109
2422 025 89112



Connectors 2422 025 89083
2422 025 89111
2422 025 89113



Male part

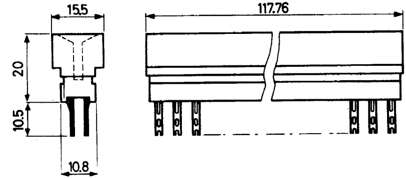


Female part

number of connections	*dimensions (mm)*				*catalog number*		
	a	*b*	*c*	*d*	*male part*	*female part*	*combination of both parts*
32	54.5	48.3	55.2	58.3	4322 026 08790	4322 026 08780	2422 025 89109
48	74.8	68.6	69.3	72.4	08840	08830	89112
64	95	88.9	95.8	98.9	10930	10920	89082
32	54.5	48.3	55.2	58.3	08800 } for panel mounting	08780	89111
48	74.8	68.6	69.3	72.4	08850 } for panel mounting	08830	89113
64	95	88.9	95.8	98.9	10940 } for panel mounting	10920	89083

ELECTRO-MECHANICAL COMPONENTS

Type number : F 058
Colour : black
Max. voltage : 100 V_P
Max. current : 3 A
Material of body : synthetic resin
Contact termination : notched lug



Single-sided connectors

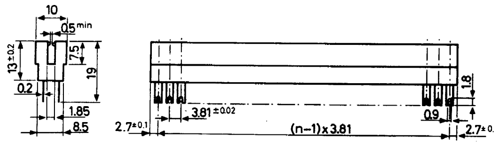
contact pitch	*number of contact springs*	*catalog number*
0.1″	45	2422 023 14502
0.1″	45 (bent terminals)	14594
0.1″	41	14596
0.2″	23	14592
0.2″	21	14598

Double-sided connectors

contact pitch	*number of contact springs*	*catalog number*
0.1″	90	2422 023 14512
0.1″	82	14597
0.2″	46	14591
0.2″	45 (staggered)	14593
0.2″	42	14599

Type number : F 046
Colour : black
Contact pitch : 0.15″ (3.81 mm)
Number of connections : 4 to 45, single sided
8 to 90, double sided
Max. voltage between adjacent contacts : 354 V_P
Max. current : 3 A
Material of body : synthetic resin
Contact termination : notched
Catalog number : 2422 036 6 .. ..

number of contact chambers (*n*) 06, 07, 08, 09, 10 or up to 45 — version, see table



double sided

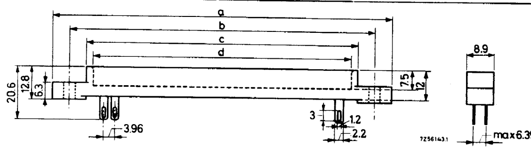
version	*number of contact chambers containing a spring*	*version indication*
single-sided	all	02
double-sided	all	12
single-sided	all but the two outermost	04
double-sided	all but the two outermost	14

Type number : F 047
Colour : blue
Contact pitch : 0.156″ (3.96 mm)
Number of connections : 6, 10, 15, 18, 22, single-sided
12, 20, 30, 36, 44, double-sided
Max. voltage between adjacent contacts: 354 V_P
Max. current : 5 A
Material of body : glass fibre filled diallyl phthalate
Contact termination : with lug
Catalog number : 2422 037 . .. ..

mounting holes or bushes
6 = fixed threaded bushes (4-40NC-2B)
7 = plain holes (3.2 mm∅)

number of contacts per row, 06, 10, etc.

02 = single-sided
12 = double-sided
16 = double-sided, bridged opposite contacts



number of contact springs per row	*a*	*b*	*c*	d_{min}
6	46.2	38.9	31.8	27.80
10	62.1	54.8	47.7	43.63
15	82.0	74.7	67.6	63.45
18	93.9	86.6	79.5	75.34
22	109.8	102.5	95.4	91.14

ELECTRO-MECHANICAL COMPONENTS

Type number : F 050
Colour : green
Material of body : glass fibre filled polyester
For further data, see F 047

Catalog number: 2422 037 . . . . .

mounting holes or bushes
0 = plain holes (3.2 mm∅)
1 = fixed threaded bushes (M3)

number of contacts per row, 06, 10, etc.

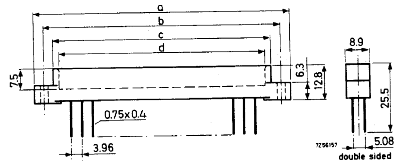
02 = single-sided
12 = double-sided
16 = double-sided bridged opposite contacts

Type number : F 053
Colour : red
Contact pitch : 0.156" (3.96 mm)
Number of connections : 18, 22, single-sided; 36, 44, double-sided
Maximum voltage : 354 V_P
Maximum current : 5 A
Material of body : glass filled polycarbonate
Contact termination : for mini wire-wrap connection
Catalog number : 2422 039 . . . . .

mounting holes or bushes
0 = plain holes (3.2 mm∅)
1 = fixed threaded bushes (M3)

number of contacts per row

02 = single-sided
12 = double-sided



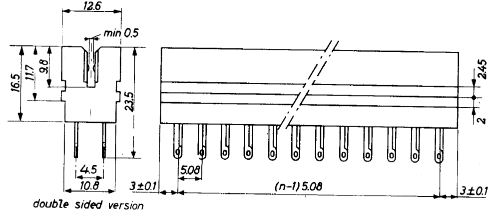
number of contact springs per row	a	b	c	d_{min}
18	93.9	86.6	79.5	75.34
22	109.8	102.5	95.4	91.14

Type number	: F 045
Colour	: black
Contact pitch	: 0.2″ (5.08 mm)
Number of connections	: 4 to 54, single-sided 8 to 108, double-sided
Max. voltage between adjacent contacts	: 145 V_{rms}
Max. current	: 5 A
Material of body	: synthetic resin
Catalog number	: 2422 0 . . 5 . . . .

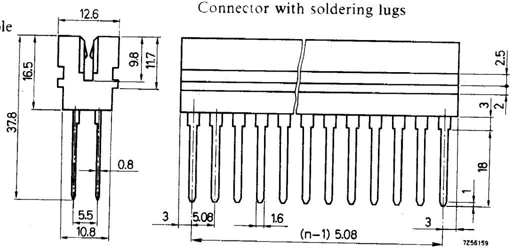
termination code
20 = soldering lugs
35 = wire-wrap pins

number of contact chambers(n) 06, 07, 08, 09, 10 or up to 54

version, see table



Connector with soldering lugs



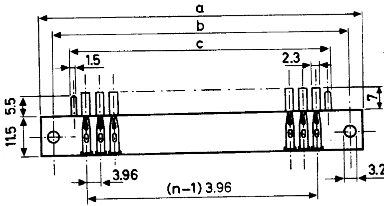
Connector with wire-wrap pins

version	*number of contact chambers containing a contact*	*version indication*
single-sided	all	02
double-sided	all	12
single-sided	all but the two outermost	04
double-sided	all but the two outermost	14

Multi-pin connectors

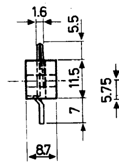
Type number : F 049
Colour : blue
Contact pitch : 0.156″ (3.96 mm)
Max. voltage between adjacent contacts : 354 V_P
Max. current : 5 A
Material of body : glass fibre filled diallyl-phthalate

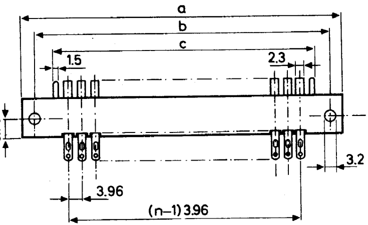
number of pins(n)	a (max) (mm)	b (mm)	c (max) (mm)	catalog number of connectors with straight terminations	catalog number of connectors with hooked terminations
6	47.0	38.94	27.70	2422 025 89002	2422 025 89026
10	62.9	54.80	43.55	89003	89027
12	70.7	62.74	51.50	89004	89028
15	82.5	74.70	63.40	89005	89029
18	94.5	86.50	75.30	89006	89031
22	110.5	102.45	91.10	89007	89032



Connector with hooked terminations (level-mounting type); see also table above.

number of pins (n)	MIL type number	catalog mumber
6	M21097/7/C106a2A	2422 025 89091
10	/C110a2A	89092
12	/C112a2A	89093
15	/C115a2A	89094
18	/C118a2A	89095
22	/C122a2A	89096



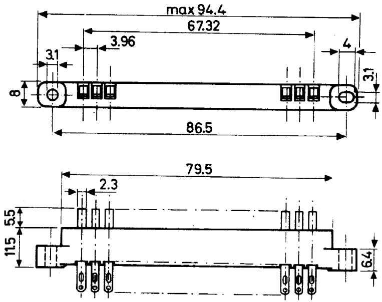


Connector with straight terminations, according to MIL-specification C-21097/7 (level-mounting type); see also table above.

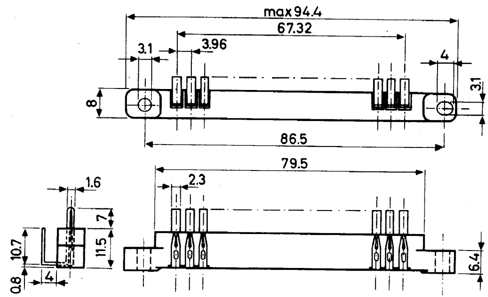
The connectors with straight terminations are also available with marking according to MIL-specification C-21097/7, which implies the MIL type number and the name of the manufacturer preceded by four digits, of which the first two digits represent the year, the last two digits the week of manufacture.

Type number	: F 052
Colour	: green
Contact pitch	: 0.156″ (3.96 mm)
Max. voltage between adjacent contacts	: 354 V_P
Max. current	: 5 A
Material of body	: glass fibre filled polyester

number of pins(n)	*a (max) (mm)*	*b (mm)*	*c (max) (mm)*	*catalog number of connectors with straight terminations (level-mounting type)*
6	47.0	38.94	27.70	2422 025 89084
10	62.9	54.80	43.55	89085
12	70.7	62.74	51.50	89086
15	82.5	74.70	63.40	89087
18	94.5	86.50	75.30	89088
22	110.5	102.45	91.10	89089



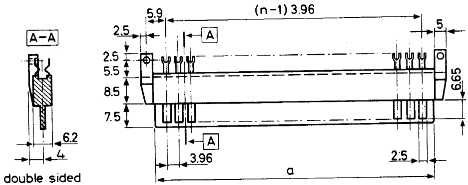
Connector with straight terminations (upright-mounting type)
Number of pins: 18
Catalog number: 2422 025 89025



Connector with hooked terminations (upright-mounting type)
Number of pins: 18
Catalog number: 2422 025 89001

Printed-wiring interconnectors

Type number : F048
Colour : blue
Contact pitch : 0.156″ (3.96 mm)
Max. voltage between
adjacent contacts : 354 V_P
Max. current : 5 A
Material of body : glass fibre filled diallyl phthalate



number of contact springs per row (n)	*a (mm)*	*catalog number*	
		single-sided version	*double-sided version*
6	27.74	2422 025 89033	2422 025 89038
10	43.58	89034	89039
15	63.40	89035	89041
18	75.30	89036	89042
22	91.10	89037	89043

Type number : F 051
Colour : green
Material of body : glass fibre filled polyester

For further data, see F 048

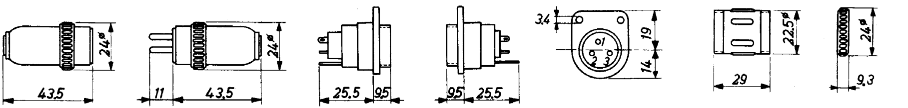
number of contact springs per row(n)	*catalog number*	
	single-sided version	*double sided version*
6	2422 025 89071	2422 025 89076
10	2422 025 89072	2422 025 89077
15	2422 025 89073	2422 025 89078
18	2422 025 89074	2422 025 89079
22	2422 025 89075	2422 025 89081

Plugs and sockets

Three-pole and six-pole plugs and sockets

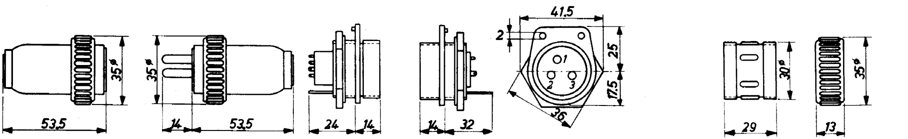
type	*max. voltage between two contacts* (V_P)	*permissible three-phase mains voltage* (*V*)	*max. power that may be switched off* (*W*)	*max. current* (*A*)	*max. cable diameter* (*mm*)
small three-pole series	500 [1])	3 × 380	250	6	6
large three-pole series	500	3 × 380	1000	15	10
six-pole series	500	3 × 380	250	6	10

[1]) Between contacts 1 and 2 : 350 V_P



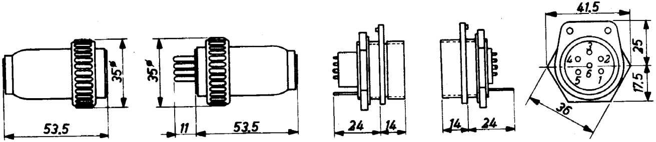
Female plug Male plug Female socket Male socket Coupling union Screw cover

Small three-pole series



Female plug Male plug Female socket Male socket Coupling union Screw cover

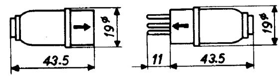
Large three-pole series



Female plug — Male plug — Female socket — Male socket

Six-pole series. Coupling union and screw cover are those of the large three-pole series.

piece	*small three-pole*	*large three-pole*	*six-pole*	*simplified small three-pole*
female plug	3922 860 43350	3922 860 43360	3922 860 43370	3922 816 06860
male plug	860 43320	860 43330	860 43340	816 06840
female socket	860 43410	860 43420	860 43430	
male socket	860 43380	860 43390	860 43400	
coupling union	860 41410	860 41420	860 41420	
screw cover	811 47100	860 47110	860 47110	



Female plug — Male plug

Simplified small three-pole series

Miniature polarised relays

SZC 7122 - Bistable polarised relay with two stable positions and one change-over contact.
No energy is required for holding the contact closed in either position.
When the relay is energised as shown in Fig. 1 contact 2-6 is closed, when energised in opposite direction contact 2-1 is closed.

SZC 7123 - Monostable polarised relay with one stable position and one change-over contact. To hold the make-contact closed, the relay must be energised. When the relay is energised as shown in Fig. 1 contact 2-6 is closed. In its normal position (if not energised or energised in opposite direction) contact 2-1 is closed.

The windings I and II can be energised either connected in series or in separate circuits.

Contact rating: The contacts are rated for a maximum steady-state d.c. voltage of 120 V and a maximum steady-state direct current of 1 A. The contacts withstand a maximum switching-on surge (as a result of wiring capacitance) of 2 A, provided this decays to a maximum of 200 mA within 6 μs.

Max. switching frequency: 200 Hz
Max. permissible working voltage: 200 $V_{d.c.}$

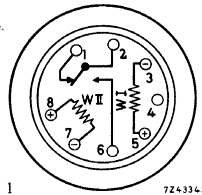


Fig. 1

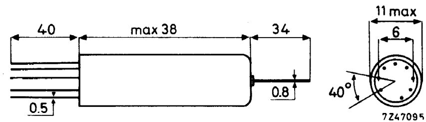


Fig. 2

Quartz crystal sockets

For holders HC-6/U, HC-13/U, HC-27/U and HC-28/U.

number of contacts	*insulating material*	*contact springs plating*	*contact springs shape*	*max. voltage* (V_P)	*max. current* (A)	*Fig.*	*catalog number*
2	ceramic	silver	cup	500	2	1	2422 518 00001
2						2	00002 [1])

[1]) For printed-wiring mounting

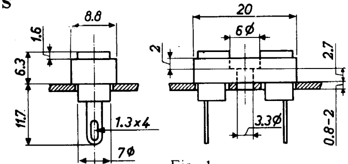


Fig. 1

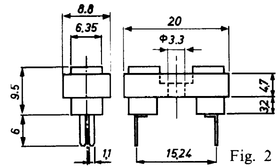


Fig. 2

Transistor sockets

type	*number of contacts*	*insulating material*	*contact springs plating*	*contact springs shape*	*max. voltage (V_P)*	*max. current (A)*	*Fig.*	*catalog number*
for OC70 series	3	phenolic	silver	fork	100	0.25	1	2422 485 00001
for TO-18	4	polycarbonate	silver	scraper	40	0.15	2	2422 486 00001
for TO-5	4	phenolic	silver	scraper	40	0.15	3	2422 486 01001
5 contacts in line	5	phenolic	silver	fork	100	0.25	4	4322 026 65641

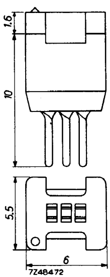


Fig. 1

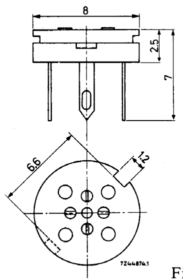


Fig. 2

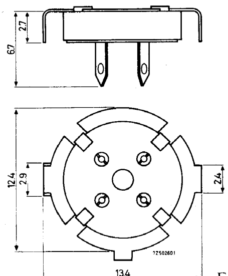


Fig. 3

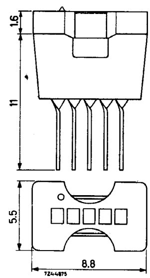


Fig. 4

Tube sockets

type	number of contacts	insulating material	contact springs plating	contact springs shape	max. voltage (V_P)	max. current (A)	Fig.	catalog number
Super Jumbo (B4D)	4	ceramic	special construction		1500	30	1	2422 511 01001
Jumbo (B4F)					1200	8	2	02001
for TB5/2500					2000	40	3	05001
Super Giant	5	ceramic	special construction		1500	12	4	2422 512 00001
Giant (B5F)		ceramic			1500	30	5	01001
O-type		phenolic			800	2	6	02001
Medium (5p)		ceramic			1000	12	7	03001
for Nuvistors		phenolic	silver	U			8	9390 013 80002
for Nuvistors		phenolic	silver	U			9	90002 [1]
Miniature (B7G)	7	ceramic	silver	fork	550	2	10	2422 500 00001 [2]
		ceramic	gold	fork			11	00002 [2]
		ceramic	silver	fork			10	00004 [3]
		ceramic	gold	fork			11	00005 [3]
		laminate	silver	scraper			12	01001
		laminate	silver	scraper			13	01003 [1] [4]
		phenolic	silver	cup			14	02001 [1]
		phenolic	silver	cup			14	02002 [1] [5]
	6	laminate	silver	scraper			15	03001
	6	laminate	silver	scraper			16	03002 [1]
Septar (B7A)	7	ceramic	special		1500	2	17	2422 513 00001
Loctal	7	aetheen	special		650	3	18	01001

[1]) For printing-wiring mounting. [2]) Insulation resistance $>10^4$ MΩ. [3]) Insulation resistance $>10^5$ MΩ. [4]) 50 pieces on one strip. [5]) Without centre shield.

type	number of contacts	insulating material	contact springs		max. voltage	max. current	Fig.	catalog number
			plating	shape	(V_P)	(A)		
Subminiature (B8D)	8	phenolic	silver	U	250	0.25	19	2422 501 00001
Rimlock (B8A)		ceramic		fork	750	2	20	01001
Octal		phenolic		cup	800	5	21	02001
		ceramic		cup	800	5	22	03001
		ceramic		cup	800	5	23	03002 [1])
Eightar		laminate		scraper	550	2	24	06001
Loctal (for QQE04/5)		ceramic		cup		5	25	90007
P-type		phenolic		special	800	2	26	2422 514 00001
Noval (B9A)	9	laminate	silver	scraper	550	2	27	2422 502 00002
		ceramic	silver	fork	750	2	28	01003
		ceramic	gold	fork	750	2	28	01004
		ceramic	silver	cup	750	2	29	01007 [1])
		ceramic	silver	cup	750	2	29	01008 [1])[3])
		laminate	silver	scraper	550	2	30	03003 [1])[2])
Loctal (B9G)		phenolic	silver	U	500	2	31	04001
Magnoval		ceramic	silver	scraper	800	5	32	05001
		ceramic	silver	scraper	800	5	33	05002 [1])
		ceramic	silver	scraper	800	5	32	90014 [4])
Decal	10	laminate	silver	scraper	500	2	34	2422 503 00001 [1])[2])
		ceramic		cup	650	2	35	01001
		ceramic		cup	650	2	36	01003 [1])
Duodecal (B12A)	12	phenolic	silver	cup	1600	5	37	2422 504 00001
for Jedec B12-244		phenolic	silver	scraper	1000	2	38	01001

13 pin type (B13B)	13	phenolic	silver	cup	500	2	39	2422 505 00001 00002 [5]) 00003 [5])
Diheptal (B14A)	14	phenolic	silver	cup	2000	2	40	2422 517 00001

[1]) For printed-wiring mounting' [2]) 50 pieces on one strip. [3]) Without centre shield. [4]) For under-chassis mounting. [5]) With different position of mounting ring versus contacts.

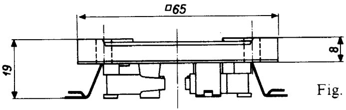


Fig. 1

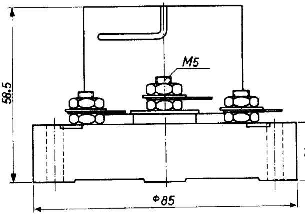


Fig. 2

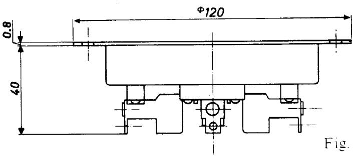


Fig. 4

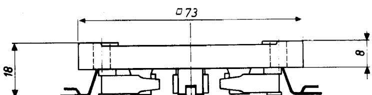


Fig. 5

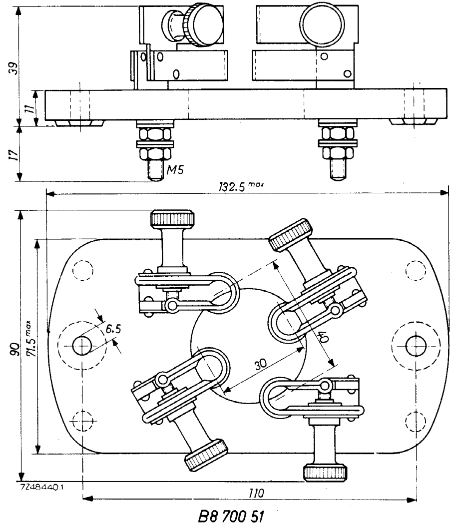


Fig. 3

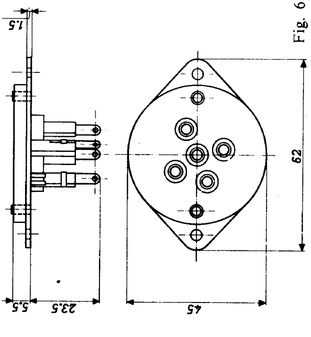


Fig. 6

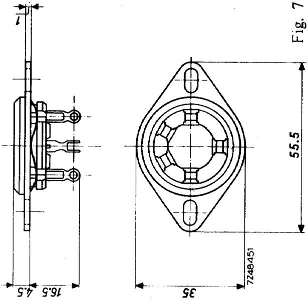


Fig. 7

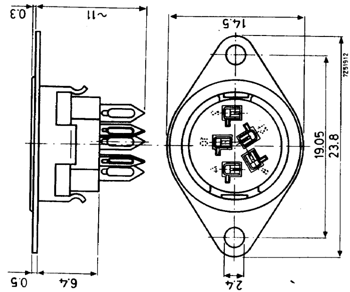


Fig. 8

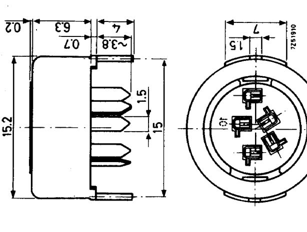


Fig. 9

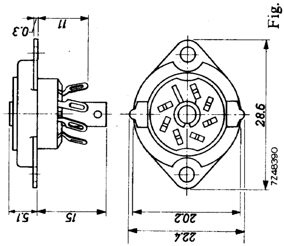


Fig. 10

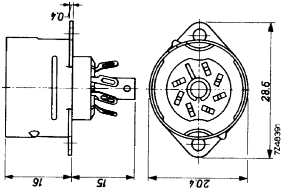


Fig. 11

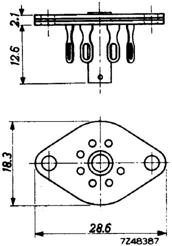


Fig. 12

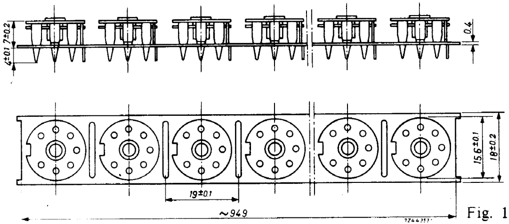


Fig. 13

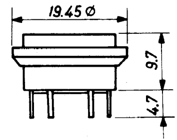


Fig. 14

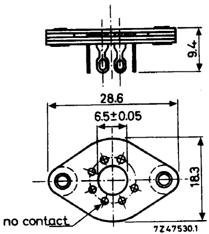


Fig. 15

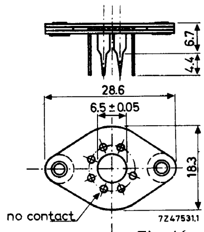


Fig. 16

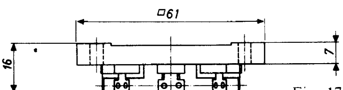


Fig. 17

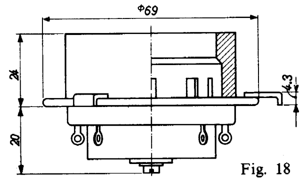


Fig. 18

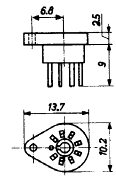


Fig. 19

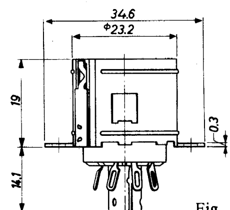


Fig. 20

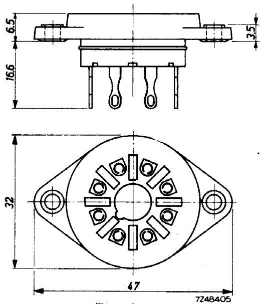


Fig. 21

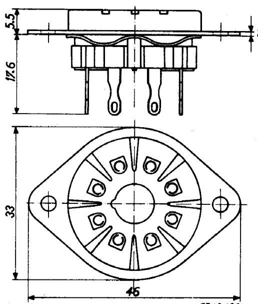


Fig. 22

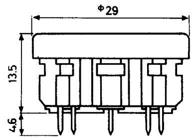


Fig. 23

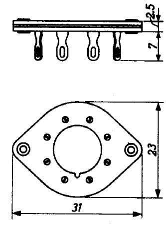


Fig. 24

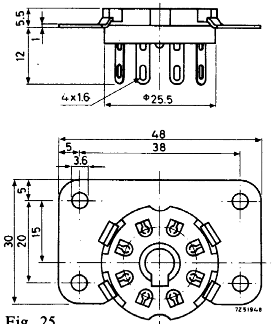


Fig. 25

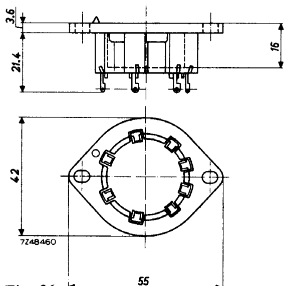


Fig. 26

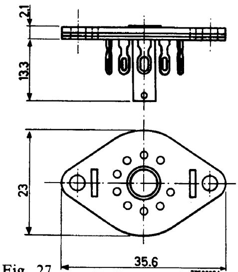


Fig. 27

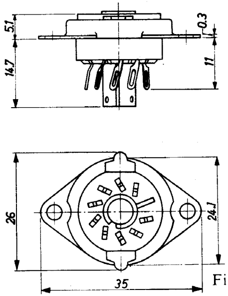


Fig. 28

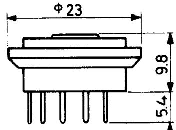


Fig. 29

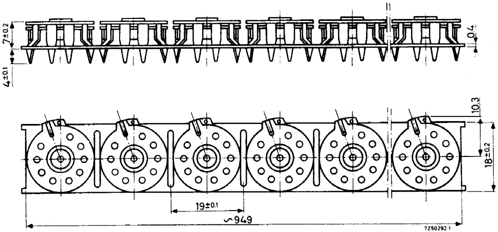


Fig. 30

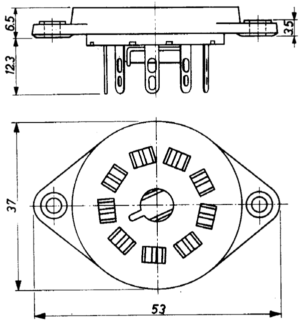


Fig. 31

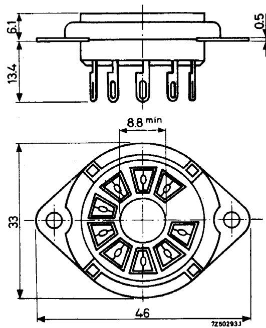


Fig. 32

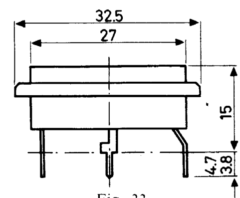


Fig. 33

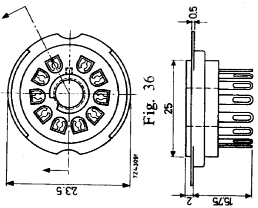


Fig. 36

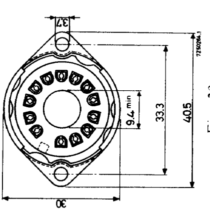


Fig. 39

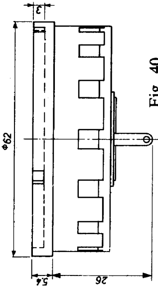


Fig. 40

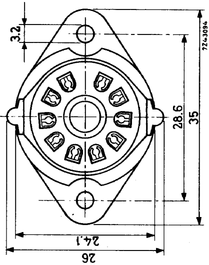


Fig. 35

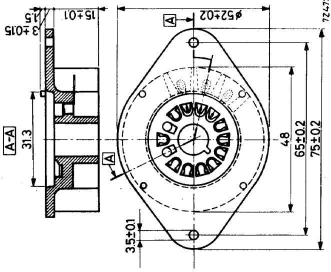


Fig. 38

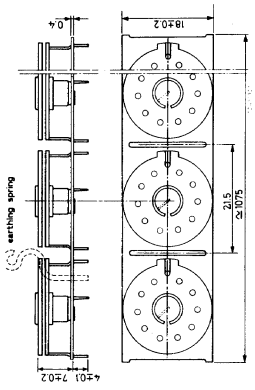


Fig. 34

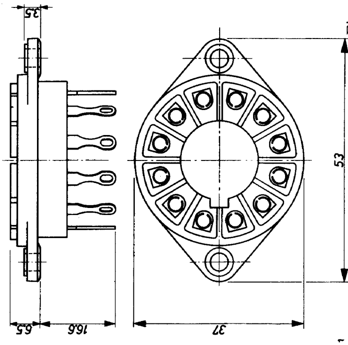
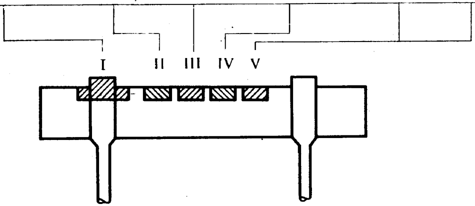


Fig. 37

CERAMIC CAPACITORS

Colour code

	temperature coefficient	*first digit*	*second digit*	*multiplier for the capacitance*	*tolerance on capacitance* $C \leqslant 10\ pF$ (*pF*)	$C > 10\ pF$ (%)
red/violet	P100					
black	NP0		0	1		±20
brown		1	1	10	±0.1	±1
red		2	2	10^2	±0.25	±2
orange	N150	3	3	10^3		
yellow		4	4	10^4		
green		5	5		±0.5	±5
blue		6	6			
violet	N750	7	7			
grey		8	8	10^{-2}		
white		9	9	10^{-1}	±1	±10



Miniature plate types, class IB

Temperature range: −55 to +85°C
Max. working voltage: 63 V
Tolerance on capacitance
for $C \leqslant 10$ pF: ±0.25 pF
for $C > 10$ pF: ±2%
Solderability: 250°C, 5 s
Catalog number:

size	*B × H (mm)* *Fig. 1 and 2*	*Fig. 3*
I	3 × 4	6 × 5
II	4 × 5	6 × 6
III	5 × 6	6 × 7
IV	6 × 7	6 × 8

2222 632 . . . . ., with flexible connecting leads (d = 0.4 mm), lead spacing 2.54 mm. Fig. 1
2222 631 . . . . ., with rigid connecting leads (d = 0.6 mm), lead spacing 2,54 mm. Fig. 2
2222 638 . . . . ., with rigid connecting leads (d = 0.6 mm), lead spacing 5.08 mm. Fig. 3

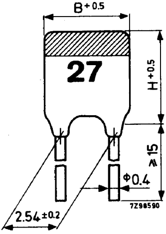


Fig. 1

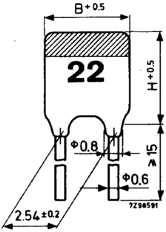


Fig. 2

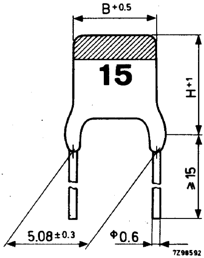


Fig. 3

CERAMIC CAPACITORS

capacitance (pF)	temperature coefficient P100: +100.10⁻⁶ deg C marking	size	suffix	NP0: 0.10⁻⁶/deg C marking	size	suffix	N150: −150.10⁻⁶/deg C marking	size	suffix	N750: −750 10⁻⁶/deg C marking	size	suffix
1.0	T	I	02108									
1.2	U	I	02128									
1.5	V	I	02158									
1.8	W	I	02188	W	I	08188						
2.2	X	I	02228	X	I	08228						
2.7	Y	I	02278	Y	I	08278						
3.3	Z	I	02338	Z	I	08338				Z	I	56338
3.9	3.9	II	02398	A	I	08398				A	I	56398
4.7	4.7	II	02478	B	I	08478	B	I	32478	B	I	56478
5.6	5.6	II	02568	C	I	08568	C	I	32568	C	I	56568
6.8	6.8	II	02688	6.8	II	08688	D	I	32688	D	I	56688
8.2	8.2	III	02828	8.2	II	08828	E	I	32828	E	I	56828
10	10	III	02109	10	II	08109	F	I	32109	F	I	56109
12	12	IV	02129	12	II	08129	G	I	32129	G	I	56129
15	15	IV	02159	15	II	08159	H	I	32159	15	II	56159
18				18	II	08189	J	I	32189	18	II	56189
22				22	II	08229	22	II	32229	22	II	56229
27				27	II	10279	27	II	34279	27	II	58279
33				33	II	10339	33	II	34339	33	II	58339
39				39	II	10399	39	II	34399	39	II	58399
47				47	III	10479	47	II	34479	47	II	58479
56				56	III	10569	56	III	34569	56	II	58569
68				68	IV	10689	68	III	34689	68	II	58689
82				82	IV	10829	82	IV	34829	82	II	58829
100							100	IV	34101	100	II	58101
120										120	III	58121
150										150	III	58151
180										180	IV	58181
220										220	IV	58221

Tubular type, class IB

Temperature range: −40 to +85 °C

Max. working voltage: 500 $V_{d.c.}$

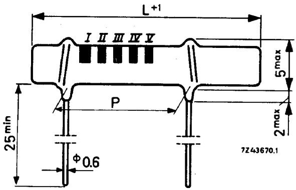
Tolerance on capacitance

for $C \leq 2.2$ pF : ±0.25 pF

for $C = 2.7$–10 pF : ±0.5 pF

for $C > 10$ pF : ±5 %

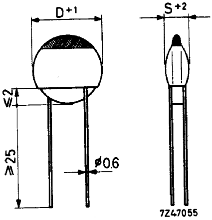
Catalog number 2222 555 .....



capacitance (pF)	*temperature coefficient*								
	*NP*0: 0.10⁻⁶/*deg C*			*N*150: −150.10⁻⁶/*deg C*			*N*750: −750.10⁻⁶/*deg C*		
	L (mm)	*P (mm)*	*suffix*	*L (mm)*	*P (mm)*	*suffix*	*L (mm)*	*P (mm)*	*suffix*
0.8							12	7.6	57807
1							12	7.6	57108
1.2							12	7.6	57128
1.5							12	7.6	57158
1.8	12	7.6	09188				12	7.6	57188
2.2	12	7.6	09228				12	7.6	57228
2.7	12	7.6	08278				12	7.6	56278
3.3	12	7.6	08338				12	7.6	56338
3.9	12	7.6	08398				12	7.6	56398
4.7	12	7.6	08478				12	7.6	56478
5.6	12	7.6	08568	12	7.6	32568	12	7.6	56568
6.8	12	7.6	08688	12	7.6	32688	12	7.6	56688
8.2	10	5.1	08828	10	5.1	32828	10	5.1	56828
10	10	5.1	08109	10	5.1	32109	10	5.1	56109
12	10	5.1	08129	10	5.1	32129	10	5.1	56129
15	10	5.1	08159	10	5.1	32159	10	5.1	56159
18	10	5.1	08189	10	5.1	32189	10	5.1	56189
22	10	5.1	08229	10	5.1	32229	10	5.1	56229
27	12	7.6	08279	12	7.6	32279	10	5.1	56279
33	12	7.6	08339	12	7.6	32339	10	5.1	56339
39	12	7.6	08399	12	7.6	32399	10	5.1	56399
47	14	7.6	08479	12	7.6	32479	10	5.1	56479
56	14	7.6	08569	14	7.6	32569	12	7.6	56569
68	16	10.2	08689	16	10.2	32689	12	7.6	56689
82	18	12.7	08829	16	10.2	32829	12	7.6	56829
100	20	12.7	08101	18	12.7	32101	12	7.6	56101
120	22	17.7	08121	20	12.7	32121	14	7.6	56121

capacitance (pF)	*temperature coefficient*								
	NP0: 0.10^{-6}/*deg C*			*N150*: -150.10^{-6}/*deg C*			*N750*: -750.10^{-6}/*deg C*		
	L (mm)	*P (mm)*	*suffix*	*L (mm)*	*P (mm)*	*suffix*	*L (mm)*	*P (mm)*	*suffix*
150	26	20.3	08151	24	17.7	32151	16	10.2	56151
180	30	20.3	08181	26	20.3	32181	18	12.7	56181
220	34	25.4	08221	30	20.3	32221	20	12.7	56221
270				36	25.4	32271	22	17.7	56271
330							24	17.7	56331
390							28	20.3	56391
470							32	25.4	56471
560							38	30.5	56561
680							44	35.6	56681
820							52	40.6	56821

Disc type, class IB



Temperature range: −40 to +85°C
Max. working voltage: 500 $V_{d.c.}$
Tolerance on capacitance
for $C \leqslant 2.2$ pF : ±0.25 pF
for $C = 2.7$–10 pF : ±0.5 pF
for $C > 10$ pF : ±5%
Catalog number: 2222 625 . . . . .

cap. (pF)	*temperature coefficient*											
	P100: $+100.10^{-6}$/°*C*			*NP0*: 0.10^{-6}/°*C*			*N150*: -150.10^{-6}/°*C*			*N750*: -750.10^{-6}/°*C*		
	D (mm)	*S (mm)*	*suffix*	*D (mm)*	*S (mm)*	*suffix*	*D (mm)*	*S (mm)*	*suffix*	*D (mm)*	*S (mm)*	*suffix*
0.5	5	4.5	03507									
0.75	5	3.5	03757									
1.0	5	3	03108									
1.2	5	3	03128									
1.5	5	2.5	03158									
1.8	5	3.5	03188	5	6	09188				5	5.5	56188
2.2	5	3	03228	5	5	09228	5	5.5	33228	5	5	56228
2.7	5	3	02278	5	4.5	08278	5	5	32278	5	4.5	56278

cap. (pF)	temperature coefficient											
	P100: $+100.10^{-6}/^{\circ}C$			NP0: $0.10^{-6}/^{\circ}C$			N150: $-150.10^{-6}/^{\circ}C$			N750: $-750.10^{-6}/^{\circ}C$		
	D (mm)	S (mm)	suffix	D (mm)	S (mm)	suffix	D (mm)	S (mm)	suffix	D (mm)	S (mm)	suffix
3.3	5	2.5	02338	5	4.5	08338	5	4.5	32338	5	4	56338
3.9	8	3	02398	5	4	08398	5	4	32398	5	3.5	56398
4.7	8	3	02478	5	3.5	08478	5	3.5	32478	5	3.5	56478
5.6	8	3	02568	5	3	08568	5	3.5	32568	5	3	56568
6.8				5	3	08688	5	3	32688	5	3	56688
8.2				5	2.5	08828	5	3	32828	5	2.5	56828
10				8	3	08109	5	2.5	32109	5	3.5	56109
12				8	3	08129	8	3	32129	5	3.5	56129
15				8	3	08159	8	3	32159	5	3	56159
18							8	3	32189	5	2.5	56189
22										8	3	56229
27										8	3	56279
33										8	3	56339

Miniature plate types, class II

Temperature range
629-series: −10 to +55 °C
630-series: −25 to +85 °C
Max. working voltage: 629-series: 40 V
630-series: 100 V
Tolerance on capacitance
629-series: −20 to +100%
630-series: ±10%
Solderability: 250 °C, 5 s
Catalog numbers: 2222 629 .....
2222 630 .....

size	B × H (mm) Fig. 1 and 2	Fig. 3
I	3 × 4	6 × 5
II	4 × 5	6 × 6
III	5 × 6	6 × 7
IV	6 × 7	6 × 8

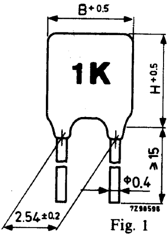


Fig. 1

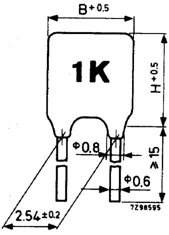


Fig. 2

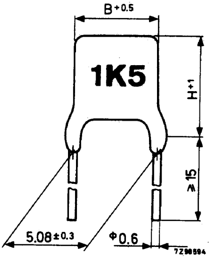


Fig. 3

CERAMIC CAPACITORS

Capacitors 629-series

capacitance (pF)	*size*	*cat. number suffix* *Fig. 1 version*	*Fig. 2 version*	*Fig. 3 version*	*marking*
1000	I	02102	01102	03102	T
2200	I	02222	01222	03222	X
4700	II	02472	01472	03472	Z
10000	II	02103	01103	03103	10K
22000	IV	02223	01223	03223	22K

Capacitors 630-series

capacitance (pF)	*size*	*Fig. 1 version*	*Fig. 2 version*	*Fig. 3 version*	*marking*
180	I	02181	01181	03181	J
220	I	02221	01221	03221	K
270	I	02271	01271	03271	L
330	I	02331	01331	03331	M
390	I	02391	01391	03391	N
470	I	02471	01471	03471	P
560	I	02561	01561	03501	Q
680	II	02681	01681	03681	680
820	II	02821	01821	03821	820
1000	II	02102	01102	03102	1K
1200	II	02122	01122	03122	1K2
1500	II	02152	01152	03152	1K5
1800	II	02182	01182	03182	1K8
2200	III	02222	01222	03222	2K2
2700	III	02272	01272	03272	2K7
3300	IV	02332	01332	03332	3K3
3900	IV	02392	01392	03392	3K9

Barrier layer type, class II

Temperature range: −10 to +55°C
Max. working voltage: 6 $V_{d.c.}$
Tolerance on capacitance: −20 to +100%
Solderability: 250°C, 5 s
Catalog number: 2222 675 . . . . .

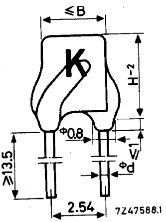


Fig. 1

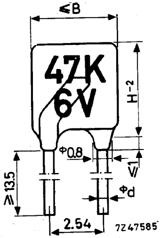
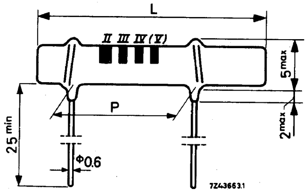


Fig. 2

capacitance (pF)	*dimensions*			*cat. number suffix*		*marking*
	B (mm)	*H (mm)*	*Fig.*	*version with d = 0.6 mm*	*version with d = 0.4 mm*	
22000	3.7	5.2	1	01223	02223	K
47000	5.0	6.5	2	01473	02473	47 K 6 V
100000	5.0	10.5	2	01104	02104	0.1 6 V

Tubular type, class II

Temperature range: −40 to +85 °C
Max. working voltage: 500 $V_{d.c.}$
Tolerance on capacitance
552-series: −20 to +50 %
561-series: ±20 %
Catalog numbers: 2222 552 . . . . ., class II
2222 561 . . . . ., class IIA



Capacitors 552-series

capacitance (pF)	*L (mm)*	*P (mm)*	*cat. number suffix*
680	12	7.6	04681
1000	12	7.6	04102
1500	12	7.6	04152
2200	12	7.6	04222
3300	12	7.6	04332
4700	16	10.2	04472
6800	20	12.7	04682
10000	22	17.7	04103
15000	30	20.3	04153
22000	40	30.5	04223

Capacitors 561-series

capacitance (pF)	*L (mm)*	*P (mm)*	*cat. number suffix*
1000	12	7.6	02102
1500	12	7.6	02152
2200	14	7.6	02222
3300	18	12.7	02332
4700	22	17.7	02472
6800	28	20.3	02682
10000	38	30.5	02103

Upright-mounting types, class II

Temperature range
563-series: −40 to +85°C
565-series: −25 to +85°C
Max. working voltage
563-series: 500 $V_{d.c.}$
565-series: 125 $V_{d.c.}$
Catalog numbers: 2222 563 .....
2222 565 .....

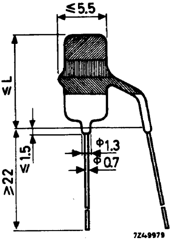


Fig. 1

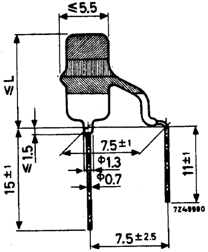


Fig. 2

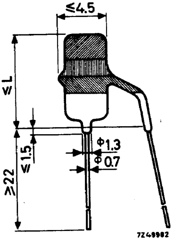


Fig. 3

Capacitors 563-*series*

cap. (*pF*)	*tol.*	*L* (*mm*)	*suffix of Fig.* 1 *versions*	*suffix of Fig.* 2 *versions*
1.5	1 pF	6.5	01158	05158
2	1 pF	8.5	01208	05208
3	1 pF	8.5	01308	05308
4	1 pF	6.5	01408	05408
5	1 pF	8.0	01508	05508
6	1 pF	7.5	01608	05608
7	1 pF	8.5	01708	05708
8	1 pF	9.0	01808	05808
9	1 pF	6.5	01908	05908
10	1 pF	7.0	01109	05109
15	20%	9.0	02159	06159
22	20%	7.5	02229	06229
33	20%	8.5	02339	06339
47	20%	6.5	02479	06479
68	20%	7.0	02689	06689
100	20%	9.0	02101	06101
150	20%	7.5	02151	06151
220	20%	8.0	02221	06221
330	20%	11.0	02331	06331
470	20%	8.0	02471	06471
680	20%	8.5	02681	06681
1000	−20/+50%	8.0	03102	07102
1500	−20/+50%	9.0	03152	07152
2200	−20/+50%	12.0	03222	07222
3300	−20/+50%	15.0	03332	07332
4700	−20/+50%	19.0	03472	07472
6800	−20/+50%	23.0	03682	07682
10000	−20/+50%	29.0	03103	07103

Capacitors 565-series

cap. (pF)	*tol.*	*L (mm)*	*suffix of Fig. 3 versions*	*suffix of Fig. 4 versions*
2200	−20/+50%	8	01222	02222
3300	−20/+50%	9	01332	02332
4700	−20/+50%	9.5	01472	02472
6800	−20/+50%	12	01682	02682
10000	−20/+50%	16.5	01103	02103

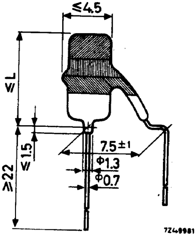
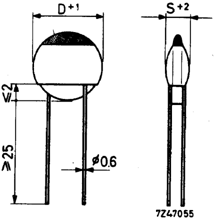


Fig. 4

Disc type, class II

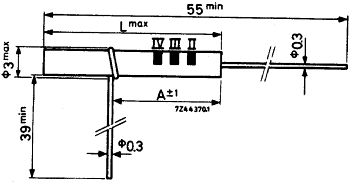
Temperature range: −40 to +85 °C
Max. working voltage: 500 $V_{d.c.}$
Tolerance on capacitance: −20 to +50%
Catalog number: 2222 627 . . . . .



cap. (pF)	*D (mm)*	*S (mm)*	*cat. number suffix*
220	5	5	01221
330	5	4.5	01331
470	5	3.5	01471
680	5	3	01681
1000	8	3.5	01102
1500	8	3	01152

Midget tubular type, class IC

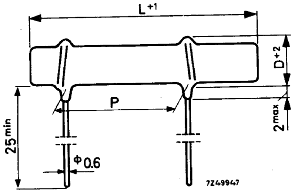
Temperature range: −25 to +85 °C
Max. working voltage at
a frequency > 100 kHz: 70 $V_{a.c.}$
Tolerance on capacitance
for $C \leqslant 5.6$ pF : ±0.5 pF
for $C = 6.8$–27 pF : ±1 pF
for $C \geqslant 33$ pF : ±3%
Catalog number: 2222 553 . . . . .



cap. *(pF)*	*temp.* *coeff.* *(10⁻⁶/deg C*	*L* *(mm)*	*A* *(mm)*	*cat.* *number* *suffix*
3.9	+100	9	5	01398
4.7	+100	9	5	01478
5.6	+100	9	5	01568
6.8	+100	9	5	02688
8.2	+100	9	5	02828
10	0	9	5	02109
12	0	9	5	02129
15	0	9	5	02159
18	0	9	5	02189
22	0	9	5	02229
27	0	9	5	02279
33	−150	9	5	03339
39	−150	9	5	03399
47	−150	9	5	03479
56	−150	9	5	03569
68	−150	9	5	03689
82	−150	9	5	03829
100	−150	11	7	03101
120	−150	13.5	7	03121
150	−150	16.5	11	03151
180	−150	20	11	03181

Tubular type (safety)

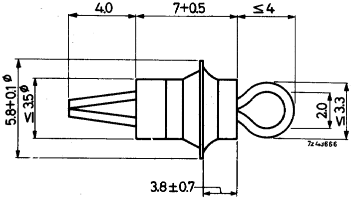
Temperature range: −40 to +85°C
Max. working voltage: 700 $V_{d.c.}$
Tolerance on capacitance: ±10%
Catalog number: 2222 562 .....



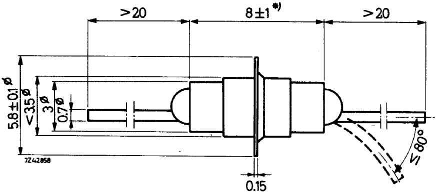
cap. (*pF*)	*D* (*mm*)	*L* (*mm*)	*P* (*mm*)	*cat. number suffix*
10	3	18	10.2	01109
12	3	18	10.2	01129
15	3	18	10.2	01159
18	3	18	10.2	01189
22	3	18	10.2	01229
27	3	18	10.2	01279
33	3	18	10.2	01339
39	3	18	10.2	01399
47	3	18	10.2	01479
56	4	18	10.2	01569
68	4	18	10.2	01689
82	4	18	10.2	01829
100	4	20	10.2	01101
120	4	20	10.2	01121
150	4	22	12.7	01151
180	4	24	12.7	01181
220	4	28	17.7	01221
270	4	32	20.3	01271
330	4	36	25.4	01331
390	4	40	30.5	01391
470	4	46	35.6	01471
560	4	52	40.6	01561

Feed-through types, classes I and II

Temperature range: −40 to +85°C
Max. working voltage: 350 $V_{d.c.}$
Catalog numbers: 2222 700 . . . . ., split pen feed-through capacitors
2222 702 . . . . ., lead feed-through capacitors



Split pen feed-through capacitors



Lead feed-through capacitors

*) 12 mm for the 4700 pF capacitor

CERAMIC CAPACITORS

Capacitors 700-series

cap. (pF)	*tol.*	*temp. coeff.* $(10^{-6}/^{\circ}C)$	*class*	*cat. number suffix*
≤2.5		+100	IC	00258
3.3	±0.5 pF	+100	IC	01338
4.7	±0.5 pF	+100	IC	01478
6.8	±1 pF	+100	IC	02688
10	±1 pF	+100	IC	02109
15	±10%	−150	IC	03159
22	±10%	−150	IC	03229
33	±10%	−750	IC	03339
47	±10%	−750	IC	03479

cap. (pF)	*tol.*	*class*	*cat. number suffix*
68	±20%	II	04689
100	±20%	II	04101
150	±20%	II	04151
220	±20%	II	04221
330	±20%	II	04331
470	±20%	II	04471
680	±20%	II	04681
1000	−20/+50%	II	05102
1500	−20/+50%	II	05152
2200	−20/+50%	II	05222

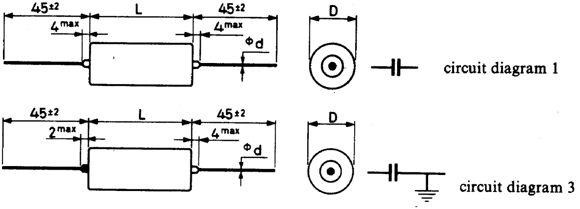
Capacitors 702-series

cap. (pF)	*tol.*	*cat. number suffix*
2	0.5 pF	04208
3	0.5 pF	04308
4	0.5 pF	04408
5	0.5 pF	04508
6	1 pF	05608
8	1 pF	05808
10	1 pF	05109
15	10%	07159
22	10%	07229
33	10%	07339
47	10%	07479

cap. (pF)	*tol.*	*cat. number suffix*
68	20%	08689
100	20%	08101
150	20%	08151
220	20%	08221
330	20%	08331
470	20%	08471
680	−20/+50%	09681
1000	−20/+50%	09102
1500	−20/+50%	09152
2200	−20/+50%	09222
4700	−20/+50%	09472

METALLISED POLYCARBONATE CAPACITORS

Types approved per MIL-specification C-18312D



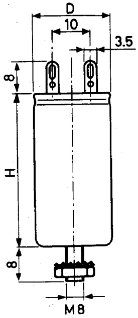
High-ambient test temperature: 85 ± 3 °C
Low-ambient test temperature: −55 ± 3 °C
D.C. voltage rating: 50 $V_{d.c.}$
Tolerance on capacitance: ± 10 %
Catalog number: 2222 321 . . . . .

circuit diagram	*cap. (μF)*	*dimensions (mm)* L_{max}	D_{max}	*d*	*catalog number suffix*	*MIL type number*
1	0.10	21.1	6.8	0.6	17104	CH09 A1R A104K
1	0.15	24.3	8.8	0.6	17154	A154K
1	0.18	24.3	8.8	0.6	17184	A184K
1	0.22	24.3	8.8	0.6	17224	A224K
1	0.27	24.3	8.8	0.6	17274	A274K
1	0.33	24.3	8.8	0.6	17334	A334K
1	0.39	30.7	8.8	0.6	17394	A394K
1	0.47	30.7	8.8	0.6	17474	A474K
1	0.56	30.7	11	0.8	17564	A564K
1	0.68	30.7	11	0.8	17684	A684K
1	0.82	30.7	11	0.8	17824	A824K
1	1	30.7	11	0.8	17105	A105K
1	1.5	30.7	13.4	0.8	17155	A155K
1	2.2	30.7	15	0.8	17225	A225K
1	2.7	37	15	0.8	17275	A275K
1	3.3	37	15	0.8	17335	A335K
1	3.9	43.3	15	0.8	17395	A395K
1	4.7	49.7	15	0.8	17475	A475K
1	5.6	43.3	17.8	0.8	17565	A565K

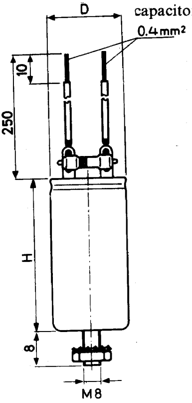
circuit diagram	*cap.* (μF)	*dimensions (mm)* L_{max}	D_{max}	*d*	*catalog number suffix*	*MIL type number*
3	0.10	19.5	6.8	0.6	19104	CH09 A3R A104K
3	0.15	22.7	8.8	0.6	19154	A154K
3	0.18	22.7	8.8	0.6	19184	A184K
3	0.22	22.7	8.8	0.6	19224	A224K
3	0.27	22.7	8.8	0.6	19274	A274K
3	0.33	22.7	8.8	0.6	19334	A334K
3	0.39	29	8.8	0.6	19394	A394K
3	0.47	29	8.8	0.6	19474	A474K
3	0.56	29	11	0.8	19564	A564K
3	0.68	29	11	0.8	19684	A684K
3	0.82	29	11	0.8	19824	A824K
3	1	29	11	0.8	19105	A105K
3	1.5	29	13.4	0.8	19155	A155K
3	2.2	29	15	0.8	19225	A225K
3	2.7	35.4	15	0.8	19275	A275K
3	3.3	35.4	15	0.8	19335	A335K
3	3.9	41.7	15	0.8	19395	A395K
3	4.7	48.1	15	0.8	19475	A475K
3	5.6	41.7	17.8	0.8	19565	A565K

A. C. types

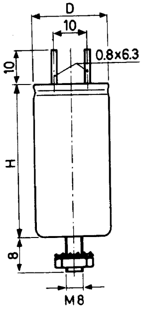
Version A
capacitors with
soldering tags



Version B
capacitors with leads and discharging resistor



Version C
capacitors with
flat connections



Temperature range: −40 to +85 °C

capacitors 2222 325 . . . . . : 160 $V_{a.c.}$

Max. working voltage (40–60 Hz)

capacitors 2222 326 . . . . . : 220 $V_{a.c.}$

capacitors 2222 327 . . . . . : 280 $V_{a.c.}$

Tolerance on capacitance: ±10%

Catalog number: 2222 325 . . . . . ; max. working voltage 160 $V_{a.c.}$

2222 326 . . . . . ; max. working voltage 220 $V_{a.c.}$

2222 327 . . . . . : max. working voltage 280 $V_{a.c}$

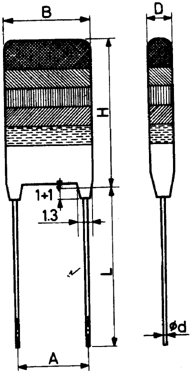
version code — capacitance code, see table

50 = version A
52 = version B
70 = version C

capacitance (μF)	*dimensions in mm D × H* 160 $V_{a.c.}$	220 $V_{a.c.}$	280 $V_{a.c.}$	*capacitance code*
1.5	—	30 × 40	30 × 40	155
2	30 × 40	30 × 40	30 × 40	205
2.5	30 × 40	30 × 40	30 × 40	255
3	30 × 40	30 × 40	30 × 40	305
3.5	30 × 40	30 × 40	30 × 40	355
4	30 × 40	30 × 40	30 × 52	405
4.5	30 × 40	30 × 40	30 × 52	455
5	30 × 40	30 × 40	30 × 52	505
6	30 × 40	30 × 52	35 × 52	605
7	30 × 40	30 × 52	35 × 52	705
8	30 × 40	30 × 52	35 × 52	805
9	30 × 52	30 × 52	40 × 52	905
10	30 × 52	35 × 52	40 × 52	106
12	30 × 52	35 × 52	—	126
14	35 × 52	40 × 52	—	146
16	35 × 52	40 × 52	—	166
18	35 × 52	40 × 52	—	186
20	40 × 52	—	—	205
25	40 × 52	—	—	206

METALLISED POLYCARBONATE CAPACITORS

Flat film type



colour					
black	–	0	1	±20%	
brown	1	1	10		
red	2	2	10^2		250 V
orange	3	3	10^3		
yellow	4	4	10^4		400 V
green	5	5	10^5		
blue	6	6			630 V
violet	7	7			
grey	8	8			
white	9	9		±10%	

Temperature range: −40 to +100°C
Maximum working voltage: 250 $V_{d.c.}$, 400 $V_{d.c.}$, 630 $V_{d.c.}$
Maximum alternating voltage (50–60 Hz)
250 $V_{d.c.}$ version: 160 $V_{a.c.}$
400 $V_{d.c.}$ version: 250 $V_{a.c.}$
630 $V_{d.c.}$ version: 300 $V_{a.c.}$
Tolerance on capacitance
for $C \leqslant 0.22$ μF: ±20%
for $C > 0.22$ μF: ±10%
Pulse loads: steepness ≤ 10 V/μs
Solder conditions for printed-wiring boards: 250°C, 5 s
Catalog number: 2222 342 . . . . .

capacitance code, see table

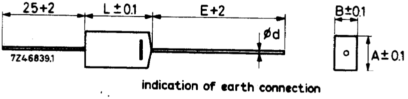
max. working voltage code
4 = 250 $V_{d.c.}$
5 = 400 $V_{d.c.}$
6 = 630 $V_{d.c.}$

capacitance tolerance code
4 = 20%, 250 $V_{d.c.}$ versions
5 = 10%, 250 $V_{d.c.}$ versions
0 = 20%, 400 and 630 $V_{d.c.}$ versions
1 = 10%, 400 and 630 $V_{d.c.}$ versions

cap. (μF)	250 $V_{d.c.}$ max. dimensions (mm)			400 $V_{d.c.}$ max. dimensions (mm)			630 $V_{d.c.}$ max. dimensions (mm)			cap code
	D	*B*	*H*	*D*	*B*	*H*	*D*	*B*	*H*	
0.010	4	12.5	9	4	12.5	9	4	12.5	9	103
0.015	4	12.5	9	4	12.5	9	5	12.5	10	153
0.022	4	12.5	9	4	12.5	9	6	12.5	11	223
0.033	4	12.5	9	5	12.5	10	6	17.5	11	333
0.047	4	12.5	9	6	12.5	11	7	17.5	12	473
0.068	5	12.5	10	6	17.5	11	6.5	22.5	11.5	683
0.10	6	12.5	11	7	17.5	12	7.5	22.5	12.5	104
0.15	6	17.5	11	6.5	22.5	11.5	9.5	22.5	14.5	154
0.22	7	17.5	12	7.5	22.5	12.5	9.5	30	14.5	224
0.33	6.5	22.5	11.5	9.5	22.5	14.5	10	30	18	334
0.47	7.5	22.5	12.5	9.5	30	14.5	12	30	20	474
0.68	9.5	22.5	14.5	10	30	18				684
1.0	9.5	30	14.5	12	30	20				105
1.5	10	30	18							155
2.2	12.5	30	20.5							225

If $B = 12.5$	$d = 0.6$	$A = 10.2 \pm 0.5$	$L = 22 \pm 3$
17.5	0.8	15.2 ± 0.3	32 ± 3
22.5	0.8	20.3 ± 0.3	32 ± 3
30	0.8	27.9 ± 0.3	32 ± 3

Moulded type ("Mepolesco")



Temperature range: −55 to +125 °C
Max. working voltage: 100 $V_{d.c.}$, 250 $V_{d.c.}$, 400 $V_{d.c.}$, 630 $V_{d.c.}$, 1000 $V_{d.c.}$, 1600 $V_{d.c.}$

METALLISED POLYCARBONATE CAPACITORS

Max. alternating voltage (50–60 Hz)
- 100 $V_{d.c.}$ version: 63 $V_{a.c.}$
- 250 $V_{d.c.}$ version: 160 $V_{a.c.}$
- 400 $V_{d.c.}$ version: 250 $V_{a.c.}$
- 630 $V_{d.c.}$, 1000 $V_{d.c.}$ and 1600 $V_{d.c.}$ versions: 300 $V_{a.c.}$

Tolerance on capacitance
- for $C \leqslant 0.22$ μF: ±20%
- for $C > 0.22$ μF: ±10%

Pulse loads: steepness ⩽ 10 V/μs

Catalog number: 2222 341 .. ...

code for max. working voltage and capacitance tolerance — capacitance code, see tables

28 = 100 $V_{d.c.}$, 20%
29 = 100 $V_{d.c.}$, 10%
88 = 250 $V_{d.c.}$, 20%
89 = 250 $V_{d.c.}$, 10%
58 = 400 $V_{d.c.}$, 20%
59 = 400 $V_{d.c.}$, 10%
60 = 630 $V_{d.c.}$, 20%
61 = 630 $V_{d.c.}$, 10%
70 = 1000 $V_{d.c.}$, 20%
71 = 1000 $V_{d.c.}$, 10%
80 = 1600 $V_{d.c.}$, 20%
81 = 1600 $V_{d.c.}$, 10%

cap. (*μF*)	100 $V_{d.c.}$ dimensions (mm)			250 $V_{d.c.}$ dimensions (mm)			400 $V_{d.c.}$ dimensions (mm)			*cap code*
	A	*B*	*L*	*A*	*B*	*L*	*A*	*B*	*L*	
0.010				8.7	4.7	14	8.7	4.7	14	103
0.015				8.7	4.7	14	8.7	4.7	14	153
0.022				8.7	4.7	14	8.7	4.7	14	223
0.033				8.7	4.7	14	9.4	5.5	14	333
0.047				8.7	4.7	14	10.4	6.5	14	473
0.068	8.7	4.7	14	9.4	5.5	14	10.4	6.5	17.5	683
0.10	8.7	4.7	14	10.4	6.5	14	11.5	7.6	17.5	104
0.15	9.4	5.5	14	10.4	6.5	17.5	11.5	7.4	23	154
0.22	10.4	6.5	14	11.5	7.6	17.5	12.8	8.7	23	224
0.33	10.4	6.5	17.5	11.5	7.4	23	14.4	10.4	23	334
0.47	11.5	7.6	17.5	12.8	8.7	23	14.6	10.4	30	474
0.68	11.5	7.4	23	14.4	10.4	23	19.5	12.4	30	684
1.0	12.8	8.7	23	14.6	10.4	30	22	15	30	105
1.5	14.4	10.4	23	19.5	12.4	30				155
2.2	14.6	10.4	30	22	15	30				225
3.3	19.5	12.4	30							335
4.7	22	15	30							475

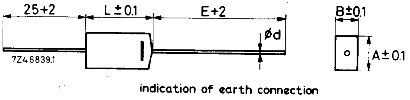
cap. (μF)	630 $V_{d.c.}$ dimensions (mm)			1000 $V_{d.c.}$ dimensions (mm)			1600 $V_{d.c.}$ dimensions (mm)			cap. code
	A	B	L	A	B	L	A	B	L	
0.001							9.4	5.5	14	102
0.0015							10.4	6.5	14	152
0.0022							10.4	6.5	17.5	222
0.0033							10.4	6.5	17.5	332
0.0047							10.4	6.5	17.5	472
0.0068							11.5	7.6	17.5	682
0.01	8.7	4.7	14	10.4	6.5	17.5	11.5	7.4	23	103
0.015	9.4	5.5	14	11.5	7.6	17.5	12.8	8.7	23	153
0.022	10.4	6.5	14	11.5	7.4	23	14.4	10.4	23	223
0.033	10.4	6.5	17.5	12.8	8.7	23	14.6	10.4	30	333
0.047	11.5	7.6	17.5	14.4	10.4	23	19.5	12.4	30	473
0.068	11.5	7.4	23	14.6	10.4	30	22	15	30	683
0.1	12.8	8.7	23	19.5	12.4	30				104
0.15	14.4	10.4	23	22	15	30				154
0.22	14.6	10.4	30							224
0.33	19.5	12.4	30							334
0.47	22	15	30							474
0.68										684
1.0										105
1.5										155

If $L < 30$ mm: $E = 40$ mm, $d = 0.8$ mm
$L = 30$ mm: $E = 50$ mm, $d = 1$ mm

Moulded type ("Mepolesco" for Booster application)

Temperature range: −55 to +125 °C
Max. working voltage: 1250 $V_{d.c.}$
Max. alternating voltage (50–60 Hz): 300 $V_{a.c.}$
Pulse loads: steepness ⩽ 30 V/μs

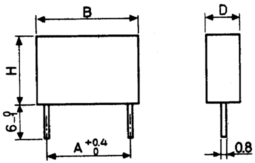
Catalog number: 2222 343 . . . . .



METALLISED POLYCARBONATE CAPACITORS

capacitance	*dimensions* (*mm*)					*catalog number suffix*	
(μF)	*A*	*B*	*L*	*E*	*d*	*tol.* ±20%	*tol.* ±10%
0.0022	10.4	6.5	17.5	40	0.8	78222	79222
0.0033	10.4	6.5	17.5	40	0.8	78332	79332
0.0047	10.4	6.5	17.5	40	0.8	78472	79472
0.0068	10.4	6.5	17.5	40	0.8	78682	79682
0.010	10.4	6.5	17.5	40	0.8	78103	79103
0.015	11.5	7.6	17.5	40	0.8	78153	79153
0.022	11.5	7.4	23	40	0.8	78223	79223
0.033	12.8	8.7	23	40	0.8	78333	79333
0.047	14.4	10.4	23	40	0.8	78473	79473
0.068	14.6	10.4	30	50	1	78683	79683
0.10	19.5	12.4	30	50	1	78104	79104
0.15	22	15	30	50	1	78154	79154

Moulded type ("Nugget")



Temperature range: −55 to +125°C
Max. working voltage: 100 $V_{d.c.}$, 250 $V_{d.c.}$, 400 $V_{d.c.}$, 630 $V_{d.c.}$
Max. alternating voltage (50–60 Hz)
- 100 $V_{d.c.}$ version: 63 $V_{a.c.}$
- 250 $V_{d.c.}$ version: 160 $V_{a.c.}$
- 400 $V_{d.c.}$ version: 250 $V_{a.c.}$
- 630 $V_{d.c.}$ version: 300 $V_{a.c.}$

Tolerance on capacitance
- for $C \leqslant 0.22$ μF: ±20%
- for $C > 0.22$ μF: ±10%

Pulse loads: steepness ⩽ 10 V/μs
Solder conditions for printed-wiring boards: 250°C, 5 s
Catalog number: 2222 344 . . . . .

max. working voltage code
- 2 = 100 $V_{d.c.}$
- 4 = 250 $V_{d.c.}$
- 5 = 400 $V_{d.c.}$
- 6 = 630 $V_{d.c.}$

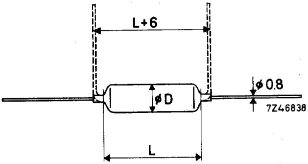
capacitance code, see tables
capacitance tolerance code
- 0 = ±20%
- 1 = ±10%

capacitance (μF)	100 $V_{d.c.}$ dimensions (mm)				250 $V_{d.c.}$ dimensions (mm)				capacitance code
	D	*B*	*H*	*A*	*D*	*B*	*H*	*A*	
0.01					4.5	13	10	10	103
0.015					4.5	13	10	10	153
0.022					4.5	13	10	10	223
0.033					4.5	13	10	10	333
0.047					4.5	13	10	10	473
0.068	4.5	13	10	10	5	13	11	10	683
0.1	4.5	13	10	10	5	17.5	11	15	104
0.15	4.5	13	10	10	6	17.5	11.5	15	154
0.22	5	13	11	10	7	17.5	13	15	224
0.33	5	17.5	11	15	8.5	17.5	14.5	15	334
0.47	6	17.5	11	15	6.5	26	15.5	22.5	474
0.68	7	17.5	13	15	7.5	26	16.5	22.5	684
1.0	8.5	17.5	14.5	15	9.5	26	19	22.5	105
1.5	6.5	26	15.5	22.5	11	30	19.5	27.5	155
2.2	7.5	26	16.5	22.5	13.5	30	22.5	27.5	225
3.3	9.5	26	19	22.5					335
4.7	11	30	19.5	27.5					475
6.8	13.5	30	22	27.5					685

capacitance (μF)	400 $V_{d.c.}$ dimensions (mm)				630 $V_{d.c.}$ dimensions (mm)				capacitance code
	D	*B*	*H*	*A*	*D*	*B*	*H*	*A*	
0.01	4.5	13	10	10	4.5	13	10	10	103
0.015	4.5	13	10	10	5	13	11	10	153
0.022	4.5	13	10	10	6	13	12	10	223
0.033	5	13	11	10	6	17.5	11.5	15	333
0.047	5	17.5	11	15	7	17.5	13	15	473
0.068	6	17.5	11.5	15	8.5	17.5	14.5	15	683
0.1	7	17.5	13	15	6.5	26	15.5	22.5	104
0.15	8.5	17.5	14.5	15	7.5	26	16.5	22.5	154
0.22	6.5	26	15.5	22.5	9.5	26	19	22.5	224
0.33	7.5	26	16.5	22.5	11	30	19.5	27.5	334
0.47	9.5	26	19	22.5	13.5	30	22.5	27.5	474
0.68	11	30	19.5	27.5					684
1.0	13.5	30	22.5	27.5					105

POLYESTER CAPACITORS

Tubular foil type

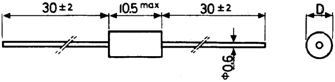


Temperature range: −40 to +85°C
Max. working voltage: 160 $V_{d.c.}$ and 400 $V_{d.c.}$
Max. alternating voltage (50–60 Hz)
160 $V_{d.c.}$ version: 90 $V_{a.c.}$
400 $V_{d.c.}$ version: 150 $V_{a.c.}$
Tolerance on capacitance: ±10%
Solderability according to I.E.C. 68–2, test T3.2
Catalog number: 2222 311 31 . . ., working voltage 160 $V_{d.c.}$
2222 311 51 . . ., working voltage 400 $V_{d.c.}$

capacitance	*max. dimensions (mm)*				*catalog number suffix*
	160 $V_{d.c.}$		400 $V_{d.c.}$		
	D	*L*	*D*	*L*	
1000 pF			7.5	18	102
1500			7.5	18	152
2200			7.5	18	222
3300			7.5	18	332
4700			7.5	18	472
6800			7.5	18	682
0.010 μF	7.5	18	7.5	18	103
0.015	7.5	18	7.5	18	153
0.022	7.5	18	8.5	18	223
0.033	7.5	18	10	18	333
0.047	8	18	11.5	18	473
0.068	9	18	9.5	32	683
0.10	10.5	18	11	32	104
0.15	12	18	12.5	32	154
0.22	10	32	14.5	32	224
0.33	12	32	17	32	334
0.47	14	32	19.5	32	474
0.68	16	32			684
1.0	18.5	32			105

POLYSTYRENE CAPACITORS

Miniature type ("Micropoco")



Temperature range
63 $V_{d.c.}$ version: −40 to +70°C
125 $V_{d.c.}$ version: −40 to +85°C
Max. working voltage: 63 $V_{d.c.}$ and 125 $V_{d.c.}$
Max. alternating voltage
63 $V_{d.c.}$ version: 25 $V_{a.c.}$
125 $V_{d.c.}$ version: 63 $V_{a.c.}$
Tolerance on capacitance: ±1%, ±2% and ±5%
Solder conditions for printed-wiring boards: 230°C, 2 s
Catalog number: 2222 42 . . . . . .

max. working voltage code
4= 63 $V_{d.c.}$
5=125 $V_{d.c.}$

capacitance code, see table

capacitance tolerance code
2=±5%
3=±2%
4=±1%

63 $V_{d.c.}$ version

capacitance (pF)	D_{max} *(mm)*	*capacitance code*
820	2.5	8201
910	2.5	9101
1000	2.5	1002
1100	2.5	1102
1200	2.5	1202
1300	2.5	1302
1500	2.5	1502
1600	4.0	1602
1800	4.0	1802

63 $V_{d.c.}$ version

capacitance (pF)	D_{max} *(mm)*	*capacitance code*
2000	4.0	2002
2200	4.0	2202
2400	4.0	2402
2700	4.0	2702
3000	4.0	3002
3300	4.0	3302

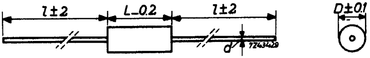
125 $V_{d.c.}$ *version*

capacitance (pF)	D_{max} *(mm)*	*capacitance code*
100	2.5	1001
110	2.5	1101
120	2.5	1201
130	2.5	1301
150	2.5	1501
160	2.5	1601
180	2.5	1801
200	2.5	2001
220	2.5	2201
240	2.5	2401
270	2.5	2701
300	2.5	3001
330	2.5	3301
360	2.5	3601
390	2.5	3901

125 $V_{d.c.}$ *version*

capacitance (pF)	D_{max} *(mm)*	*capacitance code*
430	2.5	4301
470	2.5	4701
510	2.5	5101
560	2.5	5601
620	2.5	6201
680	2.5	6801
750	4.0	7501
860	4.0	8601
910	4.0	9101
1000	4.0	1002
1100	4.0	1102
1200	4.0	1202
1300	4.0	1302
1500	4.0	1502

Tubular moulded type ("Minipoco")



If $L=15$ mm: $l=35$ mm, $d=0.7$ mm
$L=25$ mm: $l=45$ mm, $d=0.8$ mm

Temperature range
63 $V_{d.c.}$ version: −40 to +70°C
125, 250 and 500 $V_{d.c.}$ versions: −40 to +85°C
Max. working voltage: 63 $V_{d.c.}$, 125 $V_{d.c.}$, 250 $V_{d.c.}$, 500 $V_{d.c.}$
Max. alternating voltage
63 $V_{d.c.}$ version: 30 $V_{a.c.}$
125 $V_{d.c.}$ version: 63 $V_{a.c.}$
250 $V_{d.c.}$ version: 125 $V_{a.c.}$
500 $V_{d.c.}$ version: 250 $V_{a.c.}$
Tolerance on capacitance: ±1%, ±2%, ±5% and ±10%
Solder conditions for printed-wiring boards: 250°C, 5 s
Catalog number: 2222 43 . . . . . .

- capacitance code, see table
- maximum working voltage code
  - 5 = 63 $V_{d.c.}$
  - 6 = 125 $V_{d.c.}$
  - 7 = 250 $V_{d.c.}$
  - 8 = 500 $V_{d.c.}$
- capacitance tolerance code
  - 1 = ±10%
  - 2 = ±5%
  - 3 = ±2%
  - 4 = ±1%

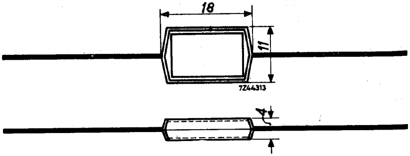
capacitance	*dimensions in mm* ($D \times L$)				*capacitance code*
	63 $V_{d.c.}$	125 $V_{d.c.}$	250 $V_{d.c.}$	500 $V_{d.c.}$	
680 pF				7.5 × 15	6801
750				7.5 × 15	7501
820				7.5 × 15	8201
910				7.5 × 15	9101
1000				7.5 × 15	1002
1100				7.5 × 15	1102
1200				7.5 × 15	1202
1300			7.5 × 15	9 × 15	1302
1500		6 × 15	7.5 × 15	9 × 15	1502
1600		6 × 15	7.5 × 15	9 × 15	1602
1800		6 × 15	7.5 × 15	9 × 15	1802
2000		6 × 15	7.5 × 15	9 × 15	2002
2200		6 × 15	7.5 × 15	9 × 15	2202
2400		7.5 × 15	7.5 × 15	10 × 15	2402
2700		7.5 × 15	9 × 15	10 × 15	2702
3000		7.5 × 15	9 × 15	10 × 15	3002
3300		7.5 × 15	9 × 15	10 × 15	3302
3600	6 × 15	7.5 × 15	9 × 15	12.5 × 15	3602
3900	6 × 15	7.5 × 15	9 × 15	12.5 × 15	3902
4300	6 × 15	7.5 × 15	9 × 15	12.5 × 15	4302
4700	6 × 15	9 × 15	9 × 15	12.5 × 15	4702
5100	6 × 15	9 × 15	10 × 15	12.5 × 15	5102
5600	6 × 15	9 × 15	10 × 15	12.5 × 15	5602
6200	7.5 × 15	9 × 15	10 × 15	10 × 25	6202
6800	7.5 × 15	9 × 15	12.5 × 15	10 × 25	6802
7500	7.5 × 15	9 × 15	12.5 × 15	10 × 25	7502
8200	7.5 × 15	10 × 15	12.5 × 15	10 × 25	8202
9100	7.5 × 15	10 × 15	12.5 × 15	12.5 × 25	9102
0.010 μF	9 × 15	10 × 15	12.5 × 15	12.5 × 25	1003
0.011	9 × 15	12.5 × 15	12.5 × 15	12.5 × 25	1103
0.012	9 × 15	12.5 × 15	10 × 25	12.5 × 25	1203
0.013	9 × 15	12.5 × 15	10 × 25	12.5 × 25	1303
0.015	9 × 15	12.5 × 15	10 × 25	12.5 × 25	1503
0.016	9 × 15	12.5 × 15	10 × 25	12.5 × 25	1603
0.018	10 × 15	10 × 25	12.5 × 25	15 × 25	1803
0.020	10 × 15	10 × 25	12.5 × 25	15 × 25	2003
0.022	10 × 15	10 × 25	12.5 × 25	15 × 25	2203
0.024	10 × 15	10 × 25	12.5 × 25	15 × 25	2403
0.027	12.5 × 15	12.5 × 15	12.5 × 25		2703
0.030	12.5 × 15	12.5 × 15	15 × 25		3003

capacitance	*dimensions in mm* $(D \times L)$				*capacitance code*
	63 $V_{d.c.}$	125 $V_{d.c.}$	250 $V_{d.c.}$	500 $V_{d.c.}$	
0.033	12.5 × 15	12.5 × 15	15 × 25		3303
0.036	12.5 × 15	12.5 × 15	15 × 25		3603
0.039	12.5 × 15	12.5 × 15	15 × 25		3903
0.043	10 × 25	12.5 × 15	15 × 25		4303
0.047	10 × 25	12.5 × 15	15 × 25		4703
0.051	10 × 25	12.5 × 15			5103
0.056	12.5 × 25	15 × 25			5603
0.062	12.5 × 25	15 × 25			6203
0.068	12.5 × 25	15 × 25			6803
0.075	12.5 × 25	15 × 25			7503
0.082	12.5 × 25	15 × 25			8203
0.091	12.5 × 25				9103
0.10	15 × 25				1004
0.11	15 × 25				1104
0.12	15 × 25				1204
0.13	15 × 25				1304
0.15	15 × 25				1504
0.16	15 × 25				1604

MICA CAPACITORS

Moulded midget type

Capacitance range: 5.6–2700 pF, E24 series
Temperature range: -40 to $+85\,°C$
Max. working voltage: 500 $V_{d.c.}$
Tolerance on capacitance
for $C < 100$ pF: ± 1 pF
for $C \geqslant 100$ pF: $\pm 1\,\%$
for $C \geqslant$ 43 pF: $\pm 5\,\%$



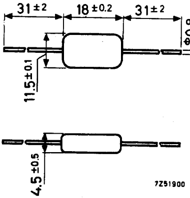
Catalog number: 2222 753 . . . . .

capacitance tolerance code
3 = ±5%
5 = ±1%
7 = ±1 pF

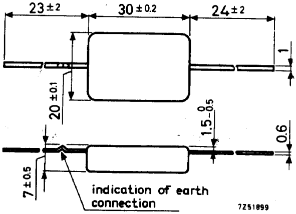
multiplier code
08 = 0.1 ×
09 = 1 ×
01 = 10 ×
02 = 100 ×

first two digits of capacitance value in pF, neglecting a decimal point

Moulded precision types



Capacitors 2222 755 . . . . .
and 2222 757 . . . . .



Capacitors 2222 756 . . . . .
and 2222 758 . . . . .

Temperature range: −40 to +85°C
Max. working voltage: 125 $V_{d.c.}$ and 500 $V_{d.c.}$
Tolerance on capacitance for $C < 100$ pF: ±1 pF
for $C \geqslant 100$ pF: ±1% and ±5%

Catalog numbers: 2222 755 . . . . . ; cap. range: 5.6–3500 pF, E24 series
max. working voltage: 125 $V_{d.c.}$
2222 756 . . . . . ; cap. range: 2700–15000 pF, E24 series
max. working voltage: 125 $V_{d.c.}$
2222 757 . . . . . ; cap. range: 5.6–2000 pF, E24 series
max. working voltage: 500 $V_{d.c.}$
2222 758 . . . . . , cap. range: 2000–7500 pF, E24 series
max. working voltage: 500 $V_{d.c.}$

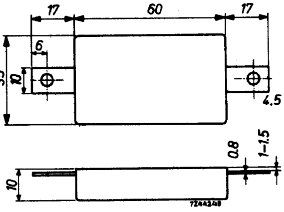
capacitance tolerance code
3 = ±5%
5 = ±1%
7 = ±1 pF

multiplier code
08 = 0.1 ×
09 = 1 ×
01 = 10 ×
02 = 100 ×
03 = 1000 ×

first two digits of capacitance value in pF, neglecting a decimal point

MICA CAPACITORS

Moulded precision type



Capacitance range: 7500–100000 pF, E24 series
Temperature range: −40 to +85°C
Max. working voltage: 500 $V_{d.c.}$
Tolerance on capacitance: ±1%, ±5%
Catalog number: 2222 763 . . . . .

capacitance tolerance code
3 = ±5%
5 = ±1%
6 = ±0.5% (on request)

multiplier code
02 = 100 ×
03 = 1000 ×
04 = 10000 ×

first two digits of capacitance value in pF, neglecting a decimal point

PAPER D.C. CAPACITORS

Rectangular box type

Temperature range : −40 to +70°C
Max. d.c. working voltages : 250 V, 500 V, 1000 V, 2000 V, 3400 V
Max. a.c. voltage (50–60 Hz): 175 V, 250 V, 330 V, 484 V, 825 V
Tolerance on capacitance : ±10%
Capacitance drift during life: <5%

Insulation resistance at 20°C

$C < 0.2\ \mu F$	$R \geqslant 10\,000\ M\Omega$
$C \geqslant 0.2\ \mu F$	$RC \geqslant 2\,000$ s
Climatic category (*IEC*)	40/070/56

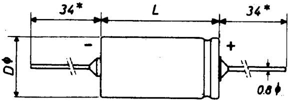
Available versions:
Capacitance values: 0.1, 0.16, 0.25, 0.5, 1, 2, 4, 6, 8, 10, 12, 16, 20, 25 μF.

250 V range:	2 to 16 μF	soldering lugs	2222 230 01 . . .
	20 to 25 μF	screw terminals	2222 230 05 . . .
500 V range:	1 to 10 μF	soldering lugs	2222 230 21 . . .
	12 to 20 μF	screw terminals	2222 230 25 . . .
1000 V range:	0.5 to 6 μF	soldering lugs	2222 230 41 . . .
	8 to 12 μF	screw terminals	2222 230 45 . . .
2000 V range:	0.1 to 2 μF	soldering lugs	2222 230 51 . . .
	4 to 6 μF	screw terminals	2222 230 55 . . .
3400 V range:	0.1 to 1 μF	soldering lugs	2222 230 61 . . .
	2 μF	screw terminals	2222 230 65 . . .

ELECTROLYTIC CAPACITORS

Miniature type for general purposes (economy range)

can size	*axial version*		*printed-wiring version*		
	D (*mm*)	*L* (*mm*)	*D* (*mm*)	*L* (*mm*)	*S* (*mm*)
4	6.7	18.5	8.7	25	7.62
6	10.4	18.5	12.9	25	10.16

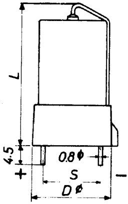


**37mm for can size 6*

Axial version (insulated)

Temperature range: −40 to +70°C
Tolerance on capacitance: −10 to +50%
Catalog numbers: 2222 001 . . . . . ; high etched foil type
2222 002 . . . . . ; low and non-etched foil type

1 = axial version
4 = printed-wiring version



Printed-wiring version

ELECTROLYTIC CAPACITORS

can size	*working voltage* ($V_{d.c.}$)	*capacitance* (μF)	*leakage current*[1] (μA)	*ripple current*[2] (mA)	*dissipation factor*[3]	*impedance*[4] (Ω)	*cat. number* 2222 .... *axial version*
4	4	8	4.1	16	0.15	5	002 12808
4	4	125	30	40	0.30	6	001 12131
6	4	400	73	125	0.30	1.8	001 12401
4	6.4	32	15	16	0.15	6	002 13329
4	6.4	100	37	40	0.30	6	001 13101
6	6.4	320	85	125	0.30	1.8	001 13321
4	10	64	37	40	0.25	6	001 14649
6	10	200	85	125	0.25	1.8	001 14201
4	16	2.5	4.1	16	0.10	5	002 15258
4	16	16	18	16	0.20	6	002 15169
4	16	40	37	40	0.20	6	001 15409
6	16	125	85	125	0.20	1.8	001 15131
4	25	1.6	4.1	16	0.10	6	002 16168
4	25	10	18	16	0.15	6	002 16109
4	25	25	37	40	0.15	6	001 16259
6	25	80	85	125	0.15	1.8	001 16809
4	40	1	4.1	16	0.10	10	002 17108
4	40	6.4	18	16	0.10	6	002 17648
4	40	16	37	40	0.10	6	001 17169
6	40	50	85	125	0.10	1.8	001 17509
4	64	0.32	2	16	0.10	18	002 18327
4	64	0.64	4.1	16	0.10	12	002 18647
4	64	4	18	16	0.10	5	002 18408
4	64	10	37	40	0.15	6	001 18109
6	64	32	85	125	0.15	1.8	001 18329

[1]) Maximum leakage current at 20°C after 5 minutes.
[2]) Maximum permissible ripple current at 100 Hz.
[3]) Maximum dissipation factor (tan δ) at 20°C and 50 Hz
[4]) Maximum impedance at 20°C and 100 kHz.

Miniature type for general purposes

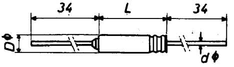


Fig. 1

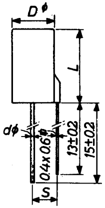
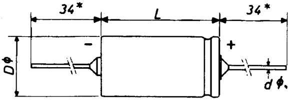


Fig. 2



* 37mm for can size 6

Fig. 3

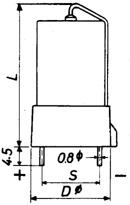


Fig. 4

can size	*d (mm)*	*axial versions*			*printed-wiring versions*			
		Fig.	*D (mm)*	*L (mm)*	*Fig.*	*D (mm)*	*L (mm)*	*S (mm)*
1	0.5	1	3.5	10.5	2	3.8	12.5	2.54
2	0.6	3	4.8	10.5	2	5.2	12.5	2.54
3	0.6	3	6.1	10.5	2	6.4	12.5	3.59
4	0.8	3	6.7	18.5	4	8.7	25	7.62
5	0.8	3	8.3	18.5	4	10.3	25	7.62
6	0.8	3	10.4	18.5	4	12.9	25	10.16

Temperature range
can size 1: −40 to +60°C
can sizes 2–6: −40 to +70°C
Tolerance on capacitance
can size 1: −10 to +100%
can sizes 2–6: −10 to +50%
Catalog number: 2222 001 1 . . . ., axial versions
2222 001 4 . . . ., printed-wiring versions

ELECTROLYTIC CAPACITORS

can size	*working voltage* ($V_{d.c.}$)	*capacitance* (μF)	*leakage current*[1]) (μA)	*ripple current*[2]) (mA)	*dissipation factor*[3])	*impedance*[4]) (Ω)	*catalog number suffix*
1	2.5	10	3.1	2.5	0.35	65	1109
2	2.5	40	8	10	0.35	24	1409
3	2.5	80	14	20	0.35	12	1809
4	2.5	160	25	40	0.35	6	1161
5	2.5	320	45	80	0.35	3	1321
6	2.5	500	63	125	0.35	1.8	1501
1	4	8	3.5	2.5	0.3	65	2808
2	4	32	10	10	0.3	24	2329
3	4	64	18	20	0.3	12	2649
4	4	125	30	40	0.3	6	2131
5	4	250	55	80	0.3	3	2251
6	4	400	73	125	0.3	1.8	2401
1	6.4	6.4	4.1	2.5	0.3	65	3648
2	6.4	25	12	10	0.3	24	3259
3	6.4	50	21	20	0.3	12	3509
4	6.4	100	37	40	0.3	6	3101
5	6.4	200	63	80	0.3	3	3201
6	6.4	320	85	125	0.3	1.8	3321
1	10	4	4.1	2.5	0.25	65	4408
2	10	16	12	10	0.25	24	4169
3	10	32	21	20	0.25	12	4329
4	10	64	37	40	0.25	6	4649
5	10	125	63	80	0.25	3	4131
6	10	200	85	125	0.25	1.8	4201
1	16	2.5	4.1	2.5	0.2	65	5258
2	16	10	12	10	0.2	24	5109
3	16	20	21	20	0.2	12	5209
4	16	40	37	40	0.2	6	5409
5	16	80	63	80	0.2	1.8	5809
6	16	125	85	125	0.2		5131
1	25	1.6	4.1	2.5	0.15	65	6168
2	25	6.4	12	10	0.15	24	6648
3	25	12.5	21	20	0.15	12	6139
4	25	25	37	40	0.15	6	6259
5	25	50	63	80	0.15	3	6509
6	25	80	85	125	0.15	1.8	6809

[1]) Maximum leakage current at 20°C after 5 minutes.
[2]) Maximum permissible ripple current at 100 Hz.
[3]) Maximum dissipation factor (tan δ) at 20°C and 50 Hz.
[4]) Maximum impedance at 20°C and 100 kHz.

can size	working voltage ($V_{d.c.}$)	capacitance (μF)	leakage current[1]) (μA)	ripple current[2]) (mA)	dissipation factor[3])	impedance[4]) (Ω)	catalog number suffix
1	40	1	4.1	2.5	0.10	65	7108
2	40	4	12	10	0.10	24	7408
3	40	8	21	20	0.10	12	7808
4	40	16	37	40	0.10	6	7169
5	40	32	63	80	0.10	3	7329
6	40	50	85	125	0.10	1.8	7509
1	64	0.64	4.1	2.5	0.15	65	8647
2	64	2.5	12	10	0.10	24	8258
3	64	5	21	20	0.10	12	8508
4	64	10	37	40	0.10	6	8109
5	64	20	63	80	0.10	3	8209
6	64	32	85	125	0.10	1.8	8329

[1]) Maximum leakage current at 20°C after 5 minutes.
[2]) Maximum permissible ripple current at 100 Hz.
[3]) Maximum dissipation factor (tan δ) at 20°C and 50 Hz.
[4]) Maximum impedance at 20°C and 100 kHz.

Miniature type for general purposes

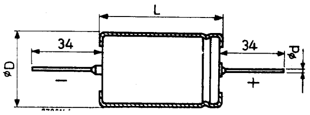


Fig. 1

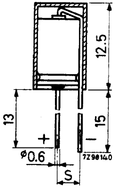


Fig. 2

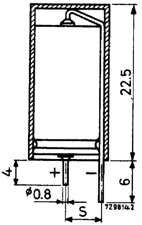


Fig. 3

Temperature range
can sizes 1 and 2: −40 to +70°C
can sizes 3–6 : −40 to +85°C

Tolerance on capacitance
can sizes 1, 2, 3 and 5: −10 to +100%
can sizes 4, 5A and 6 : −10 to +50%

Catalog numbers: 2222 006 . . . . ., can sizes 1, 2, 3 and 5A
2222 007 . . . . ., can sizes 4, 5 and 6

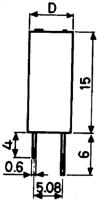
1 = axial version
4 = printed-wiring versions

can size	axial version Fig.	D (mm)	L (mm)	d (mm)	printed-wiring versions Fig.	S (mm)
1	1	3.5	11.5	0.6	2	2.5+0.04
2	1	4.8	10.5	0.6	2	2.5+0.04
3	1	6.1	10.5	0.6	2	$\sqrt{2}$(2.5+0.04)
5A	1	8.3	10.5	0.6	2	2(2.5+0.04)
4	1	6.5	18	0.8	3	2(2.5+0.04)
5	1	8.1	18	0.8	3	2(2.5+0.04)
6	1	10.1	18	0.8	3	3(2.5+0.04)

can size	working voltage ($V_{d.c.}$)	cap. (μF)	leakage current[1]) (μA)	ripple current[2]) (mA)	dissipation factor[3])	impedance[4]) (Ω) +20°C	impedance[4]) (Ω) −20°C	catalog number suffix
1	6.3	10	5	12	0.16	12	60	3109
5	6.3	220	71	125	0.16	0.6	3	3271
6	6.3	470	109	190	0.16	0.4	2	3471
2	10	22	13	26	0.13	4	20	4279
3	10	47	28	44	0.13	2	10	4569
5A	10	100	50	85	0.13	1	5	4101
4	10	100	50	85	0.13	1	5	4101
1	16	4.7	5	12	0.10	12	60	5568
5	16	100	78	125	0.10	0.6	3	5121
6	16	220	126	190	0.10	0.4	2	5221
2	25	10	15	23	0.08	4	20	6129
3	25	22	34	37	0.08	2	10	6279
5A	25	47	55	72	0.08	1	5	6479
4	25	47	55	72	0.08	1	5	6479
1	40	2.2	5	11	0.06	12	60	7278
5	40	47	87	105	0.06	0.6	3	7569
6	40	100	140	155	0.06	0.4	2	7101
2	63	4.7	15	18	0.05	4	20	8478
3	63	0.47[5])	5	7	0.05	5	25	8477
3	63	1.0 [5])	5	10	0.05	3	15	8108
3	63	2.2 [5])	7	15	0.05	2	10	8228
3	63	10	32	30	0.05	2	10	8109
5	63	22	71	80	0.05	0.6	3	8279
6	63	47	109	115	0.05	0.4	2	8479

Moulded type for printed-wiring

size	*D* (*mm*)
A	7.4
B	9.6



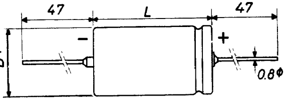
Temperature range: −40 to +85 °C
Tolerance on capacitance
size A: −10 to +100 % (for 63 $V_{d.c.}$ versions: −10 to +50 %)
size B: −10 to +50 %
Catalog number: 2222 011 . . . . .

size	*working voltage* ($V_{d.c.}$)	*capacitance* (μF)	*leakage current*[1] (μA)	*ripple current*[2] (mA)	*dissipation factor*[3]	*impedance*[4] (Ω) +20 °C	−20 °C	*catalog number suffix*
A	10	47	28	44	0.13	2	10	54569
B	10	100	50	85	0.13	1	5	54101
A	25	22	34	37	0.08	2	10	56279
B	25	47	55	72	0.08	1	5	56479
A	63	1	5	8	0.05	2	10	18108
A	63	2.2	6	15	0.05	2	10	58228
A	63	4.7	15	22	0.05	2	10	58478
A	63	10	32	30	0.05	2	10	58109

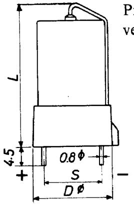
[1]) Maximum leakage current at 25 °C after 5 minutes.
[2]) Maximum permissible ripple current at 100 Hz and 70 °C.
[3]) Dissipation factor (tan δ) at 100 Hz.
[4]) Impedance at 100 kHz.
[5]) Tolerance −10 % +50 %.

ELECTROLYTIC CAPACITORS

Small type for general purposes



Axial version (insulated)



Printed-wiring version

can size	*axial version*		*printed-wiring version*		
	D (*mm*)	*L* (*mm*)	*D* (*mm*)	*L* (*mm*)	*S* (*mm*)
00	10.4	30.5	12.8	39.3	10.16
01	12.9	30.5	15.2	39.3	10.16
02	15.4	30.5	17.8	39.3	12.70
03	18.5	30.5	20.8	39.3	15.24

Temperature range: −40 to +70°C
Tolerance on capacitance: −10 to +50%
Catalog number: 2222 023 1 . . . ., axial version
2222 023 4 . . . ., printed-wiring version

can size	*working voltage* ($V_{d.c.}$)	*capacitance* (μF)	*leakage current*[1] (μA)	*ripple current*[2] (*mA*)	*dissipation factor*[3]	*impedance*[4] (Ω)	*catalog number suffix*
00	2.5	1000	100	180	0.35	1.0	1102
01	2.5	1600	145	260	0.35	0.8	1162
02	2.5	2500	215	360	0.35	0.8	1252
03	2.5	4000	325	500	0.35	0.8	1402
00	4	800	120	180	0.30	1.0	2801
01	4	1250	175	260	0.30	0.8	2132
02	4	2000	265	360	0.30	0.8	2202
03	4	3200	400	500	0.30	0.8	2322
00	6.4	640	145	180	0.25	1.0	3641
01	6.4	1000	215	260	0.25	0.8	3102
02	6.4	1600	325	360	0.25	0.8	3162
03	6.4	2500	500	500	0.25	0.8	3252
00	10	400	145	180	0.20	1.0	4401
01	10	640	215	260	0.20	0.8	4641
02	10	1000	325	350	0.20	0.8	4102
03	10	1600	500	500	0.20	0.8	4162
00	16	250	145	180	0.15	1.0	5251
01	16	400	215	260	0.15	0.8	5401

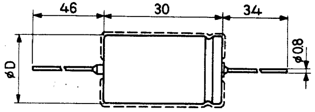
[1]) Maximum leakage current at 20°C after 5 minutes.
[2]) Maximum permissible ripple current at 50 Hz.
[3]) Maximum dissipation factor (tan δ) at 20°C and 50 Hz.
[4]) Maximum impedance at 20°C and 100 kHz.

can size	working voltage ($V_{d.c.}$)	capacitance (μF)	leakage current[1] (μA)	ripple current[2] (mA)	dissipation factor[3]	impedance[4] (Ω)	catalog number suffix
02	16	640	325	360	0.15	0.8	5641
03	16	1000	500	450	0.15	0.8	5102
00	25	160	145	110	0.15	1.0	6161
01	25	250	215	160	0.15	0.8	6251
02	25	400	325	220	0.15	0.8	6401
03	25	640	500	310	0.15	0.8	6641
00	40	100	145	110	0.1	1.2	7101
01	40	160	215	160	0.1	1.2	7161
02	40	250	325	220	0.1	0.8	7251
03	40	400	500	310	0.1	0.8	7401
00	64	64	145	110	0.1	1.0	8649
01	64	100	215	160	0.1	1.2	8101
02	64	160	325	220	0.1	1.2	8161
03	64	250	500	310	0.1	0.8	8251

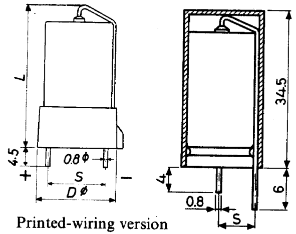
[1]) Maximum leakage current at 20°C after 5 minutes.
[2]) Maximum permissible ripple current at 50 Hz.
[3]) Maximum dissipation factor (tan δ) at 20°C and 50 Hz.
[4]) Maximum impedance at 20°C and 100 kHz.

Small type for general purposes

can size	axial version D (mn)	printed-wiring version S (mm)
00	10.1	3(2.5+0.04)
01	12.6	3(2.5+0.04)
02	15.1	4(2.5+0.04)
03	18.1	4(2.5+0.04)



Axial version



Printed-wiring version

Temperature range: −40 to +85°C
Catalog number:
2222 026 1 . . . ., axial version
2222 026 4 . . . ., printed-wiring version (insulated)
2222 026 5 . . . ., printed-wiring version (with foot)

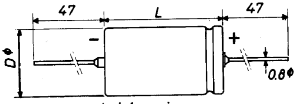
ELECTROLYTIC CAPACITORS

can size	*working voltage* ($V_{d.c.}$)	*capacitance* (μF)	*leakage current*[1] (μA)	*ripple current*[2] (mA)	*dissipation factor*[3]	*impedance*[4] (Ω) $+20°C$	$-20°C$	*catalog number suffix*
00	4	1000	140	325	0.20	0.25	1	2102
03	4	4700	580	920	0.20	0.4	0.5	2472
02	6.3	2200	435	630	0.16	0.3	0.6	3222
00	10	470	190	325	0.13	0.25	1	4561
01	10	1000	320	470	0.13	0.25	0.75	4102
03	10	2200	830	920	0.13	0.4	0.5	4275
02	16	1000	500	630	0.10	0.3	0.6	5102
00	25	220	220	270	0.08	0.25	1	6271
01	25	470	370	360	0.08	0.25	0.75	6471
03	25	1000	920	650	0.08	0.4	0.5	6122
01	40	220	340	360	0.06	0.25	0.75	7271
02	40	470	580	500	0.06	0.3	0.6	7471
02	63	220	440	360	0.05	0.3	0.6	8221

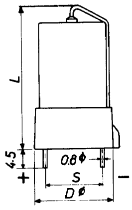
[1]) Maximum leakage current at 25°C after 5 minutes.
[2]) Maximum permissible ripple current at 50 Hz and 70°C.
[3]) Dissipation factor (tan δ) at 100 Hz.
[4]) Impedance at 100 kHz.

Small type for high voltages

can size	*axial version* *D* (*mm*)	*L* (*mm*)	*printed-wiring version* *D* (*mm*)	*L* (*mm*)	*S* (*mm*)
0	10.4	18.5	12.8	26	10.16
00	10.4	30.5	12.8	39.3	10.16
01	12.9	30.5	15.2	39.3	10.16
02	15.4	30.5	17.8	39.3	12.70
03	18.5	30.5	20.8	39.3	15.24



Axial version



Printed-wiring version

Temperature range: −40 to +70°C
Tolerance on capacitance: −10 to +30%
Catalog number: 2222 040 1 . . . ., axial version
2222 040 4 . . . ., printed-wiring version

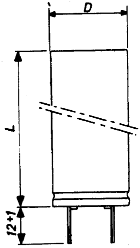
can size	*working voltage* ($V_{d.c.}$)	*capacitance* (μF)	*leakage current*[1]) (μA)	*ripple current*[2]) (mA)	*dissipation factor*[3])	*impedance*[4]) (Ω)	*catalog number suffix*
00	100	20	85	50	0.15	6.4	0209
01	100	32	130	75	0.15	4.0	0329
02	100	50	180	100	0.15	2.5	0509
03	100	80	270	125	0.15	1.6	0809
0	150	6.4	55	25	0.15	15.0	1648
00	150	12.5	85	50	0.15	8.0	1139
01	150	20	130	75	0.15	5.0	1209
02	150	32	180	100	0.15	3.0	1329
03	150	50	270	125	0.15	2.0	1509
00	200	10	85	25	0.15	8.0	2109
01	200	16	130	50	0.15	5.0	2169
02	200	25	180	75	0.15	3.0	2259
03	200	40	270	100	0.15	2.0	2409
0	250	4	55	25	0.15	20.0	3408
00	250	8	85	25	0.15	10.0	3808
01	250	12.5	130	50	0.15	6.4	3139
02	250	20	180	75	0.15	4.0	3209
03	250	32	270	100	0.15	2.5	3329
00	300	6.4	85	25	0.15	20.0	4648
01	300	10	130	50	0.15	15.0	4109
02	300	16	180	75	0.15	8.0	4169
03	300	25	270	100	0.15	5.0	4259
0	350	2.5	55	25	0.15	60.0	5258
00	350	5	85	25	0.15	30.0	5508
01	350	8	110	25	0.15	20.0	5808
02	350	12.5	160	50	0.15	15.0	5139
03	350	20	240	75	0.15	8.0	5209
00	400	4	85	25	0.15	45.0	6408
01	400	6.4	110	25	0.15	30.0	6648
02	400	10	160	50	0.15	20.0	6109
03	400	16	240	75	0.15	12.5	6169

[1]) Maximum leakage current at 20°C after 5 minutes.
[2]) Maximum permissible ripple current at 100 Hz.
[3]) Maximum dissipation factor (tan δ) at 20°C and 50 Hz.
[4]) Maximum impedance at 20°C and 100 kHz.

ELECTROLYTIC CAPACITORS

Large type for general purposes

can size	*D* (*mm*)	*L* (*mm*)
5	21.5	49.5
6	25.5	49.5
7	25.5	80.5
9	35.5	80.5
10	40.5	80.5



7Z42212a

Temperature range: −40 to +70 °C
Tolerance on capacitance: −10 to +50%
Catalog number: 2222 060 . . . . .

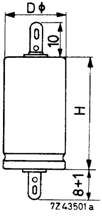
can size	*working voltage* ($V_{d.c.}$)	*capacitance* (μF)	*leakage current*[1] (*mA*)	*ripple current*[2] (*mA*)	*dissipation factor*[3]	*impedance*[4] (Ω)	*catalog number suffix*
5	6.4	2500	0.5	650	0.45	0.40	13252
6	6.4	4000	0.8	800	0.45	0.25	13402
7	6.4	6400	1.0	1250	0.45	0.16	13642
9	6.4	12500	2.4	2100	0.45	0.16	13133
10	6.4	20000	3.8	2900	0.45	0.16	13203
5	10	2000	0.6	650	0.3	0.40	14202
6	10	3200	1.0	800	0.4	0.25	14322
7	10	5000	1.5	1250	0.4	0.16	14502
9	10	10000	3.0	2100	0.4	0.16	14103
10	10	16000	4.8	2900	0.4	0.16	14163
5	16	1250	0.6	450	0.25	0.40	15132
6	16	2000	1.0	650	0.25	0.25	15202
7	16	3200	1.5	1000	0.35	0.16	15322
9	16	6400	3.0	1700	0.35	0.16	15642
10	16	10000	4.8	2300	0.35	0.16	15103
5	25	800	0.6	450	0.2	0.40	16801
6	25	1250	1.0	650	0.2	0.25	16132
7	25	2000	1.5	1000	0.2	0.16	16202
9	25	4000	3.0	1700	0.25	0.16	16402
10	25	6400	4.8	2300	0.25	0.16	16642

[1]) Maximum leakage current at 20 °C after 5 minutes.
[2]) Maximum permissible ripple current at 50 Hz and 70 °C.
[3]) Maximum dissipation factor (tan δ) at 20 °C and 50 Hz.
[4]) Maximum impedance at 20 °C and 100 kHz.

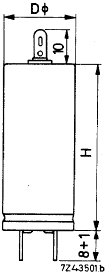
can size	*working voltage* ($V_{d.c.}$)	*capacitance* (*μF*)	*leakage current*[1]) (*mA*)	*ripple current*[2]) (*mA*)	*dissipation factor*[3])	*impedance*[4]) (Ω)	*catalog number suffix*
5	40	500	0.6	450	0.15	0.40	17501
6	40	800	1.0	450	0.15	0.25	17801
7	40	1250	1.5	1000	0.15	0.16	17132
9	40	2500	3.0	1700	0.15	0.16	17252
10	40	4000	4.8	2300	0.15	0.16	17402
5	64	320	0.6	450	0.10	0.40	18321
6	64	500	1.0	650	0.10	0.25	18501
7	64	800	1.5	1000	0.10	0.16	18801
9	64	1600	3.0	1700	0.10	0.16	18162
10	64	2500	4.8	2300	0.10	0.16	18252

[1]) Maximum leakage current at 20°C after 5 minutes.
[2]) Maximum permissible ripple current at 50 Hz and 70°C.
[3]) Maximum dissipation factor (tan δ) at 20°C and 50 Hz.
[4]) Maximum impedance at 20°C and 100 kHz.

Large types for high and low voltages

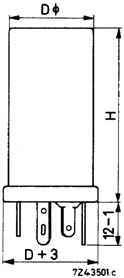


Can sizes
4, 5, 6

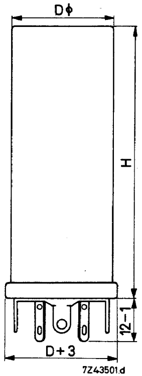


Can sizes
3, 4, 5, 6

Capacitors with soldering terminals



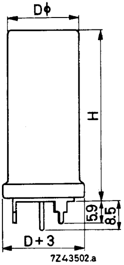
Can sizes
6T, 7



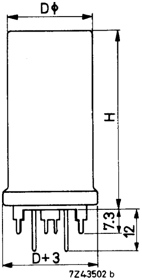
Can sizes
8, 9

Capacitors with twistable mounting lugs

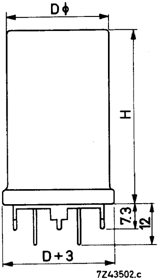
can size	D (mm)	H (mm)
3	19	34
4	19	50
5	22	50
6	26	50
6T	26	52
7	26	81
8	31	81
8A	31	52
9	36	81
9A	36	52



Can sizes 4, 5



Can size 6T



Can sizes 8A, 9A

Capacitors for printed-wiring boards

Temperature range: −40 to +70°C
Tolerance on capacitance
6.4– 64 V types: −10 to +50%
100–150 V types: −10 to +30%
Catalog number: 2222 . . . .

Capacitors with soldering terminals

Single capacitors

can size	*working voltage* ($V_{d.c.}$)	*capacitance* (*μF*)	*leakage current*[1]) (*μA*)	*ripple current*[2]) (*mA*)	*dissipation factor*[3])	*impedance*[4]) (Ω)	*catalog number suffix*
4	6.4	1600	220	600	0.50	0.63	063 13162
5	6.4	2500	500	850	0.45	0.40	252
6	6.4	4000	770	1000	0.45	0.25	402
4	10	1250	400	600	0.30	0.63	063 14132
5	10	2000	630	850	0.30	0.40	202
6	10	3200	1000	1000	0.40	0.25	322
4	16	800	400	500	0.25	0.63	063 15801
5	16	1250	600	700	0.25	0.40	132
6	16	2000	1000	1000	0.25	0.25	202

[1]) Maximum leakage current at 20°C after 5 minutes.
[2]) Maximum permissible ripple current at 100 Hz and 70°C.
[3]) Maximum dissipation factor (tan δ) at 20°C and 50 Hz.
[4]) Maximum impedance at 20°C and 100 kHz.

can size	*working voltage* ($V_{d.c.}$)	*capacitance* (μF)	*leakage current*[1]) (μA)	*ripple current*[2]) (mA)	*dissipation factor*[3])	*impedance*[4]) (Ω)	*catalog number suffix*
4	25	500	400	450	0.20	0.63	063 16501
5	25	800	600	650	0.20	0.40	801
6	25	1250	1000	850	0.20	0.25	132
4	40	320	400	450	0.15	0.63	063 17321
5	40	500	600	650	0.15	0.40	501
6	40	800	1000	800	0.15	0.25	801
4	64	200	400	400	0.10	0.63	063 18201
5	64	320	600	500	0.10	0.40	321
6	64	500	1000	800	0.15	0.25	501
4	100	100	330	250	0.15	1.25	080 10101
6	100	250	780	450	0.15	0.63	251
4	150	64	330	200	0.15	1.5	080 11649
5	150	100	500	250	0.15	1.0	101
4	200	50	350	150	0.15	1.25	080 12509
6	200	100	630	300	0.15	0.75	101
4	250	50	400	150	0.15	1.5	080 13509
5	250	64	500	200	0.15	1.25	649
6	250	100	780	250	0.15	0.75	101
4	300	32	330	100	0.15	4	080 14329
5	300	50	500	200	0.15	2.5	509
5	300	64	600	200	0.15	2	649
6	300	100	930	250	0.15	1.25	101
4	350	25	300	100	0.15	5.6	080 15259
4	350	32	360	100	0.15	4.5	329
5	350	50	550	150	0.15	2.8	509
6	350	64	700	200	0.15	2.3	649
4	400	25	330	100	0.15	7	080 16259
5	400	32	410	150	0.15	5.6	329
6	400	50	630	200	0.15	3.5	509
4	450	16	240	100	0.15	11.3	080 17169
5	450	25	360	100	0.15	7	259
6	450	32	460	150	0.15	5.6	329
4	500	16	270	100	0.15	15	080 18169
5	500	25	400	100	0.15	10	259
6	500	32	500	150	0.15	7.9	329

[1]) Maximum leakage current at 20°C after 5 minutes.
[2]) Maximum permissible ripple current at 100 Hz and 70°C.
[3]) Maximum dissipation factor (tan δ) at 20°C and 50 Hz.
[4]) Maximum impedance at 20°C and 100 kHz.

ELECTROLYTIC CAPACITORS

Double capacitors

can size	working voltage ($V_{d.c.}$)	capacitance (μF)	leakage current[1]) (μA)	ripple current[2]) (mA)	dissipation factor[3])	impedance[4]) (Ω)	catalog number suffix
4	10	640 + 640	2 × 200	2 × 300	0.30	2 × 1.25	064 14641
5	10	1000 + 1000	2 × 330	2 × 425	0.30	2 × 0.8	102
6	10	1600 + 1600	2 × 500	2 × 500	0.40	2 × 0.5	162
4	25	250 + 250	2 × 200	2 × 225	0.20	2 × 1.25	064 16251
5	25	400 + 400	2 × 300	2 × 325	0.20	2 × 0.8	401
6	25	640 + 640	2 × 750	2 × 425	0.20	2 × 0.5	641
4	64	100 + 100	2 × 200	2 × 200	0.10	2 × 1.25	064 18101
5	64	160 + 160	2 × 300	2 × 250	0.10	2 × 0.8	161
6	64	250 + 250	2 × 500	2 × 400	0.10	2 × 0.5	251
3	100	25 + 25	2 × 100	2 × 50	0.15	2 × 5	081 10259
4	100	50 + 50	2 × 180	2 × 125	0.15	2 × 2.5	509
6	100	125 + 125	2 × 400	2 × 225	0.15	2 × 1.25	131
4	150	32 + 32	2 × 115	2 × 100	0.15	2 × 3.0	081 11329
5	150	50 + 50	2 × 265	2 × 125	0.15	2 × 2	509
3	200	16 + 16	2 × 125	2 × 50	0.15	2 × 4.5	081 12169
4	200	25 + 25	2 × 115	2 × 75	0.15	2 × 2.5	259
6	200	50 + 50	2 × 330	2 × 150	0.15	2 × 1.5	509
3	250	12.5 + 12.5	2 × 100	2 × 50	0.15	2 × 6.3	081 13139
4	250	25 + 25	2 × 100	2 × 75	0.15	2 × 3	259
5	250	32 + 32	2 × 250	2 × 100	0.15	2 × 2.5	329
6	250	50 + 50	2 × 400	2 × 125	0.15	2 × 1.5	509
4	300	16 + 16	2 × 170	2 × 50	0.15	2 × 8	081 14169
5	300	25 + 25	2 × 250	2 × 100	0.15	2 × 5	259
5	300	32 + 32	2 × 330	2 × 100	0.15	2 × 4	329
6	300	50 + 50	2 × 500	2 × 125	0.15	2 × 2.5	509
3	350	8 + 8	2 × 100	2 × 25	0.15	2 × 18	081 15808
4	350	12.5 + 12.5	2 × 150	2 × 50	0.15	2 × 11.3	139
4	350	16 + 16	2 × 200	2 × 50	0.15	2 × 9	169
5	350	25 + 25	2 × 300	2 × 75	0.15	2 × 5.5	259
6	350	32 + 32	2 × 360	2 × 100	0.15	2 × 4.5	329
4	400	12.5 + 12.5	2 × 165	2 × 50	0.15	2 × 14	081 16139
5	400	16 + 16	2 × 200	2 × 75	0.15	2 × 11.2	169
6	400	25 + 25	2 × 330	2 × 100	0.15	2 × 7	259

[1]) Maximum leakage current at 20 °C after 5 minutes.
[2]) Maximum permissible ripple current at 100 Hz and 70 °C.
[3]) Maximum dissipation factor (tan δ) at 20 °C and 50 Hz.
[4]) Maximum impedance at 20 °C and 100 kHz.

can size	working voltage ($V_{d.c.}$)	capacitance (μF)	leakage current[1] (μA)	ripple current[2] (mA)	dissipation factor[3]	impedance[4] (Ω)	catalog number suffix
4	450	8+8	2×120	2×50	0.15	2×23	081 17808
5	450	12.5+12.5	2×180	2×50	0.15	2×14	139
6	450	16+16	2×240	2×75	0.15	2×11.2	169
3	500	4+4	2×80	2×25	0.15	2×62.5	081 18408
4	500	8+8	2×135	2×50	0.15	2×30	808
5	500	12.5+12.5	2×200	2×50	0.15	2×20	139
6	500	16+16	2×270	2×75	0.15	2×15.6	169

Capacitors with twistable mounting lugs
Single capacitors

can size	working voltage ($V_{d.c.}$)	capacitance (μF)	leakage current[1] (μA)	ripple current[2] (mA)	dissipation factor[3]	impedance[4] (Ω)	catalog number suffix
6T	25	1250	1000	850	0.20	0.25	063 36132
7	25	2000	1500	1100	0.20	0.15	202
8	25	2500	2000	1200	0.20	0.15	252
6T	40	800	1000	800	0.15	0.25	063 37801
7	40	1250	1500	1100	0.15	0.15	132
8	40	1600	2000	1200	0.15	0.15	162
6T	64	500	1000	800	0.10	0.25	063 38501
7	64	800	1500	1100	0.10	0.15	801
8	64	1000	1000	1200	0.10	0.15	102
6T	100	250	780	450	0.15	0.63	080 30251
7	100	500	1500	650	0.15	0.63	501
7	150	250	1150	450	0.15	0.63	080 31251
8	150	500	2300	650	0.15	0.63	501
6T	200	100	630	300	0.15	0.75	080 32101
6T	250	100	630	250	0.15	0.75	080 33101
8	250	250	1900	450	0.15	0.63	251
6T	300	100	930	250	0.15	1.25	080 34101
8	300	250	2300	450	0.15	0.63	251

[1]) Maximum leakage current at 20°C after 5 minutes.
[2]) Maximum permissible ripple current at 100 Hz and 70°C.
[3]) Maximum dissipation factor (tan δ) at 20°C and 50 Hz.
[4]) Maximum impedance at 20°C and 100 kHz.

ELECTROLYTIC CAPACITORS

can size	*working voltage* ($V_{d.c.}$)	*capacitance* (μF)	*leakage current*[1] (μA)	*ripple current*[2] (mA)	*dissipation factor*[3]	*impedance*[4] (Ω)	*catalog number suffix*
6T	350	64	700	200	0.15	2.3	080 35649
7	350	100	1100	250	0.15	1.38	101
9	350	250	2650	500	0.15	0.63	251
6T	400	50	630	200	0.15	3.5	080 36509
7	400	64	800	200	0.15	2.8	649
7	400	100	1100	200	0.15	1.75	101
6T	450	32	460	150	0.15	5.6	080 37329
7	450	50	700	200	0.15	3.5	509
7	450	64	900	200	0.15	2.8	649
8	450	100	1300	200	0.15	1.75	101
6T	500	32	500	150	0.15	7.9	080 38329
7	500	50	780	200	0.15	5	509
8	500	64	1000	200	0.15	4	649
9	500	100	1500	300	0.15	2.5	101

Double capacitors

can size	*working voltage* ($V_{d.c.}$)	*capacitance* (μF)	*leakage current*[1] (μA)	*ripple current*[2] (mA)	*dissipation factor*[3]	*impedance*[4] (Ω)	*catalog number suffix*
6T	25	640 + 640	2 × 750	2 × 425	0.20	2 × 0.5	064 36641
7	25	1000 + 1000	2 × 780	2 × 550	0.20	2 × 0.3	102
8	25	1250 + 1250	2 × 1000	2 × 600	0.50	2 × 0.3	132
6T	64	250 + 250	2 × 500	2 × 400	0.10	2 × 0.5	064 38251
7	64	400 + 400	2 × 750	2 × 550	0.10	2 × 0.3	401
8	64	500 + 500	2 × 1000	2 × 600	0.10	2 × 0.3	501
6T	100	125 + 125	2 × 400	2 × 225	0.15	2 × 1.25	081 30131
7	100	250 + 250	2 × 780	2 × 325	0.15	2 × 1.25	251
6T	150	125 + 125	2 × 650	2 × 225	0.15	2 × 1.25	081 31131
8	150	250 + 250	2 × 1150	2 × 325	0.15	2 × 1.25	251
6T	200	50 + 50	2 × 330	2 × 150	0.15	2 × 1.5	081 32509
6T	250	50 + 50	2 × 400	2 × 125	0.15	2 × 1.5	081 33509
8	250	125 + 125	2 × 950	2 × 225	0.15	2 × 1.25	131
6T	300	50 + 50	2 × 500	2 × 125	0.15	2 × 2.5	081 34509
8	300	125 + 125	2 × 1150	2 × 225	0.15	2 × 1.25	031

[1]) Maximum leakage current at 20°C after 5 minutes.
[2]) Maximum permissible ripple current at 100 Hz and 70°C.
[3]) Maximum dissipation factor (tan δ) at 20°C and 50 Hz.
[4]) Maximum impedance at 20°C and 100 kHz.

can size	*working voltage* ($V_{d.c.}$)	*capacitance* (μF)	*leakage current*[1]) (μA)	*ripple current*[2]) (mA)	*dissipation factor*[3])	*impedance*[4]) (Ω)	*catalog number suffix*
6T	350	32+32	2×360	2×100	0.15	2×4.5	081 35329
7	350	50+50	2×550	2×125	0.15	2×2.75	509
9	350	125+125	2×1350	2×250	0.15	2×1.25	131
6T	400	25+25	2×330	2×100	0.15	2×7	081 36259
7	400	32+32	2×410	2×100	0.15	2×5.5	329
7	400	50+50	2×630	2×100	0.15	2×3.5	509
6T	450	16+16	2×240	2×75	0.15	2×11.2	081 37169
7	450	25+25	2×360	2×100	0.15	2×7	259
7	450	32+32	2×460	2×100	0.15	2×5.5	329
8	450	50+50	2×700	2×100	0.15	2×3.5	509
6T	500	16+16	2×270	2×75	0.15	2×15.6	081 38169
7	500	25+25	2×400	2×100	0.15	2×10	259
8	500	32+32	2×500	2×100	0.15	2×5.5	329
9	500	50+50	2×780	2×150	0.15	2×5	509

Capacitors for printed-wiring boards

Single capacitors

can size	*working voltage* ($V_{d.c.}$)	*capacitance* (μF)	*leakage current*[1]) (μA)	*ripple current*[2]) (mA)	*dissipation factor*[3])	*impedance*[4]) (Ω)	*catalog number suffix*
4	6.4	1600	220	600	0.50	0.63	063 53162
5	6.4	2500	550	850	0.45	0.40	252
6T	6.4	4000	770	1000	0.45	0.25	402
8A	6.4	6400	1220	1300	0.45	0.15	642
9A	6.4	8000	1550	1500	0.45	0.15	802
4	10	1250	400	600	0.30	0.63	063 54132
5	10	2000	630	850	0.30	0.40	202
6T	10	3200	1000	1000	0.40	0.25	322
9A	10	6400	2000	1500	0.40	0.15	642
4	16	800	400	500	0.25	0.63	063 55801
5	16	1250	600	700	0.25	0.40	132

1) Maximum leakage current at 20°C after 5 minutes.
2) Maximum permissible ripple current at 100 Hz and 70°C.
3) Maximum dissipation factor (tan δ) at 20°C and 50 Hz.
4) Maximum impedance at 20°C and 100 kHz.

ELECTROLYTIC CAPACITORS

can size	working voltage ($V_{d.c.}$)	capacitance (μF)	leakage current[1] (μA)	ripple current[2] (mA)	dissipation factor[3]	impedance[4] (Ω)	catalog number suffix
6T	16	2000	1000	1000	0.25	0.25	063 55202
8A	16	3200	1500	1200	0.35	0.15	322
9A	16	4000	2000	1300	0.35	0.15	402
4	25	500	400	450	0.20	0.63	063 56501
5	25	800	600	650	0.20	0.40	801
6T	25	1250	1000	850	0.20	0.25	132
8A	25	2000	1500	1100	0.20	0.15	202
9A	25	2500	2000	1200	0.20	0.15	252
4	40	320	400	450	0.15	0.63	063 57321
5	40	500	600	650	0.15	0.40	501
6T	40	800	1000	800	0.15	0.15	801
8A	40	1250	1500	1100	0.15	0.15	132
9A	40	1600	2000	1200	0.15	0.15	162
4	64	200	400	400	0.10	0.63	063 58201
5	64	320	600	500	0.10	0.40	321
6T	64	500	1000	800	0.10	0.15	501
8A	64	800	1500	1100	0.10	0.15	801
9A	64	1000	2000	1200	0.10	0.15	102
4	100	100	330	250	0.15	1.25	080 50101
6T	100	250	780	450	0.15	0.63	251
8A	100	500	1500	650	0.15	0.63	501
4	150	64	330	200	0.15	1.5	080 51649
5	150	100	500	250	0.15	1.0	101
8A	150	250	1150	450	0.15	0.68	251
4	200	50	350	250	0.15	1.25	080 52509
6T	200	100	630	300	0.15	0.75	101
9A	200	250	1500	450	0.15	0.63	251
4	250	50	400	150	0.15	1.5	080 53509
5	250	64	500	200	0.15	1.25	649
6T	250	100	780	250	0.15	0.75	101
4	300	32	330	100	0.15	4	080 54329
5	300	50	500	200	0.15	2.5	509
5	300	64	600	200	0.15	1.25	649
6T	300	100	930	250	0.15	1.25	101

[1]) Maximum leakage current at 20°C after 5 minutes.
[2]) Maximum permissible ripple current at 100 Hz and 70°C.
[3]) Maximum dissipation factor (tan δ) at 20°C and 50 Hz.
[4]) Maximum impedance at 20°C and 100 kHz.

can size	working voltage ($V_{d.c.}$)	capacitance (μF)	leakage current[1]) (μA)	ripple current[2]) (mA)	dissipation factor[3])	impedance[4]) (Ω)	catalog number suffix
4	350	25	300	100	0.15	5.6	080 55259
4	350	32	360	100	0.15	4.5	329
5	350	50	550	150	0.15	2.8	509
6T	350	64	700	200	0.15	2.3	649
8A	350	100	1100	250	0.15	1.38	101
4	400	25	330	100	0.15	7	080 56259
5	400	32	410	150	0.15	5.6	329
6T	400	50	630	200	0.15	3.5	509
8A	400	64	800	200	0.15	2.8	649
8A	400	100	1200	200	0.15	1.75	101
4	450	16	240	100	0.15	11.3	080 57169
5	450	25	360	100	0.15	7	259
6T	450	32	460	150	0.15	5.6	329
8A	450	50	700	200	0.15	3.5	509
8A	450	64	900	200	0.15	2.8	649
4	500	16	270	100	0.15	15	080 58169
5	500	25	400	100	0.15	10	259
6T	500	32	500	150	0.15	7.9	329
8A	500	50	780	200	0.15	5	509
9A	500	64	1000	200	0.15	4	649

Double capacitors

can size	working voltage ($V_{d.c.}$)	capacitance (μF)	leakage current[1]) (μA)	ripple current[2]) (mA)	dissipation factor[3])	impedance[4]) (Ω)	catalog number suffix
4	10	640 + 640	2 × 200	2 × 300	0.30	2 × 1.25	064 54641
5	10	1000 + 1000	2 × 330	2 × 425	0.30	2 × 0.8	102
6T	10	1600 + 1600	2 × 500	2 × 500	0.40	2 × 0.5	162
8A	10	2500 + 2500	2 × 750	2 × 650	0.40	2 × 0.3	252
9A	10	3200 + 3200	2 × 1000	2 × 750	0.40	2 × 0.3	322
4	25	250 + 250	2 × 200	2 × 225	0.20	2 × 1.25	064 56251
5	25	400 + 400	2 × 300	2 × 325	0.20	2 × 0.8	401
6T	25	640 + 640	2 × 750	2 × 425	0.20	2 × 0.5	641
8A	25	1000 + 1000	2 × 780	2 × 550	0.20	2 × 0.3	102
9A	25	1250 + 1250	2 × 1000	2 × 600	0.50	2 × 0.3	132

[1]) Maximum leakage current at 20 °C after 5 minutes.
[2]) Maximum permissible ripple current at 100 Hz and 70 °C.
[3]) Maximum dissipation factor ($\tan \delta$) at 20 °C and 50 Hz.
[4]) Maximum impedance at 20 °C and 100 kHz.

ELECTROLYTIC CAPACITORS

can size	working voltage ($V_{d.c.}$)	capacitance (μF)	leakage current[1]) (μA)	ripple current[2]) (mA)	dissipation factor[3])	impedance[4]) (Ω)	catalog number suffix
4	64	100 + 100	2 × 200	2 × 200	0.10	2 × 1.25	064 58101
5	64	160 + 160	2 × 300	2 × 250	0.10	2 × 0.8	161
6T	64	250 + 250	2 × 500	2 × 400	0.10	2 × 0.5	251
8A	64	400 + 400	2 × 750	2 × 550	0.10	2 × 0.3	401
9A	64	500 + 500	2 × 1000	2 × 600	0.10	2 × 0.3	501
4	100	50 + 50	2 × 180	2 × 125	0.15	2 × 2.5	081 50509
6T	100	125 + 125	2 × 400	2 × 225	0.15	2 × 1.25	131
8A	100	250 + 250	2 × 780	2 × 325	0.15	2 × 1.25	251
4	150	32 + 32	2 × 115	2 × 100	0.15	2 × 3.0	081 51329
5	150	50 + 50	2 × 265	2 × 125	0.15	2 × 2	509
8A	150	125 + 125	2 × 650	2 × 225	0.15	2 × 1.25	131
4	200	25 + 25	2 × 115	2 × 75	0.15	2 × 2.5	081 52259
6T	200	50 + 50	2 × 330	2 × 150	0.15	2 × 1.5	509
9A	200	125 + 125	2 × 750	2 × 225	0.15	2 × 1.25	131
4	250	25 + 25	2 × 100	2 × 75	0.15	2 × 3	081 53259
5	250	32 + 32	2 × 250	2 × 100	0.15	2 × 2.5	329
6T	250	50 + 50	2 × 400	2 × 125	0.15	2 × 1.5	509
4	300	16 + 16	2 × 170	2 × 50	0.15	2 × 8	081 54169
5	300	25 + 25	2 × 250	2 × 100	0.15	2 × 5	169
5	300	32 + 32	2 × 330	2 × 100	0.15	2 × 4	329
6T	300	50 + 50	2 × 500	2 × 125	0.15	2 × 2.5	509
4	350	12.5 + 12.5	2 × 150	2 × 50	0.15	2 × 11.3	081 55139
4	350	16 + 16	2 × 200	2 × 50	0.15	2 × 9	169
5	350	25 + 25	2 × 300	2 × 75	0.15	2 × 5.5	259
6T	350	32 + 32	2 × 360	2 × 100	0.15	2 × 4.5	329
8A	350	50 + 50	2 × 550	2 × 125	0.15	2 × 2.75	509
4	400	12.5 + 12.5	2 × 165	2 × 50	0.15	2 × 14	081 56139
5	400	16 + 16	2 × 200	2 × 75	0.15	2 × 11.2	169
6T	400	25 + 25	2 × 330	2 × 100	0.15	2 × 7	259
8A	400	32 + 32	2 × 410	2 × 100	0.15	2 × 5.5	329
8A	400	50 + 50	2 × 630	2 × 100	0.15	2 × 3.5	509
4	450	8 + 8	2 × 120	2 × 50	0.15	2 × 30	081 57808
5	450	12.5 + 12.5	2 × 180	2 × 50	0.15	2 × 14	139
6T	450	16 + 16	2 × 240	2 × 75	0.15	2 × 11.2	169
8A	450	25 + 25	2 × 360	2 × 100	0.15	2 × 7	259
8A	450	32 + 32	2 × 460	2 × 100	0.15	2 × 5.5	329

[1]) Maximum leakage current at 20°C after 5 minutes.
[2]) Maximum permissible ripple current at 100 Hz and 70°C.
[3]) Maximum dissipation factor (tan δ) at 20°C and 50 Hz.
[4]) Maximum impedance at 20°C and 100 kHz.

can size	working voltage ($V_{d.c.}$)	capacitance (μF)	leakage current[1]) (μA)	ripple current[2]) (mA)	dissipation factor[3])	impedance[4]) (Ω)	catalog number suffix
4	500	8+8	2×135	2×50	0.15	2×30	081 58808
5	500	12.5+12.5	2×200	2×50	0.15	2×20	139
6T	500	16+16	2×270	2×75	0.15	2×11.2	169
8A	500	25+25	2×400	2×100	0.15	2×10	259
9A	500	32+32	2×500	2×100	0.15	2×8	329

[1]) Maximum leakage current at 20°C after 5 minutes.
[2]) Maximum permissible ripple current at 100 Hz and 70°C.
[3]) Maximum dissipation factor (tan δ) at 20°C and 50 Hz.
[4]) Maximum impedance at 20°C and 100 kHz.

Large types for high voltages (special series)

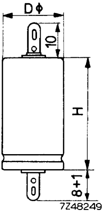


Fig. 1

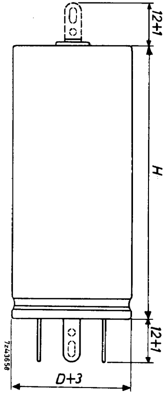


Fig. 2

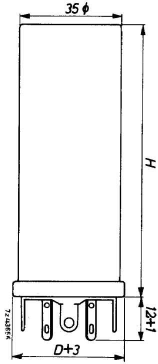


Fig. 3

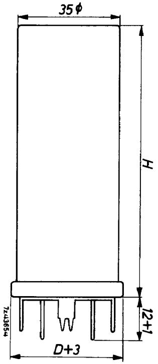


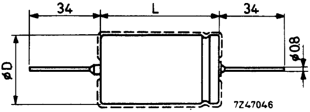
Fig. 4

ELECTROLYTIC CAPACITORS

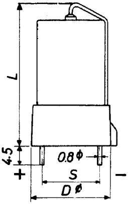
type	*capacitance* (μF)	*max. voltage* ($V_{d.c.}$)	*Fig.*	*D* (*mm*)	*H* (*mm*)	*cat. number* 2222 ....
high ripple current	200	300	2	35	80	067 90004
	200	325	2	35	80	067 90006
	50 + 50 + 50	300	3	30	80	063 90026
	50 + 50 + 50	350	3	35	80	063 90027
	100 + 50 + 50	300	3	35	80	063 90022
	100 + 100 + 50	300	3	35	80	067 90003
	100 + 100	300	3	35	80	067 90001
	200 + 100 + 50 + 25	300	2	35	80	067 90012
	200 + 100 + 50 + 25	300	3	35	80	067 90013
	200 + 100 + 50 + 25	300	4	35	80	067 90014
high discharge current	50	450	3	30	80	067 91001
	25	100	1	18	33	067 91002
	50	100	1	18	49	067 91003
	100	100	1	25	49	067 91004
	500	40	3	25	51	067 91005
bipolar	200	150	3	35	80	066 90004
	200	150	2	35	80	066 90005
	100	150	2	30	80	066 90003
	100	15	2	18	33	066 90001
	50	30	2	18	33	066 90002
	50	350	2	30	80	066 90006
	10	300/500	3	25	51	066 91002
	14	80/400	3	25	51	066 91001

Small long life type

can size	axial version		printed-wiring version		
	D (mm)	L (mm)	D (mm)	L (mm)	S (mm)
1	8.3	21.5	11.3	30	10.16
2	10.5	21.5	12.9	31	10.16
3	10.5	30.5	12.9	39	10.16
4	13	30.5	15.3	39	10.16



Axial version



Printed-wiring version

Temperature range: −40 to +70°C
Tolerance on capacitance: −10 to +50%
Catalog number: 2222 101 1 . . . ., axial version
2222 101 4 . . . ., printed-wiring version

can size	*working voltage* ($V_{d.c.}$)	*capacitance* (μF)	*leakage current*[1]) (μA)	*ripple current*[2]) (*mA*)	*dissipation factor*[3])	*impedance*[4]) (Ω)	*catalog number suffix*
1	4	25	6	20	0.20	6	2259
1	4	50	7	40	0.30	6	2509
2	4	80	8	55	0.30	4	2809
3	4	160	11.5	90	0.30	2	2161
4	4	320	18	145	0.30	1	2321
1	6.4	20	6.5	25	0.20	6	3209
1	6.4	40	7.5	40	0.25	6	3409
2	6.4	64	9	55	0.25	4	3649
3	6.4	125	13	90	0.25	2	3131
4	6.4	250	21	145	0.25	1	3251
1	10	16	6.5	25	0.15	6	4169
1	10	32	8	40	0.20	6	4329
2	10	50	10	55	0.20	4	4509
3	10	100	15	90	0.20	2	4101
4	10	200	25	145	0.20	1	4201

[1]) Maximum leakage current at 20°C after 5 minutes.
[2]) Maximum permissible ripple current at 100 Hz and 70°C.
[3]) Maximum dissipation factor (tan δ) at 20°C and 50 Hz.
[4]) Maximum impedance at 20°C and 100 kHz.

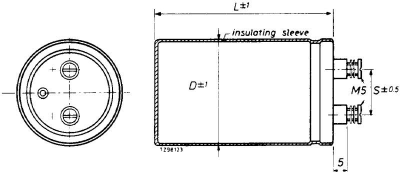
ELECTROLYTIC CAPACITORS

can size	*working voltage* ($V_{d.c.}$)	*capacitance* (μF)	*leakage current*[1] (μA)	*ripple current*[2] (mA)	*dissipation factor*[3]	*impedance*[4] (Ω)	*catalog number suffix*
1	16	10	6.5	25	0.15	6	5109
1	16	20	8	40	0.15	6	5209
2	16	32	10	55	0.15	4	5329
3	16	64	15.5	90	0.15	2	5649
4	16	125	25	145	0.15	1	5131
1	25	6.4	6.5	25	0.10	6	6648
1	25	12.5	8	40	0.10	6	6139
2	25	20	10	55	0.10	4	6209
3	25	40	15	90	0.10	2	6409
4	25	80	25	145	0.10	1	6809
1	40	4	6.5	15	0.10	6	7408
1	40	8	8	25	0.10	6	7808
2	40	12.5	10	35	0.10	4	7139
3	40	25	15	55	0.10	2	7259
4	40	50	25	90	0.10	1	7509
1	64	2.5	6.5	15	0.10	6	8258
1	64	5	8	25	0.10	6	8508
2	64	8	10	35	0.10	4	8808
3	64	16	15.5	55	0.10	2	8169
4	64	32	25.5	90	0.10	1	8329

1) Maximum leakage current at 20°C after 5 minutes.
2) Maximum permissible ripple current at 100 Hz and 70°C.
3) Maximum dissipation factor (tan δ) at 20°C and 50 Hz.
4) Maximum impedance at 20°C and 100 kHz.

Large long life type

can size	*D* (*mm*)	*L* (*mm*)	*S* (*mm*)
11	36.5	88	15
12	36.5	108	15
14	51.5	88	22
15	51.5	108	22



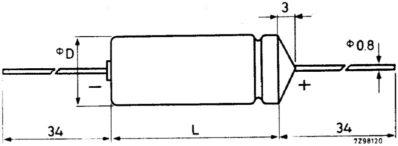
Temperature range: −40 to +70°C
Tolerance on capacitance: −10 to +50%
Catalog number: 2222 102 . . . . ., working voltage 6.4 to 64 $V_{d.c.}$
2222 103 . . . . ., working voltage 100 $V_{d.c.}$

can size	*working voltage* ($V_{d.c.}$)	*capacitance* (μF)	*leakage current*[1] (mA)	*ripple current*[2] (A) *at 50°C*	*at 70°C*	*dissipation factor*[3]	*catalog number* 2222 ....
11	6.4	10000	1.9	4.1	2.1	0.45	102 13103
12	6.4	14000	2.7	5.6	2.8	0.45	143
14	6.4	25000	4.8	8.1	3.6	0.45	253
15	6.4	31500	6.1	10	4.9	0.45	323
11	10	8000	2.4	4.1	2.1	0.35	102 14802
12	10	11200	3.4	5.6	2.8	0.35	113
14	10	20000	6.0	8.1	3.6	0.35	203
15	10	25000	7.5	10	4.9	0.35	253
11	16	5000	2.4	4.1	2.1	0.25	102 15502
12	16	7100	3.4	5.6	2.8	0.25	712
14	16	12500	6.0	8.1	3.6	0.25	133
15	16	16000	7.5	10	4.9	0.25	163
11	25	3150	2.4	4.1	2.1	0.15	102 16322
12	25	4500	3.4	5.6	2.8	0.15	452
14	25	8000	6.0	8.1	3.6	0.15	802
15	25	10000	7.5	10	4.9	0.15	103
11	40	2240	2.7	4.1	2.1	0.10	102 17222
12	40	3150	3.8	5.6	2.8	0.10	322
14	40	5600	6.7	8.1	3.6	0.10	562
15	40	7100	8.4	10	4.9	0.10	712
11	64	1400	2.7	2.9	1.75	0.10	102 18142
12	64	2000	3.8	4.1	2.2	0.10	202
14	64	3550	6.7	5.1	2.3	0.10	362
15	64	4500	8.4	6.2	2.8	0.10	452
11	100	900	2.7	2.9	1.75	0.10	103 10901
12	100	1250	3.8	4.1	2.2	0.10	132
14	100	2240	6.7	5.1	2.3	0.10	222
15	100	2800	8.4	6.2	2.8	0.10	282

[1]) Maximum leakage current at 20°C after 5 minutes.
[2]) Maximum permissible ripple current at 100 Hz.
[3]) Maximum dissipation factor (tan δ) at 20°C and 50 Hz.
Note: Mounting position not with terminals down.

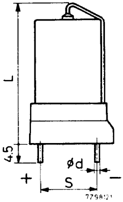
Small solid aluminium type

can size	axial version		printed-wiring version	
	D (*mm*)	*L* (*mm*)	*S* (*mm*)	*L* (*mm*)
1	6.6	14.5	7.62	24.5
2	6.6	21	7.62	30.5
3	8.3	21	7.62	30.5
4	10.4	21	10.16	30.5
5	10.4	27	10.16	39.3
6	12.9	27	10.16	39.3



Axial version (insulated)

d = 0.6 for can size 1 and 2
d = 0.8 for 3 to 6



Printed-wiring version

Temperature range: −80 to +85 °C
Tolerance on capacitance: ±20 %
Catalog number: 2222 121 1 . . . ., axial version
2222 121 4 . . . ., printed-wiring version

can size	*working voltage* ($V_{d.c.}$)	*capacitance* (*μF*)	*leakage current*[1] (*μA*)	*ripple current*[2] (*mA*)	*dissipation factor*[3]	*impedance*[4] (Ω)	*catalog number suffix*
1	4	27	9	100	0.20	2.5	2279
2	4	56	32	155	0.20	1.25	2569
3	4	100	57	235	0.20	0.75	2101
4	4	180	80	350	0.20	0.5	2181
5	4	270	105	505	0.20	0.4	2271
6	4	390	120	685	0.20	0.4	2391
1	6.3	22	12	90	0.18	2.5	3229
2	6.3	47	43	150	0.18	1.25	3479
3	6.3	82	73	225	0.18	0.75	3829
4	6.3	150	107	340	0.18	0.5	3151
5	6.3	220	140	480	0.18	0.4	3221
6	6.3	330	160	670	0.18	0.4	3331

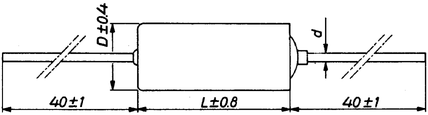
[1]) Maximum leakage current at 20 °C after 5 minutes.
[2]) Maximum permissible ripple current at 100 Hz and 70 °C.
[3]) Maximum dissipation factor (tan δ) at 20 °C and 100 Hz.
[4]) Maximum impedance at 20 °C and 100 kHz.

can size	*working voltage* ($V_{d.c.}$)	*capacitance* (μF)	*leakage current*[1] (μA)	*ripple current*[2] (mA)	*dissipation factor*[3]	*impedance*[4] (Ω)	*catalog number suffix*
1	10	15	15	80	0.16	2.5	4159
2	10	33	53	135	0.16	1.25	4339
3	10	56	90	195	0.16	0.75	4569
4	10	100	133	290	0.16	0.5	4101
5	10	150	175	420	0.16	0.4	4151
6	10	220	200	575	0.16	0.4	4221
1	16	8.2	18	65	0.14	2.5	5828
2	16	18	63	105	0.14	1.25	5189
3	16	33	108	160	0.14	0.75	5339
4	16	56	160	240	0.14	0.5	5569
5	16	82	210	335	0.14	0.4	5829
6	16	120	240	465	0.14	0.4	5121
1	25	5.6	21	55	0.12	5.0	6568
2	25	12	74	95	0.12	2.5	6129
3	25	22	125	140	0.12	1.5	6229
4	25	39	185	210	0.12	1.0	6399
5	25	56	245	295	0.12	0.8	6569
6	25	82	280	405	0.12	0.5	6829
1	40	2.7	24	45	0.10	5.0	7278
2	40	5.6	84	70	0.10	2.5	7568
3	40	10	145	105	0.10	1.5	7109
4	40	18	212	160	0.10	1.0	7189
5	40	27	280	230	0.10	0.8	7279
6	40	39	320	305	0.10	0.5	7399

[1]) Maximum leakage current at 20°C after 5 minutes.
[2]) Maximum permissible ripple current at 100 Hz and 70°C.
[3]) Maximum dissipation factor (tan δ) at 20°C and 100 Hz.
[4]) Maximum impedance at 20°C and 100 kHz.

Solid tantalum type

can size	*D* (*mm*)	*L* (*mm*)	*d* (*mm*)
1	3.45	7.25	0.64
2	4.7	12.05	0.64
3	7.35	17.4	0.64
4	8.9	19.95	0.64



ELECTROLYTIC CAPACITORS

These capacitors are in conformity with MIL-C26655B
Temperature range: −55 to +85 °C
Tolerance on capacitance: ±20 % (10 % on request)
Catalog number: 2222 141 . . . . ., standard MIL-type
2222 143 . . . . ., with civil-industrial marking
(Do not order by means of MIL type numbers)

can size	*d.c. rated voltage at 85 °C (V)*	*capacitance (μF)*	*leakage current*[1] *(μA)*	*catalog number suffix*	*MIL type number*
1	6	5.6	1	13568	CS13AB5R6M
1	6	6.8	1	13688	CS13AB6R8M
2	6	47	6	13479	CS13AB470M
2	6	56	7	13569	CS13AB560M
3	6	150	18	13151	CS13AB151M
3	6	180	21	13181	CS13AB181M
4	6	270	32	13271	CS13AB271M
4	6	330	40	13331	CS13AB331M
1	10	3.9	1	14398	CS13AC3R9M
1	10	4.7	1	14478	CS13AC4R7M
2	10	27	5	14279	CS13AC270M
2	10	33	7	14339	CS13AC330M
2	10	39	8	14399	CS13AC390M
3	10	82	16	14829	CS13AC820M
3	10	100	20	14101	CS13AC101M
3	10	120	24	14121	CS13AC121M
4	10	180	36	14181	CS13AC181M
4	10	220	44	14221	CS13AC221M
1	15	2.7	1	15278	CS13AD2R7M
1	15	3.3	1	15338	CS13AD3R3M
2	15	18	5	15189	CS13AD180M
2	15	22	7	15229	CS13AD220M
3	15	56	17	15569	CS13AD560M
3	15	68	20	15689	CS13AD680M
4	15	120	36	15121	CS13AD121M
4	15	150	45	15151	CS13AD151M
1	20	1.2	1	16128	CS13AE1R2M
1	20	1.5	1	16158	CS13AE1R5M
1	20	1.8	1	16188	CS13AE1R8M
1	20	2.2	1	16228	CS13AE2R2M
2	20	8.2	3	16828	CS13AE8R2M
2	20	10	4	16109	CS13AE100M

[1]) Maximum leakage current at 25 °C after 5 minutes.

can size	*d.c. rated voltage at 85°C (V)*	*capacitance (μF)*	*leakage current[1]) (μA)*	*catalog number suffix*	*MIL type number*
2	20	12	5	16129	CS13AE120M
2	20	15	6	16159	CS13AE150M
3	20	27	11	16279	CS13AE270M
3	20	33	13	16339	CS13AE330M
3	20	39	16	16399	CS13AE390M
3	20	47	19	16479	CS13AE470M
4	20	56	22	16569	CS13AE560M
4	20	68	27	16689	CS13AE680M
4	20	82	33	16829	CS13AE820M
4	20	100	40	16101	CS13AE101M
1	35	0.33	11	17337	CS13AFR33M
1	35	0.39	1	17397	CS13AFR39M
1	35	0.47	1	17477	CS13AFR47M
1	35	0.56	1	17567	CS13AFR56M
1	35	0.68	1	17687	CS13AFR68M
1	35	0.82	1	17827	CS13AFR82M
1	35	1	1	17108	CS13AF010M
2	35	1.2	1	17128	CS13AF1R2M
2	35	1.5	1	17158	CS13AF1R5M
2	35	1.8	1	17188	CS13AF1R8M
2	35	2.2	2	17228	CS13AF2R2M
2	35	2.7	2	17278	CS13AF2R7M
2	35	3.3	2	17338	CS13AF3R3M
2	35	3.9	3	17398	CS13AF3R9M
2	35	4.7	3	17478	CS13AF4R7M
2	35	5.6	4	17568	CS13AF5R6M
2	35	6.8	5	17688	CS13AF6R8M
3	35	8.2	6	17828	CS13AF8R2M
3	35	10	7	17109	CS13AF100M
3	35	12	8	17129	CS13AF120M
3	35	15	11	17159	CS13AF150M
3	35	18	13	17189	CS13AF180M
3	35	22	15	17229	CS13AF220M
4	35	27	19	17279	CS13AF270M
4	35	33	23	17339	CS13AF330M
4	35	39	27	17399	CS13AF390M
4	35	47	33	17479	CS13AF470M

[1]) Maximum leakage current at 25°C after 5 minutes.

VARIABLE CAPACITORS

Tubular ceramic trimmers

Temperature range: −40 to +100°C
Temperature coefficient: (−200±100) 10^{-6}/deg C
Maximum working voltage: 400 $V_{d.c.}$
Min. parallel damping at 1.5 MHz: 3 MΩ
Soldering: 260°C, 4 s
Operating torque: 0.5–5 N cm

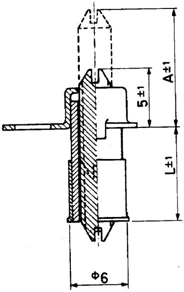


Fig. 1

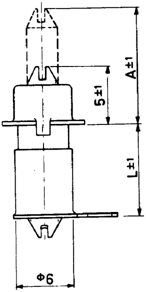


Fig. 2

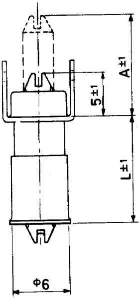
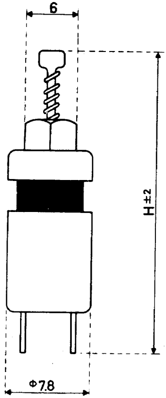


Fig. 3

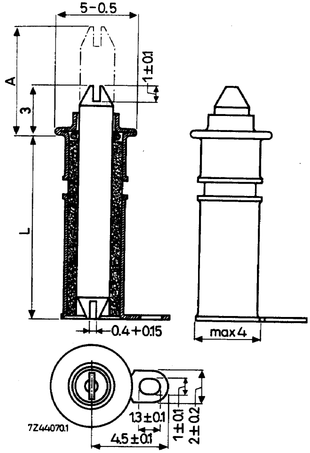
cap. swing (*pF*)	*zero cap.* (*pF*)	*dimensions* (*mm*) *L*	*A*	*Fig.*	*catalog number*
⩾3	⩽0.8	5.5	13.5	1	2222 801 20001
⩾6	⩽0.8	8.5	16.5	1	20002
⩾9	⩽0.9	11.5	19.5	1	20003
⩾12	⩽1	14.5	22.5	1	20004
⩾3	⩽0.8	5.5	13.5	2	20005
⩾6	⩽0.8	8.5	16.5	2	20006
⩾9	⩽0.9	11.5	19.5	2	20007
⩾12	⩽1	14.5	22.5	2	20008
⩾3	⩽0.8	6.5	12.5	3	20011
⩾6	⩽0.8	9.5	15.5	3	20012
⩾9	⩽0.9	12.5	18.5	3	20013
⩾12	⩽1	16	21.5	3	20014

Temperature range: −40 to +85°C
Max. working voltage: 500 $V_{d.c.}$
Min. parallel damping at 1.5 MHz: 3 MΩ
Soldering: 260°C, 5 s
Operating torque: 0.5–5 Ncm



cap. swing (pF)	*zero cap. (pF)*	*temp. coeff. (10^{-6}/deg C)*	*H (mm)*	*catalog number*
⩾6	⩽2.5	−300±100	26.5	2222 801 20021
⩾10	⩽3.5	−300±100	26.5	20022
⩾20	⩽3.5	−400±100	35.5	20023

Temperature range: −40 to +85°C
Max. working voltage: 300 $V_{d.c.}$
Min. parallel damping at 1.5 MHz: 3 MΩ
Soldering:
stator tag: in conformity with I.E.C. 68, test T
cap: the soldering temperature must lie between 240°C and 260°C, maximum soldering time is 10 s.
Operating torque: 0.1–2 N cm



cap. swing (pF)	zero cap. (pF)	temp. coeff. 10^{-6}/deg C	dimensions (mm) L	A	catalog number
⩾3	⩽0.8	−200±100	7.8	10.5	2222 801 20051
⩾6	⩽0.8	−200±200	10.8	13.5	20052

Temperature range: −40 to +100°C
Temperature coefficient: (150±100) 10^{-6}/deg C
Max. working voltage: 300 $V_{d.c.}$
Min. parallel damping at 1.5 MHz: 3 MΩ
Soldering: 250°C. 4 s
Operating torque: 0.5–5 Ncm

cap. swing (pF)	zero cap. (pF)	Fig.	catalog number
⩾3	⩽0.7	1	2222 801 96003
⩾6	⩽0.8	2	96002

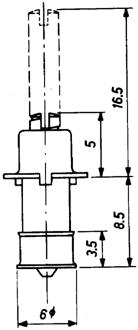


Fig. 1

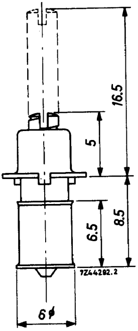
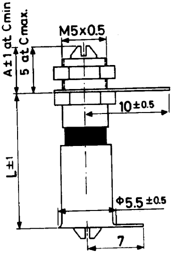


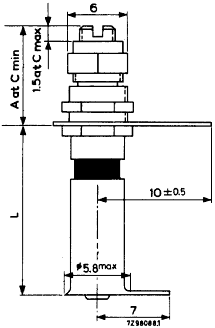
Fig. 2

Temperature range: −40 to +85°C
Temperature coefficient: (−200±200) 10^{-6}/deg C
Max. working voltage: 400 $V_{d.c.}$
Min. parallel damping at 1.5 MHz
trimmers 2222 802 20001 –
2222 802 20004: 10 MΩ
2222 802 20005: 3 MΩ
Operating torque: 0.4–5 Ncm



cap. swing (pF)	zero cap. (pF)	dimensions (mm) L	A	catalog number
⩾3	⩽0.8	11	14.5	2222 802 20001
⩾6	⩽0.8	14	17.5	20002
⩾9	⩽0.9	17	20.5	20003
⩾12	⩽1.0	20	23.5	20004
⩾18	⩽1.7	20	23.5	20005

Temperature range: −40 to +85 °C
Max. working voltage: 500 $V_{d.c.}$
Min. parallel damping at
1.5 MHz and 100 MHz: 10 MΩ
Operating torque: 0.4–4 Ncm

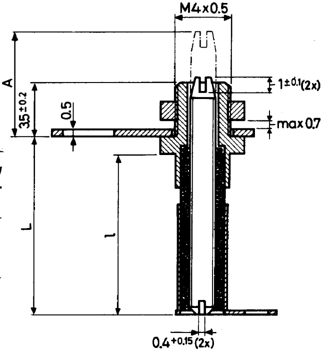


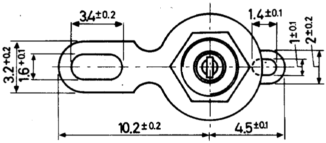
cap. swing (pF)	*zero cap. (pF)*	*temp. coeff. (10^{-6}/deg C)*	*dimensions (mm) L*	*A*	*catalog number*
⩾3	⩽0.5	−10±60	12.9	23.5	2222 802 20011
⩾4.5	⩽0.6	−10±60	15.9	26.5	20012
⩾6	⩽0.7	−10±60	18.4	29	20013
⩾9	⩽0.9	−250±250	15.9	26.5	20014
⩾12	⩽1.0	−250±250	18.9	29	20015

Temperature range: −40 to +85 °C
Temperature coefficient: (−200±200) 10^{-6}/deg C
Max. working voltage: 300 $V_{d.c.}$
Min. parallel damping
at 1.5 MHz: 10 MΩ
Operating torque: 0.1–2 Ncm

Catalog number: 2222 802 . . . . .

cap. swing (pF)	*zero cap. (pF)*	*dimensions (mm) L*	*l*	*A*	*catalog number suffix*
⩾3	⩽0.8	8.3	7.3	9	96035
⩾6	⩽0.8	11.3	10.3	12	96036





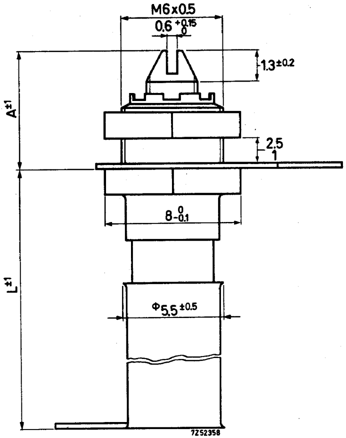


Fig. 1

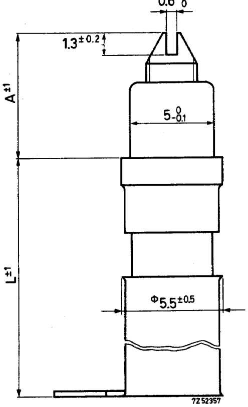


Fig. 2

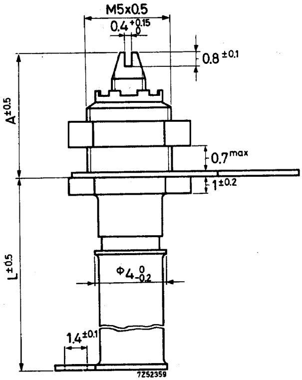


Fig. 3

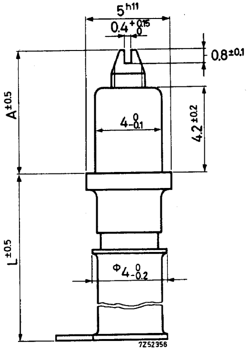


Fig. 4

These trimmers are available with a low dielectric constant (class A types) and with a high dielectric constant (class B types).
Temperature range: -50 to $+100\,^{\circ}C$
Temperature coefficient

class A types: $(-10 \pm 60)\ 10^{-6}$/deg C
class B types: $(-200 \pm 150)\ 10^{-6}$/deg C

Max. working voltage

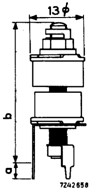
class A types: 630 $V_{d.c.}$
class B types: 400 $V_{d.c.}$

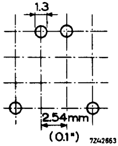
Min. parallel damping at 1.5 MHz: 10 MΩ

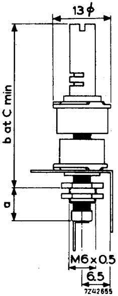
cap. swing (pF)	*zero cap. (pF)*	*class*	*dimensions (mm) see Figs. 1 and 2*		*catalog number 2222 802 960 . .*	
			L	*A at C_{min}*	*Fig. 1*	*Fig. 2*
⩾3	⩽0.8	B	10	13.5	44	51
⩾6	⩽0.8		13	16.5	45	52
⩾9	⩽0.9		16	19.5	46	53
⩾12	⩽1.0		19	22.5	47	54
⩾3	⩽0.5	A	13	16.5	66	69
⩾4.5	⩽0.6		16	19.5	67	71
⩾6	⩽0.7		19	22.5	68	72

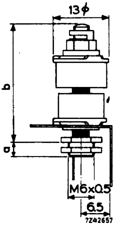
cap. swing (pF)	*zero cap. (pF)*	*class*	*dimensions (mm) see Figs. 3 and 4*		*catalog number 2222 802 960 . .*	
			L	*A at C_{min}*	*Fig. 3*	*Fig. 4*
⩾3	⩽0.8	B	8.3	10	55	57
⩾6	⩽0.8		11.3	13	56	58

Concentric air dielectric trimmers









Temperature range: −40 to +85 °C
Min. parallel damping at 1.5 MHz: 10 MΩ
Tolerance on capacitance: +20 %
Operating torque: 0.5–6.5 Ncm

cap. swing (pF)	*zero cap. (pF)*	*max. working voltage* ($V_{d.c.}$)	*temp. coeff.* (10^{-6}/*deg C*)
⩾6.4	⩽3.5	500	40±100
⩾10	⩽3.5	325	30±75
⩾16	⩽3.5	250	20±75
⩾25	⩽3.5	250	10±50

type		*maximum dimensions (mm)*		*catalog number* 2222 804			
		below chassis (a)	*above chassis (b)*	6.4 *pF*	10 *pF*	16 *pF*	25 *pF*
with tags trim-key adjustment	non-insulated rotor	3.5	27	20021	20022	20023	20024
	insulated rotor	7.5	27	20001	20002	20003	20004

type		*maximum dimensions* (*mm*)		*catalog number* 2222 804			
		below chassis (*a*)	*above chassis* (*b*)	6.4 *pF*	10 *pF*	16 *pF*	25 *pF*
with tags, screw-driver adjustment	non-insulated rotor	3.5	41.5	20031	20032	20033	20034
	insulated rotor	7.5	41.5	20011	20012	20013	20014
with pins, trim-key adjustment	non-insulated rotor	3.5	29	20041	20042	20043	20044
with pins, screw-driver adjustment	non-insulated rotor	3.5	43.5	20051	20052	20053	20054

Air dielectric trimmers

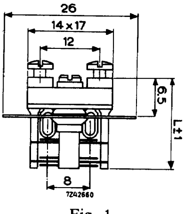


Fig. 1

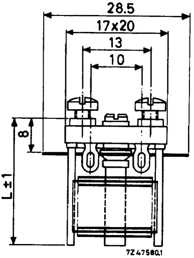


Fig. 2

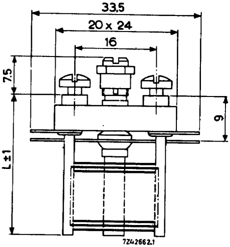


Fig. 3

Temperature range: -40 to $+85\,^{\circ}C$
Temperature coefficient: $(150 \pm 150)\ 10^{-6}$/deg C
Min. parallel damping at 1.5 MHz: 10 MΩ
Tolerance on capacitance: +20% with a minimum of 1 pF
Operating torque: 2–6 Ncm

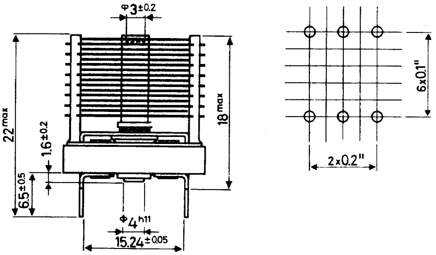
type	Fig.	cap. swing (pF)	zero cap. (pF)	dimension L (mm)	catalog number 2222 804 ..... without locking device	with locking device
single-stator	1	⩾ 2.5	⩽3 [1]	17.5	00001	
		⩾ 4	⩽3 [1]	17.5	00002	
		⩾ 6.4	⩽3 [1]	17.5	00003	
		⩾ 10	⩽3 [1]	21	00004	
		⩾ 16	⩽3 [1]	21	00005	
split-stator	1	⩾ 1.6	⩽2 [2]	17.5	00006	
		⩾ 2.5	⩽2 [2]	21	00007	
		⩾ 4	⩽2.5 [2]	21	00008	
differential	1	⩾ 10	⩽3.5 [3]	21	00009	
		⩾ 16	⩽3.5 [3]	21	00011	
single-stator	2	⩾ 6.4	⩽3 [1]	16	01001	01006
		⩾ 10	⩽3 [1]	16	01002	01007
		⩾ 16	⩽3.5 [1]	19.5	01003	01008
		⩾ 25	⩽3.5 [1]	19.5	01004	01009
		⩾ 40	⩽4 [1]	19.5	01005	01011
split-stator	2	⩾ 2.5	⩽2 [2]	16	01012	01015
		⩾ 4	⩽2.5 [2]	19.5	01013	01016
		⩾ 6.4	⩽2.5 [2]	19.5	01014	01017
differential	2	⩾ 6.4	⩽3 [3]	16	01018	01023
		⩾ 10	⩽3 [3]	16	01019	01024
		⩾ 16	⩽3.5 [3]	19.5	01021	01025
		⩾ 25	⩽3.5 [3]	19.5	01022	01026
single-stator	3	⩾ 10	⩽3.5 [1]	23	02001	02007
		⩾ 16	⩽3.5 [1]	23	02002	02008
		⩾ 25	⩽4 [1]	23	02003	02009
		⩾ 40	⩽4.5 [1]	26.5	02004	02011
		⩾ 64	⩽5 [1]	26.5	02005	02012
		⩾100	⩽5.5 [1]	36.5	02006	02013

[1]) Measured between stator and rotor
[2]) Measured between the two stators
[3]) Measured between stators and rotor

type	*Fig.*	*cap. swing (pF)*	*zero cap. (pF)*	*dimension L (mm)*	*catalog number 2222 804 . . . . . without locking device*	*with locking device*
split-stator	3	⩾ 2.5	⩽2 [1]	23	02014	02021
		⩾ 4	⩽2 [1]	26.5	02015	02022
		⩾ 6.4	⩽2 [1]	26.5	02016	02023
		⩾ 10	⩽2.5 [1]	26.5	02017	02024
		⩾ 16	⩽3 [1]	36.5	02018	02025
		⩾ 25	⩽3 [1]	36.5	02019	02026

[1]) Measured between the two stators

Temperature range: −40 to +80°C
Temperature coefficient: ⩽150.10^{-6}/deg C
Min. parallel damping at 1.5 MHz: 10 MΩ
Tolerance on capacitance: +10% with a minimum of 1 pF
Operating torque: 2–6 Ncm



type	*capacitance swing (pF)*	*zero capacitance (pF)*	*catalog number 2222 804 . . . . .*
single-stator	⩾ 6.4	⩽3 [1]	01027
	⩾10	⩽3 [1]	01028
	⩾16	⩽3.5 [1]	01029
	⩾25	⩽3.5 [1]	01031
	⩾40	⩽4 [1]	01032

[1]) Measured between stator and rotor

type	*capacitance swing (pF)*	*zero capacitance (pF)*	*catalog number 2222 804.....*
split-stator	⩾ 2.5	⩽2 [1]	01033
	⩾ 4	⩽2.5 [1]	01034
	⩾ 6.4	⩽2.5 [1]	90541
differential	⩾ 6.4	⩽3 [2]	01035
	⩾10	⩽3 [2]	01036
	⩾16	⩽3.5 [2]	01037
	⩾25	⩽3.5 [2]	01038

[1]) Measured between the two stators
[2]) Measured between stators and rotor

Film dielectric trimmers

Temperature range: −40 to +70°C
Max. working voltage: 50 $V_{d.c.}$
Soldering: 260°C, 3 s

cap. swing (pF)	*zero cap. (pF)*	*temp. coeff. (10^{-6}/deg C)*	*par. damping at 1.5 MHz (MΩ)*	*operating torque (Ncm)*	*Fig.*	*catalog number 2222 808.....* top adjustment	*catalog number 2222 808.....* top and bottom adjustment
⩾ 5.5	⩽1.4	−750±300	>10	0.1–1.5	1	00004	00011
⩾10	⩽2	−200±300	>3	0.1–1.5	1	00005	00012
⩾22	⩽2	−350±250	>3	0.1–1.5	1	00006	00013
⩾65	⩽5.5	−200±300	>3	0.2–2.5	2	01001	01004

Temperature range: −40 to +150°C
Max. working voltage: 500 V

cap. swing (pF)	*zero cap. (pF)*	*temp. coeff. (10^{-6}/deg C)*	*par. damping at 1.5 MHz (MΩ)*	*operating torque (Ncm)*	*Fig.*	*catalog number 2222 809*
⩾3	⩽1	−200±125	>10	0.1–1.1	3	05001
⩾9	⩽1.8	−250±70	>10	0.25–1.6	3	05002
⩾18	⩽2	−250±70	>2	0.25–1.6	3	05003

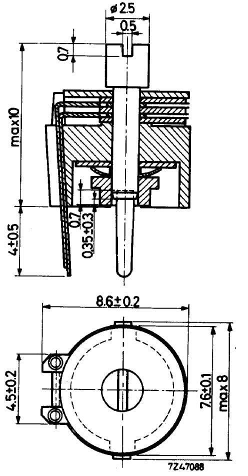


Fig. 1

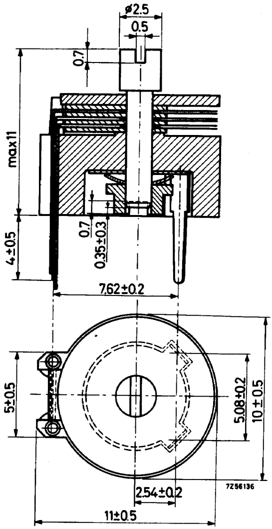


Fig. 2

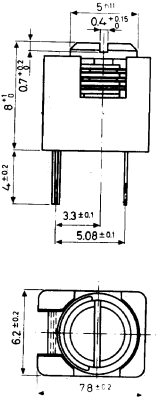


Fig. 3

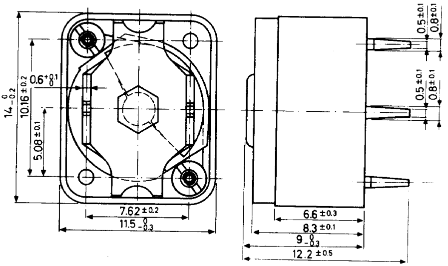


Fig. 4

VARIABLE CAPACITORS

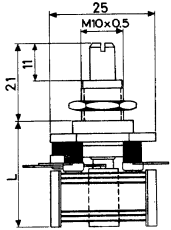
Temperature range: −40 to +150°C
Temperature coefficient: (−150±150) 10^{-6}/deg C
Max. working voltage: 350 V
Min. parallel damping at 1.5 MHz: 10 MΩ
Operating torque: 0.75–3 Ncm

cap. swing (pF)	*zero cap. (pF)*	*Fig.*	*catalog number* 2222 809 .....
≥40	≤4	4	07008
≥60	≤4	4	07011
≥100	≤4	4	07015

Air dielectric correcting capacitors

Temperature range: −40 to +85°C
Temperature coefficient: 25.10^{-6}/deg C
Max. working voltage: 1000 $V_{d.c.}$
Tolerance on capacitance: +10% with a minimum of 1 pF
Operating torque: 1.5–4 Ncm

type	*cap. swing (pF)*	*zero cap. (pF)*	*dim. L (mm)*	*catalog number* *with non-insulated rotor*	2222 804 ..... *with insulated rotor*
single-stator	≥2.5	≤2.5 [1]	23	15001	15017
	≥4	≤2.5 [1]	23	15002	15018
	≥6.4	≤3 [1]	23	15003	15019
	≥10	≤3 [1]	23	15004	15021
	≥16	≤3 [1]	23	15005	15022
	≥25	≤4 [1]	28	15006	15023
	≥40	≤4 [1]	28	15007	15024
	≥64	≤4 [1]	28	15008	15025
	≥100	≤4 [1]	28	15009	15026
split-stator	≥1.6	≤1.5 [2]	23		15027
	≥4	≤2.0 [2]	28		15028
	≥10	≤2.5 [2]	28		15029
differential	≥2.5	≤2.5 [3]	23	15014	15031
	≥10	≤3 [3]	23	15015	15032
	≥40	≤4 [3]	28	15016	15033



[1]) Measured between stator and rotor
[2]) Measured between the two stators
[3]) Measured between stators and rotor

Film dielectric variable capacitors

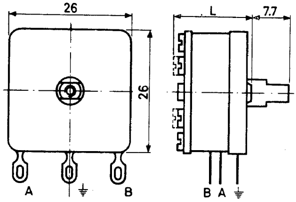


Fig. 1

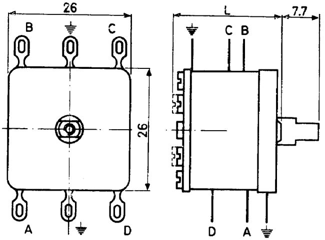


Fig. 2

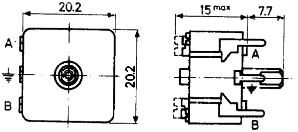


Fig. 3

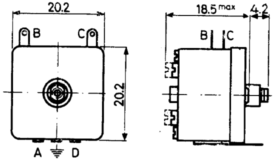


Fig. 4

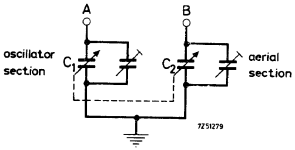


Fig. 5

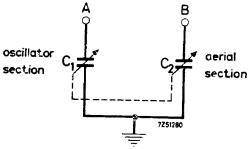


Fig. 6

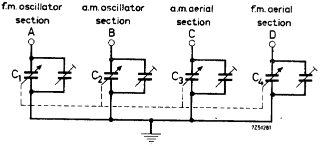


Fig. 7

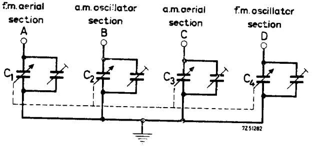


Fig. 8

VARIABLE CAPACITORS

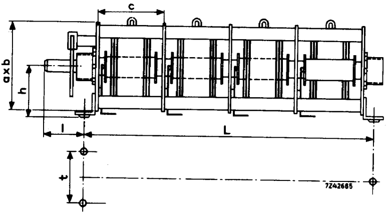
Temperature range: −25 to +70°C
Max. working voltage: 50 V_p
Min. parallel damping at 1.5 MHz: 3 MΩ

sections	*cap. swing (pF)*	*zero cap. (pF)*	*law and ganging tol. (%)*	*temp. coeff. (10^{-6}/deg C)*	*operating torque (Ncm)*	*Figs.*	L_{max} *(mm)*	*cat. number* 2222 807 .....
a.m. aerial	180	5.5	±3	−100±250	0.4–4	1,5	16	10038
a.m. oscillator	180	5.5	±3					
a.m. aerial	195	6.5	±3	−100±350	0.4–4	3,5		10067
a.m. oscillator	195	6.5	±3					
a.m. aerial	280	7	±2	−50±150	0.4–4	1,5	18.5	10044
a.m. oscillator	280	7	±2					
a.m. aerial	385	5	±2	−50±200	0.4–4	1,6	19	10048
a.m. oscillator	385	5	±2					
a.m. aerial	180	5.5	±3	−100±400	0.5–4	1,5	16	10051
a.m. oscillator	80	5.5	±3					
a.m. aerial	195	6	±3	−100±400	0.4–4	3,5		10039
a.m. oscillator	80	5.5	±3					
a.m. aerial	280	7	±2	−50±350	0.4–4.5	2,7	25	10063
a.m. oscillator	280	7	±2					
f.m. aerial	12	7	±2					
f.m. oscillator	12	7	±2					
a.m. aerial	385	7	±2		0.4–4.5	2,7	26	10065
a.m. oscillator	385	7	±2					
f.m. aerial	12	7	±2					
f.m. oscillator	12	7	±2					
a.m. aerial	180	5.5	±3	−100±400	0.4–4.5	2,7	20	10062
a.m. oscillator	80	5.5	±3					
f.m. aerial	9.5	5.5	±3					
f.m. oscillator	9.5	6.5	±3					
a.m. aerial	195	6	±3	−200±200	0.4–4.5	4,8		10043
a.m. oscillator	80	5.5	±3					
f.m. aerial	9.5	5.5	±3					
f.m. oscillator	9.5	5.5	±3					

Precision tuning capacitors

Temperature range: −40 to +85°C
Min. parallel damping at 1.5 MHz: 10 MΩ
Law and ganging tolerances: ±0.7 %

temp. coeff. (10^{-6}/*deg C*)		*number of gangs*
a × *b* = 40 × 40 *mm*	*a* × *b* = 60 × 60 *mm*	
20 ± 20	30 ± 30	1
20 ± 20	30 ± 30	2
30 ± 30	50 ± 50	3
50 ± 50	50 ± 50	4



dimensions in mm		*a* × *b*	*number of gangs*					
			normal gap				*wide gap*	
			1	2	3	4	1	2
distance between mounting holes (±0.5)	L	40 × 40	45	76.5	108	139.5	65	116.5
		60 × 60	67	117.5	168	218.5	103	189.5
	t	40 × 40	22	22	22	22	22	22
		60 × 60	35	35	35	35	35	35
compartment length (±0.2)	c	40 × 40	31.5	31.5	31.5	31.5	51.5	51.5
		60 × 60	50.5	50.5	50.5	50.5	86.5	86.5
shaft length (±0.5)	l	40 × 40	16	16	16	16	16	16
		60 × 60	18	18	18	18	18	18
shaft height (±0.5)	h	40 × 40	22.5	22.5	22.5	22.5	22.5	22.5
		60 × 60	32.5	32.5	32.5	32.5	32.5	32.5

VARIABLE CAPACITORS

size a × b = 40 × 40 mm, linear capacitance law, insulated or non-insulated rotor

single-stator (1–4 gangs) or differential[1]) (1 gang)	C_{var} (pF)		16	25	40	64	100	160	250
	$C_0 \pm 1$ (pF)[2])	normal gap	8	8.5	9	9	10	11	11.5
		wide gap			14	15	15.5	16	18.5
split-stator (1–4 gangs)	C_{var} (pF)		6.4	10	16	25	40	64	
	$C_0 \pm 1$ (pF)	normal gap	3	3	3.6	4	4	4	
		wide gap		4	4.5	4.5	5	5	

size a × b = 60 × 60 mm, linear capacitance law, insulated or non-insulated rotor

single-stator (1–4 gangs)	C_{var} (pF)		100	125	160	200	250	320	400	500	640
	$C_0 \pm 1$ (pF)	normal gap	14.5	15	15.5	16	16	17.5	19	20.5	21.5
		wide gap				26	26.5	27.5	28	29.5	30.5
split-stator (1–4 gangs)	C_{var} (pF)		25	32	40	50	64	80	100	125	
	$C_0 \pm 1$ (pF)	normal gap	5	5	5	5	5.5	5.5	5.5	6	
		wide gap				7	8.5	8	8	8	

[1]) Differential type only up to and including $C_{var} = 160$ pF.
[2]) For the differential version the C_0 values are 1 pF less than the tabulated values.

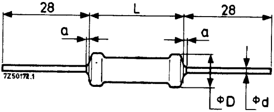
size a × b = 60 × 60 mm, logarithmic capacitance law, insulated or non-insulated rotor

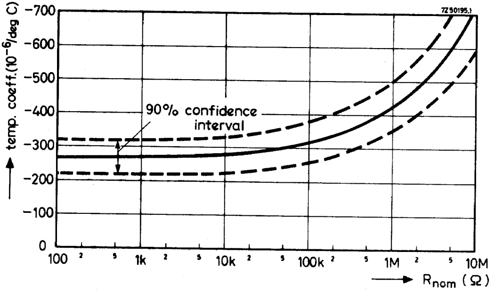
single-stator (1–4 gangs)	C_{var} (pF)		100	125	160	200	250	320	400	500
	$C_0 \pm 1$ (pF)	normal gap	13	13	14.5	14.5	14	14	14	14
		wide gap				23	22.5	22.5	22.5	21.5
split-stator (1–4 gangs)	C_{var} (pF)		25	32	40	50	64	80	100	125
	$C_0 \pm 1$ (pF)	normal gap	5	5	5.5	5.5	5.5	5.5	5.5	5.5
		wide gap				6.5	6.5	6.5	7	6.5

FIXED RESISTORS

Carbon film resistors

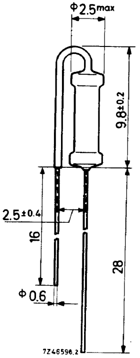
style	$D_{max.}$	$L_{max.}$	$a_{max.}$	*d*
CR16	1.6	4.5	1.0	0.4
CR25	2.5	7.5	1.0	0.6
CR37	3.7	10	1.0	0.7
CR52	5.2	18	1.2	0.8
CR68	6.8	18	1.2	0.8
CR93	9.3	38.5	3.2	1



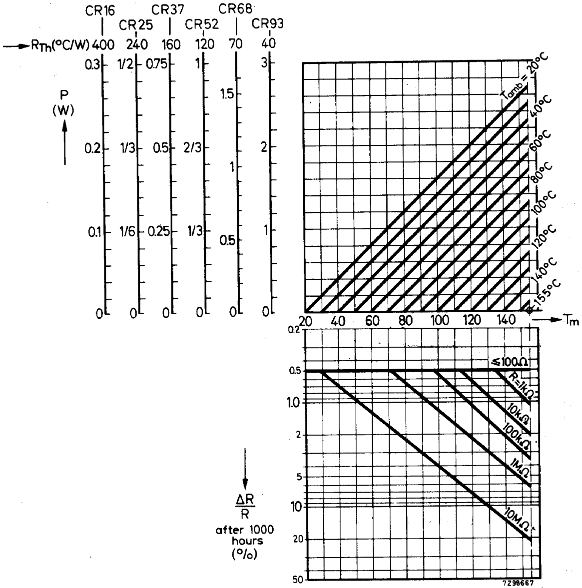


Temperature coefficient as a function of the resistance value, applicable to all resistor styles.

Style CR25A
The bent lead is covered with an insulating lacquer having a break-down voltage of minimum 50 $V_{d.c.}$



Minimum ambient temperature −55 °C
Max. hot-spot temperature 155 °C



Performance nomogram for the different styles of resistor, showing the relationship between power dissipation P, ambient temperature T_{amb}, hot-spot temperature T_m, resistance value R and max. resistance drift $\Delta R/R$ after 1000 hours operation; maximum voltage not being taken into account.

Standard range

style	*limiting voltage* V_{rms}	*resistance range*	*tolerance* ±	*series*	*catalog number*
CR16	150	10 Ω–220 kΩ	5%	E24	2322 210 03 . . .
		270 kΩ–1 MΩ	10%	E12	2322 210 02 . . .
CR25	250	1 Ω–1 MΩ	5%	E24	2322 101 33 . . .
		10 Ω–220 kΩ	2%	E24	2322 101 34 . . .
		10 Ω–220 kΩ	1%	E24	2322 221 0 . . 0.
		270 kΩ–10 MΩ	10%	E12	2322 101 32 . . .
CR25A	250	1 Ω–3.9 Ω	10%	E12	2322 106 32 . . .
		4.3 Ω–1 MΩ	5%	E24	2322 106 33 . . .
		10 Ω–1 MΩ	2%	E24	2322 106 34 . . .
CR37	350	1 Ω–1 MΩ	5%	E24	2322 212 13 . . .
		10 Ω–1 MΩ	2%	E24	2322 212 14 . . .
		10 Ω–1 MΩ	1%	E24	2322 222 0. . 0 .
		1.2 MΩ–10 MΩ	10%	E12	2322 212 12 . . .
CR52	500	1 Ω–1 MΩ	5%	E24	2322 101 63 . . .
		10 Ω–1 MΩ	1%	E24	2322 223 8. . 0 .
		1.2 MΩ–22 MΩ	10%	E12	2322 101 62 . . .
CR68	750	1 Ω–1.6 MΩ	5%	E24	2322 214 13 . . .
		10 Ω–1.6 MΩ	1%	E24	2322 224 0. . 0 .
		1.8 MΩ–22 MΩ	10%	E12	2322 214 12 . . .
CR93	1000	1 Ω–1.6 MΩ	5%	E24	2322 102 83 . . .
		10 Ω–1.6 MΩ	1%	E24	2322 225 8. . 0 .
		1.8 MΩ–10 MΩ	10%	E12	2322 102 82 . . .

Composition of the catalog number

In the above mentioned catalog number replace the first two dots by the first two digits of the resistance value. Replace the third dot by a figure according to the following table:

1– 9.1 Ω	8	10– 91 kΩ	3
10– 91 Ω	9	100–910 kΩ	4
100–910 Ω	1	1– 9.1 MΩ	5
1– 9.1 kΩ	2	10– 22 MΩ	6

FIXED RESISTORS

Metal film resistors

	style	*Fig.*	$D_{max.}$	$L_{max.}$	*d*
moulded type	MR31	1	3.1	7.0	0.6
	MR39	1	3.9	11.1	0.6
	MR58	1	5.8	16.6	0.6
	MR81	1	8.1	20.6	0.8
lacquered type	MR25	2	2.5	7.0	0.6
	MR30	2	3.0	10.0	0.6

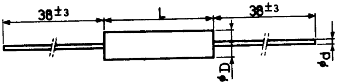


Fig. 1

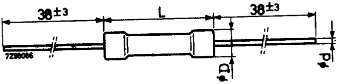
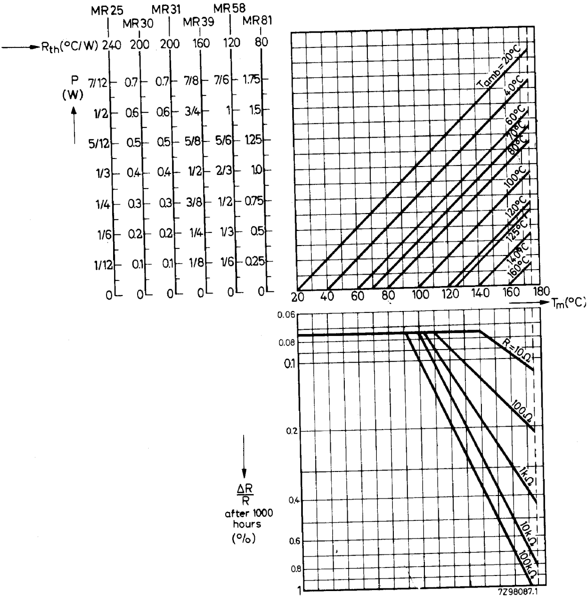


Fig. 2



Standard range

	max. temp. coeff. $(10^{-6}/^{\circ}C)$	*resistance range*	*tolerance* ± %	*series*	*limiting voltage*	*cat. number* 2322 *followed by*
MR31E	+ 25	49.9 Ω–100 kΩ	0.1/0.25/0.5/1	E192	250	123 . . . . .
C	+ 50	49.9 Ω–100 kΩ	0.1/0.25/0.5/1	E192	250	124 . . . . .
D	+100	10 Ω–100 kΩ	1	E96	250	125 5 . . . .
MR39E	+ 25	49.9 Ω–499 kΩ	0.1/0.25/0.5/1	E192	350	126 . . . . .
C	+ 50	49.9 Ω–499 kΩ	0.1/0.25/0.5/1	E192	350	127 . . . . .
D	+100	10 Ω–301 kΩ	1	E96	350	128 5 . . . .
MR58E	+ 25	49.9 Ω–1 MΩ	0.1/0.25/0.5/1	E192	500	129 . . . . .
C	+ 50	49.9 Ω–1 MΩ	0.1/0.25/0.5/1	E192	500	130 . . . . .
D	+100	10 Ω–681 kΩ	1	E96	500	131 5 . . . .
MR81E	+ 25	24.9 Ω–1 MΩ	0.1/0.25/0.5/1	E192	750	132 . . . . .
C	+ 50	24.9 Ω–1 MΩ	0.1/0.25/0.5/1	E192	750	133 . . . . .
D	+100	10 Ω–1 MΩ	1	E96	750	134 5 . . . .
MR25	+100	4.99 Ω–100 kΩ	1	E96	250	151 5 . . . .
MR25	+100	5.1 Ω–100 kΩ	2	E24	250	151 4 . . . .
MR30	+100	5.1 Ω–300 kΩ	2	E24	350	152 4 . . . .
MR30	+100	4.99 Ω–301 kΩ	1	E96	350	152 5 . . . .

Catalog number suffix

2322 . . . .

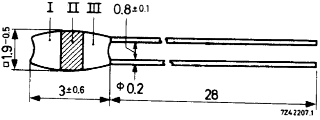
code for tolerance:

±2 %	= 4
±1 %	= 5
±0.5 %	= 6
±0.25 %	= 7
±0.1 %	= 8

code for resistance value: three significant digits of the resistance value followed by a digit for the multiplier,

8 for R of 4.99 to 9.88 Ω
9 for R of 10 to 98.8 Ω
1 for R of 100 to 988 Ω
2 for R of 1 to 9.88 kΩ
3 for R of 10 to 98.8 kΩ
4 for R of 100 to 988 kΩ
5 for R of 1 MΩ

Insulated pin-head carbon resistors



Max. dissipation at 70°C	0.05 W
Resistance values	47 Ω to 120 kΩ, E12 series
Tolerance	±10% and ±20%
Noise	<10 μV/V
Limiting voltage, peak value	50 V_p
Temperature coefficient (from +25 to +70°C)	$(+1000$ to $-2000) 10^{-6}$/deg C
Ambient temperature range	−10 to +100°C
International colour code	

Composition of the catalog number

For tolerance +10 %: 2322 120 22 . . .

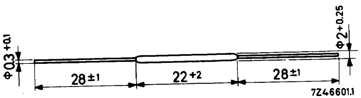
For tolerance +20 %: 2322 120 21 . . .

The first two digits of the resistance value, neglecting a decimal point.

digit for multiplying factor:

9 = × 1
1 = × 10
2 = × 100
3 = × 1000
4 = × 10000

Low-ohmic glass-sealed wire resistors



Maximum dissipation at 40 °C	1 W
Resistance values	0.1 to 6.8 Ω, E12 series
Tolerance	±10 %
Temperature coefficient	(−50 to +150) 10^{-6}/deg C
Operating body temperature	−25 to +275 °C

Composition of the catalog number

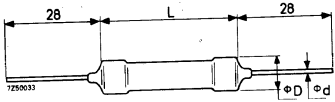
2322 327 61 . . .

The first two digits of the resistance value, neglecting a decimal point.

digit for multiplying factor:

7 = × 0.01
8 = × 0.1

Precision wire-wound resistors



Max. dissipation at 40°C	0.4 to 1.8 W
Resistance values	1 Ω to 57 kΩ, E192 series
Tolerance	±0.5% and ±0.25%
Temperature coefficient (±)	$<20.10^{-6}$/deg C
Ambient temperature range	−55 to +110°C

P_{nom} (*W*)	*nominal resistances* *min.* (Ω)	*max.* (*k*Ω)	$D_{max.}$	$L_{max.}$	*d*	*catalog series number*
0.4	1	3.2	4	13	0.8	260
0.6	3	7	5	19	0.8	261
0.7	6	12.5	5	28	0.8	262
1.2	17	33	7	43	1	263
1.8	25	57	7	67	1	264

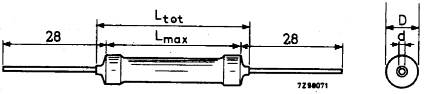
Composition of the catalog number

2322 . . . .

- Series number, see above
- Tolerance code: 5 = ±0.5 %; 6 = ±0.25%
- The first three digits of the resistance value, neglecting a decimal point
- Multiplier code: 8 = ×0.01 Ω; 9 = ×0.1 Ω; 1 = ×1 Ω; 2 = ×10 Ω; 3 = ×100 Ω

Cemented wire-wound resistors

style	*dimensions* (*mm*) L_{tot}	$L_{max.}$	*D*	*d*
WR0617	22	17	6	0.8
WR0825	30	25	8	1.0
WR1035	40	35	10	1.1
WR1047	51	47	10	1.1



FIXED RESISTORS

Max. permissible surface temperature 400°C
Ambient temperature range −40 to +155°C
Temperature coefficient −50 to $+160 \cdot 10^{-6}$/degC

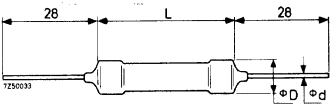
style	*dissipation at 40°C*	*resistance range (E12 series)*	*tolerance*	*catalog number*
WR0617	5 W	5.6–47 Ω	±10%	2322 325 31 ...
		56–4700 Ω	±5%	2322 325 32 ...
WR0825	8 W	6.8–27 Ω	±10%	2322 325 21 ...
		33–10000 Ω	±5%	2322 325 22 ...
WR1035	11 W	10–15000 Ω	±5%	2322 325 12 ...
WR1047	17 W	15–27000 Ω	±5%	2322 325 02 ...

Catalog number suffix
The resistance value in the catalog number is indicated by the two significant digits of the resistance value (in Ω) followed by a digit for the multiplier, the multiplier code being:

×0.1	8	×100	2
×1	9	×1000	3
×10	1		

Enamelled wire-wound resistors

Max. dissipation at 40°C (P_{nom}) 5.5, 8, 10 and 16 W
Resistance values 4.7 Ω–100 kΩ, E12 series
Tolerances ±10% and ±5%
Temperature coefficient −50 to $+140 \cdot 10^{-6}$/deg C
Ambient temperature range −55 to +155°C



d = 1.1 mm

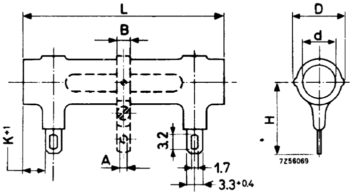
P_{nom} (W)	resistance values tolerance (± .. %)	min. (Ω)	max. (Ω)	$D_{max.}$	$L_{max.}$	catalog number: 2322 320 followed by
5.5	10	4.7	180	8	20	31 ...
5.5	5	220	15000	8	20	32 ...
8	10	4.7	47	8	29	21 ...
8	5	56	33000	8	29	22 ...
10	5	10	56000	8	44	12 ...
16	5	15	100000	8	67	02 ...

Catalog number suffix
This is formed by the first two digits of the resistance value, neglecting a decimal point, followed by a multiplier

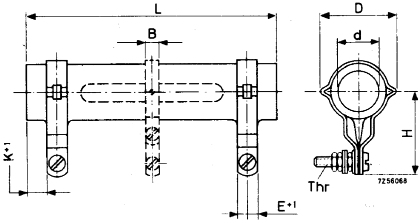
Multiplier code:		
	× 0.1 Ω = 8	× 10^2 Ω = 2
	× 1 Ω = 9	× 10^3 Ω = 3
	× 10 Ω = 1	× 10^4 Ω = 4

Fixed and adjustable wire-wound resistors with side terminiations

	cemented	*enamelled*
Max. dissipation at 40°C (P_{nom})	8(10)–250 W	8(10)–100 W
Resistance values (E12 series)	1 Ω–11 kΩ	160 Ω–120 kΩ (47 kΩ)
Tolerance	±5% (±10%)	±5%
Temperature coefficient	(−50 to +140) 10^{-6}/deg C	
Ambient temperature range	−55 to +155°C	



Resistors with $P_{nom} \leqslant 40$ W



Resistors with $P_{nom} \geq 60$ W

P_{nom} (W)	dimensions in mm								
	$D_{max.}$	$d_{min.}$	H	K	E	$L_{max.}$	B	A	Thr
8	11.5	5	14	2.5	—	26	—	—	—
10	11.5	5	14	4	—	41	5	2.8	—
16	11.5	5	14	4	—	63	5	2.8	—
25	16	8	14	4	—	64	6	3.2	—
40	16	8	14	4	—	103	6	3.2	—
60	32	12.5	33	6	9	103	6	—	M4
100	32	12.5	33	6	9	165	6	—	M4
160	44	20	40	8	11	165	8	—	M4
250	44	20	40	8	11	256	8	—	M4

coating	P_{nom} [1]) (W)	tol. (± .. %)	min. (Ω)	maxim. (Ω) fixed	maxim. (Ω) adjust.	short circuit [1]) (% R_{nom})	$D_{max.}$ mm	$L_{max.}$ mm	catalog number 2322 followed by fixed	adjust.
cement	8	10	1	100			11.5	26	323 14 . . .	
		5	110	150					323 34 . . .	
enamel		5	160	5600					321 34 . . .	
cement	10	10	1.2	27	27	9	11.5	41	323 12 . . .	324 12 . . .
		5	30	300	300				323 32 . . .	324 32 . . .
enamel		5	330	12000	3300				321 32 . . .	322 32 . . .
cement	16	10	1.5	2.7	2.7	5	11.5	63	323 10 . . .	324 10 . . .
		5	3	620	620				323 30 . . .	324 30 . . .
enamel		5	680	24000	6800				321 30 . . .	322 30 . . .
cement	25	10	2.7	15	15	4	16	64	323 08 . . .	324 08 . . .
		5	16	820	820				323 28 . . .	324 28 . . .
enamel		5	1000	39000	9100				321 28 . . .	322 28 . .
cement	40	5	4.7	1600	1600	2.5	16	103	323 26 . . .	324 26 . . .
enamel		5	1800	75000	18000				321 26 . . .	322 26 . . .
cement	60	5	3	2200	2200	3	32	103	323 24 . . .	324 24 . . .
enamel		5	2400	68000	24000				321 24 . . .	322 24 . . .
cement	100	5	6.8	4300	4300	1.5	32	165	323 23 . . .	324 23 . . .
enamel		5	4700	120000	47000				321 23 . . .	322 23 . . .
cement	160	5	10	6800	6800	1.5	44	165	323 22 . . .	324 22 . . .
cement	250	5	16	11000	11000	1	44	256	323 21 . . .	324 21 . . .

[1]) The adjustable contact short-circuits a number of windings. The maximum resistance loss has been given as a percentage of the nominal resistance. Nominal dissipation and nominal resistance values apply if no contact strap were connected.

Composition of the catalog number

2322 . . . .

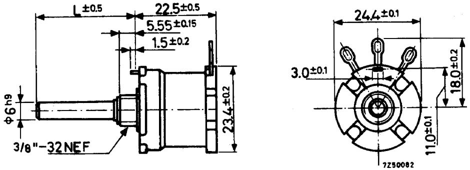
See table

The first two digits of the resistance value, neglecting a decimal point.

Multiplier code: 8 = × 0.1 Ω
9 = × 1 Ω
1 = × 10 Ω
2 = × 10^2 Ω
3 = × 10^3 Ω
4 = × 10^4 Ω

VARIABLE RESISTORS

Wire-wound trimming potentiometers



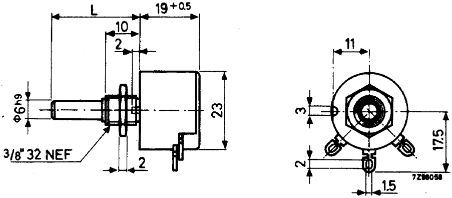
Maximum permissible dissipation at 40°C 3 W
at 70°C 2 W

adjustment	*spindle length*	*catalog number*
screw driver	9 mm	2322 000 02 . . .
knob	15 mm	2322 000 22 . . .
knob	20 mm	2322 000 32 . . .

resistance values (Ω) ±5 %	*catalog number suffix*
47	479
50	509
68	689
75	759
100	101
150	151
200	201
220	221
250	251
330	331

resistance values (Ω) ±5 %	*catalog number suffix*
470	471
500	501
680	681
750	751
1000	102
1500	152
2000	202
2200	222
2500	252
3300	332

Wire-wound potentiometers



Maximum permissible dissipation at 40 °C 1 W

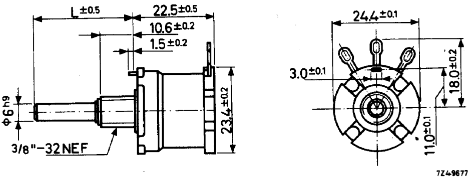
adjustment	*spindle length L*	*catalog number*
screwdriver	13 mm	2322 001 0 . . . .
for joining an extension spindle	21.6 mm	2322 001 1 . . . .
knob	25 mm	2322 001 2 . . . .
knob	50 mm	2322 001 3 . . . .

1 = $R \pm 10\%$
2 = $R \pm 5\%$ (only for $R > 35\ \Omega$)

resistance values in Ω	*T.C. in 10^{-6}/deg C*	*catalog number suffix*
1	0 to +600	108
1.5	0 to +600	158
2	0 to +600	208
2.5	0 to +600	258
3.5	0 to +600	358
5	0 to +600	508
7.5	0 to +600	758
10	0 to +600	109
15	0 to +600	159
20	0 to +600	209
25	0 to +600	259
35	−25 to +25	359
50	−25 to +25	509
75	−25 to +25	759
100	−25 to +25	101
150	−25 to +25	151
200	−25 to +25	201
250	−25 to +25	251

resistance value in Ω	*T.C. in 10^{-6}/deg C*	*catalog number suffix*
350	0 to +140	351
500	0 to +140	501
750	0 to +140	751
1000	0 to +140	102
1500	0 to +140	152
2000	0 to +140	202
2500	0 to +140	252
3500	0 to +140	352
5000	0 to +140	502
7500	0 to +140	752
10000	0 to +140	103
15000	0 to +140	153
20000	−25 to +25	203
25000	−25 to +25	253

Wire-wound potentiometers



Maximum permissible dissipation at 40°C: 3 W
at 70°C: 2 W

adjustment	*spindle length L*	*catalog number*
screw driver	14 mm	2322 003 0 . . . .[1])
		010 0 . . . .[2])
knob	17 mm	2322 003 2 . . . .
		010 2 . . . .
knob	20 mm	2322 003 3 . . . .
		010 3 . . . .
knob	30 mm	2322 003 4 . . . .
		010 4 . . . .
knob	60 mm	2322 003 5 . . . .
		010 5 . . . .

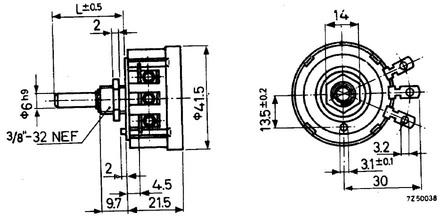
[1]) 2322 003 for radial soldering tags
[2]) 2322 010 for tags in axial direction

1 = $R \pm 10\%$
2 = $R \pm 5\%$
6 = $R \pm 10\%$ with center tap
7 = $R \pm 5\%$ with center tap

resistance value in Ω	*temperature coefficient in 10^{-6}/deg C*	*catalog number suffix*
2.2	0 to +600	228
3.3	0 to +600	338
4.7	0 to +600	478
6.8	0 to +600	688
10	0 to +600	109
15	0 to +600	159
22	0 to +600	229
33	−25 to +600	339
47	−25 to +600	479
68	−25 to +25	689
100	−25 to +25	101
150	−25 to +25	151
220	−25 to +25	221

resistance value in Ω	*temperature coefficient in 10^{-6}/deg C*	*catalog number suffix*
330	−25 to +140	331
470	−25 to +140	471
680	0 to +140	681
1000	0 to +140	102
1500	0 to +140	152
2200	0 to +140	222
3300	0 to +140	332
4700	0 to +140	472
6800	0 to +140	682
10000	−20 to +140	103
15000	−20 to +140	153
22000	−20 to +140	223

Wire-wound potentiometers



Maximum permissible dissipation at 40°C: 3 W

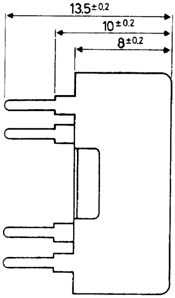
adjustment	*spindle length L*	*catalog number*
screwdriver	14	2322 004 2 . . . .
knob	20	3 . . . .
knob	25	4 . . . .
knob	30	5 . . . .
knob	35	6 . . . .
knob	80	7 . . . .

1 for $R \pm 10\%$
2 for $R \pm 5\%$ (only for $R > 75\ \Omega$)

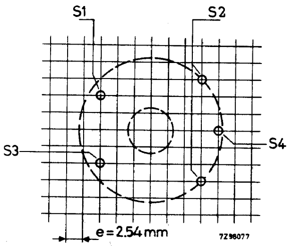
resistance value in Ω	*T.C. in 10^{-6}/deg C*	*catalog number suffix*
10	0 to +600	109
15	0 to +600	159
20	0 to +600	209
25	0 to +600	259
35	0 to +600	359
50	0 to +600	509
75	0 to +600	759
100	−25 to +25	101
150	−25 to +25	151
200	−25 to +25	201
250	−25 to +25	251
350	−25 to +25	351
500	−25 to +25	501
750	−25 to +25	751
1000	−25 to +25	102

resistance value in Ω	*T.C. in 10^{-6}/deg C*	*catalog number suffix*
1500	0 to +140	152
2000	0 to +140	202
2500	0 to +140	252
3500	0 to +140	352
5000	0 to +140	502
7500	0 to +140	752
10000	0 to +140	103
15000	0 to +140	153
20000	0 to +140	203
25000	0 to +140	253
35000	−20 to +20	353
50000	−20 to +20	503

Wire-wound trimming potentiometers



Non-tapped version



Mounting holes
(Hole S_4 is for the tapped version)

For mounting on printed-wiring boards
Maximum permissible dissipation at 40°C: 2 W
at 70°C: 1 W

Catalog number: 2322 011 . . . . .

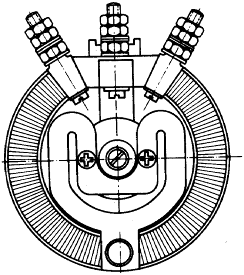
02 = without tap, without knob
03 = with tap, without knob
22 = without tap, with knob
23 = with tap, with knob

. . . . . = resistance code, see table

resistance value ±10 % (Ω)	*resistance code*
2.2	228
3.3	338
4.7	478
6.8	688
10	109
15	159
22	229
33	339
47	479
68	689

resistance value ±10 % (Ω)	*resistance code*
100	101
120	121
150	151
180	181
220	221
330	331
470	471
680	681
1000	102
150+150	301

Load potentiometers



max. perm. dissipation	dimensions in mm diameter	length*)	catalog number
25 W	36	26	2322 095 . . . . .
40 W	46	32	2322 096 . . . . .
100 W	66	48	2322 097 . . . . .

*) behind mounting panel

Temperature coefficient (−140 to +140) 10^{-6}/deg C
Ambient temperature range −55 to +100 °C

Composition of the catalog number

2322 . . . .

code for nominal dissipation

code for resistance value, see Table
21 for spindle length = 17 mm
31 for spindle length = 36 mm

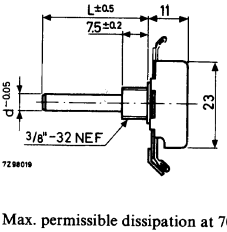
resistance values ±10%	*resistance code*
0.5 Ω[1]	507
0.75[2]	757
1	108
1.5	158
2	208
2.5	258
3.5	358
5	508
7.5	758
10	109
15	159
20	209
25	259
35	359
50	509
75	759

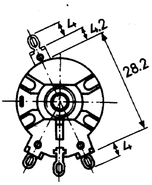
resistance values ±10%	*resistance code*
100 Ω	101
150	151
200	201
250	251
350	351
500	501
750	751
1000	102
1500	152
2000	202
2500	252
3500	352
5000	502
7500	752
10000[2]	103

[1] Not available in 25 W and 100 W. [2] Not available in 25 W.

Ganging units
For ganging two load potentiometers gauging units are available.

23 mm single carbon potentiometers





Max. permissible dissipation at 70 °C

linear resistance law	0.125 W
logarithmic resistance law	0.0625 W

types	*catalog number*
without switch	2322 350 . . . . .
with SPST rotary switch	2322 353 . . . . .
with DPST push-pull switch, 1A	2322 354 . . . . .
with DPST push-pull switch, 2A	2322 355 . . . . .
with DPDT push-pull switch	2322 356 . . . . .
with DPST rotary switch	2322 357 . . . . .

The catalog number prefix is followed by 3 digits for terminal and spindle type and then by 2 digits for resistance value and law.

spindle type (plastic)		*8th to 10th digit in catalog number*	
		tags	*pins*
plain, $d=6$ mm,	$L=18$ mm	706	756
	$L=30$ mm	703	753
	$L=60$	707	757
with screw driver slot	$L=11$ [1])	710	760
with flat face	$L=18$ [1])	740	790
	$L=30$	743	793
	$L=60$	747	797
plain, $d=\frac{1}{4}''$	$L=30$ [2])	723	773
	$L=60$ [2])	727	777

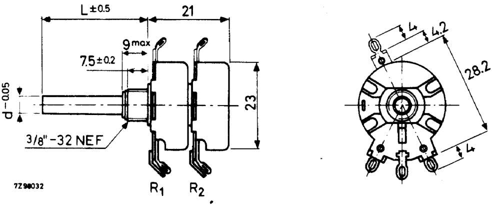
[1]) not for potentiometers with a push-pull switch
[2]) not applicable to the types 2322 356 and 357

resistance value ±20%	*11th and 12th digit in catalog number*		
	linear	*logarithmic*	
220 Ω	02		
300 Ω	19		59*)
470 Ω	03		43*)
1 kΩ	04	24	44*)
2.2 kΩ	05	25	
4.7 kΩ	06	26	46*)
10 kΩ	07	27	47*)
22 kΩ	08	28	48*)
47 kΩ	09	29	49*)
100 kΩ	11	31	51*)
220 kΩ	12	32	
470 kΩ	13	33	53*)

*) negative logarithmic

resistance value ±20%	*11th and 12th digit in catalog number*		
	linear	*logarithmic*	
1 MΩ	14	34	54*)
2.2 MΩ	15	35	55*)
4.7 MΩ	16		
400+600 kΩ	89		
100+900 kΩ		64	
0.2+2 MΩ		68	
50+420 kΩ		73	
200+800 kΩ		78	
5+17 kΩ		82	
50+170 kΩ		83	
0.5+1.7 MΩ		84	

23 mm tandem carbon potentiometers



Max. permissible dissipation at 70 °C

linear resistance law	0.125	W
logarithmic resistance law	0.0625	W

types	*catalog number*
without switch	2322 360 . . . . .
with SPST rotary switch	2322 362 . . . . .
with DPST rotary switch	2322 366 . . . . .

VARIABLE RESISTORS

The catalog number prefix is followed by 3 digits for terminal and spindle type and then by 2 digits for resistance value and law.

spindle type (plastic)		*8th to 10th digit in catalog number*	
		tags	*pins*
plain, $d=6$ mm,	$L=18$ mm	706	756
	$L=30$ mm	703	753
	$L=60$ mm	707	757
with screwdriver slot,	$L=11$ mm	710	760
with flat face	$L=18$ mm	740	790
	$L=30$ mm	743	793
	$L=60$ mm	747	797
plain, $d=\frac{1}{4}''$,	$L=30$ mm*)	723	773
	$L=60$ mm*)	727	777

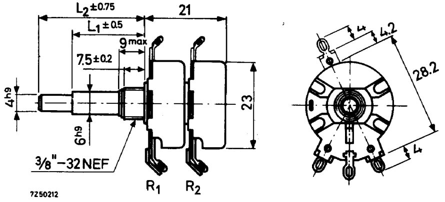
*) not applicable to type 2322 366

resistance value ±20%	*11th and 12th digit in catalog number*	
	linear	*logarithmic*
1 kΩ	04	24
2.2 kΩ	05	25
4.7 kΩ	06	26
10 kΩ	07	27
22 kΩ	08	28
22 kΩ*)	92	
47 kΩ	09	29
100 kΩ	11	31
220 kΩ	12	32
470 kΩ	13	33
470 kΩ*)	96	

resistance value ±20%	*11th and 12th digit in catalog number*	
	linear	*logarithmic*
1 MΩ	14	34
1 MΩ*)	97	
2.2 MΩ	15	35
4.7 MΩ	16	
5+17 kΩ		82
50+170 kΩ		83
50+420 kΩ		73
400+600 kΩ	89	
200+800 kΩ		78
100+900		64
0.2+2 MΩ		68
0.5+1.7 MΩ		84

*) balance potentiometer

23 mm twin carbon potentiometers



Max. permissible dissipation at 70 °C

- linear resistance law 0.125 W
  logarithmic resistance law 0.0625 W

types	*catalog number*
without switch	2322 470 . . . . .
with DPST rotary switch	2322 476 . . . . .

Composition of the catalog number suffix

2322 47 . . . . . .

code for spindle length

code for resistance value and law of R_2

code for resistance value and law of R_1

spindle length	*code in catalog number*
I $L_1 =$ 18 mm, $L_2 = 30.5$ mm	0
$L_1 =$ 30 mm, $L_2 = 42.5$ mm	1
$L_1 =$ 60 mm, $L_2 = 72.5$ mm	2

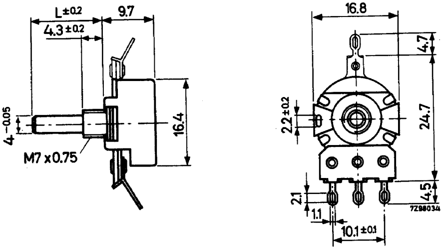
VARIABLE RESISTORS

resistance value of R_1 and R_2, ±20%	*code in catalog number*		
	linear	*logarithmic*	
220 Ω	02		
300 Ω	19		59*
470 Ω	03		
1 kΩ	04	24	
2.2 kΩ	05	25	
4.7 kΩ	06	26	
10 kΩ	07	27	
22 kΩ	08	28	
47 kΩ	09	29	
100 kΩ	11	31	
220 kΩ	12	32	
470 kΩ	13	33	

resistance value of R_1 and R_2, ±20%	*code in catalog number*		
	linear	*logarithmic*	
1 MΩ	14	34	54*
2.2 MΩ	15	35	55*
4.7 MΩ	16		
5+17 kΩ		82	
50+170 kΩ		83	
50+420 kΩ		73	
400+600 kΩ	89		
200+800 kΩ		78	
100+900 kΩ		64	
0.2+2 MΩ		68	
0.5+1.7 MΩ		84	

*) negative logarithmic.

16 mm single carbon potentiometers



Max. permissible dissipation at 40°C
linear resistance law 0.1 W
logarithmic resistance law 0.05 W

types	*catalog number*
without switch	2322 380 .....
with SPST rotary switch	2322 381 .....

The catalog number prefix is followed by 3 digits for terminal and spindle type and then by 2 digits for resistance value and law.

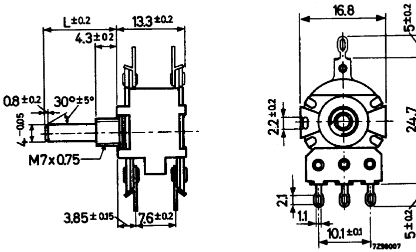
spindle type (plastic)		*8th to 10th digit in catalog number*	
		tags	*pins*
with screwdriver slot	$L=$ 8 mm	710	760
plain	$L=10$ mm	711	761
	$L=15$ mm	712	762
	$L=20$ mm	715	765
	$L=30$ mm*)	703	753
with flat face	$L=10$ mm	742	792
	$L=15$ mm	744	794
	$L=20$ mm	746	796

*) not available for potentiometers with switch

resistance value ±20%	*11th and 12 th digit in catalog number*	
	linear	*logarithmic*
1 kΩ	04	24
2.2 kΩ	05	25
4.7 kΩ	06	26
10 kΩ	07	27
22 kΩ	08	28
47 kΩ	09	29
100 kΩ	11	31

resistance value ±20%	*11th and 12th digit in catalog number*	
	linear	*logarithmic*
220 kΩ	12	32
470 kΩ	13	33
1 MΩ	14	
2.2 MΩ	15	
2+8 kΩ		76
5+17 kΩ		82
50+170 kΩ		83

17 mm tandem carbon potentiometers



Max. permissible dissipation at 40°C
linear resistance law 0.1 W
logarithmic resistance law 0.05 W

Catalog number 2322 390 . . . . .

The catalog number prefix is followed by 3 digits for terminal and spindle type and then by 2 digits for resistance value and law.

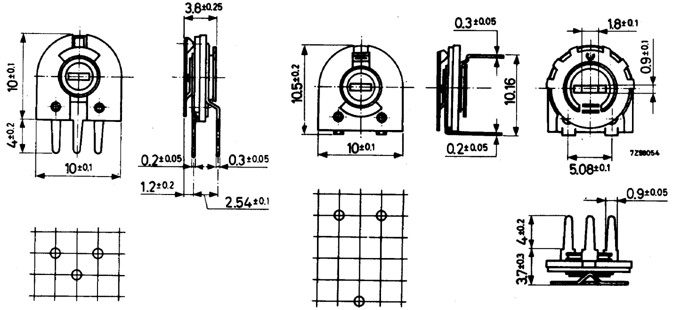
spindle type (plastic)		*8th to 10th digit in catalog number* tags	pins
plain,	L = 10 mm	711	761
	L = 15 mm	712	762
	L = 20 mm	715	765
	L = 30 mm	703	753
with flat face,	L = 10 mm	742	792
	L = 15 mm	744	794
	L = 20 mm	746	796

resistance value ±20%	*11th and 12th digit in catalog number*	
	linear	*logarithmic*
1 kΩ	04	24
2.2 kΩ	05	25
4.7 kΩ	06	26
10 kΩ	07	27
10 kΩ*)		91
22 kΩ	08	28
22 kΩ*)		92
47 kΩ	09	29
47 kΩ*)		93
100 kΩ	11	31

*) balance potentiometers

resistance value ±20%	*11th and 12th digit in catalog number*	
	linear	*logarithmic*
100 kΩ*)		94
220 kΩ	12	32
220 kΩ*)		95
470 kΩ	13	33
470 kΩ*)		96
1 MΩ	14	
2.2 MΩ	15	
2+8 kΩ		76
5+17 kΩ		82

Miniature carbon trimming potentiometers



Max. permissible dissipation at 40°C: 0.1 W

types	*catalog number*
for vertical mounting, without knob	2322 410 050 . .
for vertical mounting, with knob	2322 410 450 . .
for horizontal mounting, without knob	2322 410 033 . .
for horizontal mounting, with knob	2322 410 433 . .

resistance value ±20%	catalog number suffix
100 Ω	01
220 Ω	02
470 Ω	03
1 kΩ	04
2.2 kΩ	05
4.7 kΩ	06

resistance value ±20%	catalog number suffix
10 kΩ	07
22 kΩ	08
47 kΩ	09
100 kΩ	11
220 kΩ	12
470 kΩ	13
1 MΩ	14

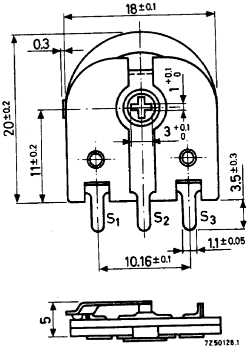
Carbon trimming potentiometers

Max. permissible dissipation at 70°C: 0.15 W

Composition of the catalog number
2322 411 . . . . .

0 = without knob
1 = with knob at the side of the base plate
2 = with knob at the side of the carbon track
4 = with adjustment wheel

00 = with soldering tags
11 = with pins for vertical mounting and a backwards protruding soldering tag
22 = with pins for vertical mounting
33 = with pins for horizontal mounting
44 = with soldering tags and large base plate
72 = with pins for vertical mounting (according to DIN 44 150)
83 = with pins for horizontal mounting (according to DIN 44 150)

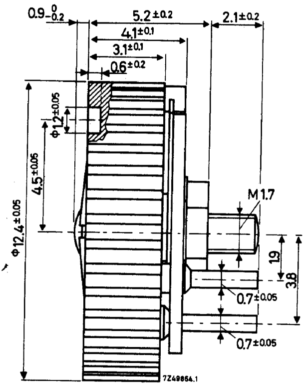


code for resistance value, see table

resistance value ±20%	code in catalog number
100 Ω	01
220 Ω	02
470 Ω	03
1 kΩ	04
2.2 kΩ	05
4.7 kΩ	06
10 kΩ	07
22 kΩ	08

resistance value ±20%	code in catalog number
47 kΩ	09
100 kΩ	11
220 kΩ	12
470 kΩ	13
1 MΩ	14
2.2 MΩ	15
4.7 MΩ	16

Miniature carbon potentiometers



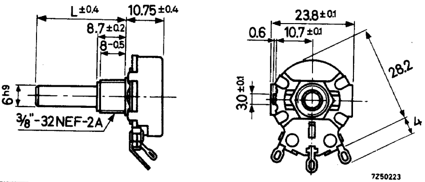
7Z49864.1

Catalog number for	
potentiometer without switch	2322 440 000 . .
potentiometer with switch	2322 441 000 . .
Maximum voltage over the resistance element	10 $V_{d.c.}$
Current through slider	$\leqslant$ 1 mA
Working-temperature range	-10 to $+70\,^\circ$C

resistance value ±20 %	*catalog number suffix*	
	linear	*logarithmic*
4700 Ω	06	26
10000 Ω	07	27
22000 Ω	08	28

Single carbon potentiometers

Max. permissible dissipation at 40 °C
linear resistance law 1 W
logarithmic resistance law 0.5 W



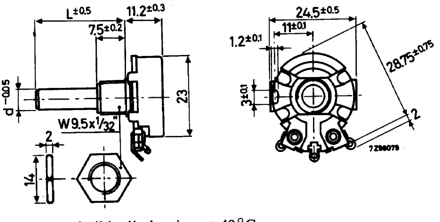
7Z50223

spindle type (plastic)	*catalog number*
plain, $L=17$ mm	2322 450 013 . .
$L=30$ mm	003 . .
$L=60$ mm	007 . .
with screwdriver slot,	
Ø 6.35 mm, $L=12.7$ mm	904 . .
$L=22.2$ mm	907 . .
$L=31.8$ mm	910 . .
$L=63.5$ mm	920 . .

resistance values ±20 %	*catalog number suffix*	
	linear	*logarithmic*
100 Ω	01	
220 Ω	02	
470 Ω	03	23
1 kΩ	04	24
2.2 kΩ	05	25
4.7 kΩ	06	26
10 kΩ	07	27
22 kΩ	08	28

resistance values ±20 %	*catalog number suffix*	
	linear	*logarithmic*
47 kΩ	09	29
100 kΩ	11	31
220 kΩ	12	32
470 kΩ	13	33
1 MΩ	14	34
2.2 MΩ	15	35
4.7 MΩ	16	

23 mm single carbon potentiometers



Max. permissible dissipation at 40 °C
linear resistance law 1 W
logarithmic resistance law 0.5 W

spindle type (plastic)		*catalog number*
plain, $d=6$ mm,	$L=18$ mm	2322 460 706 ..
	$L=30$ mm	703 ..
	$L=60$ mm	707 ..
plain, $d=\frac{1}{4}''$,	$L=30$ mm	723 ..
	$L=60$ mm	727 ..
with screwdriver slot, $d=6$ mm,	$L=11$ mm	710 ..
with flat face, $d=6$ mm,	$L=18$ mm	740 ..
	$L=30$ mm	743 ..
	$L=60$ mm	747 ..

resistance value ±20%	*catalog number suffix*	
	linear	*logarithmic*
220 Ω	02	
300 Ω	19	
470 Ω	03	
1 kΩ	04	24
2.2 kΩ	05	25
4.7 kΩ	06	26
10 kΩ	07	27
22 kΩ	08	28

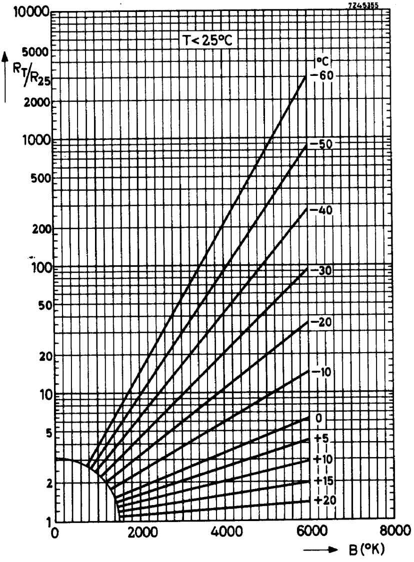
resistance value ±20%	*catalog number suffix*	
	linear	*logarithmic*
47 kΩ	09	29
100 kΩ	11	31
220 kΩ	12	32
470 kΩ	13	33
1 MΩ	14	34
2.2 MΩ	15	35
4.7 MΩ	16	

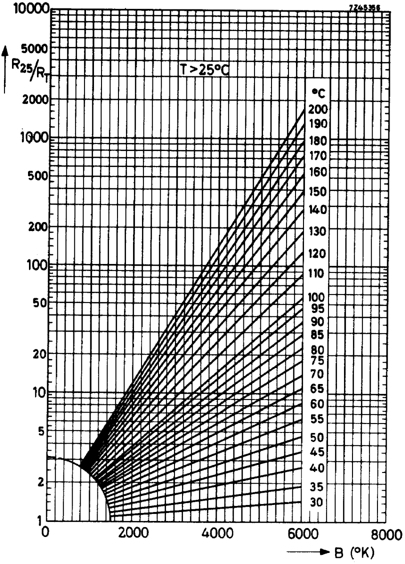
NTC THERMISTORS

NTC thermistors are resistors with a high negative temperature coefficient of resistance. The relation between resistance and temperature can be approximated by:

$$R = A\,e^{B/T}$$

where R is the resistance value at an absolute temperature T, A and B being constants for a given resistor and e the base of the natural logarithm ($e = 2.718$).



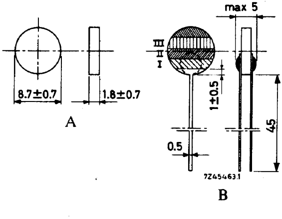


Standard disc types

Catalog number 2322 610 . . . . .
For the suffix of this number see table.

Maximum dissipation	1 W
Maximum temperature	120°C
Dissipation factor	10 mW/deg C
Thermal time constant	60 s

International colour code for resistors.



R_{25} ±20% (Ω)	B-value ±5% at 25°C (°K)	suffix of catalog number	
		without leads	with leads
2.2	2650	01228	11228
4	2800	01408	11408
6	2800	01608	11608
8	2900	01808	11808
10	2950	01109	11109
12	2950	01129	11129
15	3000	01159	11159

R_{25} ±20% (Ω)	B-value ±5% at 25°C (°K)	suffix of catalog number	
		without leads	with leads
33	3250	01339	11339
50	3300	01509	11509
82	4400	01829	11829
130	4600	01131	11131
500	5200	01501	11501
1300	5450	01132	11132

Types for motor cars

This range of discs has been developed for temperature sensors for the cooling water in motor cars. They are also suitable for temperature control in household appliances, such as washing machines.

R_{25} (Ω)	R_{40} (Ω)	R_{50} (Ω)	$R_{96.5}$ (Ω)	R_{100} (Ω)	diameter (mm)	catalog number
2200	1030–1310		147–173		7.0	2322 611 90003
500		175 –215		35 –43	6.9	90013
500		92.5–134		12 –15	6.9	90001
1000		221.5–318.5		30 –36	6.9	90004
270		97 –143		29.5–36.5	6.9	90009
700		207 –264		41.4–48.6	6.9	90011
800		244 –315		48.0–58.6	6.9	90008

Types for radio and television

application	R_{25} (Ω)	B at 25°C approx. (°K)	$W_{max.}$ (W)	normal operating conditions (mA)	(Ω)	dissipation factor approx. (mW/deg C)	max. dia-meter (mm)	max. body length (mm)	catalog number
compensation positive temperature coeff. of deflection coils	1.1 ± 20 %	2650	1	2200	0.15–0.25	14	9	21	2322 619 90002
	32 ± 30 %/ − 20 %	4200	1	1000	0.7–1.1	14	9	21	619 90003
	6 ± 20 %	2800	1	1000	~1	10			2322 610 *
	10 ± 20 %	2950	1	900	~1.1	10			610 *
	12 ± 20 %	2950	1	800	~1.2	10			610 *
	15 ± 20 %	3000	1	800	~1.2	10			610 *
	33 ± 20 %	3250	1	700	~1.4	10			610 *
shunt dial lamp	3870 – 7750	3000	3	200	60–90	10	5	16	2322 620 90001
heater chain protection	800 – 1315	3800	2	200	36–52	16	9	13	2322 621 90004
	6700 – 12600	3000	3	100	200–280	10	5	16	621 90003
	300 – 500	3700	2.5	300	25–32	30	13	23	622 90005
	645 – 1210	3600	5	300	35–48	60	13	37	622 90004
	1750 – 3250	3000	3	100	200–250	20	7	37	622 90002
	2470 – 5370	4000	4	300	38–50	24	11	37	622 90001
protection of switch and Si-diode	170 ± 20 %	4950	2.5	1000	2–3	18	14.6		2322 610 90044
	82 ± 20 %	4400	2.2	1300	0.8–1.4	18	14.6		610 90027

* See Standard disc types 2322 610

NTC THERMISTORS

Miniature types

Miniature NTC thermistors are available in 7 versions all built around the same NTC-bead. The range of resistance values and the resistance temperature characteristics for all versions are the same.

versions	*max. body dimensions mm*	*terminations at* *one side*	*terminations at* *two sides*	*catalog number*
naked bead	1 Ø		×	2322 634 01 ...
naked bead	1 Ø	×		2322 634 11 ...
glass encapsulated bead	12 × 2.5		×	2322 634 21 ...
vacuum mounted	31 × 6	×		2322 634 31 ...
vacuum gauge	87 × 6	×		2322 634 41 ...
thermometer	33 × 2.5	×		2322 627 11 ...
thermometer	5 × 1.5	×		2322 627 21 ...

R_{25} ±10% (Ω)	*B-value* ±5% *at* 25°*C* (°*K*)	*catalog number suffix*
1000	2350	102
1500	2450	152
2200	2600	222
3300	2775	332
4700	3650	472
6800	3725	682
10000	3800	103
15000	3750	153
22000	3800	223

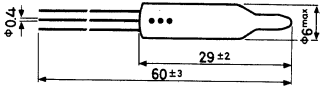
R_{25} ±10% (Ω)	*B-value* ±5% *at* 25°*C* (°*K*)	*catalog number suffix*
33000	3750	333
47000	3800	473
68000	3850	683
100000	3900	104
150000	3975	154
220000	4075	224
330000	4175	334
470000	4225	474
680000	4300	684

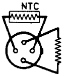
Maximum dissipation	60 mW
Maximum temperature	200°C
Dissipation factor	approximately 0.4 mW/deg C
Stability after 1000 hrs at T_{max}	< 1%

International colour code for resistors

Indirectly heated types

Vacuum mounted in glass

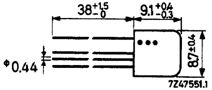


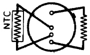


catalog number	2322 628 01332,	2322 628 01334
R_{25}	3300 Ω ± 20%	330 kΩ
B-value	2775°K ± 10%	4175°K ± 10%
Colour code	orange-orange-red	orange-orange-yellow

$W_{max.}$ heater	30 mW
$T_{max.}$	200°C
Resistance heater	100 Ω ± 10%
Dissipation factor	0.18 mW/deg C
Heater efficiency	97.5%
Thermal time constant	2.2 s
Dielectric strength heater/bead	≥200 V

Mounted in air-filled metal casing





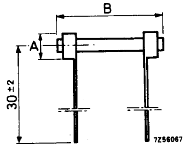
catalog number	2322 628 11332	2322 628 11334
R_{25}	3300 Ω ± 20%	330 kΩ
B-value	2775°K ± 5%	4175°K ± 5%
Colour code	orange-orange-red	orange-orange-yellow

$W_{max.}$ heater	80 mW
$T_{max.}$	200°C
Resistance heater	100 Ω ± 10%
Dissipation factor	0.50 mW/deg C
Heater efficiency	90%
Thermal time constant	1.2 s
Dielectric strength heater/bead	≥200 V

Standard rod types

Dimensions in mm

series	*A*	*B*
2322 635	3.2 ± 0.5	11 ± 1
2322 636	4.7 ± 0.5	21 ± 1
2322 637	6.2 ± 0.5	31 ± 1



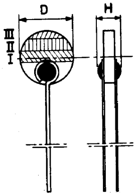
R_{25} ±20% (kΩ)	*B-value* ±5% at 25°C (°K)	$W_{max.}$ *at 25°C amb* (*W*)	*dissipation factor* (*mW/deg C*)	*thermal time constant* (*s*)	*colour code*	*catalog number*
4.7	3250	0.6	5.5	28	orange	2322 635 01472
15	3550				green	153
47	3925				blue	473
150	4075				white	154
4.7	3250	1.5	12	55	orange	2322 636 01472
15	3650				green	153
47	4000				blue	473
150	4150				white	154
4.7	3250	2.3	17	105	orange	2322 637 01472
15	3650				green	153
47	4050				blue	473
150	4200				white	154

Maximum temperature 150°C
Stability ΔR_{25} after 1000 hrs at $W_{max.}$ $<5\%$
ΔR_{25} after 1000 hrs at $\frac{2}{3}$ $W_{max.}$ $<3\%$

Standard disc types

Dimensions in mm

series	D_{max}	H_{max}
2322 642	5.5	5
2322 643	9.5	5.6
2322 644	16.5	5.7



R_{25} (Ω)	*B-value at 25°C* (°K)	W_{max} *at 25°C amb* (*W*)	*dissipation constant* (*mW/deg C*)	*time constant* (*s*)	*catalog number*
3.3	2570	0.6	6	25	2322 642 11338
4.7	2640	0.6	6	25	11478
6.8	2710	0.6	6	25	11688
10	2780	0.6	6	25	11109
15	2850	0.6	6	25	11159
22	2920	0.6	6	25	11229
33	2990	0.6	6	25	11339
47	3060	0.6	6	25	11479
68	3130	0.6	6	25	11689
100	3200	0.6	6	25	11101
150	3240	0.6	6	25	11151
220	3320	0.6	6	25	11221
330	3400	0.6	6	25	11331
470	3480	0.6	6	25	11471
680	3560	0.6	6	25	11681
1000	3640	0.6	6	25	11102
1500	3720	0.6	6	25	11152
2200	3800	0.6	6	25	11222
3300	3880	0.6	6	25	11332
4700	3960	0.6	6	25	11472
6800	—	0.6	6	25	11682
10000	—	0.6	6	25	11103
15000	—	0.6	6	25	11153
22000	—	0.6	6	25	11223
33000	—	0.6	6	25	11333
47000	—	0.6	6	25	11473
68000	—	0.6	6	25	11683
150	3400	1	10	55	2322 643 11151
470	3800	1	10	55	11471
1500	4100	1	10	55	11152
4700	4200	1	10	55	11472
150	3900	1.5	13	120	2322 644 11151
470	4200	1.5	13	120	11471
1500	3900	1.5	13	120	11152
4700	4200	1.5	13	120	11472

Maximum temperature	150°C
Stability ΔR after 1000 hrs at $W_{max.}$	<5%
ΔR after 1000 hrs at $\frac{2}{3}$ $W_{max.}$	<3%

International colour code for resistors

2322 642 with mounting stud

R_{25} (Ω)	*catalog number*
3.3	2322 642 21338
4.7	21478
6.8	21688
10	21109
15	21159
22	21229
33	21339
47	21479
68	21689
100	21101
150	21151
220	21221
330	21331
470	21471
4700	21472
6800	21682
10000	21103
15000	21153
22000	21223
33000	21333
47000	21473
68000	21683

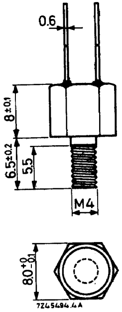


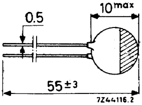
Fig.10

Properties differing from those of the 0.6 W standard disc type:

Maximum temperature	100 °C
Maximum dissipation at 25 °C	0.5 W
Dissipation factor	approximately 9.5 mW/deg C
Thermal time constant	approximately 80 s
Dielectric strength	> 100 V
Insulation resistance	> 100 MΩ

PTC THERMISTORS

Standard disc type, 1 W

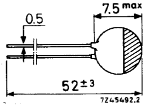


R_{25} ±15 (Ω)	*R at other temperatures*		T_{switch} [1] approx. (°C)	*max. temp. coeff.* (%/deg C)	$V_{max.}$ (V)	*colour code*	*catalog number*
50	60°C	<100 Ω	+80	+30	50	yellow	2322 660 90002
	100°C	>1 kΩ					
40	95°C	<80 Ω	+110	+60	50	green	2322 660 90003
	130°C	>10 kΩ					
30	40°C	<90 Ω	+50	+15	50	orange	2322 660 90004
	100°C	>10 kΩ					
50	100°C	3–20 kΩ	+35	+7	40	red	2322 660 90005

[1]) Switch temperature defined as the temperature at which the resistance value is twice the value at 25°C.

Dissipation factor for all types: approx. 10 mW/deg C
The resistance values are measured at 1.5 V. Higher voltages may yield different values due to self-heating and voltage-dependency.

Standard disc type, 0.5 W

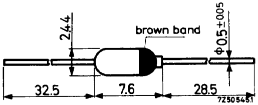


R_{25} ±30% (Ω)	R_{125} (kΩ)	R_{150} (MΩ)	T_{switch} [1]) approx. (°C)	max. temp. coeff. (%/deg C)	$V_{max.}$ (V)	colour code	catalog number
60	3–15		+35	+6	25	red	2322 660 90006
50	100–500		+50	+15	25	orange	90007
50	50–500		+80	+25	25	yellow	90008
50		0.1–1.2	+110	+35	25	green	90009

[1]) Switch temperature defined as the temperature at which the resistance value is twice the value at 25°C.

Dissipation factor for all types: approx. 6 mW/deg C
The above resistance values are measured at 1.5 V.

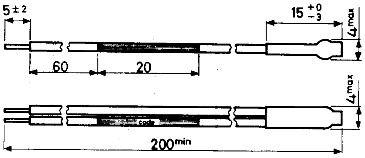
Type for liquid level control



This PTC thermistor is intended for use as detector in liquid-level control circuits.
When the environment of a PTC thermistor is changed from air to liquid its rate of dissipating heat is also changed. This causes a change in its resistance.

Maximum permissible current at +25°C	150 mA
Maximum permissible voltage	18 $V_{d.c.}$
Ambient-temperature range (working conditions)	−25 to +75°C
Maximum current when PTC thermistor is in still air of −25°C	80 mA
Current at 16 $V_{d.c.}$	
PTC thermistor in air of −25°C	≤30 mA
PTC thermistor in oil of +50°C	≥36 mA

Type for motor protection



operating temperature T_n	*catalog number*
90 °C	2322 660 90046
100	90047
110	90048
120	90049
130	90051
140	90052
150	90053
160	90054
170	90055
180	90056

temperature	*resistance value*
-20 to (T_n-10) °C	$\leqslant 150\ \Omega$
(T_n-5) °C	$\leqslant 500\ \Omega$
(T_n+3) °C	$\geqslant 700\ \Omega$
(T_n+15) °C	$\geqslant 3500\ \Omega$

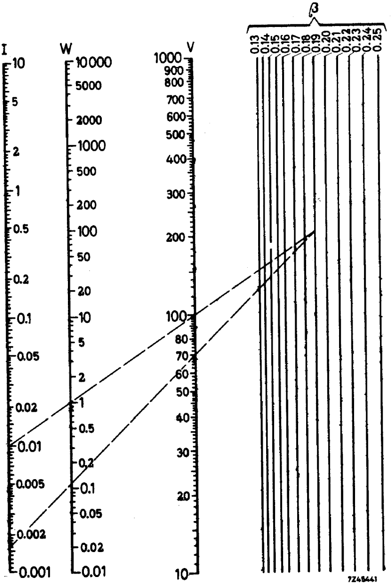
Operating temperature range -20 to (T_n+25) °C

VOLTAGE DEPENDENT RESISTORS

The relation between voltage and current of a VDR resistor can be approximated by:

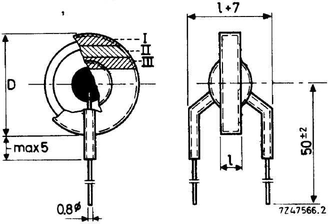
$$V = C \cdot I^{\beta} \qquad (1)$$

where V is the voltage in volts, I the current in amperes and C and β are constants. This equation is illustrated in the figure on next page.



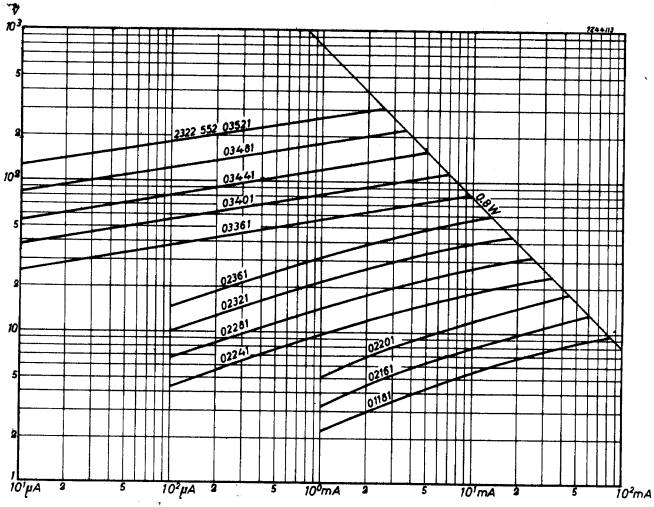
Nomogram giving the relation between voltage, current, power dissipation and β-value of any VDR.

Standard disc types with leads



Tolerance on voltage is ±20%.

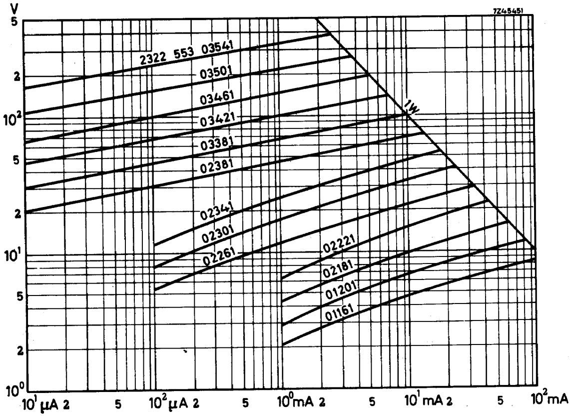
$W_{max.} = 0.8$ W
$D_{max.} = 14.5$ mm



I (*mA*)	*E* (*V*)	β	*C* approx.	$l_{max.}$ (*mm*)	*colour code* I	II	III	*catalog number*
100	10	0.25–0.40	18	5	brown	brown	grey	2322 552 01181
10	8	0.25–0.40	25	5	red	brown	blue	02161
10	12	0.25–0.40	40	5	red	red	black	02201
10	18	0.21–0.35	57	5	red	red	yellow	02241
10	27	0.21–0.35	70	5	red	red	grey	02281
10	39	0.18–0.25	100	5	red	orange	red	02321
10	56	0.18–0.25	150	5	red	orange	blue	02361
1	56	0.14–0.23	190	5	orange	orange	blue	03361
1	82	0.14–0.21	300	5	orange	yellow	black	03401
1	120	0.14–0.21	400	6	orange	yellow	yellow	03441
1	180	0.14–0.21	600	7	orange	yellow	grey	03481
1	270	0.14–0.21	900	8	orange	green	red	03521

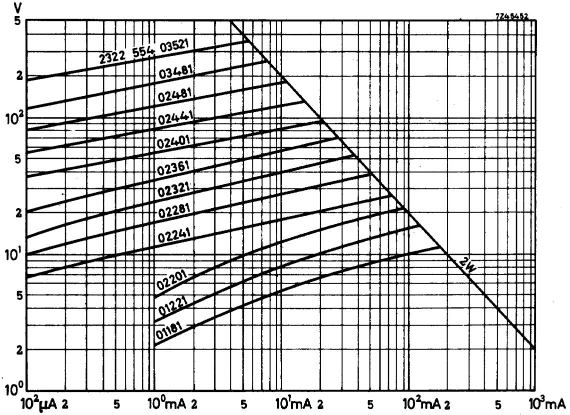
VOLTAGE DEPENDENT RESISTORS

$W_{max.} = 1$ W
$D_{max.} = 20$ mm



I (*mA*)	*E* (*V*)	*β*	*C* *approx.*	$l_{max.}$ (*mm*)	*colour code* *I*	*II*	*III*	*catalog number*
100	8	0.25–0.40	14	5	brown	brown	blue	2322 553 01161
100	12	0.25–0.40	21	5	brown	red	black	01201
10	10	0.25–0.40	32	5	red	brown	grey	02181
10	15	0.25–0.40	48	5	red	red	red	02221
10	22	0.21–0.35	60	5	red	red	blue	02261
10	33	0.18–0.25	85	5	red	orange	black	02301
10	47	0.18–0.25	130	5	red	orange	yellow	02341
10	68	0.18–0.25	180	5	red	orange	grey	02381
1	68	0.14–0.23	230	5	orange	orange	grey	03381
1	100	0.14–0.21	350	5.5	orange	yellow	red	03421
1	150	0.14–0.21	500	6.5	orange	yellow	blue	03461
1	220	0.14–0.21	750	7.5	orange	green	black	03501
1	330	0.14–0.21	1100	9	orange	green	yellow	03541

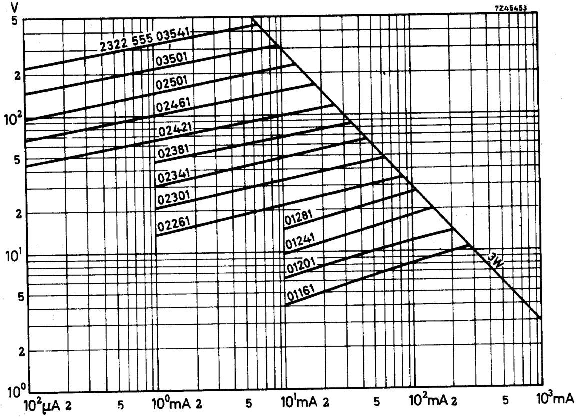
$W_{max.} = 2$ W
$D_{max.} = 27.5$ mm



I (*mA*)	*E* (*V*)	*β*	*C* *approx.*	$l_{max.}$ (*mm*)	*colour code* *I*	*II*	*III*	*catalog number*
100	10	0.25–0.40	18	5	brown	brown	grey	2322 554 01181
100	15	0.25–0.40	26	5	brown	red	red	01221
10	12	0.25–0.40	38	5	red	red	black	02201
10	18	0.21–0.35	57	5	red	red	yellow	02241
10	27	0.21–0.35	70	5	red	red	grey	02281
10	39	0.18–0.25	97	5	red	orange	red	02321
10	56	0.18–0.25	140	5	red	orange	blue	02361
10	82	0.14–0.23	170	5	red	yellow	black	02401
10	120	0.14–0.21	250	5	red	yellow	yellow	02441
10	180	0.14–0.21	380	6	red	yellow	grey	02481
1	180	0.14–0.21	540	7	orange	yellow	grey	03481
1	270	0.14–0.21	810	8	orange	green	red	03521

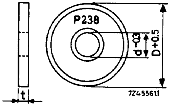
VOLTAGE DEPENDENT RESISTORS

$W_{max.} = 3$ W
$D_{max.} = 42.5$ mm



I (mA)	E (V)	β	C approx.	$l_{max.}$ (mm)	colour code I	colour code II	colour code III	catalog number
100	8	0.25–0.40	14	5	brown	brown	blue	2322 555 01161
100	12	0.25–0.40	21	5	brown	red	black	01201
100	18	0.25–0.40	32	5	brown	red	yellow	01241
100	27	0.25–0.40	48	5	brown	red	grey	01281
10	22	0.21–0.35	60	5	red	red	blue	02261
10	33	0.18–0.25	84	5	red	orange	black	02301
10	47	0.18–0.25	125	5	red	orange	yellow	02341
10	68	0.18–0.25	175	5	red	orange	grey	02381
10	100	0.14–0.23	210	5	red	yellow	red	02421
10	150	0.14–0.21	320	5.5	red	yellow	blue	02461
10	220	0.14–0.21	460	6.5	red	green	black	02501
1	220	0.14–0.21	660	7.5	orange	green	black	03501
1	330	0.14–0.21	980	9	orange	green	yellow	03541

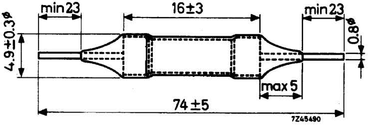
Standard disc types with a hole



For the voltage/current characteristics reference is made to those of the equivalent disc-types with leads.

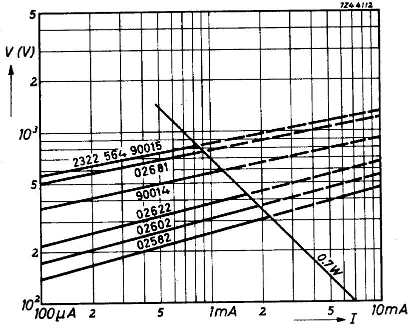
I (*mA*)	*E* (*V*)	*β*	*C* approx.	$W_{max.}$ (*W*)	dimensions (*mm*) *D*	*d*	t_{max}	catalog number
10	27	0.21–0.35	70	2	25	6.4	3.0	2322 554 22281
10	39	0.21–0.30	97				3.0	22321
10	56	0.21–0.30	140				3.0	22361
10	82	0.14–0.23	170				3.0	22401
10	120	0.14–0.21	250				3.0	22441
10	180	0.14–0.21	380				4.0	22481
1	180	0.14–0.21	540				5.0	23481
1	270	0.14–0.21	810				6.0	23521
10	22	0.21–0.35	60	3	40	10.4	3.0	2322 555 22261
10	33	0.18–0.25	84				3.0	22301
10	47	0.18–0.25	125				3.0	22341
10	68	0.18–0.25	175				3.0	22381
10	100	0.14–0.23	210				3.0	22421
10	150	0.14–0.21	320				3.5	22461
10	220	0.14–0.21	460				4.5	22501
1	220	0.14–0.21	660				5.5	23501
1	330	0.14–0.21	980				7.0	23541

Standard rod types



$W_{max.} = 0.7$ W

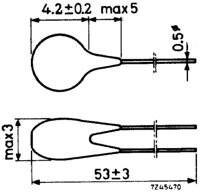
I (*mA*)	*E* (*V*)	*β*	*colour code*	*catalog number*
10	470 ± 10%	0.20–0.25	green	2322 564 02582
10	560 ± 10%	0.18–0.23	blue	02602
10	680 ± 10%	0.18–0.23	violet	02622
10	910 ± 10%	0.18–0.23	white	90014
10	1200 ± 20%	0.17–0.22	grey	02681
10	1300 ± 10%	0.16–0.21	red	90015
1	300 ± 20%	0.18–0.25	yellow	90016
2	950 ± 10%	0.16–0.21	black/blue	90005



Small disc types

For use in colour television

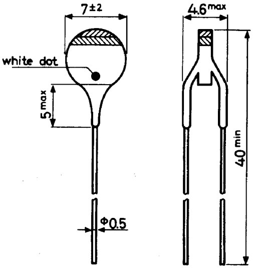
I (*mA*)	*E* (*V*)	*tolerance on voltage*	*catalog number*
1	6	±20%	2322 565 90002
1	9	±20%	90003
1	12	±15%	90004
1	15	±15%	90005
1	18	±12%	90006



Asymmetric types

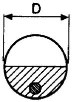
at $T_{amb} = 25\,°C$		*catalog number* 2322 574 90001	2322 574 90002
forward direction	voltage at 1 mA	1.0 V ± 10 %	1.35 V ± 10 %
	temp. coeff.	> −0.2 %/deg C	> −0.2 %/deg C
	β	0.05–0.08	0.06–0.09
	capacitance at 0 mA	~0.15 μF	~0.15 μF
	at 5 mA	~10 μF	~10 μF
	max. permissible current	25 mA	20 mA
reverse direction	current at 5 V	< 2 μA	< 2 μA
	capacitance at 0 V	~0.15 μF	~0.15 μF
	at 5 V	~0.05 μF	~0.05 μF
	max. permissible voltage	5 V	5 V

Temperature range: −30 to +70 °C
Cathode is indicated by a white dot.
Colour code 2322 574 90001 black and brown band
2322 574 90002 black and red band



Disc types for contact protection

Marking
Discs without leads:
white colourband, colour dot indicates 10th digit of cat. number.
Discs with leads:
body colour white, colourband indicates 10th digit of cat. number.

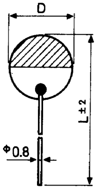


7Z45487.1

Colour code:

0 = black
1 = brown
2 = red
3 = orange
4 = yellow
5 = green
6 = blue

$W_{max.}$ (*W*)	*L*	*Catalog number prefix*	*Additional marking*
0.25	58.5	2322 575	VR3
0.40	62	2322 576	VR2
1.0	65	2322 577	VR1



7Z45493.2

These VDR's are developed for contact protection of relays in telephone exchanges.

$V_{d.c.}$ (V)	I (mA)	V_{pulse} (V)	I (mA)	$W_{max.}$ (W)	D (mm)	catalog number suffix without leads	catalog number suffix with leads
48	< 1.7	150	> 52	0.25	9.5	30272	00272
48	< 3	150	> 72	0.25	9.5	30372	00372
48	< 5	150	> 121	0.25	9.5	30472	00472
48	< 0.5	150	> 27	0.4	12.5	30072	00072
48	< 0.9	150	> 34	0.4	12.5	30172	00172
48	< 1.7	150	> 65	0.4	12.5	30272	00272
48	< 3	150	> 91	0.4	12.5	30372	00372
48	< 5	150	> 152	0.4	12.5	30472	00472
48	< 0.5	150	> 42	1	17	30072	00072
48	< 0.9	150	> 76	1	17	30172	00172
48	< 1.7	150	> 115	1	17	30272	00272
48	< 3	150	> 180	1	17	30372	00372
48	< 5	150	> 268	1	17	30472	00472
48	< 9	150	> 430	1	17	30572	00572
48	< 15	150	> 455	1	17	30672	00672

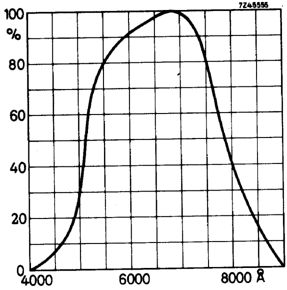
LIGHT DEPENDENT RESISTORS

The light dependent resistors are virtually small photoconductive cells, provided with two tinned copper connecting leads.

The relationship between resistance value and illumination can be expressed with good approximation by the formula:

$$R = AL^{-\alpha}$$

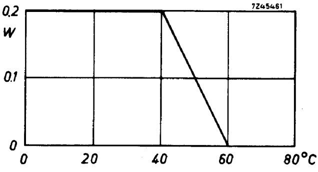
where R = resistance value in Ω
L = illumination in lux
A and α are constants



Spectral response characteristic of an LDR

Electrical performance

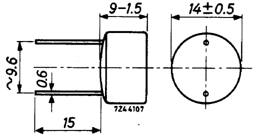
dark value	>10 MΩ
light value	75–300 Ω (measured at 1000 lux)
recovery rate	>200 kΩ/s
permissible voltage	150 V_{peak}
capacitance	<6 pF



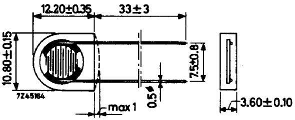
Permissible dissipation

Three versions are available differing mainly in shape and coating.

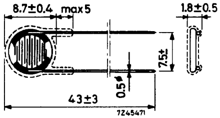
Version 2322 600 95001
Encapsulated in plastic case and synthetic resin
Ambient temperature range −20 to +60°C



Version 2322 600 93001
This cell is sealed by means of a plastic coating
Ambient temperature range −30 to +60°C



Version 2322 600 94001
This cell is covered with lacquer.
Ambient temperature range −30 to +60°C



STANDARD SERIES OF VALUES IN A DECADE

E192	E96	E48	E192	E96	E48	E192	E96	E48	E192	E96	E48	E192	E96	E48
100	100	100	169	169	169	284			481			816		
101			172			287	287	287	487	487	487	825	825	825
102	102		174	174		291			493			835		
104			176			294	294		499	499		845	845	
105	105	105	178	178	178	298			505			856		
106			180			301	301	301	511	511	511	866	866	866
107	107		182	182		305			517			876		
109			184			309	309		523	523		887	887	
110	110	110	187	187	187	312			530			898		
111			189			316	316	316	536	536	536	909	909	909
113	113		191	191		320			542			920		
114			193			324	324		549	549		931	931	
115	115	115	196	196	196	328			556			942		
117			198			332	332	332	562	562	562	953	953	953
118	118		200	200		336			569			965		
120			203			340	340		576	576		976	976	
												988		

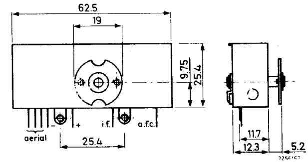
												E24	E12	E6
121	121	121	205	205	205	344			583					
123			208			348	348	348	590	590	590			
124	124		210	210		352			597					
126			213			357	357		604	604				
127	127	127	215	215	215	361			612			10	10	10
129			218			365	365	365	619	619	619	11		
130	130					370			626			12	12	
132			221	221		374	374		634	634		13		
133	133	133	223			379			642			15	15	15
135			226	226	226	383	383	383	649	649	649	16		
137	137		229			388			657			18	18	
138			232	232		392	392		665	665		20		
140	140	140	234			397			673			22	22	22
142			237	237	237	402	402	402	681	681	681	24		
143	143		240			407			690			27	27	
145			243	243		412	412		698	698		30		
147	147	147	246			417			706			33	33	33
149			249	249	249	422	422	422	715	715	715	36		
150	150		252			427			723			39	39	
152			255	255		432	432		732	732		43		
154	154	154	258			437			741			47	47	47
156			261	261	261	442	442	442	750	750	750	51		
158	158		264			448			759			56	56	
160			267	267		453	453		768	768		62		
162	162	162	271			459			777			68	68	68
164			274	274	274	464	464	464	787	787	787	75		
165	165		277			470			796			82	82	
167			280	280		475	475		806	806		91		

F.M. TUNERS

F.M. tuner AP 2151/00

F.M. tuner for European band

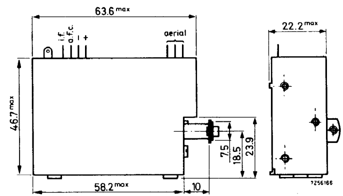
Catalog number	: 3122 108 68870
Supply voltage	: 9 $V_{d.c.}$
Frequency range	: 87–104 MHz
Total gain	: 4.5 ×
Intermediate frequency	: 10.7 MHz



F.M. tuners AP 2152/ . .

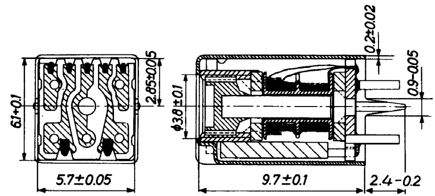
type	*catalog number*
AP2152/00, F.M. tuner for European band; with soldering lugs	3122 108 69400
AP2152/01, as AP2152/00, but with pins for printed-wiring connection	3122 108 81760
AP2152/02, F.M. tuner for American band; with soldering lugs	3122 108 68730

Supply voltage	: 14 $V_{d.c.}$
	9 $V_{d.c}$
Frequency range	
AP2152/00 and AP2152/01	: 87–104 MHz
AP2152/02	: 87–108.9 MHz
Total gain	: 4 ×
Intermediate frequency	: 10.7 MHz



COILS FOR TRANSISTORISED RADIO RECEIVERS

For use on printed-wiring boards with a grid of 0.635 mm	
Intermediate frequency a.m.	450–470 kHz
f.m.	10.7 MHz
Quality factor	100–140
Inductance adjustment range	±10% to ±15%
Temperature coefficient	100 to $400 \cdot 10^{-6}$/deg C



Coils for a.m. receivers

type		*catalog number*
Oscillator coil	AP1051/11	3122 107 30940
I.F. coil	AP1051/13	30960
I.F. coil	AP1051/14	30970
I.F. coil	AP1051/15	30980

The following performance can be obtained with these coils, measured at a supply voltage of −7 V.
Sensitivity: input 2 μV ±6 dB at 1 MHz for 50 mV audio output.
Bandwidth: 5.1 kHz ±500 Hz at 6 dB, centre frequency 470 kHz.
Attenuation: 26 dB ±3 dB at 9 kHz from centre frequency.
Consumption: 3.3 mA.

type		*catalog number*
I.F. coil	AP1051/20	3122 994 93890
I.F. coil	AP1051/21	93900
I.F. coil	AP1051/22	93910
I.F. coil	AP1051/23	93920

The following performance can be obtained with these coils, measured at a supply voltage of 6 V.
Sensitivity: input 1.6 μV ±6 dB at 1 MHz for 10 mV audio output.
Bandwidth: 4.8 kHz ±500 Hz at 6 dB, centre frequency 460 kHz.
Attenuation: 77 × at 9 kHz from centre frequency.
Consumption: 3.3 mA

COILS FOR TRANSISTORISED RADIO RECEIVERS/FIXED MAINS TRANSFORMERS

Coils for f.m. receivers

type		*catalog number*
I.F. coil	AP1051/17	3122 108 20570
Detector coil	AP1051/18	25550
Detector coil	AP1051/19	25560

The following performance can be obtained with these coils, measured at a supply voltage of 6 V.

Sensitivity: input 44 μV for 10 mV audio output; $\Delta f = 15$ kHz.

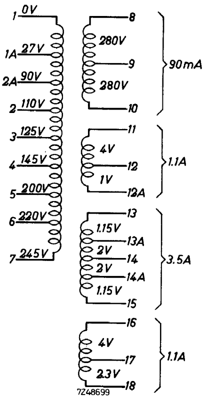
Bandwidth: 160 kHz at 6 dB.

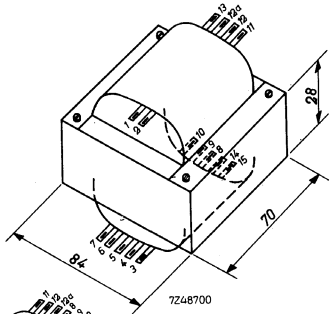
Attenuation: 450 × at 300 kHz from centre frequency.

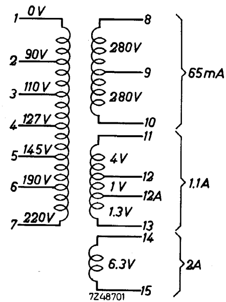
Consumption: 3.3 mA

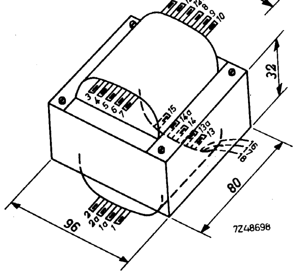
FIXED MAINS TRANSFORMERS

AD9027
No-load current: max. 90 mA
No-load losses: max. 6 W
Catalog number: 3122 108 39800









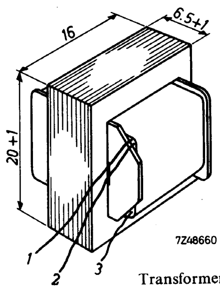
AD9026
No-load current: max. 130 mA
No-load losses: max. 7.5 W
Catalog number: 3122 108 39790

NOTE. The secondary voltages indicated in the diagrams apply to the loaded condition.

AUDIO TRANSFORMERS

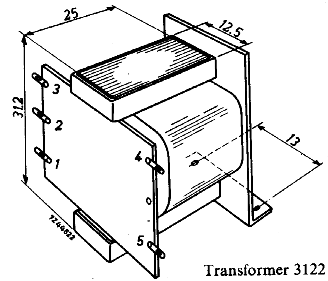
Transformers for push-pull circuits with transistors

	catalog number 3122 991			
	53900	54290	54330	
			$V_b = 7\ V$	$V_b = 14\ V$
Primary impedance (Ω)	360	98	7	41
Secondary impedance (Ω)	3	3	3–5	3–5
Power (W)	0.2	0.75	8	8
Transformation ratio	11	5.7	1.6–1.25	3.65–2.85
Frequency response (Hz) between −3 dB points (reference 1 kHz)	45–35000	50–10000	10–10000	10–10000
Type number	AD9015	AD9051	AD9054	



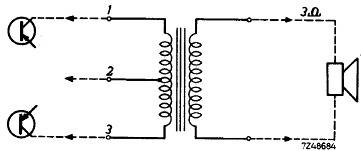
Lead 1 = brown
2 = red
3 = blue

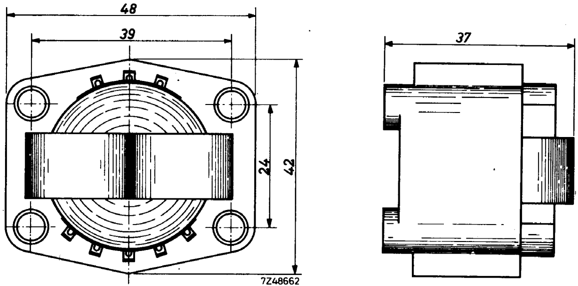
Transformer 3122 991 53900



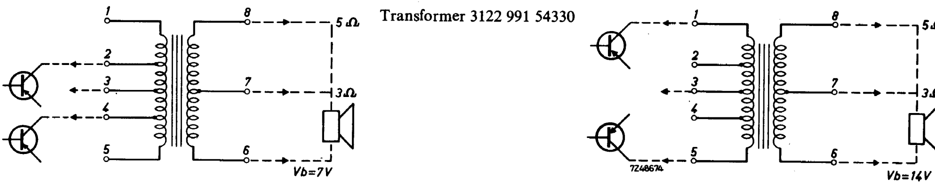
Transformer 3122 991 54290

Diagram of transformers 3122 991 53900
54290





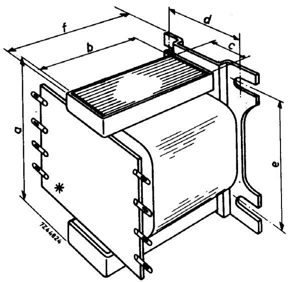
Transformer 3122 991 54330



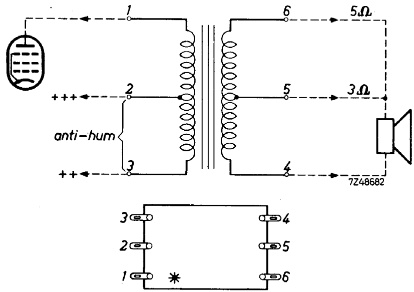
AUDIO TRANSFORMERS

Transformers for single-ended circuits

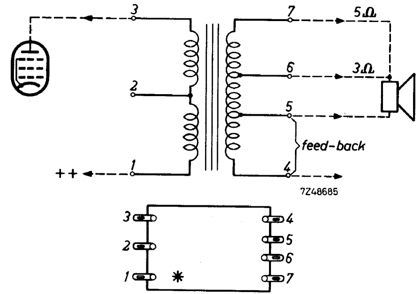
	catalog number 3122	
	991 53040	108 39990
Primary impedance (Ω)	5400	5400
Secondary impedance (Ω)	3–5	3–5
Power (W)	3	6
Transformation ratio	45–34	46–33
Frequency response (Hz) between −3 dB points (reference 1 kHz)	50–10000	40–20000
Type number	AD9008	AD9020



dimension	*catalog number* 3122	
	991 53040	108 39990
a	40	50
b	32	40
c	16	20
d	36.5	41
e	38	45.5
f	41	49



Transformer 3122 991 53040

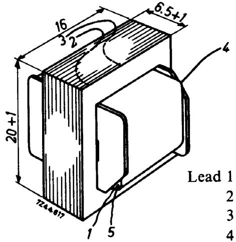


Transformer 3122 108 39990

AUDIO TRANSFORMERS

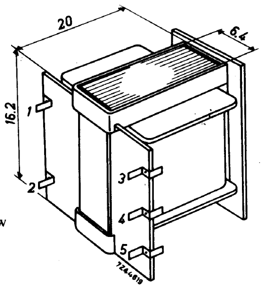
Transformers for driver circuits with transistors

	catalog number 3122 991			
	62030	62260	62240	62270
Transformation ratio	1	0.65	1.15	1.24
Frequency response (Hz) between −3 dB points (reference 1 kHz)	20–40000	50–10000	50–10000	10–60000
Type number	AD9014	AD9048	AD9050	AD9053

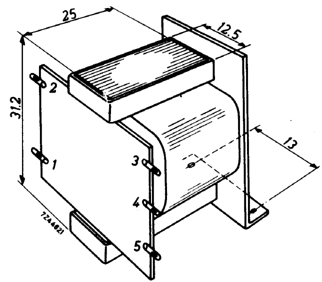


Lead 1 = red
2 = blue
3 = yellow
4 = black
5 = green

Transformer 3122 991 62030



Transformer 3122 991 62260



Transformer 3122 991 62240

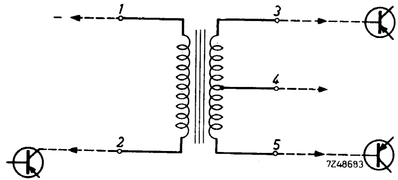
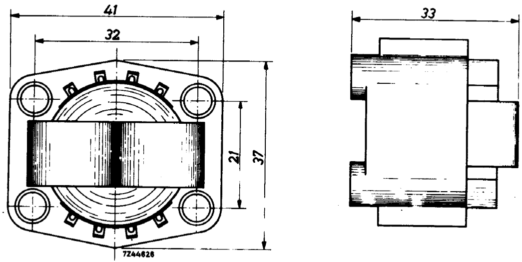
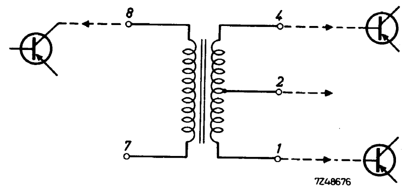


Diagram of the three
above-mentioned transformers





Transformer 3122 991 62270

LOUDSPEAKERS

Standard loudspeakers

overall diameter	*total depth*	*max. power*	*resonance frequency*	*impedance*	*catalog number*	*new commercial type number*	*old commercial type number*	*main applications*
2½″								
64 mm ∅	20 mm	0.5 W	360 Hz	4 Ω	2422 257 23801	AD2070/Z4	AD3207 Z	portable sets intercom
				8 Ω	2422 257 23802	Z8	SZ	
				15 Ω	2422 257 23803	Z15	PZ	
				25 Ω	2422 257 23804	Z25	HZ	
3″								
81 mm ∅	28 mm	1 W	250 Hz	4 Ω	2422 257 23701	AD3070/Y4		portable sets intercom
				8 Ω	2422 257 23702	Y8		
				15 Ω	2422 257 23703	Y15		
				25 Ω	2422 257 23704	Y25		
81 mm ∅	28 mm	1 W	250 Hz	150 Ω	4304 078 70281	AD3370/Y150		

3″ × 5″								
76 × 131 mm	42 mm	2 W	200 Hz	4 Ω	2422 256 30301	AD3590/X4	AD3359 RX	portable sets television
				50 Ω	2422 256 30302	X50	NX	
				400 Ω	2422 256 30303	X400	BX	
				8 Ω	2422 256 30304	X8	SX	
				15 Ω	2422 256 30305	X15	PX	
4″								
105 mm ∅	29 mm	1 W	200 Hz	4 Ω	2422 257 24201	AD4070/Y4		portable sets
				8 Ω	2422 257 24202	Y8		
				15 Ω	2422 257 24203	Y15		
				25 Ω	2422 257 24204	Y25		
105 mm ∅	39 mm	3 W	165 Hz	4 Ω	2422 257 34301	AD4080/X4		portable sets
			165 Hz	8 Ω	2422 257 34302	X8		
			165 Hz	15 Ω	2422 257 34303	X15		
			165 Hz	25 Ω	2422 257 34304	X25		
			185 Hz	4 Ω	2422 257 34305	Z4		
			185 Hz	8 Ω	2422 257 34306	Z8		
			185 Hz	15 Ω	2422 257 34307	Z15		
			185 Hz	25 Ω	2422 257 34308	Z25		
105 mm ∅	37 mm	2 W	185 Hz	8 Ω	2422 256 34301	AD4090/X8	AD3419 SX	television
			175 Hz	15 Ω	2422 256 34302	X15	PX	
			190 Hz	400 Ω	2422 256 34303	X400	BX	
3″ × 8″								
82 × 205 mm		2 W	130 Hz	4 Ω	2422 257 30301	AD3380/X4		television tape recorders portable sets
				8 Ω	2422 257 30302	X8		
				15 Ω	2422 257 30303	X15		

LOUDSPEAKERS

overall diameter	*total depth*	*max. power*	*resonance frequency*	*impedance*	*catalog number*	*new commercial type number*	*old commercial type number*	*main applications*
4″ × 6″								
103 × 154 mm	48 mm	3 W	155 Hz	4 Ω	2422 257 30201	AD4680/Z4		
				8 Ω	2422 257 30202	Z8		
				15 Ω	2422 257 30203	Z15		
				25 Ω	2422 257 30204	Z25		
		6 W	140 Hz	4 Ω	2422 257 30205	X4		radio
				8 Ω	2422 257 30206	X8		tape recorders
				15 Ω	2422 257 30207	X15		record players
				25 Ω	2422 257 30208	X25		
		4 W	125 Hz	4 Ω	2422 257 30209	M4		
				8 Ω	2422 257 30211	M8		
				15 Ω	2422 257 30212	M15		
				25 Ω	2422 257 30213	M25		
103 × 154 mm	51 mm	4 W	125 Hz	400 Ω	2422 256 30101	AD4690/M400	AD3469 BM	
				50 Ω	2422 256 30102	M50	NM	
				800 Ω	2422 256 30103	M800	AM	
				4 Ω	2422 256 30104	M4	RM	

5″

129 mm Ø		4 W	155 Hz[1]	4 Ω	2422 257 35201	AD5080/Z4		radio
				8 Ω	2422 257 35202	Z8		tape recorders
				15 Ω	2422 257 35203	Z15		record players
				25 Ω	2422 257 35204	Z25		intercom
		6 W	130 Hz[1]	4 Ω	2422 257 35205	X4		car radios
				8 Ω	2422 257 35206	X8		
				15 Ω	2422 257 35207	X15		
				25 Ω	2422 257 35208	X25		
		4 W	128 Hz[1]	4 Ω	2422 257 35209	M4		
				8 Ω	2422 257 35211	M8		
				15 Ω	2422 257 35212	M15		
				25 Ω	2422 257 35213	M25		

5″ × 7″

134 × 184 mm	58 mm	4 W	115 Hz	4 Ω	2422 257 36101	AD5780/X4		radio
				8 Ω	2422 257 36102	X8		tape recorders
				15 Ω	2422 257 36103	X15		record players
				25 Ω	2422 257 36104	X25		car radios
			100 Hz	4 Ω	2422 257 36105	M4		
				8 Ω	2422 257 36106	M8		
				15 Ω	2422 257 36107	M15		
				25 Ω	2422 257 36108	M25		
166 mm		6 W	110 Hz[1]	4 Ω	2422 257 37801	AD7080/X4		radio
			110 Hz[1]	8 Ω	2422 257 37802	X8		tape recorders
		4 W	95 Hz[1]	4 Ω	2422 257 37803	M4		record players
			95 Hz[1]	8 Ω	2422 257 37804	M8		
166 mm	47 mm	3 W	115 Hz	4 Ω	2422 256 37005	AD7091/X4	AD3729 RX	television
			95 Hz	4 Ω	2422 256 37004	M4	RM	
			115 Hz	800 Ω	2422 256 37002	X800	AX	
			95 Hz	800 Ω	2422 256 37001	M800	AM	

[1]) Preliminary figures.

LOUDSPEAKERS

overall diameter	*total depth*	*max. power*	*resonance frequency*	*impedance*	*catalog number*	*new commercial type number*	*old commercial type number*	*main applications*
6″ × 9″								
161 × 234 mm	15 mm	4 W	85 Hz	4 Ω	2422 255 39002	*	AD3696 RX	radio, record players
			77 Hz	4 Ω	2422 255 39001		RM	
			77 Hz	8 Ω	2422 255 39004		SM	
		6 W	85 Hz[1])	4 Ω	2422 257 39101	AD6980/X4		
			85 Hz[1])	8 Ω	2422 257 39102	X8		
			77 Hz[1])	4 Ω	2422 257 39103	M4		
			77 Hz[1])	8 Ω	2422 257 39104	M8		
8″								
206 mm	75 mm	6 W	95 Hz	4 Ω	2422 255 38002	*	AD3806 RX	radio, television
			95 Hz	8 Ω	2422 255 38003		SX	
			75 Hz	4 Ω	2422 255 38001		RM	
			75 Hz	8 Ω	2422 255 38004		SM	
206 mm		6 W	95 Hz[1])	4 Ω	2422 257 38201	AD8080/X4		
			95 Hz[1])	8 Ω	2422 257 38202	X8		
			75 Hz[1])	4 Ω	2422 257 38203	M4		
			75 Hz[1])	8 Ω	2422 257 38204	M15		

* Loudspeaker will be replaced by the following type.

[1]) Preliminary figures.

Special and high quality loudspeakers

overall diameter	*total depth*	*max. power*	*resonance frequency*	*impedance*	*catalog number*	*new commercial type number*	*old commercial type number*	*main applications*
2¼″ tweeters								
58 mm	29 mm	10 W [1])	800 Hz	4 Ω 8 Ω	2422 257 22001 2422 257 22002	AD2070/T4 T8		enclosures
4″ tweeters								
105 mm	49 mm	10 W	380 Hz	4 Ω 8 Ω	2422 256 24102 2422 256 24101	AD4490/T4 T8	AD3408 RM SM	enclosures
5″ woofers								
		10 W [2])	50 Hz	4 Ω 8 Ω	4304 078 70321 4304 078 70241	AD5060/W4 W8	AD3503 R S	enclosures
7″ woofer								
166 mm	74 mm	20 W [2])	28 Hz	8 Ω	2422 257 37701	AD7065/W8	AD3703 S	enclosures
8″ woofer								
206 mm	93 mm	20 W [2])	28 Hz	8 Ω	2422 257 38101	AD8065/W8	AD3803 S	enclosures
10″ woofer								
261 mm	153 mm	40 W [2])	20 Hz	8 Ω	4304 078 70261	AD1055/W8		enclosures
12″ woofer								
315 mm	164 mm	20 W	29 Hz	8 Ω	2422 258 41101	AD1255/W8	AD5201 S/77	enclosures
5″ high quality								
129 mm	56 mm	6 W	85 Hz	4 Ω 8 Ω	2422 257 35101 2422 257 35102	AD5060/M4 M8	AD3501 RM SM	enclosures

[1]) With 5 μF in series. [2]) In closed acoustic box.

LOUDSPEAKERS

overall diameter	*total depth*	*max. power*	*resonance frequency*	*impedance*	*catalog number*	*new commercial type number*	*old commercial type number*	*main applications*
7″ high quality								
166 mm	70 mm	10 W	55 Hz	5 Ω	2422 257 37102	AD7060/M5	AD3701 M	enclosures
8″ high quality								
206 mm	124 mm	6 W	60 Hz	5 Ω	2422 256 48002	AD8050/M5	AD4800 M	enclosures
$8\frac{1}{2}$″ high quality								
217 mm	116 mm	10 W	50 Hz	7 Ω	2422 258 48002	9710M/01		enclosures
				800 Ω	2422 258 48004	AM/01		
10″ high quality								
261 mm	136 mm	10 W	50 Hz	7 Ω	2422 256 41003	AD1050/M7	AD4000 M	enclosures
				800 Ω	2422 256 41002	M800	AM	
12″ high quality								
315 mm	123 mm	10 W	50 Hz	5 Ω	2422 257 31002	AD1260/M5	AD4201 M	
315 mm	160 mm	20 W	50 Hz	7 Ω	2422 256 41103	AD1250/M7	AD4200 M	electronic organs
				800 Ω	2422 256 41102	M800	AM	bass guitars
315 mm	170 mm	20 W	50 Hz	7 Ω	2422 258 51004	AD1255/M7	AD5200 M	enclosures
				800 Ω	2422 258 51003	M800	AM	

[1]) With 5 μF in series.
[2]) In closed acoustic box.

New commercial coding system for our loudspeakers

AD . . . ./. .

size and shape			*magnet system*		*frequency characteristic*		*impedance*
20	round	2¼″–2½″	90[1])	sinterpot	Z	Notably higher sensitivity around a	4 ohm
30	round	3″	80	ferroxdure standard round		response peak at about 3 kHz	8 ohm
33	square	3″	70	ferroxdure square	Y	Notably higher response level in	15 ohm
40	round	4″	65	ferroxdure big, high quality		the region of 2–6 kHz	25 ohm
44	square	4″	60	ferroxdure small, high quality	X	Same as Y but a wider frequency	50 ohm
35	oval	3″ × 5″	55	Ticonal big, high quality		range	150 ohm
38	oval	3″ × 8″	50	Ticonal small, high quality	M	Smooth response over wide	400 ohm
46	oval	4″ × 6″				frequency range	800 ohm
57	oval	5″ × 7″			T	Tweeter, high frequency range	etc.
69	oval	6″ × 9″			W	Woofer, extremely low resonance	
50	round	5″				frequency	
70	round	6½″					
80	round	8″					
10	round	10″					
12	round	12″					

[1]) Mechanical or acoustical variations are indicated by replacing 0 or 5 by some other figure (91 = Sinterpot Wafer)

TRANSISTORISED ASSEMBLIES FOR CHURCH AND CONCERT ORGANS

These subassemblies are suitable for organs with one, two or three keyboards, with sixty-one keys to a manual plus thirty-two pedals. Far from limiting design, the use of these subassemblies gives the organ builder the same breadth and flexibility enjoyed in the building of pipe organs.

Master oscillator unit, *dimensions* 40 × 12.5 × *max.* 4.5 *cm*, *catalog number* 4322 026 37640

This is the heart of the organ where the highest octave is generated, the C_5 octave (including C_6). As all other octaves are produced by frequency division, only this octave need be adjusted to fully tune the organ to an equal-tempered scale. Later stages modulate the pure tones to form the typical sound of a pipe organ and avoid the cold "mathematic" character often met with in electronic organs.

Frequency divider unit, *dimensions* 40 × 29 × *max.* 7.5 *cm*, *catalog number* 4322 026 37650 for 7 stages
4322 026 37660 for 8 stages

The frequencies of the top octave are halved to produce the C_4 octave, halved again for the C_3, and so on for seven or eight stages depending on the range of the instrument. In this way all frequencies are produced from 8192 Hz (C_6) down to 32 Hz (C contra), or even to 16 Hz (C subcontra) in the case of an eight stage divider. These circuits also shape the tones for subsequent stages.

Noise generator and choir effect unit, *dimensions* 40 × 12.5 × *max.* 2.5 *cm*, *catalog number* 4322 026 37730

Really two units in one, a noise generator that produces the characteristic sound of wind through pipes, and a choir effect unit that modulates the pitch and intensity of the pure tones produced by the master oscillator unit. The modulation is completely random and will show no repetition or regularity even if octave interval chords are held for a long time. The need for this unit arises because a pipe organ changes with temperature and humidity even immediately after tuning, and although most electronic organs lack this quality, those produced with our subassemblies do not.

Manual and pedal units, *dimensions* 67 × 28 × 7.5 *cm and* 40 × 28 × 7.5 *cm*

Superficially the simplest, these are in fact the most complex of the subassemblies. In addition to admitting the notes to the stop circuits, they also form the character of the tones and provide a response delay to mimic the slow build up and decay of the larger pipes in an organ. The length of delay is related to pitch, so notes at the left-hand end of the keyboard are delayed more than those at the right. Provision is also made to insert wind noise and for gating partials just before fundamental to produce chiff. The outputs from the manual and pedal units to the stop circuits can be equipped with equalising networks (filter circuits) to form the basic organ voices.

manual units	*version I*	*version II*	*version III*
Number of gates	4	4	5
Gate-pitches	$8'$–$4'$–$2'$–$2\frac{2}{3}'$	$8'$–$4'$–$2'$–$2\frac{2}{3}'$	$16'$–$8'$–$4'$–$2'$–$2\frac{2}{3}'$
Outputs square wave	$8'$–$4'$–$2'$–$2\frac{2}{3}'$	$8'$–$4'$–$2'$–$2\frac{2}{3}'$	$16'$–$8'$–$4'$–$2'$–$2\frac{2}{3}'$
Outputs saw-tooth wave	$8'$–$4'$–$2\frac{2}{3}'$	$8'$–$4'$–$2'$	$16'$–$8'$–$4'$–$2'$–$2\frac{2}{3}'$
Catalog number	4322 026 37680	4322 026 37690	4322 026 37930

pedal units	*version I*	*version II*
Number of gates	3	5
Gate-pitches	$16'$–$8'$–$4'$	$32'$–$16'$–$8'$–$4'$–$5\frac{1}{3}'$
Outputs square wave	$16'$–$8'$–$4'$	$32'$–$16'$–$8'$–$4'$–$5\frac{1}{3}'$
Outputs saw-tooth wave	$16'$–$8'$–$4'$	$32'$–$16'$–$8'$–$4'$–$5\frac{1}{3}'$
Catalog number	4322 026 37670	4322 026 37920

All versions can be used for pitches one octave higher than those designated, this is of greatest interest for version II of the pedal units and version III of the manual units. These units are so versatile as to be suited to any keyboard – great organ, swell organ, solo organ, etc.

Mixture pre-stage unit, *dimensions* $67 \times 11.5 \times 1.5$ *cm, catalog number* 4322 026 37750

This unit consists of 61 separate stages each shaping a particular frequency for the main mixture unit. The inputs are square waves direct from the master oscillators and frequency dividers; the frequencies used depend upon the type of mixture or cymbal to be constructed (based on $2'$ and $\frac{1}{2}'$ or $1\frac{1}{3}'$ and $\frac{1}{3}'$ etc.) The outputs are saw-tooth waveforms to suit the open diapason character of the mixture stops.

Mixture unit, *dimensions* $6.7 \times 14.5 \times 3.8$ *cm, catalog number* 4322 026 38190

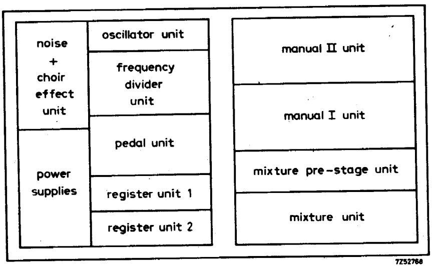
This unit has 61 separate sub-units (one per key on the keyboard) each of which has two circuits, a four-input and a three-input mixture. The mixtures are quite separate, generally they are gated from different keyboards, If desired the outputs can be strapped to form chords of up to seven notes. The gates must then be strapped as well.

TRANSISTORISED ASSEMBLIES FOR CHURCH AND CONCERT ORGANS

The unit is so arranged that, by mixing outputs from the pre-stage, the organ builder can construct chords to suit his own taste.
Although the stages are basically similar, there are differences in component values along the keyboard, to compensate for the frequency dependence of the ears's sensitivity, and to meet specific voicing requirements. No equalising networks are needed, just a single voicing network in the stop circuits.

Stop unit, *dimensions* 40 × 11 × 14 *cm*, *catalog number* 4322 026 37720
Each stop-unit panel contains 11 plug-in printed wiring boards mounted on a chassis. Each printed wiring board contains two stop circuits that can be used separately or together.
They are completely equipped except for those components that affect voice, these may be inserted to suit particular needs and personal taste.
The circuits contain provision for an input from the equalizing networks and an input for a chiff frequency. A potentiometer enables the volume of the stop to be adjusted to suit the organ's location.

Block diagram of a typical layout for a small (2 manual) organ.



RELAYS

Operating (for d.c. voltage)

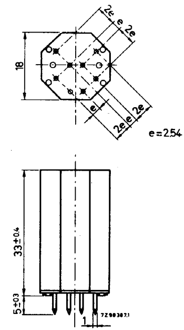
		ER1000	ER1010	ER1020	ER1030	ER1040	ER1050
Voltage	($V_{d.c.}$)	55	36	24	12	6	3
Current	(mA)	11	16.5	22	50	93	200
Power	(mW)	600	600	530	600	560	600
Resistance	(Ω)	5000	2200	1100	240	65	15
Temperature	(°C)	⩽100	⩽100	⩽100	⩽100	⩽100	⩽100

Contact

Pressure : ⩾0.1 N/cm^2
Voltage : 300 $V_{d.c.}$
Current : 40 mA
Resistance : ⩽100 MΩ
Capacitance : ⩽2 pF
Insulation resistance : ⩾40 MΩ

Catalog numbers

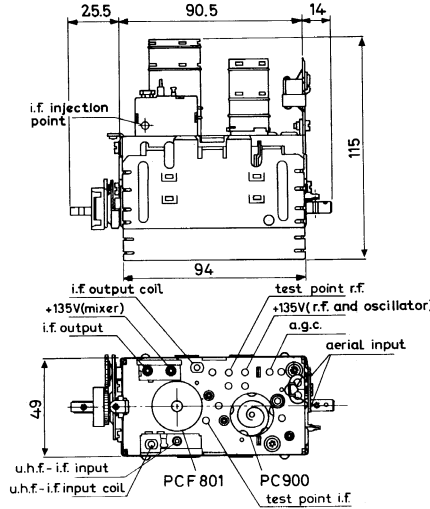
ER1000: 3122 107 95940
ER1010: 3122 108 86520
ER1020: 3122 108 86510
ER1030: 3122 108 86500
ER1040: 3122 108 86490
ER1050: 3122 108 86480



TELEVISION TUNERS

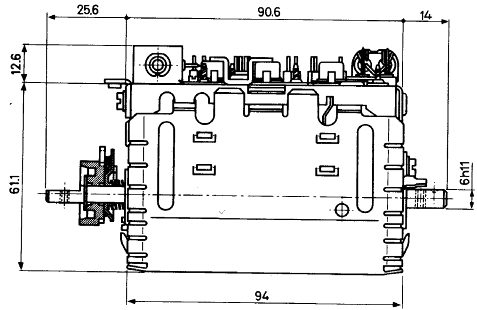
V.H.F. tuner AT 7650/90

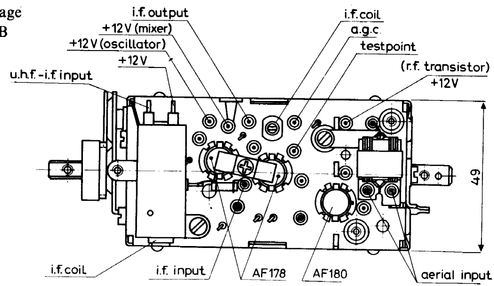
Catalog number	: 3122 996 68400
System	: C.C.I.R.
Tubes, r.f. amplifier	: PC900
oscillator	: PCF 801, triode part } $V_f = 12$ V
mixer	: PCF 801, pentode part } $I_{f\,nom} = 300$ mA
Supply, r.f. amplifier and oscillator	: $V_b = 135$ V, $I_{max} = 25$ mA
mixer	: $V_b = 135$ V, $I_{max} = 11$ mA
Frequency ranges	: 47–68 MHz (band I) 174–223 MHz (band III)
Intermediate frequencies	
picture	: 38.9 MHz
sound	: 33.4 MHz
Aerial input impedance	: 300 Ω symmetrical
Gain	: 35 dB from aerial-emf to the grid of the first i.f. stage (for an i.f. bandwidth of 6.5 MHz at 3 dB and flat within 5 %)
Gain of the pentode part of the PCF801 used as an i.f. amplifier	: 20 dB
Noise, band I	: $\leqslant 3.5\,kT_0$
band III	: $\leqslant 6.5\,kT_0$



V.H.F. tuner AT7652/80T

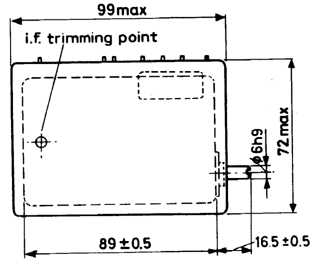
Catalog number	: 3122 108 60160
System	: C.C.I.R.
Transistors, r.f. amplifier	: AF180; I_B ~50 μA
	I_E = 2.5 mA
	V_{agc} = 12 V
oscillator	: AF178; I_E ~ 1.85 mA
	I_B ~ 0.92 mA
	V_b = 12 V
mixer	: AF178; I_E ~ 1.9 mA
	I_B ~ 1.15 mA
	V_b = 12 V
Frequency ranges	: 47–68 MHz (band I)
	174–223 MHz (band III)
Intermediate frequencies	
picture	: 38.9 MHz
sound	: 33.4 MHz
Aerial input impedance	: 300 Ω symmetrical
Gain	: 26 dB from aerial - emf to the first i.f. stage (for an i.f. bandwidth of 6.5 MHz at 3 dB and flat within 5%)
Noise, band I	: $\leqslant 5\ kT_0$
band III	: $\leqslant 9\ kT_0$

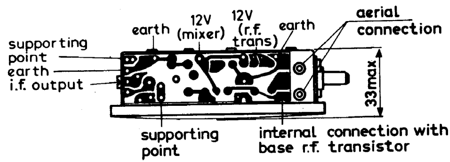




U.H.F. tuner AT6382/01

Catalog number	: 3122 108 59470
System	: C.C.I.R.
Transistors, r.f. amplifier	: AF239
mixer-oscillator	: AF139
Supply, r.f. amplifier	: +12 V (min. +9.5 V)
oscillator	: +12 V (min. +9.5 V)
Total supply current without a.g.c.	: approx. 8 mA
Frequency range	: 470–890 MHz (bands IV and V)
Intermediate frequencies picture	: 38.9 MHz
sound	: 33.4 MHz
Aerial impedance	: 300 Ω
Gain for an i.f. bandwidth of 7 MHz at 3 dB	: >18 dB
Noise, at 470 MHz	: average value 7.0 dB (max. 8.5 dB)
at 600 MHz	: average value 7.0 dB (max. 8.0 dB)
at 800 MHz	: average value 7.0 dB (max. 8.5 dB)
at 860 MHz	: average value 8.5 dB (max. 10.0 dB)
at 890 MHz	: average value 9.0 dB (max. 11.0 dB)



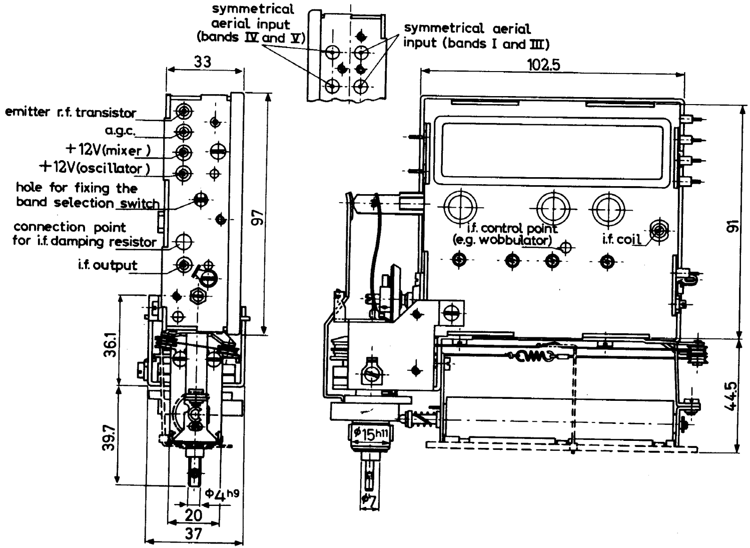


V.H.F./U.H.F. tuner AT7680/90

This tuner is fitted with a tuning device with two concentric knobs. With the aid of the outer knob a disc can be operated, which in its turn is setting the band selection slide switch to the desired band. With the inner knob, a channel out of this band can now be chosen.

Catalog number: 3122 108 82000

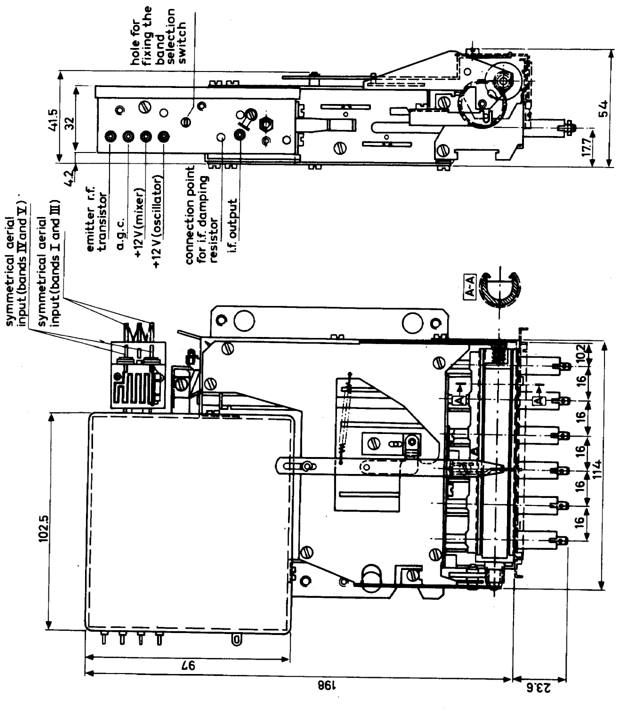
For data, see AT7672/90



V.H.F./U.H.F. tuner AT7672/90

This tuner is fitted with a push-button unit. Up to six selections are possible, each of which may be pre-adjusted to any v.h.f. or u.h.f. channel.

Catalog number	: 3122 108 65520
System	: C.C.I.R.
Transistors, r.f. amplifier	: AF239
mixer	: AF139
oscillator	: AF139
Supply, r.f. amplifier	: +12 V (min. +9.5 V)
oscillator	: +12 V (min. +9.5 V)
Total supply current	
without a.g.c.	: approx. 11 mA
with a.g.c.	: approx. 17 mA
Frequency ranges	: 47–68 MHz (band I)
	174–230 MHz (band III)
	470–890 MHz (bands IV and V)
Intermediate frequencies	
picture	: 38.9 MHz
sound	: 33.4 MHz
Aerial impedance	: 300 Ω, symmetrical
Gain for an i.f. bandwidth of 7 MHz at 3 dB	
bands I and III	: ⩾22 dB (average value 26 dB)
bands IV and V	: ⩾18 dB (average value 24 dB)
Noise, band I	: average value 5.5 dB (max. 7.0 dB)
band III	: average value 6 dB (max. 7.5 dB)
at 470 MHz	: average value 6 dB (max. 9.0 dB)
at 650 MHz	: average value 7 dB (max. 9.0 dB)
at 800 MHz	: average value 8 dB (max. 10.0 dB)
at 860 MHz	: average value 9.5 dB (max. 11.0 dB)
at 890 MHz	: average value 10 dB (max. 12.0 dB)

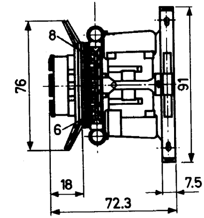


symmetrical aerial input (bands IV and V)
symmetrical aerial input (bands I and III)
emitter r.f. transistor
a.g.c.
+12 V (mixer)
+12 V (oscillator)
connection point for i.f. damping resistor
i.f. output
hole for fixing the band selection switch
41.5
32
4.2
17.7
54
A-A
102.5
97
198
23.6
114
16
16
16
16
16
10.2

DEFLECTION COMPONENTS FOR BLACK AND WHITE TELEVISION

Deflection unit AT 1040

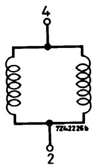
Catalog number 3122 107 31380
For use with a 110° picture tube with a neck diameter of 28 mm in conjunction with the AT2036, AT2045, AT3513 and the AT4042/02.



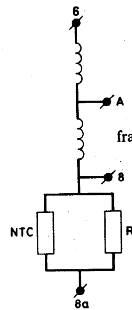
Order of contacts
8, 8a, 2, 4, A, 6

Line deflection coils, parallel connected	
Inductance	2.1 mH
Resistance	3.9 Ω
Deflection current at 18 kV	2.82 A_{p-p}

Frame deflection coils, series connected	
Inductance	66 mH
Resistance	30 Ω (6–8)
at 25°C	44 Ω (6–8a)
Deflection current	545 mA_{p-p}



line deflection coils



frame deflection coils

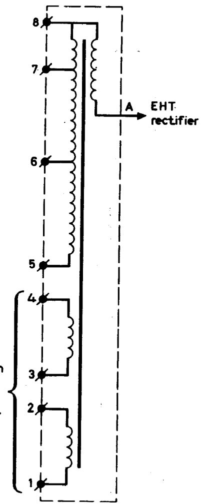
Line-output transformer AT 2036

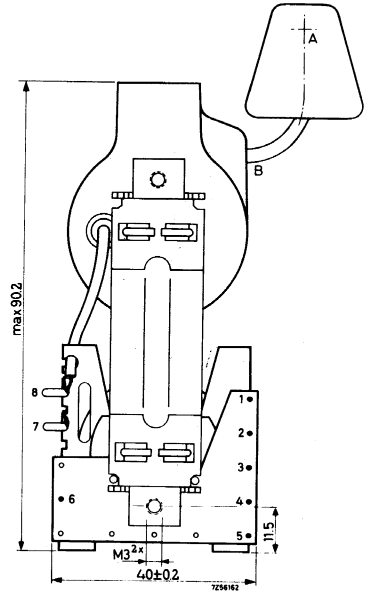
Catalog number: 3122 108 32410

This line-output transformer has been developed to provide the required scanning amplitude for 19″ or 23″ picture tubes in television receivers presenting 625 lines at 50 frames per second (C.C.I.R.) or 525 lines at 60 frames per second (USA).

It is intended for use in conjunction with deflection unit AT 1040, linearity control unit AT 4042/02, line-output tube PL504, rectifying tube DY802 and booster diode PY88. The EHT is stabilised at 18 kV.

The transformer can be mounted on either a printed-wiring board (with a grid pitch of 2.54 or 2.50 mm) or on a metal chassis



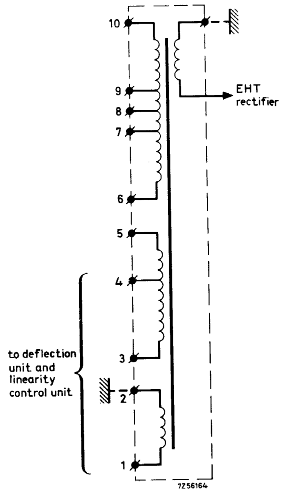


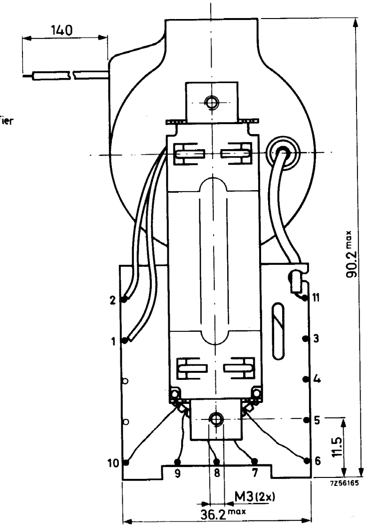
mounting height = 66.5 mm
length A – B = 60^{+5}_{0} mm

DEFLECTION COMPONENTS FOR BLACK AND WHITE TELEVISION

Line-output transformer AT 2045

Catalog number: 3122 108 32650
This line-output transformer has been developed to provide the required scanning amplitude for any 110° picture tube in television receivers presenting 625 lines at 50 frames per second (CCIR) or 525 lines at 60 frames per second (USA).
It is intended for use in conjunction with deflection unit AT1040, linearity control unit AT4042/02 and line-output transistor BU105.
The supply voltage is 130 V non stabilized.
The EHT is 18 kV or 20 kV.
The transformer can be mounted on a printed-wiring board with a grid pitch of 2.54 or 2.50 mm.

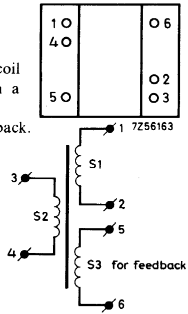


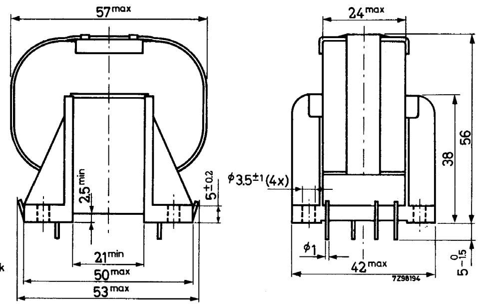


Frame-output transformer AT 3513

Catalog number: 3122 107 31740
For use in conjunction with the deflection coil AT1040. It is suitable for mounting on a printed-wiring board and on a chassis.
One winding can be used for voltage feedback.

S1:	Inductance, $I_{prim.} = 55$ mA	7.54 H
	$I_{prim.} = 70$ mA	6 H
	Resistance	230 Ω
S2:	Resistance	9.7 Ω
	Transformer ratio N_1/N_2	5.6
S3:	Resistance	165 Ω
	Transformer ratio N_1/N_3	3.9



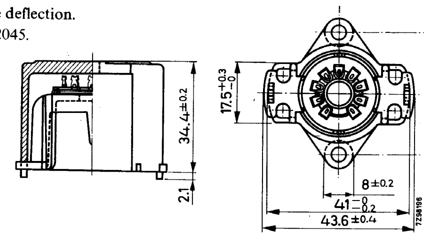


Adjustable linearity control unit AT 4042/02

Catalog number: 3122 108 39450
For use in TV sets equipped with tubes, to adjust the linearity of the line deflection.
It can be used in combination with the AT1040 and the AT2036 or AT2045.
For further data see section "Components for colour television".

E.H.T. tube socket AT 7130

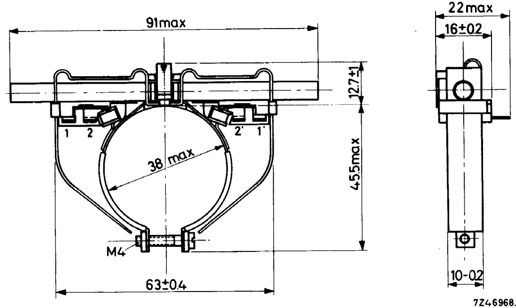
This tube socket for rectifier tube DY802 is equipped with a resistor of 1.6 Ω to be connected in series with the heater.



COMPONENTS FOR COLOUR TELEVISION

Blue lateral unit AT 1025/05

Catalog number: 3122 107 30020
For use with a 90° shadow mask colour picture tube in conjunction with a deflection unit AT1027/04 and a convergence unit AT4045/07 or AT4046/07 for static and dynamic lateral adjustment.



Coils, series connected (2 to 1′)	
Inductance	3.2 mH
Resistance	36 Ω
Coils, parallel connected (1 to 1′ and 2 to 2′)	
Inductance	0.63 mH
Resistance	9 Ω

The unit must be positioned on the colour picture tube as close as possible to the convergence unit.

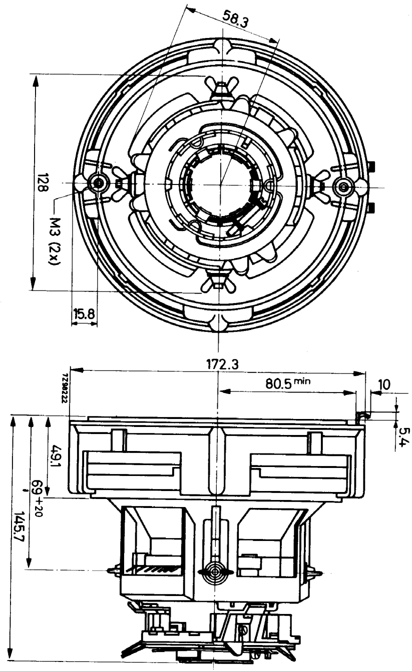
Deflection unit AT 1027/04

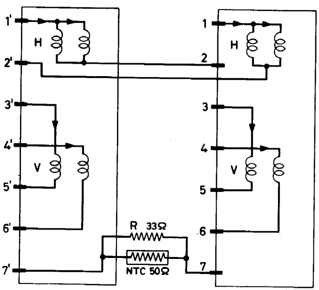
Catalog number: 3122 107 31510
For use with a 90° shadow mask colour picture tube, in conjunction with line-deflection transformer AT2051/00, E.H.T. transformer AT2052/03, convergence unit AT4045/07 or AT4046/07, blue lateral unit AT1025/05, linearity control unit AT4042/. . and transductor AT4041/06.

Electrical data

Line deflection coils, parallel connected	
Inductance	2.95 mH
Resistance at 25°C	2.9 Ω
Deflection current at 25 kV, edge to edge scan in both directions	2.6 A_{p-p}
Frame deflection coils, series connected	
Inductance	114 mH
Resistance at 25°C	56 + 20* Ω
Deflection current at 25 kV, edge to edge scan in both directions	0.415 A_{p-p}
Frame deflection coils, parallel connected	
Inductance	28 mH
Resistance at 25°C	14 Ω
Deflection current at 25 kV, edge to edge scan in both directions	0.830 A_{p-p}
Maximum working temperature	95°C

* NTC thermistor in parallel with a resistor of 33 Ω.





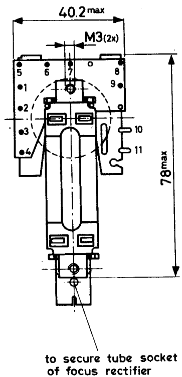
Circuit diagram

Connections

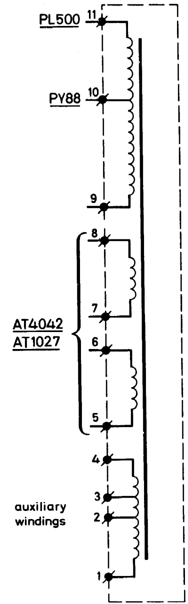
COMPONENTS FOR COLOUR TELEVISION

Line-deflection transformer AT 2051/00

Catalog number 3122 108 39390
This transformer has been designed to be used in combination with the E.H.T. transformer AT2052/03 to drive a colour picture tube with a deflection angle of 90° and an E.H.T. of 25 kV.
It is intended for use in conjunction with deflection unit AT1027/03, linearity control AT4042/02, transductor AT4041/06, line-output tube PL500, focus voltage rectifier DY51 and booster diode PY88.



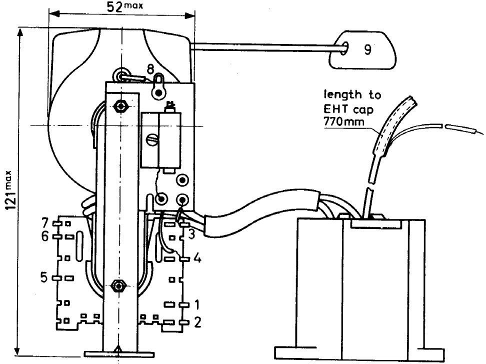
The transformer can be mounted on either a printed-wiring board (with a grid pitch of 2.54 or 2.50 mm) or a metal chassis.
Mounting height 66.5 mm



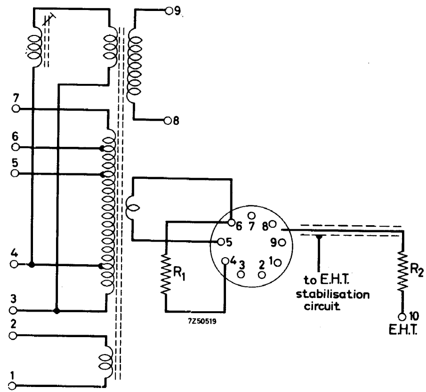
E.H.T. transformer AT 2052/03

Catalog number 3122 108 39850

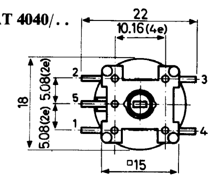
For use in combination with the line deflection transformer AT2051/00, and the tubes PL505 and PY500, to generate the E.H.T.

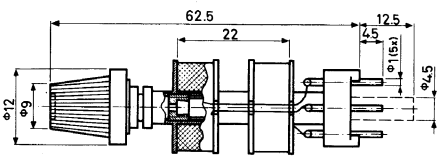


Mounting height 121 mm



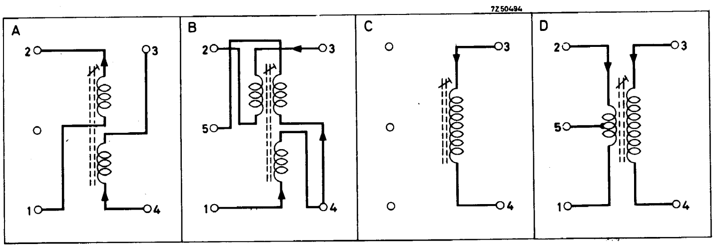
Convergence and pin-cushion adjustors AT 4040/. .





COMPONENTS FOR COLOUR TELEVISION

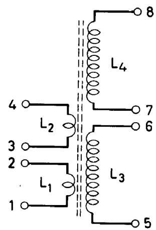
Type number	*circuit*	*L-range (mH)*	*d.c. resistance (Ω)*	*catalog number*
Convergence adjustors (with knob)				
AT4040/49	A	0.32–1.08	2.4	3122 107 30030
AT4040/53	D	0.635–3.725	3.65	30060
AT4040/56	B	1–4 = 5–4 : 0.00575–0.0225 2–3 : 0.0295–0.0105	1–4 = 5–4 : 0.11 2–3 : 0.165	30080
AT4040/57	A	0.1–0.32	0.66	30090
AT4040/63	A	0.117–0.44	1.35	30480
Pin-cushion adjustor (without knob)				
AT4040/55	C		4.1	31220

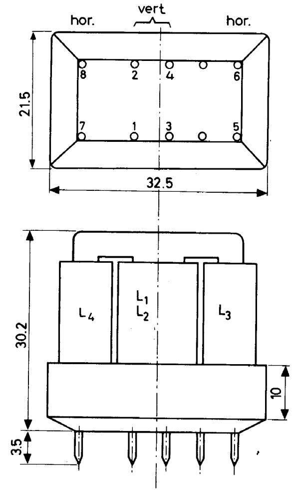


Transductor AT 4041/06

Catalog number 3122 107 31420
For use in conjunction with the AT1027/04, AT2051/00, AT4040/. . and the frame-output transformer to correct pin-cushion distortion.

The transductor can be mounted on a printed-wiring board with grid pitch of 2.54 mm.





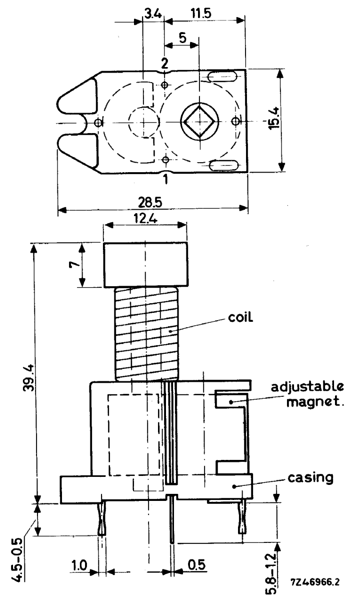
COMPONENTS FOR COLOUR TELEVISION

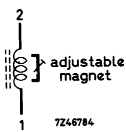
Adjustable linearity control unit AT 4042/02

Catalog number 3122 108 39450
For use in colour TV sets equipped with tubes, to adjust the linearity of the line deflection. It can be used in combination with AT1027/04 and AT2051/00.

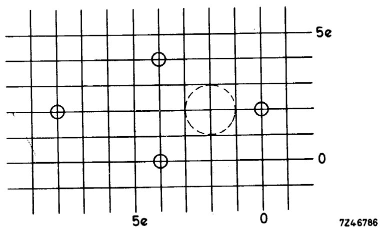
Electrical data

When a saw-tooth current (without S-correction) of 2.8 A_{p-p}, frequency 15,625 Hz, flyback ratio 18 %, flows through the linearity control unit (one connection point to earth), the correction voltage is adjustable between 15 V and 26 V.





Circuit diagram



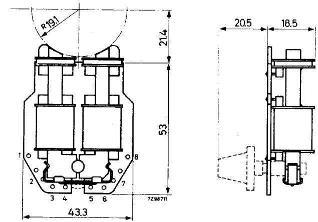
Hole pattern for mounting
on a printed-wiring board ($e = 0.1''$ or 2.50 mm)

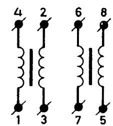
Convergence unit AT 4045/07, catalog number 3122 108 83130
Convergence unit AT 4046/07, catalog number 3122 108 83150

This unit is intended to be used with a 90° shadow mask colour picture tube, in conjunction with the deflection unit AT1027/07 and the blue lateral unit AT1025/05 to converge the three colour pictures statically and dynamically and to adjust the purity.

The AT4046/07 has a permanent magnet for static convergence

	Line coils		*Frame coils*			
	in series	*in parallel*	*in series*		*in parallel*	
			AT4045	AT4046	AT4045	AT4046
Connections	3 and 7	2 and 3	1 and 5	1 and 5	1 and 4	1 and 4
Interconnection	2–6	2–7 3–6	4–8	4–8	1–8 4–5	1–8 4–5
Inductance	0.4	0.1	1.41	1.27	0.35	0.32
Resistance	3.1	0.8	170	182	42.5	45.5



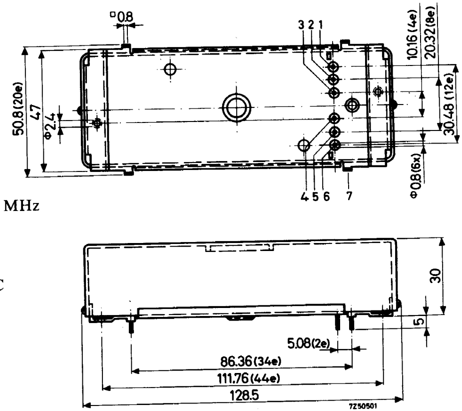


Delay line DL1E

Catalog number: 2722 121 00051

Electrical data

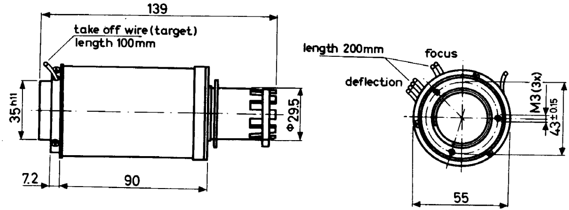
Nominal frequency f_{nom}	4.433619 MHz
Nominal phase delay-time (V_{in}-V_{out}) at f_{nom} (unmodulated sinewave voltage)	63.943 μs
Accuracy of adjustment	± 3 ns at 25°C
Bandwidth (−3 dB points)	better than from 3.43 to 5.23 MHz
Insertion loss	13 ± 4 dB at f_{nom}
Temperature drift (relative to 25°C)	
phase delay	max. ± 5 ns between +25°C and +50°C
insertion loss	typical $\pm <0.3$ dB
Maximum input at f_{nom}	10 V_{p-p}
Termination impedances	100 Ω



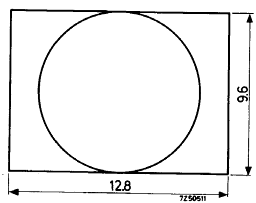
Connections: V_{in} to 4 and 6
V_{out} to 3 and 1

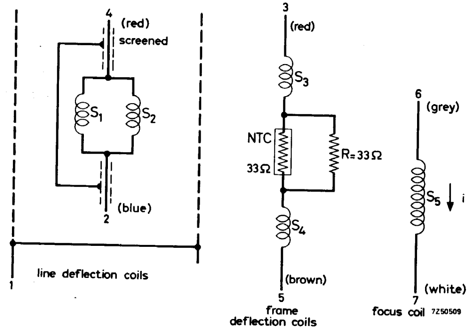
DEFLECTION ASSEMBLIES FOR CAMERA TUBES

Vidicon deflection unit AT 1102



Catalog number: 3122 107 30580
Distortions inside the circle: about 1 % of picture height
Distortions outside the circle: about 2 % of picture height

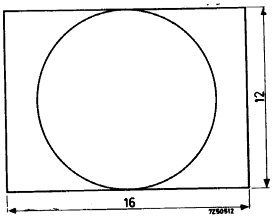


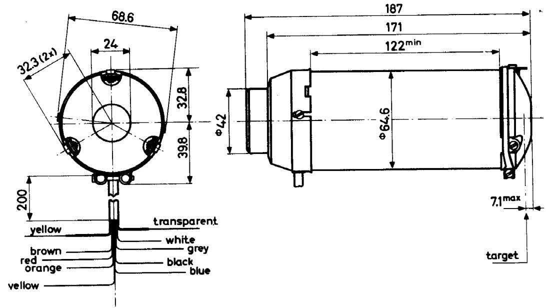


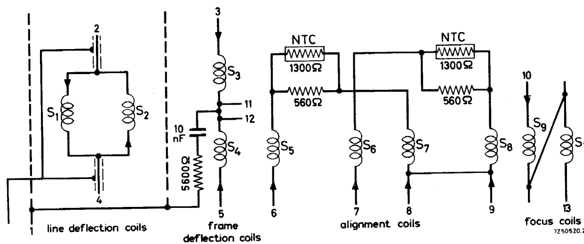
DEFLECTION ASSEMBLIES FOR CAMERA TUBES

Plumbicon deflection unit AT 1113/01

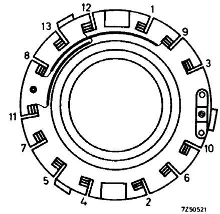
Catalog number: 3122 108 84401
Distortions inside the circle : max. 0.5 % of picture height
Distortions outside the circle: max. 1 % of picture height



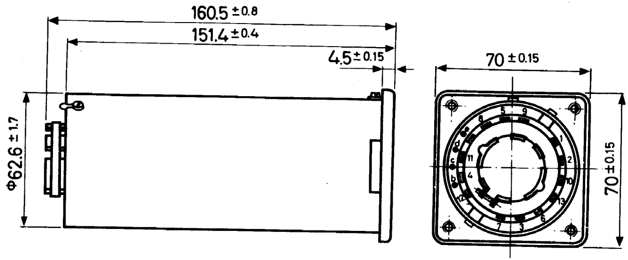




1 = black
2 = transparent (screened)
3 = brown
4 = yellow (screened)
5 = red
6 = orange
7 = yellow
8 = 9 = blue
10 = white
11 = –
12 = –
13 = grey



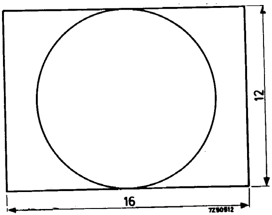
Plumbicon deflection units AT 1122 and AT 1132

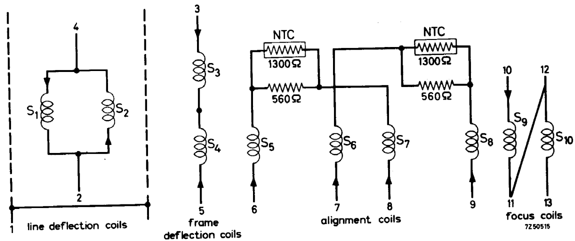


DEFLECTION ASSEMBLIES FOR CAMERA TUBES

Catalog number unit AT1122: 3122 108 39350
unit AT1132: 3122 108 39360

Distortions inside the circle	: max. 1 % of picture height	AT1122
Distortions outside the circle	: max. 2 % of picture height	AT1122
Distortions inside the circle	: max. 0.5 % of picture height	AT1132
Distortions outside the circle	: max. 1 % of picture height	AT1132





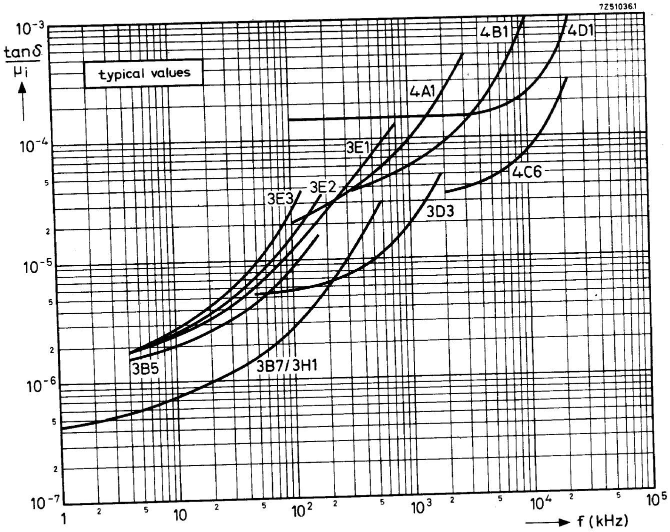
MANGANESE ZINC AND NICKEL ZINC FERRITES

Introduction

The predominant feature of ferroxcube lies in its high resistivity that allows cores to be made of solid material without the eddy current losses becoming prohibitively high, even if the cores are used in the megacycle range.
Compared with powder-iron, the permeability of ferroxcube is high, whereas the losses remain comparatively low.
Ferroxcube cores are available in convenient shapes e.g. potcores, E- and I-cores, X-cores, toroids, U-cores, aerial rods, yoke rings, screw cores, rods and tubes.
This section contains comprehensive data on manganese zinc ferrites (ferroxcube 3) and nickel zinc ferrites (ferroxcube 4) and their various grades.

Application

grade	*application*
3B	potcores, cores for small coils
3B3	frames for i.f. transformers, potcores, rods, screw cores
3B5, 3B7	potcores
3C1	erasing heads
3C2	yoke rings, erasing heats
3C4	U-cores
3C6	E- and U-cores
3C8	U and I cores
3D3	aerial rods, potcores, screw cores
3E1	E- and I-cores, toroids, potcores
3E2	H-cores and toroids
3E3	toroids
3H1	potcores, small toroids, cross cores
4A1	potcores, E-cores
4A3	aerial rods
4A4	frames for i.f. transformers
4B1	aerial rods, frames for i.f. transformers
4C1	rods and tubes
4C4	small potcores and small toroids
4C5	frames for i.f. transformers
4C6	potcores and small toroids
4C7	aerial rods
4D1, 4D2, 4E1	frames for i.f. transformers, screw cores



Eddy current losses and residual losses as a function of the frequency at low induction level

FERRITES FOR RADIO, AUDIO AND TELEVISION

Antenna rods and plates

Standard types

Rods

Grade 4A3

dimensions (mm)	*catalog number*
∅ 10 × 240	3122 104 93440
× 230	4311 020 53120
× 220	4311 020 52740
× 210	3122 104 93700
× 200	3122 104 93420
× 190	4311 020 53230
× 180	3122 104 93450
× 170	4311 020 52760
× 160	4311 020 52610
× 150	4311 020 52770
× 140	3122 104 93460
× 130	4311 020 52780
× 120	4311 020 53300
× 100	4311 020 52590
∅ 7.8 × 190	4311 020 52700
× 140	4311 020 52690
× 130	4311 020 52680
× 100	4311 020 52790
∅ 6.35 × 130	4311 020 52800
× 100	4311 020 52810

Grade 4B1

dimensions (mm)	*catalog number*
∅ 9.7 × 240	4311 020 52330
× 200	3122 104 91250
× 175	4311 020 52240
× 140	3122 104 91240
× 130	4311 020 52230
∅ 7.8 × 190	4311 020 52550
× 140	4311 020 50250
× 100	4311 020 52170
∅ 6.5 × 130	3122 104 91800

FERRITES FOR RADIO, AUDIO AND TELEVISION

Grade 4C7 (for medium and short wave reception)

dimensions (mm)	*catalog number*
∅ 10 × 140	4311 020 53530
∅ 10 × 160	4311 020 53490
∅ 10 × 180	4311 020 53450
∅ 10 × 200	4311 020 53540
∅ 10 × 210	4311 020 53550
∅ 10 × 220	4311 020 53560
∅ 10 × 240	4311 020 53510

Plates

Grade 4B1

dimensions (mm)	*catalog number*
19 × 3.8 × 150	4311 020 52410
× 125	4311 020 52400
× 100	4311 020 52390
× 75	4311 020 52380
13.4 × 4.15 × 120	3122 104 92140
× 94	3122 104 92120
× 62	3122 104 92150

Cores for small coils, e.g. i.f. transformers

Preferred types

To be used as cores in r.f. and h.f. coils with an open magnetic circuit such as in i.f. transformers.

Rods

dia. (mm)	*length (mm)*	*grade*	*catalog number*
0.95	10	3B	3522 200 03750
1.25	6.2	3B	4322 020 32080
1.65	9.2	3B	3122 104 91070
	9.2	4B1	3122 104 91060
	11.5	3B	4322 020 32100
	11.5	4E1	4322 020 32110
	12.2	3B	3122 104 91100
	12.2	4B1	3122 104 91110

dia. (*mm*)	*length* (*mm*)	*grade*	*catalog number*
1.65	19.2	3B	3122 104 91230
	25.2	3B	3122 104 91170
	25.2	4B1	3122 104 91180
	28.2	3B	3122 104 91090
	28.2	4B1	4322 020 32090
1.7	15.2	4D1	4322 020 32170
	28.2	4C1	4322 020 32120
	28.2	4D1	4322 020 32130
	28.2	4E1	4322 020 32140
	30.5	3B	3122 104 91200
1.75	10.2	3B	3122 104 91130
	18.5	3B	3122 104 91140
	18.5	4B1	3122 104 91150
6	46.2	3C	3122 104 91310
6.65	40.4	3B	4322 020 32160

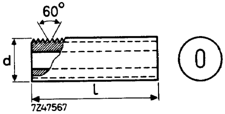
Tubes

outer dia. (*mm*)	*inner dia.* (*mm*)	*length* (*mm*)	*grade*	*catalog number*
2.8	1.2 +0.1	8.2	3B	4322 020 34340
3.7	1.2 +0.2	3.5	3B	4322 020 34400
			4B1	4322 020 34420
		6.5	3B	4022 101 80010
	1.7 +0.2	13.7	4E1	4322 020 34330
4.15	2 +0.2	7.2	4A	4322 020 34440
		12.2	4B1	4322 020 34450
			4C1	4322 020 34460
			4D1	4322 020 34470
		15.2	4B1	4322 020 34380
			4C1	4322 020 34370
		21.2	4A	4322 020 34390
			4B1	4322 020 34480
4.3	2 +0.2	7.2	3B	3122 104 92900
		12.5	3B	4322 020 34490
		15.2	4D1	4322 020 36760
		15.4	3B	4322 020 36750
		18.5	3B	4322 020 36770
		25.5	3B	4322 020 36780
			4B1	3122 104 90810
			4C1	3522 200 10950

outer dia. (mm)	*inner dia. (mm)*	*length (mm)*	*grade*	*catalog number*
4.3	2 +0.2	25.5	4D1	3522 200 10960
			4E1	3522 200 10970
		30.2	3B	4322 020 36790
		40.5	3B	3122 104 90800
		55.5	3B	4322 020 36800
4.95	1.3 +0.2	40.5	3C3	3122 104 93110
5.3	3 +0.2	22.4	3B	4322 020 36810
6.2	2.85 +0.3	30.2	4C1	4322 020 36820
8	4.2 +0.6	51.4	3B	4322 020 34310
			4B1	4322 020 34320

Screw cores

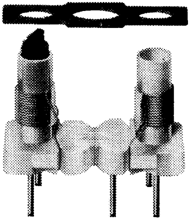
FXC grade 3D3
$\mu_i = 750 \pm 20\%$



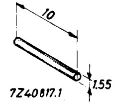
screw thread	*l* (*mm*)	*d* (*mm*)	*catalog number*
M4 × 0.50	12	3.65 + 0.05	4312 020 32041
M4 × 0.50	7	3.65 + 0.05	4312 020 32141
M5 × 0.75	12	4.55 + 0.05	4312 020 32051
M5 × 1	20	5.0 − 0.1	4312 020 32131
M6 × 0.5 [1]	12	5.9 − 0.04	4312 020 32011
M6 × 0.75	25	5.55 + 0.05	4312 020 32071
M6 × 0.75	13	5.55 + 0.05	4312 020 32061
M6 × 1	25	5.5 ± 0.02	4312 020 32031
M6 × 1	12	5.5 ± 0.02	4312 020 32021
M7 × 1	18	6.45 + 0.05	4312 020 32091
M7 × 1	12	6.45 ± 0.05	4312 020 32081
M8 × 0.75	16	7.55 + 0.05	4312 020 32101
M8 × 1.25	25	7.35 + 0.05	4312 020 32121
M8 × 1.25	16	7.35 ± 0.05	4312 020 32111

[1]) Grade 3B

Piece parts and mounting parts for small i.f. coils (lilliput type)



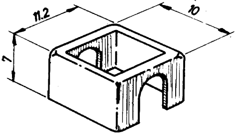
Screw core (ferroxcube)



max. frequency (MHz)	*grade*	*catalog number*
0.6	3B	3122 104 93010
2	4B1	3122 104 39020
12	4D1	3122 104 93040
40	powder iron	3122 104 91630

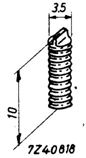
A version with a trimming grip on both sides is also available

Ferroxcube frame (lacquered)



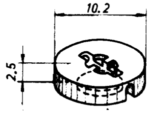
max. frequency (MHz)	*colour*	*type number*
0.6	black	AP3014/00/3B
2	green	AP3014/01/4B1
12	light blue	AP3014/02/4D1
ratio detector	light blue	AP3014/03/4D1

Coupling rod (3*B*)



For coupling between primary and secondary windings, to be inserted in disc AP3018.
Catalog number:
3122 104 91130

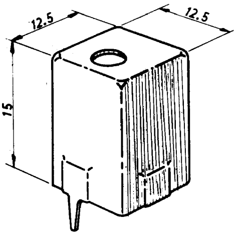
Coupling disc



Type number AP3018

Can

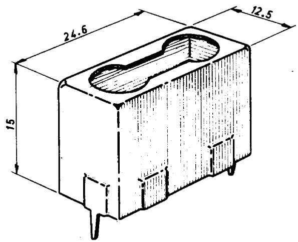
For one coil



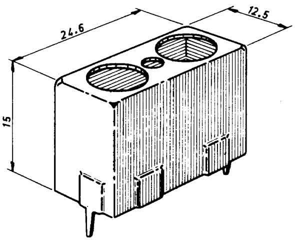
Polystyrene can for mechanical shielding, to be used when screening is not required. The Q-factor is not affected. Type number AP3015/00.

Copper can for mechanical and electrical shielding.
Symmetric hole: type number AP3015/01
Asymmetric hole: type number AP3015/02

For two coils

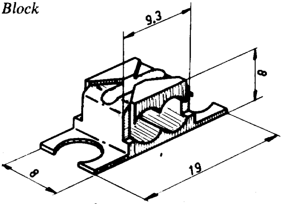


Tinned copper can
Type number AP3015/03



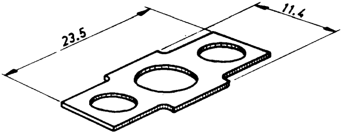
Tinned copper can
Type number AP3015/04

Block



Type number AP3019
(for ratio detector only)

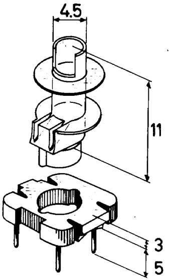
Spacer plate

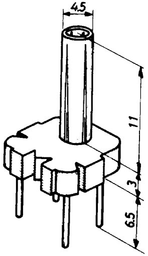


Type number AP3017

Coil formers (polyethylene)

with base	*version*	*type number*
symmetric:		
for use without	4 pins	AP3016/00
ferroxcube frame	5 pins	AP3016/01
asymmetric:		
for use with	4 pins	AP3016/02
ferroxcube frame	5 pins	AP3016/03





AP 3016/02

Coil former (without base), asymmetric, for use with frame AP3014, type number AP3016/05.

Base with 4 pins for above coil former, type number AP3016/07.

FERRITES FOR RADIO, AUDIO AND TELEVISION

Beads for screening and damping, and wide-band h.f. chokes

APPLICATION
They are used in v.h.f. radio and TV receivers and in electric motors, ignition systems etc. to reduce in- or outgoing interference, and also in v.h.f. circuits to avoid troublesome coupling.

Beads (without wire)

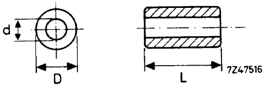


Fig. 1

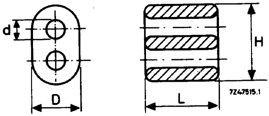


Fig. 2

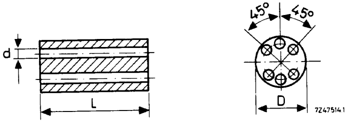
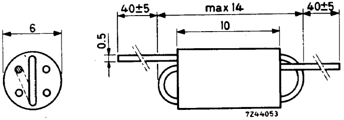


Fig. 3

Fig.	*grade*	*L (mm)*	*D (mm)*	*H (mm)*	*d (mm)*	*catalog number*
1	3B	3	3.5	—	1.3 ± 0.2	4322 020 34400
1	4B1	3	3.5	—	1.3 ± 0.2	4322 020 34420
1	3B	5	3.5	—	1.3 ± 0.2	4312 020 31060
2	4B1	8	8.5	14	3.5 + 0.5	4312 020 31570
2	4B1	14	8.5	14	3.5 + 0.5	4312 020 31520
3	3B	10	6	—	0.7 + 0.2	4312 020 31500
3	4B1	10	6	—	0.7 + 0.2	4312 020 31550

H.F. chokes

Dimensions in mm

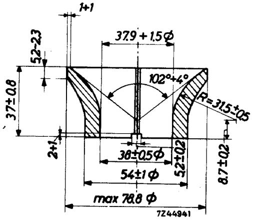


number of turns	Z_{opt} $(k\Omega)$	*f at* Z_{opt} *(MHz)*	*decrease of impedance* in the freq. range (MHz)	*dB*	*FXC grade*	*catalog number*
1.5	0.25	120	10–300	⩽7	3B	4312 020 36630
1.5	0.35	250	80–300	⩽3	4B1	4312 020 36690
2.5	0.60	50	10–220, 30–100	⩽7, ⩽3	3B	4312 020 36640
2.5	0.65	180	50–300, 80–220	⩽6, ⩽3	4B1	4312 020 36700
2 × 1.5	0.70	50	10–220, 30–100	⩽7, ⩽3	3B	4312 020 36650
2 × 1.5	0.80	110	50–300, 80–220	⩽7, ⩽3	4B1	4312 020 36710

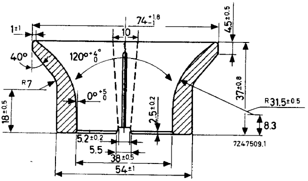
Yoke-rings for use in deflection coils for picture tubes

For 110° *black and white picture tubes*

Dimensions in mm

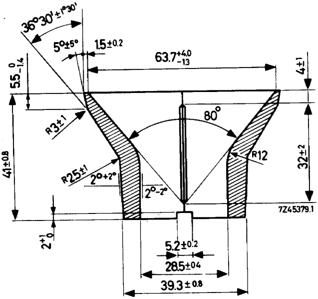


European technique
Material : Ferroxcube 3C2
Catalog number: 3122 104 92180 (standard type)



European technique
Material : Ferroxcube 3C2
Catalog number: 4322 020 35071

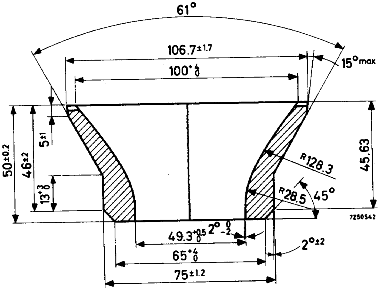
For tinyvision picture tubes (90°, 11 *inch*)

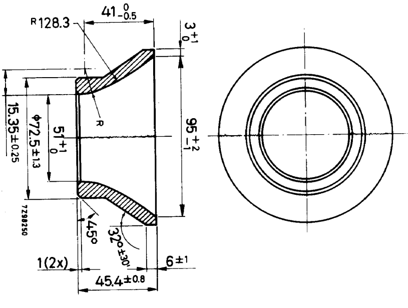


Material : Ferroxcube 3C2
Catalog number: 3122 104 90514

For 90° colour picture tubes

Material : Ferroxcube 3C2
Catalog number: 3122 108 12163
The inner surface has been lacquered.





Material : Ferrocube 3C2
Catalog number: 3122 104 99170
The inner surface has been lacquered.

Cores for line-output transformers

U-cores (for black and white television)

All types of core are available in ferroxcube grades 3C4 and 3C6. The difference in splay between two U-cores taken at random from one packing will never exceed half the total tolerance on dimension B_1.

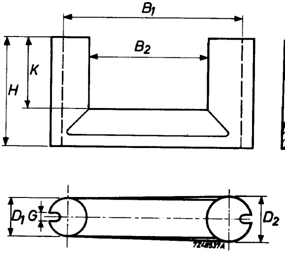


Fig. 1

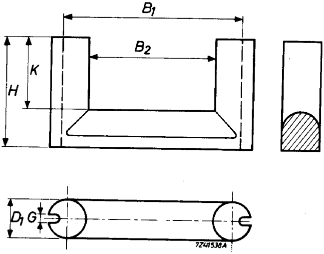


Fig. 2

$D_2 = 15.9 \pm 0.4$

Available types

dimensions (mm)						*grade*	*catalog number*
B_1	B_2	D_1	G	H	K		
							Fig. 1
49.8 ± 0.8	>26.9	15.5 ± 0.4	4.8 ± 0.2	28.4 ± 0.2	15.5 + 1	3C4	4312 020 33200
						3C6	4312 020 33300
							Fig. 2
56.7 ± 0.75	>36.1	13.8 ± 0.2	3.6 ± 0.2	29.5 ± 0.2	17.6 + 1	3C4	4312 020 33220
						3C6	4312 020 33320
60.35 ± 0.9	>37.05	15.9 ± 0.4	4.8 ± 0.2	28.75 ± 0.2	15.55 + 1	3C4	4312 020 33210
						3C6	4312 020 33310
60.35 ± 0.9	>37.05	15.9 ± 0.4	4.8 ± 0.2	31.8 ± 0.2	18.55 + 1	3C4	4312 020 33230
						3C6	4312 020 33330

U- and I-cores

Shapes

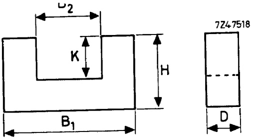


Fig. 3

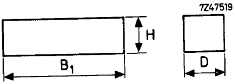


Fig. 4

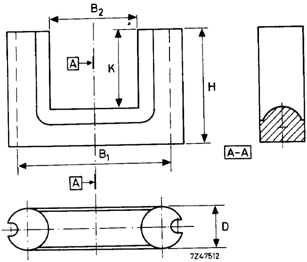


Fig. 5

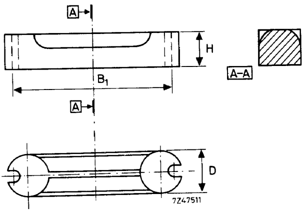


Fig. 6

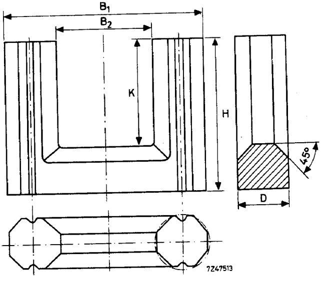


Fig. 7

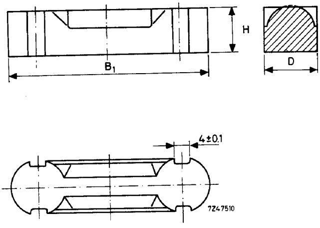


Fig. 8

Available types for black and white television

Material: ferroxcube grade 3C6

B_1 (mm)	B_2 (mm)	H (mm)	K (mm)	D (mm)	Fig.	catalog number
40.7 ± 1.3	24.4 + 1.2	33 ± 0.2	23.1 + 0.9	11.4 − 0.5	5	3122 104 90480
39.6 ± 0.4		9.5 ± 0.2		11.4 − 0.5	6	3122 104 90470
49.6 ± 0.8	27 ± 1	44.2 ± 0.2	> 31	15.6 ± 0.4	5	4312 020 33380
50 ± 0.8		12.6 ± 0.2		15.6 ± 0.4	6	4312 020 33390
58 + 1.3	28 ± 1	44.6 ± 0.5	31.5 ± 0.5	15 ± 0.4	7	4312 020 33340
58 + 1.3	28 ± 1	34.6 ± 0.5	21.5 ± 0.5	15 ± 0.4	7	4312 020 33350
59.4 ± 0.8		13.5 ± 0.2		15 ± 0.4	8	4312 020 33360
72 ± 1	44 ± 1.4	33.1 ± 0.15	19 ± 0.4	14.1 ± 0.3	3 [1])	4312 020 33000
93 ± 1.8	36.2 + 1.6	52 ± 0.5	24 ± 0.45	30 ± 0.6	3	4312 020 33100
93 ± 1.8		27.5 ± 0.5		30 ± 0.6	4	4312 020 33110
93 ± 1.8	36.2 + 1.6	76 ± 0.5	48 ± 0.9	30 ± 0.6	3	4312 020 33090
93 ± 1.8	36.2 + 1.6	76 ± 0.5	48 ± 0.9	16 ± 0.5	3	4312 020 33070
93 ± 1.8		27.5 ± 0.5		16 ± 0.5	4	4312 020 33080
101.6 ± 2	> 47	57.1 ± 0.4	31.7 ± 0.75	25.4 ± 0.8	3	4312 020 33120

[1]) Notches in back.

Available types for colour television

Material: ferroxcube grade 3C6

B_1 (mm)	B_2 (mm)	H (mm)	K (mm)	D (mm)	Fig.	catalog number
73 − 1.8	45.3 ± 1.2	65 − 1.5	49.9 ± 0.8	18.2 ± 0.4	5	3122 104 93121
73 − 1.8		14.8 ± 0.2		18.2 ± 0.4	6	3122 104 93131

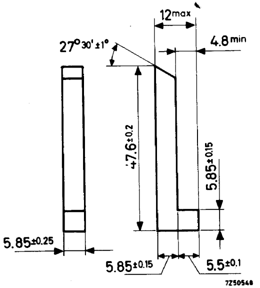
Material: ferroxcube grade 3C8

60.35 ± 0.9	35.4 ± 1.2	33.35 ± 0.2	19.05 ± 0.5	17.25 ± 0.4	5	3122 104 93950

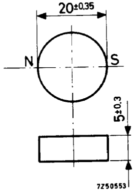
Ferrites for colour tv components

Yoke ring, see page C278
U-cores, see page C281

Special ferrite parts are:
Ferroxcube L-core and ferroxdure magnet for convergence units



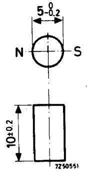
L-core
Ferroxcube 3C6
Catalog number: 3122 104 90680



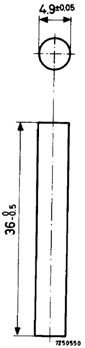
Disc magnet, diametrically magnetized
Ferroxdure 100
Catalog number: 3122 104 90620

Ferroxdure magnet for lateral convergency

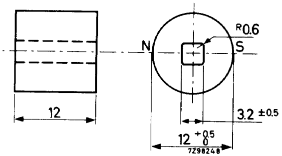
Rod magnet, diametrically magnetized
Ferroxdure 100
Catalog number: 3122 108 92850



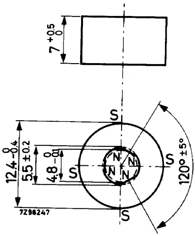
Ferroxcube rod and ferrite magnets for linearity-control units



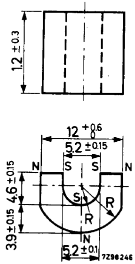
Rod core
Ferroxcube 3C6
Catalog number: 3122 104 90490



Ring magnet, diametrically magnetized
Ferroxdure 100. Catalog number 3122 104 92690



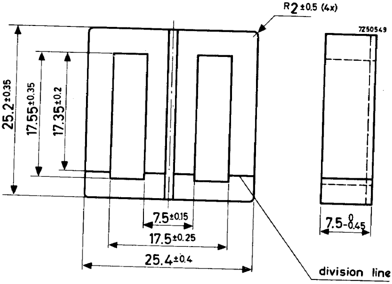
Ring magnet, radially magnetized
Plastic bonded ferroxdure P40
Catalog number: 3122 104 93530



Magnet segment, radially magnetized
Ferroxdure 100
Catalog number: 3122 104 90440

Ferroxcube E + I core for a raster correction transductor

E + I core
Ferroxcube 3C6
l_e = 5.75 cm
A_e = 0.55 cm^2
Catalog number: 3122 104 93213



Powder iron cores for small i.f. coils

Material properties

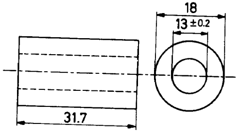
Main properties of the various grades of powder iron: 1P1, 1P2, 1P3, 2P1.

freq. range	*grade*	*Q-factor measured on a small ring*	μ_i	*particle size*
up to 10 MHz	1P1	300 at 10 MHz	10 appr.	6–8 μm
up to 40–80 MHz	1P2	350 at 30 MHz	8.5 appr.	4–6 μm
up to 40–80 MHz	1P3 [1]	350 at 30 MHz	8.5 appr.	4–6 μm
up to 100 MHz	2P1		2.5 appr.	

[1]) Only for cast parts

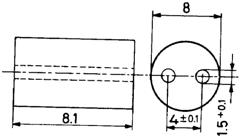
Tube

Grade 1P1
Catalog number:
4322 020 69521

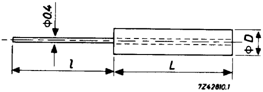


Twin bead

Grade 2P1
Catalog number:
4322 020 69511



Cores with a tinned copper wire



Grade 1P3

1 (*mm*)	*L* (*mm*)	*D* (*mm*)	*catalog number*
30+4	30	4.00	3122 997 70401
33+4	28	4.95	3122 108 70061
40+4	22	4.95	3122 108 70051

Screw cores

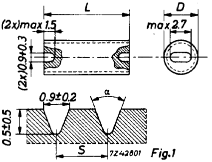


Fig.1

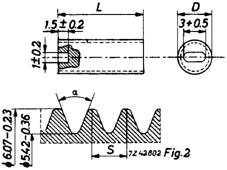


Fig.2

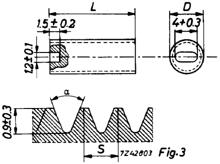


Fig.3

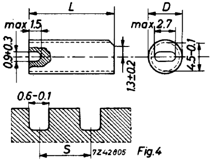


Fig.4

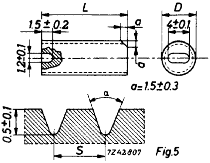


Fig.5

L (*mm*)	*D* (*mm*)	α	*S* (*mm*)	*tol.*[1]) (*mm*)	*n*	*grade*	*Fig.*	*catalog number*
5	4.95–0.1	≤85°	1.5	0.1	1	1P1	1	3122 104 91581
6	6.07–0.23	60°	0.5			1P1	2	4322 020 69501
8	4.95–0.1	≤85°	1.5	0.2	4	1P2	1	3122 104 91611
10	7 –0.1	60° ± 10°	1	0.1	1	1P2	3	3122 104 91591
12.25	4.95–0.1	≤85°	1.5	0.2	5	1P2	1	3122 104 91601
12.25	4.95–0.1	—	1.5	0.05	1	1P1	4	3122 104 93141
12.25	4.95–0.1	≤85°	1.5	0.2	5	1P1	1	3122 104 90971
13	6.07–0.23	60°	0.5	—	—	1P1	2	3122 104 90991
15	4.95–0.1	70° + 15°	1.5	—	—	1P1	1	3122 104 92971
16.5	7 –0.1	60°	1.5	0.05	1	1P2	5	3122 104 91001
16.5	7 –0.1	60° + 10°	1	0.1	1	1P2	3	3122 104 91661
20.25	4.95–0.1	≤85°	1.5	0.2	5	1P1	1	3122 104 90981

[1]) Tolerance on *S* in mm over *n* grooves

Cores for erasing heads

Material properties

low eddy current losses at frequencies up to 500 kHz
the initial permeability is approximately 900
the saturation flux at 23 °C is of ferroxcube 3C1 approximately 3300 gauss
of ferroxcube 3C2 approximately 3800 gauss

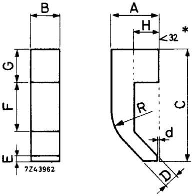


Fig. 1

* for 4322 020 30570 only

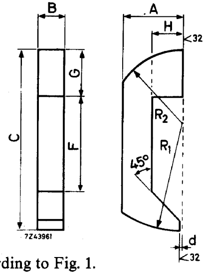


Fig. 2

Table 1, survey of cores in ferroxcube grade 3C1 and in shape according to Fig. 1.

catalog number	*nominal dimensions in mm*										*weight in g*
	A	*B*	*C*	*D*	*d*	*E*	*F*	*G*	*H*	*R*	
4322 020 30550	4.7	1.7	11	1.4	0	0.5	4.8	3.2	2.4	5	0.23
3104 101 80230	4.7	3.6	11	1.4	0	0.5	4.8	3.2	2.4	5	0.54
3922 860 20550	4.7	7.1	11	1.4	0	0.5	4.8	3.2	2.4	5	1.02
4322 020 30560	4.7	1.2	11	1.4	0	0.5	4.8	3.2	2.4	5	0.15
4322 020 30570	4.7	3.5	11	1.4	0	0.55	4.8	3.2	2.4	5	0.54
4322 020 30630	4.7	2.8	11	1.4	0+0.2	0.5	4.8	3.2	2.4	5	0.44
3122 104 92540	4.7	1.4	11	1.4	0+0.2	0.5	4.8	3.2	2.4	5	0.22
4322 020 30600	3.1	1.6	9.2	1.4	0+0.1	0.5	3.8	3.2	1.4	2	0.12

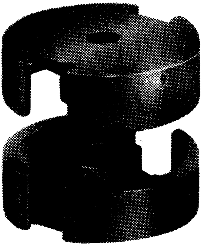
Table 2, survey of cores in ferroxcube grade 3C2 and in shape according to Fig. 2.

catalog number	*nominal dimensions in mm*									*weight in g*
	A	*B*	*C*	*d*	*F*	*G*	*H*	R_1	R_2	
4322 020 30580	5.8	3.6	18	0.1	9.4	4.5	3	11	7	1.22
4322 020 30590	5.8	1.6	18	0.1	9.4	4.5	3	11	7	0.52
4322 020 30610	5.8	2.6	18	0.1	9.4	4.5	3	11	7	0.87

PRE-ADJUSTED FERROXCUBE POTCORES, P-SERIES

Introduction

Ferroxcube potcores have been developed for constant low loss filters, coils and transformers. Due to their closed shape they combine a low weight with a small volume.
The principal properties of a potcore with a given inductance value are the quality factor Q, the temperature coefficient T.F., the disaccommodation factor D.F. and, if the potcore is used on higher induction values, the non-linearity.



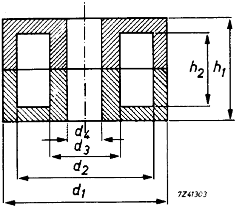
application	*approximate frequency range*	*ferroxcube grade*
filter coils	from 0.1 to 200 kHz	3B7, 3H1
	200 kHz to 2 MHz	3D3
	2 MHz to 20 MHz	4C6
loading coils, transformers chokes	up to 60 kHz	3H1
	200 Hz to 10 MHz	3H1

Potcore dimensions

The main dimensions of the potcores are in conformity with the following standardisation specifications:

IEC publication 133
CCTU 06–04 and 06–08 (France)
DIN 41 293 (Germany)

available types	*nominal dimensions (mm)*					
	d_1	d_2	d_3	d_4	h_1	h_2
P11/7	11.1	9.20	4.60	2.05	6.50	4.55
P14/8	14.0	11.8	5.90	3.10	8.40	5.80
P18/11	17.9	15.1	7.45	3.10	10.6	7.40
P22/13	21.5	18.2	9.25	4.50	13.4	9.40
P26/16	25.5	21.6	11.3	5.50	16.0	11.2
P30/19	30.0	25.4	13.3	5.50	18.9	13.2
P36/22	35.5	30.4	15.8	5.50	21.9	14.8
P42/29	42.4	36.3	17.4	5.50	29.4	20.5



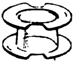
Accessories

Coil formers
The dimensions of the coil formers are in conformity with the following standardisation specifications:

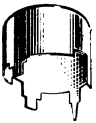
IEC publication 133
CCTU 06–02 (France)
DIN 41 294 (Germany)

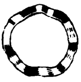
Inductance adjustors
The inductance of a pre-adjusted potcore can be increased by inserting an adjustor. For each type of potcore the corresponding type of adjustor, which will increase the published μ_e-value by a minimum of 9% and a maximum of 14% approximately is given below. For potcores P26/16, P30/19, P36/22 and P42/29 a series of step-by-step adjustor is available. These adjustors are used when a continuous adjustment of the inductance is not necessary. For instance, they are applied in loading coils to bring the inductance within a certain tolerance.
A range of 13 flexible conical step-by-step adjustors is available under the catalog numbers 4322 021 32000 up to 4322 021 32120. The higher this number the greater the effect. An adhesive is used as sliding and fixing material.

The values of μ_e, α or A_L mentioned in the tables are to be used for the potcores without the adjusting mechanism.
The inductance will only be within the given tolerance if the winding space of the coil former is completely filled.

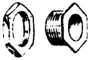

Coil former


adjustor
with nut


container


spring


tag plate


fixing bush
with nut

Mounting parts
Potcored coils can be mounted on conventional panels, as well as on printed-wiring boards, the location of the soldering tags being matched to the 0.1 in as well as to the 2.50 mm grid. The insulating material of the tag plate can fully withstand the temperatures occurring during dip-soldering.
After placing the spring in the container, the core is brought under the correct pressure by pressing the tag plate down to the rim of the container. It will be held in place after the three ears have been folded over. For conventional panel mounting, a fixing bush and nut are separately available. The type P11/7 does not possess this mounting facility.
Further information on the design of simple tools for potcore assembly will be gladly supplied on request.
For several potcore types coil formers are available provided with p.w. pins, which make the use of mounting parts superfluously.

PRE-ADJUSTED POTCORES P9/5

$\Sigma \frac{l_e}{A_e} = 12.4\ \text{cm}^{-1}$ $V_e = 0.126\ \text{cm}^3$

Potcores with standard A_L factors

A_L (nH)	*corresponding μ_e-value*	*tolerance on inductance (%)*	*with nut catalog number* 4322 022 6 . . . . *without nut catalog number* 4322 022 4		
			3*B*7	3*H*1	4*C*6
16	16	±1	—	—	1800
25	25	±1	—	—	1810
63	63	±1	1030	1230	—
100	100	±1.5	1040	1240	—
160	160	±2	1050	1250	—

Inductance $L = N^2 A_L$ (in 10^{-9} H)

Coil former

1 section catalog number 4322 021 31700

Continuous inductance adjustors

available types	
colour	*catalog number*
green	4322 021 31250
yellow	4322 021 31270
brown	4322 021 31540

recommended application	
A_L	3*B*7/3*H*1/3*D*3
63	4322 021 31250
100	4322 021 31270
160	4322 021 31540

PRE-ADJUSTED POTCORES P11/7

$\Sigma \frac{l_e}{A_e} = 9.56\ \text{cm}^{-1}$ $V_e = 0.251\ \text{cm}^3$

Potcores with standard μ_e-values

μ_e	α	*tolerance on inductance* (%)	*catalog number* 4322 022			
			3*B*7	3*H*1	3*D*3	4*C*6
15	225	±1	—	—	—	20810
22	186	±1	—	—	—	20820
33	152	±1	—	—	20430	20830
47	127	±1	—	—	20440	—
68	105.8	±1	20050	20250	20450	—
100	87.2	±1.5	20060	20260	—	—
150	71.2	±2	20070	20270	—	—
220	58.8	±5	20080	20280	—	—
660	33.9	±25	—	—	20400	—
1300	24.2	±25	20000	20200	—	—

Number of turns $N = \alpha \sqrt{L}$ (L in 10^{-3} H)

Potcores with standard A_L-factors

A_L (*nH*)	*corresponding* μ_e-*value*	*tolerance on inductance* (%)	*catalog number* 4322 022			
			3*B*7	3*H*1	3*D*3	4*C*6
25	19.0	±1	—	—	—	21810
40	30.5	±1	—	—	21420	21820
63	48	±1	—	—	21430	—
100	76	±1	21040	21240	21440	—
160	122	±1.5	21050	21250	—	—
250	190	±3	21060	21260	—	—

Inductance $L = N^2 A_L$ (in 10^{-9} H)

Coil former

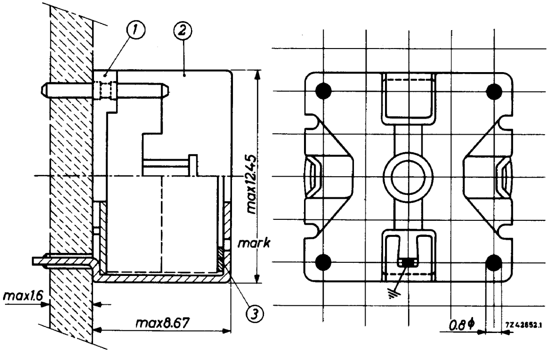
1 section catalog number 4322 021 30240

Continuous inductance adjustors

available types	
catalog number	*colour*
4322 021 31250	green
4322 021 31260	red
4322 021 31270	yellow
4322 021 31280	grey
4322 021 31540	brown

recommended application		
μ_e	A_L	$3B7/3H1/3D3$
	40	4322 021 31250
33		4322 021 31250
	63	4322 021 31260
47		4322 021 31260
68		4322 021 31270
	100	4322 021 31270
100		4322 021 31540
150	160	4322 021 31540
	250	4322 021 31280
220		4322 021 31280

Mounting parts



(1) tag plate 4322 021 30180
(2) brass container 4322 021 30510
(3) spring 4322 021 30620

PRE-ADJUSTED POTCORES P14/8

$\Sigma \frac{l_e}{A_e} = 7.89 \text{ cm}^{-1}$ $V_e = 0.495 \text{ cm}^3$

Potcores with standard μ_e-values

μ_e	α	*tolerance on inductance* (%)	*catalog number* 4322 022 ..... 3*B*7	3*H*1	3*D*3	4*C*6
15	205	± 1	—	—	—	22810
22	169	± 1	—	—	—	22820
33	137.9	± 1	22030	22230	22430	22830
47	115.5	± 1	22040	22240	22440	—
68	96.1	± 1	22050	22250	22450	—
100	79.2	± 1.5	22060	22260	—	—
150	64.6	± 2	22070	22270	—	—
220	53.3	± 3	22080	22280	—	—
680	30.3	±25	—	—	02400 [1])	—
1400	21.2	±25	02000 [1])	02200 [1])	—	—

Number of turns $N = \alpha \sqrt{L}$ (L in 10^{-3} H)

[1]) Supplied without nut for adjustor

Potcores with standard A_L-factors

A_L (*nH*)	*corresponding* μ_e-value	*tolerance on inductance* (%)	*catalog number* 4322 022 ..... 3*B*7	3*H*1	3*D*3	4*C*6
25	15.7	±1	—	—	—	23810
40	25	±1	—	—	23420	23820
63	39.5	±1	—	—	23430	23830
100	63	±1	23040	23240	23440	—
160	100.5	±1.5	23050	23250	—	—
250	157	±2	23060	23260	—	—
315	198	±2	23070	23270	—	—

Inductance $L = N^2 A_L$ (in 10^{-9} H)

Coil formers

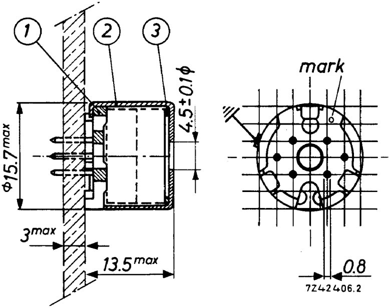
Single section	catalog number 4322 021 30250
Two sections	4322 021 30260
Single section with p.w. pins	4322 021 30070

Continuous inductance adjustors

available types	
catalog number	*colour*
4322 021 30740	red
4322 021 30750	green
4322 021 30940	yellow
4322 021 30950	white
4322 021 31070	brown
4322 021 31130	grey

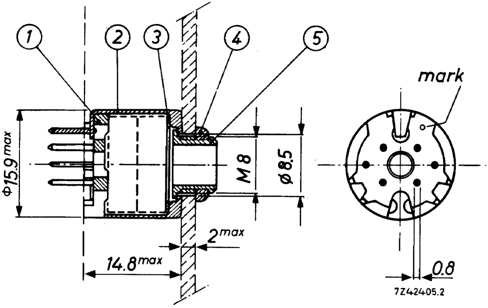
recommended application			
μ_e	A_L	*cat. number* 4322 021	
		$3B7/3H1/3D3$	$4C4$
15		—	30740
	25	—	30740
22		—	30740
	40	30750	30940
33		30750	30950
	63	30740	30940
47		30740	—
	100	30940	—
68		30940	—
100		30950	—
	160	30950	—
150		31070	—
	250	31070	—
220		31130	—

Mounting on printed-wiring boards



(1) tag plate 4322 021 30440
(2) brass container 4322 021 30520
(3) spring 4322 021 30630

Mounting on panels



(1) tag plate
4322 021 30440
(2) aluminium container
4322 021 30600
(3) spring
4322 021 30630
(4) nut
4322 021 30710
(5) fixing bush
4322 021 30720

PRE-ADJUSTED POTCORES P18/11

$\Sigma \frac{l_e}{A_e} = 5.97\ \mathrm{cm}^{-1}$ $V_e = 1.12\ \mathrm{cm}^3$

Potcores with standard μ_e-values

μ_e	α	*tolerance on inductance* (%)	*catalog number* 4322 022 ..... 3*B*7	3*H*1	3*D*3	4*C*4
15	178	± 1	—	—	—	24810
22	147	± 1	—	—	—	24820
33	120	± 1	24030	24230	24430	24830
47	100.5	± 1	24040	24240	24440	—
68	83.6	± 1	24050	24250	24450	—
100	68.9	± 1.5	24060	24260	—	—
150	56.3	± 2	24070	24270	—	—
220	46.5	± 3	24080	24280	—	—
705	25.9	±25	—	—	04400 [1])	—
1750	16.5	±25	04000 [1])	04200 [1])	—	—

Number of turns $N = \alpha\sqrt{L}$ (L in 10^{-3} H)

[1]) Supplied without nut for adjustor

Potcores with standard A_L-factors

A_L (*nH*)	*corresponding* μ_e-*value*	*tolerance on inductance* (%)	*catalog number* 4322 022 ..... 3*B*7	3*H*1	3*D*3	4*C*6
25	11.9	±1	—	—	—	25810
40	19.0	±1	—	—	25420	25820
63	30.0	±1	25030	25230	25430	25830
100	47.5	±1	25040	25240	25440	—
160	76	±1	25050	25250	25450	—
250	119	±1.5	25060	25260	—	—
315	149	±2	25070	25270	—	—
400	190	±2	25080	25280	—	—
630	298	±3	25100	25300	—	—

Inductance $L = N^2 A_L$ (in 10^{-9} H)

Coil formers

single section	catalog number 4322 021 30270
two sections	4322 021 30280
three sections	4322 021 30290
single section, with p.w. pins	4322 021 30090

Continuous inductance adjustors

available types

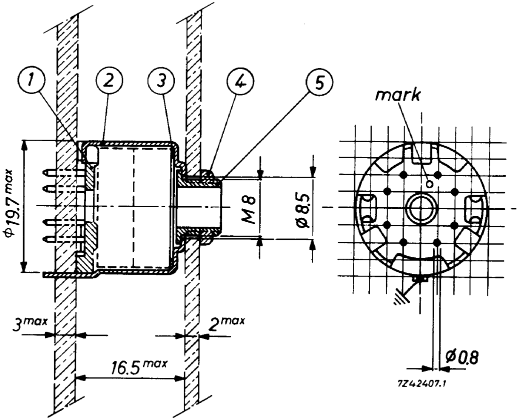
catalog number	*colour*
4322 021 30730	brown
4322 021 30760	green
4322 021 30770	red
4322 021 30960	yellow
4322 021 30970	white
4322 021 31080	grey

recommended application

μ_e	A_L	*cat. number* 4322 021	
		3B7/3H1/3D3	4C4
15		—	30760
	25	—	30760
	40	—	30770
22		—	30770
	63	30760	—
33		30760	30970
	100	30770	
47		30770	
68		30960	
	160	30960	
	250	30970	
100		30970	
150		30730	
	400	31080	
220		31080	

Mounting on P.W. board or on panel

(1) tag plate	4322 021 30450
(2) brass container	4322 021 30530
(3) spring	4322 021 30640
(4) nut	4322 021 30710
(5) fixing bush	4322 021 30720



PRE-ADJUSTED POTCORES P22/13

$\Sigma \frac{l_e}{A_e} = 4.97 \text{ cm}^{-1}$ $V_e = 2.00 \text{ cm}^3$

Potcores with standard μ_e-values

μ_e	α	*tolerance on inductance* (%)	*catalog number* 4322 022 ..... 3*B*7	3*H*1	3*D*3	4*C*6
15	162	± 1	—	—	—	26810
22	134	± 1	—	—	—	26820
33	109.4	± 1	—	—	26430	26830
47	91.7	± 1	—	—	26440	—
68	76.2	± 1	26050	26250	26450	—
100	62.8	± 1.5	26060	26260	—	—
150	51.3	± 2	26070	26270	—	—
220	42.4	± 3	26080	26280	—	—
330	34.6	± 3	26090	26290	—	—
720	23.4	±25	—	—	06400 [1])	—
1840	14.6	±25	06000 [1])	06200 [1])	—	—

Number of turns $N = \alpha\sqrt{L}$ (L in 10^{-3} H)

[1]) Supplied without nut for adjustor

Potcores with standard A_L-factors

A_L (*nH*)	*corresponding* μ_e-*value*	*tolerance on inductance* (%)	*catalog number* 4322 022 ..... 3*B*7	3*H*1	3*D*3	4*C*6
40	15.8	±1	—	—	—	27820
63	25	±1	—	—	27430	27830
100	39.5	±1	27040	27240	27440	27840
160	63.5	±1	27050	27250	27450	—
250	99	±1.5	27060	27260	—	—
315	124.5	±2	27070	27270	—	—
400	158	±2	27080	27280	—	—
630	249	±3	27100	27300	—	—

Inductance $L = N^2 A_L$ (in 10^{-9} H)

Coil formers

single section	catalog number 4322 021 30300
two sections	4322 021 30310
three sections	4322 021 30320
single section, with p.w. pins	4322 021 30110

Continuous inductance adjustors

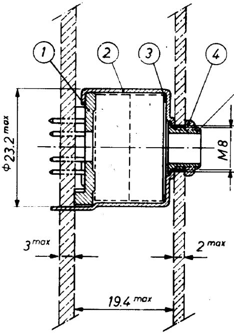
available types	
catalog number	*colour*
4322 021 31000	yellow
4322 021 31020	white
4322 021 31040	green
4322 021 31060	red
4322 021 31100	brown
4322 021 31240	black

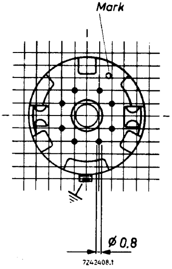
recommended application

μ_e	A_L	*cat. number* 4322 021 ..... 3B7/3H1/3D3	4C4
15		—	31060
	40	—	31060
22		—	31000
	63	31040	31000
33		31040	31020
	100	31060	—
47		31060	—
68		31000	—
	160	31000	—
	250	31020	—
100		31020	—
150		31100	—
	400	31100	—
220		31100	—
	630	31100	—
330		31240	—

Mounting on P.W. board or on panel

(1) tag plate	4322 021 30460
(2) brass container	4322 021 30540
(3) spring	4322 021 30650
(4) nut	4322 021 30710
(5) fixing bush	4322 021 30720





PRE-ADJUSTED POTCORES P26/16

$\Sigma \frac{l_e}{A_e} = 4.00\ \text{cm}^{-1}$ $\quad V_e = 3.53\ \text{cm}^3$

Potcores with standard μ_e-values

μ_e	α	*tolerance on inductance (%)*	*catalog number* 4322 022 ..... 3B7	3H1	3D3	4C6
15	146	± 1	—	—	—	28810
22	120	± 1	—	—	—	28820
33	98.2	± 1	28030	28230	28430	28830
47	82.3	± 1	28040	28240	28440	—
68	68.4	± 1	28050	28250	28450	—
100	56.4	± 1.5	28060	28260	—	—
150	46.1	± 2	28070	28270	—	—
220	38.1	± 3	28080	28280	—	—
330	31.0	± 3	28090	28290	—	—
730	20.8	±25	—	—	08400 [1])	—
1910	12.9	±25	08000 [1])	08200 [1])	—	—

Number of turns $N = \alpha\sqrt{L}$ (L in 10^{-3} H)

[1]) Supplied without nut for adjustor

Potcores with standard A_L-factors

A_L (*nH*)	*corresponding μ_e-value*	*tolerance on inductance (%)*	*catalog number* 4322 022 ..... 3B7	3H1	3D3	4C6
63	20	± 1	—	—	—	29830
100	31.8	± 1	29040	29240	29440	29840
160	51	± 1	29050	29250	29450	—
250	79.5	± 1	29060	29260	29460	—
315	100.2	± 1.5	29070	29270	—	—
400	127	± 2	29080	29280	—	—
630	200	± 3	29100	29300	—	—
1000	318	± 3	29110	29310	—	—

Inductance $L = N^2 A_L$ (in 10^{-9} H)

Coil formers

single section	catalog number 4322 021 30330
two sections	4322 021 30340
three sections	4322 021 30350
single section, with p.w. pins	4322 021 30130

Continuous inductance adjustors

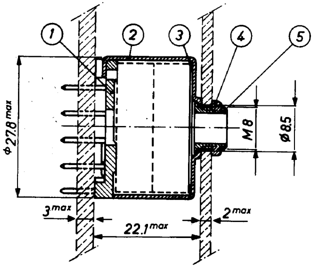
available types	
catalog number	*colour*
4322 021 30780	green
4322 021 30790	yellow
4322 021 30800	red
4322 021 30810	brown
4322 021 30980	white
4322 021 31090	grey

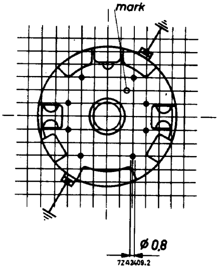
recommended application

μ_e	A_L	*cat. number* 4322 021 ..... 3B7/3H1/3D3	4C4
15		—	30780
22		—	30780
	63	—	30780
33		30780	30790
	100	30780	30790
47		30800	
	160	30800	
68		30980	
	250	30980	
100	315	30980	
150		30810	
	400	30810	
220		30810	
	630	30810	
330		31090	
	1000	31090	

Mounting on P.W. board or on panel

(1) tag plate	4322 021 30470
(2) brass container	4322 021 30550
(3) spring	4322 021 30660
(4) nut	4322 021 30710
(5) fixing bush	4322 021 30720





PRE-ADJUSTED POTCORES P30/19

$\Sigma \frac{l_e}{A_e} = 3.30\ \text{cm}^{-1}$ $V_e = 6.19\ \text{cm}^3$

Potcores with standard μ_e-values

μ_e	α	*tolerance on inductance* (%)	*catalog number* 4322 022		
			3*B*7	3*H*1	3*D*3
33	89.2	± 1	—	30230	30430
47	74.7	± 1	—	—	30440
68	62.1	± 1	30050	30250	30450
100	51.3	± 1.5	30060	30260	—
150	41.8	± 2	30070	30270	—
220	34.6	± 3	30080	30280	—
330	28.2	± 3	30090	30290	—
740	18.9	±25	—	—	10400 [1])
1990	11.5	±25	10000 [1])	10200 [1])	—

Number of turns $N = \alpha\sqrt{L}$ (L in 10^{-3} H)

[1]) Supplied without nut for adjustor

Potcores with standard A_L-factors

A_L (*nH*)	*corresponding* μ_e-*value*	*tolerance on inductance* (%)	*catalog number* 4322 022		
			3*B*7	3*H*1	3*D*3
100	26.2	±1	—	—	31440
160	42	±1	—	—	31450
250	65.5	±1	31060	31260	31460
400	105	±1.5	31080	31280	—
630	165	±2	31100	31300	—
1000	263	±3	31110	31310	—
1600	420	±3	31120	31320	—

Inductance $L = N^2 A_L$ (in 10^{-9} H)

Coil formers

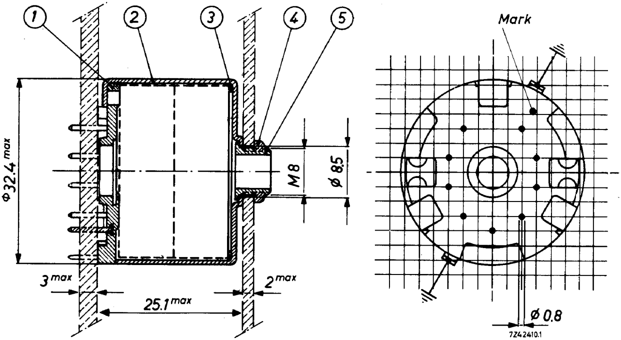
Single section	catalog number	4322 021 30360
two sections		4322 021 30370
three sections		4322 021 30380

Continuous inductance adjustors

Available types and recommended applications

colour	*catalog number* 4322 021	*potcore* μ_e	A_L
green	30780	33	100
red	30800	47	160
white	30980	68	250
white	30980	100	400
brown	30810	150	630
grey	31090	220	1000
black	31120	330	1600

Mounting on P.W. board or on panel



(1) tag plate	4322 021 30480	(4) nut	4322 021 30710
(2) brass container	4322 021 30560	(5) fixing bush	4322 021 30720
(3) spring	4322 021 30670		

PRE-ADJUSTED POTCORES P36/22

$\Sigma \frac{l_e}{A_e} = 2.64\ \text{cm}^{-1}$ $V_e = 10.7\ \text{cm}^3$

Potcores with standard μ_e-values

μ_e	α	*tolerance on inductance* (%)	*catalog number* 4322 022		
			3*B*7	3*H*1	3*D*3
33	79.7	± 1	—	—	32430
47	66.8	± 1	—	—	32440
68	55.6	± 1	32050	32250	32450
100	45.8	± 1.5	32060	32260	—
150	37.4	± 2	32070	32270	—
220	30.9	± 3	32080	32280	—
330	25.2	±25	32090	32290	—
750	16.7	±25	—	—	12400 [1])
2030	10.2	±25	12000 [1])	12200 [1])	—

Number of turns $N = \alpha\sqrt{L}$ (L in 10^{-3} H)

[1]) Supplied without nut for adjustor

Potcores with standard A_L-factors

A_L (*nH*)	*corresponding* μ_e-*value*	*tolerance on inductance* (%)	*catalog number* 4322 022		
			3*B*7	3*H*1	3*D*3
40	8.39	±1	33020	—	—
100	21	±1	33040	—	—
160	33.6	±1	—	—	33450
250	52.5	±1	33060	33260	33460
400	84	±1.5	33080	33280	33480
630	132	±2	33100	33300	—
1000	210	±3	33110	33310	—
1600	336	±3	33120	33320	—

Inductance $L = N^2 A_L$ (in 10^{-9} H)

Coil formers

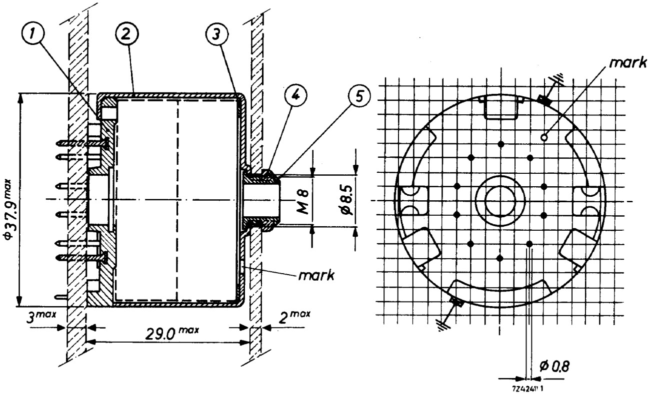
single section	catalog number	4322 021 30390
two sections		4322 021 30400
three sections		4322 021 30410

Continuous inductance adjustors

Available types and recommended applications for potcores with grade 3B7, 3H1 and 3D3

colour	*catalog number* 4322 021	*potcore* μ_e	A_L
yellow	30790	33	160
white	30980	47	250
white	30980	68	—
brown	30810	100	400
brown	30810	—	630
grey	31110	150	—
grey	31090	220	1000
black	31120	330	1600

Mounting on P.W. board or on panel



(1) tag plate	4322 021 30490	(4) nut	4322 021 30710
(2) brass container	4322 021 30570	(5) fixing bush	4322 021 30720
(3) spring	4322 021 30680		

PRE-ADJUSTED POTCORES P42/29

$\Sigma \frac{l_e}{A_e} = 2.59 \text{ cm}^{-1}$ $V_e = 18.2 \text{ cm}^3$

Potcores with standard μ_e-values

μ_e	α	*tolerance on inductance* (%)	*catalog number* 4322 022 ..... 3B7	3H1
33	78.4	± 1	—	—
47	65.7	± 1	—	—
68	55.0	± 1	—	34250
100	45.0	± 1.5	34060	34260
150	36.8	± 2	34070	34270
220	30.4	± 3	34080	34280
330	24.8	± 3	34090	34290
2120	9.85	±25	14000 [1])	14200 [1])

Number of turns $N = \alpha\sqrt{L}$ (L in 10^{-3} H)

[1]) Supplied without nut for adjustor

Potcores with standard A_L-factors

A_L (nH)	*corresponding* μ_e-*value*	*tolerance on inductance* (%)	*catalog number* 4322 020 ..... 3B7	3H1
100	20.8	±1	—	35240
250	51	±1	35060	35260
400	81	±1	35080	35280
630	130	±2	35100	35300
1000	205	±3	35110	35310
1600	325	±3	35120	35320

Inductance $L = N^2 A_L$ (in 10^{-9} H)

Coil formers

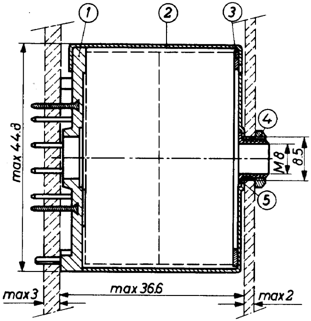
single section catalog number 4322 021 30420
two sections 4322 021 30430

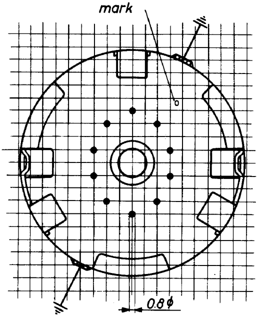
Continuous inductance adjustors

Available types and recommended applications

colour	*catalog number* 4322 021	*potcore* μ_e	A_L
white	30980	68	250
brown	30810	100	400
brown	30810	—	630
grey	31090	150	1000
grey	31090	220	—
black	31120	330	1600

Mounting on P.W. board or on panel



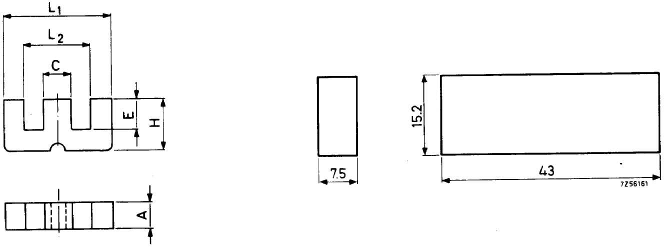


(1) tag plate 4322 021 30500
(2) brass container 4322 021 30580
(3) spring 4322 021 30690
(4) nut 4322 021 30710
(5) fixing bush 4322 021 30720

TRANSFORMER CORES

E- and I-cores

These cores are typical transformer cores. They can be used from voice frequencies up to some MHz.



type	*dimensions*						*ferroxcube grade*	*air gap (mm)*	*catalog number*
	L_2	L_1	C	A	H	E			
E20/10/5	20.8	12.8	5.2	5.3	10	6.3	3E1	0	4322 020 34530
								0.15	34550
							improved 3E1	0	34831
E30/15/7	30.8	19.5	7.2	7.3	15	9.7	3E1	0	4322 020 34630
								0.15	34650
								0.30	34660
							improved 3E1	0	34840
E42/21/15	43	29.5	12.2	15.5	21	14.8	3E1	0	4322 020 34720
								0.25	34740
								0.5	34750
							improved 3E1	0	34850
I42/7.5/15	see figure above						3E1	0	4322 020 37320
E55/28/21	56.2	37.5	17.2	21	27.5	18.5	3E1	0	4322 020 34780
E65/32/13	66.5	44.2	20	13.7	32.5	22.2	3E1	0	4322 020 34820

The dimensions are according to D.I.N. 41295

With two E-cores or one E-core and one I-core a shell type transformer can be composed.

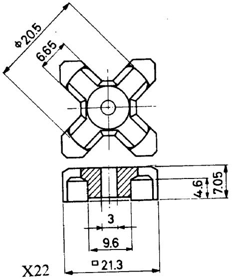
shell type transformer	*composed of*	A_e (cm^2)	$\Sigma \frac{l_e}{A_e}$ (cm^{-1})	V_e (cm^3)	μ_e	A_L (nH)	*cat. number of coil former* *without pins* 4312 021	*with pins* 4322 021 .....
20/20/5	2 × E20/10/5	0.312	13.7	1.34	1650–2760	1515–2520	28430	20240
30/30/7	2 × E30/15/7	0.597	11.2	4.00	1795–2990	2010–3350	28570	20250
42/42/15	2 × E42/21/15	1.82	5.34	17.6	1910–3140	4425–7380	28672	
42/29/15	1 × E42/21/15 + 1 × I42/7.5/15	1.83	3.67	12.3	> 1820	> 6300		
55/55/21	2 × E55/28/21	3.54	3.48	43.7	1950–3250	7050–11700	28700	
65/65/13	2 × E65/32/13	2.66	5.51	39.1	1980–3290	4500–7500		
65/65/27	4 × E65/32/13	5.32	2.75	78.2	1835–3050	8400–14000	28690	

TRANSFORMER CORES

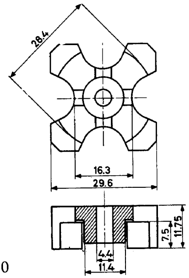
X-cores

These cores have been developed for transformers to be used on printed-wiring boards. The soldering pins are positioned according to a grid of 2.52 mm.

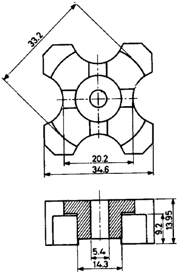
core half	*ferroxcube grade*	*air gap (mm)*	*catalog number*
X22	3E1	0	3522 200 03470
		0.15	4322 020 23700
	3H1	0	3522 200 13520
		0.02	4322 020 23710
		0.05	4322 020 23720
		0.15	4322 020 23730
		0.25	4322 020 23740
	3B7	0	3522 200 08770
	3D3	0	3522 200 03480
	4C6	0	3522 200 03490
X30	3H1	0	4322 020 23750
		0.02	4322 020 23960
		0.05	4322 020 23970
		0.15	4322 020 23980
		0.25	4322 020 23990
X35	3H1	0	4322 020 24000
		0.02	4322 020 24210
		0.05	4322 020 24220
		0.15	4322 020 24230
		0.25	4322 020 24240
	3C5	0	4322 020 24010
		0.5	4322 020 24190
		1.0	4322 020 24200



X22

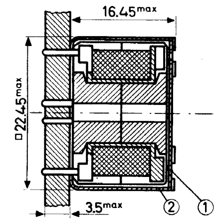


X30

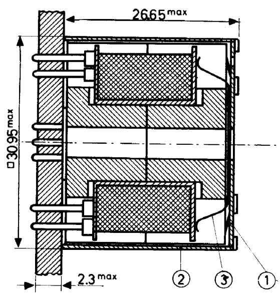


X35

X-core	ferroxcube grade	A_e (cm^2)	$\Sigma \frac{l_e}{A_e}$ (cm^{-1})	V_e (cm^3)	μ_e	catalog number of coil former
X22	3E1	0.66	5.75	2.51	≥1495	4312 021 28830 (for 3E1, 3H1, 3B7)
	3H1	0.66	5.75	2.51	≥1440	
	3B7	0.66	5.75	2.51	≥1440	
	3D3	0.66	5.75	2.51		
	4C6	0.66	5.75	2.51	≥80	
X30	3H1	1.14	4.90	6.36	≥1525	4322 021 31190
X35	3H1	1.64	4.10	11.0	≥1580	4322 021 31200 (16 pins)
	3C5	1.64	4.10	11.0		4322 021 30190 (8 pins)

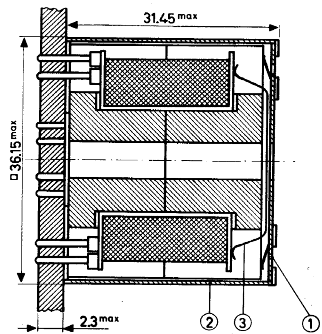


Core assembly X22
(1) Cover 4322 021 30230
(2) Container 4322 021 30040



Core assembly X30
(1) Cover 4322 021 31150
(2) Container 4322 021 31170
(3) Spring 4322 021 30210

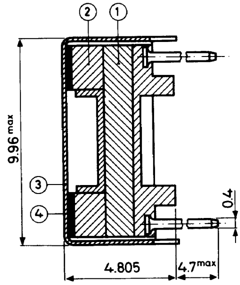
Core assembly X35
(1) Cover 4322 021 31160
(2) Container 4322 021 31180
(3) Spring 4322 021 30220



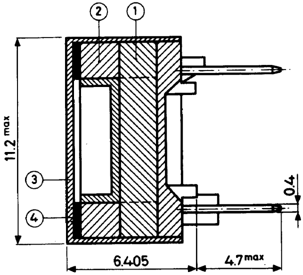
H-cores

These cores have been developed for small transformers to be used on printed-wiring boards. The soldering pins are positioned according to a grid of 2.52 mm. The material grade is FXC3E2.

type	A_e (cm^2)	$\Sigma \frac{l_e}{A_e}$ (cm^{-1})	V_e (cm^3)	μ_e	A_L (nH)	*catalog number*
H7	0.0325	54	0.0571	⩾3000	⩾700	4322 020 33020
H10	0.075	30	0.17	⩾3820	⩾1600	4322 020 33010
H16	0.349	10.2	1.22		>4500	4322 020 33030
H20	0.47	8.8	1.93	⩾3850	⩾5500	4322 020 33000

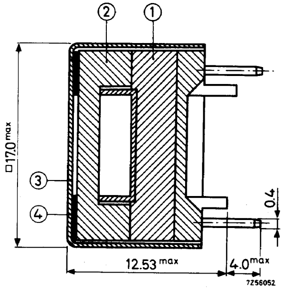


Core assembly H7
Max. length = 7.46 mm

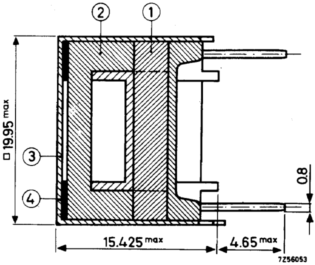


Core assembly H10
Max. length = 12.4 mm

(1) Ferroxcube H-shape with reinforced polyester coil former
(2) Ferroxcube window
(3) Brass container
(4) Silicon rubber washer



Core assembly H16

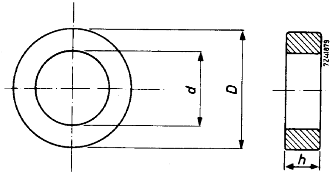


Core assembly H20

(1) Ferroxcube H-shape with reinforced polyester coil former
(2) Ferroxcube U-shape
(3) Brass container
(4) Silicon rubber washer

Toroids

Toroids are mainly used in broadband transformers, pulse transformers and chokes.



dimensions (mm) $D \times d \times h$	*ferroxcube grade*	l_e (*cm*)	$\Sigma \frac{l_e}{A_e}$ (cm^{-1})	V_e (cm^3)	μ_{tor}	*catalog number*
2 × 1.3 × 0.7	3E3	0.511	208	0.00125	> 10 000	8222 293 03230
4 × 2.2 × 1.1	3E2	0.946	95.6	0.00937	> 5000	4322 020 36650
	3E3				> 10000	8222 293 03270
	3H1				*)	4322 020 36590
6 × 4 × 2	3E2	1.55	77.5	0.0310	> 5000	4322 020 36660
	3E3				> 10000	8222 293 03280
	3H1				*)	4322 020 36600
	4C4				> 100	4322 020 36500
9 × 6 × 3	3E2	2.33	51.7	0.105	> 5000	4322 020 36670
	3E3				> 10000	8222 293 03290
	3H1				*)	4322 020 36610
	4C4				> 100	4322 020 36510
14 × 9 × 5	3E2	3.55	28.5	0.445	> 5000	4322 020 36680
	3H1				*)	4322 020 36620
	4C4				> 100	4322 020 36520
23 × 14 × 7	3E2	5.70	18.1	1.79	> 5000	4322 020 36690
	3H1				*)	4322 020 36630
	4C4				> 100	4322 020 36530
29 × 19 × 7.5	3E1	7.50	20.1	2.58	2700 ± 20 %	4322 020 36550
36 × 23 × 10	3E1	9.20	14.2	5.60	2700 ± 20 %	4322 020 36560
36 × 23 × 15	3E1	9.20	9.42	8.50	2700 ± 20 %	4322 020 36570
	4C4				> 100	4322 020 36540

*) μ_{tor} is indicated by the colour of the circumference of the core, see table below

group	μ_{tor}	*colour*
1	2000–2200	brown
2	2140–2360	red
3	2300–2540	orange
4	2480–2740	yellow
5	2680–2960	green

group	μ_{tor}	*colour*
6	2900–3210	blue
7	3150–3480	violet
8	3420–3780	grey
9	3720–4110	white
10	>4050	black

The sorting into μ groups is done merely for the convenience of the user. The toroids are not available per separate group.

PIEZOXIDE

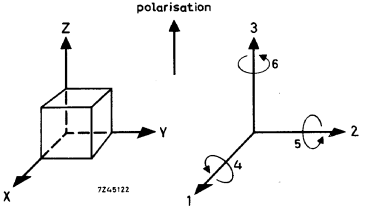
Piezoxide materials are piezoelectric ceramic materials, suitable for almost any electro-mechanical or mechano-electrical energy conversion. Because of their ceramic nature elements in these materials can be preshaped. The material grades are PXE3, PXE4, PXE5, PXE7, PXE10 and PXE11.

		PXE3	*PXE4*
Mechanical data			
Specific mass		7.8×10^3	7.45×10^3
Curie temperature		395	265
Modulus of elasticity	$Y_{11}^E = \frac{1}{s_{11}^E}$	0.88×10^{11}	0.77×10^{11}
	$Y_{33}^E = \frac{1}{s_{33}^E}$	0.79×10^{11}	0.79×10^{11}
Modulus of rigidity	$Y_{44}^E = Y_{55}^E$	0.30×10^{11}	
Specific heat		420	420
Heat conductivity		1.2	1.2
Compressive strength		$>6 \times 10^8$	$>6 \times 10^8$
Electrical data			
Relative dielectric constants	$\varepsilon_{33}^T/\varepsilon_0 = \varepsilon_r$	570	1500
	$\varepsilon_{11}^T/\varepsilon_0$	900	
Specific resistance ρ_{el} at 25°C		10^{12}	10^{11}
Time constant $\tau = RC = \rho_{el} \cdot \varepsilon_{33}^T$		>30	>30
Dielectric dissipation factor tan δ		0.5×10^{-2}	0.6×10^{-2}
Electro-mechanical data			
Coupling coefficients	k_p	0.52	0.55
	k_{31}	0.30	0.32
	k_{33}	0.65	0.68
	k_{15}	0.71	
Piezoelectric charge constants	d_{31}	-74×10^{-12}	-141×10^{-12}
	d_{33}	166×10^{-12}	265×10^{-12}
	d_{15}	366×10^{-12}	
Piezoelectric voltage constants	g_{31}	-14.8×10^{-3}	-9.4×10^{-3}
	g_{33}	34.0×10^{-3}	20.0×10^{-3}
	g_{15}	46.0×10^{-3}	
Quality factor	Q_M^E	300	500
Frequency constants	N_p	2300	2200
	N_1	1680	1620
	N_3	1560	1610
	N_5	1000	

*PXE*5	*PXE*7	*PXE*10	*PXE*11	
7.55×10^3	7.6×10^3	7.6×10^3	4.5×10^3	kg/m^3
285	320	185	400	°C
0.65×10^{11}	0.82×10^{11}	0.58×10^{11}	1.2×10^{11}	N/m^2
0.59×10^{11}				N/m^2
0.26×10^{11}				N/m^2
420				J/kg.deg C
1.2				W/m.deg C
$> 6 \times 10^8$				N/m^2
1750	680	3400	450	
1800	900		600	
10^{14}				Ωm
> 300				min
2.0×10^{-2}	2.0×10^{-2}	3.0×10^{-2}	2.5×10^{-2}	
0.62	0.53	0.65	0.43	
0.36		0.38	0.25	
0.70				
0.66	0.65		0.65	
-178×10^{-12}	-84×10^{-12}	-275×10^{-12}	-44.5×10^{-12}	C/N
356×10^{-12}				C/N
515×10^{-12}				C/N
-11.3×10^{-3}	-14.0×10^{-3}	-9.1×10^{-3}	-11.2×10^{-3}	Vm/N
23.2×10^{-3}				Vm/N
32.5×10^{-3}				Vm/N
80				
2000	2250	1900	3600	Hz.m
1460	1640	1390	2650	Hz.m
1390				Hz.m
930			1500	Hz.m

Key to subscripts

For polarised ceramic materials the direction of positive polarisation is usually taken to be that of the Z-axis of a right-hand orthogonal crystallographic axial set X, Y, Z. Since these materials have polar symmetry the senses of X and Y chosen in an element are unimportant and planes parallel to the Z-axis are reflection planes.
If the directions of X, Y and Z are represented as 1, 2 and 3 respectively, and the shear directions to these axes as 4, 5 and 6 respectively then the various related parameters may be written with subscripts referred to these.



4 = shear in 23-plane
5 = shear in 31-plane
6 = shear in 12-plane

Axial notation

Piezoelectric constants: The first subscript refers to the direction of the electric field, the second subscript refers to the direction of the strain. (k_p is the planar coupling coefficient.)

Elasticity constants : The first subscript refers to the direction of the stress, the second subscript refers to the direction of the strain.

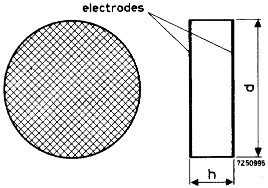
Dielectric constants : The first subscript refers to the direction of the electric field, the second subscript refers to the direction of the dielectric displacement.

Frequency constants : The subscript refers to the direction of resonance vibration.

Preferred types of PXE elements

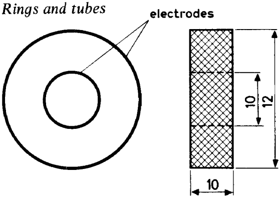
Discs and cylinders

Direction of polarisation : axial
Standard tolerance on the diameter (d): $\pm 2.5\,\%$
Standard tolerance on the height (h)
for $h \geq 0.5$ mm: ± 0.1 mm
for $h < 0.5$ mm: ± 0.05 mm

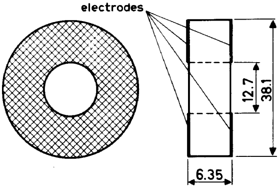


dimensions (*mm*)	*catalog number*	
d × *h*	*PXE4*	*PXE5*
3 × 0.5		8222 293 01100
5 × 0.2	8222 293 00720	8222 293 01130
5 × 0.3		8222 293 01140
5 × 0.5		8222 293 06060
5 × 1		8222 293 06070
5 × 7	4322 020 02360	
5 × 10	4322 080 02350	
6.3 × 15	4322 020 02340	
10 × 0.2	8222 293 00860	8222 293 01270
10 × 0.3		8222 293 01280
10 × 1	8222 293 06050	4322 020 02290
10 × 3		8222 293 07740
10 × 20	8222 293 06030	2P 620 77
16 × 0.2	8222 293 00910	8222 293 01300
16 × 0.5		8222 293 04300
16 × 1.1	8222 293 04110	4322 020 02250
16 × 3	2P 620 93	4322 020 02300
25.4 × 6.35	4322 020 02440	
38.1 × 6.35	4322 020 05000	

Rings and tubes



Direction of polarisation : radial
Material : PXE5
Catalog number : 8222 293 01870

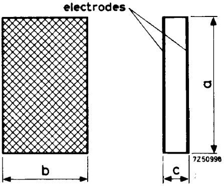


Direction of polarisation : axial
Material : PXE4
Catalog number : 4322 020 06000

Standard tolerance on the outer diameter : ±2.5%
on the inner diameter : ±2.5%
on the concentricity : 0.1 mm
on the height : ±0.1 mm

PIEZOXIDE

Rectangular plates

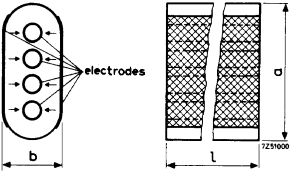


Direction of polarisation : parallel to dimension c

Standard tolerance on the length (a) : ± 0.1 mm
on the width (b) : ± 0.1 mm
on the thickness (c)
for $c \geqslant 0.5$ mm : ± 0.1 mm
for $c < 0.5$ mm : ± 0.05 mm

dimensions (mm)	*catalog number*	
$a \times b \times c$	*PXE4*	*PXE5*
6 × 2 × 0.25		8222 293 02700
10 × 2 × 0.5		8222 293 02730
12 × 6 × 0.2	8222 293 02510	8222 293 02740
12 × 6 × 0.5	8222 293 02530	8222 293 02760
16 × 12 × 1	8222 293 02560	4322 020 02310

Multimorph strips



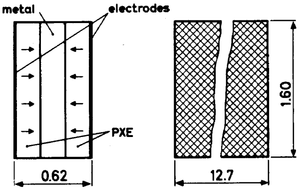
Direction of polarisation : indicated by arrows, see figure (outer electrodes negative)

Material : PXE 5

dimensions (mm) $a \times b \times l$	*catalog number*
1.6 × 0.67 × 12.7	4322 020 02480
1.6 × 0.67 × 15.5	4322 020 02490
1.6 × 0.67 × 70	8222 293 02940
4 × 1 × 70	8222 293 02970
2.4 × 0.9 × 70	8222 293 03000

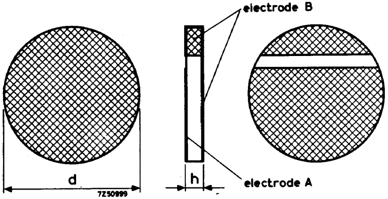
Bimorph strips

Direction of
polarisation : indicated by arrows, see figure (outer electrodes negative)
Material : PXE 5
Catalog number : 8222 293 03020



Feedback plates

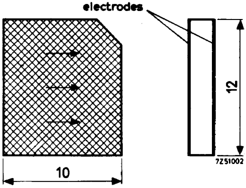
Direction of polarisation : axial
Material : PXE 5



dimensions (mm) $d \times h$	*polarity of electrode A*	*catalog number*
16 × 1.1	–	4322 020 02260
16 × 1.1	+	4322 020 02270

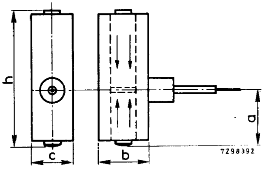
Delay-line transducer

Direction of polarisation : indicated by arrows, see figure
Material : PXE 3
Frequency of the thickness shear vibration : approx. 4 MHz
Catalog number : 4322 040 00600



Ignitions units

Direction of polarisation : indicated by arrows, see figure
Material : PXE4 in plastic housing



dimensions (mm) $h \times b \times c \times a$	*catalog numbers*
22.9 × 10 × 7.5 × 10	4322 020 04030
39.5 × 11 × 11 × 19	4322 020 04010

INSULATING AND DIELECTRIC MATERIALS

These materials are manufactured from white ceramics and intended for use in the electrotechnical and electronic industry.

Insulating materials

Below is given a description of the 9 most important insulating materials which can be obtained from our ceramic works.

K099 Composition: more than 97.5 % Al_2O_3.
Resistant to chemical influences. Can be used at high temperatures.

K512 (steatite). Composition: mainly $MgO.SiO_2$.
This material can be used as a construction material for low- and high tension insulators. It is suitable for high frequencies. It has a high mechanical strength. Application examples: wire wound resistors, tube sockets.

K617 (alkaline earth porcelain). Composition: mainly $3Al_2O_3.2SiO_2$.
For applications where h.f. losses cause no problem. At elevated temperatures very good insulating properties.
Application example: deposited carbon- and metal film resistors.

K748 Composition: more than 99 % Al_2O_3.
This insulating material can be used as a construction material and is suitable for use in vacuum. At very high temperature it still has good insulation properties.
Application example: insulation between cathode and filament.

K751 Composition: 90 % Al_2O_3.
Insulating and construction material with fairly good mechanical and electrical properties.
Application example: insulators for thermo-couples.

K756 (forsterite). Composition: mainly $2\ MgO.SiO_2$.
Good mechanical properties. High thermal expansion coefficient, which is a drawback for applications with large temperature variations. It is gastight and suitable for metal-to-ceramic connections.

K758 Composition: mainly $MgO.SiO_2$.
Moderate mechanical but good electrical properties. Suitable for applications in vacuum. Easy to machine. Application example: construction material in electron tubes.

K1134 (D.G.A). Composition: more than 99.9 % Al_2O_3.
Gastight and translucent. It has very good mechanical strength; therefore it is very well suited for envelopes of high pressure gas discharge devices. Resistant to alkaline vapor.

V003 Composition: 94 to 96 % Al_2O_3.
Very good insulating material with high mechanical quality. Resistant to nitric acid. The material is also wear-resistant, gastight and suited for metal-to-ceramic connections.
Application examples: envelopes of transmitting tubes and semiconductors, substrates for integrated circuits.

Dielectric materials

Originally ceramic capacitors were used for small capacitances only. But the modern ceramics, which are in general on the base of modified alkaline earth metal titanates, present the possibility of making capacitors with very high capacitances which meet the requirements for many purposes.

The following materials are available:

material	*dielectric constant* ε	*temp. coeff. of* ε *in* $10^{-6}/deg\ C$
K041	7 ± 10 %	P100
K833	18 ± 10 %	P100
K521	18 ± 10 %	NP0
K503	38 ± 10 %	N750
K493	40 ± 10 %	NP0
K822	42 ± 10 %	N075
K505	45 ± 10 %	N150
K825	50 ± 10 %	N220
K826	54 ± 10 %	N330
K827	65 ± 10 %	N470
K507	90 ± 10 %	N750
K830	120 ± 10 %	N1500
K516	250 ± 15 %	class 2 materials
K517	650 ± 15 %	class 2 materials
K569	> 1760	class 2 materials
K511	1700 ± 20 %	class 2 materials
K508	2200 ± 20 %	class 2 materials
K832	2200 ± 20 %	class 2 materials
K519	2500 ± 20 %	class 2 materials
K510	4200 ± 20 %	class 2 materials
K520	10.000 ± 20 %	class 2 materials

PERMANENT MAGNET MATERIALS

Introduction

Permanent magnets – either isotropic* or anisotropic* – can be classified as being basically either
metallic alloy
ceramic material or
plastic bonded ceramic material

The table shows the class to which each of our materials belongs.

	metallic alloy	*ceramic material*	*plastic bonded ceramic material*
isotropic*	reco	ferroxdure	ferroxdure
anisotropic*	"Ticonal"**	ferroxdure	ferroxdure

The most obvious differences between the groups are that the ferroxdure magnets are characterised by high values of coercivity and resistivity while "Ticonal" magnets possess higher values of remanent magnetism and energy product.

Ferroxdure is therefore most suitable for applications in which demagnetising influences (either from external sources or resulting from the use of short magnets) are large and also in high frequency applications.

"Ticonal" is particularly suitable for applications in which high values of magnetic energy are required from small volumes of magnetic material.

The isotropic materials in general are inferior in magnetic properties to the anisotropic ones but are particularly suitable for applications in which multipolar magnets are to be used or where less expensive magnets are necessary giving a reasonable performance.

The plastic bonded ferroxdure magnets combine the characteristic magnetic properties of isotropic ferroxdure (however on a lower level) with the mechanical properties of the plastic material used. These magnets open a new field of applications, especially where the price is of prime importance.

Each of the permanent magnet materials is manufactured in a variety of grades possessing different properties that result from differences in composition and treatment.

The grades are distinguished by the addition of letters and numbers to the name of the material. The numbers are approximately relative to the nominal energy product of the grade.

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* Isotropic materials can be magnetised equally well in any direction. Anisotropic materials have optimal magnetic properties in one direction only.

** "Ticonal" is a registered trade name.

permanent magnet material typical chemical composition	$(BH)_{max.}$ (MGs.Oe)		occurs at Bd (Gs)	Hd (Oe)	B_r (Gs)		H_{cb} (Oe)		H_{ci} (Oe)	
	min.	typ.	typ.	typ.	min.	typ.	min.	typ.	min.	typ.
ISOTROPIC PLASTIC-BONDED FERROXDURE										
Ferroxdure P30, P40 and SP50 magnets are extruded, injection moulded and punched, D55 magnets are pressed and cured.										
Ferroxdure P30 KPN-K-992 85% ferroxdure powder $(M)Fe_{12}O_{19}$ 15% thermoplastic material	0.3	0.35	700	500	1150	1250	1050	1100	2500	2700
Ferroxdure P40 KPN-K-989 90% ferroxdure powder $(M)Fe_{12}O_{19}$ 10% thermoplastic material	0.4	0.45	800	550	1350	1450	1150	1200	2300	2500
Ferroxdure SP50 KPN-K-7028 93% ferroxdure powder $(M)Fe_{12}O_{19}$ 7% thermoplastic material	0.5	0.55	800	690	1550	1600	1225	1275	2300	2400
Ferroxdure D55 KPN-V-815 95% ferroxdure powder $(M)Fe_{12}O_{19}$ 5% thermosetting material	0.55	0.60	850	700	1650	1700	1300	1400	2500	2750
ISOTROPIC FERROXDURE										
All magnets are pressed, sintered and can be ground.										
Ferroxdure 100 KPN-K-359 100% ferroxdure powder $(M)Fe_{12}O_{19}$	0.9	0.95	1200	800	2100	2200	1600	1650	2600	2700

permanent magnet material typical chemical composition	$(BH)_{max.}$ (MGs.Oe)		occurs at Bd (Gs)	occurs at Hd (Oe)	B_r (Gs)		H_{cb} (Oe)		H_{ci} (Oe)	
	min.	typ.	typ.	typ.	min.	typ.	min.	typ.	min.	typ.
ISOTROPIC ALLOYS-RECO										
All magnets are cast and can only be ground.										
Reco 100 24% Ni, 14% Al, bal. Fe	1.00	1.20	4000	300	5800	6200	460	480	480	530
Reco 120 1% Ti, 4% Co, 26% Ni, 13% Al, 3% Cu, bal. Fe	1.10	1.30	3100	400	5300	5900	500	600	550	650
Reco 140 0.8% Ti, 5% Co, 25% Ni, 10% Al, 7% Cu, bal. Fe	1.30	1.40	3500	400	6200	6500	530	565	550	600
Reco 160 1.9% Ti, 13% Co, 18.5% Ni, 10% Al, 7.5% Cu, bal. Fe	1.50	1.65	4150	400	6000	6600	600	680	650	750
Reco 170 5% Ti, 10% Co, 24% Ni, 9.5% Al, 6% Cu, bal. Fe	1.50	1.65	3300	500	5200	5600	830	890	900	1000
Reco 220 7% Ti, 26% Co, 15% Ni, 7% Al, 5% Cu, bal. Fe	2.00	2.30	3750	600	5600	6300	1100	1200	1200	1300
ANISOTROPIC PLASTIC-BONDED FERROXDURE										
All magnets are injection moulded.										
Ferroxdure SP130 KPN-K·7049 89% ferroxdure powder $(M)Fe_{12}O_{19}$ 11% thermoplastic material	1.3	1.4	1250	1100	2300	2400	2100	2200	2800	3000

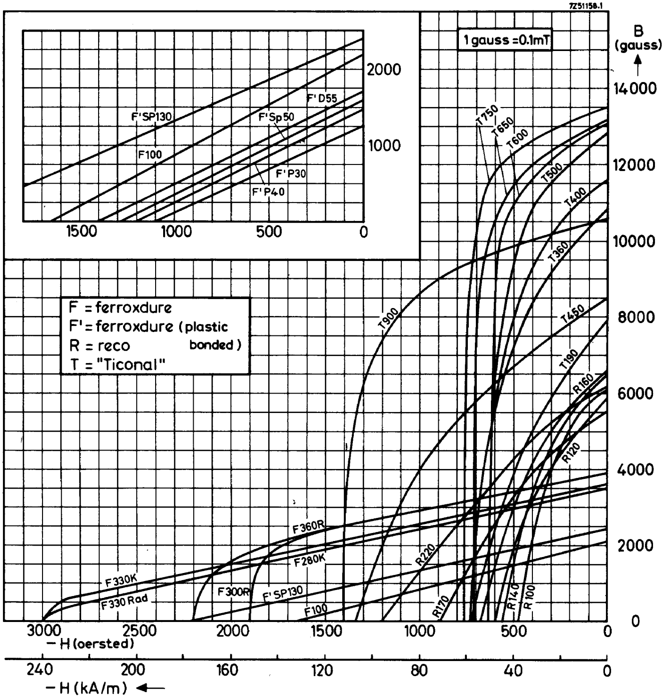
permanent magnet material typical chemical composition	*(BH)$_{max.}$ (MGs.Oe)*		*occurs at*		*B_r (Gs)*		*H_{cb} (Oe)*		*H_{ci} (Oe)*	
			Bd (Gs)	*Hd (Oe)*						
	min.	*typ.*	*typ.*	*typ.*	*min.*	*typ.*	*min.*	*typ.*	*min.*	*typ.*
ANISOTROPIC FERROXDURE										
All magnets are pressed, sintered and can only be ground.										
Ferroxdure 280 K KBN-K-435 100% ferroxdure powder (M)$Fe_{12}O_{19}$	2.6	2.8	1800	1600	3400	3500	2800	3000	3000	3200
Ferroxdure 300 R KBN-K-434 100% ferroxdure powder (M)$Fe_{12}O_{19}$	3.1	3.4	2200	1600	3800	3900	1600	1800	1700	1900
Ferroxdure 330 (Rad) KBN- 100% ferroxdure powder (M)$Fe_{12}O_{19}$	2.7	2.8	1800	1600	3400	3500	2800	3000	3000	3200
Ferroxdure 330 K KBN-V-252 100% ferroxdure powder (M)$Fe_{12}O_{19}$	3.0	3.2	1900	1700	3600	3700	2800	3000	2900	3100
Ferroxdure 360 R KBN-V-254 100% ferroxdure powder (M)$Fe_{12}O_{19}$	3.4	3.6	2000	1800	3800	3900	2000	2200	2100	2300

permanent magnet material typical chemical composition	$(BH)_{max.}$ (MGs.Oe)		occurs at Bd (Gs)	Hd (Oe)	B_r (Gs)		H_{cb} (Oe)		H_{ci} (Oe)	
	min.	typ.	typ.	typ.	min.	typ.	min.	typ.	min.	typ.
ANISOTROPIC ALLOYS-TICONAL										
All magnets are cast and can only be ground.										
Ticonal 190 14% Co, 21% Ni, 12% Al. 3% Cu, balance Fe	1.80	2.10	5000	400	7400	8000	650	730	670	800
Ticonal 360 1.5% Ti, 24% Co, 15% Ni, 8.5% Al, 3% Cu, bal. Fe	3.20	3.60	7200	500	10500	10700	680	710	700	760
Ticonal 400 0.8% Ti, 24% Co, 14% Ni, 8.5% Al, 3% Cu, bal. Fe	3.80	4.00	8000	500	11200	11600	610	640	620	680
Ticonal 450 5% Ti, 34% Co, 14.5% Ni, 7.5% Al, 4.5% Cu, bal. Fe	4.00	4.25	5300	800	8000	8500	1200	1335	1300	1500
Ticonal 500 24% Co, 14% Ni, 8.5% Al, 3% Cu, balance Fe	4.50	4.80	9600	500	12300	12800	600	630	610	650
Ticonal 600 24% Co, 14% Ni, 8.5% Al, 3% Cu, balance Fe	5.50	5.77	10500	550	13000	13100	630	645	640	680
Ticonal 650 24% Co, 14% Ni, 8.5% Al, 3% Cu, balance Fe	6.20	6.50	11000	565	12800	13000	640	700	650	780
Ticonal 750[1]) 24% Co, 14% Ni, 8.5% Al, 3% Cu, balance Fe	7.00	7.50	11500	650	13200	13400	720	760	730	780
Ticonal 900[2]) 5% Ti, 34% Co, 14.5% Ni, 7.5% Al, 4.5% Cu, bal. Fe	7.50	9.00	8000	1100	10000	10600	1300	1400	1350	1500

[1]) Cross section circular $\geqslant 10$ and $\leqslant 25$ mm dia.; rectangular sides $\geqslant 10$ and $\leqslant 20$ mm.

[2]) Only for very small rectangular magnets.

Demagnetisation curves



Conversion table for Giorgi units

1 gauss $= 10^{-4}$ weber/sq. metre = 0.1 millitesla

1 oersted $= \dfrac{10^3}{4\pi} = 79.6$ amperes/metre

1 gauss oersted $= 8 \times 10^{-3}$ VA sec/m^3 $= 8 \times 10^{-3}$ joule/m^3

Other magnetic and physical properties

Grade		*saturation field strength* H_{sat} *(Oe)*	*L/D ratio for open circuits*	*permeance* $-B/H$ *at* $(BH)_{max.}$ *(Gs/Oe)*	*recoil permeability* μ_{rec}
Ferroxdure	P30	12000	0.5	1.4	1.10
	P40	12000	0.5	1.5	1.15
	SP50	12000	0.5	1.2	1.19
	D55	12000	0.5	1.2	1.15
Ferroxdure	100	12000	0.5	1.5	1.112–1.118
Reco	100	2500	3.0	13	4.0–6.5
	120	2500	3.0	8	4.4–5.0
	140	2500	3.0	9	5.0–6.0
	160	2500	3.0	11	4.0–5.0
	170	3000	2.2	7	3.4–4.0
	220	5000	2.2	6	3.2–3.8
Ferroxdure	SP130	12000	0.5	1.14	1.10
	280K	10000	0.5	1.1	1.01–1.05
	300R	8000	1.0	1.4	1.01–1.05
	300Rad	10000	0.5	1.1	1.01–1.05
	330K	10000	0.5	1.1	1.01–1.05
	360R	8000	1.0	1.1	1.01–1.05
Ticonal	190	2500	3.0	13	3.8–5.0
	360	2500	3.5	15	4.0–5.0
	400	2500	4.5	16	4.0–5.0
	450	5000	2.2	7	2.5–3.0
	500	2500	4.5	20	4.0–5.0
	600	2500	5.0	19	3.0–4.0
	650	2500	4.5	20	3.0–4.0
	750	2500	4.3	17	3.0–4.0
	900	5000	2.2	7	1.7–2.5

Conversion of electrical resistivity: $1\ \Omega\ mm^2/m = 10^{-4}\ \Omega cm = 10^{-6}\ \Omega m$.

density	*specific electrical resistivity*	*temperature coefficient of remanence*	*Curie temp-erature*	*coefficient of thermal expansion*
(g/cm^3)	($\Omega\ mm^2/m$)	(%/deg C)	(°C)	(10^{-6}/deg C)
3.2	10^{13}	−0.2	—	—
3.6	10^{11}	−0.2	—	—
4.05	10^{10}	−0.2	—	—
4.10	10^{10}	−0.2	—	—
4.9	10^{10}	−0.2	450	8.5
6.9	0.7	−0.015	730	12.5
6.9	—	−0.015	700	12.5
7.0	0.75	−0.015	770	11.5
7.0	0.65	−0.015	810	11.5
7.0	0.60	−0.015	790	11.5
7.2	—	−0.015	750	11.5
3.4	10^{11}	−0.2	—	—
4.6	10^{12}	−0.2	450	15.0
5.0	10^{12}	−0.2	450	10.5
4.6	10^{12}	−0.2	450	15.0
4.8	10^{12}	−0.2	450	15.0
4.9	10^{12}	−0.2	450	10.5
7.0	—	−0.015	750	11.5
7.3	0.50	−0.015	860	10.8
7.3	0.50	−0.015	800	10.8
7.3	0.50	−0.015	850	10.8
7.3	0.45	−0.015	850	10.8
7.3	0.45	−0.015	850	10.8
7.3	0.45	−0.015	850	10.8
7.3	0.45	−0.015	850	10.8
7.3	0.50	−0.015	850	10.8

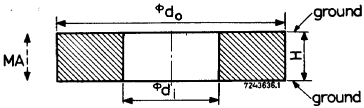
PREFERRED TYPES

A “selection” of our preferred types is given below. A complete list of preferred types, comprising the shapes and sizes of permanent magnets from existing moulds and dies, is available on request. We offer every assistance in the primary and secondary aspects of permanent magnets and their systems.

Anisotropic ferroxdure

Ring magnets for loudspeakers etc.

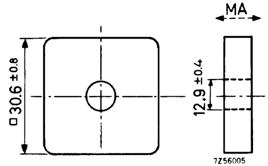
Material: Fxd 300R
Magnetic axis: axial
Supplied unmagnetised



dimensions						*catalog number*
outer diam.		*inner diam.*		*H*		
mm	*tolerance*	*mm*	*tolerance*	*mm*	*tolerance*	
40	±0.9	22	±0.5	9	±0.1	60090
45	±1	22	±0.6	8	±0.1	60100
51	±1.2	24	±0.6	9	±0.1	60150
55	±1.2	24	±0.6	8	±0.1	60160
60	±1.5	24	±0.6	12	±0.1	60190
72	±1.5	32	±0.7	15	±0.1	60240
84	±1.8	32	±0.9	15	±0.1	60270
102	±3	51	±1.5	10	±0.15	60300
134	±4	57	±1.7	14	±0.2	60330
184	±5.5	73	±2.2	18.5	±0.2	60350

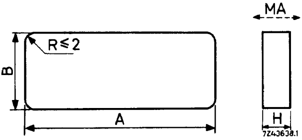
Square magnet for loudspeakers

Material: Fxd 300
Magnetic axis: axial
Supplied: unmagnetised
Catalog number: 4322 020 63010



Blocks

Material: see below
Magnetic axis: ⊥ A × B
Supplied: magnetised

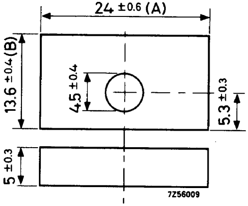


dimensions						material	catalog number
A		B		H			
mm	tolerance	mm	tolerance	mm	tolerance		
15	±0.3	9	±0.5	5	±0.25	280K	3122 104 92700
50	±1.3	19	±0.5	4.9	−0.25	280K	62090[1])
50	±1.3	19	±0.5	6.1	±0.1	280K	62110[1])
131	±3	51	±1.5	17.5	±0.2	330K	62140[1])

[1]) Supplied unmagnetised.

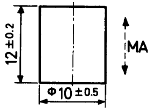
Blocks with hole

Material: Fxd 280K
Magnetic axis: ⊥ A × B
Supplied: magnetised
Catalog number: 4322 020 63100



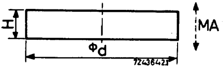
Slugs

Material: Fxd 280K
Magnetic axis: axial
Supplied: magnetised
Catalog number: 4322 020 61010



Discs

Material: see below
Magnetic axis: axial
Supplied: unmagnetised

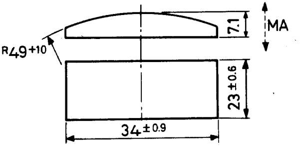


dimensions				material	catalog number
d		H			
mm	tolerance	mm	tolerance		
5.5	±0.05	1.8	±0.03	330K	4322 020 62590
12	±0.3	6	±0.25	300R	62540[1])
40.6	±1	9	±0.1	250K	62550

[1]) Supplied magnetised.

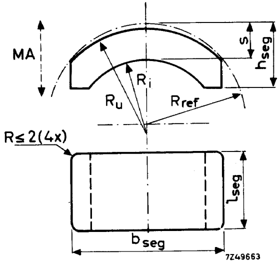
Segments

Material: Fxd 300R
Magnetic axis: diametric
Supplied: unmagnetised



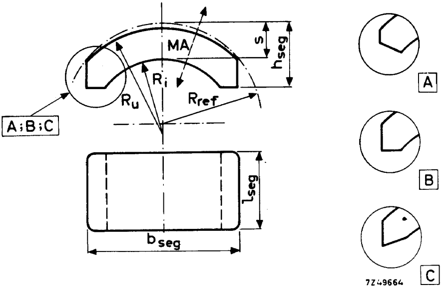
Segments for d.c. motors

Material: Fxd 330K
Magnetic axis: diametrical
Supplied: magnetised in pairs



R_i	R_u	s	h_{seg}		b_{seg}		l_{seg}		*catalog number*
mm	*tol.*	*mm*	*mm*	*tol.*	*mm*	*tol.*	*mm*	*tol.*	
⩾8.315	⩾12.025	⩽3.66	8	±0.6	18	±0.5	15	±1	4322 020 61560
									61570
⩾20.3	⩾29	⩽8.7	16	±0.6	42	±1	41	±1	30360
									30350

Material: Fxd 330 Rad.
Magnetic axis: radial
Supplied: unmagnetised



R_i mm	R_u mm	s mm	h_{seg} mm	tol.	b_{seg} mm	tol.	l_{seg} mm	tol.	catalog number	Fig.
⩾28.58	⩾35.13	⩽6.55	25.5	±0.6	62.4	+0.4	26.7	±0.75	4322 020 61510	A
⩾28.41	⩾35.55	⩽7.15	21.4	−1.2	60.3	+3.0	39.4	+1	61580	C
⩾29.03	⩾36.02	⩽7.49	21.79	±0.38	62.7	+3.0	27.88	±1.25	61590	B

Isotropic ferroxdure

Discs and bars

Material: Fxd 100
a) axially magnetised

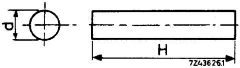


Fig. 1

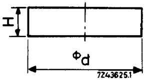
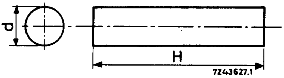


Fig. 2

dimensions				*catalog number*	*Fig.*
diam. d		*H*			
mm	*tolerance*	*mm*	*tolerance*		
3	±0.2	7.5	±0.25	4312 020 60130	1
5	±0.3	30	±0.8	60010	1
4	±0.2	3.5	±0.2	65950	2
32	−1	8.7	±0.3	65810	2

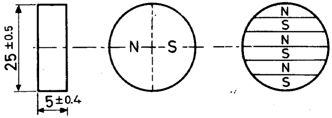
b) diametrically magnetised



dimensions				*catalog number*
diam. d		*H*		
mm	*tolerance*	*mm*	*tolerance*	
4	±0.1	10	±0.2	4312 020 60040
5	±0.5	15	±0.5	60110

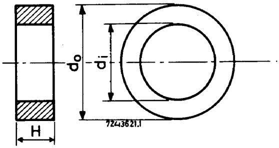
c) laterally magnetized

6 poles on 1 face
Catalog number 4312 020 65850



Rings

Material: Fxd 100



a) diametrically magnetised

dimensions						*catalog number*
outer diam.		*square hole*		*H*		
mm	*tolerance*	*mm*	*tolerance*	*mm*	*tolerance*	
12.25	±0.25	3.2	±0.5	10	±0.5	4312 020 62110
12	+0.5	3.2	±0.5	12	±0.5	62120

b) axially magnetised

dimensions						*catalog number*
outer diam.		*inner diam.*		*H*		
mm	*tolerance*	*mm*	*tolerance*	*mm*	*tolerance*	
11.9	±0.4	5.75	±0.25	6.5	±0.5	4312 020 62210
29.9	−0.05	10	±0.3	5	−0.1	62270[1])

[1]) 4p axially magnetised.

c) radially magnetised

dimensions						*magnetisation*	*catalog number*
outer diam.		*inner diam.*		*H*			
mm	*tolerance*	*mm*	*tolerance*	*mm*	*tolerance*		
13	±0.3	5.3	±0.2	8	±0.3	N pole on circ.	4312 020 62150
27	±0.7	20	±0.6	3.5	±0.5	S pole on circ.	62340

d) laterally magnetised

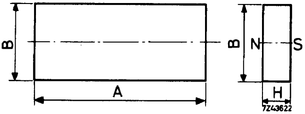
dimensions						*magnetisation*	*catalog number*
outer diam.		*inner diam.*		*H*			
mm	*tol.*	*mm*	*tol.*	*mm*	*tol.*		
1.2	−0.4	10	±0.5	24	+0.7	8 poles on outer diam.	4312 020 62040
37	±0.8	25	±0.5	3.5	−0.5	4 poles on one surface	62400

e) rings for couplings (laterally magnetised)

dimensions						*magnetisation*	*catalog number*
outer diam.		*inner diam.*		*H*			
mm	*tol.*	*mm*	*tol.*	*mm*	*tol.*		
55	±0.05	15	±0.5	13	±0.1	12 poles on outer ∅	4312 020 62430
78	±1.5	58	±0.05	13	±0.1	12 poles on inner ∅	62420

Blocks

Material: Fxd 100
magnetised ⊥ A × B

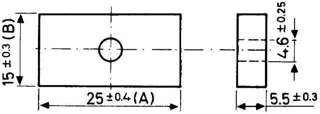


dimensions						*catalog number*
A		*B*		*H*		
mm	*tolerance*	*mm*	*tolerance*	*mm*	*tolerance*	
28	−0.5	13	−0.5	3.5	+0.5	4312 020 66750
10	±0.5	5	±0.5	3	±0.5	66760

PERMANENT MAGNET MATERIALS

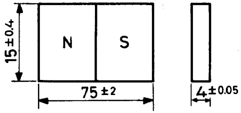
Blocks with holes

Material: Fxd 100
magnetised ⊥ A × B
Catalog number 4312 020 66710



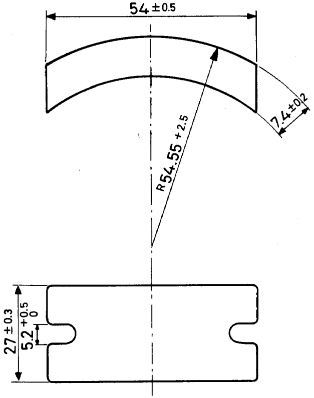
Blocks

Material: Fxd 100
laterally magnetised
8 poles on 75 × 15
Catalog number 4312 020 66860



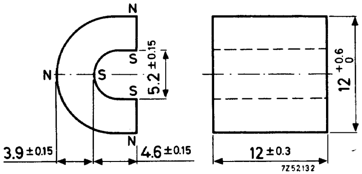
Segments

Material: Fxd 100
not magnetised
Catalog number 4312 020 61500



Special parts for colour TV sets

Material: Fxd 100
supplied: magnetised



article	*dimensions in mm*		*magnetic axis*	*catalog number*
	diameter d	*H*		
Disc	20 ± 0.35	5 ± 0.3	diametric	3122 104 90620
Bar	5–0.2	10 ± 0.2	diametric	92850
Segment	see drawing		radial	90440

Isotropic plastic-bonded ferroxdure

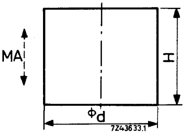
Material: see below
Supplied: magnetised

article	*dimensions*	*material*	*magnetic axis*	*catalog number*
Strip	(9 ± 0.3) × (3 ± 0.1)	P40	2 poles lateral	4312 020 70020
Ring	∅(28 ± 0.1) × (∅22–0.2) × (16.5 ± 0.2)	D55	2 poles on int. circ.	4312 020 72100
Block	(10.6 – 0.6) × (10.6 – 0.6) × (3 ± 0.15)	P30	diametrical	3122 104 93540
Bar	∅(5 ± 0.2) × (40 – 1)	P30	axial	3122 104 90360
Rings with 1 to 3 lobes for T.V. deflection units		SP10 or P40	2 poles on int. circ.	

Anisotropic "Ticonal"

Slugs

Material: see below
Direction of magnetisation: axial
Supplied: unmagnetised

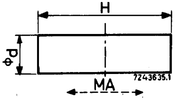


dimensions				*material*	*catalog number*
d		*H*			
mm	*tolerance*	*mm*	*tolerance*		
12.9	−0.3	10	−0.05	'Ticonal' 750	4322 059 75060
15.8	−0.1	13	±0.1	'Ticonal' 750	75030
18	−0.4	12	−0.1	'Ticonal' 600	60000
19.4	±0.3	9.4	±0.1	'Ticonal' 750	75080
21	±0.5	16	±0.05	'Ticonal' 600	60010
28.3	±0.4	19.45	±0.05	'Ticonal' 600	60150

Cylindrical slugs in "Ticonal" 750 can be supplied in any length. Standard diameters are between 12 and 22 mm.

Rods

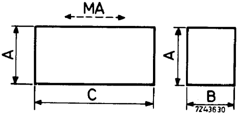
Material: 'Ticonal' 500
Direction of magnetisation: axial



dimensions				*condition*	*catalog number*
d		*H*			
mm	*tolerance*	*mm*	*tolerance*		
4	±0.2	6	±0.2	unmagnetised	4322 059 50070[1])
5.5	−1	25	±0.5	magnetised	50100[1])
8.1	−1	65	±0.5	magnetised	50110[1])

[1]) Bars in these and other small diameters can be supplied in any length between 6 and 100 mm.

Blocks



Material: see below
Direction of magnetization: ⊥ face A × B
Version: see below

dimensions						*material*	*version*	*catalog number*
A		*B*		*C*				
mm	*tol.*	*mm*	*tol.*	*mm*	*tol.*			
2	±0.05	2.6	±0.05	2.25	−0.03	'Ticonal' 900	unmagnetised	4322 059 90000
4	±0.05	4	±0.05	5	±0.02	'Ticonal' 900	unmagnetised	90010
27	−1	20	±0.5	17	±0.05	'Ticonal' 450	unmagnetised	45030
100	±1	12	±0.1	29.1	±0.05	'Ticonal' 500	unmagnetised	50130[1])
10.5	±0.2	17	±0.3	40	±0.05	'Ticonal' 500	unmagnetised	50170

[1]) with two mounting holes.

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