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QBL3.5/2000

CERAMIC, COAXIAL POWER TETRODE with integral radiator intended for use as U.H.F. amplifier or oscillator at frequencies up to 1000 Mc/s. The coaxial arrangement of the terminals enables the tube to be used as plug in tube in coaxial circuits

TETRODE DE PUISSANCE AVEC ENVELOPPE CERAMIQUE, radiateur incorporé et arrangement coaxial des connexions des électrodes pour utilisation comme amplificatrice ou oscillatrice U.H.F. jusqu'à 1000 MHz. Par suite de l'arrangement coaxial des connexions des électrodes le tube peut être inséré facilement dans les circuits coaxials

PRESSLUFTGEKÜHLTE LEISTUNGSTETRODE MIT KERAMISCHER UMHÜLLUNG und koaxialer Anordnung der Elektrodenanschlüsse zur Verwendung als UHF-Verstärker oder Oszillator bis zu 1000 MHz. Die koaxiale Anordnung der Elektrodenanschlüsse ermöglicht ein bequemes Einstecken der Röhre in die zugehörigen koaxialen Stromkreise

Filament : thoriated tungsten
Filament : tungstène thorié
Glühfaden: thoriertes Wolfram

Heating : direct
Chauffage: direct
Heizung : direkt

V_f = 4 V
I_f = 60 A

After the circuit has been adjusted for proper tube operation, the filament voltage should be reduced to a value slightly above that at which performance is affected. H.F. voltages on the filament should be avoided

Après le réglage du circuit pour le meilleur fonctionnement du tube, la tension de chauffage doit être diminuée jusqu'à une valeur un peu plus haute que celle à laquelle le fonctionnement est nui. Il faut prévenir des tensions H.F. au filament

Nachdem die Schaltung auf optimale Wirkung der Röhre eingestellt ist, muss die Heizspannung so weit verringert werden, dass die richtige Wirkung grade nicht beeinträchtigt wird. HF-Spannungen auf dem Glühfaden sollen vermieden werden.

Typical characteristics
Caractéristiques types
Kenndaten

V_a = 3000 V
V_{g_2} = 500 V
I_a = 0,48 A
S = 20 mA/V
$\mu_{g_2g_1}$ = 9

Freq.	C telegr.	
Mc/s	V_{a-g_1} (kV)	W_o (W)
600	3,11	2070
900	3,11	1500

CERAMIC, COAXIAL, FORCED AIR COOLED POWER TETRODE with integral radiator for use as U.H.F. amplifier or oscillator at frequencies up to 1000 Mc/s. The coaxial arrangement of the terminals enables the tube to be used as plug in tube in coaxial circuits.

FILAMENT: thoriated tungsten

HEATING:: direct

Filament voltage	V_f	=	4 V
Filament current	I_f	=	60 A
Filament surge current	I_{fsurge}	=	max.150 A ←

After the circuit has been adjusted for proper tube operation, the filament voltage should be reduced to a value slightly above that at which performance is affected. H.F. voltages on the filament should be avoided.

TYPICAL CHARACTERISTICS

Anode voltage	V_a	=	3000 V
Grid No.2 voltage	V_{g_2}	=	500 V
Anode current	I_a	=	0.48 A
Mutual conductance	S	=	20 mA/V
Amplification factor of grid No.2 with respect to grid No.1	$\mu_{g_2g_1}$	=	9

Freq. (Mc/s)	C telegr.	
	V_{a-g_1} (kV)	W_o(W) [1]
800	4.31	2100

←

Freq. (Mc/s)	Television service Neg.mod. Pos.synchr.		
	V_{a-g_1} (kV)	W_o sync [1] (W)	W_o black [1] (W)
800	4.32	2200	1300

←

CAPACITANCES

Grounded cathode

Grid No.1 to all other electrodes except anode	C_{g_1}	=	46 pF
Anode to all other electrodes except grid No.1	C_a	=	6.0 pF
Anode to grid No.1	C_{ag_1}	=	0.15 pF

[1]) Useful power in the load

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Capacitances
Capacités
Kapazitäten

Grounded cathode Cathode mise à la terre Katodenbasisschaltung	Grounded g_1 and g_2 g_1 et g_2 mise à la terre Gitterbasisschaltung (g_1 und g_2 geerdet)
C_{ag_1} = 0,15 pF	C_{ag_2} = 7 pF
C_a = 6,0 pF	C_{af} = 0,02 pF
C_{g_1} = 46 pF	C_{g_1f} = 20 pF

Temperatures and cooling
Températures et refroidissement
Temperaturen und Kühlung

Temperature of envelope
Température de l'enveloppe = max. 200 °C
Temperatur der Umhüllung

Forced air cooling will be required for the radiator and for the ceramic to metal seals. The distribution of the cooling air will vary with the cavity configuration around the tube
Ventilation forcée sera nécessaire pour le radiateur et pour les scellements entre les parties céramiques et métalliques. La distribution de l'air de refroidissement se changera avec la configuration des cavités autour du tube.
Pressluftkühlung ist erforderlich für den Radiator und für die Anschmelzungen zwischen den keramischen und metallenen Teilen. Die Verteilung des Luftstromes hängt von der Anordnung der Hohlräume um die Röhre ab

Air cooling characteristics for the anode radiator (For air duct see page 4)
Caractéristiques de refroidissement par air du radiateur anodique (Pour la conduite d'air voir page 4)
Luftkühlungsdaten des Anodenradiators (Für die Luftleitung siehe Seite 4)

W_a (W)	h (m)	t_i (°C)	q_{min} (m^3/min)	p_i (mm H_2O)
800	0	35	1,4	16
	0	45	1,6	20
	1500	35	1,65	19
	3000	25	1,7	18
1200	0	35	1,9	29
	0	45	2,2	38
	1500	35	2,25	35
	3000	25	2,35	34

CAPACITANCES (continued)

Grounded grids No. 1 and 2

Anode to grid No.2	C_{ag_2} = 7 pF
Grid No.1 to filament	C_{g_1f} = 20 pF
Anode to filament	C_{af} = 0.02 pF

→ TEMPERATURE LIMITS AND COOLING

Temperature of all seals = max. 200 °C

Anode temperature = max. 180 °C

For the measurement of the anode temperature see note 4) page 3.

Cooling data for the anode radiator

For recommended cooling arrangement see page 4

Anode dissipation W_a (W)	Height h (m)	Max.air inlet temp. t_i (°C)	Min. air flow q (m^3/min.)	Pressure p_i (mm H_2O)
1500	0	45	3.2	75

Remarks

Forced air cooling for the radiator and for the ceramic to metal seals will be required before and during the application of any voltage. After switching off voltages the cooling must be maintained for at least two minutes. The distribution of the cooling air will vary with the cavity configuration around the tube.

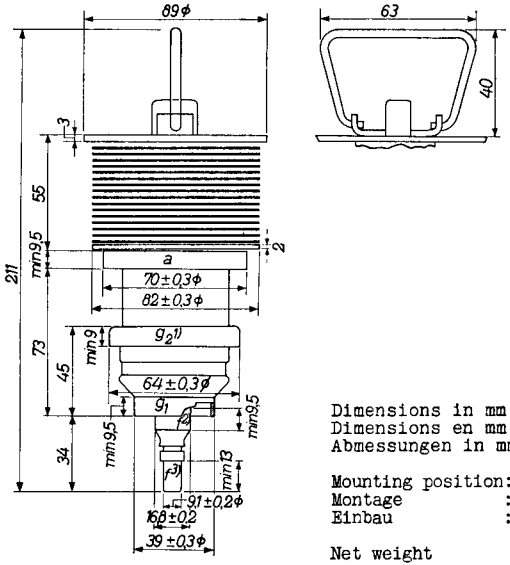
The grids and anode connections should be preferably made of contact finger stock. The fingers shall make good electrical contact with the cylindrical planes of the electrode connections. In order to avoid local temperature differences along the circumference of the seals especially at the higher frequencies the contacts shall secure a good and uniform heat conduction.

The filament connections shall provide for good electrical contacts and sufficient heat conduction.

Slots of sufficient width should be provided between the finger contacts to allow for passing of the cooling air.

The amount and temperature of the cooling air shall be watched during operation. If the amount of cooling air decreases below the specified value all voltages shall be switched off automatically.

The cooling air shall be filtered to prevent the radiator from being choked.



Dimensions in mm
Dimensions en mm
Abmessungen in mm

Mounting position: vertical
Montage : vertical
Einbau : senkrecht

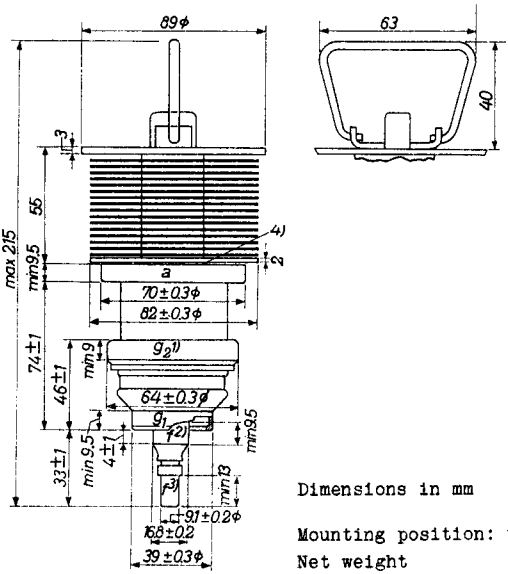
Net weight
Poids net 1900 g
Nettogewicht

---

1) Max. eccentricity with respect to the axis a-g_1 0.3 mm
Excentricité par rapport à l'axe a-g_1 0,3 mm au max.
Exzentrizität in bezug auf die Achse a-g_1 max. 0,3 mm

2) Max. eccentricity with respect to the axis a-g_1 0.4 mm
Excentricité par rapport à l'axe a-g_1 0,4 mm au max.
Exzentrizität in bezug auf die Achse a-g_1 max. 0,4 mm

3) Max. eccentricity with respect to the axis a-g_1 0.8 mm
Excentricité par rapport à l'axe a-g_1 0,8 mm au max.
Exzentrizität in bezug auf die Achse a-g_1 max. 0,8 mm



Dimensions in mm

Mounting position: vertical

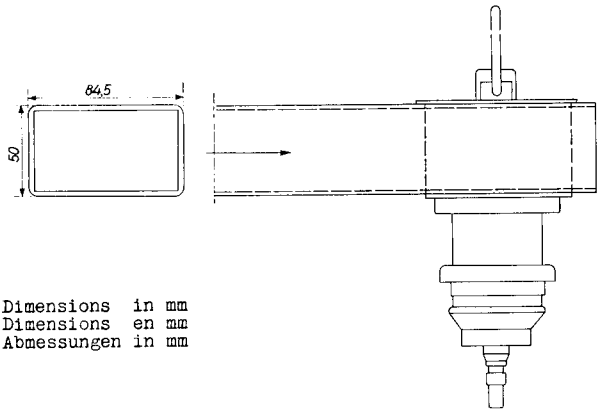
Net weight 1900 g

1) Eccentricity with respect to the axis through anode and grid No.1 max. 0.3 mm

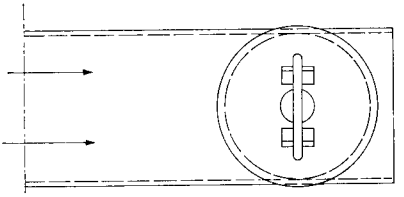
2) Cathode return terminal. Eccentricity with respect to the axis through anode and grid No.1 max. 0.4 mm

3) Eccentricity with respect to the axis through anode and grid No.1 max. 0.8 mm

4) Point for anode temperature measurement



Dimensions in mm
Dimensions en mm
Abmessungen in mm



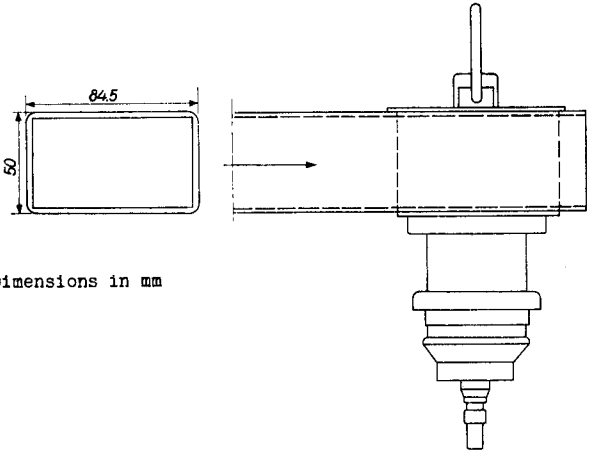
[1]) A tunable coaxial circuit is built between g_1 and g_2 which introduces a variable capacitive reactance between g_1 and g_2. The results are a better efficiency and negligible regeneration from anode to cathode

Un circuit coaxial syntonisable est monté entre g_1 et g_2 ce qui introduit une réactance capacitive variable entre g_1 et g_2. Les résultats sont un meilleur rendement et une régénération négligeable de l'anode vers la cathode

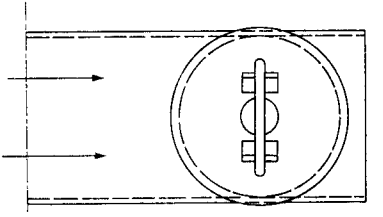
Ein abstimmbarer Koaxialkreis ist zwischen g_1 und g_2 montiert, was eine veränderliche, kapazitive Reaktanz zwischen g_1 und g_2 ergibt. Hierdurch werden ein besserer Wirkungsgrad und eine vernachlässigbare Rückwirkung von Anode nach Katode erhalten

[2]) Driver output power
Puissance de sortie de l'étage pré-amplificateur
Ausgangsleistung der Treiberstufe

Recommended cooling arrangement



Dimensions in mm



U.H.F. power amplifier, class C telegraphy, cathode driven
Amplificateur de puissance U.H.F., class C télégraphie, à commande par cathode [1)]
UHF-Leistungsverstärker, Klasse C Telegraphie, mit Katodensteuerung

Voltages with respect to g_1
Les tensions par rapport à g_1
Spannungen in bezug auf g_1

Limiting values (Absolute limits)
Caractéristiques limites (Limites absolues)
Grenzdaten (Absolute Grenzwerte)

f = max. 900 Mc/s

V_a	= max.	3500	V	W_{g_2}	= max.	50	W
W_a	= max.	1200	W	I_{g_2}	= max.	75	mA
I_a	= max.	0,95	A	I_{g_1}	= max.	100	mA
V_{g_2}	= max.	700	V	V_k	= max.	300	V

Operating conditions
Caractéristiques d'utilisation
Betriebsdaten

f	= 600	900	Mc/s
V_a	= 3110	3110	V
V_{g_2}	= 610	610	V
V_k	= 110	110	V
I_a	= 0,9	0,8	A
I_{g_2}	= 0,02	0,02	A
I_{g_1}	= 0,06	0,06	A
W_i	= 170	200	W [2)]
W_a	= 770	1040	W
W_o	= 2070	1500	W [3)]
W_ℓ	= 1760	1280	W [4)]
W_o/W_i	= 12	7,5	

1)2) See page 4; voir page 4; siehe Seite 4

3) Power transferred from the driver stage included
Y compris la puissance transmise de l'étage pré-amplificateur
Einschliesslich der von der Treiberstufe übertragenen Leistung

4) Useful power in the load, measured in a circuit having an efficiency of 85%
Puissance utile dans la charge, mesurée dans un circuit avec un rendement de 85%
Nutzleistung in der Belastung, gemessen in einer Schaltung mit einem Wirkungsgrad von 85%

U.H.F. power amplifier, class C telegraphy; cathode driven

A tunable coaxial circuit is built between grids No.1 and 2 which introduces a variable capacitive reactance between these grids. The results of this arrangement are better efficiency and negligible regeneration from anode to cathode

The reference point for the electrode voltages is the terminal of grid No.1

→ LIMITING VALUES (Absolute limits)

Frequency	f	up to	900 Mc/s
Anode voltage	V_{a-g_1}	= max. 4500	V
Anode dissipation	W_a	= max. 1500	W
Input power	W_{ia}	= max. 3800	W
Anode current	I_a	= max. 0.9	A
Grid No.2 voltage	$V_{g_2-g_1}$	= max. 700	V
Grid No.2 dissipation	W_{g_2}	= max. 50	W
Grid No.2 current	I_{g_2}	= max. 75	mA
Grid No.1 current	I_{g_1}	= max. 100	mA
Cathode voltage	V_{k-g_1}	= max. 300	V

→ OPERATING CONDITIONS

Frequency	f	= 800	Mc/s
Anode voltage	V_{a-g_1}	= 4310	V
Grid No.2 voltage	V_{g2-g_1}	= 600	V
Cathode voltage	V_{k-g_1}	= 110	V
Anode current	I_a	= 0.85	A
Grid No.2 current	I_{g_2}	= 28	mA
Grid No.1 current	I_{g_1}	= 50	mA
Driver output power	W_{dr}	= 180	W
Useful power in load	W_ℓ	= 2100	W [1]
Power gain	W_ℓ/W_{dr}	= 12	

[1]) Typical value, measured in a circuit having an efficiency of approximately 85%

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U.H.F. class C amplifier for television service, cathode modulated, cathode driven; negative modulation, positive synchronisation [1)]
Amplificateur U.H.F. classe C pour service de télévision, modulation cathodique et commande cathodique; modulation négative, synchronisation positive
UHF-Klasse C-Verstärker für Fernsehbetrieb mit Katodenmodulation und Katodensteuerung; negative modulation, positive Synchronisierung

Voltages with respect to g_1
Les tensions par rapport à g_1
Spannungen in bezug auf g_1

Limiting values (Absolute limits)
Caractéristiques limites (Limites absolues)
Grenzdaten (Absolute Grenzwerte)

f	= max. 900 Mc/s		
V_a	= max. 3700 V	W_{g_2}	= max. 50 W
W_a	= max. 1200 W	I_{g_2} sync	= max. 75 mA
I_a sync	= max. 0,95 A	I_{g_1} sync	= max. 0,1 A
V_{g_2} sync	= max. 700 V	V_k	= max. 500 V

Operating conditions
Caractéristiques d'utilisation
Betriebsdaten

f	= 800	Mc/s
B (-3 db)	= 6	Mc/s
V_a	= 3610	V
V_{g2}	= 610	V
V_k sync	= 110	V
V_k black, noir, schwarz	= 210	V
V_k white, blanc, weiss	= 380	V
I_a sync	= 0,9	A
I_a black, noir, schwarz	= 0,6	A
I_{g_2} sync	= 15	mA
I_{g_2} black, noir, schwarz	= 6	mA
I_{g_1} sync	= 50	mA
I_{g_1} black, noir, schwarz	= 20	mA
W_i sync	= 180	W
W_o sync	= 2000	W
W_o black, noir, schwarz	= 1120	W

[1)] See page 4; voir page 4; siehe Seite 4.

U.H.F. class C amplifier for television service, grid modulated, cathode driven; negative modulation, positive synchronisation

A tunable coaxial circuit is built between grids No.1 and 2 which introduces a variable capacitive reactance between these grids. The results of this arrangement are better efficiency and negligible regeneration from anode to cathode

The reference point for the electrode voltages is the terminal of grid No.1

LIMITING VALUES (Absolute limits)

		f up to 900 Mc/s		
Frequency				
Anode voltage		V_{a-g_1}	= max.	4500 V
Anode dissipation		W_a	= max.	1500 W
Input power		W_{i_a}	= max.	4000 W
Anode current		I_a sync	= max.	0.95 A
Grid No.2 voltage		$V_{g_2-g_1}$ sync	= max.	700 V
Grid No.2 dissipation		W_{g_2}	= max.	50 W
Grid No.2 current		I_{g_2} sync	= max.	75 mA
Grid No.1 current		I_{g_1} sync	= max.	100 mA
Cathode voltage		V_{k-g_1}	= max.	500 V

OPERATING CONDITIONS

Frequency		f	=	800 Mc/s
Bandwidth at -3 dB		B(-3 dB)	=	6 Mc/s
Anode voltage		V_{a-g_1}	=	4320 V
Grid No.2 voltage		$V_{g_2-g_1}$	=	600 V
Cathode voltage	sync	V_{k-g_1}sync	=	120 V
	black	V_{k-g_1}black	=	175 V
	white	V_{k-g_1}white	=	345 V
Anode current	sync	I_a sync	=	0.9 A
	black	I_a black	=	0.68 A
Grid No.2 current	sync	I_{g_2} sync	=	15 mA
	black	I_{g_2} black	=	5 mA
Grid No.1 current	sync	I_{g_1} sync	=	50 mA
	black	I_{g_1} black	=	35 mA
Driver output power		W_{dr} sync	=	220 W
Useful power in load	sync	W_ℓ sync	=	2200 W [1]
	black	W_ℓ black	=	1300 W [1]
Power gain		W_ℓ / W_{dr}	=	10

1) Typical value, measured in a circuit having an efficiency of approximately 85 %

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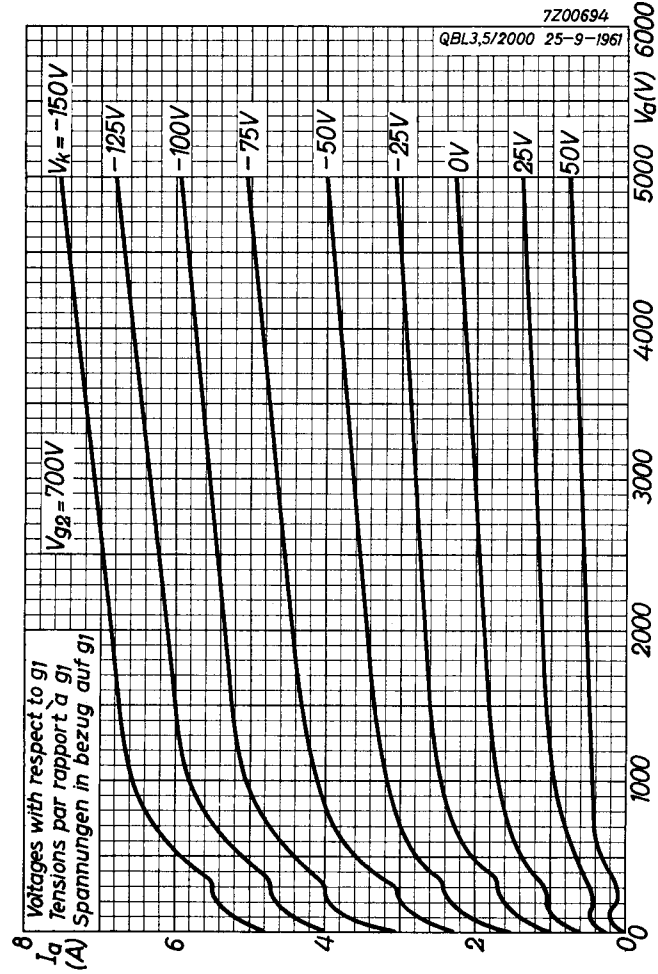

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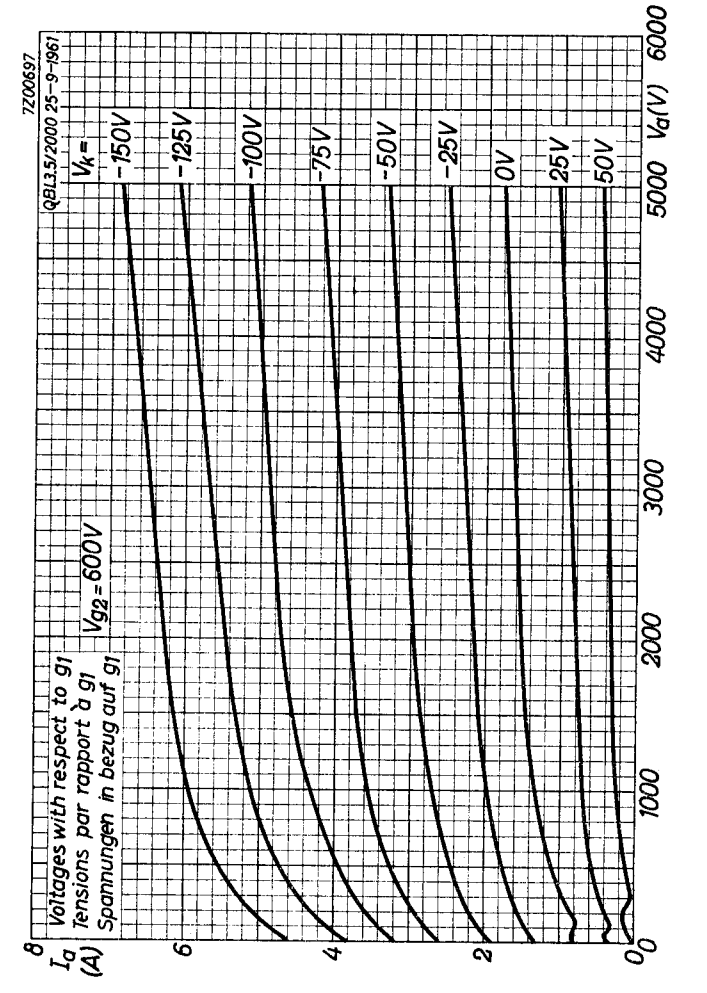
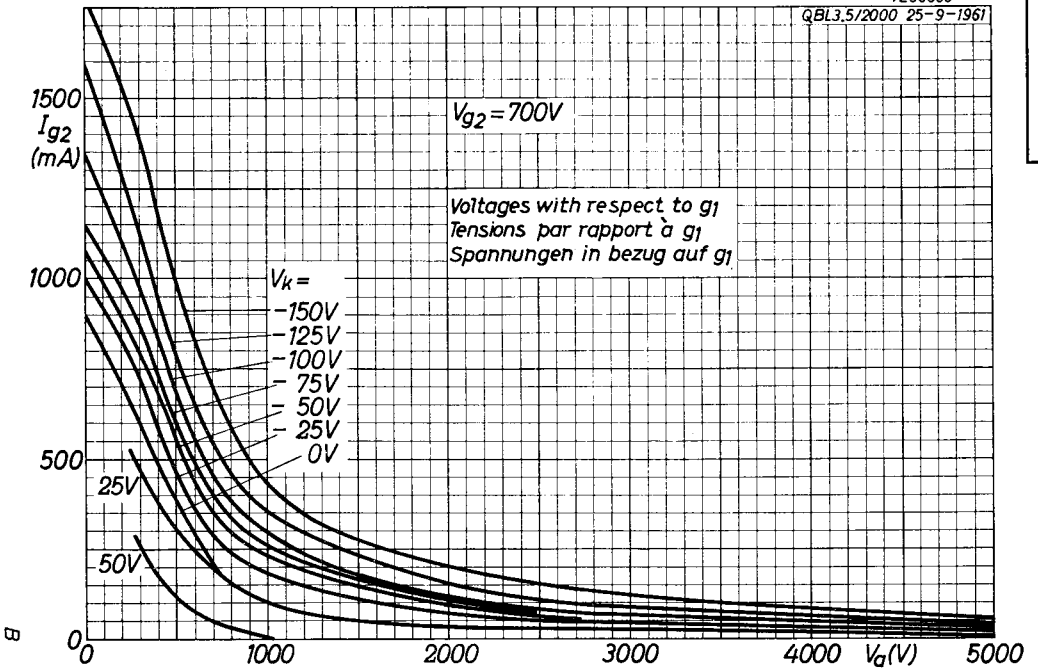

7Z00697
QBL3.5/2000 25-9-1961
Voltages with respect to g1
Tensions par rapport à g1
Spannungen in bezug auf g1
V_{g2} = 600V
V_k =
-150V
-125V
-100V
-75V
-50V
-25V
0V
25V
50V
I_a (A)
8
6
4
2
0
0
1000
2000
3000
4000
5000
6000
V_a(V)

7Z00699
QBL3.5/2000 25-9-1961



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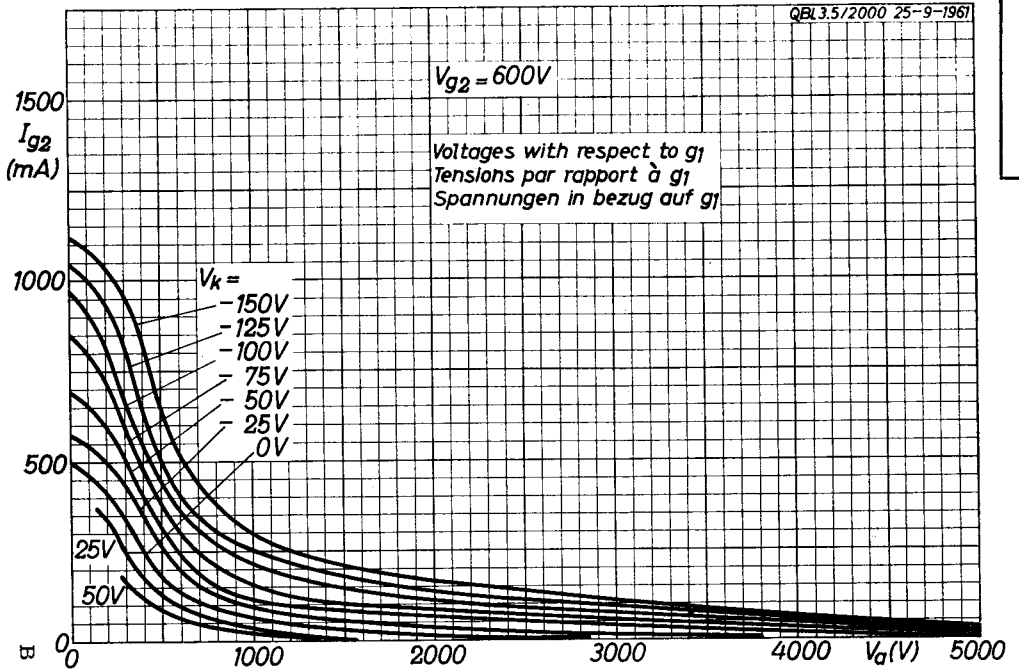
$V_{g2} = 600V$
Voltages with respect to g_1
Tensions par rapport à g_1
Spannungen in bezug auf g_1
V_k =
−150V
−125V
−100V
− 75V
− 50V
− 25V
0V
25V
50V
I_{g2} (mA)
1500
1000
500
0
0
1000
2000
3000
4000
V_a(V)
5000

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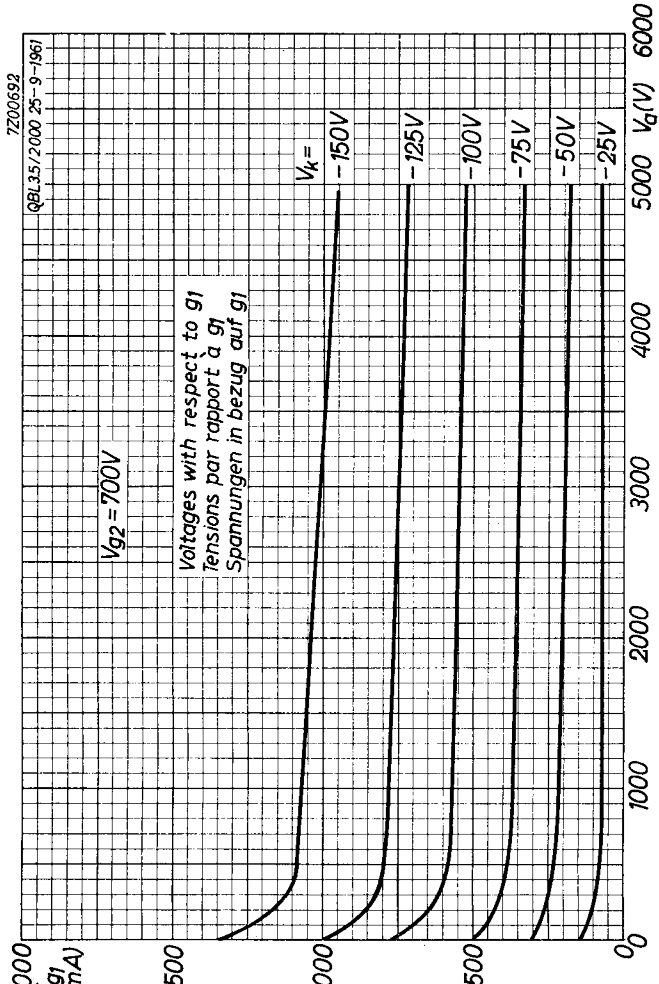
7Z00692
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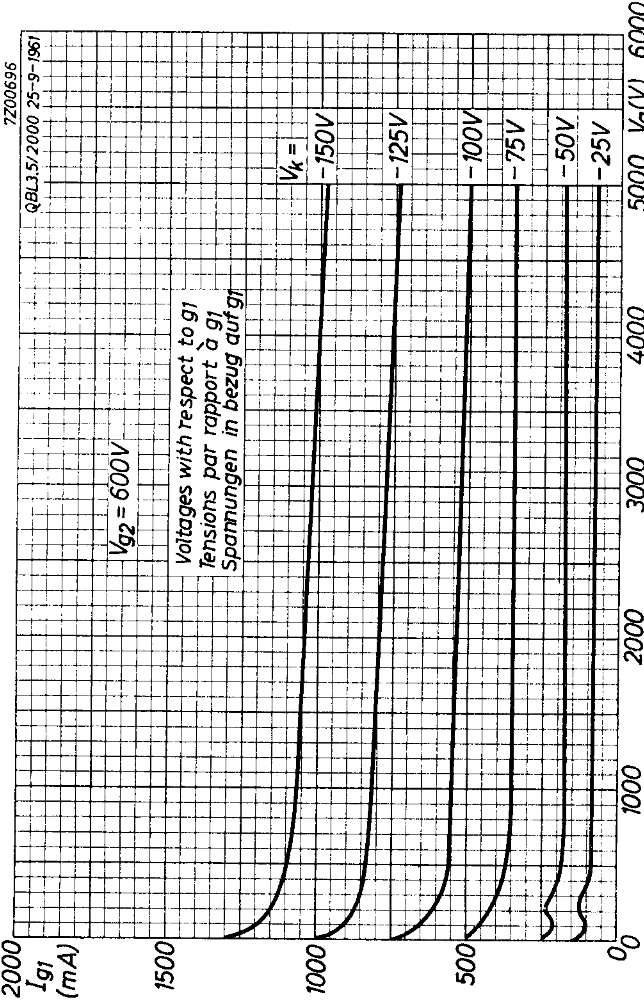
V_{g2}=700V
Voltages with respect to g_1
Tensions par rapport à g_1
Spannungen in bezug auf g_1
V_k=
-150V
-125V
-100V
-75V
-50V
-25V
V_a(V)
6000
5000
4000
3000
2000
1000
0
2000
1500
1000
500
0
I_{g1} (mA)


7Z00696
QBL3.5/2000 25-9-1961
V_k =
-150V
-125V
-100V
-75V
-50V
-25V
V_a(V)
0
1000
2000
3000
4000
5000
6000
V_{g2} = 600V
Voltages with respect to g_1
Tensions par rapport à g_1
Spannungen in bezug auf g_1
I_{g1} (mA)
2000
1500
1000
500
0

QBL3.5/2000

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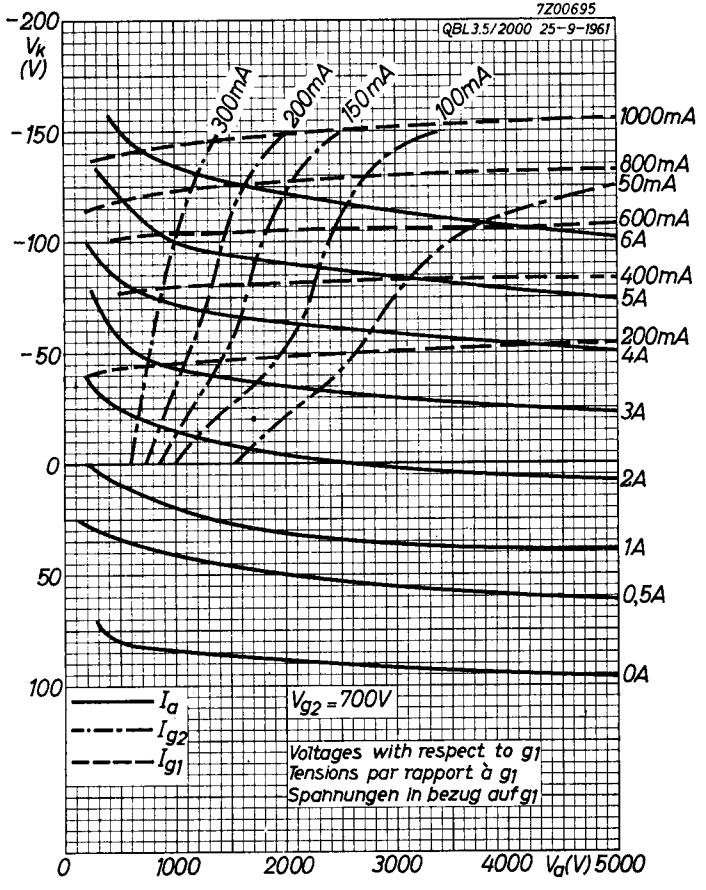

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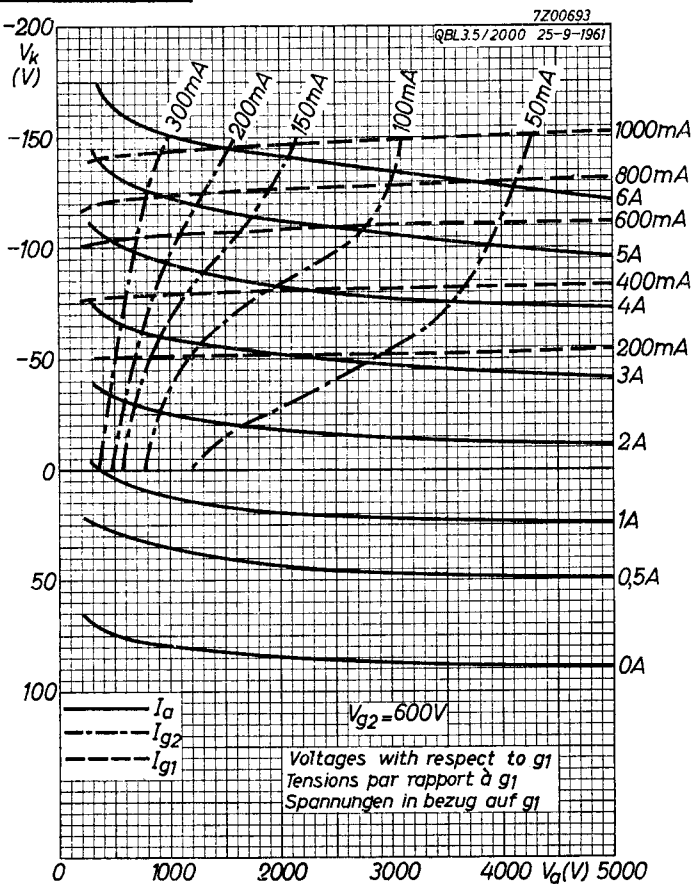
QBL3.5/2000 **PHILIPS**



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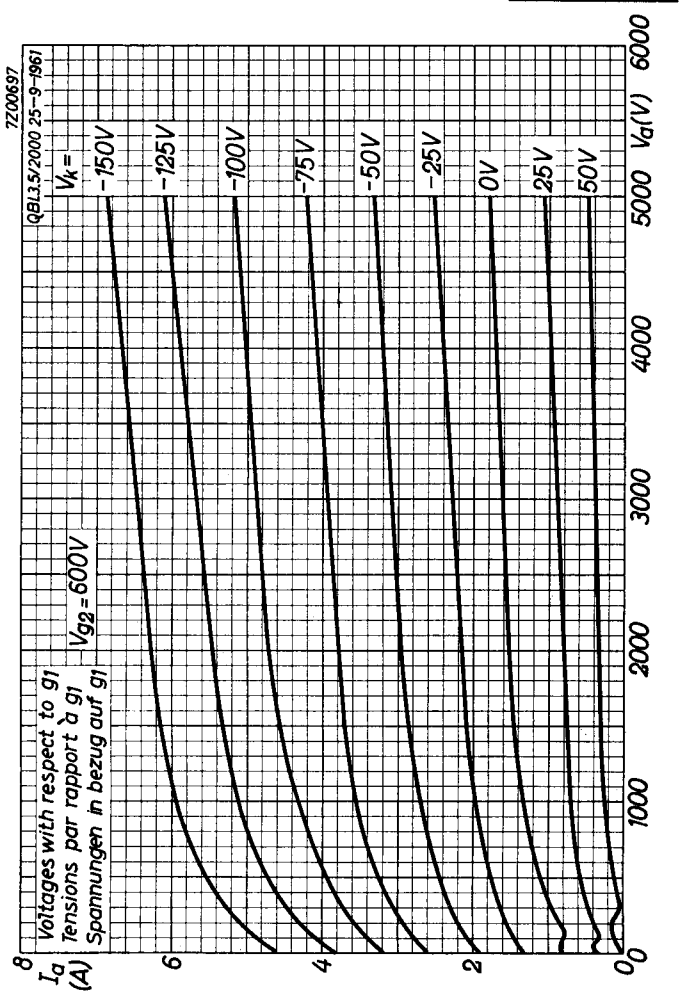
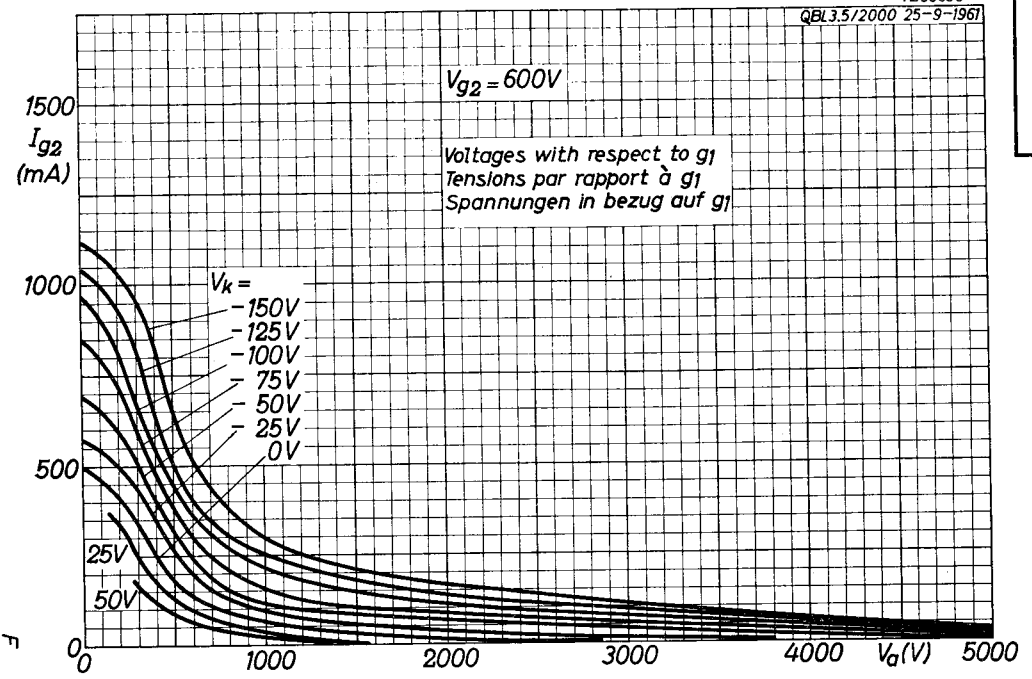
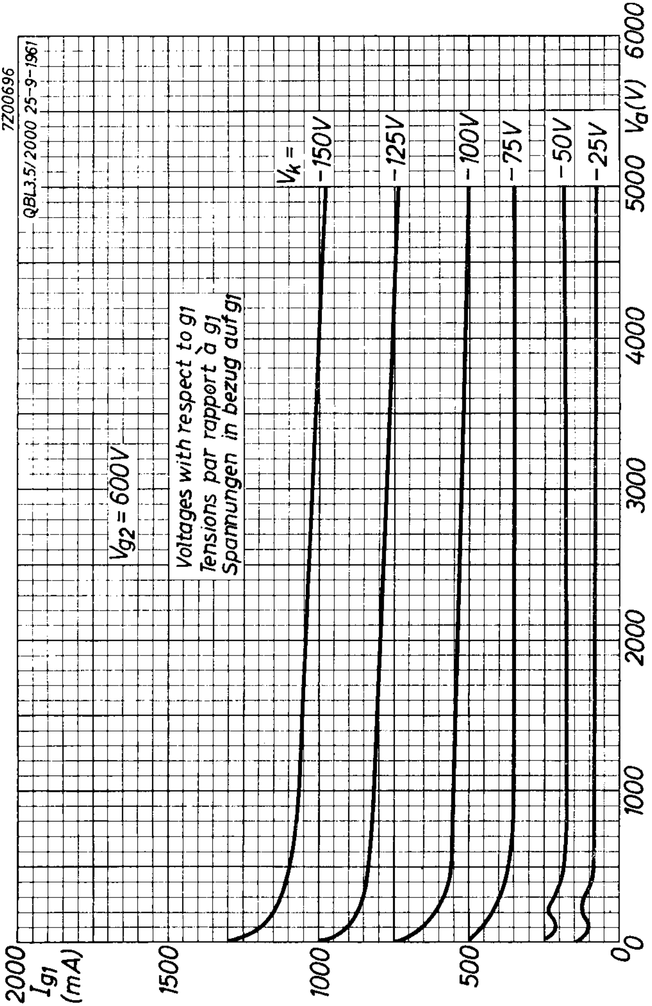
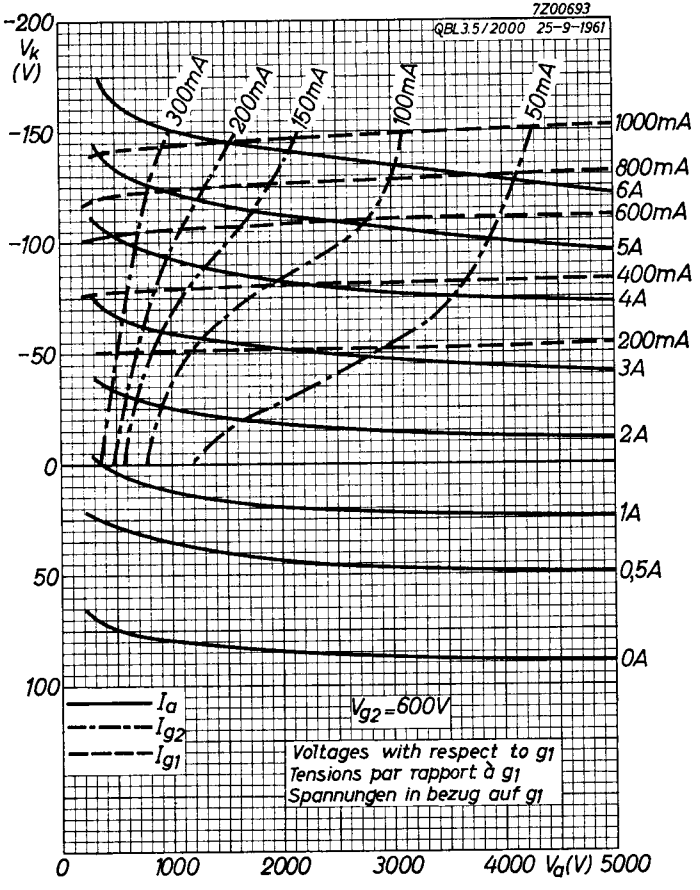

7Z00697
QBL3.5/2000 25-9-1961
V_k =
-150V
-125V
-100V
-75V
-50V
-25V
0V
25V
50V
V_{g2} = 600V
Voltages with respect to g1
Tensions par rapport à g1
Spannungen in bezug auf g1
I_a (A)
8
6
4
2
0
0
1000
2000
3000
4000
5000
V_a(V)
6000


V_{g2} = 600V
Voltages with respect to g_1
Tensions par rapport à g_1
Spannungen in bezug auf g_1
V_k =
−150V
−125V
−100V
− 75V
− 50V
− 25V
0V
25V
50V
I_{g2} (mA)
1500
1000
500
0
0
1000
2000
3000
4000
V_a(V)
5000


7Z00696
QBL3.5/2000 25-9-1961
Vg2 = 600V
Voltages with respect to g1
Tensions par rapport à g1
Spannungen in bezug auf g1
Vk =
-150V
-125V
-100V
-75V
-50V
-25V
Va(V)
0
1000
2000
3000
4000
5000
6000
Ig1 (mA)
2000
1500
1000
500
0

QBL3.5/2000

PHILIPS



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PHILIPS

Electronic Tube

HANDBOOK

QBL3.5/2000

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1	1	1961.10.10
2	1	1962.11.11
3	2	1961.10.10
4	2	1962.11.11
5	3	1961.10.10
6	3	1962.11.11
7	4	1961.10.10
8	4	1962.11.11
9	5	1961.10.10
10	5	1962.11.11
11	6	1961.10.10
12	6	1962.11.11
13	A	1961.10.10
14	A	1962.11.11
15	B	1961.10.10
16	B	1962.11.11
17	C	1961.10.10
18	C	1962.11.11
19	D	1961.10.10

20	D	1962.11.11
21	E	1961.10.10
22	F	1961.10.10
23	G	1961.10.10
24	H	1961.10.10
25, 26	FP	1999.10.19