

Subminiature cold-cathode TRIGGER TUBE with positive starter voltage, chiefly intended for use in D.C. circuits. In order to obtain a short ignition delay time the tube is equipped with a priming cathode

TUBE DÉCLENCHÉUR à cathode froide subminiature avec tension de déclenchement positive, destiné tout d'abord à l'utilisation dans des circuits alimentés par C.C. Afin d'obtenir un temps de déclenchement court le tube est équipé d'une cathode auxiliaire (primer)

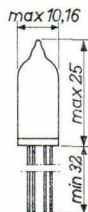
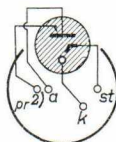
RELAISRÖHRE mit kalter Katode und positiver Starterspannung in Subminiaturtechnik, zur Verwendung in Gleichstromkreisen. Zur Erhaltung kurzer Auslösezeiten ist die Röhre mit einer Hilfskatode (Primer) versehen

Application: In counting and switching circuits and in timers. Obtainable counting speed: 2-5 kc/s, dependent upon the tolerances of the components and the stability of the supply voltage

Application: Dans des circuits de comptage et de commutation et dans des interrupteurs horaires. Vitesse de comptage réalisable: 2-5 kHz, dépendant des tolérances des éléments de montage et de la stabilité de la tension d'alimentation

Anwendung: In Zähl- und Schaltkreisen und in Zeitschaltern. Erhältliche Zählgeschwindigkeit: 2-5 kHz, abhängig von den Toleranzen der Schaltungsteile und von der Stabilität der Speisespannung

Dimensions in mm
Dimensions en mm
Abmessungen in mm



Base, culot, Sockel: SUBMINIATURE

Directly soldered connections to the leads of this tube must be at least 5 mm from the seals and any bending of the leads must be at least 2 mm from the seals

Ne pas faire de soudures à moins de 5 mm et ne pas plier les fils de sortie à moins de 2 mm de l'embase

Lötanschlüsse an den Drahtausführungen müssen mindestens 5 mm, etwaige Biegestellen mindestens 2 mm von den Glasdurchführungen entfernt sein

²⁾ pr = priming cathode; cathode auxiliaire; Hilfskatode

Typical characteristics (D.C. values; with priming discharge ignited; valid during life)

Caractéristiques types (Valeurs de tensions et de courants continus; décharge de la cathode auxiliaire amorcée; valables pendant toute la durée du tube)

Kenndaten (Gleichspannungs- und Gleichstromwerte; mit entzündeter Hilfskatodenentladung; gültig für die gesamte Lebensdauer)

$V_{st\ ign}$ ($V_a = 250\ V_{---}$) = 137-153 V ¹⁾

Temperature coefficient of $V_{st\ ign}$

Coefficient de température de $V_{st\ ign}$ = max. -25 mV/°C

Temperaturkoeffizient von $V_{st\ ign}$

$I_{st\ transf}$ ($V_a = 250\ V_{---}$) = max. 30 μA ²⁾

V_{st} = ³⁾

V_a ($I_a = 3\ mA$) = 111-121 V ⁴⁾

$V_a\ ign$ ($V_{st} = 0\ V$) { = 360 V ⁵⁾

= min. 325 V

$V_{pr-a\ ign}$ = max. 200 V

V_{pr-a} ($I_{pr} = 3\ \mu A$) = 155 V

I_k = 2-4 mA ⁶⁾

I_{pr} = 1-10 μA ⁶⁾

R_{pr} = 18 M Ω ⁶⁾

- ¹⁾ See fig. 1. The individual ignition voltage drift during life in normal applications is generally less than 3 V. When a tube is ignited for very long periods, drawing negative starter current a greater drift of the ignition voltage may occur. It is therefore advisable to design the circuit for this application for an ignition voltage of 175 V

Voir fig. 1. La déviation individuelle de la tension d'amorçage pendant la vie en applications normales est généralement moins de 3 V. Si un tube est amorcé pendant de très longues périodes à un courant négative de l'électrode d'amorçage, une déviation plus grande de la tension d'amorçage peut se présenter. Dans ce cas il est à conseiller d'étudier le circuit pour une tension d'amorçage de 175 V

Siehe Abb. 1. Der individuelle Verlauf der Zündspannung während der Lebensdauer bei normaler Verwendung ist im allgemeinen weniger als 3 V. Wenn aber eine Röhre während sehr langen Perioden bei negativem Starterstrom gezündet ist, kann gelegentlich ein grösserer Verlauf der Zündspannung auftreten. Es ist deshalb in diesem Falle zu raten die Schaltung für eine Zündspannung von 175 V zu entwickeln

- ²⁾ See fig. 2; voir fig. 2; siehe Abb. 2

- ³⁾ See fig. 3; voir fig. 3; siehe Abb. 3 } Page A,B
Seite A,B

- ⁴⁾ See fig. 4; voir fig. 4; siehe Abb. 4

- ⁵⁾ See page C; voir page C; siehe Seite C

- ⁶⁾ Recommended values; valeurs recommandées; empfohlene Werte

Subminiature cold cathode TRIGGER TUBE with priming cathode to eliminate breakdown delay. The tube has one starter, which is controlled by a positive potential. A red neon glow is emitted during conduction.

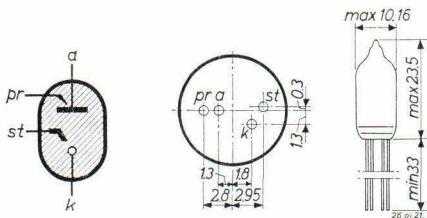
APPLICATION

Counters, scalars, etc. up to 5 kc/s
Logic circuit element in connection with photo-electric devices.
Pulse generators, pulse shapers, pulse amplifiers.
General relay services.
Timers.

QUICK REFERENCE DATA

Anode supply voltage	V_{ba}	=	250 V
Starter breakdown voltage	$V_{st\ ign}$	=	145 V
Starter transfer requirements			
capacitance	C_{st}	=	100 pF
current	I_{st}	=	11 μ A
Average cathode current	I_k	=	max. 5 mA
Anode to cathode maintaining voltage	V_{am}	=	116 V

Dimensions in mm



Tinned leads 0.43 mm diameter

MOUNTING

Directly soldered connections to the leads must be at least 5 mm from the seals and any bending of the leads must be at least 2 mm from the seals.

When soldering into the circuit the heat conducted to the glass-to-metal seals should be kept to a minimum by the use of a thermal shunt.

The leads may be dip soldered to min. 5 mm from the seals at a solder temperature of 240°C during max. 10 sec.

The starter and priming cathode circuit resistors and capacitors should be mounted close to the tube.

Touching the envelope by live components should be avoided. It is recommended to maintain a distance of at least some mm between components and any part of the envelope.

The tube may strike spontaneously when mounted in an electric field, the probability of striking being dependent on the field strength (direction and magnitude) and its rate of change. If necessary an electrostatic shield connected to the cathode can be mounted around the tube.

- 1) The value quoted relates to a tube which has been non-conducting during an appreciable time. The average value for the voltage breakdown depression is 4 V/mA. Normal values for $V_{a\text{ ign}}$ will be restored within 30 sec. after conduction.
- 2) Almost independent of the anode supply voltage between $V_{ba} = 200\text{ V}$ and 300 V . See also page C
- 3) Almost independent of the cathode current
- 4) When establishing the electrical characteristics of a large number of tubes, it will be found that for each characteristic at least 95 % of the tubes investigated will meet the figures quoted.
- 5) To determine the starter current in a particular application (sign and magnitude) a load-line for R_{st} can be drawn on the I_{st}/V_{st} characteristic. See example page A for $R_{st} = 1\text{ M}\Omega$ and $V_{bst} = -100\text{ V}$.

A. CHARACTERISTICS FOR D.C. IGNITION (with continuous priming discharge)

A.1 Limits applicable to all tubes (initial values)

Anode to cathode breakdown voltage at $V_{st} = 0$ V	$V_{a \text{ ign}} = \text{min.}$	340 V ¹⁾
Anode to primer breakdown voltage	$V_{pr \text{ ign}} = \text{max.}$	200 V
Starter to cathode breakdown voltage at $V_{ba} = 250$ V	$V_{st \text{ ign}} =$	137 to 153 V ²⁾
Anode to cathode maintaining voltage	$V_{am} =$	111 to 121 V ³⁾

A.2 Typical limits ⁴⁾ (initial values)

D.C. starter current for anode breakdown at $V_{ba}=250$ V (See also page B)	$I_{st} =$	3 to 25 μ A
Starter to cathode maintaining voltage at $I_{st} = 30$ μ A and $I_a = 0$ mA (See also page A)	$V_{stm} =$	105 to 125 V
Temperature coefficient of starter to cathode breakdown voltage averaged over the range $t_{bulb} = -55$ to $+100$ °C	$\frac{\Delta V_{st \text{ ign}}}{\Delta t_{bulb}} = \text{max.}$	-25 mV/°C

A.3 Typical life performance ⁴⁾

(Valid up to 20 000 hours with alternating stand-by and operating periods, within a cathode current range of 2 to 5 mA and with zero or positive starter current. See also page A and note ⁵⁾ for calculating the starter current)

Drift in starter to cathode breakdown voltage at $V_{ba} = 250$ V	$\Delta V_{st \text{ ign}} = \text{max.}$	5 V
Anode to cathode maintaining voltage	$V_{am} = \text{max.}$	122 V
Anode to primer maintaining voltage at $I_{pr} = 3$ μ A. (See also page E)	$V_{prm} =$	140 to 180 V
Starter to cathode maintaining voltage at $I_{pr} = 30$ μ A, $I_a = 0$ mA	$V_{stm} = \text{max.}$	128 V
D.C. starter current for anode breakdown at $V_{ba}=250$ V	$I_{st} = \text{max.}$	30 μ A

¹⁾²⁾³⁾⁴⁾⁵⁾ See page 2

B. CHARACTERISTICS FOR PULSED IGNITION (with continuous priming discharge)

B.1 Limits applicable to all tubes (initial values)

Anode to cathode breakdown voltage at $V_{st} = 0$ V $V_{a \text{ ign}} = \text{min. } 340 \text{ V } ^1)$

Anode to primer breakdown voltage $V_{pr \text{ ign}} = \text{max. } 200 \text{ V}$

Sum of bias and pulse voltages to ensure ignition at $V_{ba} = 250 \text{ V}$ and

$T_{imp} = 20 \text{ } \mu\text{sec}$
(See also page D)

$V_{st \text{ ignp}} = \text{max. } 172 \text{ V}$

Anode to cathode maintaining voltage $V_{am} = 111-121 \text{ V } ^6)$

B.2 Typical limits ⁴⁾ (initial values)

Temperature coefficient of starter to cathode breakdown voltage averaged over the range
 $t_{bulb} = -55 \text{ to } +100 \text{ } ^\circ\text{C}$

$\frac{\Delta V_{st \text{ ign}}}{\Delta t_{bulb}} = \text{max. } -25 \text{ mV}/^\circ\text{C}$

Anode breakdown delay time $= \text{max. } 5 \text{ } \mu\text{sec} ^7)$

Anode recovery time $= \text{max. } 170 \text{ } \mu\text{sec} ^8)$

B.3 Typical life performance ⁴⁾

(Valid up to 30 000 hours at stand-by or continuous operation within the limiting values)

Sum of bias and pulse voltages to ensure ignition $V_{st \text{ ignp}} = \text{see page D}$

Anode to cathode maintaining voltage $V_{am} = \text{max. } 122 \text{ V } ^6)$

¹⁾⁴⁾ See page 2

⁶⁾ Almost independent of cathode current. Within a time interval of max. 100 μsec after breakdown an abnormal low maintaining voltage may occur. Possible oscillations are excluded.

⁷⁾ The anode breakdown delay time is given under the following conditions: Starter overvoltage = 50 V, $R_{st} = 1.2 \text{ M}\Omega$, $C_{st} = 100 \text{ pF}$, $V_{ba} = 200 \text{ to } 300 \text{ V}$

⁸⁾ The anode recovery time is the time required after interruption of the anode current for the starter to regain control. The value is primarily a function of the anode current, as the extinguishing pulse amplitude as well as its duration both depend on the anode supply voltage. The figure quoted is the value of the time constant RC determining the rate of rise of the anode voltage

LIMITING VALUES (Absolute limits)

Anode supply voltage with
continuous priming discharge

with D.C. ignition

V_{ba} = max. 340 V ¹⁾
= min. 200 V

with pulsed ignition

V_{ba} = max. 310 V
= min. 200 V

Peak cathode current

(See also page F)

I_{kp} = max. 200 mA
= min. 2 mA

Average cathode current

(See also page F)

I_k = max. 5 mA²⁾
= min. 2 mA

Positive starter current

peak value

I_{stp} = max. 100 mA

average value

I_{st} = max. 5 mA²⁾

Negative starter current

with D.C. ignition

$-I_{st}$ = max. 10 μ A

with pulsed ignition, anode
to cathode gap conducting

$-I_{st}$ = max. 150 μ A

with pulsed ignition, anode
to cathode gap extinguished

$-I_{st}$ = max. 0 μ A

Negative starter pulse voltage

at $V_{ba} = 300$ V

$-V_{stp}$ = max. 30 V

at $V_{ba} = 200$ V

$-V_{stp}$ = max. 50 V

Anode to primer voltage

V_{a-pr} = min. 200 V

Primer current

I_{pr} = max. 12 μ A
= min. 1 μ A

Envelope temperature

t_{bulb} = max. 100 °C
= min. -55 °C

¹⁾ The tube may be used with the primer disconnected provided the priming current is delivered by the starter. In this case $V_{ba} = \text{min. } 180$ V

²⁾ Averaging time $T_{av} = \text{max. } 5$ sec or = max. 1 cycle, whichever is the shortest

MAXIMUM CIRCUIT VALUES (Absolute limits)

Starter series resistor	R_{st}	= max.	20 M Ω
Starter to cathode capacitor	C_{st-k}	= max.	2000 pF ¹⁾
Starter coupling capacitor	C_{st}	= max. 2000 pF ¹⁾ = min.	20 pF
Capacitor which may be charged or discharged through the anode to cathode gap	C	= max.	0.01 μ F ¹⁾

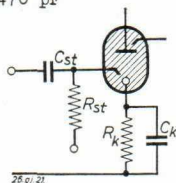
TYPICAL COMPONENT VALUES FOR SELF-QUENCHING PULSE FORMING CIRCUITS

The minimum time constant of a self-quenching circuit is 250 μ sec. The time constant is the product of the parallel resistance of R_{st} and R_k and C_k

Typical values for R_k and C_k at $R_{st} = 1.2$ M Ω are:

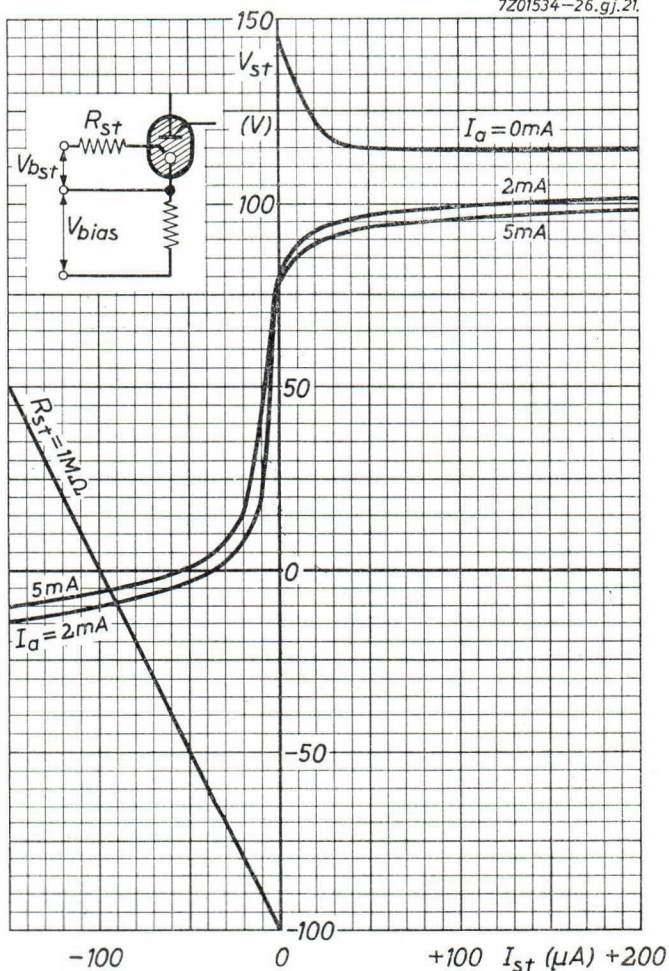
$$R_k = 1.8 \quad 1.2 \text{ M}\Omega$$

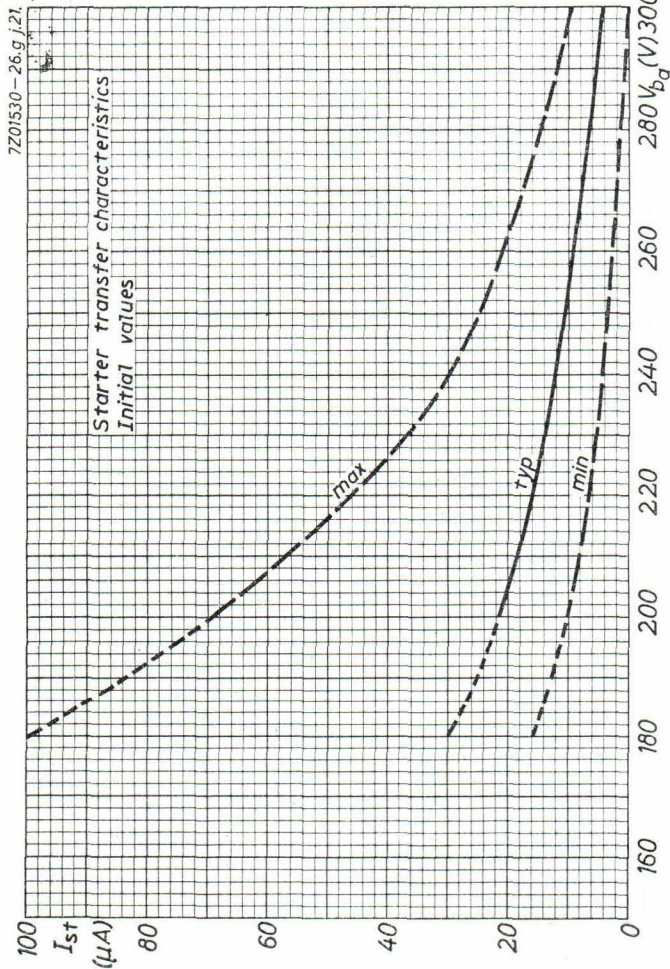
$$C_k = 330 \quad 470 \text{ pF}$$



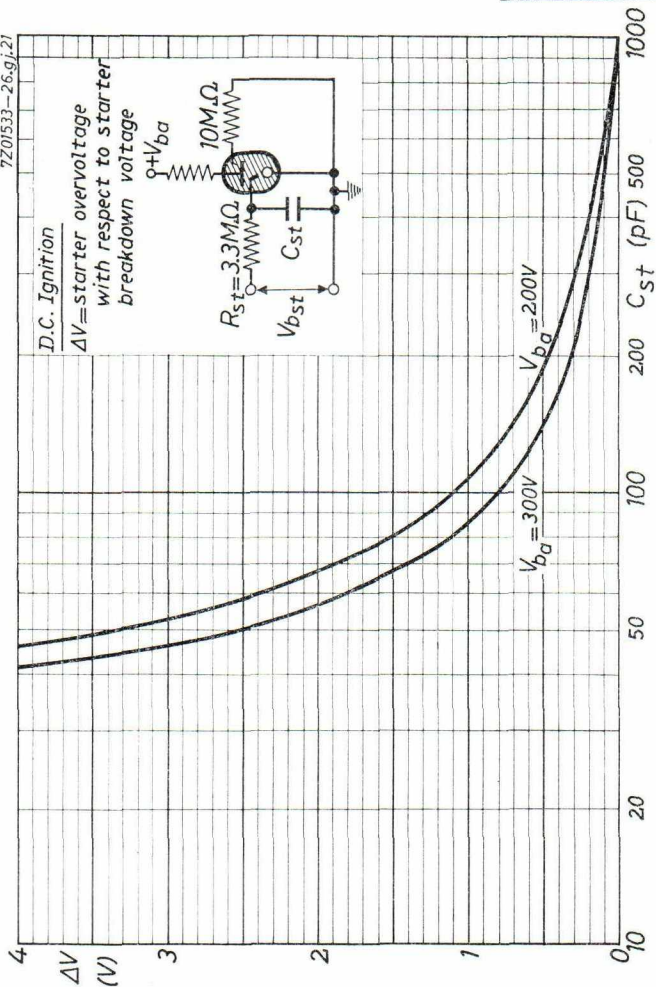
¹⁾ Higher values of these capacitors are permitted with the use of a resistor in series to limit the peak current to the max. permissible value.

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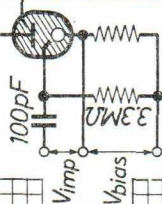
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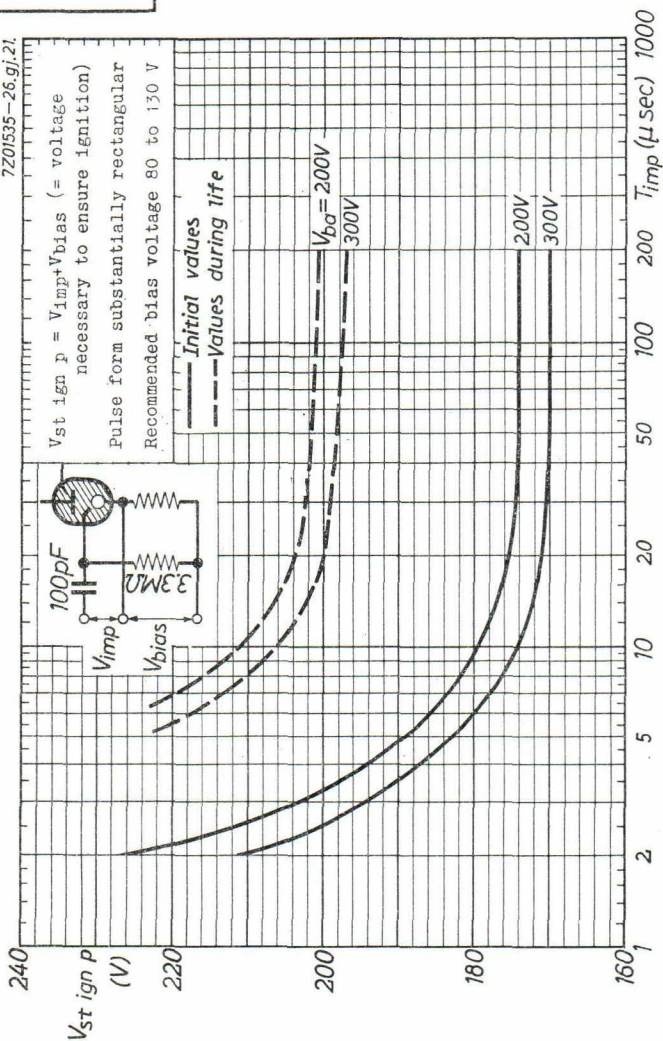
Z70U**PHILIPS**

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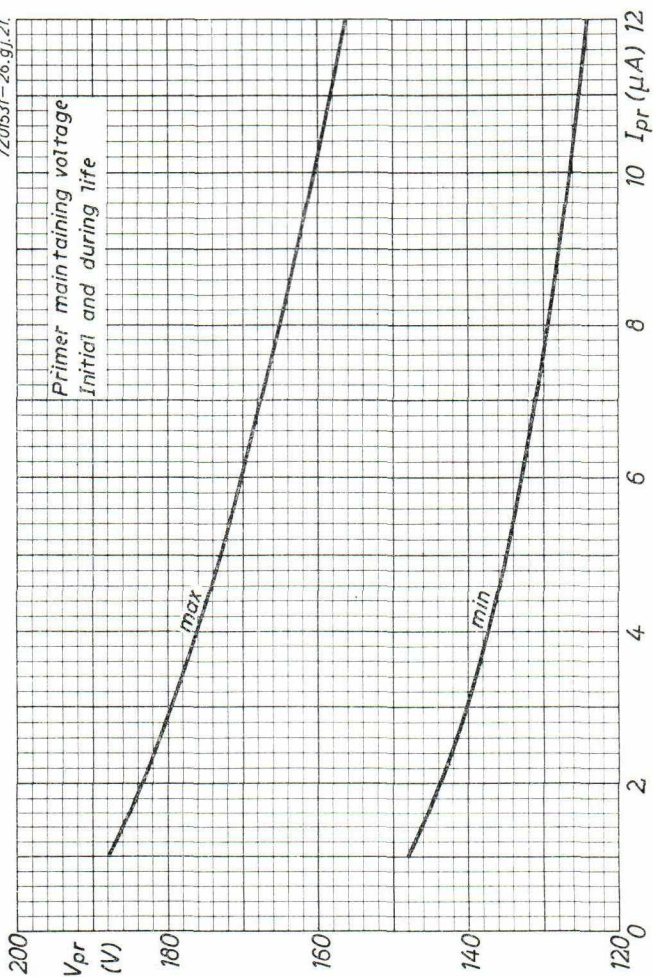
$V_{st\ ign\ p} = V_{imp} + V_{bias}$ (= voltage necessary to ensure ignition)
Pulse form substantially rectangular
Recommended bias voltage 80 to 130 V



— Initial values
--- Values during life

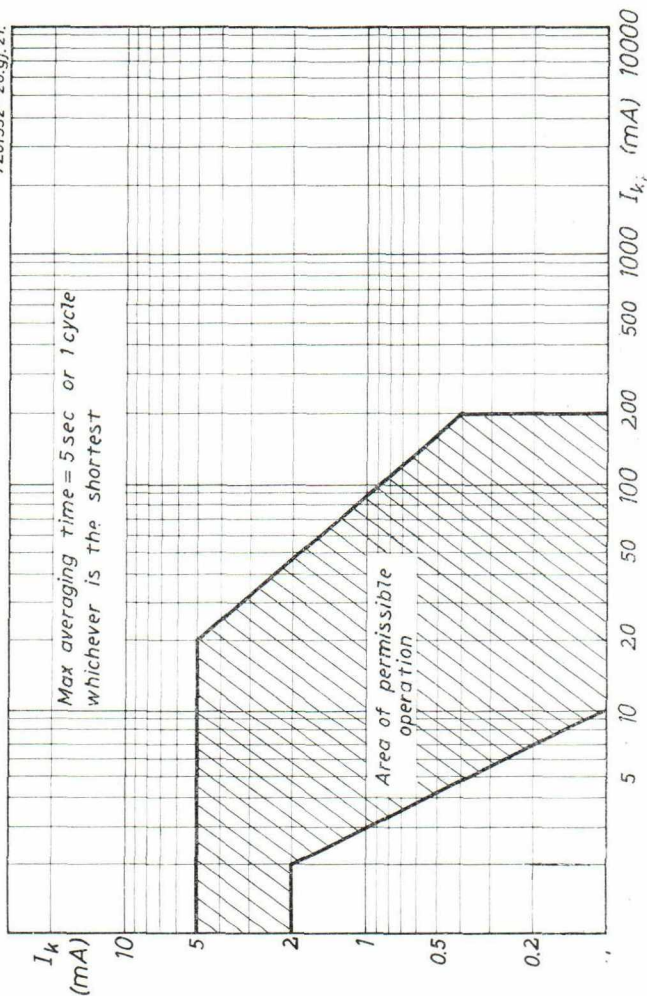


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