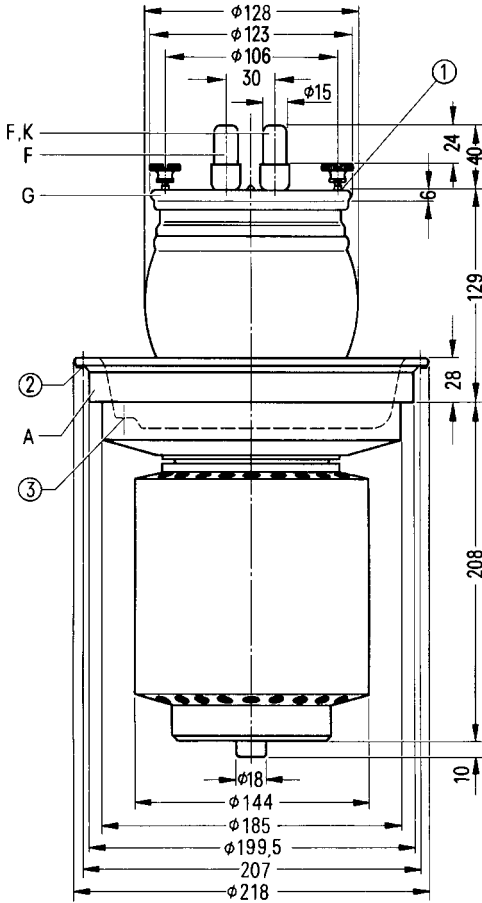


For frequencies up to 70 MHz

Ordering code Q53-X2021

Vapor-cooled triode with coaxial grid lead-through, suitable for use as RF amplifier, oscillator and modulator.



Dimensions in mm

- ① 12 tapholes M5 ($12 \times 30^\circ$)
- ② Taphole M6 for screw-in handle R6Zub31V
- ③ Taphole M5 for tube fuse R6Sich4

Approx. weight 17 kg

Heating

Heater voltage	U_F	12,6	V
Heater current	I_F	≈ 160	A
Heating: direct			
Cathode: thoriated tungsten			

Characteristics

Emission current at $U_A = U_G = 700$ V	I_{em}	75	A
Amplification factor at $U_A = 1$ to 6 kV, $I_A = 1$ A	μ	58	
Transconductance at $U_A = 3$ kV, $I_A = 1$ A	s	60	mA/V

Capacitances

Cathode/grid	c_{kg}	≈ 120	pF
Cathode/anode	c_{ka}	≈ 1,4	pF ¹⁾
Grid/anode	c_{ga}	≈ 50	pF

Accessories

Ordering code

Mounting instruction	RöMo64	
Mounting instruction	RöMo85	
Cathode connecting strip (2 for each tube)	RöKat221	Q81-X1136
Grid terminal	RöGit01	Q81-X901
Socket wrench for tube fuse	RöZub10	Q81-X2110
Handle	RöZub31V	Q81-X2133
Tube fuse	RöSich4	Q81-X1404
Pull switch for tube fuse	RöKt11	Q81-X1311
Boiler	RöKüV221	Q81-X1681
Insulating pipe at water inlet	RöKüV31Zub4	Q81-X1634
Union at water inlet	RöKüV31Zub7	Q81-X1637
Insulating pipe at vapor outlet	RöKüV201Zub3	Q81-X1673
Gasket at vapor outlet	RöKüV201Zub8	Q81-X1678
Insulator	RöKüV221Zub5K	Q81-X1686
Water level stabilizer with control electrodes	RöZubV4	Q81-X2105
LL electrolytic target	RöEI21	C65055-A667-A21
Gasket ring for boiler	RöN9373	C65051-A182-C506

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

**RF amplifier,
class B operation, grounded cathode circuit**

Maximum ratings

Frequency	f	10	30	MHz
Anode voltage (dc)	U_A	16	12,5	kV
Grid voltage (dc)	U_G	- 1000	- 1000	V
Cathode current (dc)	I_K	18	18	A
Peak cathode current	I_{KM}	65	65	A
Anode dissipation	P_A	60	60	kW
Grid dissipation	P_G	1300	1300	W

Operating characteristics

Frequency	f	≤ 10	≤ 10	≤ 30	≤ 30	MHz
Output power	P_2	110	85	110	85	kW 1)
Anode voltage (dc)	U_A	15	15	12	12	kV
Grid voltage (dc)	U_G	- 260	- 260	- 210	- 210	V
Peak grid voltage (ac)	$U_{g,m}$	600	520	650	520	V
Anode current (dc)	I_A	10,1	7,75	12,7	9,85	A
Grid current (dc)	I_G	2,0	1,3	3,0	1,9	A
Anode input power	P_{BA}	151	116,3	153	118	kW
Drive power	P_1	1080	610	1770	880	W 1)
Anode dissipation	P_A	41	31,3	43	33	kW
Grid dissipation	P_G	560	270	1140	480	W
Efficiency	η	73	73	72	72	%
Anode load resistance	R_A	920	1235	590	775	Ω

1) Circuit losses are not included.

**RF amplifier,
class B operation, grounded grid circuit**

Maximum ratings

Frequency	f	10	30	60	MHz
Anode voltage (dc)	U_A	16	12,5	8,5	kV
Grid voltage (dc)	U_G	- 1000	- 1000	- 1000	V
Cathode current (dc)	I_K	18	18	18	A
Peak cathode current	I_{KM}	65	65	65	A
Anode dissipation	P_A	60	60	60	kW
Grid dissipation	P_G	1300	1300	1100	W

Operating characteristics

Frequency	f	≤ 10	≤ 30	≤ 60	MHz
Output power	P_2	85 + 3,1 ²⁾	85 + 3,9 ²⁾	57 + 3,5 ²⁾	kW ¹⁾
Anode voltage (dc)	U_A	15	12	8,0	kV
Grid voltage (dc)	U_G	- 260	- 210	- 130	V
Peak grid voltage (ac)	U_{gm}	520	520	460 ³⁾	V
Anode current (dc)	I_A	7,75	9,85	10	A
Grid current (dc)	I_G	1,3	1,8	2,3	A
Anode input power	P_{BA}	116,3	118	80	kW
Drive power	P_1	0,61+3,1 ²⁾	0,88+3,9 ²⁾	0,93+3,5 ²⁾	kW ¹⁾
Anode dissipation	P_A	31,3	33	23	kW
Grid dissipation	P_G	270	480	630	W
Efficiency	η	73	72	71	%
Anode load resistance	R_A	1280	815	490	Ω

1) Circuit losses are not included.

2) Power transition of grounded grid circuit.

3) For $f = 60$ MHz, the maximum permissible value of grid voltage $U_{gm \max} = 500$ V, when simultaneously keeping all other maximum ratings.

**RF amplifier,
class C operation, grounded cathode circuit**

Maximum ratings

Frequency	f	10	30	MHz
Anode voltage (dc)	U_A	16	12,5	kV
Grid voltage (dc)	U_G	- 1000	- 1000	V
Cathode current (dc)	I_K	18	18	A
Peak cathode current	$I_{K M}$	65	65	A
Anode dissipation	P_A	60	60	kW
Grid dissipation	P_G	1300	1300	W

Operating characteristics

Frequency	f	≤ 10	≤ 30	≤ 30	≤ 30	MHz
Output power	P_2	120	90	72	55	kW 1)
Anode voltage (dc)	U_A	15	12	10	8,0	kV
Grid voltage (dc)	U_G	- 600	- 550	- 500	- 450	V
Peak grid voltage (ac)	$U_{g m}$	1000	940	875	810	V
Anode current (dc)	I_A	9,75	9,25	9,0	8,75	A
Grid current (dc)	I_G	2,2	2,2	2,1	1,85	A
Anode input power	$P_{B A}$	146	111	90	70	kW
Drive power	P_1	2,1	1,9	1,7	1,55	kW 1)
Anode dissipation	P_A	26	21	18	15	kW
Grid dissipation	P_G	780	690	650	605	W
Efficiency	η	82	81	80	78,5	%
Anode load resistance	R_A	850	710	600	485	Ω

1) Circuit losses are not included.

**RF amplifier,
class C operation, grounded grid circuit**

Maximum ratings

Frequency	f	10	30	MHz
Anode voltage (dc)	U_A	16	12,5	kV
Grid voltage (dc)	U_G	- 1000	- 1000	V
Cathode current (dc)	I_K	18	18	A
Peak cathode current	$I_{K M}$	65	65	A
Anode dissipation	P_A	60	60	kW
Grid dissipation	P_G	1300	1300	W

Operating characteristics

Frequency	f	≤ 10	≤ 30	≤ 30	≤ 30	MHz
Output power	P_2	120+8,5 ²⁾	90+7,7 ²⁾	72+6,9 ²⁾	55+6,1 ²⁾	kW ¹⁾
Anode voltage (dc)	U_A	15	12	10	8,0	kV
Grid voltage (dc)	U_G	- 600	- 550	- 500	- 450	V
Peak grid voltage (ac)	$U_{g m}$	1000	940	875	810	V
Anode current (dc)	I_A	9,75	9,25	9,0	8,75	A
Grid current (dc)	I_G	2,2	2,2	2,1	1,85	A
Anode input power	$P_{B A}$	146	111	90	70	kW
Drive power	P_1	2,1+8,5 ²⁾	1,9+7,7 ²⁾	1,7+6,9 ²⁾	1,55+6,1 ²⁾	kW ¹⁾
Anode dissipation	P_A	26	21	18	15	kW
Grid dissipation	P_G	780	690	650	605	W
Efficiency	η	82	81	80	78,5	%
Anode load resistance	R_A	910	770	656	540	Ω

1) Circuit losses are not included.

2) Power transition of grounded grid circuit.

Anode voltage modulation, grounded cathode circuit

Maximum ratings

Frequency	f	30	MHz
Anode voltage (dc)	U_A	11,5	kV
Grid voltage (dc)	U_G	- 1000	V
Cathode current (dc)	I_K	12	A
Peak cathode current	I_{KM}	75	A
Anode dissipation	P_A	60	kW
Grid dissipation	P_G	1300	W

Operating characteristics

Frequency	f	≤ 30	≤ 30	MHz
Carrier power	P_{trg}	66	55	kW ¹⁾
Anode voltage (dc)	U_A	11	10	kV
Grid bias (dc), fixed	$U_{G\text{ fix}}$	- 200	- 190	V
Grid resistance	R_G	90	80	Ω
Peak grid voltage (ac)	$U_{g\text{ m}}$	880	810	V
Anode current (dc)	I_A	7,6	6,9	A
Grid current (dc)	I_G	3,1	3,1	A
Anode input power	$P_{B\text{ A}}$	83,6	69	kW
Drive power	P_1	2,7	2,4	kW ¹⁾
Anode dissipation	P_A	17,6	14	kW ²⁾
Grid dissipation	P_G	1140	1000	W
Efficiency	η	79	79	%
Anode load resistance	R_A	920	930	Ω
Modulation factor	m	100	100	%
Modulation power	P_{mod}	41,8	34,5	kW
Grid current (dc)	I_G	3,95	3,8	A ³⁾
Drive power	P_1	3,25	2,9	kW ¹⁾ ³⁾
Grid current (dc)	I_G	2,6	2,4	A ⁴⁾
Drive power	P_1	2,1	1,8	kW 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 $U_A = 0\text{ V}$.

4) Maximum values at peak modulation.

**Anode voltage modulation,
grounded grid circuit**

Maximum ratings

Frequency	f	30	MHz
Anode voltage (dc)	U_A	11,5	kV
Grid voltage (dc)	U_G	- 1000	V
Cathode current (dc)	I_K	12	A
Peak cathode current	I_{KM}	75	A
Anode dissipation	P_A	60	kW
Grid dissipation	P_G	1300	W

Operating characteristics

Frequency	f	≤ 30	≤ 30	MHz
Carrier power	P_{trg}	66 + 5,3 ²⁾	55 + 4,4 ²⁾	kW ¹⁾
Anode voltage (dc)	U_A	11	10	kV
Grid bias (dc), fixed	$U_{G\text{ fix}}$	- 200	- 190	V
Grid resistance	R_G	90	80	Ω
Peak grid voltage (ac)	$U_{g,m}$	880	810	V
Anode current (dc)	I_A	7,6	6,9	A
Grid current (dc)	I_G	3,1	3,1	A
Anode input power	$P_{B,A}$	83,6	69	kW
Drive power	P_1	2,7 + 5,3 ²⁾	2,4 + 4,4 ²⁾	kW ¹⁾
Anode dissipation	P_A	17,6	14	kW ³⁾
Grid dissipation	P_G	1140	1000	W
Efficiency	η	79	79	%
Anode load resistance	R_A	990	985	Ω
Modulation factor	m	100	100	%
Peak modulation voltage	$U_{mod\ m}$	11	10	kV
Modulation power	P_{mod}	43	35	kW
Grid current (dc)	I_G	3,95	3,8	A ⁴⁾
Drive power	P_1	3,25 + 0 ²⁾	2,9 + 0 ²⁾	kW ¹⁾ 4)
Grid current (dc)	I_G	2,6	2,4	A ⁵⁾
Drive power	P_1	2,1+11,25 ²⁾	1,8 + 9,4 ²⁾	kW ¹⁾ 5)
Anode dissipation during modulation	$P_{A\ mod}$	27	21	kW

1) Circuit losses are not included.

2) Power transition of grounded grid circuit.

3) 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.

4) Maximum values at $U_A = 0\text{ V}$.

5) 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	12	kV
Grid voltage (dc)	U_G	- 1000	V
Cathode current (dc)	I_K	18	A
Peak cathode current	I_{KM}	65	A
Anode dissipation	P_A	60	kW
Grid dissipation	P_G	1300	W

Operating characteristics

at modulator operation for

		100 kW carrier power				
Output power	P_2	0	78	0	78	kW
Anode voltage (dc)	U_A	11	11	10	10	kV
Grid voltage (dc)	U_G	- 190	- 190	- 170	- 170	V
Peak control grid voltage (ac) between the 2 tubes	U_{ggm}	0	710	0	710	V
Anode current (dc)	I_A	$2 \times 0,4$	$2 \times 5,3$	$2 \times 0,4$	$2 \times 5,75$	A
Grid current (dc)	I_G	0	$2 \times 0,6$	0	$2 \times 0,72$	A
Peak grid current	I_{GM}	0	$2 \times 3,6$	0	2×4	A
Anode input power	P_{BA}	2×4	2×58	2×4	$2 \times 57,5$	kW
Drive power	P_1	0	2×190	0	2×235	W
Anode dissipation	P_A	2×4	2×19	2×4	$2 \times 18,5$	kW
Grid dissipation	P_G	0	2×75	0	2×115	W
Efficiency	η	-	67,5	-	68	%
Effective load resistance (anode to anode)	R_{AA}	-	2260	-	1810	Ω

Tube mounting

Axis vertical, anode down.

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

For the connection of the grid a number of tapholes M5 is provided at the grid terminal ring; the delivery includes knurled head screws for this purpose.

The use of the concentric grid terminal as listed under “Accessories” is recommended if a very low grid line inductance is required. This concentric grid terminal is equipped with a large number of contact springs which closely join the surface of the grid contact ring.

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	$P_{A \max} = 60 \text{ kW}$
Total power to be dissipated by the cooling system ($P_A + P_G + 0,8 P_F$)	63 kW
Equivalent thermal output	3780 kJ/min (900 kcal/min)
Flow rate of returning water	
at returning water temperature of 20 °C	approx. 1,5 l/min
at returning water temperature of 90 °C	approx. 1,7 l/min
Volume of generated vapor	
at returning water temperature of 20 °C	approx. 2,5 m ³ /min
at returning water temperature of 90 °C	approx. 2,8 m ³ /min

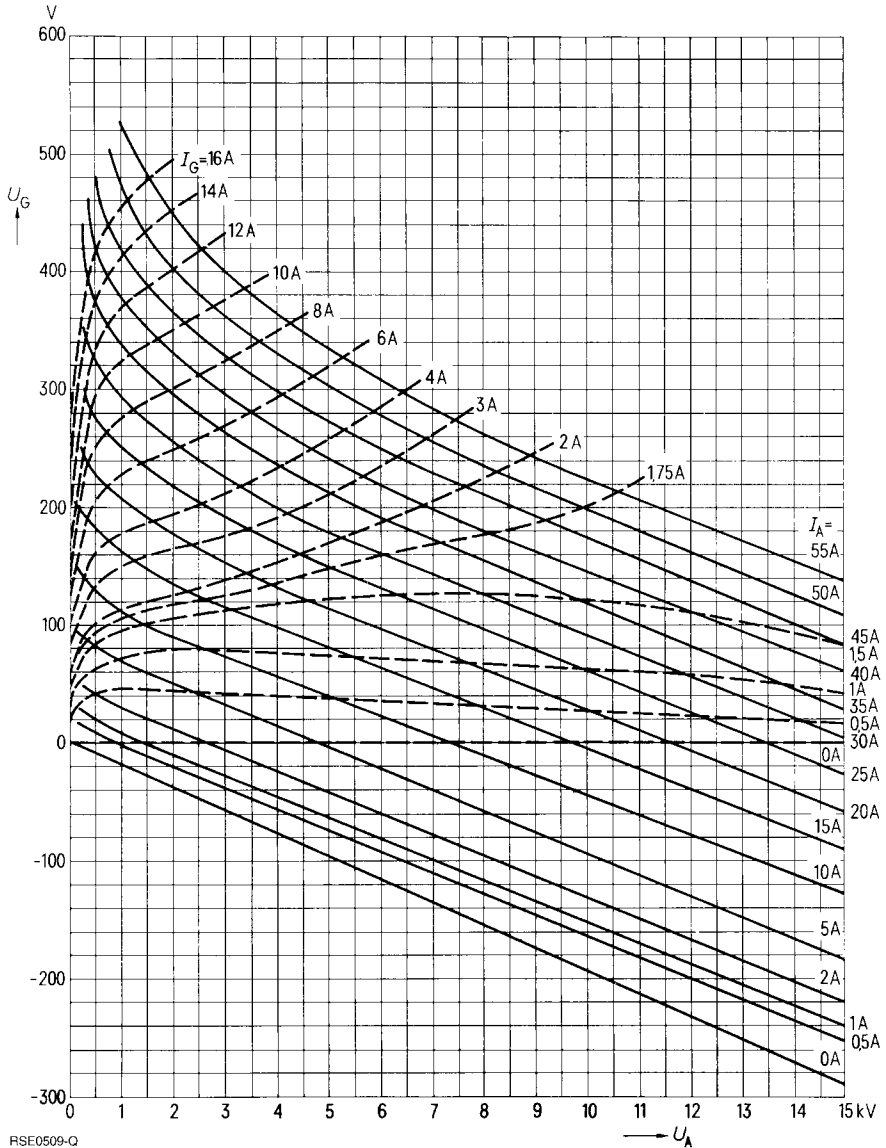
Detailed information on vapor cooling upon request. Please observe instructions on vapor cooling given under “Explanations on Technical Data”.

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 0,26 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 - - - - -



RSE0509-Q