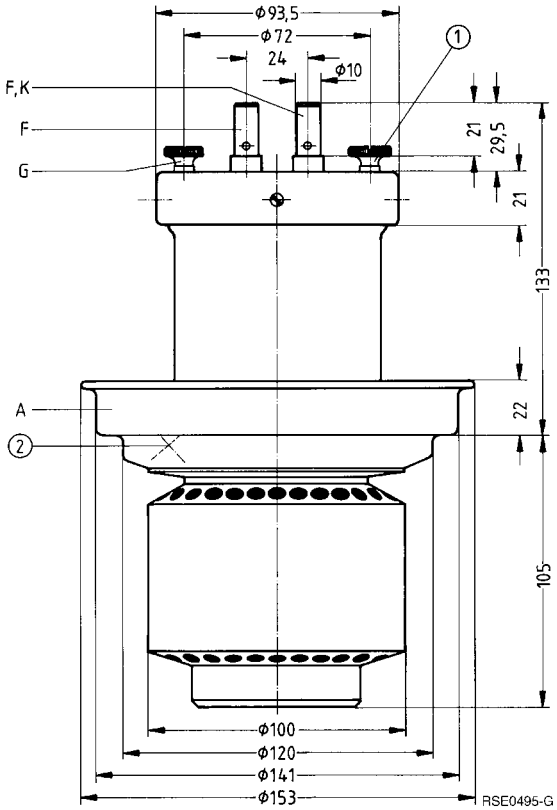
Ordering code Q53-X2011

Vapor-cooled triode with coaxial grid lead-through. Due to the low amplification factor the tube is particularly suitable for driver stages of AF amplifiers and modulators in sequential cathode circuit.

When used as RF amplifier the tube can be operated at 11 kV up to 30 MHz and at 8 kV up to 70 MHz.



Dimensions in mm

① 4 tapholes M4 (4 × 90°)
② Taphole M5 for tube fuse RöSich4

Approx. weight 4 kg

Heating

Heater voltage	U_F	10	V
Heater current	I_F	≈ 70	A
Heating: direct			
Cathode: thoriated tungsten			

Characteristics

Emission current at $U_A = U_G = 400$ V	I_{em}	20	A
Amplification factor at $U_A = 1$ to 6 kV, $I_A = 1$ A	μ	15	
Transconductance at $U_A = 3$ kV, $I_A = 1$ A	s	20	mA/V

Capacitances

Cathode/grid	c_{kg}	≈ 48	pF
Cathode/anode	c_{ka}	≈ 1,3	pF [1)]
Grid/anode	c_{ga}	≈ 23	pF

Accessories		**Ordering code**
Mounting instruction	RöMo45	
Mounting instruction	RöMo54	
Cathode connecting strip (2 for each tube)	RöKat61	Q81-X1161
Socket wrench for tube fuse	RöZub10	Q81-X2110
Tube fuse	RöSich4	Q81-X1404
Pull switch for tube fuse	RöKt11	Q81-X1311
Boiler	RöKüV61	Q81-X1661
Insulating pipe at water inlet	RöKüV01Zub4	Q81-X1604
Union at water inlet	RöKüV01Zub7	Q81-X1607
Gasket at vapor outlet	RöKüV01Zub8	Q81-X1608
Insulating pipe at vapor outlet	RöKüV31Zub3	Q81-X1633
Insulator	RöKüV61Zub5K	Q81-X1666
Water level stabilizer with control electrodes	RöZubV4	Q81-X2105
LL electrolytic target	RöEl21	C65055-A667-A21
Gasket ring for boiler	RöN9370	C65051-A360-C516

1) Measured by means of a 30 cm × 30 cm screening plate in the grid terminal plane.

RF amplifier,
class C operation, grounded cathode circuit

Maximum ratings

Frequency	f	30	70	MHz
Anode voltage (dc)	U_A	11	8,0	kV
Grid voltage (dc)	U_G	– 1200	– 1200	V
Cathode current (dc)	I_K	5,0	5,0	A
Peak cathode current	$I_{K M}$	20	20	A
Anode dissipation	P_A	12	12	kW
Grid dissipation	P_G	100	60	W

Operating characteristics

Frequency	f	≤ 30	≤ 70	MHz
Output power	P_2	22	12	kW [1])
Anode voltage (dc)	U_A	10	7,0	kV
Grid voltage (dc)	U_G	– 960	– 700	V
Peak grid voltage (ac)	$U_{g m}$	1260	950	V
Anode current (dc)	I_A	2,8	2,3	A
Grid current (dc)	I_G	275	250	mA
Anode input power	$P_{B A}$	28	16	kW
Drive power	P_1	335	210	W [1])
Anode dissipation	P_A	6,0	4,0	kW
Grid dissipation	P_G	70	35	W
Efficiency	η	78,5	75	%
Anode load resistance	R_A	1840	1500	Ω

1) Circuit losses are not included.

Anode voltage modulation, grounded cathode circuit

Maximum ratings

Frequency	f	30	MHz
Anode voltage (dc)	U_A	6,5	kV
Grid voltage (dc)	U_G	– 1200	V
Cathode current (dc)	I_K	5,0	A
Peak cathode current	$I_{K\,M}$	20	A
Anode dissipation	P_A	12	kW
Grid dissipation	P_G	100	W

Operating characteristics

Frequency	f	≤ 30	MHz
Carrier power	P_{trg}	6,0	kW [1]
Anode voltage (dc)	U_A	6,0	kV
Grid bias (dc), fixed	$U_{G\,fix}$	– 400	V
Grid resistance	R_G	3,0	kΩ
Peak grid voltage (ac)	$U_{g\,m}$	1260	V
Anode current (dc)	I_A	1,25	A
Grid current (dc)	I_G	210	mA
Anode input power	$P_{B\,A}$	7,5	kW
Drive power	P_1	260	W [1]
Anode dissipation	P_A	1,5	kW [2]
Grid dissipation	P_G	40	W
Efficiency	η	80	%
Anode load resistance	R_A	2,7	kΩ
Modulation factor	m	100	%
Modulation power	P_{mod}	3,75	kW
Grid current (dc)	I_G	240	mA [3]
Drive power	P_1	295	W [1] [3]
Grid current (dc)	I_G	200	mA [4]
Drive power	P_1	245	W [1] [4]

1) Circuit losses are not included.
2) Even during modulation the indicated maximum ratings must not be exceeded. It has to be observed that during 100 % modulation the anode dissipation increases to about 1,5 times the power dissipation stated for the carrier value.
3) Maximum values at U_A = 0 V.
4) Maximum values at peak modulation.

AF amplifier and modulator,
class B operation, 2 tubes in push-pull circuit

Maximum ratings

Anode voltage (dc)	U_A	11	kV
Grid voltage (dc)	U_G	– 1000	V
Cathode current (dc)	I_K	5,0	A
Peak cathode current	$I_{K\,M}$	20	A
Anode dissipation	P_A	12	kW
Grid dissipation	P_G	100	W
Grid resistance	R_G	10	kΩ

Operating characteristics

P_2	0	39	0	16	0	16	kW
U_A	10	10	10	10	10	10	kV
U_G	– 750	– 750	– 750	– 750	– 750	– 750	V
$U_{gg\,m}$	0	1950	0	1720	0	1500	V
I_A	$2 \times 0{,}3$	$2 \times 2{,}67$	$2 \times 0{,}3$	$2 \times 1{,}1$	$2 \times 0{,}3$	$2 \times 1{,}5$	A
I_G	0	2×185	0	2×42	0	0	mA
$I_{G\,M}$	0	$2 \times 1{,}6$	0	$2 \times 0{,}42$	0	0	A
$P_{B\,A}$	2×3	$2 \times 26{,}7$	2×3	2×11	2×3	2×15	kW
P_1	0	2×170	0	2×32	0	0	W
P_A	2×3	$2 \times 7{,}2$	2×3	2×3	2×3	2×7	kW
P_G	0	2×30	0	2×1	0	0	W
η	–	73	–	73	–	53	%
R_{AA}	–	4,15	–	10,1	–	6,1	kΩ

AF amplifier and modulator,
class B operation, 2 tubes in push-pull circuit

Maximum ratings

Anode voltage (dc)	U_A	11	kV
Grid voltage (dc)	U_G	– 1000	V
Cathode current (dc)	I_K	5,0	A
Peak cathode current	$I_{K\,M}$	20	A
Anode dissipation	P_A	12	kW
Grid dissipation	P_G	100	W
Grid resistance	R_G	10	kΩ

Operating characteristics

P_2	0	16	0	10	0	10	kW
U_A	8,0	8,0	8,0	8,0	8,0	8,0	kV
U_G	– 600	– 600	– 610	– 610	– 620	– 620	V
$U_{gg\,m}$	0	1470	0	1380	0	1220	V
I_A	$2 \times 0{,}25$	$2 \times 1{,}4$	$2 \times 0{,}2$	$2 \times 0{,}9$	$2 \times 0{,}15$	$2 \times 1{,}1$	A
I_G	0	2×60	0	2×27	0	0	mA
$I_{G\,M}$	0	$2 \times 0{,}6$	0	$2 \times 0{,}27$	0	0	A
$P_{B\,A}$	2×2	$2 \times 11{,}2$	$2 \times 1{,}6$	$2 \times 7{,}2$	$2 \times 1{,}2$	$2 \times 8{,}8$	kW
P_1	0	2×43	0	2×18	0	0	W
P_A	2×2	$2 \times 3{,}2$	$2 \times 1{,}6$	$2 \times 2{,}2$	$2 \times 1{,}2$	$2 \times 3{,}8$	kW
P_G	0	2×7	0	$2 \times 1{,}5$	0	0	W
η	–	72	–	70	–	57	%
R_{AA}	–	6,12	–	9,8	–	5,5	kΩ

Driver stage for AF amplifier and modulator,
class B operation, 2 tubes in push-pull circuit, cathode follower, $I_G = 0$

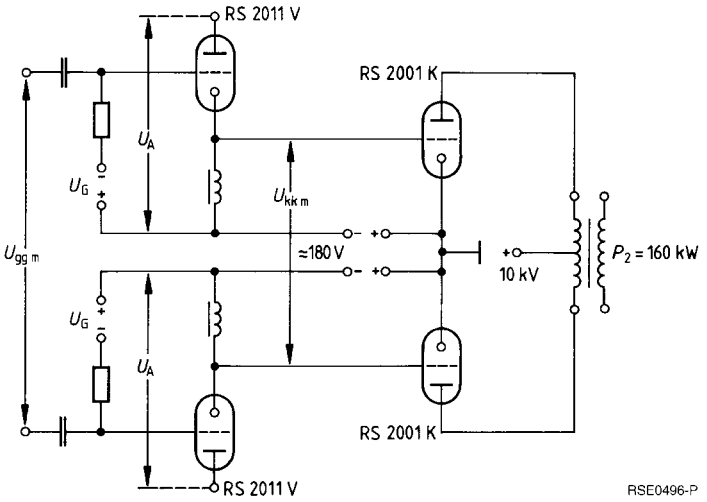
Maximum ratings

Anode voltage (dc)	U_A	11	kV
Grid voltage (dc)	U_G	– 1000	V
Cathode current (dc)	I_K	5,0	A
Peak cathode current	$I_{K\,M}$	20	A
Anode dissipation	P_A	12	kW
Grid dissipation	P_G	100	W
Grid resistance	R_G	10	kΩ

Operating characteristics (see circuit example)

Anode voltage (dc)	U_A	4,9	4,9	kV
Grid voltage (dc)	U_G	– 320	– 320	V
Peak control grid voltage (ac) between the 2 tubes	$U_{gg\,m}$	0	1550	V
Peak cathode voltage (ac) between the 2 tubes	$U_{kk\,m}$	0	910	V
Cathode current (dc)	I_K	$2 \times 0{,}5$	$2 \times 1{,}85$	A
Peak cathode current	$I_{K\,M}$	$(2 \times 0{,}5)$	$2 \times 9{,}8$	A
Anode input power	$P_{B\,A}$	$2 \times 2{,}45$	$2 \times 9{,}1$	kW
Anode dissipation	P_A	$2 \times 2{,}45$	$2 \times 8{,}35$	kW

Circuit example



Tube mounting

Axis vertical, anode down.

For connection of the cathode use the terminals listed under “Accessories”.

A number of M4 tapholes is provided at the grid terminal ring for grid connection; the delivery includes knurled head screws for this purpose.

Maximum tube surface temperature

The temperature of the glass and metal parts and of the cathode terminals must not exceed 220 °C at any point.

Vapor cooling

Cooling data for maximum anode dissipation	$P_{A\,max}$ = 12 kW
Total power dissipated by the cooling system ($P_A + P_G + 0{,}8\ P_F$)	12,7 kW
Equivalent thermal output	760 kJ/min (182 kcal/min)
Flow rate of returning water	
at returning water temperature of 20 °C	approx. 0,30 l/min
at returning water temperature of 90 °C	approx. 0,35 l/min
Volume of generated vapor	
at returning water temperature of 20 °C	approx. 0,50 m³/min
at returning water temperature of 90 °C	approx. 0,56 m³/min

Detailed information on vapor cooling upon request. Please observe instructions on vapor cooling given under “Explanations on Technical Data”.

Safety precautions

The section “Safety precautions” under “Explanations on Technical Data” describes how the tube is to be protected against damage due to electric overload or insufficient cooling. A copper wire with 0,20 mm diameter should be used to test the anode overcurrent trip circuit.

For protection against thermal anode overload the tube fuse RöSich4 is recommended. In conjunction with pull switch RöKt11 it disconnects the voltages at the tube in case of overload (see accessories).

$U_G = f(U_A)$ Parameter = I_A ——————————
Parameter = I_G — — — — — — —