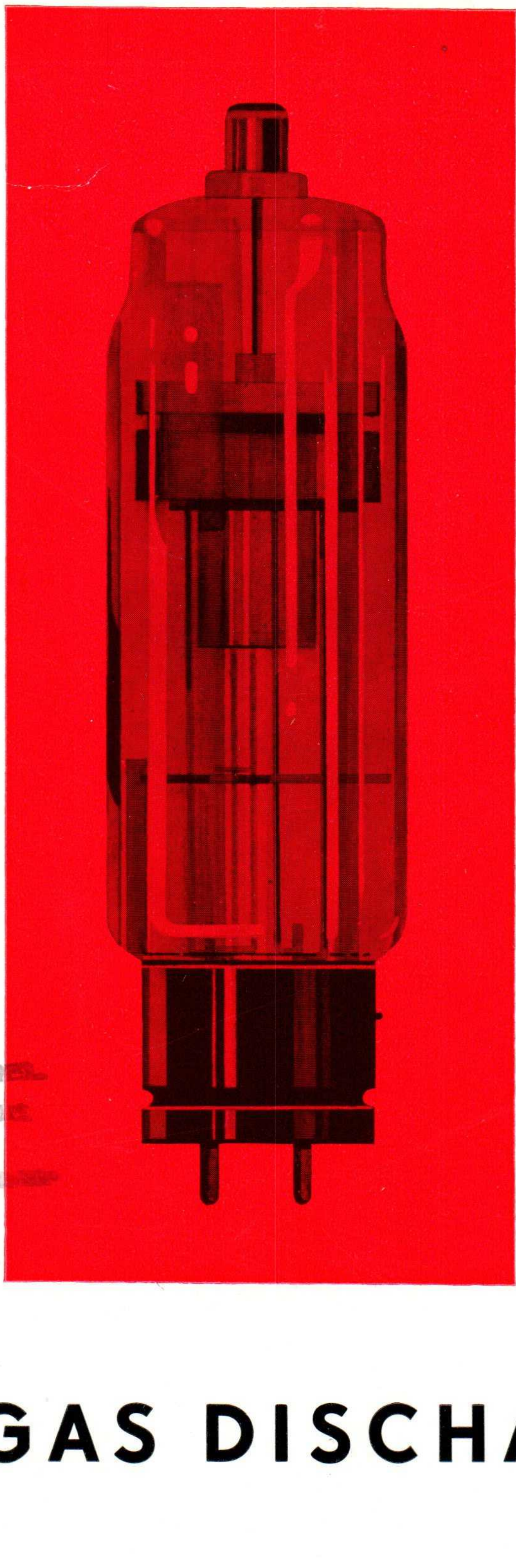
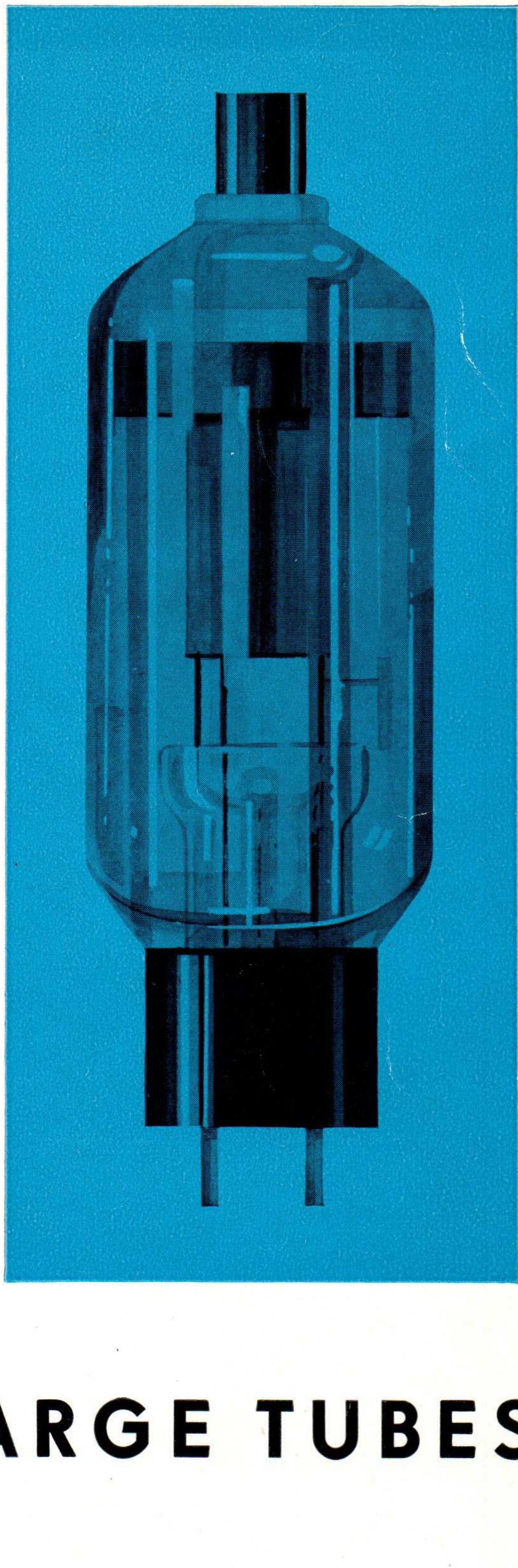
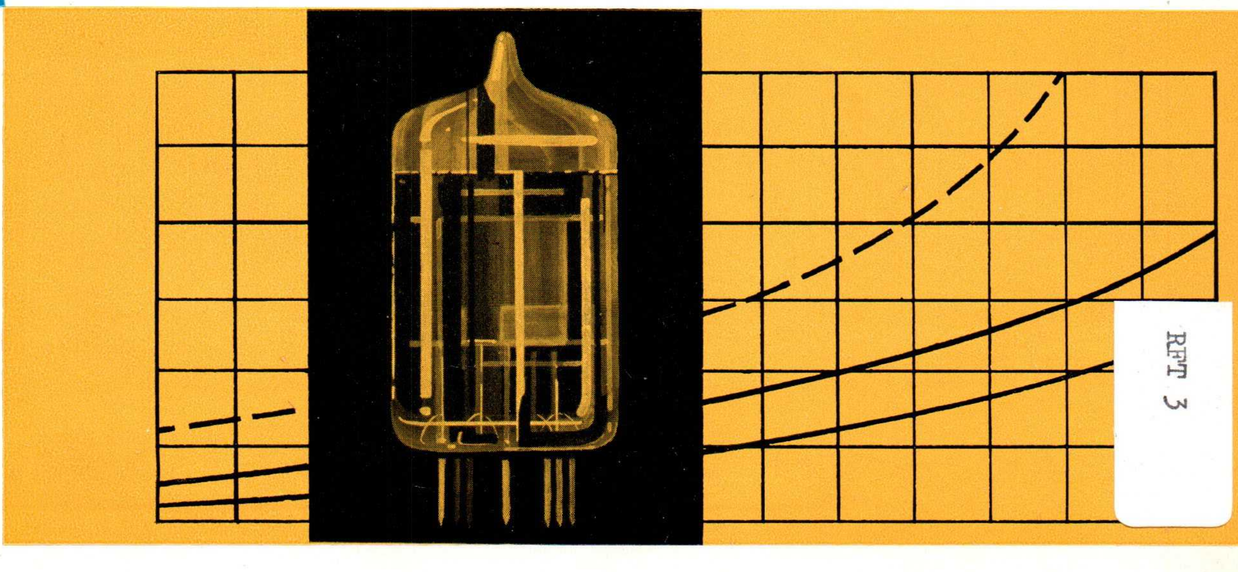




RFT

GAS DISCHARGE TUBES



GAS DISCHARGE TUBES

VEB WERK FÜR FERNSEHELEKTRONIK

BERLIN-OBERSCHÖNEWEIDE

OSTENDSTRASSE 1-5

TELEFON 63 28 41

AUSGABE 1964

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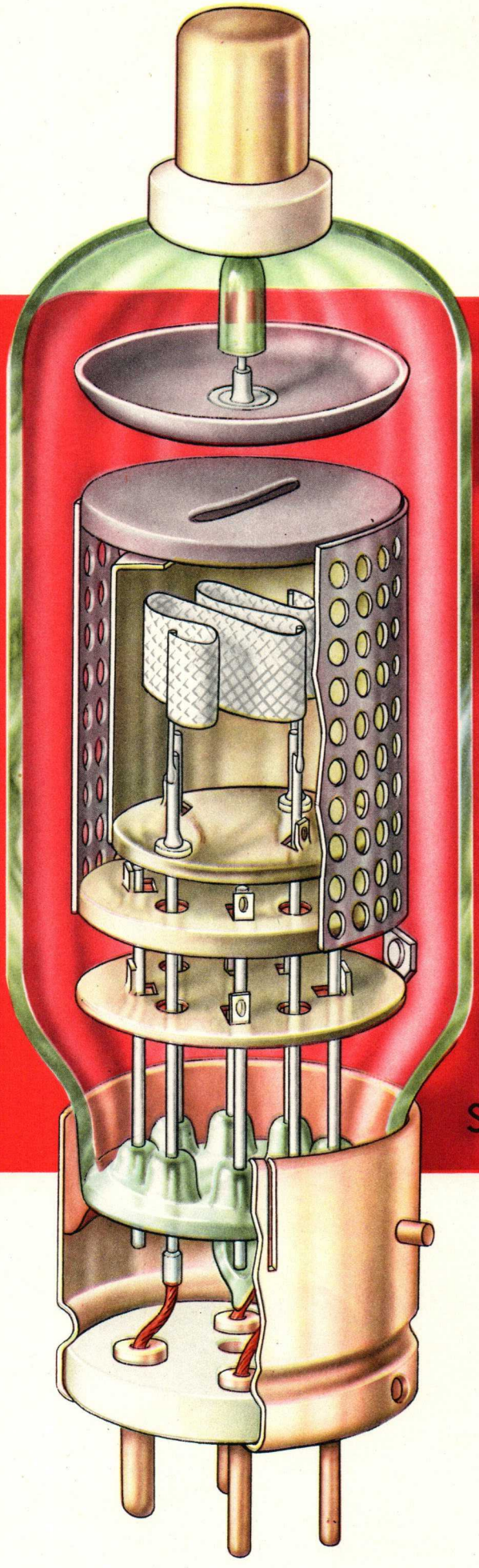


S 1,3/30 dM

THYRATRONS

THYRATRONS

Design and Operation

Thyratrons are single-anode gas-discharge devices containing a large-area directly or indirectly heated oxide cathode and one or two grids as well. The cathode and grid terminals are connected across the base, the anode terminal is at the top of the envelope. This applies to all tubes other than those used for relay service and relaxation oscillation.

Unlike high-vacuum tubes, thyratrons have a very small tube voltage drop due to the absence of negative space charge. As a result, the power loss occurring in the tube is kept at a minimum. Discharge is initiated by the grid which has been inserted between anode and cathode. Owing to suitable circuits the instant of the initiation of discharge may occur at any point of the positive sinusoidal half wave, i. e. the mean value of the rectified current may be continuously controlled from zero to a maximum which is in the scope of the given tube. In a fired tube the grid has lost control. Consequently the discharge can only be extinguished when the anode current has become zero. This takes place toward the end of each positive half wave period in an AC rectified supply.

According to their specific applications, the tubes may contain mercury vapour, inert gas, hydrogen, or a mixture of mercury vapour and inert gas.

Applications

In the industry fast-switching and control of high currents is frequently of prime importance. Since high-vacuum tubes cannot bridge this gap, they must make way for gas tubes whose great variety meets the ever growing demands especially in the field of industrial electronics. Thyratrons, relay tubes and relaxation oscillator tubes will entail improved production processes, more advanced production techniques and will enhance testing and supervision of miscellaneous processes by electronic means. Motor control should be mentioned as a good example for drives having any desired speed (rpm) — torque characteristics, whereby the operation of the control elements is virtually inertialess and involves no loss in power. Among the various examples of the usage of these tubes to improve product quality are feed mechanisms in machine tools, synchronuous gear, rolling and spinning machine groups, winding devices in textile mills and wire plants, hoist and conveyor systems as well as supervision of chemical processes, automatic temperature control, timers in welding machines and other equipment.

Key to the Type Designations

The type designation is derived from the power values, heating and gas-filling of the tube. The first letter S is used for grid-controlled gas tube (thyratron).

The following number indicates the maximum inverse voltage of the tube in kV, the number after the down-stroke indicates the highest peak current of the tube in amps. An affixed small letter shows the type of heating used: d = directly heated cathode, i = indirectly heated cathode. A following Roman number or the letter M states the type of gas-filling:

No digit = mercury-vapour

I = argon

II = helium

III = hydrogen

IV = krypton

V = xenon

VI = gas mixture (mercury vapour + inert gas)

Definitions

Maximum peak inverse anode voltage $\hat{u}_{a\ inv\ max}$:

This is the highest peak voltage which a rectifier tube or a thyratron can withstand in the reverse direction of the normal current flow. Within the specified temperature range it is the cutoff voltage below which — under normal operating conditions — no arc-backs are allowed to occur. The value $\hat{u}_{a\ inv}$ is accurately measured on a cathode-ray oscilloscope.

Peak anode voltage (positive control) $\hat{u}_{a\ max}$:

This is an additional value specified for thyratrons. It is the maximum instantaneous voltage a tube can withstand in the forward direction of current flow when the grid potential is sufficiently negative to stop the tube conducting.

Maximum peak cathode current $\hat{i}_{k\ max}$:

This is the highest instantaneous current a tube can pass in the forward direction of current flow under normal operating conditions. For accurate measurements the use of a cathode-ray oscilloscope is also recommended. If the specified values are exceeded the cathode emission may decrease and result in a shorter life.

Maximum average cathode current $\bar{i}_{k\ max}$:

This is the highest mean current a tube is allowed to conduct permanently. Under uniform load it can be measured on a DC ammeter.

Time of averaging currents $t_{\bar{i}}$:

This is the maximum value of the time required to average the anode currents.

Ionization time t_i:

This is the time interval between the arrival of a positive triggering pulse at the grid of a thyratron and the establishment of maximum anode current under fixed anode voltage. In certain limits it is dependent of the triggering pulse height.

Recovery time (deionization time) t_d:

This is the time required after interruption of anode current for the grid to regain control under normal operating conditions. It is a function of temperature, anode voltage, anode current and grid voltage.

Tube voltage drop U_{vd}:

This is the voltage measured between anode and cathode or filament centre tap of a fired tube. It is dependent of temperature, gas pressure and kind of gas filling. During useful life U_{vd} may slightly increase.

Starting time t_{start} prior to tube conduction: This is the time required to obtain stabilized operating conditions in the tube after having switched the anode input in.

General Operating Conditions and Instructions

Apart from the limiting values all values are averages. Corresponding spread around them should be taken into consideration.

The rated heater values should be maintained. The heater voltage should, in general, be held to within ± 5 per cent of its rated value (line voltage variations and circuit element spread); mind, however, that these tolerances are for short duration only, otherwise tube life may be impaired. Underheating will be particularlry harmful and cause cumulative destruction of the cathode.

The heating times stated are only applicable to circuits which ensure full heater voltage also during the heating time. Only after the heating time has passed the tube is ready to conduct! Note that the heater voltage is switched in first and the anode load afterwards.

Make sure that the heater voltage is switched off after the anode voltage.

When mercury-vapour tubes have been transported or after standby periods a heating time of at least 1 hour is required to evaporate all the mercury from the discharge.

The layout of the equipment should ensure an ambient air temperature which is within the limits of the specification. Especially the operation of mercury-vapour devices is largely dependent of room temperature which is measured at a lateral distance of 4 in. from the tube at base level. When filtering means are employed in rectifier circuits, take care that the charge current peaks of the capacitor banks are not allowed to exceed the maximum rating of the anode and cathode current given in the specification. This is obtained by suitable arrangement of the filtering means.

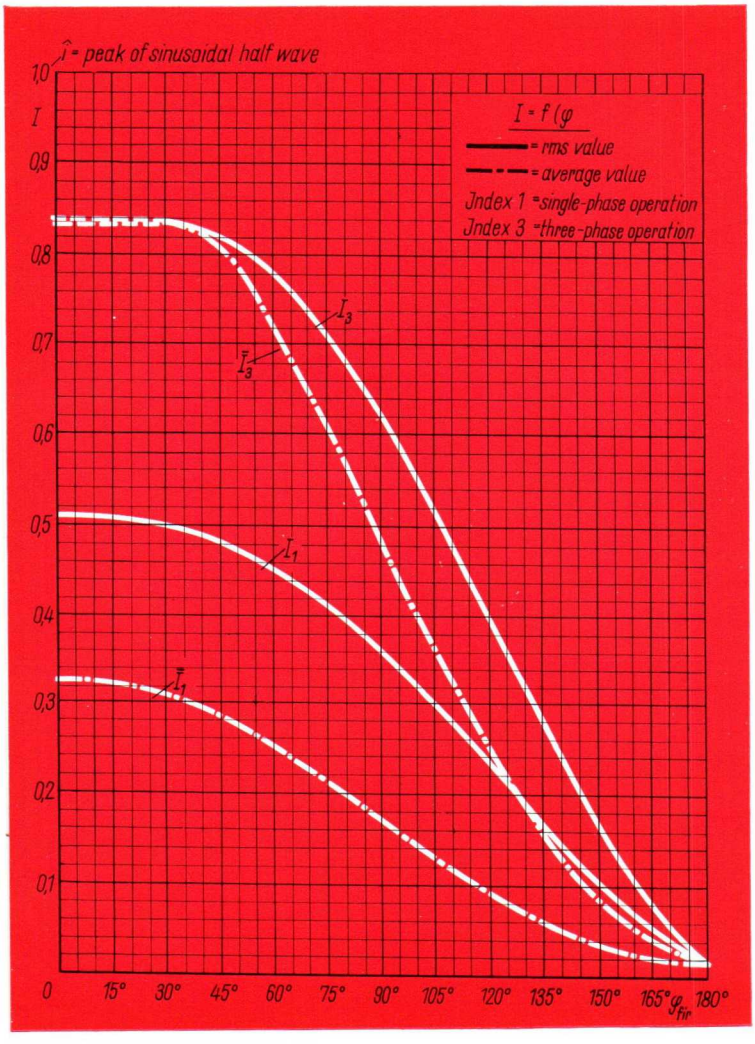
In principle, all mercury-vapour tubes should be operated in vertical position, i. e. with the base at bottom. The tubes should be arranged in such a way to provide free convective air cooling. It is essentual to shield the tubes from RF fields and RF voltages.

No external connection must be made to the free pins of the tube; they are designated „i. V." in the basing diagram.

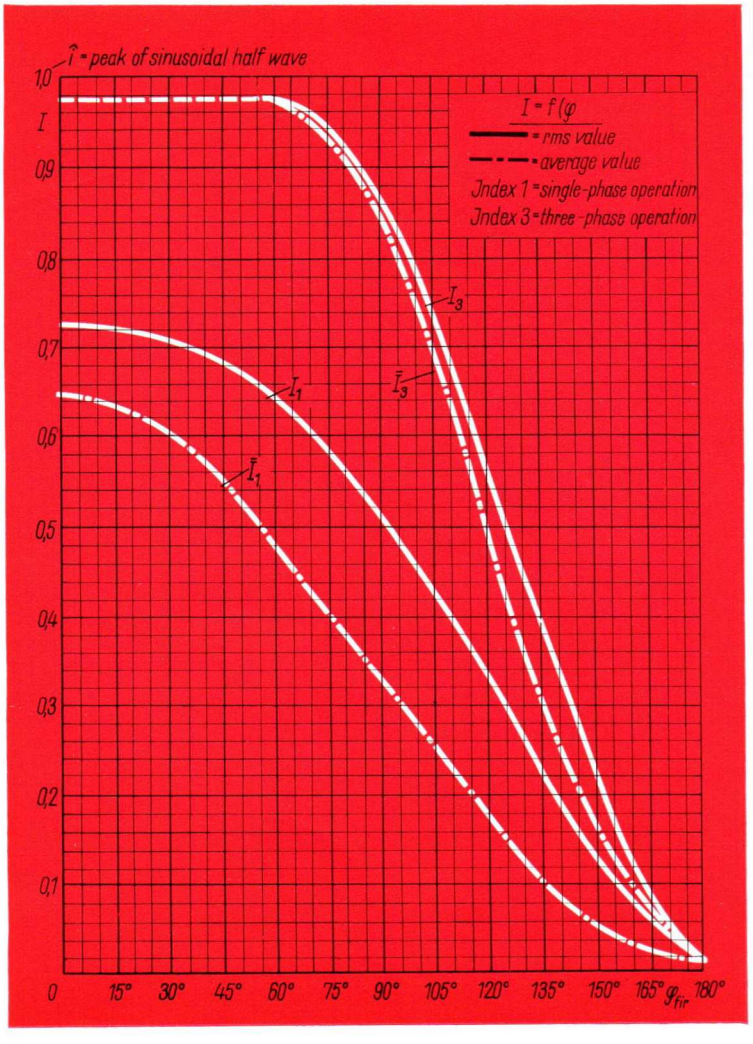
Guarantee expires if the precautions given to ensure satisfactory operation and life of the tubes are disregarded or if the limiting values are exceeded.

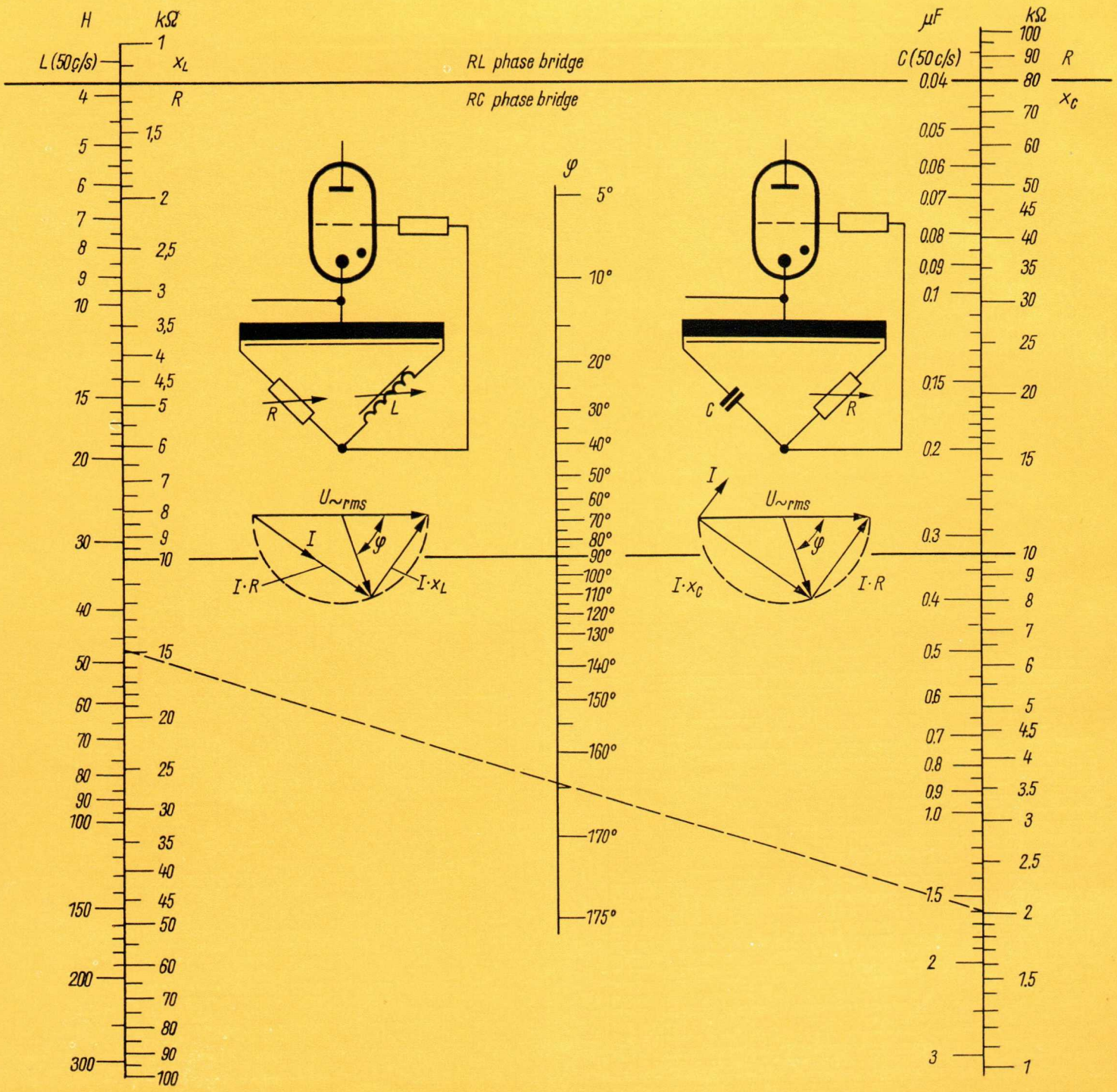
The customer should apply to the manufacturer if he wants a deviation from the specified operating conditions.

Current values as a function of the firing angle φ_{fir} for thyratrons in half-wave rectifier circuits



Current values as a function of the firing angle φ_{fir} for thyratrons in full-wave rectifier circuits





Nomographic chart for RL and RC phase bridges

More accurate calculations are possible with the formulae:

$$\varphi = 2 \cdot \arctan(\omega RC)$$

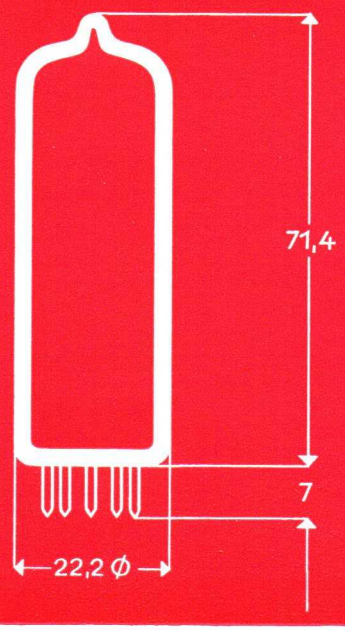
for RC bridges and

$$\varphi = 2 \cdot \arctan\left(\frac{\omega L}{R}\right)$$

for RL bridges

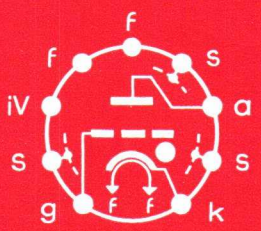
GAS TRIODE

EC 860 i II



Maximum outlines

Basing diagram



General Data

Type EC 860 i II is a grid-controlled helium-filled hot-cathode tube used sprimarily for sweep-circuit service up to 150 c/s as well as switching and controlling service in electronic equipment. Continuous control leads to a wider range of applications and permits to extinguish the discharge by the grid.

Weight	approx. 17.5 grams
Mounting position	any
Base	9-pin miniature

Manufacturer of the socket:
VEB Keramische Werke
Hermsdorf/Thüringen
Ref. No. 4109.10

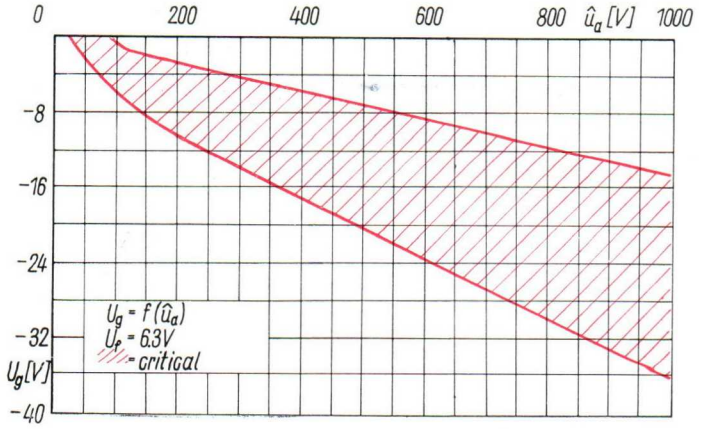
SPECIFICATION

Heater			
Indirectly heated oxide cathode			
Heater voltage	U_f	6.3	V
Heater current	I_f	approx. 1.4	A
Heating time	t_h	$\geqq$ 30	s
Typical Operation			
Tube voltage drop under DC load	U_{vd}	33	V
Anode breakdown voltage at zero bias across grid	U_{bd}	45	V
Starting time in sweep-circuit service	t_{start}	$\geqq$ 3	min.
Limiting Values			
Peak inverse anode voltage	$\hat{u}_{a\ inv\ max}$	1.3	kV
Positive-control peak anode voltage	$\hat{u}_{a\ max}$	1	kV
Negative peak grid voltage	$-\hat{u}_{g\ max}$	500	V
Grid leak	$R_{g\ max}$	1	MΩ
	$\frac{R_{g\ min}}{u_g}$	750[1])	Ω/V
Time of averaging currents	$t_{\tau\ max}$	5	s
Filament-cathode voltage	$U_{f-/k+max}$	100	V
	$U_{f+/k-max}$	100	V
Ambient temperature	$t_{amb\ max}$	+ 90	°C
	$t_{amb\ min}$	− 55	°C
Relaxation oscillator — Sweep-circuit service:			
Anode current			
Peak	$\hat{i}_{a\ max}$	750[2])	mA
Average	$I_{a\ max}$	10[2])	mA
Sweep frequency	$f_{sweep\ max}$	150	kc/s
Capacitance of parallel capacitor	$C_{p\ max}$	10	nF
Relay service:			
a) Normal DC or AC supply			
Anode current			
Peak, $t_{max} = 0.1$ s	$\hat{i}_{a\ max}$	500	mA
Average	$I_{a\ max}$	20	mA
b) DC supply under continuous grid control			
Positive-control anode voltage	$U_{a\ max}$	500	V
Grid leak	$\frac{R_{g\ min}}{\hat{u}_g}$	200[1])	Ω/V
Grid current			
Peak, for extinguished grid	$\hat{i}_{g\ max}$	5	mA

[1]) At $\hat{u}_g = -10$ V, R_g must be at least 7.5 kΩ or 2 kΩ.

[2]) The product of $i_a \times I_a$ must not exceed 4×10^3 mA^2.

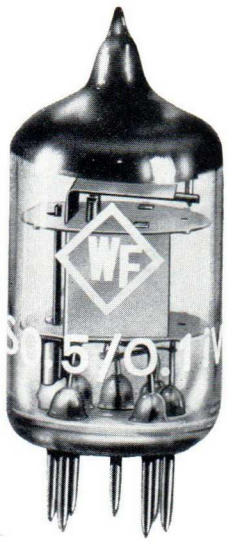
Capacitances (without external shield)			
Input	c_{in}	4.35	pF
Output	c_{out}	4	pF
Grid/anode	$c_{g/a}$	2.3	pF
Grid/filament	$c_{g/f}$	0.12	pF



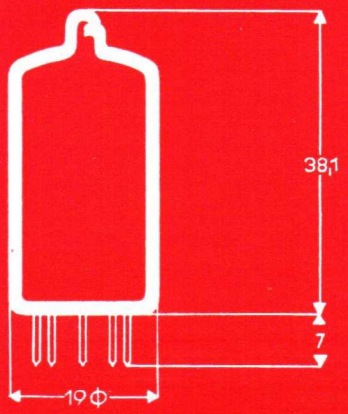
Control Characteristic

INERT-GAS THYRATRON

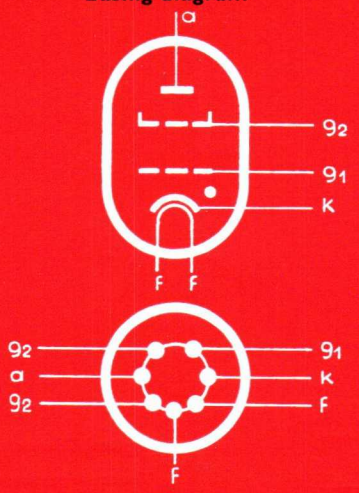
S 0,5/0,1 iV



Maximum outlines



Basing diagram



General Data

Type S 0,5/0,1 iV is a xenon-filled hot-cathode tube containing control and shield grid and lends itself primarily to electronic timers, relay service and other testing and measuring equipment. This tube complies with the types 5696, ASG 5696 and TГ 1-0,02/0,5.

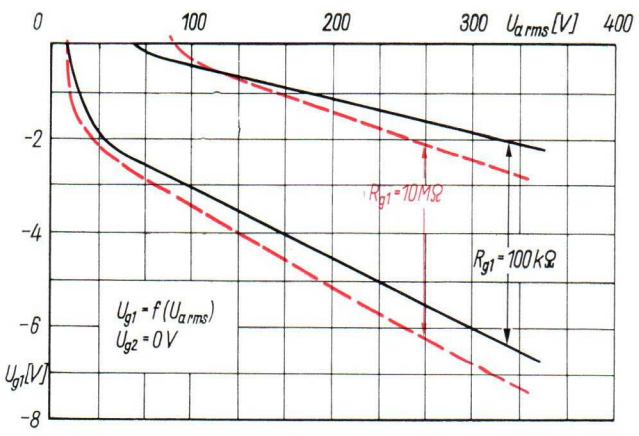
Weight	approx. 7 grams
Mounting position	any
Base	7-pin miniature

Manufacturer of the socket:
VEB Keramische Werke
Hermsdorf (Thüringen)
Ref. No. 4107.10

SPECIFICATION

Heater			
Indirectly heated oxide cathode			
Heater voltage	U_f	6.3	V
Heater current	I_f	approx. 0.15	A
Heating time	t_h	$\geqq$ 10	s
Typical Operation			
Tube voltage drop under DC load	U_{vd}	10	V
Anode breakdown voltage ($U_{g1} = U_{g2} = 0$)	U_{bd}	40	V
Limiting Values			
Peak inverse anode voltage	$\hat{u}_{a\ inv\ max}$	500	V
Positive-control peak anode voltage	$\hat{u}_{a\ max}$	500	V
Cathode current			
Peak	$\hat{i}_{k\ max}$	100	mA
Average	$I_{k\ max}$	25	mA
Negative grid-No. 1 voltage			
for extinguished tube	$-\hat{u}_{g1\ max}$	100	V
for fired tube	$-\hat{u}_{g1\ max}$	10	V
Grid-No. 1 current ($t_\tau\ g1\ max = 30$ s)	$I_{g1\ max}$	5	mA
Grid-No. 1 circuit resistance	$R_{g1\ max}$	10	MΩ
Negative grid-No. 2 voltage			
for extinguished tube	$-\hat{u}_{g2\ max}$	50	V
for fired tube	$-\hat{u}_{g2\ max}$	10	V
Grid-No. 2 current ($t_\tau\ g2\ max = 30$ s)	$I_{g2\ max}$	5	mA
Grid-No. 2 circuit resistance	$R_{g2\ max}$	100	kΩ[1]
Time of averaging currents	$t_\tau\ max$	30	s
Filament-cathode voltage	$U_{f-/k+\ max}$	100	V
	$U_{f+/k-\ max}$	25	V
Ambient temperature	$t_{amb\ max}$	+ 90	°C
	$t_{amb\ min}$	− 55	°C
Capacitances			
Input	c_{in}	approx. 1.8	pF
Output	c_{out}	approx. 1.5	pF
Shield grid/anode	$c_{g1/a}$	approx. 0.05	pF

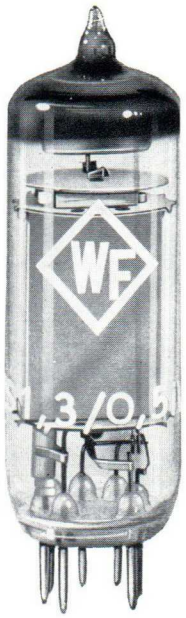
[1]) If possible, the shield grid g2 should be connected to the cathode not directly, but across a resistor of at least 1 kΩ.



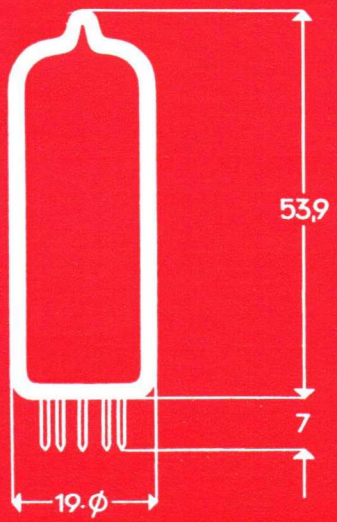
Control Characteristic

The accompanying figure shows the characteristic spread at $R_{g1} = 0.1$ MΩ and $R_{g1} = 10$ MΩ, as caused by differences in tu e manufacture, during tube life as well as by underheating and overheating.

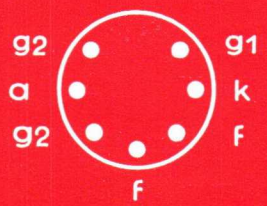
INERT-GAS THYRATRON
S 1,3/0,5 iV



Maximum outlines



Basing diagram



General Data

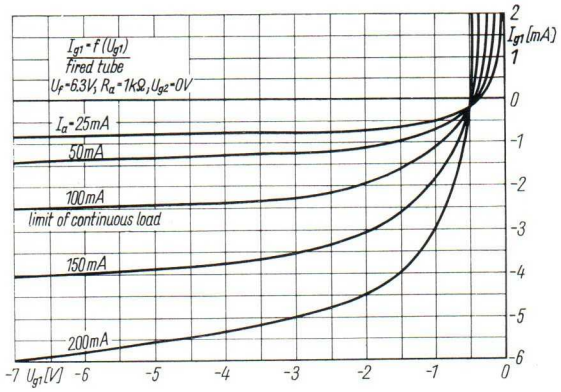
Type S 1,3/0,5 iV is a xenon-filled hot-cathode tube containing control and shield grid. It is primarily used for relay service. This tube complies with the types PL 21, 2 D 21, ASG 5121, RL 21 and EN 91.

Weight	approx. 10 grams
Mounting position	any
Base	7-pin miniature
	Manufacturer of the socket: VEB Elektro- und Radio-zubehör, Dorfhain (Sachsen) Ref. No. 4107.10

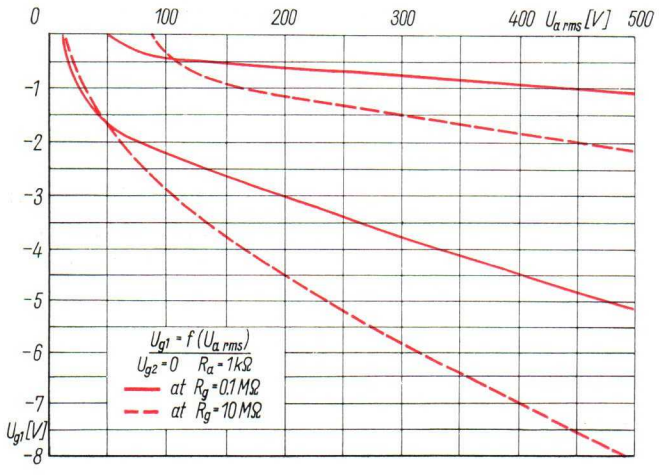
SPECIFICATION

Heater			
Indirectly heated oxide cathode			
Heater voltage	U_f	6.3	V
Heater current	I_f	approx. 0.6	A
Heating time	t_h	≧ 10	s
Typical Operation			
Tube voltage drop under DC load	U_{vd}	8	V
Anode breakdown voltage at $U_{g1} = U_{g2} = 0$ V	U_{bd}	40	V
Limiting Values			
Peak inverse anode voltage	$\hat{u}_{a\ inv\ max}$	1300	V
Positive-control peak anode voltage	$\hat{u}_{a\ max}$	650	V
Cathode current			
Peak	$i_{k\ max}$	500	mA
Average	$I_{k\ max}$	100	mA
Grid-No. 1 voltage			
for extinguished tube	$-\hat{u}_{g1\ max}$	100	V
for fired tube	$-\hat{u}_{g1\ max}$	10	V
Grid-No. 1 current ($t_{\tau max\ g1} = 30$ s)	$I_{g1\ max}$	10	mA
Grid-No. 1 circuit resistance	$R_{g1\ max}$	10	MΩ
Grid-No. 2 voltage			
for extinguished tube	$-\hat{u}_{g2\ max}$	100	V
for fired tube	$-\hat{u}_{g2\ max}$	10	V
Grid-No. 2 current ($t_{\tau g2\ max} = 30$ s)	$I_{g2\ max}$	10	mA
Time of averaging currents	$t_{\tau max}$	30	s
Filament-cathode voltage	$U_{f-/k+max}$	100	V
	$U_{f+/k-max}$	25	V
Ambient temperature	$t_{amb\ max}$	+ 90	°C
	$t_{amb\ min}$	− 75	°C
Capacitances (without external shield)			
Input	c_{in}	approx. 2.5	pF
Output	c_{out}	approx. 2.5	pF
Grid No. 1/Anode	$c_{g1/a}$	approx. 0.05	pF

Fired Tube

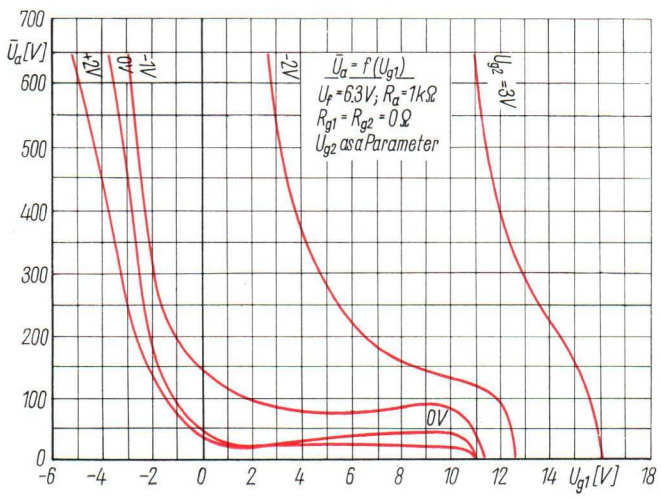


Control Characteristic Spread

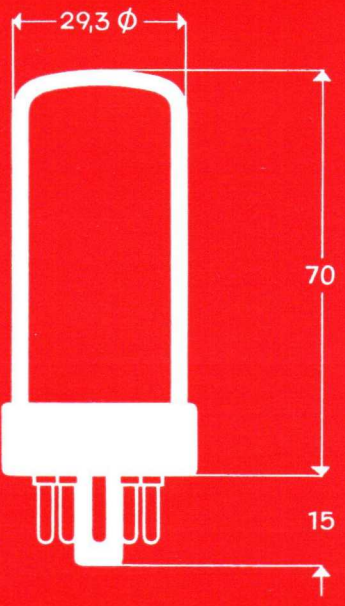


The accompanying figure shows the characteristic spread at $R_{g2} = 0.1$ MΩ and $R_{g1} = 10$ MΩ, as caused by differences in tube manufacture, during tube life as well as under-heating and overheating.

U_{g2} as a Parameter

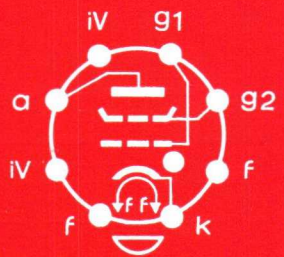


INERT-GAS THYRATRON
S 1,3/2 iV



Maximum outlines

Basing diagram



General Data

Type S 1,3/2 iV is a xenon-filled hot-cathode tube containing control and shield grid. It is primarily used for relay service. This tube complies with the types ASG 6574, PL 6574 and EN 32.

Weight	approx. 35 grams
Mounting position	any
Base	octal
	Manufacturer of the socket: VEB Elektro- und Radio-zubehör, Dorfhain (Sachsen) Ref. No. 0732.665

SPECIFICATION

Heater

Indirectly heated oxide cathode

Heater voltage	U_f	6.3	V
Heater current	I_f	approx. 0.95	A
Heating time	t_h	$\geqq$ 15	s

Typical Operation

Tube voltage drop under DC load	U_{vd}	10	V
Anode breakdown voltage ($U_{g1} = U_{g2} = 0$ V)	U_{bd}	40	V

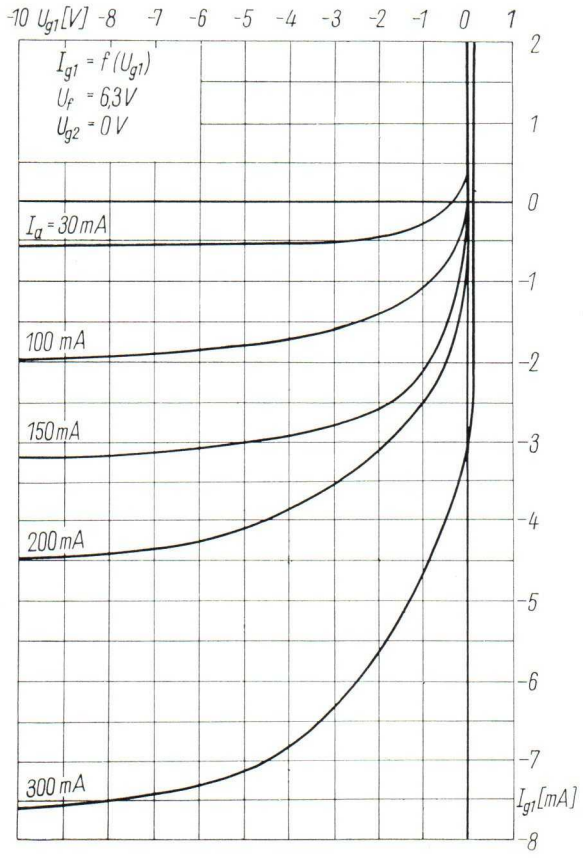
Limiting Values

Peak inverse anode voltage	$\hat{u}_{a\ inv\ max}$	1300	V
Positive-control peak anode voltage	$\hat{u}_{a\ max}$	650	V
Cathode current			
Peak	$\hat{i}_{k\ max}$	2	A
Average	$I_{k\ max}$	300	mA
Negative grid-No. 1 voltage			
for extinguished tube	$-\hat{u}_{g1\ max}$	250	V
for fired tube	$-\hat{u}_{g1\ max}$	10	V
Grid-No. 1 current ($t_{\tau g1\ max}$ = 1 cycle)	$I_{g1\ max}$	20	mA
Grid-No. 1 circuit resistance (I_k = 200 mA)	$R_{g1\ max}$	10	MΩ
Negative grid-No. 2 voltage			
for extinguished tube	$-\hat{u}_{g2\ max}$	100	V
for fired tube	$-\hat{u}_{g2\ max}$	10	V
Grid-No. 2 current ($t_{\tau g2\ max}$ = 1 cycle)	$I_{g2\ max}$	20	mA
Time of averaging currents	$t_{\tau max}$	15	s
Filament-cathode voltage	$U_{f+/k-max}$	100	V
	$U_{f-/k+max}$	25	V
Ambient temperature	$t_{amb\ max}$	+ 90	°C
	$t_{amb\ min}$	− 75	°C

Capacitances

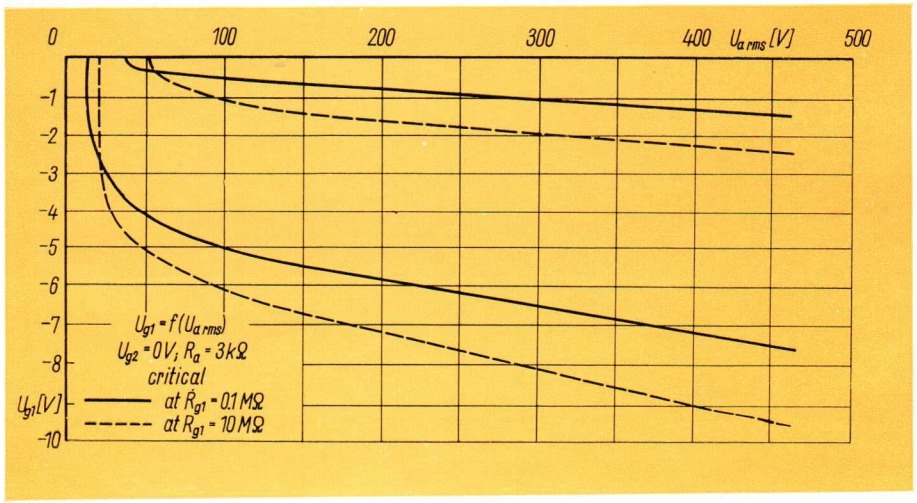
Input	c_{in}	approx. 2.5	pF
Output	c_{out}	approx. 3	pF
Grid-No. 1/Anode	$c_{g1/a}$	$\leqq$ 0.35	pF

Fired Tube

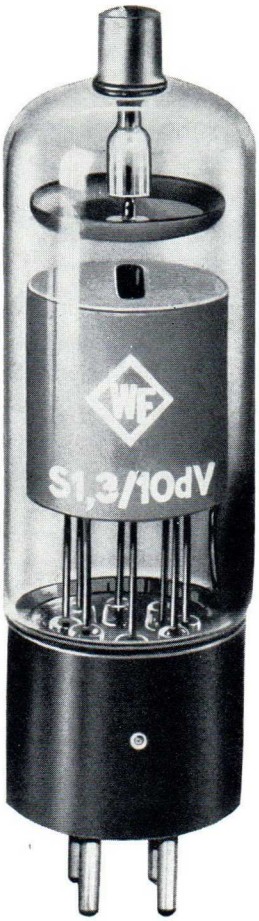


Control Characteristic

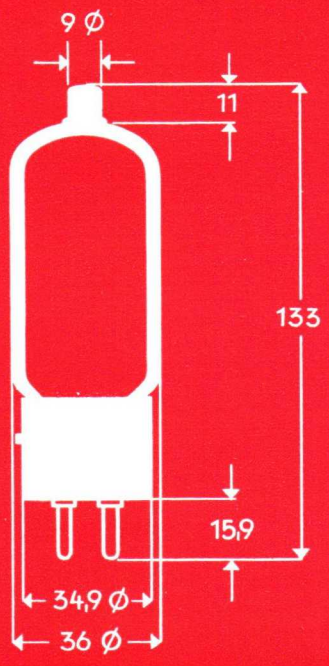
The accompanying figure shows the characteristic spread at R_{g1} = 0.1 MΩ and R_{g1} = 10 MΩ, as caused by differences in tube manufacture, during tube life as well as underheating and overheating.



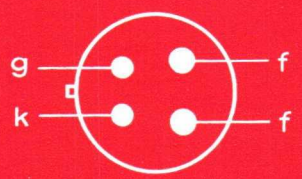
INERT-GAS THYRATRON
S 1,3/10 dV*)



Maximum outlines



Basing diagram



General Data

Type S 1,3/10 dV is an inert-gas grid-controlled hot-cathode tube. It is primarily used for electronic control gear and infinitely variable speed regulation of small-power electric drives. This tube is analogous to the type C 1 K.

Weight	approx. 70 grams
Mounting position	any
Base	medium 4-pin, bayonet
	Manufacturer of the socket: VEB Keramische Werke Hermsdorf (Thüringen) Ref. No. 4104.11

SPECIFICATION

Heater

Heater voltage	U_f	2.5	V
Heater current	I_f	approx. 5	A
Heating time	t_h	$\geq$ 60	s

Typical Operation

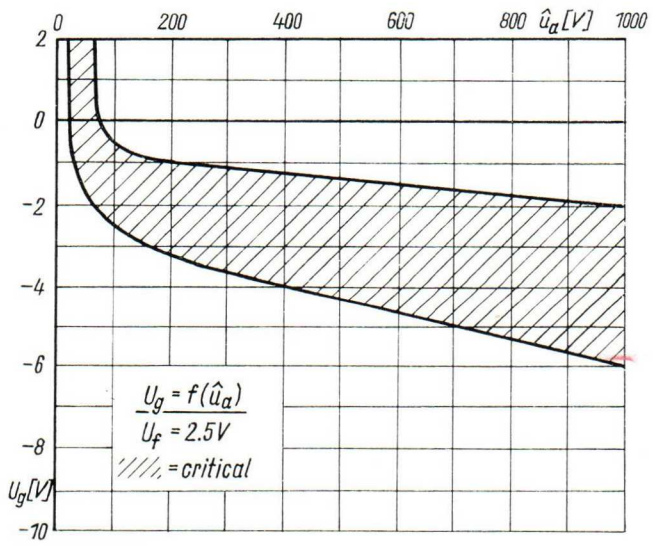
Tube voltage drop under DC load	U_{vd}	12	V
Anode breakdown voltage (at zero bias across grid)	U_{bd}	60	V

Limiting Values

Peak inverse anode voltage	$\hat{u}_{a\ inv\ max}$	1.3	kV
Positive-control peak anode voltage	$\hat{u}_{a\ max}$	1.0	kV
Cathode current			
Peak	$\hat{i}_{k\ max}$	10	A
Average	$\overline{I_{k\ max}}$	1	A
Negative grid voltage			
for extinguished tube	$-\hat{u}_{g\ max}$	200	V
for fired tube	$-\hat{u}_{g\ max}$	10	V
Peak grid current	$\hat{i}_{g\ max}$	0.5	A
Grid current ($t_{\tau\ max}$ = 1 cycle)	$I_{g\ max}$	0.1	A
Grid circuit resistance $R_{g\ max}$	$R_{g\ max}$	100	kΩ
	$R_{g\ min}$	10	kΩ
Time of averaging currents	$t_{\tau\ max}$	5	s
Ambient temperature	$t_{amb\ max}$	+ 70	°C
	$t_{amb\ max}$	− 55	°C

*) Under development

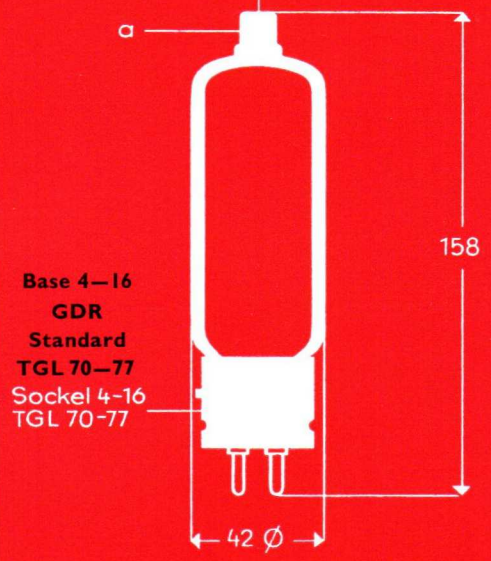
Control Characteristic



INERT-GAS THYRATRON
S 1,3/30 dV

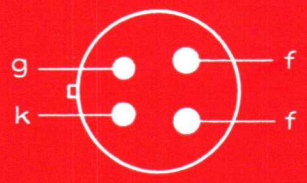
Connecting cap GDR Standard TGL 70—123
Anschlusskappe A1
TGL 70-123

Maximum outlines



Base 4—16
GDR
Standard
TGL 70—77
Sockel 4-16
TGL 70-77

Basing diagram



General Data

Type S 1,3/30 dV is an inert-gas hot-cathode tube. It is primarily used for electronic control gear, for infinitely variable speed regulation of electric drives and for ignition of ignitrons. This tube complies with the type PL 6011 and is analogous to the type PL 5684 or C 3 JA.

Weight	approx. 100 grams
Mounting position	any
Base	medium 4-pin, bayonet
	Manufacturer of the socket: VEB Keramische Werke Hermsdorf (Thüringen) Ref. No. 4104.11

SPECIFICATION

Heater

Indirectly heated oxide cathode

Heater voltage	U_f	2.5	V
Heater current	I_f	approx. 9	A
Heating time	t_h	$\geqq$ 60	s

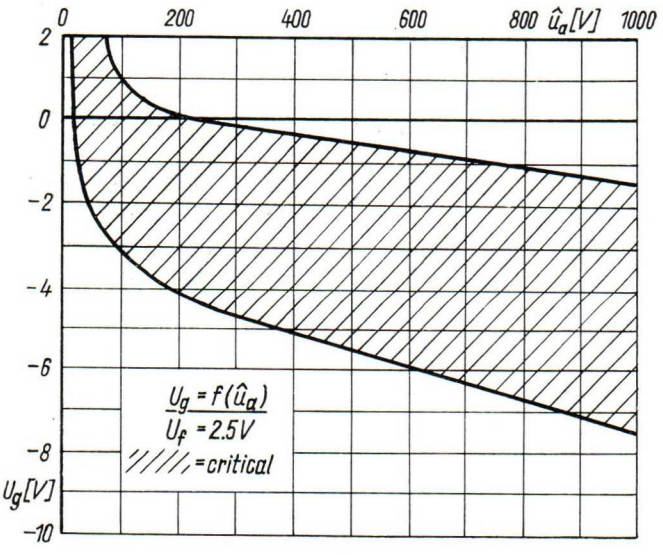
Typical Operation

Tube voltage drop under DC load	U_{vd}	12	V
Anode breakdown voltage at zero bias across grid	U_{bd}	60	V

Limiting Values

Peak inverse anode voltage	$\hat{u}_{a\ inv\ max}$	1.3	kV
Positive-control peak anode voltage	$\hat{u}_{a\ max}$	1.0	kV
Cathode current			
Peak	$\hat{i}_{k\ max}$	30	A
Average	$I_{k\ max}$	2.5	A
Negative grid voltage			
for extinguished tube	$-\hat{u}_{g\ max}$	250	V
for fired tube	$-\hat{u}_{g\ max}$	10	V
Peak grid current	$\hat{i}_{g\ max}$	500	mA
Grid current ($t_{\tau\ g\ max}$ = 1 cycle)	$I_{g\ max}$	100	mA
Grid circuit resistance	$R_{g\ max}$	100	kΩ
	$R_{g\ min}$	10	kΩ
Time of averaging currents	$t_{\tau\ max}$	5	s
Ambient temperature	$t_{amb\ max}$	+ 70	°C
	$t_{amb\ min}$	− 55	°C

Control Characteristic



MIXED-GAS THYRATRON
S 1,3/30 d M

General Data

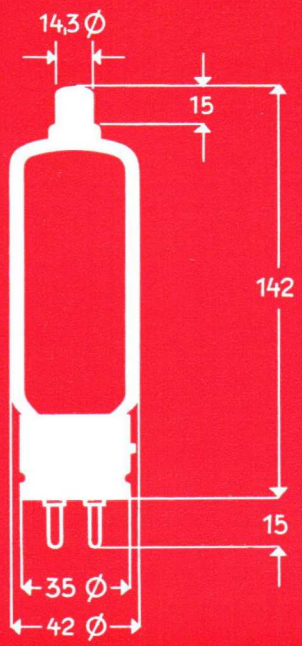
Type S 1,3/30 dM contains a directly heated cathode and is filled with a mixture of inert gas and mercury vapour. Both directly heated cathode and gas filling provide for a short heating time and low-temperature operation. Due to the additional mercury vapour long life is ensured. From the mid-tap of the cathode the load current can be directly fed to the tube.

The tube has been especially designed for use in electronic control gear, infinitely variable speed regulation of small-power electric drives and ignition of ignitrons. The compact assembly suggests its use in industrial equipment even under severe requirements.

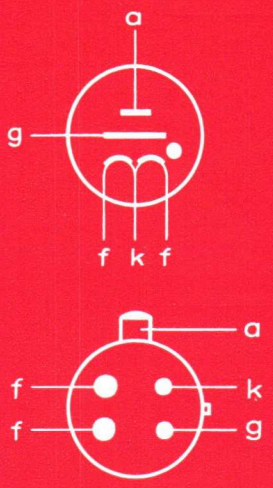
This tube complies with the type ASG 6011 and is analogous to the type PL 6011.

Weight	approx. 100 grams
Mounting position	vertical, base down
Base	medium 4-pin, bayonet
	Manufacturer of the socket: VEB Keramische Werke Hermsdorf (Thüringen) Ref. No. 4104.11

Basing diagram



Maximum outlines



SPECIFICATION

Heater

Directly heated oxide cathode			
Heater voltage	U_f	2.5	V
Heater current	I_f	approx. 9	A
Heating time	t_h	$\geqq$ 60	s
Heating time after transport	t_h	$\geqq$ 30	min.

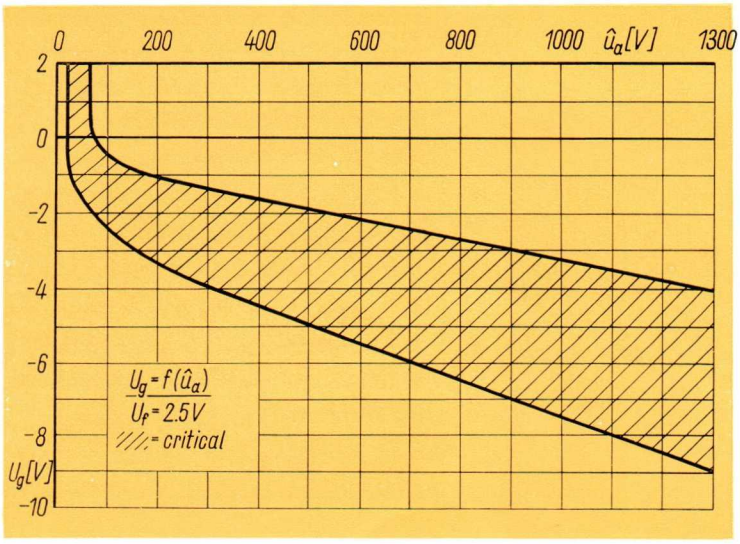
Typical Operation

Tube voltage drop under DC load	U_{vd}	12	V
Anode breakdown voltage (at zero bias across grid)	U_{bd}	60	V

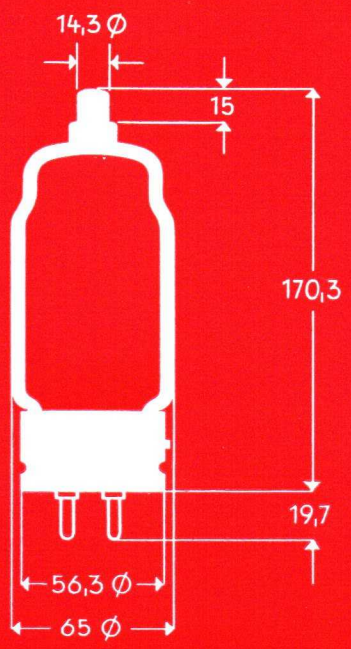
Limiting Values

Peak inverse anode voltage	$\hat{u}_{a\ inv\ max}$	1.3	kV
Positive-control peak anode voltage	$\hat{u}_{a\ max}$	1.3	kV
Cathode current			
Peak	$\hat{i}_{k\ max}$	30	A
Average	$I_{k\ max}$	2.5	A
Negative grid voltage			
for extinguished tube	$-\hat{u}_{g\ max}$	250	V
for fired tube	$-\hat{u}_{g\ max}$	10	V
Peak grid current	$\hat{i}_{g\ max}$	500	mA
Grid current (t_τ g max = 1 cycle)	$I_{g\ max}$	100	mA
Grid circuit resistance	$R_{g\ max}$	100	kΩ
	$R_{g\ min}$	10	kΩ
Time of averaging currents	$t_{\tau\ max}$	5	s
Ambient temperature	$t_{amb\ max}$	+ 45	°C
	$t_{amb\ min}$	− 20	°C

Control Characteristic

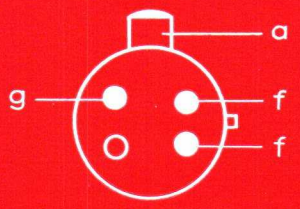


INERT-GAS THYRATRON
S 1,5/40 dV



Maximum outlines

Basing diagram



General Data

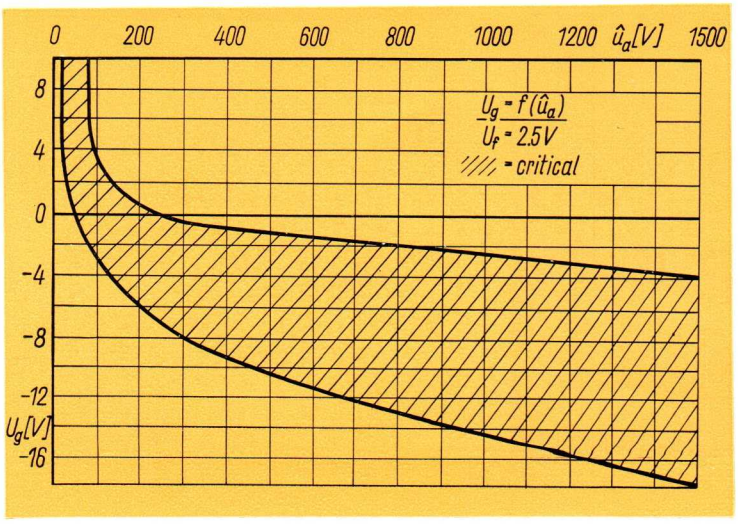
Type S 1,5/40 dV is a xenon-filled grid-controlled hot-cathode tube. It is primarily used for electronic control gear, for infinitely variable speed regulation of electric drives and ignition of ignitrons. This tube complies with the types ASG 5544, PL 5544 and TX 2/3.

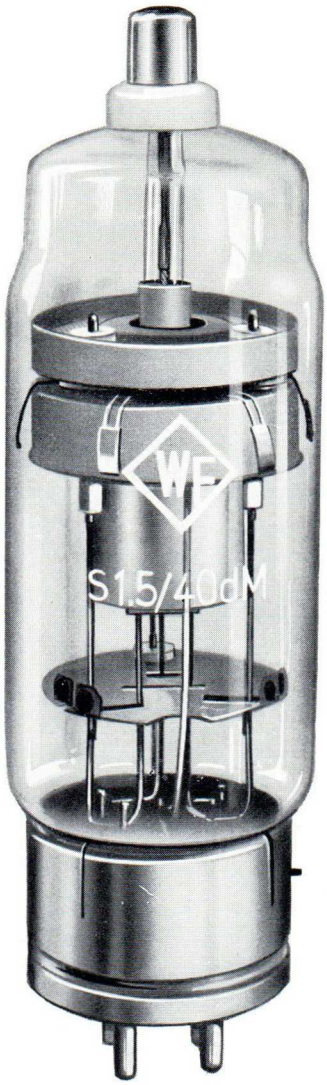
Weight	approx. 300 grams
Mounting position	any
Base	super-jumbo bayonet
	Manufacturer of the socket: VEB Keramische Werke Hermsdorf (Thüringen) Ref. No. 4104.10

SPECIFICATION

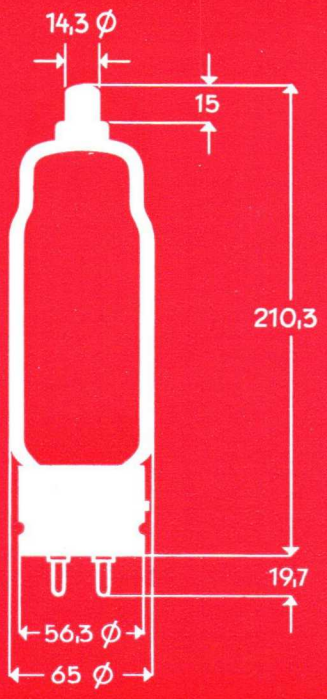
Heater			
Directly heated oxide cathode			
Heater voltage	U_f	2.5	V
Heater current	I_f	approx. 12	A
Heating time	t_h	$\geqq$ 60	s
Typical Operation			
Tube voltage drop under DC load	U_{vd}	12	V
Anode breakdown voltage at zero bias across grid	U_{bd}	200	V
Limiting Values			
Peak inverse anode voltage	$\hat{u}_{a\ inv\ max}$	1.5	kV
Positive-control peak anode voltage	$\hat{u}_{a\ max}$	1.5	kV
Cathode current			
Peak	$\hat{i}_{k\ max}$	40	A
Average	$I_{k\ max}$	3.2	A
Negative grid voltage			
for extinguished tube	$-\hat{u}_{g\ max}$	250	V
for fired tube	$-\hat{u}_{g\ max}$	10	V
Peak grid current	$\hat{i}_{g\ max}$	2.5	A
Grid current ($t_{\tau g\ max}$ = 1 cycle)	$I_{g\ max}$	0.2	A
Grid circuit resistance	$R_{g\ max}$	100	kΩ
	$R_{g\ min}$	500	Ω
Time of averaging currents	$t_{\tau max}$	15	s
Ambient temperature	$t_{amb\ max}$	+ 70	°C
	$t_{amb\ min}$	− 55	°C

Control Characteristic



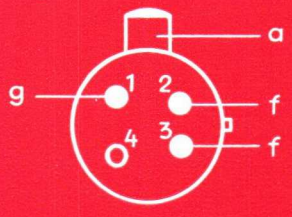


MIXED-GAS THYRATRON
S 1,5/40 d M



Maximum outlines

Basing diagram



General Data

Type S 1,5/40 dM is a grid-controlled hot-cathode tube filled with inert gas and mercury vapour. It is primarily used in electronic control gear, for infinitely variable speed regulation of electric drives and ignition of ignitrons. This tube is analogous to the types ASG 5044, PL 6755 and TQ 2/3.

Weight	approx. 370 grams
Mounting position	vertical, base down
Base	super-jumbo bayonet

Manufacturer of the socket:
VEB Keramische Werke
Hermsdorf (Thüringen)
Ref. No. 4104.10

SPECIFICATION

Heater

Directly heated oxide cathode			
Heater voltage	U_f	2.5	V
Heater current	I_f	approx. 11.5	A
Heating time	t_h	$\geqq$ 60	s

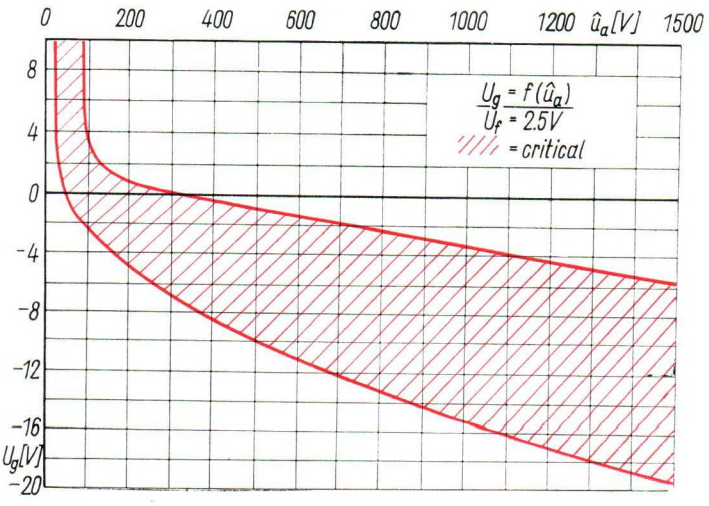
Typical Operation

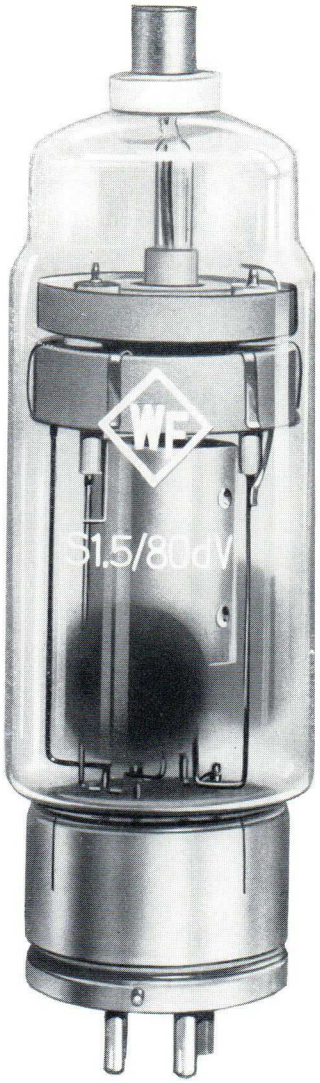
Tube voltage drop under DC load	U_{vd}	12	V
Anode breakdown voltage at zero bias across grid	U_{bd}	200	V

Limiting Values

Peak inverse anode voltage	$\hat{u}_{a\ inv\ max}$	1.5	kV
Positive-control peak anode voltage	$\hat{u}_{a\ max}$	1.5	kV
Cathode current			
Peak	$\hat{i}_{k\ max}$	40	A
Average	$I_{k\ max}$	3.2	A
Negative grid voltage			
for extinguished tube	$-\hat{u}_{g\ max}$	250	V
for fired tube	$-\hat{u}_{g\ max}$	10	V
Peak grid current	$\hat{i}_{g\ max}$	2.5	A
Grid current ($t_{\tau g\ max}$ = 1 cycle)	$I_{g\ max}$	0.2	A
Grid circuit resistance	$R_{g\ max}$	100	kΩ
	$R_{g\ min}$	500	Ω
Time of averaging currents	$t_{\bar{}\ min}$	15	s
Ambient temperature	$t_{amb\ max}$	+ 45	°C
	$t_{amb\ min}$	− 20	°C

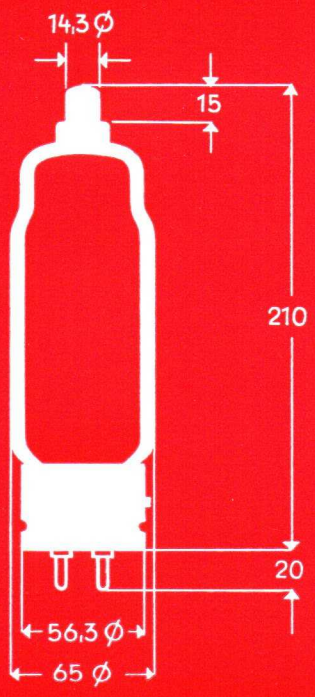
Control Characteristic



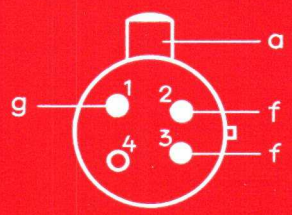


INERT-GAS THYRATRON
S 1,5/80 dV

Maximum outlines



Basing diagram



General Data

Type S 1,5/80 dV is a xenon-filled grid-controlled hot-cathode tube. It is primarily used in electronic control gear and for the infinitely variable speed regulation of electric drives. This tube complies with the types ASG 5545, PL 5545 and TX 2/6.

Weight	approx. 350 grams
Mounting position	any
Base	super-jumbo bayonet
	Manufacturer of the socket: VEB Keramische Werke Hermsdorf (Thüringen) Ref. No. 4104.10

SPECIFICATION

Heater

Directly heated oxide cathode			
Heater voltage	U_f	2.5	V
Heater current	I_f	approx. 21	A
Heating time	t_h	$\geqq$ 60	s

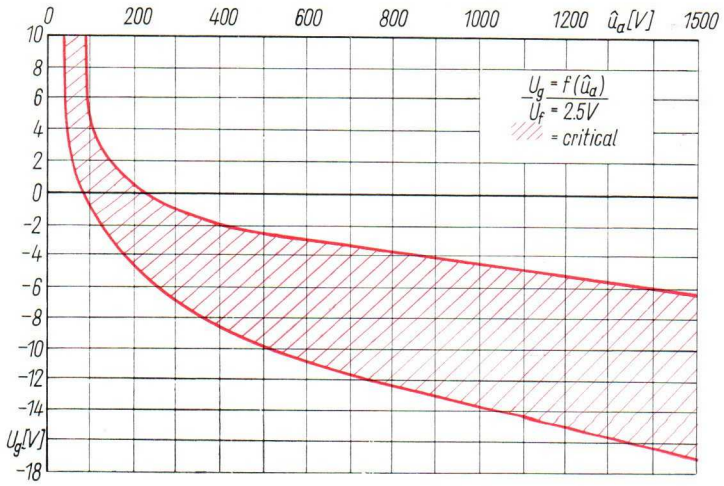
Typical Operation

Tube voltage drop under DC load	U_{vd}	12	V
Anode breakdown voltage at zero bias across grid	U_{bd}	200	V

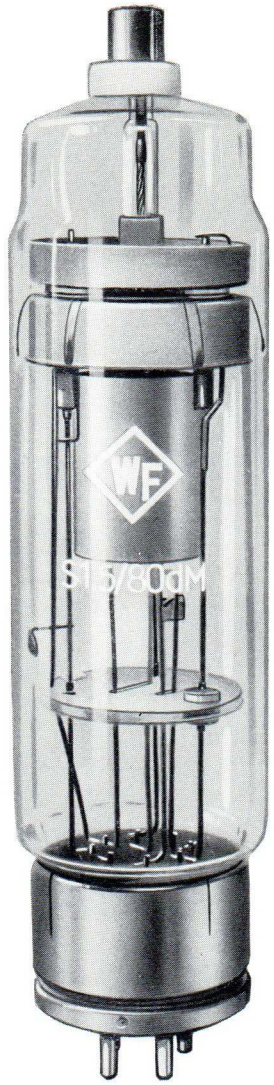
Limiting Values

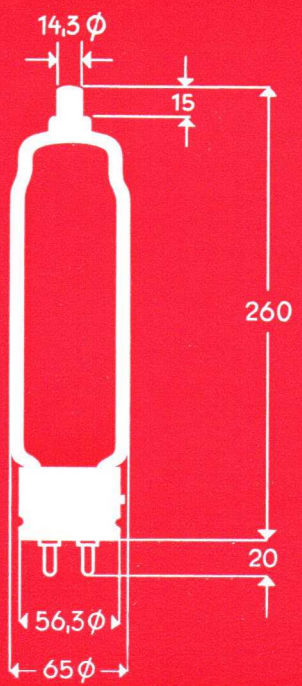
Peak inverse anode voltage	$\hat{u}_{a\ inv\ max}$	1.5	kV
Positive-control peak anode voltage	$\hat{u}_{a\ max}$	1.5	kV
Cathode current			
Peak	$\hat{i}_{k\ max}$	80	A
Average	$\overline{I_{k\ max}}$	6.4	A
Negative grid voltage			
for extinguished tube	$-\hat{u}_{g\ max}$	250	V
for fired tube	$-\hat{u}_{g\ max}$	10	V
Peak grid current	$\hat{i}_{g\ max}$	2.5	A
Grid current ($t_{\tau g\ max}$ = 1 cycle)	$I_{g\ max}$	0.2	A
Grid circuit resistance	$R_{g\ max}$	100	kΩ
	$R_{g\ min}$	550	Ω
Time of averaging currents	$t_{\tau\ max}$	15	s
Ambient temperature	$t_{amb\ max}$	+ 70	°C
	$t_{amb\ min}$	− 55	°C

Control Characteristic



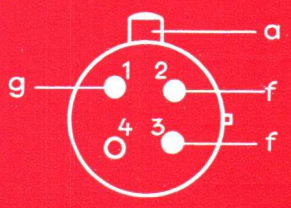
MIXED-GAS THYRATRON
S 1,5/80 d M





Maximum outlines

Basing diagram



General Data

Type S 1,5/80 dM is a grid-controlled hot-cathode tube filled with inert gas and mercury vapour. It is primarily used in electronic control gear and for the infinitely variable speed regulation of electric drives. This tube complies with the types ASG 5045 and TQ 2/6.

Weight	approx. 400 grams
Mounting position	vertical, base down
Base	super-jumbo bayonet
	Manufacturer of the socket: VEB Keramische Werke Hermsdorf (Thüringen) Ref. No. 4104.10

SPECIFICATION

Heater

Directly heated oxide cathode			
Heater voltage	U_f	2.5	V
Heater current	I_f	approx. 21	A
Heating time	t_h	$\geqq$ 60	s
Heating time after transport	t_h	$\geqq$ 60	min.

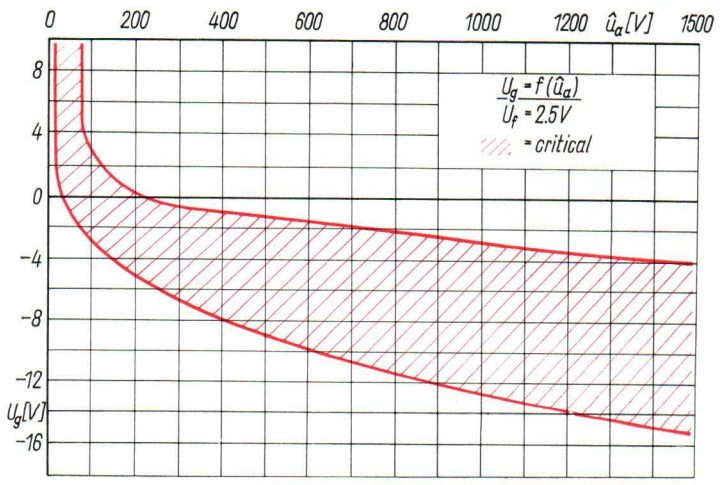
Typical Operation

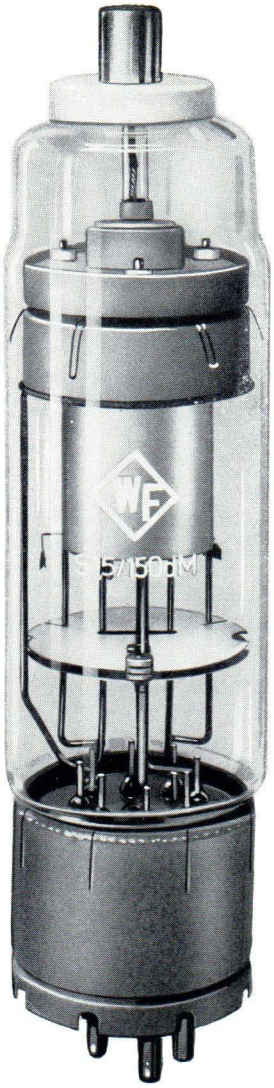
Tube voltage drop under DC load	U_{vd}	12	V
Anode breakdown voltage at zero bias across grid	U_{bd}	200	V

Limiting Values

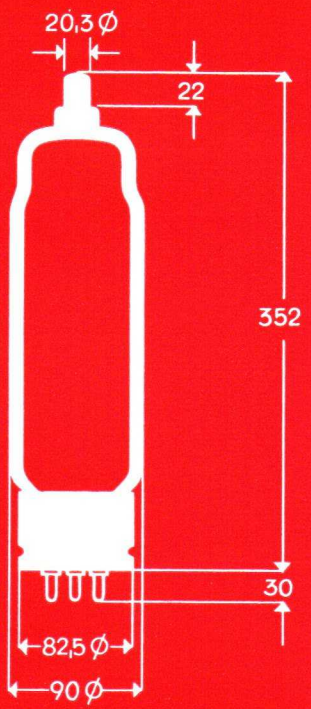
Peak inverse anode voltage	$\hat{u}_{a\ inv\ max}$	1.5	kV
Positive-control peak anode voltage	$\hat{u}_{a\ max}$	1.5	kV
Cathode current			
Peak	$\hat{i}_{k\ max}$	80	A
Average	$\overline{I}_{k\ max}$	6.4	A
Negative grid voltage			
for extinguished tube	$-\hat{u}_{g\ max}$	250	V
for fired tube	$-\hat{u}_{g\ max}$	10	V
Peak grid current	$\hat{i}_{g\ max}$	2.5	A
Grid current ($t_{\tau g\ max}$ = 1 cycle)	$I_{g\ max}$	0.2	A
Grid circuit resistance	$R_{g\ max}$	100	kΩ
	$R_{g\ min}$	500	Ω
Time of averaging currents	$t_{\tau\ max}$	15	s
Ambient temperature	$t_{amb\ max}$	+ 45	°C
	$t_{amb\ min}$	− 20	°C

Control Characteristic



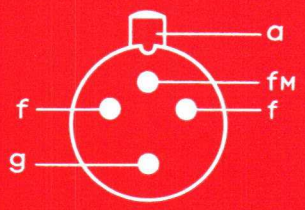


MIXED-GAS THYRATRON
S 1,5/150 d M



Maximum outlines

Basing diagram



General Data

Type S 1,5/150 dM is a grid-controlled hot-cathode tube filled with inert gas and mercury vapour. It is primarily used in electronic control gear and for infinitely variable speed regulation of electric drives up to 50 kW. This tube is analogous to the types ASG 5155 and TQ 2/12.

Weight	approx. 1000 grams
Mounting position	vertical, base down
Base	special 4-pin

Manufacturer of the socket:
Elektromechanik
Bernhard Wierschke
Berlin O 17,
Markgrafendamm 12
Ref. No. 4-35 TGL 68-5

SPECIFICATION

Heater

Directly heated oxide cathode			
Heater voltage	U_f	2.5	V
Heater current	I_f	approx. 33	A
Heating time	t_h	$\geqq$ 60	s
Heating time after transport	t_h	$\geqq$ 60	min.

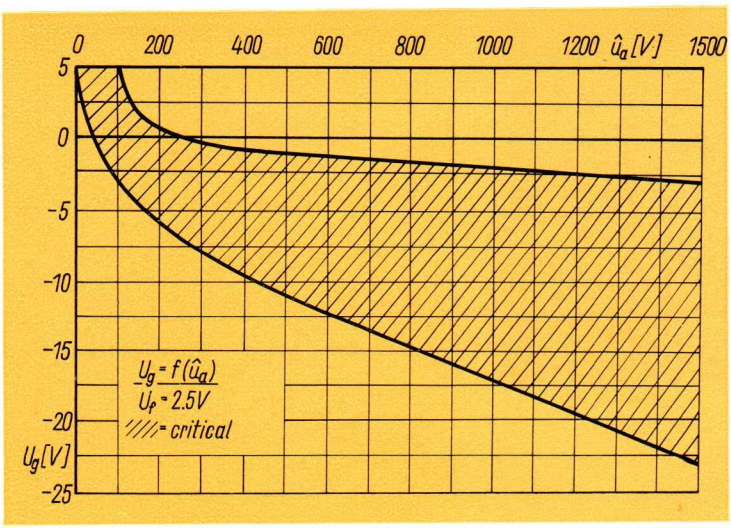
Typical Operation

Tube voltage drop under DC load	U_{vd}	12	V
Anode breakdown voltage at zero bias across grid	U_{bd}	200	V

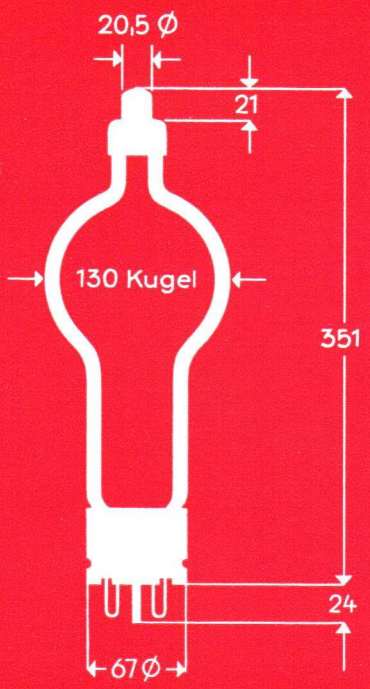
Limiting Values

Peak inverse anode voltage	$\hat{u}_{a\ inv\ max}$	1.5	kV
Positive-control peak anode voltage	$\hat{u}_{a\ max}$	1.5	kV
Cathode current			
Peak	$\hat{i}_{k\ max}$	150	A
Average	$\overline{I}_{k\ max}$	12.5	A
Negative grid voltage			
for extinguished tube	$-\hat{u}_{g\ max}$	250	V
for fired tube	$-\hat{u}_{g\ max}$	10	V
Peak grid current	$\hat{i}_{g\ max}$	2.5	A
Grid current ($t_{\tau g\ max}$ = 1 cycle)	$I_{g\ max}$	0.2	A
Grid circuit resistance	$R_{g\ max}$	100	kΩ
	$R_{g\ min}$	500	Ω
Time of averaging currents	$t_{\tau\ max}$	15	s
Ambient temperature	$t_{amb\ max}$	+ 45	°C
	$t_{amb\ min}$	− 20	°C

Control Characteristics

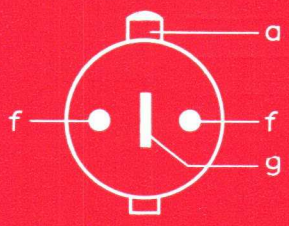


MERCURY-VAPOUR THYRATRON
S 15/5 d



Maximum outlines

Basing diagram



General Data

Type S 15/5 d is a mercury-vapour grid-controlled hot-cathode tube. It is primarily used for high-voltage half-wave rectification in general rectifier equipment and for switching & controlling service throughout the industry.

Weight	approx. 700 grams
Mounting position	vertical, base down
Base	special 4-pin
	Manufacturer of the socket: VEB Elektro- und Radiozubehör, Dorfhain (Sachsen) Ref. No. 0732.021

SPECIFICATION

Heater

Directly heated oxide cathode			
Heater voltage	U_f	5	V
Heater current	I_f	approx. 19	A
Heating time	t_h	$\geqq$ 1	min.
Heating time after transport	t_h	$\geqq$ 60	min.

Typical Operation

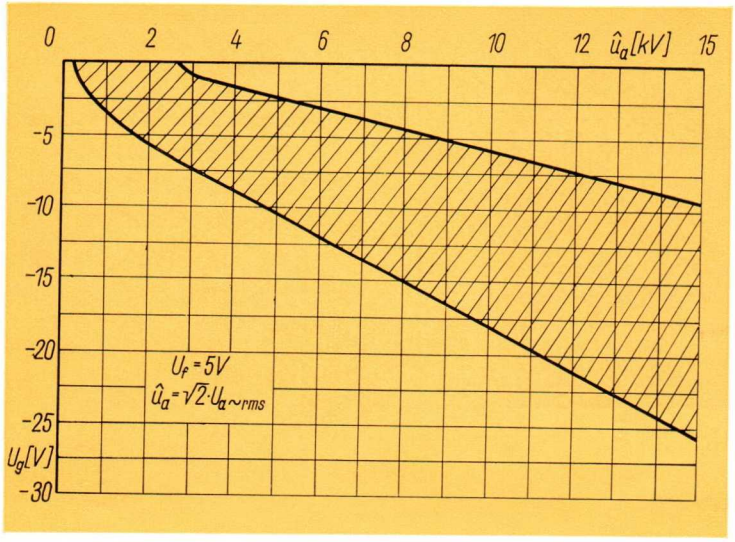
Tube voltage drop under DC load	U_{vd}	16	V
Anode breakdown voltage at zero bias across grid	U_{bd}	2	kV
Protective resistance for grid-No. 1	R_g	$\leqq$ 30	kΩ
Starting time after heating	t_{start}	$\geqq$ 5	min.

Limiting Values

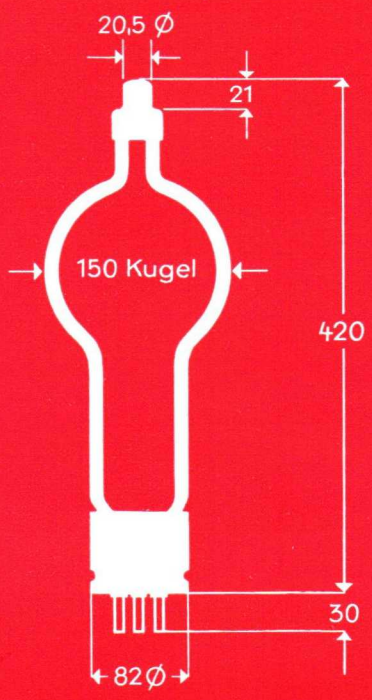
Peak inverse anode voltage	$\hat{u}_{a\ inv\ max}$	15	kV
Positive-control peak anode voltage	$\hat{u}_{a\ max}$	15	kV
Peak cathode current	$\hat{i}_{k\ max}$	5	A
Average usable cathode DC current	$I_{k\ max}$	2	A
Peak grid-No. 1 voltage	$\hat{u}_{g\ max}$	$\pm$ 600	V
Peak grid-No. 1 current	$\hat{i}_{g\ max}$	0.5	A
Ambient temperature	$t_{amb\ max}$	+ 35	°C
	$t_{amb\ min}$	+ 15	°C

Control Characteristic

(Critical)

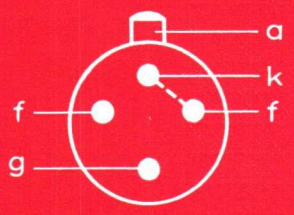


MERCURY-VAPOUR THYRATRON
S 15/40 i



Maximum outlines

Basing diagram



General Data

Type S 15/40 is a grid-controlled hot-cathode tube filled with mercury vapour. It is used primarily for high-voltage half-wave rectification in general rectifier equipment and for switching & controlling service throughout the industry.

Weight	approx. 1000 grams
Mounting position	vertical, base down
Base	special 4-pin

Manufacturer of the socket:
Elektromechanik
Bernhard Wierschke
Berlin O 17,
Markgrafendamm 12
Ref. No. 0732.020

SPECIFICATION

Heater

Indirectly heated oxide cathode

Heater voltage	U_f	5	V
Heater current	I_f	approx. 20	A
Heating time	t_h	$\geqq$ 5	min.
Heating time after transport	t_h	$\geqq$ 60	min.

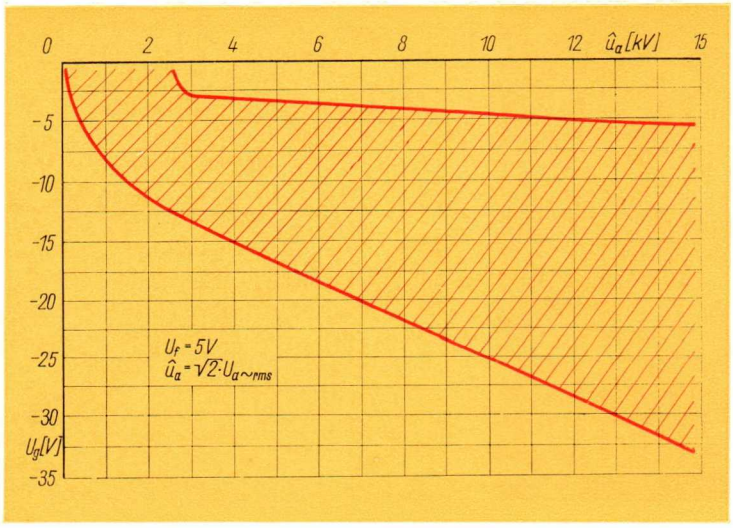
Typical Operation

Tube voltage drop under DC load	U_{vd}	16	V
Anode breakdown voltage at zero bias across grid	U_{bd}	2	kV
Protective resistance for grid-No. 1	R_g	$\leqq$ 30	kΩ
Starting time after heating	t_{start}	$\geqq$ 10	min.

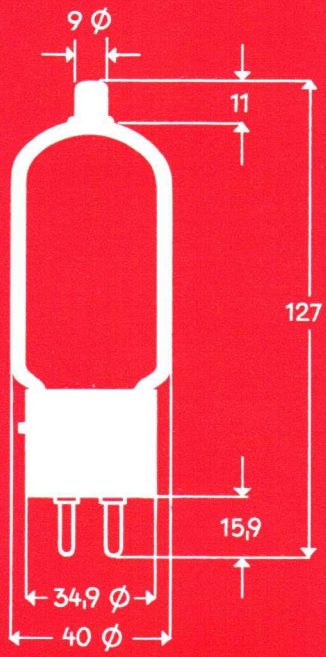
Limiting Values

Peak inverse anode voltage	$\hat{u}_{a\ inv\ max}$	15	kV
Positive-control peak anode voltage	$\hat{u}_{a\ max}$	15	kV
Peak cathode current	$\hat{i}_{k\ max}$	40	A
Average usable cathode DC current	$I_{k\ max}$	12.5	A
Peak grid-No. 1 voltage	$\hat{u}_{g\ max}$	$\pm$ 600	V
Peak grid-No. 1 current	$\hat{i}_{g\ max}$	0.2	A
Ambient temperature	$t_{amb\ max}$	+ 35	°C
	$t_{amb\ min}$	+ 15	°C

Control Characteristic
(Critical)

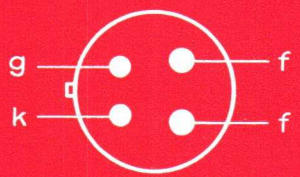


HYDROGEN THYRATRON
S 3/35 i III*)



Maximum outlines

Basing diagram



General Data

Type S 3/35 i III is designed primarily for pulse operation in radar and radio relay equipment as well as in industrial RF generators.

This tube complies with the types PL 345 and 3 C 45.

Weight	approx. 70 grams
Base	medium 4-pin
	Manufacturer of the socket: made of ceramic: VEB Keramische Werke Hermsdorf (Thüringen) Ref. No. 4104.11 made of plastic: Firma Langlotz, Ruhla (Thüringen) Ref. No. 4-16 A TGL 68-6 FS

*) Small-scale series production

SPECIFICATION

Heater

Indirectly heated oxide cathode

Heater voltage	U_f	6.3	V
Heater current	I_f	approx. 2.4	A
Heating time	t_h	$\geqq 2$	min.

Typical Operation

Operating voltage	U_{op}	1.5	kV
Mean anode current	I_a	35	mA
Grid circuit impedance	Z_g	1.5	kΩ
Repetition rate	$f_{\sqcap}$	3	kc/s
Pulse duration	$t_{\sqcap}$	1	μs
Pulse power	$P_{\sqcap}$	40	kW

Limiting Values

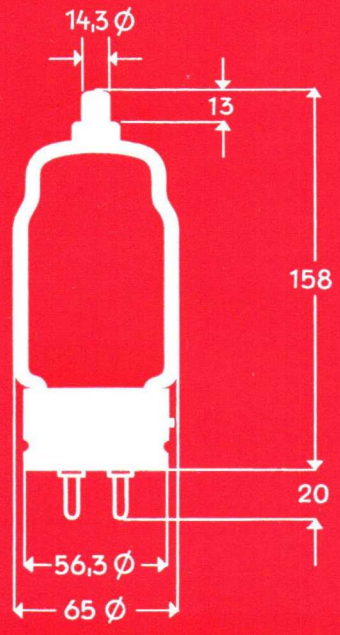
Anode take over voltage	$\hat{u}_{a\ min}$	0.8	kV
Peak forward anode voltage	$\hat{u}_{a\ max}$ [1]	3.0	kV
Peak inverse anode voltage [2]	$\hat{u}_{a\ inv\ max}$	3.0	kV
Peak anode current	$\hat{i}_{a\ max}$	35	A
Average anode current	$I_{a\ max}$	45	mA
Rate of rise of anode current	$\frac{\Delta i}{\Delta t}_{max}$	750	A/μs
Pulse duration	$t_{\sqcap\ max}$	6	μs
Pulse power	$P_{\sqcap\ max}$	50	kW
Heating factor	$(f \cdot \hat{u}_a \cdot i_a)_{max}$	3×10^8	V.A.p.p.s
Grid driving pulse	$U_{d\sqcap\ min}$	+ 175	V
	$U_{d\sqcap\ max}$	− 200	V
Temperature range	$t_{amb\ max}$	+ 90	°C
	$t_{amb\ min}$	− 50	°C

[1]) For instantaneous starting applications (slope of steep front max 75 kV/μs) $\hat{u}_{a\ max}$ is 2.5 kV.

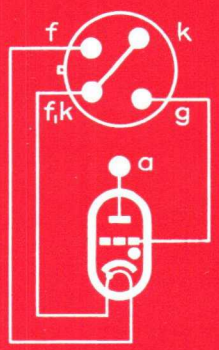
[2]) During the first 25 μs after the pulse, $\hat{u}_{a\ inv\ max}$ must not exceed 2.5 kV.

HYDROGEN THYRATRON
S 8/90 i III*)

Maximum outlines



Basing diagram



General Data

Type S 8/90 i III is a hydrogen-filled hot-cathode tube designed primarily for pulse modulation circuits in panoramic equipment and for shock excitation of tuned circuits. This tube complies with the types 4 C 35 and PL 435.

Weight	approx. 200 grams
Base	super-jumbo bayonet
	Manufacturer of the socket: VEB Keramische Werke Hermsdorf (Thüringen) Ref. No. 4104.10

*) Small-scale series production

SPECIFICATION

Heater

Indirectly heated oxide cathode			
Heater voltage	U_f	6.3	V
Heater current	I_f	approx. 6.1	A
Heating time	t_h	$\geqq$ 3	min.

Typical Operation

Operating voltage	U_{op}	4	kV
Mean anode current	I_a	90	mA
Grid circuit impedance	Z_g	500	Ω
Repetition rate	$f_{\sqcap}$	2250	c/s
Pulse duration	$t_{\sqcap}$	0.5	μs
Pulse power	$P_{\sqcap}$	300	kW

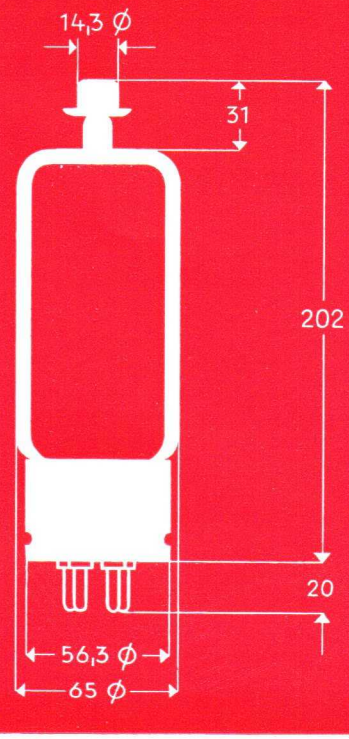
Limiting Values

Anode take over voltage	$\hat{u}_{a\ min}$	2.5	kV
Peak forward anode voltage[1])	$\hat{u}_{a\ max}$	8	kV
Peak inverse anode voltage[2])	$\hat{u}_{a\ inv\ max}$	8	kV
Peak anode current	$\hat{i}_{a\ max}$	90	A
Average anode current	$I_{a\ max}$	100	mA
Rate of rise of anode current	$\frac{\Delta i}{\Delta t}$ max	1000	A/μs
Pulse duration	$t_{\sqcap\ max}$	6	μs
Pulse power	$P_{\sqcap\ max}$	350	kW
Heating factor	$(f \cdot \hat{u}_a \cdot i_a)_{max}$	2×10^9	V.A.p.p.s
Grid driving pulse	$U_{d\sqcap\ min}$	+ 175	V
	$U_{d\sqcap\ max}$	− 200	V
Temperature range	t	− 50 to + 90	°C

[1]) For instantaneous starting applications (slope of steep front $\geqq$ 175 kV/μs) $\hat{u}_{a\ max}$ is 7 kV.

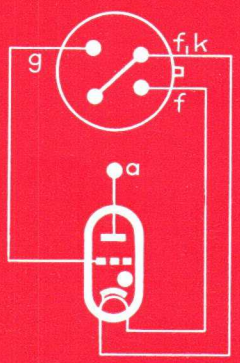
[2]) During the first 25 μs after the pulse, $\hat{u}_{a\ inv\ max}$ must not exceed 2.5 kV, exclusive of a spike of $<$ 0.05 μs duration.

HYDROGEN THYRATRON
S 16/325 i III*)



Maximum outlines

Basing diagram



General Data

Type S 16/325 i III is a hydrogen-filled grid-controlled hot-cathode tube. It is particularly suited for use in pulse modulation circuits in panoramic equipment and for shock excitation of tuned circuits. This tube complies with the types 5 C 22 and PL 522.

Weight	approx. 300 grams
Base	super-jumbo bayonet
	Manufacturer of the socket: VEB Keramische Werke Hermsdorf (Thüringen) Ref. No. 4104.10

*) Small-scale series production

SPECIFICATION

Heater

Indirectly heated oxide cathode			
Heater voltage	U_f	6.3	V
Heater current	I_f	approx. 10.6	A
Heating time	t_h	$\geqq$ 5	min.

Typical Operation

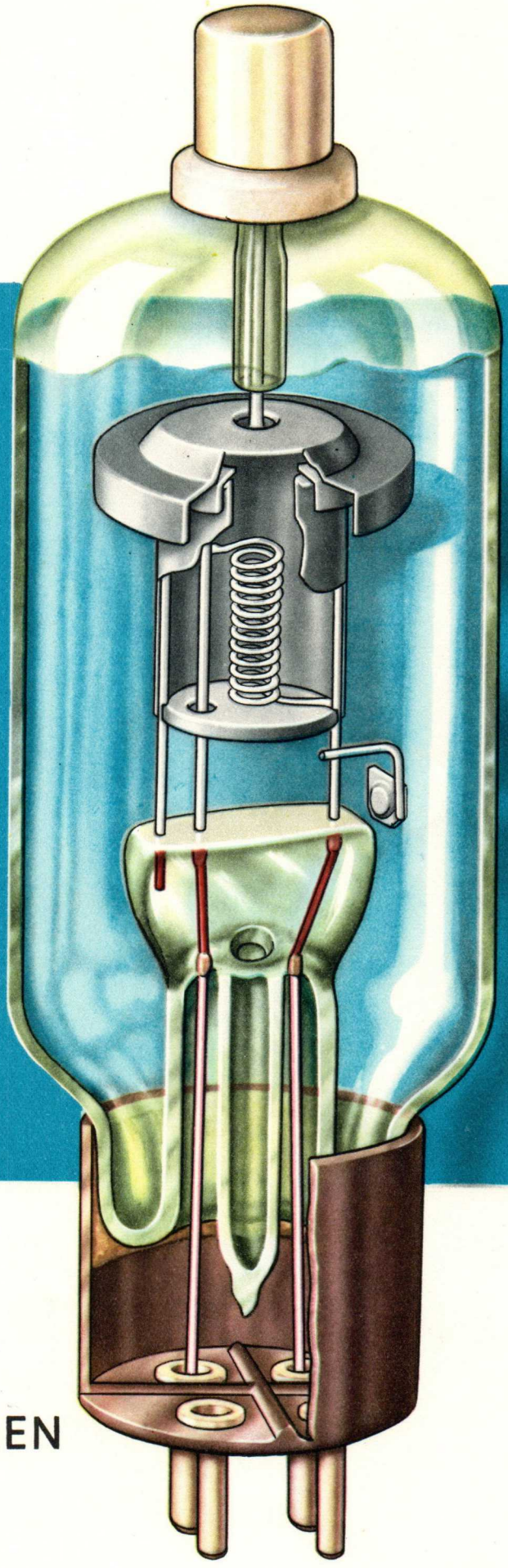
Operating voltage	U_{op}	8	kV
Mean anode current	I_a	170	mA
Grid circuit impedance	Z_g	500	Ω
Repetition rate	$f_{\sqcap}$	1000	c/s
Pulse duration	$t_{\sqcap}$	1	μs
Pulse power	$P_{\sqcap}$	1250	kW

Limiting Values

Anode take over voltage	$\hat{u}_{a\ min}$	4.5	kV
Peak forward anode voltage[1])	$\hat{u}_{a\ max}$	16	kV
Peak inverse anode voltage[2])	$\hat{u}_{a\ max}$	16	kV
Peak anode current	$\hat{i}_{a\ max}$	325	A
Average anode current	$I_{a\ max}$	200	mA
Rate of rise of anode current	$\frac{\Delta i}{\Delta t}_{max}$	1500	A/μs
Pulse duration	$t_{\sqcap\ max}$	6	μs
Pulse power	$P_{\sqcap\ max}$	2500	kW
Heating factor	$(f \cdot \hat{u}_a \cdot \hat{i}_a)_{max}$	3.2×10^9	V.A.p.p.s
Grid driving pulse	$U_{d\sqcap\ min}$	+ 200	V
	$U_{d\sqcap\ max}$	− 200	V
Temperature range	t	− 50 to + 90	°C

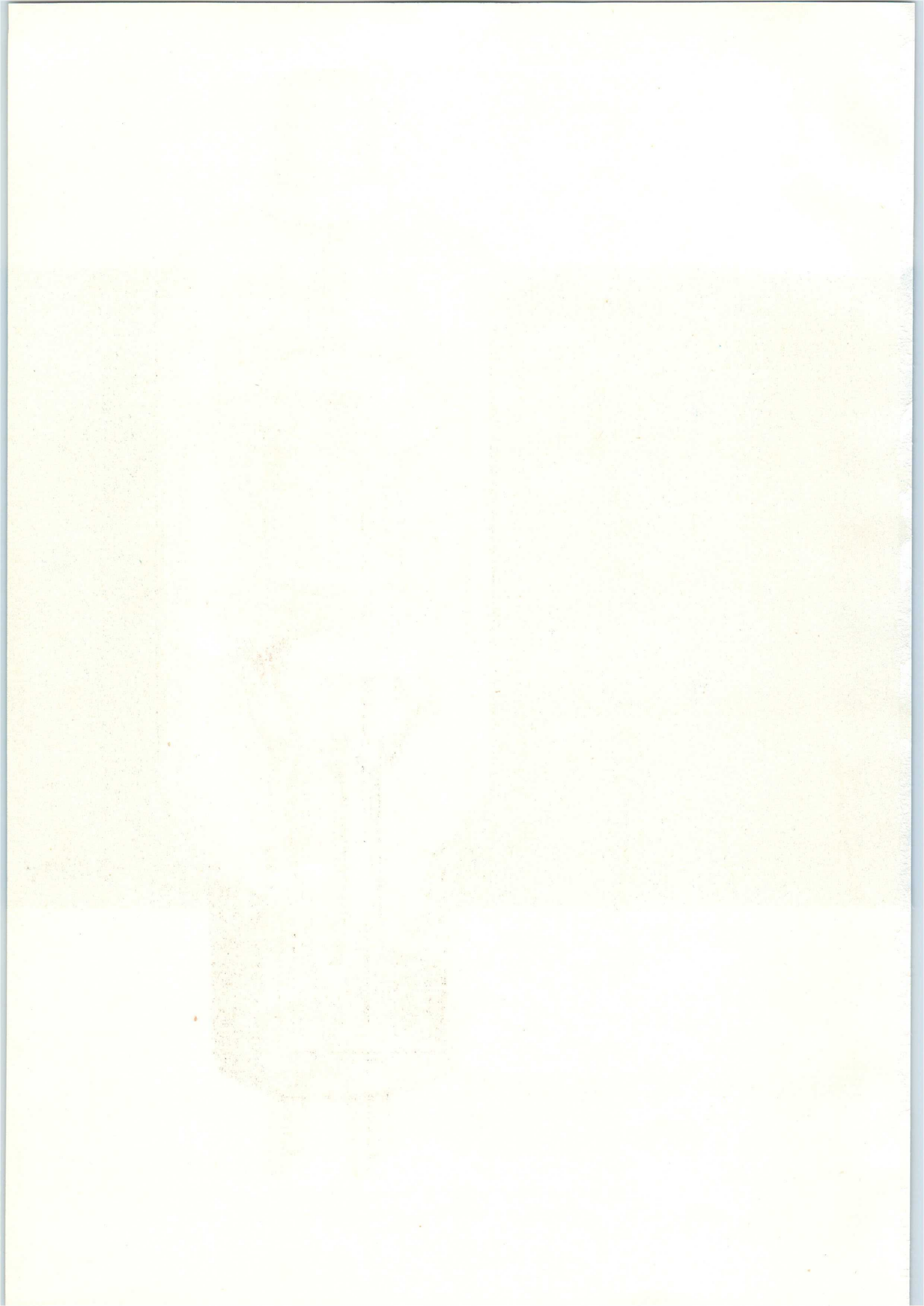
[1]) For instantaneous starting applications (slope of steep front $\geqq$ 350 kV/μs) $\hat{u}_{a\ max}$ is 13.5 kV.

[2]) During the first 25 μs after the pulse, $\hat{u}_{a\ inv\ max}$ must not exceed 5 kV, exclusive of a spike of $<$ 0.05 μs duration.



G 10/1d

GLEICHRICHTERRÖHREN



HIGH-VOLTAGE RECTIFIER TUBES

Design and Operation

High-voltage rectifier tubes are gas-filled diodes containing a large-area directly or indirectly heated oxide cathode. They are filled with inert gas or mercury vapour. Unlike high-vacuum tubes, gas-filled rectifier tubes have a very low tube voltage drop due to the absence of negative space charge. As a result of this, the rectified voltage is largely independent of load. The salient feature of the gas-filled rectifier tube is the fast rate of current rise after the breakdown voltage is exceeded. Owing to this current rise very large currents can be rectified in the presence of a sufficiently wide emitting area of the oxide cathode.

Applications

High-voltage rectifier tubes are used to rectify AC voltages up to 10000 V. They are designed for use in current converters, for feeding all types of communication transmitters as well as in RF generators for inductive and dielectric heating, for high-voltage equipment in laboratories and for alternators.

Key to the Designations

The type designation is derived from the power values, heating and gas-filling of the tube.
"G" is used for gas-filled rectifier tube.

The first number indicates the maximum inverse voltage of the tube in kV, whilst the second number (after the downstroke) shows the highest peak current of the tube in amps. The affixed small letter "d" means a tube containing a directly heated cathode. Indirect heating is designated "i". A following Roman letter states the type of gas-filling.

No digit = mercury-vapour
V = xenon
M = gas mixture (inert gas and mercury vapour)

General Operating Conditions and Instructions

Apart from the limiting values all values are averages. Corresponding spread around them should be taken into consideration.

The rated heater values should be maintained. The heater voltage should, in general, be held to within ± 5 per cent of its rated value (line voltage variations and circuit element spread); mind, however, that these tolerances are for short duration only, otherwise tube life may be impaired. Underheating will be particularly harmful and cause cumulative destruction of the cathode.

The heating times stated are only applicable to circuits which ensure full heater voltage also during the heating time. Prior to the indicated heating time the tube must not be loaded. Note that the heater voltage is switched in first and the anode load afterwards.

Make sure that the heater voltage is switched off only after the anode voltage.

When mercury-vapour tubes have been transported or after standby periods a heating time of at least 1 hour is required to evaporate all the mercury from the discharge. The layout of the equipment should ensure an ambient air temperature which is within the limits of the specification. Especially the operation of mercury-vapour devices is largely dependent of room temperature which is measured at a lateral distance of 4 in. from the tube at base level. When filtering means are employed in rectifier circuits, take care that the charge current peaks of the capacitor banks are not allowed to exceed the maximum rating of the anode and cathode current given in the specification.

In principle, all mercury-vapour tubes should be operated in vertical position, i. e. base down. The tubes should be arranged in such a way to provide free convective air cooling. It is essentual to shield the tubes from RF fields and RF voltages.

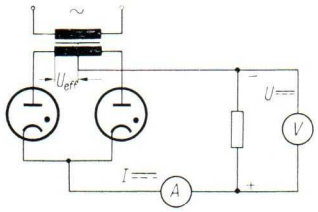
Guarantee expires if the precautions given to ensure satisfactory operation and life of the tubes are disregarded or if the limiting values are exceeded.

The customer should apply to the manufacturer if he wants a deviation from the specified operating conditions.

TYPICAL RECTIFIER CIRCUITS

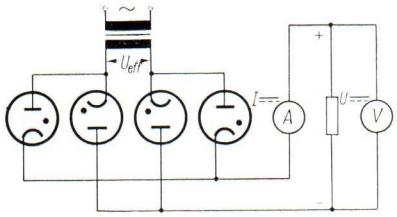
The indicated values are maximum output voltages and currents for use with type G 10/4 d.

Single-Phase Push-Pull



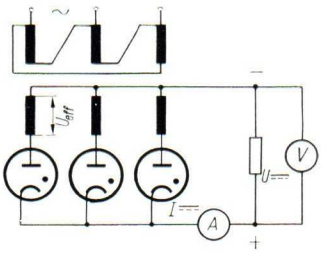
AC supply voltage $U_{rms\ max}$ (V)	Rectified voltage U_{max} (V)	Rectified current I_{max} (A)
3500 per anode	3150	2.8

Single-Phase Bridge



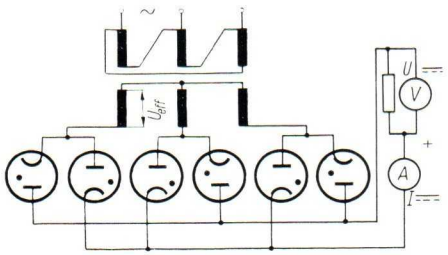
7000	6300	2.8

Three-Phase Half-Wave



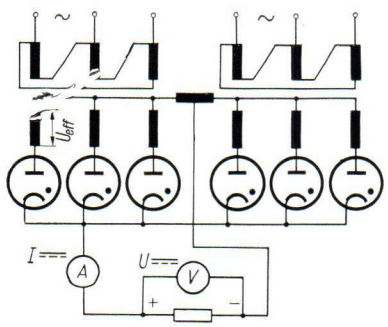
4100 per phase	1800	4

Three-Phase Bridge



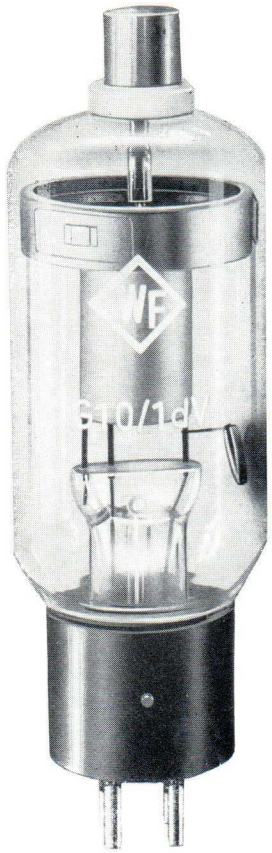
4100 per phase	9600	4

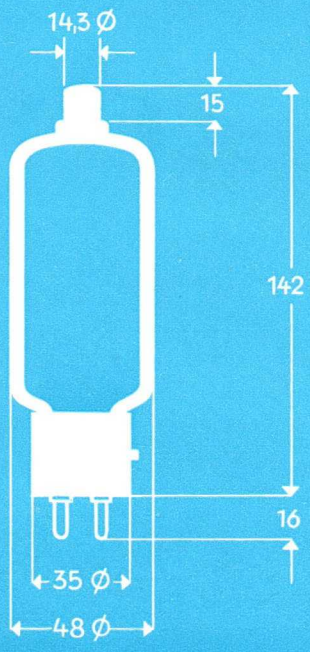
Double-Star Delta using choke input filter



4100 per phase	4800	8

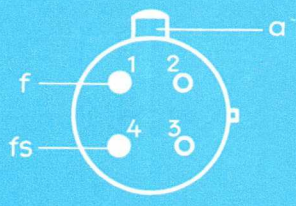
INERT-GAS RECTIFIER TUBE
G 10/1 dV





Maximum outlines

Basing diagram



General Data

Type G 10/1 dV is an inert-gas hot-cathode tube. It is primarily used for high-voltage half-wave rectification in mobile rectifying equipment. This tube complies with the types DX 2, DCX 4/1000 and 3 B 28.

Weight	approx. 100 grams
Mounting position	any
Base	medium 4-pin bayonet

Manufacturer of the socket:
Firma Langlotz,
Ruhla (Thüringen)
Ref. No. 0732.691

SPECIFICATION

Heater

Directly heated oxide cathode				
Heater voltage		U_f	2.5	V
Heater current		I_f	approx. 5	A
Heating time		t_h	$\geqq$ 30	s

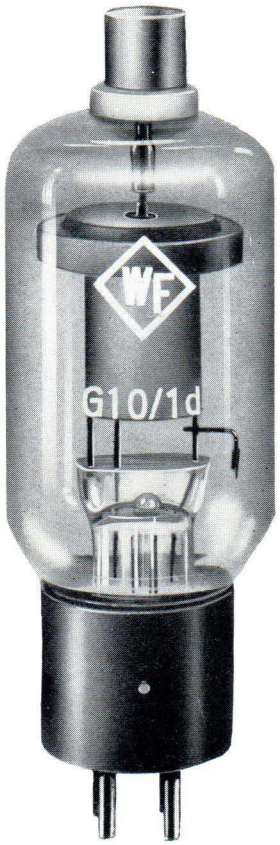
Typical Operation

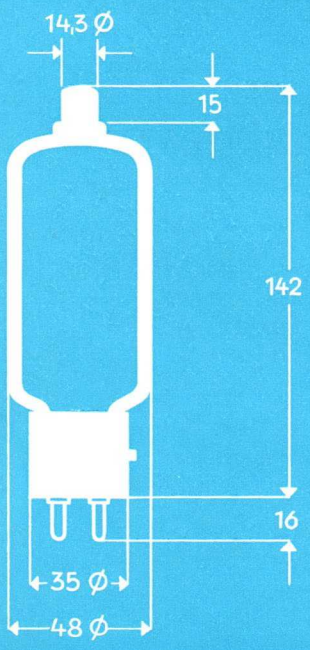
Tube voltage drop under DC load ($\overline{I}$ = 0.5 A)		U_{vd}	12	V

Limiting Values

Peak inverse anode voltage	$\hat{u}_{a\ inv\ max}$	10	5	kV
Peak anode current	$\hat{i}_{a\ max}$	1	2	A
Maximum DC output current of anode (average)	$\overline{I}_{a\ max}$	0.25	0.5	A
Time of averaging currents	$t_{\tau max}$	15	15	s
Ambient temperature	t_{max}	+ 75	+ 75	°C
	t_{min}	− 55	− 55	°C

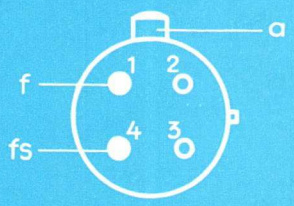
MERCURY-VAPOUR RECTIFIER
TUBE G 10/1 d
G 10/1 d





Maximum outlines

Basing diagram



General Data

Type G 10/1 d is a mercury-vapour hot-cathode tube. It is primarily used for high-voltage half-wave rectification in medium-sized rectifier equipment. This tube complies with the types DQ 2, DCG 4/1000 G and AG 866 A.

Weight	approx. 100 grams
Mounting position	vertical, base down
Base	medium 4-pin bayonet
	Manufacturer of the socket: Firma Langlotz, Ruhla (Thüringen) Ref. No. 0732.691

SPECIFICATION

Heater

Directly heated oxide cathode			
Heater voltage	U_f	2.5	V
Heater current	I_f	approx. 5	A
Heating time	t_h	$\geq$ 1	min.
Heating time after transport	t_h	$\geq$ 30	min.

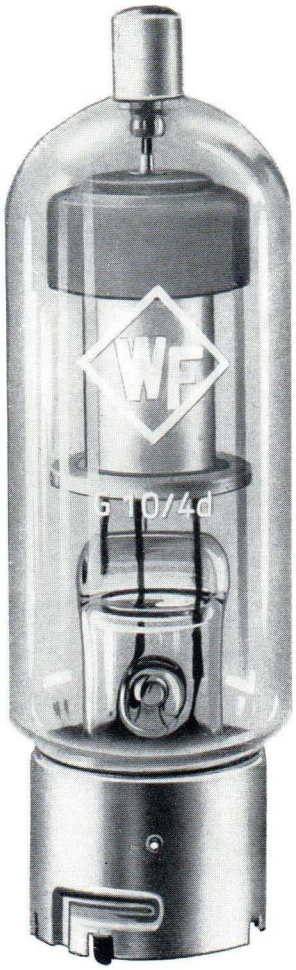
Typical Operation

Tube voltage drop under DC load ($\overline{I} = 0.5$ A)	U_{vd}	12	V

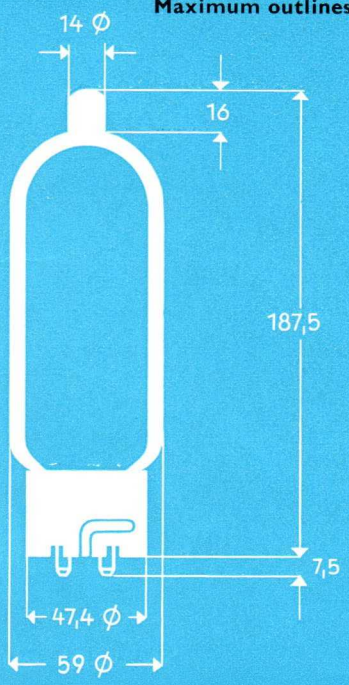
Limiting Values

Peak inverse anode voltage	$\hat{u}_{a\ inv\ max}$	10	2	kV
Peak anode current	$\hat{i}_{a\ max}$	1	2	A
Maximum DC output current of anode (average)	$\overline{I}_{a\ max}$	0.25	0.5	A
Time of averaging currents	$t_{\tau\ max}$	10	10	s
Ambient temperature	t_{max}	+ 35	+ 45	°C
	t_{min}	+ 15	+ 15	°C

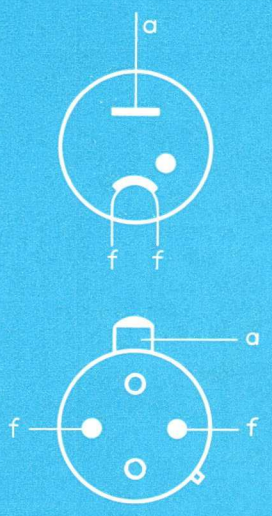
MERCURY-VAPOUR RECTIFIER TUBE
G 10/4 d



Maximum outlines



Basing diagram



General Data

Type G 10/4 d is a mercury-vapour hot-cathode tube.

The filament and AC anode supply can be in phase or 90° out of phase. The circuit shown below allows for better uitilization of the cathode, more current drain and longer life. The G 10/4 d is used for high-voltage half-wave rectification in general rectifier equipment.

Weight	approx. 200 grams
Mounting position	vertical, base down
Base	4-pin bayonet

Manufacturer of the socket:
Firma Langlotz,
Ruhla (Thüringen)
Ref. No. 0732.009-00002

SPECIFICATION

Heater

Directly heated oxide cathode

Heater voltage	U_f	5	V
Heater current	I_f	approx. 7	A
Heating time	t_h	$\geqq$ 1	min.
Heating time after transport	t_h	$\geqq$ 60	min.

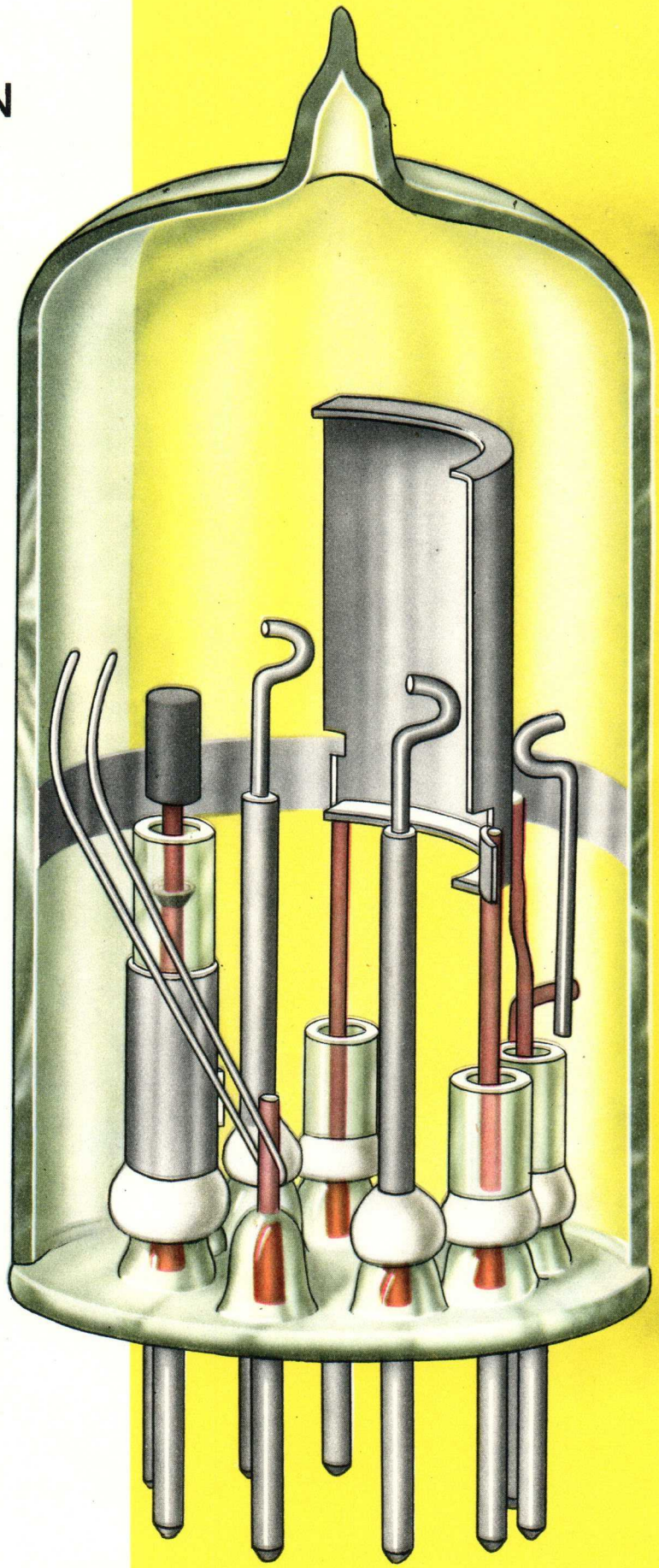
Typical Operation

Tube voltage drop under DC load	U_{vd}	16	V

Limiting Values

Peak inverse anode voltage	$\hat{u}_{a\ inv\ max}$	10	kV
Peak anode current	$\hat{i}_{a\ max}$	4	A
Maximum DC output current of anode (average)	$\overline{I}_{a\ max}$	1.4	A
Ambient temperature	$t_{amb\ max}$	+ 35	°C
	$t_{amb\ min}$	+ 15	°C

KALTKATODEN RÖHREN



Z 860 X

Design and Operation

The cold-cathode trigger tube is an ideal device in electronic control and switching applications. It includes a large-sized, sometimes sputtered molybdenum cathode that emits electrons already in its cold state in the presence of certain positive voltages. In addition to the anode and cathode the tube contains one or two trigger electrodes. Trigger tubes are designed to operate in the glow discharge region. The initiation of a glow discharge, which is due to an increase in trigger current, ist mostly effected between the trigger electrode and the cathode followed by a breakdown of the main gap. For direct triggering the necessary firing energy is derived from a pulse source. For capacitor triggering, however, a capacitor firing circuit with a capacitor between trigger and cathode will be used. To charge this capacitor requires only very small currents which are also supplied from the pulse source. To extinguish the tube it is necessary — just as with the thyratron — to reduce the anode voltage to a value below the maintaining voltage or to break the anode circuit for a short time. If properly arranged, DC operated self-extinguishing circuits can be established. There are some cold-cathode trigger tubes that are provided with an auxiliary electrode whose function is to maintain a continuous auxiliary discharge of low current. By this means, primary ionization is provided assisting striking. Thus external uncontrolled inonization effects, as caused by the influence of RF or magnetic fields or by a strong light effect, are largely eliminated. Moreover, to keep the firing time as low as possible several tubes are provided with small sources of ions (radioactive material). The small quantity can never give rise to deleterious irradiation.

COLD-CATHODE TRIGGER TUBES

Applications

Cold-cathode trigger tubes have entered nearly all fields of industrial electronics. This is not only because of the valuable properties they combine as amplifier tubes with those of relays but also because there is no necessity to have a filament supply and, correspondingly, filament power. The tube is on immediately. This applies particularly to relay circuits in warning and signalling applications and where immediate readiness is of prime importance. Trigger tubes lend themselves primarily to applications, such as relay, protection, automatic switching and signalling equipment, in automatic telephony and in electronic computers.

Key to the Type Designations

"Z" is used for cold-cathode tube. The first digit indicates the tube shape:

8 = 9-pin miniature tube
6 = subminiature tube

The second and third digit are consecutive.

The letter after the number means:

E = electrometer tube
T = trigger tube containing 3 electrodes
U = trigger tube containing 4 electrodes
W = trigger tube containing 5 electrodes
X = trigger tube containing 6 electrodes

This code does not apply to tube type Z 5823.

General Operating Conditions and Instructions

The tubes are not allowed to strike or to conduct when negative voltage has been applied to the anode, trigger or other auxiliary electrode. They should not be exposed to strong light.

Protective resistors, connected in front of the auxiliary electrode, or auxiliary firing capacitors must be soldered directly to the socket to make the trigger leads as short as possible. For subminiature tubes which are directly inserted into the circuits the soldered spots on the flying leads must be at least 5 mm from the tube bottom. A good heat sink is also of prime importance.

Guarantee expires if the precautions given to ensure satisfactory operation and life of the tubes are disregarded or if the limiting values are exceeded.

Definitions

Anode breakdown voltage $U_{bd\,a}$:
Breakdown voltage of the main gap between cathode and anode.

Anode maintaining voltage $U_{M\,a}$:
Voltage drop between the cathode and anode during the conducting period.

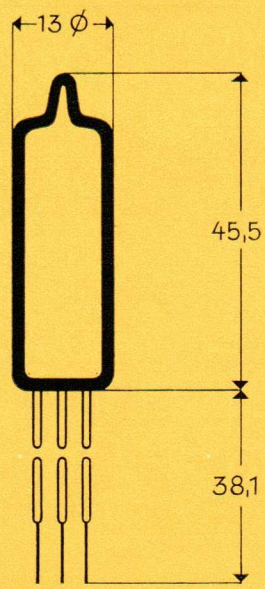
Trigger breakdown voltage $U_{bd\,t}$:
Breakdown voltage of the auxiliary gap between cathode and trigger.

Trigger maintaining voltage $U_{M\,t}$:
Maintaining voltage of the auxiliary gap between cathode and electrode.

Auxiliary electrode breakdown voltage $U_{bd\,aux}$:
Breakdown voltage between cathode and auxiliary electrode

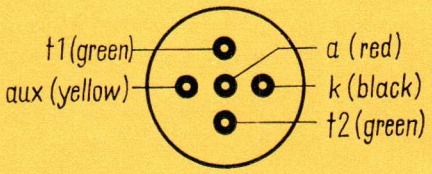
Supply voltage U_s:
Voltage applied between the anode and cathode during the nonconducting period

COLD-CATHODE TRIGGER TUBE
Z 660 W



Maximum outlines

Tube connections



The tube is soldered directly into the circuit

General Data

Type Z 660 W is a pure-metal cold-cathode inert-gas trigger tube for DC operation and is designed for on-off relay, counting and similar applications.

This tube complies with the type GR 21 and is analogous to the types Z 70 U, Z 70 W and ER 33.

Weight	approx. 5 grams
Mounting position	any

SPECIFICATION

Characteristics

Anode breakdown voltage ($U_{t1,2}$ = 0 V; I_{aux} approx. 10 μA)	$U_{bd\ a}$	320	V
Trigger breakdown voltage (U_a = 0 V; I_{aux} approx. 10 μA)	$U_{bd\ t1,2}$	140[1])	V
Auxiliary electrode breakdown voltage (U_a = 0 V)	$U_{bd\ aux}$	150[2])	V
Anode maintaining voltage (I_a = 5 mA)	$U_{M\ a}$	115	V
Trigger transfer current for direct triggering, I_{aux} approx. 10 μA	$I_{t1,2}$	50[3])	μA
for capacitor triggering, C = 100 pF, I_{aux} approx. 10 μA	$I_{t\ C1,2}$	$\leqq$ 1[3])	μA
Ionization time at I_{aux} = 0 μA	t_i	75	μs
at I_{aux} approx. 10 μA	$t_{i\ (aux)}$	20	μs
Deionization time (i_a = 5 mA)	t_d	500[4])	μs

Typical Operation

Supply voltage	U_s	220	V
Anode current	I_a	8	mA
Peak trigger bias voltage		max 100	V
Superimposed peak AC breakdown voltage		min 60	V
Trigger breakdown voltage (sum of the two voltages)	$\hat{u}_{t1,2}$	min 160	V

Limiting Values

Supply voltage	$U_{s\ max}$	270	V
	$U_{s\ min}$	180	V
Anode current	I_{max}	12[5])	mA
Peak anode current	$\hat{i}_{a\ max}$	50	mA
Trigger transfer current	$I_{t1,2\ max}$	1	mA
Auxiliary electrode current	$I_{aux\ max}$	20[5])	μA
Averaging time	$t_{\tau\ max}$	15	s
Capacitor in parallel to trigger gap and protective resistor	$C_{\parallel} < 1$ nF $R_{prot\ min}$	0	Ω
	$C_{\parallel} < 5$ nF $R_{prot\ min}$	5	kΩ
	$C_{\parallel} > 5$ nF $R_{prot\ min}$	10	kΩ
Ambient temperature	$t_{amb\ max}$	+ 75	°C
	$t_{amb\ min}$	− 50	°C

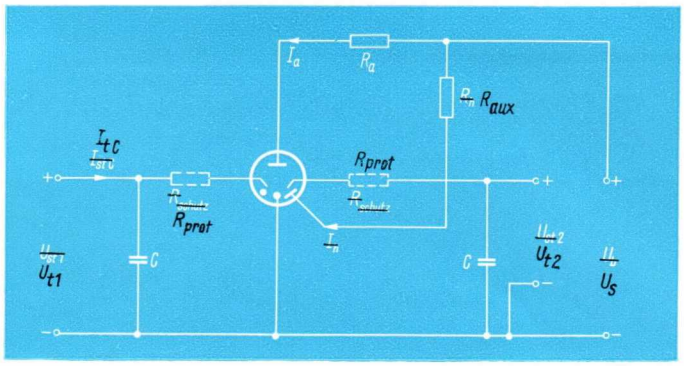
[1]) Under RF influence this value may be considerabley lower.

[2]) The auxiliary electrode aux is directly connected to the supply voltage via a resistor of 10 MΩ, if very short ionization times of the discharge or low and highly stable trigger breakdown voltages are required.

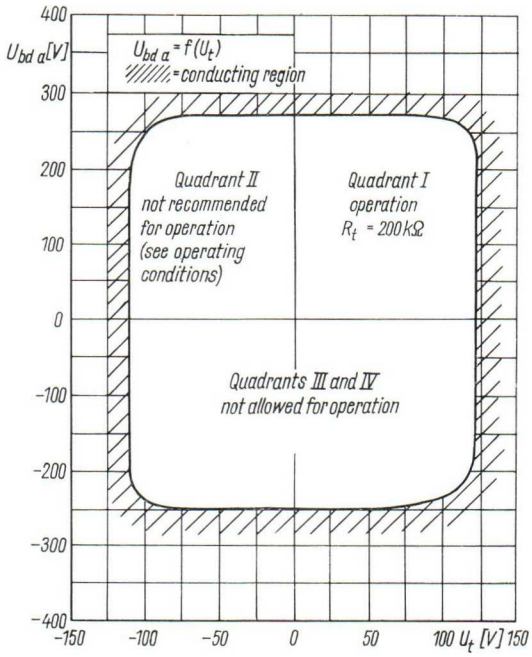
[3]) For the transfer of the discharge to the main gap a—k required trigger transfer current I_t at U_{aux} 225 V.

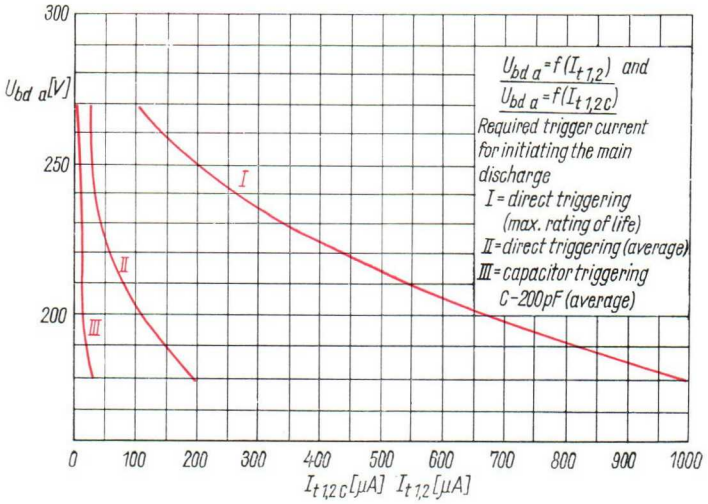
[4]) For high-current discharges (peak current operation) the deionization time can rise to more than 1 ms.

[5]) At minimum cathode current (2 mA), the glow must cover the whole front of the cathode, otherwise the tube is in unstable operation.

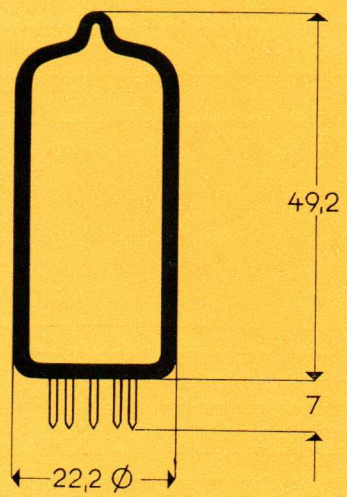


Principal Diagram



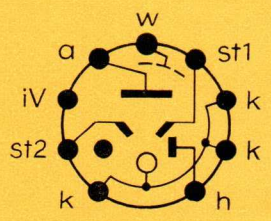


COLD-CATHODE TRIGGER TUBE
Z 860 X



Maximum outlines

Basing diagram



General Data

Type Z 860 X is a pure-metal cold-cathode inert-gas trigger tube for DC operation and is designed for on-off relay, counting and similar applications.

This tube is analogous to the types Z 803 U, GR 15, GR 20, ER 1 and ER 3.

Weight	approx. 11 grams
Mounting position	any
Base	9-pin miniature (noval)
	Manufacturer of the socket: VEB Elektro- und Radiozubehör, Dorfhain (Sachsen) Ref. No. 0732.672

SPECIFICATION

Characteristics

Anode breakdown voltage ($U_{t1,2}$ = 0 V; I_{aux} approx. 10 μA)	$U_{bd\ a}$	330	V
Trigger breakdown voltage (U_a = 0 V; I_{aux} approx. 10 μA)	$U_{bd\ t1,2}$	140[1])	V
Auxiliary electrode breakdown voltage (U_a = 0 V)	$U_{bd\ aux}$	150[2])	V
Anode maintaining voltage (I_a = 20 mA)	$U_{M\ a}$	110	V
Trigger maintaining voltage ($I_{t1,2}$ = 5 mA)	$U_{M\ t\ 1,2}$	110	V
Trigger transfer current			
for direct triggering, I_{aux} approx. 10 μA, C = 200 pF	$I_{t\ 1,2}$	50[3])	μA
for capacitor triggering, I_{aux} approx. 10 μA	$I_{t\ C1,2}$	$\leq$ 1[3])	μA
Ionization time			
at I_{aux} = 0 μA	t_i	100	μs
at I_{aux} = 10 μA	$t_{i\ (aux)}$	20	μ_s
Deionization time (ia = 20 mA)	t_d	1000[4])	μs

Typical Operation

Supply voltage	U_s	220	V
Anode current	I_a	20	mA
Peak trigger bias voltage		max 100	V
Superimposed peak AC breakdown voltage		min 50	V
Trigger breakdown voltage (sum of the two voltages)	$\hat{u}_{t\ 1,2}$	min 150	V

Limiting Values

Supply voltage	$U_{s\ max}$	270	V
	$U_{s\ min}$	180	V
Anode current	$I_{a\ max}$	40[5])	mA
Peak anode current	$\hat{i}_{a\ max}$	200[6])	mA
Trigger transfer current	$I_{t\ 1,2\ max}$	1	mA
Auxiliary electrode current	$I_{aux\ max}$	20[2])	μA
Averaging time	$t_{\tau\ max}$	15	
Capacitor in parallel to trigger gap and protective resistor	$C_{\|\|} < 1$ nF $R_{prot\ min}$	0	Ω
	$C_{\|\|} < 5$ nF $R_{prot\ min}$	2	kΩ
	$C_{\|\|} > 5$ nF $R_{prot\ min}$	5	kΩ
Ambient temperature	$t_{amb\ max}$	+ 75	°C
	$t_{amb\ min}$	− 60	°C

[1]) Under RF influence this value may be considerably lower. To avoid the influence of external fields and through the use of special triggering circuits (AF voltage) the inside bulb coating may be connected to the cathode k via the wall contact across a resistor of 1 to 2 MΩ. The supply voltage, U_s however, must not exceed 225 V.

[2]) The auxiliary electrode aux is directly connected to the supply voltage across a resistor of 10 MΩ, if very short ionization times of the discharge or low and highly stable trigger breakdown voltages are required.

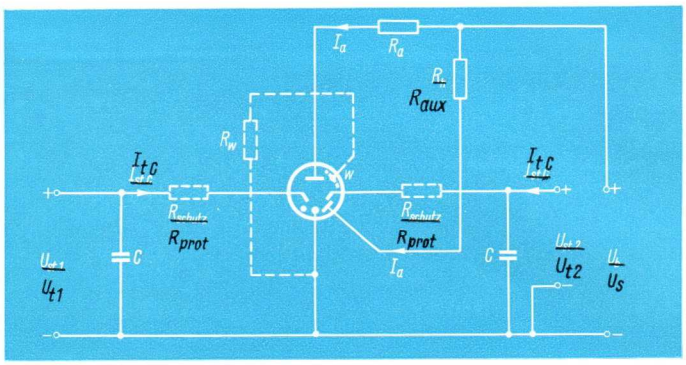
[3]) For the transfer of the discharge to the main gap a—k required trigger transfer current I_t at U_s = 200 V.

[4]) For high-current discharges (peak current operation) the deionization time t_d can rise to more than 10 ms.

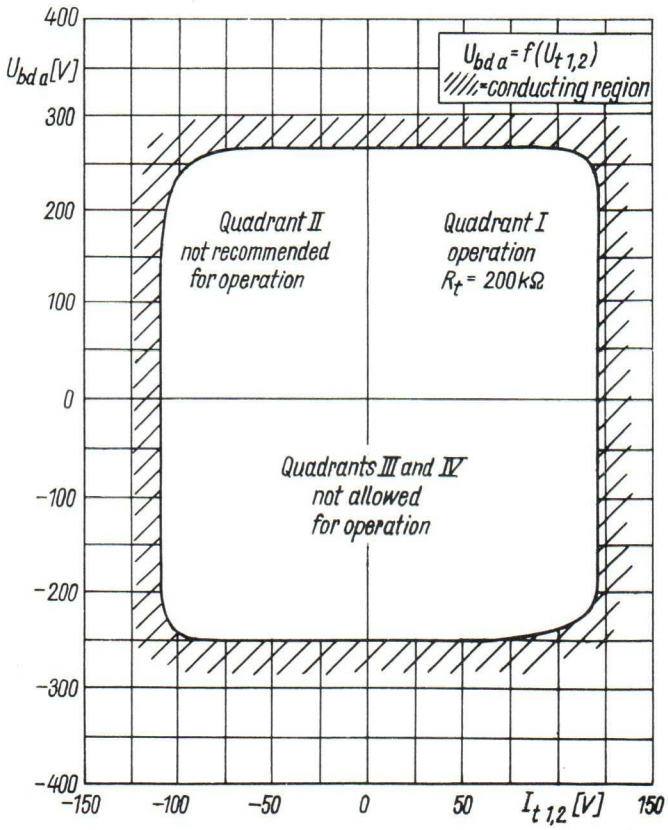
[5]) At minimum cathode current (10 mA), the glow must cover the whole front of the cathode, otherwise the tube is in unstable operation.

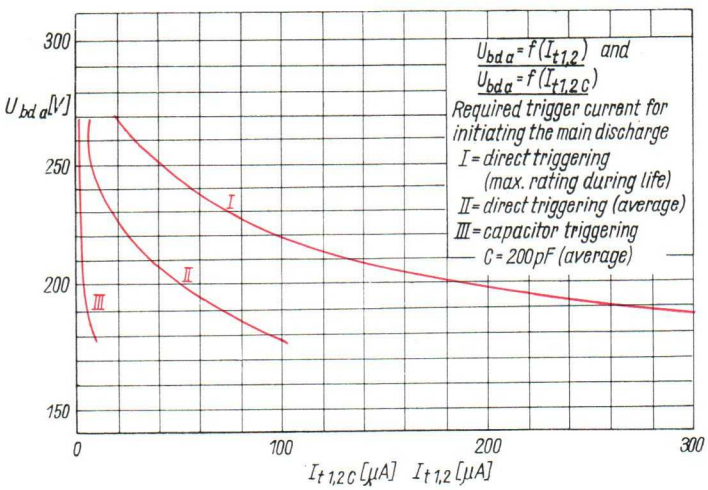
[6]) Short peak currents (0.1 s) up to 1.0 A are permissible.

Tube complying with TGL standard No. 11916

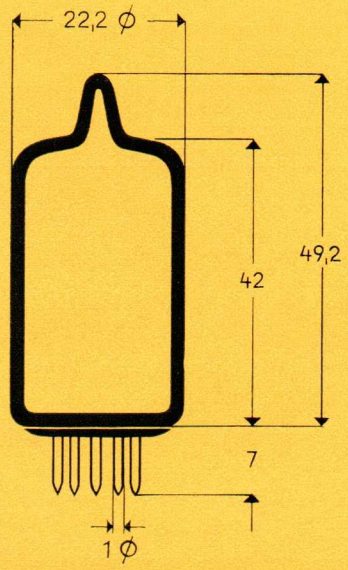


Principal Diagram



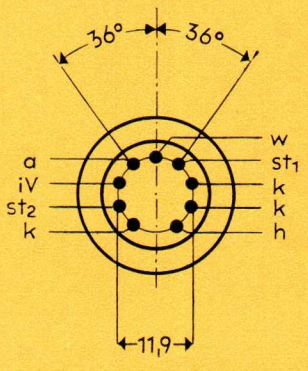


COLD-CATHODE TRIGGER TUBE
Z 861 X



Maximum outlines

Basing diagram



General Data

Type Z 861 X is a pure-metal cold-cathode inert-gas trigger tube for AC operation and is designed for on-off relay, counting and similar applications. This tube is analogous to the types Z 804 U, Z 805 U, GR 16, GR 17, ER 2, ER 21 and ER 22.

Weight	approx. 11 grams
Mounting position	any

Manufacturer of the socket:
VEB Elektro- und Radio-zubehör, Dorfhain (Sachsen)
Ref. No. 0.732.672

SPECIFICATION

Characteristics

Anode breakdown voltage ($U_{t1,2}$ = 0 V; I_{aux} approx. 10 μA)	$U_{bd\ a}$	425	V
Trigger breakdown voltage (U_a = 0 V; I_{aux} approx. 10 μA)	$U_{bd\ t1,2}$	135[1])	V
Auxiliary electrode breakdown voltage (U_a = 0 V)	$U_{bd\ aux}$	150[2])	V
Anode maintaining voltage (I_a = 20 mA)	$U_{M\ a}$	115	V
Trigger maintaining voltage ($I_{t1,2}$=5 mA)	$U_{M\ t1,2}$	110	V
Trigger transfer current			
for direct triggering, I_{aux} approx. 10 μA	$I_{t1,2}$	50[3])	μA
for capacitor triggering, C = 2000 pF, I_{aux} approx. 10 μA	$I_{t\ C1,2}$	$\leq$ 1[3])	μA
Ionization time			
at I_{aux} = 0 μA	t_i	100	μs
at I_{aux} approx. 10 μA	$t_{i\ (aux)}$	20	μs
Deionization time (i_a = 20 mA)	t_d	1000[4])	μs

Typical Operation

Supply voltage	$U_{s\ rms}$	220	V
Anode current	I_a	15[5])	mA
Positive peak trigger bias voltage		max 100	V
Superimposed peak AC breakdown voltage		min 60	V
Trigger breakdown voltage (sum of the two voltages)	$\hat{u}_{t1,2}$	min 160	V
Capacitor in parallel to trigger gap	C	200	pF

Limiting Values

Supply voltage (DC operation)	$U_{s\ max}$	350	V
	$U_{s\ min}$	250	V
Supply voltage (AC operation)	$U_{s\ rms\ max}$	250	V
	$U_{s\ rms\ min}$	180	V
Anode current (DC operation)	$I_{a\ max}$	40[6])	mA
Anode current (AC operation)	$I_{a\ max}$	25[5][6])	mA
Peak anode current	$\hat{i}_{a\ max}$	200[7])	mA
Trigger transfer current	$I_{t1,2\ max}$	1	mA
Auxiliary electrode current	$I_{aux\ max}$	20[2])	μA
Averaging time	$t_{\tau\ max}$	15	s
Capacitor in parallel to trigger gap and protective resistor			
	C < 1 nF $R_{prot\ min}$	0	Ω
	C < 5 nF $R_{prot\ min}$	2	kΩ
	C > 5 nF $R_{prot\ min}$	5	kΩ
Ambient temperature	$t_{amb\ max}$	+ 75	°C
	$t_{amb\ min}$	− 50	°C

[1]) Under RF influence this value may be considerabley lower. To avoid the influence of external fields and through the use of special triggering circuits (AF voltage) the inside bulb coating may be connected to the cathode k via the wall contact across a resistor of 1 to 2 MΩ. The supply voltage U_s, however, must not exceed 300 V.

[2]) If very short ionization times of the discharge or low and highly stable trigger breakdown voltages are required, the auxiliary electrode aux can be directly connected to the rectified supply voltage across a resistor of 10 MΩ (see Operating Conditions).

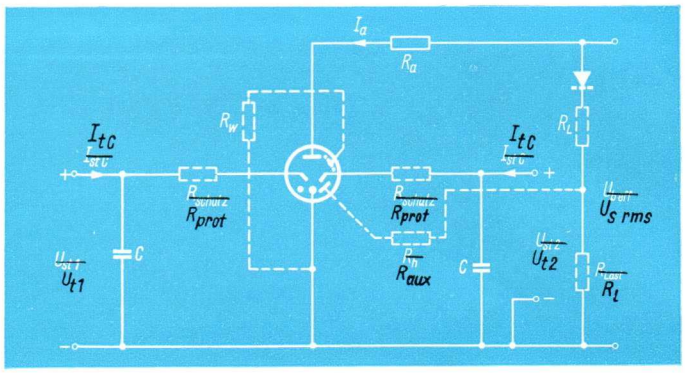
[3]) For the transfer of the discharge to the main gap a—k required trigger transfer current I_t at $\hat{u}_a$ = 300 V.

[4]) For high-current discharges (peak current operation) the deionization time t_d can rise to more than 10 ms.

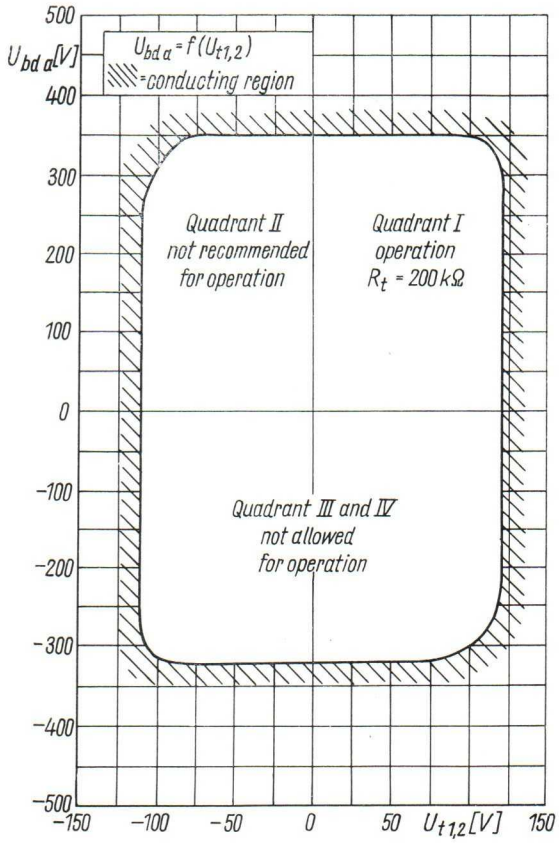
[5]) I_a measured by means of a moving-coil instrument.

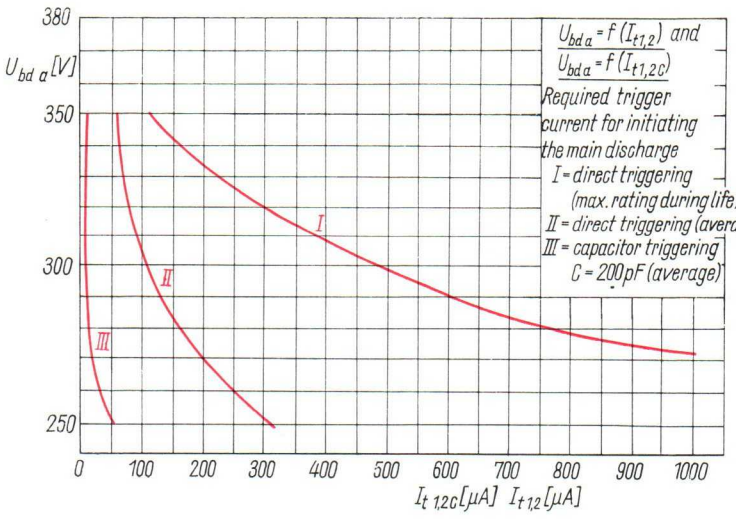
[6]) At minimum cathode current (10 mA), the glow must cover the whole front of the cathode, otherwise the tube is in unstable operation.

[7]) Short peak currents (0.1 s) up to 1.0 A are permissible.

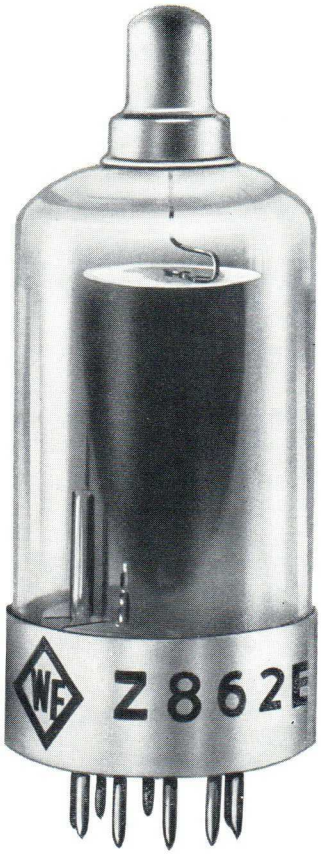


Principal Diagram

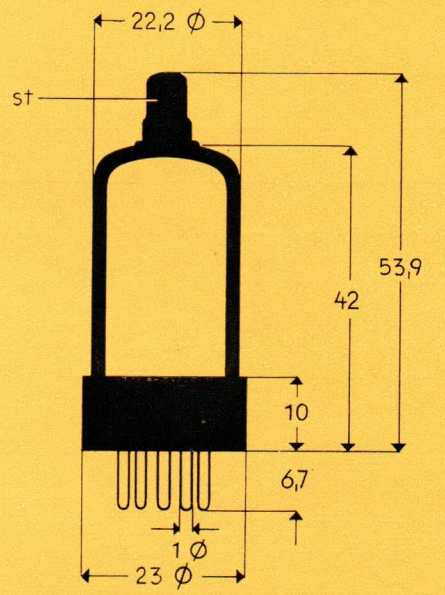




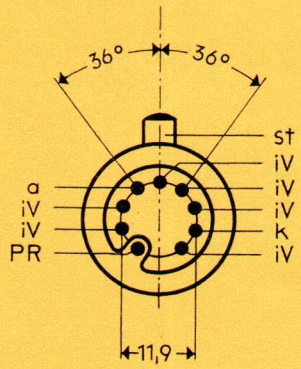
COLD-CATHODE ELECTROMETER TUBE
Z 862 E



Maximum outlines



Basing diagram



General Data

Type Z 862 E is a pure-metal cold-cathode inert-gas electrometer tube for DC operation. It is designed primarily for control by ionization chambers or similar controlling devices of very high ohmic value. The minimum control current is around 10^{-6} µA. This tube is analogous to type GR 19.

Weight	approx. 14 grams
Mounting position	any

Manufacturer of the socket:
VEB Keramische Werke
Hermsdorf (Thüringen)
Ref. No. 4109.10
TGL 11608, sheet No. 1

SPECIFICATION

Characteristics

Anode breakdown voltage (U_t = 30 V)	$U_{bd\,a}$	310	V
Trigger breakdown voltage (U_a = 0 V)	$U_{bd\,t}$	140[1]	V
Anode maintaining voltage (I_a = 10 mA)	$U_{M\,a}$	108	V
Trigger maintaining voltage (I_t = 2 mA)	$U_{M\,t}$	100	V
Trigger transfer current			
for direct triggering	I_t	10[2]	μA
for capacitor triggering (C = 100 pF)	$I_{t\,C}$	approx. 10–[2]	μA
Ionization time	t_i	100	μs
Deionization time ($\hat{i}_a$ = 10 mA)	t_d	1000[3]	μs

Typical Operation

Supply voltage	$U_{s\,max}$	220	V
Anode current	I_a	10—15	mA
Peak trigger bias voltage	max	90	V
Superimposed peak AC breakdown voltage	min	65	V
Trigger breakdown voltage (sum of the two voltages)	$\hat{u}_{t\,min}$	155	V

Limiting Values

Supply voltage	$U_{s\,max}$	260	V
	$U_{s\,min}$	180	V
Anode current	$I_{a\,max}$	25[4]	mA
Peak anode current	$\hat{i}_{a\,max}$	125[5]	mA
Trigger transfer current	$I_{t\,max}$	1	mA
Averaging time	t_τ	15	s
Ambient temperature	$t_{amb\,max}$	+ 75	°C
	$t_{amb\,min}$	— 60	°C
Capacitor in parallel to trigger gap and protective resistor			
	$C_\parallel < 0.5$ nF $R_{prot\,min}$	0	Ω
	$C_\parallel < 2.5$ nF $R_{prot\,min}$	2	kΩ
	$C_\parallel > 2.5$ nF $R_{prot\,min}$	5	kΩ

[1]) Value applies to slowly rising trigger voltage. With rapidly increasing trigger voltage this value may be exceeded.

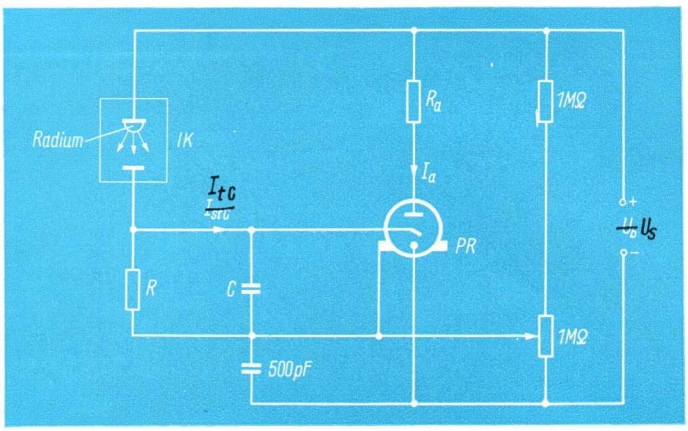
Inversely, under RF influence this value may be considerably lower.

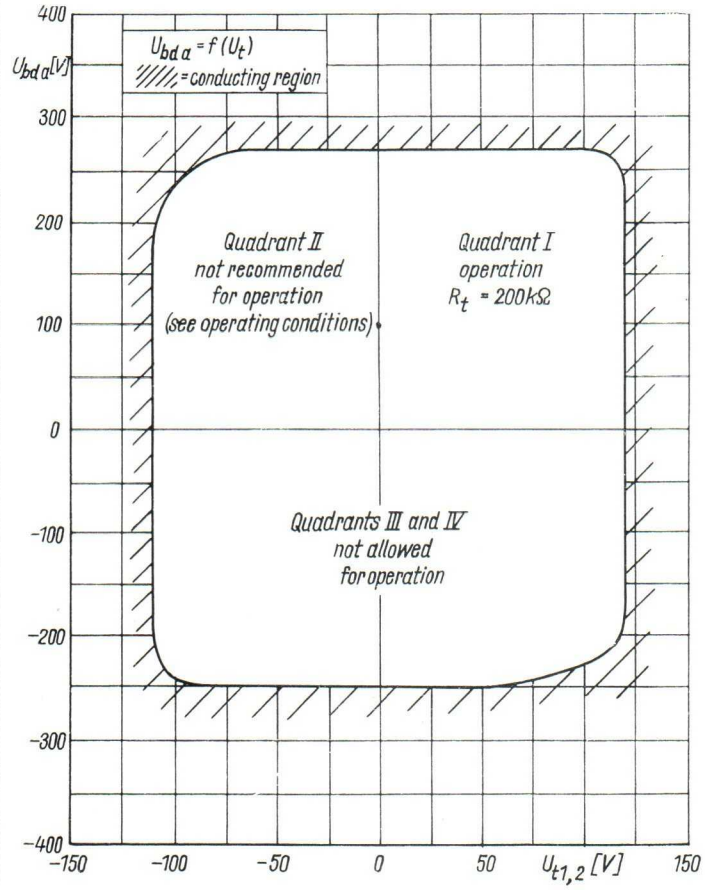
[2]) For the transfer of the discharge to the main gap a—k required trigger transfer current I_t at U_s = 220 V.

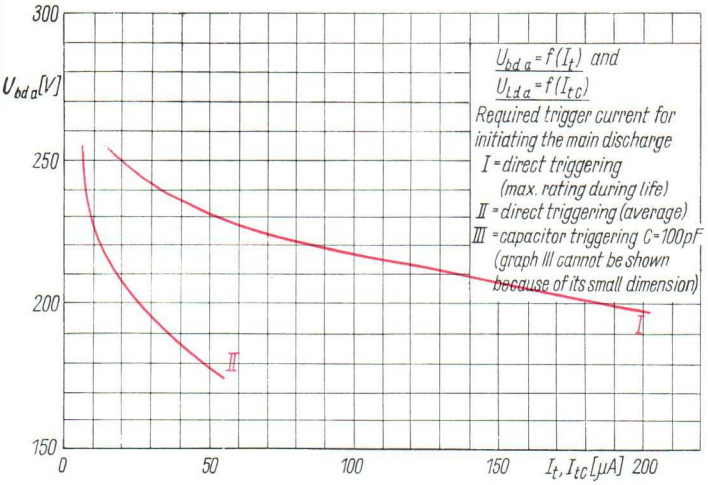
[3]) For high-current discharges (peak current operation) the deionization time t_d can rise to several ms.

[4]) At minimum cathode current (8 mA), the glow must cover the whole front of the cathode, otherwise the tube is in unstable operation.

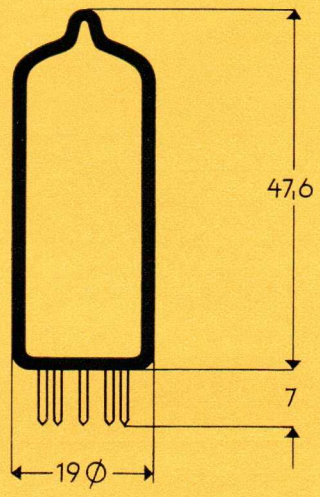
[5]) Short peak currents (0.1 s) up to 0.5 mA are permissible.





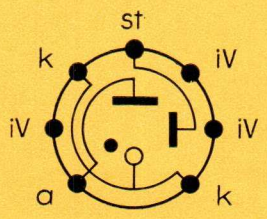


COLD-CATHODE TRIGGER TUBE
Z 5823



Maximum outlines

Basing diagram



General Data

Type Z 5823 is an inert-gas cold-cathode 7-pin miniature tube designed for on-off relay and counting and similar applications. This tube complies with the types ASG 5823, St 90 k and Z 900 T.

Weight	approx. 8 grams
Mounting position	any
Base	7-pin miniature
	Manufacturer of the socket: VEB Elektro- und Radio-zubehör, Dorfhain (Sachsen) hard-paper socket: Ref. No. 0732.676 plastic socket: Ref. No. 0732.677

SPECIFICATION

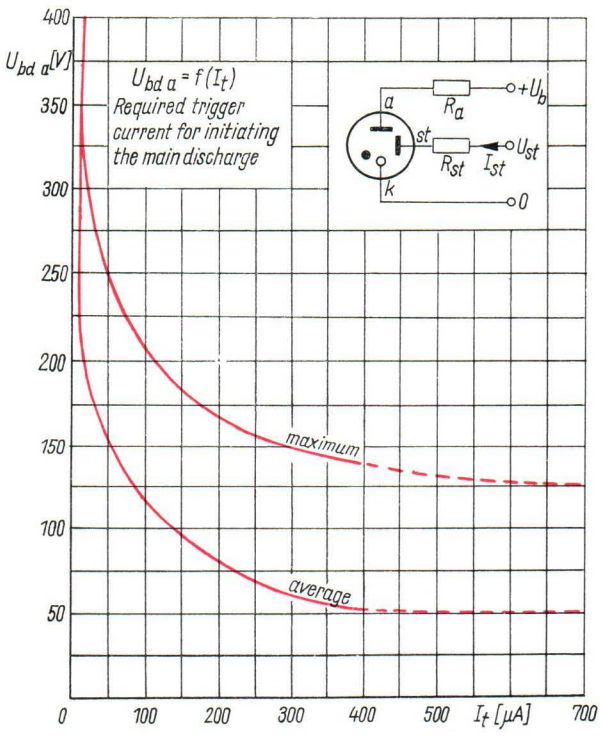
Characteristics			
Anode breakdown voltage (U_t = 0 V)	$U_{bd\,a}$	290	V
Trigger breakdown voltage (U_a = 0 V)	$U_{bd\,t}$	85[1])	V
Anode maintaining voltage (I_a = 25 mA)	$U_{M\,a}$	65	V
Trigger maintaining voltage (I_t = 10 mA)	$U_{M\,t}$	61	V
Trigger current	I_t	50[2])	μA
Ionization time	t_i	20[3])	μs
Deionization time	t_d	500[3])	μs
Characteristics during Life			
Anode breakdown voltage (U_t = 0 V)	$U_{bd\,a\,min}$	200	V
Trigger breakdown voltage (U_a = 0 V)	$U_{bd\,t\,max}$	105	V
Trigger current	$I_{t\,max}$	400[2])	μA
Typical Operation			
Relay Service			
Supply voltage	$U_{s\,rms}$	105 to 130	V
Peak trigger bias voltage		max 70	V
Superimposed peak AC breakdown voltage		min 35	V
Peak trigger breakdown voltage (sum of the two voltages)	$\hat{u}_{t\,max}$	105	V
Limiting Values			
Anode current	$I_{a\,max}$	25	mA
Short peak anode current	$I_{a\,max}$	100	mA
Trigger transfer current	$I_{t\,max}$	1	mA
Capacitor in parallel to trigger gap and protective resistor	$C_{\|\|} < 1$ nF R_{prot}	0	Ω
	$C_{\|\|} < 5$ nF $R_{prot\,min}$	5.1	kΩ
	$C_{\|\|} < 0.1$ μF $R_{prot\,min}$	10	kΩ
	$C_{\|\|} > 0.1$ μF $R_{prot\,min}$	51	kΩ
Averaging time	$t_{\tau\,max}$	15	s
Ambient temperature	$t_{amb\,max}$	+ 75	°C
	$t_{amb\,min}$	− 60	°C

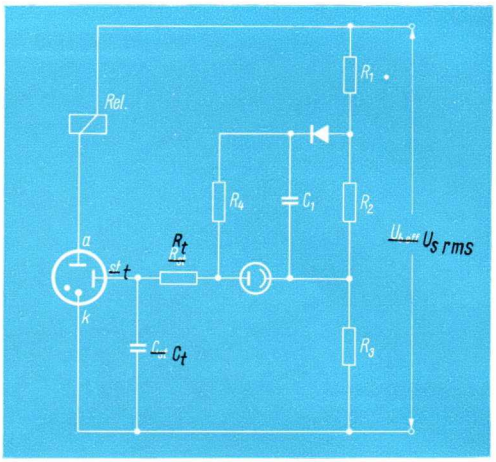
A cathode current of less than 8 mA is not recommended since it gives rise to unstable operation.

[1]) Under RF influence this value may be considerably lower.

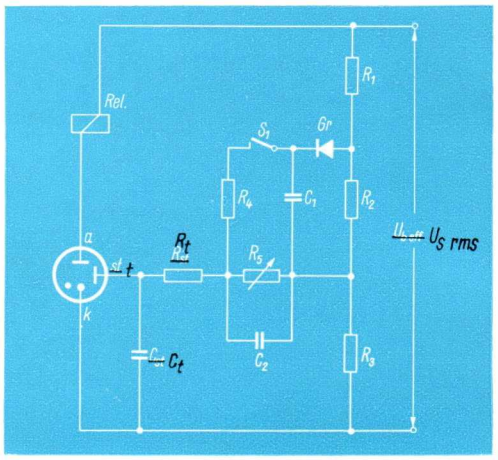
[2]) For initiating the discharge in the anode-cathode gap required value I_t at a peak anode voltage of + 140 V.

[3]) At an anode voltage of + 185 V (instantaneous value), trigger bias voltage + 70 V (instantaneous value), superimposed peak breakdown voltage + 50 V, trigger series resistor R_t = 0.1 MΩ, anode series resistor R_a = 800 Ω.



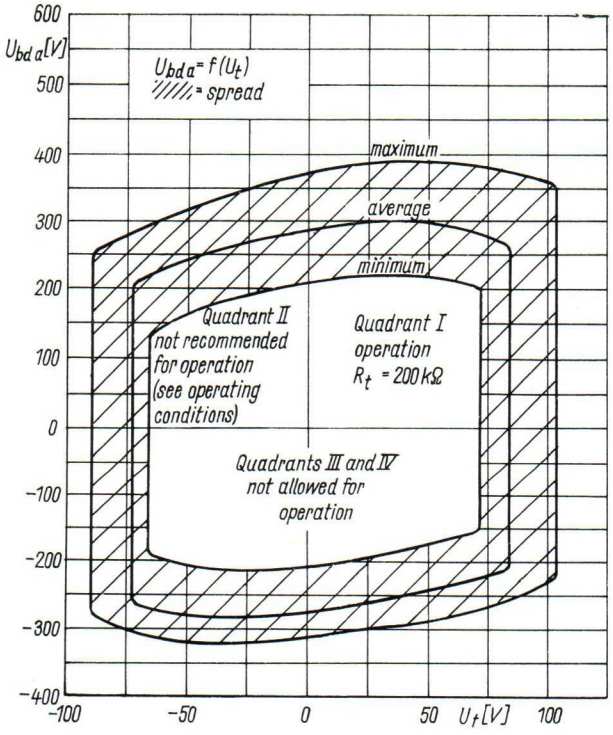


Typical Circuits



Principal Diagram of a Light Electric Switch (Ignition of the Tube by Interruption of Exposure)

Principal Diagram of a Timing Switch (Ignition of the Tube by RC Network)



DEKATRON COUNTING AND INDICATOR TUBES

Design and Operation

Dekatron counting tubes are glow transfer tubes used for the counting of electrical pulses. Ten rod-shaped cathodes, another ten as first guides and another ten as second guides are arranged around a circular disc anode. The glow discharge transfers from cathode to cathode by applying successive pairs of pulses to the guides between the cathodes. The state of the count is displayed from the dome along the vertical tube axis.

Indicator tubes are designed as numerical, symbol or decade indicator tubes. In the first two types the numerals or symbols, represented by cathodes of a glow-discharge tube, are arranged above each other. The appropriate numeral or symbol appears as a bright continuous line red neon glow when it has received a negative pulse via the corresponding base pin. Decade indicator tubes include ten rod-shaped cathodes arranged in a circle around the anode. Each cathode is connected to a base pin and is alight when negative voltage has been applied. The display or readout is achieved in the same way as with the dekatron counting tubes.

Applications

Dekatron counting tubes are suitable for counting pulses in electronic counting and computing equipment as well as in automatic control.

The indicator tubes are used for visual indication of the switching state. They provide readout in counting and computing equipment, digital measuring instruments, electronic time meters and rotational speed meters.

Key to the Type Designations

Before the number: Z = cold-cathode tube

After the number: C = counting tube
M = indicator tube
S = switching tube

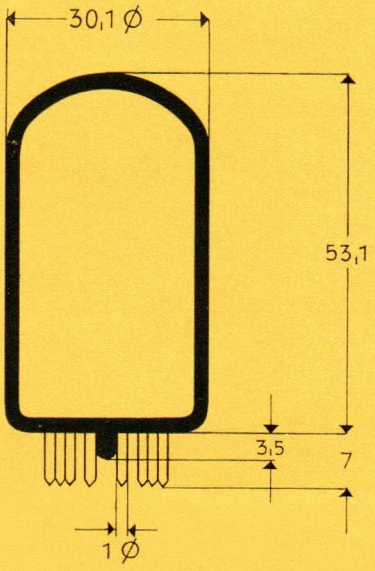
General Operating Conditions and Instructions

No connections must be made to the free base pins designated "iV" in the basing diagram.

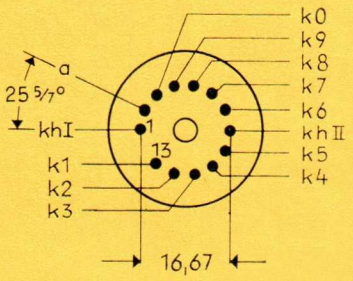
Guarantee expires if the precautions given to ensure satisfactory operation and life of the tubes are disregarded or if the limiting values are exceeded.

COLD-CATHODE DEKATRON COUNTING TUBE
Z 562 S

Maximum outlines



Basing diagram



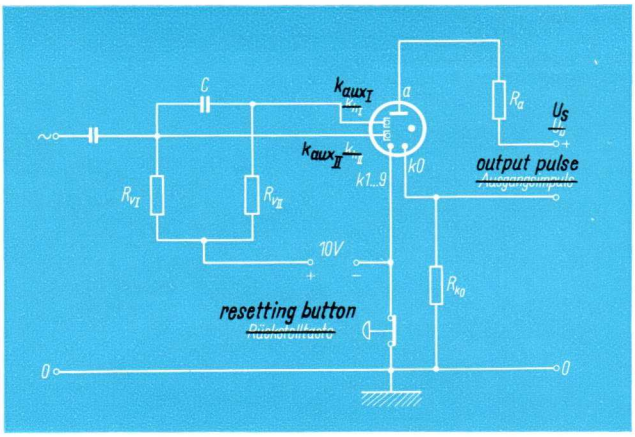
The cathode k0 is in vertical position above pin 1

General Data

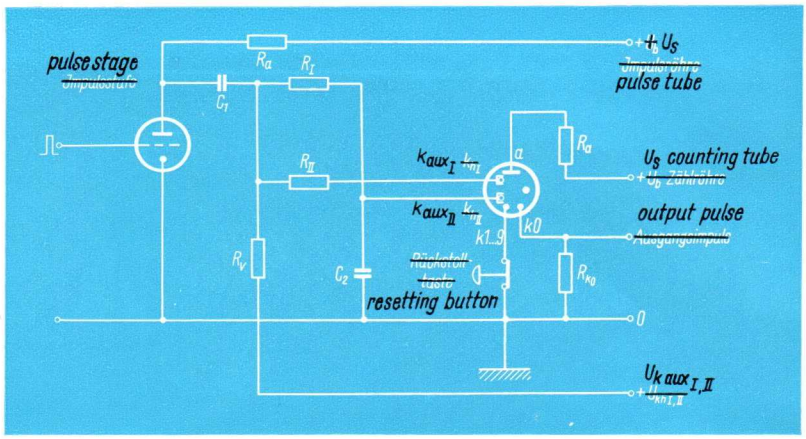
Type Z 562 S is an inert-gas bi-directional dekatron counting tube containing pure-metal cold cathodes and designed for use as an indicator and switching tube. This tube is analogous to the types Z 502 S and GS 10 C.

Weight	approx. 25 grams
Mounting position	any

Mounting of the socket:
VEB Elektro- und Radio-zubehör, Dorfhain (Sachsen)
Ref. No. 0732.628



Principal Diagram for Sine-Wave Drive



Principal Diagram for Rectangular Pulse Drive

SPECIFICATION

Characteristics

Striking voltage	U_{st}	300	V
Running voltage (I_k = 300 μA)	U_r	190	V

Typical Operation

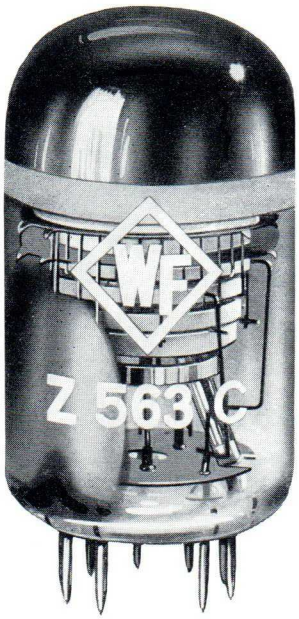
Operating voltage	U_{op}	450	V
Anode resistor	R_a	750	kΩ
Cathode resistor	R_{k0}	120	kΩ
Cathode current	I_k	350	μA
Output pulse	$U_{k0\,\sqcap}$	35	V
Sine-wave drive:			
Positive bias of guide groups I and II	$U_{gu\,I,II}$	10	V
Signal voltage	U_{rms}	40 to 70	V
Rectangular pulse drive:			
Positive bias of guide groups I and II	$U_{gu\,I,II}$	40	V
Signal voltage	$U_{\sqcap}$	100	V
Pulse width	$t_{\sqcap}$	75	μs

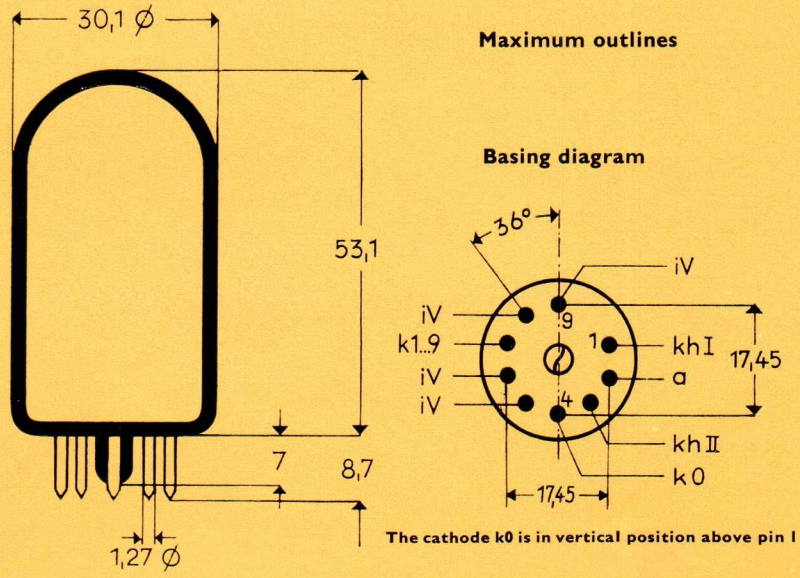
Limiting Values

Counting speed	f_{max}	4	kc/s
Minimum signal delay		250	μs
Pulse width	$t_{\sqcap\,min}$	65	μs
Operating voltage	$U_{op\,min}$	400	V
Positive bias of guide groups I and II	$U_{gu\,I,II\,min}$	35[1])	V
Negative bias of counter cathodes	$-U_{k0\,to\,9\,max}$	20	V
Minimum resetting pulse		120	V
Maximum voltage between any electrodes (apart from anode)		140	V
Cathode current	$I_{k\,max}$	550	μA
	$I_{k\,min}$	250	μA
Ambient temperature	$t_{amb\,max}$	+ 75	°C
	$t_{amb\,min}$	− 60	°C

[1]) Rectangular pulse drive

COLD-CATHODE
DEKATRON COUNTING TUBE
Z 563 C





Maximum outlines

Basing diagram

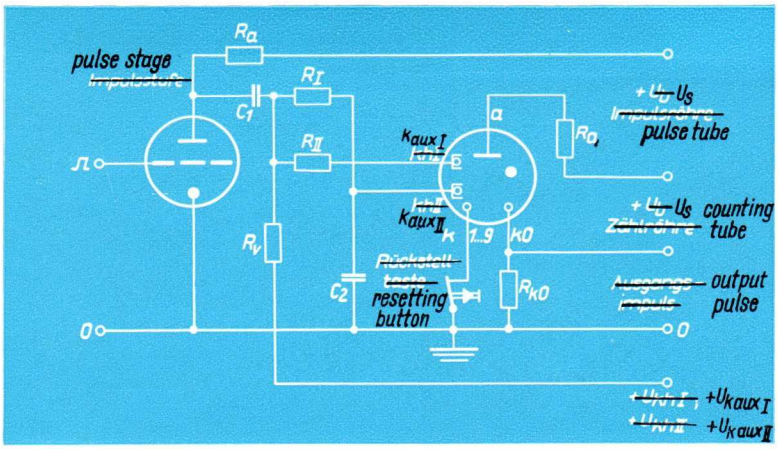
The cathode k0 is in vertical position above pin 1

General Data

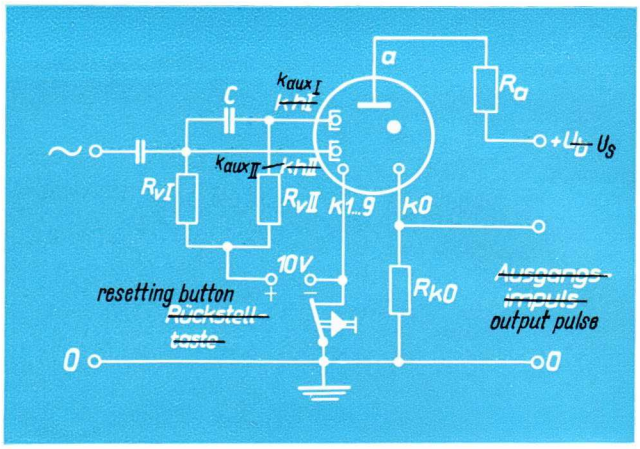
Type Z 563 C is an inert-gas bi-directional dekatron counting tube containing pure-metal cold-cathodes and designed for use as an indicator tube. This tube is analogous to the types Z 303 C and GC 10 B.

Weight	approx. 25 grams
Mounting position	any

Manufacturer of the socket:
VEB Elektro- und Radio-zubehör, Dorfhain (Sachsen)
Ref. No. 0732.632



Principal Diagram for Rectangular Pulse Drive



Principal Diagram for Sine-Wave Drive

SPECIFICATION

Characteristics			
Striking voltage	U_{st}	300	V
Running voltage (I_k = 300 μA)	U_r	190	V
Typical Operation			
Operating voltage	U_{op}	450	V
Anode resistor	R_a	750	kΩ
Cathode resistor	R_{k0}	120	kΩ
Cathode current	I_k	350	μA
Output pulse	$U_{k0\sqcap}$	35	V
Sine-wave drive:			
Positive bias of guide groups I and II	$U_{gu\ I,II}$	10	V
Signal voltage	U_{rms}	40 to 70	V
Rectangular pulse drive:			
Positive bias of guide groups I and II	$U_{gu\ I,II}$	40	V
Signal voltage	$U_{\sqcap}$	100	V
Pulse width	$t_{\sqcap}$	75	μs
Limiting Values			
Counting speed	f_{max}	4	kc/s
Minimum signal delay		250	μs
Pulse width	$t_{\sqcap\ min}$	65	μs
Operating voltage	$U_{op\ min}$	400	V
Positive bias of guide groups I and II	$U_{gu\ I,II\ min}$	35[1]	V
Negative voltage of counter cathodes	$-U_{k0\ to\ 9\ max}$	20	V
Minimum resetting pulse		120	V
Maximum voltage between any electrodes (apart from anode)		140	V
Cathode current	$I_{k\ max}$	550	μA
	$I_{k\ min}$	250	μA
Ambient temperature	$t_{amb\ max}$	+ 75	°C
	$t_{amb\ min}$	− 60	°C

[1]) Rectangular pulse drive

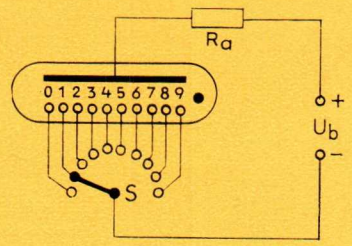
Operating Conditions

The average cathode current shall not exceed 300 μA in aperiodic counting operation.

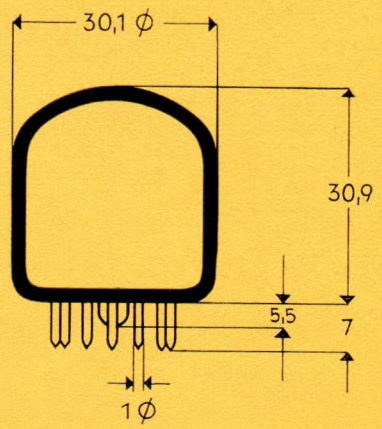
For the prevention of larger striking voltage variations caused by illumination differences a ring of radioactive material has been deposited on the inside wall of the bulb. The small quantity can never give rise to deleterious irradiation.

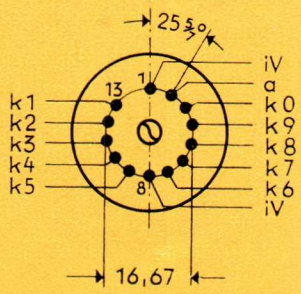
NUMERICAL INDICATOR TUBE
Z 560 M

Basing diagram



Maximum outlines





Relating to the correct readout position of the digits pin 8 is on top

General Data

Type Z 560 M is an inert-gas cold-cathode ten-digit ("0" through "9") numerical indicator tube. The indicated digit appears as a continuous line red neon glow. The readout is effected by the conversion of electromechanical or electronic signals directly to readable characters. The tube is designed primarily for the reproduction of measuring and counting values as well as time display. It is analogous to the types ZM 1020 (Z 510 M), 6844-A, D 76 and GR 10 H.

Weight	approx. 14 grams
Mounting position	any
Height of numerals	15.5 mm

Manufacturer of the socket:
VEB Elektro- und Radiozubehör, Dorfhain (Sachsen)
Ref. No. 0732.628

Running Voltage as a Function of Cathode Current
(also applicable to Type Z 561 M)

SPECIFICATION

Characteristics

Anode breakdown voltage	U_{bd}				140	V
Anode running voltage	U_r				125	V
Cathode current	I_k				2	mA

Typical Operation

Supply voltage	U_s	170	250	300	± 10%	V
Anode resistor	R_a	20	60	90	± 5%	kΩ

Limiting Values

Supply voltage	$U_{s\ min}$	160	V
Cathode current	$I_{k\ min}$	1.5	mA
	$I_{k\ max}$	3[1])	mA
Peak cathode current	$\hat{i}_k$	15	mA
Averaging time	t_τ max	1	cycle
Ambient temperature	$t_{amb\ max}$	+ 75	°C
	$t_{amb\ min}$	− 60	°C

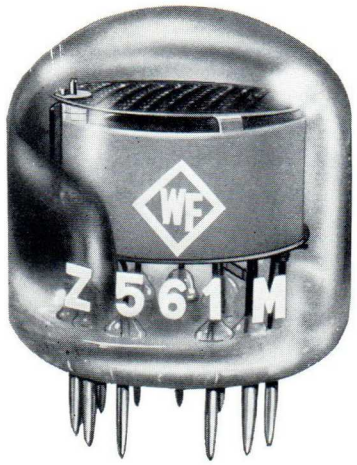
[1]) To obtain maximum life the cathode current I_k should not exceed 2.5 mA.

Operating Conditions

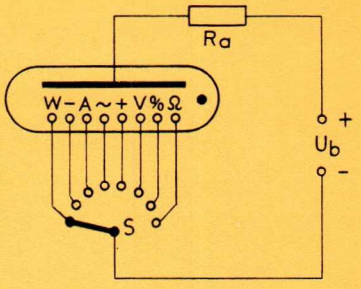
During AC operation the tube is not allowed to strike in the negative half wave.

In aperiodic operation a switching time ratio of $>$ 1 : 500 must be guaranteed within 50 operating hours per digit.

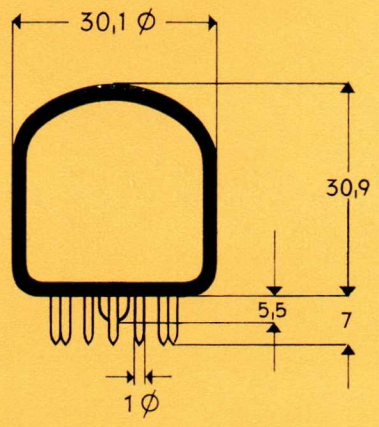
SYMBOL INDICATOR TUBE
Z 561 M

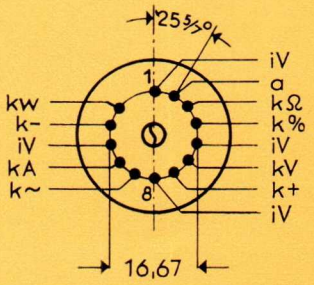


Basing diagram



Maximum outlines





Relating to the correct readout position of the digits pin 8 is on top

General Data

Type Z 561 M is an inert-gas cold-cathode symbol indicator tube. The indicated character appears as a continuous line red neon glow. The readout is effected by the conversion of electro-mechanical or electronic signals. The tube is designed primarily for the reproduction of signs and symbols for measuring and counting values. It is analogous to the type ZM 1021 (Z 521 M).

Weight	approx. 14 grams
Mounting position	any
Height of characters	15.5 mm

Manufacturer of the socket:
VEB Elektro- und Radiozubehör, Dorfhain (Sachsen)
Ref. No. 0732.628

SPECIFICATION

Characteristics						
Anode breakdown voltage	U_{bd}				140	V
Anode running voltage	U_r				125	V
Cathode current	I_k				2	mA
Typical Operation						
Supply voltage	U_s	170	250	300	± 10%	V
Anode resistor	R_a	20	60	90	± 5%	V
Limiting Values						
Supply voltage	$U_{s\,min}$				160	V
Cathode current	$I_{k\,min}$				1.5	mA
	$I_{k\,max}$				3[1])	mA
Peak cathode current	$\hat{i}_k$				15	mA
Averaging time	$t_{\tau\,max}$				1	cycle
Ambient temperature	$t_{amb\,max}$				+ 75	°C
	$t_{amb\,min}$				− 60	°C

[1]) To obtain maximum life the cathode current I_k should not exceed 2.5 mA.

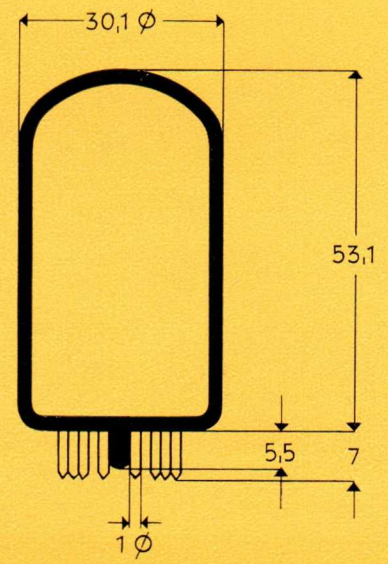
Operating Conditions

During AC operation the tube is not allowed to strike in the negative half wave.

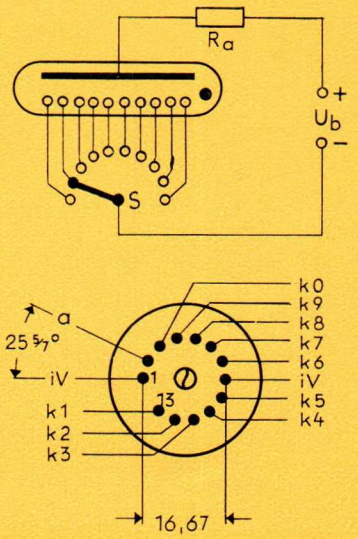
In aperiodic operation a switching time ratio of $>$ 1 : 500 must be guaranteed within 50 operating hours per character.

DECADE INDICATOR TUBE
Z 565 M

Maximum outlines



Basing diagram



The cathode k0 is in vertical position above pin 1

General Data

Type Z 565 M is an inert-gas decade indicator tube containing pure-metal cold-cathodes. The indication is effected by a neon glow discharge. The readout is accomplished by the conversion of electro-mechanical or electronic signals. The tube is designed primarily for the indication of the switching state in high vacuum tube or transistorized scalers at high counting speeds. In instruments involving the use of both dekatron counting and indicator tubes a uniform readout is provided owing to the systematic arrangement. The tube is analogous to the types GR 10 A and Z 503 M.

Weight	approx. 22 grams
Mounting position	any

Manufacturer of the socket:
VEB Elektro- und Radio-zubehör, Dorfhain (Sachsen)
Ref. No. 0732.628

SPECIFICATION

Characteristics			
Running voltage	U_r	112	V
Cathode current	I_k	100	μA
Limiting Values			
Maximum anode breakdown voltage	$U_{bd\ max}$	140	V
Minimum anode extinction voltage	$U_{a\ ext\ min}$	100	V
Cathode current	$I_{k\ min}$	50	μA
	$I_{k\ max}$	250	μA
Ambient temperature	$t_{amb\ max}$	+ 75	°C
	$t_{amb\ min}$	− 60	°C

Operating Conditions

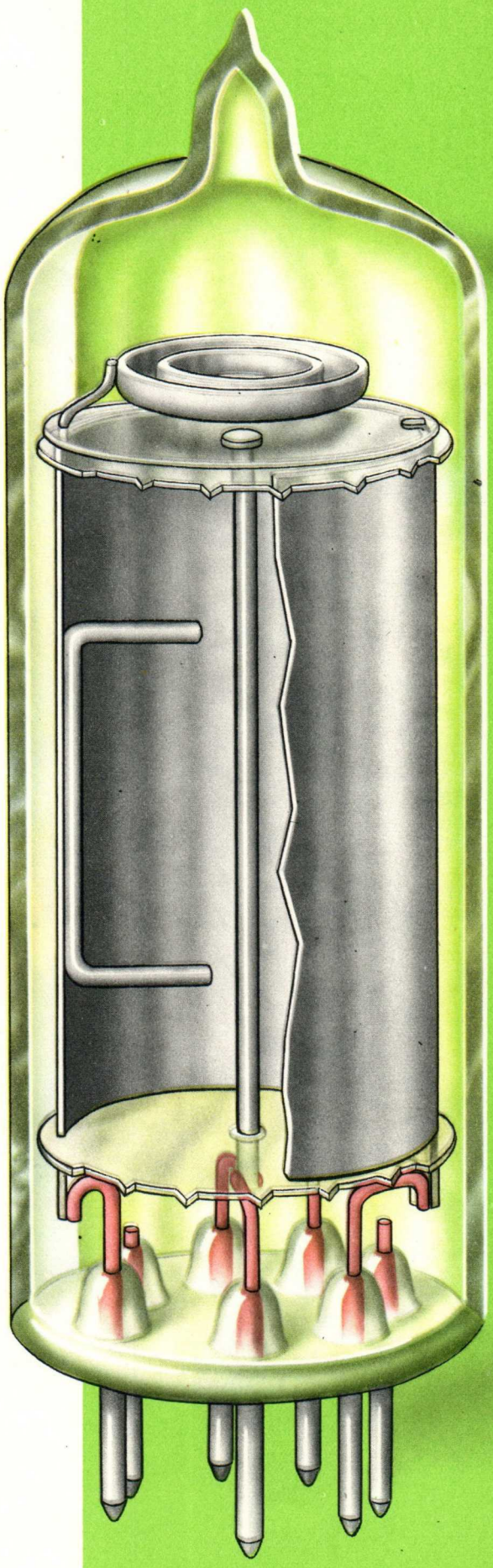
To ensure satisfactory operation of the tube the voltage variations at the cathode (k0 to k9) must be larger than the difference between maximum anode breakdown voltage and minimum extinction voltage

$$(U_{bd\ a\ max} - U_{a\ ext\ min} = 40\ V).$$

In aperiodic operation the average cathode current should not exceed 100 μA.

For the prevention of larger breakdown voltage variations caused by illumination differences a ring of radioactive material has been deposited on the inside wall of the envelope. The small quantity can never give rise to deleterious irradiation.

StR 150/30



SPANNUNGS-STABILISATORRÖHREN

Design and Operation

The voltage stabilizer tube is an inert-gas filled device utilizing the phenomenon of glow discharge at pressures which are only 1/10 to 1/100 of atmospheric. Two electrodes (for which there is a great variety of shapes) are sealed in a miniature glass envelope. The tube is not heated. The gas ions inside the tube cause a glow discharge when a DC voltage is applied. The regulating or stabilizing effect of the stabilizer is based upon the fact that the running voltage of the gap is only very slightly dependent of its load current as long as a given current density across the cathode is not exceeded. Connected in parallel to the load stabilizers act similar to booster batteries. They always take up the extra current of the load and are exposed to utmost stress unless there is a load connected to the stabilized supply.

Applications

Voltage stabilizers are designed to provide constant voltages or to reduce voltage fluctuations in the fields of communications, measuring instruments and the wide field of electronics. Beyond that, they may also be employed for voltage limitation.

Key to the Type Designations

The type designation tells you the electrical characteristics of the tube. "StR" is used for stabilizer tube. The number before the down-stroke indicates the average running voltage in volts, whereas the number after the down-stroke gives the maximum tube current.

General Operating Conditions and Instructions

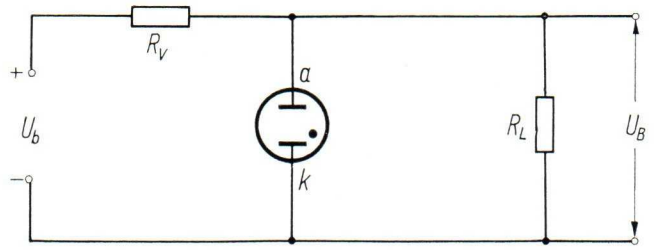
Apart from the limiting values all values are averages. Corresponding spread around them should be taken into consideration. The stabilizer must be connected to the supply without the use of a ballasting resistor to prevent a destruction of the tube. The voltage drop across the ballasting resistor corresponds at least to half the running voltage. Note that the reduction of line voltage fluctuations is the greater the higher the operating voltage. The operating voltage must be larger than the striking voltage. The minimum tube current must never be below its specified value at full load to maintain regulation. Optimum voltage regulation or stabilization will be achieved with constant tube current.

The tube must be operated only with positive voltage across the anode, otherwise regulation will be impaired.

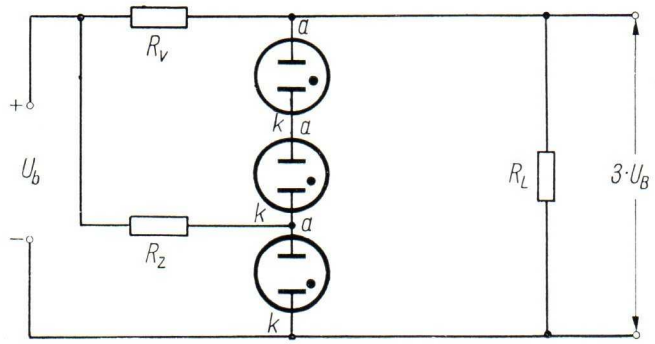
No connection must be made to the free pins of the tubes designated "iV" in the basing diagram.

The tube reaches stable values (equilibrium) only after an operating time of three minutes.

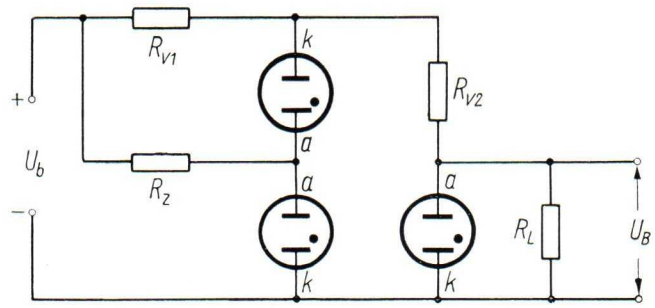
Guarantee expires if the precautions given to ensure satisfactory operation and life of the tubes are disregarded or if the limiting values are exceeded.



Basic Circuit
(R_V = Ballasting Resistor)
(R_L = Load Resistor)



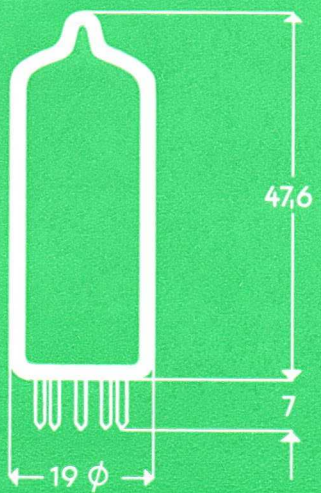
Stabilizer Tubes connected in Series
(Recommended Value for
$R_Z = 0.5\ M\Omega$)



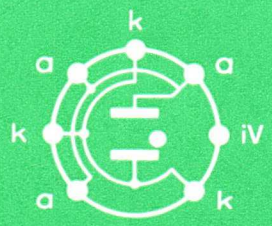
Cascade circuit provides Better Voltage Regulation
(Recommended Value for
$R_Z = 0.5\ M\Omega$)

VOLTAGE STABILIZER
StR 75/60

Maximum outlines



Basing diagram



General Data

Type StR 75/60 is a single-gap voltage stabilizer. It is designed to provide automatically a sensibly constant DC voltage. This tube corresponds to the type 75 C 1.

Weight	approx. 7 grams
Mounting position	any
Base	7-pin miniature

Manufacturer of the socket:
VEB Elektro- und Radiozubehör, Dorfhain (Sachsen)
hard-paper socket:
Ref. No. 0732.676
plastic socket:
Ref. No. 0732.677

SPECIFICATION

Characteristics

Striking voltage	U_{st}	≦ 116	V
Running voltage (I_q = 30 mA)	U_r	78	V
	$U_{r\,max}$	81[1])	V
	$U_{r\,min}$	75[1])	V
Tube current (average)	I_q	30	mA
Running voltage drift (I_q = 2 to 60 mA)	$\triangle U_r$	6[2])	V
Internal resistance	R_i	approx. 100	Ω
Starting time	t_{start}	≦ 3	min.

Limiting Values

Tube current	$I_{q\,max}$	60	mA
	$I_{q\,min}$	2	mA
Switch-in current (max. 30 s)	$I_{L\,max}$	100[3])	mA
Ambient temperature	$t_{amb\,max}$	+ 90	°C
	$t_{amb\,min}$	− 55	°C

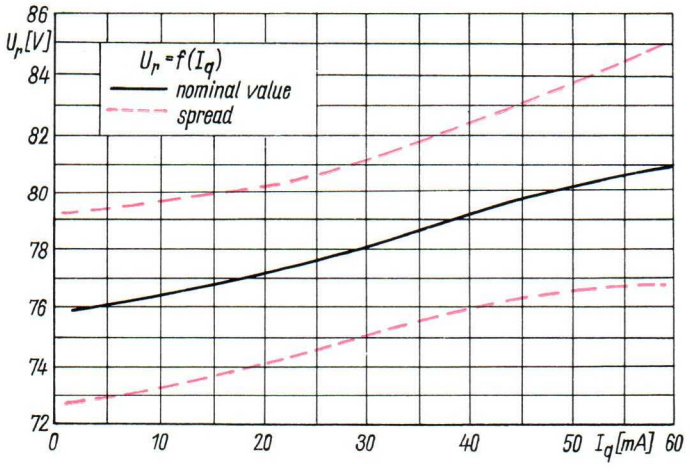
[1]) Spread from tube to tube

[2]) $\triangle U_r$ max. 8 V

[3]) To ensure longer life the switch-in current should be limited to 30 s per 8 hours

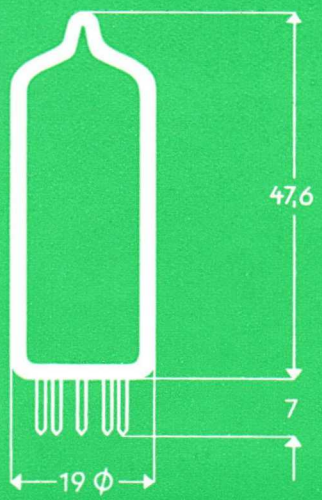
Tube complying with GDR Standard TGL No. 14024

Running Voltage Characteristic

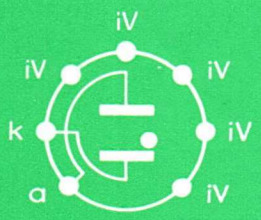


VOLTAGE STABILIZER
StR 85/10

Maximum outlines



Basing diagram



General Data

Type StR 85/10 is a single-gap voltage stabilizer having long-term time stability and designed to provide automatically a sensibly constant DC voltage. This tube corresponds to the types STV 85/10, 85 A 2 and OG 3.

Weight	approx. 7 grams
Mounting position	any
Base	7-pin miniature
	Manufacturer of the socket: VEB Elektro- und Radio-zubehör, Dorfhain (Sachsen) hard-paper socket: Ref. No. 0732.676 plastic socket: Ref. No. 0732.677

SPECIFICATION

Characteristics

Striking voltage	U_{st}	$\leqq$ 125[1])	V
Running voltage	U_r	85	V
	$U_{r\,max}$	87[2])	V
	$U_{r\,min}$	83[2])	V
Running voltage drift during life	max	0.5	%
Tube current	I_q	6	mA
Running voltage drift (I_q = 1 to 10 mA)	$\triangle U_{r\,max}$	4	V
Internal resistance	R_i	approx. 250	Ω
Temperature coefficient of running voltage	αU_r	approx. — 2.7mV/°C	
Starting time	t_{start}	$\geqq$ 3	min.

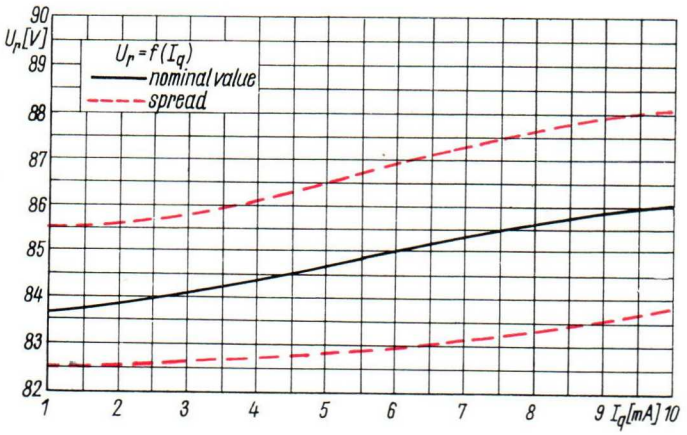
[1]) In complete darkness this value may be considerably higher
[2]) Spread from tube to tube

Limiting Values

Tube current	$I_{q\,max}$	10	mA
	$I_{q\,min}$	1	mA
Ambient temperature	$t_{amb\,max}$	+ 90	°C
	$t_{amb\,min}$	— 55	°C

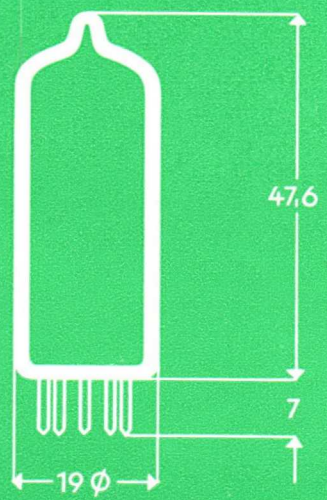
Tube complying with GDR Standard TGL No. 11527

Running Voltage Characteristic

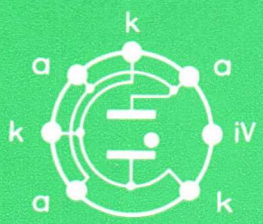


VOLTAGE STABILIZER
StR 90/40

Maximum outlines



Basing diagram



General Data

Type StR 90/40 is a single-gap voltage stabilizer. It is designed to provide automatically a sensibly constant DC voltage. This tube corresponds to the type 90 C 1.

Weight	approx. 7 grams
Mounting position	any
Base	7-pin miniature

Manufacturer of the socket:
VEB Elektro- und Radiozubehör, Dorfhain (Sachsen)
hard-paper socket:
Ref. No. 0732.676
plastic socket:
Ref. No. 0732.677

SPECIFICATION

Characteristics

Striking voltage	U_{st}	$\leqq$ 125[1])	V
Running voltage	U_r	90	V
	$U_{r\ max}$	94[2])	V
	$U_{r\ min}$	86[2])	V
Running voltage drift during life	max	1	%
Tube current	I_q	20	mA
Running voltage drift (I_q = 1 to 40 mA)	$U_{r\ max}$	14	V
Internal resistance	R_i	approx. 300	Ω
Temperature coefficient of running voltage	αU_r	approx. −2.7mV/°C	
Starting time	t_{start}	$\geqq$ 3	min.

[1]) In complete darkness this value may be considerably higher.

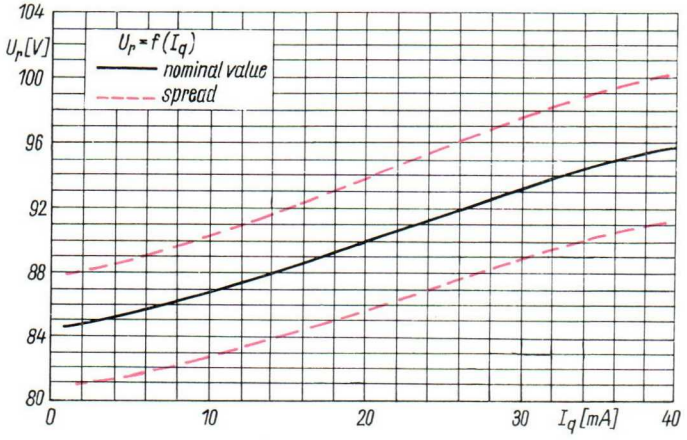
[2]) Spread from tube to tube.

Limiting Values

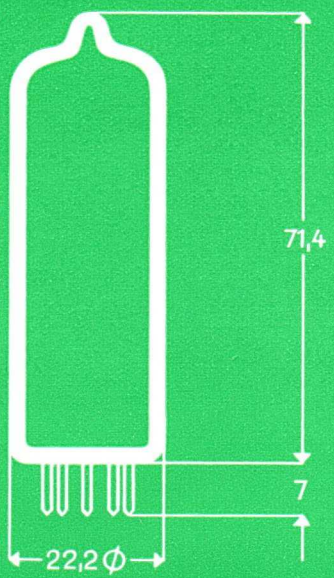
Tube current	$I_{q\ max}$	40	mA
	$I_{q\ min}$	1	mA
Ambient temperature	$t_{amb\ max}$	+ 90	°C
	$t_{amb\ min}$	− 55	°C

Tube complying with GDR Standard TGL No. 11528

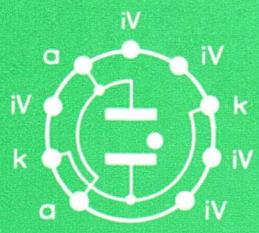
Running Voltage Characteristic



Maximum outlines



Basing diagram



General Data

Type StR 100/80 is a single-gap voltage stabilizer. It is designed to provide automatically a sensibly constant DC voltage.

Weight	approx. 17.5 grams
Mounting position	any
Base	9-pin miniature

Manufacturer of the socket:
VEB Elektro- und Radiozubehör, Dorfhain (Sachsen)
hard-paper socket:
Ref. No. 0732.672
plastic socket:
Ref. No. 0732.673

SPECIFICATION

Characteristics

Striking voltage	U_{st}	$\leq$ 150[1])	V
Running voltage	U_r	101	V
	$U_{r\ max}$	105[2])	V
	$U_{r\ min}$	98[2])	V
Tube current	I_q	45	mA
Running voltage drift (I_q = 5 to 80 mA)	$\sim U_{r\ max}$	3.5	V
Internal resistance	R_i	approx. 20	Ω
Starting time	t_{start}	$\geq$ 3	min.

Limiting Values

Tube current	$I_{q\ max}$	80[3])	mA
	$I_{q\ min}$	5	mA
Parallel capacitor	$C_{p\ max}$	0.1[4])	μF
Switch-in current (max. 15 s)	$I_{L\ max}$	200	mA
Ambient temperature	$t_{amb\ max}$	+ 90	°C
	$t_{amb\ min}$	− 55	°C

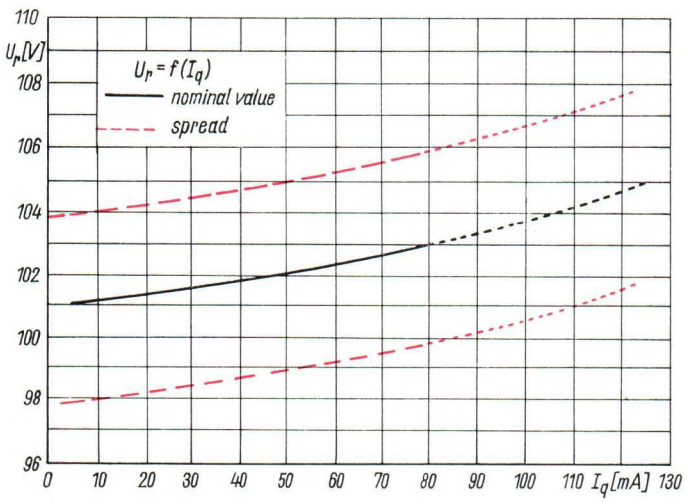
[1]) Spread from tube to tube.

[2]) Continuous load up to 125 mA maximum is permissible. The internal resistance rises to around 40 Ω.

[3]) In complete darkness this value may be considerably higher.

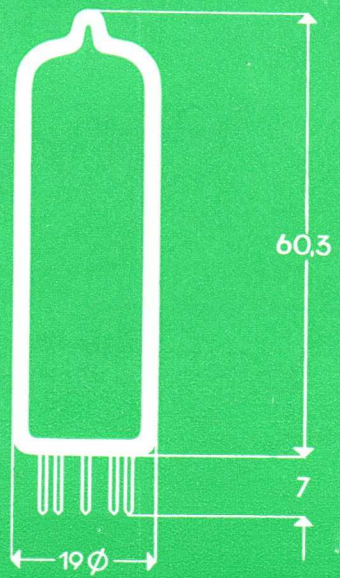
[4]) To prevent relaxation oscillations a capacitor connected in parallel should not exceed this value.

Tube complying with GDR Standard TGL No. 11615.

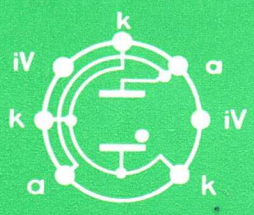


Running Voltage Characteristic

Maximum outlines



Basing diagram



General Data

Type StR 108/30 is a single-gap voltage stabilizer. It is designed to provide automatically a sensibly constant DC voltage. This tube corresponds to the types STV 108/30, 108 C 1 and OB 2.

Weight	approx. 10 grams
Mounting position	any
Base	7-pin miniature

Manufacturer of the socket:
VEB Elektro- und Radiozubehör, Dorfhain (Sachsen)
hard-paper socket:
Ref. No. 0732.676
plastic socket:
Ref. No. 0732.677

SPECIFICATION

Characteristics

Striking voltage	U_{st}	$\leqq$ 127[1])	V
Running voltage	U_r	108	V
	$U_{r\,max}$	111[2])	V
	$U_{r\,min}$	106[2])	V
Running voltage drift during life	max	1	%
Tube current	I_q	17.5	mA
Running voltage drift (I_q = 5 to 30 mA)	$\triangle U_{r\,max}$	3.5	V
Internal resistance	R_i	approx. 100	Ω
Temperature coefficient of running voltage	αU_r	approx. −2.7mV/°C	
Starting time	t_{start}	$\geqq$ 10	min.

Limiting Values

Tube current	$I_{q\,max}$	30	mA
	$I_{q\,min}$	5	mA
Parallel capacitor	$C_{p\,max}$	0.1[3])	μF
Switch-in current (max. 10 s)	$I_{L\,max}$	75	mA
Ambient temperature	$t_{amb\,max}$	+ 90	°C
	$t_{amb\,min}$	− 55	°C

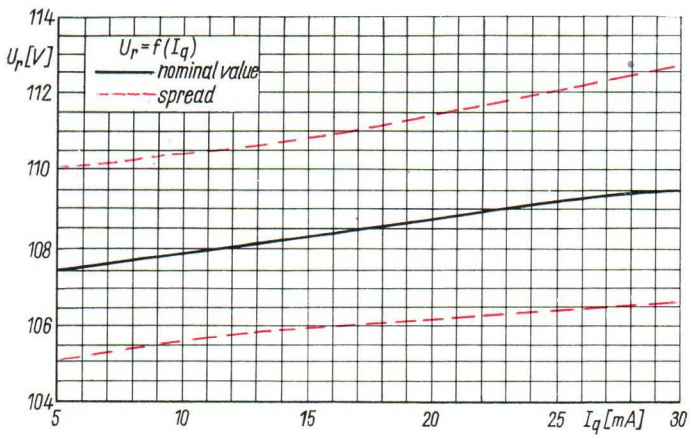
[1]) In complete darkness this value may be considerably higher.

[2]) Spread from tube to tube.

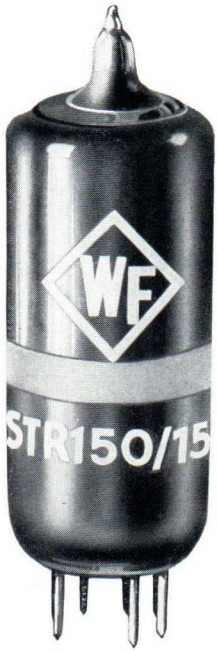
[3]) To prevent relaxation oscillations a capacitor connected in parallel should not exceed this value.

Tube complying with GDR Standard TGL No. 11529.

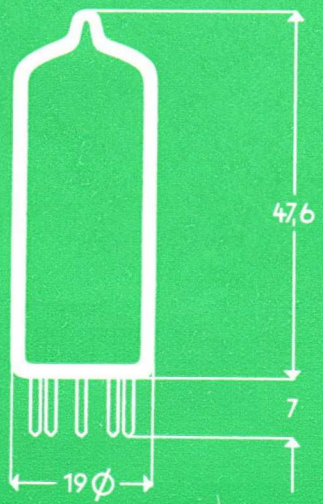
Running Voltage Characteristic



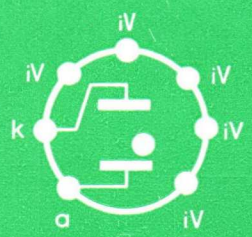
VOLTAGE STABILIZER
StR 150/15



Maximum outlines



Basing diagram



General Data

Type StR 150/15 is a miniature single-gap voltage stabilizer. It is designed to provide automatically a sensibly constant DC voltage. The tube corresponds to the types 150 B 2, QS 1200 and 6354.

Weight	approx. 7 grams
Base	7-pin miniature Manufacturer of the socket: VEB Elektro- und Radio-zubehör, Dorfhain (Sachsen) hard-paper socket: Ref. No. 0732.676 plastic-socket: Ref. No. 0732.677

SPECIFICATION

Characteristics

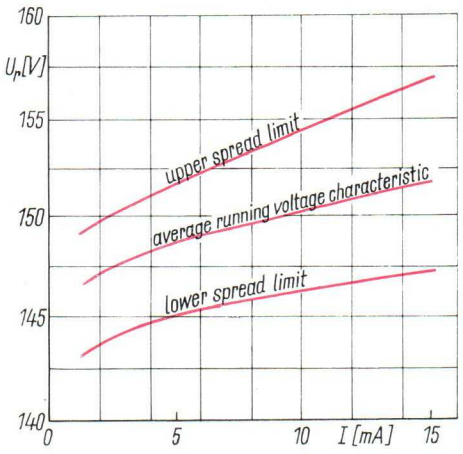
Striking voltage	U_{st}	≦ 180[1])	V
Running voltage	U_r	150	V
	$U_{r\ max}$	154[2])	V
	$U_{r\ min}$	146[2])	V
Running voltage drift during life	max	1	%
Tube current	I_q	10	mA
Running voltage drift (I_q = 5 to 15 mA)	$\triangle U_{r\ max}$	5	V
Internal resistance	R_i	approx. 250	Ω
Temperature coefficient of running voltage	αU_r	approx. 10mV/°C	
Starting time	t_{start}	≧ 3	min.

Limiting Values

Tube current	$I_{q\ max}$	15	mA
	$I_{q\ min}$	5	mA
Ambient temperature	$t_{amb\ max}$	+ 90	°C
	$t_{amb\ min}$	− 55	°C

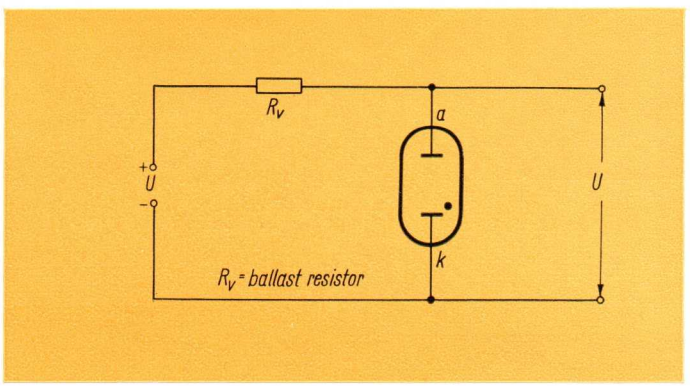
[1]) In complete darkness this value may be considerably higher.

[2]) Spread from tube to tube.

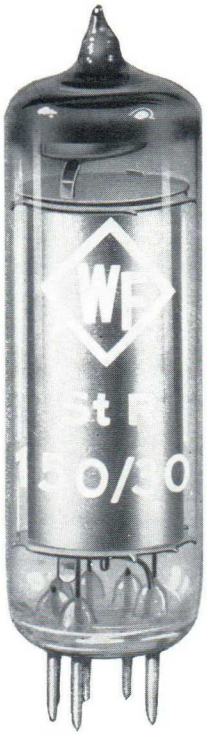


Running Voltage Characteristic

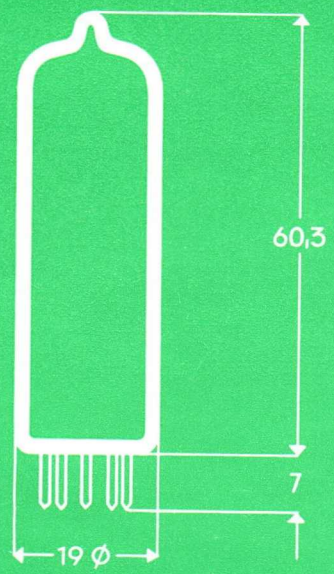
Operating Circuit



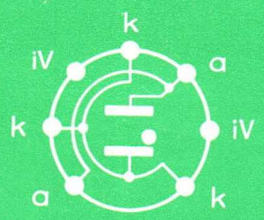
VOLTAGE STABILIZER
StR 150/30



Maximum outlines



Basing diagram



General Data

Type StR 150/30 is a single-gap voltage stabilizer. It is designed to provide automatically a sensibly constant DC voltage. This tube corresponds to the types STV 150/30, 150 C 2 and OA 2.

Weight	approx. 10 grams
Mounting position	any
Base	7-pin miniature
	Manufacturer of the socket: VEB Elektro- und Radiozubehör, Dorfhain (Sachsen) hard-paper socket: Ref. No. 0732.676 plastic socket: Ref. No. 0732.677

SPECIFICATION

Characteristics

Striking voltage	U_{st}	$\leqq$ 180[1])	V
Running voltage	U_r	150	V
	$U_{r\,max}$	158[2])	V
	$U_{r\,min}$	144[2])	V
Tube current	I_q	17.5	mA
Running voltage drift (I_q = 5 to 30 mA)	$\triangle U_{r\,max}$	4.5	V
Internal resistance	R_i	approx. 100	Ω
Starting time	t_{start}	$\geqq$ 10	min.

Limiting Values

Tube current	$I_{q\,max}$	30	mA
	$I_{q\,min}$	5	mA
Switch-in current (max. 10 s)	$I_{L\,max}$	75	mA
Parallel capacitor	$C_{p\,max}$	0.1[3])	μF
Ambient temperature	$t_{amb\,max}$	+ 90	°C
	$t_{amb\,min}$	− 55	°C

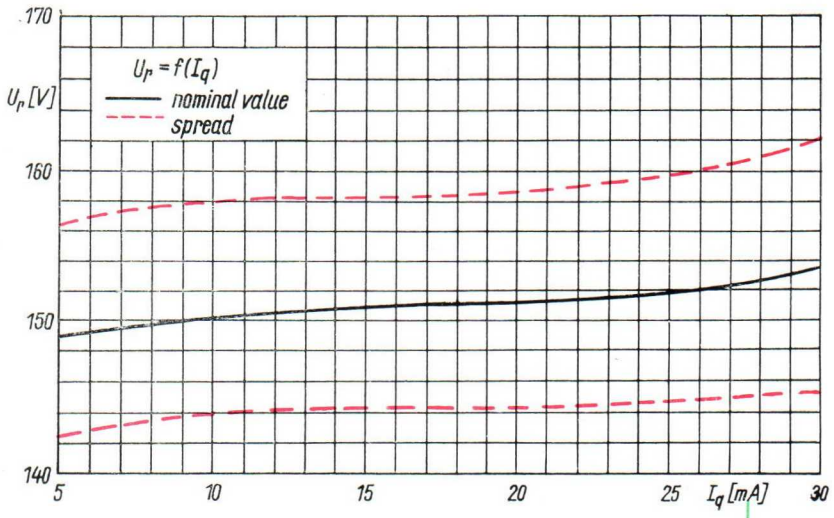
[1]) In complete darkness this value may be considerably higher.

[2]) Spread from tube to tube.

[3]) To prevent relaxation oscillations a capacitor connected in parallel should not exceed this value.

Tube complying with GDR Standard TGL No. 11526.

Running Voltage Characteristic



SURVEY OF TYPES

Thyratrons

EC 860 i II S 0,5/0,1 iV S 1,3/0,5 iV S 1,3/2 iV
S 1,3/10 dV S 1,3/30 dV S 1,3/30 dM S 1,5/40 dV
S 1,5/40 dM S 1,5/80 dV S 1,5/80 dM S 1,5/150 dM
S 15/5 d S 15/40 i S 3/35 i III S 8/90 i III S 16/325 i III

High-Voltage Rectifier Tubes

G 10/1 dV G 10/1 d G 10/4 d

Cold-Cathode Trigger Tubes

Z 660 W Z 860 X Z 861 X Z 862 E Z 5823

Voltage Stabilizer Tubes

StR 75/60 StR 85/10 StR 90/40 StR 100/80 StR 108/30
StR 150/15 StR 150/30

Dekatron Counting and Indicator Tubes

Z 562 S Z 563 C Z 560 M Z 561 M Z 565 M

Subject to Change Without further Notification

(204) Ag 071/078/64 1,5 6885